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Neolithic Burials in the Zelinda River Mouth, Northern Angara: Burial Practices and Radiocarbon Chronology

We describe new findings relating to Neolithic burials at two cemeteries in the Northern Angara area, excavated in 2012 by the Boguchany archaeological expedition. The sites are located at the outlet of the Zelinda—the right tributary of the Angara. Two burials were revealed at Ust-Zelinda-1, and five at Ust-Zelinda-2. We describe preserved remains and the funerary rite, and analyze radiocarbon dates generated from the human bones. On the basis of archaeological parallels, we attribute certain burials to the Isakovo culture. Burial practices include the use of "ocher" and the supine position of the buried along the Angara, heads to the south, upstream of the site. Calibrated radiocarbon dates, details of the funerary rite, grave goods and their typological characteristics, as well as the placement of graves within the cemeteries, suggest that three chronological groups existed within the 7499–5583 cal BP (5550–3634 cal BC) interval. The ^{14}C date of the third group (5718–5583 cal BP, or 3769–3634 cal BC), details of the funerary rite, and grave goods are indicative of the Late Neolithic (Isakovo culture of the Southern Angara). Burials of the second group, which is the best represented (7157–6555 cal BP, or 5208–4606 cal BC), resemble those of the classic Isakovo tradition. The burial (without grave goods) attributed to the first chronological group dates to 7499–7317 cal BP, or 5550–5368 cal BC. It is hypothesized that "proto-Isakovo" traditions originated on the Northern Angara, having later spread to the Southern Angara.

Keywords: *Northern Angara, Neolithic, cemeteries, radiocarbon chronology, Zelinda River.*

Introduction

To date, a great number of sites and stratified complexes has been found in the Northern Angara area; the obvious goal of the current studies is to propose a cultural-chronological scale for the region and provide it with radiocarbon dates (see, e.g., (Berdnikov et al., 2020; Saveliev et al., 2020; Weber et al., 2021; and others)). The scale is based on pottery types and is associated mainly with the stratified sites of the Baikal region, the Southern Angara region, and the middle Yenisei. Therefore, intact complexes (including those containing ceramics) are especially valuable: they provide grounds not only for cultural attribution of archaeological materials, but also for direct radiocarbon analysis of the artifacts.

The artifacts recovered from graves are traditionally regarded as the bases for establishing the cultural-chronological horizons (complexes) of both large areas and archaeological microdistricts (see, e.g., (Okladnikov, 1950; Makarov, 2008)).

Large-scale excavations have shown that there are quite few cemeteries in the Northern Angara area; such

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large cemeteries as in the Baikal and Southern Angara areas are absent here (Okladnikov, 1950; Bazaliiskii, 2012). The Northern Angara cemeteries usually include from 1 to 10 graves (Boguchanskaya arkheologicheskaya ekspeditsiya…, 2015: 84–90, 127, 175, 255, 278, 293–395, 310, 328–329, 352–354, 390–391, 410–411, 420–421, 427–428, 441–444, 452, 453–454, 474–475, 492–493). Judging by the features of burial practice, grave goods, and radiocarbon dates, such small accumulations of burials do not form long-term cemeteries; they represent different chronological periods and cultural traditions. The graves do not contain ceramic vessels or any other grave goods, which fact often hinders cultural and chronological attribution of the site and comparison of habitation and funerary materials.

The purpose of this article is to introduce the archaeological information about burial practices and the results of the radiocarbon analysis of the Neolithic burials of the Ust-Zelinda-1 and -2 sites, belonging to one of the Northern Angara archaeological microdistricts.

Description of archaeological sites

The by now completely or partially flooded sites of Ust-Zelinda-1 and -2 were located on both banks of the outlet of the Zelinda River—the right tributary of the Angara (Ust-Ilimsky District, Irkutsk Region) (Fig. 1). The distance between the sites was 300–400 m (Fig. 2, *1*) (Boguchanskaya arkheologicheskaya ekspeditsiya…, 2015: 445). There are two rapids in this section of the river: the Upper and Lower Keul riffles. The cemeteries related to a number of archaeological features located 0.1–5.0 km from one another on the nearest islands (Kamenny, Vatakina, etc.) and at the outlets of the left tributaries of the Angara (Polovinnaya, Elovka, Zhevakan, Keul). Such a concentration of sites can be regarded as an archaeological microdistrict formed in the place where various natural features relevant for the Angara population in various periods were combined. Similar combinations of islands, estuarine sections of tributaries, and river rapids have also been noted in other parts of the Angara (Boguchanskaya arkheologicheskaya ekspeditsiya…, 2015: 445–477, Grishin et al., 2016: 4). We suggest giving this microdistrict the name of Keul-Zhevakan, since this name indicates the lower and upper boundaries of the microdistrict along the river, separated by 14.5 km. In general, it is reasonable to consider the archaeological features of such microdistricts as a whole. Unfortunately, this is not yet possible, because not all the findings from the long-term studies of the region by the Boguchany archaeological expedition have been published. This article provides information about the Neolithic cemeteries of the "Zelinda" part of the Keul-Zhevakan microdistrict. Notably, Ust-Zelinda-1 and -2 are the only cemeteries in the microdistrict that are located on the right (eastern) bank of the Angara.

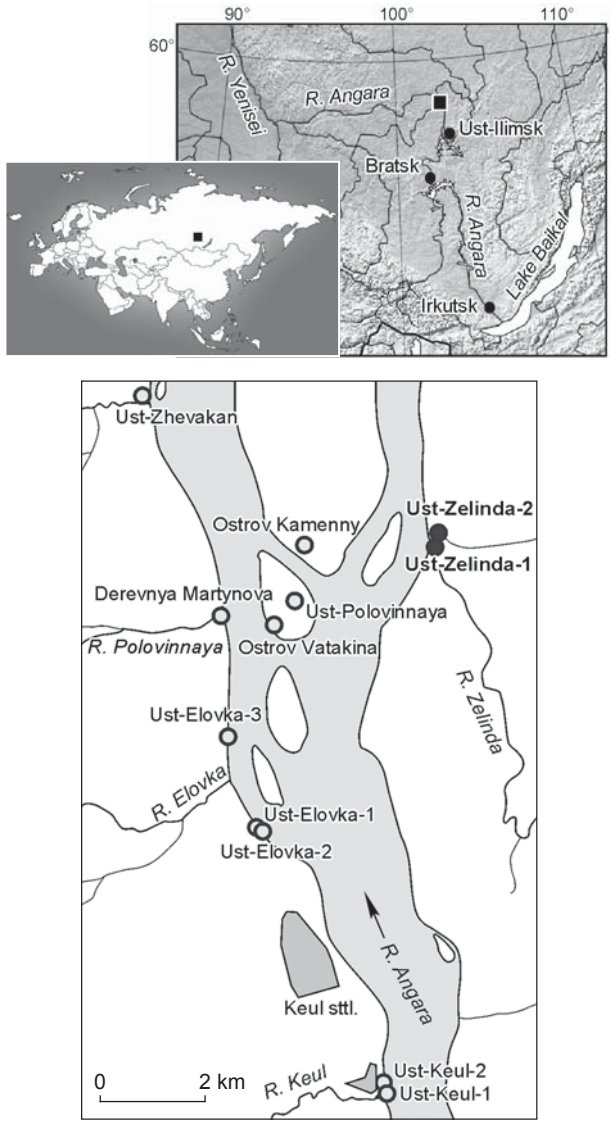

Fig. 1. Archaeological sites of the Keul-Zhevakan microdistrict in the Angara area.

