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The Middle Paleolithic of Arabia*

The study focuses on the origin and evolution of the Middle Paleolithic in the Arabian Peninsula, a major crossroads of human and animal migrations connecting Africa with Eurasia in the Late Middle and Early Late Pleistocene. Middle Paleolithic human dispersal in Arabia was caused by intermittent environmental changes and related fluctuations of the Bab-el-Mandeb level. A key role in the African Middle Paleolithic was played by Afro-Arabian Nubian lithic industries showing characteristic Levallois features and associated with anatomically modern humans who had migrated from Africa. Arabian finds are discussed with reference to the Out-of-Africa and Multiregional models of human evolution. Based on the totality of cranial, archaeological, and paleogenetic data, it is proposed that modern humankind emerged from an admixture of at least four related taxa, which had evolved in Africa and Eurasia. A hypothesis about the migration of Homo sapiens from Africa across Arabia to Southeast Asia and Sahul 70–50 ka BP is discussed.

Keywords: *Aridization, pluvials, Pleistocene, Levallois reduction method, bifaces, Afro-Arabian Nubian industry.*

The main Middle Paleolithic sites of Arabia

Owing to its geographical position, the Arabian Peninsula, just as the Levantine corridor, was an extremely important transition region for animals and humans, migrating between Africa and Eurasia. The possibility for migration through Arabia was determined by climatic conditions. Over 3 million square kilometers of the Peninsula are covered with deserts. During periods of cooling, an arid climate would emerge in Arabia, when the sea level would decrease and the Bab-el-Mandeb would dry out, or large areas of ground with small channels, passable for human and animal migrations, would emerge between the African and Arabian shores. During aridization of the climate on the Peninsula, desertification would intensify, particularly in the interior areas. Areas of comfortable living environment would shrink, and human communities would concentrate around paleolakes, in refugia where there were available water sources. The prolonged habitation of human groups in isolation triggered the appearance of new techniques of primary and secondary lithic reduction. During the pluvials, the areas of human and animal habitation would expand, and migrations within the Arabian Peninsula would become more intense. Moving between Africa and Eurasia would become hampered owing to the rise of the sea level, when the Bab-el-Mandeb would become a serious obstacle.

According to its natural environment, Arabia belongs to the Saharo-Arabian phytogeographic region. From

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this point of view, the most favorable periods for the settlement of humans in the Peninsula in the Middle Paleolithic were MIS 5e and 5a*, and the first half of MIS 3 (Sanlaville, 1992; Rose, 2004; Rosenberg et al., 2012; Drake, Breeze, Parker, 2013; and others). After 115 ka BP, when Arabia and the Levant had the most favorable environmental conditions for vegetation, the Sahara and all of North Africa experienced a period of strong aridization (Drake, Breeze, Parker, 2013). In MIS 5.2 (100–90 ka BP), Arabia also underwent considerable aridization (Preusser, 2009). In the first half of MIS 3 (55–50 ka BP), conditions for human habitation in Arabia slightly improved, as is evidenced by the sites in the area of Wadi Surdud in the western part (Delagnes et al., 2012) and Jebel Faya 1 (the upper cultural layers) in the eastern part of the Peninsula (Armitage et al., 2011). Both sites were located in a kind of refugium with reliable sources of water.

The periods when pluvial and arid conditions did not coincide in various parts of the region, were most favorable for migration processes. The specific environmental situation in the Arabian Peninsula determined the character of human settlement in the region and the techno-typological features of the industry in the Middle Paleolithic. We should mention the possibility of multiple human migrations from Africa into Arabia at the end of the Middle/Late Pleistocene, and a wide variety of industries, which resulted from the prolonged isolated habitation of human populations around paleolakes in extremely arid periods. When the climate would become warmer and more humid, arid steppes and deserts would turn into semi-arid savannah, the territories of comfortable human habitation would greatly expand, and the humans could have migrated not only all over the Peninsula, but also from Africa to Arabia and back (Rosenberg et al., 2011, 2012), as well as to the neighboring regions.

Thus, there were several periods of warming accompanied by increased humidity in the Late Pleistocene. Humans inhabited not only oases but also desert areas of Arabia. Particularly favorable was the initial period of the last interglacial stage, when a warm and humid climate was established in the Peninsula, and an arid climate was established over a significant part of Northeast Africa. The population in Arabia decreased during cooling and aridization. The prolonged habitation of hunter-gatherer groups in isolated natural and climatic niches led to technological divergence and the emergence of local Middle Paleolithic industries. At the time when climate conditions in the Levant and Arabia significantly differed, hunter-gatherer groups would move to the areas with a more favorable climate, and migrations from north to south and back would become more active.

The dynamics of migration flows between Africa and Arabia largely depended on sea level changes. When the sea level was lower, significant areas of coastal plains would emerge in Arabia and become inhabited by humans. A reverse process would occur when the sea level would rise: the sea would swallow the coastal areas, including those where Paleolithic sites used to be located. Therefore, the sites that emerged during the regression of the sea are presently not available for archaeological study. As it was mentioned above, the periods of warming and increased humidity were favorable for the movement of people from Africa to Arabia and within Arabia, but at the same time, the strait separating the south of Arabia from Africa also expanded. This mismatch of various parts of the region in their climatic conditions determined the specific nature of human settlement in Arabia in the Pleistocene.

In Arabia, no paleoanthropological finds of the Early and Middle Pleistocene have been discovered. The most numerous Lower Paleolithic sites in this region belong to the Acheulean tradition (Petraglia, 2003). A number of Lower Paleolithic localities with pebble-and-flake and Acheulean industries were discovered in Arabia by the Soviet-Yemen expedition, which worked for 20 years starting in 1992. The expedition results have been summarized by K.A. Amirkhanov (1991, 2006) in numerous articles and two monographs. The earliest Paleolithic localities with the pebble-and-flake industry, found by the expedition members, date between 1.65–1.35 Ma BP (Amirkhanov, 2006). During the field work, 21 sites with the Acheulean industry were found in addition to the sites with the pebble-and-flake industry. Four sites with the Acheulean industry, Mashhad I, III, IV, and V, have been identified as stratified sites.

Sites in various geomorphological positions containing the Acheulean industry were studied by Amirkhanov in several provinces of South Yemen. They form several groups oriented in a west-east direction. The easternmost group comprised localities of Wadi Dawan, the western group—localities in the Jebel Tala area. They are separated by approximately 700 km.

A total of 342 artifacts were discovered at the sites, including 52 artifacts identified as bifaces or partially prepared biface-like tools. The majority of the finds represented waste products or the results of raw material testing. The tool set was dominated by a variety of side-scrapers.

Products of primary reduction at the Acheulean localities of South Arabia were mostly represented by single-platform cores. Double-platform cores were very scarce. A small number of cores did not have specially-

*The designation of intervals according to oxygen isotope stages (numeric and alphabetic) in this article corresponds to that of the studies listed in the references.

prepared striking platforms, and hammerstone strikes were applied against the natural surface. The majority of cores showed striking platforms shaped by one or two transverse spalls. Quite often, striking surfaces constituted a sharp angle with the flaking surface. Additional rejuvenation of the striking platform was not performed. Cores were reduced by removing parallel and sub-parallel massive blades and blade-flakes. As Amirkhanov observed, "Firstly, we cannot speak about the borrowing of this technique, since it emerged very early and was conditioned by the peculiarities of the local raw materials. Secondly, the introduction of the sub-parallel reduction technique did not lead to a qualitative change in the industry or to substantial acceleration of the Paleolithic culture development. Broadly defined, the Levallois reduction technique is combined here with the widespread use of bifacially worked tools" (2006: 142).

The Acheulean tradition of South Arabia, from our point of view, represents special and very clear evidence of the fact that the Acheulean is not a culture but an industry. In this regard, it is very important to consider the chronology of emergence of the bifacial technique in Arabia. Amirkhanov divides the Acheulean localities of South Arabia into early Acheulean and late Acheulean, according to techno-typological criteria. In his opinion, Early Acheulean sites might have belonged to one of the stages in the first half of the Acheulean, while Late Acheulean sites might have belonged to one of the stages of the second half of that period. The materials from the stratified sites of the Mashhad group, dated to 450–410 ka BP, can be attributed to the first half of the Acheulean (Ibid.: 288). The Jol-Urum I locality was also considered by Amirkhanov to be early Acheulean.

All Acheulean sites discovered by the expedition of Amirkhanov, in our opinion, constitute a single unit. They didn't contain any typical African or Near Eastern cleavers. All bifaces were of the same type and were manufactured from pebbles or large partings, but not from flakes. The tool set consisted mainly of various side-scrapers and choppers. The Acheulean of South Arabia represented a very specific homogenous technocomplex. The only TL-date was obtained for the site of Mashhad III using a sample from the layer underlying the cultural horizon; therefore, the age of the latter should not exceed 450 ka. Another Acheulean site was discovered at the foot of Jebel Tala; on the basis of the typology of the lithic assemblage it was dated to 250–100 ka BP (Report…, 1965). Later, the expedition of Amirkhanov found three more Acheulean localities in this area. According to their techno-typological features, the assemblages from these localities did not differ from those previously found at other Acheulean sites of South Arabia. Therefore, the South Arabian Acheulean sites can be dated to 450–130 ka BP.

The Soviet-Yemen Expedition of K.A. Amirkhanov discovered Middle Paleolithic sites mainly in Western Hadhramaut (Wadi Dawan and Wadi Al-Gabr). In total, 11 sites with shallow cultural layers were found. Amirkhanov (2006) united them into a single cultural and chronological group on the basis of the unity of the sites according to their geomorphological position, techno-typological features, similarity of raw materials, and the degree of patina formation and weathering of the objects' surfaces.

The technique of primary core reduction at all sites was based mainly on the principle of subparallel flaking. According to Amirkhanov, the Levallois index at all sites did not exceed the numbers typical for the classic Levallois industries (Ibid.: 296). The cores were mostly single-platform and subprismatic, intended for production of blade-blanks (Fig. 1, *10–12*). Amirkhanov identified an important feature: the rejuvenation of striking platforms, which was found in a small number of cores. He considered the lack of traces from additional treatment of striking platforms as one of the foundations for classifying the Middle Paleolithic Hadhramaut industry as Levallois non-faceted facies. Discoid shapes were also observed among the cores.

Some scholars identify three variants of the Middle Paleolithic industry in Central and North Arabia: the Mousterian of the Acheulean tradition, the pebble Mousterian, and the Aterian (Petraglia, Alsharekh, 2015). As far as the term "Mousterian" is concerned, archaeologists express some doubts as to the validity of its application to the materials from Arabia, "Despite the overall similarity in the reduction technology of cores and flakes, the Arabian 'Mousterian' assemblages are not the direct equivalents of the Levantine and Zagros Mousterian" (Ibid.: 679). From our point of view, Arabia, as well as the Levant, had no Mousterian industry (Derevianko, 2016a, b, c).

Three Middle Paleolithic localities were discovered in the Nefud Desert in the north of Saudi Arabia, in the area of the Jubbah paleolake (Petraglia et al., 2011, 2012). The settlements were located along the shores of the lake, which was overgrown with grass and sparse trees. The time of the hominin settlement corresponds to the humid and warm periods MIS 7 and 5. The stratigraphic sequence included aeolian and calcrete deposits, paleosols, and buried soils. Multidisciplinary research has established that during the peak of rainfall in MIS 5e, the area of the lake reached 76 km^2.

Two cultural layers were identified at the earliest site of Jebel Qattar 1 (JQ-1). Twenty eight artifacts mostly made of quartz and quartzite (68 %), were extracted from the lower layer in the upper part of the buried soil, which was attributed to MIS 7. All finds were flakes including Levallois varieties with faceted striking platforms (Fig. 2, *10*). The flakes were usually small, around 3 cm

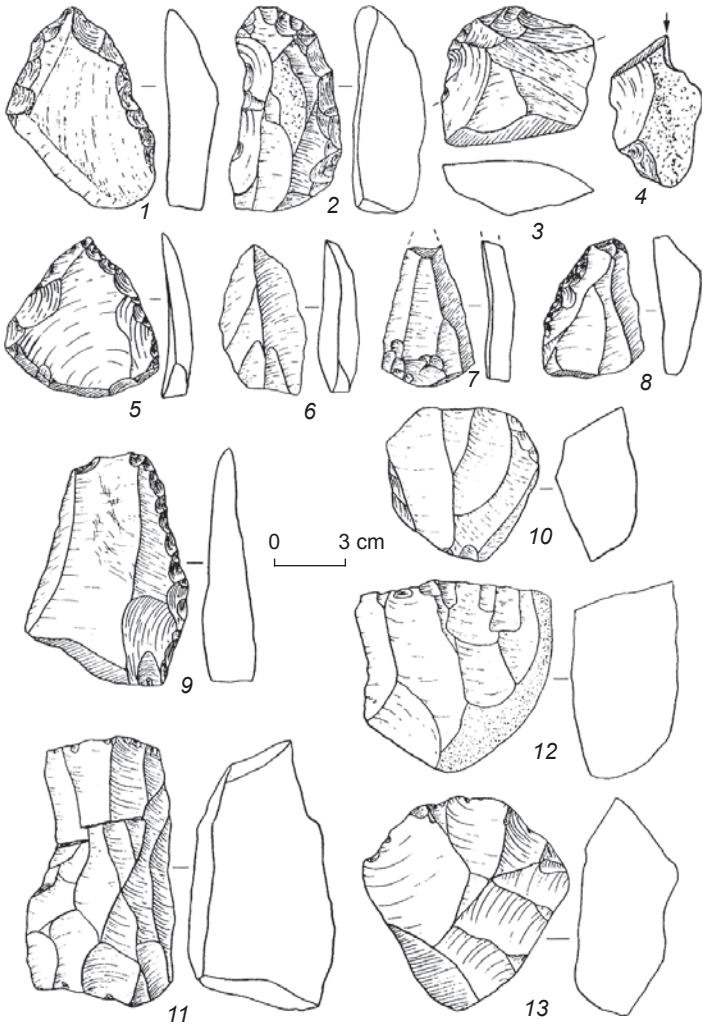

Fig. 1. Middle Paleolithic artifacts discovered in Yemen (after: (Amirkhanov, 2006)).
1–3, *8*, *9* – side-scrapers; *4* – burin; *5–7* – Levallois points; *10*, *12* – single-platform cores; *11* – double-platform subprismatic core; *13* – fan-shaped core.

in size. This can be explained by the properties of quartz and quartzite mostly used at this site, which occurred as individual inclusions of small sizes. The OSL-date of 211 ± 16 ka BP was obtained for this layer.

There were 518 artifacts discovered at the site of Jebel Qattar 1 in an unclear stratigraphic position. The second cultural horizon, where the finds occurred *in situ*, was found in the lower part of the deposits classified as paleosol of the MIS 5a period. Landscapes with mixed grassy vegetation of the S3 type and small inclusions of woody vegetation were typical of the period when this horizon was formed. These landscapes testify to the climate change towards aridization.

There were 114 artifacts of small size found in the upper cultural layer at the site of Jebel Qattar 1. They included 95 pieces of debitage, 9 cores, and 10 retouched tools mostly made of quartz and quartzite (89 %). The cores were small-sized, of the Levallois type; they were discoid, radial, and unilateral for production of atypical Levallois points. Traces of faceting were observed in 19 % of blanks. In ten objects, retouching was applied along one edge from the dorsal and ventral sides. One pseudo-Levallois point had bilateral retouch. According to scholars, the technique of primary reduction included the removal of short flakes from discoid cores, and detachment of flakes and pseudo-Levallois points from unilateral radial cores with faceted striking platforms (Fig. 2, *1–6*) (Petraglia et al., 2012: 7). This cultural horizon was dated to 95 ± 7 ka BP.

The site of Jebel Katefeh 1 (JKF-1) is located 800 m east of Jebel hill. The artifacts occurred at the surface on the top and on the slopes of the hill. In total, 923 objects were collected. Subsequently, archaeologists made an excavation trench 2 m wide and 12 m long, revealing nine layers consisting of interbedded sand and silt, which indicates instable climatic conditions, namely, the alternation of dryness and humidity.

The cultural layer occurred almost at the bottom of the stratigraphic sequence, in horizon H, which consisted of pale-yellow sand cemented with silt and veined with orange intercalations. Three hundred stone objects of small size were discovered in this layer. In total, 1222 artifacts were found in the layer and on the surface, including 1113 pieces of debitage (91 %), 99 cores (8 %), and only 10 partially retouched tools. Blanks without additional retouch must have been used for various works.

Ninety seven percent of the artifacts were made of quartz and quartzite. According to scholars, surface materials and finds from the stratified layer are technologically homogeneous and constitute a single group (Ibid.: 8). Cores of quartz (61 spec.) and quartzite (37 spec.) differ typologically. Archaeologists do not exclude the possibility that this resulted from the use of various raw materials and size of the original stone pieces.

According to techno-typological features, 39 cores were identified as Levallois cores, including centripetal cores with several negative scars, with a single and two opposed striking platforms, as well as unidirectional convergent and radial cores. Levallois points and flakes of triangular shape were produced from unidirectional convergent Levallois cores (Fig. 3). Radial cores were mainly used for production of flakes. Cores were made not only of quartzite blocks, which were readily available in this area, but also of large flakes. It was possible to carry out the refitting of individual artifacts. One flake of rhyolite (the source of the raw material is unknown) from

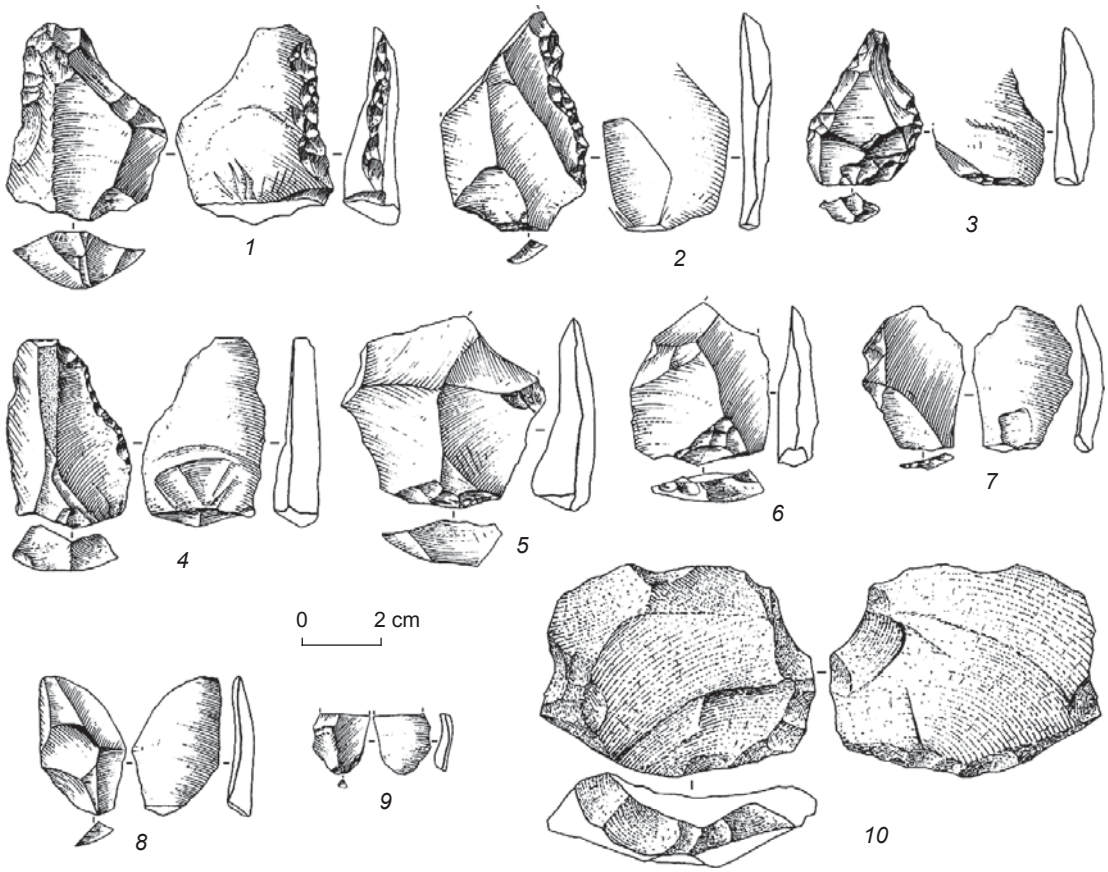

Fig. 2. Lithic artifacts from the site of Jebel Qattar 1 (JQ-1) (after: (Petraglia et al., 2012)).
1–4 – pseudo-Levallois points; *5*, *6* – Levallois flakes; *7–9* – flakes; *10* – Levallois flake with faceted platform.

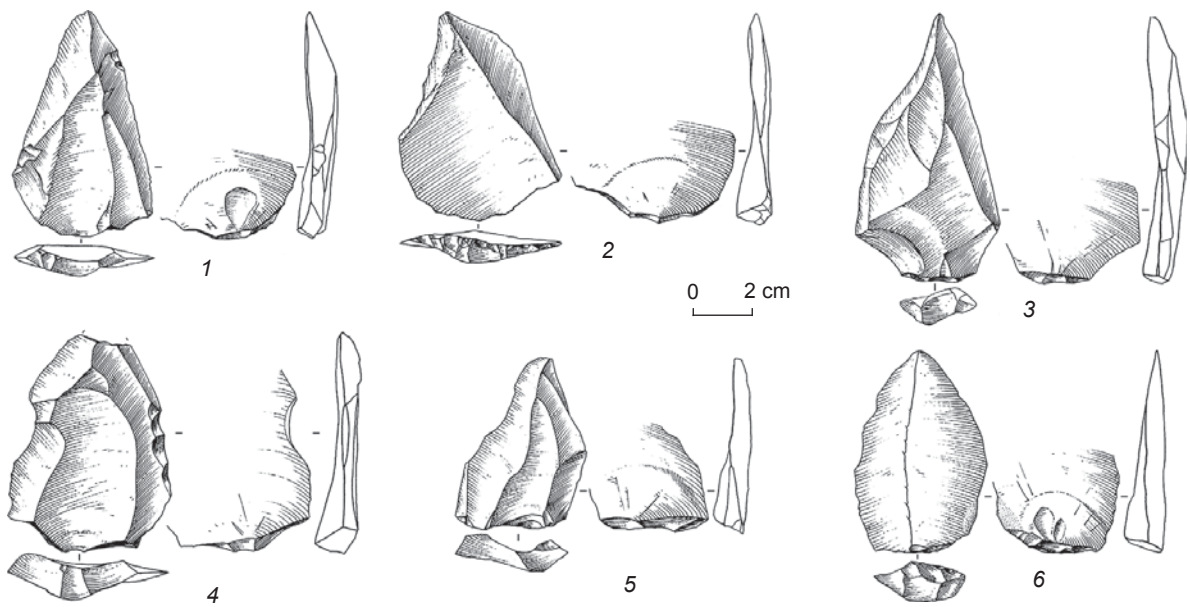

Fig. 3. Lithic artifacts from the site of Jebel Katefeh 1 (JKF-1) (after: (Petraglia et al., 2012)).
1–3 – Levallois triangular flakes (pseudo-Levallois points with faceted platforms); *4* – pseudo-Levallois point with one retouched side; *5* – Levallois triangular flake with a dihedral platform and negative scars of unidirectional flaking; *6* – flake with a faceted platform.

the culture-bearing layer had a counterpart in another flake found on the surface, which confirms the contemporaneity of the materials deposited in the layer and on the present-day surface.

Flakes (744 spec.) constituted the main part of the debitage. Twenty four percent of the flakes had faceted striking platforms. Only 11 blanks were retouched. Apparently, blanks in the form of flakes and points were used for work without additional retouch. This was confirmed by the analysis, using a high-power microscope, of seven blanks, including two Levallois points, three Levallois flakes, a blade, and a flake (six of quartzite and one of quartz), with relatively well-preserved edges. Five finds showed residues of vegetable or animal origin; thus, these objects must have been used for working with meat or plants. Such traces were absent only on the flake and on the blade. It was suggested that two Levallois points, which preserved the residues of animal origin, were attached to the shaft (Ibid.: 11). Scholars also believed that Jebel Katefeh 1 was a short-term site located on a dune near a water body.

Several OSL-dates were obtained for the cultural layer of that site: the early dates are 87 ± 6 and 86 ± 11 ka BP, and the later dates are 49 ± 5 and 53 ± 6 ka BP. Scholars supposed that the samples which gave the later dates, might have originally been deposited in the overlying layer.

The third site, Jebel Umm Sanman 1 (JSM-1), is located on the largest hill in the area; the hill's base reaches 7 km from north to south and 3 km from east to west. The site is located at the southeastern part of the hill, at a height of about 820 m. A small number of artifacts was discovered on the surface. The cross-section of a small excavation showed deposits up to 50–60 cm thick lying on the native limestone and overlain by a 5–10 cm layer of aeolian sand. The deposits had two layers: pink-gray (layer B) and light-grayish-yellow (layer C); both layers contained artifacts. Samples for OSL-dating were taken from layers B and C. Layer B revealed the dates of 96 ± 9 and 42 ± 9 ka BP, and layer C revealed the dates of 140 ± 14 and 61 ± 8 ka BP. Scholars believe that the most probable chronological range for this site is 100–60 ka BP. The humans settled in this place during the wet pluvial MIS 5, while in the arid period of MIS 4 the site was buried under the sand (Ibid.: 13–14).

In total, 88 artifacts were recovered from the site: 11 objects were gathered from the surface, and 77 were extracted from the layer. The collection contained 74 pieces of debitage, 4 retouched implements, and 10 cores. The raw materials were quartzite (92 %) and quartz (5 %). Three blanks, two fragments, and five Levallois cores with traces of centripetal reduction from the edge to the center (Fig. 4, *2–4*) were identified among the cores. Fourteen flakes had faceted platforms. Among the retouched objects, scholars found two bifaces. Judging by the drawing of one of them (Fig. 4, *5*), the object was bifacially treated with medium and small retouching only at the edges, and may be attributed to the side-scraper type.

M.D. Petraglia and his colleagues pointed out that the human groups could have penetrated into Arabia not only across the Bab-el-Mandeb Strait, but also from the Levant, Sinai, the plains of Mesopotamia, the Euphrates basin, and the Persian Gulf (Ibid.). Migration within the

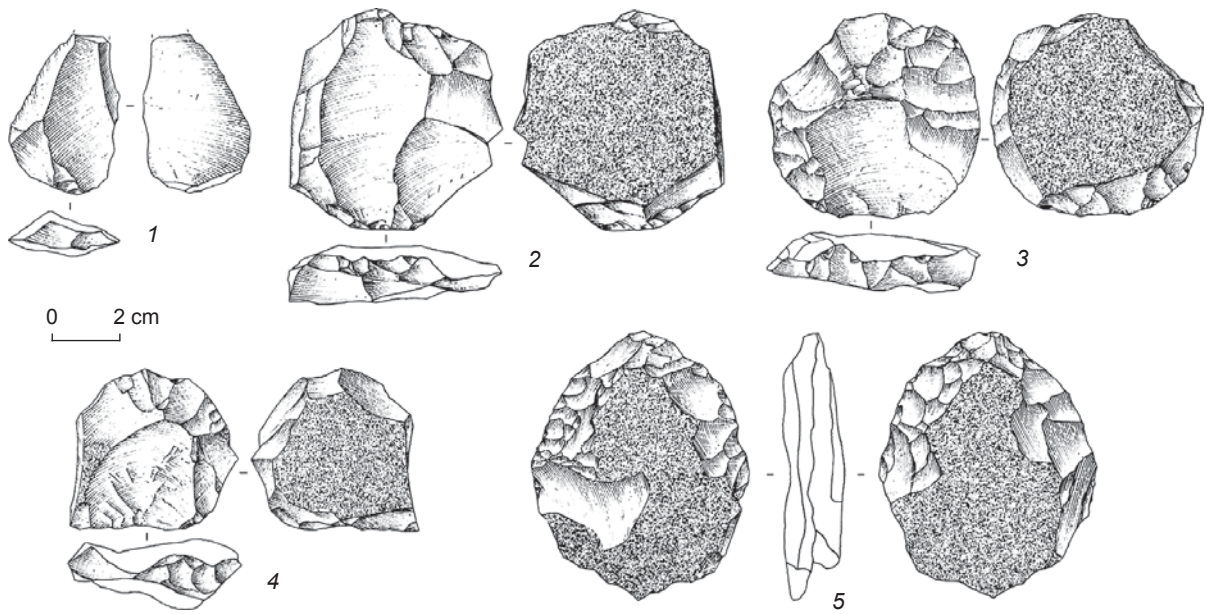

Fig. 4. Lithic artifacts from the site of Jebel Umm Sanman 1 (JSM-1) (after: (Petraglia et al., 2012)).
1 – Levallois flake; *2–4* – cores; *5* – biface.

Peninsula was possible during the pluvials, when there emerged an extensive network of rivers, and lakes were filled with water. According to scholars, multidirectional migrations and dispersals of groups of anatomically modern humans in the central regions of Arabia resulted in their hybridization with the Neanderthals in the northern territories (Petraglia et al., 2011).

When mapping the Jubbah paleolake, it became clear that it was not isolated, but was a part of an extensive system of other paleolakes. Judging by the formation of paleosols and calcrete deposits, which were formed in an arid climate, the natural environment in the vicinity of Jebel Qattar 1 and Jebel Katefeh 1 was favorable for human habitation. The date of 211 ± 16 ka BP for the lower cultural horizon at Jebel Qattar 1 allows considering it one of the earliest sites in the north of the Arabian Peninsula. This makes it possible to attribute it to the terminal Acheulo-Yabrudian period of the Levant, and to assume that the Neanderthals lived there at an early stage (Petraglia et al., 2012: 16).

Two other sites, Jebel Katefeh 1 and Jebel Umm Sanman 1, belonged to the later periods of MIS 5 and 4. According to their techno-typological features, their industry was close to the Middle Paleolithic industries of the Levant. The use of unidirectional, centripetal, and convergent unidirectional systems of primary reduction in the industry of sites at the Jubbah paleolake was similar to the Middle Paleolithic complex of the Tabun C type in the Levant. Upon comparing 55 cores from Jebel Qattar 1, Jebel Katefeh 1, layer C of Tabun, El-Wad, Skhul, the Horn of Africa, Haua Fteah (Libya), the Aterian industry, the Middle Stone Age technocomplexes in Africa, the Middle Paleolithic assemblages from the Indian sites of the time before and after the eruption of the Toba supervolcano, Petraglia and his colleagues found the closest similarities between the cores from the sites near Jubbah paleolake and from the C layer of Tabun. In their opinion, the cores from India differed from those found at the Middle Paleolithic sites to the south of the Sahara and the sites at Jubbah paleolake (Ibid.: 19–20).

Discussing the fate of the hunter-gatherer groups, who settled in the Nefud Desert in arid and hyper-arid periods, Petraglia and co-authors noted that small populations of Middle Paleolithic hominins in the Arabian Peninsula probably diminished to the point of local extinction or survived in natural niches-refugia, which was accompanied by gene flow (Ibid.: 20).

Middle Paleolithic artifacts, including Levallois cores with traces of centripetal blank reduction, were collected from the surface in the south-west of Saudi Arabia, near Lake Mundafan (Crassard et al., 2013). The materials from this locality shared some common features with the objects from Jubbah and from the Nubian industrial complex.

J. Rose and E. Marks analyzed the finds from the northwest of Arabia and proposed an original scenario for the development of industries in the area between Northwestern Arabia and the Southern Levant. Short broad-based Levallois points were found at the sites of Jubbah and Mundafan, and the industry manifests the features of radial core-reduction according to the Tabun C type, as well as features of Nubian Levallois reduction. Therefore, Rose and Marks (2014) argue that in MIS 5, areas of dispersal of the Levantine and African-Arabian hunter-gatherers might well have coincided.

According to S.J. Armitage and his colleagues, the lithic inventory from the Paleolithic site in Jebel Faya in the United Arab Emirates may indicate that anatomically modern humans might have settled in Arabia at an early time (Armitage et al., 2011). Jebel Faya is a 10 km long karstic massif rising 350 meters above the sea level. It is located to the south of the Strait of Hormuz, 55 km from both the Gulf of Oman and the Persian Gulf. The site of Jebel Faya (FAY-NE-1) was discovered in the northeastern part of the massif under a rock shelter located at an altitude of 180 m a.s.l. Three Paleolithic assemblages were identified during excavations at the site. The earliest assemblage C was deposited at the bottom. Three OSL-dates are available for that assemblage: 127 ± 16, 123 ± 10, and 95 ± 13 ka BP. It was overlain without a clear boundary by assemblage B with no available dates. The deposits containing these assemblages were covered by a sterile horizon, overlain by the deposits containing assemblage A.

In terms of primary reduction, assemblage C is characterized by several strategies of Levallois flaking. One of the strategies was associated with trimming of the working platform for the subsequent radial removal of flakes (Ibid.: Fig. 5, *2*). The blanks included volumetric blades, flakes, and foliate blanks, while the tools were represented by small bifaces, side-scrapers, end-scrapers, denticulate tools, burins, perforators, and retouched flakes (Fig. 5).

Assemblage B indicates the absence of the Levallois system of reduction. The tool set included side-scrapers, end-scrapers, notched-denticulate tools, burins, and perforators. Laminar removals were rare. The blanks for production of tools were flakes, including laminar flakes.

According to the archaeologists, assemblage C is neither technologically nor typologically associated with the Levantine Middle Paleolithic, but is very similar to the materials from the sites of East and Southeast Africa. On this basis, scholars suggest that the human groups who created assemblage C were associated with the anatomically modern humans who migrated from Africa in the early period of MIS 5 (Ibid.: 454). It is, however, difficult to agree with this suggestion. An industry from about 120 ka BP that would belong to the populations who preserved the tradition of manufacturing bifaces, is unknown both in East and North Africa. The Afro-

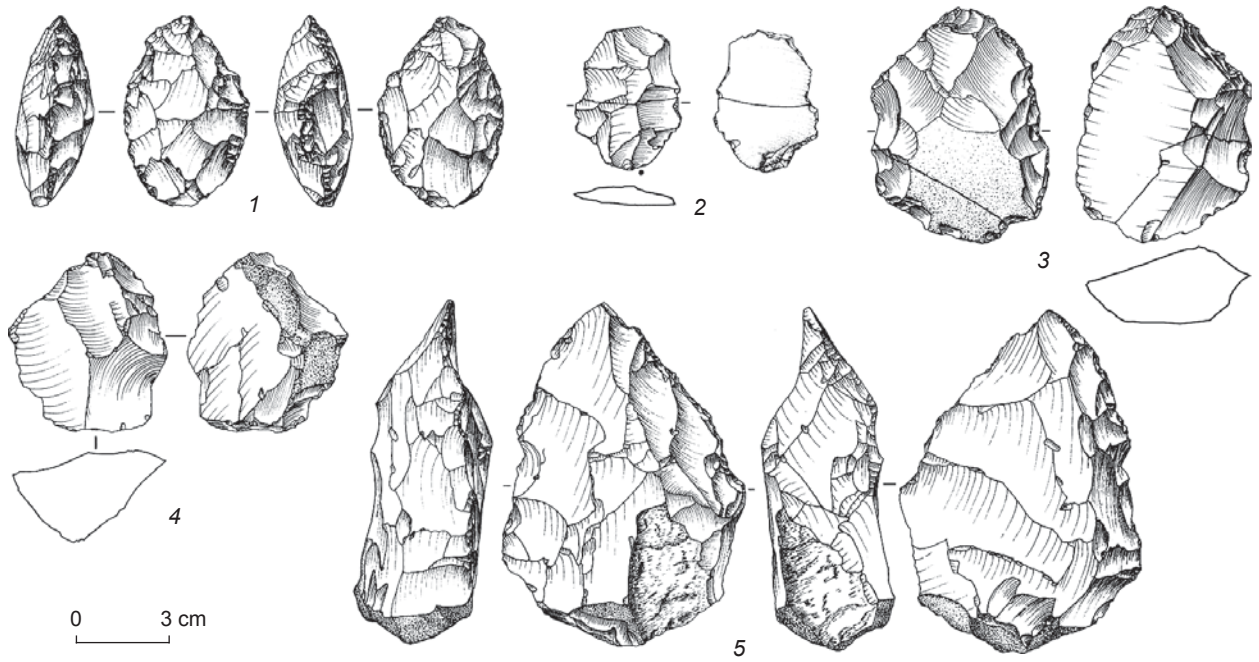

Fig. 5. Lithic industry from the site of Jebel Faya, assemblage C (after: (Armitage et al., 2011)).
1 – foliate biface; *2* – Levallois flake; *3* – bifacial blank; *4* – radial core; *5* – large biface.

Arabian industrial complex is apparently close in time to the assemblage C of Jebel Faya. It is impossible that two flows of anatomically modern people with very different industries (Jebel Faya and the Afro-Arabian Nubian industry) would leave Africa almost at the same time. Petraglia (2011) does not rule out the possibility that assemblage C was left by unknown hominins.

The assemblages A and B were quite different both from assemblage C and from the industries of the neighboring territories. This can be probably explained by the prolonged isolation of the creators of these assemblages during the arid period. Armitage and his co-authors do not exclude that assemblage A at the site of Jebel Faya might have been created by populations who left Africa during the second migration wave in the second half of the MIS 3, during the humidification of the climate, when many streams emerged, stretching from the Al Hajar Mountains to the basin of the Persian Gulf (Armitage et al., 2011). In our view, there are no sufficient grounds for such a conclusion.

Assemblage B does not have absolute dates, but judging from the stratigraphic position of the tools, Petraglia thought that it was possible to attribute it to the period of 95–40 ka BP (Petraglia et al., 2011). Several dates were obtained for assemblage A using the OSL-method: 38.6 ± 3.1 and 40.2 ± 3 ka BP; three finds from the overlying sterile sand gave the dates of 38.6 ± ± 3.2; 34.1 ± 3.2, and 34.1 ± 2.8 ka BP.

Assemblage C from the site of Jebel Faya contained bifacial foliates. In this regard, the Late Pleistocene assemblage with bifaces of this type is of interest, which was discovered in Oman along dry riverbeds associated with the basins of relic lakes on the Najd Plateau and in the Huqf depression (Rose, 2004). The rivers supplied by seasonal rains, which intensified in the pluvial periods, became permanent perennial streams flowing down from the highlands into a vast inner basin, currently covered by sands of the Rub' al Khali Desert.

All sites found in the area typically show the surface occurrence of the cultural layer, and small numbers of artifacts. The most numerous finds were collected at the site of Wadi Arah 5 km south of Bir Khafsa. The finds were concentrated in the deposits of fine-grained matt-brown chert on the edge of the crescent-shaped outcrop, which bordered the ancient playa lake. The archaeological materials without traces of rolling or minimum weathering were in undisturbed condition. In total, 42 artifacts were gathered over an area of 28 m^2.

The most numerous group comprised side-scrapers (11 spec.) and bifaces (9 spec.). Six side-scrapers were made on bilateral flattened flakes with faceted striking platforms. Bifaces had foliate or rounded shapes. They were made of thin discoid blades, and were shaped by intensive scalar retouching on both sides with soft-hammer percussion. The bifaces were of small size ranging from 4 to 8 cm.

The collection contains an exhausted core with centripetal negative scars. Considering this and other blanks, Rose concluded that the specific properties of raw materials forced the inhabitants of the site to combine the

centripetal core reduction technique and the *façonnage* technique (Ibid.: 553). The same technique, in his opinion, was widespread in the Middle Stone Age in East Africa.

The sites with bifacial foliates on the Najd Plateau have no dates. Based on the fact that a similar industry was not found in the Levant and the Zagros, Rose argued that "If, indeed, the Oman foliates/ovates date to the Upper Pleistocene, it provides concrete evidence for one or more human dispersal events out of sub-Saharan Africa" (Ibid.: 554). Assemblage C from the site of Jebel Faya, which contains bifaces, and the finds from the site on the Najd Plateau may possibly belong to the same industry. Since Upper Paleolithic parallels to the Arabian industries with bifaces are not known in East Africa, and similar industries are absent from the transit area, technological convergence cannot be excluded. This assumption is supported by the materials of the Afro-Arabian Nubian industry that was discovered in the Dhofar Governorate in Oman, which could have been chronologically close to assemblage C. It is noteworthy that the so-called bifaces from the site near the Jubbah paleolake are completely different from the bifaces of Southeast Arabia, and in fact they cannot be called "bifaces" in the literal sense because they are typologically closer to bifacial foliate points.

The solution of a number of important issues relating to the Middle Paleolithic in Arabia is associated with the study of the Afro-Arabian Nubian technocomplex, which incorporated the African and Arabian tradition of lithic reduction, defined by the presence of traits typical of the Nubian variant of the Levallois system of core reduction (Usik et al., 2013: 244). The Nubian Levallois technology was first identified in the 1960s on the territory of Sudan and subsequently in the eastern oases of the Sahara, in the hills near the Red Sea. Short-term sites with the Nubian Levallois technology have been discovered in the Horn of Africa (Beyin, 2013).

Two different industries are identified in the Nubian technocomplex: the Early Nubian industry which chronologically belongs to the stage of MIS 5e (about 130–115 ka BP) and the Late Nubian industry dated to MIS 5a (82–71 ka BP), that is the chronological gap between the industries was about 50 ka. The Early Nubian technocomplex predominantly contains cores of the Nubian Levallois type with traces of bifacial reduction (type 2), and Lupemban foliate bifaces. The Nubian cores of type 1 were much more frequently used for primary reduction in the Late Nubian industry (Usik et al., 2013; Rose, Marks, 2014; and others).

The discovery of sites with the Early Nubian Levallois system of primary reduction in the south of Arabia was of great importance for solving the problems of the earliest human migrations from Africa into Eurasia. The first evidence for the spread of the Nubian Levallois technology in Arabia was discovered in the 1980s in Western Hadhramaut in Yemen.

New extensive material on the Middle Paleolithic of South Arabia was obtained during the studies of Paleolithic sites in the Dhofar Governorate in Oman from 2010–2012 (Rose, Marks, 2014; Rose et al., 2011; Usik et al., 2013; and others). Archaeologists managed to find there about 260 sites with superficial deposition of the cultural layer that contained artifacts associated with the Afro-Arabian Nubian technocomplex and the local version of the industry, which was formed at a later time on the basis of the classic Nubian complex. From several dozens to two thousand artifacts were found at individual sites in Dhofar.

Sites with the industries of the Nubian Levallois type mostly occurred on arid gravel plains and along dry riverbeds. The highest concentration of sites was in the vicinity of the village of Mudayy, which can probably be explained by the abundance of high-quality chert in the area. Scholars observe that Dhofar is characterized by a distinctive natural environment caused by its unique microclimate. The Jebel Qara-Jebel Samhan mountain chain inhibited the passage of humid monsoon winds coming from the Indian Ocean, which resulted in relatively high precipitation (200–300 mm per year) in the mountains and a decrease in temperatures from June to September (Usik et al., 2013: 245). The availability of a sufficient amount of lithic raw materials for producing tools, and permanent water sources attracting animals were bound to bring humans to the area. Localities with the classic Nubian complex are located in the area from the slopes of Dhofar to the Rub' al Khali Desert (Rose, Marks, 2014).

Scholars conducted a thorough analysis of the technical methods of processing stone tools from the five most informative sites in Dhofar (Usik et al., 2013). Within the framework of the Nubian Levallois method, two systems can be distinguished for forming the central distal ridge. For type 1 Nubian cores, two divergent distal removals were made from the main working surface for creating a steep distal ridge, and then a pointed blank was detached from the proximal end (Fig. 6). Type 2 cores show the traces of bilateral treatment of the main working surface (Fig. 7). In the process of subsequent splitting, the creators of the Nubian complex could have given the object of one type the appearance of another type. Archaeologists also distinguished a type 1/2 that in different proportions combines elements from the system of preparation of the two basic types. A small amount of centripetal Levallois and non-Levallois cores, including unidirectional, bidirectional, and transverse cores, have also been found at the Afro-Arabian sites (Ibid.).

There are only a few retouched tools present at the sites of the Nubian Levallois. We can give the following explanation for this fact: most sites were used as workshops, and people would take the best tools away with them. The tool set includes Levallois points, side-

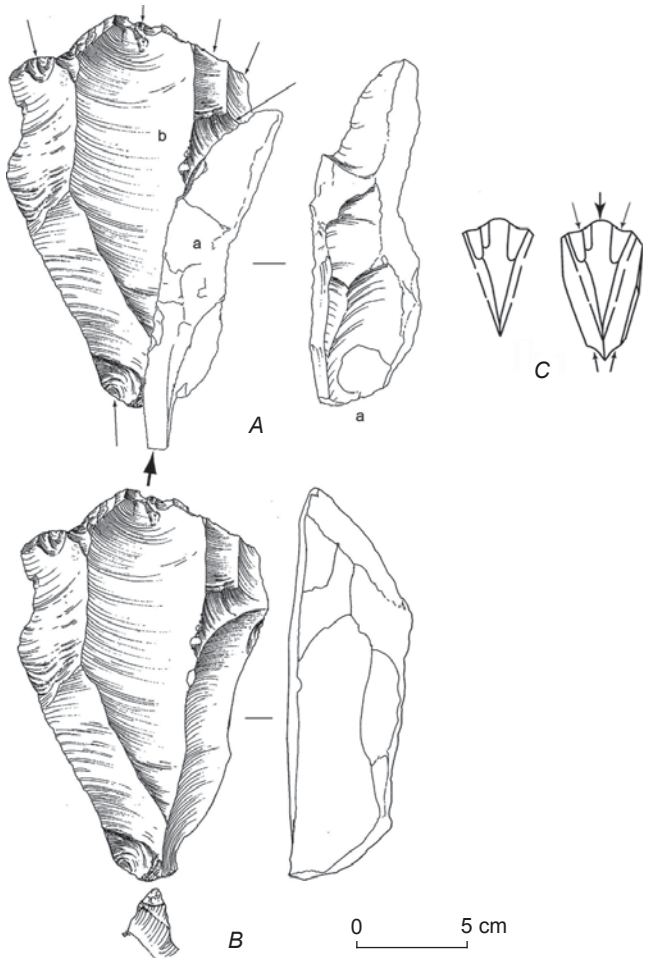

Fig. 6. Refit of a type 1 core (sample No. 564) from the locality TH 383 c (*A*, *B*) (after: (Usik et al., 2013)), and the reduction diagram of a type 1 core (*C*) (after: (Rose, Marks, 2014)).

scrapers, notched-denticulate tools, and end-scrapers. Bilaterally processed objects such as bifaces, typical of the Early Nubian Levallois industry in Northeast Africa, were not found in Dhofar.

The initial dispersal of the human groups possessing the Nubian technocomplex from Africa to Arabia happened at the beginning of MIS 5 (Rose et al., 2011). At that time, a severe drought struck North Africa (Drake, Breeze, Parker, 2013), while a warm climate formed in Arabia, and the populations crossed over on the shelf of the Bab-el-Mandeb to more favorable territories of Arabia. The site of Aybut Al Auwal, one of the earliest localities in Dhofar, is dated to 106 ± 9 ka BP (Usik et al., 2013).

The sites in Dhofar with materials belonging to the Afro-Arabian Nubian technocomplex are characterized by large elongated points removed from cores following the Nubian Levallois reduction system. Thus, at the site of Aybut Ath Thani, Nubian Levallois cores amounted to 155 out of 172 cores, or 90 %. The site of Jebel Markhashik 1 had the lowest share of such cores reaching 57 % (65 of 115 cores) (Rose, Marks, 2014).

At five sites selected for more detailed study, archaeologists recorded a large number of typical Nubian cores, which were common throughout Dhofar. The fifth site (TH 268) differed from other sites by the presence of Nubian cores of small size; there were also flat miniature bifacial cores with opposed faceted striking-platforms, and unilateral cores for parallel removal of laminar blanks (Fig. 8). The technology of producing these cores somewhat differed from the classic Nubian Dhofar technology. The localities where it was used are not isolated

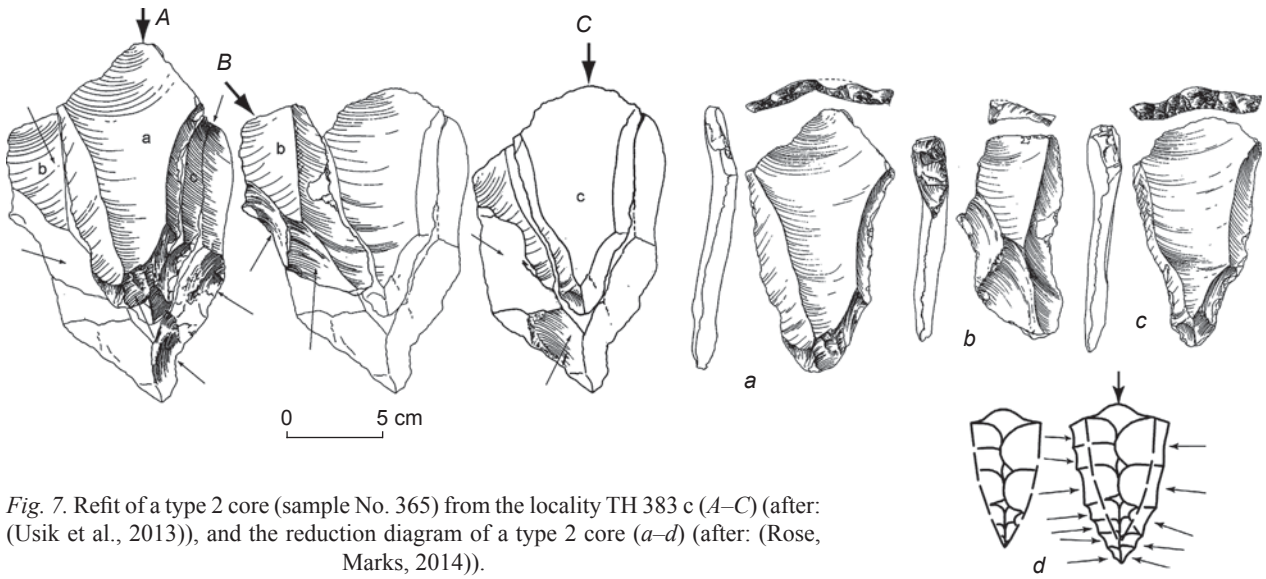

Fig. 7. Refit of a type 2 core (sample No. 365) from the locality TH 383 c (*A*–*C*) (after: (Usik et al., 2013)), and the reduction diagram of a type 2 core (*a*–*d*) (after: (Rose, Marks, 2014)).

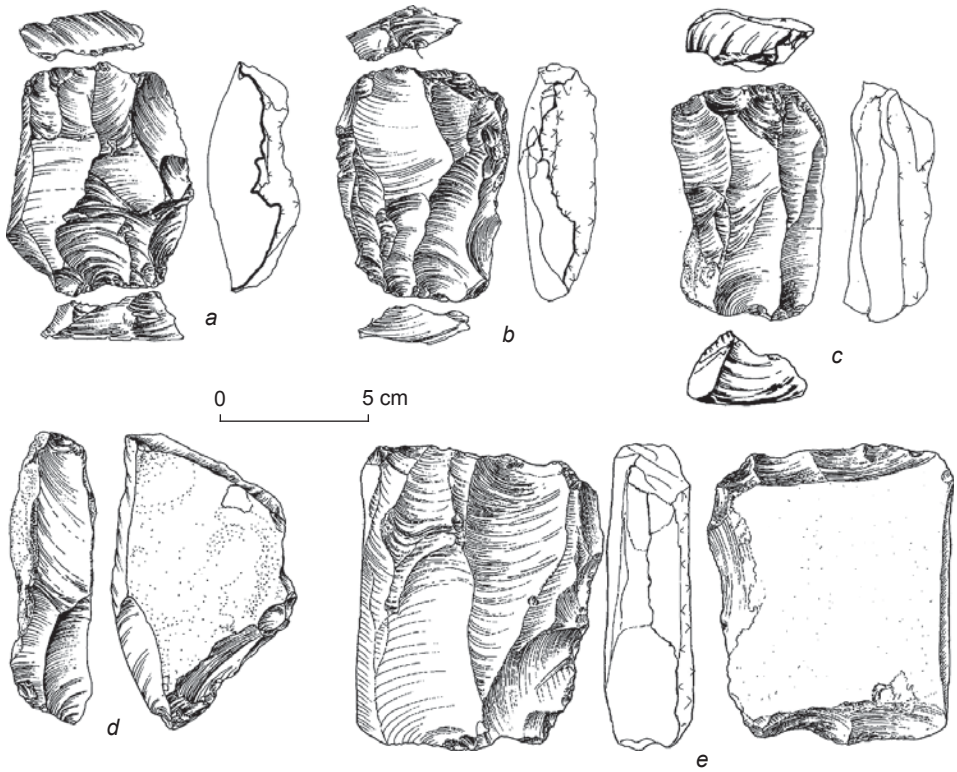

Fig. 8. Flat, opposed-platform bidirectional cores (after: (Usik et al., 2013)).

cases. Archaeologists classified their technocomplexes as a separate industry, calling it the Mudayyan industry (Usik et al., 2013: 261). The objects associated with the Mudayyan industry differed from the classic Dhofar artifacts. The Dhofar objects are often covered with a dense black patina containing spots of manganese oxide. They acquired a slightly rounded shape as a result of aeolian weathering, and were subjected to chemical impact that led to the emergence of a chipped surface. The Mudayyan artifacts are covered with light-colored, light-pink or glossy deep-red patina; they are not rounded, and show no traces of chemical exposure. Collections of tools from the sites with the classic Dhofar and Mudayyan industries, which were located close to each other, are substantially different. The sites with the Mudayyan assemblages are located mainly on the tops of residual hills, while the sites with the classic Nubian technology are located at the foot of hills (Ibid.: 262). The above characteristics of these two industries show their techno-typological and chronological differences.

In Dhofar, during the aridization of Arabia and concentration of the population in the refugia, the autochthonous Mudayyan industry emerged on the basis of the Afro-Arabian Nubian technocomplex. The approximate time of its existence probably coincides with the weakening of monsoons from the Indian Ocean after 75 ka BP (Rose, Marks, 2014).

As opposed to the sites with the classic Afro-Arabian Nubian industry with only a small amount of retouched tools, the Mudayyan localities contain a larger number of tools, and their typological set is much more diverse.

The primary reduction in this industry was based on the micro-Nubian Levallois technology. The industry also has double-platform cores for removal of blades in opposite directions. The micro-Nubian Levallois cores constitute 19–37 % of all cores at the Mudayyan localities (Fig. 9). Levallois points are the most numerous at these localities (18–58 %), but they are much smaller than the Nubian ones. A specific feature of the Mudayyan industry is the predominance of tools of the Upper Paleolithic type (42–77 %), including end-scrapers with straight and convex edges, burins, and drills.

The Mudayyan industry reflects many features of the Afro-Arabian industrial complex. During its existence, Levallois reduction was focused on production of miniature Levallois points. In addition, in some cases, the Nubian Levallois system was modified into the system of recurrent bidirectional flaking. Blades and points were removed in opposite directions both from the broad working-surface, and at the butts (Ibid.).

Paleoanthropological evidence suggests that the creators of the African Nubian Levallois complex were anatomically modern humans (Rose et al., 2011; Rose, Marks, 2014; and others). At Taramsa Hill at the site

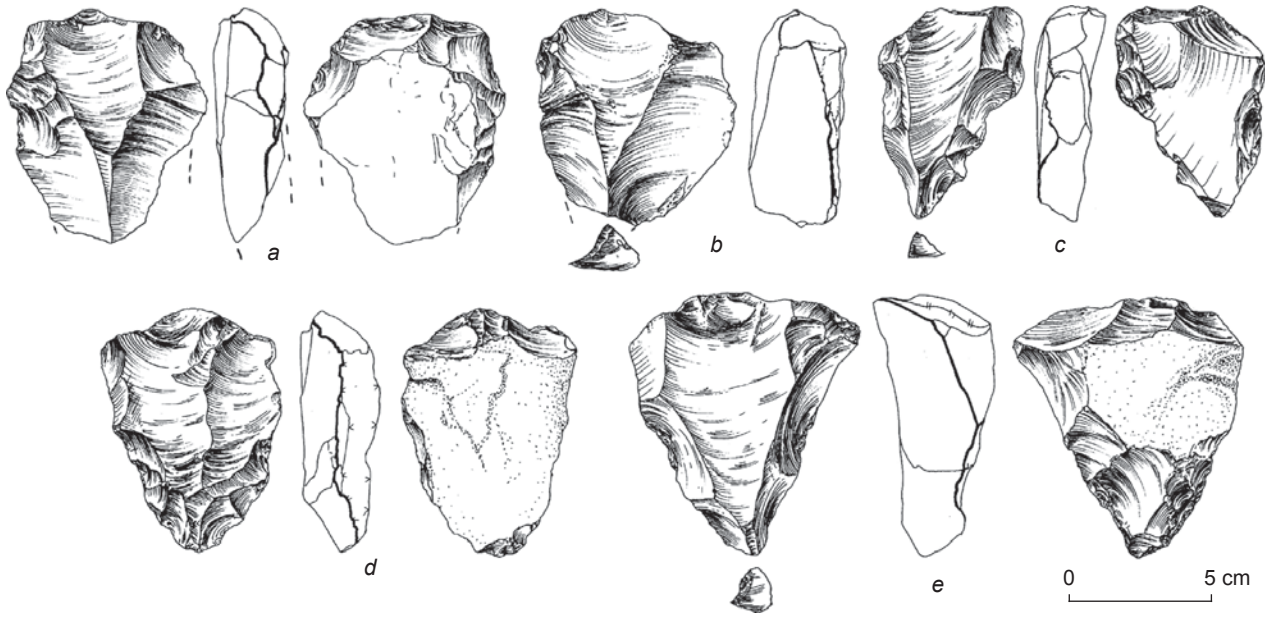

Fig. 9. Micro-Nubian cores from the Mudayyan localitites (after: (Usik et al., 2013)).

of Taramsa 1, the burial of a child of the anatomically modern type was found (Vermeersch et al., 1998); it belonged to the period when the human group with the Nubian industry returned to Africa from Arabia. It was established that the child was buried in a sitting position in a pit about 1 m deep, that is, the burial was intentional (Ibid.: 478). The burial was first dated to 80.4–49.8 ka BP, and the average age was defined as 55.5 ± 3.7 ka BP. Later, the age was corrected to 68.6 ± ± 8 ka BP (Usik et al., 2013).

Thus, the Nubian Levallois complex of South Arabia is evidence for the migration of anatomically modern people from Africa to Eurasia. Human groups moved from Africa to the Arabian Peninsula along the southern route through the Bab-el-Mandeb. Distinctive localities with the Nubian Levallois industry, as was the case with Dhofar, have not been found in the Levant and North Arabia, although there were probably some temporary contacts between the migrants from Africa and the Levantine populations. The site of Asfet that was discovered at the coast of the Red Sea in Eritrea confirms that anatomically modern humans migrated from Africa to Arabia along the southern route (Beyin, 2013). This suggestion is also supported by the map of the sites with the Nubian Levallois complex, which A. Beyin presented in his article (Ibid.: Fig. 10).

Arabia was the least populated in MIS 4 and 3, when there was aridization of climate, and most of the Peninsula became hardly suitable for human settlement. Paleolithic sites in Arabia of that time were found only in refugia with reliable water resources. One such shelter was located near a small residual reservoir at the foot of the western highlands of Yemen, in the basin of Wadi Surdud. Human groups lived there approximately 55–50 ka BP in relatively complete isolation.

The sites of Shi'bat Dihya-1 (SD 1) and Shi'bat Dihya-2 (SD 2) in the area of Wadi Surdud, in the transition period from a semi-arid to arid climate, were a kind of refugia (Delagnes et al., 2012, 2013; Sitzia et al., 2012). The natural and climatic environment of Wadi Surdud provided favorable living conditions for animals and humans even in an arid climate. Medium-altitude foothills were characterized by the availability of long-term and predictable sources of water, which contributed to the emergence of ecological niches suitable for humans and animals. Two such ecological niches are known during MIS 3 on the Arabian Peninsula: one in Wadi Surdud, and the other on the border with the southern part of the Rub' al Khali Desert, on foothills with the Tihama coastal plain to the west and the foothills of the Al Hajar Mountains to the east. The sites of SD 1 and 2 have been studied in the former area, and the sites of Jebel Faya and the assemblages A and B (Delagnes et al., 2012: 469), that were discussed above, have been studied in the latter area.

In Wadi Surdud, two complexes containing cultural horizons in the interstratified 6 m thickness of river sediments were investigated. Over 5000 artifacts were recovered from both archaeological horizons. Highly-fragmented animal bones were found during the excavation at the site of SD 1. Bovids, equids, suids, and porcupines were identified by the teeth in the faunal remains. Equids represented the taxon typical of the arid steppe environment.

For raw materials, inhabitants of the site mostly used rhyolite (93.8 %), widely occurring in the alluvial sediments of the Wadi Surdud riverbed and two of its tributaries, Shi'bat Dihya and Shi'bat al-Sharj. For producing tools, slightly rounded angular blocks were selected from the alluvium. Rhyolite, which is characterized by a fine-grain structure and homogeneity, was used to manufacture flakes and blades. Two chopper-like cores were made of basalt. From these cores, flakes were removed without preparation of a striking platform. One core showed traces of bipolar percussion; another one was turned into a hammerstone.

During the excavation, archaeologists were able to discover production waste, and to conduct six core-refits, each comprising 6 to 18 spalls. Treatment of these cores involved a minimal number of technical spalls, especially while preparing the surfaces for flake removal. Striking platforms also underwent minor treatment, which also included partial faceting. Sub-triangular flakes and Levallois-type flakes differ from laminar flakes only in their somewhat larger size of dihedral and faceted butts (Ibid.: 460).

Blades and laminar flakes which served as blanks constitute a large share of finds at the site of SD 1; they were produced using two strategies (Delagnes et al., 2012). The first strategy was aimed at obtaining blades, while the second strategy was used for production of flakes and sub-triangular laminar flakes. Levallois flaking was also present at this site. Levallois blanks were removed from cores formed with minimal preparation of the working and striking platforms. Knappers carefully selected raw materials and mainly used those stone pieces that had sharp corners, to produce blanks with minimal effort. Scholars observed that simple strategies of core reduction, which involved minimal preparation, were combined with high technical skills: materials indicate a precision of blows (Ibid.: 464).

A specific feature of the core preparation strategy was the versatility of the treatment system that made it possible to obtain various artifacts within a single reduction sequence. This can be clearly seen from pointed blades and sub-triangular flakes, which were removed from semi-circular cores. Refitting of the cores has shown that different types of blanks were obtained from a single core.

Levallois reduction is represented by a small number of cores that typologically can be divided into three groups: single- and double-platform cores for detachment of blades with broad working surfaces, cores that were unidirectional and triangular in plan, and centripetal cores. Their striking platform was formed by several major spalls. At the site of Shi'bat Dihya 1, only a small amount of Levallois cores were found, but their typological diversity manifested great variability of the primary lithic reduction methods. Notably, Levallois cores did not always meet all criteria used in defining this method; the striking platforms showed almost no traces of faceting.

Among the debitage, a large number of pointed blades, sub-triangular flakes, and blades produced using different methods was observed, revealing a developed laminar reduction strategy (Fig. 10, *11*). Most of the debitage showed no retouching; apparently, unretouched spalls were used for carrying out various jobs at the site. Twenty five of the retouched objects can be classified as notched tools, denticulate tools, and end-scrapers.

At the site of SD 2, no large-scale investigation has been carried out. In total, 1336 artifacts were found, mostly consisting of unifacial non-Levallois implements. Four radial cores made of green basalt were found. Their striking platforms were not specially prepared; the blows were made using a hard hammerstone against the natural stone surface. There were also sub-triangular flakes and pointed blades (Fig. 11, *14–17*), similar to the SD 1 items. Despite the fact that the sites of SD 1 and SD 2 differ from each other in the number of artifacts, their relationship in terms of key techno-typological characteristics is undeniable. At the site of SD 2, there were fewer sub-triangular flakes and pointed blades as compared to SD 1, but since that site was only partially investigated, this feature cannot be considered a key indicator for attributing its industry to a different type.

According to its techno-typological features, SD 1 is most connected with the layer B industry at Jebel Faya (Delagnes et al., 2012). Yet, the significant distance between these sites apparently made an impact on the specific nature of their lithic inventories. Lithic tools from Shi'bat Dihya differ from the Tabun B-type assemblages that were from the Terminal Middle Paleolithic sites of the Levant. Triangular flakes and laminar blanks with broad bases at the sites of SD 1 and SD 2 are reminiscent of similar objects from the site of Amud (layers B^4 and B^2), yet they differ in the method of forming the striking platform. While short points from Amud show well-expressed striking platforms ("chapeau de gendarme"), blades and sub-triangular flakes with broad bases from Shi'bat Dihya have no faceted striking platforms. The industry of Shi'bat Dihya, like that of Jebel Faya, represents a converged technology that evolved among human groups who became isolated in the niches-refugia owing to the arid climate. Scholars admit the possibility of short-term contacts between the inhabitants of the site of Shi'bat Dihya and the creators of the Terminal Middle Paleolithic industry of the Levant (Ibid.: 471). Parallels between the industries at the sites of Shi'bat Dihya and the contemporaneous sites of East Africa cannot be found.

The issue of taxonomic affiliation of the human groups who settled in Wadi Surdud from 55–50 ka BP remains open. However, scholars are convinced that

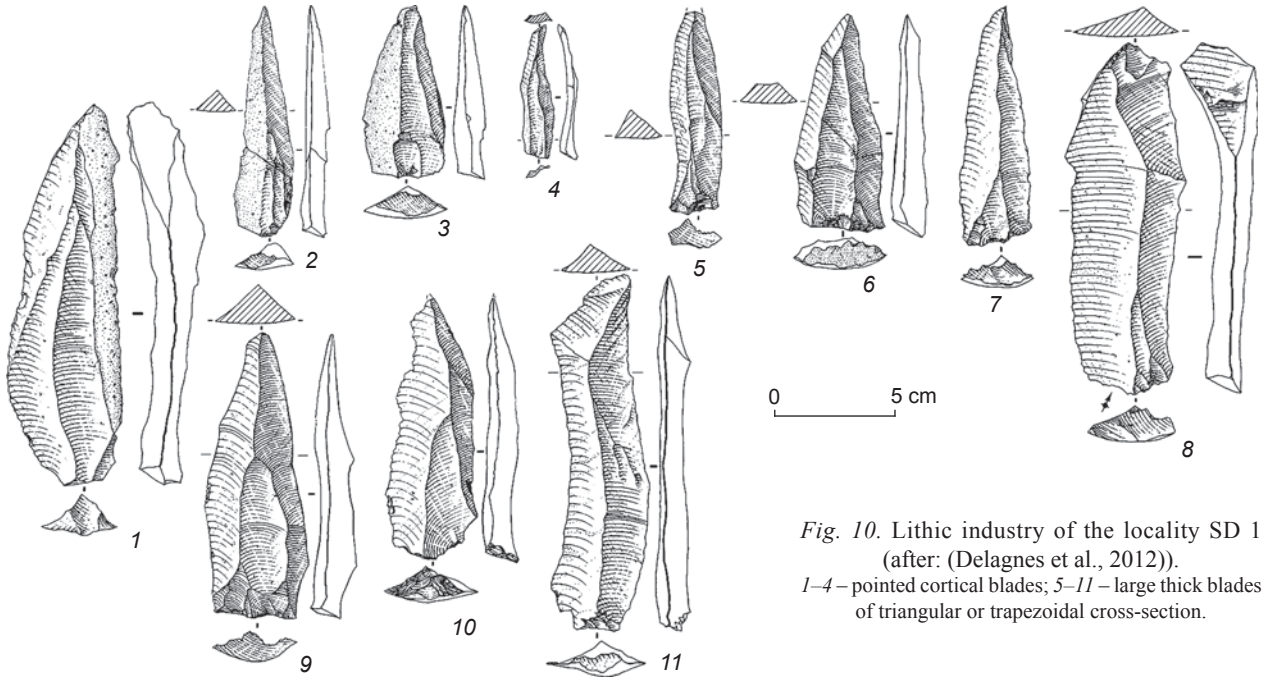

Fig. 10. Lithic industry of the locality SD 1 (after: (Delagnes et al., 2012)).
1–4 – pointed cortical blades; *5–11* – large thick blades of triangular or trapezoidal cross-section.

