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Late Krotovo (Cherno-Ozerye) Burials with Casting Molds from Tartas-1, Baraba Forest-Steppe

This article describes five burials with casting molds from the Late Krotovo (Cherno-Ozerye) cemetery Tartas-1 in the Baraba forest-steppe. Three of them form a distinct group belonging to two parallel rows of graves. One of the reconstructed molds was used for casting Seima-Turbino-type celts, and another, for manufacturing thin rods, round in section. A core was found, which was used for making a hole in a tiny chisel-like tool. All the molds are made of clay and bear traces of prolonged use. They were made using a bottom board; molding mixture was smoothed and tamped, excessive material was removed with a narrow-bladed cutting tool, and lines were drawn on the raw surface. Certain graves with casting tools were single, others were collective. All basic age and sex groups are represented: adults, adolescents, women, and children, apparently suggesting that all were involved in manufacture, and that the skills were transmitted from one generation to another. Because children were involved too, status was heritable. Emphasis on bronze casting in the funerary rite, virtually without traces of other specializations, indicates a separate social stratum, whose share was no higher than 4 %. Obviously, not all its members were professional casters; some may have participated occasionally.

Keywords: *Bronze Age, metal-working, burials, casting molds, Late Krotovo (Cherno-Ozerye) culture.*

Introduction

Burials with forging and casting tools are curious and relatively rare monuments of the Bronze Age. Their appearance in this period can probably be considered a social and economic marker of the time. Such burials, which are practically contemporaneous, have been discovered on a very vast territory of Eurasia, for instance, in Western and Central Europe (Bulter, Waals, 1967: 73; Mozsolics, 1967: 28; Childe, 1947: 163). In Eastern Europe, they have been found at the sites of the Fatyanovo, Poltavka, Catacomb, and Abashevo cultures (Shilov, 1959, 1966; Derzhavin, Tikhonov, 1981; Ilyukov, 1986), and in Western Siberia among the sites of the Seima-Turbino circle (Matyushchenko, Lozhnikova, 1969; Besprozvanny, Korochkova, Stefanov, 2011: 12).

The burial of a metallurgist-molder from the burial ground of Sopka-2/4B, C of the Krotovo culture (Molodin, 1983) can be considered a particularly striking manifestation of this phenomenon. By now, a series of such graves have been discovered; notably, a burial with casting molds found at the large Late Krotovo (Cherno-Ozerye) burial ground of Tartas-1 in the Baraba forest-steppe (Fig. 1).

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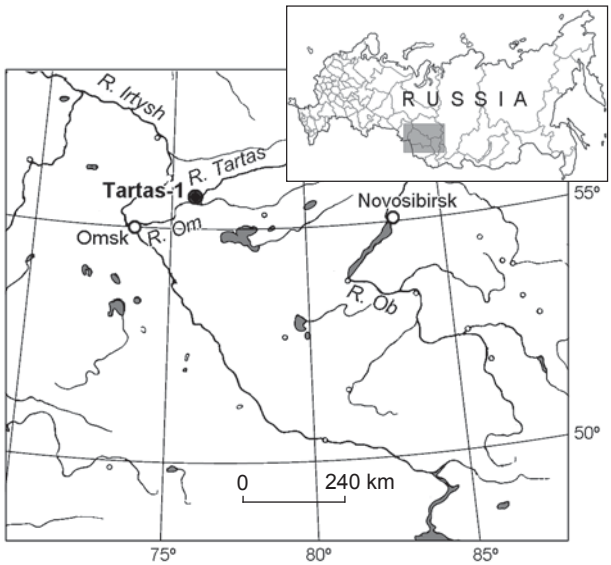


Fig. 1. Location of the Tartas-1 cemetery.

Archaeological context of the burials

So far, five burials (No. 15, 159, 323, 329, 330B) with casting molds have been found at the Late Krotovo (Cherno-Ozerye) part of the Tartas-1 burial ground. However, if we take into account the casting inventory and semi-finished objects of foundry production in ritual pits, the number of buried persons who had some relation to bronze casting may be somewhat larger.

All these burials are located along the northeastern edge of a high terrace above the floodplain and are included in the general planigraphy of the Late Krotovo (Cherno-Ozerye) cemetery. Three burials (No. 323, 329, and 330B) form a compact group and belong to two parallel rows of graves.

Burial No. 15 is a rectangular pit oriented along the ENE–WSW line and measuring 1.86 × 0.55 m, with a depth of 0.17–0.21 m*. The walls of the pit are inclined; the bottom is even. A rounded hole in the middle part of the grave resulted from looters' activities. A disturbed skeleton of an adult was found (Fig. 2, *1*, *2*). According to the position of the leg bones remaining *in situ*, the deceased was buried in an extended supine position, with the head towards the east-northeast. A fragment of the neck of a vessel which has parallels in the Late Krotovo (Cherno-Ozerye) complexes (Gening, Stefanova, 1994) was found in the area between the tibia (Fig. 2, *3*). A large bone arrowhead was discovered at the northern wall of the grave at the head of the buried person (Fig. 2, *4*). Fragments of a casting mold for producing a large object were found among mixed human bones; the mold was broken during the robbery. The outer wall of the mold with traces of trimming, tamping, and smoothing of the molding material has survived. The working chamber has been completely destroyed, thus it was not possible to establish the purpose of the object cast in the mold.

