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Early Upper Paleolithic Serpentine Ornaments from Ust-Karakol, Northwestern Altai

We describe the spatial context, technology, and possible function of serpentine-antigorite artifacts discovered at the Ust-Karakol Early Upper Paleolithic site in the Altai Mountains. The ornaments were made locally, with a single manufacturing process. They were fragmented either at the preform stage or at the stage of final trimming. There are no use-wear traces. The chaîne opératoire included the preparation of blanks, biconical drilling, and polishing. Because the material is fragile, drilling of preforms preceded their polishing. This approach was also used with artifacts made of other fragile materials, such as ostrich eggshell, widely employed in the Paleolithic of North and Central Asia. Reconstructed techniques of manufacturing serpentine ornaments belong to the technological repertoire of the Early Upper Paleolithic Ust-Karakol tradition in the Altai. The petrographic analysis of magmatic rocks of the Bashchelak and Anuy mountain ranges suggests that serpentine could have been local. The potential sources include gabbroid deposits related to the Devonian and Permian magmatism of the region.

Keywords: *Altai Mountains, experimental use-wear analysis, technological analysis, spatial analysis, Early Upper Paleolithic, serpentines, stone ornaments.*

Introduction

Stratified archaeological sites of the Anuy River valley, such as Denisova Cave, Ust-Karakol, Anuy-1–3 in the northwestern Altai, are the keys for studying the formation and development processes of the material and intellectual culture of the first Upper Paleolithic inhabitants of the region (Derevianko, Shunkov, 2004; Derevianko, Shunkov, Markin, 2014: 69–99). The most ancient and representative collection of Upper Paleolithic ornaments in Northern Asia gives a particular significance to this group of sites. Its important part consists of items made of "soft" stones (class 1–4 in the Mohs scale of hardness): pendants made of green kaolinite agalmatolite, light talc, greenish-yellow, green and light-brown serpentine; beads of yellowish-white, milk-white talc and pyrophyllite; pendants and a ring of white marble; a bracelet of dark-green chloritolite (Derevianko, Shunkov, Volkov, 2008; Kulik, Shunkov, 2011; Shunkov et al., 2016; Shunkov, Fedorchenko, Kozlikin, 2017, 2018). Such raw material and typological variety of stone ornaments is always an abundant source for archaeological reconstructions (Bar-Yosef Mayer, Porat, 2008; Kulik, Shunkov, 2004, 2011; Cârciumaru et al., 2016; Zhitenev, 2017; Lbova et al., 2018; Fedorchenko et al., 2018). Analysis of spatial context plays a major role in determining the time of manufacture of ornamental stone items (White, Normand, 2015). The spatial analysis data also help to identify the

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special status of ornaments in the structure of habitable space and their meaning as elements of symbolic activity (Bader, 1998; Derevianko, Rybin, 2003; Grigoryeva, 2003–2004; Pitulko et al., 2012).

In the Paleolithic collections from the Anuy valley sites, items made of serpentine or, more precisely, of antigorite as its variety, form a series of 15 items, which amounts to no less than 30 % of the total number of stone ornaments. Visual and physical properties of this mineral, such as an impressive color, a compact cryptocrystalline constitution of its partings, the possibility of producing smooth and shiny surfaces, and a rather low hardness (class 3.5 in the Mohs scale), made it one of the most in-demand stones as raw material in the Upper Paleolithic. In its origin, serpentine-antigorite is a rock-forming mineral of serpentinites (hydrothermally altered ultrabasites) or magnesian carbonate rocks altered by contact (Godovikov, 1983: 363–364). Antigorite is formed by filling tectonic fractures in serpentinites; and regeneration of these fractures often results in its concealed fracturing and foliation accompanied by emergence of partings similar to laminar ones, with slickenside. All serpentines, including antigorite $Mg_6[Si_4O_{10}](OH)_8$, are characterized by $Mg^{+2} \leftarrow Fe^{+2}$ substitution, which is a factor determining the color of minerals: nonferrous varieties are commonly colorless or yellow-tinged, low-iron ones are greenish or, when having a high iron content, dark-green.

In the Altai Mountains, Paleolithic serpentine ornaments have only been discovered at the Anuy valley archaeological sites, such as Denisova Cave, Ust-Karakol, and Anuy-2 (Fig. 1). The most impressive evidence is recorded in the deposits of layer 11 of Denisova Cave (Derevianko et al., 2006; Shunkov et al., 2016; Shunkov, Fedorchenko, Kozlikin, 2017). According to data from radiocarbon AMS-dating of lithological layers 11.1–11.2 in the eastern gallery, layers 11.1–11.4 in the central hall, and layer 11 in the southern gallery, these assemblages are of an age from 27.8 to 51.3 thousand years (uncal) (Douka et al., 2019). These are possibly the most ancient examples of using serpentine to manufacture ornaments. At Anuy-2, a light gray-green serpentine pendant has been discovered in deposits of lithological layer 13.2 dated in the range of 28–27 ka BP (uncal) (Prirodnaya sreda…, 2003: 328–329).

Significant information about serpentine ornaments is carried by the Ust-Karakol materials (Ibid.: 235–236). The finds of 2016 supplementing the collection of serpentine items have opened up new prospects for their in-depth study. The objective of this study is to reconstruct the production technology and functions of Ust-Karakol serpentine artifacts, and to clarify their chronostratigraphic, cultural, and spatial context.

General archaeological context

The collection of items made of ornamental stones was obtained in excavation area 2 of the Ust-Karakol site (Ust-Kansky District, the Altai Republic), which was studied from 1993 to 1997 (Prirodnaya sreda…, 2003: 235–289). It is located in the lower part of a smooth slope of the northern exposition at the spit of the Anuy and Karakol rivers. The studied area covers about 250 m^2. During excavations, slope detritus with a total thickness up to 6.5 m was unearthed. Materials of the Early Upper Paleolithic united in the EUP-1 cultural complex are related to lithological layers 8–11 (Derevianko, Shunkov, 2004; Belousova, 2012). The radiocarbon age of the deposits is within 29.7–35.1 thousand years (uncal) (see *Table*).

Archaeological materials of the EUP-1 cultural complex comprise 2248 artifacts, and pertain to the Early Upper Paleolithic Ust-Karakol industry in the Altai Mountains (Derevianko, Shunkov, 2004). The lithic assemblage is based on the blade production technology using volumetric parallel unidirectional or bidirectional reduction, with a relatively poor standardization of detachments (Fig. 2, *1*, *6*). The technology of producing bladelets with a straight or curved profile (Fig. 2, *3*, *4*, *7*, *8*), based on unidirectional, parallel, and convergent reduction of blanks along a pronounced smooth arch of edge-faceted (wedge-like) and wide-front volumetric cores (carinated items, including their specific bifrontal modifications) is of paramount importance (Fig. 2, *3*, *4*). Purposeful production of flakes from wide-front non-volumetric and arbitrary cores can be considered one of the special features of the assemblage (Fig. 2, *2*). The toolkit of the EUP-1 complex (Fig. 3) includes backed bladelets (Fig. 3, *8*); carinated end-scrapers, ogival end-scrapers, and end-scrapers on blades (Fig. 3, *1–4*, *10*, *14–16*); retouched blades (Fig. 3, *11–13*); flat-faceted, dihedral, and angle burins; and a fragment of a bifacial tool (Fig. 3, *9*). Noteworthy is a considerable number of massive items: side-scrapers with a high working edge on large flakes and pebbles, spur-like tools, etc. (Fig. 3, *18*, *19*).

The lithic assemblage of the EUP-1 cultural horizon was based on the local multiple raw materials resource of pebbles (Postnov, Anoikin, Kulik, 2000). The exception are wax-brown jasperoids, which are known in artifacts but absent in the river pebbles, as well as rock crystal and smoky quartz. Sources for these stone raw material could have been localities situated 30–60 km to the north and southwest of the site. The use of rare material is directly related to the selectivity in choosing raw materials, which is clearly manifested in analysis of the petrographic composition of stone artifacts in the complex. Large flakes were detached from the partings

Fig. 1. Location of the Ust-Karakol and other Paleolithic sites in the Altai Mountains.

Radiocarbon chronology of the Early Upper Paleolithic archaeological complex of the Ust-Karakol site

Layer	^{14}C-date, BP	±σ	Calibrated value, BP	±σ	Lab index	Method of dating
9.3	29,720	360	33,870	306	SOAN-3359	Conventional
9.3	29,860	355	33,978	297	SOAN-3358	"
9.3	31,580	470	35,480	480	AA-32670	AMS
9.3	33,400	1285	37,690	1507	SOAN-3257	Conventional
10	35,100	2850	39,563	3131	SOAN-3259	"

of aphyric effusives often of medium or low quality. Pebbles of sedimentary rocks, their weakly-hornfelsed varieties, biotite hornfels, showing splitting anisotropy caused by lamination, were used for preparing the cores for the production of blades. Bladelets were obtained from the partings of the highest quality and spalls from hornfels pebbles, dense weakly-hornfelsed sedimentary rocks, thinly crystallized aphyric effusives, and homogeneous siltstones, as well as jaspers, wax jasperoids, and rock crystal, which are stone materials of the highest quality in terms of technology.

Materials and methods of study

The serpentine-antigorite items form a small but rather informative element of the Ust-Karakol EUP-1 complex. One serpentine artifact we consider to be a pendant blank, fragmented at the final stage of drilling (Fig. 4, *1*). The second artifact represented by two small fragments was identified as an ornament with traces of polishing (Fig. 4, *2*, *3*).

A pendant blank made of pale-yellow serpentine-antigorite with a biconical hole (artifact No. 1, Fig. 4, *1*)

Fig. 2. Cores for flakes (*2*), blades (*1*, *6*), and bladelets (*3–5*, *7*, *8*) of the EUP-1 cultural complex. Ust-Karakol site.

has the shape of an irregular hexagon with a thin sub-rectangular cross-section and a straight profile. The dimensions are 19.0 × 14.0 × 3.5 mm. A drilled biconical hole (diameters of 3.0 and 5.5 mm), across which the blank was broken, is located at its center. One of the wide sides of the blank has a smooth shiny natural surface of slickenside, the other one shows traces of knapping, possibly of artificial origin. Features of the break can be observed on the upper, lower, right, and left side faces. In the last case, these are, obviously, traces of fragmentation in the course of the item's treatment. No use of polishing, planning, or scraping has been recorded on this artifact.

A large fragment of an ornament made of greenish-yellow serpentine-antigorite (artifact No. 2, Fig. 4, *2*) is composed of two appliquéd pieces of irregular rectangular

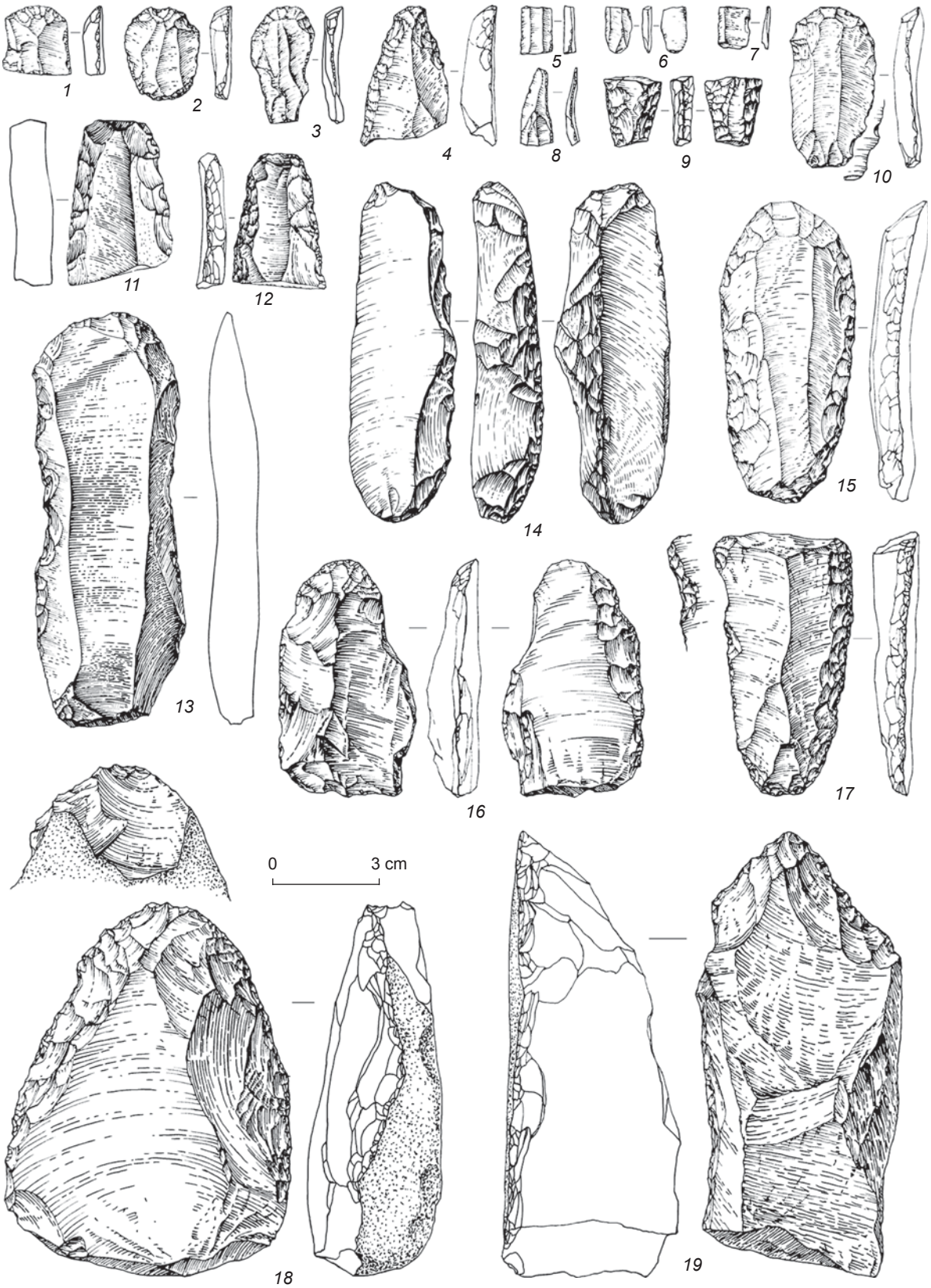

Fig. 3. Stone tools (*1–4*, *8–19*) and bladelets (*5–7*) of the EUP-1 cultural complex. Ust-Karakol site.

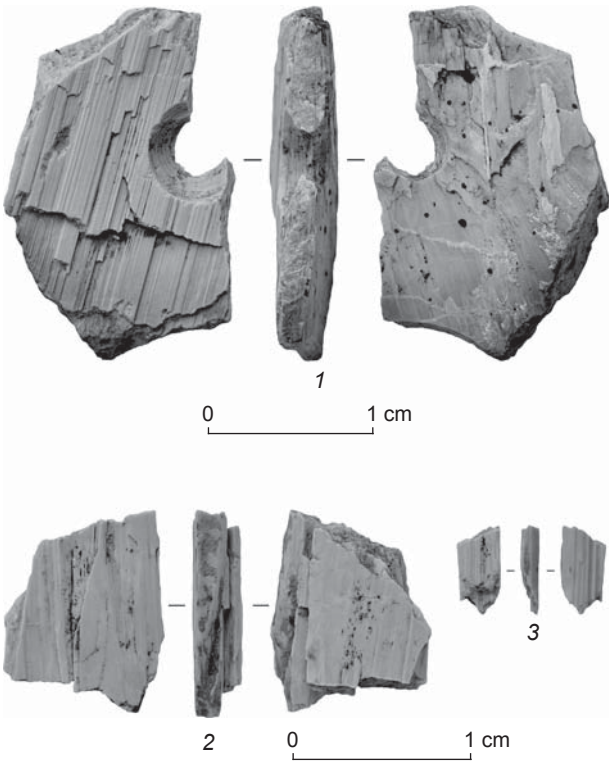

Fig. 4. Items made of serpentine. Canon EOS 7D + EF-S 60 mm f/2.8 Macro USM. Ust-Karakol site.
1 – a fragment of the ornament's blank with traces of biconical drilling; *2*, *3* – fragments of the ornament with traces of polishing.

shape. Traces of breaking are discernible over much of the artifact's perimeter. When assembled, the item has a sub-rectangular shape, plano-convex cross-section, straight profile, and dimensions of 11.0 × 9.5 × 3.5 mm. Flattened zones with traces of abrasive treatment can be seen on the flat side and on certain protrusions of the convex side (near the side faces).A face beveled at an angle of 45° to the longitudinal axis of the item is shaped on the convex side by means of abrasion.

A small fragment of an ornament made of greenish-yellow serpentine-antigorite (artifact No. 3, Fig. 4, *3*) has a sub-rectangular shape, flattened-lenticular cross-section, and dimensions of 4.7 × 2.0 × 1.5 mm. Like the previous one, it is a fragment of an indeterminate ornament. Traces of knapping are seen on both flat sides. The use-wear analysis has failed to reveal obvious traces of treatment. Since fragments of item No. 2 are appliquéd, and their color, texture, and other characteristics of the surface are identical to those of item No. 3, we suppose that they are parts of a single artifact.

Studying the manufacturing technology and determining the functions of the personal ornaments under study were based on the data from technological and experimental use-wear methods (Girya, 1997: 58–79; White, 2007; Heckel, 2016). The primary use-wear analysis was carried out at medium and low (×7–×45) magnification, using the binocular microscope Altami CM0745-T with oblique illumination. Micro-examination (×100–×500) employed the metallographic microscope Olympus BHM equipped with a reflected light illuminator and differential interference contrast (DIC) lenses. Photo-fixation of materials was performed using the Canon EOS 7D and Canon EOS 5D Mark IV Digital SLR cameras with the EF-S 60 mm f/2.8 Macro USM, EF 100 mm f/2.8 Macro USM lenses and a tripod mount with manual focus-adjustment. Microlevel photographic recording was conducted using the Canon EOS 7D camera and the Olympus BHM optical system. High-quality photographs of the artifact surfaces, with focusing in the entire area of one frame, were obtained with the Helicon Focus program. Traces were studied with the involvement of a collection of comparative use-wear references obtained as a result of experiments, and published experimental data (Francis, 1982; Gurova, Bonsall, 2017).

The study of the spatial distribution of the ornaments, aimed mainly at clarification of their cultural and chronological context, was based upon the methods of spatial analysis, refitting and raw material units, and upon the data on stratigraphy of cultural deposits of the site. Mineral raw materials were diagnosed using the microscope MBS-10. Variability of physical properties (color, texture, etc.) of serpentine partings was determined by comparing with samples included in the reference mineralogical collection owned by the Department of Geology and Geophysics of the Novosibirsk State University.

Results of the study

Spatial context. The blank of a pendant was found during the 1995 field studies in lithological horizon 9.2, sq. 9/10. Three fragments of a polished item, two of which are appliquéd, were identified in 2016 when sorting out the 1995 collection of faunal materials, among small indeterminate bone remains recorded in lithological horizon 9.3, sq. 7/11 (Fig. 5, 6).

All artifacts were discovered in the downhill part of excavation area 2, in the immediate vicinity of the northern stratigraphic section of 1995. In this area, the lithological units of layer 9 lay subhorizontally, with a gentle westward gradient (Fig. 6). Being composed of light loess loams, these were a part of geological body, relatively homogeneous in color and composition—a pack of layers 8–11. Lithological horizon 9.3 has been recorded within the entire area of excavation 2. Its boundaries are indistinct, wavy-tongued and saw-toothed; the thickness varied from 0.1 to 0.3 m. Lithological horizon 9.2 was a dynamic formation rather than a sedimentary one (Prirodnaya sreda…, 2003:

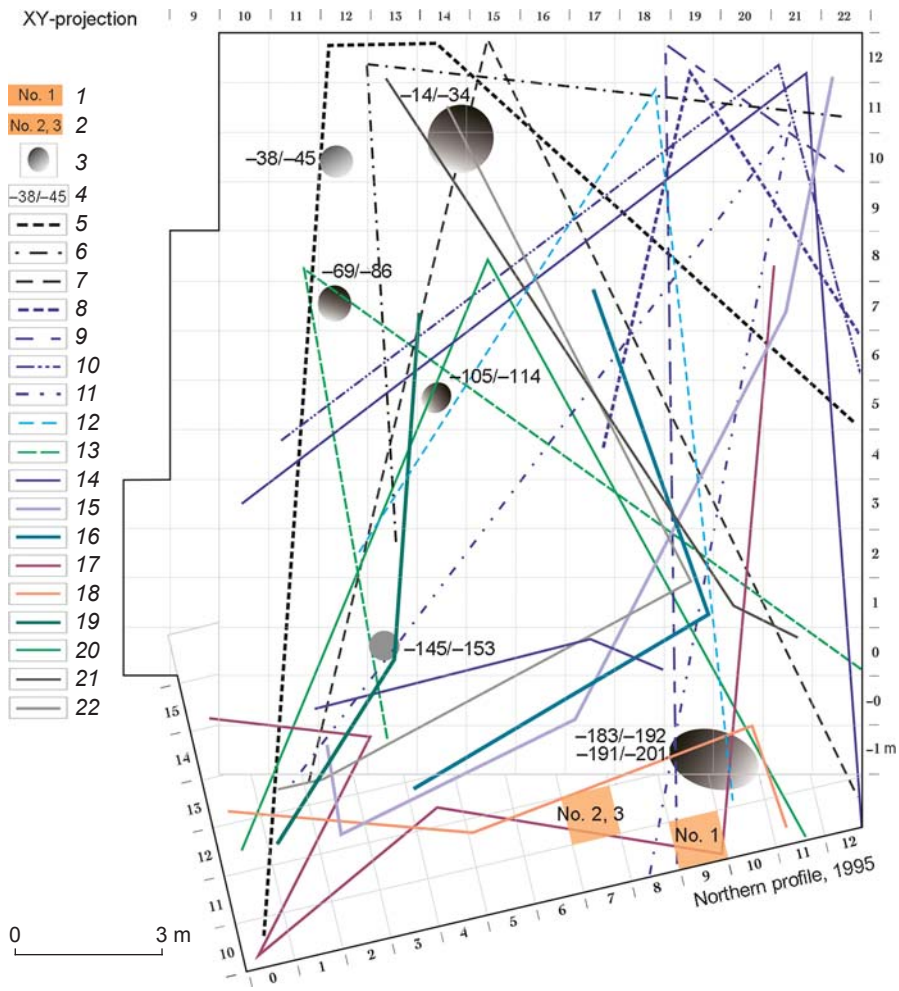

Fig. 5. Spatial context of serpentine items. Ust-Karakol site.

1 – location of a serpentine ornament blank with traces of drilling; *2* – location of fragments of a serpentine ornament with traces of polishing; *3* – coaly fireplace spots; *4* – bench marks; *5–13* – distribution zones of knapping products of individual blocks of raw materials (large groups of raw materials, including appliquéd fragments); *14–22* – spatial relations between elements of refitting and raw material groups.

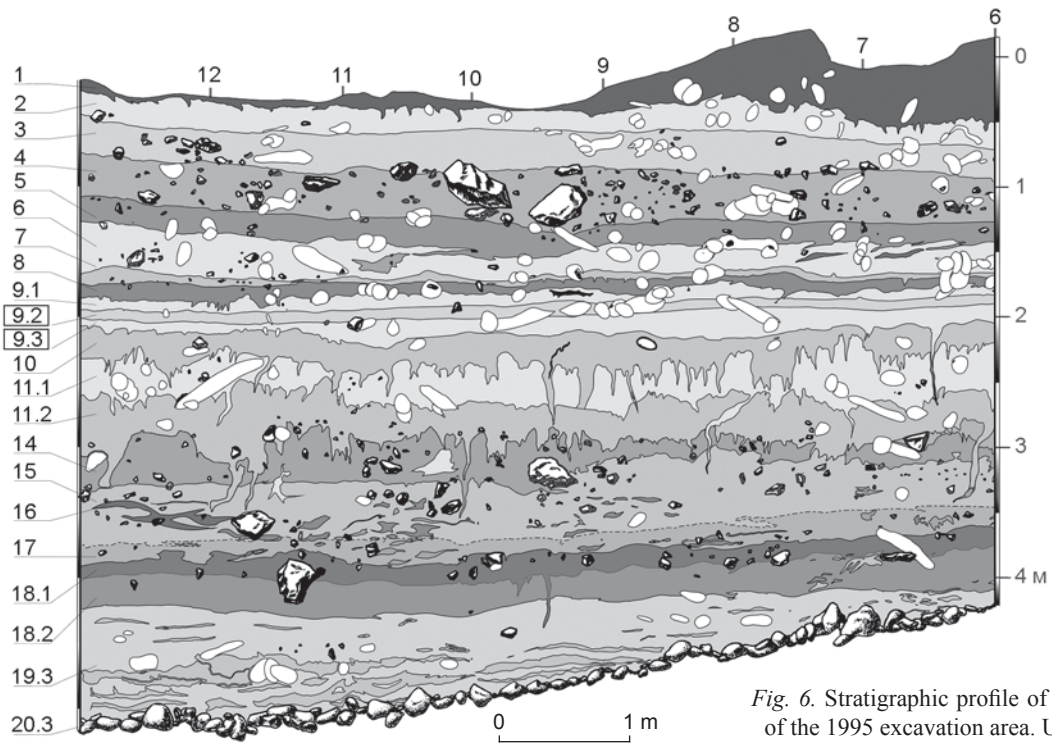

Fig. 6. Stratigraphic profile of the northern part of the 1995 excavation area. Ust-Karakol site.

240–243). In the area where the pendant blank lay, it was traced locally, in the form of an albic strip with indistinct boundaries. The horizon's thickness varied from 0.01 to 0.12 m. The stratigraphic situation in the area where ornaments have been discovered, and the data of spatial analysis, suggest severe post-sedimentary disturbances of deposits, which had a biogenic origin (Shunkov, Belousova, 2015).

The results of spatial reconstructions testify that all serpentine-antigorite items are a part of one of four large spatial structures of the EUP-1 complex, recorded during the study of technological accumulations and fireplace spots (see Fig. 5). Three of them have been revealed in the southern part of excavation area 2, in the most elevated areas of the slope. Judging by the shapes of accumulations and the distribution of their elements, active displacement of lithic artifacts from these zones was due to gravitational drifting along the slope. A zone of technological accumulations related to ornaments is located downhill, in the northwestern part of the excavation area, and confined to a large fireplace spot. The pendant blank has been found at a distance of 0.5–1.5 m from the fireplace, and other antigorite items 1.5–2.5 m from it. Such inclusion of artifacts, some of which can be appliquéd to each other, in the spatial structures of the complex suggests that slope processes probably had no noticeable influence on the distribution of ornaments; and in the post-sedimentary period, these were also not affected by burrowing animals.

Sources of raw materials and technological context. Being typical for serpentine and talc, their formation in ultrabasites, which are absent in the northwestern Altai, earlier provided reasons to associate sources of these minerals with the ultrabasite occurrence in the southern part of the Altai Mountains, closest to the Anuy valley sites (Kulik, Shunkov, 2011). These are apoharzburgite serpentenites, serpentized pyroxenites, and gabbro ($\Sigma V–Є_1$) of the Terekta Ophiolitic Mélange Belt, accompanying the Terekta fault (Fedak et al., 2011: 139). At the same time, the light color of serpentine in the Ust-Karakol ornaments also permitted its formation in magnesian carbonate rocks altered by contact. However, the latter are absent in the aureole of granitoids of the Bashchelak mountain range, neighboring upon the Anuy group of sites. This fact, along with the presence of items made from dark green serpentine and talc with magnetite inclusions in Denisova Cave, made the version about association of serpentines (including antigorites) with ultrabasites from southern Altai more relevant.

Meanwhile, the considerable remoteness of raw materials locations in the Terekta fault, and also the specific yellow color of Ust-Karakol ornaments, indicative of a nonferrous material, push for searching for other sources of serpentine. Detailed studies of the petrographic composition of magmatic rocks of the Bashchelak and Anuy mountain ranges (Ibid.: 175–176) have shown that Devonian and Permian magmatism occurrences of main composition, widely developed in this territory, are often represented by gabbroids, including gabbronorites, norites, and even olivine-norites, i.e. varieties containing Mg-Fe-pyroxenes and olivine—the original minerals in serpentinization. These minerals do not form large accumulations, and their content in rock of not more than 10 % is quite in line with a relatively rare use of serpentine as a fabricating material and the small sizes of items (in contrast, serpentines formed in ultrabasites are characterized by the formation of massive accumulations). Closest to the Anuy valley sites, such occurrences are the Butachikha mass of the Topolnoye complex in the interfluve of the Chernovoy Anuy and Shchepeta rivers (≈ 20–25 km), a mass of gabbroids of the same complex on the Pleshivaya mountain in the Anuy ridge (≈ 20–25 km), and dikes of gabbroids to the south of the Topolnoye village (≈ 15 km).

The technological context of manufacturing personal ornaments of serpentine-antigorite at Ust-Karakol and other sites of the Anuy group is incomplete, since it lacks initial nodules of raw material, primary flakes, chatters, or chips, which could testify to the transportation of small blanks and preforms to the site. This assumption is also supported by the data on consumer properties of antigorite: its untreated partings are rarely large and massive; these are more often fragile and split into small chatters owing to a high intensity of rock fracturing and foliation; i.e. primary approbation of this stone raw material should have been made at the place of its discovery.

Studying serpentine items from Ust-Karakol has demonstrated that fabricating materials for all ornaments are almost identical in texture, structure, and color, and only minor differences in tones are observed. The results of studying untreated serpentine-antigorite fragments from the reference collection testify that the recorded differences in the colors of ornaments derive from normal color variations typical for a single parting (Fig. 7). Consequently, all ornaments could have been made from one fragment of stone raw material brought to the site.

Manufacture of blanks. Analysis of the morphology of Ust-Karakol ornaments, data from petrography and experimental simulation suggest that the blanks of the items under consideration were produced by the knapping of serpentine partings by percussion technique, with the use of a stone hammer, or as a result of purposeful fragmentation in the hands of an artisan. Low hardness and pronounced lamination of serpentine (the result of foliation) made knapping of partings along the foliation directions the most suitable method for producing thin angular laminar blanks. The use of primary and secondary flakes as blanks at the Ust-Karakol site is evidenced by the morphology of the

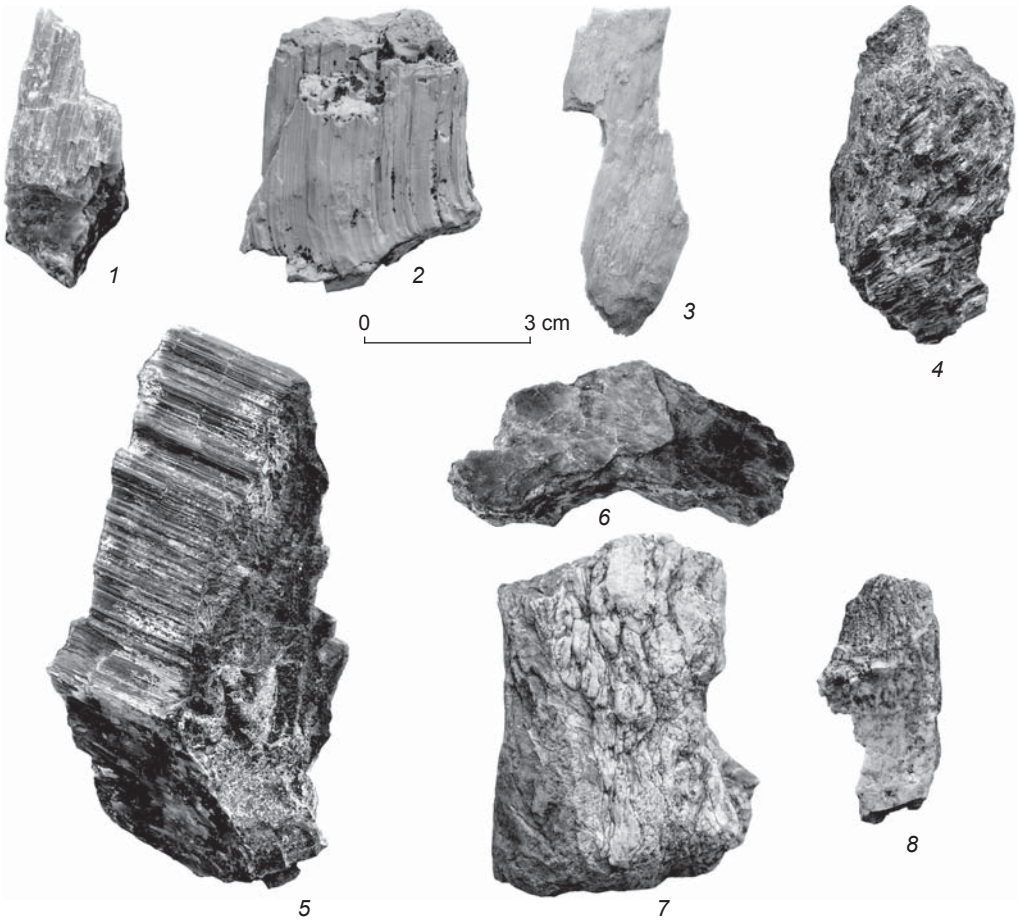

Fig. 7. Collection of serpentines and serpentinites from localities of the southern Urals (*1*, *3–8*) and western Chukotka (*2*). Canon EOS 5D Mark IV + EF 100 mm f/2.8 Macro USM.

ornaments: sub-rectangular cross-section, remains of a natural surface of slickenside, and traces of knapping along the lamination (Fig. 8, *c*).

Production of preforms. The serpentine-antigorite blank of a pendant has one hole, inside which several tiers of concentric grooves are preserved (Fig. 8, *a*). It is characterized by a regular circumference shape and biconical profile. There are no use-wear traces either inside or around the hole. The hole's morphology points to the smoothness of drilling, using a stone tool with a relatively wide symmetric working portion with a triangular shape, and the diameter of a circumscribed circle up to 6 mm. At the initial stage of drilling, a through-hole in the form of a wide truncated cone was formed on the item's surface, bearing traces of knapping along the lamination. Then, it was drilled out in the reverse direction from the opposite side, obviously by the same tool. There are no traces of leveling the passage by boring (Fig. 8, *b*). The blank's morphology is indicative of its deformation at the final stage of drilling, which may point to the manufacture of the ornament directly at the site. Heterogeneity (fracturing, lamination) of the initial parting of serpentine-antigorite was obviously the main reason for uncontrolled delamination and fragmentation of the blank when drilling perpendicularly to the lamination.

The absence of traces of preliminary abrasive or other treatment shows that the perforating stage preceded polishing in the *chaîne opératoire*. This is typical for the preparation of preforms from other fragile fabricating materials widely employed in the Paleolithic of North and Central Asia—for example, for making beads from ostrich eggshell (Tashak, 2002; Volkov, Gladyshev, Nokhrina, 2015). Notably, the *chaîne opératoire* of manufacturing Paleolithic ornaments from agalmatolite, chloritolite, and marble, known in North Asia, is dominated by the reverse operation sequence at the stage of preform preparation: first, the blank surface was treated by planing and/or polishing, and then, it was perforated using a drill or a reamer.

The final stage of manufacturing antigorite ornaments. This consisted in abrasive treatment of the surface. The technological features of this stage were reconstructed when analyzing a large ornament fragment composed of two appliquéd parts. The preserved traces of polishing are

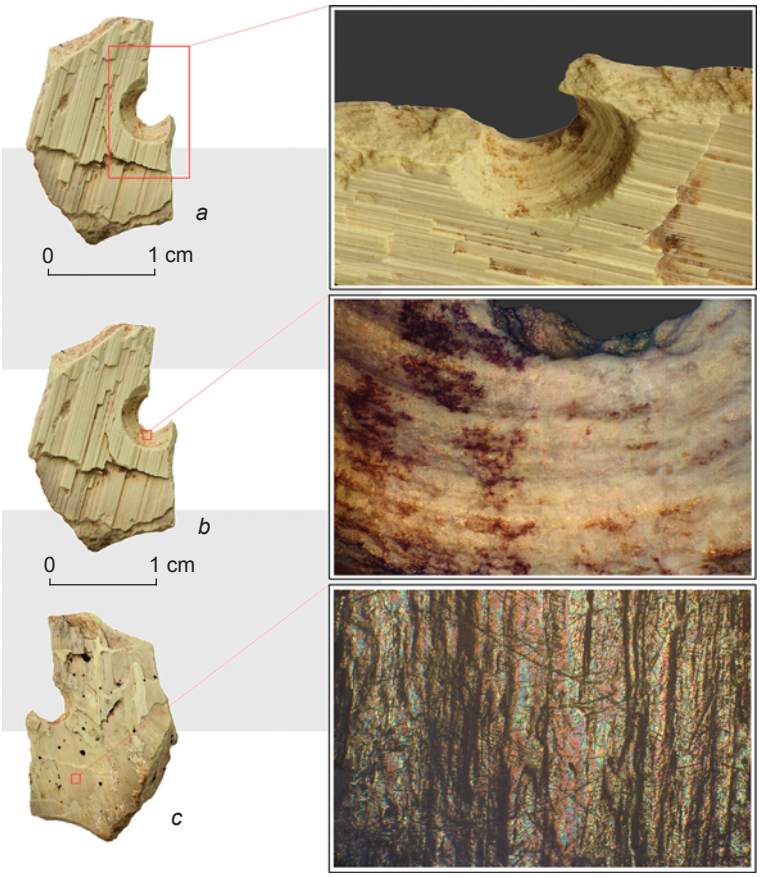

Fig. 8. Serpentine ornament-blank with traces of biconical drilling. Ust-Karakol site, the EUP-1 cultural complex. Canon EOS 7D, Olympus BHM, EF-S 60 mm f/2.8 Macro USM, processing in the Helicon Focus program.
a, *b* – traces of biconical drilling: *a* – ×3 magnification, *b* – ×40 magnification; *c* – remains of natural surface of slickenside (×40).

confined to the protruding areas of the wide surface and the adjoining side face (Fig. 9, *a*). At ×100 magnification, it has been established that they have appearance of parallel rows of long, thin incised striations. Abrasive treatment was employed to level surface irregularities (Fig. 9, *b*) and smooth side faces of preforms in order to produce items of preset shapes (Fig. 9, *c*). Use-wear analysis has not identified any explicit wear characteristics:

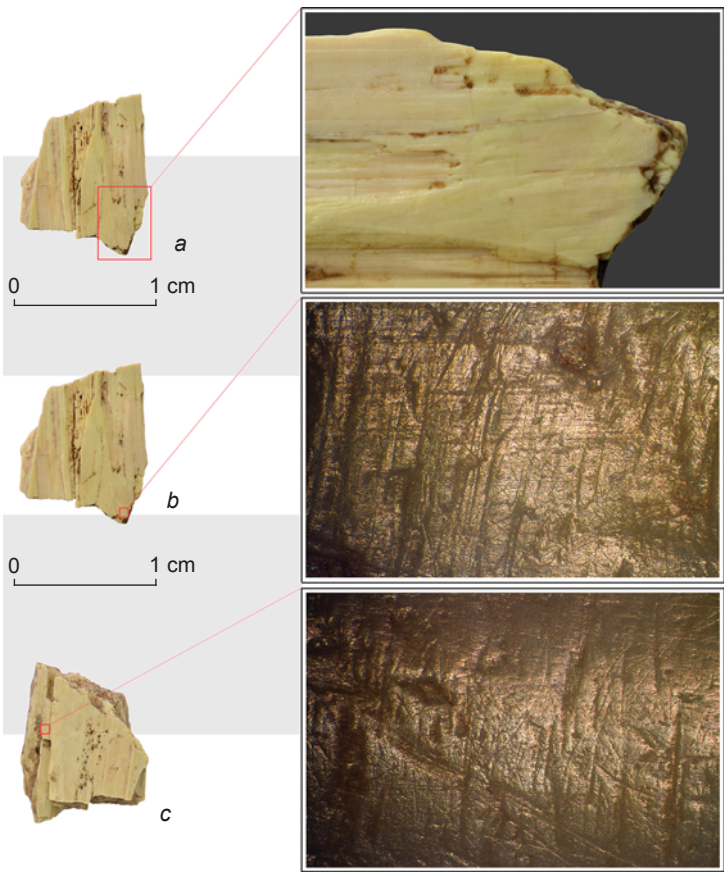

Fig. 9. Fragment of ornament with traces of polishing. Ust-Karakol site, the EUP-1 cultural complex. Canon EOS 5D Mark IV, Olympus BHM, EF 100 mm f/2.8 Macro USM, processing in the Helicon Focus program.
a – pendant's surface leveled by polishing; *b*, *c* – traces of polishing (×100).

there are neither attrition marks inside the blank's hole, nor signs of marco- and microdeformations on the fragment of the item with the traces of polishing.

Conclusions

Studying the spatial context of ornaments at the Ust-Karakol site has made it possible to establish that they lay in a relatively undisturbed condition and were not subjected to a substantial displacement due to slope and bioturbation processes. The ornaments were located within a single lithological layer in the northwestern part of the excavation area, near a large fireplace spot and several vague technological accumulations. Considering the rarity of serpentine-antigorite items, the occurrence of the pendant blank and several fragments of one ornament in a single spatial context is, most probably, evidence of one-time production activity. This conclusion is supported by the data on the variability of physical properties of raw materials similar to those employed for ornaments.

It has been established that the fabricating material for both items is identical in terms of petrography, while the differences in color derive from color shades of a single serpentine-antigorite parting.

According to the results of studies, operations for the manufacture of serpentine-antigorite ornaments were performed directly at the Ust-Karakol site. The artifacts were fragmented either at the preform stage, or at the stage of final trimming. No use-wear traces have been revealed. The *chaîne opératoire* for production of serpentine items included selection and transportation of raw materials and producing of blanks. For blanks, small angular laminar fragments were employed. Owing to the fragility of the serpentine-antigorite in use, perforation of preforms preceded the abrasive treatment of their surfaces. Such a sequence reduced the risk of breaking an item.

Reconstructed techniques of manufacturing serpentine ornaments belong to the technological repertoire of the Early Upper Paleolithic Ust-Karakol cultural tradition in the Altai. The age of the items under study corresponds to the range of values obtained for layer 9 (see *Table*), 29.7–33.1 thousand years (uncal). Lithic industries of this tradition demonstrate a good knowledge of the local raw material resource base and the high mobility of early humans. Thus, they could afford to be selective in choosing raw materials for manufacturing tools of various types. The petrographic analysis of magmatic rocks of the Bashchelak and Anuy mountain ranges showed that serpentine for Ust-Karakol ornaments could have been local. Potential sources were most probably gabbroid deposits related to Devonian and Permian magmatism of the region.

The technology of the treatment of serpentine, represented at Ust-Karakol, finds a wide range of parallels in the archaeological complexes of the Late Pleistocene and Early Holocene of North and Central Asia. Generally, the collection of artifacts made of serpentine and serpentinite consists of at least 75 items from 12 archaeological sites. Beyond the Altai Mountains, the most ancient examples of the manufacture of items from serpentine and its varieties in the form of single pendants have been recorded in the EUP complexes of the sites of Malaya Syya (34–29 ka BP) in southern Siberia (Lbova et al., 2018) and Tolbor-21 (34–26 ka BP) in Northern Mongolia (Rybin et al., 2017). An impressive collection of items made of this material (pendants, "fasteners", and a female figurine unique for the Siberian Paleolithic) was obtained at the Middle Upper Paleolithic sites of Malta and Buret (21–19 ka BP), in the southern Angara Region (Abramova, 1967). Informative ornaments in the form of flat round beads and blanks are present in the Final Paleolithic assemblages of Afontova Gora II (15–11 ka BP) (Derevianko et al., 2017) and Maltat (14.5–13.6 or 10.6–9.5 ka BP) (Paleolit…, 2018: 141), in the Yenisei region. A series of volumetric beads and pebbles, as well as a unique serpentinite bowl, have been discovered in the Paleolithic layer (16.0–13.9 ka BP) of Capova Cave, in the southern Urals (Zhitenev, 2017). Single pendants from similar raw materials have been found in Early Holocene complexes of Central Asia: in the Chikhen-Agui rock shelter (11.5–7.8 ka BP) in Central Mongolia (Derevianko et al., 2008) and at the Obishir-5 site (9.4–7.4 ka BP) in the Fergana Valley (Fedorchenko et al., 2018).

Comparison of the production technology and morphology of serpentine artifacts from Ust-Karakol and similar items from the Paleolithic sites of North and Central Asia has allowed several observations to be made. In this region, in the Early Upper Paleolithic, a rather stable set of techniques was applied to treat serpentine: biconical drilling, abrasive treatment, and polishing. Among these, the key technique was polishing, which allowed substantial changes in a blank's shape, creation of items with a thin and straight profile, and repair or reshaping. These technological solutions were used to manufacture pendants with relatively simple geometric shapes, including triangular, rectangular, or polyangular. The absence of drilling, grinding, and polishing in the Middle Paleolithic industries of the region suggests that these techniques were innovated in the Early Upper Paleolithic.

At the middle and late stages of the Upper Paleolithic, more sophisticated items are recorded. At that time, the following items were manufactured from serpentine: miniature beads (Maltat and Afontova Gora II), "buttons" and annular grooved pendants (Maltat and Buret), and, in certain instances, peculiar prestige and ritual items (a bowl from Capova Cave and an anthropomorphic figurine from Buret). The creation of more technically sophisticated shapes suggested a longer *chaîne opératoire* and strict stadiality. In the Late Upper Paleolithic, there appeared seriality and standardization in the production of certain categories of ornaments, for example flat round beads.

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Unshaped Bone Tools from Denisova Cave, Altai

This study describes a part of the Paleolithic bone industry of Denisova Cave—the site that is key for understanding a complex interaction between various groups of early humans and the Middle to Upper Paleolithic transition. The Initial Upper Paleolithic layers of the cave yielded fossil remains of Denisovans, and the earliest ornaments and bone tools in North and Central Asia. The principal objective of this study is to analyze unshaped bone tools from the Late Middle and Initial Upper Paleolithic from the East Chamber of the cave. Among more than 10 thousand bone fragments, subdivided into three groups in terms of taphonomic, technical, and utilization traces, 51 specimens were selected for study. On the basis of location of use-wear traces that varied according to function, unshaped bone tools such as retouchers, awls, intermediate tools, and knives were revealed for the first time in Denisova Cave. The results of the morphological and use-wear analysis suggest that those tools were used for processing organic materials such as leather, plant fibers, and wood. Unshaped tools indicate a developed industry that preceded, or was contemporaneous with, the formal types of tools—polished points and eyed needles.

Keywords: *Altai Mountains, Denisova Cave, Initial Upper Paleolithic, Denisovans, bone industry.*

Introduction

The issue of the Upper Paleolithic culture origins still remains debatable, since the picture of evolutionary development created on the basis of European materials is not considered universal any more. As shown by the results of studies conducted in Africa, Eurasia, and Oceania in recent decades, the model of succession of cultures in the European Paleolithic just summarizes the local scenario of peopling processes.

The context of Denisova Cave and other multilayered Paleolithic sites in the northwestern Altai does not agree with the European concept of Paleolithic development. The results of investigation of these sites indicate the concurrent existence of Denisovans, an earlier unknown population of the genus *Homo*, with Neanderthals in southern Siberia. Besides, they point to a relatively early (about 50–45 ka BP) appearance of stone and bone working technologies, as well as nonutilitarian items, which correspond to the behavior of anatomically modern humans, though no evidence of the presence of such humans in Altai in the Initial Upper Paleolithic has so far been found. The concept of "modern behavior" itself is based upon analyses of the activities

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of *Homo sapiens sapiens*, whose representatives were the founders of the Upper Paleolithic traditions in the territory of Europe.

Certain modern behavioral traits were reflected in earlier materials in the African continent (Henshilwood, Marean, 2003). Before the appearance of anatomically modern humans, some groups of European Neanderthals seem to have experienced innovations, in particular in symbolic field (Hoffmann et al., 2018). The semantic shift between biological and cultural modernity, resulting from the historical background of prehistoric researches, could lead to a circular reasoning when enlarging the focus geographically and chronologically. To avoid such a situation, the context of any site must be analyzed taking into account its specifics, whatever took place in the western part of Eurasia at that time.

Archaeological and anthropological materials from Denisova Cave are indicative of the gradual evolutionary development of behavioral traits typical of anatomically modern humans on the basis of local culture (Derevianko, 2010). This process is reflected not only by the stone industry but also by the bone.

Denisova Cave is situated in the upstream flow valley of the Anuy River, in the low-mountain and mid-mountain zone of the northwestern Altai, at 690 m a.s.l. (Fig. 1). The cave consists of several narrow dark chambers, interconnected through the Main Chamber. The cultural and chronological range of Pleistocene deposits at the site is the greatest such range for North and Central Asian sites; it covers a period from the Early Middle Paleolithic (about 300 ka BP) to the Final Late Paleolithic (Jacobs et al., 2019). Ornaments and tools made from organic materials have been discovered in deposits aged 50–35 ka BP (layers 11.5–11.1 in the Main Chamber, layers 11.2 and 11.1 in the East Chamber, layer 11 in the South Chamber). Their creation at the early stage of the Upper Paleolithic is evidenced not only by the dates of enclosing sediments, but also by those of pendants made of elk incisors and bone points (Douka et al., 2019).

Stones, bones, and animal teeth, mammoth tusks, ostrich eggshells and mollusk shells were used as raw materials for manufacturing ornaments. These were treated using various techniques, such as scraping, grinding, polishing, sawing, and drilling (Derevianko, Shunkov, Volkov, 2008; Shunkov, Fedorchenko, Kozlikin, 2018). Along with ornaments and stone tools belonging to the initial Upper Paleolithic, formal bone tools, mainly eyed needles and awls, were discovered in Denisova Cave.

Mitochondrial and nuclear DNA recovered from anthropological remains and cave deposits belongs to Denisovans and Neanderthals (Slon et al., 2017). This fact suggests that the transition to the Upper Paleolithic proceeded here on the basis of local Middle Paleolithic culture, as for example at the Arcy-sur-Cure site in France, judging by the results of analysis of the bone industry and ornaments from the Chatelperronian layer of this cave (D'Errico et al., 2003).

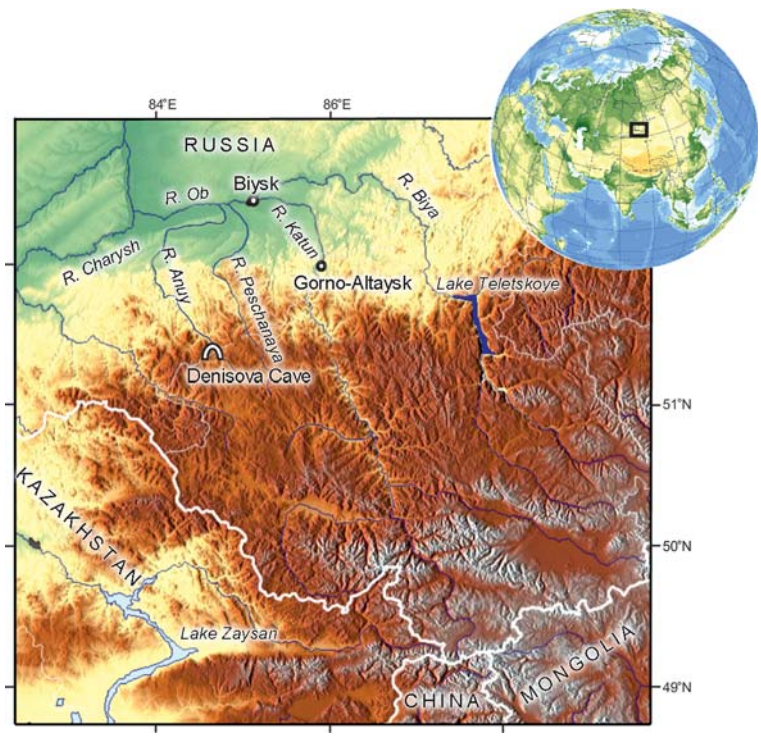

Fig. 1. Denisova Cave on the map of Altai.

Lithic industries from Denisova Cave and Arcy-sur-Cure reflect the continuity of development: Middle Paleolithic types of tools were used along with new shapes. Meanwhile, traces left by *H. s. sapiens* at the early stage of the Upper Paleolithic are absent at these sites. The bone artifacts found here are not only a new group of artifacts, but also the evidence of using a new type of raw material that was traditionally considered to be culturally specific to anatomically modern humans (Henshilwood, Marean, 2003). Is there a contradiction?

Informal bone tools in the Paleolithic

Tools made of organic materials have been recorded in the Early and Middle Paleolithic assemblages unrelated to anatomically modern humans (D'Errico, Henshilwood, 2007; Backwell et al.; 2008; Li, Shen, 2010; Mozota, 2012; Soressi et al., 2013; Stout et al., 2014; Julien et al., 2015; Zutovski, Barkai, 2016; Doyon et al., 2018). The Middle Paleolithic bone industries are characterized by small typological variability, the Upper Paleolithic ones by a great variety of shapes and manufacturing techniques (cutting, scraping, grinding, and polishing). If formal bone tools typical of the European Upper Paleolithic are discovered in earlier assemblages, they are considered as a sign of "modernity" (Backwell, d'Errico, 2014).

Comparative analysis of bone industries is based on series of items, wherein unshaped tools are usually not taken into account. However, such items are recorded not only in the Middle Paleolithic assemblages, but also in the Upper Paleolithic ones.

Solutrean assemblages of the last glacial maximum, state of the art of Paleolithic flint knapping, contain eyed needles that are the most ancient in Europe. At the same time, a considerable part of the bone industry in this culture consists of unshaped tools; among these, pressure tools for manufacturing thin leaf-shaped bifaces. These tools revealed by means of technological and use-wear analysis do not have evident signs of social or symbolic specialization. However, since they performed an important technical function, they should be considered one of the type specimens in the Solutrean industry (Baumann, 2014). Manufacture of blanks for Aurignacian tools was based mainly on percussion (Tartar, 2018). Objects of the Aurignacian portable art and antler spearheads with split bases are known better than informal bone tools of this culture.

Informal bone tools have become the subjects of special studies rather recently, for several reasons. First, owing to the absence of standardization in their shaping, it is difficult to identify them by typological criteria; second, bone items are often subject to mechanical and chemical destruction, and so are usually fragmented; third, they are hardly distinguishable from bones that were purposefully splintered by humans to extract bone marrow or were gnawed by carnivores. Thus, even if bone fragments are well preserved, it is often very difficult to distinguish shaping from other causes of anthropic or natural fracturing, in the absence of an appropriate method.

Within the framework of this study, noteworthy are needles and awls of the Initial Upper Paleolithic from Denisova Cave. The uniqueness of these tools is determined by their function rather than by shaping technology. Eyed needles and awls are generally associated with sewing clothes, weaving and plaiting, i.e. with the ability of treating hides and plant fibers, which suggested the use of various types of tools. Discovery of a series of items of the same type in a single stratigraphic context can be considered the evidence of production areas at the site and its prolonged occupation. This is the reason why we were expecting more than eyed needles and awls in the bone assemblage of the Initial Upper Paleolithic of Denisova Cave.

Material and methods

Faunal materials from layers 11.4–11.2 in the East Chamber of the cave were analyzed in the course of this study. In layer 11.2, which was accumulated during the period of the first half of MIS 3, artifacts of the Initial Upper Paleolithic have been found. Layers 11.3 and 11.4, formed during the time corresponding to MIS 4 and 5, yielded Middle Paleolithic finds. Bone fragments (over 10,000 spec.) up to 1 cm long were studied visually, without technical aids, and also using a Nikon SMZ-1 stereoscopic microscope. Photo-recording of materials was performed using a Canon 1000D and 100D SLR cameras, with a Canon EF-S 60 mm macro lens.

The bone fragments were divided into three groups by the types of traces on their surface: taphonomic, technical, and from use. Earlier described materials (Semenov, 1957; Fisher, 1995; Villa, d'Errico, 2001; Maigrot, 2003; Pickering, Egeland, 2006; Baumann, Maury, 2013; Baumann, 2014) and experimental data on manufacturing unshaped and formal bone tools were used as a comparative base.

Post-sedimentary organic (microorganisms, animals, plants) and inorganic (weathering, soil subsidence, water courses) modifications, resulting in dissolution, cracking, striations, erosion, disintegration, vermiculation, concretions, were looked for. One of the most destructive factors in Denisova Cave was the activity of carnivores, especially hyenas. There are certain criteria that allow damage on bones left by animals to be distinguished from the traces of human activities (Blumenshine, Selvaggio, 1991; Villa, Bartram, 1996; Villa et al., 2004). The traces

associated with activities of hyenas are bites, gnawed out areas, deep scratches, and pitted or glazed surfaces formed during digestion—the most widespread mark of the vital activities of hyenas.

Gnawed bone fragments are quite numerous; however, bone surfaces and edges have been little altered, probably because of a fast embedding and low temperature of the sediment, which was also propitious for DNA preservation. Consequently, the distinction between natural and anthropic traces is relatively easy there. The overall condition is good, and some samples with a well-preserved spongiosa would even look fresh, without spattering of oxide deposits on most pieces, particularly manganese.

Crushed long tubular bones were most frequently the result of brain marrow extraction. The produced splinters could have been used as blanks for bone tools. However, without systematic refitting it is not possible to establish whether they were resulting from operating sequences included in or distinct from the butchering process. Primary spalls on bones and notches from percussions, are considered as traces of man-induced reduction. Smooth surface, curved or V-shaped outlines, oblique angle of the fracture facets (Villa, Mahieu, 1991) are regarded as evidence of fresh-bone knapping.

Results

During sorting bone fragments from layers 11.4–11.2 in the East Chamber, 51 unshaped tools were found (see *Table*; Fig. 2) on the basis of 30 % of faunal materials from this portion of section. The general state of preservation of bone materials from Denisova Cave is good, and spongiosa is in perfect condition.

Unshaped tools were manufactured from the long tubular bones of ungulates of large (57 %) and middle (43 %) size. One item made of a vertebra, and two items made of rib fragments, have been found. The bones identifiable to a species belong to bison *Bison priscus* and red deer *Cervus elaphus*. Tibias were used as a basis. Humeri, femura, and metatarsi were used more rarely.

Unshaped bone tools were divided into three categories in terms of localization of wear traces and manifestations of characteristics that allow the functional purpose of items to be determined. The bones showing wear traces on their cortical surfaces are assigned to the group of tools that, since the end of the 19th century, are classified as retouchers (Daleau, 1883). The items with wear traces at one or both ends are subdivided into two groups. The first group consists of tools with a smoothed end, like awls, designed to handle soft materials. The second one includes intermediate tools with axial damage to both ends; these tools had the same operating process, but, judging by the variability of wear traces and the morphology of their ends, were used for different purposes. Obviously, tools with retouch and/or wear traces on their longitudinal edges differed functionally.

Retouchers. Items of this type are the most widespread bone tools of the Stone Age. These are known from the Early Paleolithic (Smith, 2013; Kolfschoten et al., 2015), occur in the greatest number in the Middle Paleolithic industries (Costamagno et al., 2018), and were still used in the Upper Paleolithic (Tartar, 2012b; Guadelli et al., 2013) and Neolithic (Taute, 1965). All retouchers have marks of percussions against sharp edges of stone tools. The function of retouchers was studied for the first time by H. Martin, using materials from La Quina, France (1906). According to him, these items could have been used as hammerstones to apply retouch and as anvils to perform cutting work. Later on, experiments were conducted to study the functions of these tools (Semenov, 1957; Shchelinsky, 1983; Bourguignon, 2001; Rigaud, 2007). Most scholars agree that they were used for shaping lithic edges by percussion.

Bone retouchers in layers 11.4–11.2 of Denisova Cave are rare; however, these are the first tools of this type found at the site. Blanks vary from long and narrow to short and large. Their length is 4.7–9.9 cm, width 1.1–3.6, and thickness 0.4–1.0 cm. Such heterogeneity is probably partly due to the small size of the sample and the diversity of the blanks, but also to the fragmentation of the artifacts: on at least 5 of the 8 samples, the impacted area was cut by a fracture, which occurred when the bone

Unshaped Bone Tools from layers 11.4–11.2 in the East Chamber of Denisova Cave, spec.

Items	Layer			Total
	11.4	11.3	11.2	
Retouchers	2	2	4	8
Tools with rounded end	1	1	1	3
Tools with axial damage	13	4	15	32
Tools with damaged edges	4	–	4	8
Total	20	7	24	51

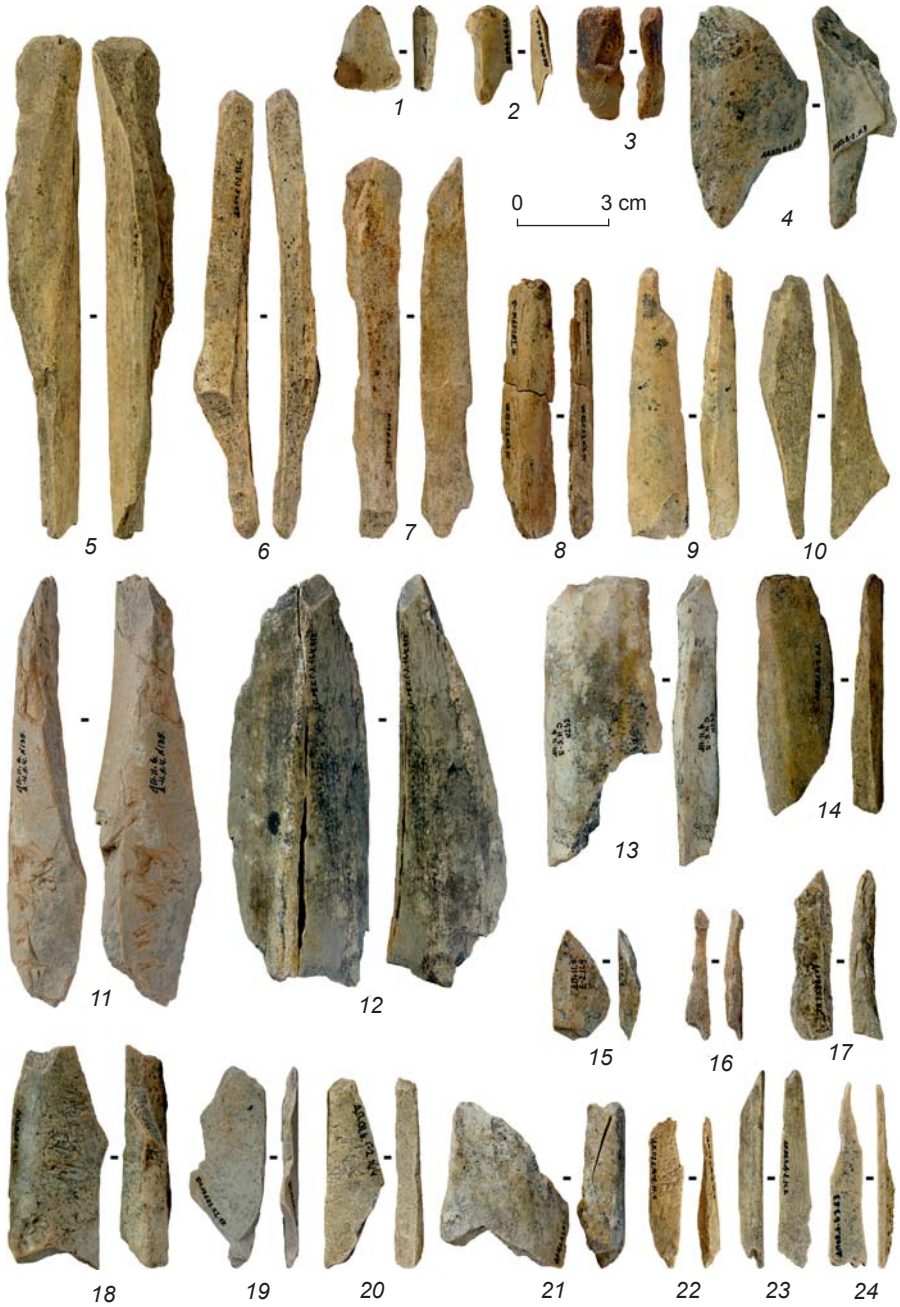

Fig. 2. Unshaped bone tools from layers 11.4 (*1*, *11*, *12*, *15*, *16*, *20*), 11.3 (*4*, *13*, *18*, *22*, *24*), and 11.2 (*2*, *3*, *5–10*, *14*, *17*, *19*, *22*, *23*) in the East Chamber of Denisova Cave (photos by M. Baumann). *1–14* – tools with axial damage; *15–17* – tools with damaged edge; *18–22* – retouchers; *23, 24* – tools with rounded end.

was fresh. In terms of density of percussion marks, the tools are distributed non-uniformly. The impact traces include both separate percussion marks (Fig. 3, *b*), and dense areas of percussion marks with microflaking (1–4 cm long) on the cortical surfaces of bones (Fig. 3, *a*). Retouchers are typical not only for layers 11.4–11.2: six such tools have been discovered in underlying Middle Paleolithic layer 12.

Tools with rounded end. The collection contains three small points with marks of smoothing. The lengths of the items are 5.6, 3.8, and 6.3 cm, widths 1.2, 2.1, and 1.0 cm, and thicknesses 0.2, 0.3, and 0.2 cm. Two tools are manufactured from ribs of ungulate animals of middle or large size, and the third from a small splinter of diaphysis. On one rib, an oblique break forming a natural trihedral point without traces of additional treatment is a working

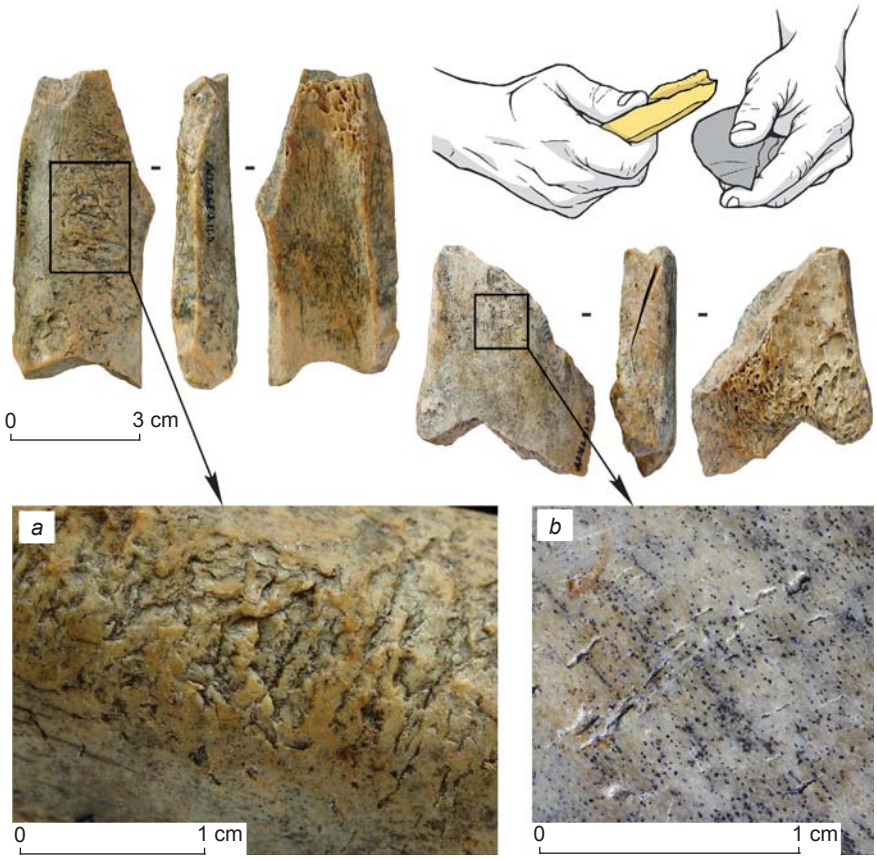

Fig. 3. Bone retouchers with traces of long-term (*a*) and short-term (*b*) use from layer 11.3 in the East Chamber of Denisova Cave (photos and drawing by M. Baumann).

edge (Fig. 4, *a–c*). Working edges of other items are shaped by fine abrupt single- or double-sided retouch, as on lithic borers (Fig. 4, *d*).

