

# The end of the earliest ceramic traditions: Dnieper-Dvina region became part of the Circum-Baltic space at the turn of the 6<sup>th</sup> to 5<sup>th</sup> millennium BC

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**ABSTRACT** – *The Dnieper-Dvina area is one of the regions in Eastern Europe which was part of a wider network of the earliest ceramic traditions, spread in the first half to the middle of the 6<sup>th</sup> millennium BC. After the collapse of this network new ceramic complexes appeared here, called the Rudnya culture, and at the end of the 6<sup>th</sup> millennium BC this manifested in changes in the directions of cultural connections. This region became part of the cultural space of the Circum-Baltic area. Several complexes within the Rudnya culture originated in different groups of Narva pottery, and are dated to c. 5400–4400 cal BC.*

**KEY WORDS** – *early pottery; hunter-gatherers; Narva culture; Circum-Baltic space; bone industry*

## **Konec najzgodnejših keramičnih tradicij: regija Dneper-Dvina postane na prehodu iz 6. v 5. tisočletje pr. n. št. del cirkumbaltskega prostora**

**IZVLEČEK** – *Področje Dneper-Dvina je ena od vzhodnoevropskih regij, umeščena v široko mrežo najzgodnejših keramičnih tradicij, ki so se razširile v prvi polovici 6. tisočletja pr. n. št. Po razpadu te mreže so se pojavili novi keramični kompleksi, imenovani kultura Rudnya, ki ob koncu 6. tisočletja pr. n. št. kažejo spremembe v povezavah kultur. Regija je tako postala del kulturnega prostora cirkum-Baltika. Več kompleksov znotraj kulture Rudnya namreč izvira iz različnih skupin kulture Narva keramike, datirane ok. 5400–4400 pr. n. št.*

**KLJUČNE BESEDE** – *zgodnja keramika; lovci in nabiralci; kultura Narva; področje cirkum-Baltik; predmeti iz kosti*

## **Introduction**

The hunter-fisher-gatherer economic and cultural system, formed as a result of the adaptation of the Final Palaeolithic population to natural changes, appeared to be very flexible and existed until at least the Middle Neolithic in Eastern Europe (Zhilin 2004). The rich and varied ecological niches of the East European Plain allowed ancient communities to maintain a hunter-gatherer way of life for a long period of time (Dolukhanov 1997; 2008; Zvelebil 2008). The instability of ecological niches due to climatic and/or anthropogenic factors and the variability of biodiversity may have forced societies to

change their adaptation mechanisms – through the development of new habitats, the adoption of innovation, the formation of new social and economic systems and networks (Burger, Fristoe 2018). The emergence and spread of ancient pottery in Eastern Europe at the end of the 7<sup>th</sup> to the first half of the 6<sup>th</sup> millennium BC can be seen as part of these processes (Mazurkevich, Dolbunova 2015; Andreev, Vybournov 2020). The *chaînes opératoires* of pottery manufacture are suggested to be embedded in social trajectories and social identity (Gosselain 2002; Livingstone-Smith 2001; Pétrequin, Pétre-

quin 2006; Gallay 1991), constituting ceramic traditions unique to each group which all makes it a powerful proxy for social reconstructions. By the middle of the 6<sup>th</sup> millennium BC ceramic traditions spread over most of the territory of Eastern Europe, following mainly the south-north direction, along river systems. Regional ceramic traditions were formed on their basis, preserved their technological, morphological and decorative features, and continued to be part of these earliest ceramic traditions (Mazurkevich, Dolbunova 2015). Later, by the end of the 6<sup>th</sup> millennium BC, this early ceramic network, partly overlapping the pre-existing Mesolithic network (Dolbunova, Mazurkevich, submitted; Timofeev 1998a) collapsed. Ceramic styles changed greatly, new regional traditions appeared, as well as new directions of contacts, and a new supra-cultural network was formed. This complete

change in all the constituents of *chaînes opératoires* may be regarded as the end of the earliest ceramic traditions on the territory of Eastern Europe which occurred at the end of the 6<sup>th</sup> millennium BC. They were replaced by communities with completely different ceramic complexes (e.g., Lyalovo culture in the Upper Volga (Lozovskaya et al. 2016), Eneolithic cultures in the Don (Skorobogatov et al. 2015) and Lower Volga region (Vybornov et al. 2016)). In turn, the first pottery spread in the Circum-Baltic space only from 5200–5000 cal BC (Loze 1988; Hartz, Lübke 2006; Raemaekers 2011; Povlsen 2013; Piezonka 2015; Kriiska et al. 2017) (Fig. 1).