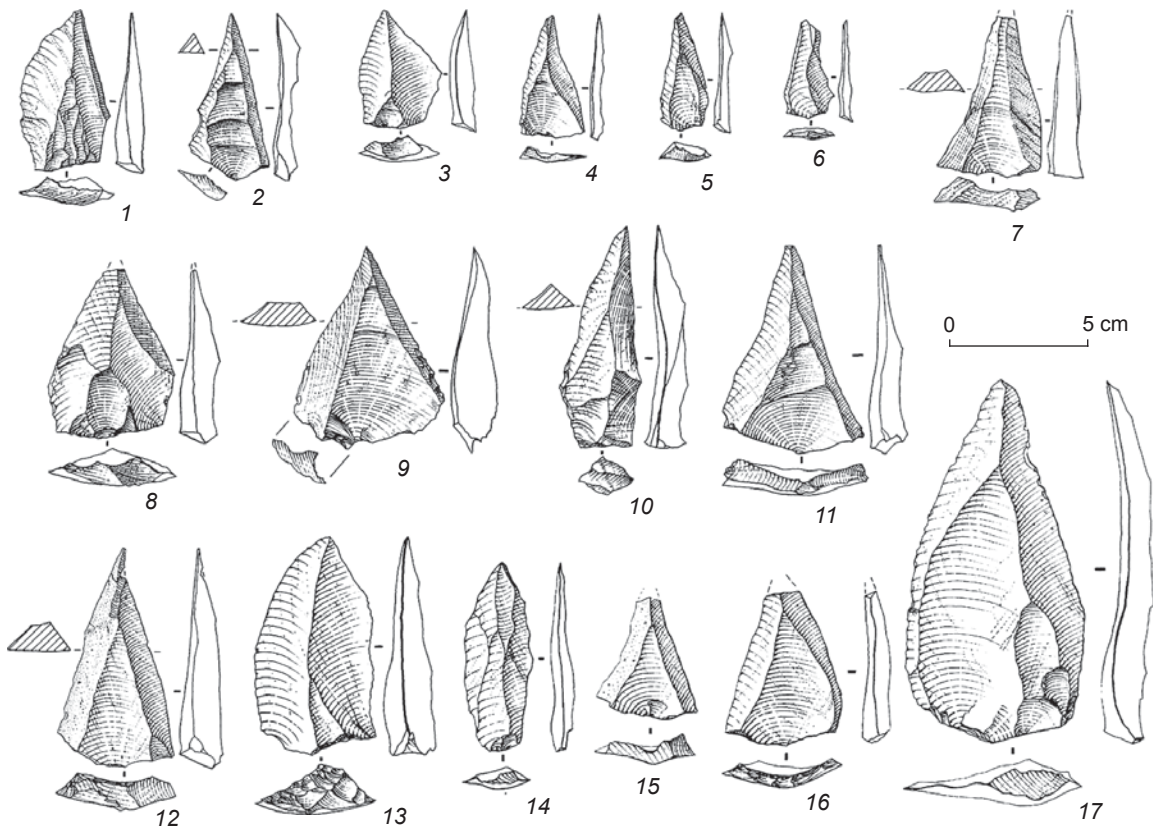

Fig. 11. Lithic industry of the localities SD 1 (*1–13*) and SD 2 (*14–17*) (after: (Delagnes et al., 2012)).
1 – crested blade; *2–6* – small pointed blades; *7* – lateral blank; *8–13* – pointed blades; *14–17* – pointed blades and flakes.

these populations were in no way associated with anatomically modern people migrating from Africa, who could have continued moving further to the east of Asia reaching Australia, since the Middle Paleolithic industry found at the sites of SD 1 and SD 2 in Wadi Surdud was absolutely different from the African one. A. Delagnes and her colleagues put forward two suggestions (Delagnes et al., 2012). First, if the inhabitants of Shi'bat Dihya were anatomically modern humans, they should be the descendants of modern humans who settled in Arabia in 120–80 ka BP (Ibid.: 471). Second, the inhabitants of the sites might have been the southern Neanderthals, who lived at that time in the north of the Arabian Peninsula, in the Middle East, the Levant, and the Zagros (Ibid.).

Several locations with stone tools were found in the area of the Saiwan paleolake in Oman. The most intense amelioration of the inner regions of Arabia, and the formation of lakes in the pluvial periods occurred approximately 6–11, 78–82, 100, and 120–130 ka BP (Rosenberg et al., 2011, 2012), which is confirmed by the speleodata for the southern part of Arabia (Fleitmann et al., 2007). According to the geomorphological data, at certain periods, Lake Saiwan covered an area of up to 1400 km^2 and had a maximum depth of 25 m (Rosenberg et al., 2012: 14). Artifacts, including bifacially worked tools, were located in superficial deposits, approximately 30 km from the border of the maximum expansion of the lake. Good preservation of the finds in the absence of established dates raises some doubts concerning their old age, although typologically the bifaces from the localities by Lake Saiwan can be compared to similar implements from Jebel Faya C and the Najd Plateau.

Paleolithic sites in Shi'bat Dihya belong to the late phase of the Middle Paleolithic. It is difficult to say anything certain about the further development of Paleolithic industries and the transition from the Middle to the Upper Paleolithic in Arabia, since owing to the arid climate, which occurred in the second half of MIS 3 and a part of MIS 2, "no Upper Paleolithic has ever been clearly identified in the entire Arabian Peninsula" (Delagnes et al., 2013: 242).

The appearance of anatomically modern humans in Arabia can be associated with the localities that contain the Aterian industry. So far, we know of one well-studied site with the Aterian industry in the Arabian Peninsula. It is located on the south-western rim of the Rub' al Khali Desert (McClure, 1994). Three hundred artifacts were found in an area of about 100 m^2. Large Aterian unilaterally worked tanged points stand out among the objects that also include small bilaterally worked foliate implements, end-scrapers, borers, knives, denticulate tools, some of which have tangs. The majority of the objects were made on flakes and have retouch on their dorsal surfaces. In the future, more sites with the Aterian industry left by anatomically modern humans may be found.

Arabia and the issue of anatomically modern humans dispersal in Eurasia

It is obvious for all those who deal with the origins of the *Homo* genus that humans originated in Africa no later than 2.5 Ma BP. Human migration from Africa to Eurasia started around 1.8–1.7 Ma BP. The problem of the origin of anatomically and genetically modern humans, as well as their dispersal around the planet, still remains the subject of discussion. Among the many hypotheses proposed, two have been the most actively discussed in the last 20–30 years. We agree with some points of the monocentric (out-of-Africa) and the polycentric (multiregional evolution) approaches, but strongly disagree with other aspects of each of them.

It is clear for scholars that the earliest anthropological materials associated with early anatomically modern humans originate from Africa. The anthropological remains of the early *Homo sapiens* from the sites of Florisbad, Laetoli, Omo, Herto, Jebel Irhoud, etc. go back to the Middle–Early Late Pleistocene. Genetic diversity of human populations in Africa suggests that anatomically and genetically modern humans emerged in this region. Genetic, anthropological, and archaeological studies conducted over the last 15 years have shown that not only Africa was the ancestral home of humans. In Eurasia, there were at least three centers where modern humans evolved: Europe, East and Southeast Asia, Central Asia and southern Siberia (Derevianko, 2011). In our opinion, if we view the model of the origin of *Homo sapiens* in the form of a tree, Africa would be the tree trunk in this evolutionary process.

A breakthrough in the study of the origin of modern humans was made by the paleogeneticists, who have established that modern humans in Eurasia inherited from 1 to 4 % of their DNA from Neanderthals. From 4.8 to 11.3 % of the Neanderthal DNA was discovered in the genome of a *H. sapiens* representative who lived 35–37 ka BP in Oase Cave in Romania (Fu et al., 2015). No less sensational were the results of DNA sequencing of a girl whose bone remains were found in Denisova Cave in the Altai (Krause et al., 2010). It turned out that the inhabitants of the cave, who had an Upper Paleolithic industry of approximately 50 ka BP, belonged neither to *H. sapiens* nor to the Neanderthals; they represented a completely different, previously unknown, taxon. Given that some of the modern populations of Southeast Asia inherited up to 5 % of DNA of the Denisova hominins, and also took part in the formation of the gene pool

of modern humans, this taxon was named *H. sapiens altaiensis* ("Denisovan") (Derevianko, 2011). These and other discoveries did not reconcile the supporters of the Out-of-Africa and Multiregional approaches in solving the problem of the origin of *H. sapiens*. One of the supporters of monocentrism and a prominent anthropologist K. Stringer (2014: 251) claims that the best model is the recent African origin of humans. The followers of the polycentric hypothesis believe that the results of the new paleogenetic and archaeological studies have fully confirmed their theory. We are of the opinion that one should refrain from unnecessary discussions and from searching the weaknesses in the arguments of the "opponents", but we should jointly seek answers to any unsolved questions. There are several of them:

1) When and via which routes did anatomically modern humans migrate from Africa to Eurasia?

2) When and where did the hybridization between anatomically modern humans and Neanderthals take place?

3) When and where did *Homo sapiens altaiensis* (Denisovan) evolve?

4) Can the earliest anatomically modern humans of Africa be considered the only taxon—the ancestors of all people living on Earth, or has modern mankind originated from several related taxa (subspecies?) evolving in several large regions? Let us briefly consider some of these questions.

Our hypothesis on the origin of anatomically modern humans is based on the theory that approximately 1.8 Ma BP, *Homo erectus* left Africa, and since that time the slow process of human dispersal throughout Eurasia began. According to archaeological and anthropological studies, the first wave of *Homo erectus* penetrated into the Caucasus (Dmanisi), and into East and Southeast Asia. About 1.3–1.2 Ma BP, *Homo erectus* appeared in Europe (Atapuerca).

The turning point in the development of modern humans goes back to 800–400 ka BP. Many scholars link this period with the appearance of a new species of *Homo heidelbergensis*/*rhodesiensis* in Africa (Rightmire, 1996, 1998; Bräuer, 2008, 2010, 2012; Hublin, 2001, 2009; and others). The paleoanthropologists do not share a common view as to whom the remains from Mauer 1, Steinheim, Swanscombe, Fontéchevade, Arago 21, or the anthropological materials of the Middle Pleistocene of Atapuerca belonged. These and other anthropological finds manifest a patchwork of advanced and archaic (erectoid, Neanderthaloid, and sapient) traits. The European anthropological remains of the early and middle stages of the Middle Pleistocene are in many ways similar to the African remains from Bodo, Kabwe, Ndutu, Eyasi, and Tighenif. The erectoid and sapient traits are also combined in a mosaic way in these and other cranial and postcranial African finds.

Homo heidelbergensis/*rhodesiensis* was a single species. A part of this population (*H. heidelbergensis* with the Acheulean industry) migrated to the Levant, and then about 600 ka BP to Europe, while another part (*H. rhodesiensis*) settled in Africa and subsequently gave rise to modern humans 200–150 ka BP. *H. heidelbergensis* in the Levant led to the origins of two morphologically and genetically close taxa—humans of the modern type (Skhul and Qafzeh) and Palestinian Neanderthals (Tabun, Amud, and Kebara). Late Neanderthals in Europe evolved on the basis of *H. heidelbergensis*. The results of DNA sequencing of hominins 430–530 thousand years old at the site of Sima de los Huesos (Atapuerca, Spain) have a great importance in this respect. Their mitochondrial DNA yielded the genes of the Denisovans, and their nuclear DNA the genes of the Neanderthals (Meyer et al., 2014, 2016). From our point of view, the combination of the genes of Denisovans and Neanderthals in the gene pool of *H. heidelbergensis* resulted from the evolution of erecti; the genes of these two taxa were present in African late erectoid forms that constituted the basis for the process of speciation about 300 ka BP.

The evolution of late erectoid forms towards sapienization in the East and Southeast Asia was different. The migratory wave of *H. heidelbergensis* with the Acheulean industry did not penetrate into this territory, and its techno-typological complex of pebble-and-flake industry developed in a different way as compared to Africa and Europe (Derevianko, 2015). In East and Southeast Asia, the Acheulean industry was not found, although the presence of bifacial stone reduction technique resulting from technological convergence before 800 ka BP has been observed (Derevianko, 2014; Derevianko et al., 2016). The evolutionary development of the humans and of their industry in this territory occurred on a local basis, without the critical influence of migrating human groups from the west of Eurasia, who had a different industry. This did not exclude short-term contacts between the autochthonous populations and those who came from the adjacent territories, and gene exchange between them. The population of the Levant, whose gene pool contained both Denisovan and Neanderthal genes, could have migrated to the east and reached the Altai about 300 ka BP, and some part of this population went further into East and Southeast Asia. As a result of further hybridization of these populations with the indigenous populations, the Denisovan and Neanderthal genes have been preserved in the gene pool of some modern peoples of East and Southeast Asia (Derevianko, 2016c).

In general, the process of human evolution in the east of Asia in the Middle Pleistocene was different from that of Africa and Europe. In East and Southeast Asia, relatively few anthropological materials from the second half of the Middle Pleistocene have been found, but the available

remains of the late erecti from Zhoukoudian, Jinniushan, Dali, and other places, which combine erectoid and sapient traits, suggest that an intensive process of sapienization was also taking place in the east of Asia (Derevianko, 2011). The proposed model of human evolution in the east of Asia casts doubt on the hypothesis of the origin of *H. sapiens* from *H. heidelbergensis*/*rhodesiensis* alone, without the participation of the late erecti in the process of speciation.

Evolution of the late erectoid forms towards sapienization in the Early and Middle Pleistocene in Africa, Europe, and Southeast and East Asia might have happened according to the same scenario. This is confirmed by a certain morphological similarity between the African, European, and Chinese hominins. Some researchers explain the similarities between the anthropological finds from Jinniushan and Dali, and from Europe by the migration of *H. heidelbergensis* into China (Groves, 1994). This hypothesis is not supported by archaeological materials. The lithic industry of hominins on the territory of China differed substantially from that in Europe. The morphological similarities between the hominins separated by many thousands of kilometers can be explained, in our view, by a unidirectional (convergent?) development of local populations, which cannot be called speciation because eventually it led to the formation of subspecies: *H. sapiens africanensis* in Africa, *H. sapiens neanderthalensis* in Europe, *H. sapiens orienthalensis* in the east of Asia, and *Homo sapiens althaiensis* (the Denisovan) in the south of Northern Asia and in Central Asia. These four major regions were not completely isolated from each other, and short-term contacts between the populations might have occurred over a long period of time (200–400 thousand years); small numbers of humans migrated from one region to the other, which resulted in the exchange of gene material.

Thus, humanity today is not only the descendant of the early African humans, but also the species that emerged as a result of hybridization of at least four related taxa (subspecies?) that evolved in Africa and Eurasia and shared the earlier common morphological and genetic roots. This was a long process, initiated by the exit of *H. heidelbergensis* from Africa about 800 ka BP. Gene exchange and other factors over 100–200 thousand years formed four related taxa that differed morphologically but were capable of hybridization and reproduction*. These four taxa were the humans of the modern type from Africa (*H. sapiens africanensis*), *H. sapiens neanderthalensis* from Europe, *H. sapiens orienthalensis* from the East and Southeast Asia, and *H. sapiens altaiensis*. They all formed modern humanity.

Geneticists believe (and they are supported by many archaeologists and anthropologists) that haplogroup L 3, which appeared in African populations about 84 ka BP, haplogroups M and N, of approximately the same age, and haplogroup R originating in India can be found in many Asian populations (Forster et al., 2001; Forster, 2004; Palanichamy et al., 2004; Macaulay et al., 2005; Oppenheimer, 2005, 2009; and others). The presence of haplogroups M, N, and R of similar age in the gene pool of the modern-type humans is one of the testimonies for the migration of modern people from Africa to Eurasia. These haplogroups were found in the Melanesians and the Aboriginal Australians, and the anatomically modern humans who emerged in Australia 60–50 ka BP (Roberts et al., 1998; Thorne et al., 1999; O'Connor, Chappell, 2003; O'Connell, Allen, 2004; and others).

The time when the anatomically modern humans left Africa, their numbers, and migration routes into the east of Asia still remain debatable. P. Forster and S. Matsumura (2005) believe that migration from Africa occurred between 85 and 55 ka BP. Many scholars follow this view.

The number of migrations of anatomically modern humans from Africa also remains an open question. Some scholars assume that there could have been several migration waves (Lahr, Foley, 1994; Stringer, 2000; and others). This assumption is based mainly on the cranial materials discovered in the early 1990s. It was believed that one migration wave from Northeast Africa moved along the north of the Red Sea through the Isthmus of Suez into the Levant, while another migration wave was associated with East African ancestry (Underhill et al., 2001). S. Oppenheimer (2004b, 2009) tested the lineage of the "relic" indigenous populations of South, Southeast, and East Asia, the Indian Ocean and Sahul for the presence of haplogroups M and/or N, and came to the conclusion that all of these populations, as well as other non-African groups, were descended from L 3, which confirms the theory of a single human exodus out-of-Africa. These two haplogroups appear in the human populations of Eastern Eurasia, including South Asia. The gene pool of the population of Western Europe and the Levant contained only haplogroup N. These results allowed Oppenheimer to conclude that the single migration wave from Africa moved not through the Isthmus of Suez, but through the mouth of the Red Sea.

Recently, the possibility of the exodus out-of-Africa of anatomically modern humans prior to the catastrophic eruption of the Toba supervolcano (Sumatra) about 74 ka BP is being discussed (Petraglia et al., 2007, 2010; Soares et al., 2011; and others). A major archaeologist and follower of the monocentric hypothesis, P. Mellars and his colleagues examined this suggestion in great detail from archaeological and genetical points of view, and came to

*We do not yet have sufficient anthropological evidence to speak of the morphological features of *H. sapiens altaiensis* (the Denisovan).

the conclusion that the movement of modern-type humans from the east of Africa to South Asia took place along the coast approximately 60–50 ka BP (Mellars et al., 2013). Many scholars have argued for the southern route from Africa to Australia (Lahr, Foley, 1994; Oppenheimer, 2004a; and others).

At the present, scholars almost unanimously support the hypothesis of the migration of anatomically modern humans from Africa into South, East, and Southeast Asia via the southern route along the ocean coast in the chronological range of 60–50 ka BP. That is, the southern part of Arabia should have been a transit area that people would inevitably pass on their way from Africa to Asia. We have already discussed this problem (Derevianko, 2011). Without rejecting the possibility of such a route of migration flow from Africa to Asia in the above chronological range, we, however, do not find sufficient archaeological and anthropological evidence for the *a priori* acceptance of this suggestion.

For addressing this problem, we should go back to the overview of the Paleolithic localities in the Arabian Peninsula. Three localities, which go back to the first half of the Late Pleistocene, have been discovered in the north of Saudi Arabia, near Jubbah paleolake: the upper cultural horizon at Jebel Qattar 1 (JQ-1) with the date of 95 ± 7 ka BP, and Jebel Katefeh 1 (JKF-1) with the earliest date of about 90 ka BP and a late date of about 50 ka BP. At the site of Jebel Qattar 1, 518 artifacts were collected in vague stratigraphic conditions, and 114 lithic artifacts were collected from the upper cultural layer. The primary reduction was associated with cores for removal of flakes. The blanks included an atypical Levallois point. Small number of blanks had faceted platforms.

A little over 2000 artifacts were found in the layer and on the surface in Jebel Katefeh 1 (JKF-1). The cores were of the Levallois type, centripetal, unidirectional convergent, and radial. Levallois points and sub-triangular flakes prevailed among the blanks. Only 11 blanks were retouched.

One more site, that of Jebel Umm Sanman 1 (JSM-1), in the north of Arabia is attributed to a wide chronological range of 100–60 ka BP. Eighty eight artifacts were found at this site, including five centripetal Levallois cores with scars of flake removal from the edge towards the center. Some flakes had faceted platforms.

Judging by the small number of finds, all three localities investigated in the area of the Jubbah paleolake should be attributed to short-term sites of small human groups. The sites were located on the shore of the lake, and over time were covered with sand. The lithic inventory shows some similarities with the Levantine Middle Paleolithic industry of the Tabun C type. The people who had settled in that area might have been the Levantine population that remained in isolation for some time with the onset of an arid climate. This is evidenced by the Middle Paleolithic tools that were found on the shores of Lake Mundafan and combine techno-typological elements of the Nubian Levallois system and the Levantine system, as well as some traits typical of the industries in the area of Jubbah paleolake.

Three Paleolithic assemblages (C, B, and A) were discovered at the site of Jebel Faya (FAY-NE-1). The earliest assemblage C, with the available dates of 127 ± ± 16, 123 ± 10, and 95 ± 13 ka BP, reflects several strategies of radial reduction, and contains bifaces, denticulate tools, burins, and retouched flakes. Assemblage B is not associated with the Levallois system of reduction. The estimated date for this assemblage is 95–40 ka BP (Petraglia et al., 2011). The uppermost cultural layer is dated to 40–30 ka BP. The industry in the upper horizons B and A differs from that of assemblage C. According to scholars, assemblage C was left by anatomically modern humans who migrated from Africa (Armitage et al., 2011). In the first part of the article we have already discussed this issue. From our point of view, in East Africa, there are no industries that would be similar to assemblage C in terms of techno-typological characteristics. Such an industry has not been found in the western part of Arabia, which could have served as a transit area for human groups migrating from Africa to Arabia. An important argument is that localities with the Afro-Arabian Nubian complex, which was created by anatomically modern humans migrating from Africa to Arabia, were found in the adjacent territory, in Oman.

The assemblage C of Jebel Faya and the Nubian Levallois industry of the early sites are almost contemporaneous; it is unlikely that two flows of anatomically modern humans with different industries could have migrated from Africa to Arabia. Therefore, we believe that the site of Jebel Faya was left by local human groups who were in contact with populations of the adjacent territories, including the Levantine populations, during the pluvials. Bifacial tools have also been found on the Najd Plateau. Assemblages A and B resulted from adaptation of the Jebel Faya population to a more arid climate, and its isolation due to desertification in the neighboring regions.

The arrival in Arabia of anatomically modern humans from Africa about 115–110 ka BP was marked by the appearance of an entirely different techno-typological complex in this territory. As we mentioned above, about 260 short-term sites with surface occurrences of artifacts, associated with the Afro-Arabian Nubian technocomplex and the local Mudayyan version of the industry, which formed at a later time on the basis of the classic Nubian complex, were found in the Dhofar Governate, Oman, in 2010–2012. From several dozens to two thousand artifacts have been discovered at the sites of hunter-

gatherer groups in Dhofar, which indicates their short-term functioning.

The most arid conditions occurred in Arabia in MIS 4 and 3. Human groups could have disappeared from the driest areas and accumulated in the niches-refugia with reliable sources of water. Over the large area of the Peninsula, in addition to individual finds, assemblages from two localities of this period were found: assemblages B and A of Jebel Faya in the east and Shi'bat Dihya 1 and 2 in the west. These were short-term sites of little hunter-gatherer groups with a numerically insignificant lithic industry.

We have provided a brief overview of the discovered and investigated Middle Paleolithic sites in order to show how sparsely Arabia was populated owing to its specific natural and climatic environment. We are confident that in the future, a more careful search in this territory might make it possible to discover new Paleolithic localities. However, the number of sites is unlikely to increase so much that it would become possible to assume that their population could have covered a distance of 12,000–15,000 km from Africa to Australia.

Some scholars have linked the chronological range of 60–50 ka BP with the most intense spread of the anatomically modern humans from Africa to the eastern areas of Eurasia reaching Australia (Oppenheimer, 2009; Forster, Matsumura, 2005; Macaulay et al., 2005; Lahr, Foley, 1994, 1998; Stringer, 2000; Mellars, 2006; and others). In MIS 4 and 3 (70–40 ka BP), the most severe arid climate in the Late Pleistocene became established in most parts of Arabia, and according to some experts, dispersal of humans in this area was generally problematic; humans possibly settled only in niches-refugia (Drake, Breeze, Parker, 2013; Petraglia et al., 2011; Rosenberg et al., 2012; and others).

Delagnes and her colleagues believe that there is no clear evidence of the continuous habitation of human populations in Arabia between MIS 5 and the onset of MIS 3 (Delagnes et al., 2012). The populations who lived in the beginning of MIS 3 in the south of the Peninsula, especially in the Wadi Surdud and Jebel Faya (A and B), apparently did not enrich the material culture of the region with any new behavioral strategies. In the Arabian Peninsula, during the Middle Paleolithic, there are no signs of producing complex stone tools, such as standardized and side-bladed tools or composite hafting systems, as well as using personal adornments, pigments, or symbolic objects (Delagnes et al., 2013: 240). Thus, there are no sufficient archaeological materials to consider Arabia the starting point for the dissemination of the African anatomically modern humans to the east of Asia as far as Australia. In addition, no lithic inventory and symbolic objects of either the African or the Arabian Middle Paleolithic techno-typological complex have been found anywhere en route from Arabia to Australia.

As a proof, the followers of the Out-of-Africa hypothesis of migration of the anatomically modern humans from Africa to Eurasia use the microlithic industry found on the island of Sri Lanka and in India that includes tools on blades with backed dorsal surface and insert blades in the form of trapezoids and segments, as well as beads and engravings, which are surprisingly similar to the artifacts of the Howiesons Poort industry in South Africa (Clarkson et al., 2009; Perera et al., 2011; Mellars et al., 2013; and others). The Howiesons Poort industry in South Africa goes back to 70–50 ka BP, while the sites with the microlithic technique and non-utilitarian and symbolic objects date to 40–35 ka BP. On the basis of similarities between the Howiesons Poort microlithic complexes and the contemporaneous Indian complexes one could make a conclusion concerning the migration of anatomically modern humans from Africa to South Asia. However, the question remains, why such an industry is not known not only in Arabia, but also along the entire route to South Asia and further east to Australia?

An explanation for this phenomenon is the hypothesis about a rapid movement of the migration flow from Africa to Australia along the narrow coastal line of the ocean (Oppenheimer, 2004a, 2005, 2009; Mellars, 2006; Mellars et al., 2013; and others). The proponents of this hypothesis suppose that the members of this migratory wave from Africa were moved very fast along the coast on timber floats or boats, and subsequently, due to the rise of the ocean level, no archaeological evidence has survived. According to Mellars, a small-numbered group of migrants moved along the narrow coastal strip during the lowered ocean level, and followed the same adaptation strategies as in Africa. Movement along the coast excluded prolonged contacts with indigenous populations (Mellars, 2006).

This model of migration from Africa to the East raises many questions. In the Paleolithic, any migration had to be a slow process. Moving into adjacent territories became necessary with an increase in population, when there were no sufficient food resources in the formerly inhabited region. How many generations passed and how much time did it take the migrating groups to reach Australia? The proponents of that idea do not rule out that for their movement the populations of anatomically modern humans could have used floating structures. However, wood processing tools are not known in the Howiesons Poort industry, and without such tools it was impossible to build a timber float or a boat. There are some more arguments against the hypothesis of fast movement of human groups from Africa to Australia; yet, the genetic evidence supports the idea of migration of anatomically modern humans from Africa to Australia. Further field studies in Arabia, the South and Southeast Asia should

give a definitive answer to the question of how and when it happened. At present, there remains a number of unresolved issues.

Conclusions

The Middle Paleolithic of Arabia differed from the Middle Paleolithic of the Levant. We believe that according to the materials of the investigated Paleolithic sites, only small human groups were dispersed over the Arabian Peninsula in the Middle and Late Pleistocene because of relatively arid climatic conditions. Even the population of anatomically modern humans with the Afro-Arabian Nubian techno-typological complex in Dhofar, which occurs at about 260 sites, was not very numerous. All of these sites typically show the surface occurrence of cultural horizons. The number of finds at these sites ranges from several specimens to 2000 items. The sites are usually short-term. One small group of people might have moved from one location to another several times a year. The presence of a few sites with scarce inventory testify to the small amount of population and sparse habitation in Arabia in the Middle Paleolithic.

The available inventory indicates that there were two migrations of anatomically modern humans from Africa, represented by the Nubian and the Aterian industries, which stand out distinctly from the entire Middle Paleolithic techno-typological complex of Arabia. The Middle Paleolithic of Arabia is manifested by industries of local origin. During the pluvials, the population in the region increased; the migration routes, as well as the contacts with populations of the neighboring areas including the Levant, expanded, and the exchange of innovations in lithic processing and gene flow between various groups of people took place.

In the periods of extreme aridity, the populations settled in the niches- refugia with permanent water resources; over time, the population became reduced or disappeared completely (Petraglia et al., 2011; Stewart, Stringer, 2012; and others). Adapting to the changing environment, hominins in the refugia developed new adaptation strategies resulting in the emergence of different techniques of lithic reduction.

We allow the possibility that anatomically modern humans migrated from Africa through Arabia to the east of Asia reaching Australia 70–50 ka BP, but we believe that so far there is no sufficient archaeological evidence to support this hypothesis.

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Archaeological Sites as Markers of Neopleistocene-Holocene Hydrological System Transformation in the Kurai and Chuya Basins, Southeastern Altai: Results of Geomorphological and Geoarchaeological Studies*

Multidisciplinary studies using geomorphological, geoarchaeological, and geochronological approaches indicate contrasting environmental changes in Southeastern Altai, beginning in the Late Pleistocene. 29 new radiocarbon dates from the subaerial complex overlying Late Neopleistocene sediments in the high-altitude Kurai and Chuya basins confirm the degradation of a single ice-dammed reservoir in that area before the Early Holocene. In the first half of the Holocene, those basins were filled with isolated lakes. At the mouth of the Baratal River in the western Kurai basin, a reservoir with a water-level of at least 1480 m a.s.l. emerged ca 10–6.5 ka cal BP; whereas in the Chuya depression, numerous residual lakes existed at least 8 ka cal BP. Landslide- and moraine-dammed lakes between the depressions in the Chuya River valley existed until 7–3 ka cal BP, when they drained away. The state of preservation of in situ archaeological sites, their cultural affiliation, and their locations within the depressions and along the main Chuya valley attest to spatial and temporal changes in the hydrological system. This evolution in the second half of the Holocene did not entail major consequences for humans. All cataclysmic flood events took place (occurred) before 10–8 ka cal BP.

Keywords: *Hydrological system transformation, Altai nomads, geoarchaeology, geochronology, Holocene, Southeastern Altai.*

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Introduction

Relief and climate changes, plus sedimentological and hydrological processes that took place during the time of existence of archaeological sites, form the topics of questions, the answers to which determine the success of archaeological studies—from the stages of reconnaissance survey and problem-setting to interpretation of results. At the same time, archaeological research can be a source of valuable information for characterizing paleolandscapes and for dating quaternary deposits and landforms.

The Altai upland was a geographical center of ancient cultures and civilizations located in the contact area between the East and the West. The southeastern part of the Russian Altai (the Altai Mountains) considered in this article includes the Kurai-Chuya system of basins and their framing ridges. The ridges reach an elevation of 3900–4300 m a.s.l. and represent one of the contemporary glaciation centers of Altai. The bottom of the Chuya basin lies in the elevation range of 1750 to 2000 m a.s.l., while that of the Kurai basin lies in the range of 1500 to 1650 m. The depressions are separated by the Chagan-Uzun massif, an independent tectonic block characterized by high seismotectonic activity during the Late Neopleistocene and Holocene.

The bottoms of the Kurai and Chuya basins and the valleys of framing ridges are an area of numerous archaeological sites belonging to different epochs from the Paleolithic to the Middle Ages. Nevertheless, the cataclysmic draining—the most powerful on the Earth—of the ice-dammed reservoirs that existed here in the Neopleistocene (Butvilovsky, 1993; Rudoy, 2005; and others), and the hydrological system's transformation in the Holocene, considerably less broad-scale but no less important for distribution of people (Rusanov, 2010; Agatova et al., 2016), have been modeled exactly for this territory. Despite a high degree of geomorphological certainty as to the Southeastern Altai, the chronology of the natural events during the Neopleistocene and Holocene in this region is a matter for considerable debate, which often assigns the roles of age-markers to the archaeological sites. However, the Chuya and Kurai basins have been explored irregularly in terms of the mapping of archaeological sites. At present, the eastern and southern parts of the Chuya depression, where a huge number of sites belonging to various cultures are concentrated, are the best-studied. In the Kurai basin, a number of archaeological sites of the Scythian and Xiongnu epochs, and Kyrgyz period have been investigated. In the Chuya River valley, in the area between the depressions, sites belonging to the Upper Paleolithic, 6th–10th centuries AD, and to the Kyrgyz culture are known. However, publications containing descriptions and definitions of the cultural affiliations of archaeological objects in the central part of the Chuya depression, a considerable part of the Kurai depression, and the Chuya valley between the depressions (except for the mouth of the Kuektanar River), are almost absent.

This article presents the results of a multidisciplinary study of the Kurai-Chuya system of intermountain depressions, using geomorphological, paleontological, geoarchaeological, and geochronological (radiocarbon and dendrochronological) methods. The issues of the existence in these depressions of Holocene lake basins, closely related to the evolution of the Neopleistocene glacio-lacustrine system, are discussed. Particular emphasis has been placed on studying the geomorphological structure of the Chuya valley between depressions and the distribution of archaeological sites in this area; because, according to the majority of researchers, the dams that impounded the lakes in the Chuya basin in the Neopleistocene and Holocene were formed exactly here.

Debating-points concerning the existence of archaeological cultures and the reconstruction of the limnosystems of the Kurai and Chuya basins in the Neopleistocene and Holocene

The existence of archaeological cultures in the Kurai and Chuya basins is directly related to the climate-responsive evolution of the hydrological system of these depressions in the Neopleistocene and Holocene. Glaciations and ice-dammed lakes formed in the depressions became the main factor for morpholithogenesis within this territory during the Neopleistocene. At 2100 m a.s.l., a single ice-dammed reservoir fully occupied the bottoms of both basins. Obviously, the chronology and character of the draining of the Neopleistocene lakes determine the possibility of finding the most ancient sites in this territory. Currently, however, there is no consensus on the times of the glaciations, nor on the chronology, number, and character of the drying-events for the ice-dammed lakes; and the last large lake(s) in the basins is dated both to the Sartan period (MIS 2) and to the beginning of Würm (MIS 4)*.

*The last most comprehensive review of opinions regarding all these issues is given in the article by A.V. Panin (2013).

Hydrological changes in the Holocene within the territory under study were closely related to the evolution of the Neopleistocene glacio-limnosystem. According to studies conducted by G.G. Rusanov (2010), an extensive lake also existed in the Chuya depression for much of the Holocene. During the period of its maximum water-level, the lake occupied the central part of the depression up to an altitude of 1800 m a.s.l., as confirmed by abrasion-terraces and the spread of lacustrine sediments, along with Late Neopleistocene-Holocene fauna of ostracods in the range from 1760 to 1800 m a.s.l. The lake's depth changed from the first meters in the southeastern part of the basin to 80 m in the Chuya valley; the volume of water was at least 3.5 km^3, and the area reached more than 100 km^2. According to Rusanov, the lake's level could have decreased to at least 1765 m a.s.l. in the subboreal period of the Late Holocene (4500–2500 BP) as a result of partial erosion of landslide-moraine dam located in the Chuya valley near the Kuektanar's mouth; however, the lake continued to exist for long time after this. In this researcher's opinion, the cataclysmic drying of the lake, which possibly occurred no more than 1000 BP, could have been caused by a large seismic landslide, which fell down into water reservoir not far from the dam.

Obviously, the existence of such a lake and the supposed abrupt changes of its level were bound to affect the distribution of people not only in the Chuya basin, but also in the Kurai basin located downstream (the Chuya River), as well as in the Chuya valley between them. At the same time, preliminary studies, using (among others) the geoarchaeological method (Agatova et al., 2016), have revealed a number of issues relating to the possible existence of a single lake in the Chuya basin in the Holocene; the chronology of its level's recessions; the time, causes, and character of its final drying.

Thus, the reconstruction of the landscapes that determined the distribution of people in the area of Southeastern Altai in the Holocene requires information not only about climatic fluctuations, but also about the evolution of the hydrological system, along with geochronological data.

Results of geomorphological and geoarchaeological studies and their interpretation

To reconstruct the parameters of the Chuya lake's basin in the Holocene and to determine the time and character of its draining we have carried out an analysis of geological evidence and the *in situ* locations of the archaeological sites in the Chuya depression, in the Chuya valley between the depressions where the landslide-moraine dam was located, and in the eastern part of the Kurai depression (which is the zone of potential influence of the cataclysmic draining of lake approximately 1000 BP, according to the suggestion made by Rusanov (2010)).

Chuya basin. Judging by the age of the buried peat horizon overlying the moraine sediments liable to seismically induced sliding on the right bank of the Boguty River (the Chikhachev ridge) at an elevation of 2500 m a.s.l., which was studied by us, the Sartan glaciers in the eastern framing of the basin retreated above 2500 m a.s.l. as early as 13786 ± 166 cal BP (IGAN-4098 (see *Table*)); which disproves the existence of an ice-sheet 14 ka cal BP (Rudoy, 2005: Fig. 6). The level of the ice-dammed lake (if it existed here then) was below this mark. In the period of approx. 8.8–8.0 ka cal BP (SOAN-8674, IGAN-4089, IGAN-4091), soil-cover was forming and forest was growing at an altitude of 2470 m a.s.l. on the Chikhachev ridge. Accordingly, lake systems in the Chuya basin could have existed only below this mark at that time. Finding a paleosol horizon in the sediments of the Yustyd floodplain at an elevation of 1951 m a.s.l. is indicative of the absence of a large reservoir in the eastern part of the basin 2150 ± 146 cal BP (SOAN-8423).

In comparison with the peripheral parts of the Chuya depression, which rise smoothly to the ridges, the bottom of it contains a considerably smaller number of archaeological sites dated to the second half of the Holocene. Quite definitely, the sites are concentrated in the depression's eastern and central parts; i.e. beyond the limits of areas unfavorable for life-activities, such as lakes, frost mounds, and bogs, which existed rather recently at the permafrost degradation locations. In the western part of the basin, in contrast to present-day settlements, no traces of earlier human presence (burials, ritual complexes, iron-melting or ceramic furnaces) have been noted directly along the Chuya River. Also, another trend is observed here: more recent archaeological sites are located structurally lower than those of the Late Bronze Age, while the low limit of their distribution is 1753 m a.s.l.

The most ancient and low-level *in situ* site in the Chuya basin has been recorded southeast of the Mukhor-Tarkhata village, between the proluvial cones of the Tarkhata and Kokozek rivers, at an altitude of 1770 m a.s.l. These rock-fills 20 and 40 m in diameter, round in plan, are presumably attributable to the Late

Radiocarbon dates obtained in the course of studies

Laboratory No.	Location of sampling	Elevation a.s.l., m	Sample type	Date*
IGAN-4098	Valley of the Boguta River, Chikhachev ridge, eastern framing of the Chuya basin	2500	Paleopeat	11,910 ± 70 (13,786 ± 166)
IGAN-4089		2470	Charcoal	7780 ± 75 (8629 ± 226)
IGAN-4091		2470	Paleosol	7350 ± 90 (8179 ± 179)
SOAN-8674		2470	Charcoal in paleosol	7640 ± 100 (8415 ± 212)
SOAN-8423	Valley of the Yustyd River, the Chuya basin	1951	Paleosol in alluvial floodplain sediments	2130 ± 25 (2150 ± 146)
IGAN-4131	Valley of the Chuya River between the Kurai and Chuya basins in the Kuektanar River mouth	1740	Vegetative detritus	850 ± 90 (796 ± 137)
IGAN-4132		1740	Same	2390 ± 70 (2517 ± 199)
IGAN-4133		1720	"	2310 ± 60 (2403 ± 253)
IGAN-4134		1740	"	650 ± 70 (611 ± 86)
IGAN-4138		1720	Fragments of tender roots	1680 ± 60 (1565 ± 149)
IGAN-4139		1750	Charcoal and vegetative detritus	1530 ± 70 (1426 ± 125)
IGAN-4140		1750	Charcoal	1290 ± 70 (1192 ± 135)
IGAN 4141		1720	Fragment of tree root	290 ± 60 (325 ± 176)
SOAN-8715		1730	Paleosol with charcoal	3330 ± 65 (3558 ± 157)
SOAN-9091		1725	Charcoal	1250 ± 65 (1152 ± 143)
SOAN-8903	Valley of the Chuya River between the Kurai and Chuya basins downstream of the Kuektanar River mouth	1735	Paleosol	7440 ± 95 (8223 ± 181)
SOAN-9090		1650	"	350 ± 65 (403 ± 108)
SOAN-9092		1670	Paleosol with charcoal	1060 ± 45 (951 ± 116)
SOAN-9093		1670	Charcoal	890 ± 30 (821 ± 87)
SOAN-9098		1635	Paleosol	1250 ± 30 (1178 ± 96)
SOAN-9100		1635	"	2835 ± 55 (2966 ± 174)
SOAN-9086	Valley of the Arydzhan River, the Kurai basin	1720	Paleosol in alluvial-proluvial sediments	7910 ± 70 (8791 ± 200)
SOAN-8424	Valley of the Tadzhilu River, the Kurai basin	1568	Paleosol in diluvial sediments	3415 ± 65 (3694 ± 142)
SOAN-8549	Valley of the Chuya River, the western part of the Kurai basin	1470	Paleosol in proluvial-colluvial sediments	3275 ± 80 (3525 ± 168)
SOAN-8681	Valley of the Chuya River in the Baratal river Mouth, the western part of the Kurai basin	1465	Paleosol	5650 ± 90 (6466 ± 177)
SOAN-9094		1475	Buried medium gravel humus horizon	8770 ± 140 (9861 ± 324)
SOAN-9096		1460	Paleosol	4560 ± 75 (5220 ± 247)
SOAN-9097		1460	"	5470 ± 160 (6274 ± 357)
NSKA-00988		1460	Collagen	9584 ± 31 (10,930 ± 171)

*2σ-calibrated values are shown in brackets.

Bronze Age and the beginning of the Early Iron Age. They consist of small boulders and pebbles, and their contours are outlined by numerous pairs of large boulders. This vast archaeological complex includes chains of Pazyryk mounds, Turkic funeral enclosures, and objects with unidentified cultural affiliations. Pazyryk mounds, characterized by the lowest location (1764 m a.s.l.) within the Chuya basin, have been recorded both here, and also on the left bank of Chuya River, 2 km south of Ortolyk village, and on the right bank of the Chagan-Uzun River. The lower limit of the distribution of Old Turkic sites known to date is an elevation of 1753 m a.s.l. (the Chagan-Uzun basin).

The locations of sites attributed to various cultures indicate that the level of the lake in the middle of the Chuya basin, which was suggested by Rusanov (2010), in the Late Bronze Age could have not been higher than 1770 m a.s.l., and did not exceed 1764 m a.s.l. in the Scythian epoch, or 1753 m a.s.l. in the Turkic epoch. Generally, their locations point rather to the local character of lakes here, and unfavorable developmental conditions in the western part of the basin during the last third of the Holocene.

Chuya valley between the Chuya and Kurai basins. In this area, the valley represents a graben separating the Kurai ridge and the Chagan-Uzun massif. Both graben shoulders are complicated by numerous seismically induced landslides, rockfalls, and large talus fans. The coastlines, preserved at elevations up to 2100 m a.s.l., attest to the existence of a single Kurai-Chuya basin during certain developmental stages of the glacio-limnosystem. The graben is divided structurally into three sections (Fig. 1).

In the first, the narrowest area, from the Chuya basin mouth to the Meshtuyaryk's mouth, the graben's width along the 1800 m a.s.l. isoline (the maximum level of the proposed Holocene lake) does not exceed 870 m. Numerous landslides and rockfalls occupy both slopes along their entire length. Areal sliding of the Neogene sediments from the lower tectonic bench of the Kurai ridge, from the elevation of 2100 m a.s.l., is observed. The Chuya River is slightly incised into boulder-pebble-sandy deposits, and it meanders. No traces of landslide dams have been recorded by us in this area. Archaeological sites have not been discovered either.

The second area, from the Meshtuyaryk's mouth to the place of incision into moraines of the Kuektanar glacier, is characterized by the graben's widening along the 1800 m a.s.l. isoline up to 3.5 km, and by the sharp deepening of the Chuya's bed up to 40–45 m in the location where the moraine is cut. In spite of this maximum width, the dam composed by the Kuektanar glacier moraines and the giant Sukor landslide was formed exactly in this part of the graben. On the left bank of the Chuya, the landslide sediments partially overlie the moraine; and on the right bank, downstream of the Kuektanar mouth, they lie in the thickness of the glacial deposits, obviously sharing their age. At present, moraine and landslide sediments reach the altitude of 1800 m a.s.l. only in the slope parts of the valley, while in the central part, their elevation does not exceed 1750–1760 m a.s.l. The terraced character of the Sukor landslide's surface up to an altitude of 1800 m a.s.l. points to its formation, and the partial erosion of the landslide-moraine dam, even before the draining of the reservoir, with the water's edge not lower than 1800 m a.s.l.—equal for both basins at that time. The "rock garden" on the left-bank terrace upstream of the landslide body is indicative of the passage of high-energy floods in this area of valley. After the drying (or level decreasing) of the single water reservoir, the dam could have impounded the lake in the Chuya basin with the water surface not higher than 1750 m a.s.l. The age of paleosol (SOAN-8903) at the base of the subaerial sequence lying on top of the lacustrine sediments at an altitude of 1730 m a.s.l. (Fig. 1, section 3) indicates that if the lake above the dam still existed around 8 ka cal BP, its edge was below 1730 m a.s.l.; and it was local, since the Chuya basin's bottom is located above this mark. Thus, as early as 8 ka cal BP, the dam in the Kuektanar mouth could not have impounded the lake in the Chuya valley, while no traces of another possible dam have been discovered higher in the valley.

The obtained radiocarbon dates imply formation of the cover subaerial complex in the considered area of the valley in the Holocene (Fig. 1, sections 1–4), as well as fluctuations of the Chuya bed and active erosion of ancient lacustrine sediments during the last third of the Holocene (Fig. 1, section 5). The disappearance, by the 6th–10th centuries AD, of any lakes here (SOAN-9091) is also evidenced by a number of iron-melting furnaces along the right coastal cliff of the river at 1720–1730 m a.s.l. These are the Kuekhtonar-1, -2 sites (Zinyakov, 1988: 46–49) and the previously unknown location below the Kuekhtonar River's mouth, which we identified on the basis of the ground's calcination to a bright crimson color (Fig. 1). No later than the 15th–16th centuries AD (IGAN-4141), the sand-massif on the right bank of Chuya was colonized by trees. Scattered finds attributable to the Paleolithic and the Kyrgyz culture were collected among the dunes (Derevianko, Markin, 1987: 11–12; Hudiakov,

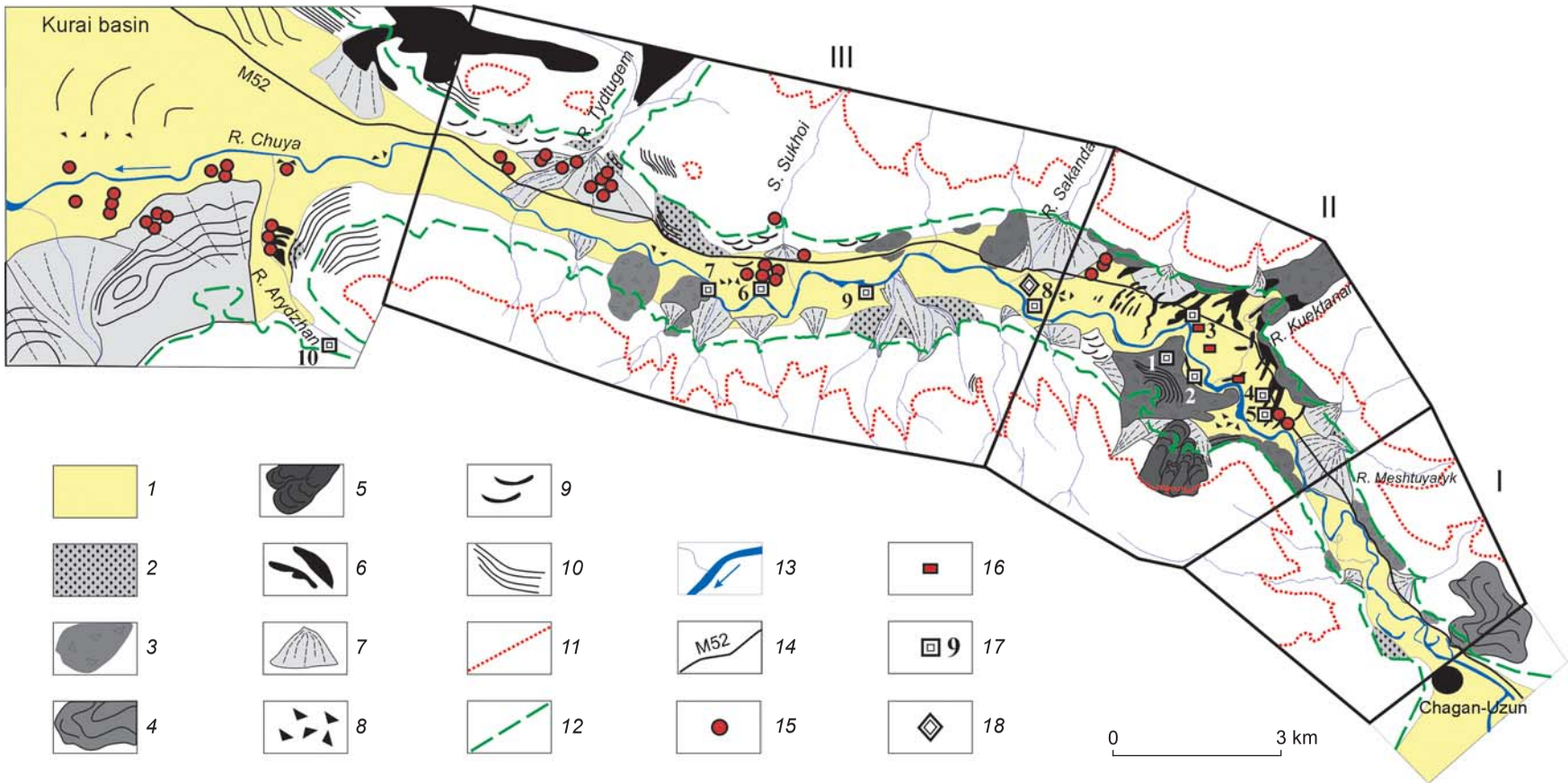

Fig. 1. Geomorphological schematic map of the Chuya valley between the Chuya and Kurai basins, and location of archaeological sites.
I–III – the valley areas discussed in the text.
1 — sediments of the basin-bottoms and Chuya valley; *2* – terraces eroded in the Late Neopleistocene (?) lacustrine sediments; *3* – landslides, slumps, rock avalanches; *4* – landslides of Neogene lacustrine sediments; *5* – rock glaciers; *6* – moraines; *7* – proluvial cones and aprons; *8* – accumulations of blocks and boulders ("rock gardens") tracing the passage of disastrous floods; *9* – bedrock slopes treated by water-flows; *10* – abrasion lake terraces modeling soft sediments; *11* – paleolake level of 2100 m a.s.l.; *12* – paleolake level of 1800 m a.s.l.; *13* – present-day hydrological system; *14* – federal highway M52; *15* – archaeological complexes; *16* – location of iron-melting furnaces; *17* – location of studied sections; *18* – place where dendrogeomorphological analysis was conducted.

1990). At the place of their discovery, on the surface of the Chuya six-meter terrace, we have recorded an *in situ* archaeological object—round spreads of stones (at least three of them) up to 2 m in diameter, partially covered by sand. The determination of the object's cultural affiliation is difficult; however, we can assume that it is relatively recent, which points to high activity of aeolian processes during the last millennium. No evidence of landslide that, according to the hypothesis of Rusanov (2010), could have caused a wave that resulted in destruction of the landslide-moraine dam and in drying the lake about 1000 BP, has been discovered in the area of this valley.

The third area extends from the dam to the outlet into the Kurai basin. The valley's width along the 1800 m a.s.l. isoline is 1.6–1.9 km here. The lake (wave-cut and accumulative) and river (erosion and erosion-accumulative) terraces, formed in the period of existence of Neopleistocene lakes and in the course of post-lake incision, represent a typical feature of this area. Abrasion-levels on the accumulative lake terrace with a surface elevation of 1700–1750 m a.s.l. in the Tydtugem's mouth suggest the existence of several lake epochs in the Neopleistocene. The lower lake terrace (1610 m a.s.l.) traced in the Kurai basin shaves off the proluvial cone of the Tydtugem River, which indicates formation of its distal part during the interlacustrine stage. Accumulations of large pieces of rock (up to blocks) of different petrographic composition on medium-height terraces indicate the passage of powerful floods across the valley. The Chuya incision into ancient lacustrine sediments reaches ca 170 m here, with the water's edge at 1582 m a.s.l.

Within the third area, several chains of Pazyryk mounds with balbals are located nearest to the Kuektanar dam, at a distance of 1000–1250 m from the highest moraine line, on the right-bank terrace (1740 m a.s.l.) along the edge of the proluvial cone of the Sakanda River. Numerous mounds and ritual structures of the Pazyryk and Old Turkic cultures are concentrated in the Sukhoi stream's mouth on a terrace, at 1665–1670 m a.s.l. Some objects are situated not far from a steep 25-meter scarp, defining this terrace, 200 m away from the present-day Chuya's bed. A single Pazyryk mound has been recorded on the rock bar of the Sukhoi stream valley, at an altitude of 1800 m a.s.l. Pazyryk cemeteries including large mounds, as well as Turkic funeral enclosures, are located on the proluvial cone of the Tydtugem, on both banks, at an elevation-range of 1630–1650 m a.s.l. Mounds whose cultural affiliation cannot be determined by morphological characteristics have been recorded on a terrace of 1610 m a.s.l., shaving off this cone, and on a more recent nested proluvial cone. Meanwhile, their affiliation could, possibly, detail the chronology of the Holocene geological processes.

Downstream the Sukhoi stream's mouth, seismically induced paleo-landslide on the left graben slope impounded the river, which resulted in formation of a local lake. The pre-Holocene age of the boulder stratum in the crest of a 15-meter right terrace of the Chuya River (Fig. 1, section 6), associated with one of the latest cataclysmic floods, is evidenced by the data of lacustrine sediments obtained by V.V. Butvilovsky (1993) (Fig. 1, section 7): 9717 ± 177 cal BP (SOAN-2378) and 8308 ± 110 cal BP (SOAN-2379). Drying of this landslide-dammed lake occurred no later than 3300–3000 cal BP (SOAN-9100). In the period of Turkic domination, soil was formed on the terrace surface again (SOAN-9098), while there was no overflow onto the 15-meter terrace itself (1633 m a.s.l.) during the last 3000 years; and possible severe floods did not go beyond the limits of Chuya's bed in this area, as confirmed by preservation of funerary complexes (including elite Pazyryk mounds) on the next 25-meter terrace (1665–1670 m a.s.l.), including its crest.

Active migration of the Chuya's bed downstream of the Kuektanar dam during the last 1000 years is evidenced by radiocarbon dates (SOAN-9092, SOAN-9093) of buried soils (Fig. 1, section 8) and by the results of dendrochronological analysis of cores and stem-discs of larch-trees, which colonized the floodplain. About 400 cal BP (SOAN-9090), the youngest paleosol was formed on the high left-bank floodplain upwards of the Sukhoi stream's mouth. This paleosol was overlaid by thin alluvium in the course of subsequent short-term flood-flows of the Chuya (SOAN-9090; Fig. 1, section 9).

Kurai basin. In its western part near the Baratal ravine mouth, we have found paleosol on the surface of talus cone (1475 m a.s.l.) formed after the drying of the last ice-dammed lake in the Kurai basin. The soil is dated to 9861 ± 324 cal BP (SOAN-9094), thus indicating that this drying occurred as early as the beginning of the Holocene. Colluvium is overlapped by a 10-meter sequence of flat-bed clastic sediments, which accumulated near the slope's foot in a water environment. The dates of paleosols in the sequence roof, such as 6466 ± 177 (SOAN-8681), 6274 ± 357 (SOAN-9097), and 5220 ± 247 cal BP (SOAN-9096), testify that a water reservoir with a level of at least 1480 m a.s.l. existed again in this part of the Kurai basin during the period between 10.0 and 6.5 ka cal BP. By the time of the erection of the

Fig. 2. The Chuya valley in the Baratal mouth.
Black arrows show the location of the glacial dam; stripes indicate Late Neopleistocene lacustrine sediments preserved around the bedrock exposures; white dashed line with arrows shows location of bed and direction of current of the pre-Chuya; red ovals show mounds of the Baratal-1 Pazyryk cemetery. Calibrated (2σ) radiocarbon dates characterize the age of paleosols at the right valley shoulder. The altitude is 1470 m a.s.l.

Borotal-1 Pazyryk mounds on the right-bank terrace of the Chuya (Kubarev, Shulga, 2007: 34–35, 180–185), the river channel, which earlier had extended along the right slope, had already taken the position close to the present-day one after moving to the valley's center (Fig. 2). The radiocarbon age (SOAN-9086) of the lowest of paleosols, overlying the alluvial-proluvial sediments in the Arydzhan River valley (eastern part of the Kurai basin) at an altitude of 1720 m a.s.l. (see Fig. 1, section 10), allows the statement that, if the lake in Kurai depression existed about 9000 cal BP, its level was considerably lower than 1720 m a.s.l., and it did not enter into the western part of the Chuya basin. The moraine-complex lying at an elevation of approx. 1625 m a.s.l. in the Arydzhan valley mouth is nested within a thick proluvial cone and eroded away. Separate erratic boulders (probably traces of iceberg rafting) are encountered here on the Chagan-Uzun massif slope up to an altitude of 1760 m a.s.l., indicating the level of one of the latest Neopleistocene lakes in the basins. The buried soils aged about 3500–3700 cal BP (SOAN-8424, SOAN-8549), overlying flood-disturbed sediments and proluvial-colluvial cone in the western part of the Kurai depression, suggest that all flood-events came to an end here in the second half of the Holocene.

Earlier unknown and numerous burials belonging to the Bulan-Koby culture of the Xiongnu epoch were recorded on the ancient proluvial cone terraced by lake-levels in the Arydzhan-Baltyrgan interfluve 1600–1610 m a.s.l. (60 m above the Chuya edge). Rock-fills ca 2 m in diameter, dominated by granite and marmorized limestone boulders, slightly bloom out on the sodded surface of the left-bank part of the cone. Both separate burials and northwest-trending chains of several graves are encountered. A vast field of similar burials, with mounds of marmorized limestone boulders, has also been discovered on the first right-bank terrace of Arydzhan 1615–1630 m a.s.l. Below the Arydzhan's mouth, on the second Chuya terrace along both river banks (11–12 m above the river edge and no further than 250 m from it), Pazyryk and Old Turkic complexes are located, which suggests that all possible cataclysmic flows had taken place before their construction (see Fig. 1).

Conclusions

New chronometric data and mapping of *in situ* archaeological sites (which was carried out for the first time in the Chuya valley in the area between the Chuya and Kurai depressions and in the adjacent parts of the basins) have allowed specifying reconstructions of the geological processes in Southeastern Altai at the end of the late Neopleistocene and in the Holocene. More than 25 new radiocarbon dates attest to the formation of all studied paleosols, overlying lacustrine sediments within the Kurai-Chuya system, in the Holocene. These data allow no conclusions to be drawn about the chronology of the draining of the Neopleistocene ice-dammed lakes here. At the same time, it can be reasonably stated that the last single ice-dammed reservoir in the basins ceased to exist as early as the beginning of the Holocene. In the interval of 10.0–6.5 ka cal BP, a lake with a level not lower

than 1480 m a.s.l. existed again in the western part of the Kurai depression; while the reservoir in the Chuya depression was desintegrated into isolated, though sizeable, lakes. Thus, in the first half of the Holocene, isolated lake-systems connected only by the Chuya River were located in the basins, while all possible cataclysmic outburst floods took place in the basins earlier than 10–8 ka cal BP. Hydrological system transformation in the second half of the Holocene proceeded without disastrous consequences for people.

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The Engraved Stone Pendant from Poiana Cireşului-Piatra Neamţ, Romania. New Contributions to the Understanding of Symbolic Behavior in Gravettian

The 2013 archaeological excavation campaign carried out at Poiana Cireşului-Piatra Neamţ Paleolithic site (Neamţ County, North-Eastern Romania) led to the discovery, in the Gravettian I layer, of the first engraved stone pendant found in this settlement, in an area where such discoveries are very rare. The pendant was engraved on its both sides and notched along its outline. The same layer provided the largest number of art objects and tools made of hard animal materials from the Romanian Upper Paleolithic. The article describes the archaeological context of the find. Data on the sequence of Gravettian deposits, absolute dates of the Gravettian I layer, and information about faunal materials, collections of tools and art objects are given. The stone pendant having an oval shape and notches on both sides is subject to comprehensive study. Notably, incisions on both the upper face and the reverse show traces of ochre; the best preserved pigment is observed along the outline of the pendant. A peculiar decorative element of the pendant is represented by the two incisions near the orifice. Stylistic features of each surface of the object and technical execution of engravings are described, as well as tools that were probably used for making incisions. Differences of the find under study from other suspended personal ornaments of the East European Gravettian, as well as certain similarities, are indentified. It has been established that the Poiana Cireşului pendant is close to Eastern Europe and Northeast Asia Upper Paleolithic adornments.

Keywords: *Gravettian, art objects, personal ornaments, engraved stone pendant.*

Introduction

Recent studies on suspended personal ornaments (beads, pendants) have brought to light their potential of highlighting various socio-cultural aspects relating to the Paleolithic, such as exchange and social networks, ethno-linguistic geography, individual and social identities (White, 1999; Taborin, 2004; Vanhaeren, d'Errico, 2005, 2006; Álvarez Fernández, Jöris, 2007). The justification for the use of personal

ornaments during the Paleolithic may have been their sustainability in relation to human experience, being often arguments for cultural and social continuity. In order to demonstrate the emergence of modern human behavior, most studies of personal ornaments have focused on the Early Upper Paleolithic finds, a fact determined by the symbolic function of the beads and pendants (Hahn, 1972; Kuhn et al., 2001; White, 1993, 1999, 2007; Vanhaeren, d'Errico, 2006; Álvarez Fernández, Jöris, 2007). However, on the Gravettian suspended personal ornaments, despite the numerous discoveries, only sparse information is available, this aspect being more obvious for the settlements in South-Eastern and Eastern Europe (Abramova, 1995; Taborin, 2004; Goutas, 2013). From this perspective, the new personal ornaments discovered in the Gravettian sites of South-Eastern Europe can provide important information on the ethno-cultural features of the Paleolithic communities of this region.

Organic raw materials were most often used in the Paleolithic to create suspended personal ornaments (shells, teeth, ivory, bones), while minerals were used rather rarely. For instance, in the Cantabrian region, in eleven Gravettian sites, 112 suspended personal ornaments were analyzed and, of these, only one was made of a mineral material: a schist pendant discovered at Cueva Morín in Spain (Álvarez Fernández, 2006: 219–220, 231–232). Few studies emphasize this aspect, yet the rarity of certain symbolic objects may have special implications for the understanding of the socio-cultural peculiarities of certain communities. At Sungir (Russia), in tomb 1, beside around 3000 ivory beads and pendants made of fox teeth, on the chest of the deceased, a single stone pendant has been found, preserving red pigment (Bader, 1978). According to some authors, this stone is primarily a witness of the symbolic production activities (manufacturing of pendants) which took place on the site (Trinkaus et al., 2014), considering that around 20 more similar pendants were discovered in the layer. But others give in it a special value, mainly because it was covered with red ochre (Bosinski, 2013: 508).

After the analysis made of the stone pendants discovered in various contexts, it may be observed that very few are engraved, the majority being perforated slabs. A few Aurignacian pendants, some decorated, are mentioned for Western Europe (Lorblanchet, 1999: 252). As regards the Early Upper Paleolithic, stone pendants were also discovered in Eastern Europe. For example, the Spitsynean (cultural layer II) of the Kostenki 17 settlement yielded 7 stone pendants, with no additional decoration (Sinitsyn, 2012: 1343–1344).

For the Gravettian, evidence is much scarcer. The Gravettian inhabitants of Isturitz cave (France), related to the "Noaillian" culture (Lacarrière et al., 2011), appreciated pebble pendants that generally had an oval and flat shape, as well as a convex side opposite to a concave one, above which a perforation for hanging was made, even if the hardness of the rock was sometimes an impediment. Y. Taborin (2004: 125) points out that the stone pendants from the French Gravettian (the so-called "Perigordian"), commonly round-shaped, with the perforation placed in one of the extremities, do not have any apparent decoration. The discovery of an engraved art object made of stone in Florestan Cave (Italy), in a Gravettian layer, cannot be integrated into the category of suspended personal ornaments because its recent analysis has proven that the so-called perforation attempt is actually a part of the object's ornamentation (Malerba et al., 2014).

For Central Europe, in Moravia, small, flat, perforated pebbles found among other decorative objects at Pavlov VI, Pavlov II and at Dolni Věstonice have been mentioned (Svoboda, 2012: 1467, 1468; Svoboda, Frouz, 2011: 204; Lázničková-Galetová, 2009; Valoch, Lázničková-Galetová, 2009); and Bárta (1988: 178, fig. 7) describes several perforated slabs found at Trencianske Bohuslavice (Czech Republic). One can notice, in the provided illustration, that two of the pendants from Pavlov I and II were decorated (Škrdla, 2000: Fig. 8; Svoboda, Frouz, 2011: Fig. 7). They are similar to the stone pendants discovered at Sungir (Russia) in a layer belonging to the latest phase of the Kostenki-Streletzkaja culture; they also present no apparent decoration (White, 1993, 2007; Abramova, 1995: 180). An oval calcareous marl pebble, with an asymmetrically placed orifice, was found in a layer attributed to the Kostenki-Avdeevo culture at the Kostenki 13 settlement. The famous Kostenki I settlement also yielded a few stone pendants made of calcareous marl, quite massive and not particularly spectacular (Abramova, 1995).

In view of the scarcity of engraved stone pendants during all the Eurasian Paleolithic, the discovery during the 2013 archaeological excavation campaign at Poiana Cireşului-Piatra Neamţ of a stone pendant geometrically engraved on its both sides and notched along its outline may provide new information on the individualization of certain communities by means of particular ornamental systems, or of the existence of large social networks. It was an important discovery because stone pendants engraved in such a manner are very rare in the Eurasian Gravettian, and the one found at Poiana Cireşului-Piatra Neamţ has several original elements.

Context of the find

The Gravettian settlement of Poiana Cireşului-Piatra Neamţ (hereinafter—Poiana Cireşului) in Neamţ County, North-Eastern Romania, is located on an

erosion level cut into flysch strata, on the right bank of the Bistriţa River, at the confluence with the Doamna Rivulet (46º55′919″ north latitude and 26º19′644″ east longitude), at an absolute elevation of 395 m (Fig. 1). In 1998, the settlement of Poiana Cireşului entered a new stage of systematic research, and excavations have since been performed with modern methods. The archaeological materials, recovered from an area of nearly 100 square meters and depths of up to 4 m, were tridimensionally provenienced relative to a unique point zero. The results of the research undertaken between 1998 and 2007 have been published in several studies (Cârciumaru et al., 2006, 2007–2008, 2010; Steguweit, 2009; Zeeden et al., 2009).

The systematic diggings concerned especially the upper part of the geological sequence (8 m loessic sequence) made up of the following stratigraphic units: 1 – Holocene pale brown soil (Cambisol); 2 – yellow Late Glacial carbonate free loess layer; 3 – compact, decalcified light reddish brown Gelistagnic Cambisol; 4 – heavily carbonated clay-loessic light olive layer; 5 – calcic olive sandy-loessic layer (Fig. 2, *1*).

Archaeologically, the Poiana Cireşului deposits yielded the following cultural sequence:

an Epigravettian layer found in the upper part of the deposit (geological unit 2), defined by more than 1500 lithic pieces;

a Gravettian (I) layer (initially marked as Epigravettian II), found at a depth of 170–210 cm in the fourth geological unit, and dated to between 19,459 ± 96 BP (ER 12162) (23.24 ka cal BP) and 20,154 ± 97 BP (ER 12163) (24,096 ka cal BP) (see *Table*). This is the richest cultural layer at Poiana Cireşului: it yielded over 15,000 lithic

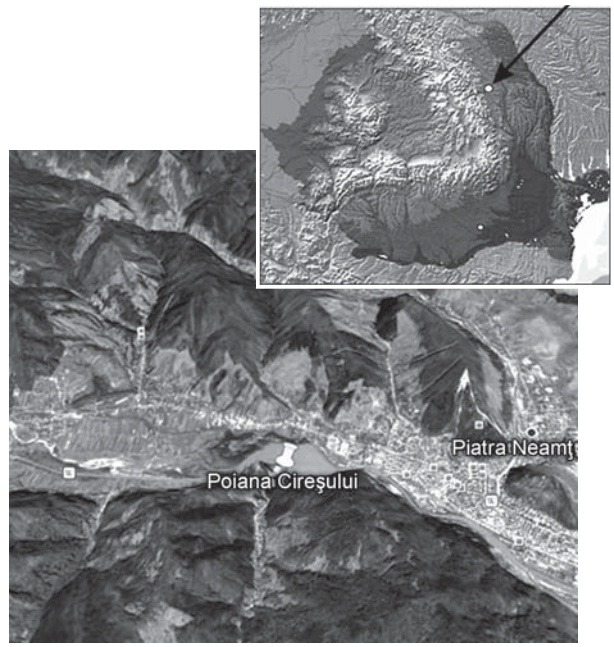

Fig. 1. The Upper Paleolithic settlement of Poiana Cireşului (Piatra Neamţ town). Site location.

