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CHRONOLOGICAL PROBLEMS WITH SITES OF THE PRIMORSKAYA CULTURE ON THE NORTH-EASTERN COAST OF THE VISTULA LAGOON

ABSTRACT

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The paper focuses on the chronology of the eastern group of the Primorskaya culture, introducing a new series of radiocarbon dates. Materials obtained from features with their foundations sunk into the ground and from cultural layers of the settlements Pribrezhnoye and Ushakovo-3 are described in the context of C-14 datings. The original nature of CWC sites from the north-western coast of the Vistula Lagoon is shown on the basis of C-14 dating, specific traits of ceramic assemblages and properties of the material culture.

Keywords: north-eastern coast of the Vistula Lagoon, Kaliningrad region (Russia), Primorskaya culture, Corded Ware culture, Globular Amphora culture, C-14 dating

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1. INTRODUCTION

One of the key obstacles to solving the problems of chronology and periodization of the Primorskaya culture is the long use of coastal settlements which could have functioned for many centuries. Inhabitants may have left that area in certain periods, but then they settled it again. Notably, the area could have been re-settled either by some related human

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Fig. 1. The situational plan of Primorskaya culture settlements on the north-eastern coast of the Vistula Lagoon

groups who had lived there earlier, or by groups differing distinctly in their culture and ethnic origin who used the same region as the most suitable for inhabitation. As a result, the area has yielded very diversified forms of cooking ceramics and other material that have often been considered as dating to the same period.

In the past fifteen years, research has been carried out in Pribrezhnoye, which was followed in the past three years by excavations near the Prokladnaya river (Frisching), 8 km south-east of Pribrezhnoye (Fig. 1). Several Primorskaya culture settlements have been

uncovered, and this paper centres on the material found in the settlements of Ushakovo-3 and Pribrezhnoye, due to their numerous radiocarbon datings. The ample material obtained in the excavation differs distinctly from previously known complexes of the Primorskaya culture. The differences are of such significance that the newly discovered settlements have been assigned by the author to the group of Waldburg-type sites, named after the most extensively researched settlement complex Pribrezhnoye (Heide-Waldburg) (Zaltsman 2010, 74).

One of the most important questions that arose in the classification of the material was as follows: Does the analysis of the new sources, including the radiocarbon datings, typology of the ceramics and the stratigraphic data, help to differentiate the finds chronologically?

However, the research has been impeded by the paucity or even lack of any osteological material. It can be explained by the geochemical qualities of soil on the north-eastern coast of the lagoon. Although some finds have been located in areas where there are proper conditions for preservation of osteological material, those areas are inaccessible because they are private property. All we can do at present, therefore, is to gather radiocarbon data and dendrodates. Common burials with human remains have not been discovered, either. The western part of the Pribrezhnoye settlement has covered oval pits oriented along the N-S axis, some of them with a slight deviation to the west or to the east. Most of them were empty, but two pits (one, 1.80 x 3.10 m, located at the lower level of Feature 9) had amber necklaces at their bottom. Another pit contained a fragment of an amphora and a fragment of a cylindrical bead. Since most bones were poorly preserved at that location, it can only be presumed that the pits had been used for burials, but additional evidence is needed.

2. THE PRIBREZHNOYE SETTLEMENT

Despite the problems mentioned above, Pribrezhnoye has yielded the remains of long houses sunk into the ground, their lower layers containing a significant amount of ceramics and other material. The settlement stands out among other sites of the Primorskaya culture because of the traces of buildings, where the lower part of the fill covered the most numerous finds. Those dwellings can be considered as relatively closed complexes. For the most part, they represent a two-row post construction of an oblong form, up to 35 m long, about 4–4.5 m wide, sunk to the depth of 0.60 m, with an apse-like roof, a fire pit and an adjacent entrance (Fig. 2). Radiocarbon datings, which do not differ significantly, show that the buildings burnt down simultaneously and no other constructions took their place.

It is necessary to describe briefly the archaeological material found in the dwellings before presenting the radiocarbon data obtained for charcoal, bones and nutshell. The lower level of the fill contained various elements of cooking ceramics, similar in form and usually preserved in fragments, as well as stone or amber artefacts. Even if we chose to

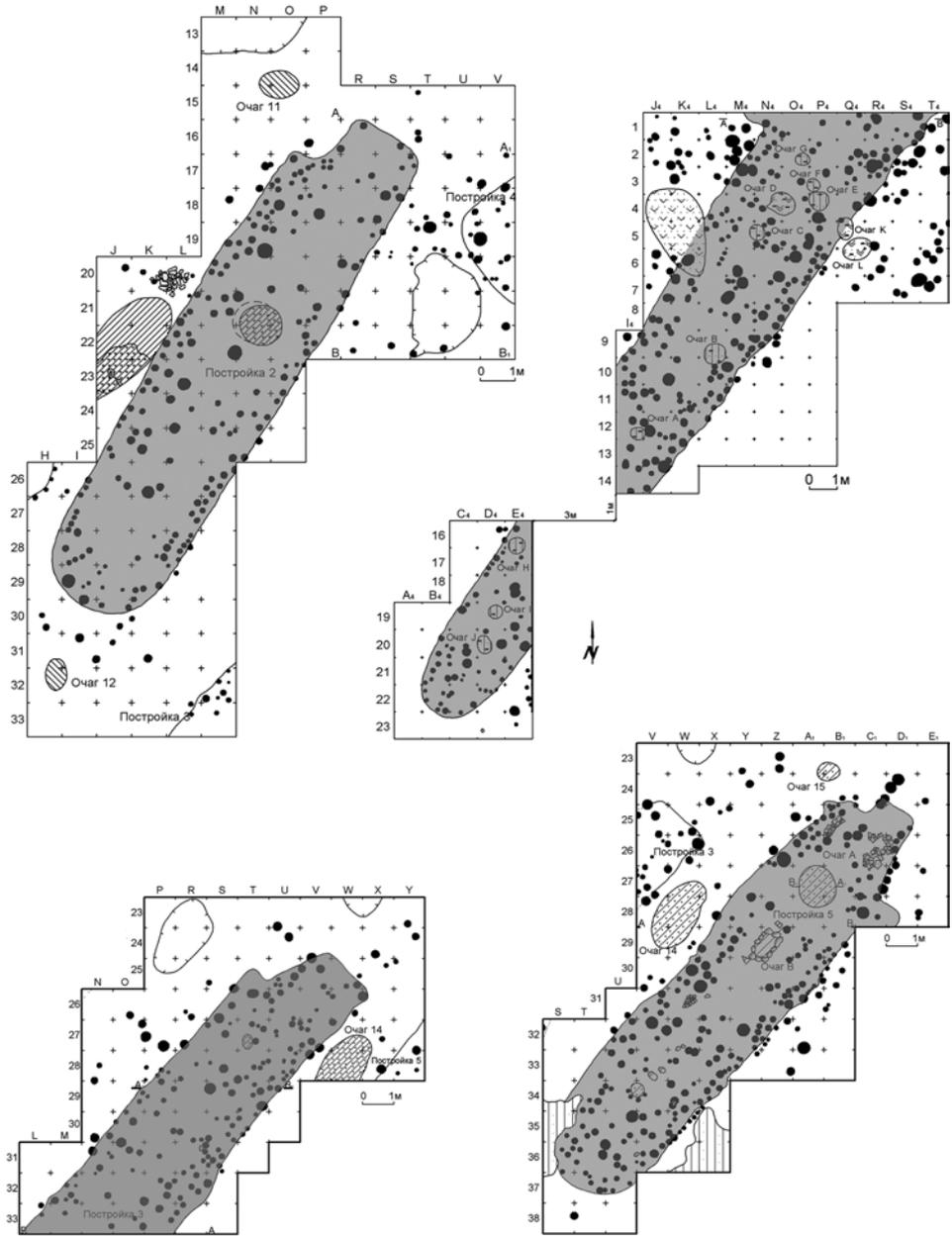


Fig. 2. The Pribrezhnoye settlement. Double-row pillar constructions

ignore the radiocarbon data, the location of the items clearly indicates contemporaneity of the material, mentioned further (Fig. 3–6).

One of the characteristic traits of the ceramic assemblage is an insignificant number of beakers (less than 5.5 % of the total amount, on average) and the prevalence of large wide-mouthed vessels of several varieties. The same holds true for the lower level of the buildings, where (Table 1) different types of wide-mouthed vessels have been found (Fig. 4). Features 2, 3, 6 and 7 contained a number of massive egg- or funnel-shaped vessels with the diameter of up to 35–40 cm (Fig. 4: 3, 4, 5, 6). The items usually have a short neck, horseshoe-like handles and a small massive bottom. Another variant is represented by stocky vessels with more or less sharply curved walls near the bottom and a straight or inverted rim (Fig. 4: 1, 2). The vessels are most often decorated with a relatively complex pattern and bear no traces of scale, which is the case with the previous variants. Wide-mouthed vessels have a rarer tulip-shaped variant with a straight rim (Fig. 4: 7).

The wide-mouthed vessels were accompanied by middle-size vessels similar to them, but with a different proportion of the neck to the bottom (Fig. 6: 8).

The characteristic traits of the beakers include a very short neck, a slightly bent rim and a poorly pronounced shoulder. Generally speaking, the beakers do not resemble the majority of European forms (Fig. 5: 1, 3, 4, 6–8). The items from the lower level of the features have a very small ornamental area and are decorated with primitive horizontal cord impressions, sometimes accompanied by finger impressions or zigzags made with cord impressions.

The ceramic assemblage recovered from the lower level of the features also contained beaker-shaped vessels with a straight rim or a slightly inverted rim (Fig. 5: 2, 5, 9).

The shape of amphorae is the most original trait (Fig. 6: 2, 5). Previously, its peculiarity was interpreted as resulting from accidental deformation. However, the amphorae found subsequently inside and even outside the features have shown that the unusual shape was in fact common. The amphorae have an oblong neck, which was compressed laterally during its moulding, and for that reason their frontal and lateral profiles differ considerably (Fig. 6: 5).

Common types of cooking ceramics also include deep bowls (Fig. 6: 1, 3, 4) and oblong or oblong-oval bowls (Fig. 6: 6, 7).

The ornamentation, in general, is quite repetitive, consisting mostly of horizontal cord impressions, semi-ovals or zigzags made with cord impressions, and pits (Table 2).

The ceramic assemblage is supplemented with stone or amber artefacts. The stone items are limited to axes and adzes with a trapezium-shape profile and a lenticular or oblong cross-section (Fig. 3: 8–13). The inventory includes miniature trapezium-shape axes (Fig. 3: 7), some of them made of imported jasper. The amber jewellery consists of broad or oblong pendants, buttons with a lenticular cross-section and discs with holes (Fig. 3: 1–6).

The material recovered from the buildings confirms the data from the lower level of the occupational layer and from household pits situated near the dwelling constructions (with

Table 1. Settlement Pribrezhnoye, constructions 2,3,5-7. Main pottery forms

Type of vessels	Construction 2			Construction 3			Construction 5			Construction 6			Construction 7									
	Lower part		% Amount	Upper part		% Amount	Lower part		% Amount	Upper part		% Amount	Middle part		% Amount							
	Amount	%		Amount	%		Amount	%		Amount	%		Amount	%		Amount	%					
Amphorae	1	2,7	1	8,3	1	5,5	3	7,7	2	6,1	1	4,8	1	8,3	1	2,3	1	2,1	3	4,1		
Beakers	2	5,4	3	25,0	3	16,7	1	2,6	7	21,2	2	9,5	1	6,2			5	10,4	4	5,4		
Middle-sized pots	4	10,9			5	27,8	16	41,0	5	15,2	2	9,5	2	9,5	3	18,9	1	8,3	11	25,6	7	9,5
Wide-mouthed pots gr. 1 (variants 1-7)	18	48,6	4	33,5	4	22,3	9	23,0	11	33,3	6	28,6	10	62,5	9	75,1	11	25,6	20	41,7	25	36,2
Wide-mouthed pots gr. 2	5	13,5	1	8,3			4	10,3	2	6,1							4	9,3	4	8,3	5	6,7
Wide-mouthed pots gr. 3			1	8,3	1	5,5	1	2,6	4	12,1	1	4,8	1	6,2			6	14,0	6	12,5	5	6,7
Beaker-shaped vessels	5	13,5			1	5,5	2	5,1			2	9,5	1	6,2			1	2,3			10	13,5
Deep bowls	1	2,7	1	8,3	3	16,7	3	7,7	1	3,0	2	9,5			1	8,3	8	18,6			10	13,5
Funnel-shaped bowls																			1	2,1		
Bowls of an oval and oblong-oval form	1	2,7	1	8,3					1	3,0	5	23,8					1	2,3	4	8,3	4	5,4
Total	37	100	12	100	18	100	39	100	33	100	21	100	16	100	12	100	43	100	48	100	74	100

Table 2. Settlement Pribrezhnoye, constructions 1-3. Main ornamentation types

Type of ornamentation	Construction 2		Construction 3		Construction 5		Construction 6		Construction 7							
	Lower part		Upper part		Lower part		Upper part		Lower part		Upper part		Middle part		Lower part	
	Amount	%	Amount	%	Amount	%	Amount	%								
Horizontal cord imprints	3	27,3	3	49,9			1	14,0	1	50	2	7,0	7	21,9	8	25
Vertical cord imprints											1	4,0			1	3,1
Cord zigzag	1	9,1	1	16,7	1	12,5									3	9,4
Cord triangles	3	27,3	1	16,7	3	37,5	1	14,0			14	50,0	19	59,4	2	6,3
Cord semi-ovals	1	9,1	1	16,7	1	12,5	1	6,7			3	11,0	1	3,1	7	21,8
Cord waves									1	33,3					1	3,1
Combinations of cord imprints and pits					1	6,7	2	29,0					1	3,1	1	3,1
Combinations of cord imprints and columns							1	14,0					2	7,0		
Triangles done in bead-like impressions			1	12,5									2	6,3		
Semi-ovals done in bead-like impressions					1	16,7										
Vertical lines done in bead-like impressions															2	6,3
Pits and dimples	1	9,1			2	25	2	29,0	2	66,7	1	50	1	4,0	4	12,5
Columns	2	18,1			1	6,7							3	11,0	3	9,4
Finger imprints					1	6,7							2	7,0	1	3,1
Total	11	100	6	100	8	100	7	100	3	100	2	100	28	100	32	100