The Dnieper-Dvina area (Fig. 2) is one of the regions in Eastern Europe where the oldest ceramic traditions penetrated in the first half to the middle of the

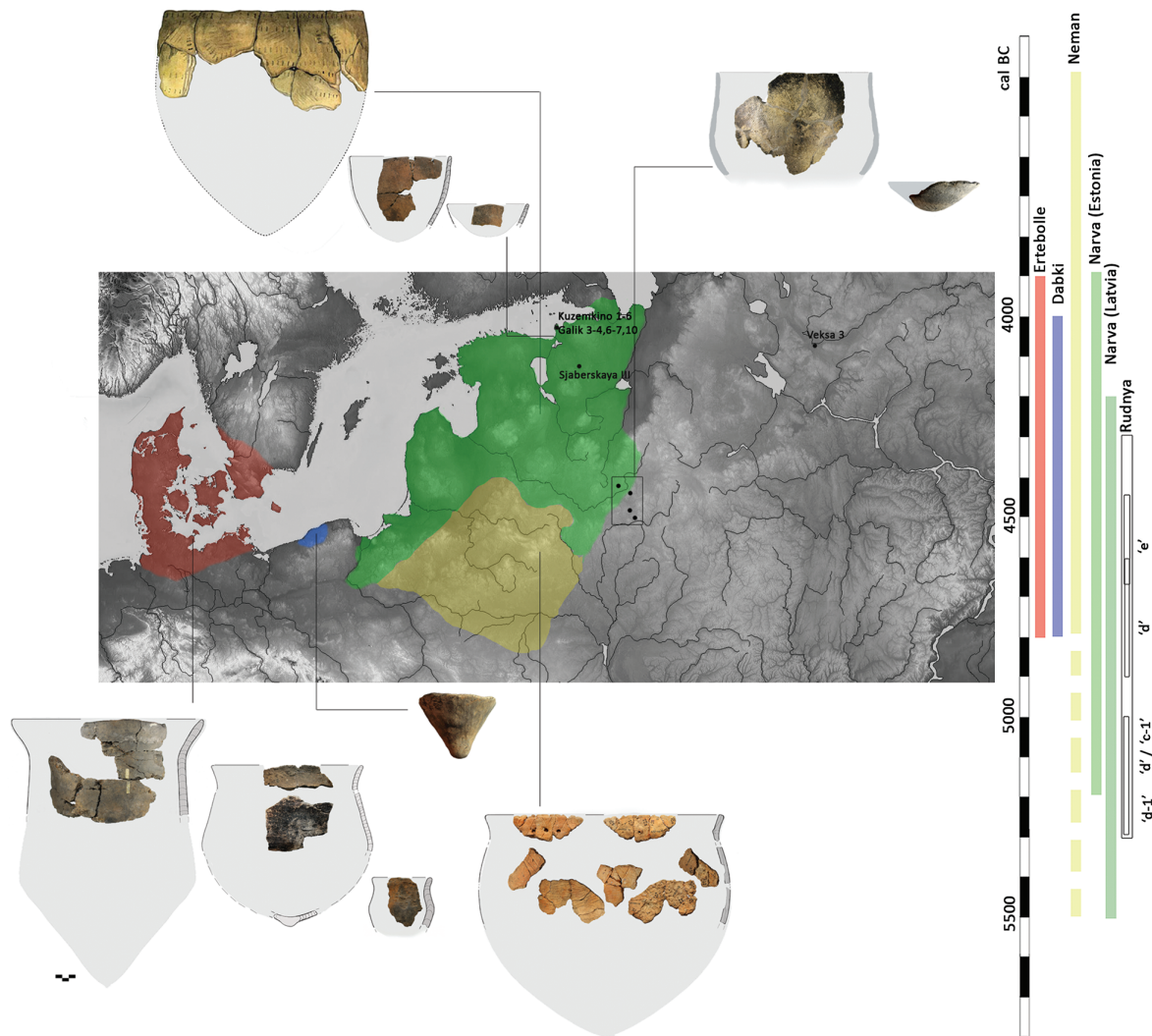
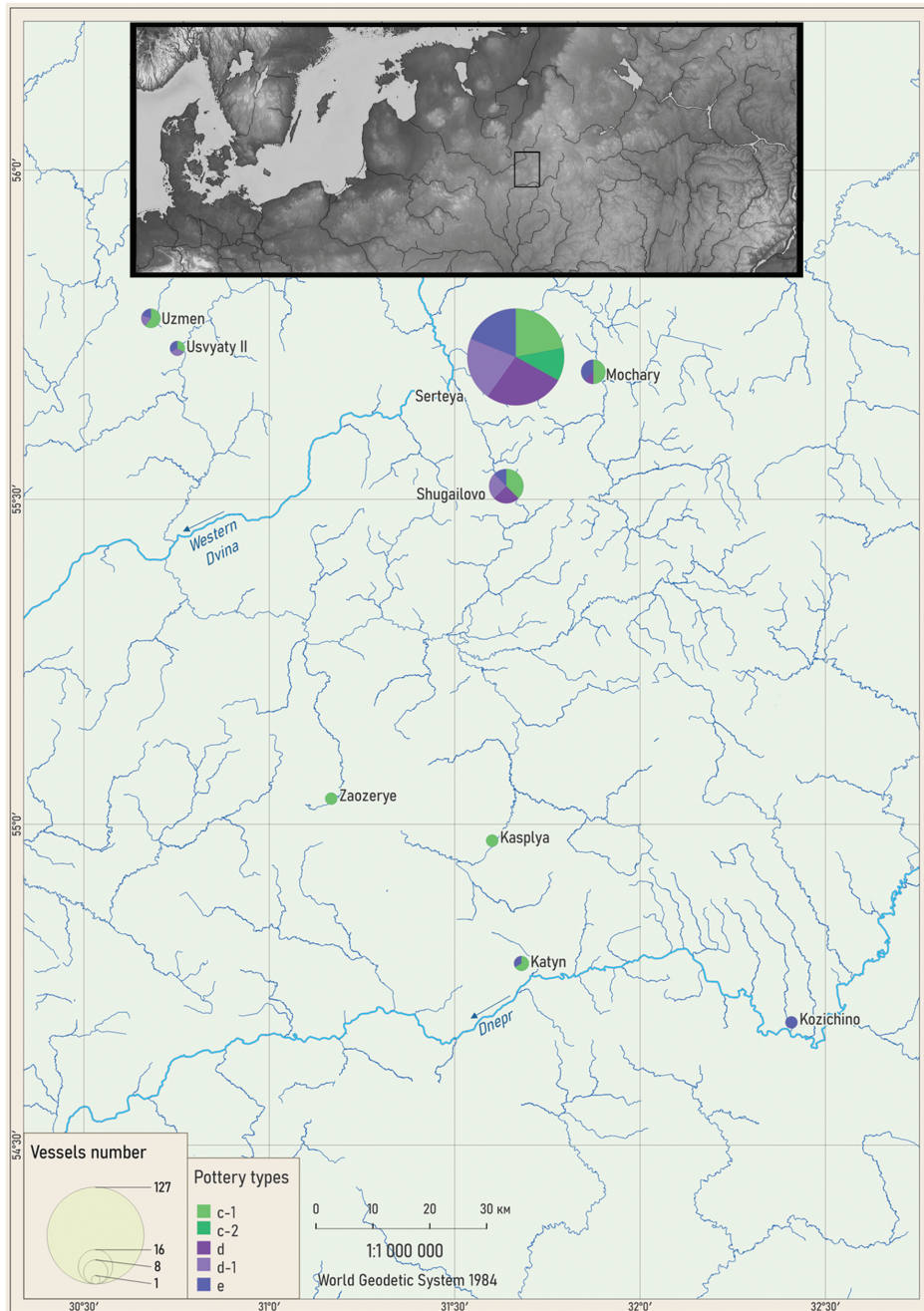