Burial No. 159 is a subrectangular pit measuring 2.18 × 1.35 m with a maximum depth of 0.23–0.25 m from the natural soil layer (Fig. 3), oriented along the ENE–WSW line. The bottom was even; the walls were vertical. The grave was disturbed during the robbery in ancient times and later while building the road.

The displaced remains of three persons (adult, adolescent, and child) were found in the burial. According to the *in situ* position of the surviving parts of the skeletons, the deceased were buried in an extended supine position, with their heads oriented towards the east-northeast. A bronze bar and fragments of a pottery vessel were found among the disturbed bones. Three bronze bracelets were placed on the forearm of the buried adult. The bracelets had twisted ends and were adjacent to each other (Fig. 4). Such bracelets occurred in the Late Krotovo (Cherno-Ozerye) burials at Sopka-2/5 (Molodin, 1985), and also at the sites of this culture in the Irtysh region (Gening, Stefanova, 1994: Fig. 8, *5*). As is known, adornments of this type are most widely found among materials of the Andronovo (Fedorovka) culture (mainly in the western part of its area); they might have been a part of the traditional Andronovo costume (Avanesova, 1991: 69; Demin, Zaprudsky, Sitnikov, 2011: 55). These objects have been found in Northern Kazakhstan, the Altai, the Middle Irtysh region, and in the Southern Trans-Urals (Krivtsova-Grakova, 1948: 109, 111, fig. 37, *1*, *2*, *4*; Ermolaeva, 2001: 105, fig. 3; Zimina, Adamenko, 1963: 58, fig. 3, *3*; and others). This type of adornment is most often dated to the first half–mid second millennium BC (Kovtun, 2014: 30). The Late Krotovo population adopted these objects from the Andronovo (Fedorovka) population.

Small fragments of a clay casting mold were found near the southern wall of the grave. A part of the mold with two parallel working chambers for casting objects in the form of thin rods with a diameter of 0.5 cm has been preserved (Fig. 5).

Casting molds for manufacturing such rods, often made on the fragments of household pottery, have occurred at a number of settlements of the Krotovo

*The cultural layer and the underlying natural ground in this part of the site were severely damaged due to the operation of a road which passed there. Therefore, the real depths of the burial pits could not be determined.

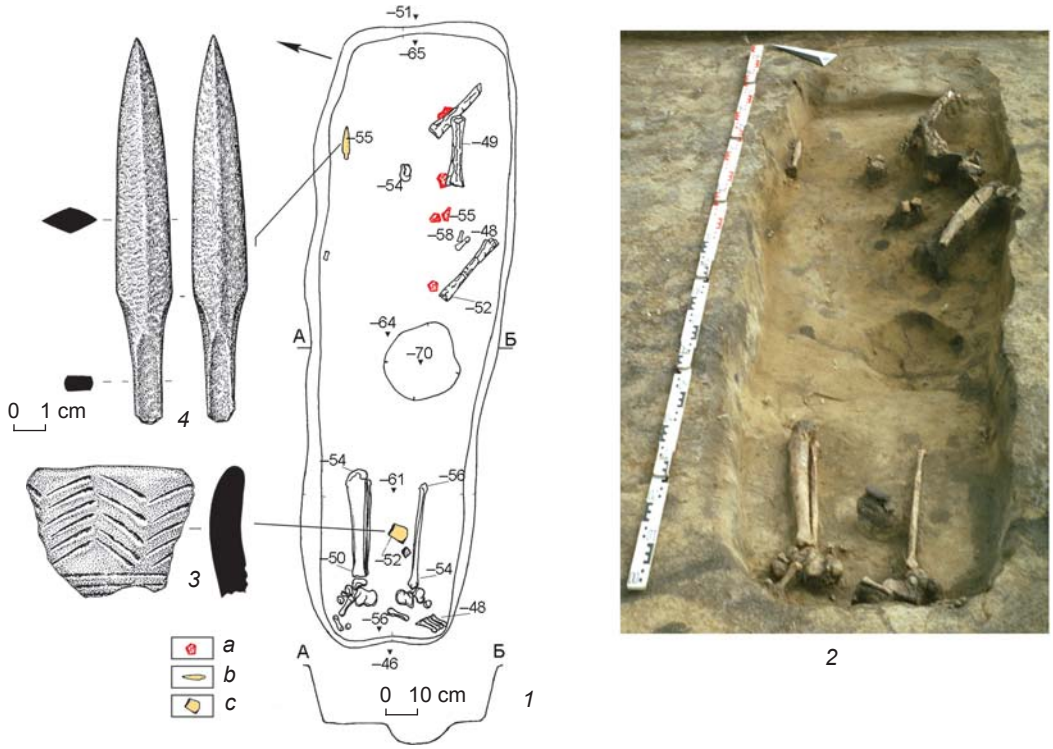


Fig. 2. Burial No. 15.
1 – plan: *a* – fragments of a casting mold, *b* – arrowhead, *c* – fragment of a vessel; *2* – general view from the southwest; *3* – fragment of a vessel; *4* – bone arrowhead.

