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## **Ornaments Made from *Unio* Shells in a Neolithic Burial at Ust-Aleika-5, Barnaul, Southwestern Siberia**

*The search for a Mongolian era cemetery at Ust-Aleika, Kalmansky District, Altai Territory, in 1982 revealed a Neolithic child burial, which was excavated. The funerary items included over 300 artifacts made of organic and inorganic materials, among them more than a hundred pendants made from fossil Pleistocene shells of *Unio* mollusks, which do not occur in the Ob basin at present. These thick-walled shells had been procured from the Kalistratikha I exposure on the left bank of the Ob. The pendants had been made according to a hitherto unknown technique: they are irregularly ellipsoid with segment-shaped longitudinal and transverse sections. The thickness of the shells allowed the artisans to use relief, which is difficult or impossible with shells of modern bivalves from the Upper Ob basin. Burial 2 at Ust-Aleika-2 dates to the middle or late 4th millennium BC. It belongs to the same cultural and chronological group as burials 1 and 5–9 at Solontsy-5, and a double burial at Bolshoi Mys (Itkul), excavated by V.I. Molodin in 1976.*

**Keywords:** *Child burial, Neolithic, Barnaul area, Ob basin, ornaments, *Unio* shells.*

### **Introduction**

The Ust-Aleika-5 site was discovered in 1981 in Ust-Aleika village, Kalmansky District, Altai Territory (Fig. 1). At that time, during the power line's construction works, a Mongolian era burial 1 was destroyed. The cemetery is located on a small promontory formed by the left side

of the River Alei valley in its mouth zone, where the old Alei riverbed joins the Ob floodplain. The promontory is crossed by Partizanskaya Street. In 1982, during the search for a cemetery of the Mongolian era, a Neolithic burial 2 was discovered and excavated—a single vertical burial of a small child with abundant grave goods. The grave was 0.6–0.7 m deep in the virgin land and ca 0.3 m in diameter.

The anthropological materials recovered from burial 2 at Ust-Aleika-5 cemetery were explored in the 1980s at the Department of Human Anatomy of the Altai State Medical Institute (postcranial skeleton, identified by A.I. Sterlin) and in the Anthropology Department of the Tomsk State University (fragments of the skull, identified by V.A. Dremov). On the basis of osteometric data on the long bones, the age of the buried child was determined as in the interval of 18–20 months; and according to the morphological features of the skull and teeth eruption, in the range of 2–3 years.

As a result of work with the fragments of the child's skull (Inv. No. 3305), kept in the Anthropology Department of Tomsk State University, it was possible to restore its shape (Fig. 2) and obtain important craniometric characteristics, as well as data on odontological features. The use of modern anthropological methods made it possible to clarify the age of the child on the basis of the size of tooth germs and the degree of formation of their roots. The age of an individual from the Neolithic burial is determined as in the range of 1.5–2 years.

The reason for the extraordinary set of grave goods and the funeral rite in general could be the pathological status of the buried. An unclosed anterior fontanel on the skull of a 1.5–2-year-old child, and its significant area, as well as the horizontal and circumferential dimensions of the braincase, which are very large for this age, with the normal size of the facial region, indicate macrocephaly, probably due to hydrocephalus.

The reconstructed “adult” dimensions of the child's skull suggest the male sex for the buried. The derived craniometric and odontological parameters suggest the attribution of the individual to the anthropological stratum of the autochthonous population of the central regions of Eurasia, represented in particular by craniological series of the Neolithic period from the cemeteries of the Barnaul-Biya-Ob region, the northern foothills of the Altai, the Middle Irtysh region, and the Aral Sea region.

In total, 328 artifacts from the collection of burial 2 at Ust-Aleika-5 were passed on to the Museum of Altai



Fig. 1. Location of the Ust-Aleika-5 site (1) and the Pleistocene deposits exposure at Kalistratikha I (2).