Fig. 1. Earliest ceramic complexes in the Circum-Baltic space (Ertebølle, Narva, Neman culture, Dabki site), sites with Narva culture materials in the eastern part and Dnieper-Dvina basin (based on the data from Courel et al. 2020; Kotula et al. 2015; Hartz, Lübke 2006; Povlsen 2013; Tkachou 2018; Wawrusiewicz et al. 2017).

6<sup>th</sup> millennium BC (*Mazurkevich, Dolbunova 2015*). Later, after their disappearance, it became part of the Circum-Baltic cultural space manifested through ceramic complexes which have direct analogies in Narva culture. In this study we examine to what extent this tradition is similar to the preceding initial ceramic complexes, or if it should be regarded as an independent phenomenon; how this area was embedded into the Circum-Baltic space at the end of the 6<sup>th</sup> to 5<sup>th</sup> millennium BC; and why there was no long evolutionary development of the earliest ceramic traditions that originated on the territory of forest-steppe and steppe zone of Eastern Europe.

### Dnieper-Dvina region. Paleoenvironmental setting

The Western Dvina Lakeland (western part of the East European Plain) is close to the European watershed of three catchments: the Baltic Sea, Black Sea and Caspian Sea. The main traits of the geology and terrain relief of this area were formed during the Valdai (Weichselian) Glaciation and later transformed in the Holocene. This region is characterized by developed lacustrine landscapes widely chosen for inhabitation by ancient hunter-gatherers. The environmental conditions of these basins seem to have