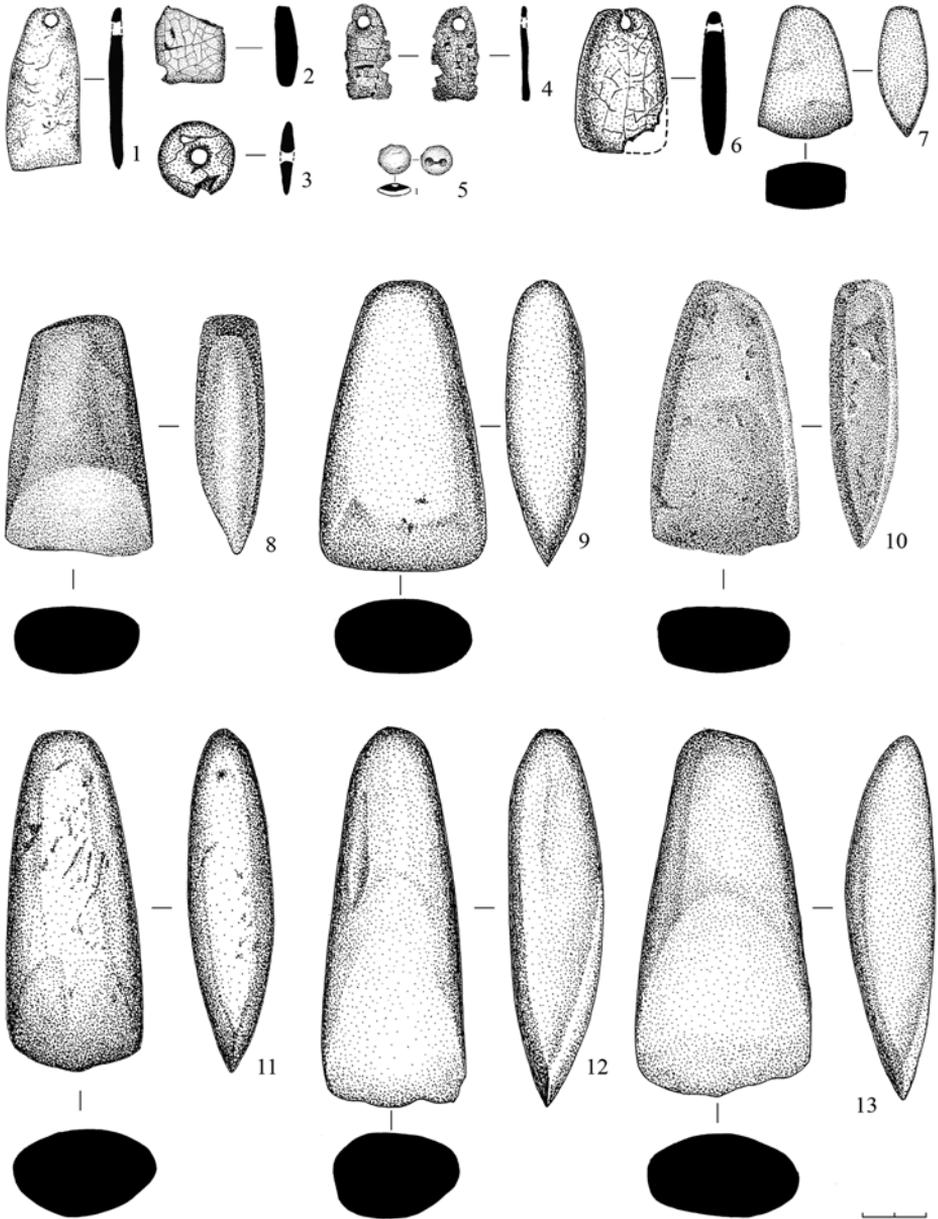


Fig. 3. The Pribrezhnoye settlement. The lower level of the fill within the features. Amber artefacts: flat amber pendants (1, 2, 4, 6); disc with a hole (3); button (5). A miniature axe (7). Trapezoidal axes (8-13) (drawing by A.P. Sutyagin)

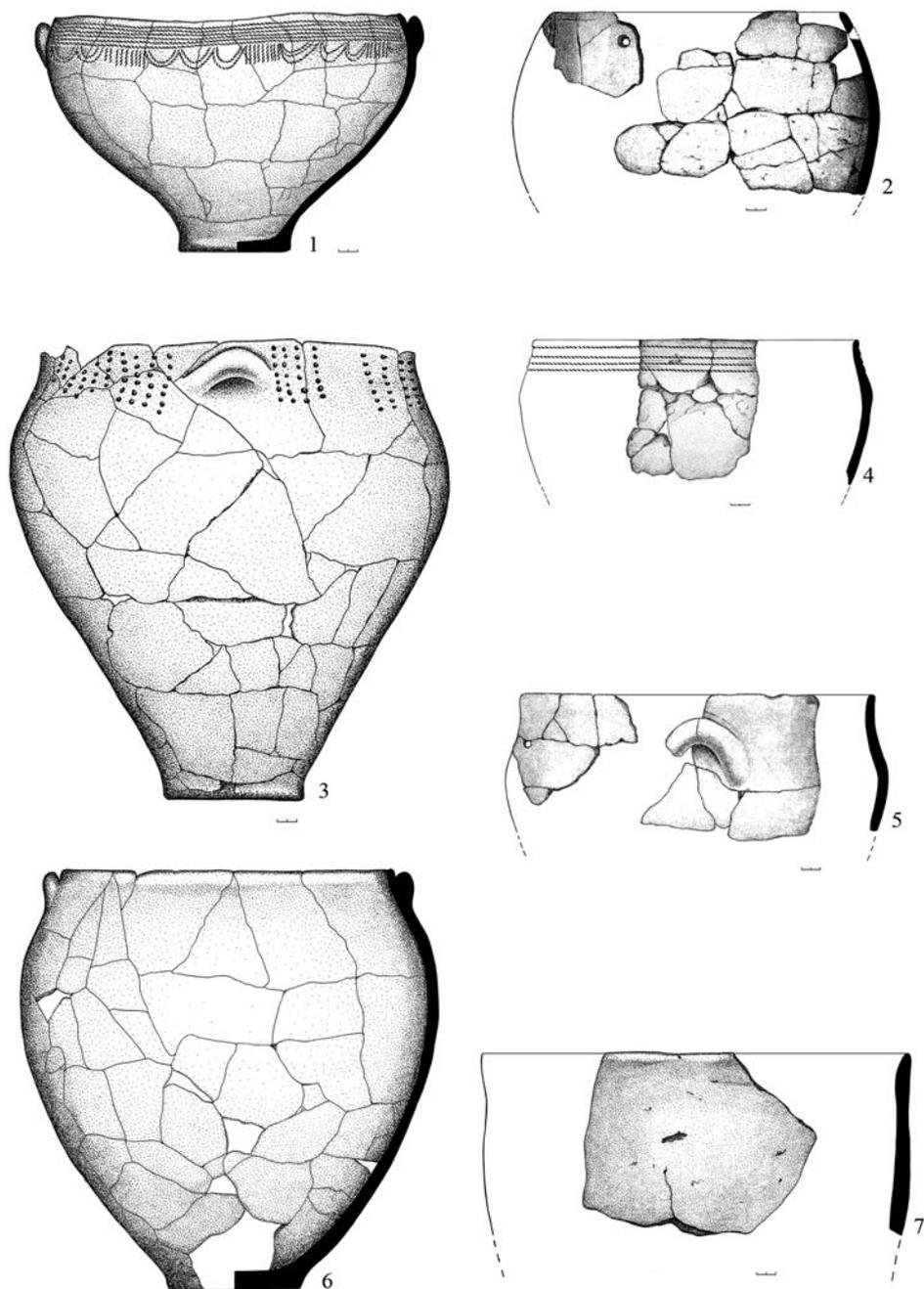


Fig. 4. The Pribrezhnoye settlement. Ceramics from the lower level of the fill within the features (drawing by A.P. Sutyagin). Wide-mouthed pots (1-7)

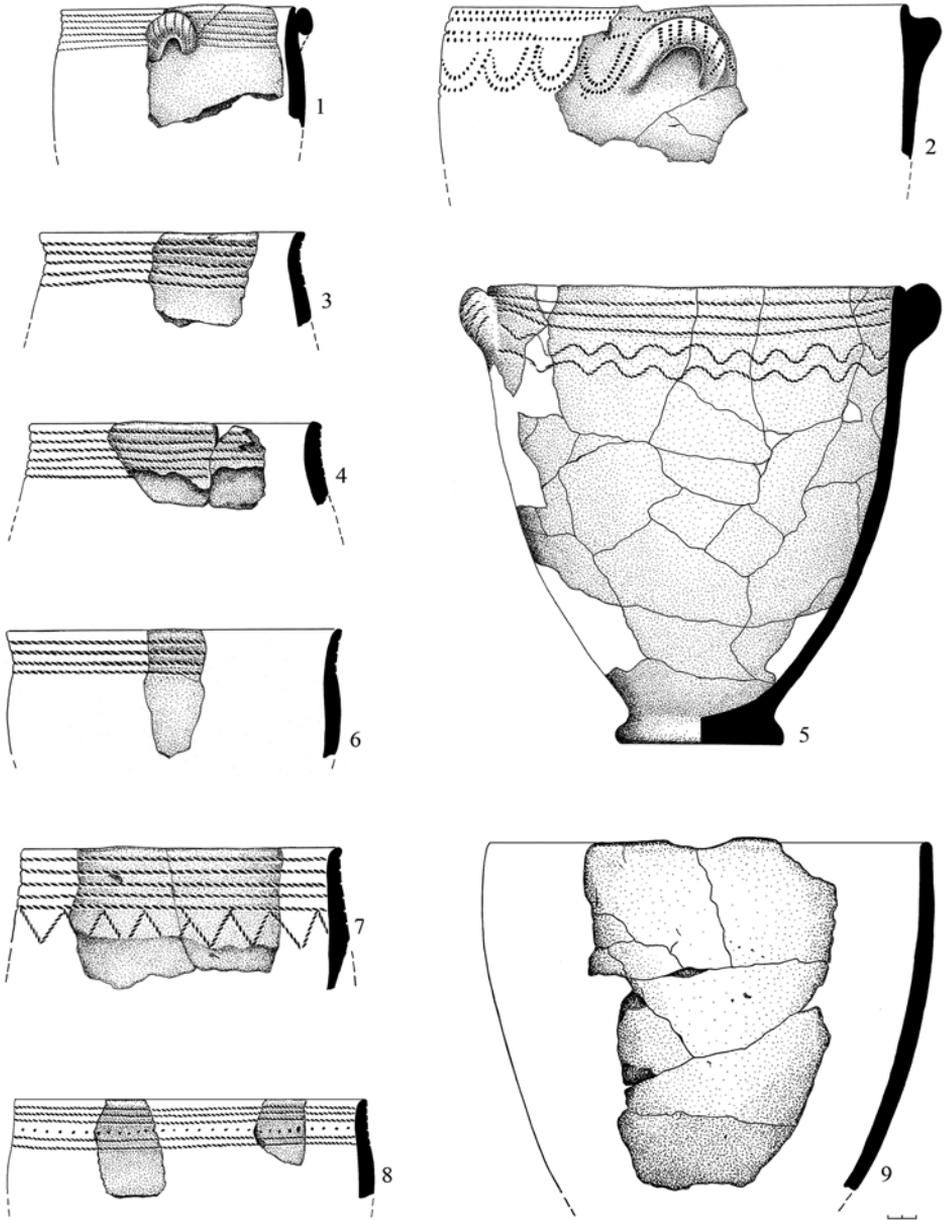


Fig. 5. The Pribrezhnoye settlement. Ceramics from the lower level of the fill within the features (drawing by A.P. Sutyagin). Beakers (1, 3, 4, 6-8); beaker-shaped vessels (2, 5, 9)