These tools correspond to the general definition of awls: "elongated objects made from bone material, partially or completely shaped, dimensions and section of which are variable, with a more or less acute point, sometimes smoothed or rejuvenated" (Camps-Fabrer et al., 1990). Awls are commonly considered as instruments for piercing hides or other soft materials (Maigrot, 2003; Christidou, Legrand-Pineau, 2005). Except sewing needles and projectile points, determined by their smooth surface and specific basal end (an eye or slots for fastening), any other pointed items are usually interpreted as awls, irrespective of their actual functions. Sharp ends of these three items became blunted, most probably as a result of working soft organic materials (see Fig. 4, *a*, *b*). Wear traces on two tools similar to lithic micro-borers are very small and correspond to the function of perforating medium-soft organic materials (see Fig. 4, *d*). Wear traces on the third item are more pronounced; undoubtedly, the tool was used for tailoring clothes, but not as an awl. The smooth morphology of the rounding, its distribution and extension, giving a spatula aspect to the active end (Fig. 4, *a*, *b*), strongly suggest a tiny hide burnisher, like the ones used for compacting the seam or for leather folding.

Unlike the Initial Upper Paleolithic awls found in the cave, these tools were manufactured without scraping and grinding. Similar unshaped tools possibly lie in the Middle to Upper Paleolithic transition layers at the sites of Arcy-sur-Cure (Chatelperronian horizon), Cavallo, Cala, and Castelcivita (Uluzzian layers) in Italy, where numerous awls manufactured by scraping and grinding have been found (D'Errico et al., 2004; D'Errico, Borgia, Ronchitelli, 2012). Unshaped points have also been recorded in the earlier assemblages, such as Mousterian horizons of the Combe-Grenal site in Dordogne (Tartar, Costamagno, 2016), in deposits aged about 80–100 ka BP at the Lingjing site in the Chinese province of Henan (Li, Shen, 2010), and in the Early Paleolithic horizons of the Schöningen site in Lower Saxony (Julien et al., 2015).

Tools with axial damage. These items form the most numerous group of unshaped tools (32 spec.). The majority of them have utilization traces, typical for intermediate tools. One (basal) end of tool was for

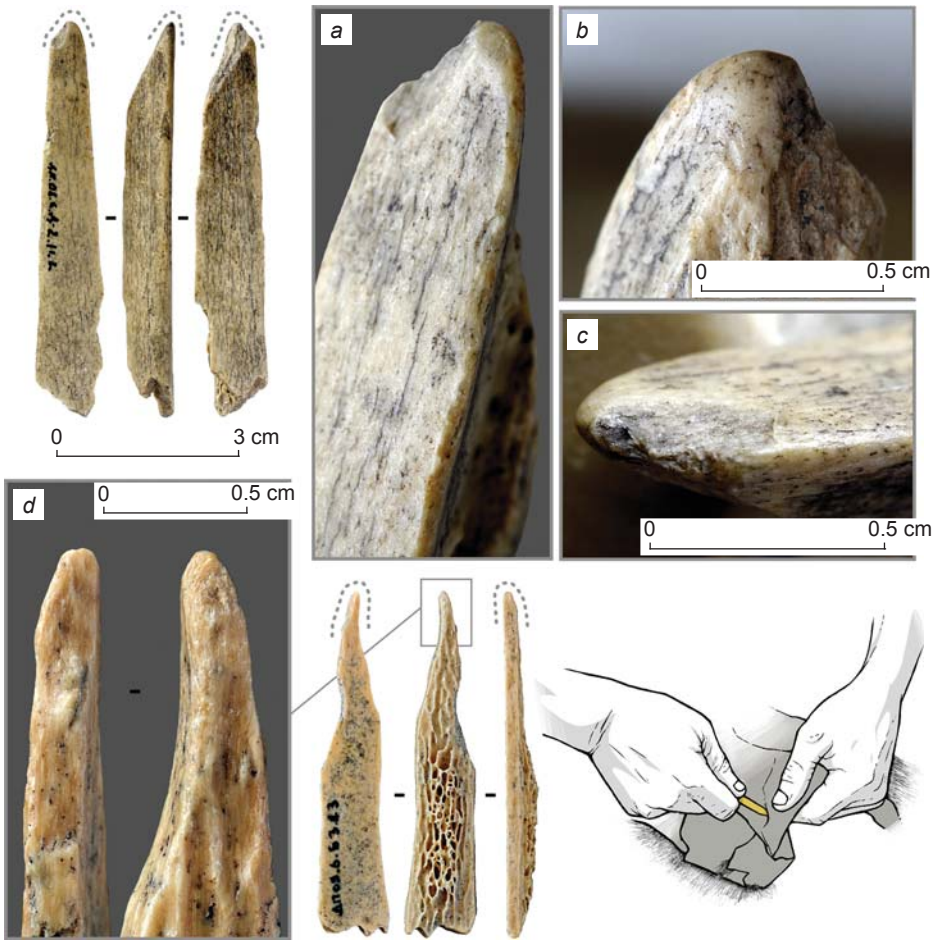

Fig. 4. Tools with rounded end from layers 11.2 (*a*–*c*) and 11.3 (*d*) in the East Chamber of Denisova Cave (photos and drawing by M. Baumann).
a – smoothed cortical surface and traces of distal end modification; *b* – smoothed inner surface of the distal end; *c* – working edge; *d* – retouched edge.

striking, while the opposite one (apical) was for working. Striking against the basal end resulted in compaction of bone tissue that was sometimes with a crushed flange and, more frequently, by appearance of edge spalls. The bevelled apical end can be compacted and have spalls, while scratches caused by contact with the work material cover its cutting edge and polished areas. The degree of concentration and the types of marks at both ends of the tool depends on the worked material, the hammerstone, and the striking angle (Rigaud, 1984; Provenzano, 1998; Tartar, 2012a). Intermediate tools are well known from numerous Upper Paleolithic finds, whose identification caused no difficulty because of similarity with ethnographic analogs (Lartet, Christy, 1865; Chauvet, 1910).

Upper Paleolithic intermediate tools were predominantly made of reindeer antlers. All such finds from Denisova Cave are made of bone. The length of intact or nearly intact items is 4.5–16.1 cm (9.2 on the average), width 0.9–4.5 cm (2.0 on the average), and thickness 0.5–1.6 cm (1.0 on the average). The tools are mostly long and massive (relationship between width and thickness is usually 2:1). In terms of morphology, these items can be divided into two groups. The first group involves tools on relatively large blanks, with a convex or straight cutting edge. Wear traces are small overlapping subparallel detachments (Fig. 5). The second group consists of longer and narrower blanks as compared to the above. Their working edge is thicker and blunted as a result of impact loads (Fig. 6, *a*, *b*). The basal part is covered by tangential detachments related probably to the shaping of tools (Fig. 6, *c*, *d*).

More than a hundred such items were discovered in the Early Aurignacian assemblages (Tartar, 2012a). However, they are not specific to the beginning of the Upper Paleolithic, and they also were mentioned in Late Mousterian sites, such as Gazaria in Basque Country, France (Ibid.), Axlor in Biscay, Spain (Mozota, 2012), Karabi Tamchin in Crimea, Russia (Burke, d'Errico, 2008). As in Denisova Cave, they were manufactured

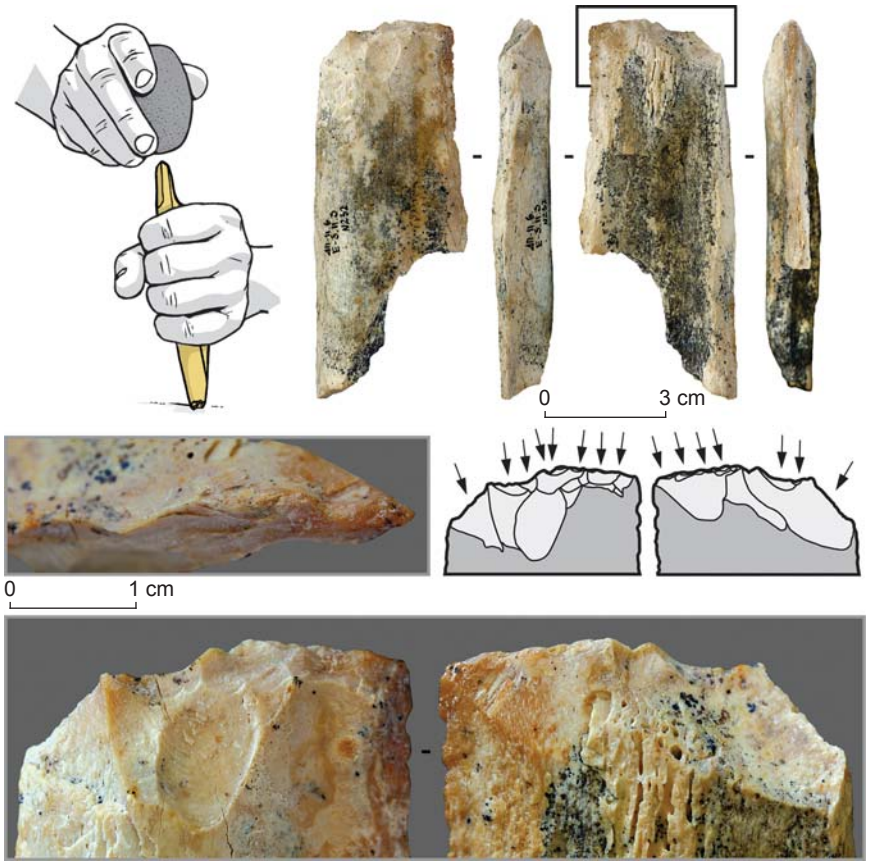

Fig. 5. Intermediate tool from layer 11.3 in the East Chamber of Denisova Cave (photos and drawing by M. Baumann).

mainly using tibias of large ungulates or straight and thick splinters of diaphyses.

Tools made from tibias, which are distinguished by their length, thickness, and tissue density, were the most resistant to impact loads. Several finds from the Early Paleolithic assemblage of Schöningen can also be assigned to the items of this type (Julien et al., 2015). The results of experimental use-wear analysis and comparison with ethnographic materials have suggested several assumptions about the function of the intermediate tools, including their use as chisel-like tools and barking instruments. Some use-wear signs and morphology of the working edges of items from Denisova Cave (see Fig. 2, *10*, *13*, *14*) confirm the possibility of such use (Semenov, 1957; Rigaud, 1984; Maigrot, 1997; Camps-Fabrer et al., 1998; Provenzano, 1998). The efficiency of these tools has been proved experimentally. However, the functional range was probably larger. Not all the traces fit with the work of woody material, such as on the tip of the sample shown on Fig. 2, *10*, which has been crushed by a repeated contact against a harder material.

Tools with damaged edges. Two intact tools are made of long tubular bones (tibia and humerus), most probably belonging to a bison; six items, different in size and morphology, were fragmented before drying of the bones. They are made from long bones (tibia and humerus) of a large ungulate (bison). The dimensions of two biggest items are 16.1 × 21.5 × 1.0 and 11.1 × 3.5 × × 1.0 cm, respectively. Wear traces (Fig. 7, *a*) typical of intermediate tools have been revealed at their transverse edges adjoining the side working edges, which suggests multi-functionality of the items.

All items show retouch at one longitudinal edge. It occupies 1/3 of the length at intact artifacts. Retouch is double-side, marginal on the dorsal side and covering the marrowy canal or spongiosa on the internal face (Fig. 7, *c*). Retouch on two items is bifacial. The shape of one item resembles a burin spall (Fig. 7, *d*) produced possibly by accident during utilization or rejuvenation of the tool. The functional purpose of the retouch is confirmed by some longitudinal removals produced during its use as a knife, and, in one case, by a light rounding of the cutting edge and a luster, probably from plant cutting (Fig. 7, *b*).

Such tools are mentioned rarely. The most known retouched bone items are Acheulean bifaces found in Africa, Europe, and in the Near East (Zutovski, Barkai, 2016). These are fully shaped pieces rather than tools

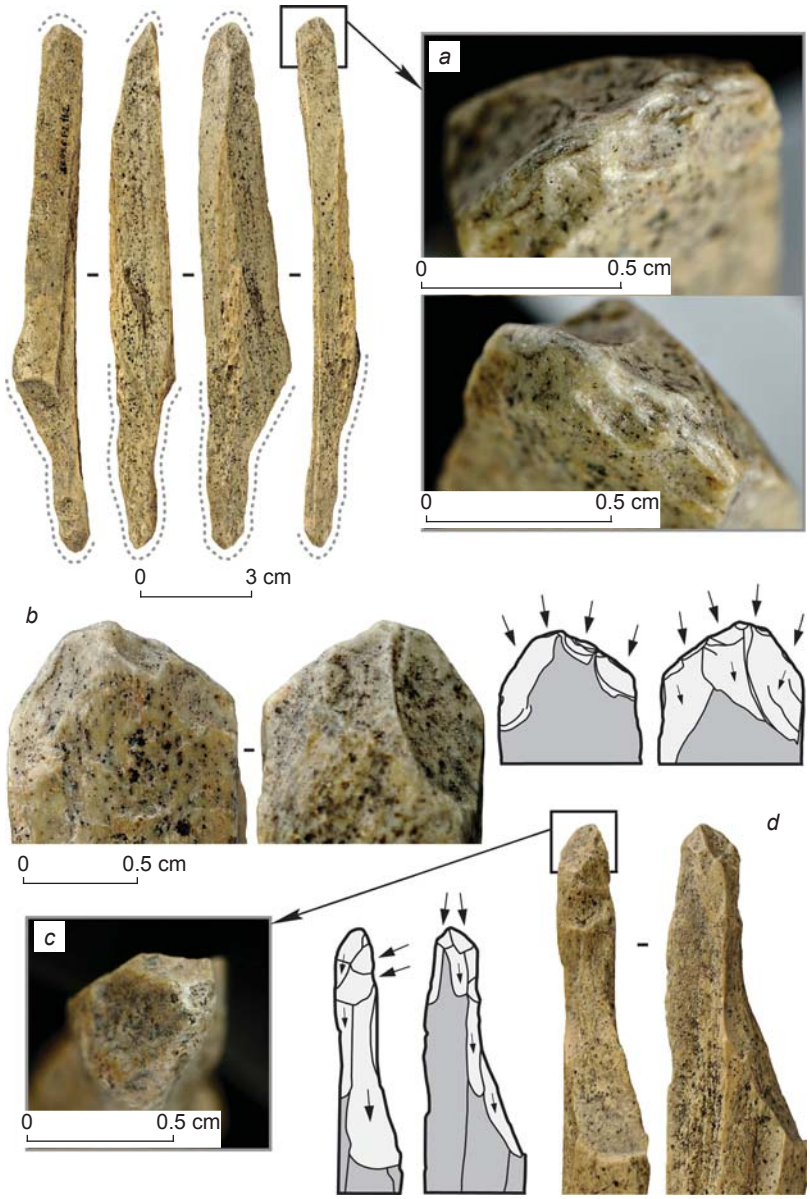

Fig. 6. Intermediate tool from layer 11.2 in the East Chamber of Denisova Cave (photos and drawing by M. Baumann).
a – compaction of the apical end; *b* – spalls at the apical end; *c* – compaction of the basal end; *d* – longitudinal and transverse spalls at the basal end.

with rejuvenation of one of the edges. Middle Paleolithic tools made of bones with retouched edges are known from materials of such sites as Vaufrey (Vincent, 1993), Combe-Grenal, and La Ferrassie (Tartar, Costamagno, 2016) in France, Axlor (Mozota, 2012) and Bolomor (Blasco et al., 2013) in Spain, and also from the Late Mousterian horizon finds in Fumane Cave in Italy (Romandini, Cristiani, Peresani, 2014). As in Denisova Cave, retouched bone artifacts at the majority of sites were discovered mostly along with smoothed points and intermediate tools.

Discussion

Unshaped bone tools discovered in layers 11.4–11.2 in the East Chamber of Denisova Cave are small in number; however, these are evidence of a developed industry rather than randomly picked bone splinters remaining after butchering animal carcasses and used to retouch stone tools. According to the morphology of tools, they were used to work different materials, including sewing of clothes from leather; severing or cutting of plants; splitting, barking, or carving of wood. In order

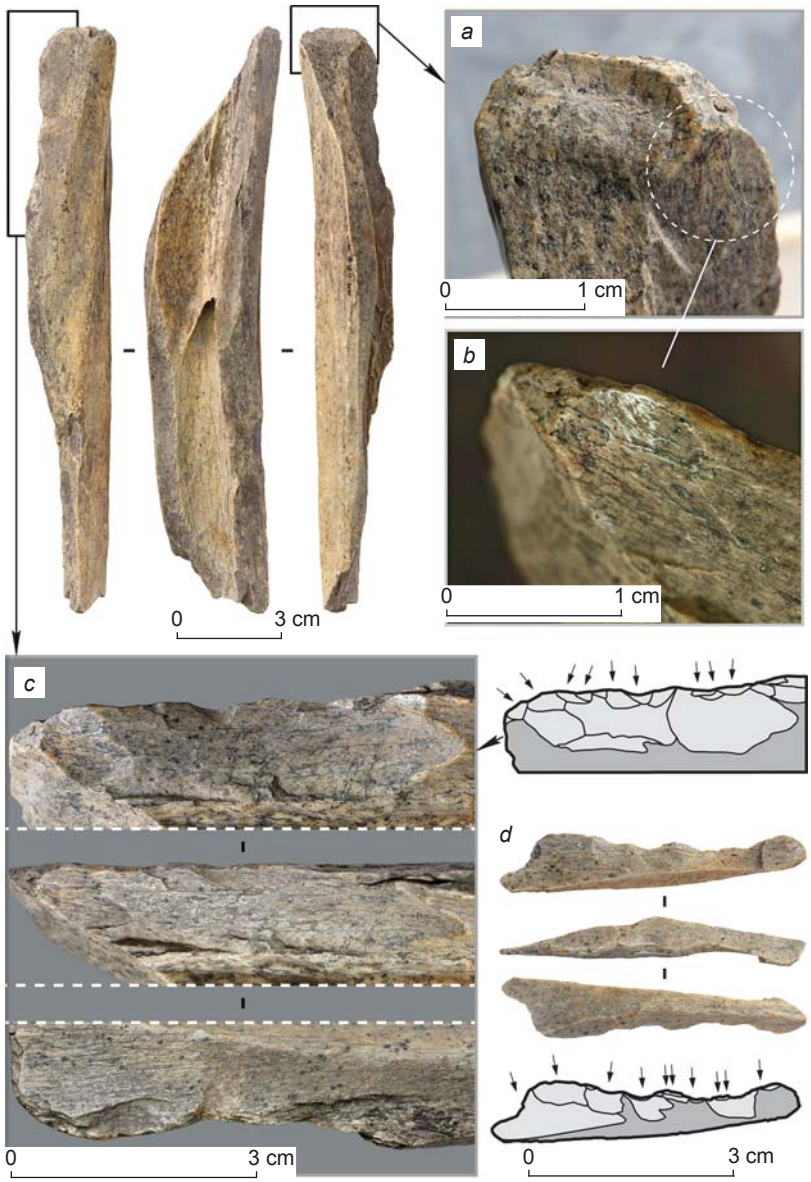

Fig. 7. Tools with damaged edges from layers 11.2 (*a, b*) and 11.4 (*c*, *d*) in the East Chamber of Denisova Cave (photos and drawing by M. Baumann).
a – wear traces at the distal end; *b* – polish of the cutting edge; *c* – retouched edge; *d* – burin spall from the retouched edge.

to determine functions of each tool, it is necessary to expand the database of experimental studies. The variety of blanks, morphology of working edges, and microwear traces suggests that this toolkit was a part of established manufacturing system. The fact that it was produced only with percussive techniques is not a satisfactory argument for refusing the term "industry", or this term should also be declined for the lithic assemblages until the introduction of stone polishing. Being part of the process of meat production, in contrast to lithic procurement, the obtaining of bone material, nevertheless, is not more opportunist than the use of beef tallow by modern industry. Concerning the absence of standardization emphasized by many researchers who reject unshaped bone tools as an industry, it should be noted that the use of elongated bone blanks to manufacture such items is no different from the use of stone blades.

The lithic industries of Denisova Cave reflect not only the continuity of development as a whole, but also the establishing of the Upper Paleolithic on the basis of the local Middle Paleolithic. In the materials from lithological layers 11.4–11.2 in the East Chamber of the cave, along with Middle Paleolithic tools, Upper Paleolithic shapes are present. While bone items among

the Late Middle Paleolithic tools in layer 11.4 were noteworthy as evidence of the use of a new type of raw material, the eyed needles, pipe-shaped beads, pendants, and other ornaments among unshaped tools of the Initial Upper Paleolithic in layer 11.2 are a part of a developed industry. Bone items are very well preserved, which rules out mechanical impact and the probability of considerable displacement in the thickness of cave deposits.

Anthropological materials and paleogenetic data pertaining to these deposits suggest the association of the innovations with the activities of (most probably) Denisovans, though the presence of Neanderthals is also observed in layer 11.4. There are no traces of anatomically modern humans at the initial Upper Paleolithic in Denisova Cave.

Conclusions

Until recently, it was impossible to record unshaped tools in bone industries owing to the complexity of differentiating items of this type from mass faunal materials. Such items can only be classified as tools by their use-wear traces: spalls, compacted areas, microflaking, smoothness, impressions, etc. A unique preservation of organic materials in Denisova Cave simplifies identification of such traces. The results of analysis of the Middle Paleolithic unshaped tools from the East Chamber allow a conclusion to be drawn that items of the said type were rather archaic. Starting from the Middle Paleolithic, they were made on chipped out bone fragments, but the scraping technique was not used; it gained widespread use during the subsequent Upper Paleolithic epoch. The bone industry under consideration, like the stone one, reflects the continuous process of cultural development and formation of the Upper Paleolithic traditions on the basis of the local Middle Paleolithic. Since there is no evidence for the habitation of anatomically modern humans either in Denisova Cave or in the whole of Altai in the Paleolithic, the obtained results suggest that the manufacture of bone tools and the development of Upper Paleolithic traditions in this territory were connected with the culture of Denisovans.

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The Sartan Upper Paleolithic Assemblages of the Northwestern Altai

This article highlights the results of comprehensive studies at Sartan cave and open-air sites (MIS 2) in the northwestern Altai. Their stratigraphic profiles include loam layers, often with geest. Absolute dates are discussed, as well as the relative stratigraphic position of lithological layers within profiles of stratified Pleistocene sites, using available paleoenvironmental data. The Sartan sites of the region are base-camps with a complete sequence of raw material reduction. Such a combination of base-camp and workshop features indicates the proximity of raw material sources. The main hunting targets were animals inhabiting mosaic landscapes. Sites correlated with various stages of the Sartan glaciation have yielded stone and bone assemblages of the final stage of the regional Upper Paleolithic. Petrographic characteristics of lithic assemblages and sources of raw material are evaluated. Typological and technological properties of industries are listed. The Late Upper Paleolithic of southern Siberia reveals a combination of Upper and Middle Paleolithic features, evidencing cultural conservatism. These industries are rather similar to those of central, southeastern, and northeastern Altai and to contemporaneous industries of southern Siberia.

Keywords: *Sartan glaciation, Final Upper Paleolithic, northwestern Altai, lithic assemblages, bone assemblages, petrographic composition, artifact typology.*

Introduction

Many sites of the Final Upper Paleolithic are known from the Altai. Unfortunately, most of them do not have reliable chronological attribution (Pavlenok, 2018), except for the sites in the northwestern Altai: their relationship with various climatic and stratigraphic units of the Sartan period has been established (Fig. 1). These are multilayered sites in caves (layers 9, 9.1, 6, 5 in the central chamber and in the entrance zone to Denisova Cave, layers 14b–11a in Kaminnaya Cave, and layers 5b, 4c in Iskra Cave) and on open spaces (layers 4–2 at Ust-Karakol I, horizons 5–3 at Anuy-2) in the Anuy River basin. In the profiles of Denisova and Kaminnaya caves, the Sartan materials occur above the technocomplexes of various stages of the Paleolithic and underlie materials from the Neolithic to the period when the traditional culture of the modern ethnic groups emerged. In Iskra Cave, the Final Paleolithic industries, embedded in the base of the loose stratum, include material complexes of Neolithic and Paleometal cultures. At the site of Ust-Karakol I, in the Sartan culture-bearing deposits which were underlain by lithological bodies, technocomplexes have been discovered pertaining to the period starting from the Early Paleolithic. At the site of Anuy-2, Karga cultural deposits occur below the Sartan deposits. The sites of the region, including multilayered sites of the Lower and Middle Paleolithic, constitute the basis for reconstructing the sequential peopling of the territory of the Russian Altai by early and late hominids, and establishing the boundaries of spatial and temporal transformation of traditions on the initial and final stages of the cultural development (Derevianko, 2012).

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Fig. 1. Upper Paleolithic sites in the northwestern Altai.

The Sartan deposits in caves are loams enriched with the products of limestone disintegration. Sometimes, cave deposits are filled with products of diverse mineralogical composition, which enter the caverns from the outer surface (Derevianko et al., 1995; Arkheologiya…, 1998; Prirodnaya sreda…, 2003). The loose strata of open sites include loess loams slightly enriched with detrital material that resulted from the destruction of closely located outcrops of bedrock, and sometimes forms block and gravel fragments in the profiles of slopes and low terraces (Prirodnaya sreda…, 2003).

The chronology of the sites is based on the results of absolute dating and evidence of the relative occurrence of loose rocks in the profiles for which the climatic sequence of the Pleistocene has been established (Arkheologiya…, 1998; Prirodnaya sreda…, 2003; Bolikhovskaya et al., 2011; Derevianko, Shunkov, Markin, 2008). It should be mentioned that considering sedimentation gaps in the deposits at some sites, the correlation of a number of sites with climatic and stratigraphic stages of the Sartan period, proposed by N.V. Kind (1974), shows some degree of conventionality (see *Table*). For example, the Gothenburg Magnetic Excursion (11–13 ka BP) established at layer 2 and set of data indicating the accumulation of deposits in relatively cold conditions may point to the Nyapan stage of layers 4 and 3 covering the Karga soil at Ust-Karakol I. Two layers of the entrance zone of Denisova Cave have also been conventionally attributed to the interstadial warming between the cooling waves of the Sartan glaciation—the Gydan and Nyapan stages. The reason for this attribution was interpretation of sediments covering layer 5 containing developed block and gravel deposits of the maximally cold stage of the Sartan glaciation, the

Chronology of cultural deposits at the sites

Climato-stratigraphic unit	Denisova Cave			Kaminnaya Cave			Iskra
	Stratigraphic unit	OSL-date, BP	Source	Stratigraphic unit	^{14}C-date, BP	Source	Stratigraphic unit
Norilsk stage (≈11,500–10,500 BP)	–	–	–	11a 11b	10,310 ± 330 10,860 ± 360	Derevianko, Markin, 2003	4c ? 5b ?
Taymyr warming (≈11,800–11,500 BP) похолодание ?	–	–	–	–	–	–	–
Kokorevo warming (≈13,000–12,000 BP)	–	–	–	11c	12,160 ± 225	Derevianko, Markin, 2003	–
Nyapan stage (≈15,000–13,000 BP)	–	–	–	11d 12 13 14a	13,550 ± 140 13,870 ± 390 14,120 ± 95 14,550 ± 230	"	–
Interstadial (≈16,000–15,000 BP)	5 ? 6 ?	–	Prirodnaya sreda…, 2003	14b	15,350 ± 240	"	–
Gydan stage (≈22,000–16,000 BP)	9.1 9	21,000 ± 800	Jacobs et al., 2019; Shunkov, Kozlikin, 2014	–	–	–	–

roof of which was dated to less than 11 ka BP. Two layers at the base of the profile in Iskra Cave, comparable to the Norilsk stage and containing abundant large detrital rocks resulting from intensification of weathering processes, were covered by other deposits with Neolithic materials.

The beginning of the Sartan period in the region was associated with a deteriorating natural environment which, according to the spore-pollen indicators of the Anuy-2 profile, caused a significant lowering of the upper boundary of dark coniferous forests. According to the palynological and faunal analysis of evidence from Denisova and Kaminnaya caves, cold and dry conditions prevailed in the next short period, which contributed to increased areas of nival and steppe biocenoses. At the subsequent Nyapan stage, the evidence from Kaminnaya Cave has shown that the climate became milder. The climatic oscillations associated with the Kokorevo interstadial caused the development of mountain-steppe biocenoses with some increase in climate humidity (according to the evidence from Ust-Karakol I) and development of periglacial forest-steppes (according to the evidence from the profile in Kaminnaya Cave). According to the evidence from Kaminnaya Cave, the Norilsk stage had several changes in landscape and climate. The beginning of cooling was the time when periglacial steppes were formed. Further, according to the palynospectra, there were two short-term substages differing in the degree of aridity—thermoxerotic with interstadial steppes and thermohygrotic, which accounts for the development of forest-steppes. At the end of the Norilsk stage, a belt of periglacial mountain-forest landscapes emerged in the region.

In the Sartan period, animals that were mostly adapted to the landscapes of cold steppes with little snow dominated among large mammals in the region (Prirodnaya sreda…, 2003; Vasiliev, Derevianko, Markin, 2006). Small mammals lived in dry steppificated landscapes (Arkheologiya…, 1998; Prirodnaya sreda…, 2003).

Archaeological evidence

Lithic industries of the Sartan period in the region were based on riverbed gravel of the Anuy River and its tributaries (Prirodnaya sreda…, 2003; Kulik, Markin, 2001, 2005). At Ust-Karakol I and in Iskra and Denisova caves, sedimentary rocks were mainly used—gray-colored aleurolites and sandstones of varying grain sizes, less often effusive and contact-altered varieties (corneous aleuropites, hornfelses). In Kaminnaya Cave, lithic resources were volcanic and sedimentary rocks and hornfelses occurring near the cavern. A small amount of jasper products (raw material of the highest quality)

of the Sartan period in the northwestern Altai

Cave	Anuy-2			Ust-Karakol I		Strashnaya Cave		
Source	Stratigraphic unit	^{14}C-date, BP	Source	Stratigraphic unit	Source	Stratigraphic unit	^{14}C-date, BP	Source
Markin, Antipov, 2012	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–
–	–	–	–	2	Prirodnaya sreda…, 2003	–	–	–
–	–	–	–	3 ? 4 ?	"	–	–	–
–	–	–	–	–	–	–	–	–
–	3 (10.1) 4 (10.2) 5 (10.3)	21,280 ± 440 21,502 ± 584	Prirodnaya sreda…, 2003	–	–	3_{1a}	19,150 ± 80	Krivoshapkin et al., 2018

has been found at all sites. Most of the small elongated flakes in the collections from Kaminnaya Cave were made of it. The use of red jasperoids, absent from the pebble material of the Anuy River basin, indicates their purposeful selection. The nearest outcrops of these rocks, which form the Zasurye Cambrian-Ordovician suite, are located far away (up to 30 km) from the sites. Notably, Zasurye jasperoids were known to the Middle Paleolithic population of the Altai Mountains (Derevianko et al., 2015). Coarse artifacts made from porphyritic varieties of volcanic rocks constitute the majority of industries in Kaminnaya Cave. Although this raw material is characterized by excessive fracturing, it shows high hardness and viscosity.

Scarce evidence from the upper unit of the cultural deposits at Anuy-2, including horizons 5 (layer 10.3), 4 (layer 10.2), and 3 (layer 10.1), is associated with the Gydan stage of the Sartan period. It yielded a retouched backed knife, angle point, chisel-like and notched tools, as well as longitudinal and transverse chopping tools (Prirodnaya sreda…, 2003; Kolobova, 2006). The industry from layer 9.1 in the central chamber of Denisova Cave (Jacobs et al., 2019) is represented by flat single- and double-platform cores of longitudinal and longitudinal-transverse reduction, as well as radial cores with elevated flaking surface. Tools produced on short and elongated flakes are scrapers (end-scrapers, including carinated, double, and flake scrapers, retouched around the perimeter), burins (lateral, middle, and transverse), borers with a distinct working part, side-scrapers (longitudinal single and double, convergent, canted), artificially backed knives, beaked tools, notched-denticulate tools, a fragment of a leaf-shaped biface, and a tanged tool (Fig. 2, *3–5*, *7*, *9–11*). Bladelets with straight backed edges and an asymmetric crescent-shaped tool constitute the microinventory of the complex. Bone artifacts include fragments of eyed needles, points, a pendant made of tooth, deer tubular bones with biconical holes, and a fragment with symmetrical transverse incisions (Prirodnaya sreda…, 2003). The technocomplex of layer 9 in the eastern gallery of Denisova Cave reflects the parallel technology of lithic reduction. It contains flat single-platform varieties of cores, double-platform cores with bidirectional flaking of blanks, narrow-faced cores, and possibly subprismatic cores. Side-scrapers include single and double longitudinal varieties with plano-convex edges, front and ventral trimming, as well as transverse, diagonal, and canted side-scrapers. The Upper Paleolithic toolkit combines end-scrapers (whose edge is sometimes offset by the angle of the blank), angle burins, chisel-like tools, retouched blades and bladelets, and sporadic backed microblades. Combination artifacts with elements of side-scrapers, notches, and spurred tools occur rarely (Shunkov, Kozlikin, 2014). Scanty evidence from two horizons of layer 3_{1a} of Strashnaya Cave includes flat and subprismatic cores for bladelet and flake production, bladelets and microblades, flake scrapers and end-scrapers, as well as a bone ornamented point and a needle (Krivoshapkin, Zenin, Shalagina, 2014; Shalagina et al., 2018; Krivoshapkin et al., 2018).

The industries from the upper part of deposits of the entrance zone of Denisova Cave and from one of the layers in Kaminnaya Cave might have belonged to the interstadial (Derevianko, Shunkov, Anoikin, 1998; Prirodnaya sreda…, 2003; Derevianko, Markin, 2003). Tools from layer 6 of Denisova Cave include narrow-faced and wedge-shaped cores, numerous elongated blanks with parallel trimming (including microblade spalls) and suggest widespread laminar lithic reduction. End-scrapers, flake scrapers, as well as pointed and carinated end-scrapers, dominate among the artifacts resulting from secondary reduction, two thirds of which were made on flakes. Borers, beaked and spurred items, rare transverse burins, longitudinal, diagonal, and convergent side-scrapers, parts of points, knives with smooth backs, truncated and retouched flakes, notched-denticulate implements, and a fragment of an oval biface (Fig. 2, *1*, *13*, *15*, *18*) have been found. The collection of tools is complemented by micro-products in the form of bladelets with a blunt edge, sometimes with a skew-shaped end of the blank. The bone inventory consists of fragments of eyed needles, tubular beads made of bird bones, and rings manufactured from the shell of ostrich eggs. The toolkit from layer 5 of Denisova Cave includes end-scrapers, flake scrapers, numerous notched-denticulate tools, retouched flakes, beaked and spurred artifacts, as well as knives with natural and smooth backs. A transversal burin, transverse side-scraper, and chopping tool (Fig. 2, *2, 6*, *8*) have been found. Noteworthy are bladelets with arched, backed edges. Bone artifacts from layer 5 include needles, a borer, a fragment of a biconvex slotted item, and a large straight tool with pointed end and thick base, made of the tubular bone of a large mammal. The toolkit from layer 14b in Kaminnaya Cave contains expressive parallel cores, including flat single- and double-platform two-sided cores with traces of longitudinal-transverse flaking, and expressive massive narrow-faced cores. Technical spalls include a steeply curved flake removed from the working surface of a wedge-shaped core, indicating the use of microblade reduction techniques. The set of tools made on blades and flakes contains end-scrapers (sometimes with the edge of the blank retouched), angle burins with the edge retouched, a chisel-like tool, blades and bladelets with frontal and ventral retouching, longitudinal side-scrapers, as well as notched-denticulate tools. A truncated artifact and bladelets with backed and convex ends have been found.

Evidence similar to technocomplexes 14a, 13, 12, and 11g from Kaminnaya Cave belongs to the Nyapan

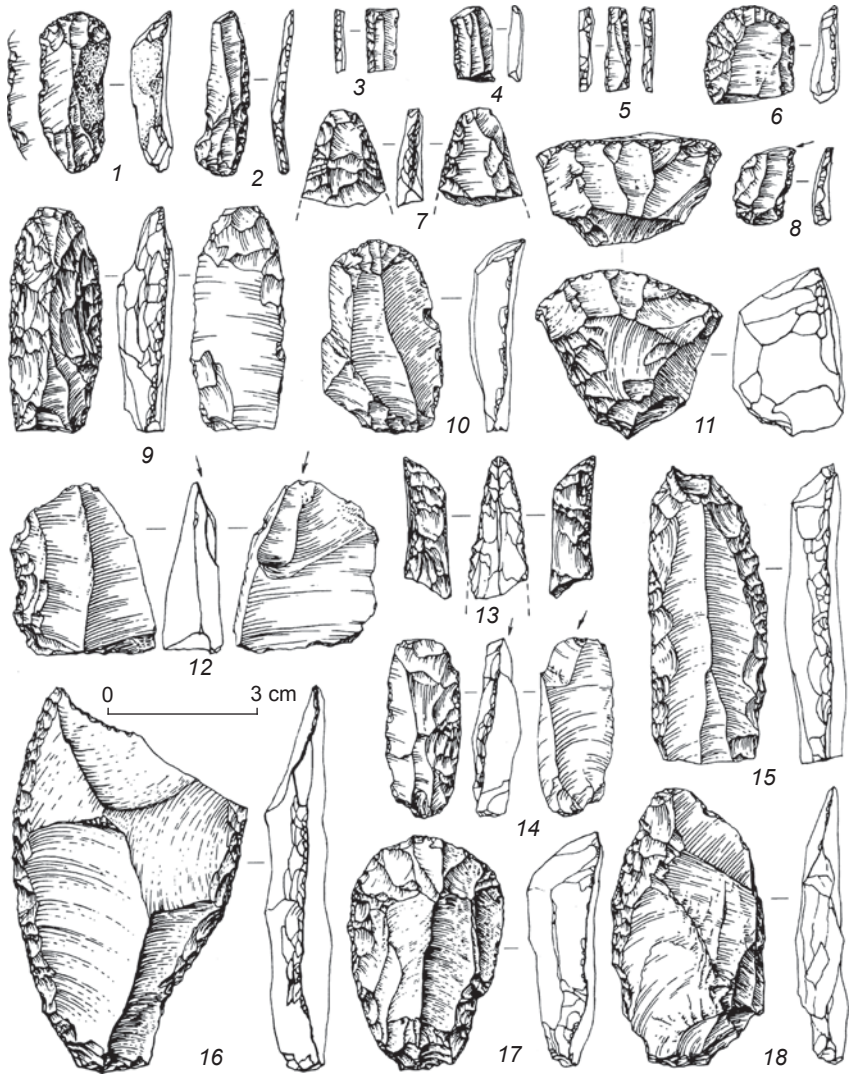

Fig. 2. Artifacts from layer 9 (*3–5*, *7*, *9–11*) in the central chamber, layer 5 (*2*, *6*, *8*) and layer 6 (*1*, *13*, *15*, *18*) of the entrance zone of Denisova Cave, and layer 2 (*12*, *14*) and layer 3 (*16*, *17*) of the Ust-Karakol I site (Prirodnaya sreda…, 2003).
1, *6*, *10*, *11*, *13*, *15*, *17* – scrapers; *8*, *12*, *14* – burins; *2–5* – backed bladelets; *7* – biface; *9*, *16*, *18* – side-scrapers.

stage of the Sartan period (Derevianko, Markin, 2003; Markin, 2005). Parallel methods of lithic reduction are represented by flat single-platform one-sided and two-sided longitudinal-transverse cores, massive narrow-faced cores, as well as shortened flakes similar to blades in trimming and size. The radial technique is reflected in discoid one-sided cores and canted flakes. Microblade techniques resulted in producing bladelets and microblades with parallel edges and facets, as well as technical spalls from the frontal surface of wedge-shaped cores. Blades and flakes, and in rare cases pebble nodules, were used as blanks for tool production. Spalls were numerous among the tools, and were primarily represented by blades with frontal, ventral, or two-sided retouching of edges, less often of the ends of blanks, sometimes with thinning of the lower surface. Noteworthy are end-scrapers and flake scrapers on wide, triangular, and elongated spalls and on rounded flakes, as well as angle and lateral atypical burins, angle borers, and chisel-like tools on triangular spalls. Side-scrapers include transverse, longitudinal, and diagonal varieties; some of the diagonal side-scrapers show retouch on lower surface, forming straight and arched edges. Notched implements were formed by retouching or deep single frontal removal; some tools with denticulated edges have thickened backs. Knives with artificial stops, points with retouched edges, pebble one-sided tools, as well as rare oval and sub-triangular bifaces, have been discovered. Materials from layers 4 and 3 of Ust-Karakol I have been preliminarily attributed to the Nyapan stage (Fig. 2, *16*, *17*). An end-

scraper with wide convex blade formed on a flake with retouched edges, medial burin, blades with retouched edges, single side-scraper, and naturally backed knife stand out from among the tools.

Scarce finds from layer 2 of Ust-Karakol I (Prirodnaya sreda…, 2003) have been preliminarily correlated with the Kokorevo interstadial. They include small one-sided cores, a scraper on flake, and spurred tool with a distinctive pointed end at the corner of a wide spall (Fig. 2, *12*, *14*). More representative is the industry from layer 11c of Kaminnaya Cave (Markin, 2005). Among parallel cores, there are massive flat one-sided single-platform cores for producing large, narrow and wide blades. Double-platform two-sided cores include those with adjoining platforms and traces of longitudinal-transverse reduction, and those with opposing platforms and traces of bidirectional flaking of blanks. The collection includes prismatic residual products with smooth platforms, covered with negative scars of bladelet and microblade removals, as well as narrow-faced cores and blanks of wedge-shaped cores. Expressive bladelets and microblades testify to the use of prismatic and microprismatic techniques. Several cores reflect the radial methods of lithic reduction resulting in angle spalls. The Upper Paleolithic tools stand out among the artifacts with traces of secondary processing. These are end-scrapers on blades, including those with diverging retouched longitudinal edges, as well as end-scrapers on flakes with retouching along the perimeter of the blank. The group of burins consists of angle varieties, some of which have a retouched edge. There are borers on blades and points with an oblique base on bladelets, the ends of which were modeled by converging the retouched and natural edges of the blank; chisel-like tools; retouched spalls, including narrow, naturally pointed and wide blades with edges formed by frontal and bidirectional retouching; and backed bladelets. The collection of tools includes naturally backed knives, large side-scrapers (longitudinal, diagonal, convergent, and with ventral retouching), and small raclettes. There are truncated artifacts made on wide blades with a beveled end and retouch along the longitudinal edge, as well as notches, denticulate tools, and a chopping tool. Bone products consist of fragments of needles.

The evidence from layers 11b, 11a of Kaminnaya Cave and possibly from the lower part of the profile in Iskra Cave belongs to the Norilsk stage of the Sartan period (Ibid.; Markin, Antipov, 2012). Complexes from Kaminnaya Cave indicate the widespread use of parallel lithic reduction. Flat single-platform cores, double-platform two-sided cores with traces of blank removals in the longitudinal and transverse directions, triple-platform cores with traces of bidirectional and transverse removals of blanks on different working surfaces have been found. There are small prismatic quadrangular cores with direct platforms; wedge-shaped cores, usually fragmented; and narrow-faced cores made on spalls. The toolkit contains an expressive group of scrapers on blades and flakes (Fig. 3): end-scrapers with retouched edges, including carinated varieties, flake scrapers with diagonal working edges. One of the artifacts combines the elements of an end-scraper and borer. Processed flakes and blades with parallel and diverging edges, covered with frontal, less often ventral, or bidirectional retouching have been discovered; these include single artifacts with a thinned lower surface in the bulbar area. Noteworthy is a group of end- and side-borers with an elongated working part. There are not many spurred tools made on the corner of blanks, points on triangular spalls with ventral retouching of edges, and chisel-like tools on flakes. The group of microinventory includes backed bladelets with opposite retouched working edges and atypical microburins. The toolkit also includes longitudinal, transverse, and canted three-blade side-scrapers, some with a trimmed lower surface of the blank, denticulate and notched tools, and naturally backed knives. A fragmented leaf-shaped plano-convex biface, fragment of a Levallois point, and a chopping tool are spectacular finds. Bone artifacts consist of the lower left incisor of an adult marmot with numerous parallel incisions along the great curvature of the tooth, and a fragment of a needle tip, round in cross-section.

In the collection from layer 5b of Iskra Cave, the parallel technique of lithic reduction is represented by a double-platform three-sided core with traces of longitudinal-transverse removals of blanks, and a single-platform two-sided core. Wide use of narrow-faced cores is evidenced by technical steeply curved elongated spalls. The tools include expressive retouched blades and bladelets, as well as blades with thinned ends of the blank, and bladelets with a backed straight and slightly convex edge. Individual end-scrapers and flake scrapers, notched-denticulate tools, and a fragment of a longitudinal side-scraper have been identified. Bone products consist of the half-dissected tubular bone of an ungulate, with a polished straight end, and a fragment of a blade with oblique incisions.

The industry from layer 4c of Iskra Cave is characterized by flat and slightly convex cores (Fig. 4). Single-platform one- and two-sided cores and double-platform three-sided cores also occur. Massive plunging removals suggest the use of narrow-faced varieties of cores. In addition to flakes, blades, and bladelets, the collection of spalls contains oval flakes with radial trimming and canted artifacts. The tool part of the collection includes end-scrapers on wide blades, some of which with completely processed diverging edges, isolated angle burins, chisel-like tools, flakes with shallow ventral retouching, and notched tools on blades. The group of processed blades and bladelets is diverse and

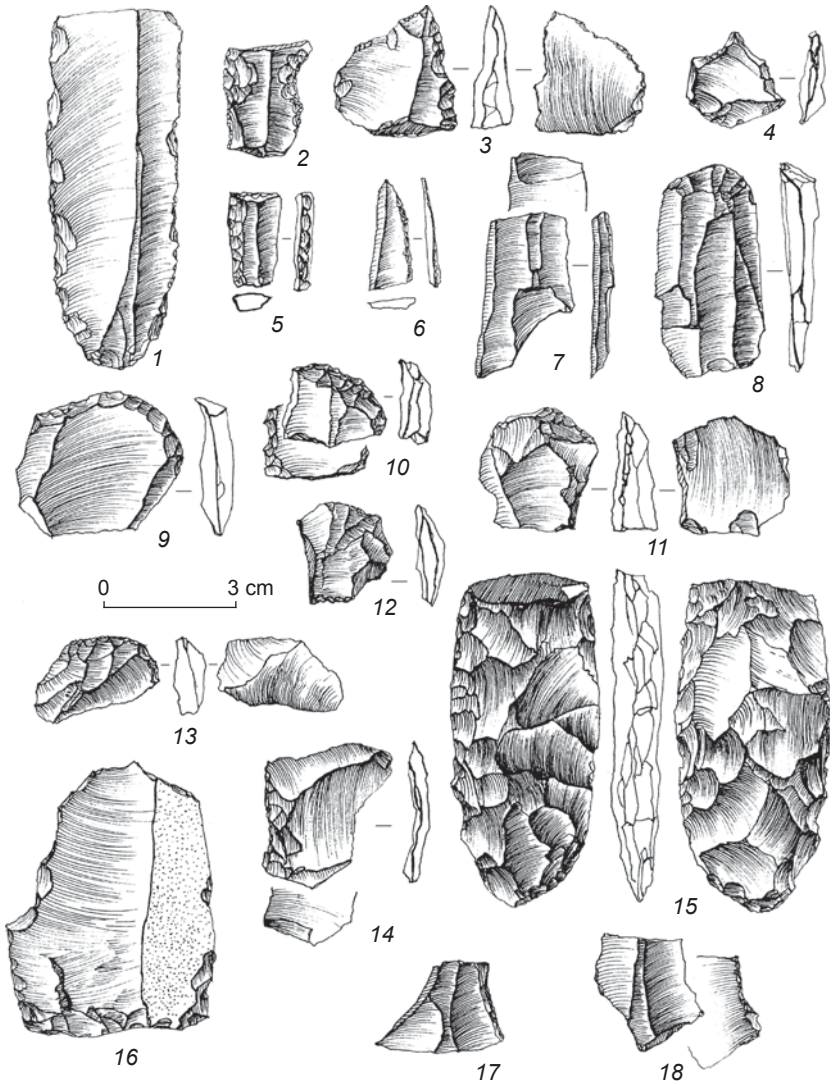

Fig. 3. Artifacts from layer 11b of Kaminnaya Cave.
1, *5*, *17*, *18* – retouched blades; *2*, *14* – notched tools; *3* – point; *4* – borer; *6* – backed bladelet; *7* – blade; *8–10*, *12* – scrapers; *11* – retouched flake; *13* – chisel-like tool; *15* – biface; *16* – side-scraper.

contains items with frontal and bidirectional retouching, and with backed edges and ends of the blank. There is a carefully modeled leaf-shaped biface with a convex base. Microtools include a micropoint and bladelets with one, less often two, backed edges. The collection also contains longitudinal, transverse, diagonal, and convergent side-scrapers, as well as those with ventral retouching. Bone products include two pendants: one is a drilled fox fang, decorated with parallel incisions at its ends; another is with a biconical hole, made of a fox molar.

Discussion

The industries of the Sartan sites described above are similar to the technocomplexes from the sites in other regions of the Altai, for example sites in the Central Altai (Ust-Sema (lower layer), Ust-Kuyum (layer 4), Tytkesken-3 (layer 6), Karaturuk, etc.) and in the foothills of the Northern Altai (Srostki (layers 2 and 3), Urozhaynaya, Maima (lower layer), Kuyuk-5, etc.) (Derevianko, Petrin, Rybin, 1992; Kadikov, Lapshin, 1978; Kungurov, 1993, 1995; Kungurov, Kadikov, 1985; Lapshin, Kadikov, 1981; Okladnikov, Vladykin, 1967; Sosnovsky, 1941). They are characterized by the technique of parallel removals of blanks from massive pebble cores. Radial and other techniques of lithic reduction were rare. Methods for producing microblades are manifested by narrow-faced and wedge-shaped cores. Flakes prevail among the spalls; blades are rare. Various side-scrapers, sometimes with partial double-sided trimming, are abundant among the tools. Expressive

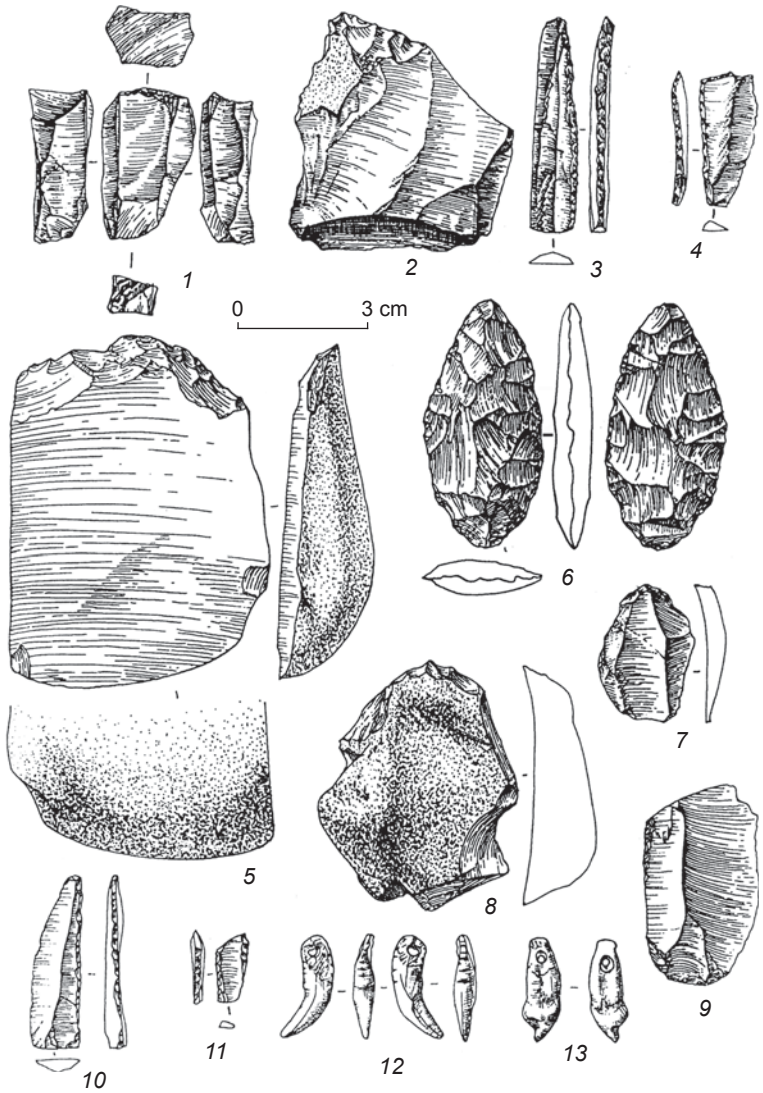

Fig. 4. Stone (*1–11*) and bone (*12*, *13*) artifacts from horizons 1 (*1–4*) and 2 (*5–13*) of layer 4c in Iskra Cave.
1 – core; *2* – side-scraper in the initial stage of production; *3*, *4*, *10*, *11* – backed bladelets; *5* – side-scraper with ventral retouching; *6* – biface; *7*, *8* – scrapers; *9* – retouched blade; *12*, *13* – bone pendants.

scrapers (rounded, oval, fan-shaped, core-like, as well as end-scrapers and microscrapers) and angle borers with massive or thin protrusion, burins, points, chisel-like tools, notched-denticulate tools, knives, and rare triangular bifaces with a convex base have been found. Materials from Ust-Sema and Ust-Kuyum include pebble tools. Surface finds include a dagger, slotted spearheads, and harpoons made of bison bones; a bone tool has been found at the site of Tytkesken-3 (layer 6).

Combinations of the toolkit similar to those under study occurred in the industries of the buried sites of Yustyd I (layers 1–4) and Yustyd II, in the southeastern Altai (Derevianko, Markin, 1987). These include flat parallel, wedge-shaped, pencil-shaped cores; retouched blades; scrapers (end-scrapers and flake scrapers, scrapers on rounded flakes); angle burins; denticulate and pebble tools; longitudinal and canted side-scrapers; and sporadic Levallois flakes.

Materials from the sites in the northeastern Altai (Ushlep-2–6, Shkolnaya Gora I, Dmitrievka, etc.) show parallels to the region under study. The industries in this part of the Altai contain flat parallel, prismatic, and wedge-shaped cores. Toolkits include notched-denticulate tools, end-scrapers, angle burins, chisel-like tools, side-scrapers, points, and chopping tools. At a number of sites, retouched blades and bladelets, microtools in the form of backed bladelets with an oblique truncated retouched end, as well as micropoints have been found (Baryshnikov et al., 2005).

The industries of the Altai show parallels with technocomplexes from various regions of Southern

Siberia. Collections from the Upper Paleolithic sites of the western part of Central Asia, primarily the sites of Kulbulak (layer 2.1), Dodekatym-2 (layers 5–2), and Shugnou (layer 1), demonstrate stadial similarity with the Altai evidence. Carinated items recorded in the assemblage of the Anuy-2 site sporadically occur in many Siberian collections (Kolobova et al., 2013; Kolobova, Krivoshapkin, Shnaider, 2019).

The Final Upper Paleolithic of the Kuznetsk Basin and Mountainous Shoria is represented by evidence from the sites of Bedarevo II, Ilyinka II, Shorokhovo I, Shumikha I, etc., showing the predominance of products of parallel reduction—single- and double-platform one- and two-sided flat cores. Narrow-faced microcores and rare wedge-shaped cores have also been found. Some artifacts reflect Levallois and radial methods of lithic reduction. The main blanks for production of tools were elongated flakes; microblades are numerous. The toolkit is dominated by blades and bladelets with retouching at the edges and sometimes at the ends. Blades with a backed edge are rare. Noteworthy are groups of notched-denticulate tools, scrapers (end-scrapers and flake scrapers, scrapers retouched around the entire or part of the perimeter, double, pointed, nosed scrapers, and micro-scrapers) made on blades and flakes, as well as burins (dihedral, angle). Side-scrapers (longitudinal, transverse, and canted), backed knives, and pebble tools occur in smaller numbers. Chisel-like tools, borers, points, and oval bifaces are few (Markin, 1986).

A large number of Sartan sites with the inventory reflecting two varieties of the culture, primarily differing in the methods of lithic reduction (Paleolit Yeniseya, 1991), are concentrated in the basin of the Upper and Middle Yenisei. In the Afontova variant (Afontova Gora II, Kokorevo II, III; Tashtyk I, II; Maina, Kantegir, Listvenka (layers 14, 4–1)), amorphous cores and microcores (wedge-shaped, celt-like, pencil-like, narrow-faced on spalls, etc.) have been recorded. Flakes served as the main blanks for tool production. The Kokorevo variant (Kokorevo I, Novoselovo VI, VII, XII, Listvenka (layers 5–13)) is characterized by large parallel single- and double-platform cores for blade production and microcores similar to the Afontova artifacts. Most of the artifacts were made on blades. The difference between the Afontova and Kokorevo tools is manifested by their percentage ratio. Various retouched blades, including bladelets backed by retouching at the edges, occur in different proportions. There have been found burins (dihedral, lateral, and transverse); scrapers (end-scrapers on blades and flakes; flake scrapers and crescent-shaped, with retouching around the entire perimeter or on half of it, double scrapers, micro-scrapers, rare pointed or tanged end-scrapers, or end-scrapers with a notch at the base); micro-chisel-like and chisel-like tools, some with retouching of longitudinal edges; borers and micro-borers; and beak-shaped artifacts. Numerous side-scrapers on flakes and blades (single lateral, double, convergent and transverse side-scrapers, those processed along the perimeter, less often angle side-scrapers, made on pebbles or cores); less numerous points (elongated, wide and shortened), and pebble tools (choppers, axes, and adzes) occur. A large group of tools consists of notched-denticulate artifacts. Sets of bone and horn tools include points (slotted, non-slotted, needle-shaped), insert tools, hoes made of deer antler, hammers, tips, awls, needles, batons, and other items. The collection of adornments contains pendants made of animal teeth or soft stone, and fragments of forehead diadems. In one of the layers at the Maina site, an anthropomorphic figurine made of burnt clay was discovered.

Materials from the sites in the Angara region, associated with the end of the Upper Paleolithic show some similarities with the Sartan industries of the Altai. A small collection from the Fedyaevo site on the Angara River includes wedge-shaped cores, longitudinal and transverse side-scrapers on flakes, and chisel-like tools (Astakhov, 1963). The industries of the Kulakovo I and Cheremushnik II sites on the Angara River (cultural horizon 2) are more representative. The methods of lithic reduction are revealed by one- and two-platform prismatic and wedge-shaped cores. Tools made on flakes and blades include scrapers (end-scrapers and flake scrapers, retouched on a part of the perimeter, and microscrapers), chisel-like tools, diagonal burins, and double-sided points. Noteworthy are side-scrapers (single, double, convergent, retouched around the perimeter), backed knives, and pebble tools. The bone inventory of Cheremushnik II contains a fragment of an awl, pendant made of deer tooth, and fragments of bones with transverse incisions (Lezhnenko, 1974).

The Final Upper Paleolithic of the Trans-Baikal region is represented by a series of sites located in the western and eastern parts of the region. Flat single-platform cores, microcores, including wedge-shaped varieties, are typical of the lithic inventory from the Oshurkovo site (Western Trans-Baikal region). Tools consist of scrapers on flakes and blades (end-scrapers and flake scrapers, carinated scrapers, and scrapers retouched along the entire or part of the perimeter), burins (on an oblique retouched truncation, transverse burins), retouched flakes, as well as arched side-scrapers and pebble tools (Abramova, 1989). Bone artifacts include bases of insert tools, a flat harpoon, and a fragment of a needle.

A large group of sites dated to 18.0–10.8 ka BP is concentrated in the Eastern Trans-Baikal region (Studenoye I (layers 19–14), Studenoye II (layers 3 and 4), Ust-Menza I (layers 21–25), Ust-Menza II (layers 4–24), Ust-Menza III (layers 2–5), Ust-Menza IV (layers 2 and 3), Kosaya Shivera I (layer 14), and Altan (layers 16–19)) (Konstantinov, 1994). Their inventory

includes subprismatic, flat, and orthogonal cores, as well as wedge-shaped microcores. Tools include end-scrapers and flake scrapers, made on blades and flakes, micro-scrapers, retouched blades and microblades, burins (transverse with retouching on the edges, angle, lateral, and medial), borers, chisel-like tools, as well as side-scrapers (transverse, longitudinal single and double, with double-sided trimming), pebble artifacts (choppers, adzes), rare points and knives. Bone artifacts include a polisher, insert knife, awl, point, handle, and hammer made of horn.

Conclusions

The evidence of the Final Upper Paleolithic in the northwestern Altai indicates the continuity and consistent development of early technocomplexes, which existed in this part of the region 28–23 ka BP. In horizons 12–6 of the Anuy-2 site, flat, prismatic, and wedge-shaped cores, various side-scrapers, end-scrapers, burins, expressive series of micropoints and backed bladelets with the ends truncated by retouching have been found (Derevianko, Shunkov, Postnov, 1998).

As opposed to the Middle Paleolithic sites, the Sartan localities of the northwestern Altai were base-camps with a complete sequence of lithic reduction. They were characterized by more sophisticated strategies of using raw materials, which were acquired both in the immediate vicinity of the sites and at a significant distance. The distribution of archaeological materials in the unearthed areas of most sites in the region has not revealed concentration zones. Only in some layers of Kaminnaya Cave, clusters (?) of a few cores and more pronounced accumulations of very small spalls have been observed, suggesting the presence of specialized sites for lithic reduction and further processing of blanks (Markin, 2006). Structures in the form of simple oval hearths have been found only in horizons 4 and 3 at Anuy-2 (Prirodnaya sreda…, 2003).

Reconstruction of the hunting activities of the ancient humans inhabiting the region is anything but a simple task. Most megafaunal remains have been found in cave strata (Ibid.; Vasiliev, Derevianko, Markin, 2006). These were species of open landscapes—the horse, woolly rhinoceros, bison, argali, saiga, and others. In Kaminnaya Cave, a lot of bones of the Siberian mountain goat, which inhabited rock biotopes, have been found. Remains of taiga inhabitants (sable) were much fewer. The bones of megafauna representatives (elk, red deer, and roe deer), which preferred semi-open forest-steppe landscapes, are not numerous. Cave hyenas and cave lions played a notable role in cave taphocenosis. A high degree of bone fragmentation, presence of gnawing marks on bone fragments, large number of bones and teeth with traces of acid corrosion are the results of consumption by cave hyenas and other predators. Cuts have been observed on a number of tubular bone fragments, indicating participation of primitive humans in cave accumulation of bone remains. Apparently, their main hunting targets were species of animals typical of mountain landscapes (mountain goats, argalis, saigas, and horses), which widely occur in the deposits.

Paleolithic technocomplexes of the northwestern Altai, which belong to various climatic stages of the Sartan period, show many common features. Variability of the toolkit is mainly expressed only in the volume of artifact varieties. The methods of lithic reduction at all sites were based on parallel flaking, which resulted in flat, typologically simple, single- and double-platform, one-sided or two-sided, less often three-sided cores with traces of bidirectional or longitudinal-transverse reduction of blanks. All assemblages contain narrow-faced and sporadic wedge-shaped cores indicating the use of microblade techniques. Blades, bladelets, and flakes served as blanks; in some cases small boulders or pebbles were used. A laminar trend of the technocomplexes is typically manifested at the sites in the low-mountain part of the region (Iskra Cave, Denisova Cave, Ust-Karakol I), where the population mostly used sedimentary rocks (aleurolites, sandstones). Elongated blanks were less typical of the industries from Kaminnaya Cave, located among the Altai mountains of middle altitude. This can be explained by the predominant use of porphyrite varieties of volcanic rocks. Obviously, the raw material factor was behind the variability of the industries. The toolkits from all sites combine artifacts of the Upper Paleolithic typology and artifacts widely occurring in the Middle Paleolithic complexes. Various scrapers, retouched flakes, and burins constitute a significant share of all tools. Chisel-like tools, borers, sporadic bifaces, and tanged tools also occur. The microinventory, primarily in the form of backed bladelets with straight or arched edges, less often with backed ends, has been found in many technocomplexes of the Sartan sites. In layer 9 of Denisova Cave, a geometric microlith not typical of the Altai Paleolithic has been discovered. Industries of the sites contain side-scrapers of various typologies, denticulate tools, notches, sporadic points, pebble artifacts, backed knives, as well as spurred and beaked tools. Bone items include needles with oval and round cross-section, borers, pendants with holes made of the teeth of large animals, tubular beads made of the tubular bones of birds, rings made of ostrich egg shells, plates with notches, and tools with flattened bases (Prirodnaya sreda…, 2003; Krivoshapkin et al., 2018).

In general, the evidence of the Final Paleolithic in the Altai shows great similarities both in terms of lithic reduction and typology of secondarily processed artifacts. A.P. Okladnikov (1981) observed that according to the

outer appearance of the industry, the Altai sites are close to contemporaneous sites in southern Siberia (Kuznetsk Basin, Angara region, Trans-Baikal region, and Yenisei region). Thus, at the end of the Upper Paleolithic, technocomplexes of the Altai were a part of the single culture of the Late Paleolithic humans of southern Siberia.

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Stages in the Late Pleistocene and Holocene Peopling of Lake Bolshoye Ushkovskoye Shore, Kamchatka

This article outlines the findings from excavations at the Ushki sites (four multi-layered and one single-layered), near Lake Bolshoye Ushkovskoye, on the Kamchatka Peninsula. The sites were discovered and excavated by N.N. Dikov and M.A. Dikova in 1961–1990. Multidisciplinary studies conducted at Ushki V in 2004–2011 by Northeastern State University extended our knowledge of the Late Pleistocene and Holocene peopling of the peninsula. Information about the chronology of the site and the technological and typological characteristics of lithics are provided. The results suggest that the habitation history of the sites included at least eight stages. Each one is described, and their absolute dates are provided: early stage of the Paleolithic to Neolithic transition (~13,320–12,022 cal BP), late stage of the Paleolithic to Neolithic transition (12,225–10,131 cal BP), Initial Neolithic (~8608–8297 cal BP), Early Neolithic (~6679–4406 cal BP), Middle Neolithic (~2809–1516 cal BP), Late Neolithic (~1059–996 cal BP, or 960–1020 AD), First Old Itelmen Period (~806–597 cal BP, or 1200–1400 AD), and Second Old Itelmen Period (~564–55 cal BP, or 1650–1700 AD). Lithics from the first habitation stage are bifacial arrowheads and stemmed projectile points, those of the second stage are tools on microblades, made with the Yubetsu technique. In the Initial Neolithic, tools on blades appear, inserts become common, and, possibly, dogs begin to be bred as draft animals. The distinctive traits of the Early Neolithic are pottery, prismatic and conical cores, and projectile points and burins on blades. The Tarya culture of the Middle and Late Neolithic is marked by trihedral arrowheads and wooden vessels; crude unifacial adzes give way to polished ones, and labrets appear. The seventh and eighth stages represent the Old Itelmen culture. The findings suggest that the earliest inhabitants of Ushki played an important role in the migratory processes connecting Northeast and Southeast Asia with northwestern America. On the basis of more accurate dates, a new nomenclature for stages 1–4 of Ushki is proposed.

Keywords: *Kamchatka, Paleolithic–Neolithic transition, Neolithic, Tarya culture, Old Itelmen culture.*

Introduction

The Ushki sites are considered to be the reference for establishing the chronology of the archaeological cultures in Kamchatka. These sites are located in the central part of the Peninsula, on the southern shore of Lake Bolshoye Ushkovskoye, on the edge of the pedestal of a large and high cone-shaped volcanic structure of the Klyuchi group of volcanoes, covered by fluvioglacial and proluvial loose sediments (Fig. 1). The thickness of the soil-pyroclastic cover, which is a part of sheet formations, can be dated to the Upper Pleistocene to Holocene (Titov, Kazakova, 1985). The sites are located at an altitude of 37 m above sea level and 3–5 m above river level.