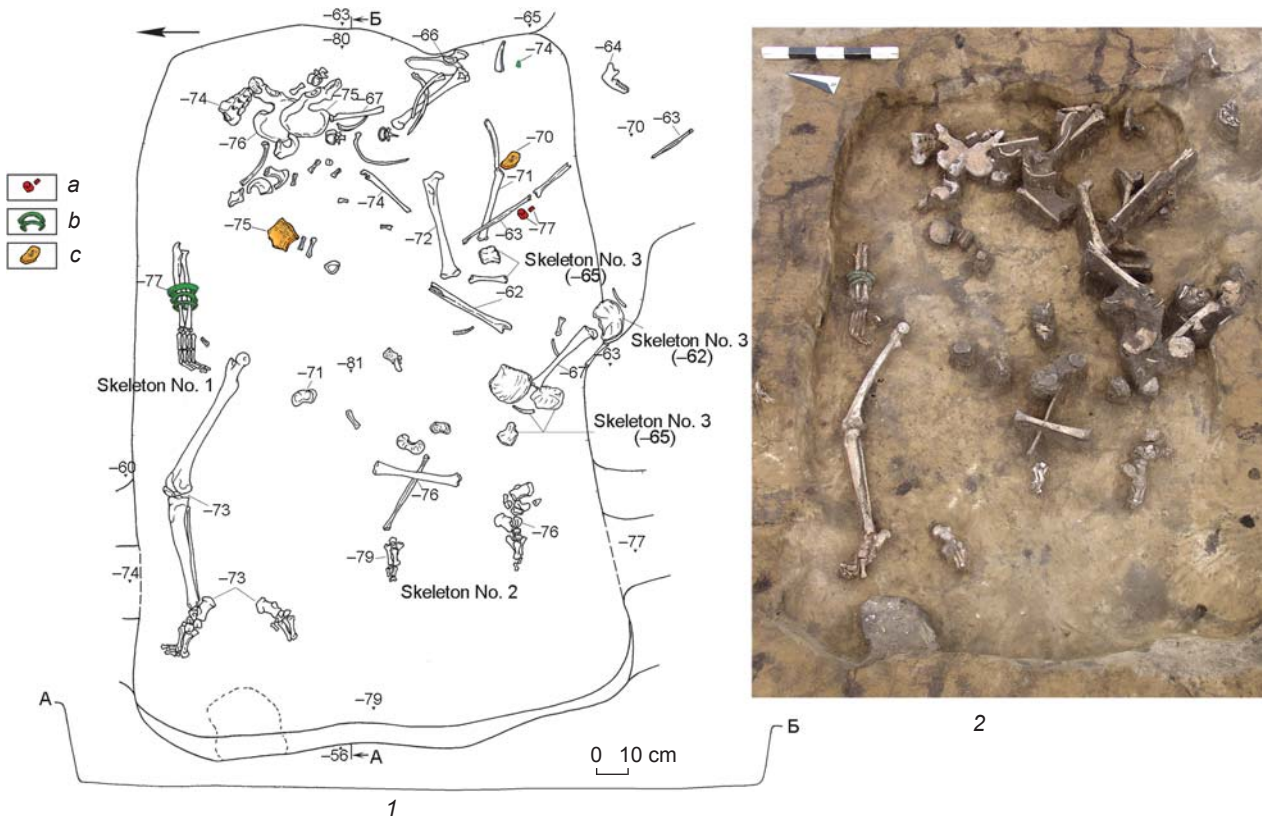


Fig. 3. Burial No. 159.
1 – plan: *a* – fragments of a casting mold, *b* – bronze products, *c* – ceramics; *2* – general view from the west.

Fig. 4. Bracelets from burial No. 159.
1 – location in the grave; *2* – position on the arm of the buried person.

culture; apparently, they were produced in large numbers (Molodin, 1977: Pl. LXI, *1*; LXII, *2*; Molodin et al., 2012: 116–118, fig. 13, 14). The purpose of the castings is not entirely clear; however, it should be noted that molds for making such objects are very common among the cultures of the Bronze Age (Shilov, 1959: 13; Nazarov, 2002).

Burial No. 323 is a subrectangular burial pit oriented along the NE–SW line and measuring 2.1 × 1.0 m, with a depth of 0.13–0.23 m from the natural soil layer (Fig. 6). Its eastern part has been partially damaged by the road.

The grave pit was filled with gray mixed sandy loam containing small fragments of calcined clay. Areas of calcined brown soil have also been found in the southwestern corner and along the eastern edge of the pit.

The displaced remains of five people were found in the burial. According to the *in situ* position of the remaining parts of the lower limbs, the people were buried in a row, in an extended supine position, with the heads towards the east-northeast.

The grave goods included six flint flakes, a bone arrowhead (Fig. 7, *1*), and 14 ram astragali (Fig. 7, *3–16*). Fragments of bronze objects were found in the northeastern corner of the grave.

Bone objects in the form of a fish (Fig. 7, *2*), ceramic ball (Fig. 7, *17*), four bronze round convex plaques with holes for sewing (Fig. 7, *18–21*), and the fragment of a clay casting mold (Fig. 8) were found among the displaced bones of the skeletons.