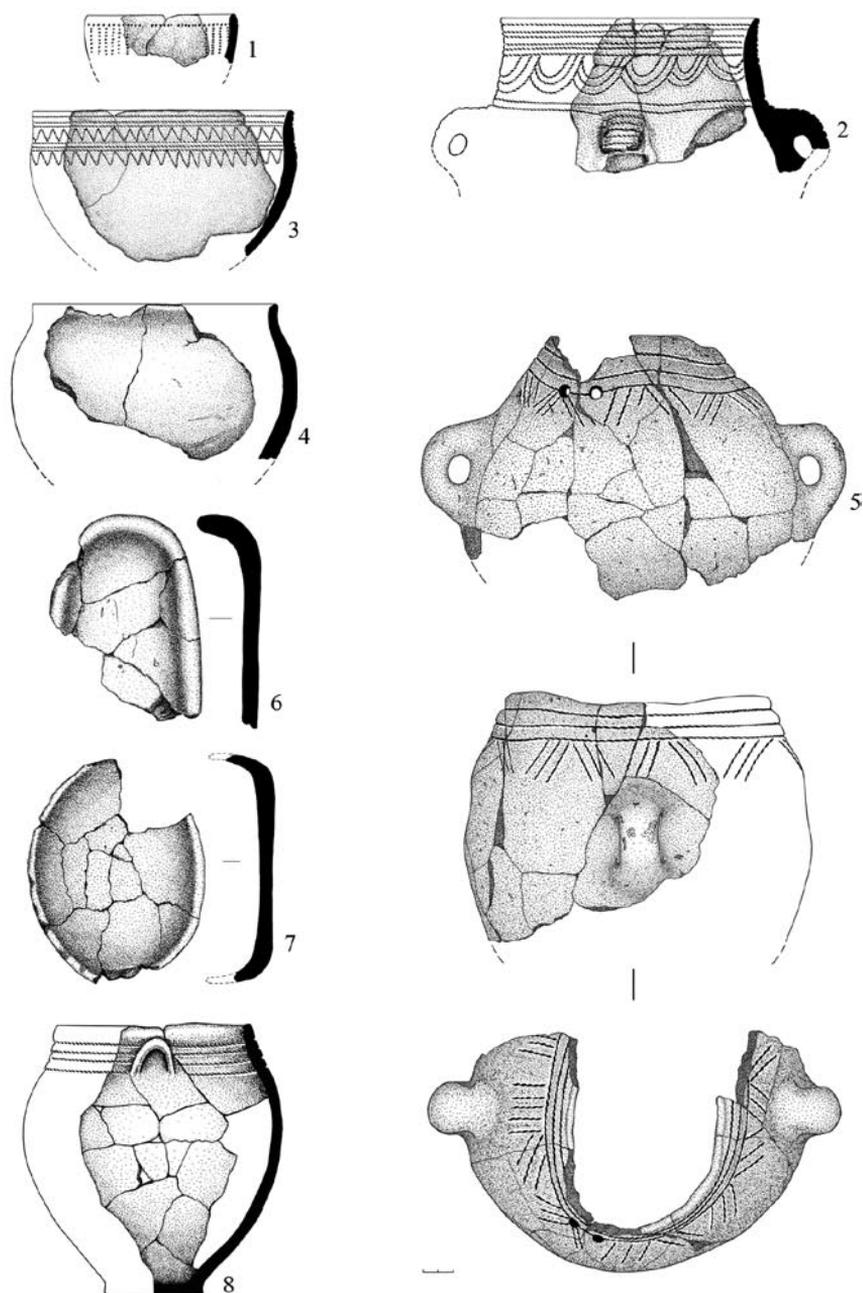


Fig. 6. The Pribrezhnoye settlement. Ceramics from the lower level of the fill within the features (drawing by Sutyagin A.P.). Deep bowls (1, 3, 4); oval and oblong-oval bowls (6, 7); middle-size vessel (8); amphorae (2, 5)

an exception of ceramics found in the western part of the settlement) (Fig. 7). The middle and the upper levels of the occupational layer covering the underground constructions included two main types of wide-mouthed vessels, somewhat similar to the previously described forms, but with a smooth outline and a prominent curve at the bottom (Fig. 8: 9, 10). The vessels are also mostly ornamented with triangles (Fig. 8: 8, 10). Moreover, the level has provided a greater variety of bead-like patterns and column-like stamps (Fig. 8: 5, 12). Beside deep bowls (Fig. 8: 3, 4), ellipsoid and stocky vessels show some development as well (Fig. 8: 8, 11), while tulip-, egg- or funnel-shaped forms of cooking ceramics are almost completely absent in there. The forms shaped differently than the items from the lower level of the features are more varied: small stocky bowls decorated with wavy or semi-oval patterns (Fig. 8: 2), funnel-shaped bowls with cord impressions on the inside (Fig. 8: 7), wide-mouthed vessels with a prominent neck (Fig. 8: 6, 12) and beakers decorated with triangles (Fig. 8: 1). According to the stratigraphic data, therefore, the relatively long neck, nicely bent rim and triangles as the predominant decorative pattern are characteristic traits of the artefacts at the next developmental stage. Despite the differences, the ceramics from the upper and middle levels of the occupational layer of the settlement indicate uninterrupted tradition, clearly visible in the features, and are linked closely to it by their origin, with the exception of a few fragments of cooking ceramics from levels 1–2 of the horizons which may be dated to the late 3rd and the early 2nd millennia BC.

It should be emphasized that there were no other forms of ceramics apart from random finds of foreign origin, which may point to cultural ties of the settlement. The finds include two fragments (from Feature 7) representing the Pit-and-Comb Pottery culture (Fig. 9: 9, 10), reminiscent of items known from the sites at Biała Góra (Weißenberg), Zedmar D and Dąbek (Eichenberg) (Gaerte 1927, 19, fig. 58, 59, 67, 68). Other finds are porous, with analogies in the local “forest” Neolithic period (Fig. 9: 1-8). The fragments correspond to the time when the settlement was used, if the dates can be trusted, of course.

Thus, the majority of the ceramic material found in Pribrezhnoye is quite homogenous and shows traces of gradual development, which comes in sharp contrast to the finds from the settlements in Nida and Suchacz. The pottery there can clearly be divided into local types and types common throughout Europe. The latter include vessels with moulds and nips, as well as beakers with quite a long prominent neck decorated with cord or finger impressions (Kilian 1955, fig. 25, 31, 144, 145, 147, 148, 149, 151; Rimantienė 1989, 102, fig. 52: 5, 7; 53: 1, 2; 129-134; fig. 83-85). Those settlements seem also linked with each other by the local kinds of cooking ceramics which include wide stocky bowls with handles, amphorae of later types, big funnel-shaped vessels and oval or oval-oblong trays, often with cone-like moulds (Kilian 1955, fig. 5-12, 91, 94, 100-104; Rimantienė 1989, 102, fig. VIII, 72: 47-49: 1, 6; 88-90). The Pribrezhnoye settlement had none of those. The explanation may be simple. Pribrezhnoye is one of the latest settlements of the Primorskaya culture to develop on the shores of the Vistula and the Courland Lagoons. According to the knowledge accepted so far, the earliest complex of that culture was the one related with ampho-

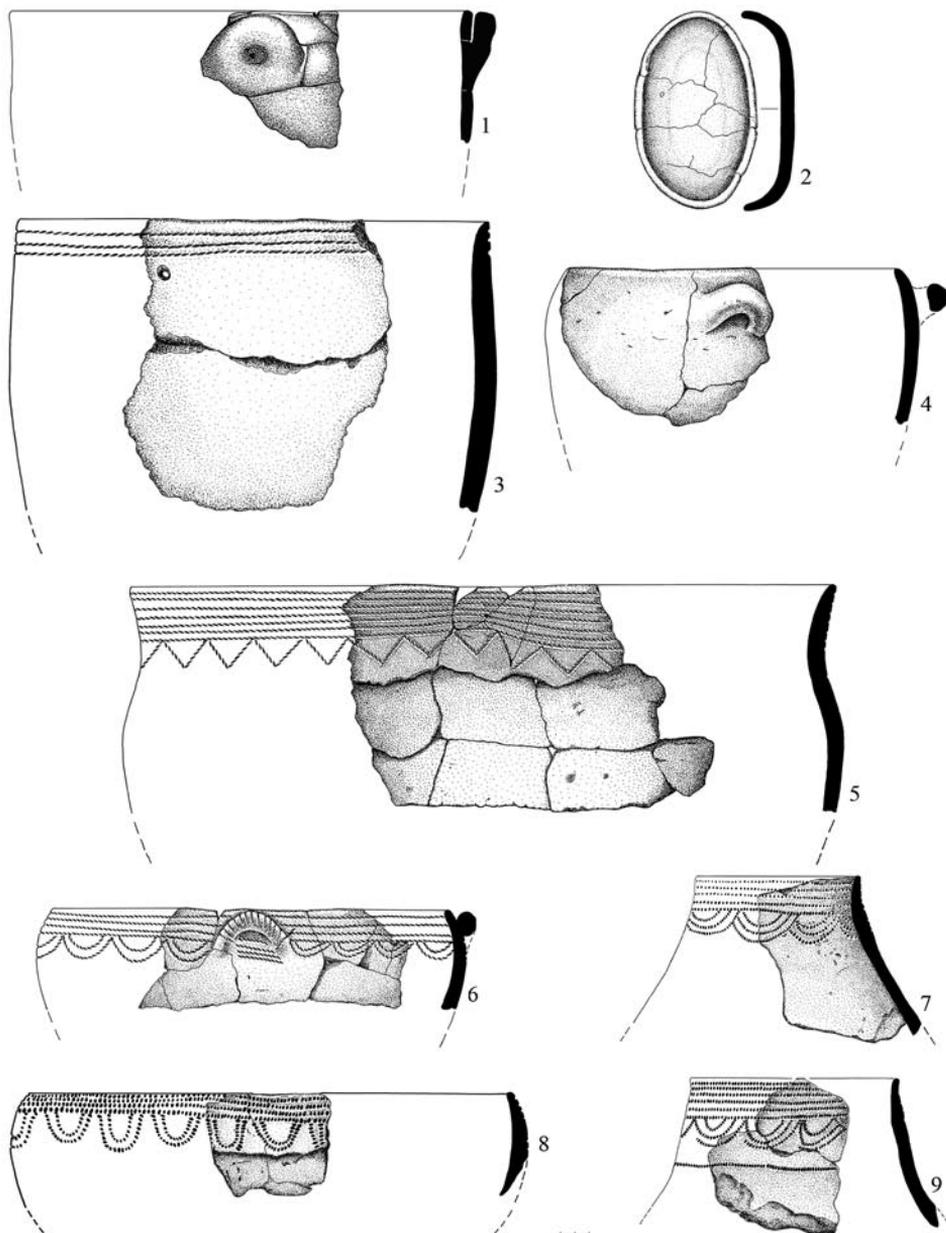


Fig. 7. The Pribrezhnoye settlement. Ceramics from the lower level of the cultural layer (drawing by Sutyagin A.P.).
Wide-mouthed pots (1, 3, 5, 6, 8); oval bowl (2); beaker-shaped vessel (4); amphorae (7, 9)

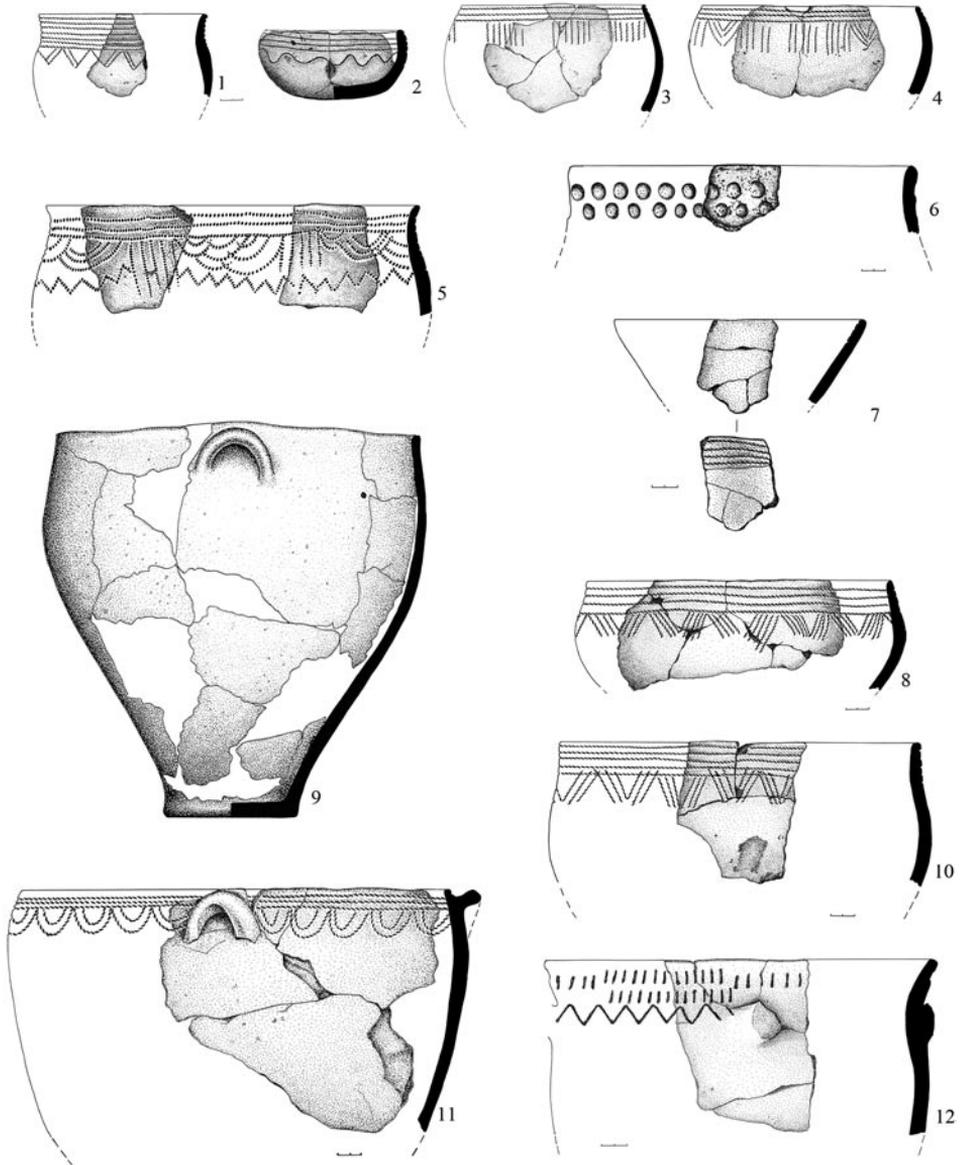


Fig. 8. The Pribrezhnoye settlement. The middle level of the cultural layer. Beaker (1); squat bowl (2); deep bowls (3,4); beaker-shaped bowl (7); wide-mouthed pots (5, 6, 8-12) (drawing by A.P. Sutyagin)

rae decorated with groups of vertical lines pointing downward, slender S-shaped beakers decorated with simple cord impressions, finger impressions or pits, and wide-mouthed vessels with finger nips. The local forms also include boat-shape vessels and variants of wide-mouthed vessels. Possible influence of the Globular Amphora culture (GAC) was obviously considered even at the initial stage of the research. Still, the basis of the early Primorskaya culture was related to the early Corded Ware culture (CWC), originating from Central Europe (Król 1997, 142; Machnik 1979, 378; 1997, 128; Rimantienė 1992, 301; Tetzlaff 1970, 361; Źurek 1954, 39; Rimantiene 1981, 34–35).