In 1961–1990, four multi-layered sites and one single-layered site of Ushki were explored by N.N. Dikov (1977, 1979, 1993) and M.A. Dikova

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(Goebel, Waters, Dikova, 2003). On the basis of his findings, Dikov identified seven habitation stages on this territory. These stages correspond to the Early Ushki Upper Paleolithic culture (13,600 ± 250 BP (GIN), 14,300 ± 200 BP (GIN 167)), Late Paleolithic stage (10,360 ± 350 BP (MO 345), 10,760 BP (MAG 219)), "Final Paleolithic" stage (8790 ± 150 BP (MAG 231)), first Ushki "Mesolithic" and Early Neolithic culture (4200 ± 100 BP (MAG 132)), the Tarya culture of the Middle Neolithic (2070 ± 190 BP (MO 354), 2160 ± 290 BP (MAG 5), 2440 ± 80 BP (RUL 607)), Late Neolithic stage (1052 ± 25 BP (MAG 32)) and "vestigial" stage (220 ± 140 BP (MO 353), 235 ± 145 BP (MO), 675 ± 80 BP (LE 70)) (Dikov, 1977: 43–44, 65, 73, 75, 242, 244).

In 2004–2011, the expedition of Northeastern State University (Magadan) conducted comprehensive studies of the Ushki V site, which have made it possible to obtain additional information on the peopling of the peninsula in the Late Pleistocene to Holocene period (Dikov, 1977, 1979, 1993; Ponomarenko, 2014; Goebel, Waters, Dikova, 2003: 502), distinguish four habitation stages at that site, and clarify the periodization of all Ushki sites and specific features of the stages, taking into account the data obtained by Dikov (1977, 1979, 1993).

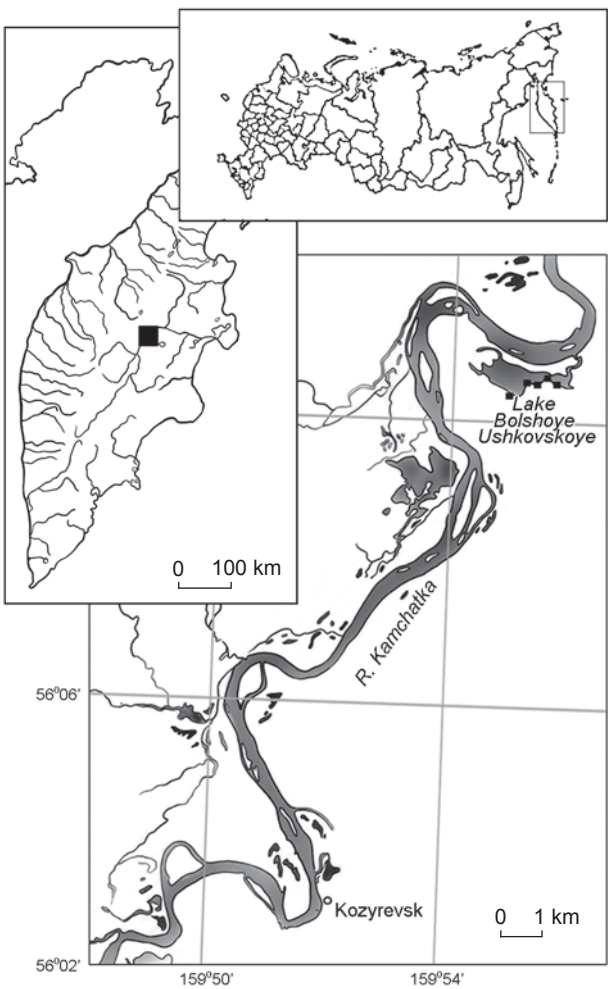

Fig. 1. Location of the Ushki sites.

Material and methods

Deposits at the Ushki V site have been unearthed over an area of 148 m^2; over 12,000 artifacts have been found, and 30 stratigraphic profiles have been studied. In the Late Pleistocene deposits, in cultural layer VII, a dwelling, with a hearth, entrance, and working area, were identified. This layer contained lithic inventory, personal ornaments (pendants, beads), a shovel made of bone, fragments of animal and fish bones, a plant seed, pine nut shell, and gastroliths. In cultural layer VI, the space between dwellings has been explored, revealing wedge-shaped cores, blades, bladelets and microblades, flakes, technical spalls, bifacial arrowheads and knives, retouched blades, side-scrapers, micro-end-scrapers, combination tools, and a hammerstone. In cultural layer V, a dwelling (?) pit 4 × 3 m has been studied, containing prismatic cores, flakes, blades, obsidian end-scrapers on blades and flakes, technical spalls, a pebble tool, etc. In cultural layer IV, three dwelling (?) pits have been discovered, yielding: prismatic and conical macro- and microcores, flakes, spalls, blades and their fragments, retouched points on blades, side-scraper-like tools of obsidian and basalt, burins, hammers of sandstone, pottery, amulets, as well as dwarf-pine nuts and numerous fragments of animal bone.

The data resulting from the tephrochronological studies of the soil-pyroclastic cover have made it possible to reconstruct the history of volcanic deposits at Ushki V. The detailed tephrochronology of Kamchatka, based on hundreds of radiocarbon dates, was "superimposed" on archaeological profiles (Braitseva, Melekestsev, Ponomareva et al., 1997; Ponomareva, 2010; Ponomareva et al., 2016). Eighteen ash layers have been found in the soil-pyroclastic cover at Ushki V; twelve of these have been correlated with specific volcanic eruptions. The ages of ash markers (Braitseva, Ponomareva, Sulerzhitsky et al., 1997) and ^{14}C dates obtained for the samples from cultural layers (Table 1) were taken into account while compiling the chronostratigraphic scale.

This study followed traditional scholarly methods (planigraphic, descriptive, and technological), as well as methods of relative and absolute dating (stratigraphic, tephrochronological, and radiocarbon analyzes, calibration of radiocarbon dates). When summarizing the data, the problem-oriented and chronological methods were used.

Stages of peopling of the Ushki sites

In the Late Pleistocene, Lake Bolshoye Ushkovskoye was a part of a vast ancient glacial reservoir between the modern channels of the Kozyrevka and Kamchatka rivers, formed ca 25,000–20,000 BP (Braitseva et al., 1968). The first peopling of this area probably occurred not earlier than 13,300 BP. The charcoal date from the Pleistocene deposits (supposedly of volcanic ash from an unknown source, which we conventionally named "rusty ash") 2–3 cm thick at Ushki V, lying below the earliest cultural layer VII, was 11,196 ± 59 BP (KIA 40603) or ca 13,000 cal BP.

Transition from the Paleolithic to Neolithic

The chronological range of the initial habitation stage corresponds to the period of transition from the Late Pleistocene to Holocene. According to ^{14}C, the beginning of the Holocene in Kamchatka is dated to 9800–10,000 BP or 12,000–11,000 cal BP (Pevzner, 2015: 10). Pollen spectra from the Ushki deposits indicate that during the time preceding the Holocene, the climate was dry and cold; tundra steppes were predominant (Egorova, 2008). Typical representatives of the tundra grass-shrub communities were alder, birch, meadow rue, madder vegetation, green moss, and ferns (Lozhkin, Matrosova, Korzun, 2004). The fauna of this period was represented by bisons, bighorn sheep, Pleistocene horses, lemmings, reindeer and elk, as well as birds (probably ducks), salmon (coho salmon and other varieties), hares, and gophers (Vereshchagin, 1979: 18–19; Zheleznov-Chukotsky, Chastukhina, 2005), and possibly the mammoths whose bones were found in the Kamchatka valley.

In that period, people settled at two different times on the shore of the reservoir.

The early habitation stage corresponds to cultural layer VII. Radiocarbon dates (Table 1) suggest that this stage lasted from 11,330 ± 50 to 10,350 ± 50 BP or from 13,320 to 12,022 cal BP (Table 2). At that time, these were mainly seasonal fishing and hunting camps, with single- and two-chamber ground dwellings, containing open hearths without stone placement, workshops for the manufacture of stone tools and personal ornaments, and burials. Lithic artifacts included tools for hunting and processing hunting products (bifacial arrowheads and stemmed projectile points, end-scrapers and side-scrapers, piercing-tools, adze-like tools, and knives for carving carcasses). Flakes and laminar spalls without secondary processing, as well as shovels made of bone, were used for household purposes. Symmetric and asymmetric leaf-shaped bifacial tools were used for processing wood, bone, and stone, cutting fish, and making ornaments. Bifacial arrowheads and stemmed projectile points (Fig. 2, *8*), as well as stone ornaments (pendants, beads), are considered to be the markers of this period. As a rule, chalcedony and flint (less often, obsidian and basalt) were used as raw materials. Burials with inventory in dwellings are known; the presence of ocher and ornaments in them indicates the performance of rituals during the burial. Microscopic analysis of ornaments has revealed traces of paints, probably of organic origin (Ponkratova, Gubar, Lbova, 2019).

The late habitation stage at Ushki, corresponding to the Paleolithic to Neolithic transition, lasted from 10,240 ± ± 75 to 9485 ± 275 BP or from 12,225 to 10,131 cal BP (Table 2). It is represented by the finds from cultural layer VI. At that time, probably, a new population came to the territory of Lake Bolshoye Ushkovskoye, which differed in its traditions from the previous one. The area of stationary settlements increased (over 40 dwellings with the population of at least 100–150 persons), designs of dwellings and appearance of lithic inventory changed. The first evidence of dog domestication and works of art in the form of stone polyiconic images and graffiti pertain to this period. Dwelling structures were of three types: dug into the ground (0.3–0.5 m deep), mushroom-shaped, with an area of 12–48 m^2, entrance corridor and a covered hearth; ground dwellings with an area of 8–16 m^2, without entrance corridor, with hearths with slab-lining; and ground dwellings with an area of 40–140 m^2, of irregularly oval, rounded, or sub-trapezoidal shapes, with one or several fire places. Lithic inventory included bifacial arrowheads of willow-like, laurel-like, or drop-like shape, single-edged scrapers on massive flakes, micro-endscrapers, microcores and microblades, symmetrical bifaces, and flakes. Stone was processed using hammerstones—elongated oval pebbles. Markers of this period are traces of microblade reduction—the Yubetsu technique (Fig. 2, *7*). The raw materials were mainly obsidian and flint. This stage is distinguished by beliefs in the afterlife (burials contained grave goods and ocher) and totemic beliefs (a geoglyph of fish sculpted of red ocher on the earthen floor has been discovered), and ritual activities.

The economic life of the inhabitants of the sites in the Paleolithic to Neolithic transitional period was based on procuring various species of animals and birds, fishing, and gathering.

Initial Neolithic

In the history of the Ushki V site, this period is manifested by the evidence from cultural layer V and lasted from 7705 ± 38 to 7642 ± 81 BP or from 8608 to 8297 cal BP (Table 2). This was the time of landscape changes: tundra steppes were replaced by marshy tundra; a mild humid climate dominated (Lozhkin, Matrosova, Korzun, 2004). The first floodplain terrace, with cover sediments

Table 1. **Chronostratigraphic scale of the Ushki sites**

Period	Cultural layer, code, and marker of the age of volcanic eruption*	^{14}C-date, BP	Lab code	Calibrated date, BP ±2σ	Source
Time of the Old Itelmen culture	I b	220 ± 140 235 ± 145	MO-353 MO	266–55 564–122	Dikov, 1977: 65, 75, 242 Ibid.
Time of the absence of inhabitants	SH_1	250 ± 60 (250)	No data	317–305	Ponomareva, 2010: 33
Time of the Old Itelmen culture	I a	675 ± 80	LE-70	806–597	Dikov, 1977: 65, 242
Time of the absence of inhabitants	SH_2	965 ± 16 (950)	No data	938–893	Braitseva, Ponomareva, Sulerzhitsky et al., 1997: 129
Late Neolithic	II	1052 ± 25	MAG-32	1059–996	Dikov, 1977: 73
Time of the absence of inhabitants	SH_3	1404 ± 27 (1400)	No data	1419–1356	Braitseva, Ponomareva, Sulerzhitsky et al., 1997: 129
	OP	1478 ± 18 (1500)	No data	1468–1388	Ibid.
	KS	1806 ± 16 (1800)	No data	1866–1771	Ibid.
	BZ	2300	No data	No data	Braitseva, Ponomareva, Sulerzhitsky et al., 1990: 8
Middle Neolithic	III	2070 ± 190 2160 ± 290 2440 ± 80	MO-354 MAG-5 RUL-07	2491–1562 2809–1516 2723–2346	Dikov, 1977: 84 Ibid. Ibid.
Time of the absence of inhabitants	SH^5	2553 ± 46 (2550)	No data	2645–2487 2758–2647	Braitseva, Ponomareva, Sulerzhitsky et al., 1997: 129 Ibid.
Early Neolithic	IV	4055 ± 75 4200 ± 100 4382 ± 79 5725 ± 90	BINP NSU-1400 MAG-132 BINP NSU-1398 BINP NSU-1399	4828–4406 4971–4498 5090–4836 6679–6315	Data of the author of this article Dikov, 1977: 242 Data of the author of this article "
Time of the absence of inhabitants	KS_2	6007 ± 38 (6000)	No data	6944–6747	Braitseva, Ponomareva, Sulerzhitsky et al., 1997: 129
	IA_B^5	6500	No data	No data	Pevzner, 2015: 132
	KHG	6957 ± 30 (6900)	No data	7853–7694	Braitseva, Ponomareva, Sulerzhitsky et al., 1997: 129
Initial Neolithic	V	7642 ± 81 7645 ± 94 7705 ± 38	AA-457212 BINP NSU-1401 KIA-35662	8598–8316 8608–8297 8557–8413	Goebel et al., 2003: 503 Data of the author of this article "
Time of the absence of inhabitants	SH_{8300}	8340 ± 120 (8300)	No data	9073–9529	Ponomareva, 2010: 33
	PL	8610 ± 60 (8600)	No data	9703–9486	Ponomareva et al., 2013: 1678
Paleolithic to Neolithic transition	VI	9485 ± 275 10,240 ± 75	AA-41387 AA-41386	11,643–10,131 12,225–11,700	Goebel et al., 2003: 502 Ibid.
	VII	10,350 ± 50 10,810 ± 50 10,960 ± 50 11,005 ± 115 11,060 ± 25 11,320 ± 30 11,330 ± 50	GrA-37279 GrA-37278 GrA-37277 AA-41388 SR-7175 UCIAMS-32199 SR-7173 UCIAMS-32198 SR-5810	12,406–12,022 12,856–12,582 12,979–12,654 13,125–12,645 13,098–12,759 13,299–13,117 13,320–13,109	Data of the author of this article " " " " " "
Younger Dryas	"Rusty ash"	11,195 ± 60	KIA-40603	13,267–12,888	Data of the author of this article

Note: ^{14}C-date for the ashes is rounded. For the calendar age, the Calib Radiocarbon Calibration Program (Stuiver, Reimer, 1993; Reimer et al., 2009) was used. Periodization of the geological time was developed using the Blytt-Sernander sequence (Neishtadt, 1982).

*Roman numerals indicate the cultural layer, capital letters without super- or subscript indicate the code, capital letters with superscript or subscript indicate the marker of the age of the volcanic eruption.

Table 2. **Habitation stages at the Ushki sites**

Period	Habitation stage	Cultural layer	Geological time	Climatic periods	Date, BP	
					^{14}C	calibrated
Time of the Old Itelmen culture	Eighth	I b	Late Holocene	Subatlantic	235 ± 145 to 220 ± 140	564–55
	Seventh	I a			675 ± 80	806–597
Late Neolithic	Sixth	II			1052 ± 25	1059–996
Middle Neolithic	Fifth	III			2440 ± 80 to 2070 ± 190	2809–1516
Early Neolithic	Fourth	IV	Middle Holocene	Subboreal	5725 ± 90 to 4055 ± 75	6679–4406
Initial Neolithic	Third	V	Early Holocene	Atlantic	7705 ± 38 to 7642 ± 81	8608–8297
Paleolithic to Neolithic transition	Second	VI	Late Pleistocene to Initial Holocene	Boreal and preboreal	10,240 ± 75 to 9485 ± 275	12,225–10,131
	First	VII			11,330 ± 50 to 10,350 ± 50	13,320–12,022

and volcanic ash, was formed in the area under study (Titov, Kazakova, 1985). As compared to the previous stage, the areas of the sites decreased. Dwellings in the form of ground tent-huts, with hearths without slab-lining but with several stones near the hearth, have been found (Dikov, 1993: 21–22). Lithic industry included products of primary reduction (prismatic cores for producing knife-shaped blades; flakes, and blades), and tools (bifaces, retouched flakes and blades, end-scrapers, pebble tools, etc.). Markers of this stage are obsidian end-scrapers on blades and flakes (Fig. 2, *6*). Obsidian, quartzite, flint, basalt, and sandstone were used as raw materials. According to the tephrochronological findings, a catastrophic eruption and powerful ashfall from the Khangar volcano happened at that time (6900 BP).

Early Neolithic

The period between ca 7400 and 5000 BP was the warmest in the Holocene of Kamchatka (Dirksen, 2017: 35). It was characterized by the spread of alder and birch forests with abundant standing grass (Lozhkin, Matrosova, Korzun, 2004). About 5000 BP, the mild climate changed into cold and dry one, which caused a decrease in the biological productivity of ecosystems (Dirksen, 2017: 35). There is a ^{14}C-date of 4200 ± 100 BP for the Ushki I site (Dikov, 1977: 242). In the Early Neolithic cultural layer IV of Ushki V, finds were located between the ashes of volcanoes KS_2 and SH_5. Radiocarbon dates (see Table 1) suggest that this stage lasted from 5725 ± 90 to 4055 ± 75 BP or from 6679 to 4406 cal BP (see Table 2)*. Dwellings were built on the ground, in the form of tents or huts, with hearths without slab-lining. The settlements had workshop areas and utility pits. The lithic inventory of Neolithic appearance includes: cores (prismatic and conical removals of knife-shaped blades), products of primary reduction (flakes, bladelets), tools (retouched points on blades; bladelets and blades used as knives; fragments of blades with traces of wear, used in insert tools; side-scraper-like tools made of obsidian and basalt, burins, hammers made of sandstone), and fish figurines. Noteworthy are knives in the form of blades with notches, for cutting fish (Fig. 2, *5*). Obsidian, flint, basalt, and rarely jasper served as raw materials. Totemic beliefs were mainly associated with the cult of fish, which was later widespread in the Tarya culture of the Itelmens of Kamchatka (Ponomarenko, 2014). Pottery should be considered the most important innovation of this period. The subsistence strategy of society was based on hunting, fishing, and gathering, as evidenced by the faunal complex, dwarf-pine nuts, etc.

Middle Neolithic (the first stage of the Tarya culture)

As compared to the previous stage, this period in Kamchatka was distinguished by an even cooler climate, and the second (small) maximum in the distribution of forests (ca 2200–1700 BP) (Dirksen, 2017: 36). The chronological framework of that stage is 2440 ± 80 to 2070 ± 190 BP or 2809–1516 cal BP. The inhabitants of the sites of Ushki I–III lived in ground dwellings with an area of about 50 m^2, and in dugouts with wooden walls and roofs, and hearths without slab-lining. Lithic inventory consists of cores (prismatic removals of knife-like blades), products of primary reduction (knife-like blades of various sizes without retouching, with retouching along the edge, and with retouching on both sides), tools (completely retouched inserts, laminar stemmed arrowheads, leaf-shaped bifacial knives, pointed

*The data were obtained using the accelerative mass spectrometer at the Budker Institute of Nuclear Physics of SB RAS.

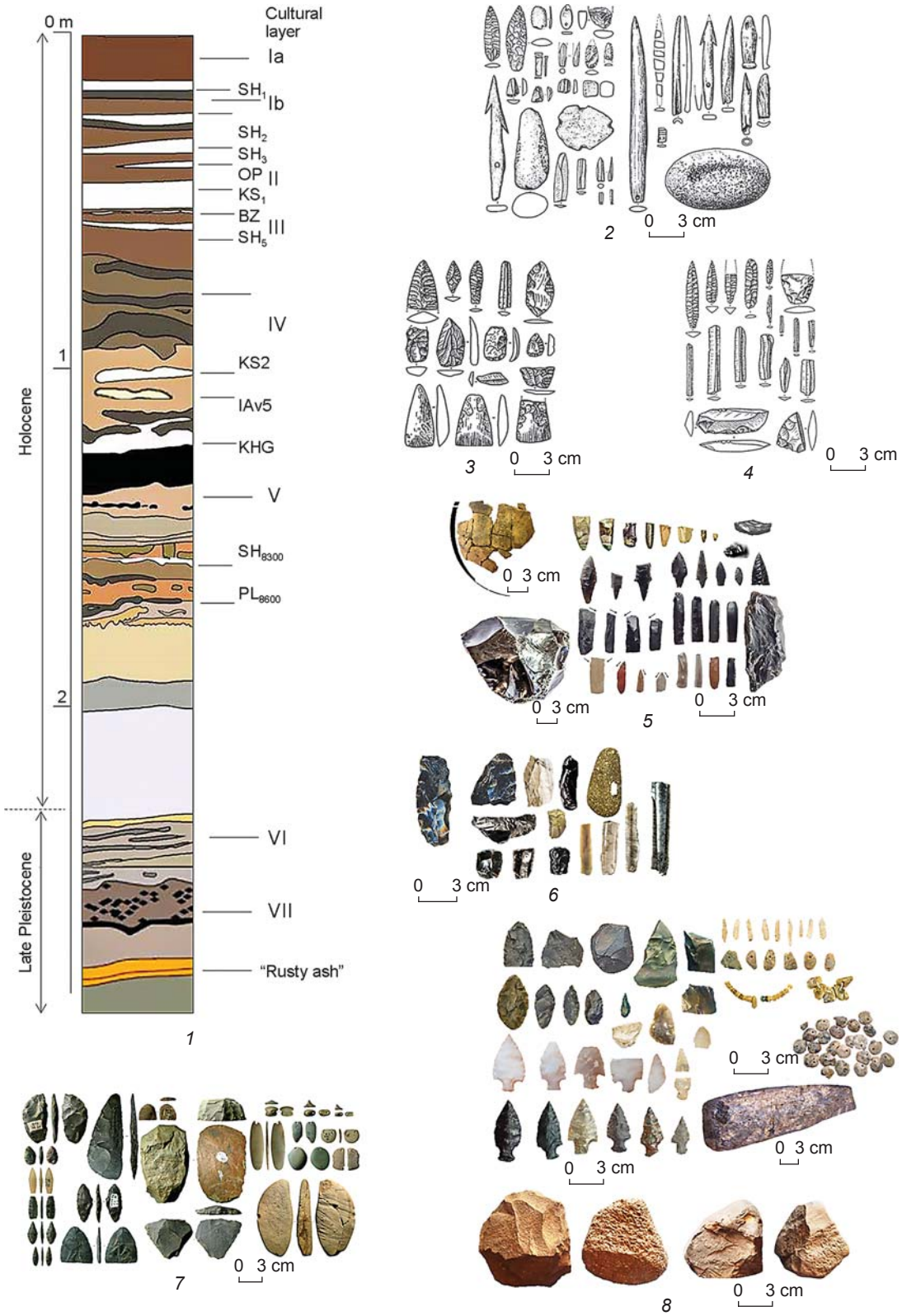

Fig. 2. Consolidated tephrostratigraphy with the markers and indices of volcanic eruptions and cultural layers (*1*); artifacts from cultural layers (*2–8*) of the Ushki sites.

2 – layer I (Dikov, 1977: 272, pl. 10; p. 279, pl. 20); *3* – layer II (Ibid.: 278, pl. 19); *4* – layer III (Ibid.: 277, pl. 17); *5* – layer IV (evidence from the excavations by the author); *6* – layer V (evidence from the excavations by the author); *7* – layer VI (Gómez Coutouly, Ponkratova, 2016: 323, 325, 326); *8* – layer VII (evidence from the excavations by the author).

knives on blades, retouched on one side, end-scrapers with the convex blade, crudely trimmed unifacial convex adzes, piercing tools, side burins on bladelets, and sinkers) (Fig. 2, *4*). Trihedral points with or without tangs, and wooden dishware became widespread. The subsistence strategy of the population during this period was based on hunting, fishing, and gathering (Dikov, 1977: 84; 1979: 113–119).

Late Neolithic (the second stage of the Tarya culture)

This stage (1052 ± 25 BP or 1059–996 cal BP) (see Table 2) corresponds to ground dwellings, possibly *balagans** of the "Itelmen type". Stone trihedral and laminar stemmed arrowheads, side burins, knife-like blades, double-sided retouched inserts, leaf-shaped bifacial knives, polished adzes, end-scrapers with the convex blade, piercing tools, and labrets (Fig. 2, *3*) continued to be used. Unusual cup-shaped rounded pits, lined with four layers of birch-bark, have been found at Ushki I. The paleoeconomy of the population was based on hunting, fishing, and gathering (Dikov, 1977: 61–62, 72–74; 1979: 113–119).

Time of the Old Itelmen culture

According to the chronological model by Dikov (1977: 43), during the existence of the Old Itelmen culture, the Uski I, II sites were populated twice: 675 ± 80 BP or 806–597 cal BP (cultural layer Ia) and 235 ± 145 to 220 ± 140 BP or 564–55 cal BP (cultural layer Ib). The boundary between the two habitation stages is marked by the ash of the Shiveluch volcano's eruption 250 ± 60 BP or ca 1700 AD. These dates suggest that the second peopling of the sites at this stage happened ca 1650–1700 AD. Dwellings with an area of about 120 m^2 were seasonal (winter) structures of the dugout type, and had the side corridor and smoke hole in the roof of the "Itelmen type", which served as entrance, as well as the sacrificial structure and utility pits for food storage. The inventory includes bone knives, a double-sided serrated bone tip of a simple harpoon, leaf-shaped bilaterally processed knives, end-scrapers, prismatic cores, knife-like bladelets, and fishing sinkers with recesses made of pebbles (Fig. 2, *2*). The subsistence strategy of the population at this time was based on hunting, fishing, and gathering. Their totemic beliefs were associated with fishing (Dikov, 1977: 62–65, 74–75).

*A *balagan* is a pile-supported structure suitable for the storage of sun-dried fish and products of gathering in the winter, and winter-time utensils (winter clothing, dog-harness, etc.) in the summer (Istoriya…, 1990: 16, 37–38).

Dwellings whose remains have been found in cultural layer Ia were likely damaged by volcanic eruption. The people who came to this territory (cultural layer Ib) were apparently familiar with the Russian Cossacks. The first Cossack fort was built in 1649 by F. Popov on the Okhotsk coast of Kamchatka; and in 1703, V. Atlasov founded Fort Nizhnekamchatsk in the lower reaches of the Kamchatka River (Alekseev, 1982). The assumption that the local population interacted with the Cossacks is supported by a copper item found in the upper layer of the Ushki II site (Dikov, 1977: 279, pl. 20, 6), as well as by ethnographic descriptions that mention the Ushki locality and the Us Kyg River*, renamed by the Cossacks into Ushki (Krasheninnikov, 1994: 17).

Discussion

Comparative analysis of the inventory under discussion and assemblages from the adjacent territories

The evidence from the Ushki sites, which goes back to the Paleolithic to Neolithic transition, is the earliest testimony on the peopling of Kamchatka. Stemmed points similar to the Ushki artifacts, which are specific chronological and cultural markers of this period, have been found in a number of Late Pleistocene assemblages from the areas south of Kamchatka. These are assemblages of the Suyange site (layer 4, 15,410–15,350 BP) (Lee Yung-Jo, Kim Ju-Yong, 2010) and Kosanri site (Lee H.W., 2010: 42) on the Korean Peninsula; Pirika I on Hokkaido Island in Japan (see (Vasilevsky, 2008: 351)); and Ogonki-5 site (horizon 1, 13,000–11,000 BP) on Sakhalin Island (Ibid.: 140, 353). The evidence from these sites reflect the similarity in adaptation strategies of their inhabitants (predominance of seasonal fishing and hunting camps, combined economy, orientation to fishing, and use of both local raw materials and high-quality ones brought from remote sites). To the north of the area under discussion, the Upward Sun River Site in Alaska (ca 11,500 cal BP) shows similarity to the Ushki sites. Parallels can be seen in lithic inventory (bifaces), the subsistence system of the population (focused on fishing), and burials (burial in dwellings) (Potter et al., 2011: 1061, fig. 4, F, G, H). Stemmed points similar to those from Ushki have also been found in the archaeological complexes of the Arctic zone of Northern America (cultures of the Aleuts, Athabasks, Tuktu/Palis, etc.) dated to 6000–200 BP (Projectile…, (s.a.)).

Some parallels with stone tools from cultural layer VI of the Ushki site (tools made with the Yubetsu technique)

*The name *Us Kyg* is derived from Itelmen *us* or *uskh* 'field, forest meadow', and *kykh* 'sea, big water'.

have been found in materials from Yakutia (the Dyuktai Upper Paleolithic complex, 17,000–13,000 cal BP) (Gómez Coutouly, 2016), the Far East (Amur region, Osipovka culture, 13,000–10,000 BP) (Shevkomud, 2005: 5–10), Sakhalin Island (the Sokol and Olympia-5 sites, 13,000–9000 BP) (Vasilevsky, 2008: 115–121), and Alaska (Swan Point CZ4, 14,000 cal BP) (Gómez Coutouly, 2012)). The earliest stone industries using the Yubetsu technique are known in Japan on Hokkaido Island (Pirika I, Kashiwadai I), and Korea (Suyanggae I, Hopyeong-dong) (Lee Yung-Jo, Kim Ju-Yong, 2010; Gómez Coutouly, Ponkratova, 2016). Parallels between the Ushki finds and assemblages from the above territories suggest that the stone industry of the second habitation stage at Ushki was associated with a vast East Asian-American cultural tradition. The closest proximity of the Ushki evidence from that layer to the earlier assemblages of the Amur region and Japan may have resulted from their genetic unity.

Tools on blades and flakes (end-scrapers, insert tools) from the third habitation stage at Ushki (Initial Neolithic) show similarities to the artifacts of the Novopetrovka culture of the Western Amur region (12,630–8590 BP) (Kuzmin, Nesterov, 2010: 105, 107), and also to the evidence discovered on Sakhalin Island (Ogonki-5, horizon 1, 13,000–11,000 BP, Kostromskoye site, Early Neolithic) (Vasilevsky, 2008: 104, 315, 362) and Zhokhov island (7450 ± 220 BP (LE 4534), 8200 ± 40 BP (GIN 6399), 7940 ± 170 BP (LU 4533a), 7930 ± 40 BP (GIN 6400) (Girya, Lozovsky, 2014; Makeev, Pitulko, Kasparov, 1992)). Taking into account the radiocarbon dates of the assemblages from these sites, it can be assumed that in that period, the territory of the Far East was populated by the groups of people who were most likely moving from the west or south. According to the historical data, in the 18th century, Kamchatka and Yakutia were connected by the Yakutsk-Okhotsk and Okhotsk-Petropavlovsk roads, with a total length of over 2600 km (Kazaryan, 2012). It is possible that this road was known to the local population even earlier. The inhabitants of the territory near Lake Bolshoye Ushkovskoye might have left the site trying to escape from the eruption of the Khangar volcano, and headed north towards Zhokhov Island. They moved from the Ushki sites to Zhokhov Island (about 2250 km in a direct line) most likely by dog sleds. This version is confirmed by dog bones and canine coprolites, as well as fragments of dog sleds, found in a hunting camp on Zhokhov Island (Pitulko et al., 2019). It is possible that the emergence of draft dog breeding in Kamchatka can be dated to the Initial Neolithic, ca 8500 cal BP.

The assemblage from the fourth habitation stage at Ushki finds parallels in the archaeological assemblages of the Sumnagin culture (9th–5th millennium BC) and the early stages of the Early Neolithic Syalakh culture (4870 ± 170 to 3490 ± 150 BC) in Yakutia, containing ceramic vessels of rounded shape, with through holes under the rim, and notches, and showing wide occurrence of arrowheads and burins on blades; the economy was based mainly on fishing (Alekseev, Dyakonov, 2009). Some similarities with the Ushki evidence have been manifested by the Early Neolithic assemblages with tools on blades and flakes, and pottery of the Gromatukha culture of the Middle Amur region (Shevkomud, 2005: 10–11), Mariinskoye culture of the Lower Amur region (Medvedev, 2008), sites on Sakhalin Island (Slavnaya-5, Pugachevo-1, Punkt 3; Starodubskoye-3 (Early Neolithic); Slavnaya-4, etc.) (Vasilevsky, 2008; Grishchenko, 2011). The pottery from the Arctic regions of Northern America, where its emergence was dated to ca 2800–2500 BP, coinciding with the development of an economy specializing in seafood production (Anderson, Tushingham, Buonasera, 2017), may also show parallels to the Ushki evidence.

Dikov suggested searching for parallels to the artifacts of the Tarya culture (Middle and Late Neolithic) found at the Ushki sites, in the assemblages from the sites of Northern and Southern Kamchatka, Chukotka, the Sea of Okhotsk, the Kuril Islands, Sakhalin, Eastern Siberia, Yakutia, and Japan, which, in his opinion, were connected with the ancestors of the Itelmens (1979: 126–127). The sites of the Tarya culture were explored by A.K. Ponomarenko, who observed the continuity of the Tarya culture from 5200 ± 100 BP to the 17th–18th centuries, and identified its local stages and variants (2014: 138–144).

On the names of habitation stages at Ushki

The analysis of new evidence has made it possible to clarify the features in the habitation stages at the Ushki sites, and suggest some new names for these stages.

"The transitional period from the Paleolithic to Neolithic". This renaming (formerly "the Upper Paleolithic" (Dikov, 1977: 47; 1979: 31, 54; 1993)) is based on refined data on the sites of the Final Pleistocene to Early Holocene. Such sites were located on the outskirts of the pedestal of volcanic structure of the Klyuchi group of volcanoes, and not on high terraces, like the Paleolithic sites in the adjacent territories. The lower part of the soil-pyroclastic cover with cultural layers VII and VI is dated to the Upper Pleistocene, for which new definitions of 13,000–10,000 cal BP have been obtained. The lithic industry manifests the emergence of skills in manufacturing and using arrowheads, spears, and adzes, as well as polishing and drilling techniques, corresponding to the Paleolithic to Neolithic transition in the adjacent territories. At that time, people created pit structures (cultural layer VI), probably used floating

devices while transporting raw materials from distant sources; had beliefs concerning the afterlife, performed rituals associated with totemic beliefs, and produced special dyes (cultural layer VII). The subsistence strategy of the population was based on fishing. It is possible that the name of the stage should be clarified with the accumulation of new evidence.

"Initial Neolithic" (formerly "Final Paleolithic" (Dikov, 1977: 58; 1979: 76; 1993)). This renaming is based on the fact that cultural layer V, containing the artifacts from that stage, overlies the deposits of the previous stage. Innovative features include the appearance of tools on blades (end-scrapers, knives) and the spread of insert technology. Draft dog breeding might have emerged at that time, and became typical of the subsequent periods in Kamchatka, where the domestication of dogs probably occurred in ca 11,000–12,000 BP (cultural layer VI) (Dikov, 1979: 60). Later, the use of dogs in harness became widespread among the Itelmens (Istoriya…, 1990: 21).

"Early Neolithic". Dikov (1979: 106) proposed introducing this term. We suggest abandoning the term "Mesolithic", since the data obtained do not correlate with the present-day concepts of the Mesolithic of coastal areas, islands, and peninsulas of the Far East (Vasilevsky, 2008).

"Old Itelmen culture". We suggest abandoning the outdated term "vestigial Neolithic", because during that period, the Itelmen culture already had the features of an ideologically consolidated community (Ibid.).

Conclusions

The comprehensive study of the Ushki V site has shown that peopling of the territory adjacent to Lake Bolshoye Ushkovskoye happened at least eight times in the period between the Pleistocene and Holocene. Identification of criteria for each habitation stage has made it possible to propose their periodization: Paleolithic to Neolithic transition (early (ca 13,320–12,022 cal BP) and late (12,225–10,131 cal BP) periods); Initial (ca 8608–8297 cal BP), Early (ca 6679–4406 cal BP), Middle (ca 2809–1516 cal BP), and Late (ca 1059–996 cal BP or 960–1020 AD) Neolithic; and time of the Old Itelmen culture (ca 806–55 cal BP or 1200–1700 AD). Lithics from the first habitation stage are bifacial arrowheads and stemmed projectile points, those of the second stage are tools on microblades, made with the Yubetsu technique. In the Initial Neolithic, tools on blades appear, inserts become common, and, possibly, dogs begin to be bred as draft animals. The distinctive traits of the Early Neolithic are pottery, prismatic and pencil-shaped cores, and projectile points and burins on blades. The Tarya culture of the Middle and Late Neolithic is marked by trihedral arrowheads and wooden vessels; crude unifacial adzes give way to polished ones, and labrets appear. The seventh and eighth stages are distinguished by the material complex of the Old Itelmen culture.

Parallels with the evidence from the neighboring territories suggest that migration processes that took place in the northeast of the Asian and northwest of the American continents in the Late Pleistocene and Holocene, did not occur simultaneously. The paces and directions of the migrations must have been different in different periods, with the composition of the migrating population. However, the ancient inhabitants of the Kamchatka Peninsula, who left traces of distinctive cultures on the shores of Lake Bolshoye Ushkovskoye, also played an important role in these processes.

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Fishing in the Early Holocene Human Ecosystem of the Northern Angara Region: Findings from Stratified Sites

Archaeological excavations in the flood zone of the Boguchany hydroelectric plant in 2007–2012 have resulted in important findings relevant to the study of prehistoric fishing in the northern Angara basin, and to the chronology of its initial stages. Evidence of fishing was recorded at the Early Holocene layers of Ostrov Listvenichny (points 1 and 2), Ust-Yodarma II, Ust-Keul I, Ust-Igirma, Ust-Kova I, and Vorobyevo. Such evidence is scarce at the latter three sites, but is more abundant elsewhere, providing an opportunity to assess the role of fishing in the subsistence strategy of the northern Angara foragers. The sites on which this study focuses are located on the Bratsk-Ilim stretch of the Angara River, from the former mouth of the Ilim to the mouth of the Kata (two sites are in the lower stretches of the Angara tributaries, and two on an island). Composition analysis of the ichthyofauna has revealed two fishing strategies, apparently related to seasonality. The first consisted in harpooning sturgeon during the pre-winter time. The second strategy was to procure burbot and pike in spring and summer by hook-and-line fishing and by setting traps. We hypothesize that these strategies evidence seasonal changes in the composition of foraging groups.

Keywords: *Northern Angara region, Early Holocene, fishing, fishing strategy, human ecosystem, ichthyofauna.*

Introduction

Taking into account regional studies, the chronological framework of the Early Holocene in the southern part of the Middle Siberia is determined by the interval of ~10.3–8.0 ka uncal BP, including Praeboreal (PB) and Boreal (BO) phases (Vorobieva, 2010: 95). Up to now, 17 localities containing materials from the Final Pleistocene to Early Holocene age have been recorded in the northern Angara region (Abdulov T.A., Abdulov A.T., 2015; Abdulov T.A., Abdulov A.T., Altukhov, 2013; Berdnikov et al., 2014; Gurulev, 2014). Archaeologically recorded traces of fishery have been found at seven of them: Ostrov Listvenichny points 1 and 2, Ust-Yodarma II, Ust-Keul I, Ust-Igirma, Ust-Kova I, and Vorobyevo (Fig. 1). In the materials of last three localities, the finds traditionally associated with fishing are represented by a horn "beater" (Ust-Igirma) (Vasilievsky, 1978: 135, 136, fig. 4), a fragment of a barbed point (Vorobyevo) (Ibid.: 136), and isolated remains of ichthyofauna (Ust-Kova I) (Vasilievsky, Burilov, Drozdov, 1988: 95). At other mentioned sites, the evidences of fishery are

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representative and show the presence of this economic activity, and also its role in the subsistence system and strategies of the ancient population in the northern Angara region. The Final Pleistocene to Early Holocene horizons of these sites contained relatively numerous diagnostic remains of ichthyofauna and fishing gear. In addition, radiocarbon dates have been obtained for the majority of the assemblages under consideration.

All these localities were flooded by waters from the Boguchany water reservoir. The possibilities of further investigation of these sites, in order to refine or obtain new correlational data, have been irretrievably lost. The only sources of information on the ancient history of a considerable part of the northern Angara region are field data obtained in the course of the Boguchany expedition's work in 2007–2012. It is quite probable that the emergency and force majeur character of these salvage operations had an impact on the qualitative composition of the obtained archaeological materials. With the general poor preservation capacity and small size of fish bones, opening of large areas was not favorable for recording the entire ichthyofauna. Another problem is a species non-diagnosability of a part of collection (Rogovskoi, Kuznetsov, 2013b: 23). However, it is hoped that even the recorded remains provide general background values of relationships between the harvested species.

The sites on which this study focuses are located on the Bratsk-Ilim stretch of the Angara River, from the former mouth of the Ilim to the mouth of the Kata (two sites are in the lower stretches of the Angara tributaries, and two on an island with two locations of camps inhabited by ancient hunters and fishers). The river valley in this area is predominantly V-shaped, 4–6 km wide. The one-sided floodplain was encountered in the form of short areas in the mouths of tributaries; its width is generally 70–150 m, and up to 400 m near the Kata River. The floodplain has a level, meadowy surface. Almost everywhere, the banks merge with the valley-side slopes, and in the steep parts they are 6–8 m high. The bottom is pebbled, being large-stony at the river bars; near the banks, it was overgrown with aquatic vegetation to a width of 10–40 m (Resursy…, 1972: 295–296).

The Bratsk-Ilim stretch was characterized by the presence of multiple islands of cumulative, sculptural, and mixed genesis, parallel-arm current with alternation of rapids and vast reaches, and numerous channels with different velocities of current (Chalov R.S., Chalov S.R., 2009: 105–106). These landscape and hydrological features provided, respectively, the best conditions for benthic fauna and a high fishing value for this stretch of the Angara (Kozhov, 1950: 50). Notably, before construction of the Angara chains of power plants, the main sturgeon-harvesting areas were located exactly here (Egorov, 1943: 5–6; Kozhov, 1950: 51).

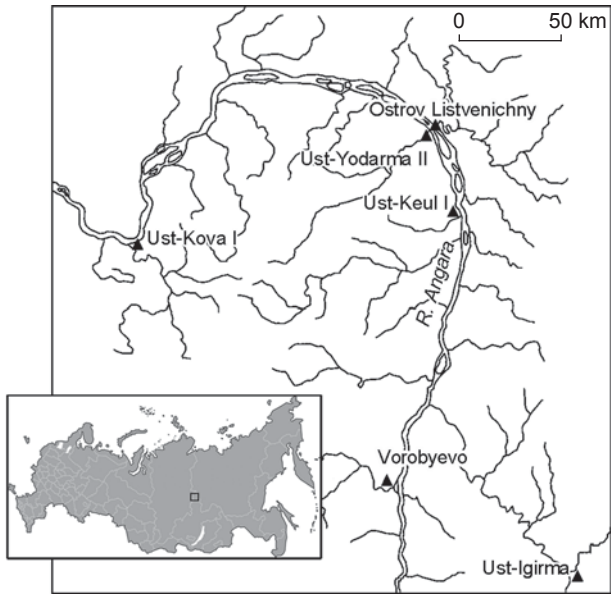

Fig. 1. Early Holocene localities of the northern Angara region where evidence of fishery was recorded.

The methodological component of research involves analysis of the ichthyofauna remains, the composition of fishing gear, planigraphic distribution of fishery traces within the site, and correlation of the obtained data between each other and with the materials from the southern Angara region and the western coast of Lake Baikal. It should be noted that the previous results of the ichthyofauna composition analysis were subjected to some correction due to the more detailed handling of the collections.

Materials

Ostrov Listvenichny. It was located halfway between the Kata and Yodarma river mouths. The valleys of these rivers, the right and left tributaries of the Angara, respectively, are actually located opposite one another, thus forming the Kata-Yodarma expansion. This place was located in the upper part of the island, in two points: in the upstream part, and 0.5 km downstream, at the right bank, facing the Kata channel.

Point 1 (in the upper part) was a gently sloping island terrace, with the distribution area of finds approximately 150 m^2, located in the immediate vicinity of a pronounced natural levee 2.0–2.5 m high. At the time of excavations, the distance from the river's surface to the top of the levee was approximately 7 m. Judging by data from microstratigraphy, the ancient habitation surface was a platform, slightly inclined towards the coastline.

The Early Holocene cultural layer (layer 2) is recorded in deposits underlying the Holocene optimum

series and represented by grayish-brown light silted loam, with inclusions of small pebbles. It included two microhorizons of occurrence of archaeological remains, partially separated by a sterile interlayer. According to the stratigraphic position and data from radiocarbon dating, the age of the layer is approximately 9 thousand years (Kuznetsov, Rogovskoi, 2019: 182).

The majority of faunal materials from this layer involve remains of ichthyofauna (79 % of all finds identifiable by specimens), while the relationship between these and other bone remains, including unidentifiable ones, is identical in both microhorizons (50.8 % and 50.9 %, respectively) (Ibid.: 183, 186). 277 pieces have been recorded. The majority are represented by such species as sturgeon and sterlet *Acipenser* (16 %), pike *Esox lucius* (13 %), and burbot *Lota lota* (59 %). The share of taimen *Hucho taimen*, cisco *Coregonus lavaretus pidschian*, roach *Rutilus rutilus lacustris*, ide *Leuciscus idus*, dace *Leuciscus leuciscus baicalensis*, and perch *Perca fluviatilis* varies from 1 % to 5 % (Mamontov, Rogovskoi, 2013: 26, tab.). In terms of planigraphy, the remains of ichthyofauna are localized around and inside fireplaces, thus forming the increased concentration zones, with various shares of finds (Kuznetsov, Rogovskoi, 2019: 185–186).

Fishing gear is represented by the only composite fish hook*. Though its wand and needle were found in different microhorizons, application provides a metrically consistent complete tool. In terms of planigraphy, artifacts also tend towards fireplaces. The bone wand is rounded in cross-section, its ventral surface is flattened by grinding (Fig. 2, *4*). The item's length is 28 mm, its diameter is 5 mm. At the upper end, a head is shaped by ring-form grooves. At the lower end, a support for front attachment of the needle to the base at an angle of 25° is separated and a knobble is carved by grinding and flattening. The needle, 20 mm long, is made from a small fragment of fish bone (Fig. 2, *3*). The point is blunted, probably as a result of use. The lower edge is curved and has a row of small parallel cut marks interpreted as a place of fastening by winding.

In point 2 (downstream), with an excavated area of about 1.2 thousand m^2, six cultural layers, fitted into clear lithological horizons, were distinguished. An Early Holocene cultural layer (layer 5) was recorded in deposits aged about 8.5 ka BP, which underlie the Holocene optimum series (Kuznetsov, Rogovskoi, 2016: 92). The locality directly adjoined the bank line, and at the time of excavations was located 4.0–4.5 m away from the water edge. According to the data from microstratigraphy, the habitation surface in the Early Holocene was not too different from the modern one, and formed a flatly inclined island terrace with an abrupt cliff facing the river.

148 specimens of the ichthyofauna remains have been recorded in layer 5, while the species attribution has been established for 85 specimens. Sturgeon and sterlet *Acipenser* account for 59 %, pike *Esox lucius* for 26 %, burbot *Lota lota* for 8 %, perch *Perca fluviatilis* for 6 %, and nelma *Stenodus leucichthys nelma* for 1 % of the total (Mamontov, Rogovskoi, 2013: 26). In terms of quantity, ichthyofauna accounts for 4.5 % of the total amount of faunal remains. In the planigraphy, it forms three local accumulations in the western part of the excavated area, one of which is confined to the fireplace.

The fishing gear includes a large series of barbed points (15 spec.), a bait fish, and the wand of a composite fish hook. All points are one-sided; the barbs are incised into the body with a rounded cross-section. The artifacts are made of bone and horn. Seven items are represented by distal, medial, and distal-medial fragments. The thickness of the blade in the majority of points varies from 6 to 9 mm, its width from 14 to 19 mm. Only one fragment of the distal portion of an item with the blade 3 mm thick and 6 mm wide stands out from the overall picture. Six artifacts are proximal and proximal-medial fragments of various states of preservation. A haft element is sharpened in all cases, suboval along the outline, with an asymmetric U- and M-shaped side recess located both immediately under the first barb (1 spec.) and in the medial (2 spec.) or distal (1 spec.) portion of the base. It is incised into the body of the base at an angle of approximately 80–90°. The length of haft element in two artifacts in a good state of preservation is 44 mm. The maximum width of the haft element is 8–11 mm.

Two intact tips deserve a more detailed description. One of these is the largest one in the collection (Fig. 3). Its length is 258 mm, the maximum width is 22 m, and the thickness is 8 mm. It is made from an ungulate's metapodium. The point was carefully ground on both sides; one of them has a longitudinal flute, a special feature of the blank material. There are five barbs: their pitch is 23–25 mm in the medial portion and 45 mm (one barb) in the distal portion. The base, 107 mm long, has a sharpened suboval contour. An M-shaped side recess incised into the body of the point at an angle of about 80° is located in its distal portion, at a distance of 36 mm from the end point.

Another barbed point stands out from the general series by its morphology (see Fig. 2, *1*). It is also treated by grinding and has a flute (a special feature of the blank material) on one side. Five barbs are incised into the point body at an angle of 70°, while in other tools this angle is

*A barbed point earlier assigned to the Early Holocene horizon of point 1 (Rogovskoi, Kuznetsov, 2013a: 109, 111, fig. 3, *7*) was later assigned to cultural layer 1 dated to the Middle Holocene time, as a result of additional microstratigraphic studies (Kuznetsov, Rogovskoi, 2019: 182).

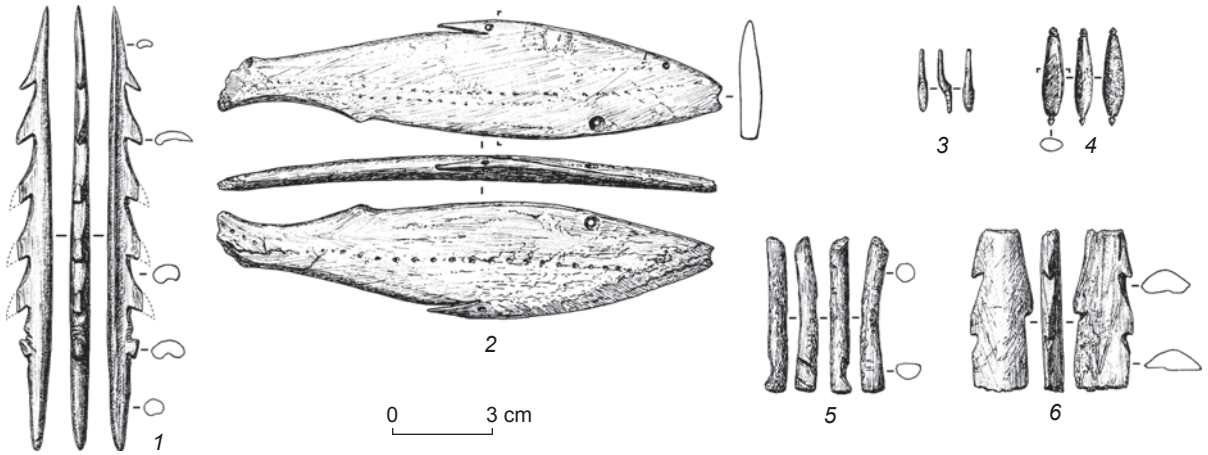

Fig. 2. Fishery tools.
1–5 – Ostrov Listvenichny: *1*, *2*, *5* – point 2 (layer 5), *3*, *4* – point 1 (layer 2); *6* – Ust-Yodarma II (layer 9).

40–50°. Besides, the needle of this item is additionally sharpened. While in other points its contour on the side of barbs is straight, in this case it is concave. The base has, not a recess, but a U-shaped projection. The haft element is rounded in cross-section and sharpened. The item's length is 129 mm, its maximum width 10 mm, and its thickness 5 mm.

Judging from the presence of such morphological features as the small number of large barbs, the profile curved in two planes, and sharpened haft elements, the items presumably pertain to the harpoon type of tool, which means the specific *modus operandi* of an artifact, i.e. the fish holding function (Petillon, 2008: 77). A distal location of the M-shaped recess in the first point, in combination with a large size of the item, suggests that it was secured either directly to a shaft or through an adapter using a flexible line. In case of rigid fastening (a variety of leister), the point with such a length and thickness could be broken on impact owing to linear dynamic load.

The bait fish (see Fig. 2, *2*) is made from a tubular bone of a large mammal by means of double-side grinding. Its body has an elongated shape. Its morphology is characterized by continuity of contours profiling the back and belly of the fish, transition to the tail by gradual narrowing of the body followed by expansion at the place of the tail fin (which is partially broken off). The head is sharpened at an angle of 35°. The dorsal fin is carefully made with a narrow, deep, oblique incision, and has a hole in the middle; a small protrusion in the lower portion of figurine near the tail most probably renders the proctal fin. An eye in the form of small (not more than 1.5 mm in diameter) well is shaped on one side of the item. A circular biconical through hole, presumably intended to secure an imitator of a branchial fin, is located on the ventral portion, near the head. Dashed lines extend from the snout to the tail on the figurine; on one side, they are depicted in two rows. These probably imitate a side line of whitefish species. In cross-section, the sculpture has a profile curved in two planes, which follows the shape of the blank (a tubular bone) and likely

Fig. 3. Barbed point. Ostrov Listvenichny, point 2 (layer 5).

ensures floating in an aquatic environment, i.e. imitation of fish behavior. The figurine is 145 mm long, 33 mm wide, and about 6.6 mm thick.

The wand of a composite fish hook is a slightly curved bone cylinder, round in cross-section (see Fig. 2, *5*). Judging by the remaining surface, the tool was given its final shape by grinding. The proximal segment is broken off. The distal end has a shallow (1 mm) groove 6 mm wide, positioned at an acute angle to the longitudinal axis of the item. This is probably the place of lateral fastening of the fish hook needle to the wand. The item's length is 45 mm, its diameter is 6 mm.

In terms of planigraphy, the majority of barbed points (9 out of 15 spec.) were concentrated in the southeastern sector of the site, in the "recreational" zone (Kuznetsov, Rogovskoi, 2016: 93), wherein they were not confined to fireplaces or accumulations. Two points were recorded as part of tool-raw deposits—compact structurally organized accumulations of artifacts (Rogovskoi, Kuznetsov, 2014). Other tools were scattered over the site area. The bait fish was in the "recreational" zone too. An accumulation of ichthyofauna remains and fragments of three barbed points were 1.0–1.5 m away from it. A fish hook wand was found in the coastal northeastern part of the site, in the "utility" zone (Kuznetsov, Rogovskoi, 2016: 93). Scarce remains of ichthyofauna and a fragment of a barbed point were found within the radius of 2 m from it.

Ust-Yodarma II. This stratified locality is part of the ensemble of archaeological sites in the mouth of the Yodarma River (the left tributary of the Angara). The ensemble includes closely-adjacent, partially inter-overlapping non-contemporaneous sites localized along the left and right banks of the river (Boguchanskaya arkheologicheskaya ekspeditsiya, 2015: 385–386). The site occupied the tip of the right Yodarma promontory situated near the mouth and a riparian area upstream the Angara River (the total length is about 1 thousand m), and formed a slightly sloping surface, with relative marks of 1–10 m, inclined towards the Angara (Lokhov, Rogovskoi, Dudarek, 2013: 118).

Materials of cultural layer 9 dated to about 8.2 ka BP pertain to the Early Holocene (Lipnina, Lokhov, Medvedev, 2013: 86)*. They contain abundant remains of ichthyofauna. The species attribution of 223 specimens has been identified. Sturgeons *Acipenser* account for 52.2 %, pike *Esox lucius* for 26.1 %, and burbot *Lota lota* for 21.7 % (Mamontov, Lokhov, 2013: 129, tab. 1). The remains of ichthyofauna make up ~32 % of faunal materials found in layer 9. In terms of planigraphy, almost all of them were represented by small accumulations confined to the fillings of rare fireplaces. The majority of bones were subjected to thermal treatment, in view of which their state of preservation was poor.

A medial fragment of a bone barbed point can be preliminarily assigned to the fishing gear (see Fig. 2, *6*). The tool is double-sided, semi-oval in cross-section. It is treated by variously directed grinding on two sides. One of them has a narrow longitudinal flute—presumably a natural element of a blank (a tubular bone). The barbs are located asymmetrically and incised into the body at an angle of 40–50°. The width of the fragment (of the barbed portion) is 18 mm, its thickness is 7 mm. The artifact's cross-sectional contour suggests that it is not a fragment of a finished tool, but the remains of a blank.

Ust-Keul I. A stratified locality was situated on a gently-sloping left area near the mouth of the Keul River (the left tributary of the Angara), with relative marks of 9–10 m (Novoseltseva, Sokolova, 2012: 137). The locality belongs to the ensemble of non-contemporaneous Ust-Keul (Left) sites (Boguchanskaya arkheologicheskaya ekspeditsiya, 2015: 470). The excavated area of the site is about 2.2 thous. m^2.

According to the stratigraphy and the radiocarbon dating data, cultural layers 8–10 belong to the Early Holocene period. The age of layer 8 is about 8.3 ka BP (Klementyev, 2014: 34), and that of layer 9 about 10 ka BP. Layer 10 is dated to the period from 10,005 ± ± 190 BP (SOAN-8644) to 11,280 ± 170 BP (SOAN-8643) (Novoseltseva, Sokolova, 2012: 141, 144).

Traces of fishery in the said layers are represented only by the ichthyofauna remains; in layer 9, only one specimen was found. The sample from layer 8 consists of 181 specimens, wherein more than 70 % (128 spec.) were recorded in the utility pit. The distribution of species composition is as follows: sturgeons *Acipenser* 64.1 %, pike *Esox lucius* 17.1 %, burbot *Lota lota* 16 %; perch *Perca fluviatilis*, taimen *Hucho taimen*, and nelma *Stenodus leucichthys nelma* are from 0.55 to 1.7 %. Among 15 specimens of ichthyofauna remains from layer 10, sturgeons *Acipenser* account for 26.7 %, pike *Esox lucius* for 53.3 %, burbot *Lota lota* for 13.3 %, and perch *Perca fluviatilis* for 6.7 % (Mamontov, Novoseltseva, Sokolova, 2013: 136, tab. 1; 137, tab. 2).

In planigraphy of layer 8, which is recorded actually throughout the entire excavated area, separate zones with an increased concentration of finds, along with small accumulations, are discernible. Remains of ichthyofauna and utility pit were located in the southeastern part, closest to the water course, near the mouth part of the site. The distribution area of archaeological materials in layer 10 does not exceed 100 m^2 and is also confined to the near-mouth part. The remains of ichthyofauna were located inside and around the fireplace.

*In cultural layer 10, for which ^{14}C-date of 10,150 ± 190 BP (SOAN-8907) has been obtained (Berdnikov et al., 2014: 55, tab.1), the remains of ichthyofauna are very rare.

Discussion

From the analysis of ichthyofauna remains, the graphs of relationships between the recorded species have been plotted. These demonstrated two different fishing strategies (Fig. 4). The first one, combining materials from Ostrov Listvenichny, point 2 (layer 5), Ust-Keul I (layer 8), and Ust-Yodarma II (layer 9) shows a predominance of sturgeons in the composition of catches. Pike and burbot are represented in an approximately equal share. The share of perch, taimen, and nelma is 0.5–5.0 %. Such a ratio correlates sufficiently well with the data from the southern Angara region, where sturgeons also prevail in the Mesolithic horizons of the Ust-Belaya site (Medvedev, 1971: 114). In the Early Holocene, in the first-order tributary of the Angara (the Khaita River), the core of catch was formed by cisco, pike, and burbot (Mamontov, Saveliev, Igumnova, 2006: 275, tab. 2), at the Maloe More sites of Lake Baikal by perch, roach, and dace (Nomokonova, Lozey, Goryunova, 2009: 15, fig. 4A), and in the Angara by sturgeon and sterlet. Noteworthy is differentiation of the relative sizes of sturgeons: while the main part of remains in the northern Angara region belonged to individuals of 4.0–11.5 kg in weight (Mamontov, Rogovskoi, 2013: 26–27), their weight in the southern Angara region reached 20 kg on the average and up to 90 kilograms (Medvedev, 1971: 114). Obviously, in the northern Angara region, the main catch was sterlet, which is much smaller than sturgeon.

The second strategy is observed with respect to the materials of Ostrov Listvenichny, point 1 (layer 2). Here, the catches were dominated by burbot, while sturgeons and pike took the second place. In addition, bone remains of taimen, perch, cisco, roach, ide, and dace were recorded in this assemblage, whereas at other Early Holocene localities, the four last-mentioned species are absent. The data on layer 10 at Ust-Keul I, where an almost identical situation (though with a predominance of pike) is observed, can be assigned to the same strategy.

Such a relationship between the harvested species can be attributed to the seasonal annual cycles of economic activities conducted by ancient hunters and fishers. The data on Ostrov Listvenichny, point 2, represent the main seasonal model for the first-type strategy. The habitation seasonality of prehistoric humans in this area was indirectly established by the analysis of the state of dentition in four ungulates: the harvesting season lasted from September to December (Klementyev, 2014: 36). This suggests that the use of the Ostrov Listvenichny site, point 2, in the Early Holocene period was limited to the autumn-winter months. Roe antlers broken off from the skull and also discovered in the cultural layer are the only evidence pointing to another seasonality (spring-summer). Taking into account the proposed pre-winter model, this fact can be interpreted as the gathering of surface bone materials by ancient foragers. The fishing strategy of the first type only proves this model. Burbot, pike, and sturgeon were the prevailing fish species whose remains were recorded at the sites. The main biting (fish rising) of pike and burbot falls on September-October (Sabaneev, 2009: 67–68), before the beginning of winter, when these fishes lead a low-active life. By autumn, sturgeons accumulate in pits and non-freezing part of rapids (Egorov, 1943: 10).

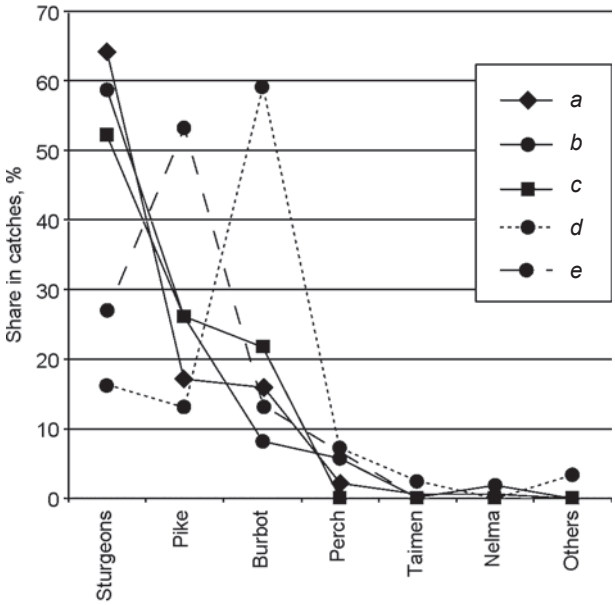

Fig. 4. Relationship between species in the catch of the ancient population of the northern Angara region in the Early Holocene period.
a – Ust-Keul I, layer 8; *b* – Ostrov Listvenichny, point 2, layer 5; *c* – Ust-Yodarma II, layer 9; *d* – Ostrov Listvenichny, point 1, layer 2; *e* – Ust-Keul I, layer 10.

The fishing strategy of the second type is related rather to the summer months. This is evidenced by a wide range of harvested species at Ostrov Listvenichny, point 1. Specialized fishing of sturgeon is not recorded, the composition of catches is dominated by burbot. The data on layer 10 of Ust-Keul I, despite a small size of original sample, also support the hypothesis on different seasonality.

One more interesting difference between the sites with different fishing strategies is the planigraphic situation. The area of distribution of finds in the cultural layers where the first-type strategy can be traced is large (1 thousand m^2 and more), while in the places where the second type is observed, it is rather compact (about 100–200 m^2) (see *Table*). This situation can be related to the annual changes in the structure of foraging groups of the ancient population: they concentrated

Species composition of the ichthyofauna remains at the Early Holocene localities of the northern Angara region, %

Site, cultural layer	^{14}C-date, BP (laboratory index)	Area of the site, m^2	Number of diagnostic finds, spec.	Sturgeons *Acipenser*	Pike *Esox lucius*	Burbot *Lota lota*	Perch *Perca fluviatilis*	Taimen *Hucho taimen*	Nelma *Stenodus leucichthys nelma*	Others
Ust-Keul I, layer 8	8370 ± 125 (SOAN-8906)	≥2200	181	64.1	17.1	16	1.7	0.55	0.55	–
Ditto, layer 10	ca 11–10 ka	~100	15	26.7	53.13	13.3	6.7	–	–	–
Ust-Yodarma II, layer 9	8200 ± 110 (SOAN-8651)	≥1700	223	52.2	26.1	21.7	–	–	–	–
Ostrov Listvenichny, point 1, layer 2	9375 ± 25 (UCIAMS-185870)	~150	277	16.24	13	59.21	5.78	2.53	–	3.24
Ditto, point 2, layer 5	8575 ± 120 (SOAN-8646) 8480 ± 135 (SOAN-8647) 8510 ± 135 (SOAN-8911)	≥1200	85	58.82	25.88	8.23	5.88	–	1.18	–

at the gathering locations during the periods of mass harvesting of resources, and fell into smaller units during other seasons. Such an organizational system is practiced by many traditional societies (see, e.g., (Popov, 1948: 32–36; Dzeniskevich, 1987: 30–33; Krupnik, 1989: 75; and others)).

Archaeologically recorded fishing tools at the sites where the first type of strategy has been revealed include barbed points, bait fish, and component parts of fish hooks. The functional connection between the barbed points and bait fish is described in detail and traced in numerous examples from the fishing practice of ethnographically recorded communities of hunters and fishers (Rogovskoi, Kuznetsov, 2013b: 27–28). It also indirectly confirms the pre-winter seasonal model of sites. Taking into account the Mesolithic materials from Ust-Belaya, where barbed points were also discovered, the strategy of the first type can be preliminarily attributed to fish harpooning (Medvedev, 1971: 117). Presumably, a large fish hook wand supplements the harvesting methods with the use of a self-activating trap.

Owing to its small size, the composite fish hook from Ostrov Listvenichny, point 1, is associated with catching fish with small mouth cavities (Nomokonova, Lozey, Goryunova, 2009: 17). In this case, cisco and roach recorded at the same place can be assigned to such fish. However, a wide range of represented species points to the mass harvesting of fish with the use of enclosures and traps. Thus, it can be assumed that the strategy of the second type was related to angling and setting traps.

Conclusions

The considered materials provide new information for analyzing the human ecosystem of the ancient population of Northern Asia. River fishing as part of post-glacial specialized strategy of harvesting food resources considerably extended and stabilized the food base for taiga hunter-gatherers in Baikal Siberia. The first evidence of this type of economic activity (remains of ichthyofauna and tools traditionally associated with procurement of fish) in the northern Angara region is recorded in the Early Holocene horizons of the stratified localities of Ostrov Listvenichny (points 1 and 2), Ust-Yodarma II, and Ust-Keul I. The concentration and location of these sites within the landscape can be related to the fishing-industry characteristics of the Bratsk-Ilim stretch of the Angara valley.

During the Early Holocene period, in the northern Angara region, the main targets of fishery were such species as sturgeon (Siberian sturgeon and Siberian sterlet), pike, and burbot, whereas the first-named prevailed at the majority of the described sites. Perch, taimen, nelma, and other species, judging by their share in catches, were associated yields.

The composition analysis of the ichthyofauna at the sites has revealed two different fishing strategies, apparently related to seasonality. The first was oriented towards the sturgeon breeds. The main technique was harpooning. This strategy may be associated with the periods of large-scale harvesting by the ancient population. The second strategy was oriented towards catching burbot and pike by means

of angling and setting traps. It is presumably related to economic activities of smaller structural units. Thus, it can be assumed that the ancient population of the northern Angara region had a complex all-year-round system for the differentiated exploitation of fishery resources, which included various catching techniques, in the Early Holocene period (10.3–8.0 ka uncal BP).