These sites, together with the vast majority of other objects in the Keul-Zhevakan microdistrict, were discovered by E.O. Rogovskoi (2008, 2012) in 1997 and explored in 2007 and 2011. At Ust-Zelinda-1 and -2, Rogovsky revealed cultural layers of the Neolithic and medieval settlements, and identified traces of non-contemporaneous cemeteries. The present authors studied these sites in 2012 as part of the archaeological works of the Boguchany archaeological expedition (Garkusha et al., 2012; Marchenko, Garkusha, Grishin, 2012; and others).

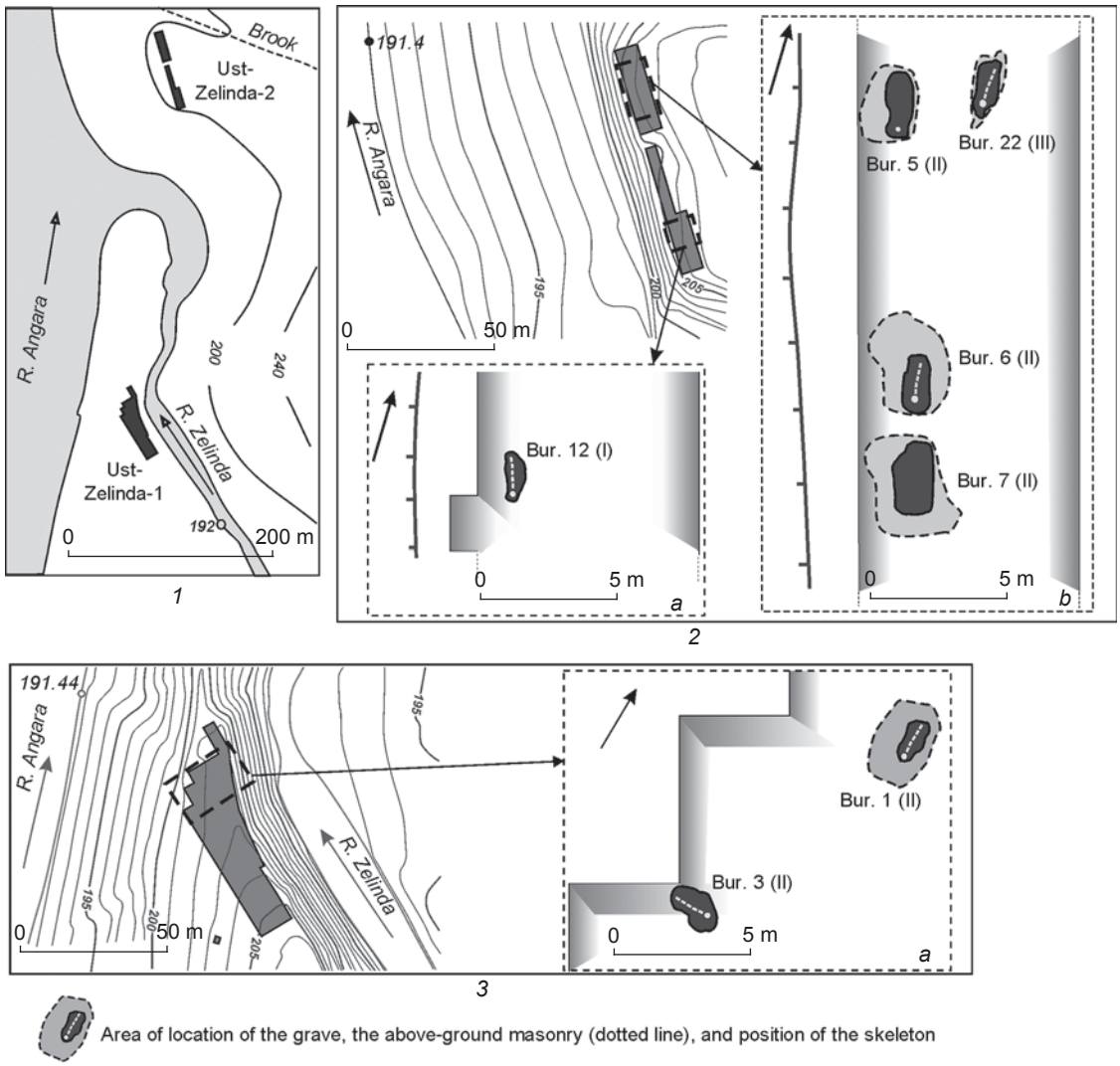

Fig. 2. Map showing location of the sites in the Zelinda River mouth (*1*), excavations of 2012 (*2*, *3*), and Neolithic cemeteries at Ust-Zelinda-2 (*2*, *a*, *b*) and Ust-Zelinda-1 (*3*, *a*). The numbers of chronological groups are given in parentheses.

Ust-Zelinda-1

At this cemetery, three burials were revealed; two of them (burials 1 and 3) were attributed to the Neolithic period. The burials were located 9 m from one another, on a slightly sloping area, and differed in the orientation of the buried and in the features of the funerary rite, including the above-ground burial structures (Fig. 2, *3*).

Burial 1. The burial was covered with a solid oval-shaped masonry (Fig. 3, *1*). The outer contour was formed by medium-sized boulders (crepidoma), the filling by smaller stones, under which there was burgundy-colored bedding. The grave was oriented along the N-S line. Its dimensions at the bottom were 1.65 × 0.7 m, the depth is 0.27 m from the level of the virgin land. The floor was horizontal and even. The pit was evenly filled with small stones to the depth of the skeleton bones. No signs of disturbing the grave were noted.

The remains of a 30–40-year-old man lay in a burgundy layer on the floor (Fig. 3, *2*). The southern part of the grave, where the skull was located, showed the greatest color-intensity. The skeleton was incomplete; the bones had been put in the anatomical order. Obviously, the body had been subjected to pre-inhumation actions that violated the integrity and, probably, the completeness of the skeleton. The bones showed a burgundy color, similar to the color of the filling. Under the bones of pelvis (4 spec.) and inside the skull, drop-shaped pendants made from the tubular bone of an animal were found (Fig. 3, *3*). The radiocarbon age is 6083 ± 44 BP (UBA-25017) (see *Table*, Fig. 4).