As we know now, the forms mentioned above evolved gradually in many CWC groups. The question arises why there are no traces of those vessels in Pribrezhnoe, not even of some modified forms. The excavation has only uncovered local varieties of cooking ceramics and stone or amber artefacts. The problem cannot be explained solely with the GAC influence. Some types of ornamentation, including column-like stamps, horizontal cord impressions crisscrossed with vertical ones at regular intervals, and semi-ovals of cord impressions may indisputably be linked to neighbouring GAC groups. However, the unusual proportions of the cooking ceramics from the Pribrezhnoye settlement seem to indicate that the vessels were not a simple derivative of GAC pottery. Moreover, hardly any type of the wide-mouthed vessels, middle-sized vessels, beaker-like vessels, beakers, amphorae and funnel-shaped bowls can be brought down to a form of GAC origin.

Fragmentarily preserved wide-mouthed vessels often recovered from settlements of the Primorskaya culture have long been regarded as traditional GAC forms, for no solid reason. As the Pribrezhnoye settlement has yielded those vessels with an intact profile, they need no longer to be linked to GAC pottery. The wide-mouthed vessels roughly resemble the famous Zedmar forms with a flat bottom and a wide mouth (Timofeev 1996, 162, рис. 51; Gumiński 2001, fig. 2: a,d,e,j).

Eighteen radiocarbon datings have been obtained for charcoal, bones and nutshells from the lower and upper levels of the features in Pribrezhnoye (see Appendix 1). The stratigraphic position of each sample was fixed as required. In order to ensure accuracy of the results, two radiocarbon datings were given for one sample in one case (charcoal taken from the hearth in Feature 4). For the rest of the cases, the datings were made in two different laboratories. The results, in general, conform with one another.

Most of the radiocarbon datings fall into two groups. The first one includes 4 datings from the period of 3600–3300 BC (no 1–5). The datings correspond to those for charcoal from the upper level of Feature 7 (no 5). The second group includes 4 charcoal datings from the period of 3100–2900 BC (no 6–9). That group corresponds to radiocarbon datings obtained for a more reliable organic material: bones in three cases and a burnt hazel shell in one case (no 10–13).

The datings around 3600–3300 BC clearly stand out against the rest of the group. It is quite possible that the reason for the early dates is so-called old wood effect, which may have distorted the chronological age. The other radiocarbon datings from group 2 seem to

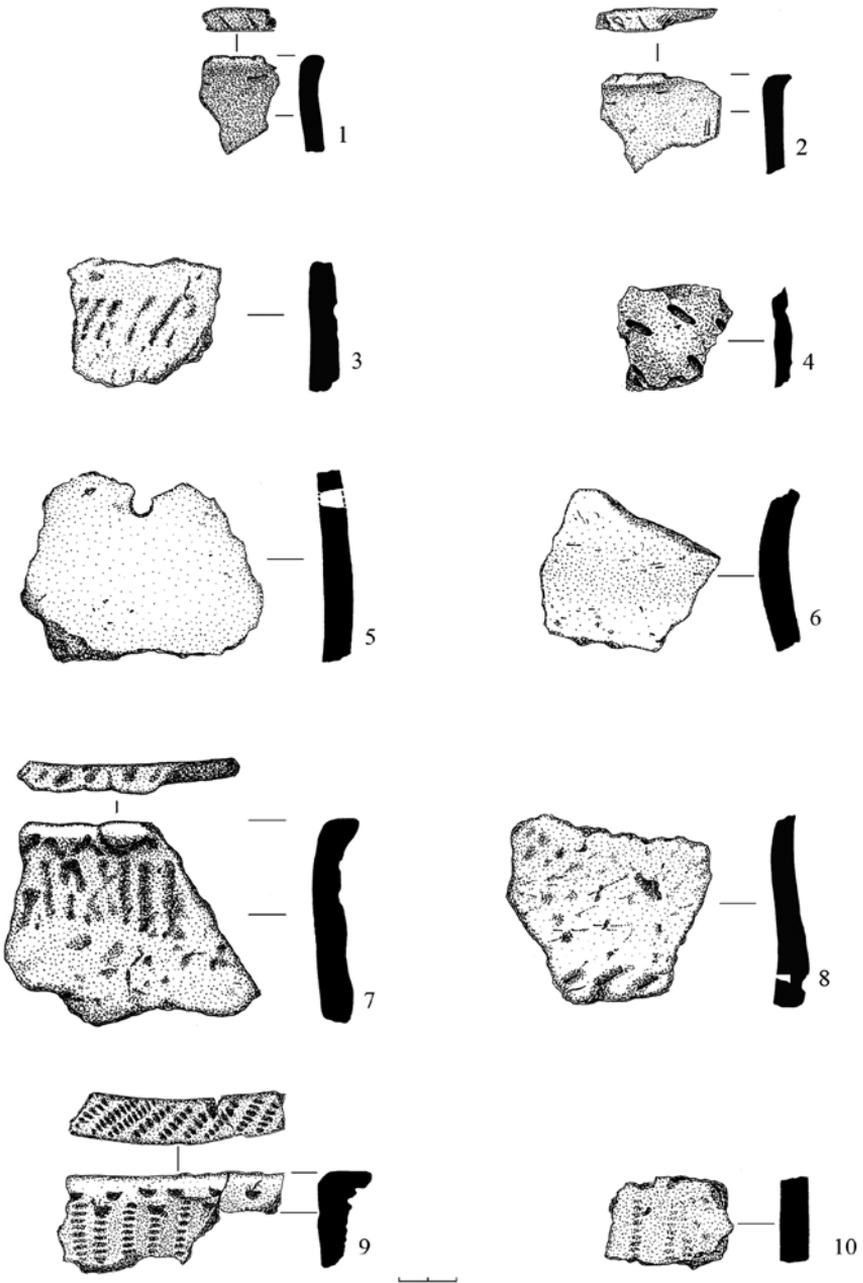


Fig. 9. The Pribrezhnoye settlement. Ceramics from the lower level of the fill within the features (drawing by A.P. Sutyagin). Fragments of porous ceramics (1-8); fragments of vessels typical of the Pit-and-Comb Pottery culture (9, 10)

be more accurate, as they match the datings obtained for more perishable material (no 6–13).

Hearth A from Feature 2, which dates back to 4220 ± 40 BP (Je-6217), seems to have been built later, and it can be proved stratigraphically, because Hearth B, constructed earlier, was located below (no 14). The apparent contradiction results from two relatively late datings of Feature 3, corresponding to the period of 2500–2300 BC (no 16, 17). However, the small amount of ceramic fragments of later origin could serve as an explanation. The fragments stand out sharply against the bulk of the pottery due to the quality of their firing, their density, shape and ornamentation (a long neck providing space for decorative patterns, simple cord impressions, light firing). It is safe to say that the fragments were brought down mechanically from the upper level, since the same type of pottery has been found there as well. In general, some of those fragments have been recovered both from the upper level of the fill in all the excavation pits in Pribrezhnoe and from the upper part of the occupational layer. The charcoal from the upper level of Feature 5 has been dated to ca 2400–2100 (no 18), which does not contradict the dates for the upper level, where there were about 20 ceramic fragments typical of the second half of the 3rd millennium BC. Several fragments found at the upper level of Feature 7 were quite typical of the 2nd millennium BC. However, since all the late datings have high standard deviation, it can be misleading. Another dating obtained for the upper level of Feature 3 (no 15) seems to be later in comparison to the previous dates, as it points to the middle of the 2nd millennium BC. Findings related to the same period are one-off in the settlement, and thus they cannot be considered as reliable.

It is not difficult to notice that most radiocarbon datings for the lower level contradict the traditional opinion about the chronology of the Primorskaya culture. At the same time, the dwelling constructions, ceramics and stone artefacts uncovered in the settlement are clearly original. The datings obtained for charcoal, bones and the hazel shell in two independent laboratories correspond to phase IIb of the GAC (Szmyt 1996, 75). Even if we consider the very end of that phase, the radiocarbon datings mainly indicate the period of 3100–2900 BC.

The question arises whether the datings related to an earlier period than the European average can be trusted. The accuracy of the radiocarbon datings for the Primorskaya culture has been disputed before (Furholt 2003, 113).

Materials from Rzucewo and Nida have mainly been radiocarbon dated to ca. 2500 BC (Król 2009, 335; Rimantiene 2004, 160). Those dates, and most finds from the cultural layer and household objects, correspond to the classical phase of the Primorskaya culture, when the Wellenleistentopf-type ceramics were common. In Rzucewo, some items have been recovered directly from dwelling constructions. They differ from those found in Nida and their dating is close to the radiocarbon dates for Pribrezhnoye (Rimantienė 1989, 176). However, the pottery from Nida includes items similar to those from the middle and upper parts of the occupational layer in Pribrezhnoye, although their number is small: fragments

of amphorae, presumably with oval necks, wide-mouthed vessels with short necks, horse-shoe-like handles decorated with zigzag cord impressions, triangles, vertical lines and finger imprints, as well as a variety of deep bowls (Rimantienė 1989, fig. 50: 3, 5, 12; fig. 66: 6; fig. 73: 5, 7; fig. 74: 6, 9; fig. 75: 1, 3; fig. 76: 4; fig. 80: 4, 8; fig. 82: 7, 11; fig. 91: 8, 10). Other local forms have more prominent necks and different ornamentation, and thus they resemble the ceramics from 2600–2500 BC.

In Niedźwiedziówka, late material is obviously predominant, but five out of seven dates seem very early and correspond to the radiocarbon datings for Pribrezhnoye (Mazurowski 2014, 53, tab. 6). Some vessels also resemble the Pribrezhnoye ceramics, mostly an oblong-oval bowl, wide-mouthed vessels with a short neck, and vessels with no neck (variants 1, 7, 8, 9 in Pribrezhnoye) (Mazurowski 2014, fig. 169: 4; fig. 143: 4, 5, 7; 153: 5; 154: 3, 4; 156: 1; 157: 3, 5). Moreover, axes with narrowed butt, including asymmetric ones, belong to the type recorded also in Pribrezhnoye (Mazurowski 2014, fig. 183: 4; 184: 1, 2).

The situation in Pribrezhnoye is much more complicated. The unusual character of the dwelling constructions, ceramics and stone artefacts is evident. As such, the material has no clear or precisely datable traits.

Undoubtedly, it would be a mistake to rely solely on the dates obtained for charcoal, which are earlier than the dates for bones found in the adjacent area. There are only four dates obtained for the bones and the nutshell in Pribrezhnoye, and they confirm the majority of the other radiocarbon datings, which are early. Clearly, this is not enough.

However, any later dating of the site seems to be contradicted by the fact that the main culture complex in Pribrezhnoye was completely impenetrable to some types of pottery and ornamentation, amber jewellery and stone artefacts, which became widespread on the Baltic coast in the late CWC period. This mostly concerns beakers with a short bent rim and covered with simple cord impressions from top to bottom, the impressions sometimes being divided into separate bands (Kilian 1955, fig. 82-84; Manasterski 2014, 104, fig. 4: 1-3); pot-like beakers with a ledge in the upper part (Kilian 1955, fig. 80,85); vessels with sharply bent or flattened rim (Manasterski 2009, tabl. 98: 3-11; tabl. 84: 1-4); cooking ceramics with scratched surfaces (Manasterski 2009, tabl. 96: 8, 9; Rimantienė 1999, 24, fig. 6) and with incised or engraved ornament (Ýurek 1954, fig. 9:4; Butrimas and Ostrauskienė 2004, 138, fig. 17: 5-8). The main cultural complex of Pribrezhnoye has preserved no traces of any neighbouring cultural formations from the late 3rd millennium and the first half of the 2nd millennium BC. In that context, the settlement seems to have been entirely isolated. Almost all foreign types of pottery found in the dwelling constructions are related to the “forest” Neolithic cultures.

It should be added that items similar to the wide-mouthed vessels and some other kinds of cooking ceramics known from Pribrezhnoye have also been found at the sites Šventoji 6 and 2/4A, where they may have looked like typical GAC products (Rimantienė 2005). This refers to vertical vessels with slightly convex walls and to wide-mouthed vessels with an S-shaped rim (Rimantienė 2005, fig. 144: 4, 8; 259:12; 143: 1,8; 259: 9,10,15).

According to Rimantienė, the items could not have been linked to the GAC (Rimantienė 2005, 131). The vessels differ from the other ceramics by the higher density and thickness of their walls. One of those fragments is decorated with semi-ovals made with bead-like impressions (Rimantienė 2005, 132, fig. 143:1), i.e. in the same style as the vessels from Pribrezhnoye (Fig. 8: 5) (Zaltsman 2011, fig. 7: 7).

Interestingly, similarities can be found not only in the shape and ornamentation of the cooking ceramics, but also in amber or stone artefacts. A typical piece of amber jewellery recovered from Pribrezhnoye is a flattened oblong pendant with a groove at its base (Fig. 3:1, 2, 4) (Zaltsman 2010, 46-49, fig. 29), and it is common at the sites Šventoji 6 and 2/4A as well (Rimantienė 2001, 89-91, fig. 4; Abb.6). With the exception of boat-like or segmental buttons with V-shaped holes, the other amber jewellery is also quite similar to that recovered from Pribrezhnoye (Fig. 3: 1-6). The same concerns lenticular buttons and discs with a hole in the centre. Moreover, the site Šventoji 2/4A has provided a Waldburg-type stone axe with a narrow butt (Rimantienė 2005, fig. 145: 2). Šventoji 2/4A and 6 have been dated to 2720 BC and 2630 BC, respectively (Szmyt 1999, 67).

As regards regional CWC groups, more thorough comparison of the material mentioned above seems rather pointless. Early pottery from CWC settlements located in Central Europe is mostly unvaried and often represented by Wellenleistentopf-type cooking ceramics which have nothing in common with the wide-mouthed vessels mentioned above (Beran 1990, 20-25; Witkowska 2006, 65). Early origin of the pottery is indicated by dendrodates obtained for Swiss settlements (Furholt 2003), though that type of cooking ceramics is also known from other areas, at least those dated to the classical phase (Rimantienė 1989, 129-134, fig. 83-85).