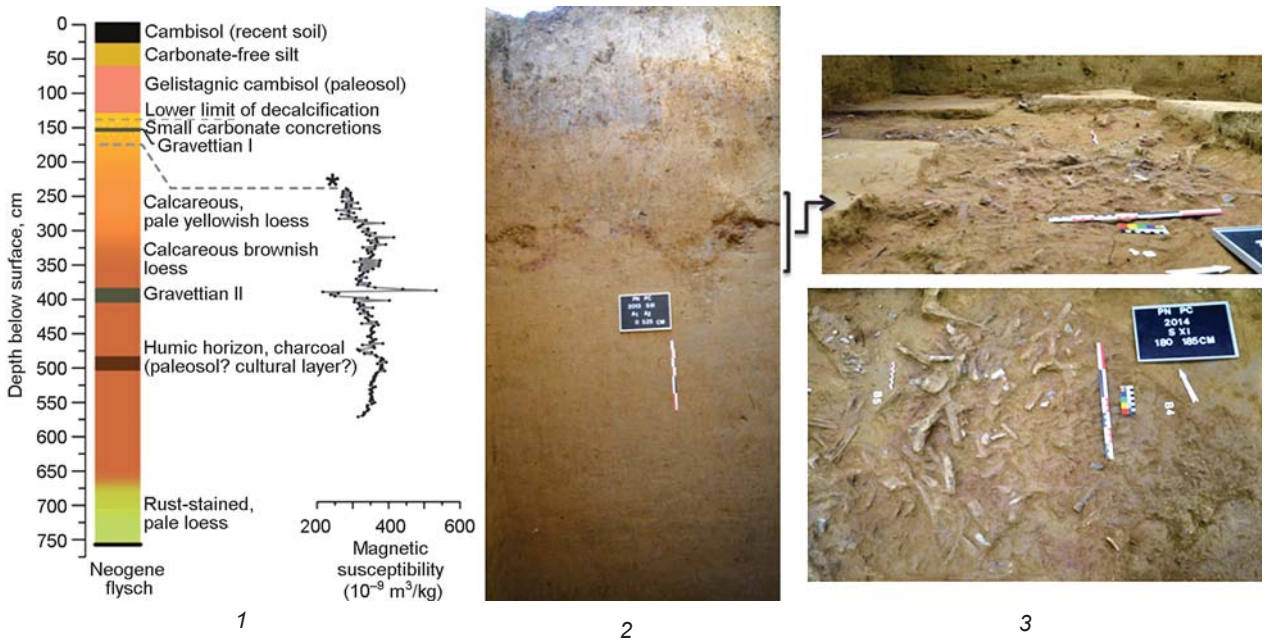

Fig. 2. The Gravettian I layer at Poiana Cireşului.
1 – profile of the western wall (top of the ridge), 2006 excavation (after (Zeeden et al., 2009)); *2* – profile of the southern wall, Gravettian I layer, section IX/2013, near the square in which the stone pendant was found; *3* – images of excavating the Gravettian I layer, section X/2014, marked in the profile of section IX/2013.

materials, numerous osteological remains, an organic material industry and mobiliary art objects (Fig. 2, *2*, *3*);

a second Gravettian (II) layer (initially marked as Gravettian I), found at a depth of 290–310 cm (the contact between geological units 4 and 5) and dated to 25,135 ± 150 BP (Beta Analytic 244072), which only provided around 200 lithic materials;

a third Gravettian (III) layer (initially marked as Gravettian II), located at a depth of 375–415 cm (fifth geological unit) and dated to between 25,760 ± 160 BP (Beta Analytic 244073) and 27,321 ± 234 BP (ER 11859) (31,969 ka cal BP). This level yielded approximately 2600 lithic materials.

The pendant was discovered in section X, square A-1, at a depth of 190 cm, in the richest cultural layer at Poiana Cireşului, the Gravettian I layer (Fig. 2). This layer benefited from absolute dating on several occasions (AMS, OSL), during different stages, all of them situating it around 20,000 uncal BP (see *Table*). The cultural layers at Poiana Cireşului are separated by very thick sterile deposits, representing veritable seals for the identified habitations. At the same time, in the Gravettian I layer, distinct activity areas were found (butchering, antler-processing, knapping, hearths and ochre areas).

Current archaeozoological research has focused on the Gravettian I layer because of the abundance of osteological material recovered from it (approximately 16,000 remains) (Fig. 2, *3*). Analyses led to the conclusion that Poiana Cireşului was a seasonal settlement, used for the hunting of *Rangifer tarandus*, which accounts for 97 % of the identified remains. Aside from reindeer, small quantities of *Bos/Bison*, *Cervus elaphus*, *Equus* sp., *Rupicapra rupicapra* and *Vulpes/Alopex* remains were found as well. The study of the inferior dentition and antlers of reindeer proves that the Poiana Cireşului Gravettians inhabited this settlement from early autumn to early winter, when they hunted mainly full-grown females and young of both sexes, especially for food (Cârciumaru et al., 2006, 2007–2008, 2010).

The hard animal material industry is quite rich and diverse, and includes ivory objects, among which two at least are processing-tools (“outils de transformation” in French), a few reindeer antler points, numerous antler tools with rounded and massive active part (wedges and/or smoothers), and rare bone awls (study by N. Goutas, in progress). The lithic material was partially published in several synthesis studies (Ibid.) and is now being analyzed. A few general features can be highlighted. The dominant tools are burins and, to a lesser extent, end-scrapers, while backed bladelets are not very numerous. Several tool-types are particular to this layer, such as denticulated bladelets, denticulated backed bladelets and finely retouched microbladelets.

The Gravettian I layer provided the largest number of art objects and tools made of hard animal materials. The Poiana Cireşului collection is characterized by significant diversity, and includes approximately 2/3 of all art objects of the Upper Paleolithic in Romania (Cârciumaru, Nițu, Ţuţuianu-Cârciumaru, 2012). The Gravettian I layer yielded four pendants made of wolf canine, deer tooth, residual deer tooth, fox canine, two beads made of stone and *Dentalium*, an engraved antler fragment (Cârciumaru, Ţuţuianu-Cârciumaru, 2009), two diaphysis with triangular incisions (notches), a whistle made of a reindeer phalange (Cârciumaru, Ţuţuianu-Cârciumaru, 2011), several variously engraved bone fragments, a quartzite pebble engraved and painted with red ochre, and four aragonite moulds (*Congeria subcarinata* bivalves) painted with red ochre (Cârciumaru et al., 2011). Another important find, this time from the Gravettian III

Absolute dating for the Poiana Cireşului Gravettian I layer*

No.	Depth, m	Layer	Material type	Lab. No	Age, uncal. ka BP	Age, ka	Age error, ka
1	1.20	Above the Gravettian I layer	Silt-sized quartz grains	BT 499	–	22.66 ± 1.81	–
2	1.90	Gravettian I	Charcoal	ER 12162	19,459 ± 96	23.24	0.31
3	1.92–1.93	Same	Same	Beta 224156	20,020 ± 110	–	–
4	2.10	"	"	Beta Analytic 244071	20,050 ± 110	–	–
5	2.07	"	"	ER 9964	20,053 ± 188	23.978	0.294
6	2.10	"	"	ER 9965	20,076 ± 185	24	0.358
7	2.10	"	"	ER 12163	20,154 ± 97	24.096	0.294

*^{14}C data were calibrated using CalPal 2007^{online} with the Weninger and Jöris (2008) calibration data; for details on the AMS dating and the OSL analyses, see (Zeeden et al. 2009).

layer (25,760 ± 160 to 27,321 ± 234 BP), is a necklace made of 12 very small snail shells (5–8 mm) of the *Lythogliphus naticoides* species (Cârciumaru, Ţuţuianu-Cârciumaru, 2012).

The manufacture of morphologically diversified adornments, the development of a decorative style with a high degree of schematization, and also engravings that are fairly similar in style and shape, etc., prove that the communities were able to produce personalized systems that defined the cultural features of this important settlement of Gravettian hunters from South-Eastern Europe.

Description of the engraved stone pendant

As mentioned above, the 2013 archaeological excavation campaign carried out at Poiana Cireşului-Piatra Neamţ led to the discovery, in section X, square A-1, at a depth of 190 cm, in the Gravettian I layer, of the first engraved stone pendant found in this settlement (Fig. 3). The pendant's dimensions are as follows: length 34 mm, width 19 mm, thickness 4.5 mm, weight 2.64 g. The pendant was made of a relatively soft rock, a polymictic siltite, with a slightly greenish tint. The intensity of the color is accentuated if the rock is wet. This property was probably noticed by the Gravettian(s) who wore this pendant.

The pendant is oval, with a convex to slightly concave profile. It has a unique perforation intended for hanging, which is located at one of its extremities (Fig. 3). The hole is biconical, and was probably created using a lithic tool with a sharpened end (e.g. a burin, bladelet, borer etc.). The current dimensions of the orifice (there is obvious wear that resulted from hanging) are 2274.16 µm (2.2 mm) in maximum length and 1429.69 µm (1.4 mm) in maximum width (Fig. 3). Suspension-marks are visible to the naked eye, in the sense that an elongation of the orifice, which probably had initially a more or less circular shape, occurred. Using a fiber-optic digital microscope (Keyence VHX 600, 20x–200x magnification), one can confirm the presence of use-wear (polishing and deformation of hole) of the upper part of the orifice (Fig. 4, *1*, *2*).

The use by suspension of this pendant is certain. Evidence for this is provided not only by the rather elongated orifice (because of the weight of the pendant which would have deformed the hole of suspension, doubtless further to long use), but also by the heavy polish on the distal part of the lower face (Fig. 3, *2*), which resulted from contact with the body of the person who wore it, or with his or her clothes. The preservation of the use-wear, particularly on the distal end, was favored by the slightly curved shape of the pendant reverse.

A peculiar decorative element highlighted on this pendant is represented by the two incisions near the orifice. The one on the upper face is placed slightly to the left, while that on the reverse is oriented towards the middle of the perforation. They do not seem to have a decorative role. These incisions are recovered by the hole and the functional polishing (Fig. 3, *1*, *2*), their realization is thus previous. Actually, we can interpret these incisions as a preparatory stage to making the hole of suspension. This stage is necessary all the more on hard materials, and when the hole is fitted out from both sides of the blank. These incisions are remnants of marks allowing the craftsman: 1) to prop up well the lithic tool, in order to realize then the hole by semi-rotary scraping; 2) to make sure that both orifices fitted out on each side correspond perfectly.

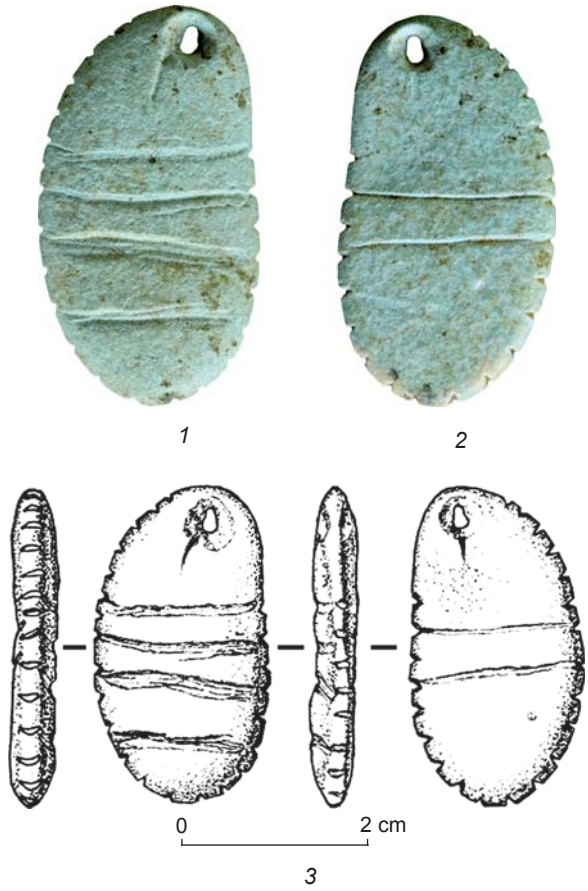

Fig. 3. The engraved stone pendant from the Gravettian I layer of Poiana Cireşului.
1 – upper face; *2* – reverse-lower face; *3* – pendant drawing and profile (drawing by F. Dumitru).

The pendant from Poiana Cireşului was decorated with schematic and abstract themes. It is possible that the use of geometrical motifs would have been suggested in this case precisely by the relatively regular and oval shape of the pendant, which encouraged the engraving of independent linear regular incisions, with a certain logic, in order to achieve a visual equilibrium (Taborin, 2004).

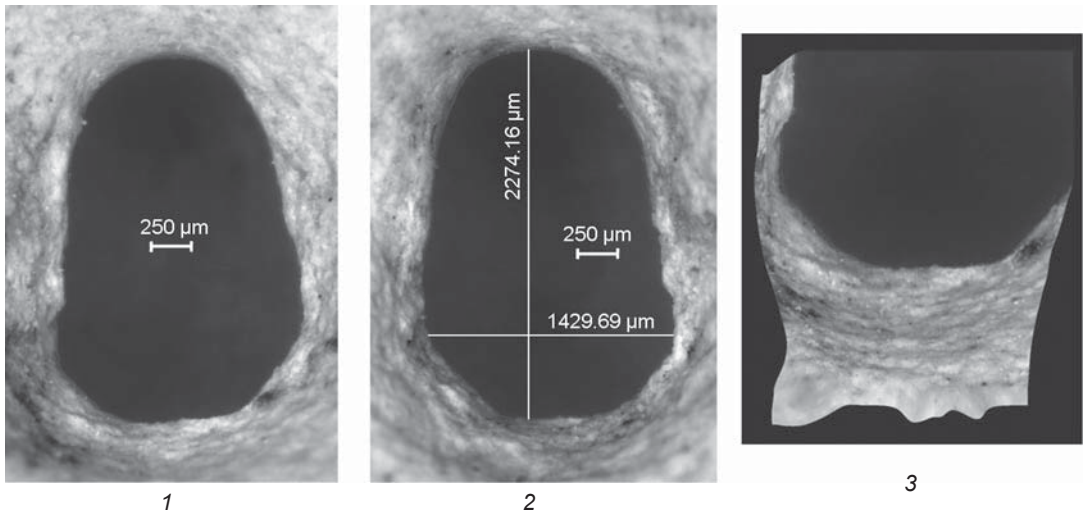

Fig. 4. Use-wear on the upper part of the orifice due to usage by suspension.
1 – upper face; *2* – reverse face (magnification 100x); *3* – marks resulting from the rotation of a lithic tool to make the penetration, preserved on the lower part (magnification 150x).

Most of the pendant's outline is marked with a total of 23 parallel and linear incisions (notches), arranged, by an overwhelming majority, roughly 3 mm apart. These were meant to give the pendant a unique aspect, particularly since the incisions were clearly painted with ochre, which is visible macroscopically, and much more so with a digital microscope (Fig. 5). In fact, some traces of pigments could also be observed on both sides of the pendant; but, because of the conditions in which the pendant had lain in the deposit, they were probably not preserved as well as on the incisions along the outline.

One of the unusual attributes of the pendant from Poiana Cireşului is that it is engraved on both sides, which is rather rare among Gravettian pendants in Europe, especially those decorated with geometrical motifs. The engravings on the upper face (Fig. 6, *1–4*) consist of four rows (numbered top-to-bottom according to the position of the pendant in Fig. 3) of incised, relatively parallel lines. From a technical point of view, these stigmata can be related to the grooving technique (Goutas, 2004). Grooves (each being composed by a "floor" and by two "walls") have a particular morphology. Indeed, they give the impression that several incisions have been drawn individually. But according to the observations on other objects from the site (study by N. Goutas in progress), these irregular incisions seem to ensue from the particular morphology of the lithic tool used, probably a burin. These features are more obvious with the first two rows, and fade out towards the fourth row.

The first groove consists, apparently, of a single incision (Fig. 6, *1*). The second groove is made of two parallel incisions with an additional third incision on the right half (Fig. 6, *2*). The third groove is the most complex, as it consists of four incisions which do not always span the entire width of the upper face; this sequence of incisions resulted in a width twice that of the previous row (Fig. 6, *3*). Finally, the fourth groove consists of two closely spaced incisions, and towards the right side, even a third incision can be observed (Fig. 6, *4*). We shall also note that the first two grooves (Fig. 6, *1*, *2*) seem to have been realized with the trihedron of the burin (V dissymmetric profile), while the third seems more realized with the dihedral of the tool (U dissymmetric cross-section) (Fig. 6, *3*).

Concerning the fourth groove, we can also wonder if the tool would not have revolved in the course of use: the groove would have been begun with the trihedron then the dihedral of the burin (Fig. 6, *4*). Experiments will be necessary to confirm this hypothesis and to better characterize techniques used.

The reverse (Fig. 3, *2*) is decorated with two relatively parallel incisions which are quite firmly traced, without hesitation. The first incision is slightly irregular in terms of its width relative to the other incision (Fig. 6, *5*), but it offers a classic "V profile", and may be related to the use of the trihedron of the burin. In any case, these two grooves were made with a different tool than the one used for the upper side. Here, a very narrow burin has been used, as an "angle burin"; or, because of the thinness of the grooves, maybe a "spall burin".

We believe that the difference in the technical execution of the decoration on the two sides of the pendant may not be accidental. The choice of a polyhedral burin to make the grooves on the upper side emphasizes the Gravettian artist's intention to give that particular surface greater aesthetic value.

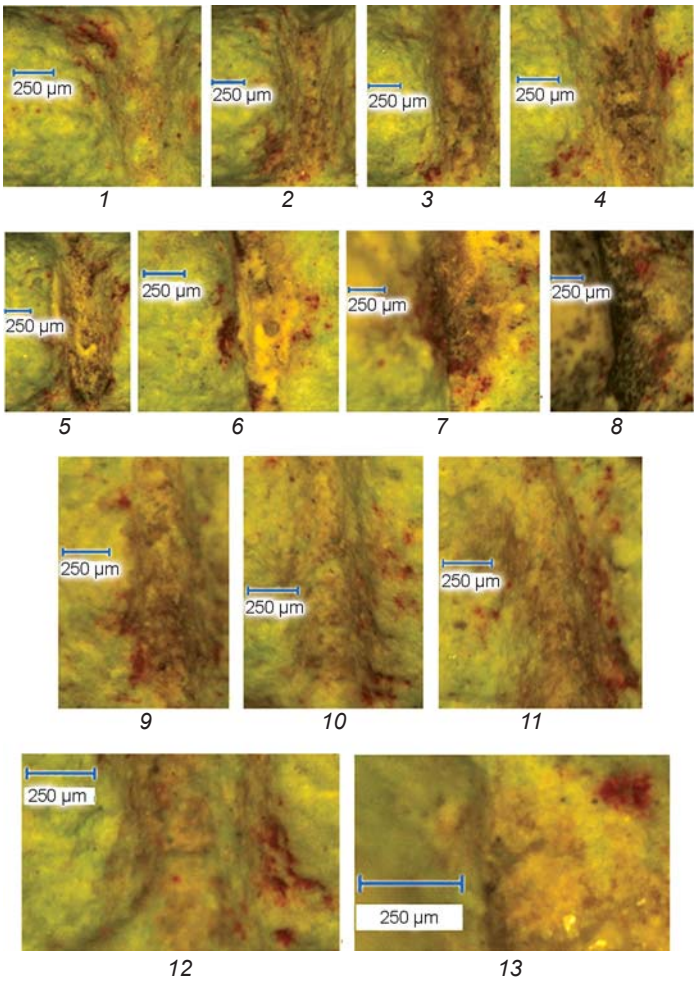

Fig. 5. Ochre preserved on the incisions on the pendant outline.
1–8 – first incisions on the concave side (see Fig. 3, *1*, numbered from top to bottom); *9–13* – incisions on the convex side: *9–11* – incisions 1–3; *12* – incision 5; *13* – incision 12 (images captured with the Keyence VHX 600 microscope).

As for the shaping of the stone by scraping or polishing, no traces of such processes could be observed, despite the use of a powerful digital microscope that allows a magnification up to 200x; this is likely due to the structural characteristics of the rock.

Discussion and conclusions

The pendant discovered at Poiana Cireşului is exceptional among the suspended personal ornaments of the East European Gravettian by three aspects: the raw material from which it was made, the schematic engraving style, and the unusual use of polyhedral burin to make some decoration. As we mentioned at the beginning of the article, decorated stone pendants are very rare during the Upper Paleolithic. If we take into account the first two aspects, some analogies that can be made refer to two more pendants discovered in Romania at Mitoc-Malu Galben (Botoşani County) (Fig. 7, *1*) (Chirica, 1982) and at the Cioarei Cave from Boroşteni (Gorj County) (Fig. 7, *2*) (Cârciumaru, Dobrescu, 1997).

The engravings on the Gravettian I (old Gravettian) pendant from Mitoc-Malu Galben (Fig. 7, *1*), discovered by V. Chirica (1982), were described by C. Beldiman (2004). The decorations consist of straight and curved, radially set lines with a V or U asymmetric profile. The pendant's outline is decorated with 23 parallel notches, the same number as on the Poiana Cireşului pendant, with 7 of them set on the two convex sides and 9 on the concave. After some hesitation regarding the stratigraphic position of this pendant, it is now generally agreed that it dates to between 28,910 ± 480 uncal BP (GrN-12636) and 26,700 ± 1040 uncal BP (GX-9418). From a stylistic perspective, the ornament of the pendant of Mitoc is hard to interpret. It is far from the realism of the

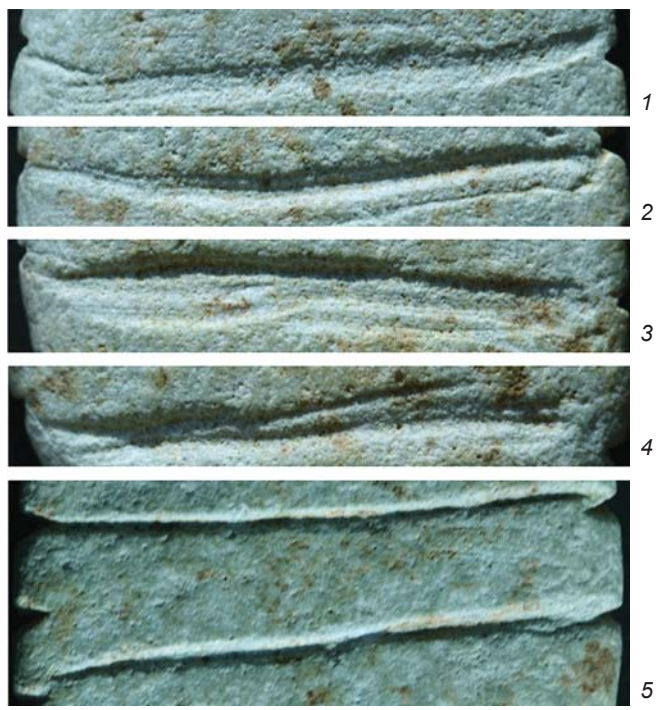

Fig. 6. Method of making incisions on the upper face (*1–4*) and reverse (*5*).

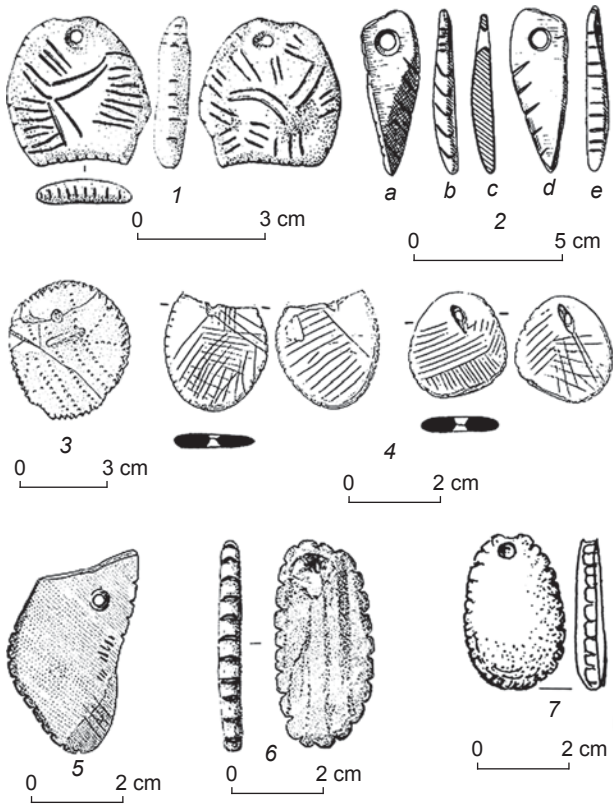

Fig. 7. Engraved stone pendants.
1 – Mitoc-Malul Galben (after (Chirica, 1982)); *2* – Cioarei cave from Boroşteni (after (Cârciumaru, Dobrescu, 1997)); *3* – Cosăuţi (after (Borziac, Otte, Noiret, 1998); *4* – Pavlov I and II (after (Škrdla, 2000)); *5*, *6* – Isturitz (after (Lorblanchet, 1999; Sacchi, 1987)); *7* – Dzudzuana (after (Bar-Yosef, 2011)).

engravings made out of various objects of the West European portable art, and does not belong to the East European schematism either.

The highly silicified marly sandstone pendant from the Cioarei Cave of Boroşteni (Fig. 7, *2*) distinguishes itself by the regularity of the incisions (Cârciumaru, 2000). On the right edge of the pendant, on both the upper face and the reverse, oblique incisions were made; these come together on the edge in a V-shape. The left edge is wider, and adorned with ten transversal, parallel incisions, which are set at different distances and reach diverse depths. The smaller edge, located above the orifice, has only two incisions. Overall, the pendant has 21 incisions along its outline. The symbolic value of the pendant found at Cioarei Cave is highlighted by the fact that its entire surface was painted with red ochre. The Gravettian layer in which the marly sandstone pendant was discovered was dated to between 25,900 ± 120 uncal BP (GrN-15051) and 23,570 ± 230 uncal BP (GrN-15050).

Relatively close to Poiana Cireşului, at the site of Cosăuţi in the Republic of Moldova, an amulet-pendant was found in the Gravettian II level, dated to between 19,020 ± 925 uncal BP (SOAN 2462) and 15,520 ± 800 uncal BP (LE 3305). It was made of a disk-shaped stone, with an oval cross-section, and measures 5.0 × 4.0 × 0.9 cm (Fig. 7, *3*). The decoration consists of about 60 incisions along the entire outline, nine alignments of deep punctuation on one surface and traces of ochre (Borziac, 1991; Chirica, Borziac, Chetraru, 1996; Borziac, Otte, Noiret, 1998; Noiret, 2009).

Among the stone pendants found in the Moravian sites Pavlov VI, I, II, Dolni Věstonice I and Předmosti (Lázničková-Galetová, 2009; Škrdla, 2000; Svoboda, 2012; Svoboda, Frouz, 2011) at Pavlov I and II, in each of these sites, a pendant engraved on both sides has been found (Fig. 7, *4*). According to the illustration provided in some studies (Škrdla, 2000: Fig. 8; Svoboda, Frouz, 2011: Fig. 7), they are incised with parallel lines on both sides and notches on the outline, stylistically being quite similar to the one from Poiana Cireşului.

The pendant from Poiana Cireşului is stylistically similar to that of Boroşteni by the ornament made up of parallel lines and by the painting with red ochre, to those from Pavlov by the notches and incisions on both sides and to the ones from Mitoc and Cosăuţi only by the notches on its outline. These are the only Gravettian stone pendants stylistically close to the complexity of the pendant from Poiana Cireşului.

The decoration of the outline with incisions (notches) is a more general characteristic style, also seen in other art objects. Actually, this type of incision is a constant of the decoration of some art objects from Poiana Cireşului, such as the incised quartz pebble and the two engraved diaphysis. In this context, we believe that the marking of the outline of the pendant indicates the invoking of possible analogies. From a certain perspective, this method of decoration would indicate the mental universe of certain Paleolithic groups, and a legacy probably from the Aurignacian. Indeed, there are several interesting examples of Aurignacian pendants on which the outline is marked by incisions, such as a schist pendant whose shape suggests a horse's head, from the typical Aurignacian found at Isturitz Cave (Fig. 7, *5*) (Lorblanchet, 1999: 252); and a perforated micaschist pebble with genuine notches on the contour, from the Aurignacian II layer of the southern chamber of the Isturitz Cave (Fig. 7, *6*) (Sacchi, 1987: 14–15).

When dealing with schematic decorations, analogies can obviously be extended on ample chronological levels. Pendants of almost the same type seem to be found more towards Eastern Europe, and even the Asian part of Russia. Some similarities in terms of the already defined criteria, namely raw material, method of decoration and chronology, come from sites located in Eastern Europe. Geographically, the closest example is one of the two stone pendants discovered at Dzudzuana cave in the Caucasus (Georgia), in the upper part of the stratigraphic

unit C, dated to between 27 and 24 ka cal BP (Bar-Yosef et al., 2011: 339, 340). The dimensions and shape of the pebble are very similar to those of the Poiana Cireşului pendant; and the same type of incisions, placed along the pendant's outline, can be observed (Fig. 7, *7*). The stratigraphic and cultural sequence, which is fairly similar at the two sites, adds to the similarities in terms of context, although the two sites seem quite distant geographically.

If one considers only the style of decoration, regular peripheral incisions seem to be a particular and common feature of decorated objects discovered in the Siberian sites of the Irkutsk region (Bednarik, 2013: 51), namely: Oshurkovo, Malta, Buret, Afontova Gora II, Afontova Gora III, Itkutskii gospital, etc. As a matter of fact, the bone pendant from Oshurkovo is stylistically comparable to the one from Poiana Cireşului. Still in Siberia, level II of the Khotyc site revealed ornamented stone pendants made of soft rocks and the Pereselencheskyi-punkt 1 site yielded a pendant with peripheral incisions and a biconical perforation. This type of schematic decoration was discovered in the two sites only in levels dated to between 30,000 and 25,000 years BP (Lbova, 2010, 2012: 1126). What we find interesting is the intensification of color in contact with water with the Khotyc pendants, a phenomenon that can be noticed with the Poiana Cireşului pendant.

In conclusion, there are several characteristics which bring the Poiana Cireşului pendant close to Eastern Europe and Northeast Asia Upper Paleolithic adornments, such as the relatively soft rocks that served as blanks, which can change color depending on the intensity of wetting, the use of geometrical motifs engraved on both sides, the incisions along the outline, the painting with red ochre, the similar chronological level of the discoveries, etc. These elements may indicate a peculiarity of some Upper Paleolithic groups and possibly large social networks.

While similarities regarding the engraving of the outline may be noticed in Eastern Eurasia, engravings on both sides of the stone pendants are extremely rare in the Gravettian from Central and Eastern Europe. For this reason, the discovery of four engraved stone pendants in the Carpathian region (the pendants of Poiana Cireşului, Mitoc, Cioarei Cave and Cosăuţi) may represent a feature of the Gravettian from this area, bringing new information on the individual and social identities of some Gravettian communities of South-Eastern Europe.

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Tentative Findings from Excavations on Suchu Island, Amur (1973 Season, Excavation I)*

This article outlines the results of the 1973 excavation season at a Neolithic habitation site on Suchu Island, in the Lower Amur. New findings relate mostly to the middle Neolithic Malyshevo culture—the stratigraphy and planigraphy of dwellings, their chronological sequence, and construction features, specifically the considerable variation of dwelling-pit depth. Artifacts, totaling 4407 specimens, include stone tools, ceramics, and objects of art and cult. Lithics, made mostly of gray siltstone, were analyzed with regard to typology and function. The toolkit indicates a complex economy: it includes hunting, fishing, and butchering tools, some for processing stone, wood, and bone, some for preparing vegetable food, and some for digging. The ceramics of Malyshevo and other Neolithic cultures from excavation I were subjected to petrographic and radiographic analysis. The results reveal cultural differences in types of clay and paste, shaping, surface treatment, firing modes, and forms of vessels. Decoration, too, is culturally specific. Apart from the Malyshevo people, the excavated area on Suchu Island was often visited by those associated with other cultures of the Middle, Late, and Final Neolithic.

Keywords: *Amur Basin, Suchu Island, Neolithic, dwellings, stone tools, ceramics, petrographic analysis.*

Introduction

In 1973, excavation works** on the Island of Suchu, one of the most important archaeological sites of the Amur Basin (Derevianko, Medvedev, 2002), were carried out in two areas: in the south-eastern lowered tip of the island, where the excavation I of 1972 (Okladnikov, Medvedev, Filatova, 2015) was expanded; and to the west of this location on the edge of the sea cliff (excavation II, the materials of which are not described in this article) (Medvedev, 1995: Fig. 1). The main research in

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**Researchers from the Institute of History, Philology and Philosophy of the Siberian Branch of the USSR Academy of Sciences, including A.P. Okladnikov (head of the North-Asian Joint Expedition), V.E. Medvedev (head of the research team), I.V. Aseyev, Y.V. Grichan, A.K. Konopatsky, V.D. Kubarev, and V.P. Mylnikov, plus a group of students from the Khabarovsk Pedagogical Institute, participated in the works.

excavation I was done directly on the bed of the earth road leading from the Mariinskaya branch of the Amur River, in a northerly direction, into the hinterland of the island. The goal of the study was to obtain new materials and to clarify the stratigraphy of the dwellings, which cut through each other at the lowest south-eastern tip of the Neolithic settlement (or group of settlements), and the sequence of their functioning, which would make it possible to identify individual stages in the development of the territory (Okladnikov, 1974: fol. 2).

The excavation area was marked out into a grid (with 1 × 1 m cells): А-31–35, Б-К-31-40, and Г-И-41-45. In 1973, the total area of excavation was 125 m^2. No traces of dwellings in the form of depressions on the bed of the earthen road were observed. The remains of the dwelling-pits were found in the process of removing the upper layers of soil. Excavation I revealed a considerable amount of material (Fig. 1, *1*), including stone tools, ceramics, and objects of art and cult, totaling 4407 specimens. It was possible to discover a half of one dwelling-pit (south-western part of dwelling E) and the edges of two other dwelling-pits (south-eastern and north-western parts of dwellings C and D, respectively); and to examine a considerably large section of space between the dwellings (Fig. 1, *2*), where we took a sample of charcoal that gave the ^{14}C date of 5830 ± 65 BP, or 3880 ± 65 BC (SOAN-843) (Orlova, 1995: 226).

Materials and methods

This article is based on the information obtained from analyzing the collection, which is now kept in the Institute of Archaeology and Ethnography SB RAS (Novosibirsk); we also, in part, used the information taken from the report on field research (Okladnikov, 1973: fol. 1) and the published data. Archaeological materials were studied using various methods, including the methods of the natural sciences. To describe the dwelling complexes and the space between the dwellings, stratigraphic and planigraphic data were used. The lithic inventory was studied using morphotypological and functional analysis; ceramics were analyzed using petrographic and radiographic methods, and the objects of art and cult were analyzed using cultural-chronological methods.

After binocular examination of the ceramic collection, we selected the sets of five samples each from the Malyshevo, Kondon, and Voznesenovskoye cultures, the Belkachi complex, and the final Neolithic type. Twenty-five transparent sections were produced from these samples in the Laboratory of Physical and Chemical Methods of Research at the Khabarovsk Innovation Analytical Center of the Institute of Tectonics and Geophysics FEB RAS. The petrographic analysis of the samples was carried out by the petrographer L.I. Shcherbak from the Institute of Mining FEB RAS. The studies were conducted using an Imager A2m polarized-light microscope. The same samples were examined by X-ray diffractometry. The X-ray phase analysis was performed by A.Y. Lushnikova, the Senior Engineer of the Institute of Tectonics and Geophysics FEB RAS, using a MiniFlex II X-ray diffractometer.

Results

Stratigraphy

In general, stratigraphy (Fig. 1, *3*) was the same in the entire excavation area. The top layer represented mixed soil up to 40.0 cm thick, overlaying the main cultural horizon of dark-brown humic soil. This horizon sometimes reached 1.5 m in thickness, and constituted the main filling of dwelling-pits and of the space between dwellings. Dark-brown soil included lenses and relatively thick bands of loose gray-yellow loam and brown soil; occasionally, it acquired lighter (brown and light-brown) colors, and was underlain by the bands of light-brown and brown soil. A clay bed was below this layer, in rare cases reaching 50.0 cm in thickness, lying directly on the native soil of yellow sandy loam. Sometimes, the loam was interstratified with spots of burnt sand and dark-brown (almost black) soil with charcoal inclusions. The lowermost layers were directly associated either with the floor of the dwellings of half-dugout type, or (outside the dwellings) with the ancient daylight surface.

Dwellings and the space between them

Dwelling C (Fig. 1, *2*) was located in the north-western corner of the excavation (the entire sq. 3, И/43, and Ж-И/44, 45; partly sq. Е/45, И/42, 43, and К/40); the main part of the dwelling-pit continued into the western and northern walls of the excavation. Almost the entire excavated area (about 10 m^2) of the dwelling covered its rim-shoulder, which turned into floor only in the corner of the excavation pit. Holes remaining from a post structure were located on a relatively sloping surface of the shoulder with small projections. Four holes (1–3, 11) were located next to the outer edge (sq. И/42, З/43, Ж/45); six holes (4–9) were located below, closer to the floor area (sq. Ж, З/44, 45); one hole (10) continued to the northern wall of the excavation pit (sq. Ж/45). All holes were rounded or suboval in plan, and had the diameters ranging from 10.0 to 25.0 cm, and depths ranging from 8.5 to 45.0 cm. The walls of the holes were quite steep; the bottoms were rounded or conical, or more rarely, flat. A part of a larger pit (I), evidently used for household

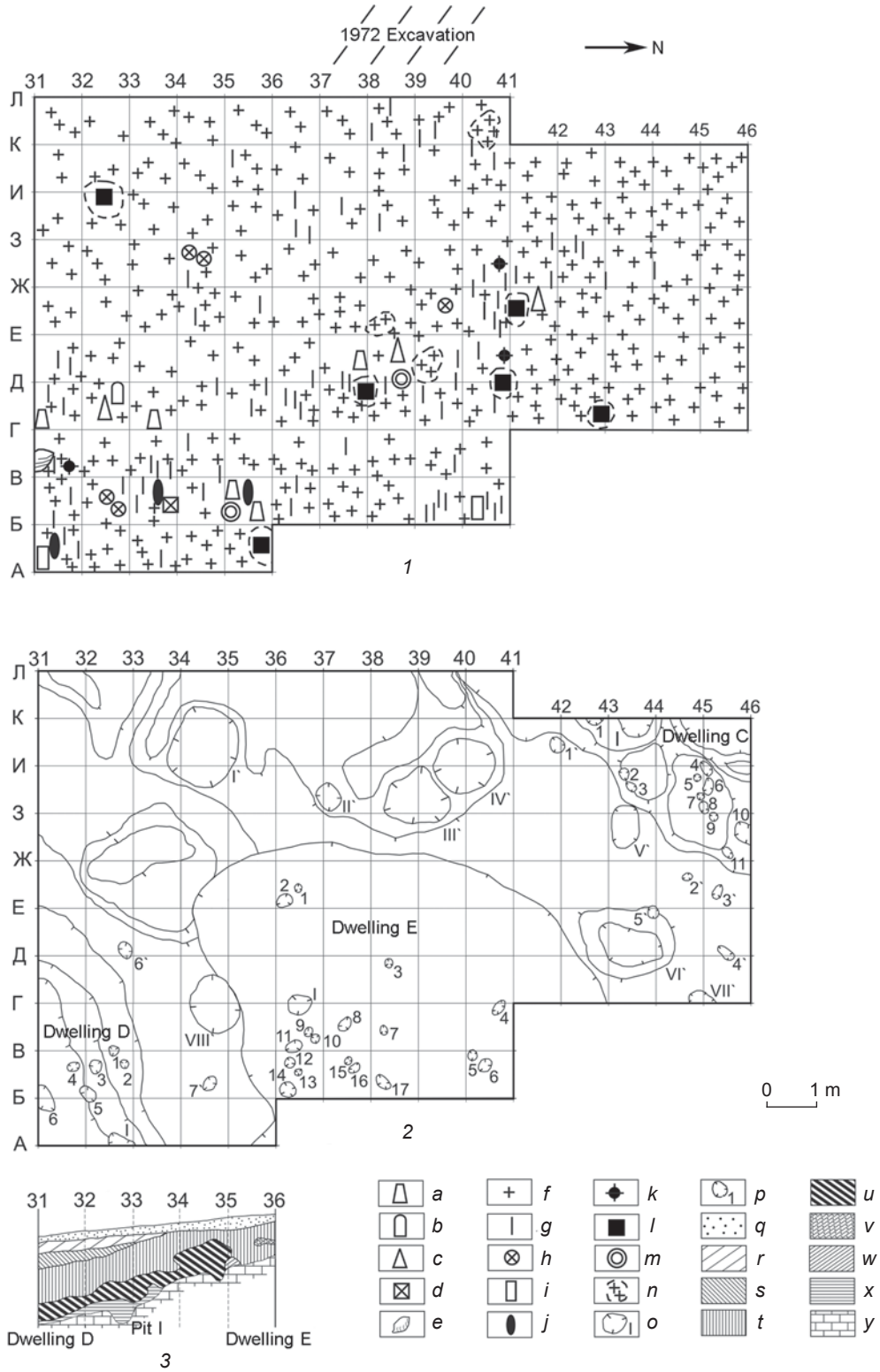

Fig. 1. Maps of parts of excavation I (1973) at the levels of dwelling filling (*1*) and native soil (*2*). Profile of the wall along the line A (*3*).

a – adze; *b* – end-scraper; *c* – arrow-head; *d* – stamp; *e* – stone; *f* – ceramic piece; *g* – flake; *h* – clay figurine; *i* – knife; *j* – ceramic rod; *k* – clay object; *l* – fragmented vessel; *m* – spindle-whorl; *n* – accumulation of ceramics; *o* – household pit; *p* – hole from post; *q*–*w* – soil: *q* – mixed, *r* – light-brown, *s* – with wood remains, *t* – dark-brown, *u* – dark-brown and almost black with charcoal inclusions, *v* – brown, *w* – gray-yellow; *x* – burnt sand; *y* – native soil.

purposes, was unearthed at the western wall of the excavation area (sq. И/43). Another similar hole (V) was located outside the dwelling (sq. Ж, З/43). The total depth of the dwelling-pit from the surface reached 2.0 m.

Dwelling D. In 1973 season, a part of this dwelling (entire sq. А-Г/31, 32; partly sq. Д/31 and А/33) covering approximately 9 m^2 was unearthed. The excavation comprised the rim or shoulder of the dwelling; its outline became traceable mostly at a depth of 60.0–65.0 cm from the surface. The rim was steep and high, reaching about 1.5 m from the floor level of the dwelling. The excavated area revealed a ledge from 20.0 to 50.0 cm wide. It ran almost parallel to the rim-shoulder. The surface of the shoulder and ledge contained the holes from the posts: five holes (1–5) were closely grouped (mostly in the sq. Б/31, 32); another hole (6) was located below the ledge (sq. А, Б/31). The holes were rounded and oval in plan; their diameters ranged from 12.0 to 30.0 cm, with depths of 10.0 to 25.0 cm. The holes had mostly vertical walls and rounded or conical bottoms. A part of the household pit (I) was also unearthed; half of the pit continued into the eastern wall of the excavation (sq. А/32).

Dwelling E. A significant part of the dwelling (25 entire squares and 9 partial squares) was studied, comprising a little less than half of the dwelling of a relatively small size. The excavated area was approximately 33 m^2. The rounded dwelling-pit was slightly elongated along the southwest–northeast line. Its approximate dimensions were 9.0 m along the north–south line and 8.0 m along the east–west line. The pit was shallow; its walls were sloping; the floor rose noticeably from the center towards the walls. The ledges were not found. Holes from the posts (7–17) were discovered mostly in the south-eastern part of the dwelling. They formed a bend, and were closely grouped, which suggests the presence of some canopy-like structure in this place. Two holes (1 and 2) were found in the south-western part; three holes (4–6) were located in the north-eastern part, and one hole (3) was almost in the center of the dwelling. The holes were rounded or oval in plan; their diameters ranged from 7.0 to 20.0 cm, and their depths ranged from 6.0 to 22.0 cm. The walls of the holes were vertical; the bottoms were flat, rounded, or conical. One household pit (I) was unearthed in the dwelling-pit near its southern wall (sq. В, Г/36); two more household pits (VI, VIII) were found outside the dwelling at its northern (sq. Г, Д/42-44) and southern (sq. В, Г/34, 35) walls.

Space between the dwellings. This had a total area of approximately 66 m^2. The spaces between dwellings contained low ledges and slight depressions, five barely visible holes with diameters ranging from 35.0 to 140.0 cm, and depths ranging from 10.0 to 30.0 cm, which we provisionally identified as pits for household purposes. Four of the pits were located in the western part of the excavation: one (I′) slightly to the side, and three (II′–IV′) next to each other; the fifth pit (VII′) was found at the eastern wall of the excavation. Seven holes remaining from the posts were also found. Three holes (1′–3′) were located at the south-eastern edge of dwelling C, the fourth hole (4′) was almost 1.0 m to the east of them (sq. Г, Д/45); the fifth hole (5′) was at the edge of the household pit VI′; two more holes (6′, 7′) were found on the opposite side (between dwellings D and E). They were rounded or oval in plan, with steep walls and flat, rounded, or conical bottoms. The diameter of the holes was 12.0–27.5 cm; their depths ranged from 7.0 to 50.0 cm. We could not identify any discernable system in their arrangement, but it can be assumed that pits 2′–5′ were a part of a post-structure, apparently associated with the household pit VI′.

Lithic artifacts

The collection of lithic artifacts from excavation I of 1973 includes 660 specimens. They were found in the filling and on the floor of the excavated dwellings, as well as in the space between dwellings.

Raw materials (Table 1). The artifacts were made mostly of siltstone, of various shades of gray color. Also, middle-sized pebbles of various isotropic siliceous rocks (including flint, chert, quartzite, chalcedony, jasperoids and others) were used. Some artifacts were made of sandstone and tuff; or more rarely, of hornstone, basalt, and granitoid.

Primary reduction. The total number of artifacts illustrating primary reduction is 508, including cores and one microcore, pebbles with flaking scars, split pebbles and tablets, debitage (flakes and spalls), and blade artifacts (knife-like bladelets, blade flakes and spalls). Fifteen cores and one microcore were found (Fig. 2, *1–3*). Mostly, siliceous (including jasper-like and chalcedony) pebbles were reduced; also, siltstone pebbles not exceeding 5.5 cm were knapped. Many single- and a few double-platform cores were identified. The platforms are mostly plain; some of them retain natural pebble cortex. The majority of cores are irregular sub-prismatic and wedge-shaped. The collection also includes pebbles bearing flaking scars (16 spec.), split pebbles (20 spec.), and split tablets (5 spec.).

Blade artifacts (Fig, 2, *4–9*) include knife-like blades (21 spec. including four fragments), blade flakes (34 spec.) and spalls (35 spec.). Bladelets are mostly two- and three-sided, with uneven edges. Blade-flakes and spalls are mostly irregular. The surfaces show dents, use-wear signs, and retouch facets. All size categories are present: very large (more than 5.0 cm), large (up to 5.0 cm), medium-sized (less than 4.0 cm), and small (less than 2.0 cm).

Table 1. **Correlation between rocks and lithic artifacts, %**

Rock	Primary reduction artifacts	Debitage	Blade artifacts	Tools, including blanks and fragments	Instruments, including fragments	Total
Siltstone	1.7	38.3	8.0	11.6	0.1	59.7
Sandstone	3.3	3.3	–	1.0	2.3	9.9
Jasperoid	1.4	4.2	1.7	2.3	–	9.6
Flint	1.2	2.0	3.2	3.2	–	9.6
Chert	0.1	4.6	0.6	1.2	–	6.5
Chalcedony	0.8	1.0	–	1.0	–	2.8
Quartzite	–	1.2	–	0.1	–	1.3
Tuff	–	0.1	0.1	0.1	–	0.3
Hornstone	0.1	–	–	–	–	0.1
Basalt	–	–	–	0.1	–	0.1
Granitoid	–	–	–	0.1	–	0.1
Total	8.6	54.7	13.6	20.7	2.4	100

Flakes (154 spec.) are mostly medium-sized (not more than 4.0 cm); some are large (up to 5.0 cm) or very large (more than 5.0 cm). A considerable proportion of flakes bear dents and use-wear traces; seven such flakes are retouched. Spalls (200 spec.) including retouched ones (7 spec.) represent core-trimming elements retaining natural cortex, and secondary front flakes without natural cortex. There are some very large spalls, exceeding 9.0 cm.

Tools. Tools (76 spec.), their fragments (44 spec.), and tool blanks (16 spec.) were subdivided into several polymorphic classes on the basis of their presumed function. Tool-manufacturing instruments (ten complete and six fragmented artifacts) were classified as a separate category.

Projectiles (Fig. 2, *10–14*) include arrow-heads (six complete tools and two blanks) and dart-heads (two complete tools and two three fragments), which were made of siliceous rocks including chalcedony and siltstone. Two types of arrow-heads were distinguished. Type 1 included bifaces foliate in plan, with straight bases (subtype 1), and elongated-triangular in plan, with notched bases (subtype 2). Both types were shaped by continuous, bifacial retouch over the entire surface, and by sharpening marginal retouch along the perimeter. Type 2 represents tools prepared on flakes rhomboid in plan. Two types of dart-heads were noted. Type 1 represents bifaces foliate in plan, with straight bases (subtype 1) and with prepared stems (subtype 2). They were shaped by bifacial trimming and finished by bifacial, marginal, sharpening retouch. Type 2 represents tools fashioned on blade flakes leaf-shaped in plan. Arrow-heads vary from 2.0 to 3.5 cm in length; the darts are about 7.0 cm long.

Cutting tools (Fig. 2, *15–17*) comprise knives (four complete specimens, seven fragments, and three blanks) made of siltstone, flint, jasper, and (more rarely) tuff. Their lengths do not exceed 7.0 cm. Two knife-types have been established: type 1—leaf-shaped, slightly asymmetrical in plan and lenticular in cross-section; type 2—elongated-subtriangular in plan. Type 1 knives were fashioned with bifacial flattening and marginal sharpening retouch. Type 2 knives showed ventral, marginal, sharpening retouch; some specimens also showed flattening retouch on the dorsal face. These have been classified as "fish knives". The category of cutting tools also includes blade-flakes and spalls bearing specific dents and use-wear traces. The total number of such artifacts is quite large (17 spec.).

Borers (five complete tools and one fragment) were made mostly of siliceous rocks. Subtypes of "angular", "shouldered", and "nosed" varieties have been established on the basis of the borer's planform shape. Their lengths vary from 2.0 to 3.5 cm.

Scraper-like tools (Fig. 2, *22–33*, *35*) include end-scrapers (23 complete specimens, 3 fragments, and 6 blanks), a side-scraper, and side-scraper-like tools (7 spec.). The tools were made mostly of siliceous rocks including chert, chalcedony, and jasper; some tools were made of siltstone; a few specimens were manufactured of quartzite and sandstone. End- and side-scrapers comprise varieties with working edges at the end or side, and various double-end-scrapers. Almost all end-scrapers exhibit marginal dorsal retouch along the cutting edge;

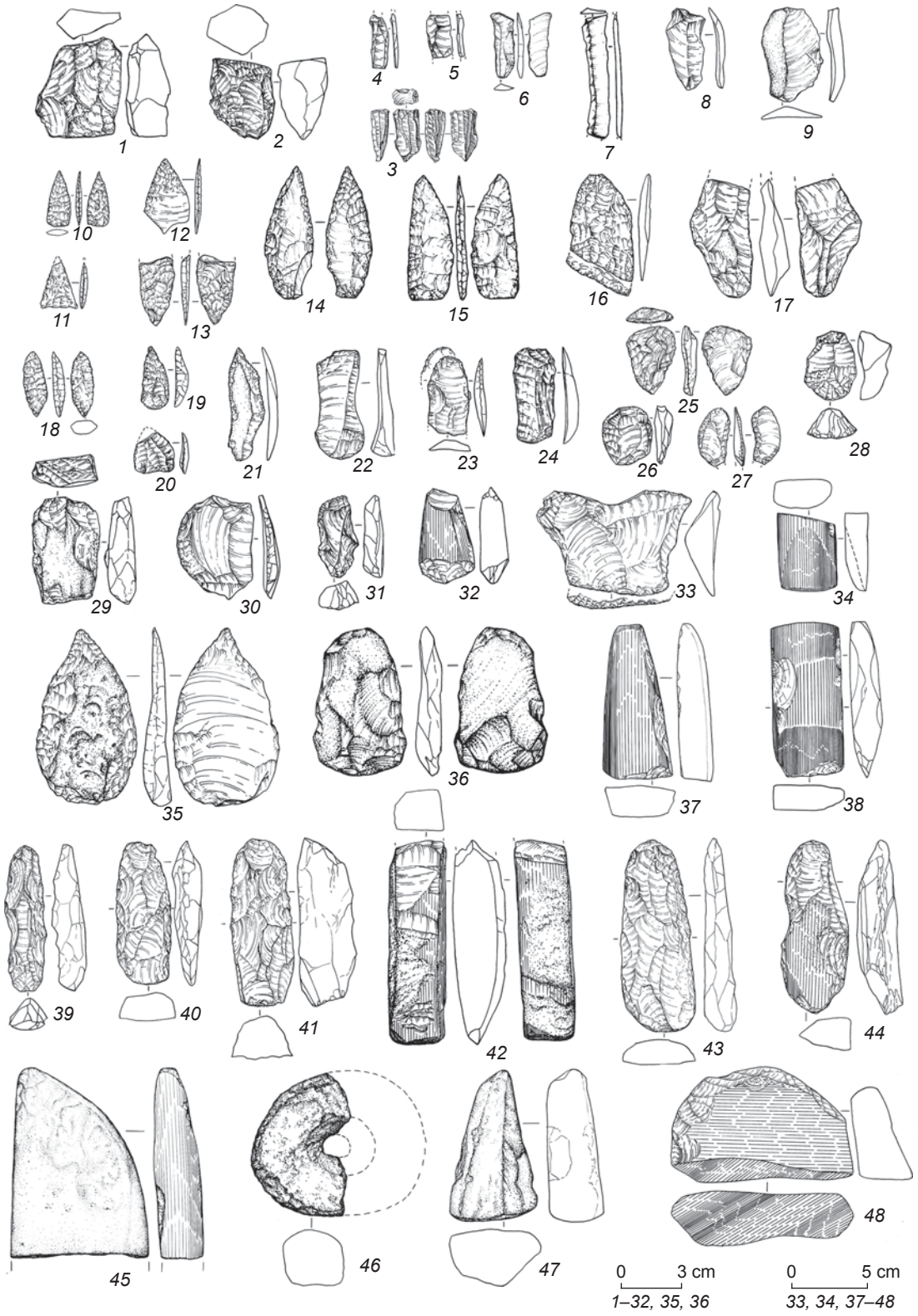

Fig. 2. Stone tools.

1–3 – cores; *4–7* – knife-like blades; *8*, *9* – balde flakes; *10*, *11* – arrow-heads; *12–14* – dart-heads (*12*, *13* – fragments); *15*, *16* – knives; *17* – knife blank; *18* – carver-borer; *19*, *21* – borer-scrapers; *20* – carver-scraper; *22–28*, *30*, *31* – end-scrapers; *29* – core-scraper-like tool; *32* – scraper blank; *33* – notched-scraper-like tool; *34* – chisel fragment; *35* – side-scraper; *36–38* – adzes; *39–43* – axes; *44* – digging tool; *45* – grinder fragment; *46* – mace-head fragment; *47* – pestle; *48* – burnisher.

some tools bear rather abrupt retouch (45°). End-scrapers were mostly 3.0 to 4.0 cm long. One of the artifacts has been identified as a side-scraper fashioned on a thick leaf-shaped spall through marginal, discontinuous, sharpening retouch along the perimeter. There are also a side-scraper-core-like specimen, a side-scraper-notched and a side-scraper-percussive tool.

Chopping tools (Fig. 2, *34*, *36–43*) include axes (three complete specimens and four fragments), adzes (three complete tools, 11 fragments, and a blank), and a chisel-fragment. Most of these were made of siltstone; or more rarely, of chert. Axes were fashioned with direct percussion. Two axe-types have been identified: elongated sub-rectangular or elongated sub-trapezoid in plan, and subtriangular or flattened lens-shaped in cross-section. The working edge was additionally improved by one spall (or more rarely, two spalls facing each other). The axes are from 11.0 to 12.5 cm long. In terms of working technique, two adze-types have been identified: adzes fashioned through direct percussion on pebbles and thick flakes, and adzes manufactured on pebbles through percussion followed by polishing of the entire surface. Type 1 adzes are elongated sub-trapezoid or sub-rectangular in plan, and flattened lens-shaped or unilaterally convex in cross-section. Their working edges show trimming through fine flaking. Type 2 adzes are elongated sub-trapezoid or sub-rectangular in plan, and rectangular or trapezoid in cross-section, slightly-rounded or straight. Working edges bear symmetrical or asymmetrical sharpening facets. Some of them show use-wear signs. Complete specimens are from 7.5 to 10.0 cm long.

Combination tools (see Fig. 2, *18–21*) represent the tools combining several functions (15 complete specimens, a fragment, and 3 blanks): knife-borer, carver-borer, knife-scraper, scraper-borer, and knife-scraper-borer. They are from 3.0 to 4.0 cm long, sometimes up to 6.0–7.0 cm long. The tools were made of siliceous rocks; or more rarely, of siltstone.

In addition, there are four complete tools, a biface fragment, and a blank, which function is hardly discernible. There are also axe-like tools (two complete tools and ten fragments) that might have been used as hoes or percussion tools. A grinder broken into two, and two pestles were also noted (Fig. 2, *44*, *45*, *47*). A mace-head fragment made of a basalt-like porous rock has been also found (Fig. 2, *46*).

Instruments include a hammerstone, a hammerstone-anvil, an anvil-whetstone, and two anvil fragments. Also, six complete grindstones, four grindstone fragments, and a burnisher (Fig. 2, *48*) were found. Natural plates of fine- and medium-grained sandstone were used for this purpose. Their flat surfaces demonstrate grooves, small pits, and dents.

Thus, the morpho-typological and functional analysis of the stone-tool kit has indicated the presence of products of primary reduction, as well as tools and instruments. The cultural-chronological attributions suggest that the majority of bifacial tools belonged to the Malyshevo culture; the polished adzes and a chisel fragment to the Voznesenovskoye culture. The collection of blade lithics has been attributed to the Kondon and Belkachi cultures on the basis of associated ceramics, which are described below.

Ceramics

The archaeological assemblage from excavation I exposed in the 1973 season includes 3730 ceramic pieces: archaeologically complete reconstructable vessels, upper, middle, and bottom vessel-parts, isolated fragments of rims, walls, and bottoms belonging to different vessels. The recovered ceramic pieces have been attributed to the Middle (Malyshevo, Kondon, and Belkachi cultures), Late (Voznesenovskoye culture), and Final (Final Neolithic type) Neolithic periods. Reconstruction of ceramic technology was based on the results of petrographic analysis (Table 2) of transparent ceramic sections, as well as on the data of binocular microscopy and X-ray phase analysis.

Malyshevo culture (Fig. 3, *1*, *2*, *4–9*). The sample consists of 2937 ceramic pieces: 4 archaeologically complete vessels, 15 upper and 2 lower vessel-parts, 336 rim fragments, 2335 wall fragments, and 245 bottom fragments. 846 ceramic pieces do not bear any decoration. Malyshevo pottery was found in the filling and on the floor of the excavated dwellings, as well as in the space between dwellings. Dwelling C yielded 478 pieces, dwelling D yielded 196 pieces, dwelling E produced 1303 pieces, and 960 pieces were found in the space between dwellings.

Technology (Table 2). Two main traditions of paste preparation were identified: non-composite (mineralogenic) and composite (mineralogenic-grog). Petrographic analysis did not reveal any organic matter in the paste. Three main recipes were used: clay + sand (two specimens); clay + sand + natural debris (two specimens); clay + sand + grog (one specimen). The X-ray diffraction analysis supported the petrographic data. Vessel surfaces were rubbed, smoothed, burnished and polished, covered with engobe, and painted red both externally and internally. Malyshevo ceramics vary in colors from light ocher (yellow, reddish, orange, light-brown) to dark (dark-brown and dark-gray, nearly black) shades. This indicated that the firing mode was oxidizing, and was carried out at a temperature not exceeding 700 °C. “Smoking” technique was also used.

Shaping and morphology. Vessels were shaped using base- and base-and-body shaping methods, as well as coil-spiral and ring-spiral techniques. The coil’s width

Table 2. **Results of petrographic analysis of the Neolithic ceramics found in 1973 season (excavation I)**

Section code	Vessel part	Paste composition	Clay composition	Sand		
				Inclusions	Size, mm	%
1	2	3	4	5	6	7
Malyshevo culture						
C-1	Bottom with a wall	C + S	Psammitic-silty, brown, ferruginous clay	Quartz, ore mineral, rarely – feldspar (plagioclase), potassic feldspar	0.5–1.0	10
C-2	Rim	C + S + RD	Psammitic, brown, ferruginous clay	Fragments of quartz, plagioclase, and ore mineral, rarely – fragments of biotite and granite	0.3–3.0	15
C-3	"	C + S	Psammitic, brown to dark-brown, very ferruginous clay	Ore mineral, quartz, plagioclase	0.2–3.0	20
C-4	"	C + S + RD	Psammitic, dark-brown, very ferruginous clay	Quartz, ore mineral, microcline, ferruginized fragments of biotitic granite	0.2–3.5	15–20
C-5	Wall	C + S + G	Psammitic, psammitic-silty, brown ferruginous clay	Quartz, feldspar (plagioclase), ore mineral, fragments of black ferruginous clay	0.2–3.0 to 4.0	15–20
Kondon culture						
C-6	"	C + RD + S	Psammitic, dark-brown to black, very ferruginous clay	Fragments of heavily kaolinized, slightly translucent, ferruginized granite, rarely – pure quartz grains, kaolinized feldspar grains, ore mineral	0.3–2.0	40
C-7	Rim	C + S	Black, very ferruginous clay	Pelitized and kaolinized feldspar, rarely – pure quartz grains, ore mineral	0.2–3.0	70
C-8	"	Same	Limonitic, brownish-black, very ferruginous clay	Fragmented crystals of pelitized, kaolinized, and ferruginized feldspar, of ore mineral, rarely – quartz grains	0.2–2.0 to 3.0	15
C-9	Wall	C + G	Black, ferruginous clay	Fragments of light-brown clay	2.0 to 3.0–5.0	40
C-10	Rim	C + S	Same	Plagioclase, quartz, and their attachments	0.3–3.5	40
Belkachi complex						
C-11	Wall	C + S + G	Black, very ferruginous clay	Fissured fragments of plagioclase and quartz crystals, their attachments, isometric and linear brown clay fragments, single epidote-crystal	0.1–3.0	20
C-12	"	C + S	Same	Fragmented crystals of quartz and plagioclase, single round grain of ore mineral	0.2–2.0	20
C-13	"	C + S + G + RD	Silty, hydromicaceous, light-brown to black, unevenly ferruginous clay	Rarely – plagioclase and quartz fragments; rounded black clay lumps (3 spec.), 2.0 × 3.0 mm, in light-brown clay; single fragment of hydromicaceous rock, 2.0 × 4.0 mm	0.2–1.0	20

Table 2 (end)

1	2	3	4	5	6	7
C-14	Wall	C + S + G	Black, very ferruginous clay	Fragmented crystals of plagioclase and quartz (2.0 × 1.0 mm), fragments of brown, hydromicaceous clay without mineral inclusions, and of light-brown clay containing 85 % of quartz and plagioclase 2.0 × 3.0 mm fragments; the clay inclusions are 1.0 × 3.0 mm	0.2–1.0 to 3.0	30
C-15	"	C + S	Hydromicaceous, brown, ferruginous clay	Fragmented crystals of quartz, plagioclase, and ore mineral	0.2–1.5	20
			Voznesenovskoye culture			
C-16	"	Same	Silty, hydromicaceous, brown, ferruginous clay	Fragmented crystals of plagioclase and quartz, and ore mineral grains	0.2–1.5	30
C-17	Rim	C + S + G	Silty, light-brown, low ferruginous clay	Fragmented crystals of plagioclase and quartz, rarely – lumps of brown clay without inclusions, and light-gray, light-brown clay with inclusions (70–80 %) of fragmented plagioclase and quartz; single epidote crystal	0.2–1.0	10
C-18	Wall	C + S	Brown, ferruginous clay	Plagioclase, quartz, rarely – grains of epidote, 2.0 × 3.0 mm	0.2–1.0 to 2.0	10
C-19	Bottom with a wall	Same	Silty, hydromicaceous, light-brown, low ferruginous clay	Plagioclase and quartz crystals and their fragments	0.2–1.5	10
C-20	Wall	"	Silty, light-brown, low ferruginous clay	Fragmented crystals of quartz, plagioclase, and epidote, rarely – fragments of ore mineral	0.2–1.5	15
			Final Neolithic type			
C-21	Rim	"	Silty, hydromicaceous, light-brown, brown clay	Plagioclase, epidote, quartz	0.2–1.0	10
C-22	"	"	Dark-brown to black, ferruginous clay	Plagioclase and quartz fragments, sphene, epidote	0.2–1.0	10
C-23	"	"	Very limonitic, dark-brown clay	Isolated grains of plagioclase, quartz. and ore mineral; epidote	0.2–1.0	10
C-24	"	"	Silty, hydromicaceous, limonitic, brown, ferruginous clay	Quartz, rarely – plagioclase and epidote	0.2–1.0	10
C-25	"	"	Silty, brown, black, ferruginous clay	Fragmented crystals of quartz and plagioclase	0.2–3.0	30

Note: P – paste , C – clay, S – sand, RD – rock debris, G – grog.

depends on the vessel's size, and varies from 4.0–5.0 to 6.0–7.0 cm. The rim-coil's width was 1.5–2.0 cm. The shapes and sizes of the vessels vary across the sample. The sample includes small and considerably large vessels with and without necks, closed and open in shape. The rims of the vessels are straight or folded out- and inward; the orifices are rounded, pointed, flattened, or beveled. Orifice whetting technique was used. The bottoms are flat.

Decoration patterns. Both embossed pattern and high relief were used, as well as flat decoration patterns. The

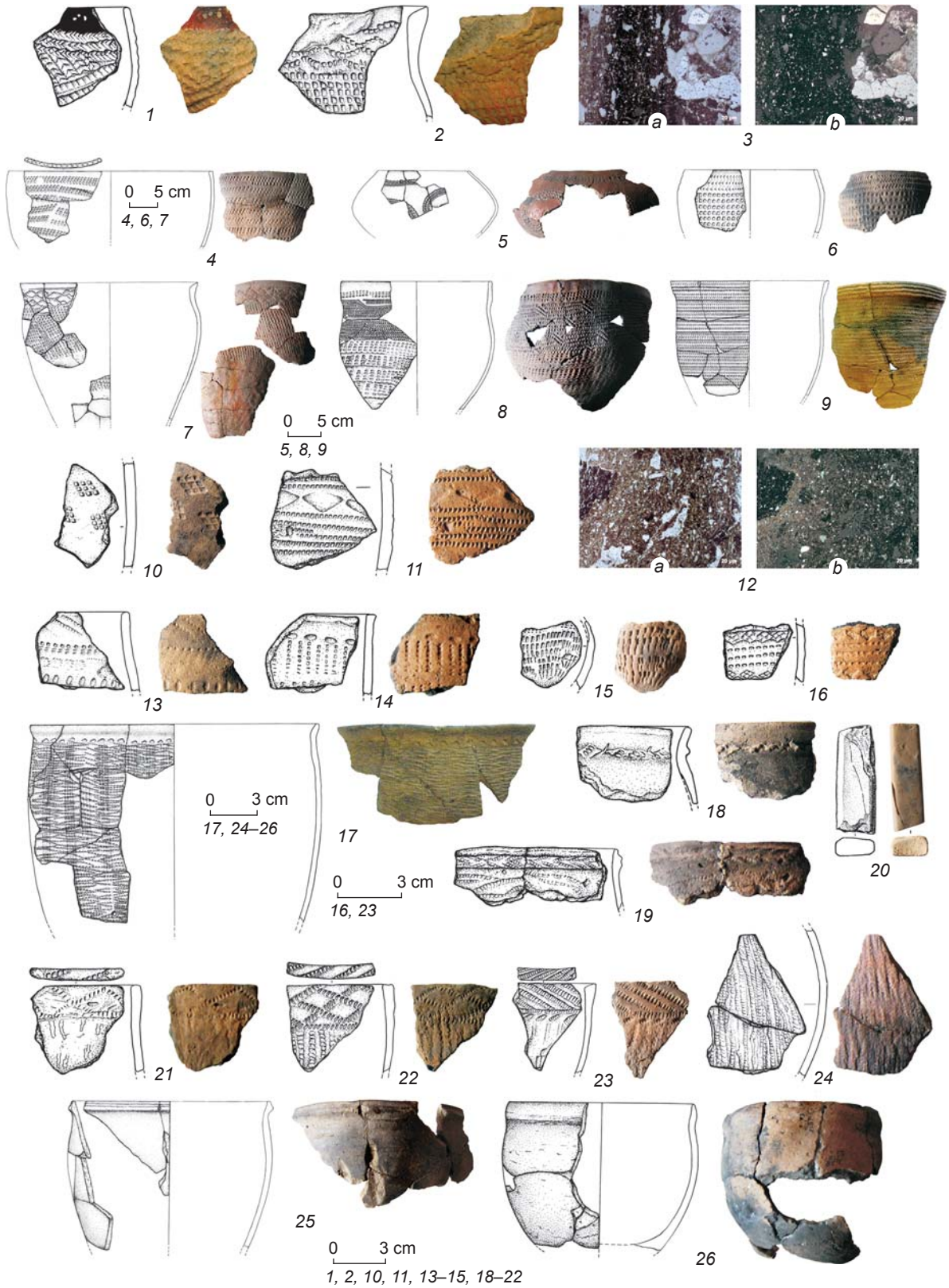

Fig. 3. Ceramicware (*1*, *2*, *4–11*, *13–19*, *21–26*), ceramic rod (*20*), and pictures of sections (*3*, *12*) in polarized light (*b*) and without it (*a*).