Burial 3 (see Fig. 2, *3*, *a*; 3, *4*). Small boulders outlined the borders of the grave. The pit was oriented

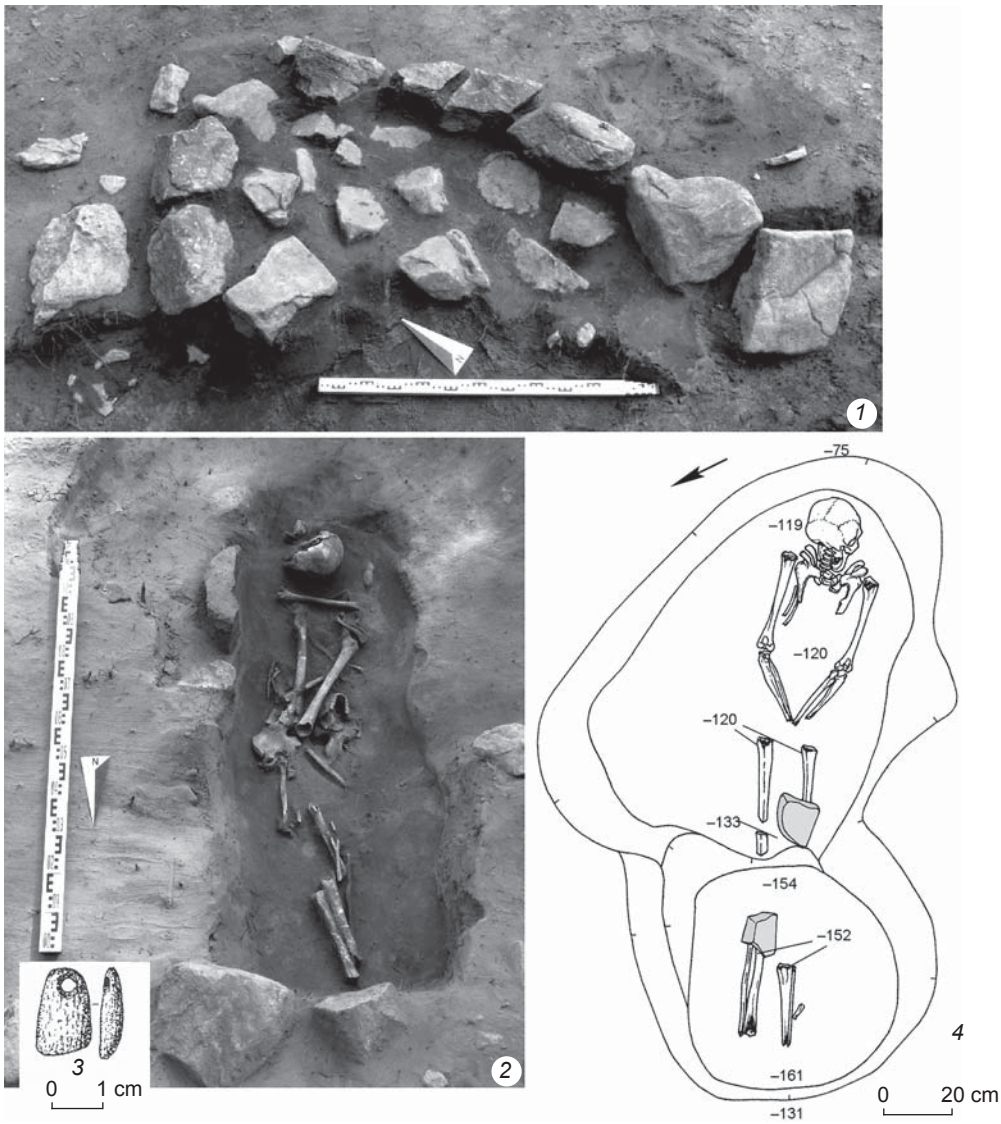

Fig. 3. Neolithic burials 1 (*1–3*) and 3 (*4*) at Ust-Zelinda-1.
1 – stone masonry; *2* – burial after excavation of the filling; *3* – pendant made of animal tooth; *4* – map of burial 3.

along the E-W line, the boundaries were conventional. The dimensions of the pit bottom were 1.1 × 0.6–0.8 m; the depth from the virgin land level was 0.42–0.55 m. The floor was flattened, slightly sloping to the NE. The grave was filled with small stones. Signs of disturbance of the original filling were noted.

At the bottom of the pit, *in situ*, the partially preserved bones of the skeleton of a 50–60-year-old man were located in anatomical order. The deceased was laid extended on his stomach, with his head towards east (perpendicular to the Angara), the hands were brought together in the pelvic area. The deliberate violation of the anatomical integrity in the pelvic bones is possible. A burgundy-colored layer, the brightest near the skull, was noted in the lowermost portion of the pit filling. A stone tablet and a small flattened boulder were placed to the right of the skull. The tibia bones were chopped off at the knees. Their distal parts were located at the bottom of an additional small pit 25 cm deep in the western part of the grave, at a distance from the rest of the skeleton, but in anatomical order and in accord with the skeleton position and orientation. The grave is relatively short in length, probably intended to contain a skeleton that has already undergone specific preparations.

Traces of pre-inhumation actions—the prone position, fixing the hands behind the back, cutting off the legs, atypical orientation of the deceased—correspond to a special ritual scenario, for example, the "neutralization" of the deceased. This emphasizes the extraordinary nature of the complex. The radiocarbon age is 5874 ± 35 BP (UBA-25019) (see *Table*, Fig. 4)

The results of radiocarbon dating of the human bone samples from the burials at Ust-Zelinda-1 and -2

Burial	Index	^{14}C-age, BP	^{14}C date, ± 2 σ		δ^{13}C, ‰	δ^{15}N, ‰	C:N $_{atom.}$
			Cal BP	Cal BC			
Ust-Zelinda-1							
1	UBA-25017	6083 ± 44	7157–6795	5208–4846	19.9	12.3	3.3
3	UBA-25019	5874 ± 35	6788–6559	4839–4620	19.8	12.8	3.6
Ust-Zelinda-2							
5	UBA-25020	5888 ± 57	6882–6555	4933–4606	–	–	–
6	UBA-25021	5077 ± 34	5910–5740	3961–3791	20.6	13.3	4.1
12	UBA-25022	6499 ± 40	7499–7317	5550–5368	20.3	12.4	3.3
22	UBA-25023	4898 ± 36	5718–5583	3769–3634	20.0	12.6	3.3

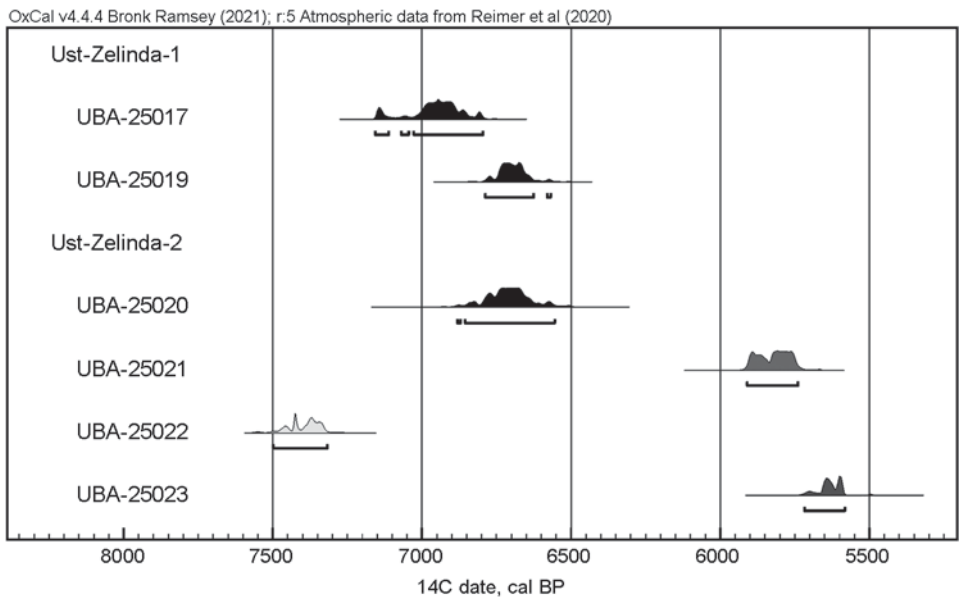

Fig. 4. Graph of calibrated radiocarbon age-values, years BP.