Thus, further research on the Pribrezhnoye settlement is needed in order to obtain more reliable results. At the same time, excavation at similar sites where conditions are favourable to preservation of organic material are required. As regards the questions discussed here, the results of research on Ushakovo-3 seem to emphasize the originality and simultaneously to show the evolution of the local cultural type.

3. THE USHAKOVO-3 SETTLEMENT

The Ushakovo-3 settlement is situated to the southwest of Pribrezhnoye, 8 km away from that site, next to a coastal terrace bounded to the east by a stream flowing into the lagoon (Fig. 1). Research on Ushakovo-3 has been carried out in 19 mechanical horizons 4 cm deep. The excavation has covered 100 m².

Most finds from Ushakovo-3, unlike those from Pribrezhnoye, have been recovered from the occupational layer which was washed away by spring thaws onto a lower shore ledge.

Technologically, two types of ceramics have been distinguished in the material from horizons 1-15. Fragments of vessels found mainly in horizons 1-4 are characterised by

lighter firing and a significant amount of slack. Coarse grains of slack are visible on the surface.

The ceramics from the upper layers (horizons 1–4) includes pot-like amphorae without ornamentation; simple undecorated beakers with bent rims; wide-mouthed pots with tongue-like handles, a groove under a straight rim, a widened central part of the body, and a sharply bent rim (Fig. 10). The ornamentation of those lightly fired vessels consists only of horizontal cord impressions, simple rows of columns or small and rather shallow pits. The beakers are decorated with horizontal cord impressions, sometimes combined with vertical impressions or columns (Fig. 10: 2, 4, 7, 9).

The ceramics from horizons 4–12 are dominated by beakers of several varieties, mostly vessels with a sharply bent rim, a prominent narrowed neck and quite a convex body (Fig. 11: 4-9); there are also simple beakers with an S-shaped profile (Fig. 11: 1-3, 11) and beakers with straight walls (Fig. 11: 10). The items may have been covered entirely with cord impressions. Beaker-like vessels resemble beakers, but are larger (Fig. 12: 2, 3-6) and with no neck; they often have horn- or tongue-like mouldings. Some of the items are decorated with an original motif based on the herring-bone pattern, consisting of small rectangular columns and rows of pits (Fig. 12: 3, 4). Medium-size vessels are almost always ornamented solely with horizontal cord impressions; in one case, the motif is accompanied by vertical cord impressions (Fig. 12: 1, 8, 9). Barrel-shaped pots are quite common, too (Fig. 13: 1, 5-12). Amphorae mostly have a slanting body and handles in the area of the neck or the shoulder (Fig. 11: 12-16). The handles are often decorated with cord impressions forming the herring-bone pattern (Fig. 11: 13, 15). Several amphorae seem to have had an egg-shaped body (Fig. 11: 16). Wide-mouthed vessels mainly come in two types: one with an S-shaped upper part and another with an undefined profile, decorated with the basic cord ornament or with rows of small pits (Fig. 12: 8-10). The last category includes undecorated deep bowls or bowls with simple cord impressions (Fig. 13: 3, 4).

The items from horizons 4–15 are characterised by much stronger firing, well smoothed surfaces and an insignificant amount of slack, though inclusions are sizeable (0,03-0,05 mm) and visible on the surface.

The ceramics from the upper and the middle layers differ in their technology, form and ornamentation, being typical of particular periods of the settlement. Generally, the attribution of the material is clearly visible layer-by-layer, though some fragments from the upper layers, usually very small pieces, penetrated quite naturally into the lower ones.

All axes are trapezoidal, with butts broader than those in Pribrezhnoye. Amber jewellery is surprisingly scarce; it consists only of a trumpet-shaped bead and a fragment of a plate.

The dominant type of cooking ceramics from horizons 16–19 is different and includes beakers with a short neck, obtained from the upper horizons, but technologically of the same origin (Fig. 14: 1-6; 15: 1, 3, 4); oblong-oval bowls (Fig. 14: 10, 11), amphorae with a slanted shoulder and a long neck (Fig. 14: 7); deep bowls (Fig. 14: 12, 13, 15); and wide-mouthed vessels (Fig. 15: 2, 5-10), some of them being quite stocky (Fig. 15: 2, 5).

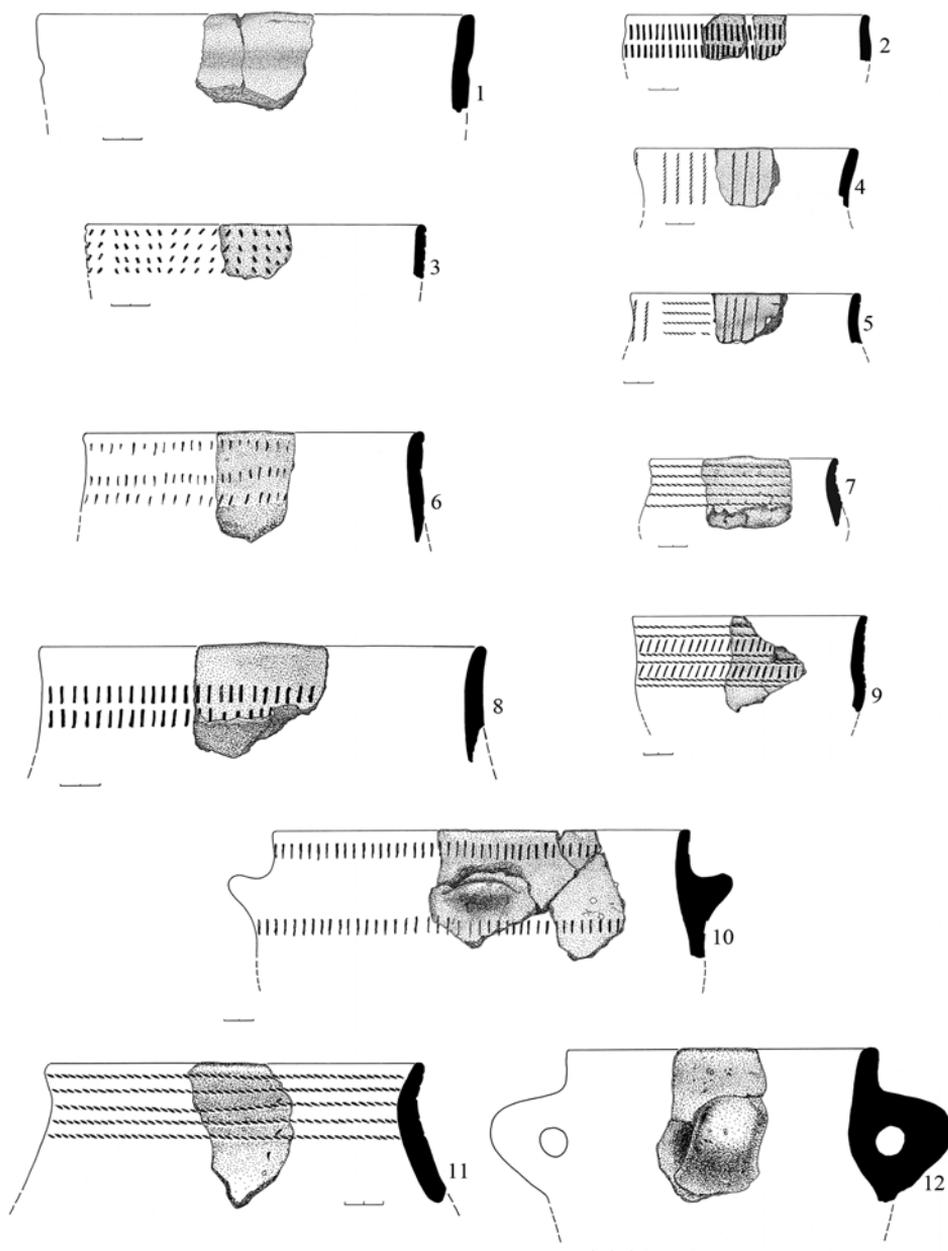


Fig. 10. The Ushakovo-3 settlement. Ceramics from the upper level of the cultural layer (horizons 2-7). Wide-mouthed pots (1, 8, 10, 11); beakers (2, 4, 5, 7, 9); beaker-shaped vessel (3); middle-size vessel (6); amphora (12) (drawing by A.P. Sutyagin)

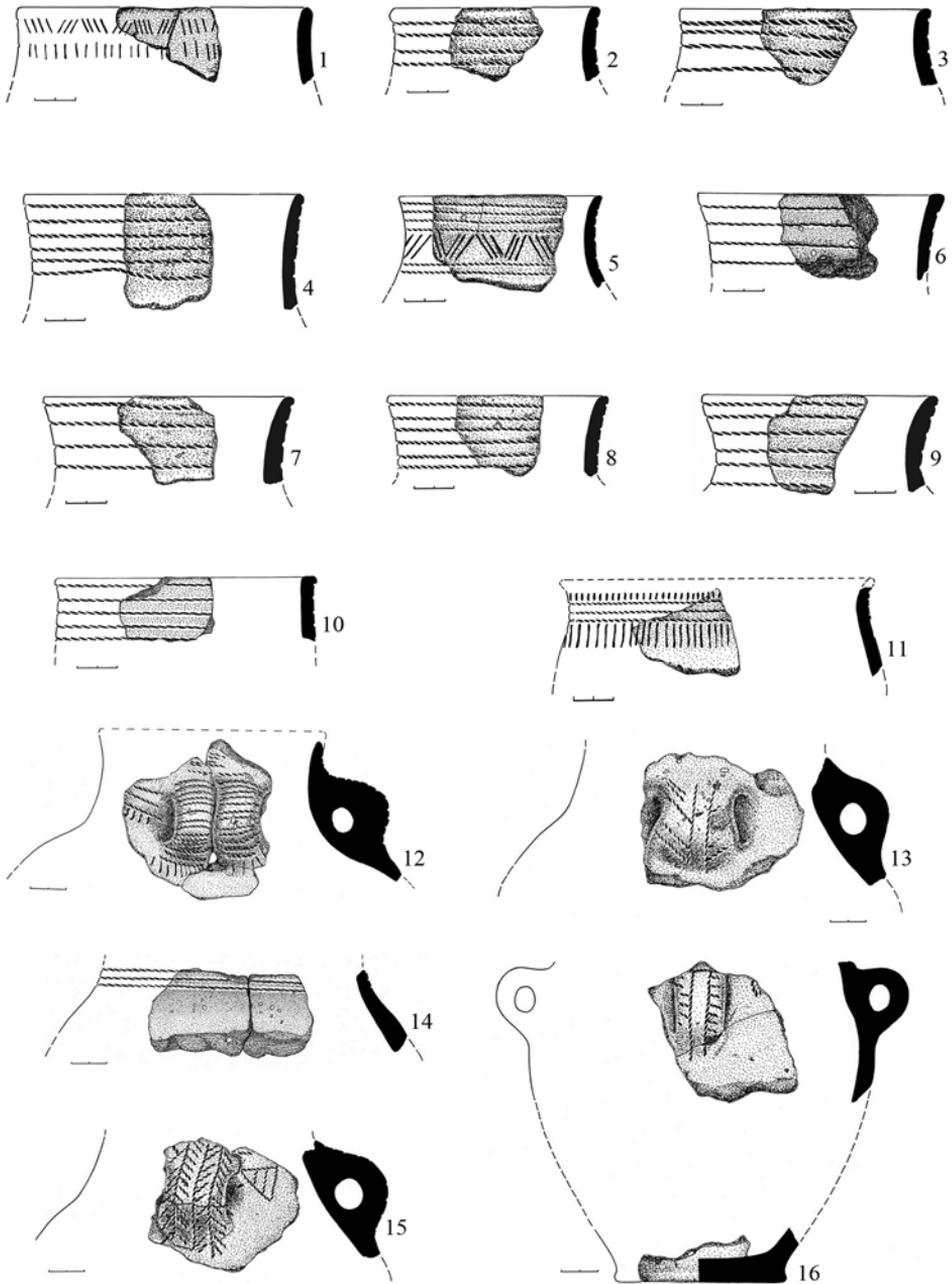


Fig. 11. The Ushakovo-3 settlement. Horizons 7-12. Beakers (1-11); amphorae (12-16)
(drawing by A.P. Sutyagin)