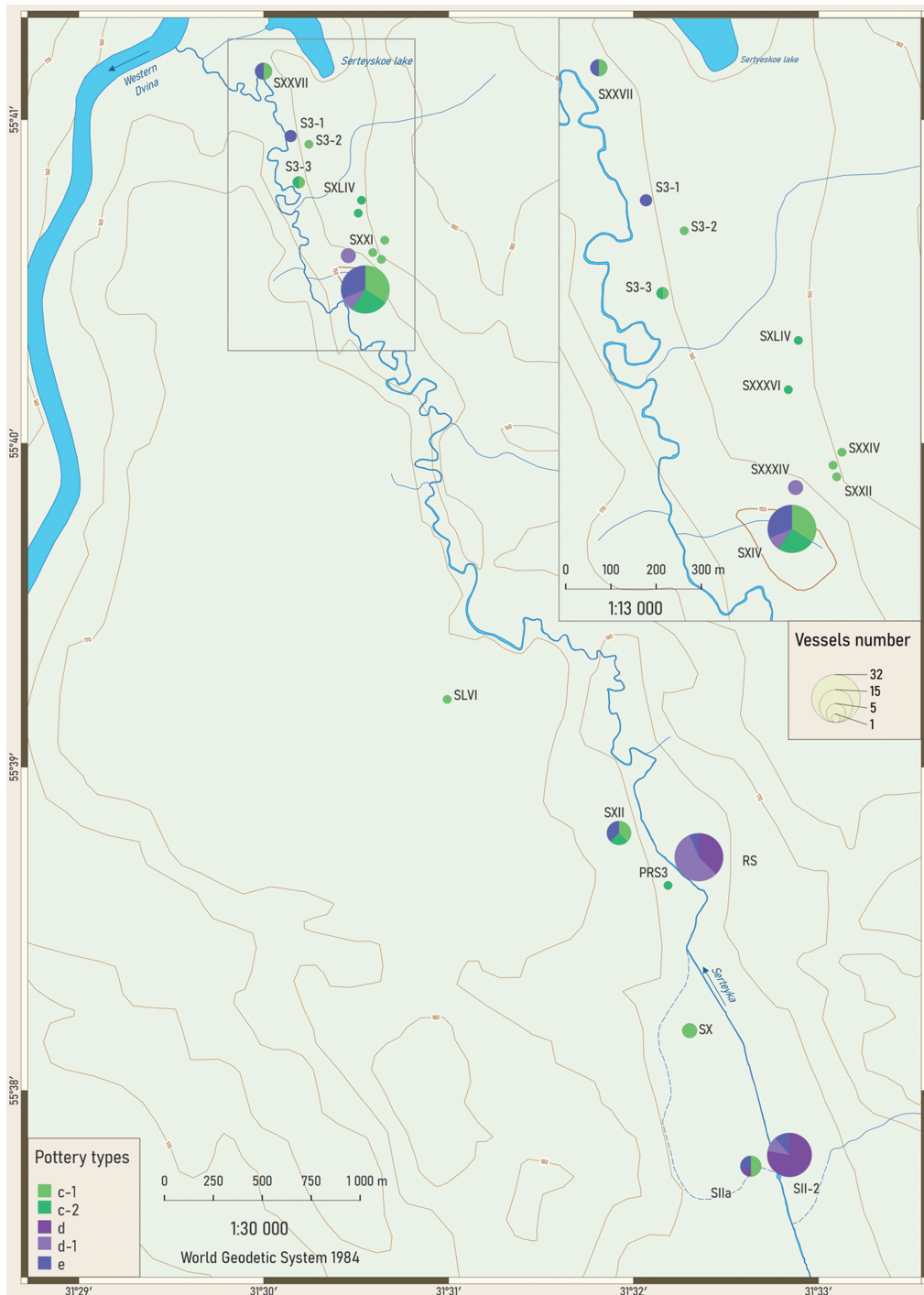


**Fig. 2. Rudnya culture sites distribution in Dnieper-Dvina basin.**

been very attractive for hunter-gatherer communities – due to a high level of landscape geo- and biodiversity, with small lakes, rivers and fertile hydrogenic and semihydrogenic soils.

Microregional studies were concentrated within the Serteyka River basin (Serteyka microregion), left tributary of the Western Dvina (Daugava) River (Fig. 3). The river was presumably draining subsequent

palaeolake water bodies during the Holocene. A few palaeolake basins were documented within the lower section of the present-day valley. These basins are 100–600 metres wide, 100–2000 metres long and are connected by narrow erosive segments of the river valley. They are filled with organic deposits of lacustrine and swamp origin up to 8 metres thick covered with sandy-silty overbank alluvia (Kulkova et al. 2001; Kittel et al. 2018). There are several of



**Fig. 3.** Rudnya culture sites distribution in Serteyka microregion of Dnieper-Dvina basin (ceramics of phases 'c-1', 'd', 'd-1', 'e').

them noted – the Great Serteya Palaeolake Basin (GSPB), Nivniki Basin, and Rudnya Basin, on the shores of which sites of the Rudnya culture were found.

Seasonal and centennial climatic fluctuations might have influenced ancient communities. Detailed multi-proxy palaeoecological analyses in the Serteya micro-region indicate weak cooling oscillations at the 7.0–6.8, 6.2, 5.9 and 4.2 ka cal BP and an increase of continentality during these periods, manifested in a lower winter temperature and lower annual precipitation (Kittel et al. 2020; Mroczkowska et al. 2020).

### Rudnya archaeological culture

#### *Ceramic complex*

The Rudnya archaeological culture was distinguished based on materials of the stratified Rudnya Serteykaya site, excavated in the Serteya microregion (Fig. 3) in 1983–1987 (Dolukhanov et al. 1989; Mazurkevich, Miklyaev 1998). Several ceramic phases were distinguished named ‘c-1’, ‘c-2’, ‘d’, ‘d-1’, and ‘e’.

*Ceramic phase ‘c-1’* (Fig. 4. 1, 6, 7). The vessels were made from fat paste tempered with organics and shells, judging by the traces of burned-out residue. The vessels were made of short coils/slabs, elongated during vessel construction, 1.7–3.5cm in height with a very sharp horizontal and vertical cut. A separate group is represented by vessels made from coils 1–1.5cm in height, with N-juncture (phase ‘c-2’). The technique of beating is testified by flattened roundish areas on the surface of fragments. Traces of scratches on both surfaces were recorded, left after the application of a thin liquid clay layer. They were polished afterwards, which can be seen on a number of fragments with a well-preserved surface, which might have been common for all the vessels of this phase. The shapes of the vessels are mostly closed with a pointed or rounded rim. Ceramics was not decorated.

