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Wooden Paddles from the Nizhny Tagil Museum-Reserve of Mining and Metallurgy in the Urals

This article describes Early Metal Age wooden paddles from the Gorbunovo peat bog, kept by the Nizhny Tagil Museum-Reserve of Mining and Metallurgy in the Urals. Their morphology and manufacturing technology are analyzed. The archaeological context and new AMS-dates are introduced. This sample of early wooden paddles is the largest and the most representative in the world. The specimens are very standardized with regard to general proportions, shape of the blade and handle, and decoration of the handle. A distinctive feature of this sample is that the handle of certain specimens is composite. A comprehensive traceological and technological analysis of the paddles has revealed several aspects of their manufacture, and xylotomy has provided information about the species of wood (pine, cedar, and spruce). On the basis of the processing traces, a tentative toolkit was reconstructed. The paddles generally fall in two categories: most are one-piece, and a few are composite. During the Early Metal Age, woodworking was probably a traditional craft in the Trans-Urals, showing a number of customary techniques.

Keywords: Gorbunovo peat bog, Early Metal Age, wooden paddles, morphology, processing traces, woodworking tools, manufacturing technology.

Introduction

Over 160 wooden paddles and their fragments have been found at peat bog land sites of the Trans-Urals, such as Karasyeozerskoye IA and IIB, Razboinichiy Ostrov, Karasyeozerskoye X, Shuvakish I, IA, VIB, VIIIF, and XIД, Elnichnoye IA, as well as open mines VI and Dalniy of the Gorbunovo peat bog; the Staroye, Novoye, and Yazevskoye mines, second

Kuryinsky mine, second Yazevskoye site, and the Shigirskoye A settlement at the Shigir peat bog. These items have been analyzed in a number of both general studies (Eding, 1940; Raushenbakh, 1956: 9, 23, 25, 30, 123; Chairkina, 2005: 215–216) and specialized ones (Pogorelov, 1998; Kashina, Chairkina, 2016, 2017). Wooden paddles have also been found at sites west of the Urals and from the Baltic Sea region (Hartz, Lübke, 2000; Vilkunan, 1986). Due to the

almost complete absence of absolute dates at the time of publication, the authors have dated almost all the paddles (simple and composite) to a fairly wide chronological period—the Early Metal Age. This article will analyze wooden paddles found at open mines VI and Dalniy of the Gorbunovo peat bog, which are now a part of the collection of the Nizhny Tagil Museum-Reserve of Mining and Metallurgy in the Urals (NTMR). These paddles have provided a series of AMS dates, and revealed their morphology and manufacturing techniques.

Sources

The set of sources for studying means of water transportation was developed in the 1920s as a result of excavations of peat bog sites, primarily mine VI of the Gorbunovo peat bog, located in the Sverdlovsk Region, 140 km north of the city of Yekaterinburg, in the area of the city of Nizhny Tagil (Fig. 1). In 1926–1929, 1931, and 1936, the site was explored by D.N. Eding; in 1948, by A.Y. Bryusov and V.M. Raushenbakh; in 1979–1980 and 1983, by V.F. Starkov; since 2007, by N.M. Chairkina; and since 2017, by the Integrated Russian-German Expedition. During the excavations, unique finds of organic materials and complexes of wooden structures have been found.

Judging by archaeological reports, as well as field and collection inventories, 86 whole paddles and fragments of their different parts were found in mine VI in the excavation pits of D.N. Eding and A.Y. Bryusov over an area of ca 1500 m² (Eding, 1928, 1929, 1936; Kashina, Chairkina, 2016). From these, 18 items extracted from the excavations of 1926–1928 and 1936 are kept at the NTMR. However, the designation of some of these items with labels “blade fragment of a paddle?” (No. 1034; TM-452/60, TM-452/63, and possibly TM-452/?) is questionable. The items transferred to the NTMR from the State Historical Museum are marked TM-452: whole paddles TM-452/4 (6/150), TM-452/5, TM-452/6, TM-452/8, TM-452/21; their parts—blades TM-452/3, TM-452/20, TM-452/33, TM-452/22, and TM-452, and handles TM-452/11, TM-452/23, TM-452/24, TM-452/25, TM-452/26, TM-?, and TM-? (24/2). The NTMR collection also contains a blade fragment (TM-7002/58) and