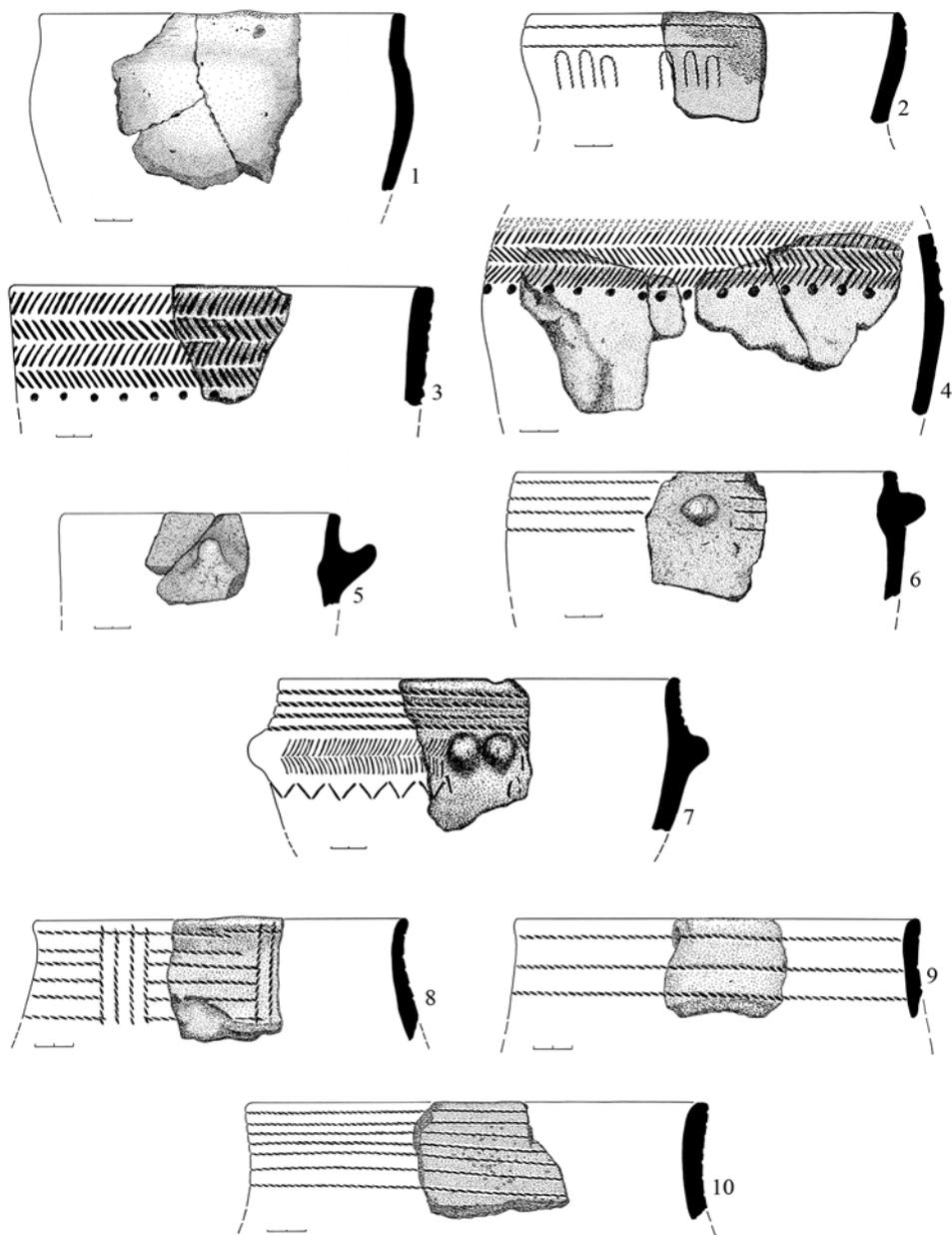


Fig. 12. The Ushakovo-3 settlement. Horizons 7-12. Middle-size vessel (1); beaker-shaped vessels (2-6); deep bowl (7); wide-mouthed pot (8-10)

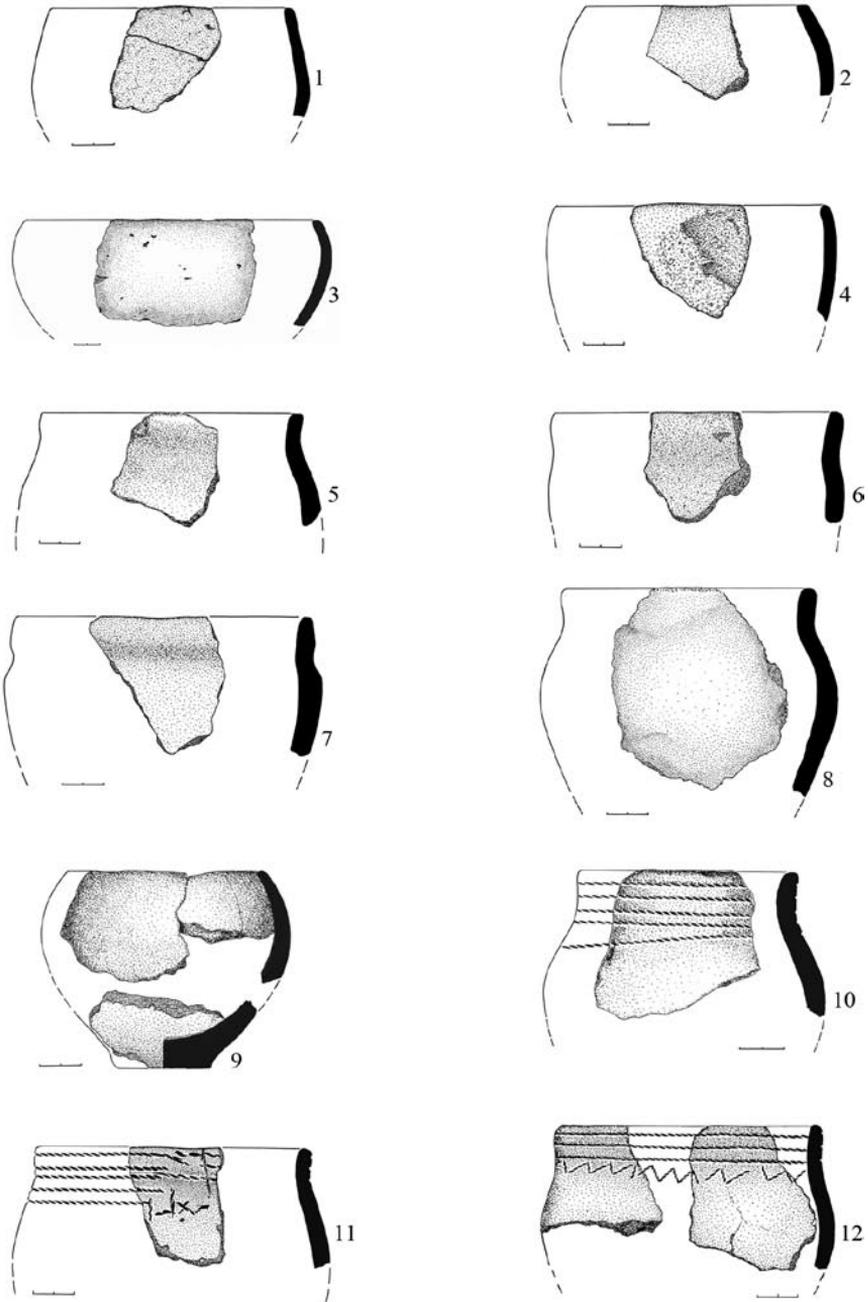


Fig. 13. The Ushakovo-3 settlement. Horizons 7–12. Barrel-shaped pots (1, 2, 5–12); deep bowls (3, 4) (drawing by A.P. Sutyagin)

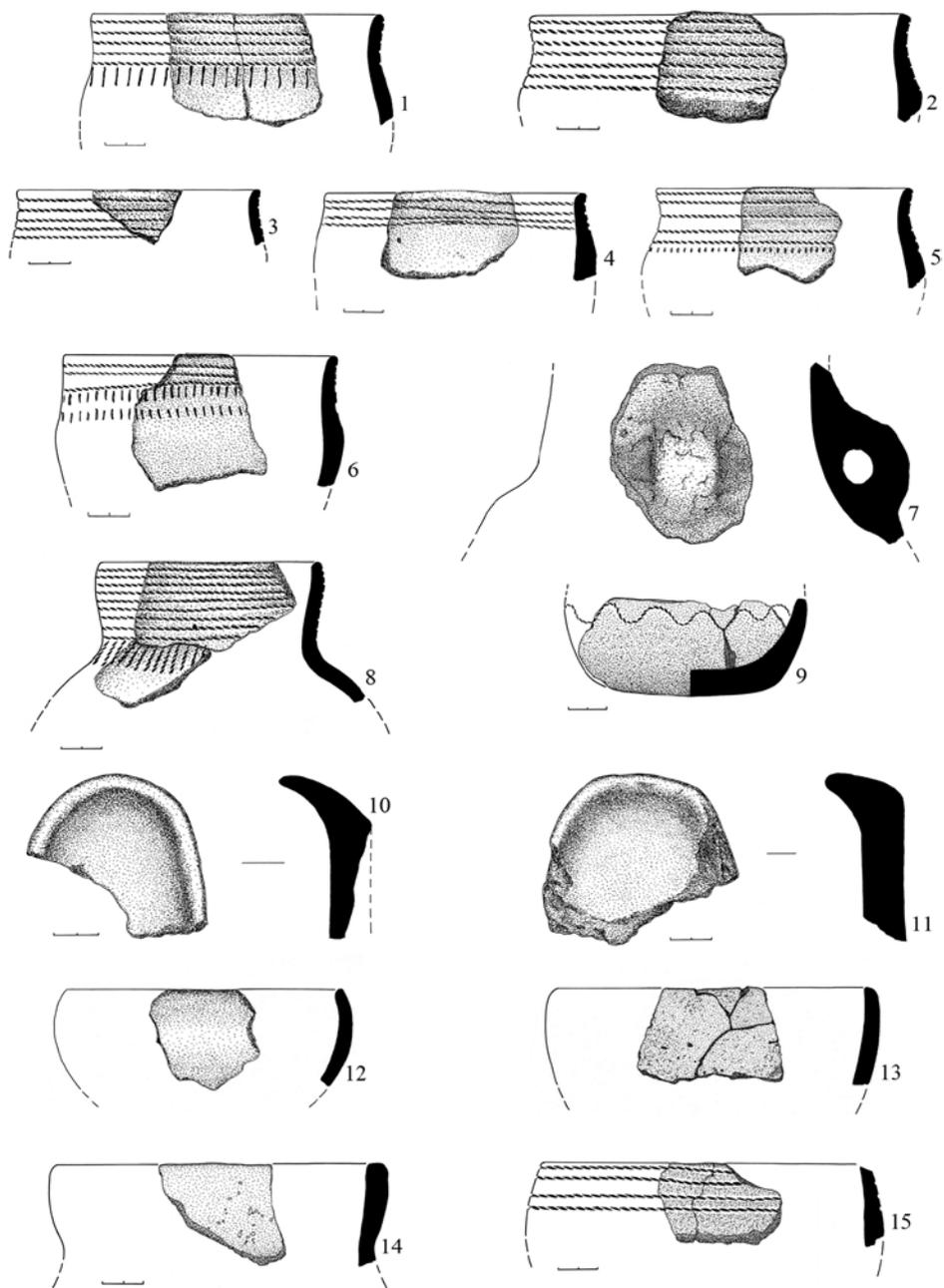


Fig. 14. The settlement Ushakovo-3. Ceramics of an early type (№ 8 – from horizon 12, the others – from horizons 15–19). Beakers (1-6, 14); amphorae (7, 8); squat-shaped bowl (9); deep bowls (12, 13, 15); oval-shaped and oblong-oval-shaped bowls (10, 11) (drawing by A. P. Sutyagin)

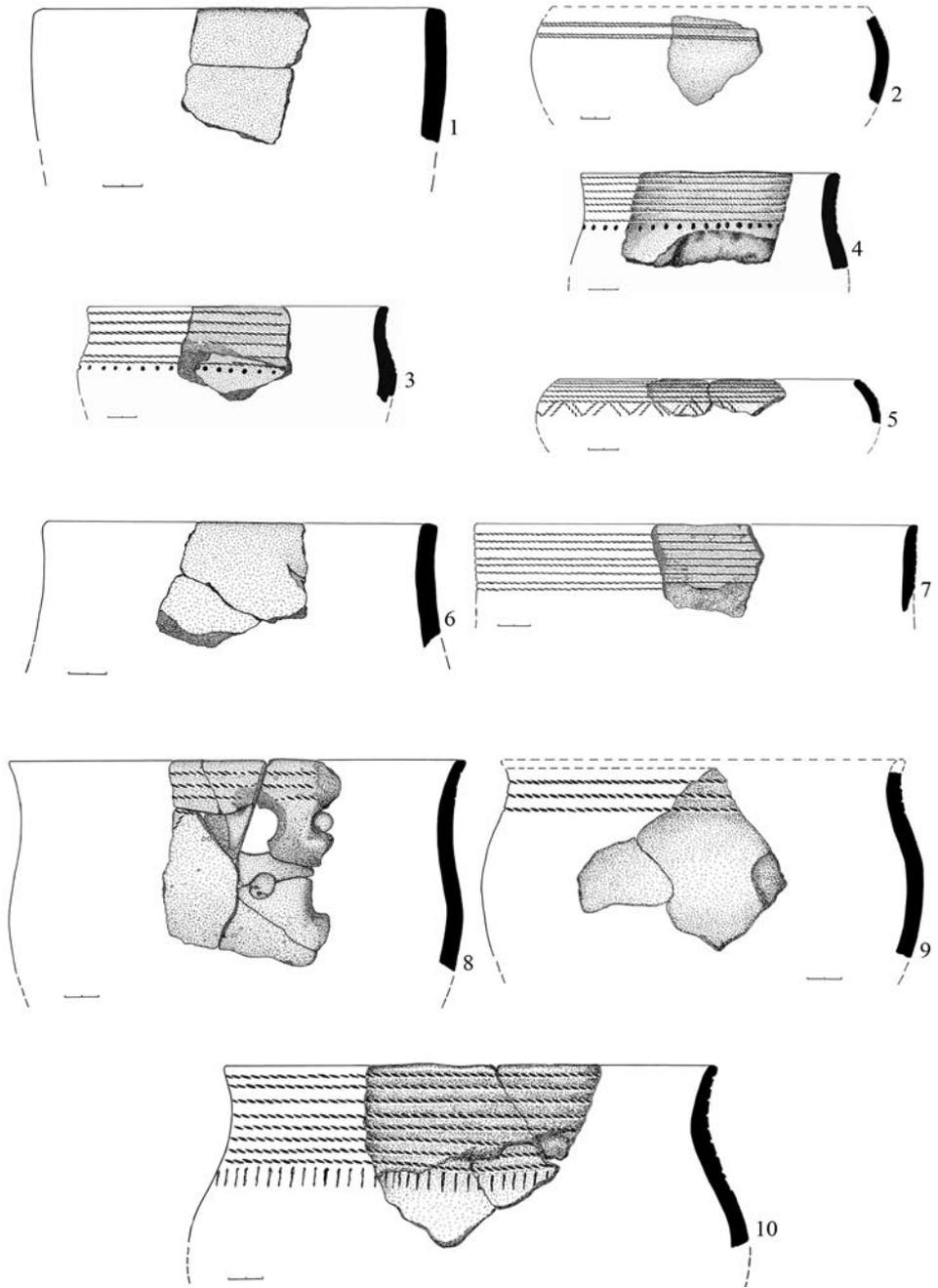


Fig. 15. The settlement Ushakovo-3. Ceramics of an early type (1, 3, 4, 10 – horizon 12; 2, 5, 6-9 – horizons 15-19). Beaker-shaped vessels (1, 3, 4); wide-mouthed pots (2, 5-10)

The ornamentation is repetitive, combining cord impressions and pits or small hatching (Fig. 14: 1, 5, 6; 15: 3, 4, 10). Simple cord impressions are also common, while cord impressions forming triangles, semi-ovals, vertical lines or waves are much rarer (Fig. 14: 8, 9; 15: 5, 8). The items are well fired; their density is much higher than that of the pottery from horizons 4–15. Their surface is well smoothed; grains of crushed quartz or granite are hardly visible. Their size is no more than 0.01–0.02 mm, and mineral admixture is only 0.02–0.03 mm even in big wide-mouthed pots.