1–9 – Malyshevo culture; *10–16* – Kondon culture; *17–20* – Voznesenovskoye culture; *21–24* – Belkachi ceramic complex; *25*, *26* – Final Neolithic ceramics.

most typical decorative techniques are comb-imprints (mainly from two to five cogs) and retreating spatula stamp (angular and bracket-shaped). There are also imprints of variously shaped cogged wheels, finger and nail imprints, appliquéd fillets (straight, with fascia, and wavy), incised lines and grooves, various scratches, pricks, etc. Separate elements form various motifs, and simple and complex compositions.

Functions. Ceramicware has been classified into two main groups: utility ware and ritual ceramics. Household utensils show soot-deposits (sometimes heavy) both outside and inside; ritual vessels have painted inner surfaces.

Thus, Malyshevo ceramics demonstrate stability of major features, and can be considered a single complex of the developed pottery tradition. However, this complex includes a significant share of ceramic fragments of the so-called Boismana type with their own ornamentation patterns.

Kondon culture (Fig. 3, *10*, *11*, *13–16*). In total, 163 ceramic fragments were found, including 11 rims, 121 walls, and 31 bottoms, of which 130 pieces were not ornamented. Dwelling C yielded 34 ceramic pieces, including 16 specimens in sq. И/45; dwelling D (sq. Б/33, Г/32) yielded 3 pieces; dwelling E produced 109 pieces, including 31 fragments in sq. Б, В/36-38. The rest fragments were recovered from the space between dwellings, one half of which were noted in sq. Ж/34.

Technology (Table 2). Two non-composite paste-preparation traditions were established: the mineralogenic and grog traditions. Petrographic analyses did not reveal any organic admixtures. The main paste-recipe is clay + sand (three specimens); other recipes: clay + rock debris + sand, and clay + grog, each represented by one specimen. The X-ray diffraction analysis supported the petrographic data. Vessel-surfaces were rubbed, smoothed and covered with engobe; a few specimens showed polishing. The colors of the inner and breakage surfaces of the ceramics vary from gray to dark-gray, while the outer surfaces are yellow or reddish. This indicates that the firing process was carried out in the redox environment at the temperature of 650–700 °C. "Tempering" mode was also used.

Shaping and morphology. Vessels were manufactured using the base- and base-and-body shaping method, and also coil-ring (with coils not less than 6.0 cm wide) and, probably, patch technique. The bad state of preservation of the Kondon ceramics makes it impossible to identify morphological features of vessels clearly. Supposedly, vessels were mostly small and medium-sized, close-shaped, with and without necks. Rims were straight and slightly folded outward; orifices were either flattened or round; bottoms were flat.

Decoration patterns. Only embossed patterns were noted, representing mostly multi-cogged comb and figured stamp-imprints (predominantly rhomboid). Leading motifs are kind of "mesh grid" framed with parallel horizontal lines, or without any framing.

Functions. All ceramics are attributed to household utensils. The pottery bears soot-deposits (sometimes heavy), both on the inner and outer potsherd surfaces.

Thus, the Kondon ceramicware, discovered in the Malyshevo dwellings and the space between dwellings, seems to attest to a very short-term presence of a small Kondon population group. These ceramics belong to the intermediate period between the early and late trends in the Kondon pottery tradition.

Voznesenovskoye culture (Fig. 3, *17–19*). In total, 401 potsherds were recovered, including an archaeologically complete vessel, upper parts (4 spec.), rim fragments (45 spec.), wall fragments (312 spec.), and bottom fragments (39 spec.). The majority of potsherds (290 spec.) do not bear any decorations.

Technology (Table 2). The paste-preparation traditions were identified as composite: mineralogenic-organogenic and mineralogenic-grog-organogenic. The main paste recipe is clay + sand + organic matter (four specimens). One specimen demonstrates a recipe of clay + sand + grog + organic matter. Petrographic analysis did not show any organic admixtures in the paste, yet the analyzed sections of Voznesenovskoye ceramics were of poor quality. Visual observations and binocular microscopic analysis have shown that shell and bodies of fresh-water mollusks were added to the ceramic paste. The X-ray diffraction analysis supported the petrographic data. Vessel-surfaces were rubbed and smoothed; a few specimens showed polishing. The colors of the inner and breakage surfaces of the Voznesenovskoye ceramics vary from gray to dark-gray, while the outer surfaces are yellowish-gray and gray-brown. This indicates that firing process was carried out in the redox environment at a temperature of 650–700 °C.

Shaping and morphology. The vessels were built using the body-and-base shaping method and coil-ring technique. The width of the body's coils varies from 3.5 to 4.5 cm, and that of rim's coils from 1.0 to 1.5 cm. Vessels are predominantly large- and medium-sized, close-shaped, with necks. Rims are mostly folded outwards; a few straight rims were also noted; the orifice is either pointed or rounded. Bottoms are flat.

Decoration patterns. Two types of relief have been noted: embossed relief was mostly executed through multi-cogged comb imprints, cogged-wheel incisions, and scratched lines; raised relief, through appliqué. The first type of relief is common for vessel-bodies, which could have been covered with vertical or, more rarely, horizontal zigzags, but could also have been smooth. Appliqué was used for decoration of exterior rim surfaces.

Functions. All ceramics are attributed to household utensils. Often, significant soot-deposits are observed on the inner and/or outer potsherd surfaces.

In general, the Voznesenovskoye ceramic-complex from excavation I of 1973 can be subdivided into two main groups of vessels. The first group is characterized by a comparatively dense paste with minor organic admixture and vertical zigzag decoration motif. The second group is further subdivided into two subgroups by decoration patterns: with body decoration and without it. On the whole, this ceramic complex is characterized by loose paste with abundant organic admixtures; by a fillet with the incised grooves and slanting imprints of multi-cogged comb stamp on the outer rim surface; and by vertical and/or horizontal zigzag motifs over the main body. The body might also not have been decorated. These observations suggest two or even three non-contemporaneous events of migration of the Voznesenovskoye people to Suchu Island.

Belkachi ceramic complex (Fig. 3, *21–24*) is represented by 98 ceramic pieces, including 10 rim fragments, the rest being wall fragments. In the filling of the dwelling C (sq. И/42-45), 30 potsherds were recovered, in dwelling D (sq. А/31), 3 pieces, in dwelling E (various squares), 17 pieces, and the rest potsherds were found in the space between dwellings (mainly in sq. Ж, З/41, 42).

Technology (Table 2). The main traditions of paste-preparation were identified as non-composite (mineralogenic) and composite (mineralogenic-grog). Three recipes were used: clay + sand (two specimens); clay + sand + grog (two specimens); clay + sand + natural debris + grog (one specimen). The X-ray diffraction analysis supported the petrographic data. Vessel surfaces were rubbed and compacted. The ceramics are predominantly brown and gray-brown. The firing process was carried out in an oxidizing environment at a temperature not more than 800 °C. "Smoking" technique was used.

Shaping and morphology. Vessels were shaped using coil-ring and coil-spiral techniques. The width of the coils depended on the vessel's size. The poor state of preservation of the Belkachi ceramics makes it impossible to identify clearly morphological features of vessels. Supposedly, they were mostly close- and open-shaped, large- and medium-sized, with poorly curved necks. The rims of the vessels are straight or folded out- and inward, orifice is rounded, pointed, flattened, or beveled. The bottoms are round or rounded-pointed (with a "spur").

Decoration patterns. Rims were decorated with appliquéd fillets, which could have also been covered with cogged-wheel or multi-cogged comb-imprints forming straight and oblique lines and grid. The walls show cord-imprints with some modifications.

Functions. All ceramics are attributed to household utensils. Soot-deposits are observed on some inner and outer potsherd surfaces.

Thus, the Belkachi ceramics represent a homogenous complex with certain main features. The location of the Belkachi ceramics in the excavation area and their comparatively small number suggest a single and a very short-term occupation of the island by the Belkachi tribe.

Final Neolithic ceramics (Fig. 3, *25*, *26*). These comprise 63 ceramic pieces, including two archaeologically complete vessels, 3 rim fragments, 49 walls, and 9 bottoms. In the filling of the dwelling C, 19 pieces were found (mainly (17 spec., including one complete vessel) in sq. И/42-45); in dwelling D, 18 pieces, half of which were recovered from sq. Б-Г/31; in dwelling E (various squares), 12 pieces; and in the space between dwellings (sq. Д-Е/43, 44, З/38, И/39), 14 pieces.

Technology (Table 2). Paste-preparation technology was identified as composite, mineralogenic-organogenic. The only recipe was clay + sand + organic matter. Petrographic analysis did not show any organic admixtures in the paste, yet the analyzed sections of Final Neolithic ceramics were of poor quality. Visual observations and binocular microscopic analysis have shown that shell and bodies of fresh-water mollusks were added to the ceramic paste. The X-ray diffraction analysis supported the petrographic data. Vessel surfaces were rubbed, smoothed, polished, and coated with engobe. The colors of the inner and breakage surfaces of ceramics vary from gray to dark-gray, while the outer surfaces are yellowish-gray and gray-brown. This indicates that firing process was carried out in the redox environment at the temperature of 650–700 °C.

Shaping and morphology. The vessels were manufactured using the base- and base-and-body shaping methods, and also coil-ring technique. The width of the body's coils varies from 4.0 to 4.5 cm, that of rim's coils from 1.0 to 1.5 cm. The vessels are large- and medium-sized, close-shaped, with necks. The rims are folded outward, orifice is pointed or rounded. Bottoms are flat.

Decoration patterns. The ceramics bear only one decoration pattern: appliquéd fillets on the exterior rim-surface. Some fillets are monolithic, others are segmented by one or two grooves. The other parts of the vessels are smooth.

Functions. All ceramicware is identified as household utensils, which is indicated by soot-deposits on the inner surfaces.

The availability of some technological, morphological, and decorative features points to a certain similarity between the Final Neolithic and Voznesenovskoye ceramics, and suggests that the Final Neolithic pottery tradition was based on the Voznesenovskoye ceramics. However, the issue of a foreign component introduced into the Voznesenovskoye culture still remains open.

In addition to the Neolithic collections described above, 66 pieces of the Early Iron Age ceramics (Poltse

culture) have been found. These are mostly isolated wall fragments (51 spec.), dark-brown and gray in color, bearing decorations in the form of segmented appliquéd fillets and nail-imprints. Almost all of them were discovered in the upper filling layers of dwelling E (25 spec.) and in the space between dwellings (26 spec.). Two late medieval vessel fragments were also found.

Pieces of art and cult, ornamenting tools

The excavation-area—mostly the sandy loam filling of dwellings—yielded 17 artifacts of fired clay (predominantly fragments) that were attributed to the Malyshevo and Voznesenovskoye cultures. The collection includes three ceramic rods (Fig. 3, *20*), four fragments of anthropomorphic figurines (one fragment represents the upper part of phallus-shaped female head, the rest represent parts of human bodies) (Medvedev, 2011: Fig. 1, *2*), and a fragment of a zoomorphic figurine (part of a body with one leg of—presumably—a bear). Among six Malyshevo spindle-whorls (two complete items and four fragments), four items were made of modified potsherds with comb-imprints, and two were originally manufactured as spindle-whorls. One of these two bears sub-ovoid notches along the edge; another whorl is ornamented with a cross-shaped (?) composition of low fillets covered with cogged-wheel imprints. The latter whorl might have been used as a cult object (churinga?) (Medvedev, 2002). The collection also includes a small fragment of a considerably large ceramic ring, which can be attributed to a cult solar object. Two ceramic stamps belong to the Malyshevo culture: a cogged wheel and a rounded rod, one end of which is nearly circular and another rhomboid, both segmented cross-wise.

Discussion and conclusions

Excavations on Suchu Island in the 1973 season yielded results that supported the available information on the existence of remains of the Malyshevo dwellings, and material remains of other Neolithic cultures, in the lowermost part of a wide hollow in the southeastern part of the island (Okladnikov, Medvedev, Filatova, 2015: 61). Apart from a part of dwelling C, discovered in 1972, the excavation of 1973 allowed investigation of a small part of dwelling D, a large part of dwelling E, and the space between them. All these dwellings belong to the Malyshevo culture, which is why the majority of finds were associated with this. On the floor, in the filling of dwelling-pits, and nearby, 2937 ceramic fragments were found (out of the total of 3730 potsherds in the entire excavation). It can be assumed that one of the first radiocarbon dates of 5830 ± 65 BP (3880 ± 65 BC) (SOAN-843) of the site is associated with the dwelling E, which yielded pieces of charcoal used in the analysis.

Planigraphic analysis of the excavated dwellings has shown considerable differences in their construction-features. Dwelling-pits vary in depth: dwellings C and D have considerably deep pits (up to 2.0 m), while dwelling E rested on a shallow pit. The rim-shoulders are gently sloping in dwellings C and E and steep in dwelling D. Dwellings C and D show ledges in their pits, while dwelling E does not have any ledges. The floor inside the dwelling E pit is uneven, and rises from the center to the walls. These features are typical for Malyshevo culture, which carriers used to build both large dwellings with ledges inside, and small dwellings without ledges. Notably, the latter are also characteristic of the Kondon building tradition.

The toolkit of this settlement-site points to the complex economy of the ancient population of Suchu Island. The kit represents hunting, fishing, and butchering tools. There are also tools for processing stone, wood, and bone, for preparing vegetable food, and for digging. These features make it possible to conclude that to the 4th millennium BC, the Neolithic population of the island established the cultural and economic system typical of game hunters, fishermen, and foragers populating large river valleys.

Analysis of the ceramics has shown a certain diversity in the ceramicware belonging to various cultural traditions: in the choice of clay- and paste-composition, methods of surface treatment, and firing modes. There are common and distinctive features in vessel-shaping and morphology. Decoration, too, is culturally specific.

In the Neolithic, Suchu Island was not only the place of constant long-term population by the Malyshevo people, but also was often visited by representatives of foreign cultures. Apparently, there were several waves of migration of the Lower Amur tribes and those from the mainland and other islands, mostly from Sakhalin.

Excavations on Suchu Island in 1973 have yielded important materials, mostly ceramicware, providing a new insight into the Neolithic of the Amur Basin.

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Portable Sculptures from Neolithic and Bronze Age Habitation Sites near Lake Baikal*

Portable sculpture provides important information on past worldviews, the ways various objects were perceived, and subsistence activities. This study addresses figurines from Neolithic and Bronze Age habitation sites on Lake Baikal, relying on a summary of published specimens, plus those from recent excavations: in total, 32 intact and fragmentary figurines from twelve sites. Chronology, assessed on the basis of stratigraphic observations and radiocarbon analysis, suggests that figurines had been manufactured on Lake Baikal since the Early Neolithic (over 7000 cal BP). Most of the early specimens represent fish, some depict Baikal seals. They conform to the Kitoy artistic tradition. Late Neolithic figurines (5590–4870 cal BP) evidence a different style, typical of the Serovo-Glazkovo tradition. Bronze Age depictions of fish are highly stylized. Overall, these differences make it possible to track chronological changes in the content and styles of portable sculpture in the region. Most representations of fish have hanging-holes and were probably used as bait. Larger ones without holes might have been used in rituals.

Keywords: *Baikal, Cis-Baikal, Neolithic, Bronze Age, portable sculpture, habitation sites.*

Introduction

Pieces of ancient art—in particular, portable art—have always attracted the special interest of researchers. These artifacts provide important information on the worldviews of ancient people and their perception of a particular image. Portable pieces of art reveal close relations with production activities. Small figurines usually represent images of animals, which played important roles in the life of ancient people. Portable sculptures reflect conditions of material life and social relations.

The first sculptures in Cis-Baikal region were discovered in the late 19th century. These were incidental finds of stone representations of fish. M.P. Ovchinnikov and D.N. Anuchin were the first scholars who studied these artifacts. They interpreted them as cult objects providing for successful fishing (Okladnikov, 1950: 246). B.E. Petri (1916: 124–126) excavated a multilayered habitation site in the Ulan-Khada Bay of Lake Baikal in 1913 and found the first large collection, of 13 stone fish figurines (both intact and fragmentary). Regrettably, all intact figurines were found on the surface of the ground, beyond stratigraphic context. Only three figurine fragments were recovered from the Ulan-Khada Neolithic layers.

Subsequently, excavations at ancient burial grounds on the banks of the Angara and Lena rivers yielded abundant materials on the portable art of the Cis-Baikal Neolithic and Bronze periods (Okladnikov, 1936, 1941, 1950:

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242–244, 390–396). Sculptures recovered from these burial grounds were mostly representations of fish, or more rarely, elk heads and anthropomorphic figurines. Analysis of the obtained objects made it possible to classify figurines by their motifs, manufacturing techniques, and stylistic features (Okladnikov, 1936, 1950: 219, 246–250; Studzitskaya, 1970, 1976).

The array of data on Baikal portable sculptures was built up very slowly. The majority of figurines represented isolated finds (Svinin, 1976: 168, 170; Gryaznov, Komarova, 1992: 18–19; Kushnareva, Khlopin, 1992: 89; Goriunova, Novikov, 2012: 84–88). Starting in the 1970s, large-scale excavations have been carried out on Baikal shores, and a considerable number of portable sculptures have been collected (Okladnikov, 1975; Goriunova, 1997: 96; Aseev, 2003: 88, 132–133; Nomokonova, Goriunova, 2004: 121; Dolganov et al., 2011: 78; 2013: 127; Goriunova, Novikov, 2012; Goriunova, Novikov, Weber, 2014: 56). The present paper's objective is to summarize and analyze the available materials on portable art from Neolithic and Bronze Age habitation sites (n = 12) in the region, as well as to assess the age of the materials with the aid of modern natural science techniques.

Study materials

This paper addresses portable figurines from Baikal region that have been published in various papers, as well as newly discovered figurines from the sites that have been excavated in recent decades. The sample includes 32 portable art objects (both intact and fragmentary specimens), which have been found throughout the years of study.

Uzur II is the Neolithic-Bronze Age site located on the eastern shore of Olkhon Island (in the territory of the Uzur settlement), 265 km northeast of Irkutsk (Fig. 1). A stone fish figurine was found by local citizens in their vegetable garden in 1991. The figurine shows a realistic image resembling a burbot (Fig. 2, *6*). The broad head of a fish merges into a narrow tail. The burbot's thick lips are accentuated. The eyes are shown by small dimples located in the same plane. The gills are marked on the ventral side by carved lines converging in the center. Two long fins (upper and lower) run along the tail part. Near the gills and on the back, holes are noted.

Tyshkine III is a multilayered site on the eastern shore of Olkhon Island, located 1.3 km southwest of Tyshkine Fall and 220 km northeast of Irkutsk (see Fig. 1) (Goriunova, Novikov, 2012: 84). A blank of a fish figurine of crystalline marble was found in cultural layer IX (Late Neolithic). It has a shape of a cisco (see Fig. 2, *1*). The sculpture is flattened at the sides, its head is pointed; the tail ends with a straight cut. The dorsal fin is made as a protrusion; the proctal fin is marked by a small convexity.

Khuzhir-Nuge V is a Neolithic-Iron Age site located on the bank of the Khuzhir-Nugaisky Bay of the Maloe More (Little Sea) Strait of Lake Baikal, 200 km northeast of Irkutsk (see Fig. 1). A fish figurine was found by tourists in a coastal cliff. It is made of a white marble, and has a stylized cisco-like shape (see Fig. 2, *8*; 3). The figurine shows the general fish outlines and proportions. The dorsal, proctal, and forked tailfins are sculpturally displayed. Neither eyes, nor gills are shown; also, the figurine has no holes.

Kulara III is a Mesolithic-Late Neolithic habitation site located in Kulara, on the northwestern bank of the Mukhor Bay in Maloe More, 193 km northeast of Irkutsk (see Fig. 1) (Ibid.: 85). A tail-fragment of a fish figurine made of chert, with a pointed tail-end and several small holes, was recovered from the Late Neolithic layer.

Ulan-Khada is a Mesolithic-Iron Age site located in the homonymous gulf in the southeastern part of the Mukhor Bay in Maloe More, 198 km northeast of Irkutsk (see Fig. 1). This site yielded the largest number of stone fish figurines (16 intact and fragmentary items): six specimens were recovered from the Neolithic and Bronze Age layers, and ten figurines were collected from the surface (Petri, 1916: 124–128, Okladnikov, 1950: 247; Gryaznov, Komarova, 1992: 18–19; Goriunova, Novikov, 2012: 85–86).

A stylized representation of a burbot-like fish, made of chert, was recovered from the Early Neolithic layer X (see Fig. 2, *7*). The figurine displays the general outlines

Fig. 1. Map showing the locations of the sites mentioned in the article.
1 – Uzur II; *2* – Tyshkine III; *3* – Khuzhir-Nuge V, Kulara III, Ulan-Khada, Kurkut III, Vostochnyi Kurkut I, Ityrkhey; *4* – Sagan-Zaba II; *5* – Smorodovaya Pad; *6* – Listvenichnoye; *7* – Katun I.

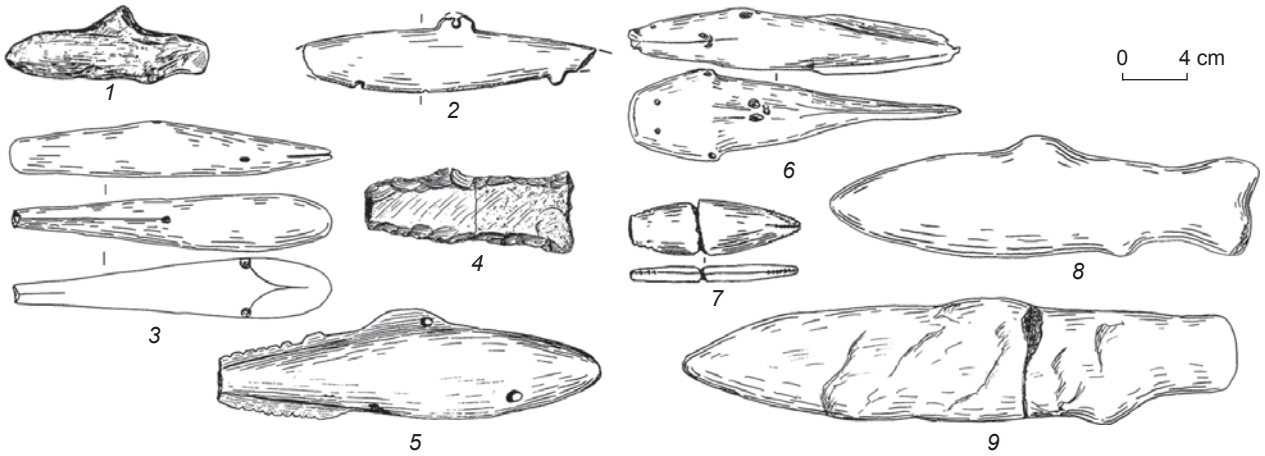

Fig. 2. Stone fish figurines.
1 – Tyshkine III; *2* – Kurkut III; *3* – Katun I; *4* – Sagan-Zaba II; *5*, *7*, *9* – Ulan-Khada; *6* – Uzur II; *8* – Khuzhir-Nuge V.

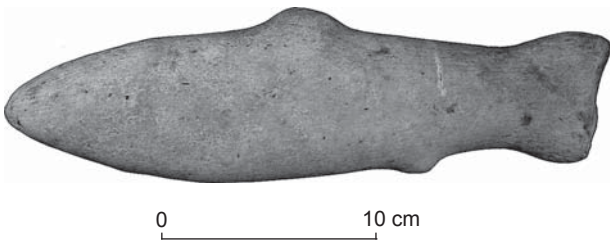

Fig. 3. Stone fish figurine from Khuzhir-Nuge V.

of a fish, without detail. The lateral sides of the figurine are flattened, the head is fashioned with a straight cut; the tail is pointed. In the areas of gills and tail, lateral notches are noted. The compressed layer of the Middle-Late Neolithic (layer IX) yielded an intact fish figurine and a tail-fragment. The intact sculpture was made of sandstone, and represented a schematic image of a burbot (see Fig. 2, *5*). There is a marked dorsal fin, from which long upper and lower fins fashioned with incisions run along the tail. Near the gills and dorsal fin, holes were noted. Fragments of fish figurines made of marble were recovered from Early Bronze Age sediments: one fragment from layer VII, and two fragments from layer IV.

The surface collection includes six intact fish figurines and four fragments, all made of fine-grained marble. Some of these items possibly represent unpolished blanks. Four figurines were classified as cisco images. All of them show a dorsal fin; two specimens also show proctal fins. Tails are mostly forked (3 spec.). The largest figurine (35 cm long) has a tailfin fashioned with a straight cut (see Fig. 2, *9*). One of the intact fish figurines has a hole in the dorsal fin.

In the Ulan-Khada Bay, two small stone sculptures (5.5 cm) representing stylized fish images with convex backs (Fig. 4, *2*, *5*) were found. The figurines have holes in their backs. One of the figurines shows a mouth made with a carved line.

Kurkut III is a Neolithic-Iron Age site located at the end of the Kurkut Bay in Maloe More, 195 km northeast of Irkutsk (see Fig. 1) (Goriunova, Novikov, 2012: 86). A marble fish figurine resembling a cisco was found in the Late Neolithic layer IV. Its head and (broken-off) tail are pointed (see Fig. 2, *2*; 5). The protruding dorsal and proctal fins are shown. Holes were noted in the gills and dorsal fin area.

Vostochnyi Kurkut I is a Neolithic-Iron Age site located in the eponymous gulf in the southeastern part of the Kurkut Bay, 196 km northeast of Irkutsk (see Fig. 1) (Aseev, 2003: 132). A stylized burbot-like fish figurine was found at the site. The figurine has a broad and flat head merging into a long narrow tail. Holes were noted in the gills, dorsal fin, and tail-end areas.

Ityrkhey is a Mesolithic-Iron Age site located in the eponymous gulf in the southeastern part of the Kurkut Bay, 197 km northeast of Irkutsk (see Fig. 1) (Goriunova, Novikov, 2012: 86). A small figurine was recovered from the Middle Neolithic layer IV. It represents a curved bone-stem topped with a head with clear zoomorphic (anthropomorphic?) features (see Fig. 4, *7*). Side-notches separate the upper (broader) end from the pointed stem, and mark out the head. In the center of this end, there is a notch forming two protruding parts (ears?). The frontal face of the stem is decorated with a geometric pattern of alternating, long (double) and short lines running transversally.

Sagan-Zaba II is a Mesolithic-Iron Age site located in the eponymous gulf in the western shore of Lake Baikal, 155 km east-north-east of Irkutsk (see Fig. 1). The Neolithic layers of the site have yielded five small figurines over the history of the site-studies (Okladnikov,

1975; Goriunova, Novikov, 2012: 86). Among these, a broken-off stone fish figurine and a bone spoon with a sculptured handle were found in Early Neolithic layer III (excavations by A.P. Okladnikov in 1974). A small fish figurine (not exceeding 4 cm) is a stylized representation of a fish with a convex back (see Fig. 4, *1*). The head and tail are missing. Deep notches are noted along the back. The spoon-handle is shaped in the form of a stretched neck and a marked head of a Baikal seal (see Fig. 4, *8*). The handle is separated from the scoop by two small symmetrical projections, possibly representing the animal's legs. The stylized image shows the Baikal seal's main characteristic features. The rather oblong shape of the image imparts a rushing-forward movement (the posture of a swimming Baikal seal).

Three other fish sculptures were found in 2008. One of them was recovered from the lower Early Neolithic layer V. It was a small (not exceeding 3 cm) marble stylized fish figurine with a convex back (see Fig. 4, *3*; 6, *1*). The tail is broken off. The figurine shows modeling on both sides: a carved line designates the mouth; the gills are shown with paired straight lines. Carved lines are also noted close to the dorsal and ventral fins. The second fish figurine was recovered from the upper Middle Neolithic layer V. It shows a small (4 cm) stylized marble fish-representation with a convex back. The third figurine was found in Late Neolithic layer IV. This chert sculpture represents a cisco-like image fashioned with large detachments (see Fig. 2, *4*; 6, *2*). It shows the dorsal, ventral, and forked tailfins.

Smorodovaya Pad is a Neolithic-Bronze Age site located on the western coast of Lake Baikal, 65 km south-east of Irkutsk (see Fig. 1). A figurine of a Baikal seal was found in the mixed layer (Kushnareva, Khlopin, 1992: 89). It is a stylized and 4.6 cm long figurine, made of black stone (see Fig. 4, *4*). Its lateral sides and ventral surface show notches, inclined with respect to the main axis. The general outlines of the body and position of the eyes suggest that the animal is shown from the back (top view) in an extended posture, as if the seal is swimming in water, so that only its head and back are visible.

Listvenichnoye: a find was made in the eponymous village situated on the right bank of the Angara River taking off from Lake Baikal (see Fig. 1). The sculpture of a fish with the shape of a burbot is shown in realistic manner (Okladnikov, 1950: 245). The broad head displays the eyes, located in the same plane. The body merges into a long narrow tail. The ventral surface shows the gills, marked with carved lines. The figurine has holes on the back and near the gills.

Katun I is a Neolithic-Iron Age site located on the eponymous cape at the western shore of the Chivyrkuisky Bay, in the eastern part of Lake Baikal, 329 km northeast of Irkutsk (see Fig. 1). Two fish figurines were found here.

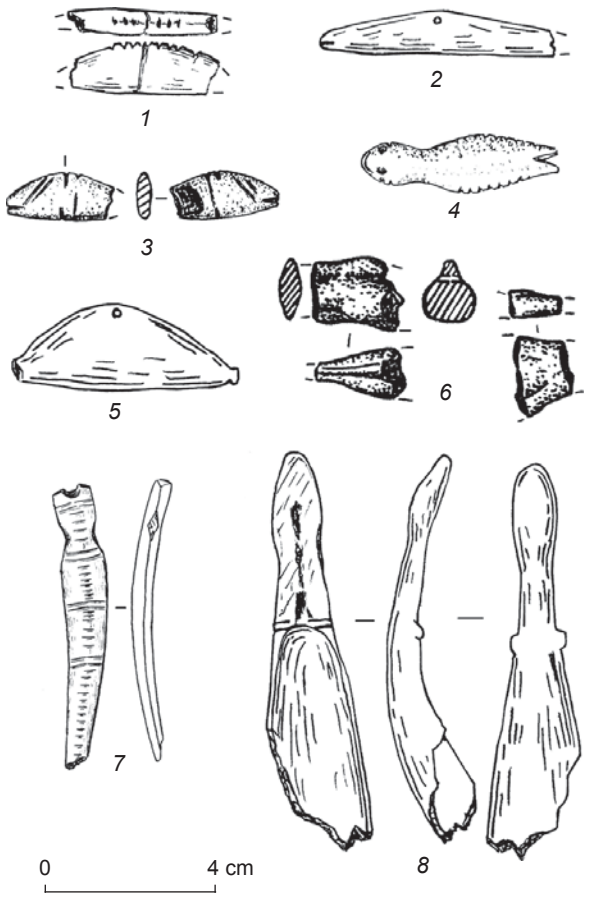

Fig. 4. Portable sculptures.
1, *3*, *8* – Sagan-Zaba II; *2*, *5* – Ulan-Khada; *4* – Smorodovaya Pad; *6* – Katun I; *7* – Ityrkhey.
1–5 – stone; *6* – clay; *7*, *8* – bone.

Fig. 5. Stone fish figurine from layer IV at Kurkut III.

One of them, made of gray chert, was found in a coastal cliff in association with Bronze Age ceramics (Svinin, 1976: 172). It represents a stylized image of a burbot (see Fig. 2, *3*). The broad head of the fish merges into a narrow tail. Mouth and gills are marked, as well as holes on the back and near the gills. The second figurine (fragmentary) was recovered from Middle Neolithic cultural layer VI (Nomokonova, Goriunova, 2004: 121). It is made of clay, and has a burbot-like shape (see Fig. 4, *6*). Its body is broad; the tail is flattened on the sides. The dorsal and proctal fins are sculptured. In the dorsal fin, the hanging-hole is made.

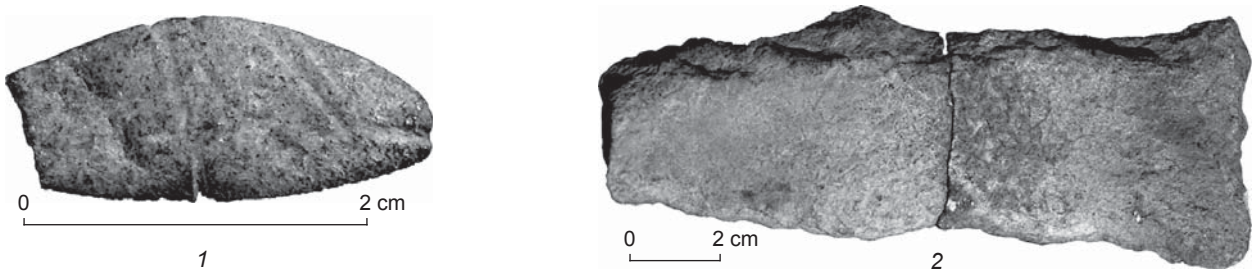

Fig. 6. Stone fish figurines from lower layer V (*1*) and layer IV (*2*) at Sagan-Zaba II.

Discussion

Currently, 32 portable sculptures (intact and fragmentary) made of stone, clay, and bone have been found in the Neolithic and Bronze Age habitation sites on Lake Baikal shores. The majority of these sculptures represent fish (29 spec.). They are mostly made of white crystalline marble (21 spec.); or more rarely, of chert (4 spec.), sandstone (3 spec.), or clay (1 spec.). The collection of stone fish figurines includes three unpolished, unfinished specimens (Tyshkine III and Ulan-Khada) (see Fig. 2, *1*, *9*). The majority of fish figurines have cisco-like shapes (eight intact and nine fragments). Among them, a subgroup is distinguished showing a straight tailfin (without a notch). These figurines possibly represent taimen fish. All the cisco-like figurines are stylized. The main features of the fish's body, which are sculpturally marked, are dorsal, proctal, and tailfins. The fish-images are shown schematically, without modeling the eyes, gills, or other details. Two figurines show notches near the dorsal fin and on the ventral surface (see Fig. 2, *2*). The majority of cisco figurines represent surface-finds collected at the Neolithic and Bronze Age sites (Ulan-Khada and Khuzhir-Nuge V). In the stratified context, they were associated with the Late Neolithic layers (layer IV at Sagan-Zaba II, layer I at Kulara III, layer IV at Kurkut III, and layer IX at Tyshkine III). For these layers, a series of calibrated radiocarbon dates* has been obtained (from the bones of ungulates), which falls within the interval of 5590–4870 BP (Nomokonova et al., 2013; Goriunova et al., 2014: 239). The cisco-like figurines have analogs in the Serovo Late Neolithic burial sites in Cis-Baikal (Okladnikov, 1950: 242–250; Goriunova, 1997: 96). Three such fragmentary figurines were found in the Bronze Age layers at the multilayered site of Ulan-Khada. The calibrated radiocarbon date of 4150–3840 BP (3660 ± 60 BP (LE-883)) has been obtained for layer VII from charcoal.

The group of burbot-like figurines includes seven specimens, one of which is made of clay. Two of these figurines are realistic representations from Uzur II (see Fig. 2, *6*) and Listvenichnoye. Other sculptures are stylized: the representations show general outlines of fish-bodies without particular details. Almost all stone figurines of this group have holes near their area of dorsal fins and gills (see Fig. 2, *3*, *5*, *6*). The only exception is a sculpture from the Early Neolithic layer X at Ulan-Khada, which is highly stylized as compared to other figurines. Another burbot-like figurine from Ulan-Khada was found in layer IX. The calibrated radiocarbon date of 5570–4880 BP (4560 ± 100 BP (LE-1282)) obtained from charcoal suggests its attribution to the Late Neolithic. The stone figurine from the habitation site of Katun I has been dated to the Bronze Age (on the basis of associated ceramics). Other burbot figurines were collected from the surface at various Neolithic-Bronze Age sites.

Small fish figurines (5 spec.), from 3.0 to 5.5 cm in size, from Sagan-Zaba II and Ulan-Khada, form another group. They display stylized fish-images. Fish-body outlines are shown as elongated images with convex backs. Two figurines have holes in the dorsal fin areas (see Fig. 4, *2*, *5*). The sculpture from the lower layer V (Early Neolithic) of the Sagan-Zaba II shows a two-sided modeling of the mouth and gills (see Fig. 4, *3*). The figurine from layer III of the same site (excavations of 1974, Early Neolithic) shows incisions along the back (see Fig. 4, *1*). The style of these figurines is well correlated with the second group of Kitoy fish representations that was identified by S.V. Studzitskaya (1976: 80) in the Cis-Baikal Neolithic. Certain distinctions likely represent local specificity. A series of calibrated radiocarbon dates in the interval of 7090–6310 BP has been obtained from ungulate bones associated with the Sagan-Zaba II layers yielding small stone figurines (Nomokonova et al., 2013; Goriunova et al., 2014: 239).

Isolated sculptures representing Baikal seal have been found in the Baikal sites belonging to the Neolithic period. The image of this animal is represented by the stone figurine from Smorodovaya Pad, and by the bone

*All the dates provided herein have been calibrated by 2σ (95.4 % probability) using Calib 7.0.1 software against the IntCal13 database (Reimer et al., 2013).

spoon with a handle in the form of a Baikal seal's head from layer III (excavation of 1974, Early Neolithic) of Sagan-Zaba II. The spoon was attributed to the group of the Kitoy Early Neolithic spoons with sculptured handles (depicting elk-head and fish-tail). This was a special category of portable art objects that was possibly used for cult purposes. The image of Baikal seal in the Cis-Baikal region and, in particular, on Baikal shores, is represented by isolated objects (Nomokonova et al., 2014: 22–24). Apparently, hunting of Baikal seal led to worship of it as a totem-animal.

Among the portable sculptures in the Baikal region, the zoomorphic (anthropomorphic?) image on a stem recovered from Middle Neolithic layer IV at the site of Ityrkhey is noteworthy. The figurine shows similarity to the Early Neolithic Kitoy stems with stylized anthropomorphic facial images on their ends (Okladnikov, 1950: 392, 394; Studzitskaya, 1970). One of the common features is the decorative pattern of repeated geometrical motifs covering the entire surface.

Conclusions

Available data on the stratified habitation sites and radiocarbon age estimations suggest that portable sculptures were made on the shores of Lake Baikal beginning in the Early Neolithic (over 7000 cal BP). Most typical were small stone fish figurines, while images of Baikal seal were rare. The stylized zoomorphic (anthropomorphic?) image on the stem is unique. The Early Neolithic figurines belong to the Kitoy art tradition, which has been recognized in the Cis-Baikal region (Studzitskaya, 1970; Goriunova, Novikov, 2012: 88). Fish figurines associated with the Late Neolithic period (5590–4870 cal BP) were made in a different style, i.e. the Serovo-Glazkovo tradition. Bronze Age depictions of fish are highly stylized. All figurines can be subdivided into the cisco- and burbot-like types. Stone fish-sculptures do not represent artifacts specific only to Lake Baikal shores: they are wide-spread in the entire Cis-Baikal region, including the middle Yenisei River.

On the basis of the abundant ethnological data, Okladnikov classified fish figurines as production implements (baits used for harpoon fishing). However, he also did not exclude their use for ritual purposes (1941, 1950: 332). Studzitskaya (1976) came to the same conclusions. The majority of fish figurines from Baikal shores, which had hanging-holes, could have been used as bait. Apart from this, some sculptures (large specimens without holes) were likely associated with religious practices. Fish figurines might have represented spirit-masters of the land, spirit-ancestors, and spirit-shaman assistants.

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The Morphology of Bronze and Early Iron Age Celts from Siberia*

Morphological characteristics of Siberian Bronze and Early Iron Age celts are described with special regard to typology. The first steps in this direction were taken by V.A. Gorodtsov (1916), S.A. Teploukhov (1929), M.P. Gryaznov (1941), V.N. Chernetsov (1947), etc. On the basis of these and later studies, it has become possible to visualize and classify all major morphological features of celts with a view towards arriving at their typology. The method is illustrated by the analysis of a Seima-Turbino celt. The set of traits includes over seventy characteristics of the socket, blade, cutting edge, loops, socket-blade joint, casting technique, decoration, and dimensions. Formalized trait codes will enable us to proceed to a statistical analysis of celts based on a maximum amount of traits.

Keywords: *Siberia, Bronze Age, Early Iron Age, celts.*

Introduction

Creation of a typology and classification is associated with a number of challenges ranging from understanding the objectives and opportunities of typology and classification to designing an algorithm for working with a certain set of traits. An indispensable condition for building any typological system is the description of the objects and their analysis. Morphological analysis together with preparing a table containing corresponding traits proved to be the most effective tool for the task. For conducting a morphological analysis, one has to disassemble the object into constituent aspects and to consider series of variability. In general, the basis of the morphological analysis was put forth in the classical works by V.A. Gorodtsov (1916), S.A. Teploukhov (1929), M.P. Gryaznov (1941), V.N. Chernetsov (1947), A.K. Khalikov (1977), as well as E.N. Chernykh and S.V. Kuzminykh (1989). In recent years, this method has received particular attention. In this regard, we should mention the studies by A.I. Soloviev (1983), Y.S. Hudiakov (1995), I.A. Durakov (1995a), Y.G. Kokorina, Y.A. Likhter (1995), and others, who identified and interpreted specific morphological features of socketed axes (celts), determined specific functional purposes of the tools, the casting technique, the structural features, etc. In her study, O.S. Likhacheva (2009) presented the morphological analysis of celts from the territory of the Altai.

In an attempt to identify the morphological traits of celts, we immediately face some problems when trying to define the object or assign it to a particular group of objects. A celt can be an axe, adze, ice pick, small shovel, a tool, and a weapon, as well as possibly a ritual object, which carries a certain semantic load. It can be both multifunctional and serve as a specific situational object, which depends not only on how the haft is located relative

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to the striker—longitudinally or transversely, but also on more than a dozen other morphological features. In the future, we will try to work out a system that would make it possible to identify the functional purpose, cultural and chronological affiliation as well as the specific typological place of the celt among analogous objects. The goal of this article is to present the main morphological units of celts from the Bronze Age and the Early Iron Age, and to compose a table of morphological traits for further research.

Terminology

Archaeological vocabulary is rich and diverse, but that diversity can be misleading in the cases when it refers to one and the same object or trait. In an effort to standardize and systematize the traits, scholars sometimes introduce a series of their own definitions and thus sometimes further complicate the analysis. In this work, we will try to collect the entire available terminological range.

The celt is a slashing weapon with the socket located perpendicular or parallel to the cutting edge depending on the setting of the haft. Traditionally, celts include three parts: the upper part—the socket, the middle part—the blade, and the bottom part—the cutting edge. Let us call these parts the taxonomic units. By taxonomic unit, we mean a group in the classification, which consists of discrete objects combined on the basis of their common properties and features. A discrete object is the smallest indivisible unit with its own set of properties, the morphological units. Thus, each taxonomic unit consists of a set of morphological units varying in size, shape, manufacturing technique, placement, and so on. Currently, we can identify three structural units (taxonomic units) and over seventy-five morphological units in the celts of the Bronze Age and the Early Iron Age, which have been discovered in Siberia.

Unit I. Socket

The socket is a hollow part of the object, where an elbowed or straight haft was inserted. The socket can be closed along the longitudinal axis (or "blind"), or it can be open with a through hole, as well as with a solid socket or open slitted socket (Fig. 1, *8*, *9*, *d*, *e*). The celts with a through socket have been known since the Bronze Age. Bronze celts include objects with battered (forged) wings and wings bent around a wooden haft. The celts with a through cast socket, which imitate such wings, are known from the sites of the Abashevo culture and the Timber-Grave culture (Avdusin, 1989: 132). Such celts with a through cast socket appeared on a massive scale in the Late Bronze Age, although one celt from the Gladunino hoard belongs to the Alakul period (Korochkova et al., 2013).

The socket consists of a hole, edge, and outer walls. The main shapes of the sockets in cross-section include: round (Fig. 1, *1*), oval (Fig. 1, *2*), almond-shaped (Fig. 1, *3*), asymmetrical almond-shaped with concave ends on one side (Fig. 1, *4*), square (Fig. 1, *5*), rectangular (Fig. 1, *6*),

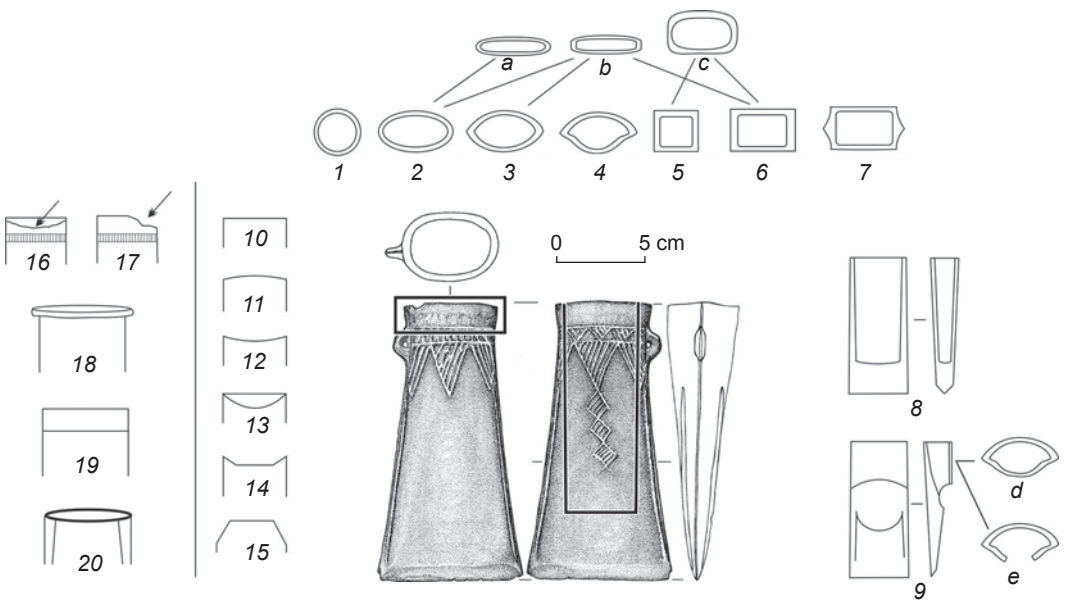


Fig. 1. Unit I. Socket.
1–7 – cross-section (*a–c* – additional versions); *8*, *9* – type (*d*, *e* – versions of molding of through sockets); *10–15* – shapes of the mouth; *16*, *17* – wear of the socket; *18–20* – additional elements.

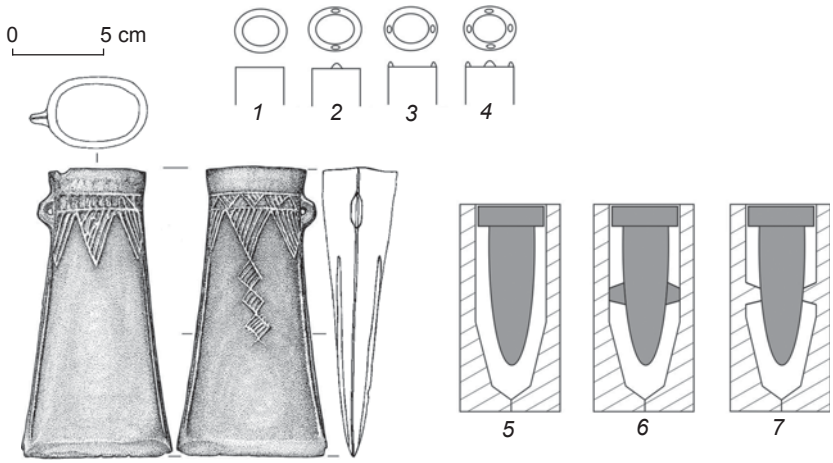


Fig. 2. Unit I. Socket. Molding technique features.
1–4 – traces of sprues; *5–7* – mounting of supports.

or in the form of a polyhedron with a rectangle on the inside (Fig. 1, *7*). These shapes, however, rarely occur in a pure form; most often the corners are rounded, the ovals are flattened (Fig. 1, *a*, *b*); sometimes the shape is an asymmetrical subsquare (Fig. 1, *c*).

The upper part of the socket is often called the mouth in the literature. Its shape (from the frontal plane) is very indicative and is one of the important cultural and historical indicators. The line of the mouth can be straight (Fig. 1, *10*), convex (Fig. 1, *11*), or concave (Fig. 1, *12*). There also occur more sophisticated shapes such as being straight on the front and concave on the back (Fig. 1, *13*). Sometimes figurative elements appear on a socket, such as protrusions (Fig. 1, *14*), or "slanting" (Fig. 1, *15*).

In determining the functional purpose, we should take into consideration the wear of the socket. If the narrow lateral side of the mouth is warped, the object must have been used as an axe (Fig. 1, *17*), and if the wide side is warped, the objects was probably used as an adze (Fig. 1, *16*).

A number of additional morphological elements, such as a bulge, can be identified on the socket. On the celts of the Late Bronze Age, it rises up to the mouth and becomes a functional part of the socket, serving as a reinforcement of its ring (Fig. 1, *18*). Most likely, the mouth of the socket in some celts of the Iron Age was designed in the form of a muft for protection against mechanical damage (Fig. 1, *19*). The simplest solution was to increase the thickness of the metal at the upper part of the socket (Fig. 1, *20*). In other cases, the wall of the socket and the blade had approximately the same thickness.

The morphological elements in the interior part of the socket are also important. Thus, a crosspiece appeared in some Siberian celts, which might have served for the tighter fit of the haft. Using a set of traits, among which the presence of the crosspiece was the most significant, Chernetsov (1947) identified the Western Siberian type of celts.

Some morphological traits can also be found in the interior of the socket. Their combination or absence may help us to establish the cultural and chronological attribution of the objects, which for the most part are associated with the specific aspects of casting technique followed at a certain period of time. When casting a celt, people would use a core, or "cone", which was clamped by mold sections. In the Early Iron Age, people followed the method of clamping the core with special protrusions, which are called braces, supports, stubs, etc. They all had the same task of keeping the core from moving inside the mold during the pouring of the metal (Ibid.; Durakov, 1995b). Two clamping methods can be distinguished; the projections could be mounted on the core (Fig. 2, *6*) or to the mold section (Fig. 2, *7*). The number of holes from braces on the celts usually does not exceed four, but some objects have been found with a larger number of holes, which apparently was caused by a casting defect or the displacement of the core.

One more morphological trait is associated with the casting technique. The core has so-called sprues, which let the metal into the mold and let the gas out. During the casting, metal sometimes remains in the sprues forming projections at the edge of the socket. Most often they are paired and symmetrical (Fig. 2, *2–4*).

We should also mention a number of external features, which no one has yet included in the series of morphological traits, although they also result from the manufacturing technique of the object: casting seams, runner channels, casting defects and damages during the use of the object, gas blowholes, and so on. At the present, it is not possible to include all these into the attributive field, but they must be described during the analysis of the object.

Unit II. Blade

The blade is the widest part of the striker. In profile, it has a symmetrical (wedge) or asymmetrical (half-wedge) shape, which is one of the basic features of the functional purpose of the object: the wedge shape indicates an axe (Fig. 3, *9*), while a half-wedge indicates an adze (Fig. 3, *10*). The wide ornamented face of the celt is sometimes called the bevel or face side. It is thought that more frequently axes have both of their sides decorated, while adzes have only one decorated exterior side. The term "bevel" means the tapered part of the edge in a metal object, and if we consider the celts of the Seima-Turbino circle, this definition fits perfectly for the wide face of the blade regardless of the presence / absence of ornamental decoration. However, over time, the frontal (ornamented) side of the celt started to be increasingly called the bevel regardless of the shape of the blade.

We know seven basic shapes of blade outline from the front view: rectangular (Fig. 3, *11*); trapezoidal with a narrowed bottom part (Fig. 3, *12*); trapezoidal with a narrowed top part (Fig. 3, *13*), or with concave vertical edges (Fig. 3, *14*); square (Fig. 3, *15*); rectangular, where the width of the blade is larger than the length (Fig. 3, *16*), and trapezoidal with a narrowed bottom part and the width of the blade also larger than the length (Fig. 3, *17*).

Just as the socket, the blades have different shapes in cross-section. We can distinguish oval cross-section (Fig. 3, *1*), oval with tapered edges (almond shape) (Fig. 3, *2*), square (Fig. 3, *5*), rectangle (Fig. 3, *6*), and polyhedron with a rectangle inside (Fig. 3, *7*). There occur even more sophisticated shapes (Fig. 3, *3*) with six faces: two side faces are left from the junction of the molds, and the other four faces are the so-called wings or vertical stiffeners. The latter are one of the signs of the celts belonging to the Seima-Turbino circle. An oval-shaped cross-section with wings (Fig. 3, *4*) typically occurs only in shovel-like celts, which are a specific type with a hollow blind socket, and solid molded and strongly flattened blade. Only the celts with a through open socket have an oval or lenticular cross-section, and the back wall is always slitted (Fig. 3, *8*).

The front and side faces of the celts often have earlets-loops. They have always been considered an important typological, cultural, and chronological element, and the shape, size, location, etc. of the loop have always been taken into consideration in the analysis. The function of the loops has not been established with certainty. Some scholars believe that these loops were used for tying the celt to the haft (Tikhonov, Grishin, 1960: 27; Soloviev, 1983: 136; Gryaznov, 1947; and others). According to other scholars, the sizes of the loops were too small and, therefore, they must have played the role of a decorative element. In addition, they could have been used for tying tassels or other decorations (Krivtsova-Grakova, 1949: 9; Bochkarev, 2004: 386–387).

From one to three loops may appear on celts (Fig. 4, *2–4*), but there are examples of celts without loops (Fig. 4, *1*). The earlets may be with (Figs. 4, *9*) or without the hole (Fig. 4, *10*), and the latter type is called a "celt with false loop" in the literature. There may be additional

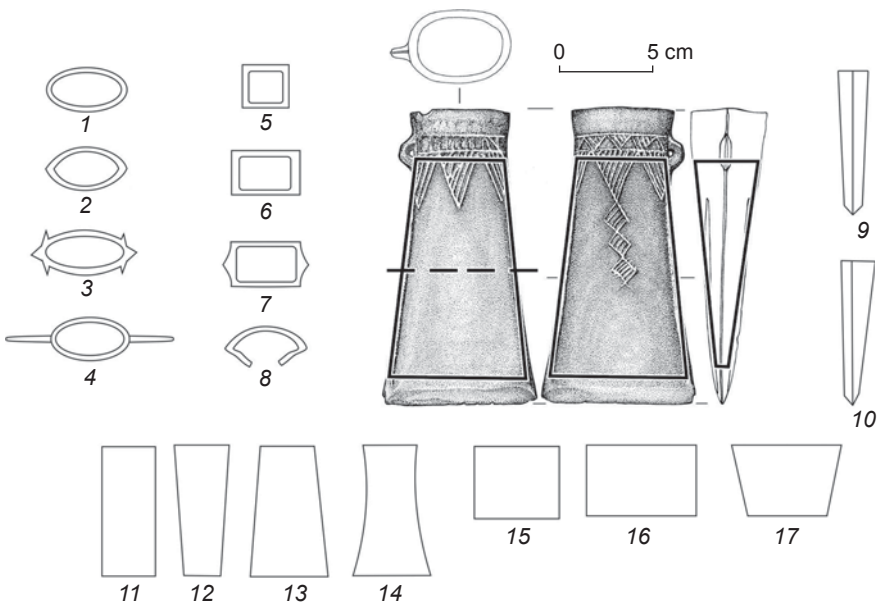


Fig. 3. Unit II. Blade.
1–8 – cross-section; *9*, *10* – shape of the profile; *11–17* – outline of the blade, front view.

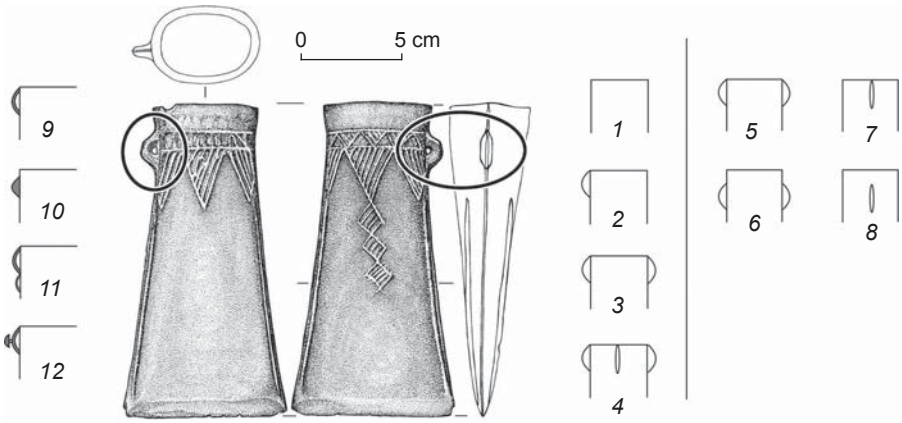


Fig. 4. Unit II. Loops.
1–4 – amount; *5–8* – location; *9–12* – additional features.

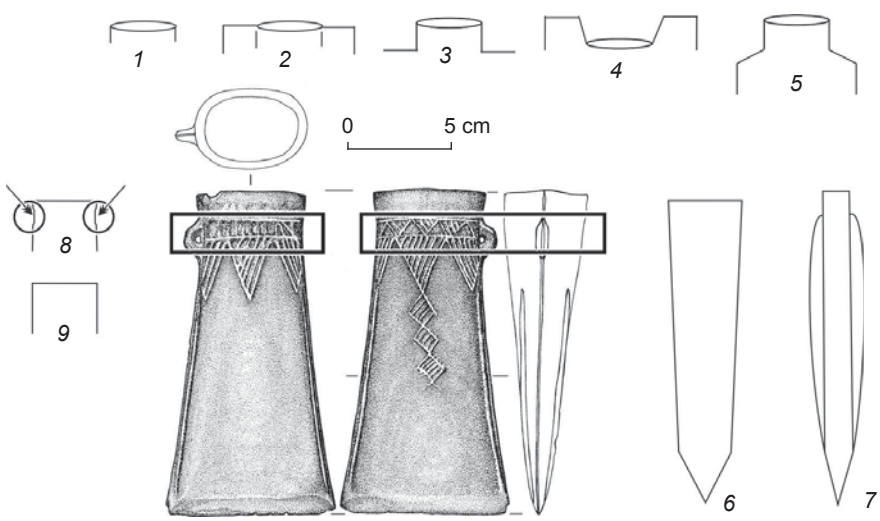


Fig. 5. Unit II. Joint of the socket and the blade.
1–5 – various joints of the socket and the blade at the mouth of the celt; *6*, *7* – protrusion of the socket relative to the blade; *8*, *9* – area of the celt "neck".

elements, such as umbrella-shaped caps (Fig. 4, *12*), or loops of a smaller size below the main loop (Fig. 4, *11*). The variability of traits and casting defects cannot be excluded; in some celts, the loops appear to not be fully molded. The location of the loops also plays an important role in the analysis. They were cast either at the narrow side of the celt at the level of the socket (Fig. 4, *5*) or the decorative band (Fig. 4, *6*), or at the same level on the wide face of the celt (Fig. 4, *7*, *8*).

We will further discuss the part of the celt located between the mouth of the socket and the upper part of the blade. In the objects of the Seima-Turbino circle, this area is called the neck (Fig. 5, *8*). It is always decorated with a band having a ladder-like pattern. If such celts have loops, the loops are located at the neck (Chernykh, Kuzminykh, 1989: 38–63). Another important trait is the protrusion of the socket relative to the blade. In some celts, the socket may be twice as wide as the blade, bulging out in profile (Fig. 5, *7*). However, this area is not always distinctly expressed in all celts (Fig. 5, *9*), and the general outlook of such objects is different: the socket is smoothly integrated into the blade and does not bulge (Fig. 5, *1*, *6*).

The presence of "shoulders" is typical of shovel-like celts and adze celts. The socket in these objects often (although not always) has an oval shape in cross-section. The socket significantly rises over the blade, or, on the contrary, is integrated with the blade. The following versions occur: the socket at the level of the shoulders (Fig. 5, *2*); the socket over the blade with straight shoulders (Fig. 5, *3*) or shoulders slanting at a slight angle (Fig. 5, *5*), and the socket recessed into the blade (Fig. 5, *4*).

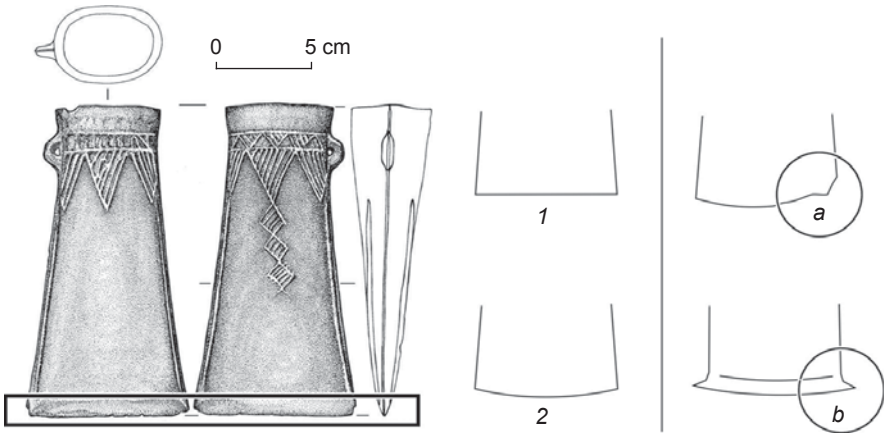


Fig. 6. Unit III. Cutting edge.
1, *2* – shape of the edge; *a*, *b* – deformation of the cutting edge resulting from its use.

Unit III. Cutting edge

The cutting edge is the sharpened edge of a cutting or slashing tool. The celts may have straight or curved cutting edges (Fig. 6, *1*, *2*). Based on the casting molds, it was done consciously. However, the blade was often forged and would change its shape and become more curved with the edge protruding beyond the width of the blade (Fig. 6, *b*). Sometimes one edge would actively wear down and become bent; in the literature, such a trait is called "the heel"; it typically occurs in slashing tools like axes (Fig. 6, *a*). The two latter traits are not morphological but they reflect well the functional purpose of the object. When conducting an analysis, it would be more correct to take into account the shape of the cutting edge that survived until now, and to avoid speculations on which shape originally existed.

We should also mention the celt-hammer (Agapov, Degtyareva, Kuzminykh, 2012: 52). Such a celt possesses all typical traits of the celts that we have identified, and only one trait distinguishes this object: it has a striker (an element of a striking tool) instead of a cutting edge. Having said that, we should mention that this celt was originally molded as a slashing tool, but in the course of its use, the blade was heavily crushed, and the tool began to be used as a hammer.

Metrological characteristics of the objects

Metrological features are one of the main criteria in typology, and objects are often distributed into different groups based on their metrological affinity. In describing a celt, the height and depth of the socket, wide and narrow faces at the mouth, at the base of the blade, and in the central part of the blade, as well as the lateral faces of the cutting edge, should be measured. Sometimes, the cutting edge is forged, in which case the measurement is carried out as close as possible to the beginning of the forging.

Specific metrological features of an object include its wall thickness, weight, and volume. In subsequent research, these measurements will make it possible to operate with such categories as volumes of crucibles and smelting ladles, as well as the required supply of bronze for producing a celt of a specific type.

Ornamental decoration

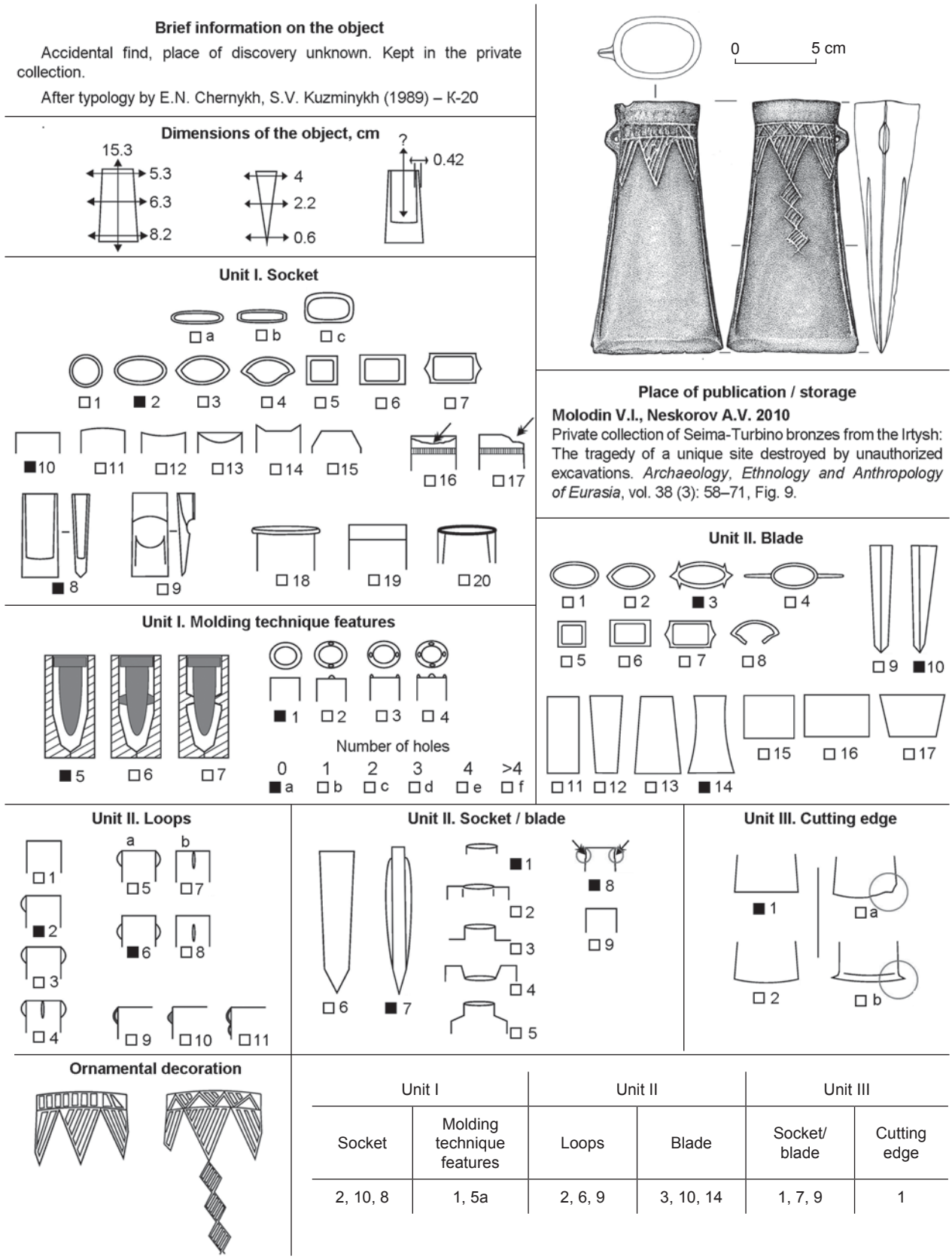
We cannot mention all types of ornamental elements, which would be the subject of a special study. However, we should indicate that two versions of rendering ornamental decorations can be found in the literature: the "lateral development" layout or "in a plane". The second method is useful for compiling our table.

Another important aspect concerning the ornamental decoration is the technique of its application. In most cases, it depended on the manufacturing technique of the celt. Three methods are known so far.

1. Casting in a stone mold. The ornamental decoration is scratched or carved in the stone. The lines are straight; the angles of figures fit tightly to each other. There may be several identical representations, since the stone molds were reusable.

2. Casting in a clay mold. The ornamental decoration was drawn with a sharp object on raw clay both on the mold and on the model. Sometimes the lines are uneven; the angles of figures are not closed and even partly overlap. Identical representations are virtually absent, since the clay molds were essentially disposable.

3. Casting in a metal molding box. The ornamental decoration was carved on the mold or on the model used for producing the celt. Consequently, the lines were either convex or concave. Sometimes, sculptural representations



Unit I		Unit II		Unit III	
Socket	Molding technique features	Loops	Blade	Socket/ blade	Cutting edge
2, 10, 8	1, 5a	2, 6, 9	3, 10, 14	1, 7, 9	1

Fig. 7. Table of morphological features of the celts from Siberia in the Bronze Age and the Early Iron Age.

were made. The ornamental decoration is identical, with defects from frequent castings in the same mold.

Regardless of the material of the mold, additional elements of the ornamental decoration in the chasing and scratching techniques, as well as figurate molding, could be applied to the object after casting.

Table of morphological traits

All the units identified are assembled on a single worksheet that contains a diagram of the morphological traits mentioned above (Fig. 7). At the stage of description and primary analysis, any person, even those who are not specialists, will be able to fully describe any celt from the territory of Siberia using this worksheet. For making the table the reference master sheet, one should add fields for the following information: place of publication / storage of the object; its inventory number, if available; circumstances and location of the discovery, and numbers of morphological traits of the particular object.

Using the table of morphological traits, we can offer an algorithm for the object's description. One should start the description with the characteristics of the material of which the object was made and provide the basic metrological data of the object (its height and width). Then, it is advisable to describe the identified units and the morphological traits within the units, such as for the socket: cross-section, shape of the mouth, inner design, molding features, etc.; for the blade: the shape in profile, the outline from the front, cross-section, loops, etc., and, finally, to describe the cutting edge. The ornamental decoration, its location, and method of application, are described separately.