A fragment of the mold with a part of the working chamber has survived. The mold was made after a model; the molding mixture was applied in large pieces; the form connector was formed on a bottom board. The relief lines of the working chamber were clearly

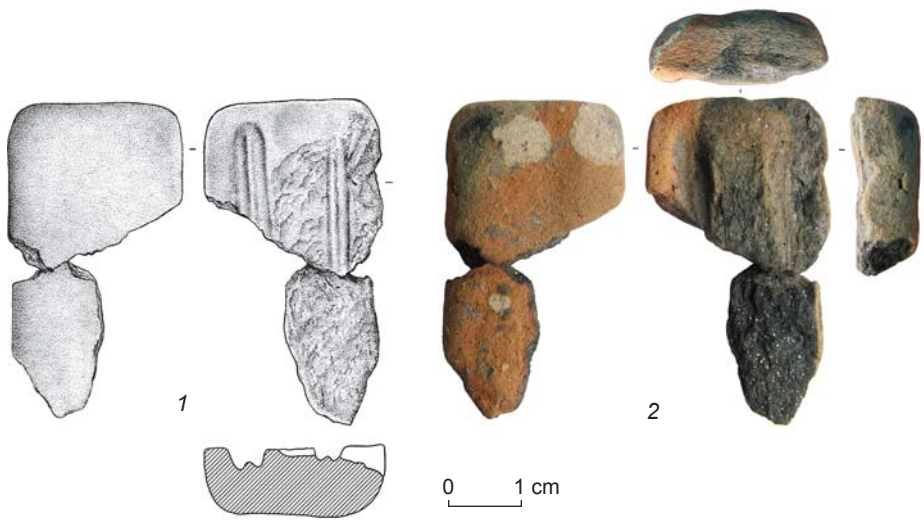


Fig. 5. Casting mold from burial No. 159.

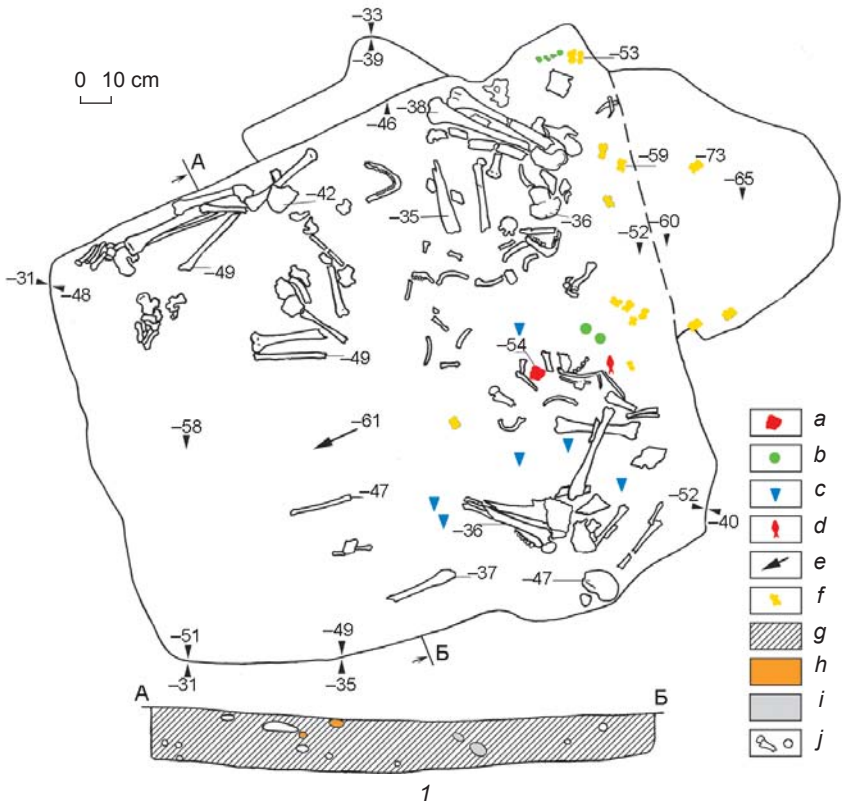
made on the raw surface, using a tool with the working part no larger than 1 mm in diameter. The back of the mold half was smoothed and tamped; the excessive material was removed with a narrow-bladed cutting tool.

In accordance with the negative of the working chamber, the celt axe that was cast in the mold had an oval-shaped socket and a hexagonal cross-section in its middle part (Fig. 9). Judging from the angle of convergence of the form connector surface and the wall of the negative, it can be established that the height of the celt did not exceed 8 cm; the reconstructed size of the socket was 4.0 × 2.2 cm. The socket was decorated with a ladder-like pattern on its upper edge. The face plane of the celt was separated from the side faces by a drawn line, which imitated the reinforcing rib typical of Seima-Turbino celt axes. A shorter band was drawn in parallel.

According to the morphological features, the celt that was cast in the mold is most likely of the Seima-Turbino type and, according to the classification of E.N. Chernykh and S.V. Kuzminykh, it belongs to category K-10 (1989: 46–48, fig. 9, *1–9*; 10, *1–5*).

Traces of thermal impact of molten metal are clearly visible on the surface of the working chamber. Taking into account H. Coghlan's findings that the consequences of a single casting of metal are insignificant and may not survive with time (1951), these traces can be considered to have resulted from the repeated use of the mold.

Burial No. 329 was looted in ancient times and was almost completely destroyed by burrows of rodents and the track of the road (Fig. 10). It was possible to identify only a part of the southern wall of the grave pit. The overall outline can be reconstructed only approximately. The grave pit is



1

2

Fig. 6. Burial No. 323.
1 – plan and stratigraphic cross-section: *a* – fragment of a casting mold, *b* – bronze products, *c* – stone flakes, *d* – sculpture of fish, *e* – bone arrowhead, *f* – ram astragali, *g* – gray mixed soil, *h* – calcined soil of orange color, *i* – gray-yellow soil, *j* – human bones; *2* – general view of the burial from the west.