Archaeology of Altai State University, including 124 mother-of-pearl pendants. This collection also includes 129 drop-shaped pendants made from thin polished bone (horn?) (Fig. 3, 1–3), and 25 items made from red-deer incisors (Fig. 3, 4–6); each item has a small hole for hanging. Some show the traces of a strap (grooved structures with soft smoothed edges) 3.5–4.0 mm wide (Fig. 3, 5).

In total, 49 lithic artifacts were found in the grave, including six intact bifaces (Fig. 3, 7) and nine fragments, three tools on siliceous shale plates, four tool fragments, an axe with polishing signs (Fig. 3, 8), four arrowheads, an abrader with a longitudinal groove, a scraper, and two retouched flakes. Production waste (17 spec.) consists of flakes, fragments, and a spall from a polished tool. Quite interesting is a small piece of trapezoidal hematite with numerous scratches and traces of smoothing. A horn point was also found. Three marmot mandibles (identified by N.D. Ovodov) were found in the grave; and also 23 marsh



Fig. 2. Neolithic child's skull from burial 2.

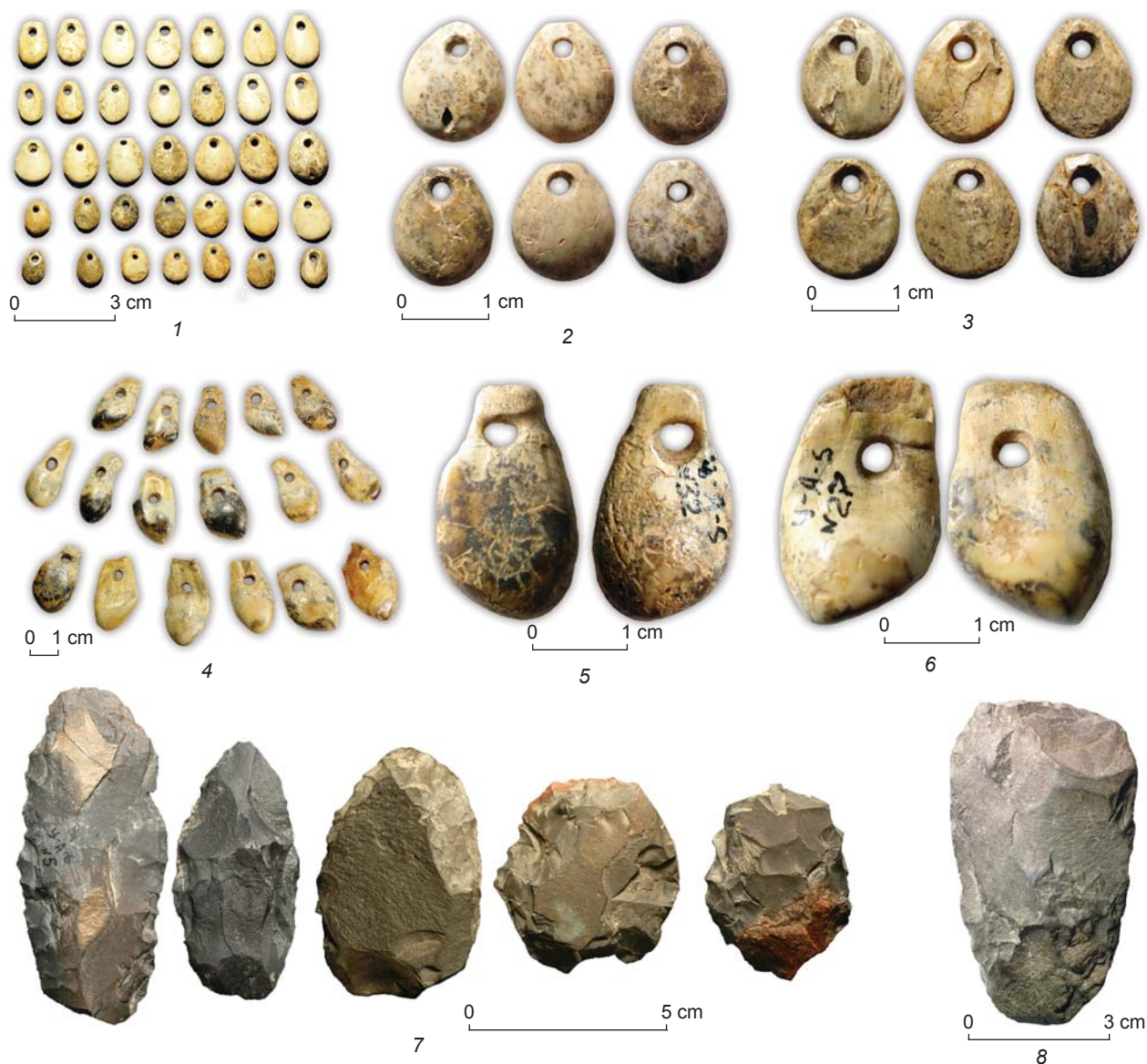


Fig. 3. Grave goods.

1–3 – drop-shaped pendants from bone and horn (1, 2 – obverse, 3 – reverse); 4–6 – pendants from red deer incisors; 7 – bifaces; 8 – an axe.

harrier bones, all from a single individual (identified by N.V. Martynovich).