Ust-Zelinda-2

Five burials from the Neolithic period have been excavated at the site. All the burials were located at the edge of the terrace and oriented along the N-S line, along the Angara (see Fig. 2, *2*). In the northern part of the excavation area, along the edge of the terrace, burials 5–7 were located in a chain. The distance between burials 6 and 7 is 1 m; that between burials 5 and 6 is 8 m. Burial 22 was located 2 m from burial 5 and parallel to it; burial 12 was located in the southern part of the excavation area, 45 m south of burial 7.

Burial 5 (Fig. 5, *1*). At the level of the ancient surface, a single-layer loose masonry of small boulders and rubble, elongated along the N-S line, was recorded. Its size was 2.9 × 2.0 m. Over time, the stones had been shifted down the slope from the grave. Traces of calcined soil, sooty sandy loam, and small spots of red sandy loam ("ocher") were recorded among and under the stones. "Ocher" was also found under the stones and at the level of the bones; in the medial part of the pit filling, "ocher" was absent. At the eastern wall of the pit, in the lower portion of the stone masonry, vessel-wall fragments were found (Fig. 5, *10*). A large piece of the fragmented vessel and its context suggest that the item was placed in the grave for ritual purposes.

In the southern portion of the grave, the masonry is loose, which may be the result of penetration into the pit. Boulders and small fragments were found in the filling. Along the western edge of the pit and in the filling, a strip of orange calcined soil was traced. At the bottom of the pit, there was a layer of red sandy loam 5–12 cm thick, which contained scattered bones of the postcranial skeleton. Its color was most intense around the head. At the bottom, the pit acquired a rectangular shape; its dimensions were 1.55 × 0.7 m. The depth from

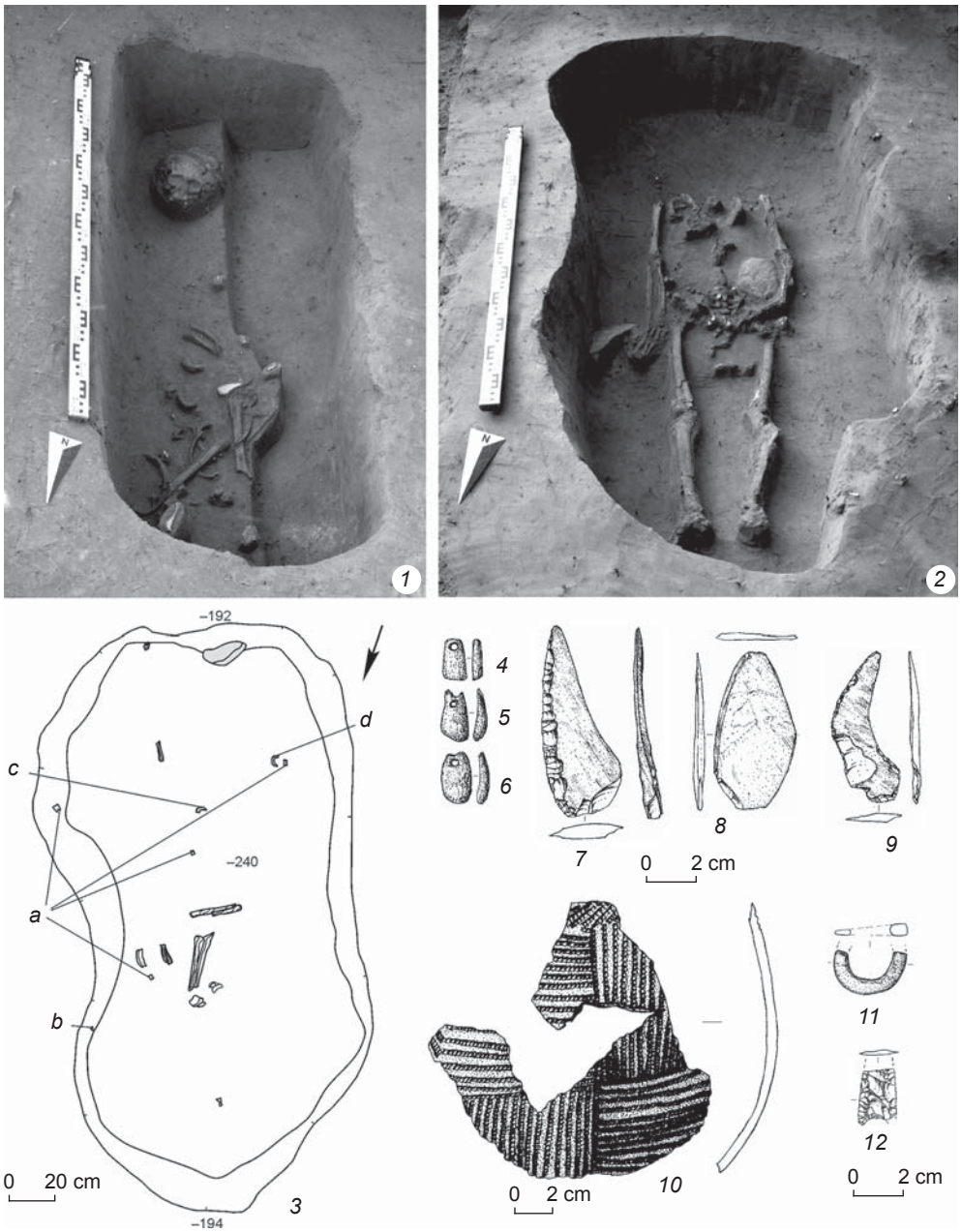

Fig. 5. Neolithic burials 5 (*1*, *4*, *5*, *7*, *10*), 6 (*2*, *6*, *8*), and 7 (*3*, *9*, *11*, *12*) at Ust-Zelinda-2.
1, *2* – burials after cleaning; *3* – burial layout; *4* – bone pendant; *5*, *6* – pendants from animal teeth; *7–9* – stone knives; *10* – vessel fragment; *11* – ring; *12* – arrowhead. *a* – stone arrowheads; *b* – pendants from animal teeth; *c* – stone knife; *d* – ring.

the virgin land level is 0.65–0.7 m. The floor is even and horizontal.