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Late Bronze Age Smelting and Processing Furnaces of the Eastern Variant of the Pakhomovskaya Culture in the Baraba Forest-Steppe

We describe smelting furnaces found in southwestern Siberia, at the Tartas-1 ritual site, representing the eastern variant of the Pakhomovskaya culture. This is so far the only known site where the ritual complex, which includes post holes, and utility and ritual pits, adjoins a special manufacturing area with furnaces for smelting copper ore and processing bronze. The pits, differing in form, depth, and size, belonged to a structure. Furnaces are of two types: deep ones, dug into virgin soil, and shallow ones with domes. The former were destined for smelting ore, and the latter for processing metal. The construction of both types is described in detail. The smelting furnaces are peculiar and have no direct parallels in the Late Bronze Age settlements and sanctuaries of southwestern Siberia, while being somewhat similar to smelting furnaces of the Early Iron Age Itkul culture of the Trans-Urals. Furnaces of the second type resemble those of the local Late Irmen culture. Apparently, in the Baraba forest-steppe, where no copper ore outcrops are available, the ritual complexes included furnaces destined for both smelting ore and processing metal. The bronze metallurgy in the region may have been introduced by immigrants practicing both copper ore smelting and metal processing.

Keywords: *Archaeology, Bronze Age, Baraba forest-steppe, Tartas-1, smelting furnaces, hearths.*

Introduction

At the end of the Bronze Age, in the Baraba forest-steppe, processes took place that seriously changed the cultural and historical situation of this part of the Ob-Irtysh region. The Andronovo community was disintegrating. New Andronovo-type cultures inherited the elements of material culture both from the Andronovo and the indigenous populations. Under the impetus of natural and cultural factors, new population groups migrated to this territory: from the west—the carriers of the Pakhomovskaya and Suzgun cultures; from the north—the carriers of the Atlym culture; and from the south—the carriers of the Begazy-Dandybai,

Alekseyevka-Sargary, and Berlik cultures (Molodin, 2010; 2014; Chicha…, 2009).

The emergence and functioning of a unique ritual complex of the eastern variant of the Pakhomovskaya culture, which is currently being studied at the Tartas-1 site (Vengerovsky District, Novosibirsk Region) (Fig. 1) pertains to the Final Bronze Age. That site was discovered in 2003 by O.V. Sofeikov. Large-scale excavations conducted in 2005–2019 by the employees of the Western Siberian Unit of the Institute of Archaeology and Ethnography of the SB RAS under the supervision of Academician V.I. Molodin have shown that the site was a combination of burial, habitation, and ritual objects from various periods (from the Neolithic to the Late Middle Ages) (Molodin, 2015).

The ritual complex is located in the eastern part of the site, and adjoins the old riverbed of the Tartas River, which in the Late Bronze Age could have been a part of the existing river system. Post holes, and household and ritual pits have been found over an area of 2225 m^2 (Fig. 2). Post holes often form rows, but it is difficult to reconstruct the design of the frame-and-post structures on their basis, although such attempts were made earlier (see: (Molodin, Nagler, Hansen et al., 2012; Molodin, Kobeleva, Nagler et al., 2013; Molodin, Durakov, Kobeleva et al., 2014; Efremova, Mylnikova, Molodin et al., 2017)). The complex of holes in sq. F^{III}–M^{III}/54–64 (Fig. 2) can be interpreted as the remains of a structure. Large pits had different shapes and depths, and contained pottery with ornamental features of the eastern variant of the Pakhomovskaya culture (Fig. 3) and fragments of animal bones. Small pits also yielded the finds of frequently discovered types. In plan view, the structure is close to rectangular shape, and covers the area of 180.2 m^2 (10.6 × 17 m).

Fig. 1. Location of the Tartas-1 site.

Notably, in the immediate vicinity of pits No. 532–535, together with accumulation of cow bones, fragments of human pelvic bones have been found. In the filling of small oval pit No. 517, together with fragments of the Eastern Pakhomovskaya pottery, a heel bone of an adult has been discovered (Molodin, Nagler, Hansen et al., 2012).

The ritual complex also includes other pits of various shapes and depths, as well as amorphous structures containing bronze items (see Fig. 2). Two pits yielded spearheads, and one an arrowhead of peculiar shape (Ibid.; Molodin, Kobeleva, Nagler et al., 2013; Molodin, Durakov, Kobeleva et al., 2014; Efremova, Mylnikova, Molodin et al., 2017; Selin, 2018). The complex also includes smelting furnaces (see Fig. 2).

The entire territory occupied by the ritual complex is distinguished by high saturation of the layer with pottery fragments, technical ceramics (crucibles, ladles, casting molds, plaster), calcined animal bones, calcareous nodules, fine ocher, and bronze items.

The complex has been identified as ritual because on its territory there are no objects typical of settlements, such as hearths or utility pits, but there is a specially designated area for production or ritual activities associated with metal smelting. In addition, the finds include bronze items without traces of use, yet in some cases intentionally damaged, as well as fragments of human bones, which might have been associated with ritual practices or ceremonies of sacrifice. Furthermore, the complex is located in the immediate vicinity of the place of simultaneous burials of people with traces of post-mortem manipulations, and burial grounds of the contemporaneous and earlier cultures.

Results

Two types of smelting furnaces were identified in the ritual complex at Tartas-1: 1) deep ones, dug into virgin soil, and most likely associated with ore smelting; 2) shallow ones with domes, associated with metal processing. In addition, objects “imitating” smelting furnaces were discovered.

In the southwestern part of the ritual complex, five smelting furnaces were found, located close to each other (see Fig. 2).

Pit No. 1184 (Fig. 4, *1*, *2*, *7–9*; 5–8) was recorded at the level of virgin soil in the form of a rounded dark gray spot, with a section of burnt soil around the edge. The filling of the pit shows several layers (see Fig. 4, *2*).

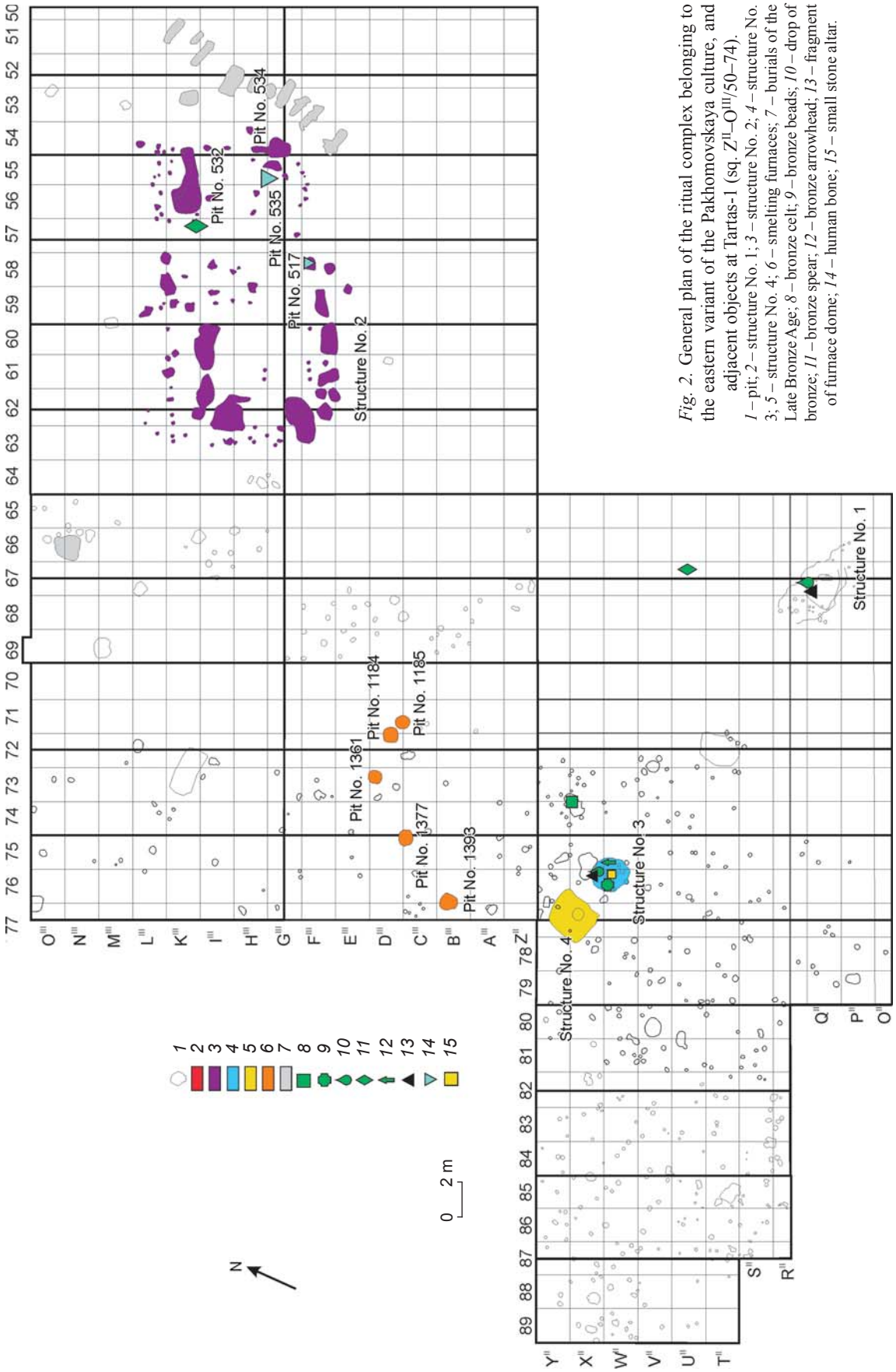

Fig. 2. General plan of the ritual complex belonging to the eastern variant of the Pakhomovskaya culture, and adjacent objects at Tartas-1 (sq. Z^{II}–O^{III}/50–74). *1* – pit; *2* – structure No. 1; *3* – structure No. 2; *4* – structure No. 3; *5* – structure No. 4; *6* – smelting furnaces; *7* – burials of the Late Bronze Age; *8* – bronze celt; *9* – bronze beads; *10* – drop of bronze; *11* – bronze spear; *12* – bronze arrowhead; *13* – fragment of furnace dome; *14* – human bone; *15* – small stone altar.

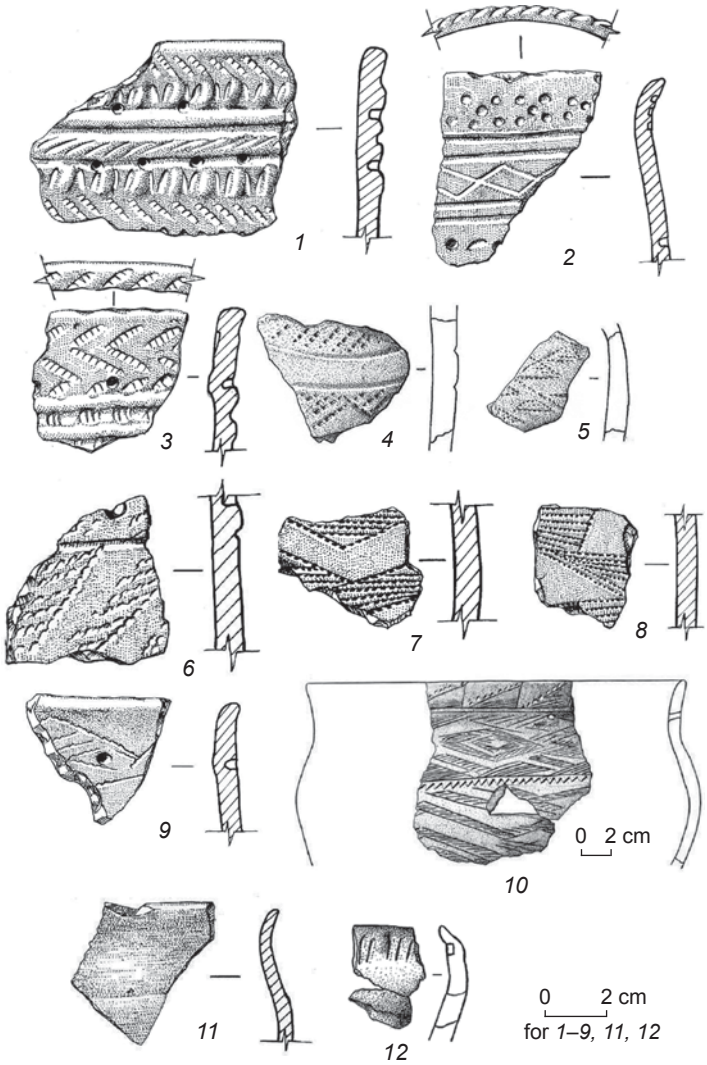

Fig. 3. Pottery from the ritual complex of the eastern variant of the Pakhomovskaya culture.
1–5, *11* – from the cultural layer; *6–9* – from pit No. 1442; *10* – from structure No. 2; *12* – from structure No. 4 (Molodin, Nagler, Hansen et al., 2012).

In the upper part, there is black soil (up to 0.1 m thick). Underneath, there is a dark gray-brown layer of soil (up to 0.15 m thick). Below, black soil is deposited, with inclusions of ash and charcoal (up to 0.13 m thick). On the walls of this pit, lenses of burnt loam were found. The layer of the discharged black soil is up to 0.02 m thick and overlaps a part of burnt soil around the perimeter of the pit.

The pit has a rounded shape, with an uneven upper edge, and measures 0.79 × 0.73 m along the upper contour, and 0.83 × 0.77 m along the lower contour; the depth from the level of virgin soil reaches 0.33 m (see Fig. 4, *1*). The walls are S-shaped; the bottom is even. The finds include calcareous nodules (24 spec.; see Fig. 6, *2*), fragments of calcined bones, and a pottery fragment from the eastern variant of the Pakhomovskaya culture.

Pit No. 1185 (Fig. 4, *3*, *4*; 8) was recorded at the level of virgin soil in the form of a rounded dark gray spot, with burnt soil around the edge. The filling of the pit consists of black soil with inclusions of ash and charcoal (up to 0.4 m thick) (see Fig. 4, *4*). The pit is of rounded shape, 0.65 × 0.6 m along the upper contour; the depth from the level of virgin soil is 0.4 m (see Fig. 4, *3*). The walls are sloping, with burnt areas most frequently occurring in the upper part; the bottom is even. The finds include calcareous nodules (22 spec.) and fragments of calcined bones.

Pit No. 1361 (see Fig. 4, *5*, *6*). The main part of the filling consists of dark gray sooty soil (up to 0.52 m thick). In its western part, at a depth of 0.14 m from the level of virgin soil, a lens of mixed brown-gray soil (up to 0.18 m thick) was found. The pit has a rounded shape, with a diameter of 0.88 m. The walls are slightly sloping, calcined; the bottom is even. The depth from the level of virgin soil is 0.47–0.52 m. The finds include small individual fragments of animal bones and small pottery fragments belonging to the eastern variant of the Pakhomovskaya culture. At a depth of 0.02 m from the level of virgin soil, in the eastern half of the pit, an accumulation of fish bones (0.3 × × 0.3 × 0.02–0.1 m) was discovered (see Fig. 4, *5*).

Pit No. 1377 (see Fig. 4, *10*, *11*). The filling in the upper part is dark gray soil interspersed with brick-red or orange partially decomposed backed clay. In the lower part, a layer of coal-black sandy loam with rare inclusions of mixed gray-yellow native loam is recorded. Small pieces of charcoal and charred fragments of wooden planks occur. A lens of burnt orange loam up to 0.11 m thick was discovered closer to the walls in the middle part of the filling. The pit is oval in shape, 0.86 × 1.02 m. The walls are straight; the bottom is even. The diameter along the lower contour reaches 0.74 m; the depth from the level of virgin soil is up to 0.68 m. The finds include calcareous nodules, 10 small pottery fragments, and 25 fragments of animal bones.

Pit No. 1393 (see Fig. 4, *12*, *13*). The filling of that pit in the upper part is uniform dark gray soil. A layer of gray-brown burnt soil (0.22–0.3 m thick) lies underneath. In the bottom part, there was black sooty soil containing calcareous nodules. A layer of burnt loam of orange color (0.08–0.02 m thick) occurs along the walls of the pit. In the western part, traces of clay coating are found. The pit is rounded in shape, 1.03 × 1.0 m along the upper contour, 1.15 × 1.13 m in the central part, and 1.05 × 0.95 m at the bottom level (see Fig. 4, 12). The walls are uneven: vertical from the level of virgin soil and have a negative slope at a depth of 0.13–0.18 m; after that they are slightly sloping. The bottom is even;

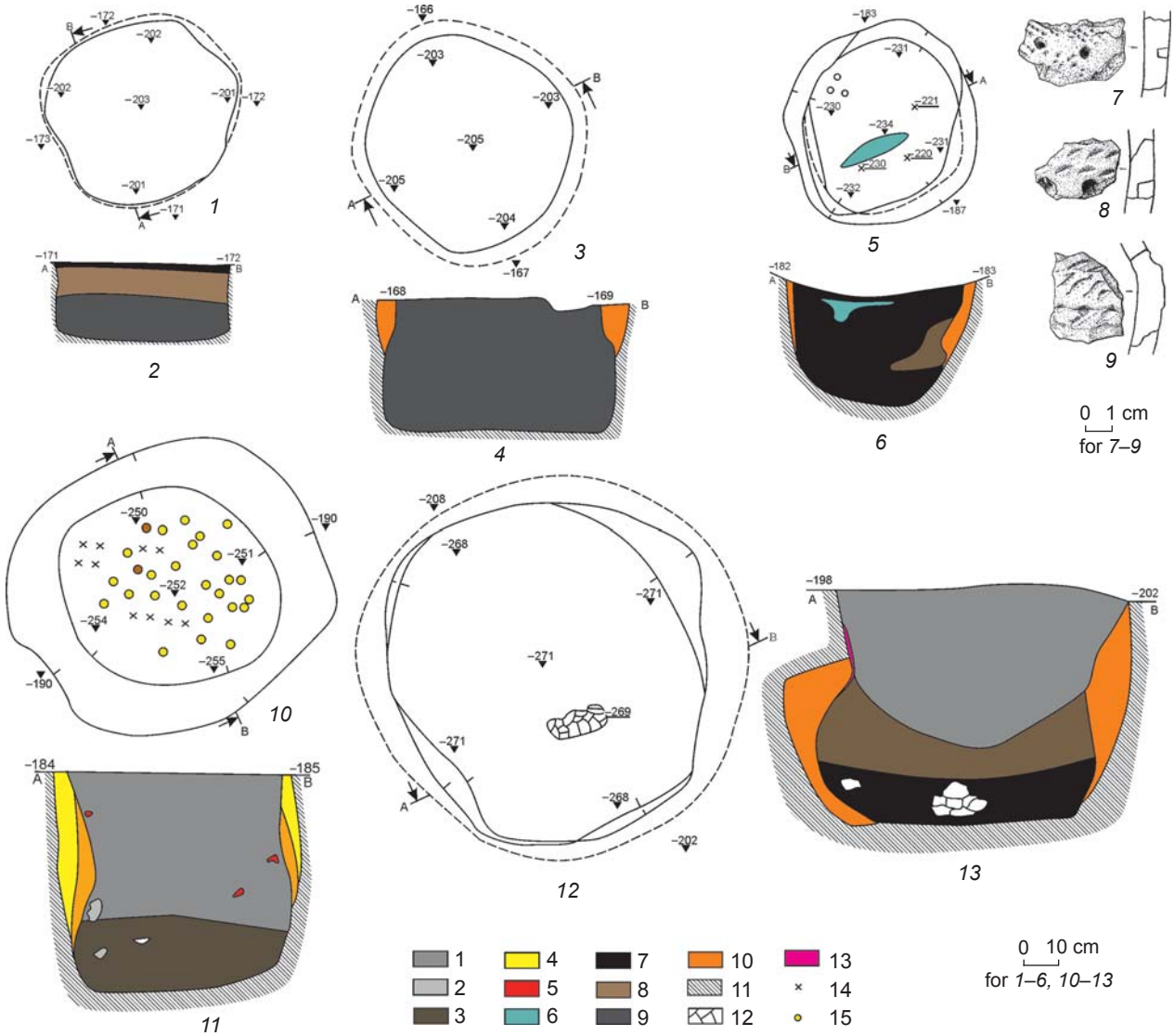

Fig. 4. Plans and profiles of pits No. 1184 (*1*, *2*), 1185 (*3*, *4*), 1361 (*5*, *6*), 1377 (*10*, *11*), 1393 (*12*, *13*), pottery fragments (*7–9*).

1 – dark gray soil with inclusions of fragments of baked clay; 2 – gray-white ashen soil; 3 – black soil with inclusions of native loam; 4 – spot of burnt soil; 5 – inclusions of baked clay; 6 – area with fish-bones; 7 – black sooty soil; 8 – dark gray-brown soil; 9 – black carbonaceous soil; 10 – burnt native loam; 11 – yellow native loam; 12 – calcareous nodules; 13 – clay coating; 14 – pottery fragment; 15 – bone fragment.

the depth is 0.7 m. The finds include 77 fragments of animal bones, 2 animal bones with bronze oxides, and 22 small pottery fragments of the eastern variant of the Pakhomovskaya culture. The second layer contained particles of orange sintered clay. Calcareous nodules were found in the bottom part.

Thus, the discovered structures are similar both planigraphically (see Fig. 2) and in their design—they are rounded (or suboval) pits measuring 0.79 × 0.73 × 0.6 m.

Fig. 5. Pit No. 1184 before extraction of the filling.

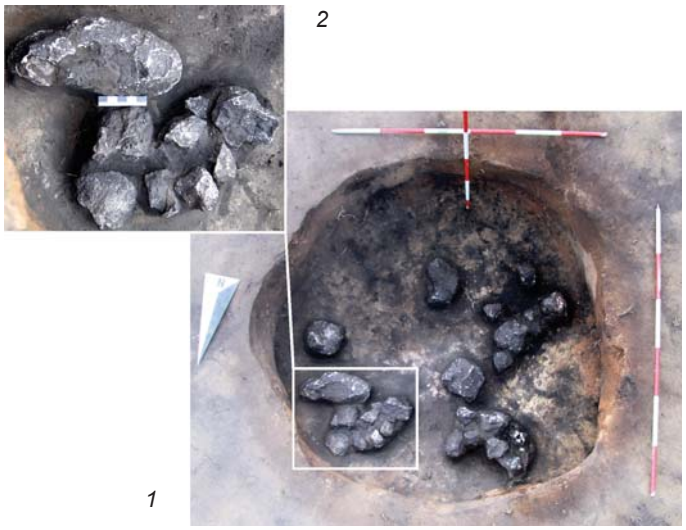

Fig. 6. Pit No. 1184 during extraction of the filling (*1*), calcareous nodules in its filling (*2*).

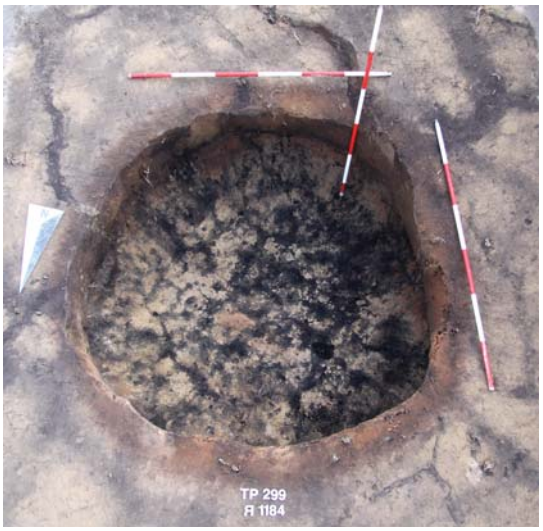

Fig. 7. Pit No. 1184 after extraction the filling.

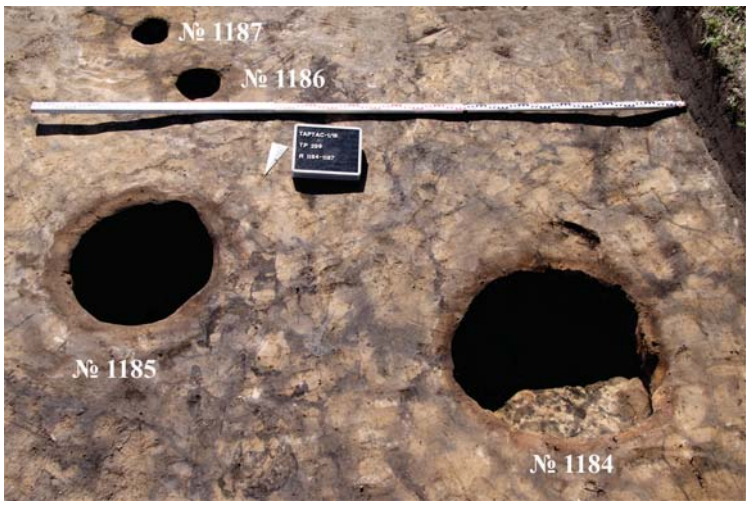

Fig. 8. Pits No. 1184–1187 after extraction the filling.

All pits have specially made S-shaped walls covered with clay (Fig. 9). The filling consists of several layers. On top, there is black soil up to 0.1 m thick. Underneath, there is a layer of black soil with inclusions of ash and charcoal (up to 0.4 m thick). On the walls, areas of burnt soil (up to 0.22–0.35 m thick) are observed. In some pits, ash layers (up to 0.03 m thick) are present between black soil and burnt areas. Finds include a large number (up to 25 spec.) of fragments of burnt calcareous nodules occurring at different levels in each explored object*.

*According to the results of technical and technological analysis of pottery fragments, nodules were crushed and then used as additive to clay during the manufacture of pottery (Selin, 2016, 2018; Efremova, Selin, Molodin et al., 2017).

Small fragments of calcined animal bones and charcoal have also been found. The presence of calcined bones with traces of bronze oxides in the filling of furnace No. 1393 suggests that these smelting furnaces were part of the bronze foundry. Noteworthy is the small number of individual finds (except for the nodules) in these objects. The furnaces could have been cleaned of production waste and prepared for further use. Pottery fragments of the eastern variant of the Pakhomovskaya culture discovered in these objects testify that these smelting furnaces belonged to the said culture (see Fig. 4, 7–9).

According to their design, the furnaces described above resembled ore smelting kilns of the second class and third subclass of the Itkul metal processing center of the Early Iron Age (Beltikova, 1981: 123–124).

Scholars have repeatedly mentioned the relationship between bronze casting activities and ritual practices (for more detail see: (Chernykh, 2007, 2018)). It seems quite natural that a special area intended for producing various artifacts, including bronze items, was located in the immediate vicinity of ritual structures of the eastern variant of the Pakhomovskaya culture; it was a part of this complex. We should mention the absence of fire traces at the Irmen ritual complex discovered at the Sopka-2 burial ground, which suggests that fire played different roles in the ritual practices of representatives of the Irmen culture and the eastern variants of the Pakhomovskaya culture (Molodin, Efremova, 2015: 75).

Analysis of the planigraphy of the ritual complex has shown that the furnaces were located outside the buildings,

on a separate ground in a natural hollow with a vertical drop of about 1 m. Rows of post holes, possibly associated with enclosures or wind-shelter partitions, were found 4 m east of the furnaces. The tradition of building heat-protecting, moisture-protecting, and wind-sheltering structures around manufacturing areas is well known from archaeology and ethnography (Bobrinsky, 1991: 70–83).

Post holes remaining from one or several frame-and-post structures were located to the south of the smelting furnaces. Currently, it is difficult to interpret the structural features of these buildings. However, judging by the planigraphy, these were oriented along a NW-SE line and were located at some distance from the manufacturing area with furnaces.

Fig. 9. Traces of clay coating on the wall in pit No. 1393.

Another type of smelting furnace on the territory of the complex is represented by a part of ***structure No. 1*** (see Fig. 2). It had an oval shape and uneven walls partially embedded into virgin soil, and was accompanied by a system of pits on the north, west, and south. A bronze casting area (marked by a depression), ground hearth, and ash pit were components of the structure.

The oval-shaped smelting structure (ground hearth) could have been a metal casting furnace, measuring 0.60 × 0.22 m. The remains of the dome, in the form of backed pieces of clay, have been preserved in its upper part, and a bronze splash was discovered under them. The thickness of the dome was 8–9 cm. Hearths with clay domes, built on the ground or weakly embedded in the ground, are quite common both in dwellings and on special grounds at the sites of the Irmen culture (Matveev, 1993; Sidorov, Novikova, 1991; Durakov, 2009).

The ritual complex is characterized by structures No. 3 and 4. The objects associated with ***structure No. 3*** are the better preserved (Fig. 10) and include a round cup-shaped depression with a diameter of 1.95 × 2.2 m and a depth of 0.08–0.15 m from the level of virgin soil. The bottom decreases slightly toward the center. Near the northeastern wall of the depression, two large clusters of items were found. The first cluster consisted of large fragments of technical ceramics. The second cluster included large fragments of casting molds and the vault of the smelter. Under the vault, two bronze beads and an animal bone were located. An oval pit 0.7 × 0.58 m in size and 0.2 m deep was in the center of the structure. At the bottom of the pit, there was a large flat stone measuring 0.15 × 0.23 m, and 0.03–0.04 m thick, which apparently served as a small altar. The filling revealed rounded calcareous nodules, fragment of a casting mold, piece of ocher, and animal bones. The layer is saturated with ash and small inclusions of burnt soil.

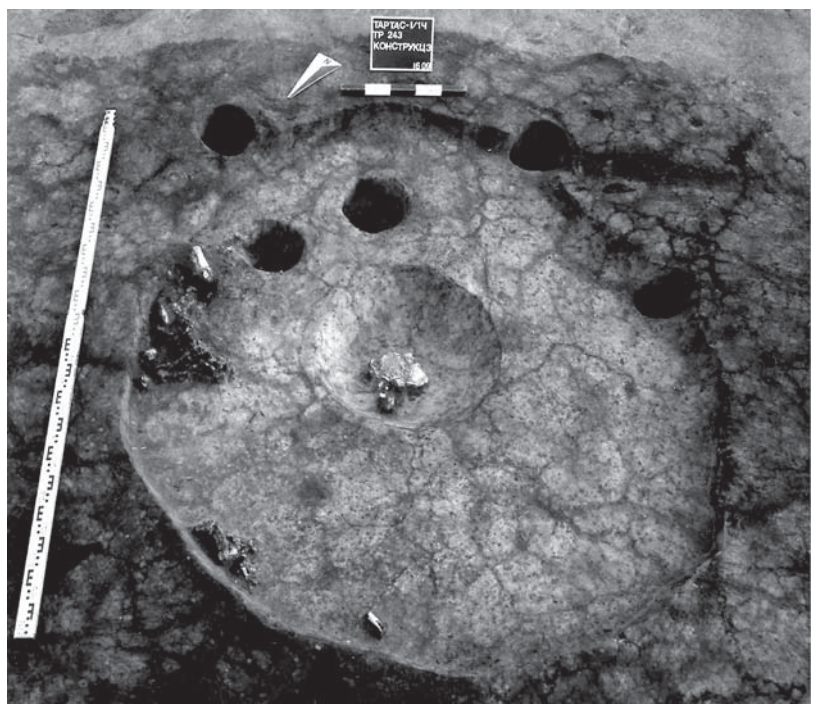

Fig. 10. Structure No. 3. View from the northwest.

However, there are no traces of fire traces on the walls of the structure.

All artifacts found at this site and associated with bronze foundry had been removed from manufacturing areas. According to the results of technical and technological analysis, the mold was made according to the West and North Kazakhstan traditions, without using a bottom board. The autochthonous traditions of using the bottom board have been recorded from the Early Bronze Age to the end of the transitional period from the Bronze Age to the Early Iron Age (the Late Irmen culture). Western tradition of manufacturing casting molds was typical of the artisans of the Krasnoozerka, Itkul, and Berlik cultures (Durakov, 2009: 229). The presence of the furnace vault without the furnace, waste from bronze casting production, bronze beads, and a stone altar may point to the sacral nature of the object.

Discussion

As mentioned above, the closest parallels to the smelting furnaces of the first type occur at the sites of the Early Iron Age in the Itkul metal processing center. G.V. Beltikova attributed them to ore smelting kilns of the second class, third subclass (1981: 123–124). These were intended for crucible ore smelting.

Similar structures have been found at the sites of the Pakhomovskaya culture in the Tobol-Irtysh interfluve. For example, in the northern part of the Oskino Boloto settlement, on the bank of a water body, a system of structures was discovered, which included hearths, household pits, post holes, and an ash pit containing numerous pottery fragments, burnt animal bones, and fragments of technical ceramics (Tkachev Al.Al., 2014, 2017; Tkachev Al.Al., Tkachev A.A., 2017). Unfortunately, descriptions of the ground-plans and profiles of the discovered hearths and associated finds have not yet been published. However, it can be stated with confidence that creation of special manufacturing areas for bronze casting was typical not only of the carriers of the Pakhomovskaya culture, but also of the representatives of its eastern variant.

Hearths inside dwellings of the Pakhomovskaya culture have the form of shallow pits of oval, rounded, or sub-rectangular shape; some show traces of clay coating. The walls of the pits are sloping; the bottom is even or cup-shaped, which is absolutely atypical for the structures described above (Korochkova, 2009, 2010; Nesterova, Tkachev, 2011: 65; Matveev, Chikunova, 1999: 44). In the settlements of the eastern variant of the Pakhomovskaya culture, hearths inside dwellings are rounded or oval burnt spots deepened in shallow pits or built on virgin ground (Bobrov et al., 2018: 220; Evdokimov, Stefanov, 1980; Tataurova, Polevodov, Trufanov, 1997).

The presence of special production sites is known from the habitation sites of the cultures contemporaneous with the Pakhomovskaya culture, such as Chicha-1 (Barabinskaya), Linevo-1 (Cis-Salair), and Berezovy Ostrov (Novosibirsk region of the Ob) (Durakov, 2009; Mylnikov, Mylnikova, 2015; Mylnikova, Durakov, 2004, 2008). These have areas with the concentration of hearths, furnaces, and kilns intended for bronze casting. At the settlements of the Irmen and Late Irmen culture, hearths in the dwellings are pits, rounded or oval in plan view, sometimes with traces of covering the walls with clay (Molodin, 1985; Molodin, Chemyakina, 1984; Matveev, 1993; Sidorov, Novikova, 1991; Molodin, Efremova, 2015). Smelting furnaces with adobe dome, built on the ground, can be considered to be parallels to the smelting structures of the second type. For instance, a furnace with similar design was found in structure No. 3 at Bystrovka-4 (Novosibirsk region of the Ob) (Matveev, 1993: 65). Hearths in dwellings No. 3 and 9 at Milovanovo-3 (Novosibirsk region of the Ob) also had adobe domes (Sidorov, Novikova, 1991). A kiln found at the bronze casting ground from excavation pits “C” and “D” at Chicha-1 (Durakov, 2009: 216) had the dome made of fired clay. In the Ob region, hearths of that type were used until the beginning of the Early Iron Age in the Ordynskoye-9 and Milovanovo-3a settlements of the Bolsherechensk culture, and the Kizhirovo settlement of Kamenny Mys (Novosibirsk region of the Ob) (Troitskaya, Durakov, 1999).

Representatives of the Suzgun culture built hearths in pits or directly on the floors of their dwellings. In some cases, walls of the hearths were covered with clay “cakes” (Matveev, Gorelov, 1991, 1993; Polevodov, 2003; Potemkina, Korochkova, Stefanov, 1995). In the settlements of the Elovka culture, hearths were located on the ground. They were laid around with stones, which probably served as walls, in oval pits or on bedrock exposures (Matyushchenko, Igolnikova, 1966; Matyushchenko, 1974: 107; Titova, Troitskaya, 2008: 92). In the settlements of the Begazy-Dandybai culture, fireplaces located on the floor of dwellings, as well as four- or five-angled hearths with stone alignments, and hearths in pits, are known (Beisenov, Varfolomeev, Kasenalin, 2014: 81; Margulan, 1979). In the dwellings of the Krasnoozerka culture, there were fireplaces on the ground, and in rare cases hearths made of clay with walls reinforced by vertically mounted poles (Borzunov, Matyushchenko, 1994; Nesterova, 2015). Furnaces built above well shafts occur at the sites of the Sintashta-Petrovka period (Koryakova, Panteleeva, 2019: 23).

Large ash pits saturated with pottery fragments, charred animal bones, clay coating, technical ceramics, or special areas for storing production waste were located next to all production grounds discovered in settlements

of the Late Bronze Age to the transitional period to the Early Iron Age. Such objects have not been found near the first-type smelting furnaces in the territory of the ritual complex of the eastern variant of the Pakhomovskaya culture at Tartas-1, which may indicate a special method of production waste disposal or a different purpose for the objects. Near the furnace of the second type, there is an ash pit.

Conclusions

Analysis of the archaeological evidence suggests that construction of special manufacturing areas with smelting furnaces, associated with ritual complexes, was rather an exception for the cultures of the Late Bronze Age to the transitional period to the Early Iron Age. The ritual complex of the eastern variant of Pakhomovskaya culture at Tartas-1 is still the only known structure of this kind.

Smelting furnaces of two types appear within the boundaries of the ritual complex: deep ones, dug into virgin soil, and most likely associated with ore smelting; and shallow ones with domes, intended for metal processing.

The design of the studied furnaces of the first type does not find direct parallels among the evidence from settlement and ritual complexes of the contemporaneous cultures of the Final Bronze Age in southwestern Siberia. Some connection with the structures of the Itkul culture (Beltikova, 1981: 123–124), intended for ore smelting, can be observed. However, the delivery of copper ore to the Baraba forest-steppe would have required its transportation over considerable distances. No ore or waste from its processing has been found at the site. The design of the hearth of the second type corresponds to the local Late Irmen metal processing tradition.

The appearance within the ritual complex of structures intended for almost the complete cycle (ore smelting and metal processing) of metal production in the Baraba forest-steppe, where there is no ore, was most likely associated with the arrival of new population groups. It can be assumed that they were migrants from the territory where two types of activity had not been separated yet: a foundry man was also metal maker. The carriers of this tradition, who migrated to the Baraba forest-steppe, brought the entire production cycle with them.

The production complex might have been created on the sacral territory of the complex for ritual purposes. It is also possible that these are the "traces" of the initial stage of adaptation of an imported technology to the new conditions of real production. Further excavations of the site will hopefully make it possible to clear this issue.

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Late Bronze Age Petroglyphs of Unyuk Mountain, in the Minusinsk Basin

This study introduces a new southern Siberian rock art site, situated on the Unyuk Mountain, in the Minusinsk Basin, and studied in 2016–2017. Stylistically, the main petroglyphs date to the Late Bronze Age, i.e. late 2nd to early 1st millennia BC. Of special interest are images of oxen with ropes fixed in their noses. Such petroglyphs are rare in that region. In one case, the ox is tied to a pillar; in the other case, a man leads it. The composition consisting of a man and an ox walking in one direction is repeated thrice. All the known petroglyphic images of a man holding a rope attached to an ox's nose were found on the right bank of the Yenisei. This may be due to the cultural and economic specificity of the southeastern, forest-steppe part of the Minusinsk Basin. At the same time, these images may be a local variant of the composition "man walking with an ox", which occurs mainly in more southerly areas of the Altai-Sayan. Another rare petroglyph found on the Unyuk Mountain shows a pillar with a triple top. Its parallels, found at other petroglyphic sites in the Minusinsk Basin, are described. They may refer either to everyday practice or to beliefs about the dead person's travel to the nether world.

Keywords: *Southern Siberia, Minusinsk Basin, Late Bronze Age, petroglyphs, ox, bull, ritual pillar.*

Introduction

The Minusinsk Basin is the area containing many rock art sites. The majority of rock art sites are located on the sandstone outcrops along the banks of the Yenisei and its tributaries. The first information about these localities became available as early as in the 17th century, and special studies were carried out throughout the 19th–20th centuries. However, despite the long history of study, there are still opportunities to discover new rock art sites providing additional information on the culture of the local population. The petroglyphs on the Unyuk Mountain on the right bank of the Yenisei, upstream of the mouth of the Syda River, are among the recently discovered sites (Fig. 1). Currently, this is the Krasnoturansky District of the Krasnoyarsk Territory. The present authors carried out a survey and studies of the petroglyphs in the summer 2016 and spring 2017. This paper introduces the petroglyphs and describes their stylistic features, age, and compositions.

Description of the site

The Unyuk Mountain is the highest peak on the right bank of the Yenisei, south of the Syda's mouth. The area is rich in archaeological sites of various types and ages. These include a multilayered settlement on the bank of

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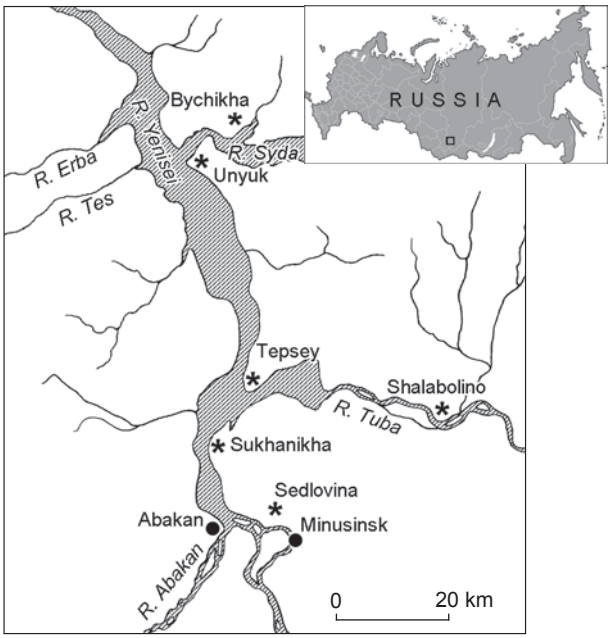
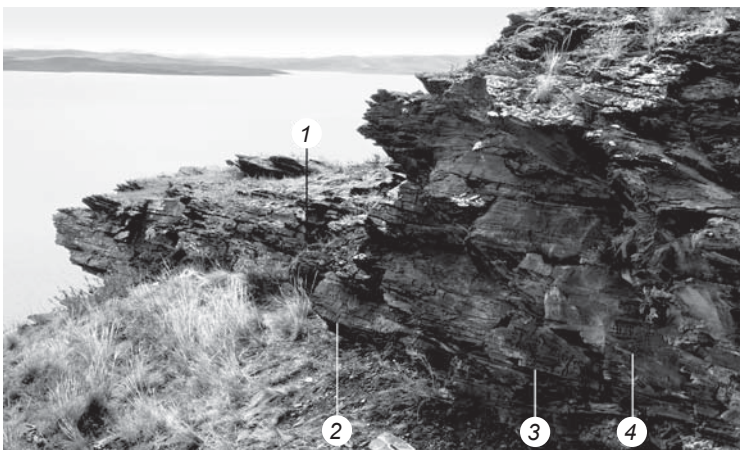


Fig. 1. Unyuk and other rock art sites on the right bank of the Yenisei River.

the Yenisei, with impressive materials from the Neolithic period and the Tashtyk culture; the Tagar and medieval kurgans; and a fortress with ramparts and moats on the mountain (Zyablin, 1973; Skobelev, Ryumshin, 2015). The area was densely populated in the past.

The mountain contains several ravines; the eastern slope is partially covered with pine forest. The western and southern slopes are formed by the rock outcrops, steeply coming down to the Yenisei (currently, the Krasnoyarsk water reservoir). The top of the scarp is about 100–120 m above the water level. These rocks are only partially visible from adjacent areas of the mountain top; they look hard-to-reach, heavily damaged, and unsuitable for making petroglyphs. But the site containing petroglyphs is located exactly on the upper tier of these cliffs (Fig. 2, *a*). It offers a good view of the Yenisei River

a



b

Fig. 2. The rock art site on the Unyuk Mountain.
a – view on the mountain from the western bank of the Krasnoyarks water reservoir (the arrow points to location of the petroglyphs). Photo by S.G. Skobelev; *b* – general view on the rock tier containing petroglyphs, from the southeast (numerals designate numbers of panels). Photo by Y.N. Esin.

valley. The most convenient approach to the petroglyphs is from inner ravine on the northwestern slope, where ancient settlements could have been situated, invisible from the Yenisei and Syda, and protected from the predominant western winds.

The petroglyphs are located on a small part of the rock's upper tier, on four panels over the scarp (Fig. 2, *b*). Rock outcrops of this tier are composed of reddish-brown sandstone, partially covered by light whitish accretions. The outcrops are stretched along the SW-NE line, with a slight elevation towards the northeast (to the top). The panels with petroglyphs face southeast. The central part of the site can be considered panel 3, under a large natural rock shelter, containing the largest number of rock images. At the bottom of some of the panels, there are niches.

Panel 1. This is the westernmost point of the site. The pass leading to other panels in the northeastern part of the site runs along the tier of rock exposures. Panel 1 is about 50 cm long and 34 cm high. It dips at an angle of about 20°. Over the panel, there is a small overhang 36 cm long. The overhang is 78 cm above the ground. In front of the panel, at the bottom of the rock tier, there is a ledge about 1 m wide (below the ledge, to the northeast of it, there is a deep scarp). The rock image is situated 25 cm above the ground. The roughly pecked image (19 × 9 cm) shows an ox with its head to the right. Four legs and two ears (or short, schematically rendered horns) are represented. Possibly later, an image of a mounted man was added on the ox's back. One of his arms is stretched forward; another, probably with a whip, is turned backward; his leg hangs down below the ox's belly. Probably simultaneously with the depiction of this mounted man, the ox's hind legs were also extended (Fig. 3, *1*).

Panel 2. This panel (60 × 83 cm, inclination about 30°) is situated 4 m to the northeast of panel 1. Over it, there is a small overhang 30 cm wide. The overhang is 1.15 m above the ground and 0.5 m above the bottom edge of the panel. Below the panel, there is a niche about 0.5 m deep; a ledge about 0.8 m wide is in front of the niche. The panel contains two pecked images.

The main image on the panel is located in the upper part. This is a large figure of an ox (37.5 × 17.0 cm), with its head to the right. Four legs, a long tail, two ears, and a protruding preputial cavity are shown. A rope runs from the ox's nose forwards and up, where it is tied to a vertical pillar (14 cm high) with a triple top (Fig. 3, *2*).

The lower right portion contains another ox image (22 × 10 cm), oriented in the same way as the previous one (Fig. 3, *3*). This image is smaller and more schematic, but shows the same main features, with a shorter tail.

Panel 3. This panel (1.3 × 83 cm, inclination about 30°) is situated 3.6 m to the northeast of panel 2. Over it, there is a large overhang, projecting to 1.2 m. The overhang is 2.5 m above the ground and 0.95 m above the bottom edge of the panel. Below the panel, there is a niche about 0.6 m deep; a ledge about 1.5 m wide is in front of the niche. The panel contains several pecked images (Fig. 4).

In the upper left part of the panel, a deer (21.5 × × 12.0 cm) is shown, with its head to the right. The deer's body is narrow, long, and rectangular, the four legs are placed apart as if running fast, the neck is stretched forward and up, the head has two branching antlers (Fig. 4, *B*, *1*). Below this image, there is a roughly pecked and poorly preserved figure of an ungulate (13.5 × 9.5 cm), with its head to the right; the animal is shown with its legs bent under its body (Fig. 4, *B*, *2*).

To the right of the deer, there is an image of a man (13.5 × 4.8 cm) leading an ox on a rope (25.6 × 12.5 cm), both moving leftwards (Fig. 4, *B*, *3*). The man's body is shown in frontal view, with his arms down at the sides of his body; his legs are shown in side view, with the forefeet to the left. The head is topped with a mushroom-shaped headgear. With his hand, the man holds the rope attached to the nose of the ox, shown with four legs, a long tail, and two ears or horns.

To the right of the image of ungulate with bent legs, an anthropomorphic figure (12.6 × 6.8 cm) is shown, with a rounded head, a body in the form of a vertical straight line, arms bent at the elbows and oriented to the body, and legs bent at the knees in a sitting pose, with marked feet (Fig. 4, *B*, *4*). Below this image, a figure of an ox is pecked (32 × 12 cm), with its head to the right. The ox has four legs, two ears, a bushy tail (rendered through several divergent lines at the end), and a male

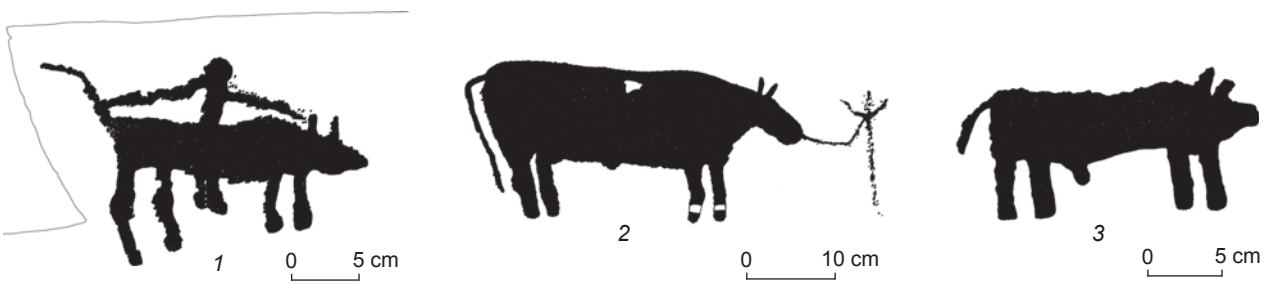
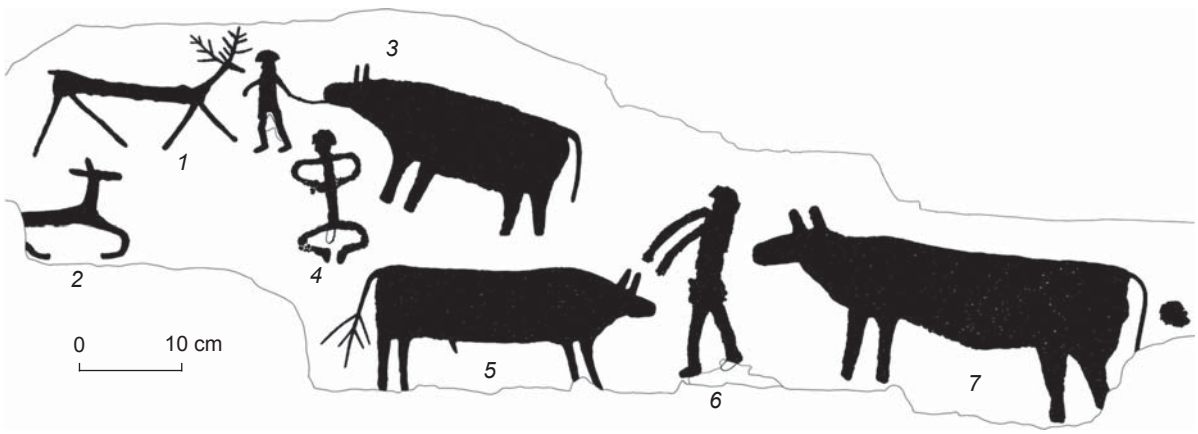


Fig. 3. Images on panels 1 (*1*) and 2 (*2*, *3*), Unyuk. Tracing by Y.N. Esin.

A



B

Fig. 4. Images on panel 3, Unyuk. Photos and tracing by Y.N. Esin.

sex organ (Fig. 4, *B*, *5*). To the right of this figure, a man (18 × 10 cm) and an ox (36.2 × 16.0 cm) are represented, both moving to the left. The man's body is shown in side view, with his arms turned down to the left from the body; his legs are slightly put apart, with the forefeet to the left (Fig. 4, *B*, *6*). The ox image shows four legs, long tail, and two ears.

Panel 4. This panel (0.5 × 0.5 cm, inclination about 20°) is situated 0.5 m to the east of panel 3. Over it, there is an overhang, projecting to 1.2 m. The lower edge of the panel is located 1.15 m above the ground, the lower image about 1.4 m above the ground. Below the panel, there is a niche about 1.1 m deep; a ledge about 1.3 m wide is in front of the niche. The panel contains three pecked images (Fig. 5).

An ox figure (20 × 10 cm) is shown, with its head to the right. The ox has four legs with cloven hoofs, a long tail, and a preputial cavity; the upper part of the head did not survive (Fig. 5, *B*, *1*).

To the right of the ox, a human figure (11.5 × 6.8 cm) is depicted. The body is shown in front view, with the arms turned down; the thickened ends represent hands. The legs are shown in side view, with the forefeet to the right. The head is also rendered in side view, with the face turned to the right and upwards; the nose and lips are shown, the neck is marked specifically. At the bottom of the body, there are small protrusions, possibly representing the lower edge of the jacket; vague lines within the body may show the jacket-breast and neck cut (Fig. 5, *B*, *2*).

Over the ox image, there is an ungulate figure, with its head to the left (10.0 × 5.5 cm). The animal's body and neck are rendered with a continuous curved line. Shown are two legs, stretched forward and down, an ear, and a small tail like that of a roe deer (Fig. 5, *B*, *3*).

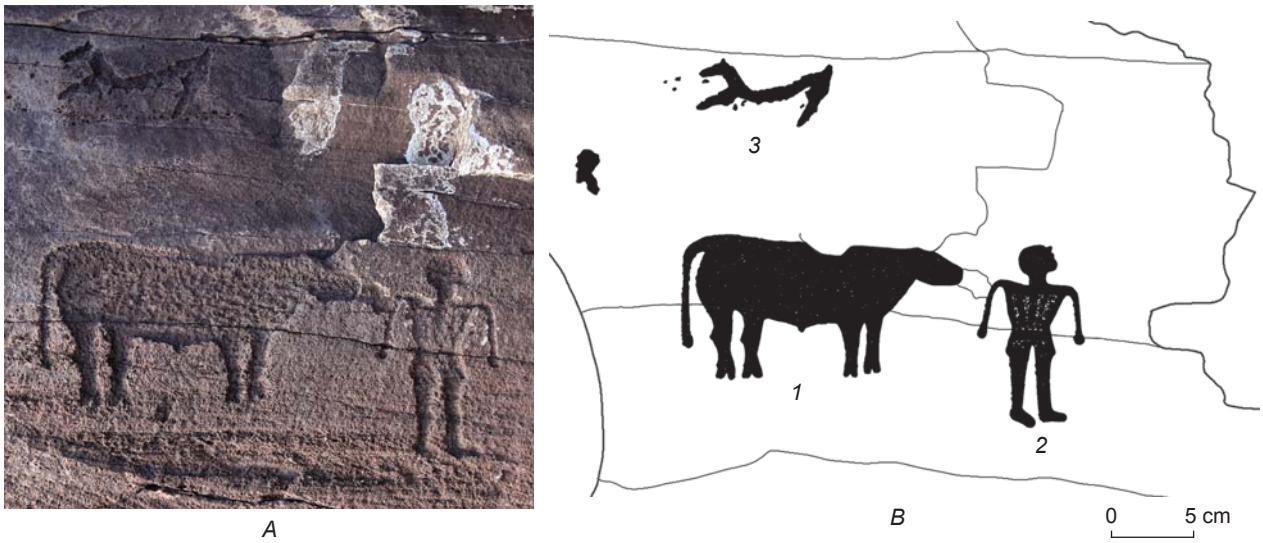


Fig. 5. Images on panel 4, Unyuk. Photos and tracing by Y.N. Esin.

Main images, their style and age

Bull (ox). In total, seven images portraying the relevant sub-family of bovids were recorded. In terms of quantity, this image is the main one at the site. Despite minor differences of detail, all the images are of similar style and belong to a single artistic tradition. The main features are a thick, sub-rectangular body, and a small head stretched forward or slightly down. The legs are shown with four vertical parallel lines. Judging by their peripheral location at the site and on panel 2, the most schematic images (see Fig. 3, *1*, *3*) were apparently made later than more realistic and larger ones. Stylistic features of oxen images at Unyuk Mountain differ from those typical of the Okunev culture of the mid-3rd to early 2nd millennia BC, as well as from the earlier Minusinsk tradition, and from the known images of the Early Iron Age and medieval period. The closest parallels are known from the near-by site of Bychikha (on the right bank of the Syda River) and on the Tepsey Mountain (Kovaleva, 2011: Pl. 1, 2, 18). Consequently, the Unyuk images can be attributed to the Late Bronze Age. Notably, oxen images occur rather rarely among petroglyphs of that time, and figures with such bodies even more rarely. In the Late Bronze Age, in the Minusinsk rock art, there were several traditions for representation of animals, including oxen, which reflected the existing ethno-cultural situation (Esin, 2013: 74).

All depicted oxen apparently were hornless, which is a feature of a domesticated animal. This is also confirmed by the rope running from the nose in two figures. This is evidently a rope for controlling the animal: one of its ends is attached to the animal's nose, another is shown either in the hand of the human or tied to a pillar. In the traditions of many pastoralist societies, the draft cattle that were controlled in such a way were usually gelded in order to reduce aggressiveness. Hence, all the depicted animals are bulls. This assumption does not contradict the fact that some of the figures show male sex organs. These animals might have been used for carrying carts, travois, load packs, and the like.

Representation of a rope fixed in the bull's nose is typical of Okunev art; however, a wooden loop inserted into the animal's nose is always shown, while the end of the rope runs between the animal's horns or is tied around them (Miklashevich, 2003–2004; Esin, 2018a). Another type of composition, where the end of the rope is shown in the human's hand, is represented in four petroglyphs on the Tepsey Mountain. Formerly, it was believed that one of them (Fig. 6, *1*), showing an ox image of the Bronze Age, was later (in the Late Tagar period) supplemented with two human figures (Sovetova, 2005: 33, pl. 28, *11*). However, only one human figure (behind the ox) can be dated to the Iron Age. The image of a man holding the rope is contemporaneous with the ox image. Stylistically, they are quite similar to petroglyphs on panel 3 of the Unyuk Mountain. Other types of oxen images with ropes at Tepsey (Fig. 6, *2*, *3*) can be dated to the late 2nd to early 1st millennia BC. One of these bull images (possibly early 1st millennium BC) shows a large ring in its nose and presumably a rope tied around its horns (Fig. 6, *4*). The shape of the ring is different from the Okunev wooden loops with crossed ends, and possibly represents a metal item. Another stylistic version of the image of an ox with a rope in its nose, the most schematic one, was pecked at the Sedlovina Mountain in the Late Bronze Age (Fig. 6, *5*).

Two compositions from the central part of the Shalabolino rock art site are considerably younger

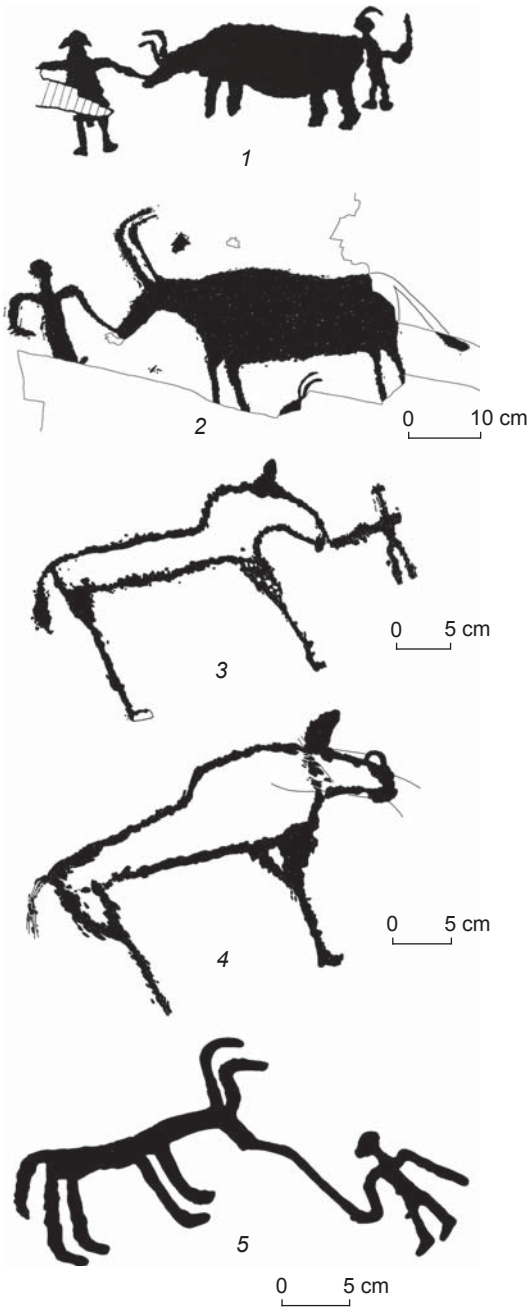


Fig. 6. Some images of oxen with a rope and a ring in the nose, in the rock art of the Minusinsk Basin.
1–4 – Tepsey; *5* – Sedlovina.
1 – after (Sovetova, 2005: Fig. 11) (no scale); *2–5* – tracing by Y.N. Esin.

(Fig. 7). Surprisingly, one of them shows a rope attached to the nose of the elk-figure executed in the Angara style. One end of this rope has a loop held by a woman (?), which image overlaps the elk image of the Early Bronze Age (riding on the elk's back?) (Fig. 7, *2*). The image of the woman holding the rope was possibly added during the medieval period (Zaika, Drozdov, Makulov, 2005); yet the exact age of these two compositions requires additional research.

Pillar. Of special interest is the image of a pillar, to which an ox is tied, at panel 2. The composition of "an ox at a pillar" is known in the Okunev art of the earlier period. However, the Okunev pillar was represented with a simple straight line. A pillar with a triple top is known only from petroglyphs of the Karasuk period (Fig. 8). These compositions usually show horses at the pillar. The horses are most often paired, and possibly represent a chariot team (Esin, 2018b). Such an image has been reported from a plate that served as a wall of the Karasuk tomb at the cemetery of Severny Bereg Varchi I (Leontiev, 1980). This can be considered another reliable argument supporting the age estimate for the Unyuk petroglyphs. The vertical line with two offshoots apparently represents the real wooden pole: the central line is a chopped-off tree trunk, and the side lines are the remains of two lower symmetrical branches. Judging by some of the images (Fig. 8, *1–3*), the pole ends might have been additionally worked and rounded. The pillars were used for attaching draft animals, primarily horses, given the available range of images. The end of the rope was thrown over one of the remained side-branches.

In reality, a pillar for attaching animals could be established close to the dwelling. The pillar also had an important ritual meaning. The shape of the pillar's top was determined not only by its suitability for attaching

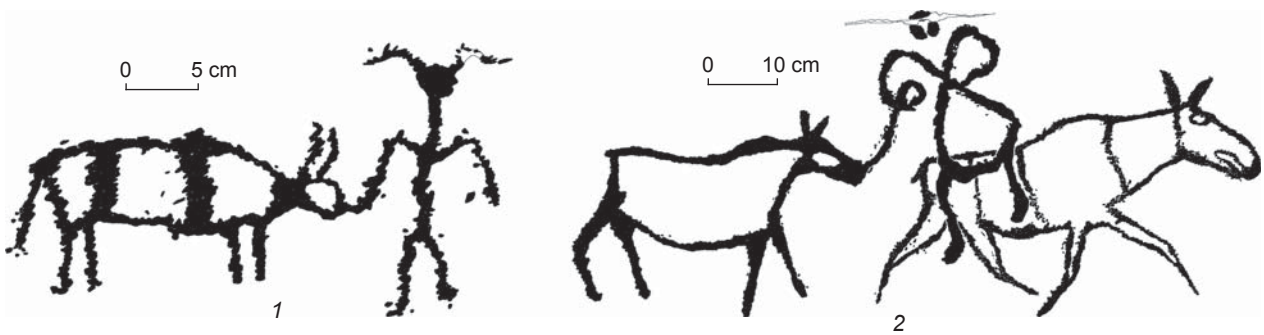


Fig. 7. Images of animals with a rope in the nose, at the Shalabolino rock art site. Tracing by Y.N. Esin.

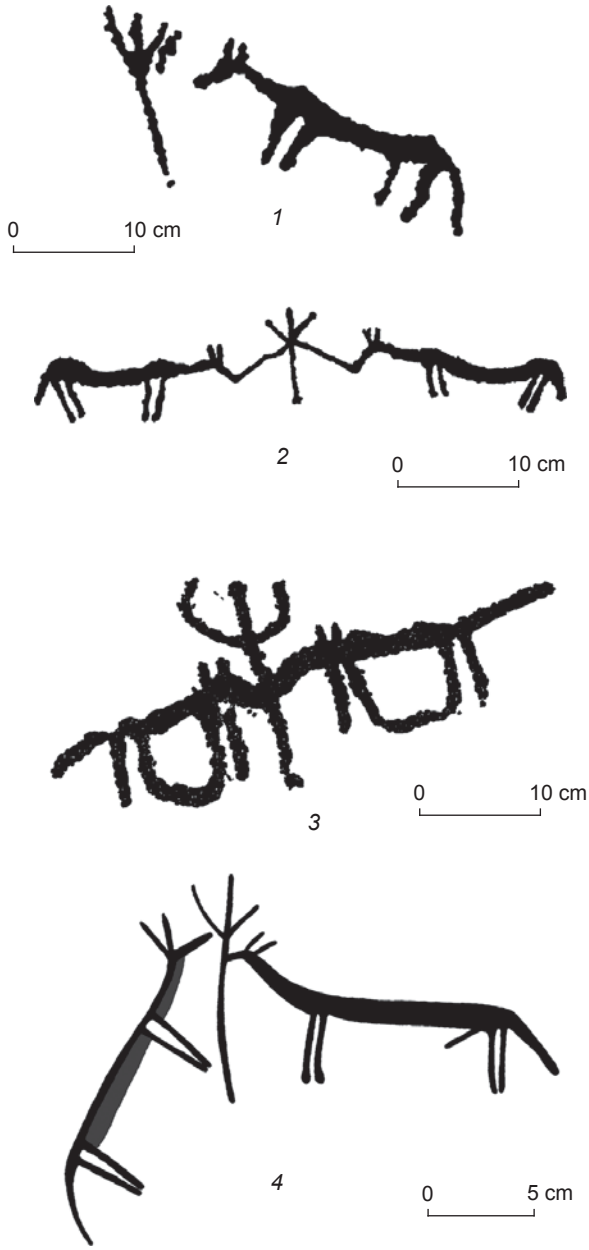


Fig. 8. Images of a pillar with triple top in the rock art of the Minusinsk Basin.
1, *2* – Tepsey (after (Sher, 1980: Fig. 74, 124)); *3* – Sukhanikha; *4* – Severny Bereg Varchi I (*3*, *4* – tracing by Y.N. Esin).

animals, but also by ritual-mythological perceptions connected with the number 3. For instance, in the art of the Kets, who inhabited the Altai-Sayan region in the past, the "shaman tree" was depicted with a triple top. It connected various tiers and parts of the universe (Alekseenko, 1967: Fig. 25). Y.A. Sher (1980: 267) argued for the ritual purpose of the Karasuk hitching post, which was represented at the Tepsey rocks.

Human. Five anthropomorphic images can be classified into three groups. Group 1 includes three rather realistic figures (see Fig. 4, *B*, *3*, *6*; 5, *2*). The characteristic features are the marked feet, thickened arm-ends, and special headgear; they all are typical of the Late Bronze Age images in the Minusinsk Basin. One of these characters leads the ox on the rope; two other are represented without ropes, but also in front of the oxen, moving in the same direction with them and forming a single composition, rendering a similar meaning.

The fourth human figure is schematic and represents a sitting man, with his arms and legs bent (see Fig. 4, *B*, *4*). The style of this image is different from that of the first group, but is also well-correlated with other Late Bronze Age images in the Minusinsk Basin, including the image on the slab of the Karasuk tomb (Sunchugashev, 1971: Fig. 1; Kovaleva, 2011: Pl. 91, 92).

The most debatable is the fifth human figure, with the arms spread apart, sitting on the ox's back (see Fig. 3, *1*). It looks as if it was added later, though the color of desert varnish of pecking is similar to that of the animal image. The leg of this character is lowered down below the ox's belly. It should be noted that in the Late Bronze Age and in Tagar art, the leg of a horseman was not usually shown below the horse's belly. Possibly the human figure was added in the late 1st millennium BC, though this issue remains open.

Deer. There is one image of a stag. The shape of the body (narrow, long, and sub-rectangular, with a small triangular projection at the shoulders), neck, head, and antler is similar to the style of the Late Bronze Age petroglyphs in the Minusinsk Basin (Kovaleva, 2011: Pl. 22, 104). Only the way of representing the legs is atypical—wide apart, in motion. This technique was specific for elk and deer images of the Early Bronze Age. In the Late Bronze Age, it could have survived as an anachronism.