Infant burial 2 at Ust-Aleika-5 is atypical among contemporaneous sites of the Altai and adjacent regions. The mother-of-pearl ornaments from the shells of large bivalve mollusks from this burial are very unusual. Such items are relatively rare in the burials of the region under consideration. Since the sources of raw materials suitable for their manufacture (reservoirs with the relevant types of mollusks or localities of fossil shells) are often known, such finds make it possible to reconstruct the area of movements and/or the cultural ties of the local population (Kiryushin Y.F., Kiryushin K.Y., Schmidt et al., 2011; Kiryushin Y.F., Kiryushin K.Y., Demin et al., 2012). Certain artifacts made from mollusk shells from

the Chalcolithic–Bronze Age burials of the Ob region and the foothills of the Altai proved to originate from rather remote regions (Ibid.). In this regard, all finds of this kind are of considerable interest.

### Study results

Mother-of-pearl pendants are 1.0–1.5 cm long and 0.8–1.0 cm wide, their average thickness is 2.0–2.2 mm (the largest is 3.0 mm). The state of the products' preservation is poor. The mother-of-pearl layer crumbles heavily. Most of the pendants are heavily damaged, but some of the items are quite well preserved (Fig. 4–7), and some items even show a characteristic mother-of-pearl sheen



Fig. 4. Mother-of-pearl pendant of irregular ellipsoid shape.  
1 – obverse; 2 – its fragment.

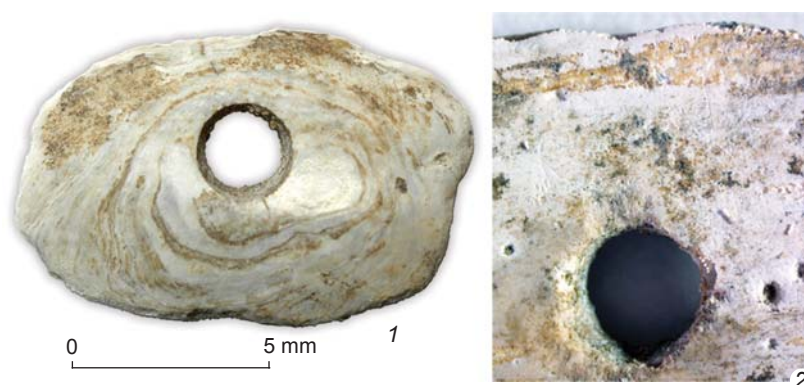


Fig. 5. Mother-of-pearl pendant of subrectangular shape.  
1 – obverse; 2 – reverse fragment.



Fig. 6. Mother-of-pearl pendants.  
1 – obverse; 2 – reverse.