In the medial part of the lowermost filling-layer, scattered fragments of bones from a young woman 14–16 years old were found. The crushed skull was colored most intensely; the pigment was noted in the filling 10 cm above the skull and in the soil below the pit bottom up to 7 cm. The position of the skull indicates the initial orientation of the body with the head to the south; the bones of the postcranial skeleton lay in disorder. The sparse pattern of the masonry and the absence of large stones in the southern part of the above-ground burial structure suggest that the head (skull?) was buried separately and later.

Above the scattered human bones, in the medial part of the pit, the skull and lower jaws of a fox lay compactly. Nearby, there were three pendants made of red-deer bone and teeth with holes (Fig. 5, *4*, *5*). A stone knife (Fig. 5, *7*) and three more pendants made of teeth and bone were found on the floor in the central part of the pit. Two

similar pendants and a retouched flake were found in the filling. Radiocarbon age is 5888 ± 57 BP (UBA-25020) (see *Table*, Fig. 4).

Burial 6. It is covered with a masonry 3.0 × 3.8 m in size, made of boulders, elongated along the N-S line, which slightly shifted along the slope of the terrace. In the medial layer of the filling, medium-sized boulders and fragments were noted; in the lowermost filling layer, areas of red soil ("ocher") were traced. The dimensions of the grave along the bottom are 2.0 × 0.85–0.95 m; the outline is close in shape to oval (Fig. 5, *2*). The depth of the pit from the virgin land level is 0.2–0.3 m. The floor is subhorizontal and even.

The deceased adult (*adultus–maturus*) was laid in the supine position, with his feet to the north. The skull was missing. The postcranial skeleton was *in situ* in anatomical order. There were no obvious traces of post-burial disturbances of the grave. Most likely, the body was buried without the head. The most intense staining was noted around the bones. Apparently, "ocher" was used to decorate the body, rather than the bottom or the filling of the pit. The colored soil was recorded up to 5–7 cm below the floor.

Near the bones of the pelvis, the right and left forearms, and between the femurs, 46 holed pendants made from red-deer teeth were found (Fig. 5, *6*). Most of the pendants were located on the bones. The position of the pendants probably corresponded to the pattern on the clothing. Under the left wing of the pelvis, closer to the sacrum, there lay a polished stone knife, with its point towards the head (Fig. 5, *8*). Radiocarbon age is 5077 ± 34 BP (UBA-25021) (see *Table*, Fig. 4).

Burial 7. The above-ground burial structure, elongated along the N-S line, consisted of small and medium-sized boulders and shatters. Its dimensions were 3.8 × 2.6 m. The outline of the grave was irregular; the pit was oriented along the N-S line (see Fig. 5, *3*). The pit had been disturbed, its original size is undeterminable. The southern part of the filling contained medium boulders, probably marking a looting-pit. The dimensions of the grave at the bottom were 2.6 × 1.16–1.4 m; the depth from the virgin land level was 0.45–0.5 m. The floor was even and subhorizontal, possibly also disturbed. Separate spots of reddish pigment strewing were traced.

In the filling and on the grave floor, a few bones of the lower extremities and a mandible fragment of an adult individual (*adultus*, 20–30 years old) were located, disorderly.

In the central part of the pit, possibly *in situ*, a stone side-bladed knife was noted (see Fig. 5, *9*). In the southwestern part of the grave, almost on the floor, a half of a stone ring and a fragment of a stone arrowhead were found (see Fig. 5, *11*, *12*). The other noted items—fragments of stone arrowheads, a stone side-blade, and a fragment of a red-deer-tooth pendant—have obviously been displaced.

Burial 12. No masonry was found. The grave was identified by a patch of inhomogeneous light-gray sandy loam. The grave pit was oriented along the edge of the terrace, along the NNW-SSE line. The boundaries of the pit were indistinct (Fig. 6, *1*). The dimensions of the grave floor were 1.85 × 0.5–0.65 m, the depth 0.46 m. The floor was horizontal and even. Two medium-sized boulders were located in the filling above the feet, and two in the medial part of the grave.

The buried was a man 40–50 years old. The upper part of his body was probably displaced *in corpore* closer to the corner of the pit during inhumation or subsequent penetration. Initially, the dead was placed in a supine position, with his head almost to the south (upstream the Angara). At the bottom of the burial, blurry red-burgundy spots were traced. The radiocarbon age is 6499 ± 40 BP (UBA-25022) (see *Table*, Fig. 4).

Burial 22. The masonry had been partially destroyed by a 20th-century house. The dimensions of surviving masonry were 2.4 × 0.6 to 0.8 m. The grave was oriented along the edge of the terrace, along the N-S line. The dense filling was composed of boulders (up to 0.4 m in diameter) and medium and small rocks. A slab 0.3 × 0.2 m had been installed vertically in the southern part of the pit (at the head). In addition, three sandy loam layers were identified in the filling. There were no signs of disturbance. The grave pit had a regular oval shape (see Fig. 6, *2*). Its dimensions along the bottom were 1.53 × 0.65 m, the depth from the virgin land level 0.64–0.7 m. The bottom was even and subhorizontal.

The anatomical order of bones of the skeleton of an 8–9-year-old child was partially disturbed. The broken skull, with the occiput facing up, was located in the southern part of the grave. Only the pelvic and femoral bones were in a anatomically correct position. Judging by these bones, the deceased was laid in the supine position, with his head to the south. The rest of the bones lay disorderly. The body of the buried was probably subjected to pre-inhumation manipulations, which violated its integrity.

At the southern wall, close to the head, a compact crushed jar-shaped vessel was recorded (about 1/3 of its volume was missing) (see Fig. 6, *3*). Between the potsherds, there was an end-scraper (which had been probably placed in the vessel). Under the skull, an almost complete skeleton of a sable was found. To the west of the human skull, there was an accumulation of 11 stone arrowheads, two of which were located under the skull; the rest were scattered around (see Fig. 6, *14*, *15*). A large stone stemmed arrowhead was located separately (see Fig. 6, *12*).

At the bottom of the pit, among the bones of the buried person, several artifacts were found: an item made from an elk antler (see Fig. 6, *4*), a bone borer made from an elk