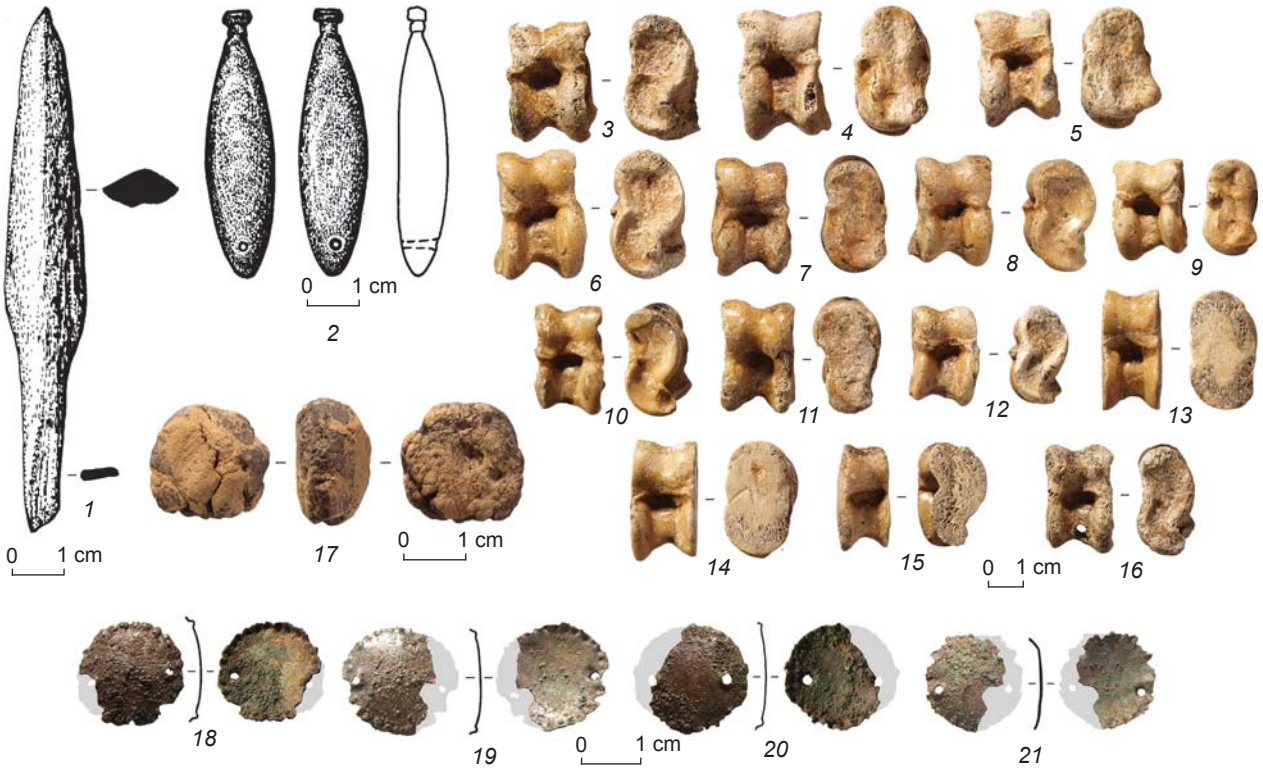


Fig. 7. Grave goods in burial No. 323.
1 – bone arrowhead; *2* – bone object in the form of a fish; *3–16* – ram astragali; *17* – ceramic ball; *18–21* – bronze plaques.

Fig. 8. Fragment of a casting mold from burial No. 323.