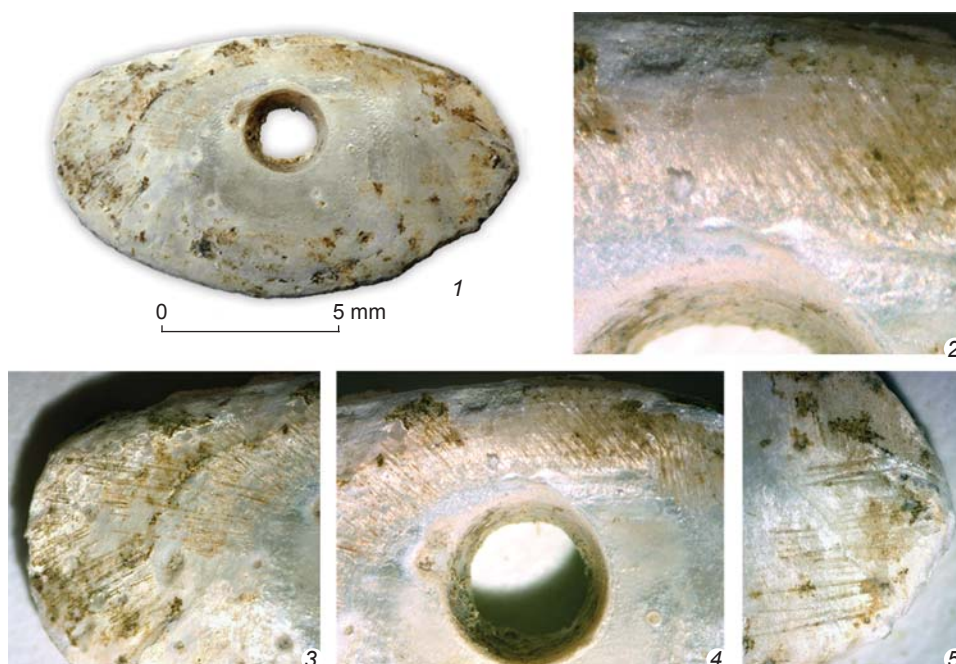


Fig. 7. Mother-of-pearl pendant.  
1 – obverse; 2–5 – its fragments.

(see Fig. 4; 6, B; 7). Most of the ornaments have an irregular ellipsoidal shape (see Fig. 4), but there are also subrectangular ones (see Fig. 5).

All the pendants have conical holes, the diameters of which are smaller on the reverse side of the product than on the obverse side. In most of the pendants, the hole is located closer to the upper edge (see Fig. 4; 6, B; 7), but some of them bear the hole almost in the center (see Fig. 5; 6, A). In most cases, the hole's edge is polished from the reverse (see Fig. 5, 2; 6, A, 2; B, 2).

Several pendants show traces of fastening (grooved marks with smoothed edges) 0.15–0.18 mm wide on the obverse (see Fig. 4). On some items, these marks are recorded on the reverse, but they are rather vague (see Fig. 5, 2). These are the characteristic traces of attaching an item to clothing. There is no doubt that the mother-of-pearl items were used as pendants, each of which was individually attached to the outfit. These ornaments looked quite impressive, showing the brilliance and play of mother-of-pearl.

On the reverses of the pendants, growth lines of shell valves are visible (see Fig. 6, A, 2; B, 2). The affiliation of these artifacts to mollusk shells is also proved by the remains of the horny (periostacal) layer on the obverse of some specimens (see Fig. 4, 1).

All pendants show a segment-shaped cross-section in the longitudinal and transverse views; the reverse being almost flat, while the obverse is convex. Owing to removal of material through grinding, the shells' growth lines in the central parts of the pendants, on their outer

sides, became concentric. The reverse of the products was processed on a rather coarse abradant, traces of which are visible to a certain degree on all pendants. The obverse of almost all products is carefully polished. Grinding marks formed in the course of pendant shaping are found only on a few items (see Fig. 4, 1; 7, 2–5). Radial scratches, sometimes deep, are traced mainly along the edge, and are absent in the medial part (see Fig. 7, 2–5). In most cases, they are smoothed through subsequent careful polishing of the obverse of the products. It can be concluded that during the manufacture of a pendant, the reverse of the shell became the obverse of the item, and the obverse became the reverse side.