handle (TM-7285/1), discovered by Y.B. Serikov during exploration works in 1978. Three handles, including one from a composite paddle, two blade fragments, and three whole paddles (TM-22000/1, TM-22000/2, and TM-2000/133) were found in the excavation pits of V.F. Starkov (1979, 1980, 1983). Wooden paddles were also found at mine VI in subsequent years (Chairkina et al., 2019: Fig. 1, 6).

Prior to the detailed radiocarbon analysis of the most typical items from various typological series, cultural and chronological attribution of these items was based on their stratigraphic occurrence and the accompanying finds, and was not always unambiguous. The site was investigated mainly in the first half of the 20th century. The exact location, depth of occurrence, and stratigraphic situation of the discoveries in some cases were not indicated in collection inventories, but even when such information was available, it did not serve as a clear chronological indicator. The problem is that all the excavations of Eding and Bryusov, with the exception of one (1936), were carried out on the northern side of mine VI, where peat was not extracted in the early 20th century. The excavation pit of 1936 was inside mine VI, where peat was extracted. Scholars established the depth of finds from the surface, which corresponded to the natural terrain (or was higher due to peat bricks stored for drying on the side) and was

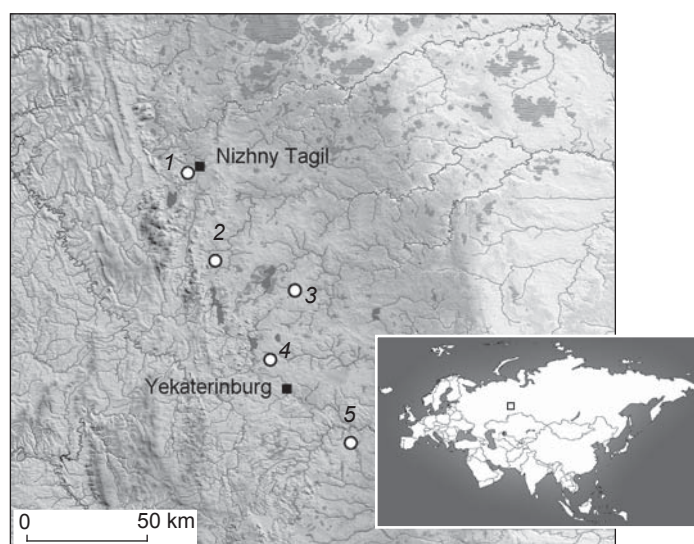


Fig. 1. Location of archaeological sites in the Trans-Urals, where the paddles were found.

1 – Mines VI and Dalniy at the Gorbunovo peat bog; 2 – Staroye, Novoye, Yazevskoye, and Second Kuryinsky mines, Yazevskoye site at the Shigir peat bog; 3 – Elnichnoye settlement IA; 4 – Shuvakish I, IA, VIB, VIII, and XI settlements; 5 – Karasyeozerskoye IA, IIB, Razboinichiy Ostrov sites, Karasyeozerskoye X settlement.

clearly lower than the natural level in the mine, where peat had been removed to various depths. Therefore, this indicator was of little help for comparing the occurrence level of wooden structures and items marking cultural layers. Due to these circumstances, the cultural and chronological attribution of the items under discussion was not exhaustive in the previous studies. It was determined by a relatively sophisticated comparison of information from the reports and publications of Eding, modern research of the site analyzing the accompanying evidence from the collections of the State Historical Museum and NTMR, as well as several parallels with paddles found at other sites of the Trans-Urals.

The Dalniy mine is located in the western part of the Gorbunovo peat bog. In 1978, the site was examined by V.F. Starkov (1979). A fragment of wooden flooring made of wooden poles, marked by the Chalcolithic Lipchinskoye-type pottery, two handles (TM-6599/25), and a paddle fragment (TM-6599/24) were discovered.