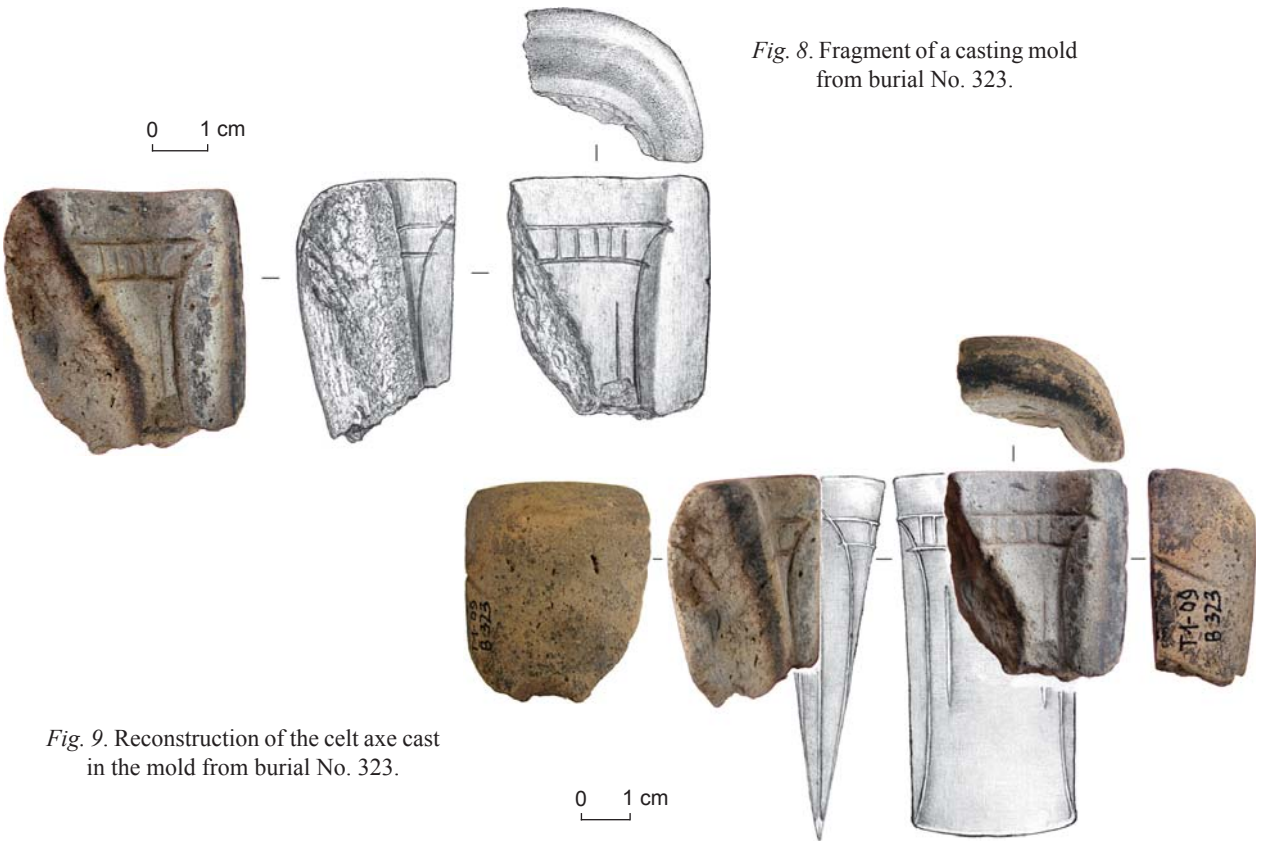


Fig. 9. Reconstruction of the celt axe cast in the mold from burial No. 323.

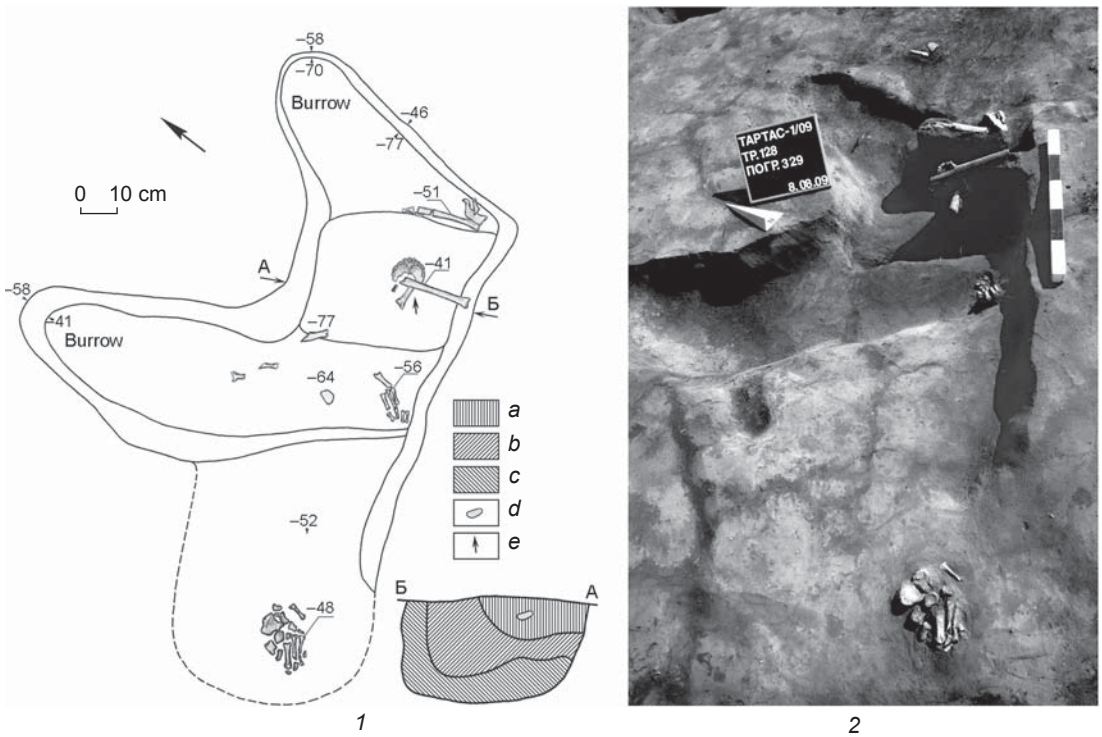


Fig. 10. Burial No. 329.
1 – plan and stratigraphic cross-section: *a* – dark gray soil, *b* – gray mixed soil, *c* – gray-yellow mixed soil, *d* – human bones, *e* – arrowhead; *2* – general view of the burial from the southwest.

oriented along the ENE–WSW line. Its reconstructed sizes are 2.0–2.3 × 0.53 m, with a depth of 0.11–0.12 m from the natural soil layer. The skeleton has been displaced. According to the *in situ* position of the surviving bones of the right foot and left hand, the deceased was buried in an extended supine position, with the head towards the northeast. Two trihedral tanged arrowheads have been found near the hand.

A beaver tooth, two bone arrowheads (Fig. 11, *1*, *2*), a ram astragalus (Fig. 11, *3*), and three flint flakes (Fig. 11, *4–6*) were found in the filling of the grave pit among the displaced bones of the skeleton. A piece of copper ore (copper sulphide) and a fragment of a ceramic mold core (Fig. 11, *7*, *8*) were found in the same place. The core was used for producing a tapering wide blind hole in the casting, most likely, the socket of a miniature celt.