As noted above, thickness of the pendants is 2.0–2.2 mm on average (the largest is 3.0 mm). Taking into account that the items were polished, the initial thickness of the original shell valves should have been at least 2.5–3.5 mm. At the same time, the relative position of growth lines indicates shell sizes of approximately 10–15 cm.

As noted above, the pendants are 2.0–2.2 mm thick on average (the thickest is 3.0 mm). The items were polished, hence, the initial thickness of the shell valves from which they were made should have been at least 2.5–3.5 mm. At the same time, the relative position of growth lines indicates shell sizes of approximately 10–15 cm.

In the continental regions of Northern Eurasia, there is only one group of bivalves with similar thick-walled shells. This is the genus *Unio*, pearl shell, which does not occur in the modern fauna of the Upper Ob region (Kuzmenkin, 2013). Swan mussel of the genus *Anodonta*

(*Colletopterum*), which is similar in shell size and widespread in the region, has rather fragile thin-walled shells (Starobogatov et al., 2004). The largest modern swan mussels in the Upper Ob region have the valves with a maximum thickness of 2.4 mm (in their joint area), but their average thickness is much less, in the range of 0.7–1.0 mm. These are the reliable grounds for attribution of the mollusks, from the shells of which these ornaments were made, to the genus *Unio*.

The Kalistratikha I exposure of the Pleistocene deposits was established on the bank of the channel of the Ob near the northern outskirts of Kalistratikha village, Kalmansky District, Altai Territory (see Fig. 1), approximately 18 km north of Ust-Aleika-5. The stratigraphic sequence of the section was subjected to paleontological analysis, and was attributed to the Middle to Late Pleistocene (Zudin, Panychev, 1968; Razrez..., 1978: 42–43; Stratigrafiya..., 1977: 20–21). The Kalistratikha exposure contained numerous faunal remains (bones of large and small mammals, mollusk-shells, micro- and macro-plant remains) (Razrez..., 1978: 42).

The reliable habitats of *Unio* bivalve mollusks that are closest to the study area are currently located in the basin of the Tobol River and Bukhtarma Reservoir. However, these mollusks appeared there relatively recently, presumably as a result of human activities that contributed to their dispersal from the nearby areas of the Volga-Kama basin, or during the introduction of commercial fish (Babushkin et al., 2021: 3). The only *Unio* population in the region with a presumably relict aboriginal origin inhabits the Cherny Irtysh River in the vicinity to the Kazakhstan border with China (Ibid.: 8). Thus, the areas of the modern habitation of *Unio* are rather far away from the Ust-Aleika-5 cemetery. The area of distribution of this group of mollusks in the 5th–4th millennium BC hardly differed significantly from the modern one. However, fossil Pleistocene *Unio* mollusks are fairly typical for the Upper Ob region (Maloletko, 1972: 67, 81).

To test the hypothesis on the possible use of fossil material in the manufacture of ornaments, Pleistocene

mollusk shells from Kalistratikha I were studied. The exposure was inspected and samples were collected in October 2021. Numerous fragments and whole valves (Fig. 8) of *Unio* aff. *tumidus* pearl shell were recovered from a Pleistocene layer of bluish-gray clays, ca 3 m above the river level. The shells have also been noted on the beach downstream. The remains of *Unio* shells (mostly small fragments, very rarely whole valves) also occur upstream from the indicated place, for about 5 km. Intact valves are oblong-oval in shape and 8–15 cm long. Their thickness varies from 2.1 to 4.0 mm. The corneous layers of the shells extracted from the deposits crumble quickly; their fragments remain only along the growth lines. The general state of preservation of the valves seems to be sufficient for the manufacture of small items.