*Ceramic phase ‘d’* (Fig. 5; 6.1–4, 6, 9). Pottery was made from paste tempered by a large amount of shell and organics. The vessels were manufactured from stretched coils/slabs with an S-juncture. The extreme fragmentation of the vessels complicates accurate determination the size and type of coils/slabs and the presence of the beating technique. The vessels are 0.4–0.7cm thick. On both sides there are traces left by a comb tool. The external side of some of the vessels was polished. The vessels were poorly fired, only thermally dried at low temperatures (Ma-

zurkevich, Miklyaev 1998). The rims are flattened, and the vessels are slightly profiled. One conical bottom with an added clay lump at the extremity and a roundish bottom were found. The vessels were decorated with small pits, notches, small triangular marks and impressions of a thin, curved comb stamp, which differed from the decoration of the vessels of the previous Serteya culture. They were decorated by one or several horizontal rows or a combination of horizontal and vertical ones. Only two vessels were decorated by a combination of pits and notches, pits and impressions of a comb stamp. Only the upper part of the vessels was decorated, the rest was often covered by scratches, which were deliberately left and not smoothed over.

*Ceramic phase ‘d-1’*. Vessels were made from paste tempered by shell and organics (Fig. 7; 6.5, 7, 8, 10). The vessels were made from stretched coils with an N-juncture. On both sides there are traces left by a comb tool. The surface was polished afterwards in major cases. The beating technique was widespread. On the surface of the vessels there was a cracking mesh due to drying clay, which was subjected only to temperature drying. The rims are bevelled inwards, flattened, straight or inclined inwards. The bottoms are rounded. The vessels are 0.7–0.9cm thick. The pots were not decorated or decorated with a single line of holes under the rim or a net made from scratches. One of the vessels is decorated with triangular marks, arranged in horizontal lines. This group also includes a series of small bowls with a C-shaped profile and pointed rim.

*Ceramic phase ‘e’*. Vessels were made from fat paste tempered with organics, judging by the burnt-out remains, from short coils/slabs in the S-technique (Fig. 4.2–5, 8–11). In a few cases, the use of U-juncture was noted which was applied for vessels construction from the slabs. The surface of the vessels was smoothed, occasionally there are traces of scraping, smoothed afterwards in a number of cases. The rims of the vessels are flattened and straight. The pottery is decorated with small pinholes, a grid of dashed lines and small oval imprints.

A comparison of the ceramic manufacturing technology of the Rudnya culture and preceding Serteya culture using correspondence analysis of features, which constitute the *chaîne opératoire* (Fig. 8.1; see description of features – Fig. 8), indicates two completely different technological groups. Major differences are also observed in decoration and morphology (see the description of the Serteya culture in

Mazurkevich and Dolbunova (2015)), which may indicate a complete change in the ceramic traditions and, probably, local population that existed in the Dnieper-Dvina Basin in the first half to the middle of the 6<sup>th</sup> millennium BC and later – at the end of the 6<sup>th</sup> to the first half of 5<sup>th</sup> millennium BC.

A comparison with the Narva complexes shows particular similarities both in the technological sphere (see the correspondence analysis of technological features in Fig. 8.2) and decorative, morphological one. Ceramics of ‘d-1’ appear to be close to some types of ceramics of the Zvidze site and sites in Es-

tonia (Kääpa complex) (Kriiska 1996; Kriiska et al. 2017) and in Belarus (Charniauski 2017). Pottery of phase ‘d’ seems to be closer to the ceramics found at sites of Lubana Lake, and specifically the Zvidze and Osa sites (Loze 1988; Zagorskis 1973). Pottery of phases ‘c-1’ and ‘c-2’ is similar to that found at the coastal river estuaries and coastal lagoon group of sites in Estonia (Kriiska 1996; Kriiska et al. 2017).

**Flint and bone industry, the remains of constructions**

A few flint and bone items were found nearby the pottery of the phases ‘d’ and ‘d-1’ at the Rudnya Ser-