The example of how a celt is described in a study is given below (Molodin, Neskorov, 2010: 63). The object was cast of bronze. Its length is 15.3 cm; the width at the blade is 8.2 cm; the size of the mouth along its long axis is 5.3 cm and along the short axis is 4.0 cm. The socket of the celt is closed ("blind") without additional elements at the mouth, and is oval in cross-section. The blade is symmetrical in profile and has the shape of a wedge. On the front, the outline of the blade is in the form of a trapezoid, with a narrowed top and concave vertical edges. A pair of stiffeners appears under the socket on the side of the wide faces. The cross-section is oval with "wings". This object has one lateral loop located under the mouth at the level of the neck of the celt (in the area of the band). The cutting edge is straight, and slightly forged.

The decorated band on one side of the celt consists of parallel vertical lines forming a horizontal "ladder"; the decoration on the other side is represented by triangles with hatching, set with their corners down. "Hanging" isosceles triangles (also with hatching) are depicted below the band on each side, and a vertical chain of three diamond shapes with hatching is represented below the band on one side. The ornamental decoration was made on wet clay in mold sections.

According to the published figure, it is difficult to evaluate the degree of the object's use. The straight smooth cutting edge, the absence of dents on the socket and other mechanical damage indicates that after casting the celt was not used or was used for a very short time.

In conclusion, it should be emphasized that this study does not claim to be final and comprehensive. The list of morphological traits can be expanded at any time and by any amount, since the system of their classification is open. At the same time, the system proposed makes it possible to address the typology of the celts and build a model of their genesis based on the most complete set of morphological traits. Moreover, computer software can be designed for data processing, which would facilitate the objectivity of the results.

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Remains of Tapestry from a Xiongnu (Early 1st Century AD) Burial in Mound 22 at Noin-Ula*

The article describes two pieces of decorated woolen tapestry discovered by the Russian-Mongolian expedition in a Xiongnu (early 1st century AD) burial at Noin-Ula (Noyon Uul) mound 22, Mongolia, in 2012. One piece shows a composition consisting of a line of flowers surrounded by a "rolling wave" woven along the left edge, and bands of similar waves skirting the opposite side. The design on the other piece consists mostly of five bands with floral patterns separated by plain tawny stripes. The pieces are close, technologically, to woolen fabrics unearthed at Eastern Mediterranean cities such as Palmyra, Dura-Europos, and Masada. The designs resemble those on fabrics from early 1st millennium sites in Xinjiang (Shampula, Niya, and Loulan), as well as those on Syrian fabrics having typical Palmyra design. However, the Noin-Ula pieces differ from their Palmyran and Xinjiang counterparts by a more expressive manner of rendering floral motifs. On the basis of analysis of the dyes, the original palette is reconstructed. Our analysis suggests that the cloth could have been manufactured at an Eastern Mediterranean tapestry workshop—one of those of enduring fame. The cloth was probably imported to the Mongolian steppes, together with other articles, along the southern section of the Silk Road.

Keywords: *Xiongnu, Noin-Ula mounds, tapestries, dyes.*

Introduction

Woolen tapestry was first found in the Kondratyevsky mound in Tzurumte Pass, Noin-Ula Mountains, which was excavated by the Mongolian-Tibetan expedition headed by P.K. Kozlov in 1924. Small pieces of well-preserved tawny woolen fabric about 40 cm wide, with woven mono- and multicolored ornamental bands, were located on the floor of the looted burial chamber, west of the coffin (Rudenko, 1962: Fig. 74, pl. LXVIII, LXIX). In his description of the woven pattern, S.I. Rudenko mentioned "gentle outlines of flowers and leaves, and delicate colors testifying to the good taste of the artisan" (Ibid.: 110). In his opinion, one of the decorative bands shows either tulips or poppies, while the other band represents twigs of some climbing plant (Ibid.: 108). Rudenko believed that it was impossible to determine the place of manufacture of the discovered fabric, owing to the lack of reliable data; but probably it was in Asia Minor (Ibid.: 110).

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Description of the tapestry fabrics

In 2012, in the course of excavations of Noin-Ula mound 22, pieces of fabric similar to those found in the Kondratyevsky mound, yet not identical to them, were discovered, together with various other artifacts, on the floor of the burial chamber close to the well-preserved coffin. Like all the other objects, these textile pieces were embedded in clay (Fig. 1), and regained their original appearance only after profound restoration work. Apparently one of the pieces was used for the manufacture of some article: the fabric was folded in two, ruffled at one end, and probably sewn up at the other, as evidenced by the remaining holes and threads (Fig. 2). The article shows traces of two vertical seams located about 10 cm from one another, and a horizontal seam in the center. Iron "staples" were noted at the left and right ends of the article. Restorer E. Karpeyeva cleaned the article by removing clay from the top, inside, and bottom of it; after which it was decided to unfold the piece of fabric, conserving the threads of stitching in place. When the piece of fabric was unfolded and stretched, it showed a vertical decorative line of flowers in black-beige-brown colors, surrounded by narrow stripes ornamented as "rolling waves", 10 cm to the left and to the right of the main line. The composition was balanced by the band on the right side of the piece, which consisted of two opposed "rolling wave" stripes (Fig. 3). The woven images of flowers resembling irises or lilies* demonstrate astonishing manufacturing skills (Fig. 4). Even now, this piece of fabric creates a great impression by its art of weaving the flower-images in a beautiful pictorial manner. This fabric, whose original purpose in the Xiongnu culture is currently unknown to us, was used by its owners as a soft piece of textile for manufacturing some article. Judging by the original appearance of the find, it might have been used as a head-bolster**.

Another piece of tapestry was found on the floor of the interior burial chamber, stuck in clay in the same way as the piece described above: this piece, though, was in a far better condition. The find represents a fabric edge 80.7 cm long, with an adjoining portion of unevenly cut-off textile (Fig. 5). The woven pattern on this piece consists of five vertical bands alternating with plain tawny stripes. Patterned bands, as in the first piece, were woven in tapestry technique: to create the intended pattern, the weft was drawn only through a portion of the warp yarns. The central band represents two ivy-stems with variegated leaves twisting in opposite directions. The "rolling wave" stripes extend at both sides of the central band; and closer to the edges, two more ornamental stripes are located, which preserve representations of flowers and fruits.

Technological analysis of this piece has been carried out by T.N. Glushkova, who classified it as a patterned kilim rug*. According to Glushkova's data, the warp yarn consists of double, even, thin threads of Z2S-type, in which single threads of Z-twist are 0.25 mm thick, while double threads of extremely strong S-twist are approximately 0.3 mm thick. The weft yarns in plain fabric are very soft, show soft Z-twist and are 0.5–0.6 mm thick. The considerable looseness of the weft yarns attests to a low weaving-tension for imparting softness and elasticity to the produced fabric. The weft yarns used in patterned bands vary in color: red, dark brown, and two shades of light brown. The warp's density is 11 threads to 1 cm; the weft's density is 24 to 26 threads to 1 cm of plain fabric. The thread-density of patterned portions depends on the pattern, and varies with respect to the technique of weft yarn drawing within the ornamental scheme. The warp yarns are clearly seen in the areas of the torn-off border, and are practically invisible elsewhere on the cloth, because the warp yarns are densely interwoven with the weft yarns. A nap of the soft weft yarns was formed on the textile in the course of use.

Textiles manufactured through a combination of Z- and S-twist threads are of special interest, since their origin is unclear**. Woolen fabrics with S-twist threads in the warp and Z-twist threads in the weft were identified in thousands of textile articles from Palmyra burials***. However, A. Stauffer considered

*In the antique and medieval artistic tradition, these two flowers were closely associated, and even interchangeable, images. For instance, according to one version, the "heraldic lily" of the Royal Household of France represents a stylized image of the Florentine Iris (L. *florentina*). Antique images of iris (lily) have been recorded in Assyria, Egypt, Greece, and Crete. Images of these flowers decorate royal scepters, tiaras, necklaces, seals, and bas-reliefs (Pasturo, 2012: 104).

**Use of such textile bolsters by the citizens of Xinjiang oases was revealed by the well-preserved grave goods from the sites of Niya, Ingpan, and Loulan (Qi Xiaoshan, Wang Bo, 2008: 53, fig. 11; p. 36, fig. 1).

*E.G. Tsareva (2006: 247–248) designated fabrics of this sort as kilims of tapestry-weaving structure.

**R. Pfister has established that threads of S-twist were common among antique and medieval Egypt fabrics, while Z-twist threads were typical of fabrics from Persia and Central Asia (Stauffer, 2000: 14).

***For instance, 47 articles with different twist of warp and weft threads have been recorded among 123 textile samples from the tomb of Kitot (40 AD) (Stauffer, 2000: 15).

Fig. 1. Textile article before cleaning.

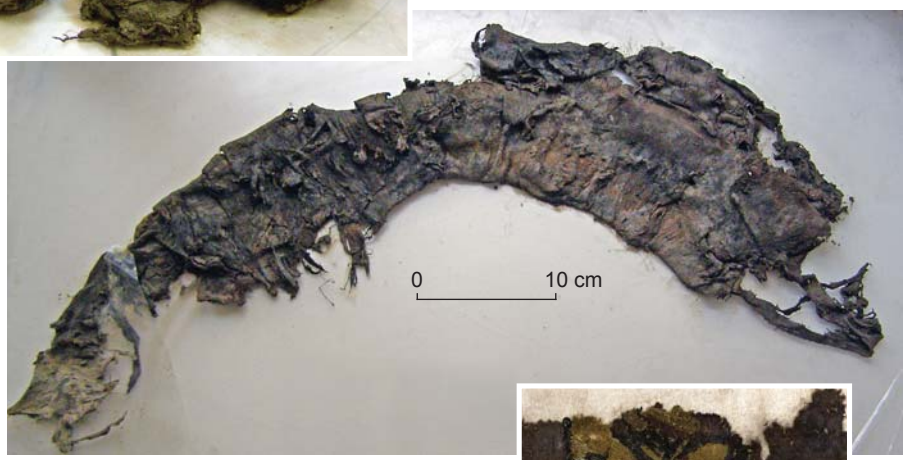

Fig. 2. Textile article in the course of cleaning.

Fig. 3. Piece of tapestry after cleaning.

Fig. 4. Piece of tapestry with floral pattern.

Fig. 5. Piece of tapestry with vegetative pattern.

this type of fabric untypical for Palmyra. It has also been recorded in other Eastern Mediterranean towns, such as Dura-Europos and Masada (Ibid.).

The technology of weaving yarns of varied twist was used for improving the fabric's quality: warp double yarns of dense S-twist were stronger and thinner, while weft single yarns of loose Z-twist were softer and thicker; this allowed soft and durable fabric, which was likely used for manufacturing clothing. The burial in mound 22 yielded many pieces of unpatterned woolen fabric with similar technological features. Such fabric was also used for the manufacture of the gaiters (unstitched pants) found in this burial, which represented the only complete textile article here (Polosmak, 2015). The cloths of this type were probably imported to the Mongolian steppe from a single source.

In terms of ornamental composition, the textile pieces described herein are very close to woolen fabrics with typical Palmyran pattern, which were found in rich tombs of the 1st century AD at Palmyra (Fig. 6). A certain similarity can also be noted in individual motifs: the compositions on the compared cloths include the "rolling wave" pattern, which is also designated as "Vitruvian wave"*, as well as representations of flowers and ivy stems. However, the described textile pieces and the piece from Kondratyevsky mound show the more elaborate pattern woven in tapestry technique, which is close to floral motifs; for example, in Pompeii fresco-painting. Small and elegant graphical patterns on the Palmyran fabrics were executed in another technique. According to Stauffer (2000: 22), they represent the highest degree of the multicolored-weaving technique.

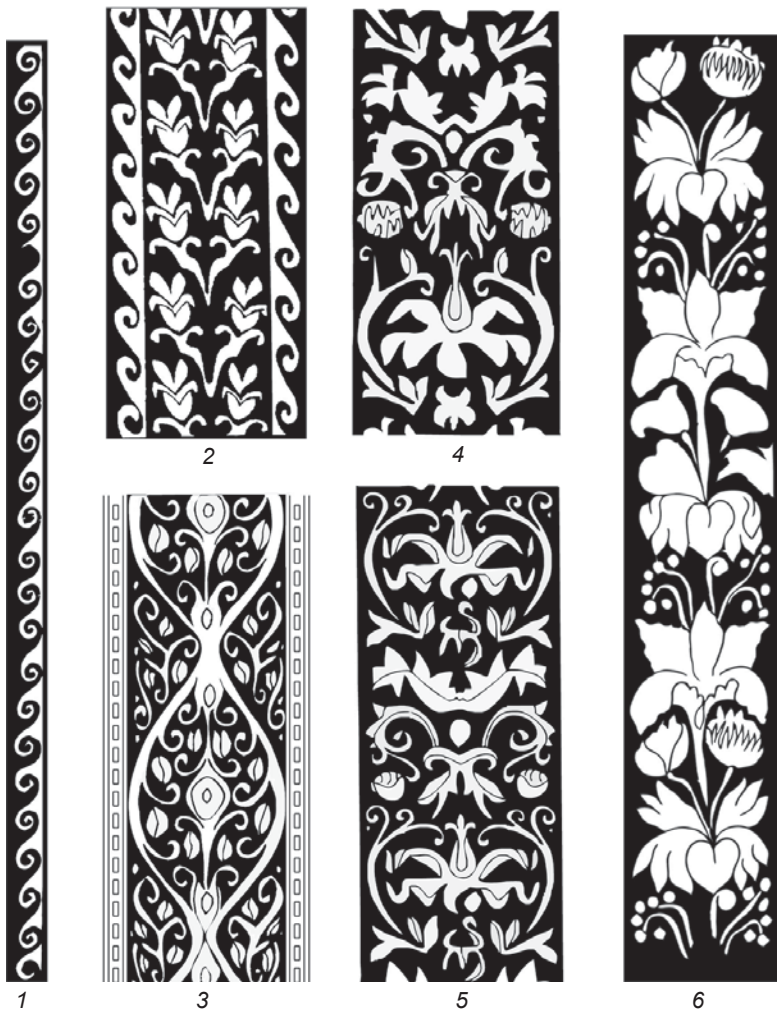

Fig. 6. Drawing of patterns on woolen fabrics from Noin-Ula, Kondratyevsky mound (*1*, *6*), and Palmyra (*2–5*).

Tapestry with such an arrangement of floral patterns (in the form of a framed band) has been discovered in the tombs at Shampula, Niya, and Loulan (Qi Xiaoshan, Wang Bo, 2008: 31, fig. 6; p. 54, fig. 1), where they were preserved in almost perfect condition, owing to the specific climate of this region. They belonged to the same period as the Noin-Ula pieces, and were mostly used in garment-manufacture. However, the articles compared herein cannot be regarded as very close analogs, because representations of flowers and leaves on the Xinjiang fabrics are more decorative than pictorial, and do not show subtle color renditions typical of the images on the Noin-Ula fabrics. Sometimes these ornaments were embroidered; such articles are known in Niya (Ibid.: 54, fig. 5). Supposedly, tapestry and

*Various designations refer to a single motif, consisting of recurrent wave-like scrolls widely used in 4th century BC in Greek vase painting, and later in the Greco-Roman mosaic art and architecture (Wilson, 1999: 12, fig. 29). This motif has been recorded on fabrics, rugs, frescoes, and bone and metal articles over a vast territory from Gandhara to Xinjiang (Zhang He, 2012: 111–112), and on East Iranian rugs of the 4th–6th century AD (Spuhler, 2014: 30–57). The design was so popular that it is worth a special consideration as to its meaning. For instance, in Egyptian hieroglyphics, a wavy line with small sharp crests represented water.

embroidered cloths were produced in Xinjiang oases, where artisans followed the models imported from the West along the southern branch of the Silk Road, which was most popular branch during that period.

Dyes and fabric-color

Owing to their centuries-long stay in Xiongnu graves in Noin-Ula, the fabrics have lost their original colors. In order to imagine the original look of the tapestry, special research, aimed at establishing the dyes used for coloring the yarns, was carried out at the Center of Spectral Investigations in the Department of Physical Organic Chemistry at the N.N. Vorozhtsov Novosibirsk Institute of Organic Chemistry SB RAS (for details of the techniques used and the research results, see: (Karpova et al., 2016)). Dyes of six samples of yarns were analyzed: black, beige, soot-colored, dark brown, dull red, and red.

Red yarns, which were used in weaving foliate patterns, yielded alizarin, purpurin, laccain acids, and indigotin. The original color is thought to have been purple. Black yarns of the tapestry were dyed with indigotin and tannins (ellagic acid has been revealed). They were probably dark green originally. Traces of indigotin have been noted in the beige yarns of the tapestry. Originally, they were possibly pale blue. The dark brown tapestry-yarns were dyed with tannins and indigotin; this combination of dyes suggests an original green color. Traces of kermesic acid, alizarin, and purpurin have been noted in the soot-colored yarns, suggesting red or pink originally. The red yarns were dyed with laccain acids, and possibly were vermillion.

Fig. 7. Reconstruction of the original color of the tapestry from the Noin-Ula mound 22 (drawing by E.V. Shumakova).

Research results allowed restoration of the presumed palette of tapestries (Fig. 7, 8): this included purple, red, white, pink, dark green, and light blue. The red coloring of tapestry-cloths and of yarns used in pattern-weaving, which currently evidences an indefinite brown color, is a result of the use of various dyes. The red dye of cloths contains laccain acids—lac dye, which since ancient times had been produced of lac insects (*Kerria lacca*). Lac insects mostly inhabit India and southern China (Yashchenko, 1999). It is noteworthy that the yarn's coloring combined dyes of both vegetable and animal origin: alizarin, purpurin, and kermesic acid. Alizarin and purpurin might have been produced from madder (*Rubia tinctorum* L.). The source of kermesic acid can be only one *Kermes* species, *K. vermilio Planchon*, inhabiting oak trees in the Mediterranean and the Near East. The well-preserved red color of the cloth attests to the durability of dyes produced from *Kerria* lac insects, which are more resistant to unfavorable conditions, as compared to the dyes made from madder roots and *Kermes* insects from the Mediterranean.

The combination of various dyes of different origin used for dyeing in particular colors the yarn, which was then used in weaving the multicolored patterns on the described tapestry, indicates that dyeing was carried out by skilled artisans with a profound knowledge and experience in this field. Similar compositions of dye were recorded during study of some woolen fabrics from Palmyra (Bohmer, Karadag, 2000: 83–84). Yarn-dyeing and tapestry-production were most likely carried out in Eastern Mediterranean workshops, where there were not only skilled weavers and dyers, but also raw materials and weaving samples necessary for the production of such high-quality cloths.

Study of the dyes used in woolen tapestry manufacture testifies to the original brightness of the articles. Fabrics and rugs found in Xinjiang were produced in various places and in different epochs, but retained their original colors; just like the Coptic

Fig. 8. Reconstruction of the color of the tapestry from the Noin-Ula mound 22 (drawing by E.V. Shumakova).

fabrics discovered in Egypt, they demonstrate bright coloration exclusively. The ancient textile doesn't have any dull colors; it was dyed in surprisingly bright and saturated colors that the ancient dyers somehow managed to obtain.

Conclusions

The pieces of tapestry from Noin-Ula mound 22, as well as the many other high-quality textiles of high historical value that were found earlier in the Xiongnu mounds at Noin-Ula (see: (Rudenko, 1962; Polosmak, 2012, 2015; Polos'mak, 2015)), are specimens from a superior weaving culture of the Eastern Mediterranean*. These fabrics differ from their analogs both in Syria (Palmyra) and in Central Asia (Xinjiang). In terms of weaving quality, raw materials, and method of plain weaving, the fabrics under study are closest to one type of woolen fabric that was recovered from Palmyran tombs (Stauffer, 2000: 15), yet they are not identical. The skill in rendering floral motifs resembles that of the best Coptic textiles of the 4th–7th centuries.

We believe that in the late 1st century BC to early 1st century AD, in Xinjiang oases, woolen tapestries were produced for internal needs in accordance with the existing fashion and following the imported samples, such as fabrics from the Kondratyevsky mound and Noin-Ula 22 mound. Such locally produced tapestries of were found at several sites located along the southern section of the Silk Road. They are characterized by bright colors, and accuracy of patterns.

The fabrics recovered from the Noin-Ula mounds have faded and lost their original colors. Special research aimed at identifying the dyeing substances enabled reconstruction of the colors. The observed color-palette of floral patterns in the ancient fabrics suggested that the artisans did not follow natural models, but rather their own perceptions of them. Judging by available written records, starting from the Han period, woolen tapestry was in great use and demand among the high-ranked Chinese generals and officials, who were ready to pay heavy prices for these goods (Lubo-Lesnichenko, 1994: 248–249). The finds described herein demonstrate the superior quality of the tapestry imported to China. However, we have come to know them exclusively from their placement in the tombs of nomadic nobility.

*The raw materials used, weaving technique, set of dyes, and ornamenting patterns suggest that the Eastern Mediterranean region was the place of manufacture of these extraordinary fabrics.

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Chinese Lacquer Cup from the "Golden Man" Tomb at Bugry, Northern Altai*

In 2013, the South Siberian Archaeological Expedition headed by K.V. Chugunov excavated tomb 3 of mound 1 at the Bugry burial ground in the Altai. On the floor of the burial chamber, numerous fragments of a Chinese lacquer cup of the er bei type were found. Exact parallels to its decoration are known among the artifacts from tombs in the central Hubei Province, dating to the Qin–early Western Han Dynasty based on epigraphic data and suggesting that tomb 3 dates to the late 3rd century BC. Similarly decorated artifacts were found in other tombs in the Altai. The physicochemical analysis of the lacquer layers makes it possible to identify their compounds and to reconstruct the technique of the manufacture of er bei cups.

Keywords: *Er bei cup, Bugry burial ground, Chinese lacquerware, Qin Dynasty, Western Han Dynasty.*

Introduction

In the summer of 2013, the South Siberian Archaeological Expedition of the State Hermitage Museum headed by K.V. Chugunov, which worked in the Rubtsovsky District of the Altai Territory, continued its excavation of mound 1 at the Bugry burial ground (Fig. 1). The main object of the study was tomb 3 in the southern part of the burial mound, which was oriented in the latitudinal direction. The bottom of the small-sized grave pit (measuring 3.5 × 4.8 m) was paved with stones, on which the builders made a log construction with three layers. The ceiling was made of longitudinal and transverse beams and has survived only in a small section in the eastern part of the grave. An adult male was buried there at a depth of a little over 4 m. Despite the fact that burial was looted several times, it still contained some

Fig. 1. Location of the Bugry burial ground.

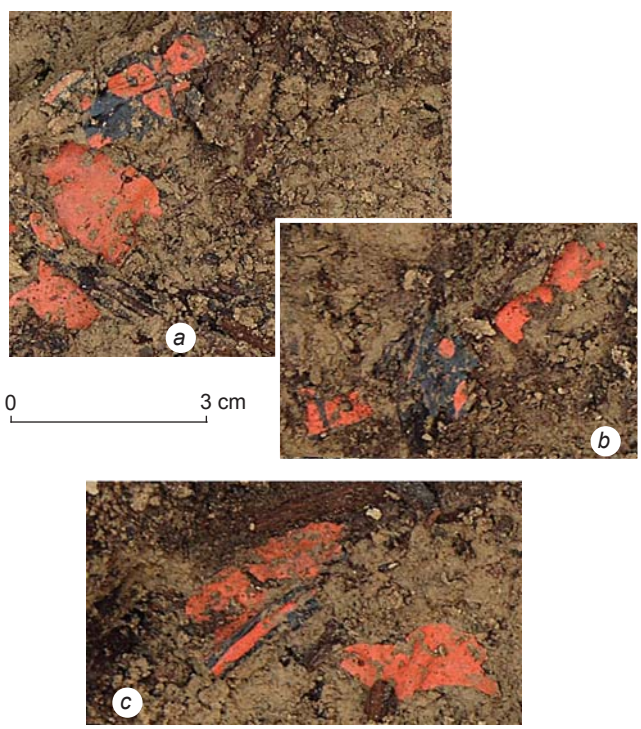
*Supported by the Russian Foundation for the Humanities, Grant No. 15-31-10162a(ts).

objects which once accompanied the deceased person. Over 1500 plaques and rectangular plates of gold foil and embossed gold leaf decorated the clothing and the headgear of the deceased; his shoes were decorated with an embroidered rhombic pattern of argillite tubular beads. The person was buried with his weapons. These materials suggest that a "golden man" was buried in tomb 3 (Chugunov, 2014).

Other finds include the remains of an object of special interest. It is a lacquer vessel which was badly damaged because of the length of time it was located in the ground, and because of the looting of the grave, yet it has not lost its beauty. The object is represented by a large number of fragments. Their location suggests that originally the vessel stood on a wooden tray in the north-western part of the log construction, behind the back of the buried man. Small lacquer flakes of red and black color were found here; some of them preserve fragments of ornamental decoration (Fig. 2, *d*). The largest fragment was found in the filling in the opposite part of the wooden chamber, at the feet of the buried man. Most likely the fragment ended up there as a result of looters' activities. The shape and decoration of the fragment suggests that an *er bei* cup (耳 杯) was placed into the burial.

Description of the finds

The remains of lacquer coating were extracted from the bottom of the grave pit. The wooden base of the cup was almost entirely destroyed, and thus it is not possible to establish the original thickness of the vessel walls. Most of the fragments are lacquer flakes no more than 2 cm in length. Their reverse side preserves the remains of primer coating and the wooden base. The largest fragment of the cup with a surviving rim (10.3 × 4.3 cm in size) is a part of the lacquer coating of the inner and outer surfaces, tightly connected to each other (ca 3 mm thick) (Fig. 3). The remains of wooden core were visible only in the places where the lacquer cracked or was torn apart. This fragment of the cup made it possible to carefully study its ornamental decoration. The decoration of the inner surface includes a deep black color for the background and bright red color for the pattern, which was traditional for Chinese lacquerware. A band of ornamental decoration runs along the rim. At its upper part, the band is bordered by two thin red lines; altogether, the band is not wider than 3 cm. The black background of the decorated rim and the body of the cup, which was painted a single red color, have a clear color boundary. The set of elements that fill the ornamental band are very unusual. Thick stripes in the shape of a Y-shaped element and curved lines ending with rounded protuberances (Chinese "motif of a bird's head") form a "triangle". A dot in its lower part separates it from the next element. A circle (or rather a "sub-square"), which is coarsely drawn with a thick line, is connected by a barely visible thin line to two vertical stripes. Another thin line expands to the right from the lower edge of the vertical stripes and connects with the next short vertical stripe (Chinese "B-shaped motif"). Two red dots are



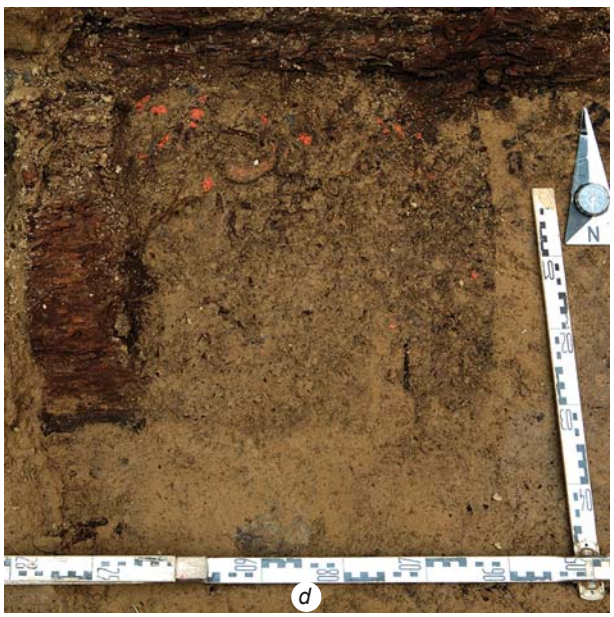


Fig. 2. Fragments of the *er bei* cup lacquer coating from tomb 3 of mound 1 at the Bugry burial ground.

shown on both sides of the connecting line, and another red dot is at the top. The following two circles marked with thick lines, are connected with each other by a vertical barely visible line. Short thick "tails" diverge from each of the circles in the horizontal direction, forming a mirror representation with a shift relative to each other. A small dot is followed by the edge of another "triangle" that probably had the same termination as the leftmost element of our fragment. Two red dots divide this "triangle" and the similar "triangle" located across a diagonal. We may assume that this fragment of the cup, which survived at the bottom of the burial chamber, was decorated with a set of elements in the form of a pattern repeating itself along the rim. Three colors were used for decorating the outer surface of the fragment: black for the background, and red and brown for the pattern. An ornamental band about 2.5 cm wide was also located along the rim of the cup, but at the bottom it was bordered only by one thick red line. In contrast to the inner surface, on the outer surface both the rim and the body of the vessel have a black background. The ornamental decoration on the outside of the fragment is simpler; it consists of fewer elements and is made in a more sweeping manner. Short thick stripes of red and brown lacquer form a kind of a large stretched zigzag. The gaps between the strokes are marked with one or two dots. The pattern employs another element—two dot-"pearls" separated by a vertical line. A similar element (two small circles with triangular dots above) can be found on one of the small lacquer fragments (see Fig. 2, *a*). Some ornamental details (lines, dots) have also been preserved on other lacquer flakes (see Fig. 2, *b*, *c*).

Fig. 3. Inner (*a*) and outer (*b*) surfaces of the lacquer cup.

Scientific analysis of the object

In the last decade, the study of the composition and technological features of ancient lacquer has been conducted in the Department of Scientific and Technical Expertise of the State Hermitage Museum. A comprehensive study of the chemical composition and structure of lacquer coatings of the find from tomb 3 of mound 1 at the Bugry burial ground was carried out by various physical and chemical methods, including microscopy, infrared spectroscopy, Fourier transform infrared spectroscopy, and X-ray analysis*.

The outer sides of the samples have lacquer coating (pattern and background) with black, bright red, and brown colors; remains of soil and the wooden base have survived on the reverse side (Fig. 4). Stratigraphy of this complex coating showed its composite multilayered structure.

The thickness of the lacquer flakes ranges from 20 to 36.5 μm (depending on the amount of layers that retained adhesion between each other); the length of the samples reaches approximately 20 mm.

*All infrared spectra were taken at the St. Petersburg State University of Industrial Technologies and Design using a Shimadzu FTIR-8400S Fourier transform infrared spectrometer with high sensitivity temperature-stabilized DLATGS detector with KBr windows in the spectral range of 7800–350 cm^{-1}. The X-ray fluorescence analysis was performed by the Deputy Head of the Department of Scientific and Technical Expertise of the State Hermitage Museum, S.V. Khavrin, to whom the authors express their sincere gratefulness.

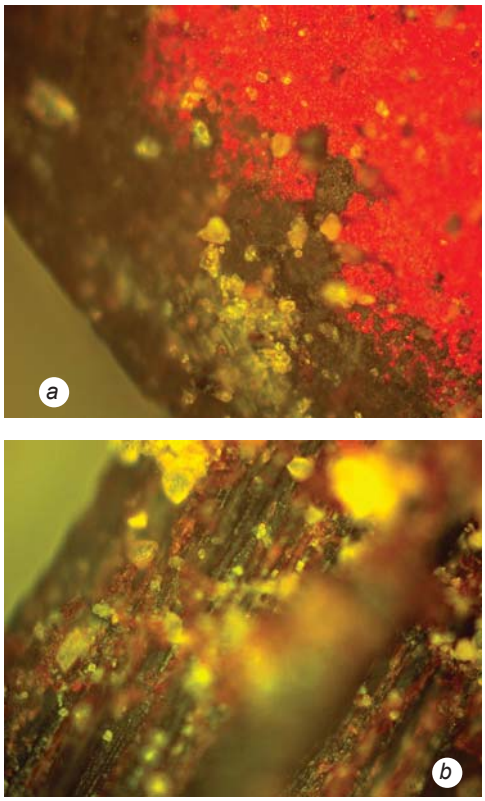


Fig. 4. Layers of paint in the background and ornamental decoration on the outer surface of the fragment (*a*), and the remains of wood on the reverse side of the lacquer coating (*b*) of the cup. Macro-photography made in the Department of Scientific and Technical Expertise of the State Hermitage Museum using a Leica DM2500 P microscope (X 150).

All infrared spectra of the samples (taken at different points of the background and painting) correspond to the IR-spectra of traditional Chinese lacquers. The spectra of lacquer which has been analyzed show spectral bands typical of urushiol aromatic compounds: three sharp bands at 1450–1650 cm^{-1}. Bands in the zones of 1630, 1560, and 1440 (1410) cm^{-1} were established for our object. They correspond to an absorption band of about 1000–1200 cm^{-1} (in our case, 1080 cm^{-1}) and typical out-of-plane deformation vibrations of –CH groups and also vibration groups of –CH-bonds of the aromatic ring in the zone of 670–900 cm^{-1} (in our case, 692, 795, 875, and 920 cm^{-1}). The absorption bands of –CH, –OH, –C=O groups, specific to urushiol polymers, and also the –CO group typical of polysaccharides of plants and wood, were present. The red lacquer layer contained trace amounts of tung oil (the band at 712 cm^{-1} was absent).

Microscopy examination revealed that the lacquer samples of our fragments consisted of several layers. All layers of lacquer consisted of a natural filming agent—a biopolymer based on urushiol pyrocatechols with a high degree of cross-linking. The biopolymer was obtained from the sap of the Chinese lacquer tree (Lat. *Rhus verniciflua*). The layer of red paint (pigmented red layer of flakes) consists of the paint *tong qi* (彤 漆), a mixture of *qi*-lacquer with cinnabar. The paint shows a high degree of fineness and pigment content. Despite the fact that Chinese lacquer also was a filming agent for the red paint, high content of pigment in the red paint and, consequently, the lack of a binding media, led to chalking of cinnabar on its surface (in the thick strokes) (i.e. when the pigment is rubbed with a brush or other tools, pigment particles may come off the surface). Impurities, typical of native cinnabar (HgS), antimonite (Sb_2S_3), and lead sulfide (PbS), were not found. A specific feature of the red paint in our case was the presence of not only cinnabar as a typical pigment of Chinese lacquers, but also of iron oxide (pigment / filling agent). Another feature of the lacquer coating on our fragments was the composition of the black background, which was produced on the basis of a mixture of *qi*-lacquer and finely graded pigment (soot). The paint is well-saturated with pigment, and the background does not have any luster and traces of polishing. The use of brown color in the painting on the outer surface of the fragment seems to be unusual. The paint was made on the basis of brown *qi*-lacquer (which does not contain iron). All the red color compounds indicate the presence of trace amounts of tung oil. In the Chinese tradition of lacquer painting, the stage of grinding cinnabar with tung oil is essential, since otherwise it is technologically impossible to produce red paint in *qi*-lacquer. In this case, tung oil protects the pigment and modifies its surface. Apparently, during the production of paint, cinnabar was ground or milled with oil, and then lacquer tree sap was added to the mixture. Tung oil was not used as a modifier in the binding lacquer coating of the samples.

Thus, we can conclude that after producing the wooden base of the cup, the wood was treated with brownish-black lacquer (sized), and then the primer was applied to the base. The base was made of a mixture of *qi*-lacquer with animal glue and filler, based on aluminum silicates and kaolin clay. The primer contains micro-inclusions of quartz. An irregular fiber structure is visible between the layers of primer and black lacquer. These are the remains of thin fabric (apparently, made of vegetable fibers of hemp or ramie), soaked in black lacquer. Two layers of black lacquer paint were applied to the fiber for creating the background: the first (lower) black layer and the transparent *qi*-lacquer layer (sap of the lacquer tree, containing iron ions). Each layer of the composite lacquer and paint structure was dried in special temperature and humidity conditions. After drying, the background was decorated with thick, dense, and opaque red paint. At the end, the surface was coated with a protective layer of transparent animal glue.

Fig. 5. Lacquer *er bei* cups from Chinese burials.
a – Shuihudi, tomb M9; *b* – Shuihudi, tomb M11; *c* – Shuihudi, tomb M47; *d* – Dafentou, tomb M1.
a, *c* – (Chu Qin Han qiqi…, 1996: 189, fig. 136; p. 233, fig. 191, *3*); *b* – (Yunmeng Shuihudi…, 1981: Tabl. 22, fig. 1);
d – (Lu Yao, 2012: 22, fig. 16).

Despite the fact that the samples were extremely brittle, the adhesive bond between the layers of lacquer coating has a medium-to-high degree of preservation. Optical microanalysis showed cracks on the paint surface, resulting from the impact of soil pressure or influence of temperature and humidity on the object. In some places, the cracks go through the entire thickness of paint, but do not cause interlayer separation. The destruction of the paint conglomerate mainly occurred in the weakest layer, the primer. The red paint had such a good adhesion to the background, that it could not be removed even in an alkaline solution. However, some places show physical losses (chipping) in the layer of red paint through which the underlying black layer is visible. General preservation of the layers of painting, taking into consideration scratches, chipping, and other minor damages, suggests that the object had been used for a relatively long time before it was placed into the grave.

Date and place of production

The comparison of the fragments of our cup with the objects found in China makes it possible to draw some conclusions as to the time and place of its production. Objects similar in shape and decoration to the cup from Bugry in the forest-steppe of the Altai were found in the central part of the Hubei Province at the sites of the Qin and Western Han periods, including the tombs of the Shuihudi cemetery (M9, M11, M47) and the Dafentou cemetery (M1) (Yunmeng *C*ounty) (Chu Qin Han qiqi…, 1996: 189, 232–233, 301, 314; Yunmeng Shuihudi…, 1981: 34–37, fig. XXII; Chen Zhenyu, 1981: Fig. 21, *2*) (see Fig. 5). The similarities in the set of decorative elements, their arrangement along the rim and on the handle, as well as the style of execution, suggest that the Bugry cup from Western Siberia and the cups from Yunmeng County were made following the same models. This is also supported by the direction of the ornamental band: while strictly adhering to the set of elements and the sequence of their placement, the pattern could be made both in a direct and mirror image (cups from the tombs M9 and the M11 of the Shuihudi cemetery) (Fig. 5, *a*, *b*). It should be noted that earlier O. Mänchen-Helfen and E.I. Lubo-Lesnichenko suggested the possibility of using stencils and templates in decorating the surfaces of lacquerware from Changsha and a cup from the burial mound 6 in the Noin-Ula Mountains (Lubo-Lesnichenko, 1969: 268).

Some Chinese burials, which contained cups similar in shape and ornamental decoration, were dated by epigraphic data. An assemblage of administrative, economic, and legal documents written on bamboo planks (over 1150 planks) and going back to the Warring States–Qin period was discovered in tomb M11 of the Shuihudi cemetery. The documents tell us that the judicial official Xi (喜) from Anlu County (安陆) in the Nanjun Prefecture (南郡)*, who died not later than 219–217 BC, was buried

*The territory of the present-day Yunmeng County of the Hubei Province, where the Shuihudi cemetery is located, formerly belonged to the Chu State which was conquered by the Qin army in 278 BC. After the conquest, the Nanjun Prefecture (南郡) was organized there.

in this grave. This date is indicated by the contents of the *Chronicle* (编 年纪) section in the private chronicles of judicial official Xi (Yunmeng Shuihudi…, 1981: 14–15, 68–69). A detailed analysis of the epigraphic evidence from Shuihudi was performed by M.S. Tseluiko, who showed that the records of the *Chronicle* could have been made from 244 to 217 BC (2011). Thus, 219–217 BC is the date for the earliest known grave where an *er bei* cup, similar to the discovery from the Bugry burial ground, was found.

According to the similarities in the burial rite, as well as similar forms of pottery and bronze vessels, the series of tombs from the Shuihudi cemetery was dated to the period of the Qin Dynasty (Hubei Xiaogan diqu…, 1976: 58–59; Cha Xianqi, Zhang Zedong, Liu Yutang, 1981: 43–46; Yunmeng Shuihudi…, 1981: 68–69). Particularly notable is tomb M9 where another cup decorated with the same pattern as our cup, was found (Chu Qin Han qiqi…, 1996: 189, 301). The latest of the known tombs containing a cup with a similar design is M1 of the Dafentou cemetery. In spite of the general similarity of the ornamental decoration in terms of the elements, this cup is clearly distinguished by the manner of pattern execution: the lines are coarser; the elements become less clear as if flowing from one into another; and new small details emerge (Fig. 5, *d*). That tomb is dated to the early Western Han period. Using the method of comparative analysis involving certain categories of grave goods (bronze objects, pottery), it was established that the burial was made in the period between 217 and 167 BC. An indirect confirmation was a wooden plaque found at the burial site, which contained the list of things placed into the grave. According to the Chinese scholars, the text was written using several writing styles. Most of text was written using *han li* (汉隶)—the business writing style of the Han period, but some parts were written using *qin zhuan* (秦 篆)—the writing style of an earlier period (Chen Zhenyu, 1981). Tomb M47 of the Shuihudi cemetery, where another cup with a similar decoration (Fig. 5, *c*) was discovered, is dated to the time of the Western Han Dynasty. Unfortunately, the Chinese authors do not provide substantiated evidence for this dating (Chen Zhenyu, 1986: 517–518, 521).

Chinese parallels may also give an answer to the question of where our cup was produced. Already in the first publications of materials from the Shuihudi cemetery, the authors drew attention to specific features of tombs where lacquer objects were found. According to the authors, most of the tombs reflected the cultural influence of the Qin State, but some tombs showed the continuity with the traditions of the Chu State (Hubei Xiaogan diqu…, 1976: 60). Further studies of the Shuihudi cemetery confirmed that assumption (Chen Zhenyu, 1986: 518). Later, Chen Zhenyu noted that the lacquer objects from the burials of the Qin State, which date back to the time of the late Warring States, show marked differences from the lacquerware produced in the Chu State (Chu Qin Han qiqi…, 1996: 253–254). At that time, inscriptions were discovered on the outer and inner surfaces of the lacquer objects, including engravings, stamps, and characters written in lacquer (Hubei Xiaogan diqu…, 1976: 54–56, 60). A stamp with the characters "咸 亭 甲" was made on the reverse side of the cup handle from tomb M47 of the Shuihudi burial ground (Chu Qin Han qiqi…, 1996: 232, 314). Engraving in the form of a vertical line, and a stamp that contained the characters "咸" and "上," are represented on the cup from the tomb M11 of the same burial ground (Yunmeng Shuihudi…, 1981: 127). The authors of the publications interpreted the first character as an abbreviation of the name of Xianyang (咸阳, 咸 市)*. According to their suggestion, production of lacquerware was well developed in this city at the time, and lacquerware might have been exported to other regions, for example, Anlu County in the Nanjun Prefecture (the present-day Yunmeng County) (Ibid.: 60–61). Having analyzed these materials, Hun Shi noted that many lacquer objects of the late Warring States period and the Qin period with the stamp "咸" or "咸 亭" have been found. The majority of them came from the Shuihudi cemetery. Certain templates were used for manufacturing lacquerware with such stamps in the center of their production. Unfortunately, Hong Shi did not specify where exactly such a center might have existed (2006: 201–202). Most of the objects with similar ornamental pattern, found in the burials in the Hubei Province, could have been manufactured in various regions of China. Individual elements of typical ornamentation were used for decorating the surface of not only the above-mentioned *er bei* cups, but also other types of lacquerware, found at the burial sites in the same region: *chang he* (长 盒) boxes, *yuan lian* (圆 奁) caskets, *pan* (盘) plates, etc. The B-shaped pattern and its versions occur quite often; a significant number of vessels with such a pattern originated from the central provinces of China (K voprosu…, 2012: 487–489). The most common pattern has the form of two dots with a dividing line or third dot above them. A variety of modifications of this pattern were used, for example, for decorating the vessels from the burials of the Mawangdui, Changsha (Hunan Province) (Changsha Mawangdui…, 1976: Fig. 74, 189; Changsha chu mu, 2000: 350–351, fig. 280, *2*, 281, *1*).

The materials collected to date suggest that Chinese lacquerware did not occur in the burials of the nomads as rarely as it had earlier seemed. Until recently, the most striking finds were believed to have originated from Xiongnu burial mounds, from both elite and ordinary tombs (Rudenko, 1962; Konovalov, 1976; Miniaev, Elikhina, 2009; Polosmak, Bogdanov, Tseveendorj, 2011).

*The present-day city of Xianyang in the Shaanxi Province was the capital of China during the reign of the Qin Dynasty.

The emergence and wide proliferation of Chinese-made items in the monuments of the Xiongnu was the result of the policy pursued by the government of the Chanyu ruler and the Chinese Emperor (Materialy…, 1968, 1973).

Field studies made known a large number of burials belonging to the nomads of the last centuries of the first millennium BC, where Chinese lacquerware objects were found. The sites are located over a wide area, including the Altai Mountains (the Pazyryk and Bulan-Koba cultures) and the Altai foothills, as well as the forest-steppe of the Trans-Urals and Western Siberia (the Sargat culture). Lacquerware vessels with black-and-red decoration, and also weaponry and lacquer-coated belts were discovered in the tombs of the Isakovsky I, Sidorovsky I, and Abatsky III burial grounds (Pogodin, 1997). The Ust-Alma burial ground in the Crimea is the westernmost place where Chinese lacquerware has been discovered (Die Krim…, 2013).

The most interesting objects for the purpose of this study are those which have been found at the sites of the Altai and its foothills. At the Bugry burial ground, the cup was found in tomb 3, and the remains of lacquer coating were revealed in tomb 2 of mound 1 and in several tombs of mound 4. The discovered fragments are very small in size and many are undecorated. However, locations of discovery of lacquer flakes suggest their association with weaponry decoration (Tishkin, 2012: 507). Painted objects from different mounds of this burial ground turned out to be close to each other in terms of the sequence of layers of lacquer and paint coating and the composition of the filming agent. The paint on the objects from different tombs of the Bugry burial ground was made on the basis of *qi*-lacquer (IR-bands of all lacquer coating samples were similar: 1630, 1417–1413, 1270, 1080, 1031 cm^{-1}). In addition, all samples of lacquer coating from Bugry are rich in protein (bands 1547–1561 cm^{-1}, typical of the amino groups).

The finds from the Altai Mountains, including the fragments of lacquer coating of a cup from the Shibe burial mound of the Pazyryk culture, and a comb made from the handle of a cup from mound 57 of the Yaloman II burial ground of the Bulan-Koba culture (Fig. 6), are of particular interest in the context of our study. These objects preserve red ornamental decoration in the form of a broken zigzag line and two circles with a dividing band, on a black background (Barkova, 1978: 42, fig. 5; Tishkin, 2007: 178, fig. 2). The decoration of these two finds is similar to the pattern presumably painted on the handle of the cup from tomb 3 of mound 1 at the Bugry burial ground. We may assume that the vessels, the fragments of which were found in the burials of the Altai Mountains (Shibe, Yaloman II) and in the Altai foothills (Bugry) came from the same area of lacquerware production, possibly from the territory of the present-day Hubei Province.

An important observation was made in the Department of Scientific and Technical Expertise of the State Hermitage Museum: regardless of great similarity in ornamental patterns, the objects from the sites of the Altai Mountains may represent different traditions (or versions) of lacquerware production. Scholars proposed that the fragments of the lacquerware object from the Shibe mound are comparable with similar objects from the burial ground in the Noin-Ula Mountains, while a find from mound 57 at the Yaloman II burial ground can be associated with the southern tradition of lacquerware production (Novikova, Stepanova, Khavrin, 2013: 122). The black lacquer layer of the object from Yaloman II contains significant amounts of copper and nickel (copper-nickel vessels could have been used in the process of its manufacturing). On the find from the Shibe mound and on our fragment from the Bugry burial ground, the black lacquer layer was produced using substances containing ions of iron and calcium. Comparison of the red paint from various monuments also revealed differences in its pigment composition. Paint on the objects from the Shibe mound 57, from the Yaloman II burial ground, and from tomb 3 of mound 1 in Bugry was apparently made of pure cinnabar: it does not contain micro-impurities and supposedly was produced artificially. However, iron oxide was added to cinnabar in the lacquer coating of the Bugry cup and of the Yaloman II object.

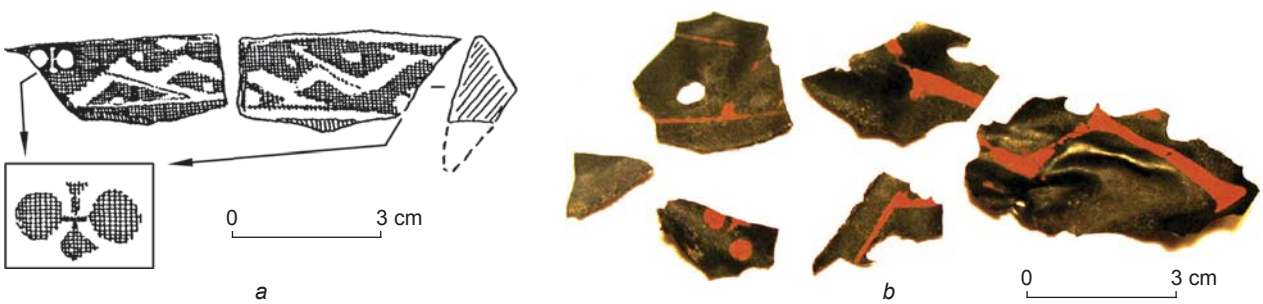


Fig. 6. Lacquer objects from the burials of the Altai Mountains.
a – mound 57 at the burial ground of Yaloman II; *b* – Shibe burial mound.
a – (Tishkin, 2007); *b* – (Novikova, Stepanova, Khavrin, 2013).

The study of lacquerware makes it possible to identify the directions in which traditions were transmitted: from the central provinces of present-day China, Chinese lacquerware found its way to the burial mounds of the nomads who inhabited the Altai Mountains and the Altai foothills in the last centuries of the first millennium BC. Why do some of the objects show similarities to the Noin-Ula lacquerware, and others do not? What caused the emergence of such differences: regional features of production technology or chronological changes? A special study will be devoted to the comparison of lacquerware from those sites. The increased number of Chinese objects found during archaeological excavations in the graves of nomads from the pre-Xiongnu time brings to mind the arguments of Lubo-Lesnichenko concerning the routes which linked the ancient Chinese states and Central Asia (1994: 211–234).

Conclusions

The study has revealed that a Chinese *er bei* lacquer cup was placed as a part of grave goods into one of the tombs of mound 1 at the Bugry burial ground. The shape of the cup can be established not only by the surviving fragments, but by parallels with the objects from the central counties of the Hubei Province. The patterns on the surfaces of the cups from the tombs of the Shuihudi and Dafentou cemeteries (Yunmeng County) almost coincide with the patterns on the find from the Bugry burial ground. The earliest of the currently known burials which contain lacquer cups with a similar pattern, dates back to 217 BC; the latest burial with a lacquer cup belongs to the beginning of the Western Han period. This suggests that tomb 3 of mound 1 at the Bugry burial ground was made not earlier than the late 3rd century BC.

The decoration on the Bugry cup shows some similarities to that of two finds from the sites of the Altai Mountains. Common roots of such ornamental decoration may go back to the ancient history of lacquerware production in the central regions of present-day China. The objects might have also reached the Altai from there. According to the analysis performed by the methods of natural science, the lacquerware cup from the "golden man" tomb was manufactured according to the traditional technology and rules of painting on a wood base, covered with paint made of *qi*-lacquer and cinnabar. Special features of the Bugry object include the presence of proteins in the lacquer coating (which is a common feature of the lacquer under study and the Pazyryk lacquers) and the absence of a modifier, tung oil, in the binding agent (the same feature was found in the more complex coating of objects from the Noin-Ula burials). These observations suggest that at some point of its history, the population of the Altai maintained active contacts with the inhabitants of the central areas of present-day China. The grave goods in the series of tombs at the Bugry burial ground also demonstrate close connections with the traditions of the southeastern part of present-day Kazakhstan. Thus, research into individual objects reveals extremely sophisticated interaction between the populations of the region, as reflected in the burial rites of nomads living in the Altai foothills in the last centuries of the first millennium BC.

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A Runic Inscription at Kalbak-Tash II, Central Altai, with Reference to the Location of the Az Tribe*

The article introduces and interprets a new runic inscription found at the Kalbak-Tash II petroglyphic site in Central Altai. Whereas the adjacent petroglyphic site, Kalbak-Tash I, is the largest collection of Old Turkic runic texts in the Altai Republic and in Russia at large, Kalbak-Tash II has so far yielded only one such inscription, consisting of seven characters. Professor Marcel Erdal has suggested its transliteration, translation, and commentary. The proposed translation reads, "The Horse tribe. Hunters of the Az (tribe), open (the way)!" The inscription, evidently dating to the 8th century, marks boundaries of tribal grazing areas or those of small social units, in this case, the Az tribe. This article considers references to the Az tribe in runic texts from Mongolia and Tuva; various viewpoints regarding their location, affinities with neighboring tribes, origin, and later history are discussed. This new inscription confirms the common idea that the so-called mountain (or mountain-taiga) Az lived not only in Western Tuva, but also in Eastern and Southern Altai; whereas the steppe Az lived alongside the Qïrqïz in the Khakass-Minusinsk Basin. The culture possibly associated with the Az is the Kudyrge culture in Altai. The Kalbak-Tash II inscription, short though it is, is a significant addition to the well-known Orkhon runic texts addressing the history of the Turkic Khaganates.

Keywords: Runic inscriptions, translation, interpretation, Kalbak-Tash II, Central Altai, Old Turkic epoch, Az tribe.

Introduction

Each new Turkic runic inscription from South Siberia and Central Asia is an important scientific discovery. To date, the corpus of runic inscriptions from the Altai consists of about ninety concise texts and lines (Tybykova, Nevskaya, Erdal, 2012: 16). The overwhelming majority of these inscriptions are epitaphs dedicated to relatives or respected people, and only a small number of inscriptions contain references to political events, the highest titles of the holders of state power, or the names of tribes. Some runic and one Uyghur inscription from the area of Urkosh, which have recently been discovered in Central Altai, represent a striking example of such epistolary monuments (Tugusheva, Klyashtorny, Kubarev, 2014). They mention the titles of the highest holders of state power or the tribal leaders (*erkin*, *tengriken*); and the inscription in Uyghur script was probably devoted to *erkin*, the leader of the tribe and the subject to one of the Qïrqïz Qaghans (Ibid.: 92).

In 1991, V.D. Kubarev carried out extensive works on copying and photographing drawings at the site of Kalbak-Tash II. In the field season of 2015, the Chuya team of the North-Asian Joint Expedition of IAE SB RAS continued research at that site with the purpose of copying Early Medieval graffiti, those which were already known and those discovered for the first time (Kubarev G.V., 2015).

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The petroglyphic complex of Kalbak-Tash II is located in the Ongudaysky District of the Republic of Altai, on the right bank of the Chuya River, 1–1.5 km from its confluence with the Katun River and 10 km from the petroglyphic site of Kalbak-Tash I (Fig. 1)—the reference site of the Altai rock art (Kubarev V.D., 2011). Moreover, this site is the largest center of runic rock-inscriptions from the Old Turkic period—not only in the territory of the Republic of Altai, but in the whole of Russia (Ibid.: 9, App. IV; Tybykova, Nevskaya, Erdal, 2012: 4, 69). In total, 31 Old Turkic runic inscriptions have been found at Kalbak-Tash I since the early 1980s. They have been studied by such specialists in Turkic studies as V.M. Nadelyaev, D.D. Vasiliev, L.R. Kyzlasov, M. Erdal, L.N. Tybykova, I.A. Nevskaya, and others. It is surprising, then, that until now, not a single runic inscription had been found at the petroglyphic site of Kalbak-Tash II, which is located relatively closely to Kalbak-Tash I. Thus, the first such discovery at that site is of great importance for Old Turkic epigraphy.

Fig. 1. Location of the petroglyphic site of Kalbak-Tash II.

The runic inscription was found on the residual outcrop that stretched as a rock-ridge across the valley of the Chuya River, north of the Chuya Highway, in the area of Chuy-Oozy (Fig. 2). The rock-ridge forms large rock ledges of almost rectangular shapes. A short runic inscription was distinctly engraved on a vertical surface of one of the ledges facing east (Fig. 3). Shale rock-surface in this location is overgrown with moss and lichen. The last characters at the bottom line of the inscription overlay an earlier engraved representation of an animal.

Transliteration, translation, and commentary by M. Erdal*

The inscription clearly runs from top to bottom, and consists of seven characters: two on the top, then (after a small gap) two more very distinct and three barely legible characters, almost merging with each other (Fig. 3, 4). No additional characters are visible at the bottom, on the part damaged by incision, although apparently the vertical frame-line continues in that direction. The majority of runic rock inscriptions from Southern Siberia are vertical, since they represent epitaphs commemorating the death of a respected person or a relative.

I propose the following transliteration of the inscription: t_1 l_2 A z $ŋ_2$ ^{i}č č

Notes on the individual characters. If we consider the first character a variant of the usual shape of t_1, this character would have been turned clockwise by 90°. Another possible reading would be the lower half of a horizontally inverted d_1; the area near this character is damaged, which makes it possible to interpret it in this way. However, the sequence d_1 l_2 does not seem to make sense if the inscription is to be read as Turkic.

The fourth character is far from having the canonical shape of character z, but I cannot interpret it otherwise (Vasiliev, 1983a: 142). The rightward hook in the lower part of the character excludes the reading of the character as k_2.

The fifth character should have been normally read as s_2, since the vertical line is clearly visible here; but that would leave without explanation a small but clear horizontal line to the left of the character. The line should be assigned to this character and not to the sixth character, to read the character as $ŋ_2$, although I personally see on all photographs that it is linked to the sixth and not to the fifth character. According to the drawing made by G.V. Kubarev, this line is linked with both characters (Fig. 4, *a*); but the interpretation of individual characters links it only with the fifth character (Fig. 4, *b*). I am following Kubarev in this matter, since I cannot suggest any paleographic or semantic interpretation of the inscription with a different reading of these characters.

*The comments of Prof. Erdal in this article are cited verbatim.

Fig. 2. General view of the mountain-range in the area of Chuy-Oozy where the runic inscription was found.

Fig. 3. Runic inscription on the rock of Kalbak-Tash II.

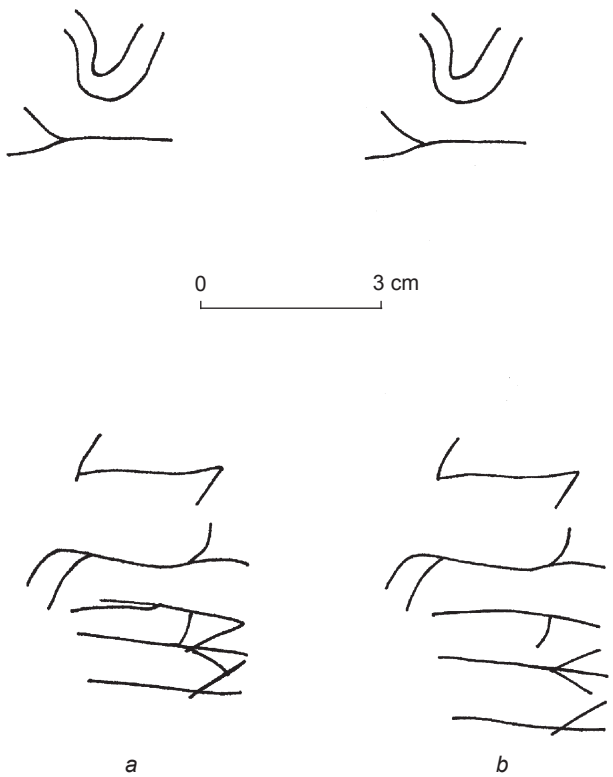

Fig. 4. Drawing of the runic inscription (*a*), and the interpretation of its individual characters (*b*).

The sixth and seventh characters can be confidently interpreted as ⁱč (that is, i before or after č) and č (with a rare but attested asymmetric shape).

I tentatively propose the following reading and translation:

(A)t (e)l Az (ä)ŋči, (a)č!

"The Horse tribe. Hunters of the Az (tribe), open (the way)!"

Notes on the reading of the inscription. The *At el* tribe is mentioned in line A1 of the inscription E-68 (Erdal, 2002: 65–68)*. This line corresponds to the line XI from the monographic study of D.D. Vasiliev (1983b: 36). My edition is based on the unpublished work of K. Wulff (the assistant of W. Thomsen), who in the early 1920s used the estampages of the Asiatic Museum in Leningrad**, whereas Vasiliev used the first publication of the inscription (Nasilov, 1963)***. According to lines 7 and 13, the woman commemorated in that epitaph**** lived in the town of *At balïq*. But until now, neither *At el* nor *At balïq* were attested elsewhere. Now we have a second instance when this tribe is mentioned.

The inscription E-68 was discovered in the Republic of Tuva, south-west of Kyzyl and west of the Elegest River valley. In the early 8th century, this was the area where the Az lived, to the west of the Čik and to the east of the Qïrqïz (Golden, 1992: 142). The inscriptions dedicated to Köl Tegin (line E-20) and Bilgä Qaghan (line E-17) inform us that the Old Turks defeated the Az, killed their Qaghan, and reorganized the Az and Qïrqïz tribes. Line N3 of the inscription of Köl Tegin mentions the disappearance of the Az (*yoq boltï*). It seems that the third word in our inscription from Kalbak-Tash II also refers to the Az. If they really were destroyed by the Old Turks in the early 8th century, the inscription must have been earlier than the Orkhon runic monuments.

In spite of the Old Uyghur spelling and form of the word in Mongolian and Turkic languages of Siberia (the latter borrowed it back from the Mongolian languages), the Old Turkic word for "hunter" is not *aŋčï* but *äŋči* (Erdal, 1991: 435–436; Röhrborn, 1998: 384). The word *äŋ* and its derivatives were spelled exactly in this way in *Irq Bitig* ("The Book of Omens"). A number of runic inscriptions from Southern Siberia have two completely different characters for $ŋ_1$ and $ŋ_2$, including the epitaph E-68. The inscription E-68 uses the character $ŋ_2$, but we cannot be sure that this guarantees a frontal consonant, since we cannot know to which spelling tradition this short runic inscription might have belonged.

The character ⁱč may represent both the sound sequences *ič* and *či*, but the latter sequence contradicts the classical spelling rule of the Orkhon inscriptions to leave the vowels at the ends of words unexpressed. The spelling rules in Southern Siberia could have been not as strict; and moreover, there is no other way to make sense of the inscription.

The word *ač* in the inscription is the imperative form of the verb "open", but it also has numerous metaphorical meanings such as "conquer" (in line 28 of the Toñuquq inscription, combined with the word "spear" in the instrumental case, that is, "by the spear"), "initiate", and "develop".

History of research on the Az using written, archaeological, and ethnographic sources

Before analysis of the data on the Az contained in the runic written monuments, we should note that in spite of rendering the same general meaning, translations of the same Orkhon texts may differ significantly in detail, which affects their interpretation. As far as the much smaller runic inscriptions from Tuva and the Minusinsk Basin are concerned, their translations by various scholars sometimes show radical differences. In the following, I will try to list all cases when the Az may have been mentioned in the runic texts, at the same time indicating that in the translations of other scholars some of the inscriptions may not contain the name *az*. In my conclusions, I will primarily rely on the texts that are the least debated among specialists.

The Orkhon runic texts have been translated by many scholars including W. Thomsen, V.V. Radlov, P.M. Melioransky, S.E. Malov, K. Orkun, A.S. Amanzholov, K. Sartkozhauly, M. Zholdasbekov, and others. Radlov alone published them four times, each time providing some new revisions. It is thus not surprising that in many aspects the translations differ markedly from each other, and contain controversial expressions. This applies in full to the key phrases in the Orkhon texts, which mention the Az tribe. It should be noted that the word *az* has several meanings in the Old Turkic language: 1) little, few; 2) desire, greed; 3) the Az (ethnic name); and 4) or (conjunction, a part of speech) (Drevnetyurkskiy slovar, 1969: 71–72).

The Az tribe is mentioned in the three largest Orkhon texts: the inscriptions dedicated to Köl Tegin,

* In the inscription, *el* is spelled with the explicit character *e*, while in our inscription it remains implicit; very often vowel [e] (as well as vowel [ä]) is not explicit in the runic inscriptions but only implied.

** Now the Institute of Oriental Manuscripts of RAS in St. Petersburg.

*** Wulff read the inscription E-68 from the bottom up (the inscription is vertical) because the characters of a larger size were located at the bottom, and especially because of the contents (which was disregarded by Vasiliev)

**** Inscription E-68 is one of a very few runic inscriptions dedicated to a woman.

Bilgä Qaghan, and Toñuquq*. The first two inscriptions describe the military campaigns of the Turks against the Az. In the period of the Second Eastern Turkic Khaganate, the Tugyu Turks campaigned three times against the Az, conquering the territory of the Altai-Sayan. In 709, they conquered the Az together with the Čik, "Having crossed the Kem, I moved with my army against the Čik people, fought at Orpen, and defeated their army. I captured… and subjugated… the Az" (Malov, 1959: 20). In 710–711, in the Battle of Bolchu (Urungu River), the Turks defeated the Az detachment headed by the Elteber as a part of the Turgesh army (Malov, 1951: 41). Finally, in 715, the Turks defeated the Az in the Battle near Lake Karaköl in Western Tuva, "The Az have become the enemy to us. We fought near Karaköl ('Black Lake')… he threw himself into attack, grabbed the Elteber of the Az; the Az then perished" (Ibid.: 42). The text dedicated to Toñuquq and describing the campaign of the Old Turks against the Qïrqïz mentions "the land of the Az", the tribe of the steppe Az, and a guide from that tribe (Ibid.: 67).

In the notes to the translation of the runic inscription from Kalbak-Tash II, M. Erdal mentions the Qaghan of the Az who was killed by the Turks. From the very beginning, scholars translated and interpreted this fragment of the text dedicated to Köl Tegin in various ways. The translation of Radlov and Melioransky is markedly different from other translations; thus it seems useful to cite it in full: "Khan [Qaghan – **G.K.**] of the Turgeshes was my Turk, my subject (or out of my people). Since from not understanding (his good), he was found guilty before us, the Khan (himself) died (was killed); his Buyuruqs and Begs all died; the people who held his side suffered distress. So (this) land (lit. 'earth and water'), which was in the power of our ancestors, would not be (remain) without a ruler, we established the Az people**… There was Bars Beg; we gave him here (at that time) the title of Khan, gave him my younger sister, the Princess (as wife). He was guilty (before us), (therefore) he died, and his people became slave-girls and slaves. So the Kogmen land (land and water) would not remain without a ruler, I established the *Az-Qïrqïz* people (in the same way)" (Radlov, Melioransky, 1897: 21–22). However, only two years later, Melioransky came to the conclusion that the word "az" here should be translated as "not numerous" (1899: 68–69); and in the comments to the translation he suggested that it should be interpreted not literally, but as a defeated, scattered people (the Turgeshes and the Qïrqïz) who experienced a temporary decline (Ibid.: 112). Such an interpretation seems to be the most convincing; this fragment of text dedicated to Köl Tegin does not speak about the Az. Otherwise, its context becomes difficult to understand: why the army of one people was destroyed, but the Turks "established" a completely different tribe (and gave them a Qaghan). Subsequently, the interpretation of Melioransky was followed by Malov and Sartkozhauly who translated the word *az* here not as an ethnic name, but as an adjective: "small-numbered (or Az) people", "small-numbered (that is, those who experienced decline) Qïrqïz people" (Malov, 1951: 38–39), "small nation", "small-numbered Qïrqïz people" (Zholdasbekov, Sartkozhauly, 2006: 187).

The interpretation of this passage did not cause any particular discussion in the works of the Soviet and Russian scholars. According to them, Bars Beg was first appointed as a Qaghan of the Qïrqïz by the Turks, was given the princess (the younger sister of Qaghan) in marriage, and was subsequently killed by the Turks (Klyashtorny, 1976; Butanaev, Hudiakov, 2000: 67–68; and others).

The defeat of the Az in 715 did not lead to their physical disappearance, but rather implied their loss of independence. According to the translation by S.G. Klyashtorny, in about 753 (the time when the Terkhin monument with a runic inscription was created), seventeen Az Buyuruqs acting as representatives of their tribe, and "the Az Shipa Tai Sengun and his people", were present during the setting of the monument of Uyghur Eletmish Bilgä Qaghan in Khangai (2010: 43). The inscription from Mogoyn Shine Usu in Mongolia mentions "a person from the Az people" who was sent as a spy to the land of the Qïrqïz. These events correspond to 752, the Uyghur campaign against the Čik in Tuva (Ibid.: 63). Thus, one could argue that the Az continued to live in their territories after the defeat by the Old Turks in 715; and after the disappearance of the Old Turks from the political landscape in 742, for probably the entire 8th century and possibly even later.

According to B.B. Mongush, the ethnic name *az* appears in the Khemchik-Chergaky runic text of the Qïrqïz period (E-41) (2013: 147). In the translation by D.D. Vasiliev, the epitaphs from the site of Bayan-Kol (E-100) in Central Tuva (right bank of the Ulug-Khem) mention "Alty-az" ("six Az people" or "six-partite Az people") (1976). The runic inscription on the stele from the Abakan River (E-48) mentions "Aza tutuk" (Malov, 1952: 95–96). However, none of the above-mentioned inscriptions from the territory of Tuva and Khakassia contains the name *az* in the translations performed by I.V. Kormushin (1997: 44–60, 247–252; 2008: 41–57), which should be accepted considering Kormushin's personal familiarity with the monuments and the thorough

*W. Thomsen was one of the few scholars who denied the existence of the Az and the references to them in the Orkhon inscriptions (Melioransky, 1899: 112).

**Note from the translators, "The damaged place could be read, 'And we gave them the ruler, it was'" (Radlov, Melioransky, 1897: 21).

manner of his research on them. Apparently, these inscriptions cannot be used for studying the history and boundaries of the Az territories.