Other ungulates. The figure of an ungulate animal with bent legs on panel 3 can be correlated with the schematic image of a sitting man on the same panel, and dated to the same period (Ibid.: Pl. 38, 65, 74). Another version of this style is represented by a figure of an ungulate with its legs stretched forward and down. It can possibly be dated to the Bronze to Iron Age transition period.

Conclusions

To sum up, it can be concluded that the main petroglyphs from the small rock art site at the Unyuk Mountain were executed in the Late Bronze Age. Their age can be estimated as the late 2nd to early 1st millennia BC. The images are not contemporaneous, and point to repeated human visits to this place. Noteworthy is the specificity of the Unyuk petroglyphs in terms of the set of images, style, and compositions, as compared to many other petroglyphic sites of the same age in this region.

The domesticated ox was the most important image for the creators of the petroglyphs. In one case, it is represented tied to a pillar of especial shape, which was likely used not only in household activities, but also for ritual purposes. This suggests that the scene was associated with animal sacrifice. The composition consisting of a man and an ox is repeated thrice, probably reflecting the very important part of everyday human life. Who these people are, and where they are going with their animals, is not clear, but it is noteworthy that the face of one character is turned up to the sky. This topic can be correlated with a chariot as the image of another means of transport of the Late Bronze Age. According to one hypothesis, in that period, the images of chariots in the Altai-Sayan were associated with burial rites and transition of dead to the nether world (Devlet, 1998: 183–185; Kilunovskaya, 2011: 44; Esin, 2013: 75). It cannot be excluded that the Unyuk images also show the deceased on their way to the nether world, but using another means of transport. Prior to the wide spread of horse riding in the Early Iron Age, oxen were commonly used as means of transport in mountain or forest terrain, unsuitable for wheeled vehicles. In Western Tuva, these means of transport survived till the early 20th century; in some highland regions of Asia (Tibet, the Pamirs, etc.) they are still common, but with the use of yaks and their hybrids. The safe journey of the deceased to the afterworld was very important for the relatives, who conceived of such a journey as a real trip. Some of the rock images were likely executed in the context of such beliefs and recurrent burial and funeral rites.

The role of the ox image is a distinctive feature of the Unyuk petroglyphs as compared to the typical Late Bronze Age rock images in the steppe part of the Minusinsk Basin, located mostly on the left bank of the Yenisei, in which the horse image played the main role. It is not surprising that the main parallels to the Unyuk petroglyphs were noted in the vicinity, on the mountains of Bychikha, Tepsey, and Sedlovina, on the right bank of the Yenisei. The specificity of this site can be explained by the echo of the Early Bronze Age tradition, which continued its development in the southeastern forest-steppe periphery of the Minusinsk Basin in the Andronovo period. Owing to environmental conditions, important economic (including transport) and ritual significance of oxen survived for a longer period here. This small local ethno-cultural substrate, with its original traditions, might have become one of the components of a new culture emerging in the Late Bronze Age.

On the other hand, it should be noted that the image of a man leading an ox on the rope, rare in the Minusinsk Basin, is rather typical of the Bronze Age petroglyphs in the southern regions of the Altai-Sayan. All these images can be regarded as versions of one type of scene—"man walking with an ox". The main dispersal area of this composition includes mountain regions to the south and southwest of the Minusinsk Basin. This area is characterized by similar environmental settings and forms of economy, as well as some cultural similarities. Along with the general similarity in composition (and sometimes in headgear), there are also significant differences in particular elements and style. For instance, petroglyphs to the south of the Minusinsk Basin usually show passengers and load packs on the animals' backs, with the animal often led by a woman (Devlet, 1990; 1993: Fig. 4, *4*, *5*; Kubarev, Tseveendorj, Jacobson, 2005: Fig. 89, 90, *10–12*, 93, *4–8*; Kubarev, 2009: Fig. 921, 980, 981). Such differences reflect the independent cultural development of the populations of either side of the large mountain ranges in the Altai-Sayan.

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Tagar Artifacts at the Stavropol State Museum Reserve (G.N. Prozritelev's Collection)

This article introduces 16 bronze weapons and horse harness items representing the Tagar culture (a dagger, ten knives, bits, a cheekpiece, an axe, a celt, and a mirror) from the Minusinsk Region, collected by G.N. Prozritelev in the early 1900s. The objective of this study is to describe them and to assess their chronology. The dagger and the three knives exemplify the animal style of 500–300 BC. The cross-guard of the dagger is shaped like two oppositely facing bird heads separated by a spiral scroll. The pommels of the knives are decorated with figurines of a standing ram, a standing donkey, a ring, a roll, a drop-shaped slit, etc. The handles of two knives are decorated with a band consisting of oblique hatches, two rows of triangles, and a hoof sign. Based on the data, certain artifacts (the dagger, the knives, the cheekpiece, and the mirror) date to 600–300 BC. The axe, the celt, the bits, and possibly a massive knife with a bird's head at the junction of the handle and blade may date to 700–500 (possibly even 800–500) BC. A considerable scatter of dates suggests that the artifacts come from different sites. They may have been part of a single hoard whose separate items span a chronological range between 700 or even 800 to 400 BC.

Keywords: *Collection, Tagar culture, animal style artifacts, bronze weapons, horse harness.*

Introduction

In 1905–1906, the famous archaeologist and local historian G.N. Prozritelev organized the Stavropol Museum of the Northern Caucasus (Okhonko, 2005: 103). Its collections were assembled from excavation materials, donated items, and whole collections of artifacts purchased from dealers of antiquities. At that time, he was shown a collection of bronze items found in Minusinsky Uyezd of the Yenisei Governorate. The attention of the scholar was attracted by the excellent quality of bronze, craftsmanship of the casters, and animal style embodied in the decoration of the artifacts. So, the collection consisting of a dagger, ten knives, an axe, a celt, a set of bridle bits, a cheekpiece, and a mirror was acquired for the Museum. Since these items of the Tagar culture were found in an area rather remote from the Northern Caucasus, local archaeologists have not turned to these artifacts as objects of research for almost a hundred years. The purpose of this article is to describe this collection. Currently, it is stored in the Prozritelev and Prave Stavropol State Historical, Cultural, and Natural Landscape Museum-Reserve (hereafter referred to as the Stavropol Museum)*.

Description of the collection

The collection includes sixteen items of weaponry, horse harness, and household utensils.

*I thank the staff of the Archaeology Department of the Museum and its Director N.A. Okhonko for their assistance in the process of studying the collection of the Tagar items, and for their making it possible to publish a description of them.

1. A bronze dagger with sub-trapezoidal pommel, zoomorphically decorated cross-guard, and wedge-shaped blade with a rib (distinguished by a smoother transition in the tip area) (Fig. 1, *1*; 2), item No. 9466 / inv. No. 585*. The length of the dagger is 282 mm; the length of the blade is 176 mm; the width is 30 mm; the height in rhombic cross-section is 8 mm.

The handle is flat, oval in cross-section, with a height of 8.9 mm and a width of 19 mm. It is decorated with two grooves, asymmetrically shifted to the left.

The cross-guard of the dagger has the form of two oppositely facing bird (griffin?) heads separated by a spiral scroll (a common ear?). The bands in relief around large rounded eyes, the scroll between them, and upper parts of elongated beaks are arranged in a single line. The ceres of the birds are marked in relief. The beaks gradually expand. Their pointed ends are lower than the middle part of the cross-guard; the lower contour of the cross-guard is emphasized by two curved bands in opposite directions (see Fig. 1, *1*; 3).

It should be mentioned that the cross-guard of the dagger from the Stavropol Museum has a form not typical of Tagar weaponry. The two griffin heads turned in opposite directions with beaks facing the tip are represented in the upper part of the cross-guard. This type does not appear in the typologies of the Tagar daggers proposed by S.V. Kiselev, N.L. Chlenova, A.M. Kulemzin, A.I. Martynov, Y.S. Hudiakov, or A.V. Subbotin (2014: 12–16, fig. 2–7). The dagger of type III of the pre-Scythian period (according to V.I. Kozenkova (1995: 46–47, fig. 5)) from Ciscaucasia, with a rectangular cross-guard and arcuate recess in the part facing the blade, is the closest parallel to the dagger described above.

2. Bronze knife No. 1 has a widened blade and arcuate back (using the terminology of S.V. Kiselev (1949: 208–213)) (see Fig. 1, *2*), item No. 9466 / inv. No. 585. There is a small ledge between the blade and handle. The handle is slightly narrower than the blade, and is decorated with a three-dimensional image of a goat standing on a stand. The length of the item is 210 mm, the length of the blade is 121 mm, the width is 13 mm, and the width of the handle is 11 mm.

The front side is convex; the back side is flat. The handle on the front side is decorated along the bottom edge in a relief band with oblique convex notches. The blade is triangular in cross-section and forged.

The pommel has a three-dimensional figurine of a goat (sculpture in the round) in a stiff calm pose. The height of the figurine is 14 mm, width 18 mm, thickness 4 mm. The muzzle is elongated and beak-like. The double horn with protrusions in relief is twisted into a rounded loop. The upper part of the torso is straight. There are no through holes between the legs.

3. Bronze knife No. 2 has a widened blade and arcuate butt (see Fig. 1, *3*), item No. 9466 / inv. No. 585. The tip of the blade is broken off. There is a small ledge between the blade and handle. The handle is slightly narrower than the blade; it is decorated with a three-dimensional image of an animal standing on a stand with long ears and lowered head (an onager?). The length of the remaining part of the artifact is 168 mm, the length of the blade is 83 mm, the width is 14 mm, and the width of the handle is 11 mm. The handle is convex on the front side and flat on the back side. The convex surface along the bottom edge is decorated with two parallel rows of triangles (the lower row consists of triangles in relief; the upper row consists of engraved triangles). A sign in the form of the upper part of a horse's hoof is depicted at the place where the handle reaches the blade. The blade is triangular in cross-section and forged.

The pommel represents a donkey-onager (?) figurine in the round, with slightly bent legs. Its height is 10 mm, width 17 mm, thickness 4 mm. The muzzle consists of two ovals. The eye and nostrils are marked by recesses. An elongated ear is pressed to the shoulder; the back is slightly curved. There are two through holes of sub-triangular shape between the legs and head.

4. Bronze knife No. 3 has a blade slightly larger than the handle and a slightly curved arcuate butt (Fig. 4, *4*), item No. 9466 / inv. No. 585. There is a small ledge between the blade and handle. The handle extends towards a triangular pommel. The length of the knife is 208 mm, the length of the blade is 108 mm, the width of the blade is 13.5 mm, and the width of the pommel is 21 mm. The butt part expands in the middle. A hole of sub-rectangular shape is located in the expanded part of the pommel.

5. Bronze knife No. 4 has a blade wider than the handle and a bent arcuate butt (Fig. 4, *5*), item No. 9466 / inv. No. 585. The tip of the blade is broken off. There is a small ledge between the blade and handle. The length of the preserved part of the artifact is 199 mm, the length of the blade is 108 mm, the width of the blade is 17.5 mm, and the width of the handle is 17 mm. A band in relief is located on the narrow face of the handle. The edge of the blade was forged.

6. The massive bronze knife No. 5 has a blade wider than the handle, and arcuate butt (Fig. 5, *1*), item No. 9466 / inv. No. 585. The tip of the blade and the pommel are broken off. A small ledge decorated with a transverse image of the head of a bird of prey is between the blade and handle. The handle along the bottom edge is

*Hereafter, the number before the inventory number indicates the initial designation of the items in the Stavropol Regional Museum of Local History, where the collection was transferred after uniting the Governorate Museum of the Northern Caucasus and the Prave City Museum of Visual Aids. All items of the collection had the same number apparently owing to their placement in one display since the 1920s.

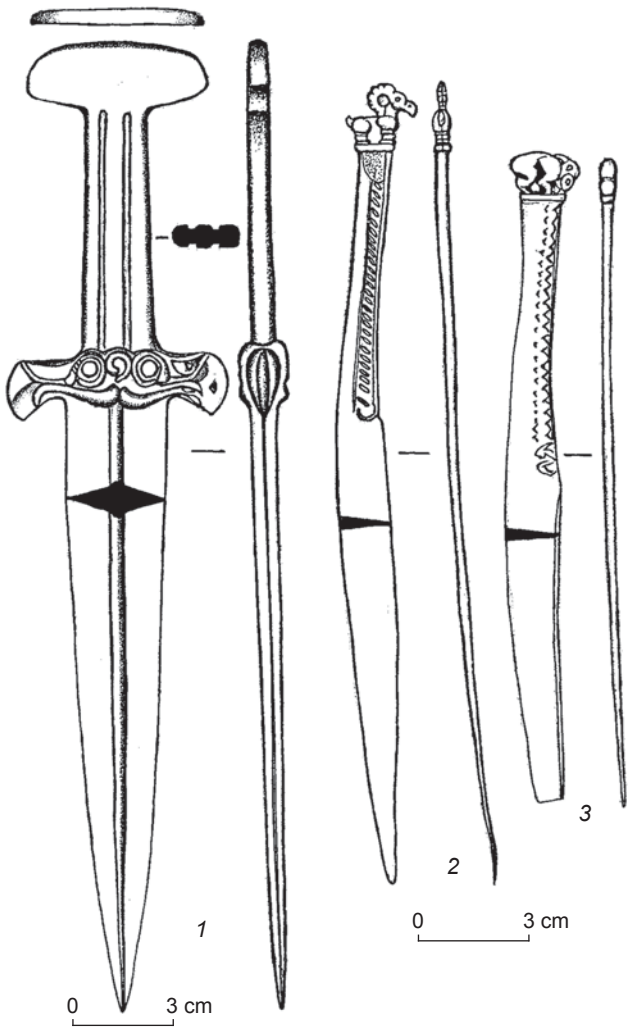

Fig. 1. Bronze dagger (*1*) and knives (*2*, *3*) of the Tagar culture.

Fig. 2. Bronze dagger of the Tagar culture.

decorated with a narrow groove. A rounded notch (cavity?) appears on its surface in the first third closer to the butt. The length of the preserved part of the artifact is 190 mm, the width of the blade is 21 mm, and the width of the handle is 14 mm. The head of the bird of prey on the ledge between the blade and handle was made using the engraving technique. The length of the image is 12 mm, height 10 mm, and length of the eye 4 mm. The eye, encircled by a rim in relief, and curved beak are decorated with rounded recesses. The edge of the blade was pressed and forged.

Fig. 3. Fragment of the dagger's cross-guard.

7. Bronze knife No. 6 has a slightly arcuate butt and straight blade (see Fig. 4, *1*), item No. 9466 / inv. No. 585. The handle is not distinct. The pommel is ring-shaped. The length of the surviving part of the artifact is 219 mm, the width of the blade is 13 mm, and the largest width near the pommel is 12 mm. The pommel ring is asymmetric and oval.

8. Bronze knife No. 7 (see Fig. 4, *2*) has an almost straight butt, straight handle, and narrowed blade, item No. 9466 / inv. No. 585. The edge of the handle is decorated

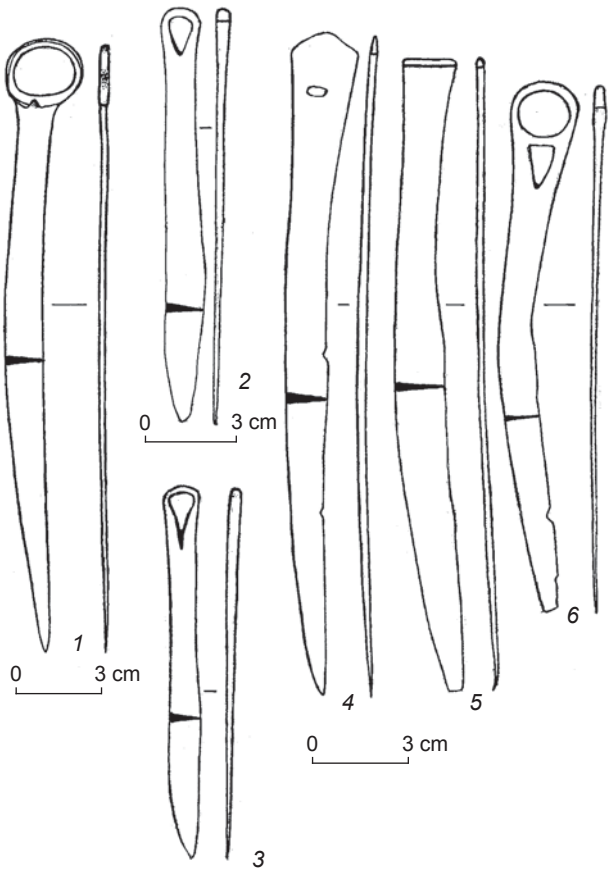

Fig. 4. Bronze knives of the Tagar culture.

with a drop-shaped slit. The length of the preserved part of the artifact is 129 mm, the width of the blade is 13 mm, and the largest width (near the pommel) is 13 mm.

9. Bronze knife No. 8 has an almost straight butt, straight handle, and slightly widened blade (see Fig. 4, *3*), item No. 9466 / inv. No. 585. The handle expands smoothly towards the upper edge, and has a triangular hole. There is a small ledge between the blade and handle. The length of the preserved part of the artifact is 163 mm, the width of the blade is 12 mm, and the width of the handle (at the pommel) is 13 mm.

10. Bronze knife No. 9 has a straight butt and handle, and a narrowed blade (see Fig. 5, *3*), item No. 9466 / inv. No. 585. The edge of the handle is decorated with a drop-shaped slit. The length of the preserved part of the artifact is 129 mm, the width of the blade is 13 mm, and the width of the handle near the pommel is 13 mm.

11. Bronze knife No. 10 is "elbow-shaped" in the terminology of N.L. Chlenova (1967: 187–188), or "with snake-like spine" according to A.I. Martynov (1979: 37, 71), with the handle expanding upwards; the end of the handle is rounded (see Fig. 4, *6*), item No. 9466 / inv. No. 585. The tip of the blade is broken off. The handle is made in openwork. A drop-shaped loop-like hole is divided by a transverse bridge into one round and one sub-triangular slit. The length of the preserved part of the artifact is 170 mm, the width of the blade is 13 mm, and the width of the handle is 22 mm.

12. A bronze two-hole C-shaped cheekpiece, arcuate according to P.I. Shulga (2013: 35, fig. 32, *1–3*, *5–7*; 33, *1*, *3*), is made of a rod rounded in cross-section, with rounded cone-like pommels at the ends (see Fig. 5, *2*), item No. 9466 / inv. No. 585. At the holes, the rods expand to form a socket. The length of the artifact is 159 mm, the length of the rod is 7–8 mm, the width of the cones are 8 mm, and the length of the sockets are 13.5 mm.

13. Bronze cast two-piece bridle bits are with sub-triangular ends and an additional hole, with smooth rod-mouthpieces (see Fig. 5, *4*), item No. 9466 / inv. No. 585. The endings consist of a triangular frame and rounded hole located at its top, and belong to type 2 according to N.A. Bokovenko (1986: 11), or type 2, subtype 1, subvariant 2, and subtype 2 according to S.B. Valchak (2009: 36, fig. 32, *2*, *6*), or form 2 according to P.I. Shulga (2013: 26, fig. 17–22). The ending has the form of a triangle in link No. 1 (the length of the item is 95 mm; the length of the rod is 7 mm), and segment-like shape in link No. 2 (the length of the item is 101 mm; the length of the rod (deformed) is 5–7 mm).

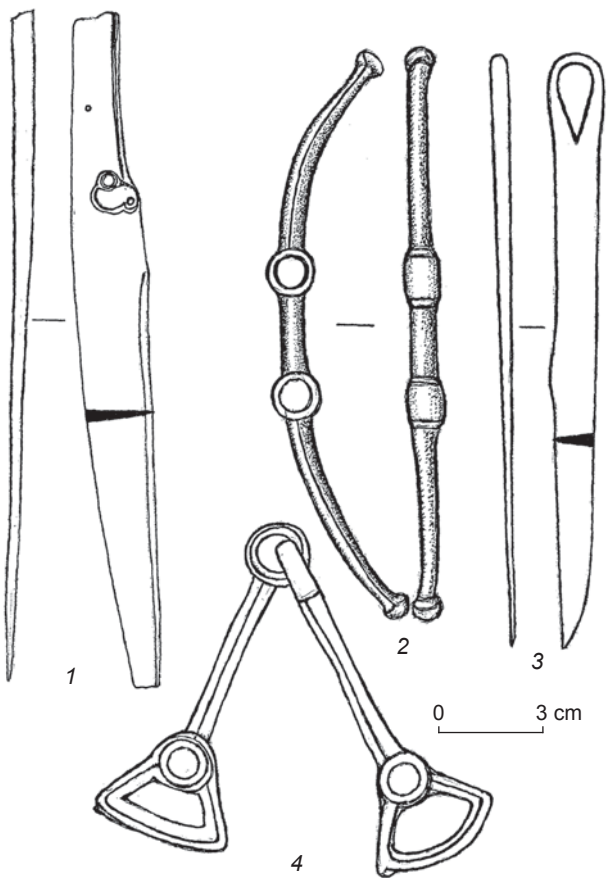

Fig. 5. Bronze knives (*1*, *3*), cheekpiece (*2*), and bridle bits (*4*) of the Tagar culture.

Fig. 6. Bronze pole axe (*1*), celt axe (*2*), and mirror (*3*) of the Tagar culture.

14. A bronze pole axe is with a wedge-shaped striking part (the blade is slightly widened and arcuate), protruding butt, and high truncated-conical socket which is oval in cross-section (Fig. 6, *1*; 7), item No. 9466 / inv. No. 585. The length of the artifact is 126 mm, the thickness is 18 mm, the width of the blade is 36 mm, the width of the butt is 29 mm, the height of the butt is 61.5 mm, the height of the socket is 31 mm, and the length of the socket is 2.1–3.7 mm. The central part of the body and butt are grooved. The sub-rectangular butt part at the top, bottom, and end is decorated with oval cap-shaped protrusions (the length of the item is 14–16 mm, length of the socket is 11 mm and 9–10 mm in the lower part). The angle between the striking part and socket is occupied by a segment of three overlaps made in relief. There are through holes in the socket and butt part.

15. A bronze wedge-shaped double-eyed celt is with a high oval socket (see Fig. 6, *2*; 8), item No. 9466 / inv. No. 585. Lateral eyelets pass into lateral lens-shaped bands. The body of the artifact is decorated with six weakly distinguished longitudinal facets. A truncated-conical socket with oval base in cross-section is reinforced with three transverse bands. The length of the artifact is 101 mm, its width is 51 mm, the width of the blade is 41 mm, the length of the socket is 32–41 mm, the height of the eyelets is 10 mm, and their thickness is 4–5 mm. In its shape, the celt remotely resembles the items of type 4 according to the classification of M.P. Gryaznov (1941: 250–260), or type I according to A.I. Martynov, but is close in size to small lightweight celts of type 3 according to the classification of Martynov (1979: 43–44). However, western celts of variants II.2.18, II.2.19, II.2.20, and II.5.18, according to the classification of E. Ushurelu (2010: 28, 31, 39, 47), are the closest in shape to the celt described above.

16. A bronze mirror (see Fig. 6, *3*), item No. 9466 / inv. No. 585, belongs to type I with a loop on the back, according to the classification of Chlenova (1967: 32), or disk-shaped and looped according to typology of Subbotin (2014: 52, pl. 27, 6), item No. 9466 / inv. No. 585. The diameter is 58 mm; the thickness of the disk is 1 mm. A sub-trapezoidal loop with a wide rectangular bar was soldered to the disk.

Discussion

Chronological analysis of morphological features of the dagger (see Fig. 2) is important for establishing

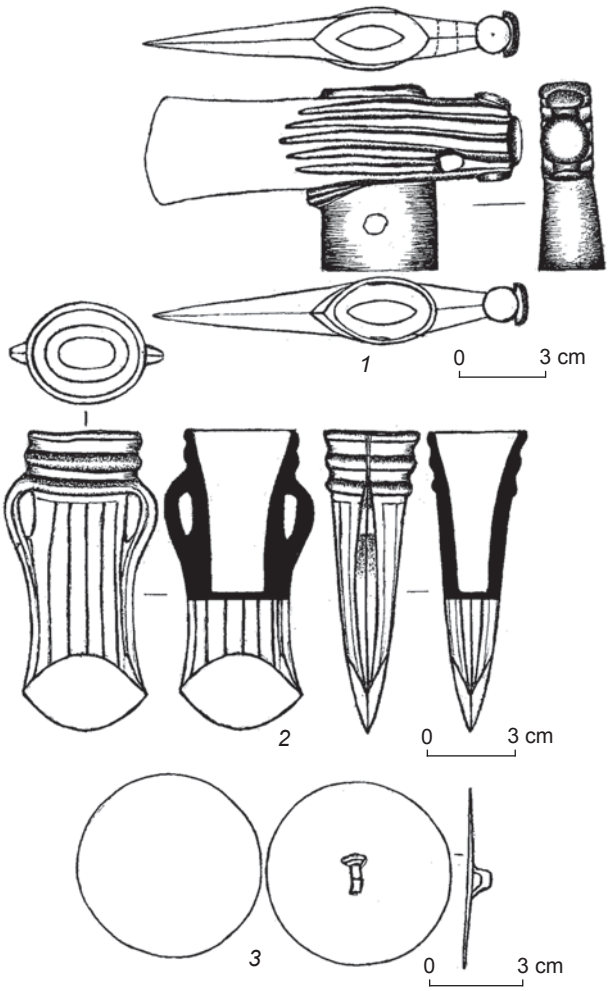

Fig. 7. Bronze pole axe.

Fig. 8. Side view of the celt axe.

the age of the items described above. The Tagar culture is characterized by "wings" on a butterfly-shaped cross-guard in the form of the mirrored representation of a pair of heads of various animals. Representations of the heads of birds of prey in relief emerged in the 7th century BC (Chlenova, 1967: 114). Images of doubled (mirrored) griffin heads in the area of the Tagar culture first appeared on the "undeveloped" cross-guards of daggers of the "Krasnoyarsk" type. This group includes the dagger from the Verkhne-Metlyaevskaya hoard (Cis-Baikal region), with the image of two stylized bird heads not only on the cross-guard, but also on the pommel (two bird heads with one common eye, turned in opposite directions) (Maksimenkov, 1960: Fig. 2, *1*). Notably, according to the observations of Chlenova, the motif of "double bird heads with one common eye" on the pommels of daggers appeared in the Minusinsk Basin in the 5th century BC (1967: 132). The Verkhne-Metlyaevskaya hoard was hidden in the 7th–5th centuries BC (Maksimenkov, 1960: 10; Savinov, 2002: 228). Several daggers (without cross-guards) with a similarly shaped transition zone from the handle to blade appear among the random finds from the Minusinsk Basin (Chlenova, 1967: 245, pl. 25, *15*, *16*).

Images of two bird (or griffin) heads either facing each other or turned in opposite directions became typical for the decoration of daggers from the Minusinsk Basin since the 5th century BC (dating by Chlenova). A new element (cere) appeared in the image of the bird on those daggers; it had not been depicted in the Minusinsk Basin in the earlier period (Ibid.: 121; Moor, 2015: 32).

Chlenova viewed such daggers in the context of daggers with pommels in the form of a pair of griffin heads. She mentioned the presence of daggers similar to the Tagar examples at the sites of the Ananyino culture, but believed that the decoration of the Minusinsk daggers made in the Altai animal style testifies to their Western Siberian origin (Chlenova, 1981: 8–10).

It is noteworthy that ten iron acinaci of the "Marychevka" type (from the 7th to first half of the 6th century BC), distinguished by a cross-guard in the form of mirrored representations of the heads of a bird of prey (Ismagilov, Skarbovenko, 1977; Ismagil, 2011: 13–15), have been discovered in the immediate vicinity of the area of the Ananyino culture (the Volga-Kama region), in the interfluve of the Volga and the Ural rivers, from Bogoruslan in the west to Sterlitamak in the east (Kunakbaevo, Tolmachevo), and from Orenburg in the south ("Kitaiskoye pole") to Tuymazy in the north.

According to N.N. Pogrebova, the emergence in the animal style of representations of the head of a bird of prey with the ear was associated with an imitation of griffin iconography (1948: 62, 66–67). A.R. Kantorovich believed that such heads corresponded not to griffins, but to birds. From his point of view, images of the "eared" bird, including reduced representations, in the European part of the Scythian-Siberian world (Northern Black Sea region, Middle Dnieper region, Don region, and Northern Caucasus) were typical of the "Scythian classics" of the 5th–4th centuries BC, although they could have emerged in the Altai-Sayan region in the mid 6th century BC (Kantorovich, 2015: 120, 199–200).

Some bronze daggers with pommels in the form of two bird (griffin?) heads from the sites of the Urals and Western Siberia have cross-guards in the form of two heads of a bird of prey (similar in their pictorial solution to the swords of the "Marychevka" type), which resemble those on the artifacts from the Stavropol Museum. Daggers with a similar design of cross-guards with mirrored heads of a bird of prey are known from the Kama region (Yadrinsky Uyezd of the Kazan Governorate) and Western Siberia (Krasnoyarsky Uyezd of the Yenisei Governorate; Mariinsko-Achinsky District) (Chlenova, 1981: Fig. 4, 9, 14, 16). In terms of the cross-guard, Western Siberian daggers are the closest to the dagger from the Stavropol Museum. The upper contour of bird heads is also arranged in a straight line (see Fig. 3). These daggers are also similar in the grooved ("ribbed" according to Chlenova (1967: 16), "striated" according to Martynov (1979: 48), "fluted" according to Subbotin (2014: 49, 99, pl. 25)) design of the handle. Chlenova (1967: 16) attributed daggers with such handles from the Minusinsk Basin and Tuva to the 5th–4th centuries BC.

The use of a spiral scroll as the divider of the bird heads on the cross-guard of the dagger from the Stavropol Museum, as well as appearance of this motif in the Minusinsk Basin, might have been caused by the influence of the Ananyino culture. A bronze dagger with the handle decorated with spiral scrolls was discovered at the Ananyino cemetery. The scroll is located in the center of the cross-guard on that item (Chlenova, 1981: Fig. 3, *1*).

The dagger with the cross-guard decorated with the representation of bird heads separated by a scroll from the Stavropol Museum may also be dated to the 5th–4th centuries BC. As was mentioned above, a cere is shown on this bird image. Its inclusion into representations of a bird of prey in the Minusinsk Basin in the 5th century BC was associated with the influence of the Altai animal style (Chlenova, 1967: 121). This date does not contradict the grooved handle with sub-trapezoidal pommel.

In the collection under discussion, three out of ten knives, like the dagger, were decorated in the animal style.

Knife No. 1 with a distinct handle and a pommel with standing goat figurine (see Fig. 1, *2*) belongs to section I, class 1/8, according to the classification of Chlenova (Ibid.: 184). Chlenova believed that such knives appeared in the 5th century BC. A knife with a handle similarly decorated with a band of oblique hatches in relief and pommel representing a standing goat has been found in

Sargov Ulus, on the left bank of the Yenisei River (Ibid.: 184: pl. 39, *15*). Notably, the statuette of the goat on the knife handle from the Stavropol Museum also shows the signs of the animal style of the 5th–4th centuries BC, such as the small diameter of the arc of horns, elongated beak-like pointed muzzle, and absence of a marked shoulder blade and through holes (Ibid.: 132–133).

Knife No. 2 with a distinct handle and a pommel of a hardly identifiable humpbacked donkey or onager figurine with muzzle bowed down, long ear pressed to the back, and slightly bent legs (see Fig. 1, *3*) may also be dated to the 5th–4th centuries BC. According to Chlenova, the emergence of such motifs was associated with the spread of the Altai style in the art of the population living in the Minusinsk Basin in the 5th century BC. Notably, simplification and stylization of zoomorphic imagery (for example, the transformation of the images of wild boars), as well as employment of images of an ungulate with bent legs, also occurred in this period. Decoration of two parallel rows of triangles and a hoof-like sign which according to Chlenova was of Minusinsk origin, appeared in an earlier period, but was quite common in the 5th century BC (Ibid.: 134, 139, 184).

A knife similar in the design of its handle to the knife in question, with a similar pommel in the form of an animal figurine with slightly bent legs and long ear, was described by E.B. Vadetskaya (1986: 88–89, pl. VII, *12*) among the knives of the Tagar culture.

Knife No. 3 with a distinct handle, slightly arcuate butt, and expanded angular pommel with a hole (see Fig. 4, *4*) (trapezoidal triangular pommel with a hole, according to Subbotin (2014: 51, pl. 28)) resembles the knives that Chlenova attributed to the 5th–4th centuries BC. For example, an item with a similarly shaped pommel was found in kurgan 1 (5th century BC), at the Malaya Inya cemetery (Altai Republic) (Chlenova, 1967: 250, pl. 39, 23). A knife with similar shape of its pommel appears in the materials of the 4th–3rd centuries BC from kurgan 3 at the Kolok cemetery (Republic of Khakassia) (Pshenitsyna, Polyakov, 1989: 61, fig. 2, 21).

Knife No. 4 with a distinct handle, slightly arcuate butt, and pommel in the form of a simple band (see Fig. 4, *5*) belongs to section 1, class 1/3, according to the typology of Chlenova (1967: 168). Such knives typically appear at the sites of the Tagar culture of the second half of the 6th century BC (Ibid.: 168). The weak curve of the butt and miniature size of the thin band may possibly be explained by the late origin of the item from the Stavropol Museum, which can be tentatively dated to the 5th century BC.

The specific type of the massive knife No. 5 with arcuately curved butt, a distinct handle, and decoration of the ledge between the handle and blade with the image of the head of a bird of prey (see Fig. 5, *1*) is difficult to identify owing to the lack of the pommel. Similar images of bird heads have been found on knives of the 7th–4th centuries BC. This artifact combines early (massiveness) and late (weakly marked ledge between the blade and handle) elements. Thus, the knife from the Stavropol Museum can be possibly dated to the 7th–5th centuries BC.

Knife No. 6 with a handle which is not distinct and a ring-like pommel (see Fig. 4, *1*) belongs to section II, type II/19, according to the classification of Chlenova, who pointed out that such items typically appear at the complexes of the Tagar culture of the 5th–4th centuries BC (Lake Tagarskoye in the Minusinsky District of Krasnoyarsk Territory, the Torgashino hoard from the vicinity of the city of Krasnoyarsk, Korkino from the vicinity of the city of Krasnoyarsk, etc.) (Chlenova, 1967: 182: pl. 39, *18*). Such knives commonly occur at the sites of the forest-steppe region in the area of the Tagar culture (Martynov, 1979: 156, pl. 2). Similar items have been found at the sites of the 5th century BC in Mongolia; for example, at the Ulangom cemetery (Novgorodova, 1989: 260, fig. 2). Bronze knives with ring-shaped pommels have also been discovered in the Upper Ob region (sites of the 7th–6th centuries BC); but in those knives, the blade was separated from the handle by a small ledge (Mogilnikov, 1997: 180, fig. 50, *8*).

Knives No. 7–9 with a straight butt, a handle which is not distinct, and drop-shaped slit in the pommel belong to class II/2 (subclass II/2a), section II, according to the classification of Chlenova (1967: 168), or to group B (straight), type 12, according to Martynov (1979: 39–40), or to knives with a trapezoidal drop-shaped pommel according to Subbotin (2014: 51, No. 4911). According to Chlenova, loop-shaped artifacts similar to knife No. 8 appeared in the 5th century BC. Knives similar to items 7 and 9 were used from the 7th to the 4th century BC (Chlenova, 1967: 168, 170). Judging by the miniature size, the knives from the Stavropol Museum were most likely made in the 5th–4th centuries BC.

Elbow-shaped knives with a slotted openwork handle (trapezoidal oval pommel with a bar in the loop according to Subbotin (2014: 51, No. 4912)), similar to knife No. 10 (see Fig. 4, *6*), have been identified by Chlenova as belonging to class I/17 of section I. Such items are typical of the 5th–3rd centuries BC (the cemeteries of Bateni—at the landing place at the left bank of the Yenisei River); grave 2, kurgan 2 in Malaya Inya in the Altai Republic; Chastoostrovskoye fortified settlement in the Krasnoyarsk Territory, etc.) (Chlenova, 1967: 188). Similar items have also been found at the sites of the Upper Ob region (Mogilnikov, 1997: 180, fig. 50, *14*), Kemerovo Region, in the Kuznetsk Okrug, Kansk, and Trans-Baikal region (Chlenova, 1967: 188, pl. 39, *8*, *13*).

The bronze two-hole (coupling-like) cheekpiece (see Fig. 5, *2*) is arcuate according to Chlenova (Ibid.: 73), or slightly curved—group 5, variant 1, according to

Shulga (2013: 35, 122–123, fig. 32, *1–3*, *5–7*; 33, *1*, *3*). B.B. Besetaev (2015: 25) connected similar cheekpieces from the sites of Eastern Kazakhstan with the third stage in the development of the horse harness (late 6th–5th centuries BC). In the Minusinsk Basin, such harness elements came into use in the 6th century BC, but were most frequently used together with bridle bits with large oval or rounded rings in the 5th–4th centuries BC (Chlenova, 1967: 73; Shulga, 2013: 54–55).

The artifacts from the collection of the Stavropol Museum, as was mentioned above, include cast two-piece bridle bits with sub-triangular endings and smooth rod-mouthpieces (see Fig. 5, *4*). The endings consist of a frame (one with straight base, and the other with oval) and a rounded hole located at its top. Similar sets of bridle bits with different endings appear in the assemblages of the Oznachennoye cemetery (Sayanogorsk, Republic of Khakassia) and the Abakan River valley (Chlenova, 1967: Pl. 16, *9*, *10*).

Chlenova dated similar bridle bits from the Tagar sites to the 7th century BC (Ibid.: 68; 1992: 215). According to Besetaev (2015: 25), stapediform bits with an additional hole from the assemblages of Eastern Kazakhstan belonged to the second stage of horse harness development—7th–6th centuries BC.

Individual similar items have been found at the sites in southeastern Europe. Two artifacts are random finds from Kharkov Region in the Ukraine (stored in the Kharkov Historical Museum). Another set was discovered at the Early Iron Age site near the village of Pesochin, in the vicinity of the city of Kharkov. The stapediform-ringed bits found in this region are considered to be evidence of contacts of the local population with the migrant population from Asia during the pre-Scythian period, especially in its final stage, apparently in the 8th to early 7th century BC (Valchak, 2009: 34, 36, fig. 34, *2*, *4*).

According to Shulga (2013: 54, 109; fig. 17–20), such bridle bits are typical of the Tagar horse harness of the 8th–7th centuries BC. Shulga pointed out that 83 bridle bits have been found in the Minusinsk Basin; seven bridle bits have been found in the Altai and the adjacent territory of Eastern Kazakhstan, while in Tuva, such bits have been found only in two bridles from the sites of Arzhan-1 and -2. In the Altai, Eastern Kazakhstan, Tuva, and other regions, similar bits have been found in the assemblages of the 8th–7th centuries BC (Shulga, 2008: Fig. 54; 2013: 24, fig. 47; 48, *1*, *2*). A set of similar bronze bits found at one of the Sargatka sites in the vicinity of Omsk belongs to the 5th–4th centuries BC (Mogilnikov, 1992: Pl. 121, *28*).

A bronze pole axe with a wedge-shaped striking part, slightly widened arcuate blade, protruding butt (with three mushroom-shaped protrusions), and high truncated-conical socket, which is oval in cross-section (see Fig. 6, *1*; 7) does not find exact parallels among the Tagar items. However, in terms of butt decoration, it is close to the pole axe from grave 17 in kurgan 1 of the Bateni cemetery (the left bank of the Yenisei River), in which the butt was decorated not with mushroom-shaped protrusions above and below, but by the heads of predators (Chlenova, 1967: Pl. 8, *5*). According to Chlenova, the most of the Tagar pole axes can be dated to the 6th century BC (Ibid.: 30). The item from the Stavropol Museum may belong to the time when the Verkhne-Metlyaevskaya hoard (which included a pole axe with a grooved butt) was hidden, that is, the 7th–5th centuries BC (Maksimenkov, 1960: 10; Savinov, 2002: 228).

Small wedge-shaped celts, similar in size to the celt from the Stavropol Museum, typically appear at the sites in the area of the Tagar culture. They have been found in the vicinity of Krasnoyarsk and in the territory east of it, around Kansk, and appear among the materials of the Verkhne-Metlyaevskaya hoard, etc. (Maksimenkov, 1960: 23, app. IX; Martynov, 1979: 44). According to the observations of Martynov, small wedge-shaped celts mostly appeared in the assemblages of the 5th–3rd centuries BC (1979: 44), which is consistent with the conclusions of Gryaznov (1941: 263–265) that such items belonged to the second half of the period of the Minusinsk Kurgan (Tagar) culture. However, small wedge-shaped celts are not complete parallels to the celt from the Stavropol Museum (see Fig. 8); there are no such items among the Tagar artifacts. The decoration on the part of the celt with three transverse convex bands, as is the case with the celt from the Stavropol Museum, appears on a few late eastern celts (for example, a celt without an eyelet from the Bystrovka-1 cemetery of the 3rd–2nd centuries BC (forest-steppe Ob region) was decorated in this manner (Troitskaya, Borodovsky, 1994: 36, 163, pl. XXXIII, 1)), which means that the celt from the Stavropol collection is of earlier origin. Western celts of variants II.2.18; II.2.19; II.2.20, and II.5.18 (according to the classification of E. Ushurelu) have a form that is the most similar to the Stavropol celt. Variants II.2.18; II.2.19, and II.2.20 include items with a socket raised above the eyelets and bordered by a rim and two (three) horizontal ribs (the lower one is connected with the eyelet) from the Northern Caucasus (random finds near the aul of Tauykhabl in the Republic of Adygea, etc.). The celts of variant II.5.18 (with a socket raised above the eyelets, encircled by three horizontal bands) are typical of the Middle Volga region (the hoard from Sabanchevo) and are dated to the 9th century BC (Ushurelu, 2010: 28, 31, 39, 47, fig. 4, *14–17*; fig. 12, *11*, *12*).

Disk-shaped mirrors with an eyelet on the back, similar in size to the mirror from the Stavropol Museum (see Fig. 6, *3*), correspond to the Tagar sites of the 6th–4th centuries BC (Chlenova, 1967: 82). Items close to the described mirror in terms of the trapezoidal shape of the eyelet

appear among the materials of the 4th–2nd centuries BC at the Nekrasovo II kurgan cemetery (Saveliev, German, 2015: 108, 112, fig. 3, *1–13*) and 4th–3rd centuries BC at kurgan 3 at the Kolok cemetery (Republic of Khakassia) (4th–3rd centuries BC) (Pshenitsyna, Polyakov, 1989: 61, fig. 2, *2*). Similar mirrors have been discovered at the sites of the 5th–4th centuries BC in the Upper Lena region, Tomsk Region, Tuva, Northeastern Kazakhstan, and in other areas (Chlenova, 1967: 83). However, such mirrors have also been found in earlier complexes. For example, two similar items (one with a sub-trapezoidal eyelet) have been discovered at the Biyke site in the Altai. They belong to the final period of the Biyke culture, and were dated to the second half of the 7th to the second or third quarter of the 6th century BC (Tishkin, Seregin, 2011: 8, fig. 1, 3, 4).

Conclusions

Chronological analysis of the Tagar items from the collection of the Stavropol Museum makes it possible to attribute a part of them (the dagger, knives, cheekpiece, and mirror) to the 5th–4th centuries BC. The axe, celt, bridle bits, and probably the massive knife with the representation of a bird's head between the handle and blade should be dated to an earlier period of the (8th) 7th–6th centuries BC. The significant chronological range of the items under consideration indicates that the collection consists of finds from sites of different periods. G.N. Prozritelev might have received as a gift an assembled hoard of bronze items, which included artifacts of the (8th) 7th–5th centuries BC. Similar hoards are known: one of them is the Verkhne-Metlyaevskaya hoard, which consisted of bronze knives, an axe, celts, a dagger, etc.

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An Early Pazyryk Kurgan at Khankarinsky Dol, Northwestern Altai: Chronology and Attribution of Artifacts

This article introduces a Pazyryk kurgan, unearthed at Khankarinsky Dol, in the northwestern Altai. On the basis of the funerary rite, burial goods, and radiocarbon analysis, the kurgan dates to the late 6th or early 5th centuries BC and is one of the earliest Pazyryk kurgans in this area known to date. A detailed description of artifacts is provided, including a bimetallic dagger, bronze hairpins, a quiver hook, a mirror, a belt buckle, a slotted clip, a knife, and a torc lined with foil. Special attention is paid to the details of a horse harness, which include bronze bits, two bone plaques, cheek-pieces, four strap distributors, a shackle, two clasps, and a bone girth buckle. The analysis of zoomorphic images on cheek-pieces suggests that the images of a wolf and a short-snouted feline carnivore are interchangeable in Scythian-Saka art. Evidently, the distinction between them mattered less for the nomads than did the fact that the animal was a carnivore. The reconstruction of the early Pazyryk horse harness is proposed. The burial rite and the burial goods indicate a high social status of those buried.

Keywords: *Pazyryk culture, Altai, funerary rite, artifacts, radiocarbon analysis, horse equipment.*

Introduction

The cemetery of Khankarinsky Dol is a part of the Chineta archaeological microdistrict near the village of Chineta, Krasnoshchekovsky District, Altai Territory (Fig. 1) (Dashkovskiy, 2016). The site is located in the eastern part of the second floodplain terrace on the left bank of the Inya River (a left tributary of the Charysh River), 1.0–1.4 km south-southeast of the village of Chineta. Since 2001, the Krasnoshchekovsky Archaeological Expedition of Altai State University, headed by the author of this article, has carried out excavations at the cemetery. Kurgans belonging to the Afanasievo, Pazyryk, and Srostki cultures have been explored. Currently, twenty-eight kurgans of the Scythian-Saka period have been excavated. This article describes the results of research into kurgan 25 belonging to the Pazyryk culture.

Fig. 1. Location of the Khankarinsky Dol cemetery.

Description of the funerary rite

Kurgan 25 was discovered in the northern part of the Khankarinsky Dol cemetery, near the edge of the second floodplain terrace (Fig. 2). The diameter of the mound made of small and medium-sized stones piled in three or four layers, was 9.50 (W-E) to 9.75 (N-S) m. The height of the stone structure reached 0.6 m (0.8 m together with the layer of soil). A depression measuring 2.25 m along north-south and 1.5 m along west–east was discovered in the central part of the mound. A ring-shaped stone crepidoma of larger stones was made along the circumference of the mound base. Under the mound, a grave spot of subrectangular shape, oriented with its long axis along the NW-SE line, was discovered. The grave pit measured 3.1 × 2.8 × 2.7 m at the level of the ancient horizon. Unlike other excavated kurgans at Khankarinsky Dol, this grave was filled only with soil without stones. The filling was highly compressed and visually resembled the sterile layer. A double burial of a man and a woman was on the bottom of the grave, at a depth of 2.50–2.56 m along the southern wall (Fig. 3). The deceased were placed in a flexed position on their right side, and were oriented with their heads to the southeast.

The male skeleton lay along the southern wall. A bimetallic combat dagger in a wooden scabbard (Fig. 4) was found near the left tibia, and a bronze quiver hook (Fig. 5, *7*), a buckle-fastener (Fig. 5, *1*), and a belt clip (Fig. 5, *2*) were discovered in the waist area. The buried person had no upper vertebra, possibly because his head had been severed. The second skeleton belonged to a female. Two bronze hairpins were found under the skull (Fig. 5, *3*, *4*); a bronze torc decorated with gold foil (Fig. 6, *2*) was discovered in the neck area, and a bronze mirror was found near the left tibia in the pelvis area (see Fig. 5, *6*). A fragmented ceramic vessel was located 15 cm north of the left hand bones of the second skeleton, at a depth of 2.55 m, and the remains of ritual food (lamb bones) and bronze knife (see Fig. 5, *5*) were discovered 25 cm to the east of the vessel. The burial was probably covered by wood slabs, which were laid on ledges along the western and eastern walls of the grave. Remains of four wood slabs up to 20 cm long and 10 cm wide long were found along the eastern wall, at a depth of 1.9 m.

An accompanying burial of a horse was unearthed on clay ledge along the northern wall of the grave pit, at a depth of 1.35–1.68 m; the horse was placed on its stomach, and was oriented with its head to the southeast (see Fig. 3). The hind legs of the animal were tucked in, and the front legs were half-bent, as a result of which it seemed that the horse was rising from the ground. Two bone plaques were on the frontal bone of horse's skull (Fig. 7, *2*, *3*); bronze bits (see Fig. 6, *1*) with bone cheek-pieces decorated with zoomorphic images (Fig. 8) were found in the teeth. In the area of horse's skull, bone strap distributors were discovered: three round (Fig. 9, *5–7*) and one in the form of animal fang (see Fig. 7, *1*). A bone shackle was near the first cervical vertebra (see Fig. 9, *2*), and a bone girth buckle (see Fig. 9, *1*) was in the area of the ribs.

Fig. 2. Kurgan 25 at Khankarinsky Dol after removing the mound.

Attribution and dating of grave goods

Grave goods included items in a variety of categories. Weaponry was represented by a bimetallic dagger in a poorly preserved wooden scabbard (see Fig. 4). The total length of the dagger was 28.5 cm; the length of the bronze hilt was 11 cm. The iron part of the dagger included a blade 17.5 cm long and a tang, which was well secured in the slot of the bronze hilt. The width of the blade (rhombic in cross-section) at the crossbar was 3.5 cm; the thickness at its widest point was 5.5 mm. The length of the tang was about 7 cm; from the upper part of the crossbar, it was inserted into its through hole and pushed into the slot of the hilt. The width of the hilt was 4–5 mm smaller than the width of the tang, since the edges of the tang entered into small longitudinal grooves on the inner sides of the slot; its width in the visible part was 0.7 cm, and 1.65 cm taking into account the grooves. The tang inserted into the slot was attached by four iron rivets set in pre-made holes. The pommel of the dagger was mushroom-shaped, and the crossbar was heart-shaped.

Bimetallic daggers occur quite rarely at the sites of the Pazyryk culture in the Altai, and also generally in the kurgans of the Scythian period in Central Asia. In particular, a weapon similar in some morphological features (like the presence of a bronze hilt with the heart-shaped crossbar, an iron blade with the tang, etc.) was found in kurgan 5 at the Ala-Gail-3 cemetery (Kubarev, Shulga, 2007: 5, fig. 27, *3*). Another full-featured bimetallic dagger with a bronze hilt decorated with an image of a griffin and a butterfly-shaped crossbar was found in kurgan 2 at the Tavdushka cemetery (Ibid.: 75). In addition, daggers that have either the crossbar or hilt made of bronze are known from the Pazyryk kurgans in the Altai. These include the finds from Kosh-Tal (kurgan 9) (Surazakov, 1993: 32, fig. 29, *1*), Kyzyl-Dzhar I (kurgan 8) (Mogilnikov, 1983a), and Buraty IV (kurgan 11) (Kubarev, Kocheev, 1983). According to some scholars, daggers with only one element (crossbar or pommel) made of bronze should not be considered

Fig. 3. Burial in kurgan 25.

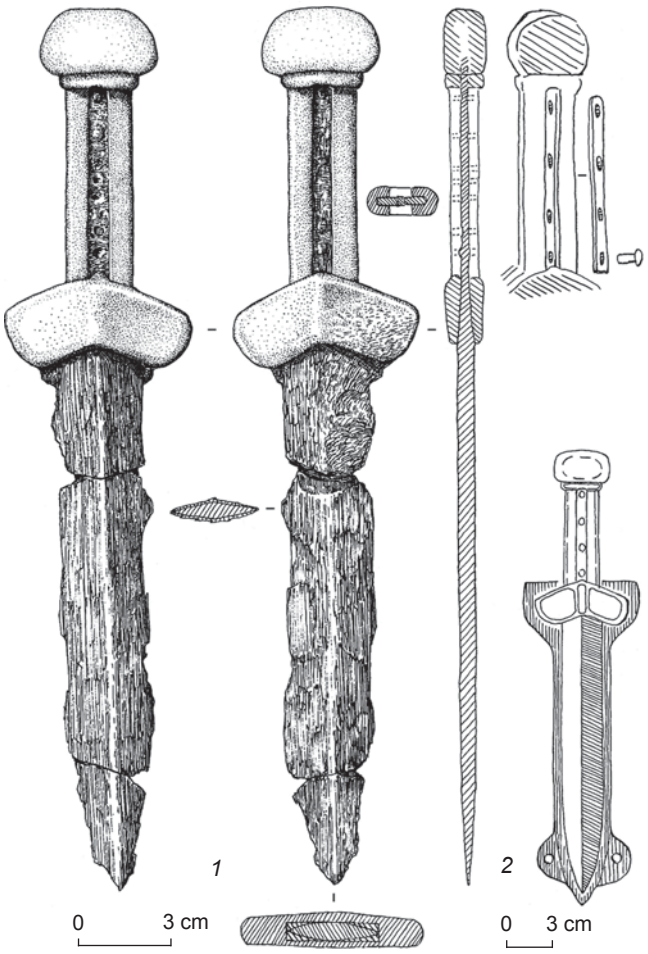

Fig. 4. Bimetallic dagger (*1*) and reconstruction of this dagger in wooden scabbard (*2*).

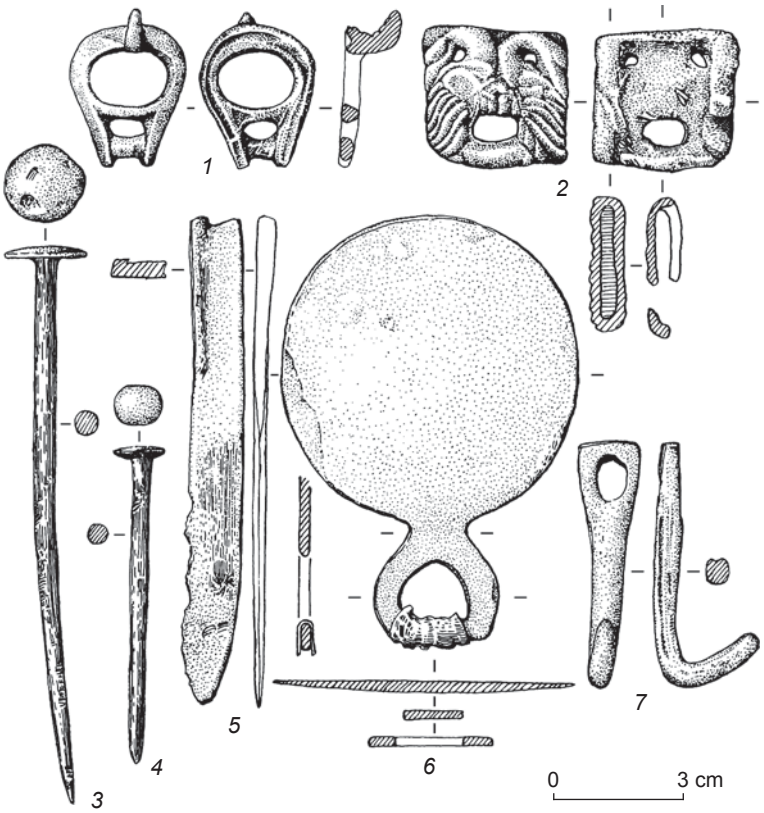

Fig. 5. Burial goods.
1 – belt buckle; *2* – belt clip; *3*, *4* – hairpins; *5* – knife; *6* – mirror; *7* – quiver hook.

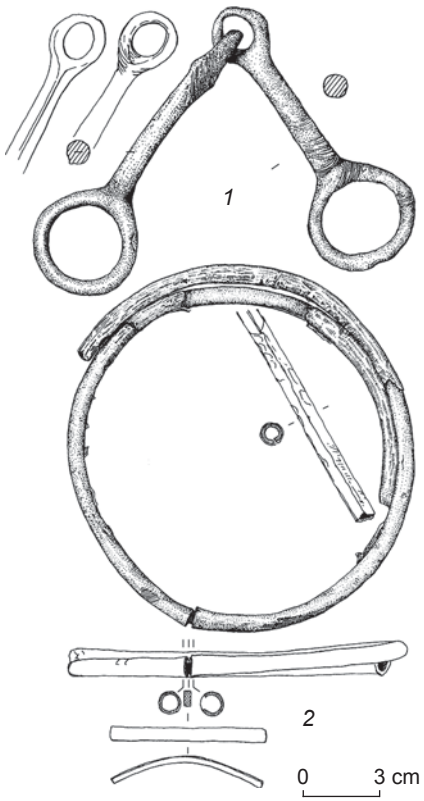

Fig. 6. Bronze mouthpiece (*1*) and torc lined with gold foil (*2*).

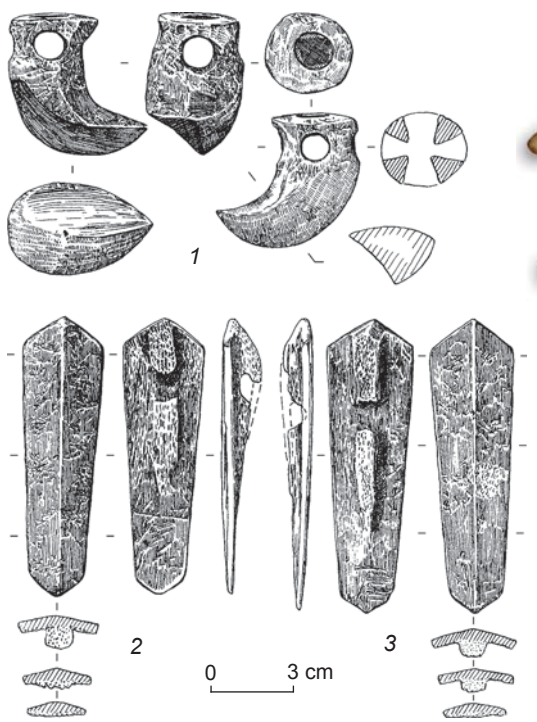

Fig. 7. Distributor made of horn (*1*) and bone plaques (*2*, *3*).

Fig. 8. Cheek-pieces made of horn.

bimetallic in a full sense of the word (Kubarev, Shulga, 2007: 75).

Bimetallic daggers are also known from the kurgans of the Sagly culture in Tuva. For instance, a dagger with an iron blade and a slotted bronze hilt was discovered in kurgan 13 at Sagly-Bazhi II (Grach, 1980: 33, fig. 30, *1*), although scholars have rightly drawn attention to the fact that there is a photo placed in the monograph by A.D. Grach on which the dagger cannot be entirely identified as bimetallic (Kubarev, Shulga, 2007: 76). Notably, this fact does not exclude the presence of a bimetallic dagger at the site altogether. An important problem is dating of

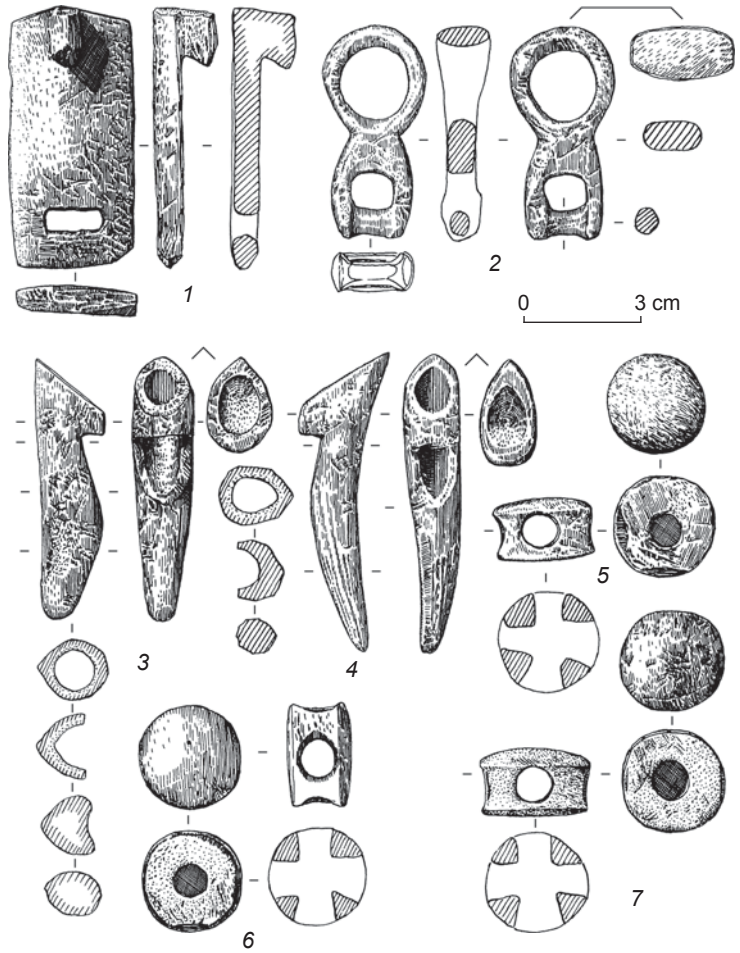

Fig. 9. Burial goods.
1 – girth buckle; *2* – shackle; *3*, *4* – fasteners; *5–7* – distributors.

such items. The position of V.D. Kubarev and P.I. Shulga, who analyzed them together with all of items of the material complex, seems to be the most reasonable. Thus, they suggested that taking into account specific features of horse harness and other artifacts, the full-featured bimetallic dagger from kurgan 5 at Ala-Gail-3 can be dated to the middle to the latter half of the 6th century BC. The authors dated the dagger from kurgan 13 at Sagly-Bazhi II to a somewhat later time, but did not specify what exactly (Ibid.). They dated the bimetallic dagger from kurgan 2 at Tavdushka to late 6th to first half of the 5th century BC (Ibid.: 77). It is noteworthy that similar finds from the Saka sites in Central Asia also belong to a rather early period—7th–6th or rather 6th century BC (Litvinsky, 1972: 113–114). Thus, taking into account other items of the material complex, including the elements of a horse harness, the bimetallic dagger from kurgan 25 at Khankarinsky Dol should be dated to the second half of the 6th to early 5th century BC.

The accompanying goods included a bronze quiver hook (see Fig. 5, *7*), although scholars pointed out that items of this type could also have been used for hanging the scabbards, pickaxes, and mirrors, or as belt fasteners (Surazakov, 1988: 59; Kiryushin, Stepanova, 2004: 66–67; Kiselev, 1951: 294). However, given the presence in the grave of a bronze belt fastener, this item was likely to serve as a quiver hook. Its length was 5.7 cm; the maximum width at the top was 1.5 cm. Scholars are currently aware of the existence of over fifty quiver hooks, including four made of iron, two made of wood, and the rest made of bronze (Kiryushin, Stepanova, 2004: 68). The hook from kurgan 25 at Khankarinsky Dol is most similar to the hooks with rounded or oval loop on the rod. Its upper part, in which an oval hole was made, has the shape of inverted trapezoid. According to a number of morphological features, this item is similar to the hook from kurgan 7 at Kok-Edigan (Ibid.: Fig. 29, *5*). Bronze quiver hooks, including those of the type described, have been found mainly at the sites of the late 6th–4th century BC in Tuva, Ob region, Kazakhstan, and Mongolia (Surazakov, 1988: 59–60; Kiryushin, Stepanova, 2004: 67–70; Mannai-Ool, 1970: 52; Smirnov, 1961: 35; and others).

Two bronze items belonged to belt fittings: a buckle with quadrangular base and a forward protruding prong (see Fig. 5, *1*), and a slotted clip with the image of two swans on the front side (see Fig. 5, *2*). Bronze belt fasteners with protruding or curved prongs, which resemble girth buckles made of bronze, are only rarely discovered in the Pazyryk kurgans. For example, they have been found in the graves at Ulandryk I (kurgan 1), Ulandryk IV (kurgan 3) (Kubarev, 1987: 83, fig. 29, *3*, *4*, pl. IV, 2; LXXXVIII, 16), and Yustyd I (kurgan 4) and XXII (kurgan 1) (Kubarev, 1991: 92, fig. 19, *5*, *6*, pl. IX, 4; LXIV, 3). A bronze belt buckle with a protruding prong has been found in kurgan 1 at the Yubileinyi II cemetery of the Bystryanka culture (Surazakov, 1988: 71, fig. 46, *2*). Another belt buckle has been found in kurgan 1 at Duzherlig-Khovuau I in Tuva (Grach, 1980: 205, fig. 67). Bronze belt buckles similar in shape to girth buckles made of the same material have been discovered from the late 6th century BC (Surazakov, 1988: 2–3). Some of them were found in kurgans dated to the 4th–3rd centuries BC, for example, in kurgan 1 at Yustyd XXII (Kubarev, 1991: 134).

There was a bronze belt clip with a nearly quadratic shape (3.4 × 3.3 cm). A rounded hole for hanging items, primarily weaponry, was found at its bottom (see Fig. 5, *2*). Some bronze slotted belt clips appeared at the end of

the Early Scythian period, but became most widespread during the early stage of the Pazyryk culture in the 6th–5th centuries BC (Surazakov, 1988: 71–73; Kubarev, Shulga, 2007: 107). In the second half of the 5th century BC, they started to be replaced by plate-like bone slotted badges and their wooden counterparts (Kubarev, Shulga, 2007: 107; Kubarev, 1987: 79–82; 1991: 85–91; 1992: 77–84).

The items of female toiletry included two bronze nail-shaped hairpins (see Fig. 5, *3*, *4*). The length of one hairpin was 13 cm; the length of the other hairpin was 7.5 cm; the diameters of caps were 1.9 and 1.1 cm respectively. Metal, especially bronze, hairpins have been rarely found in the Pazyryk kurgans (Kiryushin, Stepanova, 2004: 86–89). Wooden hairpins were probably more widespread, but they have rarely been preserved (Kubarev, 1991: 111; 1992: 93–95; and others). Bronze nail-shaped hairpins are not typical of the Pazyryk culture of the Altai. They occur, albeit in limited numbers, among the evidence of the early Scythian period (Ak-Alakha II) (Polosmak, 1993: 26, fig. 3). Iron hairpins of the nail-like type appear at the sites of the Pazyryk period. They have been found in kurgan 18 at Kok-Su I (Sorokin, 1974: 69), kurgan 14 at Tytkesken VI (Kiryushin, Stepanova, Tishkin, 2004: 183, fig. 15, *6*), and kurgan 25 at Maltalu IV (Kubarev, 1992: 218, pl. LXX, 15). It should be emphasized that the first two kurgans belonged to the early stage of the Pazyryk culture and were dated to the mid 6th–5th century BC, while the last kurgan was dated to the 4th–3rd centuries BC. Keeping this in mind, bronze nail-shaped hairpins from kurgan 25 of Khankarinsky Dol can be dated to the mid 6th–early 5th century BC.

According to the classification proposed by Y.F. Kiryushin and N.F. Stepanova, a bronze mirror from the kurgan under consideration (see Fig. 5, *6*) belongs to a single-part type, in which the length of the handle is less than the radius of the disk, and the handle has the shape of an oval or rounded loop (section 1, subsection 2, group 1, type 1, version 2) (2004: 78). Its parallels include the mirrors from kurgans 18 and 25 at Kok-Su I, kurgan 14 at Tytkesken VI, and kurgans 18, 23, 26, and 27 at Yustyd XII (Sorokin, 1974; Kiryushin, Stepanova, Tishkin, 2003: 183, fig. 15, *1*; Kubarev, 1991: Pl. XLIII, LII, LVI, LIX), etc. Mirrors of this type have also been found in kurgans that belong to the early stage of the Pazyryk culture—the second half of the 6th–5th centuries BC (for example, kurgan 18 at Kok-Su I, kurgan 14 at Tytkesken VI).

The finds from kurgan 25 at Khankarinsky Dol included an item of special social importance. It is a bronze torc in one and a half turns, lined with gold foil (see Fig. 6, *2*). Its diameter is 14.2 cm; its thickness is 0.7 cm. It is important that the base of torcs among the "Pazyryk people" could have been made not only of bronze, but also of wood or iron, and then covered with gold foil. Eight torcs have been found in the burials of Khankarinsky Dol, and about sixty torcs, including twenty made of metal, are currently known from the kurgans of the Scythian period (Stepanova, 2001: 90; Kubarev, 2005). Considering that over 600 burials of the Pazyryk period have been excavated in the Altai Mountains, burials with torcs constitute less than 10 %, and with metal torcs less than 3 % of all burials. At the same time, there were 28 % of such burials at Khankarinsky Dol. Torcs have been found both in male and female burials. This feature, together with other indicators of the funerary rite (like the topographic and planigraphic location of the cemetery within the Chineta microdistrict; a high percentage of the accompanying horse burials; the presence of headdresses, etc.) indicates that the nomads buried at the Khankarinsky Dol cemetery, including kurgan 25, had a high social position as compared to the rest of the population of the Inya River basin.