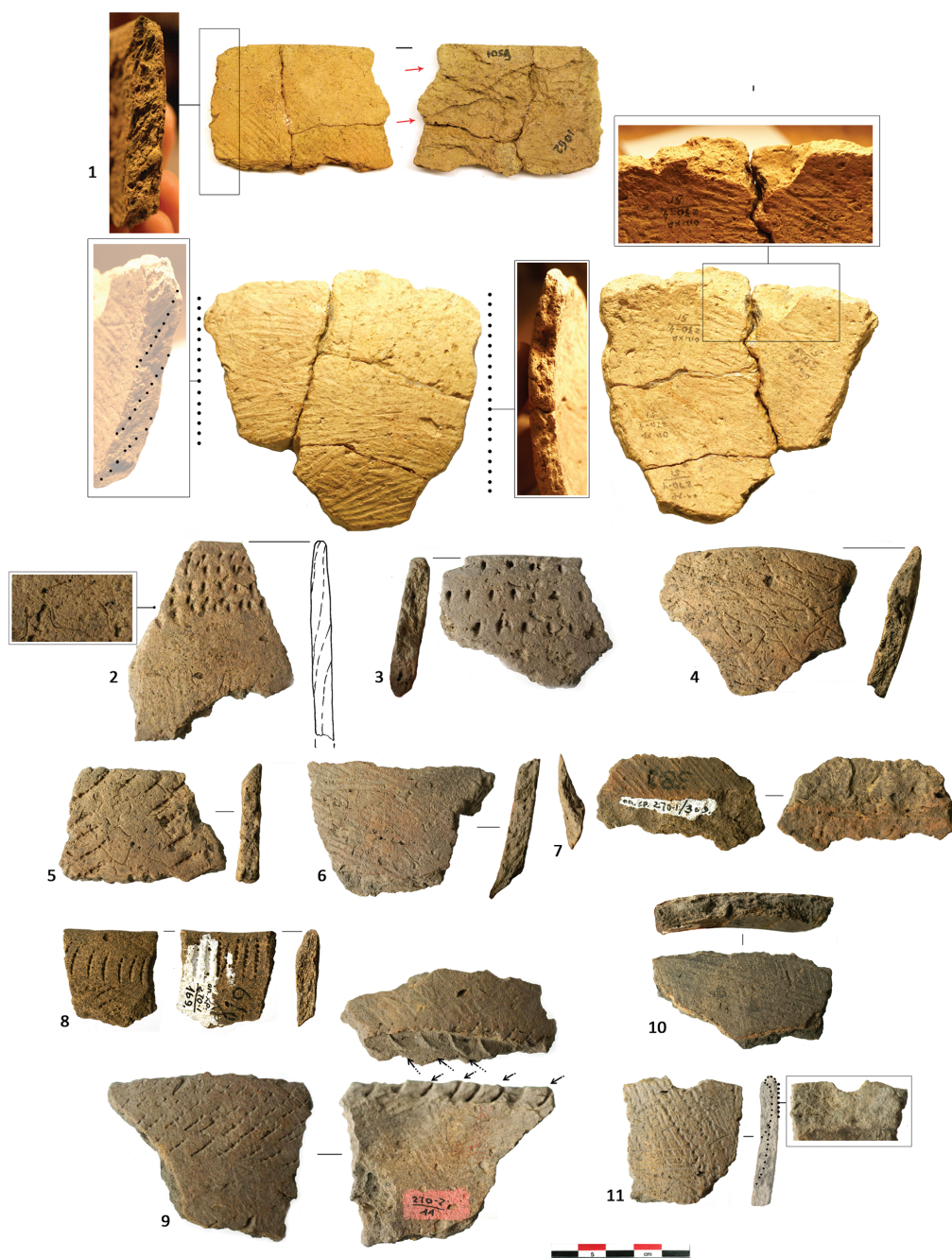


Fig. 4. Pottery fragments of phase ‘c-1’ (1 Serteya XII; 6, 7 Uzmen); ‘e’ (2–5, 8–11 Uzmen).

teyskaya site (Mazurkevich, Miklyaev 1998), and single items were found at Serteya II (II-2) and Serteya X (Figs. 9, 10). At the Rudnya Serteyskaya site, the flint industry includes a rhomboid-shaped arrowhead with bifacial retouch, end scraper, roundish scrapers with a rounded blade, oval axes with an asymmetrical lenticular cross-section and polished areas on the blade. Two single-platform edge-faceted cores and two double-platform nuclei were also found.

Bone tools include knives, which are characterized by a lateral cutting edge (Fig. 10.1, 6). They were produced by scraping from various anatomical supports, always from elk. It should be noted that the knives known for the Middle-Late Neolithic Usvyaty and Zhizhitsa cultures were made exclusively from

elk ulna. Early Neolithic bone knives are known in the Baltic area (Vankina 1999), and also in Belarusian sites (Charniauski 2007).

A few ornaments are also recorded. The Serteya X site provided a pendant made from an incisor with a grooved suspension (Fig. 10.4). Two other boar incisors with grooved suspension were found at the Serteya II-2 site. Several elk tooth grooved at their proximal part were also found in Early Neolithic layer at the Zamostje 2 site (Lozovskaya 2018). Teeth pendants remained fairly common throughout the Neolithic period, but their attachment system changed, and perforation began to be used in the Middle Neolithic.