Thus, currently, the NTMR collection contains seven whole or almost whole paddles, seven blade fragments, and ten handles, found at mines VI and Dalniy of the Gorbunovo peat bog.

Morphological description of the paddles

Wooden paddles discovered at the Ural peat sites can be divided into two categories: one-piece (over 150 fragments and fully preserved items), and composite (12–15 items) (Pogorelov, 1998; Kashina, Chairkina, 2016, 2017). Among one-piece items, those 120–130 cm long, with an oval blade 50–60 cm long and handle with a rounded end, were predominant. A blade design with a realistic or stylized waterfowl head, or rarely an animal head, were less common. According to the length of the handles, the paddles can be divided into very short (25–40 cm), short (51–62 cm), medium-sized (about 70–79 cm), and long (84–96 cm). The maximum length of the known paddles from the beginning of the blade to the end of the handle was 156 cm; the minimum length was 100 cm.

According to their length, paddle blades can be divided into long (61–75 cm), medium-sized (50–60 cm), and short (49 cm); according to width, into wide (10–16 cm) and narrow (4–10 cm). Their shape is varied: ellipsoid-shaped and wide; lanceolate-shaped and wide, with shoulders at the point of transition to the handle; oval- and suboval-shaped, which are both wide or narrow; and suboval short paddles (about 1/2 of the usual length of a large paddle). In cross-section,

paddle blades can be divided into subtriangular and rhombic, rarely suboval. The paddle handles usually have an oval cross-section (3.5×2.5 cm), rarely round, subtriangular, or subrectangular (Pogorelov, 1998).

Paddles of the composite category consist of two parts—the blade with a short piece of the handle, and the handle itself. The handles are cut into a slanting wedge and equipped with grooves or notches used for attaching the parts together (Pogorelov, 1998; Kashina, Chairkina, 2016, 2017).

One-piece paddles with a blade and handle. TM-2452/8. The item is almost intact, only the end of the blade is broken off. This paddle is of medium length, with a wide, medium-sized, ellipsoid blade, and handle with curved thickening at the end (Fig. 2, 1). The length of the surviving part of the blade is 53 cm; the width is 10 cm. A protruding sharp reinforcing rib is noticeable on the outer surface. The length of the handle is 67 cm. In cross-section, it is round (3 cm in diameter) near the blade and oval (2.0×1.2 cm) at the end near the thickening. The length of the thickening is 6.7 cm; the diameter is 3 cm. The paddle is carefully manufactured. The entire surface is polished as a result of secondary processing and long use. The item has a radiocarbon date of 4819 ± 23 BP (Table 1, No. 5)*.

TM-452/6. A short paddle with wide, oval blade of medium length, and a handle with rounded end (Fig. 2, 2). The overall length is 114 cm. The length of the blade is 51.5 cm; the width is 11.7 cm. Its outer surface is convex; the inner (working) surface is flat. The diameter of the handle is 3 cm. Two triangular recesses were cut out at its end with a knife, probably for a better grip.

TM-2452/21. A short paddle with narrow, oval blade of medium length, and a handle with a straight end (Fig. 3, 1), made of cedar (Table 2, No. 3). The total length is 105.3 cm. Its state of preservation is poor. Its flat blade is significantly broken on both sides. The length of the surviving part is 55.6 cm; the width is 8.5 cm. The handle is oval (3.5×2.5 cm) in cross-section. The end is flat; it was planed with a knife on both sides. This paddle gave a radiocarbon date of 3936 ± 21 BP (see Table 1, No. 3).

TM 2000/133. Probably a short paddle with long, wide, oval blade (Fig. 3, 2). The end of the handle is broken off. The total length is 115.5 cm. The length of the blade is 64.3 cm; the width is 13.5 cm. The blade is

*All radiocarbon dates were obtained at the Curt Engelhorn Center of Archaeometry (Mannheim) and were calibrated using the Oxcal4.4 software and Intcal20 calibration curve (Reimer et al., 2020).