The literature in Russian on the history, archaeology, and ethnography of Southern Siberia pays significant attention to the Az tribe. The studies primarily rely on the references to the tribe in the Turkic runic monuments (inscriptions dedicated to Bilgä Qaghan, Köl Tegin, Toñuquq, the Uyghur Eletmish Bilgä Qaghan) and the testimonies of the Arabic and Persian written sources. Scholars also used, extensively, the place-names and tribal names of the indigenous population of Tuva, Khakassia, and the Altai. Kyzlasov was one of the first scholars to analyze in great detail the written records and other evidence on the Az tribe, associated with the population living in the territory of Tuva in the 6th to 8th centuries (1969: 50–52). He came to the conclusion that the Čik and the Az, who were the ancestors of the modern Tuvan population, lived in this area. Both tribes maintained a close relationship with the Qïrqïz. The Čik settled in Western and Central Tuva. The mountain (or mountain-taiga) Az lived at the junction of the Western Sayan and the Altai Mountains, in the highland steppes of Southeastern Altai and the westernmost part of Tuva (the area of Lake Kara-Khol) (Ibid.: 50), and the steppe Az lived to the north of the Sayan Mountains, in the territory of the modern-day Khakassia, in the immediate vicinity of the Qïrqïz. The text dedicated to Köl Tegin mentioned twice his "brown Az horse" (Malov, 1951: 42), which, according to Kyzlasov, might have indicated that the Az bred good horses (1969: 50). Both the Čik and the Az were Turkic-speaking (although they might previously have spoken the language of a different group, and been Turkicized only at a later period) (Ibid.). I fully agree with the conclusions of Kyzlasov.

According to Kyzlasov, the (mountain taiga) Az settled in the entire Altai; they were under protection of the Turgeshes, and even were one of the Turgesh tribes (Ibid.). The previously-mentioned appointed ruler of the Turgesh Qaghan (the "tutuk of the Az people") resided in the Altai. According to the Muslim authors, the Turgeshes were divided into the Tokhsi and the Azi. According to V.V. Bartold, "the reading of these names is doubtful; it is possible that the Azi are identical to the Az, mentioned in the Orkhon inscriptions" (1963: 36). B.B. Mongush also believed that until 711–715, the territory of the Altai and Western Tuva might have been a part of the eastern wing of the Turgesh State, the union of the Kara Turgesh (2013: 148).

N.A. Serdobov believed that the modern-day Teles were a special tribe formed in the Altai-Sayan as a result of the mixing of the local tribes—primarily the Az—with some tribes of the Tiele and part of the Tugyu Turks (1971: 44). Using the same written sources, Serdobov, Kormushin, and Mongush supported the view of Kyzlasov on the division of the Az into the steppe and the mountain-taiga groups, and on the above-mentioned territories of their residence (Ibid.: 49; Kormushin, 1997: 12; Mongush, 2013: 146–147). Serdobov suggested that the Az and the Čik were not only the related tribes, but also formed a tribal union headed by the Čik, had common allies (the Qïrqïz, the Qarluqs, and the Tokuz Tatars), and a common enemy—the Tugyu Turks (1971: 52). According to Mongush, the Az were incorporated into the military-administrative system of the Uyghur Khaganate, enjoyed the confidence of the Uyghurs, and took their side during the uprising of the Čik in 750–751 (2013: 147).

Probably the most original point of view on the ethnic name *az* was held by V.Y. Butanaev (Butanaev, Hudiakov, 2000: 71–73). He considered the Az an elite part of the Qïrqïz, and identified them as the "royal family of the Qïrqïz State, recorded in the Chinese chronicles in the form of 'azho' ('azhe')" (Ibid.: 72). This view was supported and developed by T.A. Akerov (2010). However, in the light of all the above-mentioned evidence from the written sources and the arguments of the scholars, this hypothesis seems to be insufficiently justified.

According to Mongush, the etymology of the ethnic name *qïrqïz* sheds some light on the origins of the Az and the Qïrqïz people. The name can be read in a traditional way as "qïrqïz", but also as "qïrq-az" or "qïrïq-az" ("forty Az"—forty tribes or clans of the Az) (2013: 148). Mongush suggested that forty clans of the Az separated from the old Az tribal union in the territory of Khakassia and, having mixed with the local tribes, formed a new "Qïrq-Az" nation—the Qïrqïz people—while other Turkicized parts of this tribal union became a part of the Turgeshes (the Altai-Tuva Az) (Ibid.: 149). This hypothesis, based solely on a questionable assumption from the reading of the name of the Qïrqïz, also seems doubtful.

Mongush suggested that the Az were the Turkicized descendants of the Iranian-speaking Asiani-Wusun, and a part of the Semirechye Asiani was involved in the migrant flow together with the ancestors of the Turks from the Eastern Turkestan to the Altai and further into the territory of Tuva and Khakassia, where they became known as the Az (Ibid.). A similar view was expressed by Akerov (2010).

There is no doubt that numerous groups of Old Turks, who left horse-burials, lived together with the Az in the territory of the Altai and Tuva. The great similarity among the Turkic horse-burials (burial rituals and grave goods) in the Altai, Tian Shan, and Western Tuva is an undeniable fact. It is difficult to correlate with certainty any Altai archaeological sites of this period with the Az. Even Kyzlasov wrote that the burial mounds of the

Az in Southeastern Altai and Western Tuva could not yet be identified, while he did note the sites of the Čik (burials without horses) and their relationship with the Shurmak culture (1969: 52). According to Serdobov, one of the recorded accumulations of stone statues in the area of Lake Kara-Khol may be attributed to the Az (1971: 50).

A.A. Gavrilova believed that the Kudyrge type of burials in the Altai region, with typical and distinctive artifacts, did not belong to the culture of the Old Turks; and other ethnic groups could have left them (1965: 104–105). Thus, can it be the case that these burials were left by the representatives of the Az tribe? At least, the preliminary data of radiocarbon analysis show that the Kudyrge and the Katanda antiquities are not the chronological and stadial phases of a single archaeological culture. The "Kudyrge people" and the "Katanda people" coexisted at least throughout the 6th to 8th centuries. The Turks ("Katanda people") lived mainly in the Central and Southern Altai. Burials of the Kudyrge type are more specifically confined to the territory of the Eastern and Northern Altai and its foothills. It should be noted (keeping in mind a possible entry by the Az into a tribal alliance with Turgeshes or the resettlement of some of them in the Tian Shan, as well as their kinship with the steppe Az) that the belt and bridle sets showing heraldic style also appear at the archaeological sites of the Semirechye, the Ob region, and Khakassia. Single burials containing such objects are known from Western Tuva (Ozen-Ala-Belig) (Weinstein, 1966: Pl. IX) and the Minusinsk Basin (rock burial at the Chibizhek River) (Kyzlasov I.L., 1999). The former monument is a single human burial without a horse, similar to the burials at the Gorny-10 and Osinki cemeteries at the Altai foothills. The collection of pseudo-buckles and other items of a belt-set, similar to the Kudyrge belt-sets, is a part of the collections in the Minusinsk Museum. They belong to the category of accidental finds, and apparently originate from the destroyed or looted burials in the Minusinsk Basin.

However, the parallels manifested by the Tashtyk materials in Khakass-Minusinsk Basin and the Kudyrge monuments in the Altai and its foothills (pseudo-buckles, buckles of the "Western" types, earrings, etc.) are much more important for our topic. These are not sporadic parallels, but the evidence for the historical connections between these groups of sites, as already pointed out by numerous scholars.

The distribution of objects in the heraldic style, and of some other typical objects in burial complexes in the south of Kazakhstan (Borizhar cemetery, Kok-Mardan, etc.) and in Tian Shan, confirms my hypothesis and the above-mentioned suggestions of my predecessors (Bartold, Kyzlasov, and Mongush) that the Azi (the Az) were a part of the Turgeshes. Some scholars have already argued for a possible connection between the monuments of the pre-Turkic period from the Central Asia, and the Tashtyk culture of the Minusinsk Basin. It is possible that these facts confirm the hypothesis of the origin of the Az from the Iranian-speaking Asiani-Wusun*.

Interestingly, exactly the northern and eastern Altaians have a component *as* in their ethnic names. Thus, the Kyzlasov's conclusions that the Az and the Turgeshes were some of the ancestors of the modern-day southeastern Altaians, seem to be convincing. In support of this hypothesis, Kyzlasov listed the names of clans: *tört as* from the Teleuts, *tirgesh* from the Tubalars, and *baylagas* (*baylak as* – "rich As") from the Altaians-Kizhi. The Khakas called the southeastern Altaians *chystanastar* ("the taiga Ases") (Kyzlasov L.R., 1969: 50). According to L.P. Potapov, the names of the Telengit seoks (*Tërt-as* – "four Ases", *Djeti-as* – "seven Ases", *Baylagas* or *baylangas* – "numerous Ases") suggest that in the Early Middle Ages, the Az tribe was a part of the Tiele tribes, and is certainly connected with the modern-day Altai population (1969: 166–167). Moreover, he believed that "the territorial proximity of the Čik to Eastern Altai in the 8th century is also undeniable, just as the proximity of the Az. At that time, the Čik and the Az could well have reached the Altai" (Ibid.: 168). According to Potapov, in early times, the Čik, just like the Az, had been a part of the Tiele confederation of tribes, and later their nomadic camps were located to the north of the Altai Mountains, in the steppes of the Ob region.

The presence of Az-Kyshtym Volost in the Kuznetsky Uyezd in the 17th–19th centuries is no accident. In the 16th century, the Az-Kyshtym lived between the Tom and the Ob rivers, mixed with the Teleuts (Ibid.: 169–170). Whereas, the word "az-kyshtymy" is translated as "the tributaries of the Az people". It is impossible to disagree with the conclusion of Potapov, that "the Teleut Az-Kyshtyms represent the descendants of some small tribal groups that were in the Kishtym's dependence from the Az who lived in the Sayan-Altai Mountains and then in the steppes of the Ob region…" (Ibid.: 170). The latter fact is very well correlated with the spread, in the 6th–8th centuries, of the Kudyrge monuments in the Ob region, which contained various objects (belt and bridle sets in the heraldic style, bladed weapons, protective lamellar armor, etc.) of southern origin. These monuments belong to several archaeological cultures (the Upper Ob culture, the Relka culture, etc.), which most likely have two-partite composition, including the local and migrant components.

In general, it must be emphasized that the idea of the identification of the Kudyrge antiquities with the Az

*Justification (using archaeological data) of my hypothesis that the monuments with objects in the heraldic style could have belonged to the Az, would be a subject of a special study

people, who are known from the written sources, is only a hypothesis. It has a number of supporting arguments; but with the accumulation of new data, it will be either definitively confirmed or refuted.

Conclusions

We should agree with the suggestion of Erdal that the runic inscription from Kalbak-Tash II may have been a boundary inscription left by the people from the clan or tribe of Az, who, as is known, were several times defeated by the Old Turks in the early 8th century, but having lost their independence continued to live in the same territories. Notably, they seem to have used the Turkic language for writing (even if not for speaking). Many scholars, as P. Golden pointed out (1992: 142, 143), considered the Az not to be a Turkic-speaking tribe. This runic inscription may prove that either this tribe was Turkic-speaking, or it was in the process of adapting the Turkic culture.

The suggestion that the inscription from Kalbak-Tash II might have been a boundary inscription can find a confirmation in the presence of the Bichiktu-Kaya rock only 4–5 km from it, downstream of the Katun River (Fig. 5). This narrow and cliff-like rock on the right bank of the river was a natural barrier that prevented groups of nomads or enemy forces from penetrating the Central and Northern Altai (and further, Western Siberia) from the territory of Mongolia, Eastern Altai, and Tuva. Remains of fortified structures (walls or embankment of stones) defending some open areas were found at that site (Soenov, Trifanova, 2010: 44, phot. 10, 11). The left bank was securely closed by a rock at the confluence of the Katun and the Chuya rivers.

The Bichiktu-Kaya rock is associated with a legend about the Mongolian Khan Sonak, recorded and published by V.I. Vereshchagin at the beginning of the 20th century (Ibid.: 72). The legend tells how during one of the invasions by the Mongols under Sonak's command in the Altai, the Altaians blocked the narrowest mountain passes with piles of stones, including the pass through the Bichiktu-Kaya. Trying to bypass this stronghold, most of the Mongol army was killed. Khan Sonak wrote the curse of the Altaians, and forbade his descendants to invade the Altai any longer. Since then, the rock is called Bichiktu-Kaya ("rock with the inscription"). Apparently, such tactics (of using the advantage of narrow mountain passes) were also followed by the local population in previous historical periods.

Fig. 5. View of the confluence of the Chuya and the Katun, and of the Bichiktu-Kaya rock.

The mouth of the Chuya and the place of its confluence with the Katun also served as the boundary between the tribes of the Altaians in the ethnographic period: the Telengits living in the valleys of the Chuya and the Argut, and the Altai-Kizhi in Central and Northern Altai. Is it possible that while addressing his fellow tribesmen, the author of the Kalbak-Tash inscription metaphorically referred to this natural frontier, additionally fortified by the people, and to further advancement to the Central Altai?

Some scholars have suggested a connection between the content of the runic inscriptions, and petroglyphs. We can support this point of view, since the mention of the hunters from the Az tribe in our runic inscription is vividly illustrated by numerous engraved hunting scenes and representations of hunters at this petroglyphic site.

The fact that the inscription from Kalbak-Tash II contains an ethnic name (the tribe of the Az) emphasizes the importance of this discovery. Despite their brevity, such examples of Old Turkic writing serve as substantial addition to the well-known Orkhon runic texts that tell us about the history of the Turkic Khaganates. They make it possible to estimate more reasonably the settlement of the tribes in the territory of the Altai-Sayan in the Old Turkic period; to reconstruct, to some extent, the events in the political history of the region, and to correlate them with the investigated archaeological sites.

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An Old Turkic Statue at Borili, Ulytau Hills, Central Kazakhstan: Cultural Realia*

The article introduces a distinctive Old Turkic statue from Borili, discovered in the hills of Ulytau, Central Kazakhstan. It differs from other Old Turkic statues in that both arms are down, and the hands are on the weapons––a sword and a studded battleaxe, the latter replacing the traditional vessel. No exact matches of this sculpture are known. Only isolated traits (such as clothing style, weapons, and belt mountings) are paralleled by other Old Turkic specimens. Items shown on the Borili statue are similar to those relating to the Sogdian and Turkic traditions, and also those depicted in works of East Asian art from the time of the earliest states. Compositional features of the Borili statue could have been due to the sculptor's acquaintance with the art of the neighboring regions, primarily that of Sogdiana and China, the latter being spatially closest. The distinctive features of the Borili statue prompt us to examine its semantics in several ways relating to the visual and emotional aspects of the funerary rite. On the basis of the artistic and material parallels, the statue dates to the 7th or early 8th centuries.

Keywords: *Old Turkic statues, Central Kazakhstan, Sogdian art, China, bladed weapons, ring pommels, studded battleaxes.*

Introduction

Old Turkic stone statues from the western part of the Asian steppes are distinguished by marked originality as compared to similar eastern monuments, for example, this being expressed in the wide occurrence of such iconographic motifs as hair in the form of braids, lapelled coats, stemmed cups, weapons with ring pommels, etc. (Ermolenko, 2004: 43). The objects that exemplify the originality of Western Turkic sculpture are of particular interest for research. One such object is an unusual statue from the location of Borili in Ulytau Hills, southwestern Kazakh Uplands (Sary-Arka). The study of the statue involves the search for parallels in the art of the Western Turkic Khaganate and Sogd (which have been already analyzed in several studies on sculpture, murals, coroplastics, etc. (Sher, 1966: 67, 68; Albaum,

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1975: 30–34; Ermolenko, 2004: 38–41; and others)), or cultural impacts from the centers of the ancient civilizations in East Asia. The problem of attributing and dating the sculpture described in this article, with the help of material parallels, is complicated by an almost complete absence of such parallels among the regional materials, which demanded that the artifacts be addressed from the adjacent territories. This study focuses on the material complex embodied in the reliefs on the surface of the sculpture, while the interpretation of the sculpture will be discussed in a subsequent article.

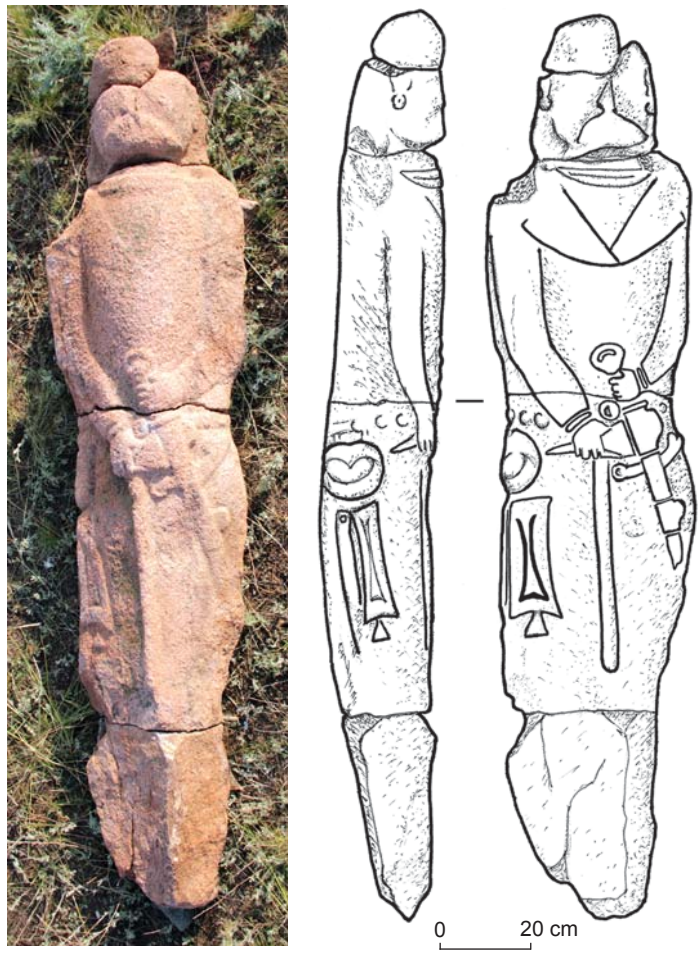

Fig. 1. Stone statue from Borili.

Description of the statue

The statue was discovered in the location of Borili* at the confluence of the Tamdy and Terekty rivers (48º57′155″N, 66º59′850″E, at an altitude of 483 m). The statue was probably located at the site of its original setting, at the eastern tail of an earthen mound 12 m in diameter and 0.4–0.5 m in height. Stones, including white quartz, were found on the surface of the mound. A presumably later stone pavement 6 m in diameter and 0.3 m in height, with missing stones in the middle, was located on the western side of the earthen structure. The sculpture is made out of a block of pink, coarse granite and represents a man holding weapons in each hand (Fig. 1). The size of the sculpture is 195 × 25–44 × 10–22 cm. The convex shape of the block and the proportions of the sculpture are close to those of a real-life figure, and give the impression of a three-dimensional sculpture. The reverse side of the sculpture is covered with coarse spalling, and bears no representations.

Although the sculpture had been toppled and broken some time in the past, it shows a satisfactory degree of preservation, with most damage on the head, which was split off. The representations of ears, with rounded pendant earrings, can be discerned on the sides of the head, and the outlines of the nose and (wide?) mustache are distinguishable on the face. The body of the sculpture was broken into three parts; the right shoulder was damaged by the spall. A narrow segment-like bas-relief, divided by a longitudinal line, a representation of a two-row neck adornment (a torque?), runs around the base of the neck. Narrow bracelets are shown on the wrists. The lapels of the coat are indicated on the chest of the figure. Although the line showing the edge of the coat is absent, the placement of the right lapel over the left suggests the left overlap of the clothing.

The belt is indicated by such details as a rounded buckle with a segment-like hole for the belt, six round onlay plates (three in a row on each side of the buckle), and a small fragment of the belt on the right side. According to the design of the buckle, the belt was fastened on the side opposite to the overlap of the clothing: that is, on the right.

The hand of the half-bent left arm of the sculpture is above the belt, and is tightly holding the hilt of a long-bladed weapon (broadsword?) with an oval-ring pommel and straight thin crossbar. A sheath with distinctive semicircular clips connecting the paired transverse braces is shown. The position of the sheath is almost vertical. A relief of a short-bladed weapon (knife or dagger) was carved below the upper clip and almost perpendicular to the broadsword. The blade of that weapon is enclosed in a sheath of asymmetrical triangular shape, with a similar device for fastening to

*The location of the statue was reported by E. Omarov, the Junior Researcher of the Ulytau National Historical and Cultural Reserve and Museum, where the statue is presently being kept.

Fig. 2. Some parallels to the Borili statue in the Old Turkic figurative tradition.
1 – sculpture from the Chuy valley (Sher, 1966: Pl. XII, *51*); *2* – statue from Aerkate (Aersyati, Bortala County) (Si chou zhi lu…, 2008: 238); *3* – fragment of relief on the sculpture from Aerkate. Ürümqi, Xinjiang Regional Museum.

the belt. The hilt of the weapon, located at an angle to the blade, is crowned with the ring pommel.

The right hand of the sculpture is below the belt, over the middle part of a battle axe whose blade is facing left towards the bladed weapon. The axe has a trapezoidal blade, a wedge-shaped striker, and a long, straight handle reaching the border of the lower untreated part of stone, which was dug into the ground. We may assume that the figure that was carved of granite might have leaned on this weapon like on a staff. An oval hanging bag can be seen at the belt on the right side of the figure. The upper flap* and a decorative edging, or the outline of a pocket-compartment sewn on the front side of the bag, are represented in relief. Two elongated objects "hanging" next to each other are carved under the bag. The front object (closest to the front plane) has the form of an elongated trapezoid with concave sides and a base, from which a triangle extends downwards possibly indicating a hanging truss. This object is probably also a small bag with a flap and a patch pocket. Its shape, locking system, and décor resemble a miniature quiver. We may assume that the bag was used for carrying elongated things (?). The rear object (closest to the back plane) apparently reproduces a whetstone with a hole for hanging.

*The interpretation of this element as a flap was confirmed by Y.A. Sher (1966: Pl. II, *11*; VII, *32*; p. 78, 88).

Identification of representations with specific objects

Atypical features of the statue from Borili include not only the position of its right hand, but also the attribute that the hand is "holding". As a rule, in Old Turkic sculptures, the right hand is depicted bringing a vessel to the chest, and is placed above the left hand. According to the position of both hands, the object from the Chuy valley (Sher, 1966: Pl. XII, *51*) is close to our statue. The photograph published by Sher shows no attribute in the right hand of that sculpture (or it is not discernible), while the sword, whose hilt is held by the left hand, is slanted in the same way (Fig. 2, *1*). Furthermore, the description mentions a "kaptargak" (round bag) (Ibid.: 96).

Representations of bladed weaponry with ring pommels have been found only on Western Turkic statues depicting men holding a vessel in the right hand. Besides the Semirechye, South, Central, and East Kazakhstan (Ibid.: Pl. II, *9–11*; IV, *18*; VI, *30*; VII, *32*, *35*; Arslanova, Charikov, 1974: Fig. 2, *8*; Charikov, 1984: Fig. 1; 1989: Fig. 2, *1*; Margulan, 2003: Ill. 24; Ermolenko, 2004: Fig. 5, *16*; 9, *20*; 33, *60*; 61, *105*; 62, *106*; Baitanaev, 2004: 78) (Fig. 3, *1–10*), the statue with such an attribute has been found only in East Turkestan. This is a massive sculpture 2.85 m high from Aerkate (Aersyati, Bortala County) (Hudiakov, 1998: Fig. 12; Si chou zhi lu…, 2008: 238) (see Fig. 2, *2*, *3*; 3, *18*). In addition to the pommel, long-bladed weapons that are depicted on the statues from Aerkate and Borili exhibit similar systems of attaching to the belt, semicircular sword belt clips on the sheath, and a position close to vertical. A long-lapelled coat, a torque (with a trapezoidal double pendant) on the neck, and earrings are also represented on the statue from Aerkate. The dagger on the belt of that sculpture also has an asymmetrical triangular blade; its outline can be discerned in the shape of the sheath decorated with a trapezoidal pendant-truss (?), and equipped with the same system of attachment to the belt as in the long-bladed cutting and stabbing weapons of both statues. The handle of the dagger, placed at an angle to the blade, has ribbed unilateral projections, which are well known

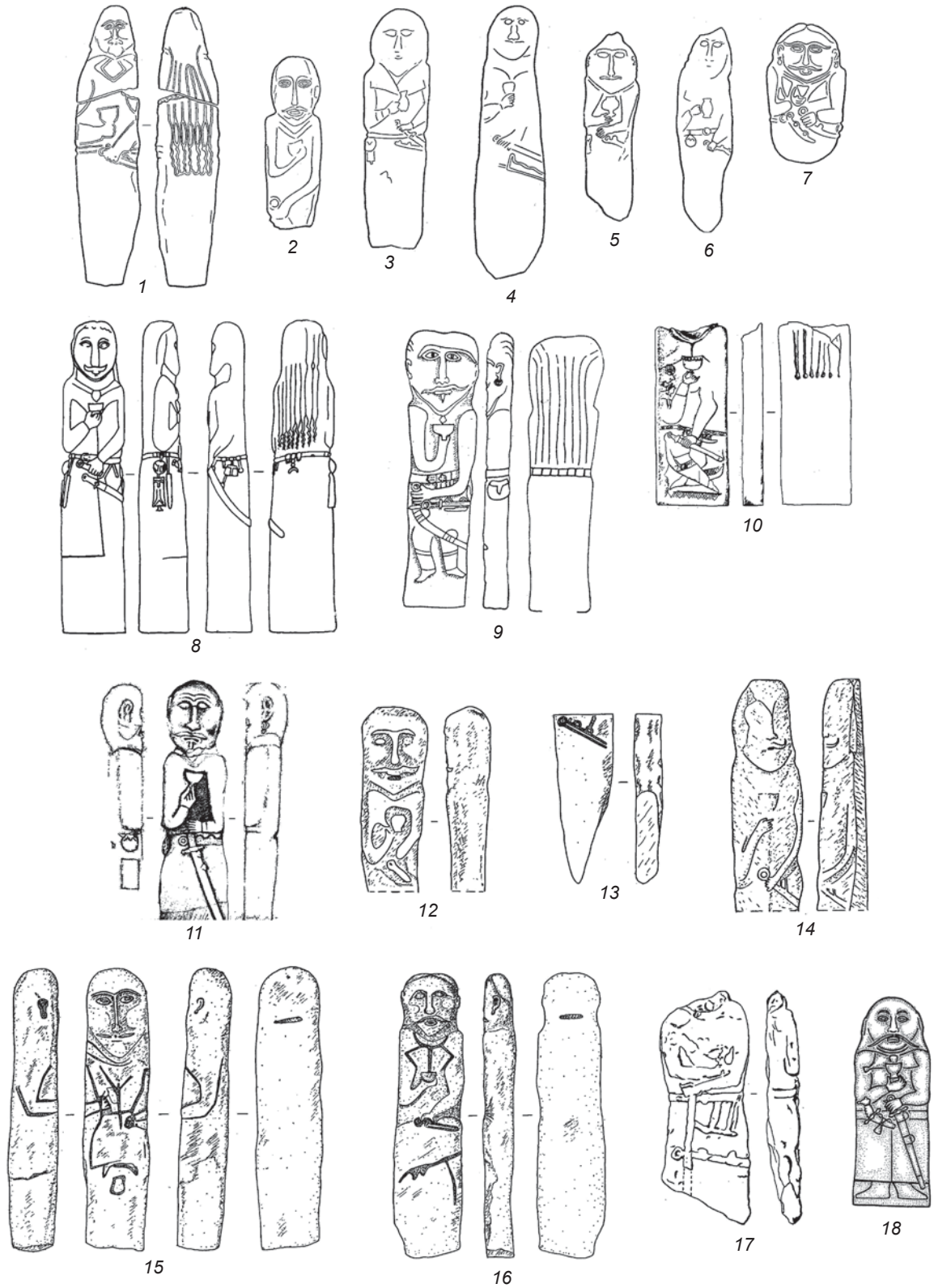

Fig. 3. Weaponry with the ring pommel hilt in the iconography of Old Turkic sculpture.
1–7 – after: (Sher, 1966: Pl. II, *9–11*; IV, *18*; VI, *30*; VII, *32*, *35*); *8* – after: (Arslanova, Charikov 1974: Fig. 2, *8*); *9* – after: (Charikov, 1984: Fig. 1); *10* – after: (Charikov, 1989: Fig. 2, *1*); *11* – after: (Margulan, 2003: Ill. 24); *12–16* – after: (Ermolenko, 2004: Fig. 5, *16*; 9, *20*; 33, *60*; 61, *105*; 62, *106*); *17* – after: (Baitanaev, 2004: 78); *18* – after: (Hudiakov, 1998: Fig. 1, *2*).

from illustrations of the attributes of Old Turkic statues (Evtyukhova, 1952: Fig. 67), and now also from the real finds in the Western Siberian forest-steppe region. Upon direct examination, the intricate pommel, whose shape in the published drawings resembles a small teapot (see Fig. 3, *18*), turned out to be the same as in the sculpture from Borili; that is, in the form of a ring (see Fig. 2, *3*). In terms of the mutual arrangement of both bladed weapons, the statue from Borili is similar to the sculpture found in the lower reaches of the Tamdy River (Ulytau) (Margulan, 2003: Ill. 24) (see Fig. 3, *11*). The short-bladed weapon represented on this sculpture is located parallel to the belt and has a ring pommel. A rounded bag and a rectangular bag below are depicted on the right side. The decor of the upper part of the round bag, which is most likely a rendering of the flap, is similar to the same element on the Borili statue. A similar arrangement of weapons and a set of bags are represented on the statue from the Trans-Ili Alatau (the Semirechye) (Ibid.: Ill. 140, 141).

The position of long- and short-bladed weapons with ring pommels at an angle to each other is attested in the iconography of the sculpture from the village of Baltakol (South Kazakhstan) (Charikov, 1984: Fig. 1) (see Fig. 3, *9*). Two paired clips with semicircular projections are shown on the sheath of a strongly-bent long-bladed weapon (a saber, according to A.A. Charikov), and two semicircular loops (most likely the same clips) with a bolster running around the external outline can be seen on the sheath of the short-bladed weapon. A rounded bag "with a profiled flap" is shown on the left side (Ibid.: 58). The intersecting long-bladed weapon with the ring pommel and a short-bladed weapon are represented on the statue from Karkaralinsk (Central Kazakhstan) (Sher, 1966: Pl. II, *11*) (see Fig. 3, *3*). The statue also bears the representations of the bags, connected and attached to the belt on the right: a round and a rectangular with a small protrusion on the bottom. The lapels of a long coat with the left overlap are also shown.

The combination of a round bag and a rectangular bag with concave sides and a protrusion (truss?) on the bottom appears on the statue from Kara-Koba, along with a rare detail for the Altai, the lapels (Kubarev, Kocheyev, 1988: Pl. 5, *7*). A similar combination was found on several sculptures from Central Kazakhstan and the Semirechye (Margulan, 2003: Ill. 142; Ermolenko, 2004: Fig. 5, *15*; Kurmankulov, Ermolenko, 2014: Ill. 119).

The statue from the Michurinsky state farm (East Kazakhstan) (Arslanova, Charikov, 1974: Fig. 2, *8*; cf.: Sher, 1966: Pl. IX, *17*) shows the greatest similarity to the Borili statue according to the combination of attributes. This is a realistic representation, close to the round sculpture, with braids and other details on the back surface (see Fig. 3, *8*). The lapels of a long coat are visible on the chest of the statue (Ermolenko, 2003: Fig. 3); the edge of the coat continues into the outline of the upper right flap. Thus, the clothing has the left overlap, but the belt is buckled to the right. Oval-ring pommels are shown on both hilts of the bladed weapons. The shape of the cutting edge of the short-bladed weapon, closed by the hand, is unclear. The long-bladed weapon, whose representation continues to the side face, looks bent, and thus was identified by F.K. Arslanova and A.A. Charikov as a saber. As opposed to the statue from Borili, the bladed weapons on that sculpture are depicted parallel to each other and at an angle to the belt. The same direction of suspending the set of weapons with the ring pommel on the hilt was found on four more sculptures from South Kazakhstan and Semirechye (see Fig. 3, *4*, *7*, *10*, *17*) (Sher, 1966: Pl. IV, 18; VII, 35; Charikov, 1989: Fig. 2, *1*; Baitanaev, 2004: 78). Two combined bags suspended from the belt are shown on the right side of the statue from the Michurinsky state farm. Their shape is the same as in the Borili statue, but the attribute identified with the whetstone is located in front of the bags. Similar combination of three objects with the representations of paired sets of bladed weapons (without pommels) and lapels has been found on two sculptures from Karatau (South Kazakhstan) (Margulan, 2003: Ill. 98; cf.: Sher, 1966: Pl. III, *16*) and from Kypchyl (Altai) (Sorokin, 1968: Fig. 2, *1*; cf.: Kubarev V.D., 1984: Pl. XXXIII, *198*). Notably, the combination of bags (rounded and rectangular) and a whetstone, or of only such bags, has not been found on the Old Turkic statues from Tuva and Mongolia*.

Until now, axes have not been found among the sets of objects appearing in Old Turkic sculpture. Even though the representation of an axe tucked behind the belt (?) in an upturned position has been identified by V.D. Kubarev and V.A. Kocheyev (1988: Pl. 5, *6*, p. 213–214) on one of the Altai statues, the problem of the statue's date remains unsettled. The axe suspended from the belt by the end of its long handle appears on several sculptures from the North Caucasus (Bidzhiev, 1993: 238–239, fig. 54, 57, 63). According to K.K. Bidzhiev (Ibid.: 244), these statues may be dated to the 12th–13th century transition or later. However, the axes mentioned above are different in their shapes from that carved on the Borili statue.

Pictorial parallels to the attributes of the statue from Borili occur among the sculptures and murals of the Sogdian towns. For instance, the reception of ambassadors by a Sogdian king (early second half of the 7th century (Marshak, 2009: 28)) is depicted on the western wall of room I in Afrasiab. The Turkic character wearing a long coat with lapels has a rectangular bag with a triangular

*Some sculptures from Mongolia, the Altai, and Tuva show a combination of a rounded bag and a narrow object (Evtyukhova, 1952: Fig. 17, *2*; Kubarev V.D., 1984: Pl. VII, *48*; XXV, *151*; XXXI, *191*; XXXIII, *199*; Kubarev, Tseveendorj, 1995: Pl. II, *1*; Bayar, 1997: Ill. 104, 116; Bayar, Erdenebaatar, 1999: Ill. 26, 27).

"appendage" at the bottom, suspended from the belt on the right, while a narrow object is represented nearby (in the front) (Albaum, 1975: Fig. 5, *6*). Unfortunately, the section of painting from the waist to the low-hanging bag has not survived (Ibid.: Pl. VIII). Ring pommels on the sword hilts are shown in several representations of foreign ambassadors (Ibid.: Fig. 6, *11*, *14*; 7, *24*, *25*). According to the suggestion of L.I. Albaum, some of these characters might have arrived from China or East Turkestan (Ibid.: Fig. 6, *11*, p. 22), and others from Korea (Ibid.: Fig. 7, *24*, *25*, p. 75). The former have paired weapons, with the short-bladed weapon located almost horizontally and the long-bladed weapon at an angle; each weapon hangs from its own two semi-circular loops. The latter have only long-bladed weapons suspended at an angle on two figurate loops. Oval-ring pommel appears on the hilt of the dagger of one Turkic character (Arzhantseva, 1987: Fig. 4, *1*).

The composition of the feast in the wall-paintings of room XVI/10 in Panjakent (Belenitsky 1973: Ill. 19) (late 7th–early 8th century (Marshak, 2009: 38)) shows parallels to the objects represented on the Borili statue. Some of the men, who are sitting in the oriental manner, are dressed in "Turkic" long coats with lapels; others are wearing robes with similar decorative details, but with the collar*. Bags are suspended on large rings from the belts on the right sides of the feasting men, and narrow objects can be seen behind the bags. Rectangular bags differ in the shapes of their bottom edges. Two characters have bags with the "appendage" on the bottom. Short-bladed weapons in sheaths are fastened horizontally to the belts of the participants in the feast with two loops; a ring pommel is distinguishable on the hilt of one of the weapons (Belenitsky, 1973: Ill. 21).

Three characters feasting under a canopy in the wall-painting of room VI/1 (Ibid.: 21) (early 8th century (Marshak, 2009: 43)) have bladed weapons, including paired ones, with ring pommels. Some scholars believe these nobles to be Turks (Lobacheva, 1979: 24) or Turgeshes (Ermolenko, Kurmankulov, 2012: 105). However, apart from the pommels, their intricately decorated weapons differ from the weapons represented in Old Turkic sculptures, as well as from other attributes, including clothing; although a small beard in the form of a vertical strip under the lower lip on the faces of the revelers is identical to the beard recorded on some Old Turkic statues (Ibid.: 97–103) (see Fig. 3, *9*, *11*). The bladed weapon of a bearded man who is represented in the wall-painting of room XXI/3 conversing with a noblewoman (Belenitsky, 1973: 32) is similar to the representations in the Old Turkic sculptures. Bladed weapons with ring pommels in the sheath with two clips and semicircular projections are fastened to the belt of the man. Although the man who is speaking to the lady is an important person and is dressed similarly to those who are feasting under a canopy, his weapons are not decorated*.

The various weapons depicted in the frescoes of the Sogdian towns include studded battleaxes. For instance, a young man is holding such an object on his shoulder in one of the compositions in the ceremonial hall VI/41 in Panjakent (Ibid.: 28) (blue hall with wall-paintings dated to ca 740 (Marshak, 2009: 40)). The axe is shown in side view; it consists of a pole-axe-like blade expanding towards the ends, a circular detail enclosing the socket, and a truncated-rhombic striker (Fig. 4, *5*). A partial representation of a similar object was found in a fragment of wall-painting in the room I in Afrasiab (Albaum, 1975: Pl. L) (Fig. 4, *3*). However, these axes, like an elegant two-sided axe—the royal insignia (Panjakent, room VI/1) (Belenitsky, 1973: 21) (Fig. 4, *2*), and the cymbiform battleaxe of a jouster (Panjakent, room VI/1) (Ibid.: 19) (Fig. 4, *6*)—do not resemble the axe on the Borili statue.

We may find more parallels with the so-called dish from Kulagysh, which was made by a Sogdian metalworker in the 7th century (Marschak, 1986: Abb. 198). The scene of a combat between two military leaders wearing armor and tricorn headwear (helmets) is shown on the inner surface of the dish (Fig. 5, *4*). Their weapons include long-bladed ones, whose sheaths are provided with paired clips with semicircular projecting petals, and axes with trapezoidal blades, wedge-shaped strikers, and sockets with rounded sides (Fig. 5, *5*). However, the comparison of the axes remains relatively arbitrary, since the middle part of the axe on the statue from Borili is covered by the hand, and cannot be seen.

Riders that have studded battleaxes with eyelets that differ from those depicted on the dish from Kulagysh and, accordingly, on the statue from Borili, are shown on two almost identical Sogdian (Central Asian) dishes—the Verkhneye Nildino dish and the so-called Anikovskoye dish (Darkevich, Marshak, 1974: Fig. 3; Baulo, 2004: Fig. 1) (Fig. 5, *1–3*). The former dish is dated to the 8th–early 9th century, while the latter dish is dated to different periods (Baulo, 2004: 132–133). It is important that (according to the conclusion by B.I. Marshak), the Anikovskoye dish was cast from an impression of the

*An Old Turkic statue representing the elements of a similar garment was found in the Altai. V.D. Kubarev (1984: 27) suggested that it depicted a Turkic long coat with buttoned lapels, and G.V. Kubarev (2000: 87) noted the influence of the Sogdian fashion.

*Another parallel to the weapons with the ring pommels was found on a bronze plaque with a representation of a rider dressed in a lapelled coat (6th–8th centuries) from the fortified settlement of Kanka (Bogomolov 1986: Fig. 2, *1*). The attribute that G.I. Bogomolov identified as "a rod or a mace" is, in our opinion, the hilt of a bladed weapon placed in its sheath.

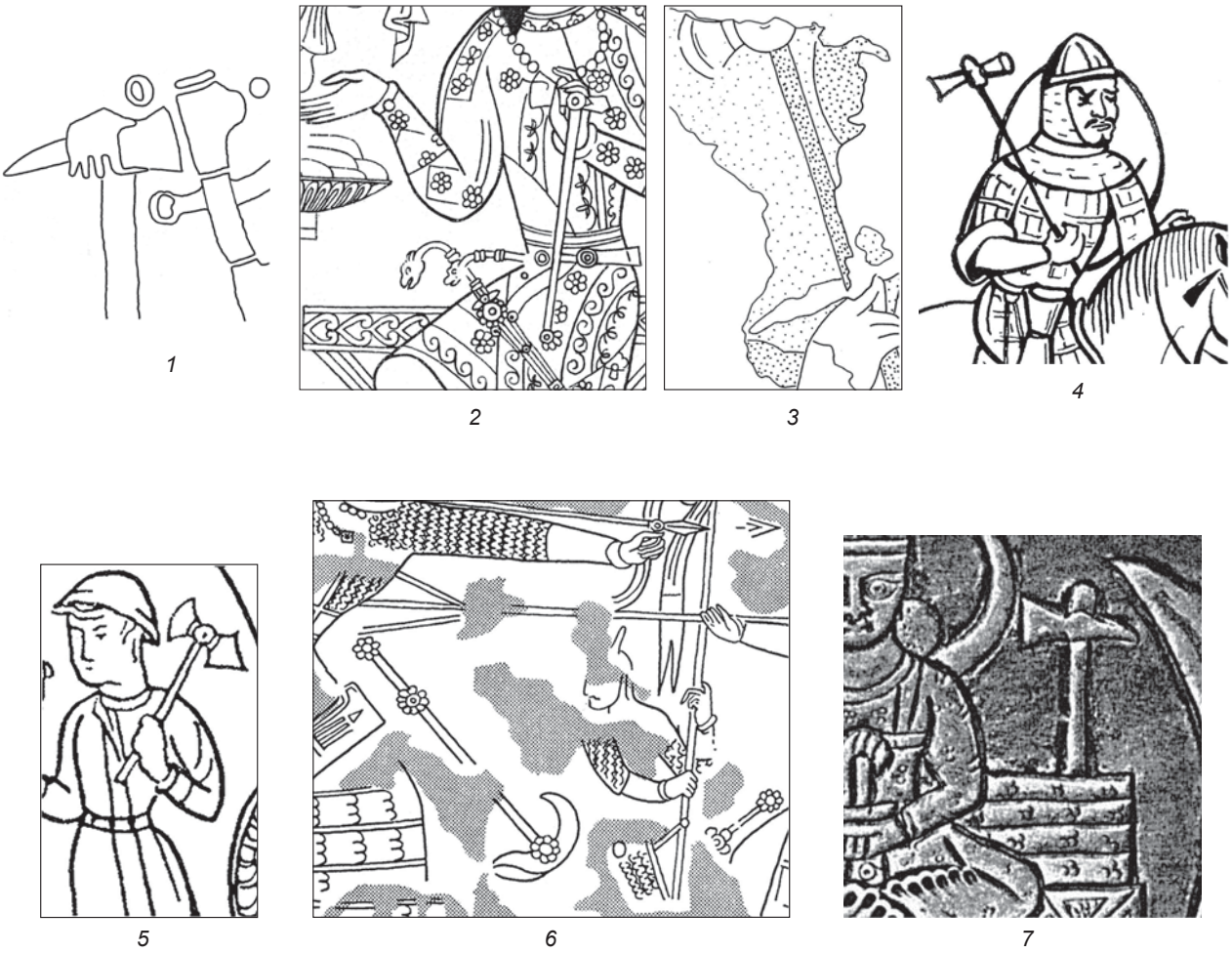

Fig. 4. Axes in the medieval figurative tradition.
1 – Borili; *2* – Panjakent VI/1 (Belenitsky, 1973: 21); *3* – Afrasiab (Albaum, 1975: Pl. L); *4* – Shikshin (Dyakonova, 1984: Fig. 12); *5* – Panjakent VI/41 (Belenitsky, 1973: 28); *6* – Panjakent VI/1 (Ibid.: 19); *7* – village of Klimova in the Solikamsky Uyezd of the Perm Governorate (Smirnov, 1909: Fig. 306; fragment).

relief on the original 8th-century dish, and retained its details (Marshak, 1971: 11; Darkevich, Marshak, 1974: 217)*, including the axe. As a parallel to the rider with the axe, Marshak pointed to the representation of a 8th-century horseman in the paintings in the cave sanctuary in Shikshin (East Turkestan) (Marschak, 1986: Abb. 212, *10*). However, in the drawing for the article by N.V. Dyakonova (1984: Fig. 12), the axes of two other "warriors of Shakya" (Shikshin sanctuary 11) are distinguished by the presence of the socket (see Fig. 4, *4*).

A studded battleaxe with a trapezoidal blade and coracoid striker also appears in the Sasanian toreutics. On the dish with the image of the "Clock of Chosroes" (7th century (Trever, Lukonin, 1987: 111) or the late 7th–early 8th century (Marschak, 1986: Abb. 437)), this weapon is shown with its business end up on the couch of the king who is sitting in an oriental manner leaning on his vertically set sword (see Fig. 4, *7*).

It should be noted that the characters armed with an axe, which appear in monumental painting and toreutics, usually carry the axe on their shoulders holding it by the handle. Only the ruler sitting on the throne (Belenitsky, 1973: 21) leans on the axe holding it by the round middle part, which can be seen since the palm of the hand is on the rear side of the axe (see Fig. 4, *2*). The axe is near the chest of this royal person, while the end of the handle rests on his thigh. We should mention that axes, especially richly decorated ones, as well as maces, were high-status weapons in the retinues of Europe, North Asia, and China, and served as symbols of power (Raspopova, 1980: 76, 78).

A certain material parallel to the weapons with ring pommels carved on Old Turkic statues is a luxury

*In the 1971 study, Marshak indicated a date of the 7th–8th centuries.

1

2

3

4

5

Fig. 5. Representations of axes on Eastern metal dishware.
1 – dish from Malaya Ob (Verkhneye Nildino). Museum of History and Culture of the Peoples of Siberia and the Far East of SB RAS; *2*, *3* – fragments of reliefs, drawing by A.P. Borodovsky (Gemuev, Sagalaev, Soloviev, 1989: 54); *4* – dish discovered near the village of Kulagysh in the Kungursky Uyezd of the Perm Governorate; *5* – fragment of this dish with a representation of axes (Smirnov, 1909: Fig. 50).

broadsword from Pereshchepino (7th century); its hilt and sheath are decorated with embossed gold onlays (Sher, 1966: 42; Charikov, 1984: 59; 1989: 187). It was made by a Byzantine artisan in accordance with the "Avar custom". Scholars find the typological equivalents of this obviously "custom-made" weapon, intended for a person of Khan level, among the finds from the burials of the Avar aristocracy of the 7th century in Hungary (Sher, 1966: 42; Sokrovishcha…, 1997: 89, 135). However, despite the similarities of the ring pommels on the hilts, the shapes of the petals on the clips of Avar sheaths for the swords, and on bladed weapons represented in stone, are different. The protrusions, which bear loops, on the clips of Avar weapons are of figurate shape consisting of three semicircles (Ibid.: 135).

According to Z.A. Lvova and B.I. Marshak, swords with ring pommels (along with pseudo-buckles) "were widespread in the steppes and the adjacent territories" (Ibid.: 89). However, they have not yet been found in the western part of the Asian steppes, except for a broadsword from Berel, discovered by V.V. Radlov (Gavrilova, 1965: Fig. 4, *12*; Soloviev, 1987: 67). But overall, an impressive number of bladed weapons of this kind (single-edged, with ring pommels and predominantly straight cutting-and-slashing edges) originated from the territories of the earliest states of East Asia. They were widespread in the military circles of Korea as early as the second quarter of the first millennium AD (Lee Sang-yeob, 2008: 92, 93). They are also well known in Japan. A representative series of such weapons, exhibiting both straight blades and blades with concave cutting edges, was found, for example, during the excavation of the Tōdaijiyama burial mound dated to the 3rd century AD (Yamato no…, 2002: 54). The rings of some pommels, which are round in cross-section, were decorated on the outside with flat-figured (including flame-like and leaf-shaped)

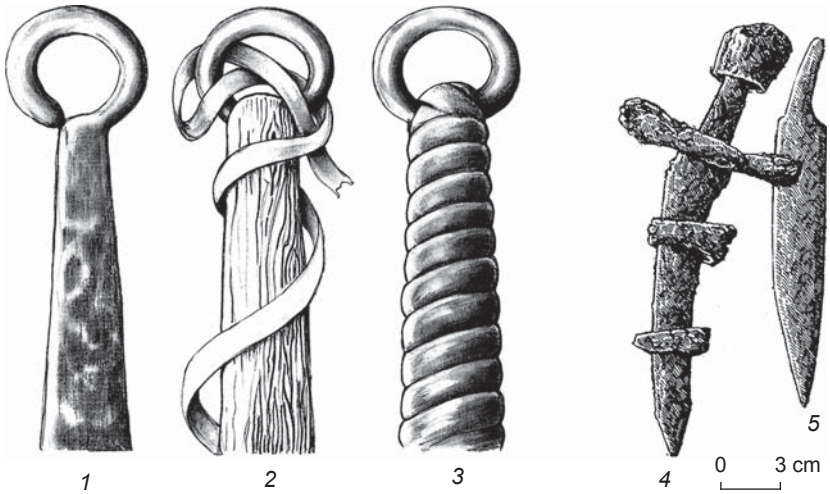

Fig. 6. Some parallels to the bladed weapon depicted on the Borili statue.
1–3 – hilts with the ring pommel; *4* – combat knife from the necropolis of Arkhiereiskaya Zaimka; *5* – bladed weapon from the Ryolka burial-ground.

projections, altering the perception of the geometric simplicity of the object. In such cases, the outline of the ring might form a fairly intricate shape similar to that which the ancient artisan of the above-mentioned sculpture from Aerkate might have tried to render. For example, a small decorative "trefoil" was sometimes placed inside the ring (in a part adjacent to the hilt). An attempt to reproduce this element in such coarse material as granite, unsuitable for rendering small details, might have resulted in the appearance of a specific protrusion inside the ring of the bladed weapon on the statue from Borili. A beautiful inlaid ring pommel of an iron sword of the 6th century AD, with the hilt covered with bronze leaf, was found in the Okamine burial mound in the Nara Prefecture. Blades with ring pommels became one of the most common typological units of bladed weaponry in the Kofun period (250–538 AD) (Derevianko, 1987: 39). In China, long iron broadswords with ring pommels appeared in the period of the Eastern Han Dynasty (25–220 AD) (Yang Hung, 1980: 124) and continued to exist until the time of the military operations of the Chinese People's Liberation Army*.

Going back to archaeological materials, we should note a beautiful broadsword in a black lacquer sheath with gold inlay that once belonged to a high-ranking official of the early period of the Eastern Jin Dynasty (316–420 AD). This sword was found by Chinese archaeologists in burial 4 at Fuguishan not far from Nanjing**. The length of the broadsword is 96.9 cm; the width of the blade is 2.4 cm; the thickness of the back part of the blade is 0.6 cm. The broadsword had a ring pommel with a bronze rounded protrusion in its lower part (type 2) (Zhongguo…, 2015: 641), which appears to be identical to the one reproduced on the Borili statue.

Material parallels to the cutting and stabbing weaponry depicted on the statue from Borili may also be found among the objects from Western Siberia. Thus, the Elykaevo and Parabel collections contain bladed weapons with ring pommels, including pommels in the form of an open ring. One of the ends of the ring was bent close to the tang, but was not connected to it by forged welding (Soloviev, 1987: Fig. 12, *2*, *3*; 14, *2*, *5–7*; 15, *1*, *7*, *8*). The final assembly of the hilt by placing wooden onlays with their subsequent attachment by threads, leather, or simply by winding around many layers of leather straps, would result in an "actual" ring pommel with a noticeable protrusion in its lower third (Fig. 6, *1–3*)*.

Parallels to the short-bladed knife or dagger with an inclined hilt, which is depicted on the Borili statue, can also be found among the materials originating from the necropolis of Arkhiereiskaya Zaimka in the Tomsk region of the Ob, dated (according to the material complex and a Tang coin) mainly to the 7th–8th centuries (Belikova,

*The Military Museum in Beijing owns a rich and representative collection of weapons with ring pommels.

**We express our deep gratitude to S.A. Komissarov, A.L. Nesterkina, and E.A. Solovieva for their help with the Chinese, Korean, and Japanese materials.

*In recent years, there has been a tendency to date the Elykaevo hoard to the earlier period owing to clearly early materials in the hoard. However, the presence in the hoard of bladed weapons with a noticeable curvature of the blade, which in fact are early sabers, does not make it possible to agree with this approach, and gives grounds for dating the collection, still, to the Early Middle Ages (the 6th–8th centuries).

Pletneva, 1983: 37–41, 92, 95; Chindina, 1991: Fig. 21, *8*, *9*; Soloviev, 1987: Fig. 26, *3*), and among the objects from the Minusinsk Basin and the North Caucasus (Evtyukhova, 1952: Fig. 68). We should, however, make the reservation that in this case the similarity is relative—especially since we do not know anything about the design and shape of the bladed weapon hidden in the sheath that is represented on our statue. Regarding the Tomsk finds, we can only mention a similar angle of the hilt, the system of attaching to the belt, and, supposedly, the similarity of the working part. Moreover, the combat knife from the Ob region has a different pommel, in the form of a cap (Fig. 6, *4*). Similar bladed weapons with slanting hilts have been found in this region at the Ryolka burial ground (Fig. 6, *5*), where a slightly curved saber (broadsword, according to L.A. Chindina) with a clip-like pommel (in the form of a truncated ring) covered with bronze leaf has also been found (Chindina, 1977: 27, 28, fig. 6, *1*; Soloviev, 1987: Fig. 17, *5*; 26, *3*).

Having analyzed the materials of Southern Siberia and Central Asia, Y.S. Hudiakov (1986: 157–158, fig. 71) noted the presence, albeit relatively rarely, of battleaxes in Old Turkic complexes, and included this type of weaponry into the typological and chronological matrix of the Old Turkic weaponry. Battleaxes equipped with an additional striker in the butt were customary for the population of the Minusinsk Basin throughout its entire Medieval history interrupted only by the Mongol invasion (Hudiakov, 1980: 62–65, pl. 16). However, the shape of the striking platform on the butts of these axes remained flattened, like hammer's. Studded battleaxes with flattened upper platforms (Soloviev, 1987: Fig. 29, *1–3*) were a part of the weaponry used by the inhabitants of the subtaiga and southern taiga regions of Western Siberia, who were strongly influenced by the Turkic-speaking population. However, a striker with a convex sector-shaped blade and a long sharp faceted pick-like butt, visually very similar to that depicted on the Borili sculpture, was found exactly here, in the Middle Ob region (Ibid.: Fig. 29, *4*); although it should be noted that the Chernilshchikovsky burial ground, where that item was found, is heterogeneous in time*. Although the materials of the site include a large fragment of a broadsword with a figured bronze clip and braces from a system of attaching the weapon to the belt (Ibid.: Fig. 20, *11*), similar to that described above, it is difficult to assign the axe definitively to the period that is of interest to us. As far as the Eastern European parallels are concerned, only a studded axe of the 6th century from the burial ground of Borisovo in the North Caucasus (Kovalevskaya, 1981: Fig. 62, *58*) bears some resemblance to the axe shown on the statue from Borili.

*The site was excavated several times by different archaeologists in the late 19th–first half of the 20th century, and thus the resulting materials are kept in various museums in different cities (Tomsk, Kolpashevo).

Conclusions

On the basis of the parallels listed in the article, the statue from Borili may be dated to the 7th–early 8th century, most likely the 7th century. Despite the specificity of the position of the right hand and the attribute determining this position, the rest of the statue does not differ from the "typical" Old Turkic statues. Moreover, it shows significant similarities with the Western Turkic statues that represent the elements of Turkic clothing and hairstyles. These parallels are found among the materials of Sogdian art; and, in part, in the Chinese pictorial tradition. Even previously, the comparison of the Old Turkic statues with the Sogdian and Chinese materials allowed scholars to identify the parallels in representations, gestures, and attributes. Thus, the iconography of some of the statues, including those depicting weapons with a ring pommel, contains elements similar to some motifs in Sogdian paintings (such as the refined gesture of the hand holding the cup, wavy stylized endings of braids-locks, etc.). It seems that in terms of its composition, the statue from Borili may be correlated in some way with the image of the ruler in the Panjakent monumental painting. The stability, wide prevalence, and importance of the combination of bladed weapons and axe among the "royal" attributes are manifested by the Iranian dish with the representation of the "Clock of Chosroes".

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Prospection Studies of Bohai Graves Near Kraskinskoye Fortified Settlement, Primorsky Krai*

Locating graves at a Bohai (698–926 AD) cemetery near the fortified settlement of Kraskinskoye in southern Primorye is difficult because their outward signs were destroyed by the large-scale flooding and meandering of the Tsukanovka River during the medieval warming phase. Therefore, several prospection methods were employed. While drilling proved useful for locating stone structures in the alluvium, we tried to achieve similar results by nondestructive techniques. Micromagnetic survey and electrical profiling techniques were employed on a large area to reveal anomalies suggestive of underground stone structures in friable soil. Kappametry of ground surface was applied layer by layer within excavated areas to document magnetic susceptibility of deposits. Comparative analysis of data obtained by prospection techniques (micromagnetic sensing, georadar, magnetic susceptibility measurement) and by archaeological methods was helpful for detecting medieval burials without visible features. We revealed the orientation, arrangement, and general features of Bohai burials, located probable stone mines, and unearthed ceramics suitable for dating. Bohai burials at Kraskinskoye are paralleled by contemporaneous ones in China. Paleogeographic and petrological analyses provide clues to the reasons behind the destruction of Bohai burials. A reconstruction of the environment around the habitation site and cemetery is suggested.

Keywords: *Primorsky Krai, Middle Ages, Bohai state, archaeological prospection, geophysics.*

Introduction

The Kraskinskoye fortified settlement, whose history of research extends over 30 years, is a reference site for studying the Bohai culture in the Russian Far East (Fig. 1). It is located in the Khasansky District of the Primorsky Krai, 2 km southwest of the Kraskino urban village, on the right bank of the Tsukanovka (Yanchihe) River, near its estuary. The majority of Russian, Chinese, and Korean researchers consider this settlement the remains of the Bohai Yan (Salt) District, which was included in the Lunyuanfu (the Eastern Capital) region in the

*This study was performed under the Russian Science Foundation Project No. 14-18-01165, "Towns of the Medieval Empires of the Far East".

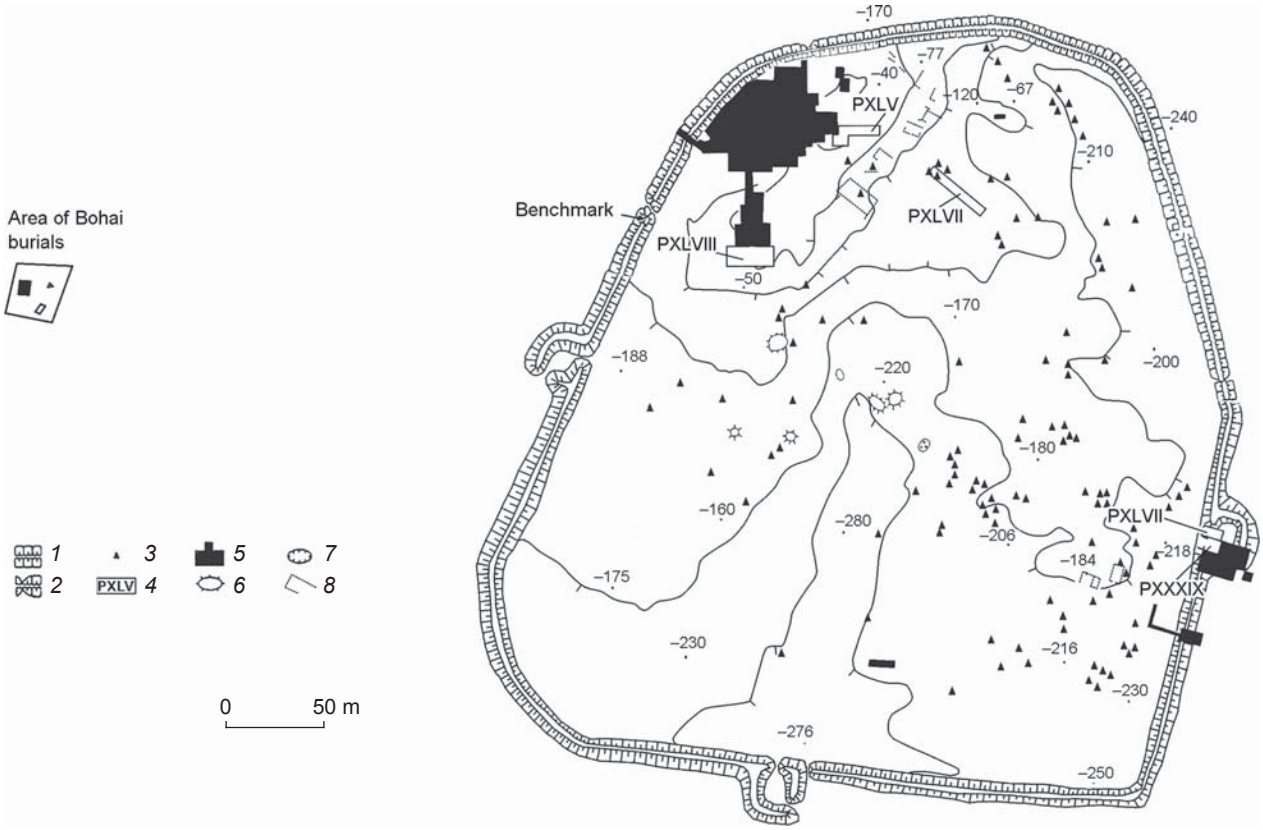

Fig. 1. Layout of the Kraskinskoye fortified settlement, indicating the location of Bohai cemetery (survey of 1995 corrected according to later measurements).
1 – earthwork; *2* – earthwork gap; *3* – stone base; *4* – excavation areas of 2011; *5* – excavation areas of 1980–2010; *6* – rock fill; *7* – pit; *8* – traces of structures revealed by prospection.

8th to the first third of the 10th century. The town's name is probably associated with the name of Yanchihe (present-day Tsukanovka) River, running into Expedition Bay.

The Kraskinskoye cemetery is located in the neighborhood of the site, mainly south of it, along the coasts of the bay and the banks of the river. Excavations of the mounds have provided Jurchen materials attributed to the early 13th century (Raskopki pamyatnikov…, 1994: 251–333). Information about Bohai burials was first obtained in 2003 by Y.G. Nikitin, who accidentally discovered mason-work under turf in a layer of sand (without visible features on the daylight surface) 300 m west of the Kraskinskoye fortified settlement (Nikitin, Isao Usuki, 2004; Nikitin, 2009). In 2005, in the course of studies conducted by the expedition of the Institute of History, Archaeology and Ethnography of the Peoples of the Far East FEB RAS led by V.I. Boldin, a geomagnetic survey was performed in the vicinity of an excavated burial by E.A. Bessonova, a researcher of the Pacific Oceanological Institute FEB RAS. In 2007, the georadar technique was employed to search for other graves here, and preliminary results, requiring verification, were obtained.

In 2011, the International Russian-Chinese Expedition of the Institute of History, Archaeology and Ethnography of the Peoples of the Far East FEB RAS and the Jilin Province Institute of Archaeology conducted a drilling survey at the Kraskinskoye fortified settlement and in its neighborhood. Positive results were obtained both at the site and in the area around the grave discovered in 2003 (Gelman, Ivliev, 2013). The remains of another burial were found near it.

This article presents the results of comprehensive studies of the area comprising Bohai graves near the fortified settlement of Kraskinskoye (2005–2012). A comparative analysis of data obtained by different methods of searching for burials without visible features on the daylight surface has been conducted.

Archaeogeophysical studies

In 2005, in order to reveal flat burials of the Early Middle Ages (which are the hardest-to-find hidden historical and cultural heritage sites), an area of 900 m^2 was explored by means of direct current electrical profiling M 1 : 200

and magnetic survey M 1 : 100 (Bessonova, Zalishchak, Valitov, 2005). The objects of interest are shallowly buried limited-size accumulations of large stones, which are not typical of flood-plain deposits in this area of the Tsukanovka River valley, and differ from the enclosing rocks in electrical conductivity and magnetic intensity. According to the results of petromagnetic studies of soft sediments and the stone material of burial enclosures, the magnetic susceptibility of rock-fragments brought by people is twice that of enclosing soil (Fig. 2, *f*, *g*). However, the volume of stone material is small, and (taking into account the depth of its occurrence) only low-amplitude magnetic anomalies can be identified; therefore, the use of different geophysical methods is justified. In-plane coincidence of anomalously high values of electrical resistance and low-amplitude magnetic anomalies was used as a criterion for locating the objects of interest (Sholpo, 1977; Kortunov, Kulinich, Valitov, 1999). A low-amplitude magnetic anomaly, spatially coincident with a geoelectric one, has been revealed on the schematic maps of abnormal magnetic fields and electrical resistance. A distinguished local diagonal-strike area, compatible in size with the 3 × 5 m objects of interest (Fig. 3, 4), was subsequently explored by drilling technique, which proved to be successful. In microrelief, the position of the grave in plan corresponds to a small isometric prominence going northward beyond the burial-enclosure (see Fig. 2, *h*).

Taking into account the high informational contents of the petromagnetic studies of the cultural layer (Mullins, 1974; Clark, 1990: 132–162; Zalishchak, 2002; Linford, 2005; Arkheologicheskiye issledovaniya…, 2011: 175–190; Bessonova, Gelman, Nikolaeva, 2013), kappametry of soft sediments was applied layer by layer on a 1 × 1 m grid within the entire excavated area of the burial, in accordance with the planigraphy of the excavations (see Fig. 2, *a–e*) (Dudkin, Koshelev, 2001). The distribution of the magnetic susceptibility of soil is characterized by well-defined areas of low and high values, with distinct boundaries for various strikes. The surface of the topsoil is distinguished by minimal values (see Fig. 2, *a*). Consistency is observed of magnetic susceptibility distributions on the soil's surface and at the level of the fourth stratum (burial location) (see Fig. 2, *d*). Comparison of the results of the excavations and the distribution of the magnetic susceptibility of the topsoil's surface has identified the correspondence between anomalously high values of the parameter under study and the position of the burial area in plan, as anticipated*. We relate this fact to different compositions of subsurface soil inside the grave and beyond its limits.

Archaeological studies

Results of prospection drilling. Drilling was carried out on the selected test site, on 3 × 3 m grid, until the location of mason-work was found, following which the outer and inner boundaries of the object were determined. The stratigraphy of the area was the following: turf-cover approximately 30 cm thick was underlain by a gray-brown sandy loam layer approximately 20 cm thick, which overlaid terrestrial sand deposits.

The grave was located in the layer of gray-brown sandy loam. Its edge was discovered at a depth of approximately 50 cm, and the bottom was traced at a depth of more than 1 m. The grave had a rectangular shape, and was oriented along a north-south line. It had a length of 470 cm and a width of 260 cm. The walls were composed of stones of various sizes and shapes. The thickness of walls reached 30–40 cm, the height was about 60 cm (Gelman, Ivliev, 2013).

Results of archaeological excavations. In August 2012, grave 2 was excavated by the Russian Expedition of the Institute of History, Archaeology and Ethnography of the Peoples of the Far East FEB RAS (led by E.I. Gelman). The excavations confirmed the results of prospection drilling, though slightly correcting them (see Fig. 4). In particular, it has been established that the grave is oriented according to cardinal points, and has a nearly rectangular shape. Its length is 390–410 cm from south to north, and the width is 320–350 from west to east. It is compatible in size with the stone structure of grave 1, excavated in 2003 (400 cm from north to south, and 340 cm from west to east), and with large graves at the Bohai cemetery of Hongzunyuchang (Heilongjiang province) in the People's Republic of China (Ninan Khuntczuniuichan, 2009: 615). The inner part of grave 2 had a size of 240–280 cm from west to east and 300 cm from south to north. Masonry walls had a thickness of 15–20 cm and a height of 26–43 cm. The grave structure became apparent at a depth of 30–40 cm below the daylight surface, while stone foundations of walls were located at a depth of 60–70 cm. Obviously, the size of burial revealed by drilling differs from the actual one. This is because the number of drilling locations was limited to ensure the best integrity of the burial-structure.

During archaeological excavations, large stones of the grave's masonry walls were exposed right after the removal of turf 23 to 30 cm thick. The average benchmark of the upper points of these boulders is 85 cm. Upon removal of the second stratum, it became evident that the largest stones were concentrated near the southern wall.

*__Pat. 2506610 C1 Russian Federation.__ Method for mapping of archaeological sites. By E.A. Bessonova, S.A. Zverev, N.A. Nikolaeva, A.L. Gelman, A.L. Ivliev. No. 2012133057, filed on 01.08.2012; published on 10.02.2014, Bull. No. 4.