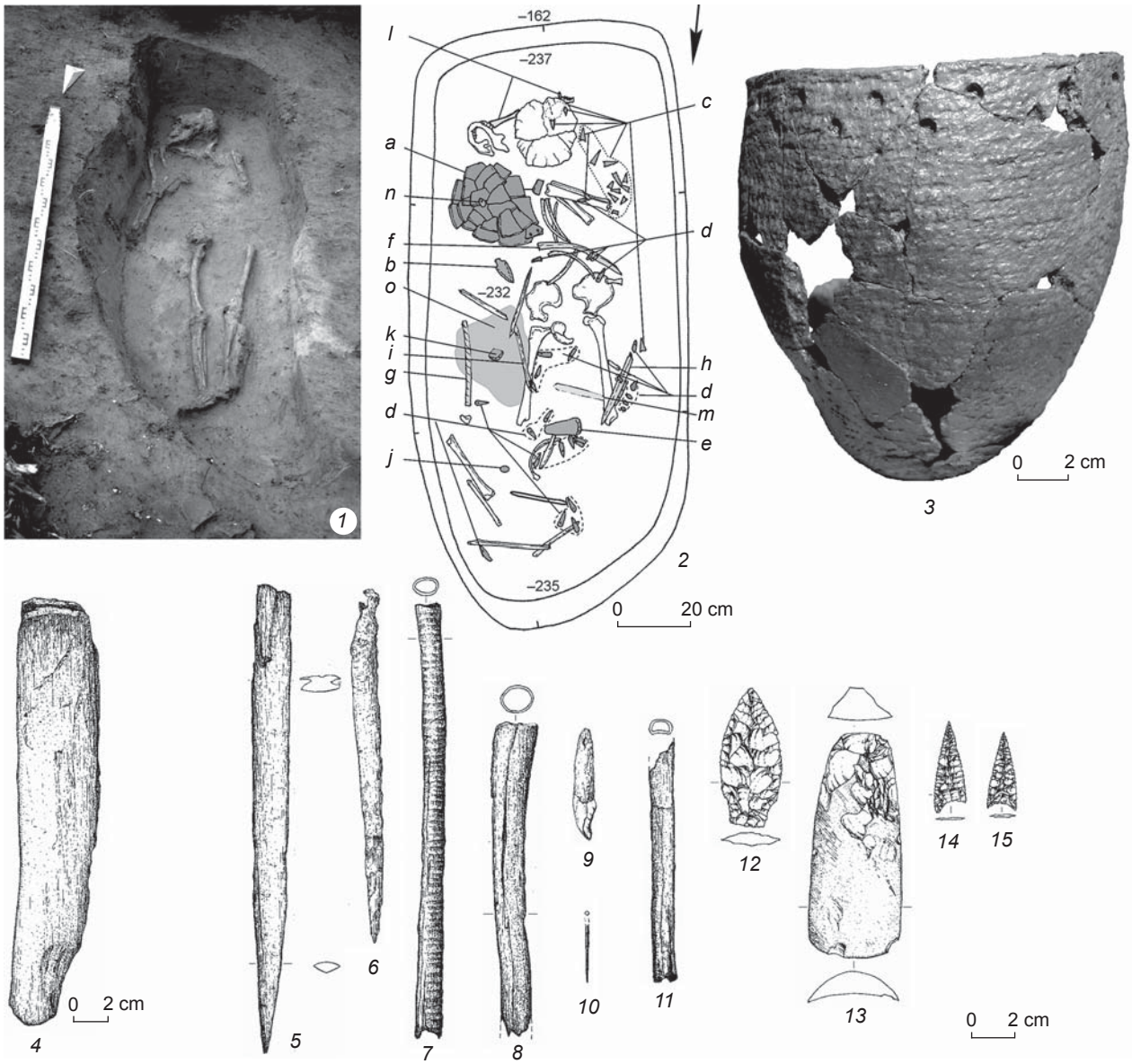

Fig. 6. Neolithic burials 12 (*1*) and 22 (*2–15*) at Ust-Zelinda-2.
1 – burial after cleaning; *2* – burial layout; *3* – ceramic vessel; *4* – antler artifact; *5* – bone haft of the side-bladed tool; *6* – bone borer; *7*, *8*, *11* – artifacts from tubular bones; *9* – pendant from animal tooth; *10* – bone needle; *12*, *14*, *15* – stone arrowheads; *13* – stone adze. *a* – ceramic vessel; *b* – stone arrowhead; *c* – stone arrowheads; *d* – pendants from animal teeth; *e* – stone adze; *f* – antler artifact; *g* – artifacts from tubular bones; *h* – bone side-bladed tool; *i* – bone borer; *j* – lithic blank; *k* – retouched flake; *l* – sable-bones; *m* – bone needle-case; *n* – stone end-scraper; *o* – patch of red pigment.

splint-bone (see Fig. 6, *6*), a hollow tube with transverse notches (see Fig. 6, *7*), and a needle-case made from the diaphysis of a bird-bone (see Fig. 6, *11*), in which a bone needle was found (see Fig. 6, *10*), the bone haft of a spear (dagger ?)* with two stone side-blades (see Fig. 6, *5*), a small polished adze (see Fig. 6, *13*), at least 23 pendants made of elk-teeth (see Fig. 6, *9*), a stone blank, and a retouched flake. A subrectangular spot of a red mineral, measuring 0.13 × 0.3 m, was recorded between the right femur and an ornamented bone tube. The radiocarbon age is 4898 ± 36 BP (UBA-25023) (see *Table*, Fig. 4).

*The lower part of the item is missing, so its interpretation as a spear-tang is of presumptive nature.

Results of radiocarbon dating

Anthropological remains from almost every Neolithic burial at both sites have provided radiocarbon

determinations (n=6) in the range from 6499 ± 40 BP (UBA-25022) to 4898 ± 36 BP (UBA-25023) (see *Table*, Fig. 4). The analysis was carried out in the laboratory of the ^{14}CHRONO Center for Climate, the Environment and Chronology at Queen's University Belfast. The measured collagen in almost all the samples meets the quality criteria (C:N ratio in the range of 2.9–3.6 (DeNiro, 1985)), which makes it possible to consider almost all dates reliable. The exception is the date of burial 6. In the sample from this grave, the C:N atomic ratio is above normal (4.1), which requires rechecking the age. The date of burial 5 is not quite reliable either, because the amount of material is insufficient for additional analysis (to measure the C:N ratio).

Comparison of ^{14}C-dates generated on the bones of humans, terrestrial and marine mammals from the Neolithic burials of Baikal and the Southern Angara revealed a freshwater reservoir effect (FRE) (Nomokonova et al., 2013). On the basis of regression analysis for specific sites in these regions, age adjustment models were developed, using δ^{13}C and δ^{15}N values (Schulting et al., 2014; Weber et al., 2016). Since all the radiocarbon data were derived exclusively from human bone samples, and there are no comparative data on terrestrial mammals yet, the issue of the FRE in the Northern Angara area and the possible correction of ^{14}C dates are not discussed in the article.

The results of measurement of stable isotopes δ^{13}C and δ^{15}N in the bones of all buried people at the cemeteries under consideration are close (see *Table*). This suggests a similar diet, which was obviously based on the meat of local herbivorous mammals and fish. Therefore, even if there is an age-estimation error due to the FRE associated with consumption of river resources (fish), it won't change the relative chronology of the burials within this sample. Consequently, when comparing the age of burials at Ust-Zelinda-1 and -2 with the radiocarbon chronologies of the cultures of Baikal and the Southern Angara area, we will primarily focus on similar data—chronologies built on data obtained for human bones, without correction for FRE (Weber et al., 2006; Bazaliiskii, 2012).

The ranges of all Neolithic calibrated dates from both sites falls within the range of 7499–5583 cal BP (or 5550–3634 cal BC)* (Reimer et al., 2020; Bronk Ramsey, 2009). The ^{14}C-date was established for burial 12 at Ust-Zelinda-2 (7499–7317 cal BP). Burials 1 and 3 at Ust-Zelinda-1 produced similar ages within the range of 7157–6559 cal BP. Burial 5 at Ust-Zelinda-2 (6882–6555 cal BP) is contemporaneous with the above. At Ust-Zelinda-2, burial 22 is the youngest (5718–5583 cal BP); burial 6 is close to it (5910–5740 cal BP).