The features of the state of preservation of the artifacts under discussion indicate fossilization of the raw material; the samples of Pleistocene shells collected at Kalistratikha I in the fall of 2021 demonstrate the same state of preservation. This fact, and the proximity of the section to Ust-Aleika-5, make it possible to conclude that it was the material from this exposure that was used to manufacture the ornaments.

## Discussion

Categories of artifacts from burial 2 at Ust-Aleika-5 are widely represented in the Neolithic and Chalcolithic materials from the Barnaul Region of the Ob and adjacent territories. It is generally accepted in the scientific literature that some of them (drop-shaped pendants made of bone or horn) were widespread “in the cultures of the Neolithic and Early Bronze Age of Eurasia, and it makes no sense to provide parallels to them” (Molodin, 1999: 44). Therefore, to determine the cultural and chronological position of the burial under discussion, it is necessary to consider the available absolute dates.

Radiocarbon dating of the bone samples (drop-shaped pendants) from burial 2 at the Ust-Aleika-5 flat-grave

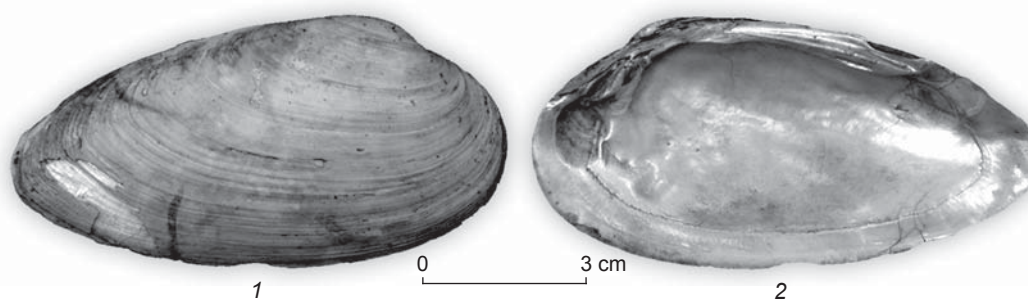


Fig. 8. *Unio* aff. *tumidus* fossil shell from Kalistratikha I exposure.  
1 – obverse; 2 – reverse.

burial ground was carried out at the Center for Collective Use “Laboratory of Radiocarbon Dating and Electron Microscopy” of the Institute of Geography RAS, in the Center for Applied Isotope Studies at the University of Georgia, USA (outsourcing), and at the Budker Institute of Nuclear Physics SB RAS. Two AMS-dates have been derived:  $5550 \pm 25$  BP (IGAN-5829) and  $5219 \pm 86$  BP (NSKA-01941). The intervals of calendar age determined through calibration show a small scatter for the first date (4445–4415, 4400–4380, 4375–4350 BC by  $1\sigma$ , and 4450–4340 BC by  $2\sigma$ ) and a very significant scatter for the second one (4230–4190, 4170–4090, 4080–3950 BC by  $1\sigma$ , and 4350–3800 BC by  $2\sigma$ ). It is noteworthy that there is a small overlapping of these intervals: the lower value by  $2\sigma$  4350 BC (NSKA-01941) and the upper by  $2\sigma$  4340 BC (IGAN-5829).

The closest parallels to the drop-shaped bone and horn pendants, deer incisor ornaments, and lithic artifacts found in burial 2 at Ust-Aleika 5 have been recorded in the materials of the Solontsy-5 flat-grave burial ground (Kungurova, 2005: 14–17). Burial 1 of this burial ground revealed a man of 35–40 years old and a child of ca 1.5 years old, with rich grave goods (Ibid.: 14–15). The length of the child’s skeleton is 0.70–0.75 m; the skull is crushed (Ibid.). In the child burial, there were a side-bladed dagger, eleven stone arrowheads and their fragments, four stone flakes, “a piece of hematite (red mineral paint)”, tusks of a musk deer, teeth of a roe deer, and three round valves of large shells (Ibid.). Unfortunately, N.Y. Kungurova did not mention the species of the shells found. In the analysis of the grave goods of the burials at Solontsy-5, the author noted that “shells” and “twisted snail shells” with “thin walls” were found in the female burials, and “shells of a different type; shell valves of *Glycymeris* sp. (*Anodonta* sp. *Corbicula fluminalis*) in male burials” (Ibid.: 33). The relevant drawings (Ibid.: 111, fig. 31, 4) suggest that in burial 1, shells of *Glycymeris* bivalve mollusks were found.