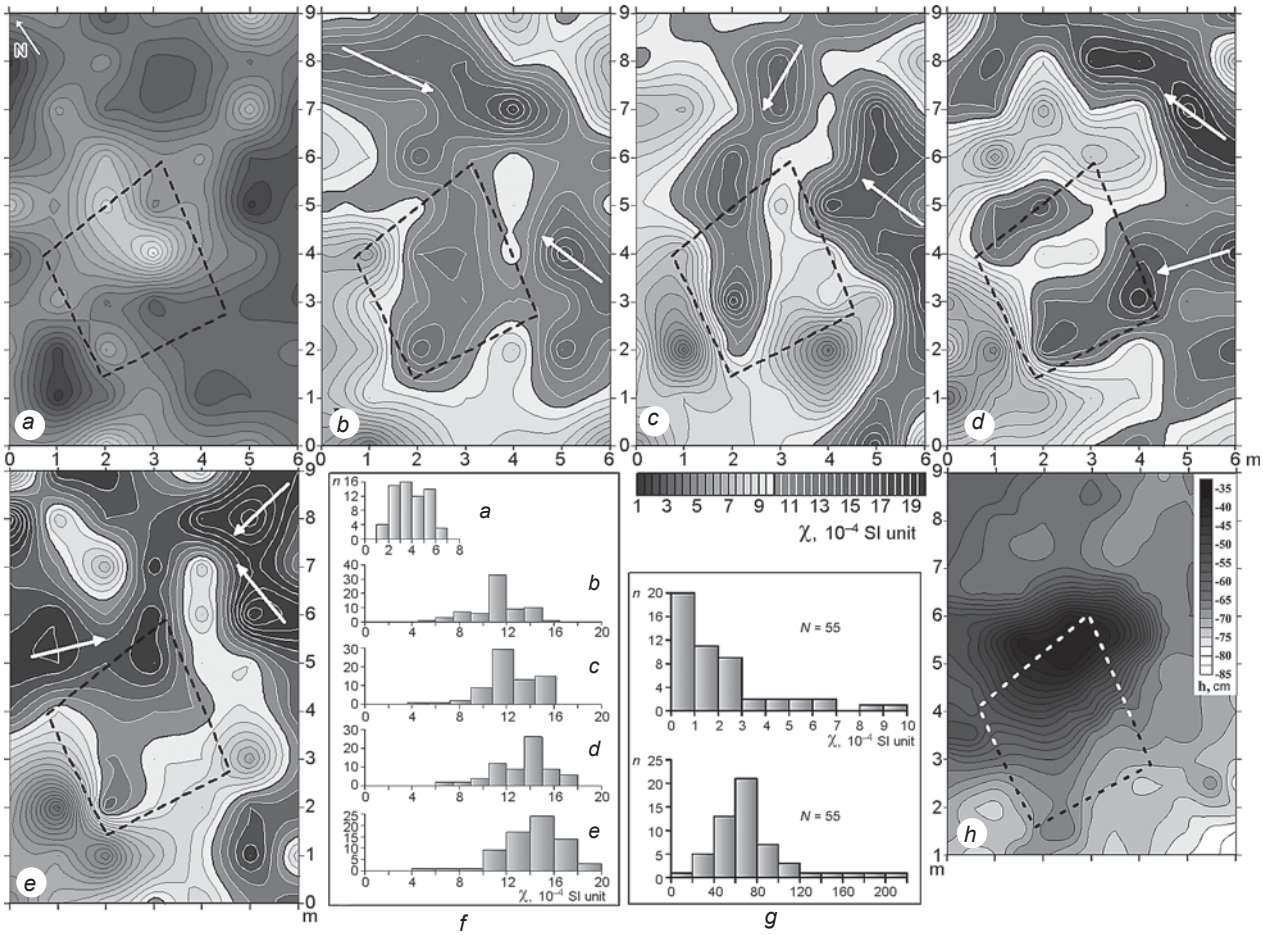

Fig. 2. Kappametry results.
a–e – schematic maps (M 1 : 100) of magnetic susceptibility of soil in the excavation area: *a* – topsoil surfaces; *b*, *c*, *d*, *e* – soil surfaces after removal of the 1st, 2nd, 3d, and 4th strata respectively; *f* – distribution histograms of magnetic susceptibility of soil surface (according to the planigraphy of excavations); *g* – distribution histograms of magnetic susceptibility of stone material; *h* – microrelief of the excavation area (daylight surface). Position of enclosure foundation in plan is shown by dashed line.

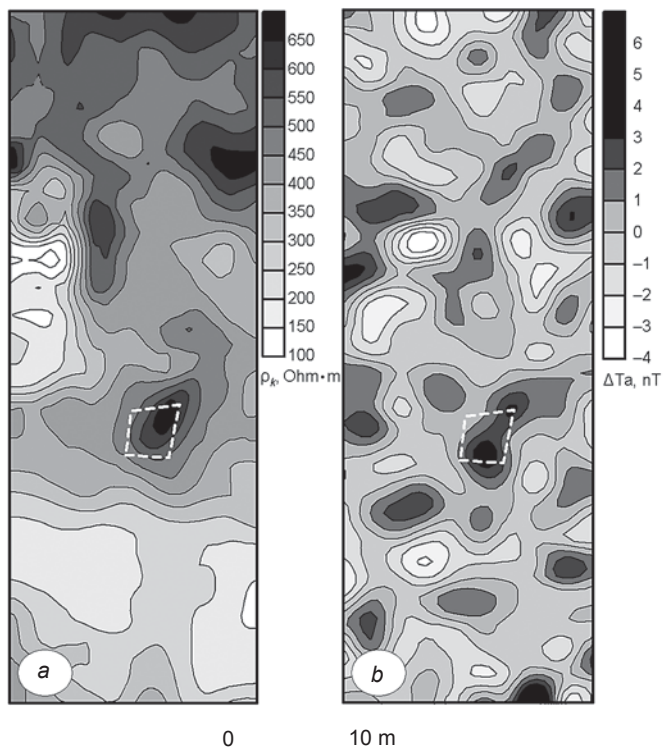

Fig. 3. Results of archaeogeophysical studies.
a – distribution of apparent electrical resistance in a near-surface layer; *b* – local positive magnetic anomalies. Location of burial is shown by dashed line.

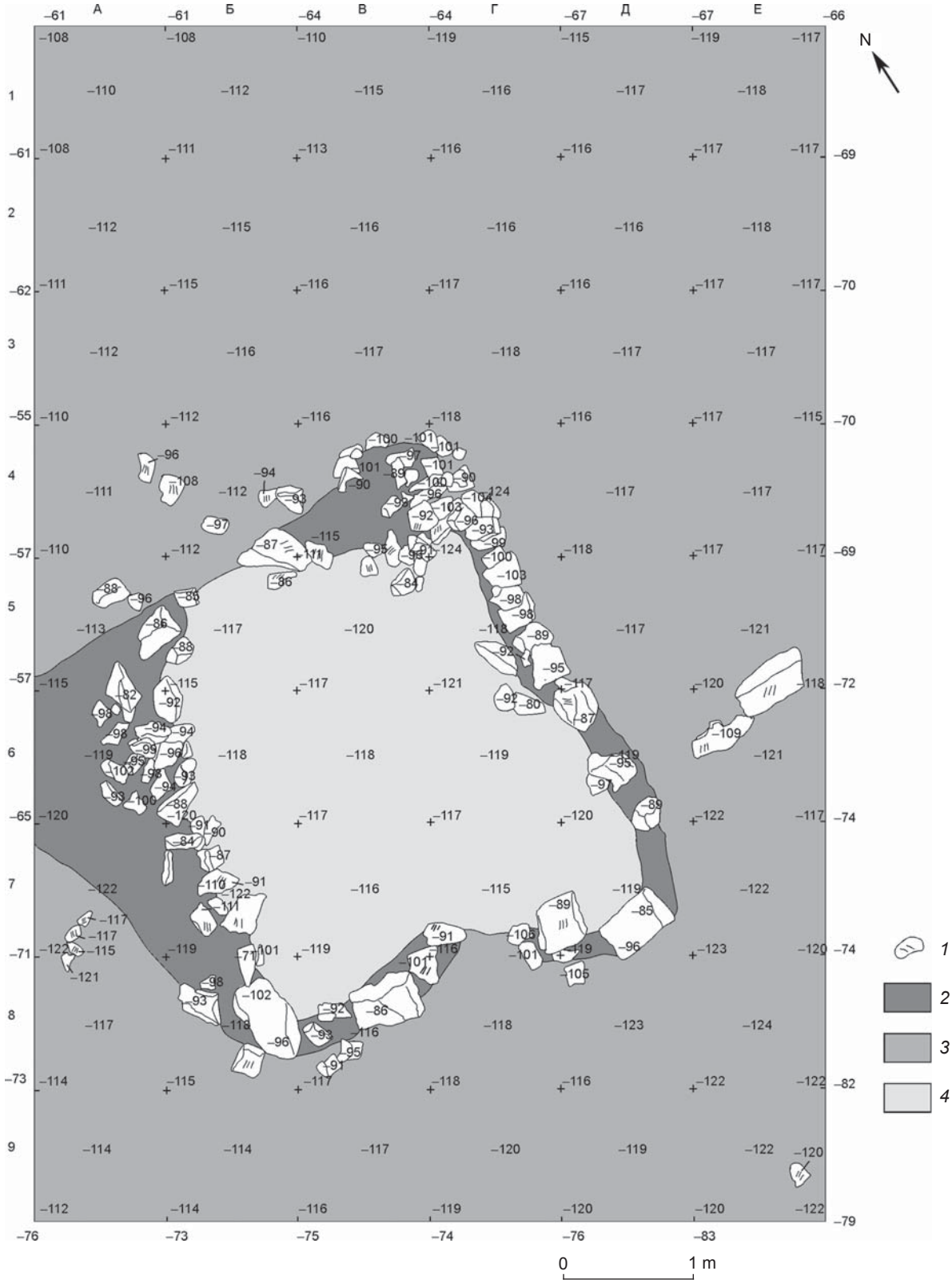

Fig. 4. Layout of grave 2.
1 – mason-work; *2* – grayish-brown sandy loam; *3* – brown uneven-grained sand; *4* – pale-brown fine-grained sand.

This permitted the assumption that the entrance into the burial facility was located exactly here. In the middle of the southern wall, there was an aperture 1 m wide, shaped by a large stone block on either side (40 × 40 and 50 × 40 cm). Another two similar stones were installed in the southern and eastern corners of the grave (50 × 34 and 60 × 36 cm). The eastern wall composed mainly of the average-sized stones was in better condition; the western and southern ones were most severely damaged as early as the Bohai period. The masonry structure of the grave was made of the same stone that was employed for construction and repair of the fort-walls of the Kraskinskoye settlement.

It has been determined that filling of the inner part of the burial is homogeneous, and consists of pale-brown fine-grained sand. On the outside of the stone cover, the main layer consists of brown uneven-grained sand. The masonry structure of the grave was arranged in compact grayish-brown sandy loam that is preserved along the burial boundaries, in the areas without stones. This layer has also been revealed in the course of drilling while determining the burial's boundaries.

Six small fragments of Bohai wheel-thrown ceramicware, and a pawn in the form of a flat stone disk (Fig. 5), have been found during excavations. No remains of bones were discovered in this grave. The cultural layer turned out to be almost completely destroyed, presumably because of periodic flooding of the river and underground water activity, which resulted in the grave's being filled with fine-grained sand. Kappametry data applied within the area of the burial confirm this presumption.

Thus, the grave type (availability of stone cover and sandy or earthen bottom), its shape and size are most typical of the Bohai burials (Liudinshan…, 1997: 18, 19, 126–129; Nikitin, 2009). Grave 1, excavated in 2003, is oriented with its long sides along a N-S line, while the entrance was located on the southern side and was shaped in a similar manner, by flat stone slabs. However, this grave was distinguished by thicker stone walls with a height of 74–90 cm, which imparted to it a certain resemblance with a crypt. Six rows of clay-bound stones have been traced in the mason-work of the northern wall (Nikitin, 2009). It should be noted that certain graves of the Bohai cemetery of Hongzunyuchang are oriented according to cardinal points, some of them have an entrance located on the southern side and often shaped by almost rectangular large stone slabs (Ninan Khuntczuniuichan, 2009: 615).

The absence of bones and funerary goods in graves is not unique. Empty graves and burials with a minimal number of finds were also discovered in the Bohai cemetery of Hongzunyuchang. Grave 1 of the Bohai group of burials near the Kraskinskoye fortified settlement contained only iron elements of belt set and a fragment of a wheel-thrown vessel. It is likely that the character of finds and arrangement of the burial (thickness and thoroughness of mason-work) point to a high status of the buried person.

Paleogeographic features

Cultural layer of the burial turned out to be completely destroyed, probably, eroded. This is explained by high flood water activity on the floodplain of the Tsukanovka River, which has been established from the results of excavations and geophysical survey of the Kraskinskoye fortified settlement (Bessonova, 2007; Bessonova, Gelman, Nikolaeva, 2013). The subsurface soil in the excavation area is represented by uneven-sized sandy deposits of derived silts from the floodplain elevation: inside the grave, sandy-aleuritic material is distinguished, and beyond the stone cover, irregular deposits composed of gravel and coarse-sand grains, medium- and fine-grained sand, and aleurite. Many grains are covered with a thin iron film, and fissured. Fissures are filled with clay matter and iron oxides. Coarse aleuritic material is poorly preserved. Such condition of grains can be indicative of their arrival during erosion of the shallow areal weathering crust developed on granitoids, outcrops

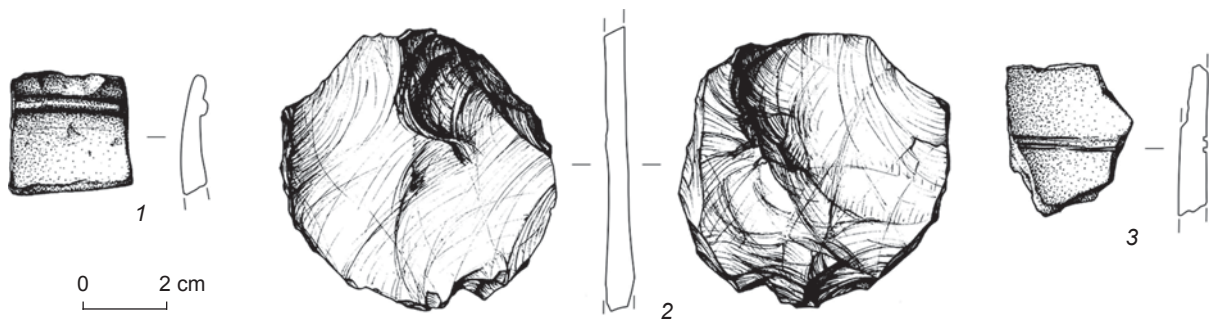

Fig. 5. Artifacts discovered during investigations of grave 2.
1 – fragment of a wheel-thrown vessel rim; *2* – stone game-piece; *3* – wall of wheel-thrown vessel decorated with incised pattern.

of which are observed upstream of the Tsukanovka River. Differentiation of friable material beyond the limits and inside the grave was, most likely, formed as a result of filtration of suspended matter by the walls of burial structure.

The age of burial most likely corresponds to the medieval warming phase (1000–1300 BP), when the climate on the coast of the Peter the Great Gulf was more humid and warmer than nowadays. Sedimentation in the Tsukanovka River mouth proceeded in the shallow desalinated lagoon, with considerably increased volume of river run-off and flood water activity.

Distribution of the magnetic susceptibility of soil at various levels of the excavation area (see Fig. 2, *b–e*) is determined by varying proportion of sand and clay particles formed according to microrelief. During floods, material with reduced content of clay particles, which is characterized by increased magnetic susceptibility, was deposited on the most elevated areas. This has made it possible to determine potential directions of arrival of friable material, shown by the arrows on the schematic maps (see Fig. 2, *b–e*). On all maps, location of burial area in plan is marked by increased magnetic susceptibility values. Thus, burial was always expressed by a small mound in relief.

Conclusions

Study of the remains of Bohai grave 2 with a stone cover near the Kraskinskoye fortified settlement in 2012 has confirmed that, apart from the earlier known Kraskinskoye cemetery of the Jurchen period, a separate group of Bohai graves also existed here (Raskopki pamyatnikov…, 1994: 251–333). In terms of its arrangement, the unearthed grave is similar to many Bohai burials both at the Chernyatino-5 cemetery in Primorye and at Bohai burial grounds studied in China.

The excavations have largely confirmed the results of geophysical studies and prospection drilling. In the absence of visible features on the daylight surface, and with the availability of stone structures in the graves, alternative methods of archaeological exploration in the area under study are promising in terms of determining the boundaries of the Bohai cemetery and of separate burials, the relative depths of their locations, stratigraphy, etc. However, they can clearly not substitute for full-fledged archaeological excavations.

Mapping of the magnetic susceptibility of soil surface in the area where micromagnetic measurements and electrical profiling have already been performed appears to be promising in terms of the search for other burials. Most probably, kappametry of the soil surface within this territory can be employed subsequently as an independent method of searching for burials, which will make reconnaissance surveys considerably cheaper and increase their reliability.

Mapping of the magnetic susceptibility of subsurface soil has made it possible to establish that the formation of the upper part of the geological deposits took place in conditions of high floodwater activity; and to determine the directions of the arrival of suspended silts and, consequently, the directions of water-flow. Despite the destruction, the area of the Bohai graves' discovery is undoubtedly promising for further investigations.

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Burials Dating to the Migration Period in Western Siberia*

Traditions and innovations in 4th–5th century AD burials in the northern forest-steppe and sub-taiga areas of the Tobol valley (Kozlov Mys-2, Revda-5, Ustyug-1, and Ipkul) are described. The burial rite reveals cultural heterogeneity. The mounds, the northerly orientation of bodies, the use of horsemeat in the funeral feast, and the addition of sand and grog to ceramic paste are elements inherited from the earlier Sargat culture. Features such as secondary cremation, inhumation with a horse placed on the roof of the grave perpendicular to the human body, wrapping the bodies in carpets, skins, and felt mats, as well as delayed burials, have no roots in local Early Iron Age traditions. The addition of burnt bones to the ceramic paste, new types of vessels such as pitchers and mugs, and heavy circular deformation of the head—all these elements were introduced by migrants from Southwestern Central Asia, as evidenced by parallels with the Aral Sea area, the steppe part of the Irtysh basin, the Southern Urals, the Tien-Shan piedmont, apparently indicating immigration of isolated groups of nomads of proto-Bulgarian and Xiongnu origin. The emergence of flat cemeteries with rows of graves arranged along the latitudinal line, the use of boats as coffins, the stamp decoration of pottery, and bowls are features introduced by immigrants associated with the Karym culture of the forest parts of the Tobol and Irtysh basins.

Keywords: *Early Middle Ages, Migration Period, burial rite, migrations.*

Introduction

Despite over half a century of study, burial sites of the Early Middle Ages from the forest-steppe zone of the western part of Western Siberia, which can be attributed to the Bakal culture (Salnikov, 1956: 211–214; Viktorova, Morozov, 1993: 178; Maslyuzhenko, 2005: 172), are still extremely rare (Rafikova, 2011: 97). The Bakal population in this area replaced a powerful social and economic entity of the Early Iron Age with nearly a thousand years of history (Mogilnikov, 1992), possibly even an early state, created by the carriers of the Sargat culture (Matveyeva, 2000: 301). In the first centuries AD, this sophisticated and hierarchically organized society with a diversified economy began to rapidly disintegrate turning into a mosaic of nomadic communities, which have left relatively poor burials and short-time settlements. Archaeological materials of the initial stage of the Bakal culture (4th century AD) (Matveyeva, 2012b: 84) reveal a specific combination of cattle breeding with a high share of horses in the herd, mobile dwellings, which would leave only hearths and pits at the settlements, and very crude pottery (Matveyeva, Berlina, Rafikova, 2008: 157, 176). In the Early Middle Ages, the culture became simplified, and property differences became leveled, as is revealed by the reduction of imported goods along

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the northern branches of the Silk Road and the cessation of constructing large burial mounds (Matveyeva, 1997). We may also see social disintegration in the decrease of population, which manifested itself in ten times fewer sites of the Bakal culture as compared to the previous culture (Rafikova, 2011: 98).

The causes of this transformation are believed to be, first, the impact of the nomads from the Hun hordes, who invaded the forest-steppe region coming from the Aral Sea region or the Southern Urals (Botalov, Gutsalov, 2000: 180), as well as the influence of northern taiga migrants, the carriers of the Karym culture, who came from the Lower Ob region (Chernetsov, 1957). A second cause could have been a change in the environment, with increased moisture and the spread of wild grass meadowlands and birch groves (Ryabogina, Ivanov, 2013: 138; Matveyeva, Ryabogina, 2014: 314), which might have created conditions for the influx of the nomads as well as social tensions. Next, we shall analyze the mechanism behind these transformations, traditions, and innovations in the burial rite of the Bakal culture, and the origins of migrations.

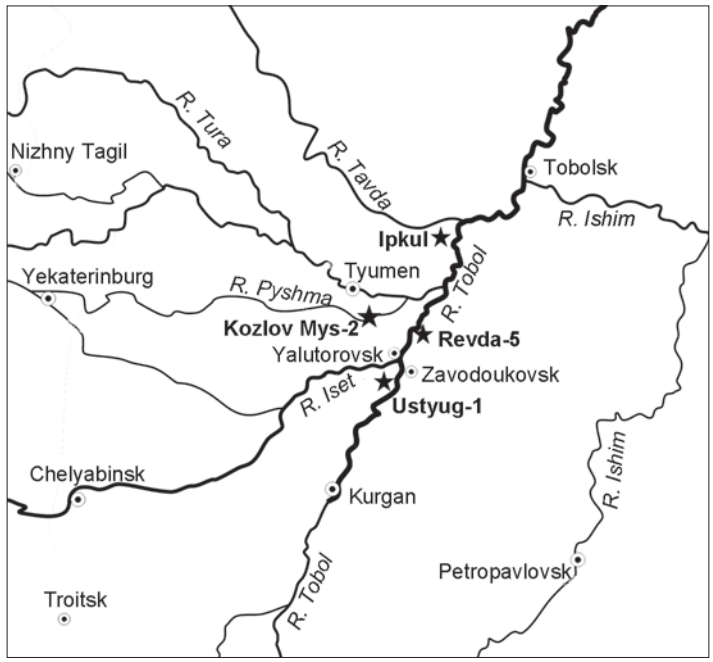

Fig. 1. Arrangement of burial grounds of the Migration Period in the Trans-Urals region.

The sources for this period are the burial grounds of Kozlov Mys-2 (83 burials) (Matveyeva, 2012c), Ustyug-1 (30 burials) (Matveyeva, 2012a), Revda-5* (13 burials), and Ipkul (9 burials) (Chikunova, 2011) (Fig. 1). Single-layered settlements are not known for this period (Rafikova, 2011: 99). The above-mentioned burial grounds were used from the late 3rd to the early 5th centuries AD. Having clarified the chronology of finds from these sites, we propose dating the group of mounds 25, 26, 28, 29, 35, and 40 at the Ustyug-1 burial ground, mounds 1, 4, and 5 at the Ipkul burial ground, and burials 12a, 20, 22, 47, and 56 at the Kozlov Mys-2 burial ground to the late 3rd–mid 4th centuries AD. Burials from mounds 13 and 14 at the Ustyug-1 burial ground (Fig. 2) and burials 21, 25, 45, 54, and 70 at the Kozlov Mys-2 burial ground belong to the 4th century AD. Judging by the material complex, we date burials 2, 5, 7, 29, 36, 48, 51, and 91 at the burial ground of Kozlov Mys-2 to the 5th century AD (Matveyeva, Zelenkov, Chikunova, 2014).

Discussion

All the burial grounds are located consistently on lake or river capes with terraces of bedrock, jutting well into the flood plain. Burial sites show the combination of traditions of flat burials and mound burials; graves form unified rows regardless of the presence or absence of mounds above them; ditches are absent. Chains of burial mounds with a diameter of 4–10 m are usually stretched across the terrace: quite densely at its tip, and more sparsely in other parts of the burial ground. The mounds more remote from the tip are located relatively high on the ground and are larger in size.

The analysis of micro-topography of the excavated surface at the Ustyug-1 and Revda-5 burial grounds using instrumentation data has revealed that mounds 10–15 cm high were made above "moundless" burials (usually they are not visible to the eye). The corpses were placed in graves in the extended position on the back with their arms at the sides of the body, although some were buried in a crouched position, and in the position of a rider. All burial pits are of an elongated oval shape, measuring 2.0–2.5 × 0.7–1.1 m; their depth is mostly 0.3–0.9 m from the native surface.

Brown remains at the bottom of pits indicate the use of organic beddings and coffins. Thus, burial 3 in mound 35 at Ustyug-1 contained the imprints of birch-bark boxes; burial 2 in mound 25 contained mats made of thin twigs of reed or other plants, while in burial 2 in mound 40 at Ustyug-1 and burial 3 in mound 13 at Revda-5, the corpses were buried wrapped in felt mats and skins. A log structure and half of a boat were found at the burial ground of Kozlov Mys-2. The corpses were swaddled or tied. A pillow was placed under the head, or a raised end of the pit was made for the head. Grave goods and food were placed at the head. Double and communal burials have been found along with the predominantly single burials.

*Excavated in 2014 by the author of this article.

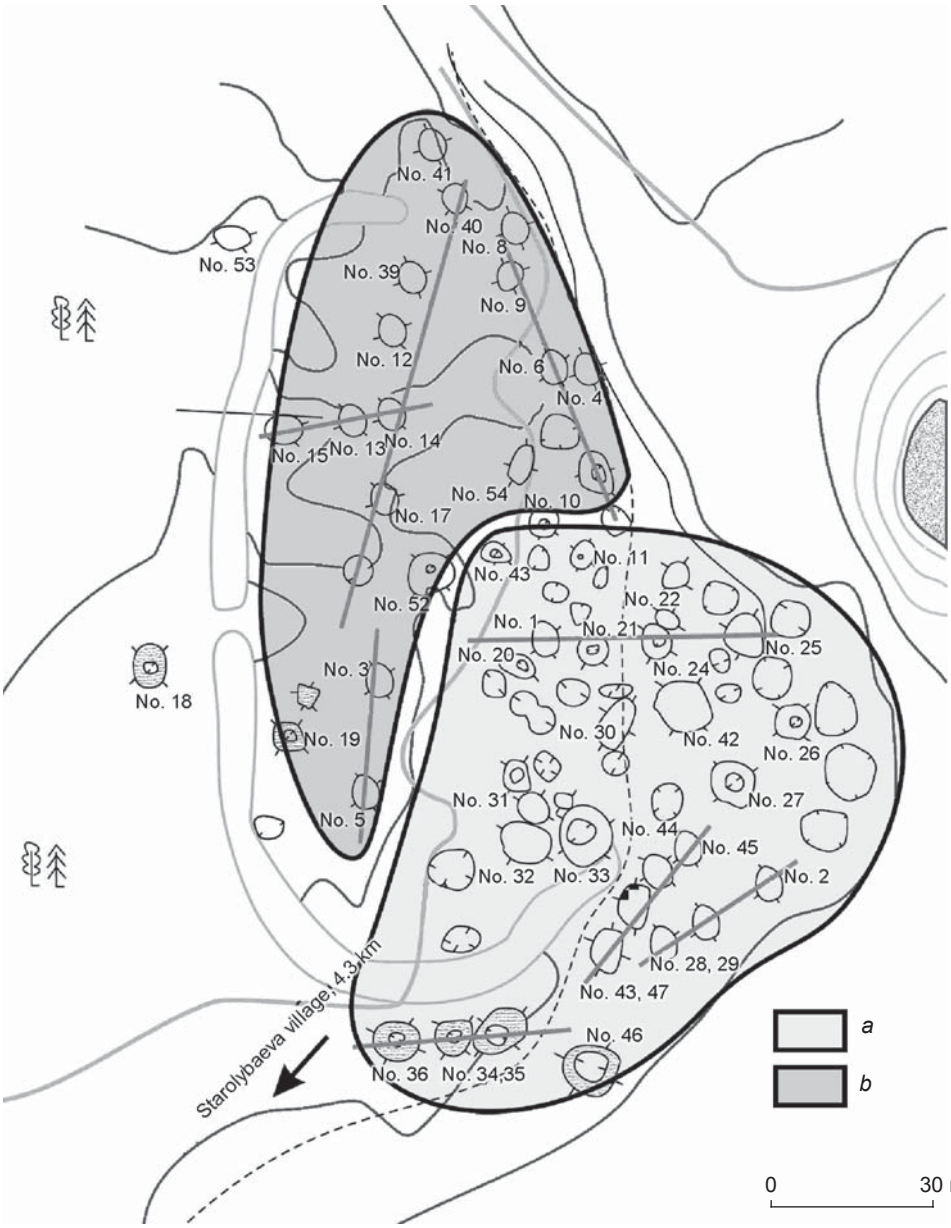

Fig. 2. Plan of the Ustyug-1 burial ground.
a – burial mounds of the late 3rd–early 4th century AD; *b* – burial mounds of the 4th century AD.

Judging by the age and sex of the dead, a single burial mound was not a family complex, which more likely was a chain of adjacent mounds stretched in the same line (Matveyeva, Poshekhonova, 2013).

Traces of funeral feasts have been discovered near the graves or on the covering of the graves. They are represented by intact vessels, broken pottery in the filling, as well as by accumulation of teeth and hooves of horses and leg bones of small cattle located at the edge of the pit at the level of the ancient surface. Meat of large animals was placed as food for the deceased; bones of canines have also been found.

At the burial ground of Kozlov Mys-2, cremation traces of some organic remains were discovered at the bottom of burial pits next to the skeletons. These were lenses 40–50 cm in diameter composed of a thick layer (about 40 cm) of sooty coals and calcined remains from fire, which were found in one corner of the pit. Such fire-pits also occur at the foot of the grave and on the ancient horizon. In Revda-5, the remains of cremation together with vessels placed in the northern end of the pits were located in standard graves, in the same rows with inhumations (Fig. 3). We assume that the cremation was secondary, accompanied by ritual actions, in which

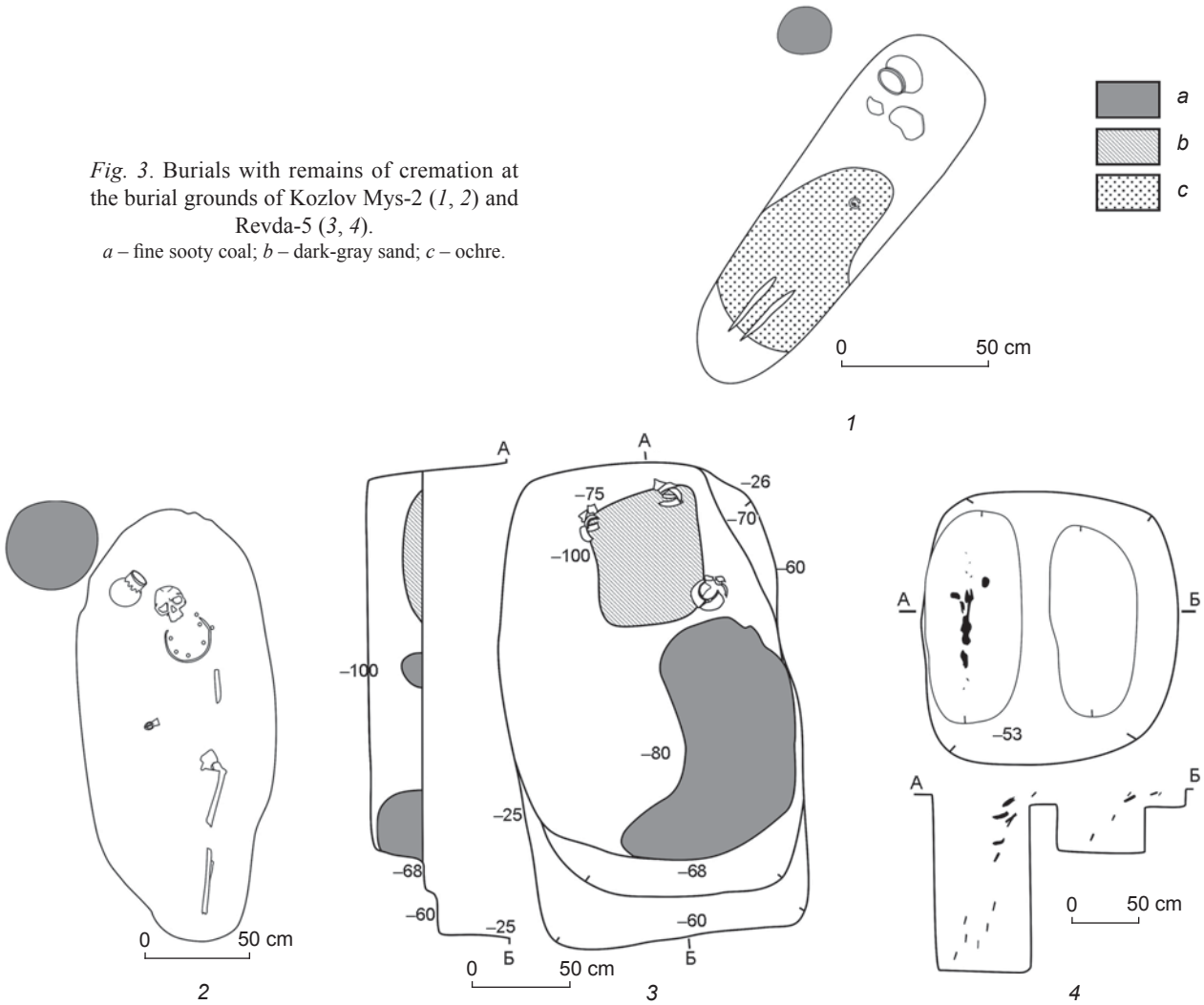

Fig. 3. Burials with remains of cremation at the burial grounds of Kozlov Mys-2 (*1*, *2*) and Revda-5 (*3*, *4*).
a – fine sooty coal; *b* – dark-gray sand; *c* – ochre.

the remains of the fire were collected in a birch-bark box or bag and were placed into the grave before its filling. The emergence of cremation is considered to be a manifestation of foreign ethnic and cultural impact in the Migration Period (Gening, 1959: 182).

Two cenotaphs and two burials with horses have been found in Ustyug-1 (Fig. 4, 5). In contrast to early Turkic traditions, the animal in this case was placed not in the same grave with the rider, but above the grave pit, in a separate recess perpendicular to the longitudinal axis of the human burial. Thus, we may tentatively suggest that this innovation might have been brought by migrants from the Southern Urals or Kazakhstan (Klyashtorny, Savinov, 1994: 63) belonging to the Avar or Bulgarian environment. The arrangement of graves in rows, their northwestern orientation, and the presence of Southwestern Central Asian pottery of the same shapes as metal vessels at the present burial grounds is also similar to the Avar burial grounds in Hungary (Erdély, 1986: 324, 326). The present Western Siberian burials also show some similarities to the Early Bulgarian burial customs, which have been identified at the sites of the Novinki circle, such as, for example, the Netailovka and Krasnogorovka burial grounds (Aksenov, 1995: 11). The parallels include the presence of horse skulls in the mounds, the arrangement of graves in rows, swaddling of corpses, and placement of horses in pits, which were made above human burials (Bagautdinov, Bogachev, Zubov, 1998: 50, 53). Even a distinctive burial with two coffins, placed side-by-side on the bottom of the pit (see Fig. 4), has a planigraphic parallel in burial 2 of mound 13 at the Novinki burial ground (Ibid.: 61).

Interestingly, there were no weapons at all and very few tools in the graves. Some bone arrowheads and a bridle have been found. The largest number of adornments came from children's and adolescents' graves, where adornments might have played the role of amulets and were placed separately in small wooden or birch-bark boxes. The quartzite pebbles, which were placed in a grave at the Kozlov Mys-2, might also have had some symbolic importance.

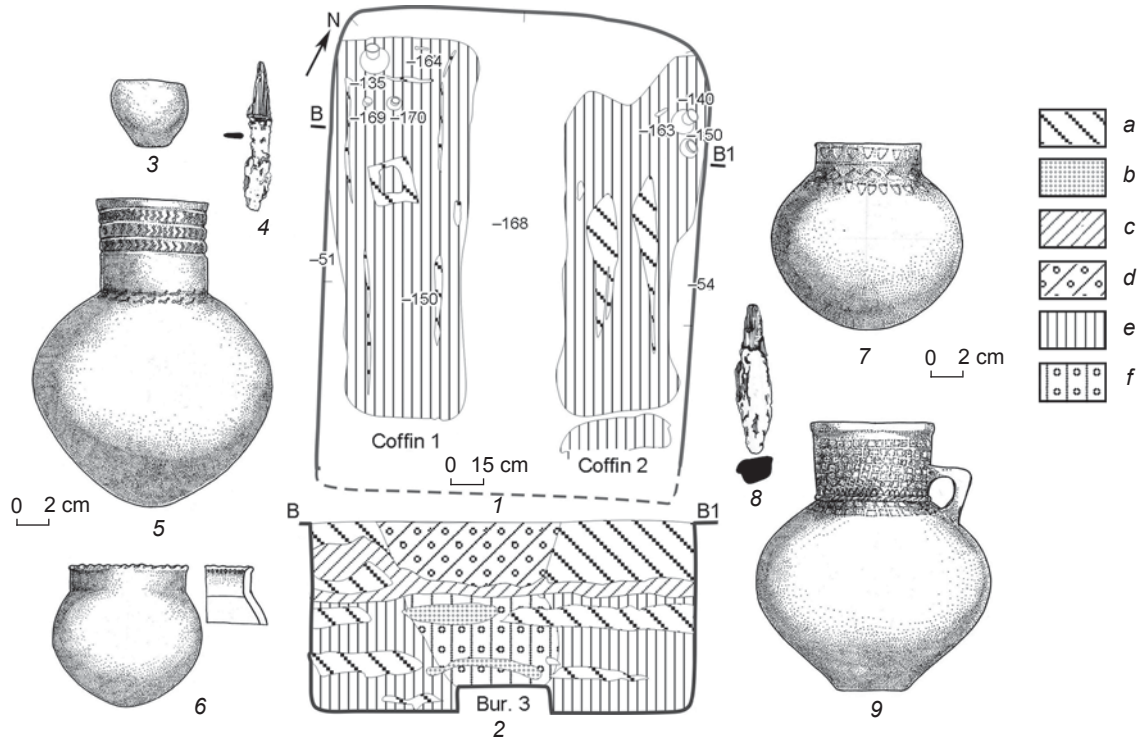

Fig. 4. Cenotaph (*1*, *2*) and items from it (*3–9*). Ustyug-1, mound 35, burial 3.
a – gray sandy loam; *b* – yellow loam, refuse; *c* – dark-gray sandy loam; *d* – dark-gray mixed sand; *e* – brown sand; *f* – light-brown mixed sand.

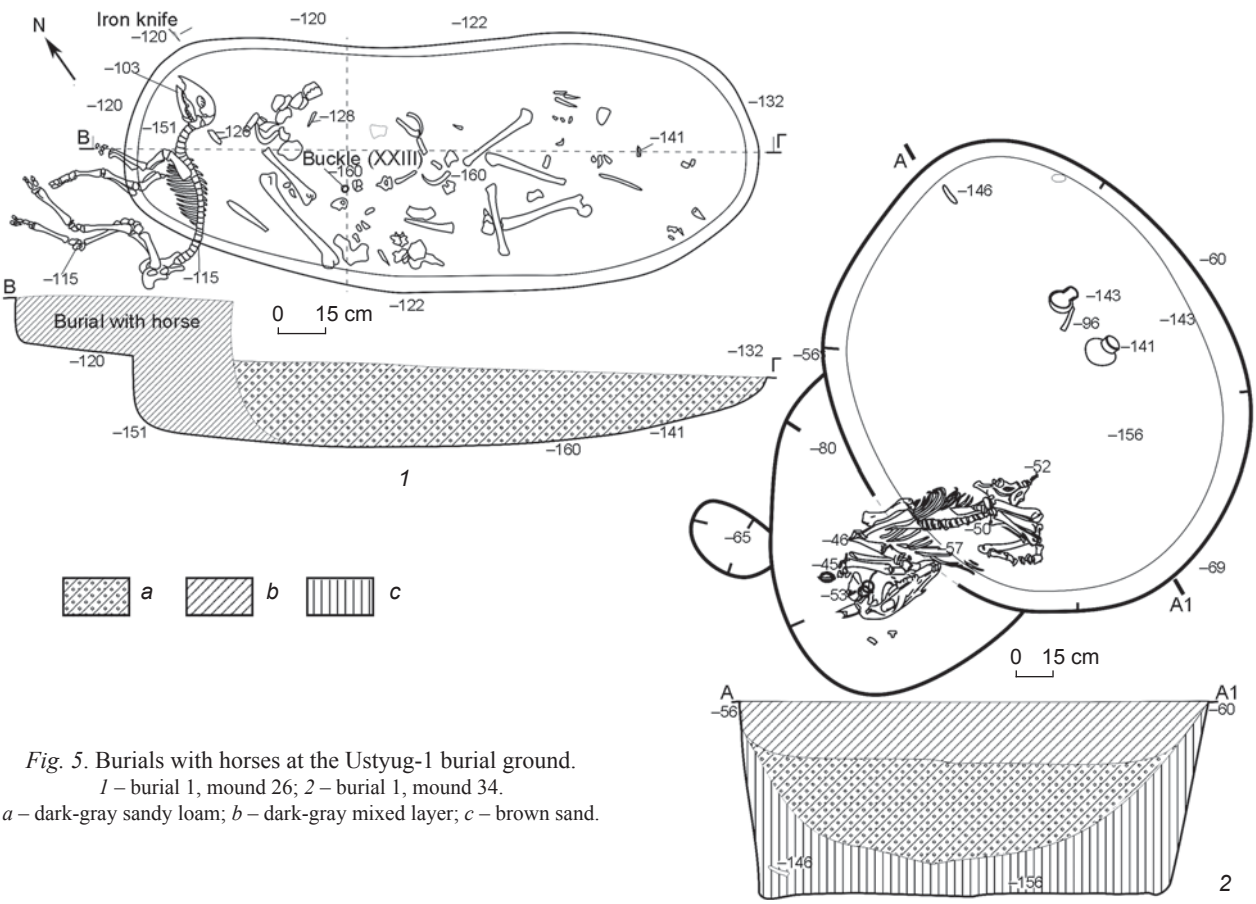

Fig. 5. Burials with horses at the Ustyug-1 burial ground.
1 – burial 1, mound 26; *2* – burial 1, mound 34.
a – dark-gray sandy loam; *b* – dark-gray mixed layer; *c* – brown sand.

At all the burial grounds under consideration, burials do not form any significant groups as far as a specific type of pottery is concerned; diverse types of dishware have been frequently found in a single burial. According to its composition, the Bakal pottery can be considered oversanded, and it is four-partite according to its structural features. Some vessels are polished, but the majority of crude vessels were smoothened with woodchips or the fingers (Fig. 6). Typical decoration motifs include the "herringbone" pattern made with a comb stamp, chased grids, lines composed of pits, pinpoints, pinches, or nail imprints (Matveyeva, Kobeleva, 2013). The Bakal complex exhibits continuity with the Sargat pottery of the Tobol-Irtysh region. This is particularly clear from the materials of the southern taiga burial grounds of Ipkul and Kozlov Mys-2, where objects of Sargat appearance have been discovered. Yet, generally only a part of shapes and decoration motifs were adopted (Matveyeva, 2012c: Fig. 10, *3*, *6*). Some parallels to low pots are found among the main types of Mazunino pottery. However, the composition of clay and decoration significantly differ in the Urals and the Trans-Urals (Ostanina, 1997: 100, tabl. 30, fig. 50).

Pitchers and small thin-walled pots, sometimes with handles, represent the pottery of the "Kushnarenkovo" type. Its clay compound had many ingredients and, in addition to fine sand, contained burnt bone, which made the vessels thin and light. The dishware had a three-partite structure. The vessels were carefully smoothed and burnished. Ornamental decoration was made with a metal ornamenting tool, figured stamp, or teeth of a small predator only on the neck and shoulders with small, dense rows of horizontal lines, zigzags, and grids. On the basis of specific leaners and vessel shapes, as well as ornamenting tools, which do not find parallels in the preceding and synchronous sites of the Tobol-Ishim region, we consider this group of dishware to be imported. However, it includes mugs and pitchers made of oversanded clay without the addition of bone, which might have been made locally as an imitation of the imported pottery.

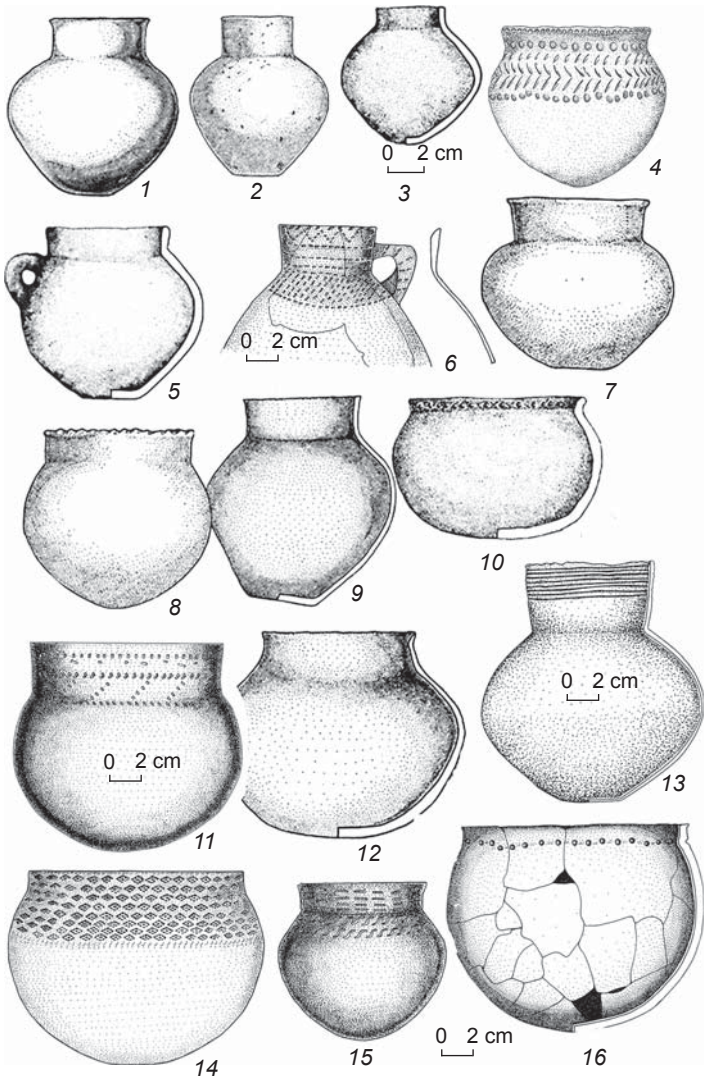

Fig. 6. Pottery from the burial grounds of Ustyug-1 (*1–5*, *7–10*, *12*) and Revda-5 (*6*, *11*, *13–16*).
1–3, *5–7*, *9*, *12*, *13* – "Kushnarenkovo" type; *4*, *8*, *10*, *11*, *15*, *16* – Bakal type; *14* – Karym type.

We can conclude that pitcher-like and bowl-like shapes, borrowed from some southern migrants (such shapes were extremely rare in the Sargat period), had already become a part of the local dishware of the Migration Period, along with the methods of their modeling. In addition, the Sargat technological heritage is manifested in pottery production of the forest-steppe population of the Early Middle Ages. Notably, carriers of the Bakal culture did not adapt figurative stamped motifs. Such decoration is present on the traditional Karym vessels from Revda-5 (Fig. 6, *14*) and Kozlov Mys-2 (Matveyeva, 2012c: 74, fig. 57) dated to the second half of the 4th–early 5th century AD. But in a highly modified form they were only occasionally found in the earlier pottery complex of Ustyug-1 located 100 km to the south. It seems that either there were several taiga Karym migration waves, which could have been short-term, associated with the 4th century, or the migrant population was mostly concentrated on the border between the taiga and the forest-steppe.

The similarity of the sites under consideration with the later Bobrovka mound cemetery on the Irtysh River is noteworthy. The Bobrovka pottery complex contains 16 % of the Bakal vessels along with Potchevash pitchers, wooden bowls, and profiled jars typical of

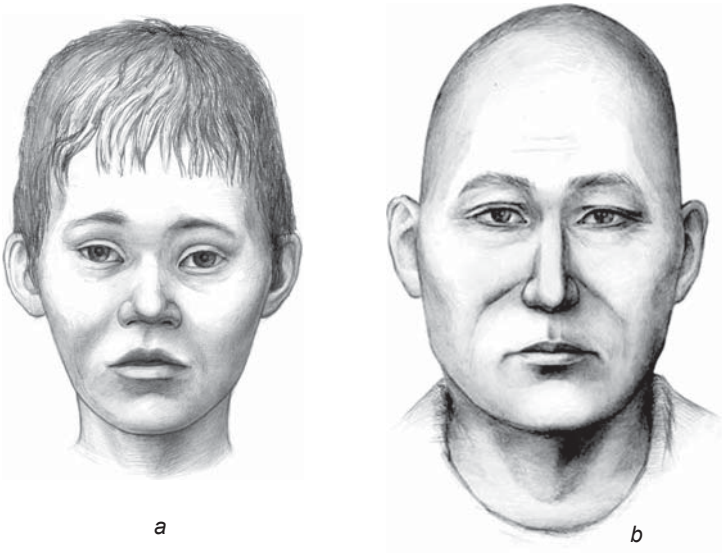

Fig. 7. Reconstruction by E.A. Alekseyeva (2013) of the face on the basis of the skull of a child 8–10 years of age (*a*) and a male 30–40 years of age (*b*) from burial 1, mound 1 at the Ustyug-1 burial ground.

the settled population of Southern Kazakhstan. At the Bobrovka burial ground, like at our sites, corpses were buried in graves, tree trunk coffins, and pieces of felt, but the orientation of the graves was to the south-west. The occurrence of skulls, leg bones, and hooves of horses near the burial pits has been determined, and such sacrificial complexes have also been found in burial mounds with cremation (Arslanova, 1980: 79, 82, 86), which occurs in two versions: as a burial of burnt bones, and as ashy or carbonaceous spots, in thickness similar to those described above. We can also find a parallel to an interesting detail (placement of fur-animal bones into a vessel) at the Bobrovka burial ground: in mound 3, the mandibles of a fox, a ferret, and a saiga were placed in a vessel (Ibid.: 85).

At the Ust-Tara VII burial ground in the Irtysh region, we can see similar sizes of burial mounds and graves, their northerly orientation, the circular deformation of heads of the buried persons, and horse sacrifice (Skandakov, Danchenko, 1999: 167). However, there were ditches made around the mounds, and log fences; dishware was placed not only at the head, but also at the feet of the dead persons; fire was used in a different way: birch-bark and wooden coffins were only partially burned (Danchenko, 2008: 49). Parallel arrangement of burials under the mound and traces of cremation in small pits were found at one of the earliest Potchevash burial grounds of Okunevo-3. It has been suggested that the similarities resulted from the common Sargat substrate in the areas compared (Mogilnikov, 1987: 186–187). In the early group of burials at the Birsk burial ground, which was dated to the 3rd–early 5th centuries AD (Vasyutkin, 1971: 98), the same narrow shallow pits with steep walls also occur; corpses were placed in coffins; the variety of adornments is poor. At the Birsk burial ground, all manners of arranging pottery (at the head, in the filling of the pits, and next to the graves) have been found (Mazhitov, 1968: 12, 22, 25). The accumulation of objects at the head can be compared with the "sacrificial complexes" of things laid next to the buried, typical of the Mazunino culture (Ostanina, 1997: 31).

There are some parallels in the burial practices with the sites of the Hunno-Sarmatian period in the South Ural steppes, although these parallels are quite scant: the meridional orientation and the placement of the head and limbs of the horse at the side of the grave (Botalov, Gutsalov, 2000: 152, 154); these graves have no shaft and chamber burials, stepped burials, nor specific Xiongnu types of grave goods.

An important feature of the population of the Migration Period in the Trans-Urals was deformation of the head, which was carried out using a circular bandage without flat pads. As a result, the forehead would become sloped upwards; the parietal ridge would become prominent, and the entire skull elongated (Fig. 7). This type of deformation can be considered to be Sarmatian; it came to the forest-steppes of Western Siberia from the southwest in the Early Iron Age (Zolotareva, 1957: 250). Anthropologists note the traces of animal bites on a large part of skeletons from the burial grounds of Ustyug-1 and Revda-5, which may indicate the preservation of corpses in the settlements in the winter period (delayed burials), or even the tradition of exhibiting the corpses.

In addition, many of the buried show skull and limb damages from beating; one woman had her spine broken below the sternum; a number of individuals had damages of bone tissue, the loss of teeth occurring during the lifetime, and other consequences of social conflicts and malnutrition. We can find parallels to deformation of the head and a pathological condition of the skeletons, including a number of wounds, at Ust-Tara VII, a site with a Karym appearance; however, at this location females clearly prevail among the buried (Skandakov, Danchenko, 1999: 161–163). The demographic picture indicates multiple outbursts of aggression among the forest-steppe population of that time (Matveyeva, Poshekhonova, 2013).

Conclusions

The materials from the burial grounds of Ustyug-1, Ipkul, Kozlov Mys-2, and Revda-5 show that the burial rite of the emerging Bakal culture combined a few traditions

surviving from the Early Iron Age with innovations caused by the fusion of heterogeneous cultural elements of the migrant groups. Some of the burial practices such as arrangement of the graves in rows or cremation, were later lost. The materials of these burial grounds manifest some common traits with the Karayakupovo, Mazunino, and Kushnarenkovo complexes, indicating the participation of the same groups in the cultural genesis of the Trans-Ural and Ural regions. The forest-steppe heritage was not that significant, and comprised barrow mounds, orientation of corpses to the north, and the use of horses in the ritual. The taiga impact was limited to the arrangement of graves in rows, confinement of burials to headland forms of terrain, and the use of boats as containers for the corpses; the Southwestern Central Asian influence can be seen in new forms of pottery, and the emergence of burials with horses and cremation elements. There is a considerable similarity to the Ural Mazunino and Kharino complexes in terms of grave goods and methods of their placement.

It is difficult to establish the origins of the borrowing, since the situation contributed to rapid changes in cultural stereotypes. When comparing the technological methods of pottery used by the population of the forest-steppe and steppe Trans-Urals, we have found a common element at the sites of Solyony Dol, Druzhnoye, Magnitny, and Ustyug-1: an innovation in producing clay material with the addition of burnt bones, as well as new forms of mugs, pitchers, and vases. This similarity can be explained by the wave of migrants who were coming in the 3rd century AD from a single center, which might have been located at the foothills of the Tian Shan (Matveyeva, Kobeleva, 2014). However, in addition to that migration, several more migrations from the middle and lower basin of the Syr Darya took place in the Southern Urals in the 3rd–4th centuries AD. These migrations were associated with different forms of burial structures and various forms of pottery (pitchers, censers, cauldrons, or frying pans). The reduced influence of the last migration was also manifested in the forest-steppe region in the form of the specific decoration of the Bakal dishware—coarse incising of the rim resulting in a wavy edge (see Fig. 6, *8*).

We cannot yet answer with certainty the question of whether the materials from the burial sites of Ustyug-1, Ipkul, Kozlov Mys-2, and Revda-5 reveal a Xiongnu influence or the early penetration of the Turkic-speaking nomads into the Western Siberian forest-steppe region. Some scholars attribute the appearance of the proto-Bulgars in Eastern Europe to the 3rd–5th centuries AD, already regarding them as a part of the Hun hordes, while other scholars view the proto-Bulgars as the Huns who remained in the Aral Sea region and created new political associations (Bagautdinov, Bogachev, Zubov, 1998: 171; Smagulov, Pavlenko, 1998: 149). Therefore, the penetration of the proto-Bulgars into the Trans-Urals might have been occurring in the period when the burial grounds under study emerged. Based on still scarce data on the burials with horses, we cannot definitively say who exactly, the Avars or the proto-Bulgars, appeared in the Trans-Urals in the 4th–5th centuries AD, but the penetration of the steppe population was undoubtedly taking place. Moreover, the penetration of the units from the post-Hunnic Hephthalite and Kidarite milieu far into the north is probable.

The mass distribution of circular deformation of heads in the Trans-Urals (Matveyeva, Poshekhonova, 2013), as well as the Caucasoid outlook of the population buried in the region (Alekseyeva, 2013), also seem to confirm the conjoint and early appearance of the Hunnic and Turkic elements of culture far into the forest-steppe zone, to the north of the main migration routes of these groups of nomads.

Burial sites from the initial stage of the Medieval period in the western part of Western Siberia are original in their heterogeneity, caused by the brevity of the transition period from the Early Iron Age to the Middle Ages, and by the complexity of resulting cultural formations.

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The Arctic Nomads: Strategies of Mobility*

The research focuses on the Chukotka, Yamal, and Kola peninsulas—the three source areas of Arctic reindeer-herding nomadism. The method of recording movement, termed TMA (tracking–mapping–acting), reveals a multidimensional pattern of nomadic movement with peaks and pauses, personal and social trajectories. The comparison of tracks shows that in contrast to ordinary reindeer-herders, leaders perform more complex and extended maneuvers for surveying vicinities, evaluating the situation, and specifying next steps. Three "close-ups" of leaders demonstrate their dense activity-patterns, covering natural and social environment and ensuring control over territory, reindeer, the nomadic community, external contacts, and threat prevention. In terms of spatial control and movement, herders practice different styles such as "circular" (Chukotka), "migratory" (Yamal), and "fenced" (Kola). In all three tundras, key roles belong to influential leaders whose experience and energy are the backbone of reindeer-herding. In turn, the leaders argue that husbandry is inefficient without authoritarian control, although they widely use social (including kin) ties in their strategies. Nomads and their leaders rely upon traditions, but are open to innovations. Reindeer symbolize the identity of Arctic nomadic cultures, since herding provides autonomy in subsistence, movement, and communication. However, traditional technologies of life-in-motion can be seen as valuable resources for present-day Arctic strategies.

Keywords: *Mobility, nomads, leaders, strategies, movement, Arctic, Chukchi, Nenets, Saami, Izhma-Komi*

Introduction

The nomadic lifestyle is usually associated with extensive animal husbandry, and in the Eurasian Arctic, with reindeer-herding. But pastoralism is not equivalent to nomadism. Not only nomadic hordes and shepherds, but also migratory hunters and warriors, traveling salesmen, craftsmen, artists, and healers were all nomads. Today, they are joined by "neonomads": mobile businessmen, people engaged in transportation and cyber-networks, real and virtual travelers of all kinds.

There is a widespread delusion that nomadism emerged either in the Neolithic, with the advent of agriculture, or in the Mesolithic, through the development of hunting strategy. But in fact, nomadism is a primordial and original state of mankind that made possible its spread throughout the globe. Nomadism is not an "episode" but rather a long-standing phenomenon. There are at least three thematic and chronological "horizons" in studying nomadism: (1) nomadism as an aspect of culture from the most ancient times; (2) the place of nomads in history; (3) nomadic algorithms in modern mobility technologies. In other words, the aim of nomadology is to study not only particular nomadic communities but also the phenomenon of movement in anthropology and history.

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The Arctic is a space where the nomadic tradition still persists strongly. Reindeer-herders (Saami, Nenets, Evenks, Evens, Chukchi, Koryaks), dog-breeders (Eskimo, Yukaghirs), seafarers (Normans, Pomors, Eskimo), horse-breeders (Scandinavians, Russians, Yakuts), foot-sloggers (for instance, in Chukotka, running and fast-walking were nearly objects of a cult) were nomadic in the high latitudes of Eurasia at different times. These mobile cultures were interacting in contact areas: seafarers, reindeer-herders, horse-breeders, and dog-breeders made up a communication network that produced a "circumpolar culture" effect.

Mobility is a key feature of inhabitants of high latitudes, an algorithm of their culture where dynamics dominates over statics. In many Arctic cultures, nomadism was considered wellbeing, and settled life a misfortune. Mastery and control of vast territories have largely shaped the motivation and philosophy of life of hyperboreans. It is not just a metaphor that not small nations, but rather cultures of vast area have always existed in the North. The aim of this article is to define the field of activity of a Northern nomad, who is commonly viewed as a primitive shepherd monotonously watching over his herd.

Field methods of the anthropology of movement

The method of movement-recording, termed TMA (tracking–mapping–acting), is particularly suitable for studying nomadic technologies. It includes three types of documentation: (a) GPS-tracking of movements of a person during a day; (b) mapping the locations of nomads' camps during a year; (c) photo- and video-recording of actions. The GPS movement-tracking, accompanied by a visual background, can vividly convey the "anatomy of mobility". This is a kind of animation of the activity-field that reveals a multidimensional pattern of nomadic movement with peaks and pauses, personal and social trajectories (Golovnev, 2014).

A day-route track on the map is supplemented by the following information: (1) main activity during the day, (2) rhythm and episodes of action, including pauses, (3) tools and equipment, (4) interaction with partners, (5) task-execution and own decisions, (6) terrain, and (7) weather. The actions are fixed via photo- and video-recording, whereby all episodes should be imaged. However, the fullness of such recording depends on the situation and external (e.g. weather), as well as internal (e.g. nomad's mood), circumstances. Ideally, a synchronous tracking of all inhabitants of the camp provides a full picture of the movement/activity of a nomadic group, which permits definition of the general rhythm and the intense episodes of activity, communication nodes, and the role of a leader.

The mapping makes it possible to consider the system of movement at different scales: from a scheme of annual migrations (general view) to the maps of seasonal movement (medium view), and, finally, to the topography of single camps and pastures (close view). The general view shows not only the route of a nomad, but also his contacts with semi-settled trade populations or settled township people. Identification of the mobility pattern of different groups and the type of their contacts (cooperation, competition, conflicts) is crucial for understanding the mobility strategy and motivation.

It is necessary not only to observe the nomadic mobility, but also to take part in it, particularly in critical episodes. Nomads usually look kindly on ethnographic studies of their movement; and, realizing their advantage in mobility, they are keen to share their skills with the researchers.

According to the aims of this study, I present here just a small sample of the collected TMA data: the patterns of activity of three leaders of nomadic groups from the Chukotka, Yamal, and Kola peninsulas, describing them from the East to the West—as the sun goes.

Three tundras

The Chukotka, Yamal, and Kola peninsulas, having a lot in common, but nevertheless display substantial differences in the herding styles and mobility of the Chukchi, Nenets, Saami, and the Izhma-Komi. In each of the tundras, reindeer-herding developed independently, on the basis of local hunting traditions; although the circumpolar contacts have always provided for the exchange of nomadic technologies (e.g. during the expansions of Ymyyakhtakh culture, "stone" Samoyedic peoples, "stone" Chukchi, and the Izhma-Komi).

Unmounted and harnessed grazing of large herds is typical of the mountain and costal tundras of Chukotka. In the 20th century, it was supplemented with cross-country vehicles. Here, the horizontal (tundra-sea) and vertical (mountain-valley) migrations are combined. In summer, winds of coastal and mountain tundras give protection from biting flies, while in winter, lowlands and valleys covered with forest provide fuel and protection from cold winds. The annual migratory cycle of herders is circular (Fig. 1), and the pastures of Chukotka are divided into "nomadic circles" belonging to different brigades. The area of such a circle is approximately 5–6 thousand km^2, with a radius of 40–60 km. A herder, moving on foot or on a reindeer sled, is able to cross it in any direction in one or two days (the Chukchi consider a walk of 40 km per day to be average for a man). Thus, the whole circle is under control of the nomad. Such cyclic localization of the pastures enables reindeer to graze freely, only occasionally controlled. The herd is gathered together in autumn.

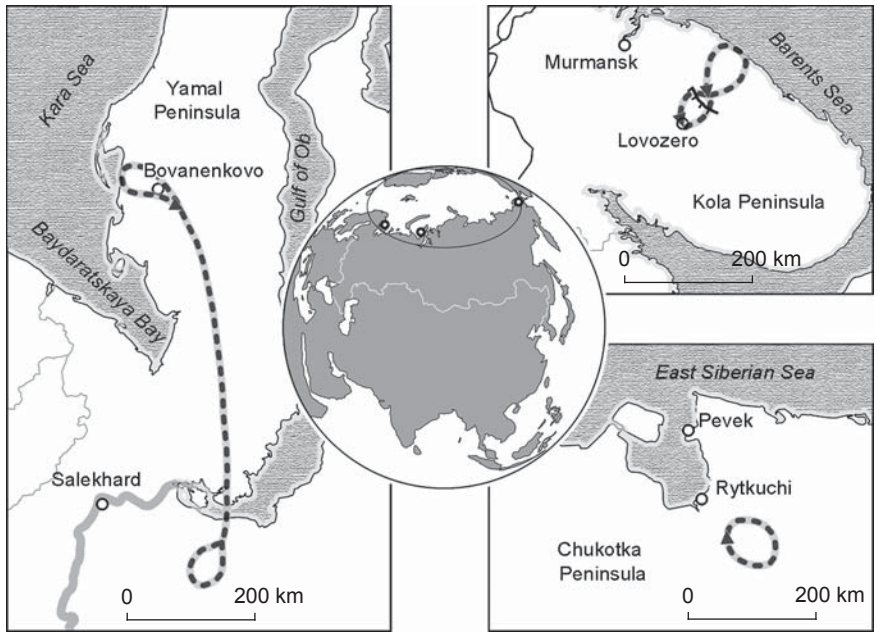

Fig. 1. Migrations of reindeer-herders of Yamal (4th brigade), Kola Peninsula ("left wing"), Chukotka (3rd brigade) (shown by dotted line).

The vast lowland tundra of Yamal, spanning 700 km from forest to seaside, sets a seasonal pace for meridional migrations of reindeer-herders. The migrations are up to 1500 km in length, and large herds are watched over perennially using reindeer-sleds pulled by special dogs. Such large-scale migrations are stimulated by the need for firewood, protection from winds in winter, and the search for northern coastal pastures in summer when the rest of tundra is covered with swarms of mosquitoes and gadflies (a comfortable summer tundra is called a "herder's paradise"). The migrations between summer and winter pastures go through the "Yamal ridge" (Khoy), an elevated watershed between the Baydaratskaya and Ob flows (Fig. 1). In spring and autumn, it is almost completely covered with reindeer herds moving to summer or winter pastures (the main flow via the ridge makes more than a half of the total migration). Northern and southern phases of annual migration are greatly divided by this mainline: the Nenets traditionally consider summer (*soon*) and winter (*tal*) to be two different years.

The Kola tundra looks like a narrow strip (about 100 km wide) between forest and sea. Here, the Saami have long practiced the grazing of small herds (up to several dozen reindeer) with short migrations; for transportation they used sleigh (*kerezhki*) and pack saddle. This so-called "cottage herding" comprised the milking of does, free summer grazing, and gathering of herds using herding-dogs. In the 1880s, the migrant Izhma-Komi introduced to the peninsula commercial breeding of large herds with perennial grazing, large-scale autumn slaughtering of reindeer, hiring of shepherd-workers (including Saami), and commercial manufacture of various goods (e.g. suede or fur clothes). In the 1970s, the Kola reindeer-herders got back to free summer grazing (Fig. 1), and a solid fence (*ogorod*) was built at the border between tundra and forest,, in order to control seasonal migrations of the reindeer. Along the fence, cottages and wooden corrals were built. The herding became "cottage", and "nomadizing" became rotational, with people going away for shifts and later returning to settlements (Lovozero, Krasnoshchelye). As a herder V.K. Filippov from Lovozero says, comparing Kola and Yamal traditions, "In the big [Yamal] tundra, fences do not make sense; the routes are narrow, about a thousand kilometers each. Let the herd go, as we do, and it will mix with the neighboring herd, and will be eaten. But here it is comfortable for us, particularly with such a small number of herders".

The social adaptation of reindeer-herders is no less important than the ecological. The 16th–18th centuries were the time of a "reindeer-herding revolution", which rolled from the West to the East of the Eurasian tundras as a response to Scandinavian and Russian colonization of the North. The mass migrations of the northern nomads were accompanied by strife for reindeer herds and by settling in the most remote tundras. Even today, the success of herding depends not only on the availability of pastures but on human resources as well. The three Eurasian tundras are almost equal in terms of their herding potential: in Chukotka, Yamal, and Fennoscandia (including the Scandinavian and Kola tundras), the population of domestic reindeer

approximates 500 thousand head. The reaction of the reindeer-herding societies to social change is particularly evident when comparing Yamal and Chukotka, the world leaders of reindeer-herding in Soviet era. In 1990, the numbers of reindeer in the Yamal-Nenets and Chukotka autonomous okrugs were equal: 490 and 491 thousand head, respectively. But the post-Soviet crisis had different effects in Yamal and Chukotka: by 1995, the reindeer population of the Nenets has grown to 508 thousand, while that in Chukotka had decreased to 236 thousand head. Today, there are about 600 thousand domestic reindeer in Yamal and about 200 in Chukotka (in total, there are ca 1.8 million domestic reindeer in the world). Each tundra suffers from its own crisis: in Yamal there is an overproduction of reindeer, while in Chukotka there is a catastrophic fall of production. The stability of herding in Yamal and vulnerability in that in Chukotka largely depend on the sociocultural situation in both regions: persistence of private herds in Yamal and their total collectivization in Chukotka. Furthermore, the decrease in the reindeer population in Chukotka coincided, both in terms of scale and time, with a massive (up to 2/3) post-Soviet departure of non-native people, mainly qualified specialists. In contrast, the social and demographic structure of the Yamal population was preserved. Following a formerly popular logic of the conflict of interests between indigenous population and newcomers, it might be expected that the leaving of the latter would open new avenues for the traditional economy, particularly for reindeer-herding, demanding a space for pastures. But in fact we see the opposite situation: the crush of the social environment, which Chukotka's culture has been adapting to for decades, has plunged the region into a systemic crisis, an ambience of chaos and marauding. Yamal has become the sole leader in world reindeer-herding, three times surpassing Chukotka.