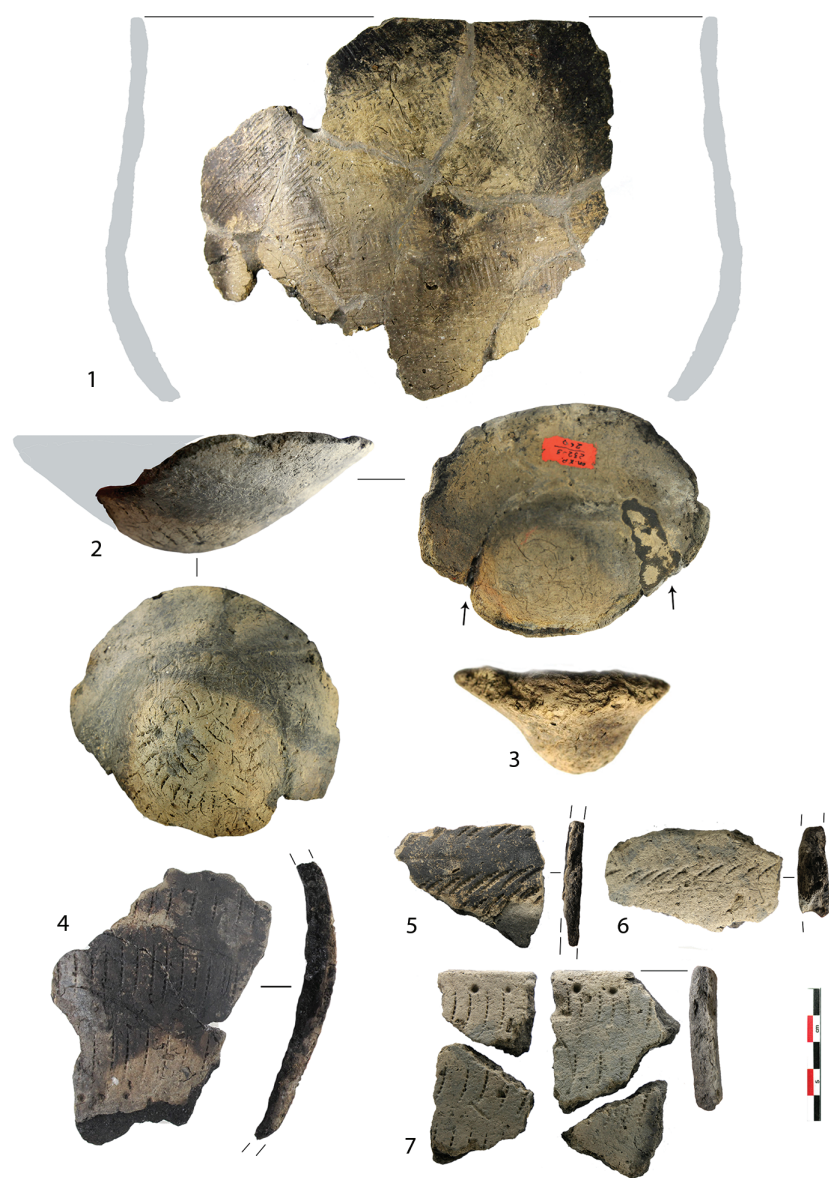


Fig. 5. Pottery fragments of phase 'd' (1–3 Rudnya Serteyskaya, 4–7 Serteya II).

Most of the Early Neolithic bone projectile points are characterized by bulging and often biconical heads, mostly with a tapered tip (Fig. 9.2, 4, 5), one of them was decorated with short incisions (Fig. 9.4). Their shaft, quite short, is often pointed and could be flattened or rounded in cross-section. This type is also quite common in Upper Volga (Lozovsky, Lozovskaya 2010; Lozovskaya 2019; Zhilin et al. 2002), and in the Narva culture (Vankina 1999; Loze 1988). A particular type of a biconical flattened arrowhead with symmetrical wings and a short, pointed shaft was found at Rudnya Serteyskaya (Fig. 9.3) and the Serteya II-2 site (Fig. 9.1). These projectile points found in the Dnieper-Dvina Basin constitute discriminating elements of the Early Neolithic which will no longer exist in the following periods. Rudnya Serteyskaya had a rather particular bone projectile point with a very long shaft and a head decorated with short transverse incisions (Fig. 9.8). A wooden projectile point imitating bone items was found at the Rudnya Serteyskaya site (Fig. 10.2).

Two harpoons (one is fragmented) were found (Fig. 10.6, 7). The whole piece consists of a three-barbed harpoon with shouldered proximal part. It might have been made from a bone blank extracted from an elk metapodium. Most of the harpoons from the Upper Volga culture feature a tight succession of barbs and a pointed proximal part (Lozovskaya, Lozovsky 2013), which does not correlate with Early Neolithic pieces from the Dnieper-Dvina basin. Neither of the analogies can be traced within the Baltic complex (Vankina 1999). In these two re-

gions, shouldered proximal parts of the harpoons seem to arrive later (Middle or Late Neolithic).

The remains of stake structures of rectangular or circular shape with ground hearths were recorded at the Serteya X and XIV sites (Mazurkevich et al. 2003). The remains of a fishing trap at the Serteya XIV and Rudnya Serteyskaya sites and strongly eroded wooden objects (on Serteya II-2 site) can also be attributed to different stages of the Rudnya culture (Tab. 1).