Thus, comparative analysis of the burials with sets of grave goods similar in contents and size (Ust-Aleika-5 and Solontsy-5) has shown the coincidence in the age of the buried children, and also in the availability of stone arrowheads and flakes, as well as pieces of hematite. In addition, one of the graves yielded fossil shells, the other fossil shell ornaments. The similarities look even more significant if we take into account that the grave of a man from the same burial included ornaments made of deer incisors and drop-shaped pendants made of bone or horn (Ibid.: 106, fig. 26, 16–22, 35), which are almost identical to those found in burial 2 at Ust-Aleika-5, as well as stone axes and bifaces (Ibid.: 98–106, fig. 18, 26). Burials 6–9 at Solontsy-5 revealed drop-shaped pendants made of bone or horn, round pendants made of mother-of-pearl, deer teeth, and pieces of “paint of ferriferous rock” (Ibid.: 16–

17). The radiocarbon dates of  $5485 \pm 85$  (SOAN-4627) and  $5325 \pm 45$  (SOAN-4628) BP were obtained for burials 1 and 7 at Solontsy-5 (Ibid.: 57).

Drop-shaped bone ornaments and round mother-of-pearl sewn-on decorations were found in a double burial at the Bolshoi Mys (Itkul) cemetery, excavated by V.I. Molodin in 1976 (Molodin, 1999). Drop-shaped pendants made of bone were found in burial 5 at this cemetery (Kiryushin, Kungurova, Kadikov, 2000: 111, fig. 18). In the burials at the Ust-Isha cemetery, drop-shaped bone ornaments (burials 8, 9, and 12), pendants made of red-deer incisors, and round mother-of-pearl sewn-on decorations (burials 8 and 12) were found (Ibid.: 80, fig. 15; 89, fig. 4). Burial 12 yielded pieces of hematite (Ibid.: 14, 91, fig. 26, 4); burial 8 contained *Corbicula* (?) shells (Ibid.: 13, fig. 15).

Drop-shaped bone ornaments and round mother-of-pearl sewn-on decorations were found in a female Neolithic burial in Kaminnaya Cave (Markin, 2000). The dates of  $5320 \pm 90$  (SOAN-3401) and  $5300 \pm 150$  (AECV-2040 C) BP were generated on charcoal from the grave-pit filling just above the skeleton. (Ibid.: 63).

The results of radiocarbon dating point to a contemporaneous proximity of the considered child burial to burials 1 and 7 at Solontsy-5 and the Kaminnaya Cave burial. Comparative analysis of the materials suggests that it constitutes a single cultural and chronological group with burials 1, 5–9 at Solontsy-5 (Kungurova, 2005: 14–17) and a double burial at Bolshoi Mys (Itkul), studied by Molodin in 1976 (Molodin, 1999). The currently available series of radiocarbon dates for the complexes under study was generated on various materials (animal bone and horn, human bone, charcoal from the grave-pit filling) in different laboratories, using different methods (AMS and LSC), and it can hardly be considered representative. At the present stage of the study, the available dates suggest attribution of this group of burials to the middle–late 4th millennium BC. In all likelihood, as soon as new dates become available, the chronology will be corrected. The group will probably be expanded by the inclusion of burial 5 of Bolshoi Mys (Itkul) and burials 8, 9, and 12 of Ust-Isha (Kiryushin, Kungurova, Kadikov, 2000: 12–14).