Burial No. 330B is partially covered the earlier burial (No. 330A) associated with the Odinovo culture (Fig. 12, *1*). It is a subrectangular pit measuring 1.43 × 0.57 m, with a depth of 0.2–0.3 m from the natural soil layer. The pit is oriented along the NE–SW line. Its filling was homogenous dark gray sandy loam.

The disturbed remains of a 5–6 year old child were in the burial. According to the *in situ* position of the surviving bones, the deceased was buried in an extended supine position, with the head towards the northeast. In the central part of the grave, to the right of the skeleton, a cluster of objects was discovered, including shells of river mollusk (Anodonta), a fragment of a bird bone, and a fragment of a casting mold (Fig. 12, *2–4*). The mold was made by the method of flapped application of molding mixture on the model; the back side was almost not smoothed. Only a small fragment of the outer wall without the working chamber has survived, so it is not possible to determine which product was cast in the mold.

Two bone spokes and a dagger-like tool, decorated with a pattern of dashed triangles (Fig. 12, *5–7*) (Molodin et al., 2009: Fig. 1, *5*), were located in a burrow to the northeast of the grave, and might have also belonged to that burial. Tools of this type are typical of the Late Krotovo (Cherno-Ozerye) culture (Molodin, 1985: 51, fig. 25, *1–5*, *7*), but the decoration of the find may suggest that it belongs to the Andronovo (Fedorovka) culture.

Discussion

Five burials containing objects associated with Late Krotovo (Cherno-Ozerye) bronze casting have been discovered at the Tartas-1 cemetery. The presence of such graves is usually considered to be an indisputable

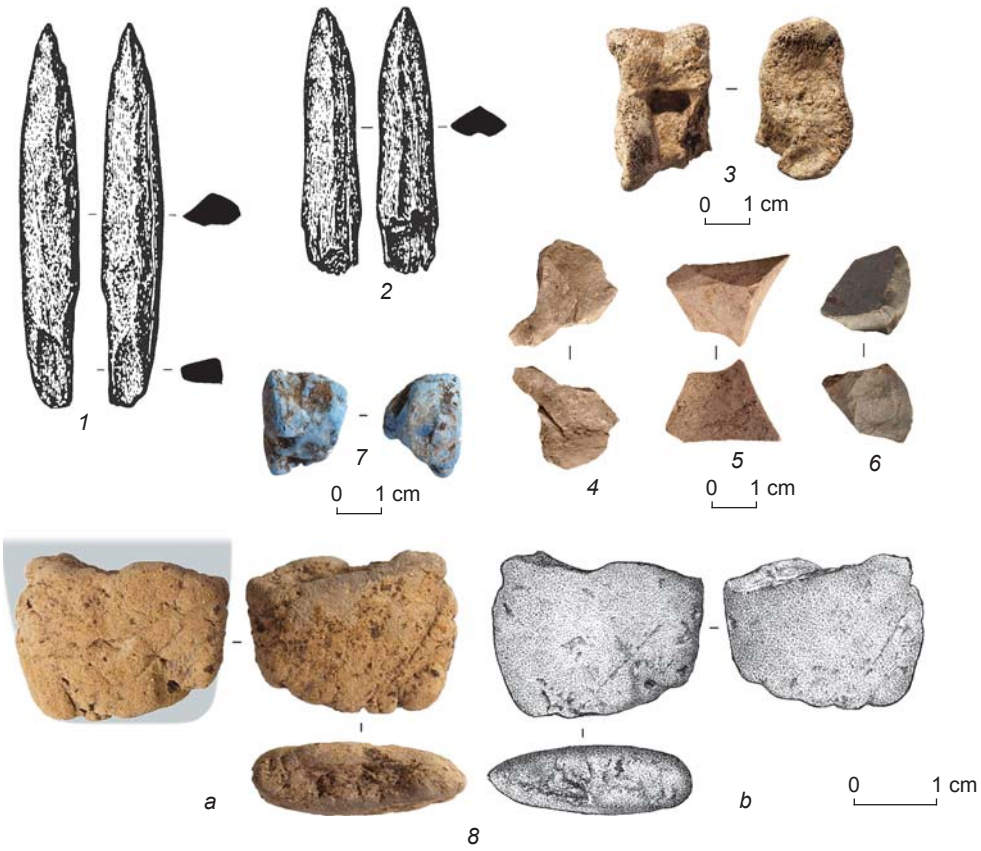


Fig. 11. Grave goods in burial No. 329.
1, *2* – bone arrowheads; *3* – ram astragalus; *4–6* – stone flakes; *7* – piece of ore; *8* – fragment of ceramic core of a casting mold: *a* – photo, *b* – drawing.