A bronze knife from the kurgan under consideration can be described as straight and laminar, with straight back and without the pommel (see Fig. 5, *5*). The length of the blade is 11.3 cm. Knives of this type were quite widespread throughout the entire period of the Pazyryk culture (Kiryushin, Stepanova, 2004: 70–71; Kubarev, 1987: 52–54; 1991: 69–70; 1992: 53–54; Surazakov, 1988: 16–23; and others).

Radiocarbon dating

The dating of kurgan 25 at Khankarinsky Dol on the basis of an inventory analysis has been supplemented by the results of radiocarbon dating, which was carried out in the Analytical Center for Isotope Research at the Institute of Monitoring of Climatic and Ecological Systems of the SB RAS (IMCES SB RAS, Tomsk). Using a sample of horse bone, the ^{14}C date of 2447 ± 102 BP was obtained (IMCES-1151). G.V. Simonova, Senior Researcher of IMCES SB RAS, established the intervals of the calibrated calendar age, using the software designed at the Oxford University: 760–400 BC according to 1σ (68 %) and 850–350 BC according to 2σ (95 %) (Fig. 10). The results of the radiocarbon dating, like the analysis of the artifacts, indicate that the kurgan under study belongs to the early stage of the Pazyryk culture of the Altai. This complements the previously obtained data for the Khankarinsky Dol and Chineta II cemeteries of the Chineta archaeological microdistrict (Tishkin, Dashkovskiy, 2007; Dashkovskiy, Tishkin, 2015; Dashkovskiy, 2018). In general, taking into account all the results of comprehensive dating, kurgan 25 at the Khankarinsky Dol cemetery can be dated to the second half (or possibly late) 6th to early 5th century BC.

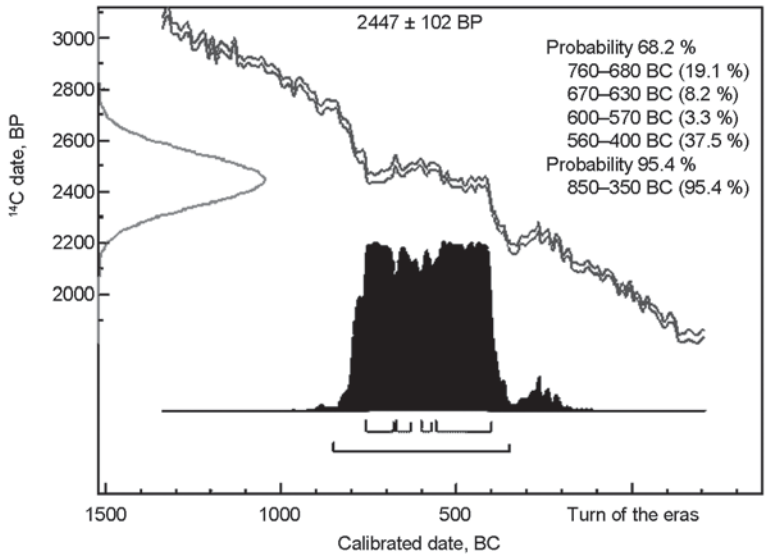

Fig. 10. Results of the radiocarbon dating.

Reconstruction of the horse harness

The horse harness set discovered in kurgan 25 at Khankarinsky Dol included two double-hole cheek-pieces made of horn, a bronze, hinged mouthpiece, four distributors, a shackle, a throatlatch fastener, and a girth buckle all made of horn, as well as two bone pendants. Cheek-pieces were made of prongs of red deer antler and were round in cross-section. Images of a long-beaked bird of prey (a mythical eagle) were carved on the pointed ends, and images of a wolf were carved on the expanding ends (see Fig. 8, 11). Cheek-pieces of horn with zoomorphic endings are well known from the early sites of the Pazyryk culture. The represented zoomorphic predator could be either a wolf, or a representative of the feline family. Items of this type have been found, for example, at the Ala-Gail (kurgan 19), Kok-Su I (kurgan 26), and Taldur I (kurgan 4) cemeteries (Shulga, 2015: 89; Sorokin, 1974; Mogilnikov, Elin, 1982). It should be emphasized that the interchangeability of the images of the wolf and the short-nosed predator of the feline family was typical of the Scythian-Saka art, since in this case the general concept of "predator" was of primary importance, rather than its exact species (Korolkova, 2006: 119; Perevodchikova, 1994: 11).

Bronze, ring-shaped hinged bits (see Fig. 6, *1*) have been found mainly at the sites of the early stage of the Pazyryk culture, although some specimens are also known from subsequent stages of its development (Shulga, 2015: 95–96). As parallels, one can mention the bits from the Taldur I (kurgan 4) (Mogilnikov, Elin, 1982; Shulga, 2015: Fig. 15, *9b*), Bashadar (kurgan 10), and Borotal I (kurgan 82) cemeteries (Shulga, 2015: Fig. 21, *4*; 22, *11*), etc.

Three distributors made of horn had a low-cylindrical shape and intersecting openings (see Fig. 9, *5–7*). The parallels have been observed in the materials of the Chemal-Karyer site (Ibid.: Fig. 17, *6*) and kurgan 2 at Kyzyl-Dzhar II (Mogilnikov, 1983b; Shulga, 2015: Fig. 14, *20*). The fourth distributor was made of horn in the form of a wild boar tusk (see Fig. 7, *1*). Such distributors have been found only in kurgans belonging to the early stage of the Pazyryk culture and serve as reliable chronological indicators (second half of the 6th–early 5th century BC) (Shulga, 2015: 103). Moreover, they received very limited circulation among the nomads of the Altai Mountains. For example, such distributors have been discovered only in small Tuekta kurgans (Kiselev, 1951: 295), kurgan 1 at Kok-Su I (Sorokin, 1974), and kurgan 4 at Chernovaya (Shulga, 2015: Fig. 17, *8*, *9*).

A shackle made of horn was found on the left side of the horse's skeleton. This once again confirms the conclusion that both in the early Scythian and Pazyryk periods, shackles were always fastened precisely on the left side (Ibid.: 106–110). According to the morphological features, it can be described as belonging to the simple type, which was typical of the Early Pazyryk period. Parallels have been found, for example, in kurgan 2 at the Kyzyl-Dzhar VIII cemetery (Mogilnikov, 1983a; Shulga, 2015: Fig. 14, *18*).

A fastener for a horn throatlatch had a slight bend, a hoof-shaped obliquely cut base, and a side hole on the convex side (see Fig. 9, *3*). Items of a similar type are known from the Early Pazyryk complexes, for example from kurgan 4 at Taldur I (Mogilnikov, Elin, 1982). A hoof-shaped fastener of the throatlatch, made of horn, was also found at the Chemal-Karyer I site, but it had a side hole on the concave side (Shulga, 2015: Fig. 17, *4*). Another similar

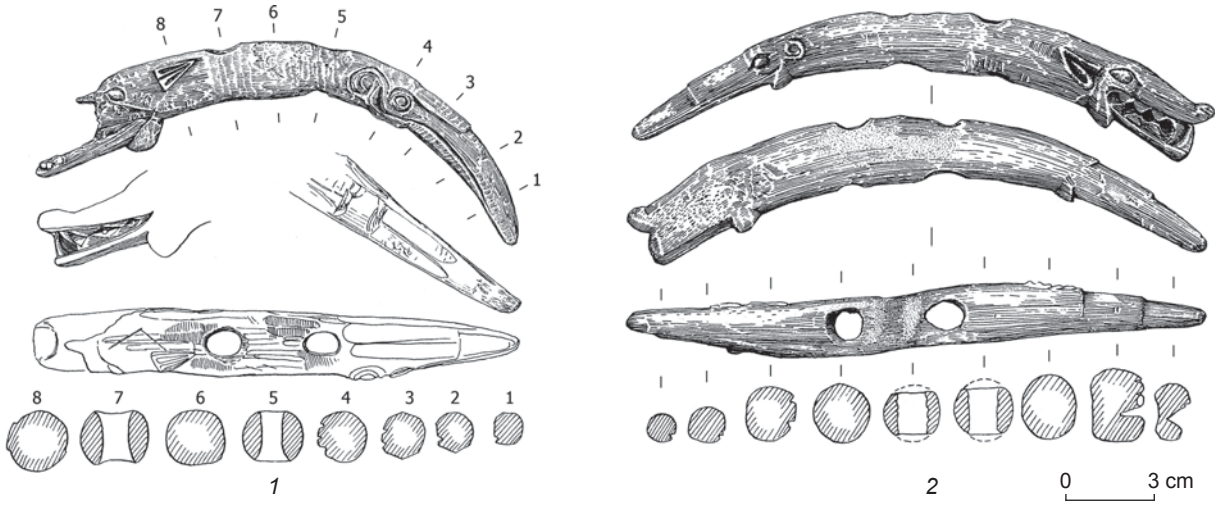

Fig. 11. Drawing of the cheek-pieces and their cross-sections.

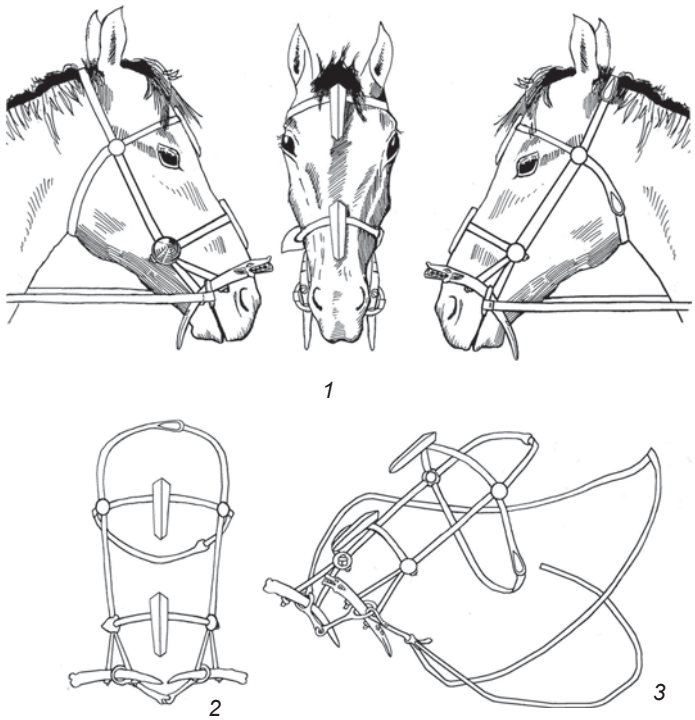

Fig. 12. Reconstruction of the bridle.

item from the kurgan under study served as a fastener for the crownpiece (see Fig. 9, *4*). According to P.I. Shulga, such use of fasteners has been reliably observed only in the Pazyryk I elite kurgan. Some of similar items might have been made of horn and served as buttons (Shulga, 2015: 111–112; Gryaznov, 1950: 55, fig. 20).

Two bone pendants had the same elongated shape with triangular ends (see Fig. 7, *2*, *3*). They expanded in the upper part where the fastening element was located on the reverse side, and narrowed down in the lower part. The pendants were fastened one below the other on the browband and noseband in their middle parts. Brow plates made of wood and bone are well known from the elite kurgans of the Pazyryk culture at the Pazyryk, Bashadar, Tuekta, and other burial grounds (Rudenko, 1953: 154–156; 1960: 125; Shulga, 2015: 54, fig. 27, *1*; fig. 33, *1*; and others). Particularly interesting is a round brow plate of gold foil, which was found on horse's skull in kurgan 31 at Chineta II, located in the same valley as Khankarinsky Dol (Dashkovskiy, Meikshan, 2015). Initially, the disc made of gold foil could have been mounted on a base of leather (fabric) or wood. Small holes were visible along

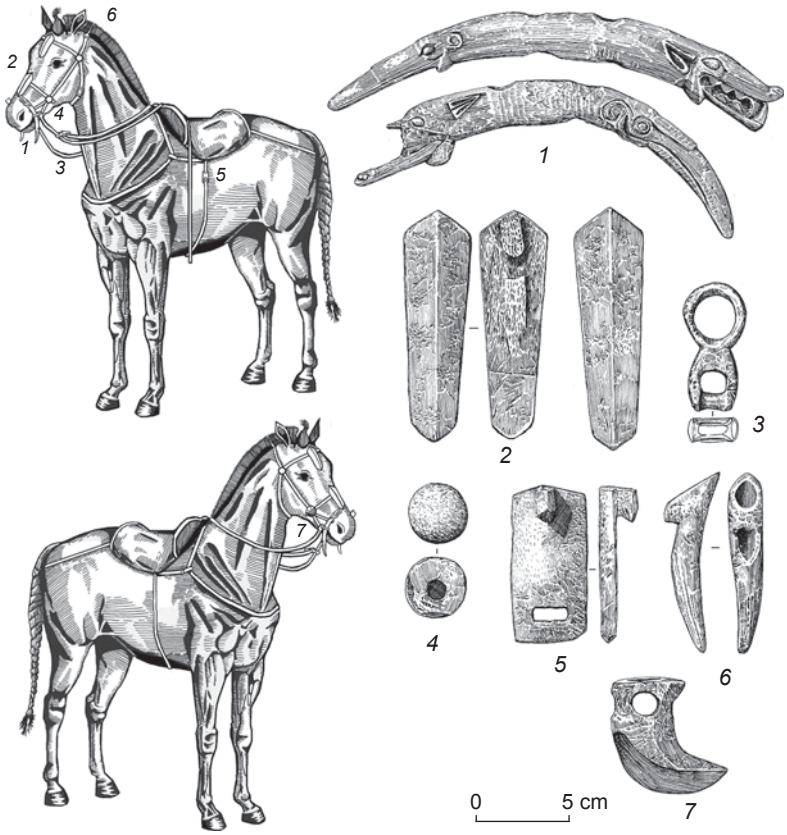

Fig. 13. Reconstruction of places for horse harness elements.
1 – cheek-pieces; *2* – plaque; *3* – shackle; *4*, *7* – distributors; *5* – girth buckle; *6* – fastener of the headpiece.

its edges. Two thin straps attached brow plates. The same principle of fastening appeared in the majority of the elite kurgans of the Pazyryk culture (Shulga, 2015: 54, 64, fig. 33, *1*).

A girth buckle made of horn was a large sub-rectangular plate-like item without a hole for the free end of the strap and with a hook-like peg perpendicular to the frame (see Fig. 9, *1*). According to Shulga's classification, it belongs to type 1, version 1. As Shulga indicated, out of 105 girth buckles known from the materials of kurgans of the Pazyryk culture, twenty-eight such well-preserved items of this type have been identified (Ibid.: 124–125). The buckles from kurgan 72 at Berel (Samashev, 2011: Fig. 423; Shulga, 2015: Fig. 47, *15*), elite kurgans of Tuekta I, Bashadar II (Rudenko, 1960: Pl. LXV, *6*; and others), Kastakhta (Stepanova, 1987: 168–183), etc. are the closest to the item from Khankarinsky Dol.

The bridle has been reconstructed based on the attribution of artifacts from kurgan 25 (Fig. 12), and the location of all elements of horse harness found in the burial has been established (Fig. 13). The data obtained supplement our knowledge about the features of the horse harness at an early stage of the Pazyryk culture and in general strongly confirm the conclusions of other scholars.

Conclusions

This study has shown that kurgan 25 at the Khankarinsky Dol cemetery is one of the earliest among the explored kurgans of the Pazyryk culture, not only in the Chineta archaeological microdistrict, but also in the entire northwestern Altai. According to the results of analyzing archaeological evidence and radiocarbon dating, the kurgan belonged to the second half (possibly, the end) of the 6th–early 5th century BC. The presence of the accompanying burial of a horse, a complete set of its harness, as well as socially significant artifacts (a torc, a combat bimetallic dagger, etc.) indicate that the male and female who had a fairly high status in a nomadic society, were buried in this kurgan. A variety of elements of the horse harness discovered in the burial makes it possible to present a detailed reconstruction of the bridle from the early stage of the Pazyryk culture of the Altai.

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The Triquetras from the Filippovka Kurgans, Southern Urals

*The triquetra sign is comparatively rare in early nomadic cultures. It occurs mostly in the steppe area east of the southern Urals, specifically on petroglyphs, metal details on horse harness, bronze mirrors, metal plaques, and felted items. This article describes a series of triquetra signs from kurgans 1 and 4 at Filippovka I, representing the culture of the early nomadic elite of the southern Urals. The burials in which they were found have a "royal" status. Finds include gold onlays of wooden vessels in triquetra shapes, 20 gold argali figurines, and a horse-shaped handle of a vessel. The thighs of animals are marked with triquetras. Of particular interest is an iron sword with a gold-inlaid blade, showing scenes with humans and animals. The triquetra ornament occurs thrice in these inlays. Analysis suggests that the scenes are from Iranian mythology, and that the triquetra marks the *Hvarnah (farn). Similar scenes are found on Sasanian silver dishes, featuring Iranian kings who receive *Hvarnah. The fact that triquetra signs in Filippovka I occur only in "royal" kurgans, and that all of them are made of gold or mark the items made of gold indicates their connection with the symbolism, the use of which was the prerogative of the top-ranking nomadic elite of the southern Urals.*

Keywords: *Early nomads, southern Urals, "royal" kurgans, art, symbolism, triquetra, *Hvarnah.*

Introduction

The sign of triquetra*, known in many cultural traditions of antiquity, occurs relatively infrequently at sites from the Scythian period in the Great Steppe. Specialists most often consider it together with swastikas and "swirl rosettes" (Korolkova, 2009; Beisenov et al., 2017; Dzhumabekova, Bazarbaeva, 2018), mostly regarding them as solar symbols. Archaeological evidence contains both images of triquetras and zoomorphic objects in which the heads or bodies of various animals bear a resemblance to this sign. In the southern Urals, the triquetra is known only from evidence discovered in royal kurgans 1 and 4 at the Filippovka I cemetery (Fig. 1), which includes 31 triquetra images, all made of gold, or appearing on gold items. There were no swastikas at Filippovka I, and "swirl rosettes" were used for decorating only very few elements of a horse harness (Yablonsky, 2013: Cat. 45, 48, 49, 2741). Triquetras appear on gold onlays of wooden vessels, on sewn plaques, and in gold inlays on a sword. Triquetras and "swirl rosettes" in Filippovka I do not show any "points of contact", which makes it possible to focus solely on the triquetra ornament.

*The names of "triquetre", "triquestre", "triskele", "triskelion", "triscelium", "three-beam swastika", "three-beam rosette", and simply "solar sign" can be found in the literature. In using the name of "triquetra" for this sign, we will follow the author of the book "Mif i simvol" (Golan, 1994: 145, fig. 305, 306, 309, 311–313).

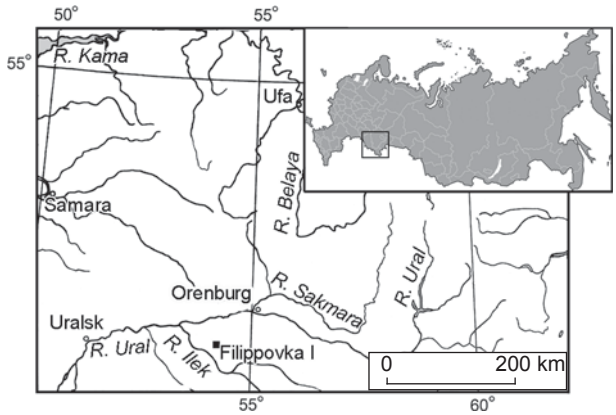

Fig. 1. Location of the Filippovka I kurgan cemetery.

Objects of study and discussion of the results

The evidence from Filippovka I, dated to the interval from the turn of the 5th–4th to the third quarter of the 4th century BC (Treister, Yablonsky, 2012: 284), include the following items with the image of triquetra:

1) Five small flat onlays on wooden vessels in the form of triquetra, kurgan 1, cache 1 (Kollektsii…, 2018: Cat. 540, 582–585) (Fig. 2);

2) An open-work onlay on a vessel, the lower part of which shows the image of triquetra with strongly curved crescent branches, inscribed in a circle and emphasized by holes in the form of "comma"-magatama*, kurgan 1, cache 1 (Ibid.: Cat. 335) (Fig. 3);

3) The hollow handle of a vessel in the form of horse figurine showing the recessed image of a triquetra with the spirally twisted ends of branches on each thigh, kurgan 1, cache 1 (Ibid.: Cat. 466) (Fig. 4, *1*);

4) 20 argali figurines with similar images of triquetra, kurgan 1, cache 2 (Ibid.: Cat. 785–804) (Fig. 4, *2*);

5) An iron sword showing three images of triquetra with the spirally twisted ends of branches on its gold-inlaid blade, kurgan 4, burial 2 (Yablonsky, 2013: Cat. 296) (Fig. 5).

Five onlays from kurgan 1 represent the triquetra, but lack any context. They are small in size, ranging from 1.1 × 1.3 cm to 1.6 × 2.0 cm. On four onlays, slightly curved branches of a triquetra pattern are bent to the right, and on one onlay to the left (see Fig. 2). In fact, they do not stand out from other small onlays abundantly found in this kurgan, which mostly have the form of various curls (Fedorov, 2012: Fig. 13, *5*; 14, *5*). A similar situation has been observed in the antiquities of the Middle Sarmatian period in the Kuban region, where gold sewn plaques in the form of triquetra were only one of many types of plaques (Gushchina, Zasetskaya, 1994: Pl. 54, *6*; Marchenko, 1996: Fig. 11, 72), but because of a large chronological gap between them and the Filippovka onlays, this should be assumed to be a mere coincidence.

The rest of the Filippovka triquetras are explicitly associated with other images, which provides a rationale for identifying their meaning. The onlay with a triquetra inscribed in a circle is flat; its size is 3.8 × 2.5 cm (see Fig. 3). The symbol was engraved; it has a small circle in the middle; the spaces between the branches constitute the holes in the form of "comma"-magatama. The circle with the inscribed triquetra constitutes a single whole with trapezoidal plate, which shows a griffin head with a strongly elongated closed beak without its cere, and two curls behind the back of the head. Several similar images are known from Filippovka I; for example, the image at the end of the handle of a wooden vessel (Kollektsii…, 2018: Cat. 453).

Similar triquetras have been associated with other cultures of nomads inhabiting the eastern part of the Eurasian steppes in the Early Iron Age. A small wheel, the shape of which is similar to the Filippovka design, was found in Northwestern China (Xinjiang), at the Yanbulake cemetery of the 7th–6th centuries BC (Shulga, 2010: Fig. 52, *25*; 81, *32*) (Fig. 6, *2*). Such a triquetra is depicted on a bridle plaque from kurgan 3 of the Tasmola-5 cemetery of the same period (Kadyrbaev, 1966: Fig. 72) (Fig. 6, *3*). Many other metal items show this type of design: it appears on the buttons of Tagar mirrors (Fig. 6, *1*) and plaques (Chlenova, 1967: 85, pl. 21, *1*; Kungurova, Oborin, 2013: Fig. 3, *1*; 9, *1*), but never combined with the image of a bird of prey. Triquetras associated with this image have been found in different regions and in different periods. The best known objects have triquetras ending in all branches in the form of the heads of a bird of prey. Such images have nothing to do with the Filippovka representations. Perhaps only the gold "badge" from kurgan 2 at the Duzherlig Khovuzu I cemetery of the Sagly culture of the 6th–5th centuries BC shows some similarities. The triquetra on that badge is composed of three images representing the head of a bird of prey inscribed in a circle; moreover, these heads resemble "comma"-magatamas in their shape (Grach, 1980: 35–36, fig. 68) (Fig. 6, *4*).

Parallels to the Filippovka triquetra, which are contextually associated with the image of a bird of prey, have been found in the materials of the Pazyryk culture, on the felt decorations of a saddle cover from the Second Bashadar kurgan. The full-face volume of the chest with two griffin representations was rendered by three "comma"-magatamas made of felt of a different color, forming triquetra (Rudenko, 1960: Pl. CXVII, *2*). The direction of the branches is clockwise in one figure, and

*D. Mackenzie calls these signs "three magatamas" (1926: 148–152).

Fig. 2. Gold onlays on wooden vessels in the form of triquetras, Filippovka I, kurgan 1, cache 1 (after (Kollektsii…, 2018: Cat. 540, 582–585)).

Fig. 3. Gold onlay on a wooden vessel with the representation of the triquetra inscribed in a circle (after (Kollektsii…, 2018: Cat. 335)).

counterclockwise in the other figure (Fig. 7). A circle with a triquetra combined with the image of griffin head is very similar to the Filippovka representation.

If the origin of the design with branches formed by the figures in the form of the "comma"-magatama can be easily established (from the steppes east of the southern Urals), the origins of the image of a triquetra with narrow spirally twisted branches, which is the most common in Filippovka I, are not clear. Such signs have sometimes been found on petroglyphs; for example, on stone 40 at the foot of Mount Aldy-Mozaga in the Upper Yenisei

Fig. 4. Gold animal figures with recessed representations of triquetras on the thighs, Filippovka I, kurgan 1.
1 – vessel handle in the form of horse figurine, cache 1 (after (Kollektsii…, 2018: Cat. 466)); *2* – argali figurine, cache 2 (after (Kollektsii…, 2018: Cat. 801)).

Fig. 5. Representations on the gold-inlaid blade of an iron sword (their numbers in linear compositions are indicated), Filippovka I, kurgan 4, burial 2.
11, *12*, *30*, *42–46* – after (Yablonsky, Rukavishnikova, Shemakhanskaya, 2011: Fig. 5, 7, 8); *30a* – after (Yablonsky, 2013: 87, cat. 296).

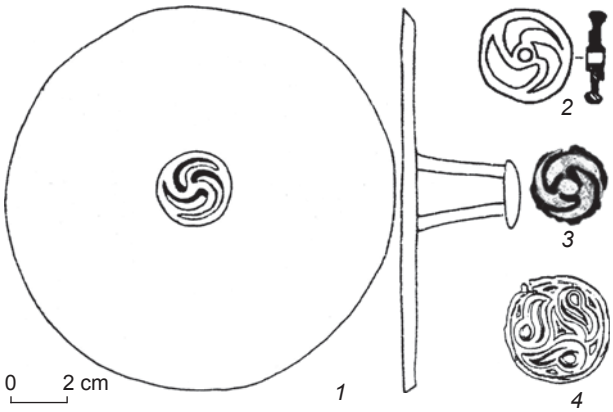

Fig. 6. The sign of the triquetra on items from Northern Kazakhstan and Eastern Siberia.
1 – bronze mirror, the village of Tesinskoye, Minusinsk Basin, Tagar culture (after (Chlenova, 1967: Pl. 21, *1*)); *2* – bronze wheel, the Yanbulake cemetery, Xinjiang (after (Shulga, 2010: Fig. 52, *25*)); *3* – iron bridle plaque with gold inlay, Tasmola-5, Northern Kazakhstan, Tasmola culture (after (Kadyrbaev, 1966: Fig. 72)); *4* – gold "badge", Duzherlig Khovuzu I, Tuva, Saglyn culture (after (Grach, 1980: Fig. 68)).

Fig. 7. Fragment of a saddle cover, the Second Bashadar kurgan, Pazyryk culture (after (Rudenko, 1960: Pl. CXVII, 2)).

River region (Devlet E.G., Devlet M.A., 2005: Fig. 197) (Fig. 8, *II*), but their dating is difficult: they can be both earlier and later than the Filippovka representations. Images of a triquetra recessed into metal, that is, representations similar to the animal figures from Filippovka I, are well known from the Koban culture of the Northern Caucasus, appearing on the shields of semi-oval (segment-like) buckles (Kozenkova, 2013: Pl. 35, *5*, *7*). Despite the great resemblance to the Filippovka representations, they cannot be genetically linked. The Koban buckles date from the 13th to the first half of the 12th century BC (Ibid.: 75) and have only intra-Caucasian parallels (Ibid.: Pl. 35, *10*, *12*).

The sole parallel to three triquetras made of gold on the iron blade of the sword in terms of manufacturing method appears on a bridle plaque from Tasmola-5, yet the sign is of a different type (see Fig. 6, *3*). In a special article on this sword, the authors examined all the human and animal representations in detail. The number, to which we will further refer to, was assigned to each representation. The authors suggest that the compositions revealed on the planes of the blade depict "the legend of the warrior-hero and warrior-sorcerer" (Yablonsky, Rukavishnikova, Shemakhanskaya, 2011: 240). Yet, very little attention in the article was paid to triquetras, whereas from our point of view they played the key role in the narrative. One triquetra twisted clockwise is depicted on the thigh of the predator with clawed legs (see Fig. 5, *11*), which opens its mouth and is trying to grab the deer's muzzle (see Fig. 5, *12*), but, according to the authors of the article, instead, the predator's mouth is threatened by the antlers directed forward. If this is true, what we have here is the extremely rare case of a successful confrontation of a herbivore against a predator. In all other "torment scenes", ten more of which appear on the blade, the predator grabs the prey by its muzzle, which is generally typical of the Filippovka art (only in one composition, the second predator is grabbing the deer by its back). In the image under consideration, the deer's muzzle is indeed directed downward past the mouth of the predator; the bent "neck-muzzle" forms a rather steep arc, as is usually represented in the animals that are not under attack (see Fig. 5, *30*, *30a*). In the deer under attack, this bend is very small (*9*, *17*, *20*, *31*, *39*, *41*) or this line is almost straight (*22*, *24*). The antlers in many figures are poorly preserved. Wherever they are clearly distinguishable, the antlers are bent far back and partially stick straight up; otherwise, they would have interfered with the scene of the torment. The antlers are poorly preserved in the composition under consideration. One antler bent back is visible; one prong sticks up; another short prong is directed forward and down. As far as the forward direction of the prongs, resulting in placement of "antlers in the mouth of the predator" (Ibid.: 233), is concerned, this observation is not obvious, since the incrustation lines seem to be displaced, most likely owing to the poor preservation of the blade in this area. The completely disintegrated representation 35 is located on the corresponding section on the backside of the blade. Thus, "the composition of a deer repelling a predator's attack" (Ibid.) is probably the result of reconstruction flaws, and this is the usual "torment scene". This being said, more complex "relations" between the deer and predator cannot be completely excluded. This is the only scene where a triquetra is depicted on the body of the predator, and maybe it was not done by chance. On the back of the sword, a triquetra then appears on the figure of the deer, and moreover it is twisted in the opposite direction.

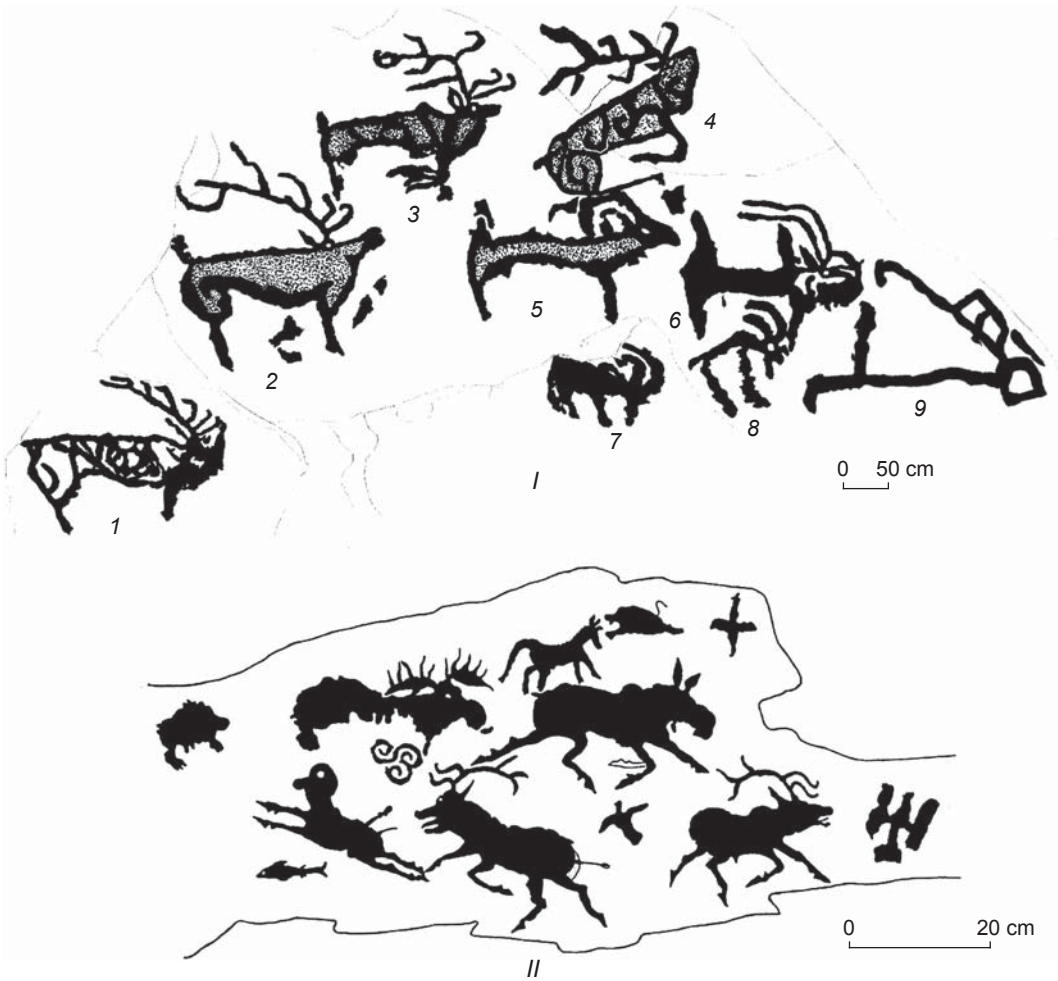

Fig. 8. Rock images with representations of triquetras on animal figures.
I – design on the shoulder of deer leader (*4*), petroglyphs of Mount Kherbis, group 5 (after (Kilunovskaya, 2003: Fig. 7, *4*));
II – a triquetra projected onto the body of male elk, petroglyphs at the foot of Mount Alda-Mozaga, stone 40 (after (Devlet E.G., Devlet M.A., 2005: Fig. 197)).

The image of a triquetra with branches twisted clockwise appears on the free field of the blade of the same sword, between the figures of a deer and a mountain ram, and it touches the deer antlers (see Fig. 5, *30*). The authors of the article even suggest that this sign "is a continuation of the antlers on the inclined deer head" (Ibid.: 235). This seems not to be the case, since the sign is depicted separately, but very close to the antlers. Triquetras located among the figures of animals (mainly herbivores) are a fairly well-known motif among the petroglyphs of the Altai-Sayan region. Sometimes they are isolated from other figures, like for example at Kuilug-Khem (stone VIII) (Devlet, 2001: Pl. 6), but sometimes they directly interact with the figures. In Kuilug-Khem VII, seven triquetras were placed on the stone among the human and animal representations; the two largest triquetras touch the horns of mountain goats (Ibid.: Pl. 4, *3*; 5) (Fig. 9). The motif of touching the triquetra with horns, which is also present on the Filippovka sword, emphasizes that this ornament and the herbivores are attracted to each other. In some figures, a triquetra was depicted on the figure of the animal. For example, in the group of five petroglyphs on Mount Kherbis (Tuva), a triquetra was depicted on the shoulder of one out of four deer, which is located in the highest position, is going forward and upward, and seems to be the obvious leader (Kilunovskaya, 2003: Fig. 7, *4*) (see Fig. 8, *I*, *4*). On stone 40 at the foot of Mount Aldy-Mozaga, in the Upper Yenisei region, an expressive triquetra with the spirally twisted branches was projected onto the figure of male elk approximately in the shoulder area (Devlet E.G., Devlet M.A., 2005: Fig. 197) (see Fig. 8, *II*).

As has been already mentioned, in the evidence from Filippovka I, the image of the triquetra was most frequently found on the figures of herbivores. The fact that this is not simply an ornamental decoration is confirmed by both the design and its location on the thigh of the central character in the composition of a

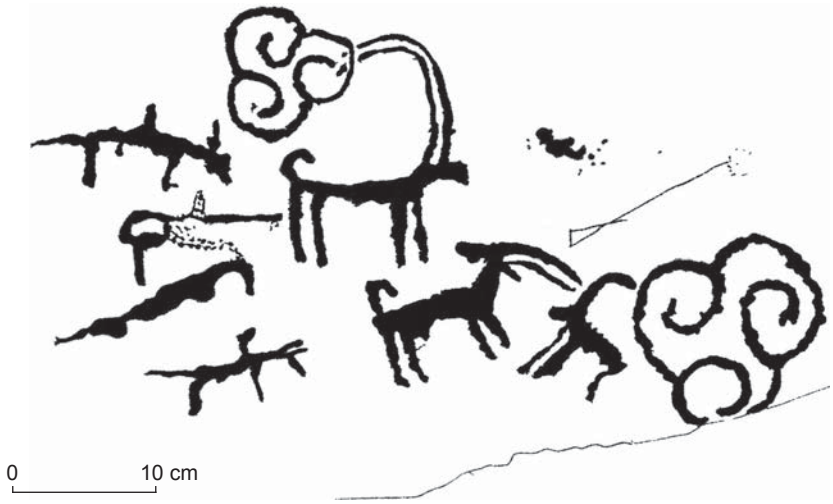

Fig. 9. Representations of mountain goats touching triquetras with their horns, Kuylug-Khem petroglyphs, stone VII (after (Devlet, 2001: Pl. 4, *3*)).

deer sacrifice appearing on the blade of the sword. A clue to the semantics of the sign among the early nomads of the southern Urals can probably be found in this scene. It is hardly possible to doubt that the deer opposing the predator with a triquetra on its thigh in the compositions on the blade, the deer touching the triquetra with its antler, and the deer with triquetra on its thigh, are one and the same animal. The interpretations of the images on the sword that have been proposed so far have been based on the assumption that the main characters in this "story" are human. The "story of the deer with the triquetra" remains virtually beyond the scope of interpretation.

The scene of a deer sacrifice (see Fig. 5, *42–46*) has attracted the greatest attention among all the compositions on the blade of the sword. Two people are grabbing a lying deer, one holding the deer by the leg turned upside down, another by the antlers or ear, and each person is directing forward the other hand with a dagger. The persons who grabbed the deer look alike in every way: they have the same postures, figures, faces, and weapons (daggers and quivers with bows hanging behind their backs). The horses behind each person are also exactly alike. V.G. Kotov and R.B. Ismagil, who suggests that the composition represents the confrontation of two brothers, because the characters point their weapons not so much at the deer but at each other (2013: 80), must have been right in their interpretation. The subject of confrontation between brothers is very typical of many mythologies in the world, including Iranian mythology, where the motif of the righteous protagonist dying from the hand of his evil and envious brother is not uncommon. Yima and Iraj die in this way. Moreover, these events had global consequences: after assassination of Yima, evil triumphed on earth, and the death of Iraj determined the fate of Turan to be the eternal enemy of Iran. In the upheavals of this enmity, the leaders of the Iranians and Turanians sought to seize *Hvarnah, lost by their common ancestor Yima, and fratricides were committed again: Frangrasyan killed his brother Agreras, and Rustam died at the hand of his brother Shaghad*.

The composition of deer sacrifice could have represented the allegory of the struggle between the Aryans and Turanians for *Hvarnah, which was depicted in the form of deer with triquetra on its thigh. Each of the characters is pulling the deer in his direction, and at the same time seeks to hit the other character with a dagger. Chasing and capturing *Hvarnah in the form of a wild, predominantly ungulate, animal is one of the frequent motifs in the Iranian art. For example, Iranian shahs striking various animals (rams, mountain goats, gazelles, wild boars, or lions) were often depicted on Sasanian dishes, and this is the motif of capturing *Hvarnah (Trever, Lukonin, 1987: 56–57). The prey also include deer; moreover, in one composition (a dish from the collection of the Metropolitan Museum of Art), Shah Yazdegerd I hits a deer with a figure on its thigh, consisting of three semicircles, that is, the figure similar to triquetra (Plate…, 399–420) (Fig. 10). We should note that real triquetra on the bodies of herbivores in hunting scenes (for example, on the thigh and shoulder of a gazelle grabbed by an eagle) are also known from Sasanian dishes (Trever, Lukonin, 1987: 115) (Fig. 11).

Therefore, the sword from burial 2 of kurgan 4 presents a kind of "story of *Hvarnah". Lost by Yima, it abides in nature, being sometimes in the sky and sometimes in the depths of the sea. On the blade of the

*In the interpretation of the Iranian mythology, this study follows mostly (Rak, 1998).

Fig. 10. Sasanian dish with a representation of Shah Yazdegerd I striking a deer with a three-partite figure on its thigh, The Metropolitan Museum of Art (after (Plate…, 399–420).

Fig. 11. Sasanian dish with a representation of an eagle grabbing a gazelle. The signs of triquetra are shown on the shoulder and thigh of the gazelle. The State Hermitage Museum (after (Trever, Lukonin, 1987: 115)).

sword, the events happening to *Hvarnah are probably shown in the form of its transition from animal to animal—from the world of darkness (wolf) to the world of light (deer). At the time when *Hvarnah was abiding in the "sun deer", a struggle ensued between the brothers—the Aryan and the Tur. The result of the struggle is not shown on the sword, but contextually it is expressed in the idea that *Hvarnah becomes in the possession of the person holding this sword.

The remaining images of triquetra in the materials of Filippovka I can also be interpreted as a part of the plot related to *Hvarnah. It flew away from Yima in the form of the bird Varagn (eagle, falcon), and in the same guise returned to Traitaunas. The triquetra with the head of a bird of prey on top obviously represents *Hvarnah in this form. In the legend of Ardashir, *Hvarnah accompanied him in the form of a beautiful ram, and then appeared on the croup of Ardashir's horse. This corresponds to the images of triquetra on the figures of rams and horse.

Conclusion

A search for parallels to the Filippovka triquetras has revealed that the main distribution area of the design inscribed in a circle and formed by means of recesses/holes in the form of "commas" in the 7th–4th centuries BC was the steppe belt east of the southern Urals. Rock drawings depicting triquetras, which touch the antlers and are placed on the bodies of herbivores (the features observed in Filippovka I), also appear in the same region.

The origin of the triquetra with the spirally twisted ends, which have been most often found among the materials of the site, is not very clear. Signs with similar morphology are known from the complexes of very early burial grounds of the Koban culture, located far to the west. In the early and classic Scythian culture, and in the antiquities of the Sauromatians inhabiting the Don region and the Volga region, this design seems not to appear at all. Moreover, the triquetra appears nowhere else in the southern Urals, except for Filippovka I. To the east of the Urals, similar triquetras are known only on petroglyphs, the exact dating of which is difficult. Nevertheless, an eastern origin for this type of ornament is more likely than a western origin.

In Filippovka I, the images of triquetra numbering over 30 specimens have been found only among the evidence from "royal" kurgans 1 and 4. These circumstances, as well as the fact that all of them were either made of gold or appeared on gold items, indicate that the design belongs to the symbols only the highest nobility of the early nomads inhabiting the southern Urals could use. The context of the images suggests that the sign of triquetra is a symbol of *Hvarnah. The chief or military leader, who was in possession of *Hvarnah, fell under the special protection of gods and as a result became invincible, invulnerable, and successful. Such an idea could be very popular in the militarized society of the early nomads who inhabited the southern Urals and were oriented in their external relations toward the Achaemenid Iran. The triquetra whose image reached the southern Urals from the eastern regions of the Great Steppe belt, could have been reinterpreted as a symbol of *Hvarnah in the process of contacts with Iran. However, it cannot be ruled out that such notions existed in the nomadic milieux, not only in the southern Urals, but also in the areas located to the east. After studying the semantics of the headdress from Aluchaideng, the Chinese scholar Zhen Ziming came to the conclusion that, "at that time, the tribes in Ordos believed in Zoroastrianism. On this basis, we may speak about various cultural exchanges and ethnic interactions between the nomads of Eurasia along the Silk Road" (Zhen Ziming, 2015: 380). Any assumption that based on the presence of Zoroastrianism in Ordos is certainly too bold, but the fact that the Ordos nomads could have professed some form of pre-Zoroastrian religion, similar to the beliefs of the nomads in the southern Urals, cannot be ruled out. The presence of zoomorphic triquetra among the finds in Aluchaideng (Kovalev, 1999: Fig. 2, *11*) should also be mentioned in the context of our discussion.

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Early Iron Age Carpenter Tools from the Altai and Adjacent Territories

This article deals with the functional attribution of Early Iron Age woodworking tools from the Altai and adjacent areas. Finds come from burials, settlements, and hoards; some are random. The attribution was based on the analysis of traces left by tools on the surfaces of wooden items. The methods were both traditional and special (use-wear, typological, and experimental), enabling one to reconstruct the function of the tool, manufacturing technique, organization of the manufacturing process, technology, and, to some extent, skill. The totality of data suggests that tools were of several types: metal ones used for chopping (celts, axes, and adzes), wooden ones used for striking (hammers, mallets, and mauls), universal cutting and shaving tools (knives of various sizes and profiles), striking and cutting combined tools (chisels), cutting and boring tools (flat drills, reamers, and awls). Results of use-wear analysis in terms of operations (chopping, shaving, and cleavage) suggest that since the Early Bronze Age, three types of processing surfaces with chopping tools have been used: butting, cutting with the grain, and cutting across the grain. Factors affecting efficiency and accuracy of woodworking are discussed.

Keywords: *Early Iron Age, Altai, woodworking tools, tool attribution.*

Introduction

An idea of the methods of manufacturing wooden items and woodworking as an established set or system of sequential actions in the Early Iron Age in the Altai and adjacent territories can be ascertained using the results of comprehensive analysis of all the wooden artifacts, as well as the stone and metal tools with which these artifacts were made. Very few sources from that time have survived. All the wooden artifacts of the Early Iron Age were mostly found at the sites containing permafrost formations. Tools for wood processing were mainly from surface finds and a part of hoards; therefore, they can be connected with a specific time and place only hypothetically.

Primary traces of processing by the blades of tools used by ancient carpenters and wood carvers have survived on the external and internal surfaces of wooden items extracted from the permafrost sites. Use-wear analysis and comparative typological analysis of these items, together with tools from hoards and surface finds, has made it possible to reconstruct the approximate sizes and shapes of working edges, tool blades, as well as techniques and methods of working with them, and distinguish the types of wood processing in the Early Iron Age.

The vast majority of wooden artifacts with traces of processing are finds from the sites of the Late Bronze Age and Early Iron Age (Mylnikov, 2003, 2008; Mylnikov, Bobrov, 2011). Use-wear analysis and comparative-typological research of marks left by various tools and the peculiarities of wooden surface processing indicate the emergence of the main set of woodworking tools at that time. These tools were made of high-quality

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materials that were new for the artisans—bronze and iron. Manufacturing techniques and methods were also improved. It can be assumed that it was exactly in that period that the most important woodworking traditions for this region or culture were elaborated. Owing to large amount of woodwork, labor cooperation intensified, and great opportunities for the development of artisanal forms of production appeared.

Raw materials, processing tools, and a person (a woodworking specialist) form the totality of primary means needed for organizing the production of an artifact—this is a single whole comprising any ancient production process. Each of its components has its own features, which in combination give us clear idea about the emergence of a finished product.

Research methods and materials

A well-ordered system of stages and operations for changing wooden blanks by using all types of tools with cutting edges constitutes the process of wood processing by cutting (Borisov, 1999: 63). In the Early Iron Age, wood processing included several stages; each of them entailed its own set of operations (Fig. 1). Each stage and operation required the use of a specific tool.

The earliest sets of tools for primary and secondary wood processing occur among lithic artifacts from the Neolithic settlements of the Urals. Preparatory or primary wood processing was carried out using axes, chisels, side-scrapers, or saws (blades with notched edges).

A set of tools "for producing finishing and engraving works" (i.e. for secondary finishing) consisted of planes, shaving knives, drills, reamers, cutters, and burins (Usacheva, 1997). The variety of Neolithic stone tools indicates a high level of woodworking, and makes it possible to reconstruct the technology of secondary surface treatment of artifacts and the standard order of main operations in this cycle: rough shaving, scraping-evening, finish planing, carving and engraving, smoothing and polishing (Mylnikov, 2003).

The reconstruction of specific techniques and elements of wood processing in the Early Iron Age is complicated by the fact that the tools of that time have usually been random surface finds or parts of hoards, not associated with cultures (Akishev A.K., 1984: 10; Morgunova, 1994: 167; Mylnikov, 2003; Akishev K.A., Kushaev, 1963: 106–110; Popescu, Antonini, Baipakov, 1998: 262, fig. 389–396). According to E.N. Chernykh, in ancient times, the artisans took great care of their tools; they kept even broken and worn-out tools in fear that "these might deprive them [their owners – *translator's note*] of their skills and power, and send diseases to the whole family clan for disrespecting them" (1972: 196).

In the absence of tools, information about them can be found from their traces on wooden artifacts (Fig. 2, 3). Comparing such marks on archaeological artifacts, experimental samples, and ethnographic items makes it possible to reconstruct the appearance of tools: their shape, width, and the thickness of the working edge, configuration of blade profile, degree of sharpness, and angle of sharpening (Raev, 1976). Information on the location and nature of the marks left by tools, the depth of the marks, and the direction of blade's movement constitute the basis for reconstructing methods and techniques for using this tool, as well as technological operations (Mylnikov, 1999, 2008).

STAGES		
WOOD SELECTION	WOOD PREPARATION FOR PROCESSING	WOOD PROCESSING (PRODUCTION OF AN ITEM)
OPERATIONS		
Selection of wood type Logging Removal of branches Removal of bark Drying	Ripping Splitting Tracing	Cutting Rough hewing Facing Tracing Chiseling Drilling Joining Grafting Corner joining technique Mortise joining technique Bending Lathing Cutting-planing (woodcarving)

Fig. 1. Wood processing in the Early Iron Age in the Altai.

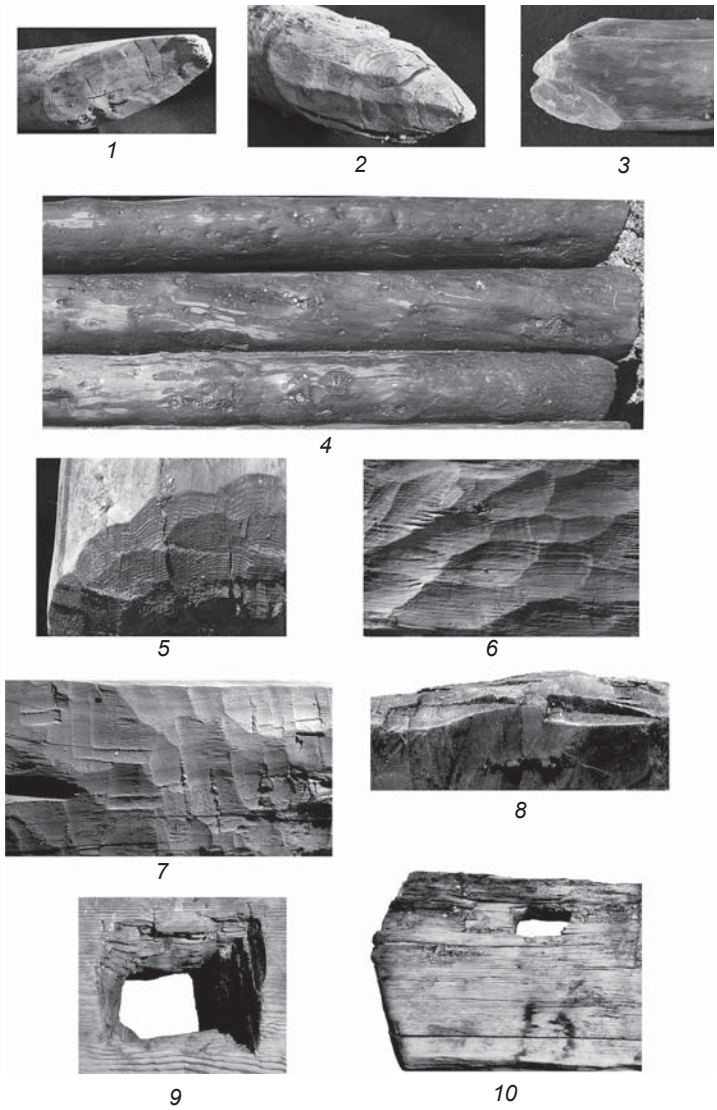

Fig. 2. Traces of processing with metal tools on wooden items of the Early Iron Age. Altai.
1–3 – chopping with axe; *4* – removing bark from logs with axe and adze; *5–7* – trimming with adze; *8* – trimming with axe; *9* – cutting hole with chisel and adze; *10* – cutting hole with mortise chisel and regular chisel.

Experimental studies are very important for establishing the composition of a toolkit. In the Early Scythian kurgan of Arzhan in Tuva, traces of processing have survived on 560 logs of the burial structure, but the tools have not been found. On the basis of results of use-wear analysis of blade marks, scholars have concluded that the logs of the complex were cut using two types of tools—an axe with a blade 4.9–6.1 cm wide, and an adze with a blade 3.5–4.5 cm wide. Technical and technological analysis of their traces has shown that the tools were cast in no less than 72 molds (Nemirovskaya, 1975).

Experimental use-wear analysis of tools and their marks makes it possible to confirm the function of an item and its manufacturing technique, reconstruct the organization of production and technological processes, and to some extent assess the level of skills of an ancient human (Semenov, Korobkova, 1983: 3–5; Volkov, 2000; Mylnikov, 2008: 22–26; 2011: 104–114; 2014: 55–59).

When identifying the types of Early Iron Age woodworking tools from their traces, we used the following definitions: *woodworking tools*—a set of specialized tools for wood processing; *wood processing*—a system of techniques and methods for applying various tools to the surface of wood in order to change its primary shape to the intended volume and size.

Depending on skills and goals, ancient artisans, like modern craftsmen, determined the qualitative and quantitative composition of the tools needed for carrying out a particular technological task. Most likely, a blacksmith or caster made the working parts

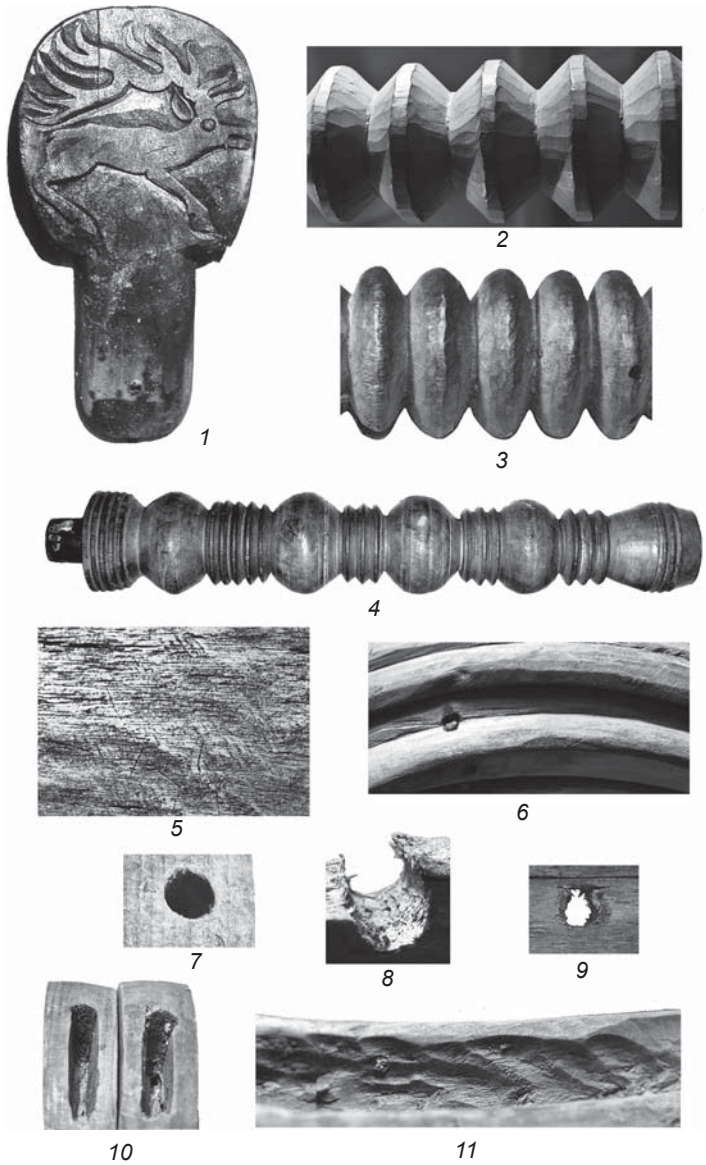

Fig. 3. Traces of processing with metal tools on wooden items of the Early Iron Age. Altai.
1, *2* – carving with knife; *3* – smoothing; *4* – lathing; *5* – scraping (treating with a rasp-like tool); *6* – polishing; *7*, *8* – drilling with bow drill (round metal rod with a bifurcated bit); *9* – drilling with awl with the bifurcated end (reamer); *10*, *11* – recesses cut by chisels with flat and semicircular working edges.

of woodworking tools according to requests and sizes specified by the artisan (this is indicated by the variety of forms, types, and number of elements). Woodworkers carved tool handles out themselves; they adjusted handles to their own hands so it would be possible to carry out any operation as conveniently and effectively as possible. Modern "traditional craftsmen", who work with wood their entire lives, do the same (Tokunaga Kyoko, 1997; Tokunaga Kyoko, Itakura Yoshiko, 1997: 13).

Information about wood processing contained in the studies by M.P. Gryaznov (1950, 1980), S.I. Rudenko (1948, 1953, 1960, 1962), S.A. Semenov (1956, 1957), S.A. Semenov and G.F. Korobkova (1983), K.A. Akishev, G. Kushaev (1963), A.D. Grach (1980), and E.L. Nemirovskaya (1975); the results of our own trace studies and comparative-typological analyses of wooden artifacts with marks of tools; ethnographic evidence; and experimental data suggest that carpenters of the Altai and adjacent territories in the Early Iron Age used the following types of tools for wood processing: chopping, striking, cutting tools and their varieties, piercing and boring tools, and tools of combined action.

Chopping tools – *adzes, celts, and axes* – consisted of wooden handle and metal part with sharp cutting blade of various widths and profiles (Fig. 4, 5). From the Upper Paleolithic to the Chalcolithic, axes and adzes were made

Fig. 4. Double-looped celts (*1–6*), casting mold for making celts (*7*), socketed celt with a hollow (*8*), single-looped celts (*9*, *10*), flat facing adzes with tangs (*11–14*) of transitional period from the Bronze Age to the Iron Age, and of the Early Iron Age. Altai.
1, *2*, *6–14* – Museum of the Altai State University, Barnaul (Radlov, 1896); *4* – Museum of the Siberian Federal University, Krasnoyarsk; *5* – Kyzlasov Khakassia National Museum of Local History, Abakan.

of the hardest types of stone, such as flint, quartz, basalt, or jasper; subsequently, they began to be made of copper and bronze, and from the 6th–5th centuries BC primarily of iron. The iron axe was the most sophisticated tool in terms of its manufacture, and was the most universal carpenter's tool in this category (Zavyalov, 1987: 156; Kolchin, 1953: 100–110; 1985).

For a long time, the celt axe was the most common tool for wood processing (see Fig. 4, *1–10*; 5; 6, *8–11*). Depending on the hafting (orientation of blade in a longitudinal or transverse direction relative to the axis of handle) and the cross-section of the blade, it could be used either as an axe (with a blade symmetrical in cross-section) or as adze (with an asymmetrical blade).

In collections of bronze cast chopping tools, multifunctional celts were identified: single- and double-looped, symmetrical and asymmetrical in cross-section, shovel-like celts, and celt-adzes with a hollow and blade of different sizes and configurations (Bekhter, Khavrin, 2002: Fig. 1, *1*, *2*, *10*, *12*, *14*). Use-wear analysis has shown that the sizes of marks left by celt blades on wooden items of the Early Iron Age in the Altai and adjacent territories ranged from 3.7 to 5.9 cm. Single- and double-looped celts were multifunctional (axe-adze); shovel-like celts and celt-adzes with a hollow were used by ancient carpenters only as adzes. Celts with semicircular back wall and concave front wall, and with semicircular or sometimes crescent blade, were used for removing a large amount of wood when making cavities during manufacturing wooden slabs and blanks for dishware production.

Adzes intended only for trimming were of different types: with oval back wall and flattened blade ("passing" adzes)—for the primary

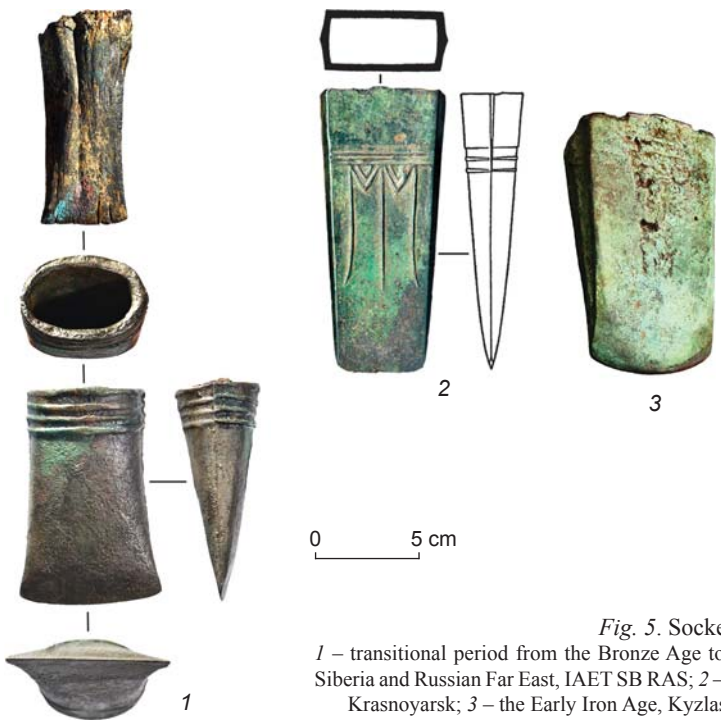

Fig. 5. Socketed celts. Western Siberia.
1 – transitional period from the Bronze Age to the Iron Age, Museum of History and Culture of Peoples of Siberia and Russian Far East, IAET SB RAS; *2* – the Early Iron Age, Museum of the Siberian Federal University, Krasnoyarsk; *3* – the Early Iron Age, Kyzlasov Khakassia National Museum of Local History, Abakan.

Fig. 6. Mortise chisels, chisels (*1–7*), double-looped celt (*8*), single-looped celts (*9*, *10*), and celt with a hollow (*11*) from hoards of the transitional period from the Bronze Age to the Iron Age, 12th–9th centuries BC. Kazakhstan.
1–5, *10*, *11* – (Popescu, Antonini, Baipakov, 1998: 262, fig. 389, 396); *6*, *7* – (Ibid.: 123, fig. 48, 49); *8* – (Ibid.: 184, fig. 50); *9* – (Ibid.: 184, fig. 51).

processing of large planes with a large area of timber, and with a straight back and front walls, and a flat even blade ("facing" adzes)—for treating small areas of timber during final evening and facing of commercial-timber planes during construction and creation of blanks for manufacturing various small wooden household items, as well as for carving (see Fig. 4, *11–14*; 6, *8–11*). The sizes of marks left by the blades of flat tanged adzes were 3.7 × 4.9 cm.

With the development of iron processing skills and techniques in the 3rd century BC to the 2nd century AD, bronze single- and double-looped celts completely disappeared (Chernetsov, 1954: 186). They were replaced by more convenient and efficient tools with open sockets (Soenov, Konstantinova, 2013), as well as shaft-hole adzes and axes made of iron and steel. For dividing large logs into planks (by splitting), wedge-shaped axes were used, looking similar to the present-day splitting axes, with a symmetrical or asymmetrical body in the cross-section. For specialized carpentry, hammer axes were invented, which performed the functions of two tools—axe and hammer (Frolov, 1996; Kiryushin, Ivanov, 1996; Abdulganeev, 1996: 132; Nelin, 1996; Ivanov, Isaev, 1999).

Bronze celts with the body asymmetrical in cross-section, shovel-like celts, and celt-adzes with a hollow were transformed into classic shaft-hole tools: removing, passing, and facing adzes with iron or steel blades of various shapes and sizes. Axes and adzes are also the main tools among modern carpenters.

Striking tools – *hammers*, *mallets* of different sizes made of wood, *mauls* of wood and horn with handles. Ancient carpenters used these as intermediate tools for working with chisels, for fitting the elements of corner joints, etc.

Fig. 7. Chisels (*1–5*), knives (*6–9*), and awls (*10–14*) from archaeological sites of the Early Iron Age of the Altai, Western Siberia, and Kazakhstan.
1–4, *12–14* – Museum of the Altai State University, Barnaul; *5* – Museum of the village of Novoselovo, Krasnoyarsk Territory; *6–11* – (Bolshoy atlas Kazakhstana, 2011: 363, 364).

Combined tools (striking and cutting, driven by striking tools) – mainly metal *mortise chisels* (made of bronze or iron) and rarely *chisels*. These were used for hollowing during production of through and deaf apertures (Mylnikov, 2003), for connecting individual parts of wood and other materials (see Fig. 6, *1–7*; 7, *1–5*). The sizes of chisels' working surfaces were 9 × 25 mm.

Cutting tools – lathing *burins* made of hardened iron or steel (Ibid.). These were used for manufacturing elements of sophisticated profile—stalks for wooden dishes, legs and backs of chairs, and decorations for the wooden chariots of nobles.

Cutting and boring tools – *flat drills* (made of bronze and iron) with manual and bow drives, *reamers* (rods with the bifurcated working part, with pointed edges). These were used to drill through and blind holes of various diameters and depths, in manufacturing a wide range of household and weaponry items.

Universal cutting and shaving tools – bronze and iron *knives* of various shapes, medium-sized and small-sized, most often with a narrow back and a very sharp thin blade (see Fig. 7, *6–9*; 8, *1–15*), small *chisels* with a semicircular or flat blade (see Fig. 6, *1–7*), and *mortise chisels* with a wide flat blade. These were used to prepare the surface by facing the blanks for all types of carving, making recesses, in manufacturing dishware, etc.

Piercing and boring tools – *awls* – thin long round rods of various diameters, pointed at one end, made of bronze or iron, with wooden handles (see Fig. 7, *10–14*). These were used not only for piercing various holes and recesses, but also for marking patterns and profiles on wooden blanks as a drawing or marking tool.

The results of use-wear analysis indicate that as early as the Early Bronze Age in the Altai, craftsmen were skilled at fashioning three types of processing wooden surfaces with chopping tools: butting, cutting with the grain, and cutting across the grain. During experiments, some peculiarities of working with large-sized timber have been identified, which are confirmed by the ethnographic evidence.

The effectiveness of wood processing depends on the sharpness angle of the blade, the inclination angle of the

Fig 8. Knives (*1–15*) and stone abrasive tools (*16–23*) of the Early Iron Age from the Altai and Kazakhstan.
1–15 – Museum of the Altai State University, Barnaul; *16–23* – Museum of the Margulan Institute of Archaeology, Almaty, Kazakhstan.

blade relative to the supporting handle, the chopping angle, as well as the angle of trimming or cutting the wood (that is, the inclination angle of the tool during its operation), the direction of chopping, trimming, or cutting the surface (the height and angle of inclination of the artisan), the width of the working edge of the blade, the shape of the working edge of the blade (oval, semicircular, or flattened), the degree of the bluntness on a tool's blade, the friction of the blade against the timber (shavings), as well as the hardness and elasticity of the timber.

The surface finish of wood is determined by the shape, integrity (preservation), and sharpness of the working edge on the blade of a metal tool; the depth and angle of wood chopping, trimming, or cutting; the amount of applied physical power; the pliability, and the degree of wood desiccation or moisture content.