Fig. 2. Paddles TM-?452/8 (1) and TM-452/6 (2).
a – front; b – back.

curved, with an asymmetrical, rounded end. Its outer surface is slightly convex; the inner (working) surface is flat, with four round dark spots located at equal distance along the long axis. The diameter of the handle is 4.5 cm at the blade and 3 cm at the broken end. This item gave a radiocarbon date of 3822 ± 21 BP (see Table 1, No. 1).

TM-452/5. A very short paddle (children's?), with a short, narrow, suboval blade, and a handle with beveled end (Fig. 4, 1), made of cedar (see Table 2, No. 7). The total length is 72.5 cm. The length of the slightly curved blade, which is flattened at the end, is 42 cm; the thickness is 3 cm at the beginning and 8 cm in the middle part. The diameter of the handle is 2.5 cm. Its end was asymmetrically rounded and trimmed with bilateral cuts. This paddle gave a radiocarbon date of 5044 ± 23 BP (see Table 1, No. 7).

TM-22000/1. A long paddle with short, wide, oval blade (Fig. 4, 2, left). The total length is 135 cm; the length of the handle is 95 cm. The blade is 10 cm wide. Its end is worn and beveled. Initially, the blade had a symmetrical shape. The handle is bent, and becomes gradually thinner towards the end.

TM-22000/2. A long paddle with narrow, oval blade of medium length (Fig. 4, 2, right). It is well preserved, with symmetrical shape, and is marked by a particular refinement. The length of the paddle is 135 cm. The length of the blade is 50 cm; the width is 8.1 cm. The handle ends with a straight cut.

Blades of one-piece paddles. TM-452/3. A wide (11.3 cm), oval blade of medium length (52.3 cm) (Fig. 5, 1), made of pine (see Table 2, No. 8). Fractures are present on its rounded edges. On the outer surface, traces of secondary processing by a chisel with flat working surface have survived. The diameter of the remaining part of the handle is 3.2 cm; the length is 3 cm. It is almost flat, with rounded edges. This item gave a radiocarbon date of 5059 ± 23 BP (see Table 1, No. 6).



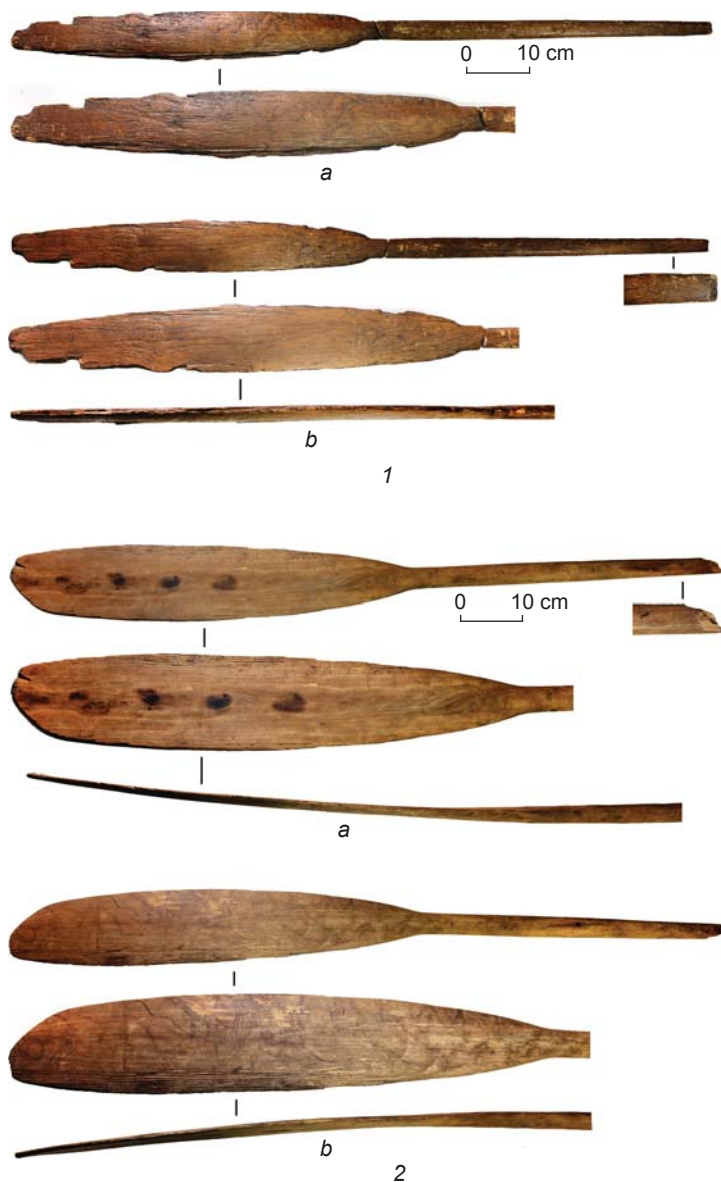
TM-6599/24. A shortened oval blade of medium width (Fig. 5, 2). The end is broken off. The length of the preserved part is 47.5 cm; the width is 9.3 cm. The outer surface is convex, with a thickening along the longitudinal axis; the inner surface is flat. The diameter of the surviving fragment of the handle is 2.2 cm.