Our results confirm the idea that human (and ethnocultural) potential is the main driver of reindeer-herding and nomadism. Three centers of reindeer-herding in the three tundras were chosen for observation: the Chaun tundra of Chukotka (ca 100 herders and 22 thousand reindeer), the northwestern tundra of Yamal lying between Kharasavey and Mordy-Yakha (ca 90 herders and 23 thousand reindeer), and the Lovozero tundra of the Kola Peninsula (ca 50 herders and 25 thousand reindeer). In all three tundras, key roles belong to influential leaders whose experience and energy (according to the local people's belief) are the backbone of reindeer-herding. Thus, their activity patterns are of principal interest for studying modern Arctic nomadism.

Andrei Antylin (Chukotka Peninsula) had many times to start from scratch and raise a herd (Fig. 2, 3). Fifteen years ago, he was persuaded to leave the successful 3rd brigade with 6 thousand reindeer, and to lead the distressed 1st brigade. Over five years (1999–2004), he managed to increase the number of reindeer from 800 to 5 thousand head. Meanwhile, the herd of the 3rd brigade has almost disappeared. Asked by his elder brother Vukvukay, Andrei went back and restored the herd to 6 thousand head. Only 3 out of 12 brigades of the Chaun tundra exist today; among them, one is led by Vukvukay (12 thousand reindeer) and another, by Andrei Antylin (6 thousand reindeer). Both brothers are strong enough, despite their

Fig. 2. Andrei Fedotovich Antylin, aged 73. Mentor of the 3rd reindeer-herding brigade of the "Chaunskoye" agricultural enterprise. Nick name: the Elder.

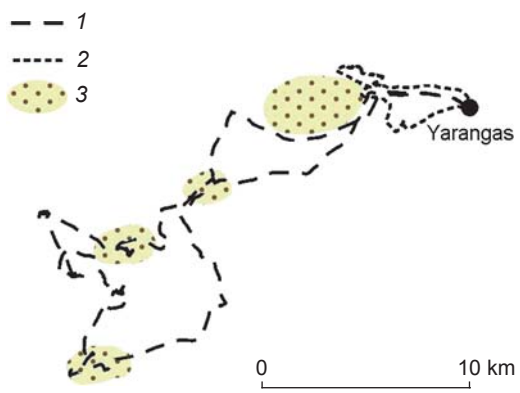

Fig. 3. Tracks of the mentor (*1*) and the shepherd (*2*) (Chukotka).
1 – Andrei Antylin, cross-country vehicle, 90 km;
2 – Grygory Pavlyukov, unmounted, 26 km; *3* – reindeer.

venerable age: Vukvukay still wins races, although over 80. Having formally passed foremanship to their sons and being just mentors today, both actually still rule their brigades. The Chukchi consider them the leading herders of the Chaun tundra.

In Vukvukay's camp, the old customs dominate and the old rites are performed; while in his brother's camp, the sacred dolls *taynykut* are left in only one yaranga. Andrei Antylin was the first in the Chaun tundra to drive a "Buran", buy a computer, and master a quad bike. Vukvukay relies upon the old, and Andrei is brave in admitting the novelty; in the Vukvukay's camp, the Chukchi language is spoken, and in the camp of his brother, mostly Russian. At his own risk, he mixes the Chukchi customs and new technologies.

Like many herders in Chukotka, Andrei Antylin has a "reindeer thinking", which is reflected, for example, in the names of months: *gro-jyligyn*—calving (April), *netgyligyn*—the skin peels from horns (August), *ejnejgylgyn*—rut (September), *chachal-jilgyn*—hair on the snouts of fawns in the womb (February), *l'orgyka-jilgyn*—the head with hair of the fawns in the womb (March). Antylin characterizes people as if they were reindeer: "mushrooms-eater"—a lover of mushrooms (pleasures), who forgets everything for this; "urine-eater"—a person who likes human urine, who easily lets other people to take control of him (a definition of submissive people). He has strictly scolded a young herder who hit a reindeer and gouged out its eye. But when an aggressive reindeer, tied up behind his sled, was butting him, Antylin did not lash it, but instead reasoned with the reindeer: "Why are you butting me, after all, I cannot butt you, I do not have horns". His perception of weather is also related to the care of reindeer: if it is warm, there will be gadflies whom reindeer dread more than wolves; if there is fog, reindeer will scatter and may be killed by wolves. The state of the does before calving attracts Antylin's greatest sympathy: "The fetus is moving inside the doe, and so the doe moves fast". Having noticed the crows, he says, "These now imagine how they will be pecking the fawn's eyes".

Wild reindeer ("savages") are perceived by Andrei Antylin from the point of view of the keeper of the herd. He points out such merits in "metis" (offspring of wild and domestic reindeer) as strength, beauty, ease of running, and the ability to lead the herd through good pastures. That is why he does not drive a stray wild male away from the domestic herd: "Let him walk, he is going to produce good reindeers for us". Antylin keeps an ancient Chukchi custom noted by V.G. Bogoraz (1991: 10–11) long ago: herders attract the savages to the herd and value their offspring for quickness in the sled team, and for their ability to attract wild reindeer during hunting. But he knows very well that when rut begins, the savages can split domestic herds and lure away its parts (in 2008, the savages lured away the whole herd of the 1st brigade). Domestic reindeer easily succumb to the beautiful savages, follow them, and do not obey the herders. Thus, the savages become a threat for Antylin in the time of gathering the herd in autumn: "The savage must be killed, so he does not muddle the herd"; "wild must be wild, and reindeers must be in the herd". According to Antylin, people today have gotten weaker, and wild reindeer have gotten stronger, "Masters have died out, and the savages have thrived".

The gathering of the breakaway parts of the herd in late summer is a complicated set of actions by a search team comprising a cross-country vehicle and herders, some of whom (herders-keepers) watch over the main herd, while others (herders-searchers) drive the breakaway parts to the herd. The work is complicated by movements of the main herd, which can at any time break apart owing to fog, wolf- or bear-attacks, or inefficient guarding; or because of the interest of the reindeer in mushrooms. The parts grazing on mountain-slopes have to be "pushed" from different sides and with a certain amount of effort towards a convenient valley so that it will be possible to gather them later with one maneuver on a cross-country vehicle.

The parts of the herd led by the savages are particularly difficult to control. As a cross-country vehicle is following a part running away, its appearance and roaring make the savages shoot ahead, while domestic reindeer lag behind. At this moment, it is necessary to drive a wedge between the wild and domestic animals, and divide them by shouts and frightening gestures. If this doesn't succeed, then a carbine comes to play, and the savage falls victim to his own beauty and strength.

The gathering of the parts of the herd is reminiscent of military activities in terms of exertion. Andrei Antylin controls the whole chain of these parallel and sequential actions designed to push the herd to yarangas, join the parts, and assign other herders to be the keepers, the searchers, and the drivers. He also controls the movement of the cross-country vehicle, the quad bike, and the savages—as well as the camp life with its women's affairs. All the participants of the race follow his directives blindly, and he is the Elder who makes the herders act as a team. The finale of this long and versatile activity is the *einetkun*—"young reindeer's fest", which is not bound to any particular date but is celebrated upon the successful gathering of reindeer. The *einetkun* is a kind of "victory day" for herders.

Besides herding, Antylin controls the "social front" where he struggles with alcohol sellers (who are poachers as well) and with the recently appointed Director of "Chaunskoye" agricultural enterprise. The alcohol sellers are the worst enemies of the Elder: they "have killed the elder son", "have finished the nephew", and they "are getting to Ivan [the younger son]". Antylin does not like

fests, and he is afraid of the guests from the village. He believes that the vices of settled life kill the tundra youth and take away the future of the Chukchi. In September 2013, the Elder found the alcohol-sellers at his brigade and alone entered into an unequal battle, shot out the tires of their car with his carbine, and called the police by a satellite phone. But the police officers gave their own interpretation to Antylin's actions when he caught the sellers in the act: they confiscated the Elder's carbine and charged him with "intentional damage to property… in a socially dangerous way". The investigation has lasted for 1.5 years, and many of Antylin's tribesmen did not share his tenacity in the struggle with the "mafia". Only in April 2015 was his carbine returned to him, and the case seemingly closed.

The conflict between Antylin and the Director of "Chaunskoye" agricultural enterprise has lasted for two years (as of the end of 2015). If Antylin is talking about somebody but does not mention his name—does not even use a pronoun—that means he is talking about the Director, who annoys him no less than the savages and poachers. The Elder realizes that the Director is supported by a mighty corporation, and it is a big risk to be at odds with it. But Antylin is inexorable: he feels responsible for the fate of the Chukchi (both nomadic and settled). And so, he insists that the enterprise move back from Pevek city to Rytkuchi village, and he claims attention and respect for the herders. The competition with the Director additionally mobilizes Antylin. The 73-year-old Elder controls the space of tundra surrounded by a complicated network of natural and social factors: from seasonal migrations and watching over reindeer to saving his tribesmen from the poachers, alcohol-sellers, and harmful (from his point of view) managers.

Nyadma Khudi (Yamal Peninsula) confesses the Nenets creed: the reindeer-herder feels good if his reindeer feel good (Fig. 4, 5). Like Antylin, he has a "reindeer sense": watching around a pasture during migration, he says gladly how good reindeer "will be eating" here. Sometimes, Nyadma sincerely condoles: "Reindeer cry when they feel bad, when they are beaten, when they are castrated inappropriately". He perfectly understands what hardships fall on reindeer in hot weather, when they are overwhelmed by mosquitoes and gadflies, when the thread of "foot rot" (necrobacillosis) and "cough" (cephenomyosis) infections is rising. Having noticed the disease, a brigade-leader immediately drives the sick animals to the tail of the herd, or sends the "sick part" to a separate pasture with a shepherd. The brigade-leader watches not only over the herd, but also over the neighborhood in order to decide what to do next. That is why his track is longer than a track of a common shepherd.

The skill of the reindeer-herding Nenets is in maneuvering with the herd in a "sea of reindeer". The navigation between numerous herds—especially in the stream of mass migration through the ridge of Yamal—requires being able to avoid encounters with other herds, but at the same time not lagging behind them (a latecomer goes through devastated pastures). But successful maneuvers would be impossible without the support of kin and the goodwill of the neighbors. In family and

Fig. 4. Nyadma Nyudelevich Khudi, aged 56. Brigade-leader of the 4th brigade of the "Yarsalinskoye" reindeer-herding enterprise, the honorary reindeer-herder of Yamal (since 2011). Nickname: Tartsavey (the Beard).

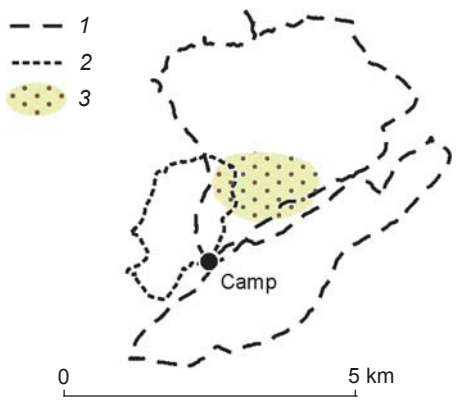

Fig. 5. Tracks of the brigade-leader (*1*) and the shepherd (*2*) (Yamal).
1 – Nyadma Khudi, reindeer sled, 31 km; *2* – Alexandr Khudi, reindeer sled, 12 km; *3* – reindeer.

between-kin relationships, the herder must be as skilled as in using lasso or ruling a reindeer-sled.

As the herders say, the tundra migrations resemble a game of chess. This similarity is further strengthened by the traffic rule of the Nenets: "We nomadize checkerwise so as not to mix reindeer". Each "player" leads his *argish* (caravan) via the ridge of Yamal, trying to leave neighbors behind and be the first at the best pasture. But always moving ahead of the curve is not allowed; thus, the nomadic leader sometimes surrenders the initiative to a neighbor so as to have a reason to make a crucially important move to outrun at the right time (for instance, at the entrance to calving pastures). The tradition says that herds of different brigades shall alternate with each other in the vanguard.

The routes of herders over the land are depicted on maps as lines; but in fact they more resemble a lacework. According to the track records of Yamal reindeer-herders, they graze the herd in a 5 km circle around their camp, driving reindeer round this circle from section to section following the sun. Then, the brigade moves to another place, some 10 km from the previous one, and repeats the circular grazing. The line depicting the movement of the herd in such a sequence resembles the petals of a flower. However, any herd may encounter another herd circling in the same way, which can have fatal consequences, up to the complete loss of reindeer. This occurs mostly because of fog, but also as a result of a blizzard, an ice-slick, a wolf-attack, or a mistake on the part of the shepherd.

For the Nenets, the authority of a herder depends entirely on his skill in "herd navigation", and the words *erv* (chief) and *teta* (having a lot of reindeer) are almost synonymous. The reindeer herd is not only the basis of subsistence, but also a tool of spatial strategy; that is, in a nomadic tactic, "pressure of a big herd". A herd of many thousands of reindeer is the main figure on the nomadic "chessboard". It moves faster than smaller herds, and its "flywheel" covers huge territories. If a big herd "covers" reindeer of a small sluggish herder, this latter will have either to laboriously catch his reindeer in the huge herd of his neighbor (which is impossible on his own), or to follow it submissively. Sometimes the return of the lost reindeer occurs only at the winter corral (a control paddock used for counting and sorting of herds) in the southern tundra. Not every small herder is able to take this chance, as he moves substantially slower than a big herder or a brigade. If the small herder cannot catch his reindeer before winter, then, by the law of tundra, they can be used by their new owner at his own discretion (Golovnev et al., 2014: 32–50).

In August 2013, a part of the herd of a private herder Petr Serotetto (nicknamed Tarzan) mixed with the five-thousand-herd of the 4th brigade. The brigade-leader Nyadma found before himself a tough choice. On the one hand, it was an opportunity to give a good lesson to an intrusive neighbor; but on the other hand, Nyadma knew that Serotetto was famous for his independent character and an astounding (even supernatural according to gossip) luck in herding: during four years, his herd had increased from 70 to 800 heads; "all his youths live, and one-year old does spawn". He grazed his reindeer with just one chum, maneuvering among numerous herds. This inspired the respect of some and the sympathy of others. Finally, Serotetto belonged to one of the most numerous clans of the western Yamal. There is a rule in the Nenets tradition for family-neighbor relationships: your attitude towards others is the same as their attitude towards you. So, the brigade-leader had taken a decision, complying with the tundra ethics: the whole brigade was helping Tarzan to catch his reindeer.

The 4th brigade resembles an extended family, in which Nyadma is not only a herding-leader, but also a father and an elder brother to most men. He always leads the caravan, and he is the first to place his chum at the camp. His younger brother Evgeny closes the caravan and the row of chums from the opposite side. Decisions are made in the same manner: the brigade-leader starts a discussion, his brother supports him, and then the brigade-leader takes the final decision. Such a patriarchal style of leadership is still the norm for the nomadic Nenets. Using kin relationships, Nyadma also influences the neighboring 8th brigade, where his mother lives. She plays a role of a "grand mother" (*narka nebya*) for the members of both brigades.

The difficulties of nomadic life are further worsened by the expansion of the oil and gas industry. The route of the 4th brigade has been blocked by a huge industrial base of the Bovanenkovo oil and gas condensate field. Several years ago Nyadma had to decide: should he give up reindeer-herding, or keep on working taking into account the "Bovanenkovo factor", as there is no other route to coastal pastures. And he dared the risky experiment of running reindeer through the industrial "jungle": for three days, the herders had to drive five thousand reindeer through a narrow corridor, which was marked on concrete roads by traffic signs "Reindeer". They faced a lot of troubles, including crossing the roadway, moving under pipelines, and lodging for the night by arrangement with chums among industrial structures. Today, this compelled innovation becomes a tradition: migrating over the area of commercial development of the Bovanenkovo field has turned to a show performed by the 4th and 8th brigades twice a summer. The herders, reindeer, workers of the industrial base, and guests that include TV crews from various countries—all take part in the show. The herders, demonstrating a masterful control of the herd, find a kind of drive of extreme experience in front of hundreds of spectators in this "polar encierro" (the Spanish tradition

of running of the bulls through the city streets). It seems that now the Nyadma's title "honorary reindeer-herder of Yamal" implies some new competencies.

Vladimir Filippov (Kola Peninsula) is not as immersed in the "reindeer thinking" as his colleagues from Chukotka and Yamal (Fig. 6, 7). For him, reindeer are just an object of commercial production. He follows in the footsteps of his ancestors, the Izhma-Komi, who were able in the 19th century to create something unbelievable: "reindeer-herding capitalism", with hired tundra proletarians, the cycle of processing and selling the products (including the Zyryan suede), and perception of reindeer as a capital asset. As a result of the expansion of this "economic miracle of tundra", the Izhma-Komi reached the Kola Peninsula in 1880s.

Fig. 6. Vladimir Konstantinovich Filippov, aged 55. The Head of the reindeer-herding plant of the "Tundra" agricultural enterprise (Lovozero). Komi-Ukrainian by birth. Nickname: Waldemar.

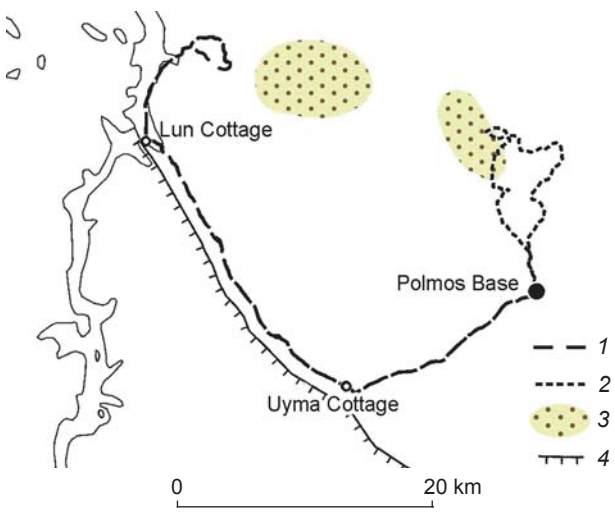

Fig. 7. Tracks of the head of the plant (*1*) and of the shepherd (*2*) (Kola Peninsula).
1 – Vladimir Filippov, snowmobile, 116 km; *2* – Andrei Sorvanov, snowmobile, 39 km; *3* – reindeer; *4* – fence.

Since his youth, Filippov has been a witness and participant of the renaissance of "tundra capitalism" and the subsequent "snowmobile revolution" (stimulated by the proximity of the industrial zone) from 1980 to the 1990s. Today, he plays the role of a captain of the reindeer business (see Fig. 6). Being the head of the reindeer plant of the whole cooperative and, at the same time, the chief of its "left wing" (which includes three brigades with a total of 7–8 thousand reindeer), he connects, by his control, the Lovozero settlement with the Polmos corral base, and the reindeer-herding brigades. He personally keeps count of reindeer at the corral, and coordinates the interaction between the left and the right wings (the latter also includes three brigades). He is aware of everything related to the shepherds, herds, equipment, fuel, and complex of buildings and structures. His frequent and unexpected visits create the effect of an all-seeing eye. Filippov does not graze reindeer himself, but he leads the shepherds.

The head of the reindeer plant is responsible for the whole reindeer-herding cycle, which includes spring calving, summer feeding, autumn gathering, December corral, wintering, and, finally, selling the products. The corral is the center of the Kola reindeer-herding today: the place and time of examination, sorting, and utilization of the herd. By December, reindeer are directed to the Polmos corral where calculations are made, the animal-yield is distributed, and a "slaughter part" is identified. The latter is driven to Lovozero, to the slaughterhouse, and includes handsome white reindeer which are sold to "Fathers Christmas" before the New Year. The rest of the herd is sent to wintering grounds (December to March). By the end of wintering, the animals are driven to the corral again, where the bulls are castrated, and the pregnant does are aggregated in a separate herd (*nyalovka*). In June, a "light corral" (*tandara*) is made up, where reindeer are branded. Then they let the whole herd, excluding rideable bulls, go for grazing to the coastal tundras.

The reindeer-herding production implies a strict discipline and division of workers into several groups: brigade-leaders, "seamen" (experienced herders who gather reindeer in the rocky coastal tundra), common shepherds, "gardeners" (those who "sit" in cottages and look over a 10 km sector of the fence), "chum workwomen", and corral workers. These temporary groups are formed by the head of the "left wing".

Each group has its own mobility pattern: the track of a "gardener" is short and monotonous, the track of a "seaman" intricate and variable.

Not long ago, shepherds with loaded bulls went in summer to the seaside to fish and watch over the herd. Today, such summer trips are less usual, and are made without rideable reindeer. Near the sea, the herders stay overnight at the recently established hostels.

The important changes in reindeer-herding and mobility were brought about by the "snowmobile revolution" (Istomin, 2015). In the Kola Peninsula, the snowmobiles have replaced the Izhma sleds, Saami packs, and herding dogs, and have become the main helper in watching over the reindeer. Only in May, and just for one month, the shepherds change to sleds; but soon a quad bike may supersede the reindeer sleds (now, only Filippov drives a quad bike). This equipment has made it possible to halve the number of people in brigades, and replace the permanent pasturing of the herds by periodic watch-keeping. All these innovations alienate the shepherd from the herd, and for him the nomad camp is not associated with home anymore. Today the herder is much like a rotational worker who visits the herd for a couple of weeks. The herders' children know reindeer mostly as venison.

Filippov is interested in personnel for herding. He believes that the herder is motivated not by a regular salary (ca 15–20 thousand rubles per month), but rather by the income from slaughtering his private livestock. The head of the reindeer plant controls its replenishment by distributing the animal yield at the corral. According to the existing standard, a shepherd can have up to a hundred private reindeer, grazing together with the main herd, and he takes a half of their litter. The shepherd's profession remains ancestral: a family tradition and a vocation. According to Filippov, "there must be domesticity, there must be private reindeer, there must be a connection with the herd; no connection—no work".

He is particularly concerned with poachers (who are also called "bracks"). In 1990s, it was common to see the following scene: a killed reindeer is pulled on one horn by a shepherd, and on another by a "brack", and they are arguing about whom the reindeer actually belongs to. The pastures remote from Lovozero (between Murmansk and Tumanny) were lost for herding because of an invasion of "bracks". The turning-point was reached 15 years ago, when a special forces troop called "Rys" helped the herders. In the winter tundra, a team of soldiers and herders on six snowmobiles captured three bands of "bracks" in the act. After this raid by "Rys", and for the next five years, the "bracks" had a dread of herders. The herders began to wear black masks, so that the "bracks" thought that they were being pursued by the special forces troop again. "This is the only way to stop bracks, and fines are just bullshit", Filippov says.

Filippov bravely moves towards modernization and centralization of reindeer-herding. Earlier, each brigade of the "left wing" grazed its own herd, and had its own base and corral. Filippov has merged the herds of three brigades into one, transformed their bases into transit guest cottages (stops), and turned the corral at Polmos into a paddock complex of high throughput capacity. A settlement with houses for the brigades and their guests, canteens, bath-house, toilets, LED-lightning, and a wind farm is rapidly growing nearby the corral. People call this settlement Filippovka.

Filippov is a herder-businessman. Supported by his three adult sons, he controls all the reindeer-herding of Lovozero; and even the Director of the "Tundra" agricultural enterprise does not interfere with his activities. Sometimes, his carefulness seems excessive: for instance, being a zealous advocate of cleanliness, he picks up garbage near the houses himself. The reindeer plant headed by him is the only profitable plant in the "Tundra" cooperative.

Conclusions

Where do people with a strategic talent appear from in the tundra? On the one hand, this is the influence of the northern tradition, affirming people to be the rulers of their own fate; on the other hand, the strategic talents develop together with the responsibility taken on by the leaders. However, the leaders described above are not lonely heroes: their power is supported by the strong kin relationships without which nomadic strategies do not work.

One of the basic values of the nomads is independence. The Chukchi, Nenets, and Saami graze reindeer in different ways, but they all consider reindeer-herding the kernel of their economy, and reindeer a symbol of their independence (for the Izhma-Komi it is a commercial project as well). The herding makes them independent in terms of transport, economy, social life, and worldview. And this independence, in turn, creates conditions for the distinctiveness of any culture relying on nomadic reindeer-herding as a subsistence strategy.

The spatial technologies of Eurasian Arctic are diverse: the "circular" style of the spatial control is typical of Chukotka, "migratory" of Yamal, and "fenced" of Kola. But all these practices are complex sets of actions directed by herding leaders. The leaders believe that herding is impossible without authoritarian control.

The spatial control has two dimensions: natural and social. The former includes control over territory and reindeer; the latter, control over the nomadic community, external contacts, and conflicts.

The three examples (Chukotka, Yamal, and Kola) are illustrative in terms of their adaptability. Relying upon

traditions, the nomadic leaders are nevertheless open to innovations, which expands the range of their activities and responsibility. The balance between traditions and innovations, which is regulated by the leaders, is of crucial importance in the context of the "technological revolution".

Mobility, including nomadism, has always been and still is the basic principle of development of the Russian Arctic. The topic of the contrast between the values of nomadism and sedentariness, nomadic camps and settlements, is pivotal for the Arctic. Many of technological innovations, particularly those related to transportation and navigation, do not destroy but rather develop the nomadic culture. And many traditional technologies of the life-in-motion can be seen as valuable resources for the development of present-day Arctic strategies.

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A Genetic Analysis of Human Remains from the Bronze Age (2nd Millennium BC) Cemetery Bertek-56 in the Altai Mountains*

Bone samples from two individuals (an adult and a child) buried at a Middle Bronze Age cemetery Bertek-56 on the Ukok Plateau, Altai, were subjected to a genetic analysis. The results are interpreted with reference to archaeological and paleoanthropological data. Four systems of genetic markers were analyzed: mitochondrial DNA, the polymorphic part of the amelogenin gene, autosomal STR-loci, and STR-loci of the Y-chromosome. Complete information on these genetic markers was obtained for the adult individual. For the child, data on mitochondrial DNA, the amelogenin gene, and partial profiles of autosomal and Y-chromosomal STR-loci are available. The individuals were shown to be unrelated, and both were male. The boy's mitochondrial DNA belongs to the Western Eurasian haplogroup K (subgroup K1a24a), and that of the man, to the Eastern Eurasian haplogroup C. Using a predictor program, the Y-chromosomal haplotype of the adult individual (17 Y-chromosomal STR-loci) was identified as Eastern Eurasian haplogroup Q. Phylogenetic and phylogeographic analysis of the results suggests that the Bertek population originated from an admixture of two genetically contrasting groups: one with Eastern Eurasian, the other with Western Eurasian features. These results are consistent with those of the archaeological and paleoanthropological analysis indicating the admixture of autochthonous groups with immigrants from Western Eurasia.

Keywords: *Paleogenetics, ancient DNA, mitochondrial DNA, uniparental genetic markers, STR-loci, Y-chromosome, Altai, Ukok Plateau, Bronze Age.*

Introduction

Cemetery Bertek-56 at the Ukok Plateau in the Altai Republic (Fig. 1) was studied in the summer of 1992 by the Western-Siberian branch of the North Asian Joint Expedition of the Institute of Archaeology and Ethnography (Siberian Branch of RAS) led by V.I. Molodin. The excavation was a part of international project "Pazyryk" (Molodin, 1993). The site is a stone ring, 14 m in diameter, filled with stones inside (Fig. 2, 3), under which two burials at the level of subsoil were discovered. The deceased were placed in stone "cysts" consisting of long side walls (but without end walls), covered by massive slabs (Molodin et al., 2004: 205–206). They were buried in extended positions on their left sides, with heads in an eastward direction (Fig. 4, 5). The absence of some skeletal bones might suggest the

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Fig. 1. Ukok Plateau.

secondary nature of the burials. On the basis of skeletal morphology, one of the deceased (bur. 1) was an infant (8–9 years old) and the second (bur. 2), an adult male who died at the age of 30–35 (Chikisheva, 2012: 129–131).

Fragments of three ceramic vessels found at the site of Bertek-56 suggest that it can be reliably dated to the Middle Bronze Age (2nd millennium BC). Numerous previous studies (Molodin, 1993; Molodin et al., 2004: 206; Molodin, 2006) have demonstrated that this cemetery is atypical of the contemporaneous Karakol culture of the Altai Mountains, and thus cannot be attributed to that culture.

The cranial morphology of the deceased shows, in general, a close similarity to the Caucasoid pattern; but their cranial features and dental traits suggest a mixed ancestry for these individuals (Chikisheva, 2012: 129–131) (see also Results and Discussion).

Modern methods of paleogenetics can potentially provide more comprehensive and reliable data on ancestry and relationships between ancient populations, as well as on the sex of skeletons and kinship among individuals buried in double or communal graves. As the skeletons from Bertek-56 were well-preserved, it was

Fig. 2. Cemetery Bertek-56 after cleaning.

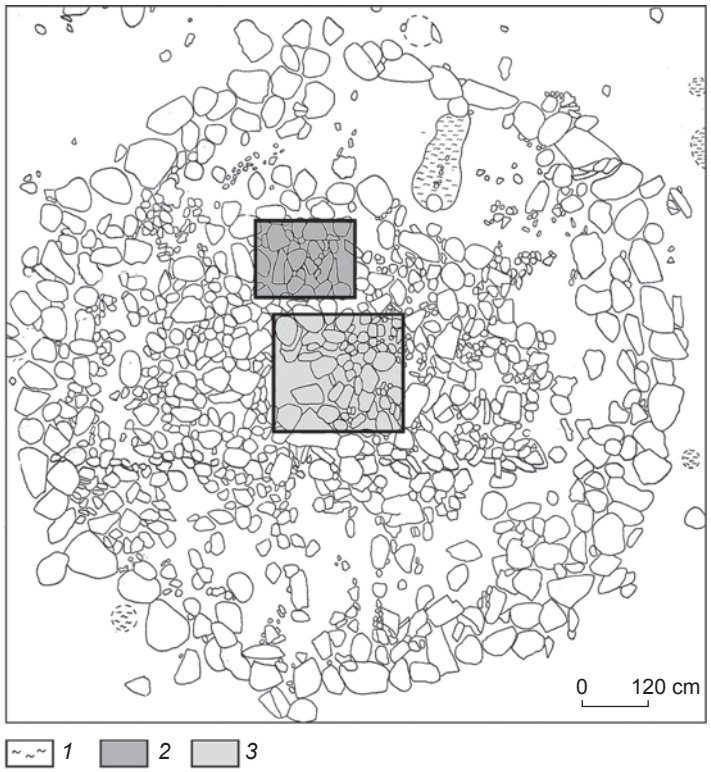

Fig. 3. Layout of the cemetery.
1 – fireplace; *2* – burial 1; *3* – burial 2.

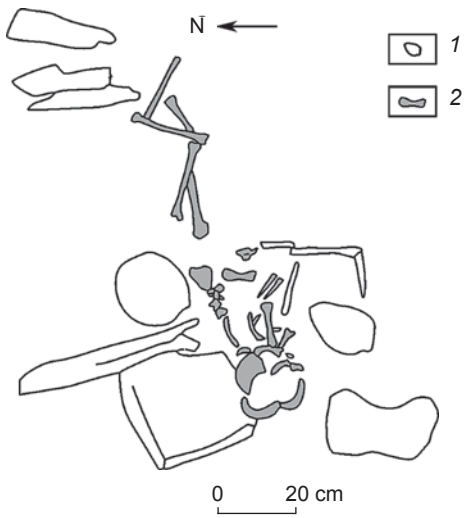

Fig. 4. Burial 1.
1 – stone construction; *2* – human remains.

possible to conduct a thorough molecular genetic investigation, including study of sex markers, uniparental markers (important from phylogenetic and phylogeographic points of view), and other markers of genetic affinity. In this article, we present the results of that investigation, and assess it in the light of previous archaeological and paleoanthropological studies of the site.

Materials and methods

Skeletal samples. The best-preserved postcranial bones (visually assessed) were sampled for the genetic analysis: the femur of the first individual (child) and the tibia of the second individual (adult). Notably, the bone tissue of the adult male was very well preserved while bone of the child exhibited low density, different color, and porosity, which indirectly pointed towards a reduced amount of ancient DNA in that specimen.

In order to exclude the possibility of cross-contamination between the specimens of individuals 1 and 2, they were treated separately at different times.

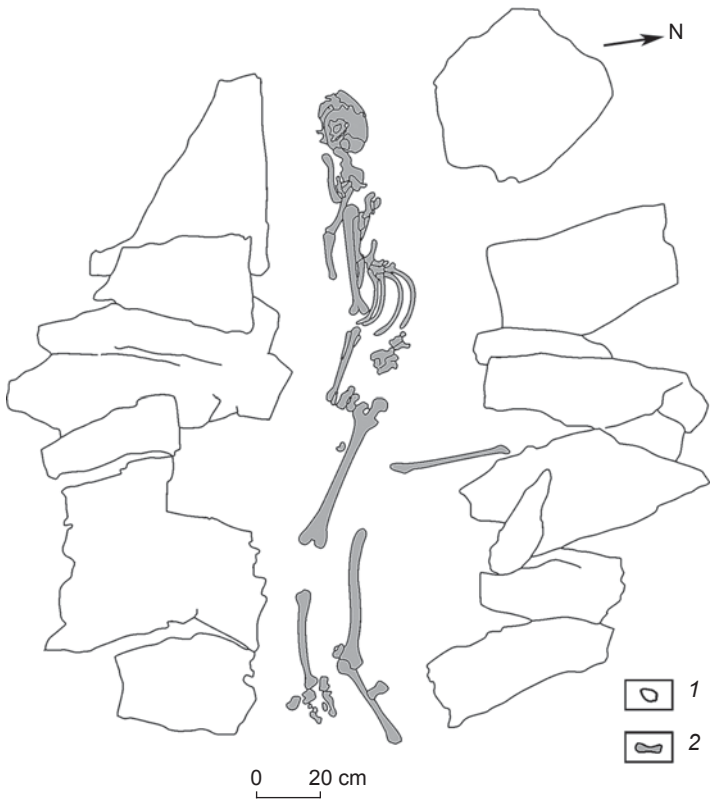

Fig. 5. Burial 2.
1 – stone construction; *2* – human remains.

Pre-treatment of the skeletal samples and DNA extraction. The protocol of this study is thoroughly described in our previous publications (Pilipenko, Romashchenko, Molodin et al., 2010; Pilipenko, Trapezov, Zhuravlev et al., 2015). In order to eliminate any modern-DNA contamination, the external surfaces of the samples were treated by a 5 % solution of bleach, and then irradiated with UV for 1 hour. After that, the external layer (1–2 mm thick) was mechanically removed, and the samples were irradiated again for not less than 1 hour. Fine bone-powder was then drilled out from the cortical layer.

Before DNA extraction, the bone powder was incubated in 5M guanidine thiocyanate buffer at 65 ºC, while being constantly mixed during incubation. DNA extraction was performed using a phenol/chloroform protocol with subsequent sedimentation with isopropanol.

Analysis of genetic markers. This study employed four systems of genetic markers: mtDNA (HVR I region and some informative polymorphisms in the mtDNA coding region); fragment of the amelogenin gene (sex marker); hypervariable autosomal STR-loci (universal markers of kinship); STR-markers of the Y-chromosome (phylogenetically and phylogeographically important markers, male line kinship markers) (see: (Pilipenko, Trapezov, Polosmak, 2015)). Study of mtDNA and STR-loci of the Y-chromosome permits the reconstruction of population-history through both female and male lines, respectively. Genotyping protocols for both marker-systems are described below.

Amplification of the mtDNA HVR I region was carried out using two different protocols: four short overlapping fragments in one round of PCR (Haak et al., 2005); and one long fragment by nested PCR (consisted of two reaction rounds) (Pilipenko et al., 2008). Amplification of informative fragments of the mtDNA coding region was performed using the primers described in (Wilde et al., 2014).

DNA sequencing was carried out with an ABI Prism BigDye Terminator Cycle Sequencing Ready Reaction Kit (Applied Biosystems, USA). Sequencing extracts were analyzed with an ABI Prism 3100XL Genetic Analyzer automatic capillary sequencer (Applied Biosystems, USA) at the SB RAS Genomics Core Facility (http://sequest.niboch.nsc.ru). The obtained results were interpreted using phylogenetic and phylogeographic analysis, as described earlier (Pilipenko, Trapezov, Polosmak, 2015).

Profiling of nine autosomal STR-loci and analysis of the amelogenin gene region polymorphism was performed using a commercial AmpFlSTR® Profiler® Plus PCR Amplification Kit (Applied Biosystems, США), following the manufacturer's protocol. Profiles of 17 STR-markers of the Y-chromosome were determined using commercial AmpFlSTR® Y-filer® PCR Amplification Kit (Applied Biosystems, США), following the manufacturer's protocol. Haplogroups of the STR-haplotypes of the Y-chromosome were determined using freeware "Haplogroup predictor" (http://www.hprg.com/hapest5/).

Measures against contamination, and verification of the results. All procedures with the skeletal specimens were carried out in a specially-equipped Laboratory for Molecular Paleogenetics (Institute of Cytology and Genetics of the SB RAS and Institute of Archaeology and Ethnography of the SB RAS, Novosibirsk, Russia). A description of the anti-contamination measures and verification of the results can be found in our previous publication (Ibid.). The employment of those measures and the consistency of the obtained results ensure the reliability of our experimental data.

Results and discussion

DNA preservation. Our analysis has shown different states of preservation of the ancient DNA in the two skeletal samples from Bertek-56. For both individuals, complete data on mtDNA structure were obtained, including HVR I sequence and the status of certain informative positions in the coding regions of mtDNA. We have successfully amplified both short fragments of mtDNA (up to 150 bp, using one round of PCR) and a long sequence (using two rounds of nested PCR). The efficiency of amplification of the latter was less for individual 1 (child) than for individual 2 (adult). Difference in DNA preservation between the two individuals most strongly affected analysis of the nuclear loci. For individual 2 it was possible to obtain full data for all systems of nuclear markers (polymorphic part of amelogenin gene, full allelic profiles of the autosomal and Y-chromosome STR-loci). This suggests a high degree of preservation of nuclear DNA in the adult remains. For the child (individual 2) it was only possible to amplify fragments of DNA less than 15 bp long, including the polymorphic part of the amelogenin gene, and the shortest fragments containing some autosomal STR-loci (4 out of 9) and Y-chromosome STR-loci (5 out of 17). Amplification of DNA extracted from the child's skeleton demonstrated low efficiency for all systems of nuclear markers. This fact suggests that the reason for the low efficiency was the poor preservation of the DNA, but not the ineffectiveness of the PCR techniques employed in our study. Notably, the poor DNA-preservation in the child's remains is associated with generally worse preservation of the bone tissue in that individual. This finding provides an example of a different degree of DNA preservation in bones of individuals buried at the same burial ground, in similar ambient conditions. Such a situation we already observed earlier, during the

investigation of human remains from Pazyryk burials in the Altai Mountains (Pilipenko, Trapezov, Polosmak, 2015). In our opinion, this difference can be explained both by local environmental differences within a burial ground, and by different conditions in which the remains were kept before inhumation. The latter seems to be the case in Bertek-56. It was previously noted that the absence of some bones, despite the right anatomical position of the skeletons, could suggest that they were reburied.

Sex and kinship determination. Determination (or confirmation) of the sex of the deceased, as well as assessment of their kin relationships, are among important aims of a paleogenetic study of double and communal burials. Both individuals from Bertek-56 were identified as males. There was initially no doubt that the adult individual was male. The sex of the child was also tentatively determined as male on the basis of the skull's size and robustness (Chikisheva, 2012: 130). Our results (presence of two alleles of amelogenin gene; amplification, albeit partial, of STR-loci) confirm this determination (Table 1).

For assessment of kinship between individuals, it is necessary to have data on mtDNA, and full (or almost full) profiles of autosomal and Y-chromosome STR-loci. However, owing to the poor preservation of the boy's nuclear DNA (see above), only partial profiles of the STR-loci were obtained (Tables 1, 2). Nevertheless, even these incomplete data provide strong evidence that direct kinship between the two individuals can be excluded. In other words, they could not have been father and son. This case illustrates the necessity for objective assessment of kinship between individuals buried in double and communal graves instead of making "common-sense" assumptions about genetic relationships between the buried. It is of note, though, that for final rejection of direct kinship between the individuals, more complete profiles of STR-loci need to be obtained.

Phylogenetic and phylogeographic interpretation of mtDNA and Y-chromosome data. In both individuals buried at Bertek-56, mtDNA HVR I was sequenced (Table 3). We have also determined the status of the positions in the coding region of mtDNA that mark haplogroups of mtDNA previously determined on HVR I. The results obtained for HVR I and coding region of mtDNA in both individuals were similar. The structure of the haplotypes of HVR I suggest a definite phylogenetic position of the studied samples of mtDNA.

The mitochondrial DNA of the man possesses the 16223T-16287T-16298C-16327T haplotype, and belongs to Eastern Eurasian haplogroup C. The structure of the haplotype does not permit determination of the subgroup to which this variant belongs. The mitochondrial DNA of the boy possesses the 16145A-16224C-16311C haplotype, and belongs to the Western Eurasian

Table 1. **Genotypes of the autosomal STR-loci and polymorphic part of the amelogenin gene**

Locus	Genotype	
	Individual 1, child	Individual 2, adult
D3S1358	15/17	15/15
vWA	17/17*	18/18
FGA	No data	21/23
D8S1179	14/14*	14/16
D21S11	No data	30/32.2
D18S51	Same	22/22*
D5S818	13/13*	10/13
D13S317	No data	10/12
D7S820	Same	10/12
Amelogenin (sex)	XY (male)	XY (male)

*Signal from the second allele can be absent, since the allele was not amplified owing to DNA degradation.

Table 2. **Y-chromosome STR-loci profile**

Locus	Genotype	
	Individual 1, child	Individual 2, adult
DYS19	No data	13
DYS385a/b	Same	15/21
DYS389I	13	14
DYS389II	No data	30
DYS390	Same	24
DYS391	"	9
DYS392	"	14
DYS393	13	14
DYS437	14	14
DYS438	No data	12
DYS439	Same	11
DYS448	"	19
DYS456	15	16
DYS458	No data	16
DYS635	Same	22
YGATAH4	13	10
Haplogroup	?	Q

Table 3. **mtDNA specimens structure**

Individual	Age and sex (based on skeletal morphology)	mtDNA HVR I haplotype	mtDNA coding region markers	mtDNA haplogroup (subgroup)	Genetically determined sex
1	Child, 8–9 years	16145A-16224C-16311C	12308G	K (K1a24a)	Male
2	Male, 30–35 years	16223T-16287T-16298C-16327T	13262G	C	"

haplogroup K. A substitution in the 16145 position suggests that this variant belongs to the K1a24a subgroup.

These variants (as well as the haplogroups they belong to) are different from a phylogeographic point of view. Haplogroup C is widely spread in modern indigenous populations of Eastern Eurasia. It is most typical of Siberian populations, but is also found in Central Asia and Altai. The 16223T-16287T-16298C-16327T haplotype is rare, and shows a mosaic distribution. According to previous publications, it is found in Central Asia in the Kyrgyz (Comas et al., 1998), but also in the north of Western Siberia, in the Khanty (Gubina, Osipova, Villems, 2005). Because of such a mosaic distribution, this variant of the haplogroup cannot be associated with the population of any particular region. We can only deduce that it undoubtedly belongs to the Eastern Eurasian mtDNA cluster and likely reflects a genetic impact from some local Southern Siberian population (or a population from adjacent regions). This hypothesis is also confirmed by the omnipresence of several variants of haplogroup C in the autochthonous Eastern Eurasian component of the mtDNA gene pool of ancient populations of adjacent regions of the south of Western and Eastern Siberia (spanning from the Cis-Baikal region to the forest-steppe zone of Western Eurasia), from the Neolithic on (Molodin et al., 2012; Trapezov, Pilipenko, Molodin, 2014). According to our unpublished results, haplogroup C is also present in the gene pool of the Okunev population of Minusink Basin and in the Bronze Age Karakol population of the Altai Mountains (though in this case, different variants of this haplogroup are found). Owing to the lack of data on the mtDNA gene pool of the populations from the Altai-Sayan and adjacent regions of Southern Siberia, it is impossible to find an association with ancient groups of the region known from archaeological data. The above-mentioned variant likely represents an autochthonous genetic substrate, rather than arising from genetically contrasting groups from other regions of Eurasia.

Unlike haplogroup C, haplogroup K is typical of the gene-pool of Western Eurasian populations. Interestingly, variants identical to the one observed in the boy from Bertek-56 are only found in rare cases in the populations of Southwestern and Central Europe: the Spaniards (Larruga et al., 2001) and the French (Richards et al., 2000). Similar, but not identical, variants were found in the Basques (Corte-Real et al., 1996) and the Germans (Pfeiffer et al., 1999); and outside Europe, in the Iranians (Metspalu et al., 2004). Subgroup K1a is found mostly in haplogroups of Near Eastern origin brought to Europe by Neolithic farmers and stockbreeders. The source of the later spread of this subgroup into Eastern Eurasia could have been either Eastern Europe (and adjacent areas) or the region of the Near East/Southwest Asia. Certainly, it is impossible to choose between these two possibilities on the basis of just one specimen. We can only state that presence of haplogroup K undoubtedly reflects the westward direction of the genetic relationships of the Bertek-56 population. The Western Eurasian gene-flow might have taken place not only in the Middle Bronze Age, but in previous times as well. Another structural variant of haplogroup K was found in, among others, a representative of the Afanasievo culture from the Altai-Sayan (Trapezov, 2014). One of its variants (an unrelated subgroup) was found in a representative of the Andronovo culture from Minusinsk Basin (Keyser et al., 2009), though haplogroup K, to our knowledge, was not as typical of the gene pool of populations of Andronovo historical-cultural community.

Thus, the two variants of mtDNA found in the Bertek-56 samples are phylogenetically and phylogeographically in contrast. Their simultaneous presence in the gene-pool of the same ancient population points towards that population's mixed origin. The population emerged as a result of an admixture of groups of local (or Eastern Eurasian) and Western Eurasian origins. Such a structure is typical of the Middle Bronze Age population in the vast contact zone between Western and Eastern Eurasian populations that includes Central Asia, Western Siberia, and the Altai Mountains.

The availability of a full allelic profile of the Y-chromosome of the man (see Table 2) made it possible to assign it, using the predictor program, to haplogroup Q, which is most typical of modern native population of Siberia and Central Asia. The presence of this haplogroup (with a low frequency) in some populations of Western Eurasia is usually explained by a gene-flow from the East (from Central Asia). Thus, this structural variant of the Y-chromosome is also a marker

of an Eastern Eurasian component of the Bertek-56 population's gene-pool. At present, Y-chromosome variation in ancient populations is very poorly understood: there are only data on single specimens or very small samples. According to the results of study of a small sample of the Andronovo culture (Keyser et al., 2009; Allentoft et al., 2015), as well as of few specimens of the Afanasievo culture (Allentoft et al., 2015), haplogroup Q was not typical of those two archaeological cultures. Reference data on the Bronze Age Southern Siberia and Central Asia population are rather scarce: we can only note the presence of a variant of haplogroup Q in an individual of the Karasuk culture (Late Bronze Age) from Minusinsk Basin (Ibid.). Later, in the middle of the 1st millennium BC, this haplogroup was represented in the gene-pool of early nomads from the south of Inner Mongolia (China) (Zhao et al., 2010). In Altai, it was still present in the Early Iron Age (few specimens, see: (Allentoft et al., 2015)). A search for completely identical allelic profiles of the 17 Y-chromosome STR-loci in the "Y-Chromosome STR Haplotype Reference Database" has revealed that such variants are present in some modern individuals from Northeast China and South Korea (though it should be noted that populations from Northern Eurasia are poorly represented in this database, which can bias the results).

Thus, variants of mtDNA and Y-chromosome found in the man are markers of a component of Bertek's gene-pool that is either autochthonous for Southern Siberia, or originates from adjacent regions of Eastern Eurasia. This finding concurs with the prevalence of the "Eastern stock" markers in his dental morphology (Chikisheva, 2012: 130). We have not found any genetic evidence of individual admixture effect (e.g. very strong genetic difference between his parents), and our data do not support the hypothesis of mixed ancestry for him. At the same time, the presence of phylogenetically and phylogeographically contrasting variants of mtDNA in the gene-pool of the group suggests a mixed origin for the population. The "mosaic" cranial and dental morphology of the Bertek-56 individuals, noted in previous studies, was probably not a result of admixture in the previous generation. Rather, it points towards the mixed origin of the population in general, as a result of admixture between strongly morphologically and genetically diverse groups of people. "Eastern" elements could have originated from people of Karakol and/or Okunev cultures of Southern Siberia (which is in line with findings of physical anthropologists), while "Western" elements cannot yet be associated with any particular ancient population of Western origin.

Notably, the ceramics found at the site are unusual for the Altai Mountains region (Molodin et al., 2004). Very similar vessels were found during the excavation of a ritual complex on Kucherla River (Molodin, Efremova, 2001), where the Bronze Age cultural layer was not identified at all (Molodin, Efremova, 2010). In the light of our results, it is important that very similar burial structures and ceramics were found at the Bronze Age Akbats burial ground in the Mangyshlak Peninsula (Balandina, Astafieva, 2000). This region might have been a source of migratory influx arriving in the Ukok Plateau. Importantly, the burial rite of Bertek-56 differs from that of the northerly Karakol culture (Kubarev, 1988; Molodin, 2006), which is in all respects closer to Okunev culture, as well as from the southerly Chemurchek culture (Drevneishiye evropeitsy…, 2014). Probably, we are dealing with a distinct ethnocultural phenomenon that combines an autochthonous base with a Western "coloring". This was previously shown by archaeological and anthropological data, and has been further confirmed by our paleogenetic data.

Further reconstruction of complex ethnogeneses of South Siberian populations of the Bronze Age and later periods will largely depend on the accumulation of new genetic data on numerous ancient groups. Not only the study of various polymorphisms (mtDNA, Y-chromosome, and others), but correct interpretation of the obtained results in the light of archaeological and anthropological data, will be crucial. This approach is being employed by our interdisciplinary team in several ongoing research projects.

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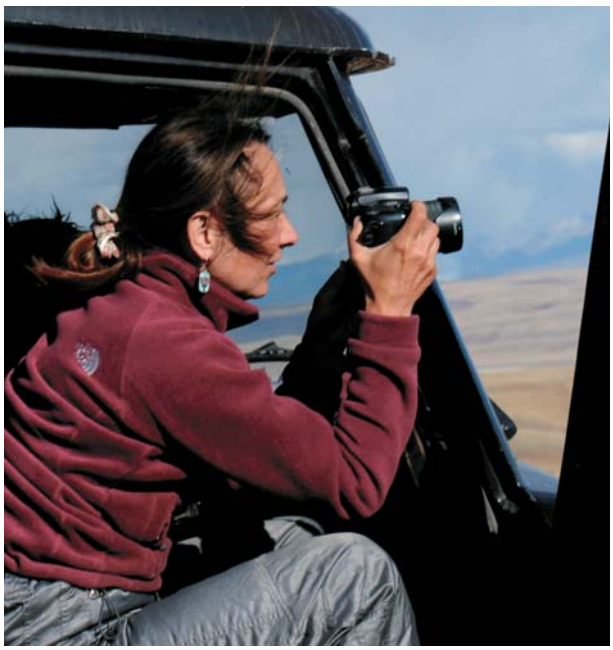
Following the Tracks of "Gold-Guarding Griffins"



On 12 September 2016, Natalia Polosmak, a Corresponding Member of the Russian Academy of Sciences, doctor of historical studies, Chief Researcher at the Bronze Age Department of the Institute of Archaeology and Ethnography of the Siberian Branch of the Russian Academy of Sciences, and our friend, observed her first jubilee. All her scholarly life has been connected with the Institute of Archaeology and Ethnography (until 1990, the Institute of History, Philology and Philosophy of the Academy of Sciences of the USSR) and the Bronze Age Department.

N.V. Polosmak was born in Khabarovsk into a military family and owes much to her parents Viktor Ivanovich and Alla Naumovna. They not only inculcated in their daughter the best human qualities but also encouraged her to study, to acquire the knowledge and skills of an archaeologist, the profession that attracted her as early as her school years. She made her first expedition to the Altai as a member of a group of the prominent Russian archaeologist and specialist in Siberian studies, doctor of historical sciences V.A. Mogilnikov, after which she made her final choice of a profession.

In 1973, Doctor Polosmak entered the Humanities Faculty of Novosibirsk State University—in essence, the school of Academician A.P. Okladnikov. After her first year, she spent four or five months in expeditions each year. Natalia's first instructor was V.I. Molodin, with whom she subsequently connected her own future.

As a student Natalia was actively engaged in scholarly work, participated in student conferences, prepared materials unearthed during the expeditions, and wrote scholarly reports. Already at that time she published several serious articles (e.g., "The Ceramic Assemblage of Krokhalevka-4", in "Ancient Cultures of the Altai and Western Siberia", Novosibirsk: Nauka, 1978), which are requested by specialists even today. While a student she was given an Archaeological Excavation Permit that enabled her to conduct independent digs.

After graduation, Natalia Polosmak worked under a salvage project of the Institute of Archaeology of the USSR Academy of Sciences, Leningrad Branch. In 1981, she began graduate studies at that institution, and during her studies conducted independent excavations, primarily at the Tagar cemeteries. Her adviser was Professor V.M. Masson, a prominent Soviet scholar specializing in the archaeology of Central Asia. However, for her dissertation she chose a Siberian topic: "Culture of the Western Baraba Population in the Scytho-Sarmatian Era". By that time, the focus of Natalia's research shifted toward the archaeology of the Scythian period. Participation in Central Asian expeditions led by Vadim Mikhailovich substantially enriched her knowledge and understanding of field archaeology.

In 1984, the young scholar submitted her dissertation, completing her graduate studies. In 1985, she defended it with distinction at the Institute of Archaeology of the USSR Academy of Sciences, Leningrad Branch.

In 1985, Natalia Polosmak took up permanent residence in Novosibirsk's Akademgorodok, joining the institute that became her home as a Junior Researcher.

In the 1980s, she continued to explore problems relating to the Early Iron Age of Western Siberia. She published her first monograph "Baraba in the Early Iron Age" (Novosibirsk: Nauka) in 1987 and conducted excavating the complex burial ground Protoka on the middle Tara River. During that period, N.V. Polosmak was drawn to problems concerning the ancient history of the taiga zone of Western Siberia in the Early Iron Age. Together with E.V. Shumakova she prepared an important monograph "Essays in the Semantics of Kulai Art" (Novosibirsk: Nauka, 1991). In this book, the approach of A.P. Okladnikov's school is clearly apparent, which

is based on the extensive use of ethnographic data for interpreting archaeological sources. N.V. continues to use this approach in her investigations to this day.

In northwestern Baraba, Doctor Polosmak discovered a remarkable Neolithic site—Protoka, and presented her findings in the monograph "Neolithic Cemeteries of Northern Baraba" (Novosibirsk: Nauka, 1989), co-authored with the physical anthropologists T.A. Chikisheva and T.I. Balueva. This work evidences a multidisciplinary approach to the analysis of archaeological sources, which has become fundamental for her subsequent studies.

Natalia Polosmak has always been drawn to problems relating to the Scythian age. Her special area of interest was Gorny Altai (the Altai Mountains). During that period, the legendary inhabitants of the region were enigmatic "gold-guarding griffins" associated with the rich Pazyryk culture, known from the excavations by V.V. Radlov, M.P. Gryaznov, S.I. Rudenko, and V.D. Kubarev. The outcome of her studies was the so-called Ukok project that envisioned the search for and conduct of excavations of the Pazyryk burial mounds with permafrost. Already in the first year (1990) of the investigations, the kurgan at Ak-Alakha-1 cemetery, which she had chosen, yielded amazing results. The kurgan contained an undisturbed burial of two Pazyryk individuals. Unique objects dating to 400–300 BC were preserved in the frozen ground: clothing, utensils, trappings of saddle horses, etc. Excavation of the kurgan required special techniques of studying "frozen" burials. A joint Russian-Japanese project "Pazyryk" was launched with a view of excavating burial mounds on the Ukok Plateau. The leading role in implementing it was assigned to Natalia Polosmak. Over the five years, her archaeological team did an enormous work in excavating the largest Pazyryk tumuli on the plateau (see Polosmak N.V. "The Gold-Guarding Griffins…", Novosibirsk: Nauka, 1994). A genuine triumph awaited her in 1993 when in the ice of a kurgan at Ak-Alakha-3 a female mummy was discovered with strikingly abundant funerary goods (Polosmak N. "A mummy unearthed from the Pastures of Heaven", National Geographic, 1994, vol. 186 (4)).

Doctor Polosmak presented the results of her excavations of Pazyryk mounds in southern Altai Mountains in the monograph "Horsemen of Ukok" (Novosibirsk: INFOLIO-press, 2001), which shortly after publication became a bibliographical rarity. An enlarged edition has now been published in the Republic of Korea. However, Natalia's primary contribution is not so much the discovery of a series of unique Pazyryk burials on the Ukok Plateau as the organization and conduct of multidisciplinary study of the unearthed artifacts. Diverse and unique data were published in a series of joint monographs ("The Phenomenon of Altai Mummies", Novosibirsk: Izd. IAE SO RAN, 2000; "The Population of the Altai Mountains in the Early Iron Age as an Ethno-Cultural Phenomenon", Novosibirsk: Izd. SO RAN, 2003). In 1997, Natalia Polosmak defended her doctoral dissertation titled "Pazyryk Culture: A Reconstruction of Worldview and Mythological Concepts".

Issues relating to Pazyryk culture are continually within her eyeshot. Her important achievements in that area include the monograph "Costume and Textiles of the Pazyryk People of Altai (4th–3rd centuries BC)", co-authored with L.L. Barkova and analyzing the fabrics from the elite Pazyryk tumuli of central Altai Mountains and Ukok (Novosibirsk: INFOLIO-press, 2011).

Natalia's works on the Altai are highly appraised by both the scholarly community and the nation. In 2004, N.V. Polosmak was awarded the State Prize in science and new technologies for the discovery and excavation of the unique 600–300 BC Pazyryk tumuli in the Altai Mountains.

In 2001, N.V. Polosmak was elected a corresponding member of the Russian Academy of Sciences.

A stage of no less importance in Natalia Polosmak's career are the excavations of the Xiongnu elite burial ground at Noin-Ula, northern Mongolia. Artifacts recovered there by Petr Kozlov's expedition in the 1920s and published by K. Trever and S.I. Rudenko were augmented by new finds (high-quality decorative fabrics, Greco-Roman and Chinese plaques, a Chinese chariot, etc.). Natalia conducted a technically faultless examination of three huge tumuli, removing stones and cutting through the frozen ground by hand layer by layer in a stepwise fashion, even when the burial chamber was twenty meters beneath the surface, as in tumulus 20. Importantly, the finds were published without delay (see Polosmak N.V., Bogranov E.S., Tseveendorj D. "Tumulus 20 at Noin-Ula", Novosibirsk: INFOLIO-press, 2011; Polosmak N.V., Bogdanov E.S. "The Sudzukte Tumuli, Noin-Ula, Mongolia", Novosibirsk: INFOLIO-press, 2015). These studies earned for her the National Prize for the preservation of Russia's archaeological heritage, "The Patrimony of Generations".

Natalia Polosmak regularly takes part in international and all-Russian conferences with papers, which unfailingly arise interest among her colleagues. As a scholar she is held in exceptionally high repute. She holds grants from major Russian and international scholarly foundations. Natalia has authored more than 200 works, which have been published in Russia, Austria, Belgium, Germany, China, Korea, Mongolia, the USA, France, Switzerland, Japan, and elsewhere.

Doctor Polosmak successfully combines scholarly and pedagogical activities. She gives special courses at her home university in Novosibirsk, and oversees the preparation of graduate and undergraduate students. Natalia Polosmak is a member of the Scientific Council

and the Dissertation Committee of the Institute of Archaeology and Ethnography of the Siberian Branch of the Russian Academy of Sciences. Her scholarly and organizational activities have been repeatedly recognized with certificates of honor from the Presidium of the Russian Academy of Sciences and the Siberian Branch of the Russian Academy of Sciences.

In 2009, N.V. Polosmak was honored with a commendation from the President of the Russian Federation "For longstanding efforts in the implementation of state policy for youth in science and education, and in support of young scholars and specialists".

One of Natalia's characteristics is the drive to find something to pursue every day. She cannot conceive of doing without expeditions, at times extreme ones, and always achieves brilliant results. At present, she is working with Indian colleagues on a project to study the Kushan civilization in Kashmir.

Natalia Polosmak is at the height of her powers and scholarly creative abilities. We, her colleagues and friends at the Bronze Age Department of the Novosibirsk Institute of Archaeology and Ethnography, wish her health and success in producing original work, brilliant discoveries in the field and at her desk.

A.P. Borodovsky, E.I. Derevianko, V.I. Molodin, V.P. Mylnikov, L.N. Mylnikova, S.P. Nesterov, A.I. Soloviev, A.V. Tabarev, Y.S. Hudiakov, and T.A. Chikisheva

"Life is Everlasting, You Can be Certain of It...": In Honor of Nikolai Tomilov's 75th Birthday

Many things are tied with Nikolai Tomilov, Professor, Doctor of History, and Director of the Omsk Division of the Institute of Archaeology and Ethnography (the Siberian Branch of the Russian Academy of Sciences), the Head of the Department of Ethnology, Anthropology, Archaeology, and Museum Studies at Omsk State University, who celebrated his 75th birthday on September 14, 2016.

Nikolai Tomilov was born on September 14, 1941 in Yeniseysk in Krasnoyarsk Territory. Yeniseysk is one of the oldest towns in Siberia; it was founded in 1619 by a Cossack unit as a military fortress (*ostrog*) on the left bank of the Yenisei River, 12 versts from its tributary, the Kem River. For over one and a half centuries Yeniseysk was the main gateway to Eastern Siberia, the town from the tales of the "Arabian Nights": incredible stories and legends were told about the famous Yeniseysk. Yeniseysk was also known as a town of skilled craftsmen and political exiles.

It is worth noting that political exiles also taught in School No. 43, which N.A. Tomilov graduated. This school was distinguished by a very high level of teaching; it was neither provincial, nor backward. In this regard, we would like to cite the words of the writer Vladimir Korolenko, "Who knows what would have happened if the Russian government did not have a commendable habit to populate the farthest frontiers by the European-educated people?" Years spent in Yeniseysk—a town with a rich history—were bound to affect the formation of celebrant's personality.

It was the natural desire of Nikolai Tomilov to receive his higher education in Tomsk, the Siberian Athens, the cultural capital of Siberia. In 1967, he graduated from the Department of History and Philology of Tomsk State University, but his academic career had begun much earlier. Already in 1961, as a part of the Tomsk University ethnographic expedition headed by the outstanding scholar Galina Pelikh, he made his first trip to the Selkups and Khanty people of the Tomsk Region.

Life was such that Nikolai Tomilov had to be a factory worker, a school teacher of history (he even had a teaching experience in German), and a military construction worker. However, all these activities could not get him off the main track of becoming an ethnographer, determined already in his younger years.

Over the years of work in the Fundamental Research Laboratory of History, Archaeology, and Ethnography of Siberia at Tomsk State University (as a Junior Researcher and later as a Senior Researcher) and preparation of his doctoral dissertation, entitled "Contemporary ethnic, cultural, and everyday processes among the Siberian Tatars", which was successfully defended in 1973 at the Institute of Ethnography of the Soviet Academy of Sciences, Nikolai Tomilov had acquired a vast experience that became the basis for the development of his unique talent of a scholar and academic organizer.

In 1974, a new institution of higher education—Omsk State University, now bearing the name of Fyodor Dostoyevsky—was opened in Omsk. Almost 50 professors, who came there mainly from the universities of Omsk, Irkutsk, Novosibirsk, and Tomsk, faced a major task of establishing academic education in the region. In the same year, the Museum of Archaeology and Ethnography of the Omsk State University was

established. Nikolai Tomilov, at that time still an Assistant Professor at the Department of History of the USSR, saw the future in the development of academic humanities in Omsk.

In 1983, Nikolai Tomilov defended his post-doctoral dissertation, "Ethnic History of the Turkic-speaking population of the West Siberian Plain in the late 16th–early 20th century". Two years later, he established the Department of Ethnography, Historiography, and Source Studies of the History of the USSR (since 1994, the Department of Ethnography and Museum Studies, now the Department of Ethnology, Anthropology, Archaeology, and Museum Studies) at Omsk State University. Opening of a specialized department at a provincial university (incidentally, at that time, a department of ethnography was only in five universities of the Soviet Union) became a testimony to the successful development of ethnography in Omsk.

Nikolai Tomilov is one of the founders of the Omsk Division of the United Institute of History, Philology, and Philosophy of the Siberian Branch of the Russian Academy of Sciences (since 2006, the Omsk Division of the Institute of Archaeology and Ethnography of the Siberian Branch of the RAS) in 1991, and its permanent Director. Two years later, in 1993, the Siberian Division of the Russian Institute for Cultural Research of the Ministry of Culture of the Russian Federation (now, the Siberian Division of the D.S. Likhachev Russian Scientific Research Institute for Cultural and Natural Heritage) was established thanks to the efforts of Nikolai Tomilov.

The contribution of Nikolai Tomilov in the transformation of Omsk is obvious: in less than a decade, the academic and educational outlook of the city has changed beyond recognition. Nikolai Tomilov successfully combines active organizational work and scholarly activities. His has extensive range of scholarly interests, including general ethnology, historiography of Russian ethnology (ethnography), ethnography of the peoples of the North Asia and Central Asia, ethno-archaeology, ethnic ecology, anthropology, Russian history, cultural studies, museum studies, regional history, and religious studies. Even half of that list would be quite sufficient for the work of an entire research group.

Undoubtedly, one of the main achievements of Nikolai Tomilov is the creation of a team of anthropologists (ethnologists), ethno-archaeologists, culture experts, and museologists in Omsk, who are capable of competently solving fundamental and applied research tasks. Notably, this scholarly team is not a formal union, but a community of like-minded people, carefully fostered by Nikolai Tomilov. It became a real scientific entity thanks to the personal qualities of Nikolai Tomilov, such as openness, friendliness, reliability, capacity to see the prospects and reveal them to his students and colleagues. The students of Nikolai Tomilov skillfully combine the research traditions that they received from him, and their own original developments. Many of them attended the lectures of Nikolai Tomilov or wrote their final theses and doctoral dissertations under his supervision: over 40 scholars successfully defended their doctoral dissertations. Nikolai Tomilov was a consultant of three post-doctoral dissertations.

For many years, Nikolai Tomilov has been the Chief Editor of the journal, "Cultural Studies in Siberia" (published since 1999), as well as series of collections of scholarly articles, "Culture of the Peoples of Russia" (since 1995) and "Ethnographic and Archaeological Complexes: Problems of Culture and Society" (since 1996). He is the organizer and leader of numerous ethnographic and complex historical and ethnographic expeditions.

Nikolai Tomilov's active life position, his interpersonal skills, and industriousness are embodied in the constant public work: he is the Chairman of the Presidium of the Omsk Division of the Russian (Soviet) Cultural Fund, a member of the specialized scientific councils on awarding academic degrees, a member of a number of presidiums of Russian and Regional non-governmental organizations, the Chairman and a member of many scientific councils of universities, research institutions, and museums, of the Scientific Council of the Museums of Siberia of the Russian Ministry of Culture.

One gets the feeling that Nikolai Tomilov lives in some special dimension. We cannot but admire how much he managed to accomplish in his creative life.

Nikolai Tomilov is the author of dozens of books and many hundreds of scientific articles published both in Russia and internationally.

Scientific and organizational achievements of Professor Nikolai Tomilov have been distinguished by numerous awards, including the Order of Friendship and the Order of Honor.

Students and colleagues of Nikolai Tomilov greatly value his contribution to the development of science and education, and wish him good health and realization of his creative ideas.

A.P. Derevianko, E.Y. Smirnova,
V.I. Molodin, and M.V. Shunkov

AN SSSR – USSR Academy of Sciences

DVO RAN – Far Eastern Branch of the Russian Academy of Sciences

GANIIIYAL – Gorno-Altaysk Research Institute of History, Language and Literature (Gorno-Altaysk)

IA RAN – Institute of Archaeology, Russian Academy of Sciences (Moscow)

IAE SO RAN – Institute of Archaeology and Ethnography, Siberian Branch of the Russian Academy of Sciences (Novosibirsk)

IIFF SO AN SSSR – Institute of History, Philology, and Philosophy, Siberian Branch of the USSR Academy of Sciences (Novosibirsk)

IPOS SO RAN – Institute of Northern Development, Siberian Branch, Russian Academy of Sciences (Tyumen)

KSIA – Brief Communications of the Institute of Archaeology, Russian Academy of Sciences

KSIIMK – Brief Communications of the Institute for the History of Material Culture

MAE RAN – Museum of Anthropology and Ethnography, Russian Academy of Sciences (St. Petersburg)

MIA – Materials and Investigations on Archaeology in the USSR

NGU – Novosibirsk State University (Novosibirsk)

UdmNIIYALI UrO RAN – Udmurt Institute of History, Language, and Literature, Ural Branch, Russian Academy of Sciences (Izhevsk)

UrO RAN – Ural Branch of the Russian Academy of Sciences

VSOGO – East Siberian Department of the Russian Geographical Society

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