Analogies to that assemblage have also been found in Pribrezhnoye.

Most radiocarbon datings for the Ushakovo-3 settlement are very likely to conform to the material found there (see Appendix 2). Three of the latest datings for horizons 4, 10 and 11 (no 19, 21, 22) coincide with the end of the late Neolithic Age and the early Bronze Age. In the Baltic periodization, the latter period began in the 2nd millennium BC (Antanaitis-Jacobs and Girininkas 2002, 19). The items from the uppermost horizons also correspond to that period. Other four dates lie in the likely range of ca 2300–2100 BC (no 20, 23, 24, 26). The finds from horizons 4–13 conform in their bulk to those four dates (Fig. 11–13). All of them are typical of the post-classical phase (*postklassische Stufe*) of the Primorskaya culture. Partly similar ceramics have been found, though in a small quantity, in the bottom levels of up to the 18th horizon. All the items are characteristic of one of the final stages of the Primorskaya culture. But horizons 17–19 of the occupational layer have mostly yielded pottery whose most striking examples are only known from Pribrezhnoye (Fig. 14, 15). Some fragments, which are typical of the Pribrezhnoye settlement, were located as early as in horizons 13–14. Those forms include deep bowls, beakers with a short neck, oval bowls, middle-size vessels and wide-mouthed pots with simple cord ornament. The only exceptions are: a beaker with an inverted rim (Fig. 14: 14) and an amphora with a cylindrical neck (Fig. 14: 8), which resembles amphorae of the Złota culture and has no analogies at other settlements of the Primorskaya culture (Krzak, fig. 21: a).

The dates obtained for the lower level (horizons 17–19) are much earlier, even if the end of the period of 2900–2800 BC is taken into account (no 25, 27–32). Interestingly, only one date has been obtained for charcoal, while other datings are for wood, including a wooden pile. Ten outer rings of the wooden pile have been radiocarbon dated twice with quite close results (no 29, 30). Nonetheless, it seems better to rely on the last two dates obtained for wood in 2015, when the sample was dated to 2800–2700 BC.

The main ceramic assemblage from Ushakovo-3 shows the greatest similarity not to the materials from Nida, Suchacz or Rzucewo, but to the finds from the Niedźwiedziówka site in Żuławy Wiślane (Mazurowski 2014). Although the ceramics from Niedźwiedziówka have little ornamentation, their forms resemble those from Ushakovo-3. Admittedly, the forms and ornamentation of the Ushakovo-3 ceramics are much more varied, but this can be explained by the different nature of the sites, as Niedźwiedziówka was only used seasonally. In general, the two sites seem to have been related in some way, despite the fact that certain categories of cooking ceramics have not been recorded in Niedźwiedziówka.

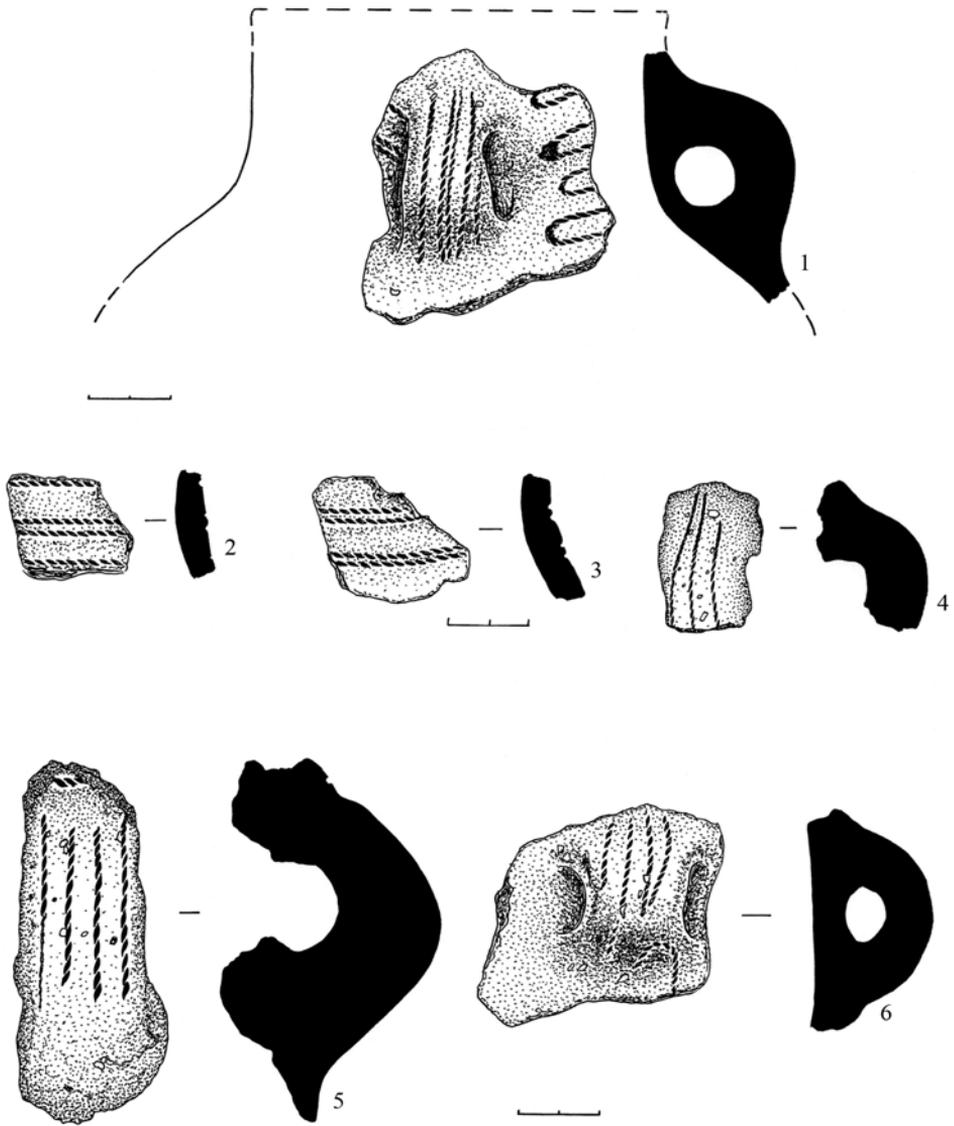


Fig. 16. Ushakovo-3 Settlement, the middle level of the cultural layer (horizons 12-15).
Fragments of Mierzanowice Culture pottery (1-6)

The resemblances include, first of all, vessels with straight walls or slightly inverted rims and pots with convex walls; moreover, deep bowls, middle-size pots with short necks and prominent rims, and vessels with horn- or cone-like moulds (Mazurowski 2014, fig. 142: 4, 5; 144: 1, 3; 146: 1, 2, 3; 149: 5, 8; 155: 2-4; 158: 1, 3; 159: 2; 160: 2; 161: 6 and others). Niedźwiedziówka differs from the Ushakovo-3 site mainly in its great number of wide-mouthed vessels with convex walls. The former site has likewise been dated to 3740 ±80 BP (Gd-15687) (Mazurowski 2014, 53).

There are connections with certain categories of cooking ceramics from Šventoji-1A, with its ceramic assemblage clearly divided into three groups. Two of those groups are linked to the CWC of Central Europe, the GAC and, to a lesser degree, the pre-classical phase of the Primorskaya culture (A-amphorae, beakers of earlier types, pots with finger nips and roller-like moulds, beakers with a straight neck, deep bowls with simple cord ornament, stocky pots with a straight neck, vessels with slightly convex walls, wide-mouthed vessels shaped like a funnel or having a short neck and, most likely, a narrowed bottom), while the third group is of later origin (Rimantienė 2005, fig. 99; 100: 1, 3, 6; 98: 1, 2, 3, 5, 6; 96: 1, 2, 4, 8, 9). The items in the third group include cooking ceramics decorated with combination of alternating horizontal and vertical cord impressions, as well as wide-mouthed vessels with long necks and widely spaced patterns of cord impressions (Rimantienė 2005, fig. 95: 1, 2, 4, 5, 8, 9, 11). More or less similar forms are also known from Ushakovo-3. Two radiocarbon dates for Šventoji-1A: 3860 ±50 BP (Le-835) and 3880 ±80 BP (Le-835), obtained for wood, correspond both to the material and to the datings from Ushakovo-3.

The Ushakovo-3 ceramic assemblage shows relationships between various settlements of the Primorskaya culture and also suggests possible contacts with other cultural units. The nature of those cultural ties differs from that recorded in Pribrezhnoye and corresponds to the phase in which the main ceramic assemblage was produced. Several fragments of what we estimate to be four vessels, including a piece of an amphora (Fig. 16), may be related directly to the early Mierzanowice culture (Kadrow and Machnik 1997, 29-53, fig. 11: 11,13; 14: 32, 33, 37; 16: 7). Many Ushakovo-3 amphorae have handles decorated with the herring-bone pattern made with cord impressions (Fig. 11: 13, 15), known from the Strzyżów culture (Głosik 1968, 46, tabl. 9: 13; 12: 3, 7). Beakers with a narrowed neck and a convex body (Fig. 11: 4-9) have no analogies in ceramics from settlements of the east group of the Primorskaya culture, and one can recognize the southern tradition in the proportions of the beakers (Włodarczak 2006). The herring-bone pattern consisting of columns (Fig. 12: 3, 4, 7) has been recorded on pottery from Ząbie-Szetno in the Masurian Lake District (Manasterski 2009, tabl. 46: 5; tabl. 32: 14; Manasterski 2014, 104, fig. 5: 5, 7), and it is also known from Belarusian Ponemanye of the CWC (group 1, type 3, according to V.L. Lakiza) (Lakiza 2008, 104, tabl. 11: 15; 23: 4, 5; 29: 6, 7, 9; 31: 11-17).

4. MAIN CONCLUSIONS

The materials from Pribrezhnoye and Ushakovo-3 clearly indicate different stages of the Primorskaya culture. If the idea of a direct connection between that culture and the GAC is correct, as it has already been stated by Šturms (Šturms 1970, 183), the finds from the lower level of the features in Pribrezhnoye may have been related to the protophase (*Vorstufe*) not later than 2900 BC, when the early CWC had not yet covered the Baltic region. With great caution, we can assume the following: the original impulse came from the GAC, though some original forms, bearing little resemblance to the GAC pottery, had already been in use in the first stage. Wide-mouthed vessels with a small bottom and oval bowls (also known as boat-shaped vessels), probably linked by their origin with the local Zedmar culture of the “forest” Neolithic Age, may be considered as the most important part of the assemblage and the type that went through several stages. However, the boat-shaped vessels disappeared in one of the last phases, which is easily noticeable in Ushakovo-3.

The length of the neck seems an important chronological determinant in the ceramics. Short necks were mainly related with the early stages, as evidenced by the material from both Pribrezhnoye and Ushakovo. Horseshoe-like handles, replaced with horn-like handles in the classical stage, were another early trait, which is shown by the majority of finds attributed to the Primorskaya culture.

It should be emphasized that the ceramics from Pribrezhnoye is repetitive in its forms, ornamentation and technological traits. The Ushakovo-3 material shows that the homogeneity was partly interrupted later on, although the entire cultural basis preserved its individual character. According to the stratigraphic data, typological analysis and a series of radiocarbon dates, the earliest forms, dated to the protophase (3100–2900 BC), are various types of wide-mouthed pots, including egg- or funnel-shaped vessels, pots with straight walls or stocky pots with an inverted rim (Fig. 4: 1-7). The vessels are decorated with horizontal cord impressions or semi-ovals, and all of them have horseshoe-like handles, common in the CWC and late FBC pottery (Fig. 4: 1, 3, 5, 6). Oval or oblong-oval bowls, possibly used as lamps, should be regarded as an early form as well (Fig. 6: 6, 7). Beakers, rare in the material, are oblong with a short neck and the ornament of simple cord impressions, sometimes combined with finger impressions (Fig. 5: 1, 3, 4, 6-8). Amphorae have oval necks (Fig. 6: 2, 5), and they are mainly decorated with triangles. Moreover, early types of pottery include middle-sized beaker-shaped vessels and deep bowls (Fig. 5: 2, 5, 9; 6: 1, 3, 4, 8). Generally, all the vessels have the shape of wide-mouthed pots. Their ornamentation usually consists of simple cord impressions, zigzags, sometimes rows of pits or rectangular columns. Semi-ovals made of cord impressions are typical of pottery from the early period; they were uncommon in the CWC, but they were used by some groups of the GAC.

Obviously, egg- or funnel-shaped vessels and beakers with an oblong body ceased to be used with time. The ornamentation became more varied: cord impressions were supple-

mented with rows of variously shaped pits or columns forming combinations of horizontal and broken lines, as well as by finger impressions.