TM-452/20. Fragment of a very wide, oval blade of medium length, made of cedar (see Table 2, No. 4). The length of the preserved part is 52 cm; the width is 9 cm. The outer surface is convex, shaped as smooth oval, and shows clear traces of processing by a chisel with flat working surface. The inner surface is concave, shovel-shaped (Fig. 6, 1).

TM-452, "a separate sample". A perfectly manufactured, narrow, oval blade, with pointed end (Fig. 6, 2). The inner surface is flat; the outer surface has a weakly visible reinforcing rib. The total length is 85 cm; the length of the blade is 79 cm; the width in the middle is 11.8 cm; the thickness is 0.8–1.2 cm.

Table 1. Radiocarbon dates of wooden paddles from mine VI of the Gorbunovo peat bog

No.	Collection code	Item	Date, BP	Index	Calibrated date, yrs BC	
					$\pm 1\sigma$	$\pm 2\sigma$
1	TM-2000/133	Paddle	3822 \pm 21	MAMS-53626	2293–2205	2397–2150
2	TM 452/24	Handle of the composite paddle	3924 \pm 22	MAMS-53627	2467–2350	2471–2305
3	TM-?452/21	Paddle	3936 \pm 21	MAMS-53628	2471–2350	2560–2343
4	TM-7285/1	Paddle handle	3946 \pm 22	MAMS-49165	2557–2352	2565–2346
5	TM-?452/8	Paddle	4819 \pm 23	MAMS-53625	3641–3536	3645–3529
6	TM-452/3	Paddle blade	5059 \pm 23	MAMS-53629	3944–3800	3949–3793
7	TM-452/5	Paddle (children's?)	5044 \pm 23	MAMS-53630	3940–3792	3948–3778
8	TM-452/23	Paddle handle	5090 \pm 24	MAMS-53631	3954–3809	3961–3800

Fig. 3. Paddles TM-?452/21 (1) and TM-2000/133 (2).
a – front; b – back.

TM-452/33. Fragment of a paddle blade blank (Fig. 7, 1), 48 cm long and 3.9 cm wide. The thickness of the rounded two-plane part is 2.7 cm. Traces of planing with a knife are well preserved on the blank.

TM-7002/58. Fragment of the middle part of a paddle blade, carefully processed and smoothed. Its length is 60.8 cm; the width in the middle is 6.5 cm. The thickness is 2.7 cm at the beginning of the handle, and 1 cm at the end of the rounded part. A thickened and pointed reinforcing rib passing into the handle is clearly visible on the outer surface (Fig. 7, 2).

TM-?452/22. Fragment of a narrow paddle blade made of pine (see Table 2, No. 5). Its size is 34.0 \times 7.0 \times 0.8 cm. One side was processed very well; the other side was manufactured less carefully. The profile is slightly deformed; the cross-section is oval.

TM-11.8/4461-4468. Fragment (half) of a thin paddle blade. Its length is 57.8 cm; the width is 5.4; the thickness at the broken edge in the area of transition to the handle is 1 cm. A through hole was made on both sides with the thin tip of a sharpened knife, or was drilled with a pin-drill at the end of the blade, near the broken edge. This hole was possibly made for fastening two halves of the split blade.