Summing up, it is worth noting that mother-of-pearl pendants of irregular ellipsoid shape from burial 2 at Ust-Aleika-5 have no direct parallels in the materials of the Neolithic-Chalcolithic sites of the Altai and adjacent territories, where only round-shaped mother-of-pearl ornaments are known. The original raw material (thickness of shells) allowed the ancient artisan to produce artifacts in relief, which would be impossible or very difficult with the modern forms of bivalve mollusk from the Upper Ob region. This issue is discussed in comparatively few papers; but the collections from the

Tavdinsky grotto (Volkov et al., 2006) and the Tuzovskiy Bugry-1 cemetery (Kiryushin Y.F., Kiryushin K.Y., Schmidt et al., 2011) suggest that the materials from burial 2 of Ust-Aleika-5 present the technology of making ornaments from mother-of-pearl, which was atypical of the region.

The mother-of-pearl pendants from the Tavdinsky grotto were made from fragments of shells; judging by their thickness and degree of preservation, these were swan mussels (*Anodonta* sp.), which inhabited the lower reaches of the Katun during the Chalcolithic. The products were from 1.0 to 2.4 mm thick (1.5–1.7 mm on average), which corresponds to the original thickness of the valves, since no signs of special processing were noted either on their reverse and obverse sides.

Traceological study of 29 mother-of-pearl pendants from the Chalcolithic horizon of the Tavdinsky grotto revealed a series of characteristic traces of grinding, polishing, drilling, etc. (Volkov et al., 2006: 253). On the basis of a cumulative analysis of products, the main technological stages of their manufacture have been established. At first, flattened fragments of shells were given the outlines rounded in plan view by rough removal of protruding outer edges (Ibid.). Then, the product was ground on a wide fine-grained abradar with a flexible base. Then, a hole was made in the central part of the product. In some cases, drilling was stopped—probably because of the risk of destruction of the mother-of-pearl plate, i.e. in the cases when the blank was relatively thin (Ibid.: 254)—and continued from the opposite side. The final stage of work was polishing the ends of the products. Their surfaces do not bear traces of special grinding or polishing. Only solitary areas showed polishing overlapping, as if “concealing”, the traces of unintentional destruction (picking out) of the mother-of-pearl layer, which were produced during the previous stages (Ibid.: 255).

The process of making the Ust-Aleika-5 pendants (shaping the product and subsequent polishing) required more labor costs than other ornaments from the Tavdinsky Grotto. Apparently, in the Neolithic and Chalcolithic burial complexes of the Altai, the technological (and possibly cultural and chronological) tradition of producing round mother-of-pearl pendants can be traced, similar or very close to that of the Tavdinsky Grotto materials. This technology was adapted to the local raw materials (swan mussel shells) and was less labor-intensive.

## Conclusions

In the course of the research, it was found that mother-of-pearl pendants from burial 2 at Ust-Aleika-5 were made of fossil Pleistocene shells *Unio aff. tumidus*. The raw material's provenance was also established; it was the

Kalistratikha I exposure on the left bank of the Ob River, 18 km north of the Ust-Aleika-5 cemetery.

The derived AMS-dates of  $5550 \pm 25$  years BP (IGAN-5829) and  $5219 \pm 86$  years BP (NSKA-01941) suggest the attribution of the burial to the middle–late 4th millennium BC. It has been concluded that burial 2 at Ust-Aleika-5 is chronologically close to burials 1, 5–9 of the flat-grave burial ground of Solontsy-5 and the double burial at Bolshoi Mys (Itkul) excavated by Molodin in 1976.

The discussed mother-of-pearl pendants of irregular ellipsoid shape are distinct from the similar ornaments from contemporaneous sites in the Altai and adjacent regions. The differences are largely due to the source material—fossil Pleistocene *Unio* shells, the thickness of which (from 2.1 to 4 mm) allowed the ancient artisans to make relief products, which would be impossible or very problematic when using modern forms of bivalve mollusk of the *Anodonta* genus (*Colleopterum*) from the Upper Ob region.

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