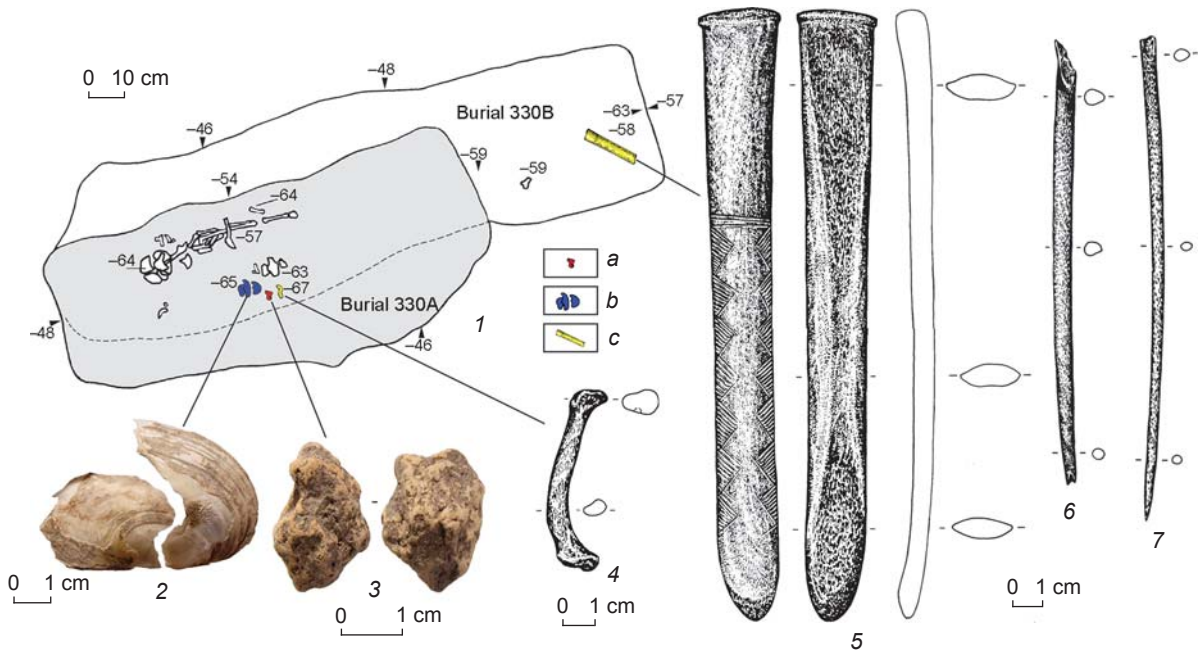


Fig. 12. Burial No. 330B.
1 – plan: *a* – fragment of a casting mold, *b* – accumulation of shells, *c* – bone object; *2* – mollusk shell; *3* – fragment of a casting mold; *4* – bird bone; *5* – dagger-like tool; *6*, *7* – bone spokes.

indicator of specializing in foundry and the emergence of professional artisans (Bochkarev, 1978: 48). The stability of markers of professional affiliation with this type of activity in the funerary rite (against the background of a very weak expressiveness of burials with the markers of other types of specialization) testifies to the emergence of a special social and economic stratum in the society. The tendency towards its conscious isolation is reflected in the clustering of the burials of casters or people to some extent related to this production at the Krotovo cemetery Sopka-2/4B (Molodin, Grishin, 2016). To a lesser extent, this tendency was manifested at the Tartas-1 site, but even there three of the five burials belonged to one of the grave clusters and are located very close to each other.

The number of this social group in the Late Krotovo (Cherno-Ozerye) society was probably insignificant. The share of graves belonging to its representatives at Tartas-1 was 4.31 % of the total number of burials of this culture. In addition, although the study of Tartas-1 is still far from being complete, the series of 116 burials identified so far makes it possible to consider the site as a representative source which reliably reflects the situation in the community which left it.

A very similar case can be observed at the Sopka-2/5 cemetery: four (4.21 %) out of 95 Late Krotovo (Cherno-Ozerye) graves contained forging and casting inventory. Apparently, such a ratio of the members of the community, who were to some extent related to foundry, to the ordinary members of the community was optimal, although a higher degree of population involvement into production was noted in a number of cultures with a complete mining and metallurgical cycle of activities (Epimakhov, Berseneva, 2016: 67).

The analysis of the gender and age composition of the buried "casters" sheds some light on the organization of metal processing industry in the Late Krotovo (Cherno-Ozerye) culture. Notably, both single and collective burials occurred at the cemetery, and all main age and sex groups (adults, adolescents, women, and children) are represented. Casting of metal required participation of 3–5 persons; apparently, all members of the family, including women and even children, were engaged in it. Such organization of metalworking was practiced for example among the Lohars of Eastern Rajasthan (Misra, 1975).

In burial No. 330B, a fragment of a casting mold was located in the burial of a child, who could not pursue independent production activities because of his age. It is possible that professional affiliation was inherited from the moment of birth. Foundry inventory was found in the burial of a woman with a child at the Krotovo burial ground of Sopka-2/4B, C (Molodin, Grishin, 2016: 170–172). Casting molds have also been found in two female burials (No. 24 and 33) at the synchronous burial ground of Rostovka (Omsk region of the Irtysh) (Matyushchenko, Sinitsyna, 1988: 31–34, 46–47, fig. 42, 67). This information makes it possible to assume that all age and gender groups were included in the production activities, and that production skills were accompanied by a certain social status.

It is noteworthy that the burials of people associated with metalworking were distinguished from among ordinary graves by the presence of imported objects, things with decoration motifs, which clearly originated in a different cultural context, and art objects of ritual and cultic purpose. The Late Krotovo (Cherno-Ozerye) society must have greatly advanced in terms of social stratification. The materials at our disposal make it possible to conclude that not all buried people whose graves contained objects associated with bronze casting can be unequivocally qualified as professional casters. Clearly, some part of the community (regardless of gender or even age) might have been associated with this production only sporadically. Consequently, the attribution of the buried to casting artisans only on the basis of funeral practices (as occurred while investigating burial No. 282 (mound 25, grave 64) at Sopka-2/4B, C) is not always justified.

Acknowledgement

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