It was necessary to choose the right abrasive tool for optimal sharpening and straightening of the blades during work, which would ensure a quality treatment of the wood surface. Sharpeners and whetstones were most often elongated rectangular or sub-trapezoidal flattened bars of gray or brown sandstone, mudstone, or steatite. According to the degree of granularity, they were divided into coarse, medium, and fine (Lukas, 1958: 670–680; Theophrastus, 1951: 178). Whole sets of abrasive tools of various sizes and configurations have been found in the burials of the Early Iron Age (see Fig. 8, *16–23*). Whetstones were flat in cross-section and had rounded ends. In the 6th–5th centuries BC, the most valuable abrasives could have been used as symbols of power—wands. They were set in golden hilt-cases decorated with granulation. Given that whetstones have often been found among the inventory, it was previously suggested that they might have been used as amulets (Gryaznov, 1961). However, according to ethnographic research, whetstones served not only as grindstones, but also as a means for healing wounds (Korolkova, 2001: 72, collection 8; Galanina, 2001: 200, collection 177).

When determining the main stages of wood processing, we have taken into account the principle developed by many generations of woodworking specialists: for each specific operation, a tool was primarily used that was specifically designed for that operation. It is possible that in some cases the high degree of skill of individual artisans allowed them to perform several sequential operations with a single tool. For example, construction and house-building among the Ob Ugrians determined the rational composition of the toolkit, certain types of which (axe, adze, chisel, and knife) had been multifunctional since ancient times (Morozov, 1993: 198–199). Using the axe, the present-day carpenters can first cut (fall) the tree, then clear the trunk from the branches, remove the bark, cut the trunk into logs, trim the logs, and split them into planks, using the metal working part of the axe as a wedge; pick with the axe and not with the chisel (the rough cutting of large holes has been known since ancient times) (Semenov, 1956: 210), and even plane small planks, sticks, and pegs.

A comprehensive analysis of a significant number of primary sources with a good degree of preservation, showing numerous traces of blades left by various tools, and the comparative analysis of secondary sources suggest that there were three main branches of woodworking in the Altai in the Early Iron Age: construction, carpentry, and woodcarving. Numerous burial structures made of wood (structures above the cribworks, cribworks, burial beds, etc.), which reflect rich practices for building dwellings and household structures, as well as various small wooden items for household needs, weaponry, and decorations, indicate the use of a variety of specialized tools employed by the artisans for each of the woodworking branches.

Conclusions

Tools for working with timber were one of the main components for woodworking in ancient times. The problem of distinguishing tools for wood processing in the Early Iron Age in the Altai, their identification, attribution, and classification is caused by the fact that woodworking tools, with rare exceptions, have not been found at the archaeological sites associated with a specific culture. Their parallels have been found in surface materials and hoards, and appear among random finds.

To establish the external appearance of tools, reconstruct techniques and methods of working with them, and identify special sets of woodworking tools, one needs to carry out a number of special studies of original sources—wooden items of that time with traces of processing.

Use-wear analysis of processing marks surviving on the internal and external surfaces of wooden items, a comparative typological analysis of indirect sources (metal tools) from the archaeological sites of close chronological periods, random finds and hoards, as well as experimental data from working with replicas of these tools, all serve as a basis for reconstructing each stage and operation of wood processing and the manufacturing of artifact, and hence, for restoring the entire process of woodworking and creating a finished product with the maximum degree of conformity to the prototype.

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A Comparative Analysis of Structural and Developmental Trends at Major Cheptsa Fortified Sites in the Western Urals (Idnakar, Uchkakar, and Guryakar)

This article outlines the findings of interdisciplinary studies at the three largest medieval fortified settlements (9th–13th centuries AD) on the middle Cheptsa River, northern Udmurtia: Soldyr I Idnakar, Kushman Uchkakar, and Gordino I Guryakar. To assess the general trends and characteristic features of their structure and planning, a geophysical survey was carried out, using electrical and magnetic prospecting methods. By correlating geophysical anomalies with excavation findings, two interrelated tasks were completed: reconstructing past events on the basis of archaeological evidence, and assessing the reliability of the geophysical findings. Previously unknown defense lines were revealed at all the sites. Inner layout was virtually linear. Settlement areas (residential, household, and production) were identified. Despite external similarity, the three sites show significant differences in structural and developmental trends. Specifically, at Idnakar and Guryakar, the "annexed" territory protected by a new line of fortifications was used as a household and production periphery. At Uchkakar, this territory was used mainly for residential and household activities, whereas the household and production zone was outside the enclosure. Another distinction of Uchkakar is that the promontory did not reveal the residential, household, or production development zone traditional for Cheptsa settlements. At Guryakar, in contrast to two other sites, an in-depth fortification system was revealed, but no annexed areas.

Keywords: *Medieval settlements, Cheptsa culture, structure, layout, settlements, defense constructions, geophysics.*

Introduction

In the western Urals, the upper and middle reaches of the Cheptsa River represent a unique archaeological region. Over 300 archaeological sites are currently known there. Most of them belong to two chronologically and genetically related cultures, namely the Polom (late 5th to early 9th centuries AD) and Cheptsa (late 9th to early 13th centuries) cultures (Arkheologicheskaya karta…, 2004: 46–64). According to updated data, 143 sites can be attributed to the latter. These sites are distributed over the northern portion of the modern Udmurt Republic. Fortified settlements are located along the banks of the Cheptsa and its tributaries: on promontories between the river and creek, the river and ravine, or near the creek between ravines. Topographic features of the promontories predetermined the uniform structure of the fortifications, consisting of one or several lines of ramparts and ditches, which protected the ground from the external part of the settlement. Cheptsa fortified settlements differ significantly in terms of size, structure, and thickness of their cultural layers. They probably played different roles during the Middle Ages (Ivanova, 1998: 217–224). We will examine three major fortified settlements—Idnakar,

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Fig. 1. Location of Cheptsa settlements.
1 – fortified; *2* – unfortified.

Uchkakar, and Guryakar—as key medieval centers in the Cheptsa River basin (Fig. 1).

To assess the general trends and features of their structure and planning, a geophysical survey was carried out, using electrical and magnetic prospecting methods. By correlating geophysical anomalies with excavation findings, two interrelated tasks were completed: reconstructing past events on the basis of archaeological evidence, and assessing the reliability of the geophysical findings.

Idnakar fortified settlement

Soldyr I Idnakar settlement is located 2 km west of Soldyr village, in the Glazovsky District of the Udmurt Republic. It currently falls within the boundaries of the town of Glazov. The settlement occupies a large promontory of a high bedrock river terrace formed by the Cheptsa and its right tributary Pyzep River. In the east, from the unprotected external part of the site, two large ramparts are visible. The outer rampart delimits the ground, while the medial one divides it into two roughly equal portions (Fig. 2, *c*). S.G. Matveev, who excavated the site in 1927 and 1928, recorded the inner line of fortification, invisible in the landscape. The outlines of the inner fortifications were reconstructed on the basis of geophysical data.

Idnakar was mentioned in records of the 17th century. A.A. Spitsyn (1893: 73–74) and N.G. Pervukhin (1896: 66–70) were the first who described it as an archaeological site. In 1927 and 1928, S.G. Matveev conducted there large-scale excavations, using the method of mutually perpendicular trenches; however, the results of the study were not published. Since 1974, the site has been excavated by the archaeological team from the Udmurt Institute of History, Language, and Literature of the Ural Branch, Russian Academy of Sciences (Izhevsk), supervised by M.G. Ivanova. As a result, all structural elements of the settlements (inner, medial, and outer) and fortification lines were examined (Fig. 3).

Geophysical prospection has been carried out in parallel with excavations, starting from 1992. Resistivity survey and electrical resistivity tomography were conducted in the areas where no excavations were planned: primarily, in the site's northern and southern peripheries (Ivanova, Zhurbin, 2006: 72–74), and then along all three fortification lines (Ivanova, Zhurbin, Kirillov, 2013). In some places, archaeological excavation crosschecked geophysical data (Fig. 3). Thus, almost the entire territory of Idnakar, excluding destroyed areas, was involved in interdisciplinary studies.

As comparative analysis of a variety of data has shown, the layout of the inner and medial parts of the settlement was close to linear. In most cases, long sides of rectangular buildings were oriented along the N-S line. In the outer part of the settlement, no evident regularity in locations of buildings can be observed.

The main trends in the planning of the settlement were identified. In the inner and medial parts, predominantly residential and household buildings were situated (areas *A* and *B*; Fig. 4, *a*; Table 1). Dwellings were concentrated in the center of the settlement, while household and rare production structures were located along the southern and northern slopes of the promontory (Ivanova, 1998: 29–30). Later on, non-residential buildings were found in the area of the destroyed rampart and the ditch of the inner fortification line (Fig. 3; 4, *a*, line 1). According to archaeological data, from not later than the 11th century,

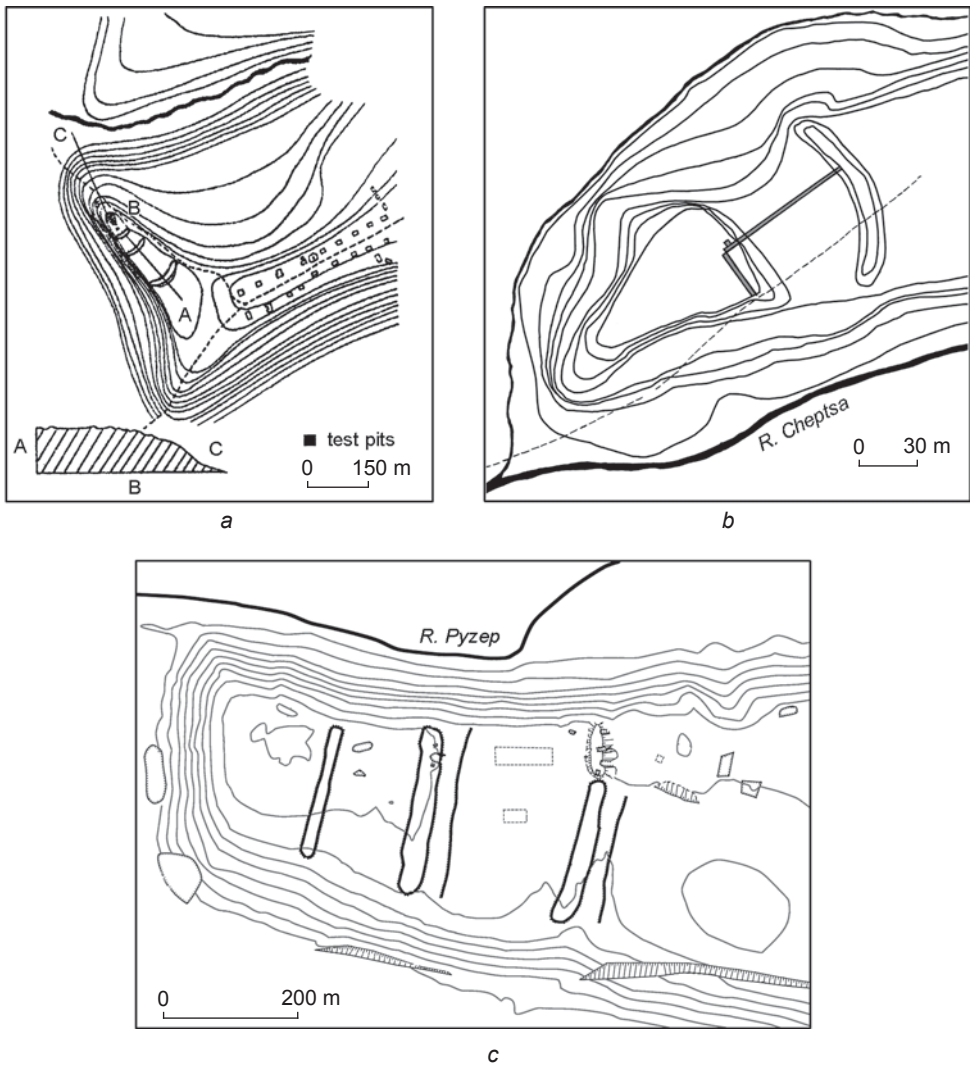

Fig. 2. Plans of the largest fortified settlements in the Cheptsa River basin.
a – Gordino I Guryakar of the 9th–13th centuries (Ivanova, 1998: Fig. 103, *1*); *b* – Kushman Uchkakar of the 9th–13th centuries (Ivanova, 1998: Fig. 103, *4*); *c* – Soldyr I Idnakar of the 9th–13th centuries (theodolite survey by V.I. Morozov, 1993; supplemented by A.N. Kirillov, 2009).

the rampart was flattened and the ditch was filled with clay removed from the top of the rampart (Ibid.: 20–22). After that, this area was actively used. Production structures associated with metalworking were unearthed there. In the boundary between the rampart and the ditch, a hearth and a pit attributable to the 11th century were found. In the outer part of Idnakar (area *C*; see Fig. 4, *a*; Table 1), the cultural layer has almost not been preserved—it was destroyed by long-term tillage. Excavation revealed primarily pits and bases of hearths. Most pits contained implements.

The analysis of changes in the layout of the site indicates common organizational principles. At the final stages of Idnakar use, household areas in the inner and medial parts were located along the slopes. However, as the excavations have shown, household and production structures based immediately on the subsoil preceded dwellings in the medial part of the settlement. Consequently, before the outer defense line (line 3; see Fig. 4, *a*) had been constructed, this area served as the household and production periphery of the settlement, which then was "shifted" to the outer part of Idnakar (Ibid.: 81).

Generally speaking, what we can observe at Idnakar is a gradual expansion of the settlement's area. The boundaries of the "annexed" territory were determined by the new line of fortifications, while the area itself represented the household-production periphery of the settlement. No cultural layer has been recorded outside the outer defense line.

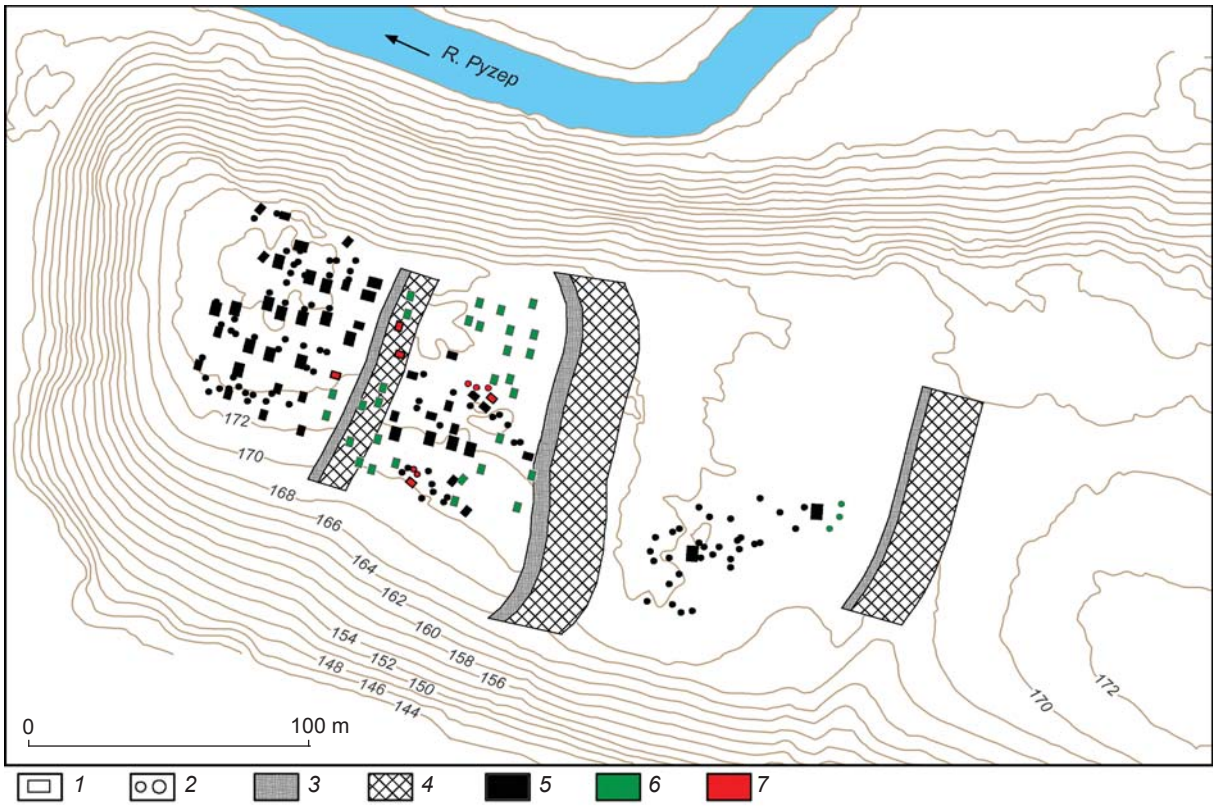

Fig. 3. Structure and layout of Idnakar.
1 – clay platforms; *2* – utility pits; *3* – rampart; *4* – ditch; *5* – features revealed by excavations; *6* – features revealed by geophysical methods; *7* – features revealed by geophysical methods and confirmed by excavations.

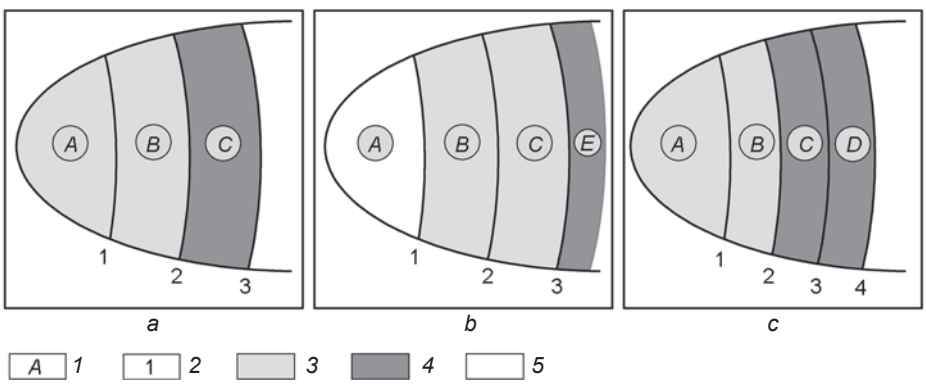

Fig. 4. Schematic representation of the structural and housing trends of the settlements.
a – Idnakar; *b* – Uchkakar; *c* – Guryakar.
1 – designation of structural parts; *2* – fortification lines; *3* – residential and household zone; *4* – household and production zone; *5* – housing strategy unidentified.

Uchkakar fortified settlement

Kushman Uchkakar settlement is the westernmost site of the Cheptsa culture (Fig. 1). It is located on the promontory formed by the river bank and a deep valley of a creek (Fig. 2, *b*). The surface of the site is even, densely covered with turf and high grasses. Two defense lines are visible on the ground (Arkheologicheskaya karta…, 2004: 200–203). The settlement was first mentioned in records from the 17th century. In the early 1880s, Spitsyn examined the site, and in the middle of the same decade, Pervukhin conducted there pilot excavations, made a topographic plan, and bought a large collection of finds from local peasants. In 1930, A.P. Smirnov conducted studies at the settlement and made two mutually perpendicular trenches through the inner ground near the ditch and through the

Table 1. **Housing trends of the settlements**

Settlement	Structural parts				
	A	*B*	*C*	*D*	*E*
Idnakar	Residential and household	Residential and household	Household and production	–	Not found
Uchkakar	Unidentified	"	Residential and household	–	Household and production
Guryakar	Residential and household	"	Household and production	Household and production	Not found

outer part of Uchkakar (Fig. 2, *b*). Twenty constructions were unearthed, including dwellings, storehouses, hearths, furnaces, sheds, and pinfolds. Of especial interest were bloomeries, which were further mentioned by different researchers, including B.A. Kolchin (1953: 30–37). The findings remained long undescribed. On the initiative of Smirnov, they were introduced into scientific use and dated to the 9th–12th centuries, possibly to the first half of the 13th century (Ivanova, 1976).

Systematic investigation of Uchkakar began in 2011. The interdisciplinary research strategy differed from that used in the study of Idnakar. A geophysical survey was conducted throughout the entire territory of the settlement prior to the excavations (Zhurbin, Ivanova, 2018). This provided a preliminary idea about the structure and layout of the settlement. Then, residential and household structures, utility and production pits, and the inner fortification line were systematically excavated (Fig. 5). In all structural elements of Uchkakar, various layout features were revealed. The subsequent comparison of findings from the excavation (relating to less than 2 % of the site area) to the combined map of geophysical anomalies has enabled us to assess the settlement's layout and to reconstruct its plan. In addition, the thickness of the cultural layer and its state of preservation were assessed. For the first time at Cheptsa settlements, an unprotected external part of the settlement was discovered (area *E*; Fig. 4, *b*; Table 1).

The structure of Uchkakar turned to be more complicated than would be imagined from the visible topographic features. The geophysical survey revealed the inner fortification line invisible in the landscape. Excavations supported this finding (Modin, Zhurbin, Ivanova, 2018). As a result, four structural parts of the settlement were identified (see Fig. 4, *b*; Table 1): the inner (area *A*, delimited by fortification line 1, evened in the past); medial and outer (areas *B* and *C*, delimited by fortification lines 2 and 3, visible in the landscape); and the unprotected external part (area *E* outside outer fortification line 3).

The layouts and general trends in construction of the medial and outer parts of Uchkakar (areas *B* and *C*; see Fig. 4, *b*; Table 1) are similar to those of the inner and medial parts of Idnakar (areas *A* and *B*; see Fig. 4, *a*; Table 1). The buildings were arranged in irregular rows. In area *C,* the cultural layer had been almost destroyed by long-term tillage. Only deepened features (about 80 pits) have been preserved (Fig. 5). Excavations confirmed the presence of dwellings in the central part of area *B* (which had previously been detected by geophysical methods), and the presence of deepened household structures of sophisticated construction in area *C*, near the southern slope of the promontory. An identified hearth with a pit could have been used both for heating and for some production purposes (Ivanova, Modin, 2015). The data obtained agree with the results of excavations conducted by Smirnov (Ivanova, 1976). Most buildings revealed by him are residential or household structures (see above). Regrettably, the plans of these excavations have not been preserved. However, since the largest portion of the trench was located in the central part of the outer area of the settlement (Fig. 2, *b*), the provided data agree with the hypothesis that area *C* was occupied mostly by residential and household structures.

In the unprotected external part of Uchkakar (area *E*; see Fig. 4, *b*; Table 1), chaotically located deepened features were recorded. Most of these correlate with bipolar anomalies on the magnetogram, possibly evidencing the pyrogenic infill of the pits (Skakun, Tarasov, 2000; Fedorina, Krasnikova, Mesnyankina, 2008). Excavations conducted in the area of such an anomaly have shown that it resulted from a deepened production structure of a sophisticated configuration (see Fig. 5). Chaotically located smaller depressions (possibly, utility pits) were also found. This situation agrees with the regularities of planning observed in the outer part of Idnakar (area *C*; see Fig. 3; 4, *a*). The principal difference of Uchkakar is the well-developed household-production periphery, located outside the protected part of the settlement.

Another distinctive feature of Uchkakar is the fragmentary layout of its inner part (area *A*; see Fig. 4, *b*; Table 1). This is located on the spit of the promontory and limited by the fortification line, invisible in the landscape

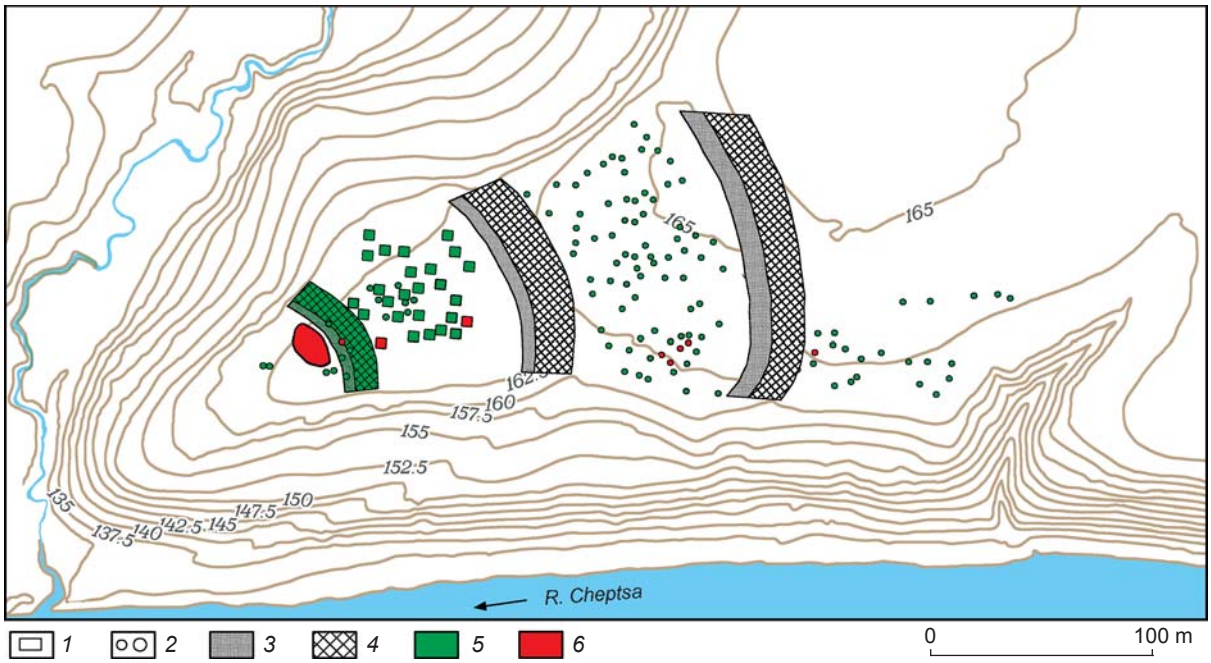

Fig. 5. Structure and layout of Uchkakar.
1 – clay platforms; *2* – utility pits; *3* – rampart; *4* – ditch; *5* – features revealed by geophysical methods; *6* – features confirmed by excavations.

(line 1; see Fig. 4, *b*). The cultural layer is nearly absent in this area. Geophysical survey revealed only some features deepened into subsoil: an ellipsoidal hollow measuring 12 × 20 m and several chaotically located pits 1–2 m in diameter (see Fig. 5). As excavations have shown, the hollow represents a compact group of surface and deepened household structures of a sophisticated configuration (Mezhdistsiplinarnye issledovaniya…, 2018: 63–69). Certain non-contemporaneous structures partly overlap. In addition, several specific features were found. These are stone pavements without traces of thermal impact. They have no parallels at Cheptsa settlements. The unusual layout of this part of Uchkakar and the peculiarities of the revealed features prevent us from reconstructing the housing scheme.

In general, gradual expansion of the settlement can be traced at Uchkakar. New lines of fortifications delimit the "annexed" territory occupied by residential and household structures. The presence of the unprotected external part of the settlement (household-production periphery) and the absence of the dense housing zone in its promontory part constitute significant differences between Uchkakar and other known sites of the Cheptsa culture.

Guryakar fortified settlement

Gordino I Guryakar settlement is located in the eastern part of the Cheptsa cultural area (see Fig. 1). It was first mentioned in records from the 17th century. Despite the relevance of Guryakar to the Cheptsa culture and to the medieval history of Finno-Ugric peoples in general, very little is known about that site. It was examined by N.G. Pervukhin in the 1880s, A.P. Smirnov in 1894, and T.I. Ostanina in 1991. In 1957, V.A. Semenov made a topographic plan of the settlement and dug two test pits (Arkheologicheskaya karta…, 2004: 119–120). In 1979, M.G. Ivanova (1982) conducted the first (and the only) large-scale excavations there. The excavated area, measuring 288 m^2, was situated in the promontory part of the settlement. As at other Cheptsa sites (Ivanova, Zhurbin, 2006: Fig. 3), the central element of the dwellings was a subrectangular platform made of compacted or burnt clay. Dwellings contained utility pits and hearths. A deep pit measuring 12–16 m^2, with steep walls, normally adjoined the platform. Such a pit was filled with heterogeneous humified material with stones, ceramic fragments, coals, fired soil, and decayed organic matter. At Guryakar, most clay platforms are oriented along the NE-SW line. During the interpretation of geophysical data, the combination of these characteristics has made it possible to delimit the complexes of dwellings.

Guryakar occupies a promontory of a high bedrock terrace (Fig. 2, *a*), which is typical of the Cheptsa medieval fortified settlements. From the sloping side of the promontory, the settlement's ground is delimited by fortifications. It was previously believed that there were three defense lines at Guryakar. At present, these are hardly visible in the landscape because of long-term tillage. Interdisciplinary studies revealed another

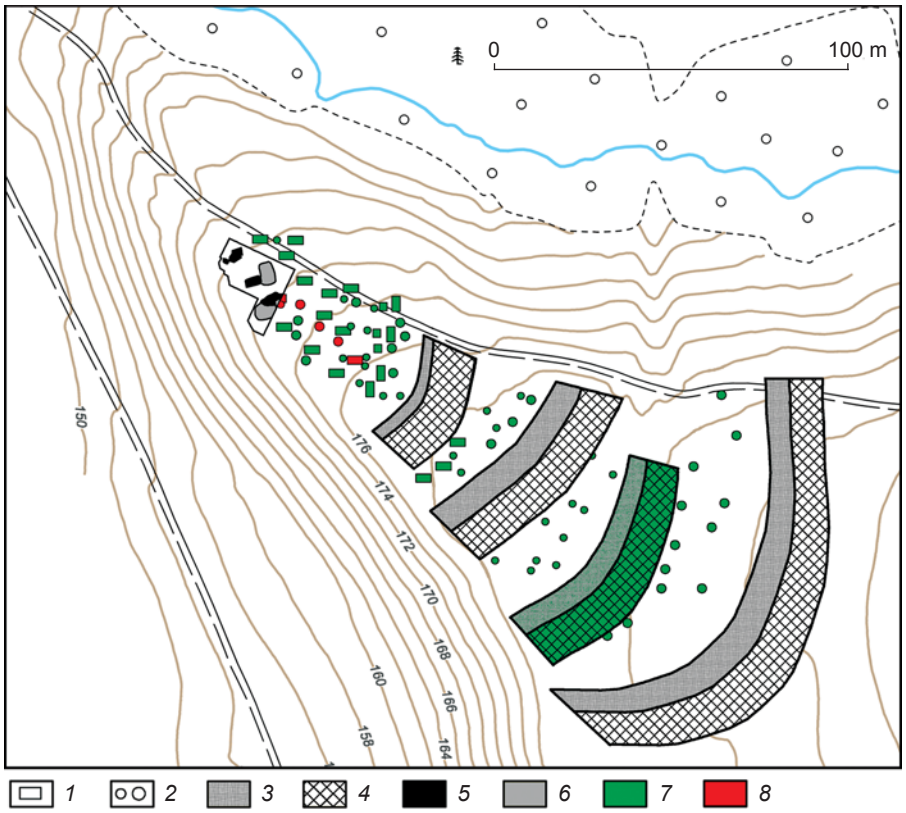

Fig. 6. Structure and layout of Guryakar.
1 – clay platforms; *2* – utility pits; *3* – rampart; *4* – ditch; *5*, *6* – clay platforms (*5*) and utility pits (*6*) revealed by excavations; *7* – features revealed by geophysical methods; *8* – features revealed by geophysical methods and confirmed by excavations or soil boring.

fortification line located between the previously known second and third lines (line 3; see Fig. 4, *c*; 6).

A geophysical survey (resistivity and magnetometry surveys, electrical resistivity tomography) was conducted throughout the entire territory of the settlement, including the area excavated by Ivanova. This provided additional clues for interpreting the totality of geophysical data. In the eastern part of the excavation, a deep pit with large stones (at a depth of 1.0 m from the level of recording) and a platform of burnt clay were partially unearthed (Ivanova, 1982: Fig. 5). The excavated area covers only part of these features. Their juxtaposition with geophysical anomalies adjoining this area has allowed us to correlate them. Such pits and platforms normally belong to residential complexes. Subsequent focused soil-boring revealed three other utility pits and a clay platform, as well as ramparts and ditches of all four fortification lines (Fig. 6).

Analysis of geophysical data and the results of soil boring has made it possible to assess characteristic features of the layout and general trends of the settlement's planning. A dense zone of residential and household construction supposedly existed on the promontory part (area *A*; see Fig. 4, *c*; Table 1). Three rows of structures, oriented along the promontory's axial line, can be traced. Excavations revealed several other constructions (Fig. 6). In area *B* (see Fig. 4, *c*; Table 1), buildings were arranged along the fortifications. Obviously, there were not only residential, but also production structures: a group of large pits with pyrogenic infill was recorded along the inner border of fortification line 2 (see Fig. 4, *c*; 6). In areas *C* and *D* (see Fig. 4, *c*), no clay platforms were found. In these areas, mostly pits filled with fire-affected soil are present (see Fig. 6). These features were probably associated with household or production activities. They were also located along the defense constructions.

In contrast to Idnakar and Uchkakar, the residential area at Guryakar remained within the boundaries of the protected part (area *A* and, possibly, *B*), despite repeated expansions of the territory. In areas *C* and *D*, the geophysical survey revealed some deepened features supposedly associated with fire-hazardous production activities. As at Idnakar (in contrast to Uchkakar), the unprotected external part of the settlement was not identified.

Table 2. **Parameters of structural parts of the settlements**

Settlement	Number of fortification lines	Distance between fortification lines, m	Housing area increase (times) at different stages	Initial / total housing area, m^2
Idnakar	3	1 and 2 – 60 2 and 3 – 100	2 2.1	6150 / 26,300
Uchkakar	3	1 and 2 – 65 2 and 3 – 80	3.8 2.2	2250 / 21,800
Guryakar	4	1 and 2 – 15 2 and 3 – 25 3 and 4 – 25	1.5 1.3 1.6	2400 / 7400

Conclusions

Interdisciplinary studies at the three largest fortified settlements of the Cheptsa culture (Idnakar, Uchkakar, and Guryakar) have made it possible to assess their boundaries, structure, and layouts. At each site, a specific research strategy was used. The reconstruction of Idnakar was based on a comparative analysis of findings from large-scale excavations and from geophysical surveys. At Uchkakar, pilot excavations of separate features were carried out using the map of geophysical anomalies, spanning the entire site area. At Guryakar, the structure and layout were assessed by a comparison of the totality of various geophysical data with the results of focused soil boring and earlier excavations. In all cases, the extrapolation of geophysical findings ensured a high accuracy for the archaeological reconstruction.

Various approaches combining geophysics with archaeology revealed previously undetected fortifications (cf. Fig. 2 and Fig. 3, 5, 6), and also shed light on the layout and housing trends of each structural part of these Cheptsa settlements, which were similar in appearance, but different in essence (see Fig. 4; Table 1). At Idnakar and Guryakar, the "annexed" territory, protected by a new line of fortifications, was used as a household-production periphery. At Uchkakar, this territory was used mainly for residential and household construction, whereas the household-production zone was located in the unprotected external part of the settlement. Another important difference at Uchkakar is the absence of residential, household or production zones on the promontory part, which were typical of Cheptsa settlements.

Interdisciplinary studies also allowed the dynamics of Idnakar's, Uchkakar's, and Guryakar's development to be assessed (see Fig. 4; Table 2). Notably, the table indicates the net surface area of the settlements' parts: those which could have been used for residential, household, or production structures (excluding the territory occupied by ramparts and ditches). These data clearly demonstrate the differences in expansion of the habitable territories. New fortification lines at Idnakar and Uchkakar (see Fig. 3 and 5) increased the settlements' area at least twofold. The "annexed" territory was intensely used as a residential and household zone. Both excavations and the geophysical survey show dense housing there. Thus, at Idnakar and Uchkakar, the construction of another fortification line, defending a newly developed territory, can be regarded as evidence of a new stage in the evolution of the settlements. At Guryakar, the width of the "annexed" territory does not exceed 25 m (see Fig. 6), and the size of the protected territory increases by half at most (Table 2). It can be tentatively proposed that at this settlement, an in-depth fortification system was created, without expanding the site's area.

Interdisciplinary studies provided rich information for a comparative analysis of the structure and layout of all three key fortified settlements of the Cheptsa culture Despite their external similarity (topographic characteristics, large area, thick habitation layer, several fortification lines, etc.), Idnakar, Uchkakar, and Guryakar show substantial differences in structural and housing trends.

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Ancestors of the Oriental Horse in Eurasia: Origin and Distribution

This study discusses the origin and dispersal of the Oriental agile horse, using a range of data—historical, faunal, genetic, and iconographic. It focuses on the Akhal-Teke horses as the model breed of the Oriental horse. Their unambiguous ancestors were horses ridden by the Pazyryk chieftains (400–200 BC). Findings about the Oriental horses, based on the analysis of the Akhal-Teke and Pazyryk breeds, are compared with osteological and iconographic data relating to horses from adjacent territories. This paper looks at horse breeding in Iran and at the Nisaean breed—the earliest one mentioned in written sources. Using the criteria outlined by the prominent Russian horse expert W.O. Witt, the exterior of the Oriental horse is described, and its homeland and dispersal across the neighboring areas are reconstructed. The likely homeland was Central Asia from the Caspian coast to Fergana, and the time of origin is between the beginning of horse riding and military campaigns. The Oriental horse was possibly an outcome of a cross between the domesticated horse from the Middle Volga and the tarpan of the Eurasian or Asian steppes.

Keywords: *Oriental horse, Akhal-Teke, Nisaean horse, origin, distribution, Eurasia, Middle East, 1000 BC–1000 AD.*

Introduction

This article considers the appearance of the agile horse breed referred to as "Oriental" early in Greco-Roman sources, which undoubtedly suggests its oriental origin with respect to Europe and the Middle East, in the Old World. An excellent description of the exterior of ancient, Oriental, agile, noble horses based on iconographic materials is given by professor W.O. Witt: "We can see a rather large, slender, lean horse with a high-set neck, a well-bred head, and well-developed withers. An artist tries to express the horse's vivid temperament and depicts it as striving forward, light-legged, standing on somewhat thin, lean legs" (1937: 12). However, as concerns the historiography of the Oriental horse (*Equus orientalis*), we shall start from the 5th century BC, from the works of Herodotus, the father of history. He was the first to talk about fast, large horses of the Median Niseya breed, without calling them "Oriental", but emphasizing the eastern location of these horses. In the opinion of outstanding Cambridge hippologist M. Levin, "Oriental horses, obviously, from Southwestern Asia, judging by the available data (meaning genetic data – **V.K.**), were primarily imported to Egypt about the 16th century BC" (Levine, 2006: 199). Consequently, before that, at least in the 2nd millennium BC, or even earlier, Oriental horses had already existed in Southwestern Asia. Thus, we obtain genetic confirmation of the fact that the agile horses so vividly described in the Rig-Veda and Avesta, which were called "heavenly", "supernatural", Nisaean, "blood-sweating" horses by ancient authors, were used in chariots and for horseback riding even by Indo-Europeans during their migrations from the Eurasian steppes to the south and southeast up to the Middle East and India.

Within the 5th–4th centuries BC, Xenophon, an unrivaled expert on horse breeding, mentioned in

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"Cyropaedia" that, being the heir to the Persian throne, Cyrus, while visiting his grandfather in Media during the days of his youth, devoted himself to achieving success in horse riding; Xenophon justly considered the Median cavalry to be "the best in the world" (1976: 16, 27).

Many ancient authors talked about the advantages of Oriental horses, which is emphasized by E. Houël in his book summarizing the history of horses in the middle of the 19th century: "Persian horses were most famous throughout the entire period of antiquity for the beauty of their form, gracefulness, energy, and all of those rare qualities, for which Oriental horses are renowned in the highest degree. Ancient historians describe them as being superior to all others in their proud and graceful posture and softness of movements. They semi-squatted on their hind legs, having a light front. Their swan-like necks bear an elegant head, gracefully curved in the air or coiled up against the breast. Their movements were rhythmical and their pace was tremendous" (Houël, 1848: 178). Strabo (several centuries after Herodotus) mentions famous Nisaean Oriental horses "that were used by kings as the best and largest ones" (Strabo, 1964: 495), while it is important to bear in mind that not only Media, but also Armenia was their formative hotbed; consequently, the area of the Nisaean breed, as well as the role of Oriental horses in the global horse breeding, considerably increased over the course of nearly five centuries. Subsequent to Nisaean horses, Bactrian and Parthian, and after them Alanian (the favorite saddle horses of Roman emperors), became equally famous.

In the domestic historiography, works of our great encyclopedist and hippologist Witt became the starting point for posing and solving the issues surrounding the role of the Oriental horse in the horse-breeding cultures around the world. It is precisely his studies that are foundational for considering the problem specifically addressed in this article. Among the horses of antiquity, we distinguish agile horses like the racers of Akhal-Teke breed. Only after the publication of Witt's 1937 paper was the myth of the Arabian as the most ancient breed dispelled. The author has proven that the Akhal-Teke breed "contains the last drops of the pure blood that generated all of the riding-horse breedings in the world" (Witt, 1937: 12). In his next paper, Witt (1952) substantiated a hypothesis that Pazyryk horses had been bred in the Altai by introducing the blood of true-bred Central Asian Oriental racers. It was not accepted by all paleo-zoologists (see (Tsalkin, 1952)); however, new materials from Pazyryk kurgans reinforced this hypothesis (Grebnev, Vasiliev, 1994; Vasiliev, 2000).

In order to consider the origin of Akhal-Teke horses in a professional manner, tracing their history back to remote ages, it is necessary to evaluate the specifics of the materials we handle. We have the characteristics of the modern Akhal-Teke horse as a representative of the breed: exterior, height, basic body measurements, coat colors. We know its features such as pace, activity, endurance, attachment to the owner (humanality), long and short racing records. Also, we have osteological data analyzed by experts in the Akhal-Teke breed and measurements of modern Akhal-Teke horses, as well as their genetic makeup for today.

Research methods

So, against what should we compare data on the Akhal-Teke horses, going far back in the ancient history? First of all, these are osteological collections from archaeological excavations, where the starting point of comparison will involve the head size and profile, the degree of thin-limbedness, the height at the withers, and the relative length of legs and body. Analysis of statistical characteristics of the body composition type allows getting an idea of the horse use and establishing its connection with earlier and contemporaneous horses. Studying the osteological data, paleo-zoologists can assess the exterior, height, and the degree of ride-ability. Our possibilities can be considerably expanded by referring to extensive iconographic materials starting from the Paleolithic cave paintings to the pictures of recent past: these include the monumental sculptures and figurines, petroglyphs and paintings in palaces, terracotta artifacts and images on ceramics, etc. They also allow the exterior, coat color, height, gait, and degree of ride-ability to be characterized. Written artifacts deepen our understanding by introducing the necessary temporal and spatial confinedness. All the above groups of sources require a professional approach. This is a subject of special examination and comparison, while our purpose is to reveal all milestones in the prolonged prehistory of horses belonging precisely to the Akhal-Teke breed in steppes, table- lands, and plains of Eurasia. Like an archaeologist who, when setting out to reach the most ancient layers, should study all later strata at first, the researchers of the Akhal-Teke breed goes further and further to the ancient times, starting from consideration of Turkmen horses of today and yesterday. Before comparing horses of various epochs to find the features suggesting that they are ancestors of the Akhal-Teke horses, let us characterize the modern Akhal-Teke horse.

The Akhal-Teke horses

The Akhal-Teke horse's head is small, chiseled, light, lean, with a straight profile or, rarely, arched face; the eyes are big, speaking, severe and burning, bluish-black, or, sometimes, sandy-yellow; the neck is long, thin, with a good swan-like bend, sometimes "deer" with an Adam's apple (Fig. 1, 2*). The distinctive features are a vertical

*Fig. 1–3 – photos by Y. Kuznetsova.

Fig. 1. Tykma-Serdar, a brown bay stallion of the Akhal-Teke breed, born in 2006 (Stavropol stud, Russia). World champion in 2009.

neck-carriage, especially at clipping gaits, and a set of the head at an acute angle, which are absent in other breeds and create an unparalleled beauty and a proud posture. Ears are small, perfectly-shaped, very mobile. The whole appearance is dominated by long lines, by which the Akhal-Teke horses are reminiscent of ancient engravings depicting first pure-bred horses in England, ascending to them. The extremities are lean, strong, with well-defined tendons, correct pasterns, very strong and tidy hooves. The Akhal-Teke horses are distinguished by a variety of coat colors, including those rare for other breeds: these are golden or purple-bay, pink-palomino (the sunrise color), gray, bluish-black and chestnut. Another special feature of the Akhal-Teke horses (which can be also seen in ancient images) is their surprisingly natural movements: a low, light and flying wide trot, a smooth floating gallop, flat and powerful jumps along with a high agility and vigor. Always being efficient, they know only one owner and always protect him against people and animals. We can see this incomparable racer in Nisaean horses of ancient Iran, "blood-sweating" Central Asian horses in China, "Oriental" horses in Greece, "Alanian horses"

Fig. 2. Khalal-Khon, a cream stallion of the Akhal-Teke breed, born in 2013 ("Uzbegim" stud, Uzbekistan). Uzbekistan champion in 2016.

Fig. 3. Gokkhan, a modern representative of the Iomud breed, a successful participant of long-distance endurance riding in Turkmenistan.

in Rome and West Europe, Central Asian Argamaks of those peoples that made efforts to breed and train the "supernatural heavenly fast horse" (Fig. 3).

Genetic data

Currently, genetic data obtained from the horse bones found at archaeological sites can be used to analyze the role of ancestors of the Akhal-Teke horses. This requires major preparatory work to select diachronous osteological materials stored in the museum holdings, university and institute centers. For nearly half a century, studies of the gene pool of Akhal-Teke horses have been conducted in the All-Russia Research and Development Institute of Horse Breeding under the supervision of T.N. Ryabova. During this time, the DNA microsatellites of 2024 Akhal-Teke horses from all over the world have been analyzed. It has been established that the Akhal-Teke breed is notable for a wide range of alleles and a great genetic diversity (Khrabrova, Ryabova, Ustyantseva, 2012). Genetic proof of the old age of this breed has been obtained. Successful future comparison of diachronous ancient horses with modern specimens of Akhal-Teke is ensured by the fact that the latter have certain genetic markers inherent in them alone. The resemblance between this breed to the Tuvinian and Khakassian horses can be traced according to some rare alleles, and to the Bashkirian and Transbaikalian horses according to others, which is indicative of either their common ancestor in ancient times or, rather, their genetic relations. A more accurate definition will become possible based on the results of studying genomes of ancient horses taking into account spatial and temporal characteristics of fossil materials (whether they belonged to mountain or steppe areas).

Akhal-Teke horses and horses of the Pazyryk chieftains

What may be said about the ancestors of Akhal-Teke horses? The archaeologists were lucky twice. First, in the 1920s and later, S.I. Rudenko and M.P. Gryaznov discovered the frozen graves of Pazyryk chieftains from the 4th–3rd centuries BC in the Altai Mountains. Second, foremost Russian hippologist, (practitioner and theoretician of horse breeding), one of twentieth-century Russia's last encyclopedists, W.O. Witt, participated in these pre-war field works. Witt was given the possibility to prosect an Altai chieftain's horse buried in a grave,

so it would be relevant to quote a large extract from his first article on this subject: "The grave was in the grip of permafrost… and the corpses of horses and all the details of their caparison, as well as the trappings that accompanied them to the grave… were frozen in centuries-old ice blocks. Our interest, as hippologists, in the caparison items, saddles, and bridles gave way to the great interest aroused by the horses themselves, which look at us from out of remote ages and millennia past as witnesses to long-gone historical epochs. <…> A chestnut horse from an Altai Scythian's grave is a noble riding horse of antiquity, a war-horse of Central Asia, immortalized in the images created by great artists of Assyria, Egypt, and Hellas. Particularly striking is the fact that the Scythian horse had the cultural appearance of a horse that was looked after, fed with grain, cleaned, and groomed, and that was taken care of to a old age, since the chestnut horse is older than 20 years. <…> The horse's hair has still not tarnished; the coat color, though autumnal, has a warm tone with a slight golden tint. <…> The chieftain's chestnut horse is at least 150 cm tall. Its head, though rather big and somewhat arched, is lean and nice; the neck is long and high-set, the main hair is cut and gripped on both sides with a special main holder; the withers are high, as befits a riding horse; the back is rather short; its legs are lean; perfect in terms of bones and rather long with respect to the body, its fetlocks are extremely small, almost absent, while the hooves are strong and small; the tails are bobbed originally… in a manner we can see in a number of ancient images. <…> In what way did these large, thoroughbred, fast horses come from Central Asia to distant Altai? Most probably, the Scythian nomads of Altai could obtain such horses by way of exception, as the highly valued spoils of war taken from southern neighbors. Possibly, horses of such a breed were also bred in remote northern areas, in a small number of stud farms belonging to chieftains. <…> Still, the most probable explanation of the penetration of these horses into remote northern areas is by way of war and spoils" (Witt, 1937: 22–23). The descriptions made by Witt and, what is more, the conclusions he made based on this paper, which launched an entire body of literature about the Pazyryk horses, are invaluable for us. Suffice it to say that two very important articles were issued in 1952: one of them was written by Witt, and another one by a prominent paleo-zoologist engaged in publishing osteological collections of the Institute for the History of Material Culture (the Institute of Archaeology) of the USSR Academy of Sciences, V.I. Tsalkin. The latter was devoted to studying osteological materials obtained as a result of excavations of Altai kurgans by S.V. Kiselev. We are most interested in the views of Tsalkin on the Pazyryk horses, among which he, subsequent to Witt, distinguished a local breed of the Kazakhstan and Siberia northern steppes, as well as taller horses having "a common constitution and exterior features of a riding horse. They had relatively small heads, long necks, short withers; their tail, as distinct from the horses of northern type and working breeds, is high-set and not long. Tubular bones are thinner and more elongate than in steppe horses… pasterns are longer. A number of common craniological features make them similar to the modern representatives of riding breeds having southern origin—Turkmenian and Thoroughbred horses" (Tsalkin, 1952: 147).

A large summarizing article by Witt was devoted to the interpretation of osteological material from all Pazyryk burials known by that time. In this article, the author revised his point of view on the Pazyryk horses: based on the statistical analysis of the osteological material he came to the conclusion about a single breed, for Altai, of the Pazyryk period, including horses of a different height at the withers (Witt, 1952).

Summing up Witt's studies of Pazyryk horses, V.P. Alekseev emphasized that the latter differentiated "two combinations of features in them: 1) a scrubby horse, with a rather rough exterior and resembling modern Altai, Buryat, and Mongolian horses; 2) a large horse, with an obvious riding form, and a ceremonial golden-red coat color… they were bred at the location, by crossbreeding with the local horse, and facilitated its improvement. Though, in general, he does not deny the Central Asian origin of tall true-bred horses from the zone of developed civilizations of the Middle East, which is most important and turns out to have a basis in fact" (1990: 162). Developing this thought, the author pointed out that "the representatives of aristocratic tribal elite used horses looking much like modern Akhal-Teke and Arabian horses for horseback riding in the mountain areas of Altai" in the Early Iron Age (Ibid.: 163). It is highly significant for us that Alekseev recognized the great role of the Central Asian Argamak, which had provided the basis and remained a breed improver, in formation of the Pazyryk horse. That is why the Altai nobles had more well-bred and tall horses. These horses were kept in good conditions and were derived from more well-bred parents within a single breed of Pazyryk horses from the 4th–3rd centuries BC.

The role of horses in the life of Altai population was also described by N.V. Polosmak: "Excavations of average-size mounds in Ak-Alakha I (1990) and Kuturguntas (1990) have shown that horses were the main wealth of people buried there… Among the horses that accompanied the people buried in the middle kurgans near the Ak-Alakha River, some exceeded in size the tallest horses from the Pazyryk kurgans. The presence of well-bred horses in the "royal" and middle kurgans of noble warriors suggests that they were not such a "black swan" for the Pazyryk people" (1994: 80). In the annex to the above-cited

monograph, I.E. Grebnev and S.K. Vasiliev use new, statistically processed, major material to show that "all horses found in the burials of the Pazyryk culture-bearers belong to the same breed" (1994:109), thus confirming the concepts of Witt, put forward in 1952. This is considered in more detail in an article by Vasiliev who "makes an attempt to establish a systematic position for the Scythian horse and its phenotypic features at a new level, and to trace the transformation of the Altai horses over time to find out whether horses from the burials of nobles and common Pazyryk people were different" (2000: 237). Graph plotting the average proportions of horse metatarsal bones proved to be new. They have shown the maximum resemblance of Altai horses to the *Equus* ex.gr. *gallicus*, with a greater gracileness in the structure of the metapodium bones of the first ones. As the author supposes, "the Holocene descendants of these horses (*Equus* ex. gr. *Gallicus* – **V.K.**) served, most probably, as a breed for domestication, which presumably took place for the first time in the Northern Black Sea Region in the 4th millennium BC" (Ibid.: 241). It should be clarified that earlier Vasiliev called this probable descendant the "Western Siberian tarpan". The proposed hypothesis on the origin of Pazyryk horses adds further credence to the Oriental (with respect to Europe) origin of the large, well-bred, and agile horse that we can see in the Pazyryk horses being similar in many characteristics to the modern Akhal-Teke breed.

Ways to study Pazyryk horses

It is a very complicate task to trace the ancestors of Oriental horses, knowing only the end point of the process in the form of Akhal-Teke horses of Turkmenistan, as well as an intermediate one in the form of Pazyryk elite horses of Altai of the 4th–3rd centuries BC, substantiated both paleozoologically and archaeologically. The task began in the middle of the 20th century by Witt, who relied upon the materials that were available at that time. The results of research on these materials have increased since Witt's era. The research path, proposed on the basis of historical and iconographic parallels, is subjective and, possibly, non-optimal; besides, it requires that a team of specialists expend their efforts. First, we need to know the starting point in time and space. As for the location, there is a good chance that this point might be found in Central Asia, obviously the Pre-Caspian area, and Western Siberia. The latter is confirmed by the name "Oriental horse" (*Equus orientalis*) known to the Greco-Roman sources, as this animal was an Oriental phenomenon relative to the ancient metropolitan territory.

Now, with respect to the period when agile horses became necessary for people: the horse was first domesticated in the Middle Volga area in the 5th–4th millennia BC as a meat-producing animal. Its agility was rather a hindrance, because it is easier to keep a relatively more phlegmatic horse, such as the "Kazakh," to which A.G. Petrenko compares the domesticated Middle Volga horses (2007: 29). Consequently, the need for fast, large, and persistent riding horses was an incentive for breeding an agile racer. Such a horse should have appeared when people started hunting wild horses, i.e. as early as the first stage of their domestication. However, these are just the logical prerequisites, and there are no indisputable facts confirming that horseback riding in the steppes preceded the use of horses in chariots at our disposal. Nevertheless, from our point of view, the necessity of hunting wild horses for obtaining meat in the Eurasian steppes engendered a need for horseback riding and, as swift-footed tarpans inhabited the steppe area, fast horses were required (Kovalevskaya, 1977: 12–13).

The historical period when the nomads, warriors, and hunters needed agile horses coincides with the domestication of horses as riding (and not chariot-pulling) stock. Since such innovations spread with lightning speed, this took place everywhere, though sporadically, in the last quarter of the 2nd millennium BC, and in a massive way as early as in the 1st millennium BC. Huge droves of tarpans grazed in the Eurasian steppes. While hunting, it was possible to separate a wild colt, tame it, and subsequently mate it with a domestic horse already able to serve people. By that time, horse-bridling methods had been improved, and taming horses, as we have written earlier, had achieved astonishing success. Having outlined the space-time framework for the necessity of using agile horses, let us consider the available facts based on specific materials. And, as it is subordinate to the geographical principle, let us start with the territories that are the most closely adjacent to Central Asia.

The horses of Iran

The famous Nisaean horses, notable for their outstanding qualities, are known precisely in the Iran territory. "These horses are called 'Nisaean' for the following reason: there is a vast plain called 'Nisay' in Media. It is exactly on this plain that such large horses are bred" (Herodotus, 1972: 326–327). It is interesting that in his first-rate study "The Horses of Turkestan" (1910), recently reissued, V.P. Kolosovsky (2016) repeatedly calls the Akhal-Teke breed the "Nisaean horses", without regard to whether this provision was correct. It is possible to agree with him on this point. There is a striking resemblance in their exterior, pedigree, and growth, despite a time period of more than 25 centuries that separates them, which confirms this fact.

We have a lot of information to allow us to have a sufficiently complete picture of the Iranian horses.

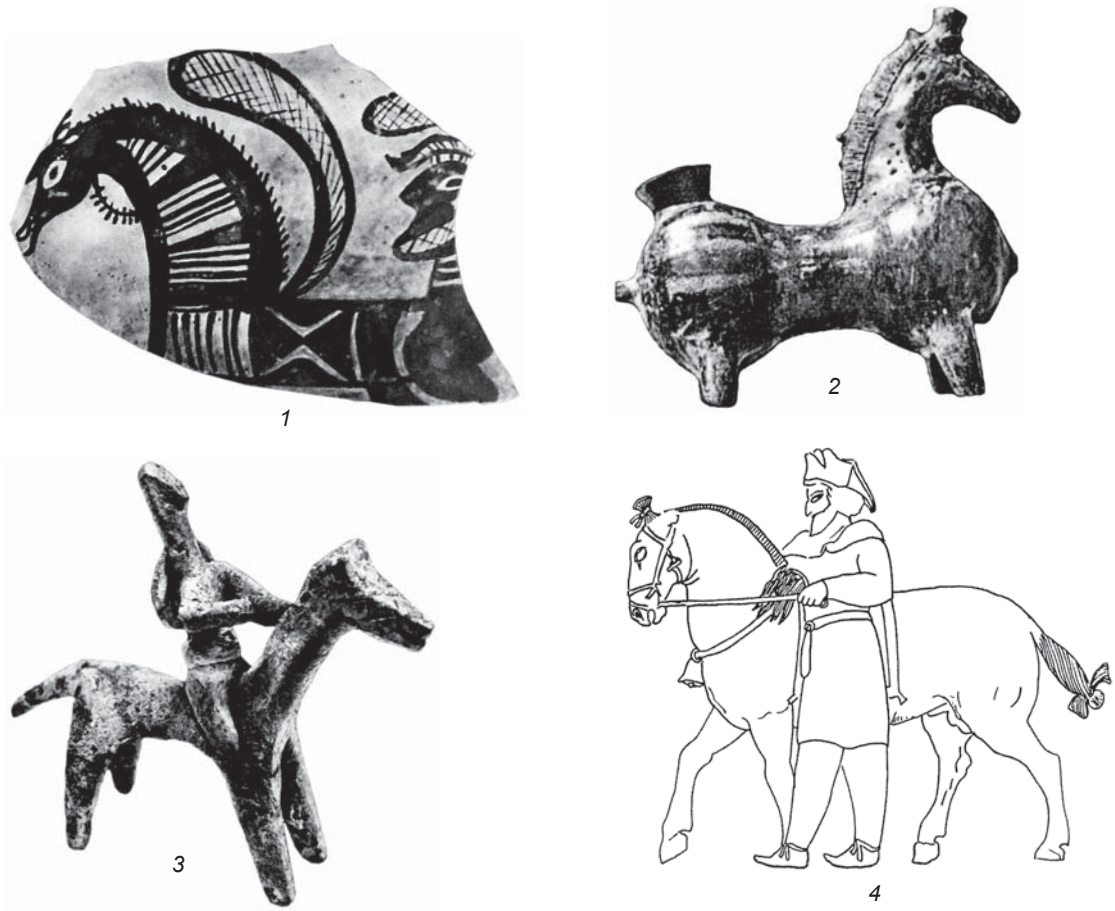

Fig. 4. Representations of Iranian horses of the 10th–8th centuries BC from Sialk (*1*), Amlash (*2*, *3*), and Persepolis (*4*).

This involves both extensive osteological data from the Qazvin valley introduced into scientific use by paleozoologist M. Mashkour (2003), and a numerous variety of images (Fig. 4). The earliest drawings were schematic, but as early as the last third of the 2nd millennium BC they reveal the exterior features inherent in the Oriental horses, as noted by hippologists. The decorated vessels from Sialk of the 10th–9th centuries BC show thin-limbed horses with long, thin, and taut bodies, high-set tails, powerful chests, curved long necks, small heads with a somewhat convex front and large eyes. The clay painted vessels in the form of a horse (water-bearers of that, or a somewhat later time) reflect the same exterior features of the Oriental horse, where a nicely curved neck with a hog mane, and a graceful head with a straight profile and cocked ears, as emphasized by the craftsman, are especially important.

A great number of images pertain to the glory days of the Persian Empire, where the role of horses was greater than ever. As estimated by contemporaries, the Persians were unrivaled horsemen. Presumably, it is exactly Nisaean horses that are depicted on the walls of Persepolis: large muscular horses harnessed to royal chariots with long bodies, massive croups and chests, with short, fleshy (though beautiful) necks, decorated by hog manes, and with ram-profile heads, as well as with convex expressive eyes. They are much more massive than the graceful horses of Egypt and Assyria, and taller (obviously reaching 140–150 cm at the withers), though scrubby horses were also depicted at the same time. Notably, riding horses of the same exterior type and height as the horses pulling the royal chariot but taller than those harnessed to conventional chariots are depicted in Persepolis reliefs of the 5th–4th centuries BC.

An even greater portrait gallery of Nisaean horses is presented by ancient gemmae studied by S.Y. Berzina, especially from this point of view (2002). Earlier specimens of the 13th–8th centuries BC depict either mythic winged horses or those harnessed to chariots. They are graceful, agile, and thin-limbed, with taut bodies, nicely curved top lines, vertically set thin necks, and small heads. Three Achaemenian seals pertain to the 6th–5th centuries BC. Sacred horses devoted to Ahura-Mazda, which were described by Herodotus, are represented on two of them. Interestingly, they are externally different. Depicted in one case is a light, long-line horse with a

strong chest, a nicely arched neck, a tidy head with high-set ears, standing on thin legs in the first stage of a gallop (a light type of agile racer). An Achaemenian cylinder seal found in Greece shows a powerful horse with a large head on a short fleshy neck in the ceremonial step posture, with a rein thrown on its neck, under a soft, richly decorated saddle-cloth. Two types of well-bred horses of the Ancient East, extreme with respect to their exterior features, are presented here—light, agile, and massive stepping equines. They have the features of the horses represented in the Persepolis reliefs, which manifest most clearly in the images of the 5th–4th centuries BC (Fig. 4, *4*). In all likelihood, the typical image of the Persian horse—a well-set, strong, long-legged and arched face one that was the glory of Persian, Bactrian, and Parthian horses—was established exactly in the 5th century BC. Obviously, these horses became known to the Greeks as Nisaean, the first ancient breed famous for its exterior and excellent racing capacities.

Such detailed descriptions are caused by the desire to emphasize the existence of both a certain compositional type of horse, as well as different variants within this framework. Using this beneficial material, it is sometimes possible to detect changes in the type of breed; for example, by comparing three seals belonging to the times of Persian king Cyrus (7th–6th centuries BC), which are separated by half a century. Notably, the Southwest Asian campaigns of the Cimmerians and Scythians, who introduced a new horseback-riding technique, as well as new tactics, and, what is more, agile horses from the Eurasian steppes, which could not but reflect on the exterior of horses in Western Asia, pertain just to this period. When comparing the images on seals (Ibid.: Fig. 5, 8, 9), a gradual increase in height, elongation of neck, and changes in the saddle can be noted. The latest of these seals is Neo-Babylonian. It depicts the spearman, Ninurta-Ah-Iddana, seated on a large horse, excellently muscled, on long strong legs, with a high-set graceful neck, strong chest, and a small head with a somewhat protruding front. A high-set and not long tail (possibly, in a sheath) supplements the resemblance to a typical Akhal-Teke horse.

A great variety of ancient Oriental horse types is noted by such a great expert of the Akhal-Teke breed as T.N. Ryabova: "Here, in drawings and petroglyphs, we can see light, thin-legged, slab-sided horses, with elongate light heads on long, high-set necks and with insignificant fringe. The modern Akhal-Teke type is clearly discernible in this type of horse. Such horses were used both for horseback riding, and in harness. These swift-footed, light, maneuverable, fearless animals had the reputation of being the best war horses of all time" (2016: 153).

We began our description with the Nisaean horses pertaining to the middle of the 1st millennium BC, and added their images on gemmae starting from the 13th century BC. As can be seen, the Nisaean horses are the first breed distinguished by ancient authors. This breed's features, for which Oriental horses owned by the Iranian-speaking population of Eurasia were notable, such as a large height and excellent racing capacities, were emphasized. Herodotus indicated the area where these horses were bred (the Nisaean plain in Media), and five centuries later Strabo raised the issue of their origin: "…the meadow… bears the name of 'Horse-breeding'; through it, they pass… from Persida and Babylon to the Caspian Gates, and in the Persian times, as it is said, more than 50,000 mares were grazed on this meadow. These were royal herds. As for the Nisaean horses that were used by kings as the best and largest ones, some argue that their breed originates from here, while others are native to Armenia" (1964: 495). Strabo's information about breeding the Nisaean horses in Armenia is important (Ibid.: 499). Consequently, the breed was distinguished not by its geographical confinedness, but by the specific exterior and working capacity features intrinsic to it, exactly as it is considered nowadays. While the Nisaean horses were related to a certain valley in Media in the times of Herodotus, five centuries later they were bred both in the earlier designated territory and in Armenia.

As already mentioned, the Persians were unrivaled riders. Xenophon describes innumerable horseback hunts introduced by Persian king Cyrus, an outstanding equestrian, as a military exercise for horsemen and horses, and emphasizes that the Persians paid great attention to the breeding and training of horses (1976: 14–16, 215–217). Therefore, the Persian hoses, namely the Nisaean ones, had no equals among other horse breeds for a long time. During his campaign in Greece, Persian king Xerxes "in Thessaly… arranged horse races between his and Thessalian horses (he heard that the Thessalian cavalry is the best one in Hellas). Sure, the Hellenic horses lagged far behind" (Herodotus, 1972: 366). During competitions, short- and long-distance (more than 10 km) races were conducted in hippodromes. The Achaemenid Empire created a postal service with post houses located at a day's run distance from each other; royal messengers on changeable horses traveled a distance of 2500 km in one or two weeks (Edwards, 1987: 67).

Also, the famous Parthian cavalry should not go unmentioned, since, according to Strabo, it was the fastest and strongest at that time; the Parthian horses were even superior to the Persian ones. Roman emperors strove to have them as steeds, since it was known that these horses could go a distance of 150 km daily for 8–10 days; contemporaries greatly appreciated their fearlessness. It is essential that even by the time of Strabo, Nisaean horses remained the best riding steeds "that were used by kings… Like the Parthian horses, they are notable for their peculiar points as compared to Hellenic and other

horses…" (Strabo, 1964: 495). This is a sufficiently solid confirmation of the fact that the Nisaean horses were rightfully called the "Nisaean breed", which is similar to the Parthian horses in their qualities but, judging by the Strabo's text, non-identical.

After one triumphant entry of Sulla, famed Parthian steeds appeared in the horseracing venues of Rome. Parthian *cataphracts* and *clibanarii*—men-at-arms who were "impossible to escape"; their remarkable arrows invisible in flight; heavy spears with iron points; armored horsemen that "emerged… like flames—wearing helmets and armors made of Margianian dazzling steel, while their horses were covered by copper and iron armors" are especially colorfully described by Plutarch (1994: 69). Tacitus also describes the Parthian cavalry: "…the Parthian, accustomed to attack and turn back with equal dexterity, disperses its cavalry units to hit enemies with his arrows without hindrance…" (2003: 219).

Having appeared in Europe and in the Caucasus in the 1st century AD, the Alans, whose Oriental (Massaget) origin was emphasized by ancient authors, brought to Europe (first Eastern, and then Western) their famous "Alanian horses" renowned as the Nisaean during the times of Herodotus and Strabo, and being representatives of the "Oriental horse" to the same extent. They had the same superior qualities, among which were pace, tirelessness, fearlessness, and capacity for performing prolonged marches, and were especially highly esteemed in the epoch of the Xiongnu invasion and Great Barbarian Migration. The Sarmatians and "brave and multi-horse" Alans (Dionysius, the 2nd century AD) were renowned for their light cavalry, and their "ringing-legged" (Sidonius, the 5th century) horses, "suitable for passages of any length" (Ovid, the 1st century AD) were notable for their pace and unpretentiousness. Using ancient images of well-bred, taut, thin-legged, agile racers with proudly raised graceful heads (paintings in Kerch crypts, gravestones, etc.) we can appreciate the exterior and working qualities of these horses being similar to the modern Akhal-Teke Argamak. Borysthenes, the name of the emperor Hadrian's horse, is indicative of its Oriental origin, while a bitter epitaph devoted by Hadrian to the death of Borysthenes points to its outstanding qualities. Both descriptions and images depict a typical Oriental horse, maybe, just having more exquisite shapes than the horses of the first millennium BC.