All the axes are trapezoidal with an oval or lenticular cross-section (Fig. 3: 8-13). The amber jewellery, which is rare in the material, includes trapezoid or broad-oblong pendants with a groove at the base, round buttons with a lenticular cross-section, and lenticular discs with holes in their centre (Fig. 3: 1-6).

Apparently, none of the observations presented above applies to the most widely known settlements of the Primorskaya culture, namely Suchacz and Nida, which functioned on the coast for a long time. The cultural complexes of those settlements undoubtedly acquired a variety of common cord ornaments typical of an area larger than that of the Baltic region, so they must have evolved differently. Even if the local peculiarities are considered, the material from those sites conforms to finds from other areas of Europe. This has resulted in the idea of the development of the Primorskaya culture which corresponds to the general theory of the spread of the CWC, though researchers propose slightly different versions of that idea.

Despite numerous differences, the origin of the main cultural complex of Ushakovo-3 is closely related to finds of the Waldburg type. However, if the radiocarbon datings and the typology of the cooking ceramics are taken into account, the latter must have undergone many transformations and must have lost some forms, while developing previously unknown ones. This places Pribrezhnoye and Ushakovo-3 at the opposite ends of the time scale.

Judging by the material from Ushakovo-3, boat-shaped bowls ceased to be used. Stocky or round wide-mouthed vessels and funnel- or egg-shaped pots disappeared altogether. Amphorae took a different form, and horseshoe-like handles, so common in Pribrezhnoye, became rare, being supplanted by tongue-like handles and cone- or horn-like moulds, quite popular in other Primorskaya culture complexes (Fig. 10: 10; 12: 5-7). Most vessels acquired longer necks; consequently, there was more room for ornamentation. Finger impressions, typical of Pribrezhnoye, were replaced with fingernails. The original beading ornament and semi-ovals made of cord impressions were forgotten; triangles were employed rarely, too. The pattern consisting of columns changed: instead of zigzags or combinations of horizontal lines made from the columns, the herring-bone pattern and combinations of cord impressions with a band of columns below gained in popularity (Fig. 12: 3, 4, 7). Pit ornamentation vanished. Beakers were produced in great numbers and variety, the dominant type being the previously unknown form with a narrowed neck and a rounded body (Fig. 11: 4-9). The uppermost horizons contained some items with sloppy ornamentation.

Unlike in Pribrezhnoye, the cooking ceramics from Ushakovo-3 are characterised by lighter firing and thinner walls; it is only in the lowest horizons that one can find fragments resembling those from Pribrezhnoye in their density and thickness.

In general, the ceramics and mostly the ornamentation gradually took forms which were popular in the adjacent areas; some types of cooking ceramics originating from the

earlier stages were still in use, but they all had quite a generic and standardized look. The profile of wide-mouthed vessels changed somewhat due to the tongue-like handles and the short neck. Bowls were repetitive in form and had very simple ornamentation or no ornamentation at all. Beaker-shaped vessels were decorated in a different way, according to the trend of the period. Beakers with short necks have rarely been recorded in the upper horizons; most of them come from horizon 14 and the lower ones.

The form, ornamentation and technological traits of the pottery from the bottom level in Ushakovo-3 are similar to those of the Pribrezhnoye ceramics, which served as the criterion in identifying the cultural layer. The ceramic assemblages differ in that the predominant type of ornamentation in the bottom layer in Ushakovo is a combination of cord impressions and pits, quite common in the early CWC.

The finds have been recovered from horizons 4-6 cm deep, which has helped to identify gradual changes in the composition of the assemblage and determine the degree of mechanical mixing of the material. The data suggest homogeneity of the material at the bottom of the foundation pits in Pribrezhnoye. The homogeneity is also typical of the finds from the main part of the occupational layer in Ushakovo-3.

Most of the items from Ushakovo-3 (horizons 4-15) correspond to the post-classical stage of the Primorskaya culture. The materials from the classical stage known from Nida, Suchacz and Rzucewo have been recorded neither in Ushakovo nor in the constructions in Pribrezhnoye. The only dating for Ushakovo that matches the period of 4010 ±80 BP is most probably set too high. Although radiocarbon dates for horizons 4-15 in Ushakovo-3 have only been obtained for charcoal, most of them correspond to the finds from those horizons.

Translated by Irina Tomashevskaya

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Appendix 1. Radiocarbon datings from Pribrezhnoye settlement:

No	Carbon-bearing material	Context	Measured ¹⁴ C Age, BP	OxCal (2013) 68.2%	OxCal (2013) 95.4%	Lab index
1	charcoal	House 2 (lower level of the filling)	4670 ± 160	3644 - 3326 (56.8%) 3231 - 3174 (6.4%) 3161 - 3119 (5.1%)	3765 - 3723 (1.5%) 3716 - 3006 (91.8%) 2989 - 2931 (2.1%)	Je-7035
2	charcoal	House 3 (lower level of the filling)	4880 ± 130	3906 - 3880 (3.9%) 3801 - 3520 (64.3%)	3958 - 3491 (85.9%) 3470 - 3373 (9.5%)	Je-7036
3	charcoal	House 10 (hearth A)	4720 ± 100	3633 - 3556 (24.9%) 3539 - 3495 (14.4%) 3465 - 3376 (28.9%)	3708 - 3326 (91.7%) 3231 - 3225 (0.2%) 3220 - 3174 (1.9%) 3161 - 3119 (1.7%)	Je-8969
4	charcoal	House 5 (lower level of the filling)	4790 ± 125	3695 - 3497 (50.6%) 3458 - 3377 (17.6%)	3942 - 3857 (3.1%) 3820 - 3332 (90.8%) 3214 - 3188 (0.8%) 3155 - 3131 (0.7%)	Ki-17516
5	charcoal	House 7 (upper level of the filling)	4620 ± 150	3629 - 3585 (6.5%) 3531 - 3311 (39.3%) 3295 - 3286 (1.2%) 3275 - 3265 (1.3%) 3239 - 3106 (19.9%)	3655 - 2925 (95.4%)	Ki-18294
6	charcoal	House 7 (lower level of the filling)	4320 ± 90	3261 - 3255 (0.8%) 3098 - 2872 (65.9%) 2799 - 2793 (0.8%) 2786 - 2780 (0.7%)	3335 - 3211 (10.1%) 3192 - 3152 (2.4%) 3138 - 2837 (71.0%) 2816 - 2672 (11.9%)	Je-8971
7	charcoal	House 4 (hearth)	4570 ± 60	3493 - 3468 (7.6%) 3375 - 3319 (21.8%) 3273 - 3267 (1.3%) 3236 - 3112 (37.4%)	3516 - 3397 (17.3%) 3385 - 3091 (78.1%)	Ki-10581
8	charcoal	House 4 (hearth)	4510 ± 60	3346 - 3308 (12.6%) 3301 - 3282 (6.1%) 3277 - 3265 (3.9%) 3240 - 3105 (45.6%)	3486 - 3474 (0.6%) 3372 - 3017 (94.8%)	Ki-9948
9	charcoal	House 3 (lower level of the filling)	4410 ± 80	3316 - 3274 (7.7%) 3266 - 3237 (6.6%) 3110 - 2916 (53.9%)	3340 - 3204 (25.8%) 3198 - 2903 (69.6%)	Je-6218
10	bone	House 2 (lower level of the filling)	4470 ± 60	3334 - 3212 (36.2%) 3190 - 3153 (10.2%) 3135 - 3086 (13.7%) 3061 - 3030 (8.2%)	3355 - 3008 (90.1%) 2985 - 2934 (5.3%)	Ki-11352
11	bone	House 3 (lower level of the filling)	4530 ± 60	3359 - 3311 (16.3%) 3295 - 3286 (2.7%) 3275 - 3265 (2.9%) 3239 - 3106 (46.2%)	3494 - 3467 (2.3%) 3375 - 3079 (88.6%) 3071 - 3025 (4.5%)	Ki - 11351

Appendix 1 cont.

No	Carbon-bearing material	Context	Measured 14C Age, BP	OxCal (2013) 68.2%	OxCal (2013) 95.4%	Lab index
12	bone	House 6 (lower level of the filling)	4570 ± 60	3493 - 3468 (7.6%) 3375 - 3319 (21.8%) 3273 - 3267 (1.3%) 3236 - 3112 (37.4%)	3516 - 3397 (17.3%) 3385 - 3091 (78.1%)	Ki-9949
13	nutshell	House 7 (hearth B)	4470 ± 70	3335 - 3211 (35.1%) 3192 - 3152 (10.5%) 3137 - 3085 (14.0%) 3063 - 3029 (8.6%)	3357 - 3004 (87.7%) 2991 - 2930 (7.7%)	Je-9055
14	charcoal	House 2 (hearth A)	4220 ± 40	2897 - 2862 (29.3%) 2807 - 2758 (33.9%) 2718 - 2708 (5.0%)	2908 - 2839 (37.1%) 2815 - 2675 (58.3%)	Je-6217
15	charcoal	House 3 (upper level of the filling)	3310 ± 150	1861 - 1853 (1.1%) 1772 - 1425 (67.1%)	2014 - 1998 (0.4%) 1979 - 1257 (94.4%) 1251 - 1231 (0.6%)	Ki-18292
16	charcoal	House 3 (lower level of the filling)	3930 ± 130	2617 - 2612 (0.5%) 2581 - 2204 (67.7%)	2868 - 2803 (4.3%) 2777 - 2122 (88.7%) 2093 - 2042 (2.4%)	Ki-18293
17	charcoal	House 3 (lower level of the filling)	4010 ± 140	2856 - 2811 (6.6%) 2747 - 2725 (3.0%) 2698 - 2345 (58.6%)	2897 - 2194 (94.1%) 2176 - 2145 (1.3%)	Ki-17548
18	charcoal	House 5 (upper level of the filling)	3870 ± 150	2569 - 2516 (6.5%) 2500 - 2135 (61.4%) 2069 - 2065 (0.4%)	2862 - 2807 (2.5%) 2758 - 2718 (1.5%) 2708 - 1939 (91.4%)	Ki-18316

Appendix 2. Radiocarbon datings from Ushakovo-3 settlement:

No	Carbon-bearing material	Context	Measured 14C Age, BP	OxCal (2013) 68.2%	OxCal (2013) 95.4%	Lab index
19	charcoal	Horizon 4, cultural layer	3680 ± 170	2336 - 2323 (1.3%) 2308 - 1877 (63.5%) 1841 - 1821 (2.0%) 1796 - 1782 (1.4%)	2567 - 2523 (1.3%) 2498 - 1638 (94.1%)	Ki-18693
20	charcoal	Horizon 7, cultural layer	3840 ± 90	2458 - 2201 (68.2%)	2565 - 2526 (2.1%) 2496 - 2033 (93.3%)	Ki-18300
21	charcoal	Horizon 10, cultural layer	3680 ± 80	2196 - 2171 (6.3%) 2146 - 1951 (61.9%)	2335 - 2324 (0.3%) 2307 - 1877 (94.0%) 1841 - 1823 (0.6%) 1795 - 1783 (0.4%)	Ki-18099
22	charcoal	Horizon 11, cultural layer	3510 ± 90	1950 - 1737 (63.8%) 1715 - 1696 (4.4%)	2127 - 2090 (2.1%) 2045 - 1621 (93.3%)	Ki-18608
23	charcoal	Horizon 14, cultural layer	3920 ± 80	2559 - 2536 (5.1%) 2491 - 2291 (63.1%)	2622 - 2194 (93.8%) 2175 - 2145 (1.6%)	Ki-18601
24	charcoal	Horizon 15, cultural layer	4010 ± 80	2836 - 2816 (3.8%) 2671 - 2455 (62.3%) 2418 - 2408 (1.4%) 2374 - 2369 (0.7%)	2865 - 2805 (7.7%) 2761 - 2296 (87.7%)	Ki-18105
25	charcoal	Horizon 13, cultural layer	4430 ± 60	3320 - 3273 (10.8%) 3266 - 3236 (8.3%) 3169 - 3164 (1.1%) 3113 - 3005 (33.6%) 2990 - 2930 (14.4%)	3338 - 3207 (29.1%) 3195 - 2917 (66.3%)	Ki-18096
26	charcoal	Horizon 17, cultural layer	3790 ± 50	2295 - 2139 (68.2%)	2455 - 2418 (3.0%) 2407 - 2376 (3.2%) 2351 - 2119 (81.6%) 2097 - 2040 (7.6%)	Ki-18605
27	charcoal	Horizon 16, cultural layer	4390 ± 130	3328 - 3218 (18.9%) 3178 - 3159 (3.1%) 3122 - 2899 (46.2%)	3497 - 3458 (1.4%) 3377 - 2836 (87.7%) 2816 - 2670 (6.3%)	Ki-18302
28	wood	Horizon 17, cultural layer	4380 ± 40	3079 - 3071 (3.9%) 3024 - 2921 (64.3%)	3263 - 3249 (1.4%) 3100 - 2903 (94.0%)	Ki-18097
29	wood	Horizon 18, cultural layer	4210 ± 50	2897 - 2856 (22.1%) 2811 - 2747 (34.2%) 2725 - 2698 (11.9%)	2910 - 2832 (30.1%) 2821 - 2632 (65.3%)	Ki-19202
30	wood	Horizon 18, cultural layer	4230 ± 40	2902 - 2864 (37.6%) 2806 - 2760 (30.6%)	2913 - 2841 (44.1%) 2814 - 2678 (51.3%)	Ki-19204
31	wooden pile, 10 external rings	Horizon 19	4310 ± 50	3011 - 2978 (17.9%) 2967 - 2951 (5.8%) 2943 - 2887 (44.5%)	3091 - 2872 (95.4%)	Ki-18111
32	wooden pile, 10 external rings	Horizon 19	4370 ± 50	3081 - 3069 (5.5%) 3026 - 2913 (62.7%)	3312 - 3295 (1.0%) 3286 - 3275 (0.6%) 3266 - 3238 (2.7%) 3108 - 2891 (91.1%)	Ki-18101