Fragments of paddle handles with preserved ends. The length of the handles ranges from 36 to 61 cm. Their cross-section is oval (TM-452/24, TM-452/25, TM-?, TM-7285/1) or quadrangular (TM-452/23), from 1.5 to 2.5 cm at the end

Table 2. Wood species of the items found during excavations at the Gorbunovo peat bog*

No.	Collection code	Item	Wood species
1	TM-452/23	Paddle handle	Pine
2	TM-452/26	"	"
3	TM-?452/21	Paddle	Siberian pine
4	TM-452/20	Paddle blade	"
5	TM-?452/22	"	Pine
6	TM-452/25	Paddle handle	Spruce
7	TM-452/5	Paddle	Siberian pine
8	TM-452/3	Paddle blade	Pine
9	TM-?452/4	Paddle	"

*Compiled using archival books of the Nizhny Tagil Museum-Reserve of Mining and Metallurgy in the Urals (F. 2, Inv. 1, D. 15, fols. 1, 2).



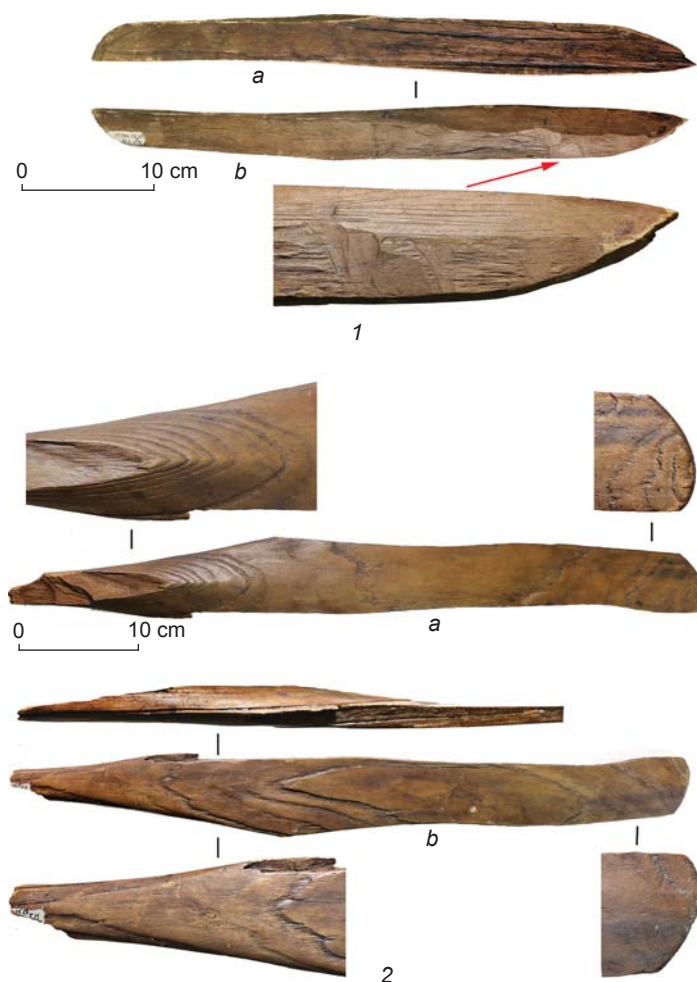
Fig. 4. Paddles TM-452/5 (1), TM-22000/1, and TM-22000/2 (after (Starkov, 1983: Fig. 16, 2, 3)) (2). a – front; b – back.



Fig. 5. Paddle blades TM-452/3 (1) and TM-6599/24 (2). a – front; b – back.



Fig. 6. Paddle blade fragment TM-452/20 (1) and blade TM-452, “separate sample” (2).
a – front; b – back.



of the handle, and from 2.1 to 2.9 cm at the broken end. The ends of the handles, with the exception of one (with widened oval shape), are flattened, slightly widened, and bent at an angle of 10–45°.