In the 2nd century AD, emperor Marcus Aurelius transferred the 55th cavalry ala from Pannonia to the Hadrian's Wall in northern Britannia, and in the time following, the Sarmatians and Alans are mentioned as soldiers of the first Pannonian and Sarmatian cavalry alas (Edwards, 1987: 87). Based on the osteological materials from Roman settlements pertaining to the Hadrian's Wall, paleo-zoologists distinguished six types of horses (Ibid.: 87, 88). Among them, there were small local ponies (110–120 cm high), common Roman chargers (120–130 cm), and large horses (140–150 cm), in which the horses brought by the Sarmatians from the Northern Black Sea Region can be seen. A horse of exactly this type is represented on a stone of the York fortress wall located somewhat to the south of the Hadrian's Wall, which I managed to see during an academic trip to Great Britain in 1988. Representations of such large slender horses with beautiful graceful small heads on arched and high-raised necks are known on medieval Pictish gravestones found in Scotland and stored in the exhibition of the Edinburgh museum. It must be emphasized that this type of horse was not encountered in the depictive materials of earlier time in Britannia and Gallia. It appeared here after arrival of Sarmatian-Alanian military units that familiarized the local population with high half-bred Oriental horses.

Since the 2nd century BC, the Chinese have also been familiar with the Oriental type of fast, tireless horses; though, of course, as with an achievement of the world that was considered western to them. Interestingly, the Chinese distinguished two types of outstanding horses at that time. They obtained one of this type from the Wusuns and sent embassies with rich gifts for horses of another type, even more valuable, to Davan (Ferghana). Chinese connoisseurs of horses gave special names to the well-bred Central Asian racers. According to Sīmă Qiān, a famous Chinese historian, the Wusun horses were called "horses from the western borderlands", and the Davan ones "heavenly horses" (see (Samoshin, 2012: 153–154)). It was thought that the latter had a divine origin, as we can read in a song made up by emperor Wu Di:

> Spirit of the Polar Star has granted
> Me a Heavenly Horse.
> It will sweep ten thousand li,
> Harnessed to a chariot.
> Only a River Dragon
> Can be a match for it.
>
> (Ibid.: 154).

Conclusion

This paper demonstrates that, throughout the millennia, people have needed different qualities of horses since their domestication. At first, when horses were domesticated in the Middle Volga area in the 5th–4th millennia BC as meat-producing animals, the possibilities of their bridling, pinfolding, water bearing, and husbandry in grazing meadows were valued. There was no need for agility and height, not to mention that animals always become smaller during domestication. Their facile nature and ability to bend to the human will were the qualities expected from horses. Probably, since the domestication of horses, they have been used not only to drag loads,

or carry them in packs, but also for horseback riding, at least for journeys, the protection of herds, and horseback hunting.

Judging by the images on the horse-headed scepters of the 4th–3rd millennia BC, the apparent muzzles with a slackened noseband and bridles with a tawed mouthpiece made it possible to handle the riding horses successfully. The demand for persistent, fast, and maneuverable horses arose when it became necessary to use horses in war chariots, which took place in the Eurasian steppes and in the Middle East in the 3rd–2nd millennia BC. However, as has been demonstrated by experimental studies in the recent past, chariots required small horses of 120–130 cm at the withers (Spruytte, 1977: 40), though this is still not the "Oriental horse". The demand for large swift-footed horses appeared owing to their use for horseback riding and war, i.e. during the final centuries of the second millennium to the initial centuries of the first millennium BC and, possibly, somewhat earlier in the Eurasian steppes. The ancient written sources emphasize the advantages of the Oriental horses (Persian, Parthian, and Scytho-Sakian) for the first millennium BC. This study shows those Oriental horses that became known to the Greeks in the epoch of opposition between the East and the West, when their possession was a key to success. The Roman authors considered the Alanian horses as unrivaled racers suitable for going under the emperor's saddle. Possession of excellent Oriental horses was also important for the Chinese emperors, who aspired to have Central Asian Argamaks ("heavenly horses") in the final centuries of the first millennium BC, and beyond.

Oriental horses probably appeared in Central Asia as a result of crossing the domesticated horse from the Middle Volga with the tarpan, most probably in the second millennium, or even in the third millennium BC. From this area, they spread to the Middle East, Egypt, and Hellas. Both the Nisaean horses of Media and the Pazyryk horses of Altai in the 4th–3rd centuries BC pertained to the Oriental horses. They came to Europe at the time of the Scythians, and then later, owing to Sarmatian-Alanian movements of the first centuries AD.

Finally, it is worth dwelling on the possibilities provided by the genetic analysis of paleozoological materials from the burial grounds of the Urals, Siberia, and Central Asia. Of special interest are the burials of tribal chieftains, who sought victories at the battlefields, which depended on the strength, speed, and tirelessness of the steeds embodied most impressively in the Oriental horse. As can be expected, genetic indicators typical for the Akhal-Teke breed will be seen. These can be horses such as those owned by the Pazyryk chieftain from kurgan 5. Possibly, the role of Oriental horses in improving a breed will be revealed, but undoubtedly the genetic analysis of horses will help in discovering new aspects in the life of the local Siberian population known from archaeological studies. The Oriental horse can be a status marker and a social level indicator that will turn out to be an important characteristic of the ancient society studied by us. Possibly, these expectations are too bold, but the purposeful and systematic collection of genetic materials of ancient horses and their analysis will surely make it possible to take a new look at the history of the population of Siberia and the Altai Mountains from the first millennium BC to the first millennium AD.

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Regional Features of the Traditional Clothing of Ukrainians and Belarusians in the South of the Russian Far East (Late 19th to Early 20th Century)

This article highlights regional specifics in the traditional clothing of Ukrainian and Belarusian settlers in Primorye in the late 19th to early 20th century. It is based on ethnographic collections owned by the Arseniev State Museum of Primorye, on archives of the Institute of History, Archaeology and Ethnography of the Peoples of the Far East, and on field data. Publications by Siberian researchers have made it possible to reveal parallels in the transformations of the traditional clothing in areas colonized by the Eastern Slavs. In this article, separate items are described and analyzed—male and female undergarments (shirts), female waist clothing (plakhta), skirts (spidnitsa), dresses with bodices (sayan), aprons, male trousers (porty), female sleeveless jackets (kirsetka), outer garments (svitka, yupka), belts, male and female headwear, and footwear (lapti, ichigi). In terms of cloth, design, decoration, manufacturing techniques, there are regional differences related to the settlers' provenance (natives of the Chernigov, Poltava, Kiev, Mogilev, Grodno, and Minsk governorates). Adaptation to new environments is analyzed (for instance, woolen outer garments, such as svitki, were abandoned because of poor acclimatization of sheep). Socio-economic and ethno-cultural transformations caused complex changes in technology, design, and ways the outfits were worn. Eventually, traditional clothing was replaced by that of the urban type.

Keywords: Primorye, Ukrainians, Belarusians, ethnographic collections, traditional clothing, museum.

Introduction

Studies of the regional specifics of traditional culture in recently-settled regions cover a wide range of topics associated with various aspects of ethnic traditions, including their stability and alteration. The regional specifics in the clothing of Ukrainian and Belarusian settlers of the colonized areas in the south of the Russian Far East are of special interest. Research into the regional components in the traditional outfits of Ukrainians and Belarusians in Siberia was made by E.F. Fursova (2004, 2011), T.M. Nazartseva (2005), and M.A. Zhigunova (2005). Quite a few studies of traditional clothing on the basis of ethnological materials have been carried out in the Far East and in Primorye. Important data obtained from the studies of the outfits of Ukrainians and Belarusians in Primorye are provided in monographs and field records by Y.V. Argudyaeva (1993, 1997; Argudyaeva, Sem, 1971). Interesting information on the shirts of the Eastern Slavic settlers in the Khabarovsk Territory is provided in the catalogue of the Grodekov Khabarovsk Regional Museum (Rubakhi slavyan-pereselentsev…, 2007). Regional specifics of the traditional shirts, female sleeveless jackets *(kirsetka),*

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and waistbands of the Ukrainian and Belarusian settlers were studied on the basis of ethnographic collections owned by the Arseniev State Museum of Primorye (Streltsova, 2012, 2014a, b). However, any comprehensive studies of the regional specifics of the Ukrainian and Belarusian traditional outfits in the south of the Russian Far East have not been carried out so far. This topic is essential for the understanding of regional distinctions in manufacturing techniques, usage and development in clothing traditions of the Ukrainian and Belarusian settlers in Primorye in the late 19th to early 20th centuries. The terms designating the garments and their components, as well as methods of decoration, used in the present paper correspond to the generally accepted terms in scientific literature. Some descriptions contain local clothing names that were recorded in interviews with the local people; each case is mentioned in the text.

Transformation of the traditional clothing of Ukrainians and Belarusians in Primorye

The Ukrainian and Belarusian population in Primorye was formed in the course of agrarian colonization of the Russian Far East in the late 19th to early 20th century. Owing to the specifics of the resettlement process in the south of the region, the majority of new settlers came from Left-bank Ukraine, including people from the Chernigov Governorate – 40 %, the Kiev Governorate – 26 %, and the Poltava Governorate – 22 % (Argudyaeva, 1993: 32). Settlers from Belarus arrived in groups mostly from the Mogilev, Grodno, and Minsk Governorates, as well as from the northwestern uyezds of Starodubsky, Novozybkovsky, Surazhsky and Mglinsky of the Chernigov Governorate. In the course of adaptation to a new environment, mutual assimilation of ethnic traditions occurred, which eventually led to the acculturation of the settlers. However, isolation from their native land and compact settlement of the Ukrainians and Belarusians in new areas stipulated a specific conservation of the local traditions of their folk and economic culture; one of the components of this culture was the traditional set of clothing. In Primorye, the set of clothing characteristic of the population of Central and Eastern Ukraine became most typical. The female set included an embroidered shirt, waist clothing (*plakhta*) or skirt-*spidnitsa*, sleeveless jacket-*kirsetka*, and apron. The Belarusian female set mostly resembled that of Mogilev region and the northern uyezds of the Chernigov Governorate. The set consisted of an embroidered shirt, skirt (*spadnitsa*, *andaraka*) or skirt with bodice (*sayan*), and apron. The male set of clothing typical of Ukrainians and Belarusians was universal and included a shirt of hand-made or manufactured fabric and trousers (*porty*). The traditional male and female clothing sets also included waistbands, headgear, and footwear.

Shirts were the basic item in the Ukrainian and Belarusian female outfit at the turn of the 19th–20th centuries. The shirts in Primorye were sewn either of homemade canvas, hemp fabric or manufactured cotton textile. Hemp was mostly used as the raw material for homemade textiles, because flax yields were often poor (Argudyaeva, Sem, 1971). In Primorye, the shirts were usually made with straight *poliks* (rectangular inserts sewn along the weft line). These inserts connected the body parts with the sleeves and provided additional space for free body movements (Zelenin, 1991: 231). The collar and cuffs had close, fine tucks, making the garment loose-fitting and festive. The joint of the top of the sleeve with the insert was often decorated with tucks too. Specimens from the ethnographical collections show an archaic tunic-like design that was also used in Primorye; for instance, a female shirt of a settler from Chernigov from the collection of the Arseniev State Museum of Primorye (MPK 12297 T4-2885) (Fig. 1). The tunic-like female shirt of the Eastern Slavs in the 19th century is considered to be a relic of the past (Maslova, 1956: 605). This style was noted among the female grave shirts of the Russian Old Believers, as well as in the everyday female outfit in the southwestern provinces of Ukraine (Etnografiya vostochnykh slavyan…, 1987: 267). In Primorye, shirts with one-piece sleeves typical of the Middle Dnieper basin were also recorded (MPK 8727-10 T 1-179) (Ukraintsy, 2000: 212). In the first third of the 20th century, with the wide spread of industrially produced fabrics, *zalakotnitsy* shirts with half sleeves (just below the elbow) ending with bell-shaped ruffles with a drawstring became popular (MPK 10278-3 T1-534; 9144-5 T1-171). Such shirts were also sewn with yokes (Lobachevskaya, 2009: 36).

In terms of the cut type, female shirts were classified into one-piece items (MPK 17257-1 T-6237; 3409 T1-588) and compound items, i.e. made of two horizontal parts: the body (*stan*) and lower part (*podstava*) (MPK 9110-1 T1-602; 10126-1 T1-558). The upper (*stan*) part of shirts was usually cut of fine bleached fabric, while the lower part of coarse fabric. With the spread of industrially manufactured cotton fabric, the upper part was made of percale or calico fabrics, while the lower part was made of homemade fabric. Wedding shirts of brides, and female underclothing worn under the *plakhta* (waist clothing) were made of a single piece of fabric. Hems of such long shirts were exposed and decorated with embroidery, lace, or hemstitch. It is noteworthy that Ukrainians decorated hems not only on festive, but also on casual shirts (Zelenin, 1991: 229).

Fig. 1. Female shirt. Chernigov Governorate. Canvas, embroidery in the technique of cross-stitch, "drawn thread" decorative seam. Donated by V.Y. Demchenko (born in 1929), a citizen of the Arkhipovka village, Chuguevsky District of the Primorye Territory. MPK 12297-1 T4-2885.

Female shirts were usually decorated with various ornamental stitches; such stitches decorated the inserts, sleeves, cuffs, collars, shirtfronts, and hems. The following decorative techniques were used both separately and in various combinations: "cutting out", "pricking out", satin stitch, chain stitch, embroidery on net, Bulgarian and ordinary cross, and various types of hemstitch. Old stitch types, like "pattern darning" and "holbein stitch", were rarely used. Decorations were also made with turn-in seam, connecting seam, and the like, serving as an additional element in the ornamentation pattern.

The ornamentation of shirts of the Ukrainian settlers was composed mostly of vegetative and geometric motifs. Belarusian shirts were often decorated with geometric motifs in the form of diamonds, crosses, and eight-petal rosettes. The main color range of the decoration was red with inclusions of black and more rarely dark blue. Residents of some regions of Ukraine and Belarus (predominantly the Chernigov, Poltava, and Gomel regions) used to wear shirts embroidered with white canvas or cotton threads over the white fabric ("white over white" embroidery). Shirts of this type also occurred in Primorye (MPK 9110-1 T1-602; 17257-1 T-6237). These were the traditional, bridal wedding clothing, festive outfits of elderly women, and graveclothes (Lobachevsky, 2009: 86) (Fig. 2).

Regional and local distinctions in clothes were observed in the ornament composition. The Chernigov female shirts bore ornaments in the form of horizontal bands on the inserts and upper sleeves (MPK 12297-2 T4-2884; 9144-4 T1-591) (Fig. 3). The Chernigov shirts also showed a marked line of connecting-decorative seams on the upper sleeves (MPK 8403-7 T1-590; 10128-1a T-5368; 11885-4 T-2619). This ornamentation technique is represented by the so-called Chernigov broad hem stitch with diamond motif, typical for the local shirts (Ukrainskoye narodnoye iskusstvo…, 1961: 28). The Poltava shirts were usually ornamented with ruffles (plumps) in the upper sleeves, adjacent to the inserts (MPK 9956-2 T585; 9110-1 T1-602; 10283-1 T1-555; 13781-1 T6-3781) (Nikolaeva, 1988: 172). Embroidery in the form of isolated flower rosettes covered the whole sleeve. The cuffs and collars of the Poltava shirts were usually not ornamented. The female shirts of settlers from Ukrainian Polesye showed ornamented shirt fronts with broad collars and cuffs (Ibid.: 156). The natives from the Mogilev Governorate used to wear shirts with ornamentation bands at the joints of the sleeves with inserts (MPK 9144-8 T-587) (Lobachevsky, 2009: 19).

The traditional male outfit was not as diverse as the female garments. The basis of the traditional male outfit of Primorye settlers from Ukraine and Belarus was a shirt with a band collar opening from the center (Zelenin, 1991: 224). Male shirts had a straight cut; the upper back part was doubled with linen *podopleka* (lining) to secure durability. In the early 20th century, the Ukrainian and Belarusian male shirts were hip-long. The shirts were worn over trousers, and were girdled or at a later time belted. Festive shirts were sewn of manufactured, white cotton fabric. The cuffs, collar and front opening were embroidered with red and black threads (MPK 9971-1 T1-226; 10551-3 T2-1776).

Ukrainian and Belarusian male half-length clothing consisted of trousers made of homemade canvas fabric. Traditional trousers with comparatively narrow legs (Russ., Belarus. – *porty*, *portki*, Ukrain. – *portyanitsi*, *gachi*, *nogavitsi*) made of homemade white, less common dark blue, coarse cotton fabric (*pestryadina*) were widely used by the Eastern Slavs until the first half of the 20th century (Maslova, 1956: 592). The traditional tapered trousers had two trapezoid-shaped inserts between the pant legs, widening the pant leg (MPK 12297-3 T 2886). The Belarusian trousers had an additional rhomboid-

Fig. 2. Female shirt. Mirgorodsky Uyezd, Poltava Governorate. Canvas, embroidery in the "cut out" technique. Hemstitch work, "drawn thread" decorative seam. Donated by V.Y. Usik. MPK 9110-1 T1-602.

Fig. 3. Female shirt. Chernigov Governorate. Canvas, embroidery in the "pattern darning" technique. Donated by P.K. Moiseenko (born in 1898) from the Frolovka village, Partizansky District of the Primorye Territory. MPK 9144-4 T1-591.

shaped piece attached with the pointed corner up, between the legs (MPK 929-6 T 890). Canvas trousers were used as a summer garment, woolen trousers were worn during the cold season.

Among the Ukrainian settlers, the *plakhta* (female waist clothing) was popular. This clothing was typical of Ukrainian women in Central and Eastern Ukraine until the late 19th to early 20th centuries. Notably, in Primorye, this type of clothing was not widely used. *Plakhta* clothing brought from the Ukraine was used only for the first years after resettling (MPK 10282 T 3505) (Fig. 4). The *plakhta* was regarded as festive clothing for marriageable girls and married women. It was made of two pieces 1.5–2.0 m long; the pieces were sewn halfway down, the ends of which were folded down over a girdle; it was attached at the waist (Nikolaeva, 1988: 46). *Plakhta* was made of woolen checkered fabric; the checks bore additional diamond and rosette motifs. The connecting seam on *plakhta* looked like alternate circles of various colors (Zelenin, 1991: 236) and had both constructive and ornamental functions. The seam was made with woolen threads (worsted work). Red was the dominant color in *plakhta*.

Skirts became the most popular female waist clothing in Primorye in the early 20th century. Skirts had various names in the Ukrainian and Belarusian traditional clothing (Ukr. – *spidnitsa*, *andarak*, *kabat*; Belar. – *spadnitsa*, *andarak*, *sayan*) (Zelenin, 1991: 239). In Primorye, Ukrainian settlers called their skirt the *spidnitsa*. The Belarusian settlers, for example those born in the village of Petrova Buda of Surazhsky Uyezd, Chernigov Governorate, used to wear homespun *sayan* skirts (Argudyaeva, Sem, 1971). In scholarly literature, the term *sayan* usually designates a Belarusian skirt with attached bodice. The designs of traditional skirts were similar to one another: several widths were sewn together, gathered along the upper edge, and attached to the waistband with fasteners or ties. The main distinctions were the fabrics used (homespun canvas, printed cloth, wool, sateen, and others) and manners of decoration (stitched pleats, sewn-on satin or velvet bands). The skirt length varied from 62 to 88 cm. In Primorye, settlers from Surazhsky Uyezd, Chernigov Governorate, until the 1920s, used to wear skirts made of homespun canvas or woolen cloth, which were dyed dark blue, green, or red (Ibid.). Fabrics were dyed with

Fig. 4. Plakhta. Chernigov Governorate. Early 20th century, wool, hand weaving. Donated by A.G. Tereshchenko. MPK 10282 T 3505.

mineral and vegetative dyes. Oak bark produced a dark red color, alder bark a yellowish color, the fruit of the weed named "small birch" produced a dark blue color (Fetisova, 2002: 40).

Another female clothing item popular among the settlers from Chernigov Governorate was a skirt with attached bodice (MPK 10128-2 T 561) (Fig. 5). Such a garment, which as mentioned above was called a *sayan*, was typical among the Belarusians, and was likely borrowed from the Baltic nations (Maslova, 1956: 643). This type of skirt was commonly used by the population of the northern part of Chernigov Governorate, and was called a "*spidnitsa do nagrudnika*" (Nikolaeva, 1988: 167). Y.V. Argudyaeva described this clothing item on the basis of interviews with the citizens of the village of Mnogoudobnoye in the Shkotovsky District of the Primorye Territory, natives of Surazhsky Uyezd of the Chernigov Governorate, and designated this piece as a "sarafan" (Argudyaeva, Sem, 1971). The same name is recorded in the museum catalogues. However, according to G.S. Maslova, this item was called a "sarafan" only by the Russians (1956: 643).

The apron was another item of female waist clothing. In the Ukrainian traditional outfit, aprons represented a transformation of the *zapaska* skirt—waist clothing consisting of one or two narrow pieces of woolen fabric with ties, which was worn together with the *plakhta* (Ibid.: 631). The Ukrainian and Belarusian settlers in Primorye wore aprons made mostly of homespun or industrially produced fabrics (percale, chintz, calico) over the skirt or *sayan*. The upper apron parts were gathered and attached to the waistband. Depending on the width of the fabric, aprons were made of one or two pieces. The aprons were usually 15–20 cm shorter than the skirts. Casual aprons were made of dark-colored fabric (homespun casual aprons were dyed dark blue and edged with red bands) (Argudyaeva, Sem, 1971). Festive aprons were a bright decorative element of the outfit. The aprons were sewn of homespun and industrial white fabrics and trimmed with stitched pleats, embroidery, and lace. The ornamentation was mostly located on the lower parts of the apron in horizontal lines alternated with lace inserts (MPK 11885-9 T-2624; 10127-5 T1-550). Lace was attached to the lower edge of the apron; sometimes all the apron edges were decorated with lace (Ibid.). In the early 20th century, the aprons became shorter in correlation with the skirt length, the gap between the apron and the skirt lengths remained unchanged (MPK 11885-9 T-2624; 10127-5 T1-550) (Lobachevskaya, 2009: 37).

Women-settlers used to wear sleeveless jackets. This clothing was typical for the Ukrainian women and Belarusian settlers from the northern districts of Chernigov Governorate and the frontier regions close

Fig. 5. Sayan. Novgorod-Seversky District of the Chernigov Region. 1930s. Sateen, satin ribbons. Donated by M.F. Skachek from the Galenki village, Oktyabrsky District of the Primorye Territory. MPK 10128-2 T 561.

to the boundary between the Gomel and Bryansk governorates. This type of sleeveless jacket was named "kirsetka" or "korset" (Argudyaeva, Sem, 1971). *Kirsetka* jackets were made of industrially produced fabric: thin cloth, dark-colored sateen, or chintz. *Kirsetka* jackets were lined and fashioned according to the design and decoration pattern of their Ukrainian parallels.

Regional distinctions were reflected in the design, length, and decoration patterns. For instance, the Poltava *kirsetka* was quite long (to the knees or lower), with a high waistline fashioned on the back (MPK 9110-6 T-395). *Kirsetka* jackets were decorated with applique and trimmed with black velvet or other dark-colored fabric. The Chernigov *kirsetka* was shorter than the Poltava one, approximately hip-long, and had tucks and pleats on the back (MPK 9120-3 T234). Women from Chernigov used a decorative machine stitch in ornamenting *kirsetka* jackets. A slant pocket decorated with applique was made on the right sides of the Chernigov *kirsetka* jackets (MPK 10126-3 T 559) (Ukrainskoye narodnoye iskusstvo…, 1961: 28). In Primorye, *kirsetka* jackets were fashioned by village tailors, who produced the clothing for several neighboring villages (Argudyaeva, 1993: 80). The *kirsetka* jackets produced in the Spassky District of the Primorye Territory demonstrated a typical style and decoration pattern (MPK 10733-1 T 1733; 9120-1 T 552, MPK 16250-1 T 4818) (Fig. 6). These *kirsetka* jackets are cut-off at the waist, made of black sateen, lined, with pockets, and decorated with black velvet and a decorative machine stitch.

The Ukrainian and Belarusian outer clothing consisted of the *svitka*, which was made of felt from white or brown sheep's wool. The *svitka* outer garments were cut off at the waist and had two or three pleats (*vusiki*) in the back. Informants said that *svitka* garments were seldom produced in Primorye, partially because of the poor acclimatization of sheep. The peasants usually wore *svitka* garments brought from the places of their previous residence (Argudyaeva, Sem, 1971).

The ethnographic collections of the Arseniev State Museum of Primorye contain items of female outerwear called the "*yupka*". These items are designated as "*svitka*" in the museum catalogue, but the Ukrainian and Belarusian *svitka* garments are outerwear made of woolen cloth (Nikolaeva, 1988: 168). The specimens under discussion are made of industrially manufactured cotton fabric. The discussed items are close to the *kirsetka* in design and decoration pattern, with the exception of their having long sleeves. The items under discussion are better classified as *yupka*, because the Ukrainian *yupka* garments, as opposed to the *svitka* garments of woolen cloth, were typically made of industrially manufactured canvas, and their style and decoration mostly resembled those of the *kirsetka* (Ukrainskoye narodnoye iskusstvo…, 1961: 27). The analysis of the museum items showed the typical traits of this outer garment. The local *yupka* varieties were made mostly of black sateen (MPK 9110-7 T 405, MPK 9110-4 T 402) or black reps fabric (MPK 18628-4 T7291); the front was bell-shaped, the back was well-fitted with the aid of tucks and flaring box pleats laid at the waist (Fig. 7). *Yupka* garments were lined or quilted with padding, decorated with applique of black velvet, decorative buttons, machine embroidery, and buttoned on the left side on buttons or hooks. This type of clothing, brought by settlers from Ukraine, quickly went out of use in Primorye.

Fig. 6. Kirsetka. Spassky District of the Primorye Territory. 1920s. Sateen velvet, decorative stitch. Donated by M.A. Krokhina (born in 1910) from the Krasny Kut village, Spassky District of the Primorye Territory. MPK 10733-1 T 1733.

The waistband was an accessory of the Ukrainian and Belarusian folk outfit. It combined utilitarian and ritual purposes and represented an invariable part of the clothing of the Eastern Slavs.

In Primorye, waistbands were made of homespun woolen fabric mostly dyed red. Waistbands were either woven, knitted, hand-woven, or woven on a reed frame, using the technique of "weft weaving" (MPK 14011-2 T 3592), "weaving on a spring" (MPK 11885-1 T 2616), and others (Lebedeva, 1956: 501). The band's ends were decorated with fringes from the free ends of the thread ("*makhry*") or tassels (Argudyaeva, Sem, 1971). The wedding waistbands were richly decorated; such

Fig. 7. Yupka. Mirgorodsky Uyezd, Poltava Governorate. Early 20th century. Sateen, velvet, applique. Donated by V.Y. Usik. MPK 9110-7 T 405.

waistbands were often the bride's wedding present to the groom.

The most popular male headgear were purchased peaked caps and warm caps often lined with padding; fur-caps were less common (Ibid). The traditional Belarusian felt cap (*magerka*) and the Ukrainian cap (*bryl*) were also in use. Unmarried and married women wore various head scarves: homespun or cotton *khustki* and a woolen shawl (*shalya*) (Ibid.: 116). Married women would wear caps (*chepets*)—a head covering in the form of soft cap covering the hair, under their head scarves. The word *chepets* is common to all Slavic languages; the closest parallels are the Ukrainian *ochipok* and Belarusian *chapets* (Maslova, 1956: 684). In Primorye, the name *ochipok* was commonly used by the settlers (Argudyaeva, Sem, 1971). The *ochipok* cap was the basic headwear of married women in Central and Eastern Ukraine. In Primorye, this sort of cap was worn both by Ukrainian and Belarusian women (MPK 2311-24 T2743) (Fetisova, 2002: 42).

The characteristic features of these caps are ruffles set over the forehead band *ochelye* and in the back close to the ties (*vzderzhka*). Casual caps were made of homespun fabric, cotton or other cheap fabrics. Festive lined caps were made of expensive fabrics. In Primorye, such caps were worn under homemade or manufactured head scarves. Informants from Kharitonovka in the Shkotovsky District of the Primorye Territory said that purchased scarves were seldom used. Homemade head scarves were usually ornamented along the edges, called "banks", with woven bands, motifs embroidered with red threads, and fringes (Argudyaeva, Sem, 1971).

Bast shoes were the basic footwear for settler-peasants. In the late 19th to early 20th century, bast shoes were typical for Belarusians; Ukrainians from the northern districts of Kiev and Chernigov Governorates also wore bast shoes (Nikolaeva, 1988: 74).

In Primorye, bast shoes were in demand among the Belarusian and Ukrainian settlers, especially during haymaking time, when plenty of bast shoes were purchased (Argudyaeva, 1993: 80). The Belarusian and Ukrainian bast shoes differed from Russian shoes in shape, weaving style, and the material used. The former type was characterized by a straight weaving style of the sole, low sides, and vaguely shaped toe fashioned with long loops, through which a tightening cord or bast was drawn (Zelenin, 1991: 268). In Primorye, as raw materials for bast shoes, settlers used plants that were widespread in the places of their resettlement: lime tree, willow (MPK 4125-5a DR 94), as well as bark of the Manchurian walnut abundant in the Ussuri taiga (MPK 13376-1b DR 2235). Footwear made of rawhide was also in use: *postoly*, *morshni*, and *ichigi*. *Ichigi* shoes were ordered at a shoemaker or purchased in shops (Argudyaeva, Sem, 1971).

Discussion

This study revealed the regional specificity of the clothing of Ukrainians and Belarusians in Primorye, as well as traced the transformations that took place in the traditional clothing of settlers at the turn of the 19th and 20th centuries. Comparison of the results of our research with data on the clothing of Ukrainian and Belarusian settlers in Siberia have made it possible to record the common and distinctive features. During the stated period, in the south of the Russian Far East, as well as in Western Siberia, certain archaic elements still existed in the traditional clothing sets of the Ukrainian and Belarusian settlers. The use of homespun cloth, traditional design, and ornamentation distinguished the clothes of Ukrainians and Belarusians from those of the Russian old resident population. However, despite the settlers' commitment to their traditional outfits, certain components of clothing, such as the *plakhta*, *svitka*, and *yupka*, quickly went out of use and were not widespread in Primorye. Similar developments were observed in Siberia, where the processes of acculturation

and the subsequent abandonment of customary types of clothing were mostly typical in places of Ukrainian and Belarusian settlements dispersed among Russian old residences. In the harsh Siberian climate, the settlers primarily borrowed the off-season and winter clothes of the old residents (Fursova, 2011: 321). Unlike Siberia, where the Russian old resident population prevailed, in the South-Ussuri Region in the early 20th century, the vast majority of old residents and newcomers were Ukrainians (81.26 % of the total number of settlers); the shares of Russians and Belarusians were 8.32 and 6.8 %, respectively (Argudyaeva, 1993: 33). Therefore, the Russian old residents in Primorye could not be regarded as the crucial factor for abandonment of the habitual clothing. In this case, it seems more appropriate to consider the influence of the common urban-style clothing on the peasant style; urban garments gradually replaced the traditional types of clothing owing to the development of trade, distant seasonal work, and other economic factors. The spread of industrially manufactured fabrics and urban clothing style in the first half of the 20th century led to the change of the traditional style, which was equally typical for the settlers in Primorye and Siberia (Fursova, 2011: 320). In the 1920s–1930s, short embroidered shirts with yokes and elbow-long sleeves became very popular. Female canvas shirts and male trousers of the traditional style were gradually transformed into the category of underclothing. The Ukrainian folk *plakhtas* were replaced by skirts that were decorated with satin ribbons and velvet. The decoration style was also changed mostly owing to simplification of the traditional ornamentation techniques. To sum, the data of the present study mostly coincide with the data collected by Siberian scholars, which suggests a similarity in the processes of usage and transformation of traditional clothing in the areas colonized by the Eastern Slavs.

Conclusions

Research into the regional specifics of the traditional clothing of Ukrainian and Belarusian settlers in Primorye in the late 19th to early 20th century was based on ethnographic collections, archives, and field data. The main conclusion is that the prevalence of settlers from the Chernigov, Kiev, and Poltava governorates led to a wide spread of the traditional clothing of the residents of the Ukraine and Belarus ethno-contact zone over the areas of settlement. Dense settlement of the settlers was among the important factors in accumulation of traditional clothing. Regional specificities have been noted in design, composition, and decoration patterns. In the process of adaptation to the local environment and the new ethno-cultural surroundings, such clothing items as the *plakhta*, *svitka*, and *yupka*, were abandoned. It was partially the result of contacts with old residents, as well as development of a distant seasonal working schedule and eventual borrowing of urban-style clothing. Complex changes in the traditional outfit of Ukrainians and Belarusians migrating to Primorye in the first third of the 20th century were caused by various socio-economic and ethno-cultural factors (development of industrial manufacturing, impacts of the urban culture, and interethnic contacts). In general, the traditional set of clothing of Ukrainians and Belarusians established using the data from Primorye is of scholarly interest, because it demonstrates the extensive stratum of the East Slavic culture, which had a significant impact on the formation and functioning of local traditions.

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Collection Related to the Omaguaca Indians from the Pucará de Tilcara Fortress, Northwestern Argentina, at the Museum of Anthropology and Ethnography RAS, St. Petersburg: Tentative Findings

This study describes artifacts and human remains from the Pucará de Tilcara fortress, in the Province of Jujuy, Argentina, acquired by MAE RAN from the Ethnographic Museum in Buenos Aires in 1910 under the Russian-Argentinian exchange project. Unearthed in 1908–1910, many cultural and skeletal finds were shipped to American, European, and Asian museums. Later, scholars were unable to study the site in detail. The re-examination of those materials is all the more important because the habitation layers were destroyed in 1935 during the construction of the monument to the Pucará de Tilcara's discoverers. The study of isolated parts of the collection and their typological analysis make it possible to narrow the date of the site and to assess certain aspects of technology. We examined archival sources owned by MAE RAN, SPbF ARAN, and the Juan B. Ambrosetti Ethnographic Museum. The comparative typological approach was used as well. In this article, we provide the first results of the attribution of artifacts, their typological classification, and a brief description of cranial finds. An important part of the study is the reconstruction of the occupations and knowledge system of those who lived at Pucará de Tilcara.

Keywords: *MAE RAN collections, Late Period (Regional Development period), Omaguaca Indians, Northwestern Argentina, Pucará de Tilcara, Russian-Argentinian exchange.*

Introduction

The fortified settlement of Pucará de Tilcara was located near the place of inflow of the Guesamayo River into the Río Grande River, in the Quebrada de Humahuaca valley (the Province of Jujuy, Northwestern Argentina). It was founded by the Omaguaca Indians in the 8th century AD, and ceased to exist upon arrival of Spanish conquistadors in 1536. Since 1493, it had been a fortress. By the end of the 15th century, it had been finally conquered by the Incas, under the leadership of Túpaq Yupanqui, and remained under their reign for the last 50 years. In 1586, the modern settlement of Tilcara was founded about 1 km northeast of the fortress. The Pucará de Tilcara site pertains to the Regional Development period (Seldes, Botta, 2014; Sprovieri, 2013: 26), also known as the Late Ceramic period (Handbook…, 2008: 587).

The fortress occupied 61 thous. m^2 and accommodated about 2 thousand buildings, enclosed by a wall of stone slabs. Its ruins were discovered at the beginning of the 20th century by J.B. Ambrosetti. In 1908, he started systematic excavations at the site. The works were conducted till 1910 (Zaburlín, Otero,

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2014: 212). During the following 100 years, the fortress territory was subjected to repeated irregular excavations. After the death of Ambrosetti, studies of the site were continued by his disciple and associate S. Debenedetti in 1918 and 1928–1929. The site became one of the classic examples of the Omaguaca Indians culture, and the foremost Argentinian archaeologists worked in its territory (Casanova, 1958–1959; Krapovickas, 1958–1959; Madrazo, 1969; Tarragó, 1992; Tarragó, Albeck, 1997; Zaburlín, 2009, 2010; Otero, Ochoa, 2011; Otero, 2013; Otero, Cremonte, 2014). In 1935, upon the initiative of archaeologist E. Casanova, a monument devoted to the memory of Pucará de Tilcara's discoverers was erected in the northwestern part of the fortress by architect M. Noel (Casanova, 1950). It was installed in the area excavated by Ambrosetti (Zaburlín, Otero, 2014: 207), and actually covered and destroyed the cultural layer.

Despite the primary importance of the site for studying the Omaguaca culture, systematic analysis of collections obtained in 1908–1910 was not conducted earlier. In 1912, a brief note by Ambrosetti (1912) about the first excavations, and a review article by Debenedetti (1912) about the cemetery in Pucará de Tilcara were published. A small paper about clay jars from Tilcara came out shortly before the death of Ambrosetti (1917). In 1930, a monograph by Debenedetti (1930) devoted to later excavations of the fortress was released. Initially, this was intended as a consolidated scientific paper summarizing the results of study of the site from 1908 to 1929; but finally, it only tangentially addressed the early stage of the works, while the main part of the monograph was devoted to the excavations conducted by Debenedetti in 1928–1929. The materials obtained by Ambrosetti in 1908–1910 were never published. The museum politics of that time led to fragmentation of the collections as a result of numerous international exchanges, which precluded taking a general look at the archaeological assemblages for long years. Before long, the finds from excavations conducted by Ambrosetti were sent to the largest museums of Europe, Asia, and America, including the Museum of Anthropology and Ethnography in St. Petersburg.

Though more than 100 years have passed since the start of the study of the site, the research interest in its materials remains persistently high. On the Argentinian side, the works for reconstructing the site's excavation history and studying the documentary records of its early research stage are conducted by scientists from the Tilcara Interdisciplinary Institute (the Faculty of Philosophy and Literature of the University of Buenos Aires) and the National University of Jujuy, K. Otero and M.A. Zaburlin. In 2014, they discovered handwritten notes by Ambrosetti about the 1908–1910 excavations at Pucará de Tilcara, in the archive of the Ethnographic Museum in Buenos Aires (Zaburlin, Otero, 2014). The manuscript was badly damaged; however, it preserved information about a number of studies conducted at the site, and references to several items currently stored in the MAE RAN collection. The modern favorable situation created in the sphere of international cooperation has made it possible to compare earlier separated assemblages for the purpose of their further unified scientific interpretation.

Materials

Finds from Pucará de Tilcara were delivered to MAE RAN in 1910 under the exchange project with the Ethnographic Museum in Buenos Aires (Lukin, 1965: 132). The collection was first mentioned in the letter of Ambrosetti, the Director of this museum, to MAE's Senior Ethnographer L.Y. Sternberg of September 30, 1910, with the information that the Argentinian party is "sending antiquities found during excavations of the Pucará de Tilcara fortress in the Quebrada de Humahuaca valley" (SPbF ARAN. F. 282, Inv. 1, Item 179, fol. 390–391). The list of items sent to St. Petersburg was preserved in the archive of the Ethnographic Museum named after J.B. Ambrosetti (Archivo Fotográfico y Documental del Museo Etnográfico "Juan B. Ambrosetti". Legajo No. 50). The inventory of the MAE collection contains one more letter from Ambrosetti, dated December 6, 1910, wherein he duplicated the information about the place of origin of the materials. This letter was accompanied by the full list of items to be transferred to MAE. According to this list, 153 archaeological artifacts and 20 deformed skulls were sent to St. Petersburg.

Discussion

Attribution of the MAE RAN collection required a great scope of research work. It involved studying the remaining museum documents together with the primary source, that is with the general catalogue of the Ambrosetti Ethnographic Museum, as well as with the items actually sent from Buenos Aires. According to the latest studies, the finds of early excavations conducted

by Ambrosetti originate from the fortress area that functioned after the conquest of Pucará de Tilcara by the Incas (the end of the 15th–16th centuries).

As a result of comparing the available field ciphers with the general catalogue of the Ambrosetti Ethnographic Museum, the items that do not pertain to the Pucará de Tilcara assemblage have been distinguished. These originate from the site of La Paya, contemporaneous with the fortress, and were placed into this collection mistakenly. The items include a bronze plate (1306; 1800-130) and a large shell of the *Pecten* genus (1378; 1800-110) both found during excavations by the second expedition of the Faculty of Philosophy and Literature of the University of Buenos Aires in 1906; as well as an amulet made from the *Azorella madreporica* plant (1730; 1800-133), discovered by the third expedition in 1907.

113 items in the MAE collection have preserved their field numbers. According to the documents, these pertain to the excavations conducted by the fourth to sixth expeditions of the Faculty of Philosophy and Literature in Pucará de Tilcara in 1908–1910. These finds are subdivided into six categories: cranial sample, ceramic vessels, stone items, horn and bone items, those made of other organic materials, and copper items.

Cranial sample. The sample includes 20 skulls: 18 belonged to adults (7 female and 11 male), one to a 6–8 year old subadult, and one to 14–15 year old female. At the time the specimens were received from the Buenos Aires museum, all the skulls had mandibles. But during re-registration of the collection in 1934 by E.V. Zhirov, a member of the anthropology department, all the mandibles except one were excluded from the sample, as it was not clear if these belonged to the skulls from Pucará de Tilcara (see MAE collection description, No. 5148).

All the individuals display artificial fronto-occipital deformations (Fig. 1). Traumatic lesions were detected in some of them as well. These include at least two cases of healed vault blunt force trauma, one case of a peri-mortem blunt force trauma, a case of penetrating wound (likely the cause of death of the individual), and a case of nasal bone fracture. Such a high frequency of traumatic lesions is typical of the Omaguaca Indians during the Regional Development period.

The most abundant types of pathological manifestations in the sample are related to dental health. Most individuals exhibit multiple cases of ante-mortem tooth loss, alveolar abscesses, dental chipping, periodontal disease, caries, and dental calculus. The only mandible displays signs of a surgical operation aimed at extracting a lower molar and treating an alveolar abscess. The intervention was likely carried out shortly before the individual died.

Ceramic items. In the collection owned by MAE RAN, these are mostly bowls (*pucos*). Such vessels were widespread in the Late Ceramic period of the Northwestern Argentina cultures. In the collection, there are bowls with hemispherical and truncated conical shapes, characterized by a rough working. The diameters of their rims vary from 14.0 to 24.0 cm, their heights from 6.0 to 11.0 cm. The shapes of bowls from Pucará de Tilcara are not as diverse as those in assemblages from contemporaneous sites in the Province of Salta. The proportion of painted

Fig. 1. Artificially deformed skull from Pucará de Tilcara (collection 5148).

vessels is smaller than that in the collection from La Paya (Sprovieri, 2013: 56–68; Dmitrenko, 2018: 242–244). Preference was given to spiral patterns. Images of snakes filled with a netlike ornament were often used (Fig. 2, *1*). Such pottery pertains to the traditional Omaguaca type. The painting was performed with black paint against a red background. In several cases, a V-shaped pattern was used. Painting of this type is typical of the articles made by the Calchaquí Indians (Salta Province, the La Poma tradition). Unlike them, the Omaguaca painted black, fully or partially, the inner surface of hemispherical red ware bowls (Fig. 2, *2*).

Among other ceramic shapes, noteworthy are painted small-size pseudo-aryballoi (Fig. 2, *4*). These were decorated with geometric figures filled with netlike ornament, which is typical of the combined Inca-Omaguaca style. A series of materials once owned by various Inca communities is distinguished among the ceramics of Pucará de Tilcara (Calderari, Williams, 1991). The collection also includes spherical pots with coupled handles in the central part of the body or near the rim; mugs with loop-shaped handles; and low truncated conical vessels with very wide rims and large loop-shaped handles, similar to antique lamps in shape (Fig. 2, *3*).

Stone items. The collection yields 19 grinders of irregular spherical form, made of coarse-grained bedrocks (various granitoids), and two flat grinding-stones of a very large size (51.0 cm long and 13.0 cm wide). The last two were broken off, and massive protruding handles were preserved at the surviving ends. Pronounced use-wear traces in the form of polish can be observed on the lateral and frontal surfaces of these items. Pecking technique was employed in manufacturing both tools. This is indicated by the traces on the grinders' parts that were not used during working. A set composed of a large grinding-slab (57 cm long, 27.5 cm wide) and a flat oblong grinding-stone is unique for the collection. On the latter, a deep rounded recess on one side is equal to the slab in width. The products were rubbed by movements directed along the entire slab, as evidenced by the wear-traces on its surface.

The assemblage contains seven small stone mortars with recesses, rounded owing to wear. Remains of brown-red coloring matter are preserved on the working surface of one of them. Along with mortars, short cylindrical pestles were used. The collection yields a stone knife, similar to the Inca tumi knives in shape (Handbook…, 1946: 621). The items delivered without field numbers include 13 splinters and 6 blanks of tools made from black and transparent-gray obsidian.

Antler and bone items. These constitute a considerable series of 29 specimens. According to the list provided by Ambrosetti, three tools were made

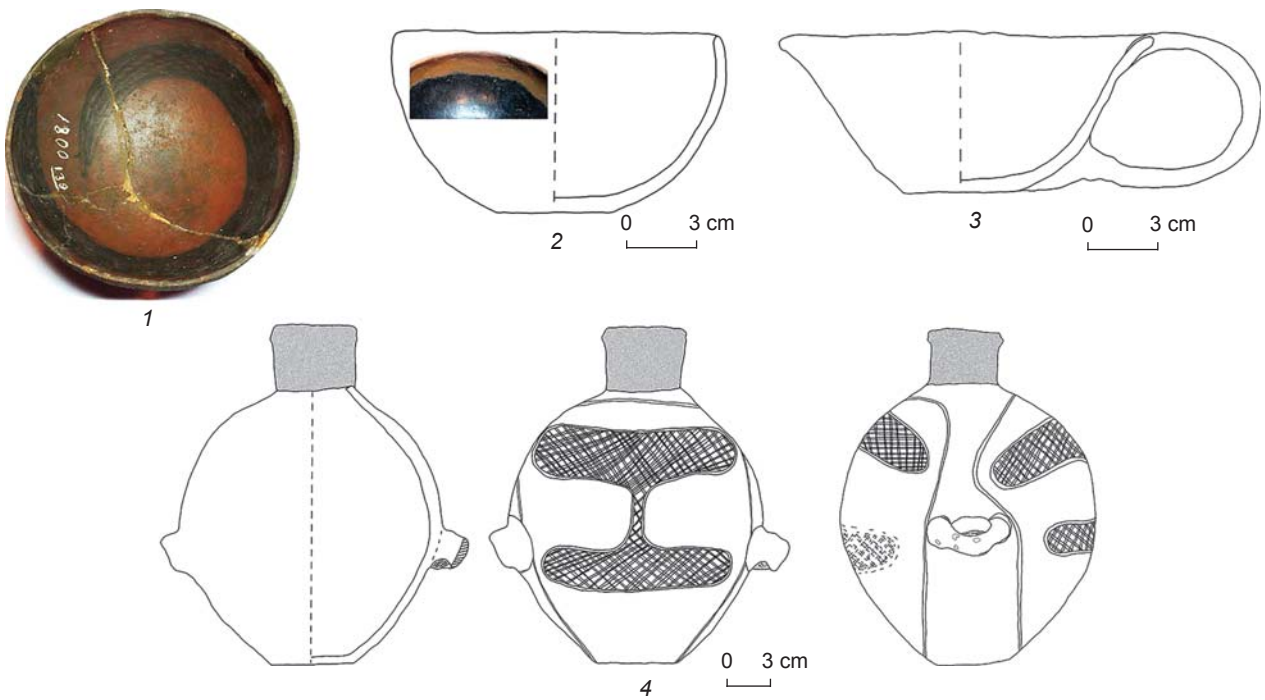

Fig. 2. Ceramics.
1, *2* – hemispherical bowls; *3* – a lamp; *4* – a miniature pseudo-aryballos.

of Chilean guemal antlers (*Hippocamelus bisulcus*; "cerves chilensis"—the name from the inventory list). They are characterized by a standard shape and a number of unified treatment techniques. The tip of the antler beam was sawed off; then, a round recess was drilled out therein, obviously intended to secure an insert; and flattened flakes were made at the ends of the first (eye) tines (Fig. 3, *1*). At the junctions between the beam and tines, a pronounced polish (probably, a result of tool use) is observed. Considering its location and the shape of the item, it can be assumed that the tool had an insert, which was put into the recess at the end of the beam and brought into operation by rotational movements through the use of tines.

Other unique items made of deer antlers are flutes (Fig. 3, *2*). Only one of these is completed with a mouthpiece, while two others are extant in massive hollow parts of the base. Flutes in better condition have been found at other Omaguaca sites (Ibid.: 630). Owing to these materials, it is possible to reconstruct the initial shapes of instruments from the MAE RAN collection. The flutes were composed of two mouthpieces, which were either tubular bone-fragments or hollow pipes carved out of antlers, and a massive part made of the antler beam's base. These elements were, obviously, connected using organic substances similar to rubber, or clay. Notably, in one flute, small holes (0.1 cm in diameter) were drilled out along a widened edge, apparently intended for more secure attachment of the instrument's component parts. In addition, the collection contains two hollow pipes carved out of deer-antlers. These are similar to the flute mouthpieces in their shape at the end (Fig. 3, *4*) and in the middle portion (Fig. 3, *5*).

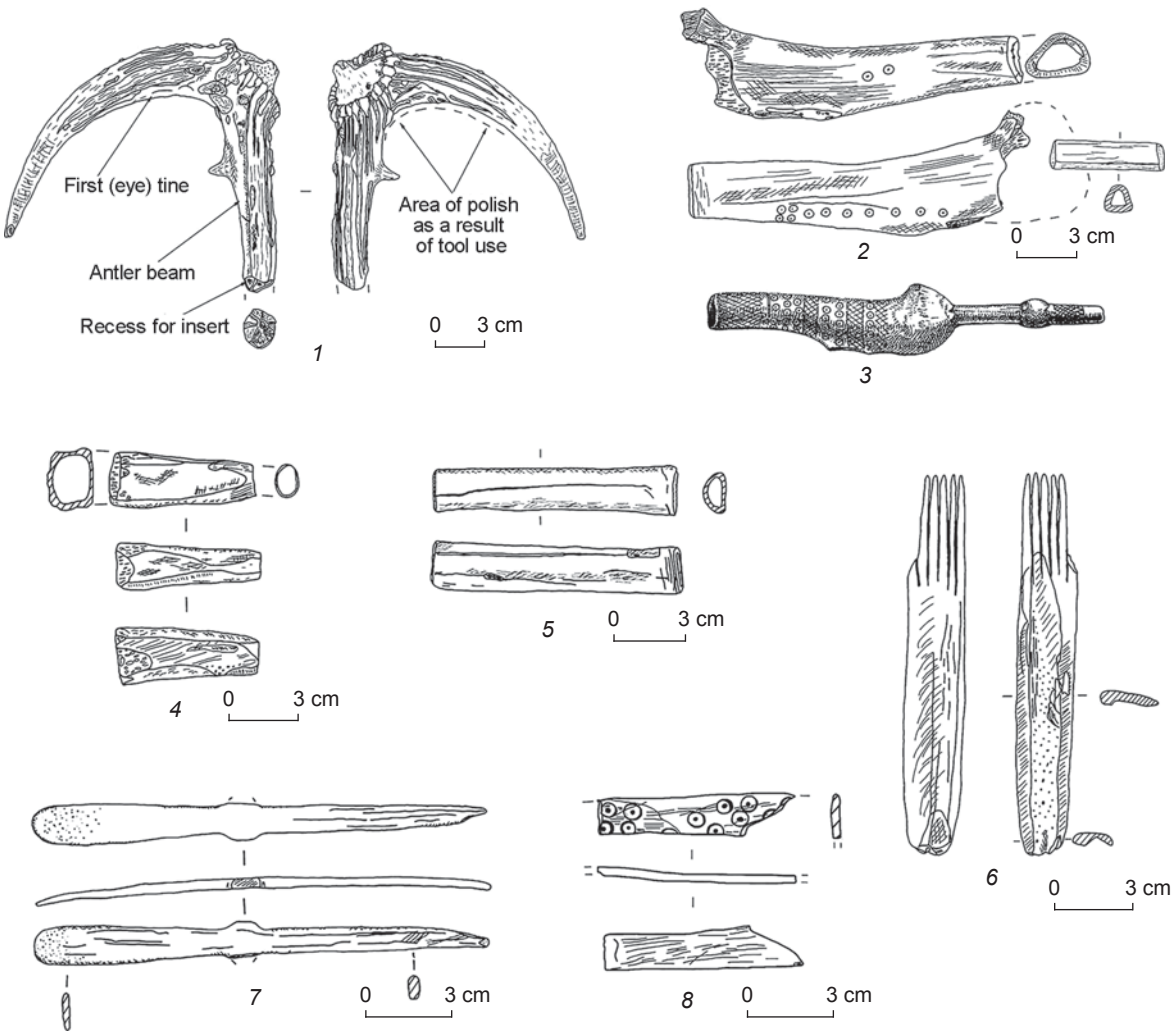

Fig. 3. Antler and bone tools.
1 – a tool made from Chilean guemal antler; *2* – reconstruction of a flute from Pucará de Tilcara; *3* – a flute from the collection of the Ethnographic Museum in Buenos Aires (Handbook…, 1946: 630); *4*, 5 – parts of antler flutes; *6* – a comb; *7* – a bone spatula; *8* – a fragment of an item with a "circular" ornament.

All bone tools are thoroughly polished. The surfaces of certain items are decorated with slotted, so-called circular ornaments, similar to that on the fragment of an item in the form of bone blade (Fig. 3, *8*). Such decoration is also present on one of the flutes (Fig. 3, *2*).

Among the bone items, noteworthy are three long narrow combs (Fig. 3, *6*). The surfaces of these items, especially those of the cogs and their bases, were strongly polished. Taking into account the abundance of clothing fragments made of lama wool or plant fibers in the burials, as well as the shape and degree of polish of the combs, it can be assumed that they were used as ripples.

The collection contains thin bone tools (two intact ones and a fragment) referred to as "spatulas" in the foreign literature (Ibid.: Pl. 133) (Fig. 3, *7*). Their length is 16.0–17.5 cm, the width is 1.6–1.7 cm. Utilization traces are concentrated mostly on the flattened surfaces of the items, and are directed diagonally, which rather suggests the use of the tools for treatment of clay, i.e. in pottery production (a definition given by N.A. Aleksashenko, a senior expert in the scientific-storage work of MAE RAN). This assumption is also evidenced by remains of black coloring matter in the spatula pores, as well as by traces of black paint on its surface. A wide flat tool with a slightly cut linear ornament on a thoroughly polished front surface may also pertain to this category (MAE, No. 1800-84). Remains of black paint that formerly covered the sides of the item are preserved on it. Paint at the pointed tip has been erased owing to wear. The tool is 13.5 cm long and 2.2 cm wide.

The collection includes a bone blank intended to manufacture a spoon, whose analog is stored in the collection of the Ambrosetti Ethnographic Museum (Zaburlín, Otero, 2014: 184, lam. 7).

Items made of other organic materials. Owing to special features of the soils, the cultural layer of Tilcara provided the researchers with a large variety of finds made of organic materials. A series of wooden items includes flattened stands for burning aromatic substances (Fig. 4, *3*), two spoons with long handles, a cylindrical beaker, V-shaped elements of harness (Fig. 4, *4*) that were used to secure pack-cargoes transported on lamas (Fig. 4, *5*), and two tools

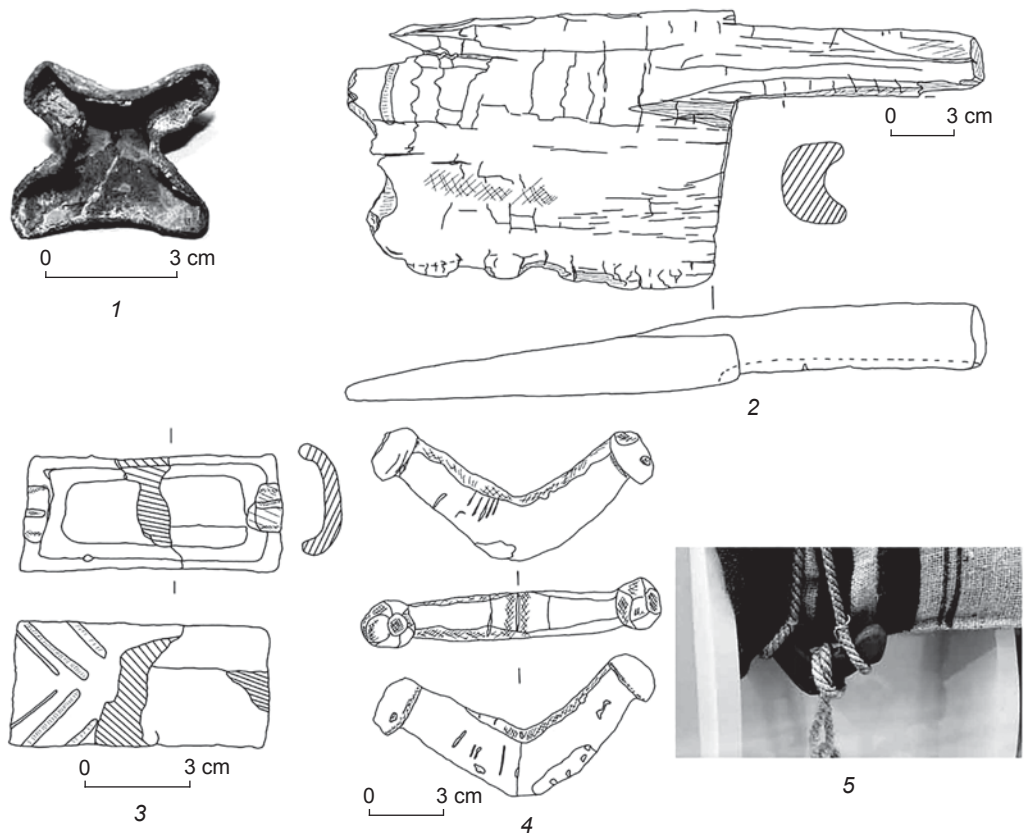

Fig. 4. Copper (*1*) and wooden (*2–5*) items.
1 – a bell; *2* – a spatula; *3* – a stand for burning aromatic substances; *4* – a lama harness fastening element; *5* – reconstruction of its use (exposition of the Ambrosetti Ethnographic Museum).

resembling plain-back shovels. At one end of one such tool, a shank shifted towards the side edge is cut out. A longitudinal rounded recess for securing a removable shaft is made in the shank (Fig. 4, *2*).

Noteworthy is a hemispherical bowl carved from half a pumpkin. The outer surface of the vessel is decorated with a geometric ornament made with the burning-out technique. Vessels of this type are frequent finds at the Puna sites, contemporaneous with Pucará de Tilcara (Handbook…, 1946: 626). In the center of the bowl, a running rhea is depicted (Fig. 5, *1*), surrounded by compositions of ornament similar to that encountered on the classic bowls of the Calchaquí culture (Fig. 5, *2*). On both sides of the bird figure, there are strips filled with floral ornament. As an indirect analogy, we can mention a myth of the Jivaro Indians about the moon that turned temporarily into a rhea, who, having quarreled with his cunning wife (a night bird auhu), climbed up to the heavens along a liana (https://www.indiansworld.org/Articles/pochemu-luna-nandu-ushel-na-nebo.html#.W-GhwNUzbIU). Notably, the quarrel between the spouses started because of eaten *yuvi* pumpkins, and the auhu, following the rhea, "collected her clay pots and boards, on which women rub clay for modeling". It is not clear so far whether this mythological subject is related to the Omaguaca and Calchaquí vessels, but it is interesting that ornamental compositions with a rhea surrounded by certain geometric and floral motifs occur exactly on calabashes and clay vessels. Taking into account the absence of folkloric mythological subjects known from the oral literature of the Central and Northwestern Argentina peoples (Berezkin, 2007: 273–281), such images can be of particular importance for studying the Omaguaca culture. As for the iconographic tradition, analogs of materials of pre-Inca and Inca periods of Northwestern Argentina are discovered far beyond the limits of Ecuador and Peru, which are the traditional habitat territory of the Jivaro Indians (Ibid.: 119).

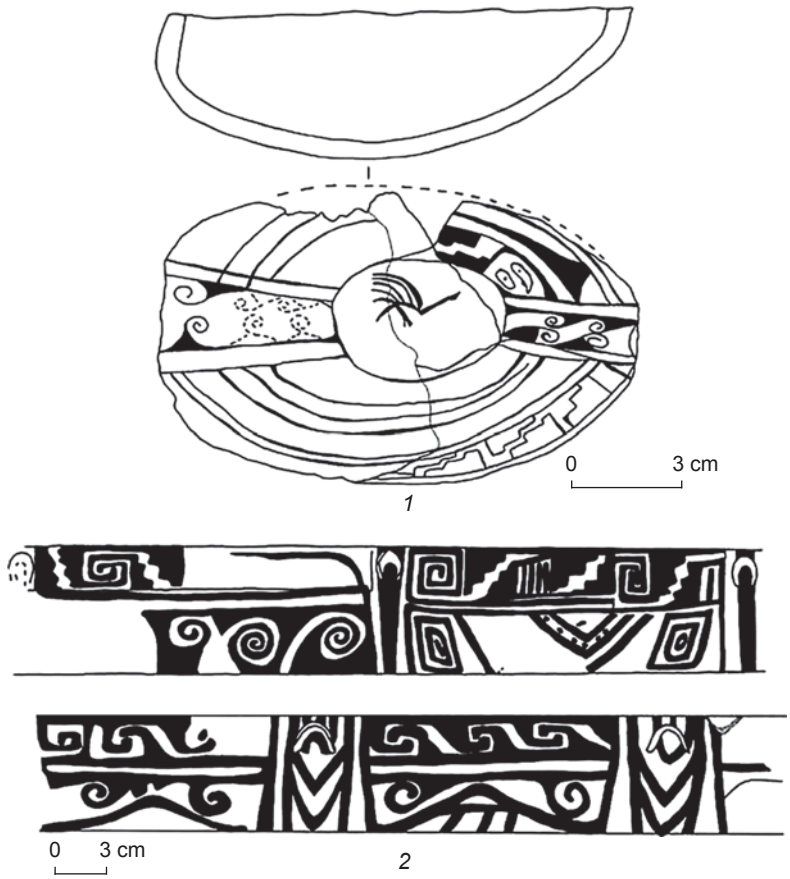

Fig. 5. Calabash with a burned-out ornament from Pucará de Tilcara (*1*) and tracing of ornaments on bowls from the settlement of La Paya (*2*).

Copper items. Among these, there are three plates which are halves of broken tweezers, a stick with a circular cross-section, and a bell made of a square copper plate with rounded corners (see Fig. 4, *1*).

Some items in the collection without numbers or accompanying information about places of their discovery include: a necklace made of seeds; beads made of malachite; pieces of ocher; nutshells intended for manufacturing bells; maize grains found in a burial; a fragment of a charred maize cob; a calabash with a deepened ornament on its outer surface; wooden tools and obsidian splinters. These finds, originating from different features of Tilcara, were selected by Ambrosetti, who obviously wanted to send to MAE items made of a wide variety of materials, in order to represent the Omaguaca culture assemblage to the fullest extent possible.

Conclusions

Attribution of archaeological and cranial finds from the Pucará de Tilcara fortress, which are stored in MAE RAN, has made it possible to refine the information about their origin and to reveal a series of items that do not belong to the assemblage of this site. Analysis of

the general catalogue of the Ambrosetti Ethnographic Museum has shown that the majority of the above materials from Pucará de Tilcara in the MAE RAN collection pertain to the excavations conducted in the northwestern part of the site in 1908–1910.

Studying the remaining documents has revealed numerous inconsistencies between different lists, and in some cases was of no help in determining the places of discovery of the items. For example, funerary ceramic urns from the materials of 1905 excavations in the Province of Salta are itemized in the general catalogue of the Ambrosetti Ethnographic Museum (hereinafter, the GC AEM) under the numbers of a series of stone tools from Tilcara specified in the list of MAE RAN (No. 200–213). According to the information received from employees of the Archaeological Department of AEM, the field numbers of finds of the first expedition of the Faculty of Philosophy and Literature in the general catalogue do not coincide with the numbers preserved on the items stored in the museum's collection. In the GC AEM, instead of three grinding-slabs (790, 791, and 792) from the MAE list, painted bowls from the settlement of La Paya found during the second expedition of 1906 are recorded.

In spite of all difficulties, the materials available in MAE RAN contain important information about the Omaguaca Indians' culture, which will be presented in detail in subsequent articles. The results of the study of the cranial specimens suggest that the Omaguaca Indians were able to perform specialized surgical manipulations. These results are also informative about the health status of the population that buried its members on the site.

A large series of ceramics, items made of bones, antler, and stones in the MAE RAN collection supplement the picture of economic activities of Pucará de Tilcara's inhabitants. The presence of bichrome ceramics and bone tools for polishing the ceramics (presumably, with the remains of respective paints on the surfaces) argues for the manufacture of some vessels within the fortress. The inhabitants of Tilcara were also engaged in textile fabrication, which is indicated by bone combs for combing out wool, and indirect evidence of the use of lamas (wooden fittings to fasten loads). The assemblage contains a lot of artifacts confirming that the local population was engaged in agricultural activities: wooden spades and hoes; a large number of tools for rubbing plant products or mineral substances (grinders, mortars with pestles). This is evidenced by the presence of maize cobs and separate maize grains in the cultural layer.

Description of the MAE RAN collection provides new materials for restoration of the formerly isolated assemblage of Pucará de Tilcara. Since it is impossible to finish research into the fortress area destroyed by building works in the first half of the 20th century, it is also extremely important to study the already available sources for refining the microchronology and cultural and economic specifics of the site.

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ASGE – Archaeological Collection of the State Hermitage Museum

BAR – British Archaeological Reports

BNC SO RAN – Buryat Science Center, Siberian Branch, Russian Academy of Sciences (Ulan-Ude)

DVO RAN – Far Eastern Branch of the Russian Academy of Sciences

GANIIIYAL – Gorno-Altaysk Research Institute of History, Language and Literature (Gorno-Altaysk)

GmbH – Gesellschaft mit beschränkter Haftung

IA RAN – Institute of Archaeology, Russian Academy of Sciences (Moscow)

IAET SO RAN – Institute of Archaeology and Ethnography, Siberian Branch, Russian Academy of Sciences (Novosibirsk)

IEA RAN – Institute of Ethnography and Anthropology, Russian Academy of Sciences (Moscow)

IEI UFIC RAN – Kuzeev Institute of Ethnological Studies, Ufa Scientific Center of the Russian Academy of Sciences (Ufa)

IIMK RAN – Institute for the History of Material Culture, Russian Academy of Sciences (St. Petersburg)

IIYAL UNC RAN – Institute of History, Language, and Literature, Ufa Research Centre, Russian Academy of Sciences (Ufa)

IrGSKHA – Ezhevsky Irkutsk State Agrarian University (Irkutsk)

KhakNIIYALI – Khakass Research Institute of Language, Literature and History (Abakan)

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 – Peter the Great Museum of Anthropology and Ethnography (Kunstkamera), Russian Academy of Sciences (St. Petersburg)

MIA – Materials and Investigations on Archaeology in the USSR

PNAS – Proceedings of the National Academy of Sciences

SAIPI – Siberian Association of Prehistoric Art Researchers

SPbF ARAN – St. Petersburg Branch of the Archive of the Russian Academy of Sciences

SVFU – North-Eastern Federal University (Yakutsk)

SVKNII DVNT AN SSSR – North-East Interdisciplinary Scientific Research Institute, Far Eastern Scientific Center, USSR Academy of Sciences (Magadan)

SVKNII DVO RAN – Shilo North-East Interdisciplinary Scientific Research Institute, Far Eastern Branch, Russian Academy of Sciences (Magadan)

TNIIYALI – Tuva Research Institute of Language, Literature and History (Tuva)

UIIYAL UrO RAN – Udmurt Institute of History, Linguistics, and Literature, Ural Branch, Russian Academy of Sciences (Izhevsk)

UrO RAN – Ural Branch of the Russian Academy of Sciences

VASKhNIL – Lenin All-Union Academy of Agricultural Sciences

VSEGEI – Karpinsky Russian Geological Research Institute (St. Petersburg)

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