Features of the funerary rite

Most of the sites described show the following features of the funerary rite: orientation of the buried with the head upstream the Angara, the "stretched supine" position, presence of stones in the grave filling, and traces of red pigment in the bottom part and/or on the bones of the skeleton. These features are generally characteristic of many Neolithic sites in the Baikal-Yenisei region (Bazaliiskii, 2012). All the complexes show traces of post-mortem manipulations with the bodies or post-burial penetration.

Noteworthy is the orientation of the skeleton perpendicular to the Angara in burial 3 at Ust-Zelinda-1. I.M. Berdnikov et al. (2021: 40) analyzed the burial complexes of the region and characterized this feature as a rare one. The interpretation of this feature should take into account the flow direction of the Angara tributaries, on the coast of which the graves in question are located. For example, the necropolis at Sosnovy Mys (Northern Angara) is located at the lower (downstream) part of Sosnovy Island, opposite the mouth of the Kata River (30 km north of the Zelinda mouth). This Angara area can also be considered as an archaeological microdistrict. A group of islands is located in an area of less than 4 km along the river. The large tributaries Yodarma (left) and Kata (right) flow into the Angara in this area (Boguchanskaya arkheologicheskaya ekspeditsiya…, 2015: 378–416, fig. 370). In total, 16 (!) archaeological sites have been discovered in this area. We believe that the human remains in burials 2, 4, 5, 7 and 8 at Sosnovy Mys are oriented with their heads upstream the Kata (i.e. to the east, perpendicular to the Angara). The bodies of deceased in burial 3 at Ust-Zelinda-1 are directed with their heads to the east, almost in the direction of the Zelinda stream in this area (Fig. 2, *3*).

Thus, at both sites, the practice of orienting the head of the buried upstream the tributary, rather than the

*The chronology of sites and cultures of the European and West Siberian Neolithic and Bronze Age is based on the calendar system of chronology (years BC). For East Siberian sites of the same periods, the non-calendar time-scale (years BP) is usually used. The same approach is retained when converting radiocarbon determinations to calibrated age values. These differences are associated with two traditions of estimating the age of the complexes: binding to the historical events of the Ancient World ("Western" tradition) or to dated geological deposits (the so-called geoarchaeology, "East Siberian" tradition). Since this article discusses the issues of the East Siberian Neolithic, the comparative analysis of chronologies will be executed in a non-calendar scale (years BP). For convenience of perception and for comparison with West Siberian materials, the calibrated values in the table will be duplicated in the calendar system. All calibrated values are given with ±2σ.

Angara, was recorded. For various reasons (place of birth, permanent residence, direction of roaming, etc.), the tributary turned out to be more significant than the Angara.

Chronology of burials

The results of radiocarbon dating indicate that the Neolithic graves at the mouth of the Zelinda are non-contemporaneous, and provide grounds for distinguishing at least three chronological groups (see *Table*, fig. 2, *2*, *3*; 4).

The first chronological group (7499–7317 cal BP (5550–5368 cal BC)) is burial 12 at Ust-Zelinda-2. Unlike other burials, it does not have any above-ground structure, nor grave goods; and it is isolated from other Neolithic graves (see Fig. 2, *2*, *a*). The ^{14}C-date of burial 12 coincides with the period of formation of the nearest dated Early Neolithic necropolis at Sosnovy Mys (group 1) – 7567–7275 cal BP (Saveliev et al., 2020: 27). The features of funerary rite recorded in burial 12 are similar to those noted in group 1 at the Sosnovy Mys cemetery. The orientation of the buried may seem to be a distinctive feature; however, we believe that the principle of orientation "head upstream the river" was the same, but the landmarks were different.

The second chronological group (7157–6555 cal BP (5208–4606 cal BC)) includes burial 1 and 3 at Ust-Zelinda-1, and burials 5–7 at Ust-Zelinda-2. The difference in age between burials 5 and 6 is 811 radiocarbon years; we explain this by the unreliability of the younger date of burial 6. The chronological closeness of the two burials is evidenced not only by spatial distribution, but also by the above-ground masonries, similarity in the sets of grave goods (pendants made of red-deer teeth and stone knives), and the use of the red mineral in the rite. All three burials (5–7) are located in the northern part of the necropolis and form a chain along the edge of the terrace (see Fig. 2, 2*b*).

The stone set of grave goods of burials 5–7 is distinct from those of other Neolithic burials at Ust-Zelinda-1 and -2. The set contains knives fashioned on elongated flakes. Two knives are double, convex-concave, showing variously shaped edges (burials 5 and 7). The concave edge is prepared by polishing; the convex edge is made through bifacial retouch. Similar double knives are known from burials of the Isakovo culture (Okladnikov, 1950: 175, fig. 26). The third knife, fashioned on a rounded tablet, shows an elongated oval shape (burial 6). It has a convex edge; the edge and back are polished.

Six other stone items—arrowheads, side-blades, and a fragment of a ring—were found exclusively in burial 7. Three arrowhead fragments bear signs of bifacial working. The two arrowheads probably had triangular blades with concave bases. The third arrowhead likely had a slightly convex tang. One side-blade was broken; it had been subjected to bifacial working. The second side-blade had a notch in the distal part, bearing signs of retouch on the dorsal face. The ring had been polished.

The appearance and composition of the grave goods, as well as the features of funerary rite, in burials 5–7 at Ust-Zelinda-2, in our view, generally correspond to the ritual practice of the Isakovo culture (Ibid.: 165–190; Bazaliiskii, 2012: 82, 84). The radiocarbon dates of the Isakovo cemeteries on the Southern Angara fall within a younger range, 6000/5800–5200 cal BP (Bazaliiskii, 2012: 81–83, tab. 5; Weber et al., 2016), as compared to the burials of the second chronological group of Ust-Zelinda-2; i.e. the Northern Angara materials are older than the "classic" Southern Angara Isakovo complexes.

A fragment of a large vessel-wall from the upper part of the filling of burial 5 at Ust-Zelinda-2 (see Fig. 5, *10*) is of considerable interest with respect to the chronology of ceramic vessels; in particular, in terms of its age in comparison with typologically close pottery from the Angara area. The context of location of this item cannot be considered unambiguous. However, its size and conditions of deposition (between and partially under the stones of the masonry) suggest that it was a ritual item. It belongs to a thin-walled vessel, densely decorated with comb-stamp impressions forming a "parquet" pattern. In terms of decorative and morphological characteristics, the vessel is close to one of the varieties of Ust-Belaya pottery from the Northern Angara area (for example, from the sites of Ust-Karabula, Tolsty Mys, Khedugin Ruchey) (Makarov, 2013: Fig. 23, *1*; Grevtsov, Lysenko, Galukhin, 2010: 512–514; Lysenko, Matveeva, Reis, 2011; Kogai, Berdnikov, 2013: Fig. 6). The radiocarbon dates available for Derevnya Pashino on the Northern Angara, to the west from Ust-Zelinda, attribute the Ust-Belaya complexes to the late 5th – first half of the 4th millennium BC (Grishin, Garkusha, Marchenko, 2011: 129). However, taking into account the results of dating the stratified deposits with the Ust-Belaya pottery in the Southern Angara area (the sites of Ust-Belaya and Gorely Les), these complexes can be compared by age (6716–6311 cal BP) (Berdnikov et al., 2021: 39, tab. 1)) with the second chronological group Ust-Zelinda burials where this Ust-Belaya ceramic fragment was found.