Items TM-?, TM-452/24, and TM-452/25 have long slanting cuts at the ends, which indicates that these are handle fragments of composite paddles. All these handles were made very carefully, using all secondary processing operations (scraping, planing with scrapers, abrasive grinding, and polishing with pieces of suede skin).

Radiocarbon dates have been obtained for three items: TM-452/24 (3924 ± 22 BP), TM-7285/1 (3946 ± 22 BP), and TM-452/23 (5090 ± 24 BP) (see Table 1, No. 2, 4, and 8).

Manufacturing technique and use

Comprehensive technical and technological analysis has shown that production of wooden paddles for boats has specific features. Trace

Fig. 7. Fragments of paddle blade blank TM-452/33 (1) and blade TM-7002/58 (2).
a – front; b – back.

analysis and xylotomy have revealed that most of the one-piece paddles were made of whole tree trunks, using almost all of the main and auxiliary wood-processing techniques (Mylnikov, 2008: 33–38). This feature of the manufacture of paddles dating to the 5th millennium BC (Ertebølle culture) and the selection of specific tree species are mentioned by European scholars (Kloof, 2015: 201–206, tab. 56–57; p. 207).

Blades of almost all the paddles have a fairly significant deviation from the straight line of the handle (up to 5–7 cm). This was done intentionally, to move water more effectively, in order to increase the efficacy of rowing, speed of movement, and maneuverability of the vessel. The first studies of the sources indicate that the sequence of paddle manufacturing could have been the following. First, searching for a tree with suitable straight grained wood and for a trunk section with a minimum number of knots. Then, splitting the log with an axe, wedges, and a mallet for obtaining bpaddleds (flitches), cutting out the blanks with a metal or stone knife from the bpaddled, and processing the blank by trimming, scraping, and grinding, for which adzes, stone or metal scrapers or scraper-knives, sand, and other abrasive materials might have been used (Pogorelov, 1998).

Anatomical analysis of the wood structure has revealed that mostly coniferous tree species, such as cedar, pine, and spruce, were used for making the paddles (both the whole paddles and fragments) (see Table 2). The clearest surviving traces of processing indicated that the main set of tools included an axe, adze with flat blade, and knife. Distinctive long, even spikes at the ends of many of the strips of wood (blanks for paddles) may indicate that these tools were metal (copper or bronze). Trace analysis identified the woodworking operations. Primary processing consisted of splitting, trimming and planing; secondary processing included shaving, scraping, sanding, and polishing.

The thoroughness of the secondary processing of the paddles is noteworthy. Their entire surface was sanded and polished: technological traces of planing on blades were sometimes entirely absent. In addition to evidence of the repair of handles, a careful attitude toward the paddles is manifested in their continued use after the breaking of the edges of the blade, since the breakage surface in some items was worn out and smoothened.

Most of the items show traces of long use. In some cases, the ends of the blades are crushed, chopped, broken, and have crude longitudinal scratches. Some items are split in half. On average, the handles were broken at a distance of 10 cm from the edge of

the blade. The first scholars believed that if it was impossible to use a broken paddle as intended, blades and handles were reused as other products (Ibid.).

S.N. Pogorelov suggested that paddles with ellipsoid, wide blades, suboval, narrow blades, and partially with oval, wide blades, together with handles with a rounded end, as well as some paddles with theommel of a stylized image of a beast's head, could have belonged to an earlier time. In his opinion, they showed traces of crude trimming and scraping with stone (?) tools. These items could have been made in the Late Neolithic–Early Chalcolithic. They also include paddles with a short reinforcing rib and composite paddles. At the end of the first half of the Chalcolithic, there probably appeared (and began to prevail) paddles withommels showing a stylized image of the head of a waterfowl, with handles that had a slightly curved, flattened, or extended end, bent at an angle of 10–45°, as well as handles ending with a slanting unilateral cut with a longitudinal narrow groove. These were made by metal tools, which is confirmed by distinctive traces (Ibid.). E.A. Kashina and M.N. Chairkina suggested a wider chronological range for all types of Ural paddles, dating them to the Chalcolithic–Early Bronze Age (2017).