Now, let us turn to the Neolithic complexes of Ust-Zelinda-1 included in the second chronological group. These do not contain ceramic materials and expressive artifacts. Notably, burial 1 yielded bone imitations of red-deer teeth pendants, while the graves of Ust-Zelinda-2 contained pendants mainly made of red-deer teeth (burials 5 and 6). The above-ground masonry of burial 1 at Ust-Zelinda-1 shows a more sophisticated and peculiar structure; the pigment was used not only at the stage of decorating the lower part of the grave and human remains, but also during the construction of the masonry.

Despite the greatest chronological proximity of Ust-Zelinda-1 burials 1 and 3, the complex of burial 3 show signs of an "extraordinary" burial practices, which makes it essentially unsuitable for generalizations.

By the appearance of material culture and features of the funerary rite (above-ground burial structure, use of pigment, bone pendants imitating red-deer teeth) burials 1 and 3 from Ust-Zelinda-1 can be attributed to the Isakovo culture. However, there are still no sufficient grounds for correlating these burials with the Isakovo or with any other cultural group.

Burial 22 at Ust-Zelinda-2 belongs to the *third chronological group* and is distinguished by a "rich" set of grave goods. Noteworthy is an incomplete ceramic vessel (see Fig. 6, *3*). The restored container has a shape of somewhat closed jar, slightly curved walls, and tapers towards a rounded bottom. Its height is 15 cm, the rim diameter is 13.2 cm. The decoration consists of a row of shallow paired pitted pricks along the edge of the rim. The exterior and interior surfaces bear technological traces in the form of "textile" imprints. In terms of decorative and morphological features ("paraboloid" shape, tapering bottom, impressions of a large-mesh grid, rows of pit-impressions forming a zigzag line), the vessel corresponds to the Isakovo ceramic tradition (Okladnikov, 1950: 167, fig. 21–23; Saveliev, 1989; Berdnikov, 2013: 209; Bazaliiskii, Goryunova, 2017: 31–32, fig. 4, 5).

Parallels of most of the items made of bone (base of the side-bladed spear (dagger?), borer, ornamented tube, needle-case, pendants made of teeth) have a wide chronological range. Isolated items are found both in the Early Neolithic Kitoy and Late Neolithic Isakovo and Serovo complexes of the Baikal and Southern Angara areas, and in the graves of the "archaic group" on the upper Lena (Okladnikov, 1950: 180–182, 187, 272–277, 327, 365–366, 391; Bazaliiskii, 2012: 67, 87, 92–93).

The grave goods of burial 22 include triangular bifacial stone arrowheads with concave bases, with asymmetric (n=13) and symmetrical (n=2) form of blades, which are similar to the Late Neolithic artifacts of the Southern Angara area (Bazaliiskii, 2012: 87–90, 92). There is a large, leaf-shaped arrowhead with a distinct stem. Stemmed arrowheads are known in the Late Neolithic Isakovo and Serovo cultures (Okladnikov, 1950: 179, fig. 29, p. 230, fig. 68). A fluted adze (group 1 in the Okladnikov's classification), with traces of wear, is typical of the Isakovo material culture; this tool-type is also reported from the Serovo collections (Ibid.: 174–176, fig. 26, p. 202).

The features of the funerary rite recorded in burial 22 are characteristic of both the Isakovo and Serovo traditions (Ibid.: 165–190, 336–354; Bazaliiskii, 2012: 86–89, fig. 13, p. 92).

The radiocarbon date of the sample from burial 22 (5718–5583 cal BP) corresponds to the chronology of the Isakovo culture in the Southern Angara area (6000/5800–5200 cal BP (Bazaliiskii, 2012: 81–83, tab. 5; Weber et al., 2016)).

Despite the noted distinctions in the grave goods, the burials of the second and third chronological groups of Ust-Zelinda-2 show certain similar features. These are typologically similar subtriangular stone arrowheads and side-blades from burial 7 and 22, as well as personal ornaments made from animal teeth. Red mineral is used in the rite, but in varying degrees. In our opinion, the burials of the second and third groups at Ust-Zelinda-2 may reflect the changes and variants of the Isakovo traditions.

Conclusions

We have identified at least three main chronological groups of burials left by the population inhabiting the Zelinda estuarine area in the Neolithic (see Fig. 2, *2*, *3*; 4). By age, burial 12 at the Ust-Zelinda-2 cemetery is comparable with the Early Neolithic burial ground at Sosnovy Mys, and fits into the range of 7499–7317 cal BP (5550–5368 cal BC).

The burials of the second chronological group, the most numerous, belong to a fairly long period of 7157–6555 cal BP (5208–4606 cal BC). These are diverse in burial practices, and apparently reflect several episodes in the ritual development in the Zelinda mouth area. Cultural identification of the Ust-Zelinda-1 burials is complicated by the use of post-mortem manipulations with the body and/or the disturbance of all the complexes.

No burials contemporaneous to the graves of the second chronological group of Ust-Zelinda-1 and -2 have been identified among the Southern Angara burials. This group falls into the period of the so-called hiatus in the cultural development of the Baikal regions (Weber et al., 2006, 2016). However, according to a number of features, these burials most closely correspond to the Isakovo cultural tradition and, apparently, precede the appearance of classic complexes on the Southern Angara ("proto-Isakovo"). If this point of view is confirmed in the future, then it would be appropriate to return to Okladnikov's arguments for the periodization of the Baikal Neolithic, in which this researcher assigned the Isakovo complexes to the earlier period on the basis of a more archaic appearance of their material culture (blade-sided tools, massive side-scrapers) (Okladnikov, 1950: 176–183).

Burial 22 at Ust-Zelinda-2 has been classified into the third chronological group (5718–5583 cal BP (3769–3634 cal BC)); in terms of burial practice, specific grave goods, and radiocarbon age, it is closest to the classic Isakovo traditions of the Southern Angara area. The specificity of the vessel from this burial can

be considered a reliable cultural marker of this ceramic tradition in the region.

Until ^{14}C-dates on the bones of herbivorous animals are obtained, determination of the boundaries of radiocarbon chronology of the Neolithic graves at Ust-Zelinda-2 cannot be considered completed, although new data will hardly change the relative position of the complexes. Generation of new radiocarbon determinations will make it possible to establish the effect and magnitude of the FRE for the Neolithic in the Keul-Zhevakan archaeological microdistrict, and more reasonably distinguish groups on the basis of the chronology of complexes of the Middle Holocene and hiatus period in the cultural-chronological sequence of the Baikal-Yenisei region.

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