Analysis of the collection has revealed a significant predominance of one-piece paddles over composite paddles. The first category includes only one item (TM-?452/8) of average length, with a handle having a bent end, and with a wide blade of medium length, showing an ellipsoid shape. The item was made in the first half of the 4th millennium BC (see Table 1, No. 5). The rest of the paddles have a wide (TM-452/6, TM-2000/133, TM-22000/1) or narrow (TM-?452/21, TM-452/5, TM-22000/2) blade of oval or suboval shape. These include both short (TM-452/6, TM-2000/133, TM-?452/21, TM-452/5) and long (TM-22000/1, TM-22000/2) items. Ends of the handles in these items are straight (TM-? 452/21, TM-22000/2), slightly slanting (TM-452/5), rounded (TM-452/6), or bent (TM-22000/1). One of the paddles with a wide, oval blade (TM-2000/133) was dated to the last third of the 3rd millennium BC (see Table 1, No. 1). An item with a narrow oval blade (TM-?452/21; see Table 1, No. 3) was made probably somewhat earlier, in the third quarter of the 3rd millennium BC. A short paddle, which might have belonged to a child, with a similar blade (TM-452/5), was dated to the first half of the 4th millennium BC (see Table 1, No. 7). It was almost contemporaneous with the single item containing an ellipsoid blade.

Paddle fragments included only oval blades: wide (TM-452/3), very wide (TM-452/20), medium

(TM-6599/24), and narrow (TM-452, “separate sample”); short (TM-6599/24), medium (TM-452/3, TM-452/20, TM-7002/58), and long (TM-452 “separate sample”). A wide blade of medium length was made in the first third of the 4th millennium BC (see Table 1, No. 6).

Three handles oval in cross-section (TM-452/24, TM-452/25, TM-?), with bent ends, as with the handles of one-piece items (TM-7285/1, TM-452/23, TM-452/26, TM-?), to prevent hand slipping during rowing, also belonged to composite paddles. Radiocarbon dates for these handles of composite and one-piece paddles suggest the mid third millennium BC (see Table 1, No. 2, 4). The handle TM-452/23 has another design (with a widened oval shape) and quadrangular cross-section. It could have belonged to a one-piece paddle, dating to the earliest time—the early 4th millennium BC (see Table 1, No. 8).

Conclusions

The collection of paddles kept at the Nizhny Tagil Museum-Reserve of Mining and Metallurgy in the Urals, from mines VI and Dalniy of the Gorbunovo peat bog, shows a clear morphological resemblance to similar items from peat bog sites of the Trans-Urals. They are distinguished by substantial uniformity, common proportions of details, occasional composite handles, and figurative design (Eding, 1940; Raushenbakh, 1956: 9, 23, 25, 30, 123; Chairkina, 2005: 215–216; Pogorelov, 1998; Kashina, Chairkina, 2016, 2017). These features clearly differentiate these paddles from those found in the Baltic region, which demonstrate great variability (Kloß, 2015: Fig. 254; Hartz, Lübke, 2000: Fig. 2).

Long paddles with a pointed blade, possibly for men, could have served for pushing off and controlling boats; short paddles with an oval end, possibly for women, could have been used for rowing (Kulemzin, Lukina, 1977: 51). It cannot be excluded that small items were not used as paddles, but belonged to rites, games, everyday life, and/or production activities. Paddles with ornithomorphic or zoomorphic pommels of handles, and with drawings on the blades in black paint, could have had a sacred function. Traces of paint have been found on handles (Eding, 1940: 54) and blades (TM-2000/133) of the paddles from mine VI of the Gorbunovo peat bog. A blade fragment with a geometric pattern of two isosceles triangles filled with paint and facing each other with their apexes, and rows of dots moving away from them, was discovered at the Shuvakish I settlement (Chairkina, 2005).

The AMS-dates indicate that almost all the types of wooden paddles found at the Trans-Urals peat bog sites existed for a relatively long time, from the early 4th to late 3rd millennium BC (Chalcolithic–Early Bronze Age).

Acknowledgments

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