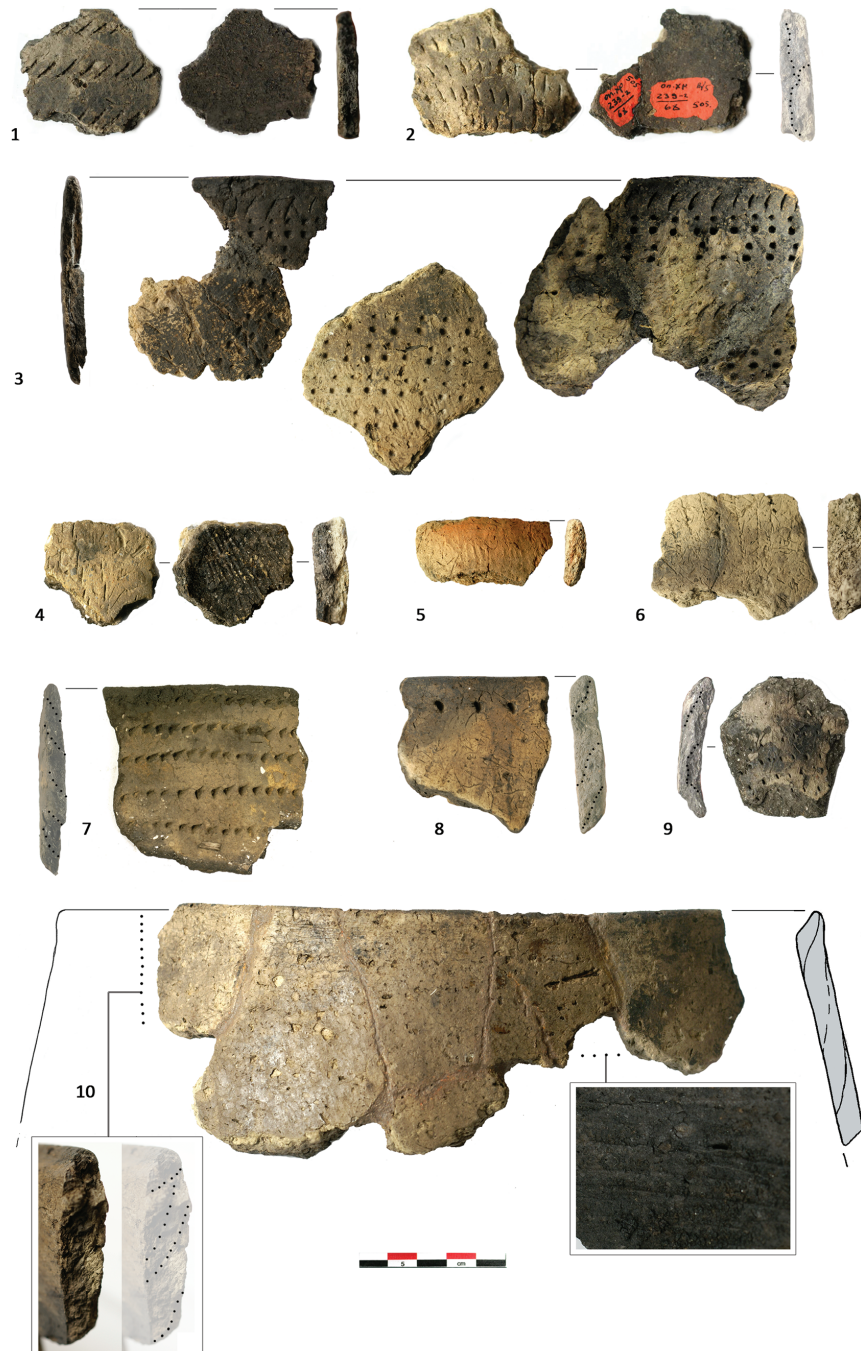


Fig. 6. Pottery fragments of phase 'd' (1-4, 6, 9), and 'd-1' (5, 7, 8, 10) on Rudnya Serteyskaya site with indication of coils/slabs juncture (2, 7, 10).



### Rudnya culture chronology

The archaeological layers with materials of the Rudnya culture lie above the layers or are separated spatially from the materials of the Serteya culture, which made it possible to create the sequence of these cultures (Mazurkevich et al. 2017), supplemented by typological analysis. Ceramics of phases 'c-1'/'c-2', and 'd-1' are among the earliest within the sequence of Rudnya culture, following by materials of ceramics of the phase 'd' and later phase 'e'. The absolute chronology is based on a series of radiocarbon dating by associated terrestrial material (wood and charcoal), deposited together with finds of ceramics of the Rudnya culture at the Rudnya Serteyskaya, Serteya II and Serteya XIV sites (Tab. 1). The dif-

ficulty of using direct dating of ancient hunter-gatherer ceramics is connected with the reservoir effect arising at dating of food crust formed after processing of mainly aquatic products in vessels (Courel et al. 2021.SI).

The Rudnya Serteyskaya site is located on a terrace that was buried under wetland deposits, on a small promontory that juts into the Rudnya lake basin. The uncovered area of the site was 146m<sup>2</sup> (Mazurkevich, MiklyaeV 1998). Archaeological layer A, with finds of Early Neolithic ceramics of the Serteya culture dated to the 6<sup>th</sup> millennium BC, was deposited in a layer of fine sand at the base of bluish gyttja. The overlying layer B, where fragments of Rudnya culture pottery were found (phases 'd' and 'd-1'),

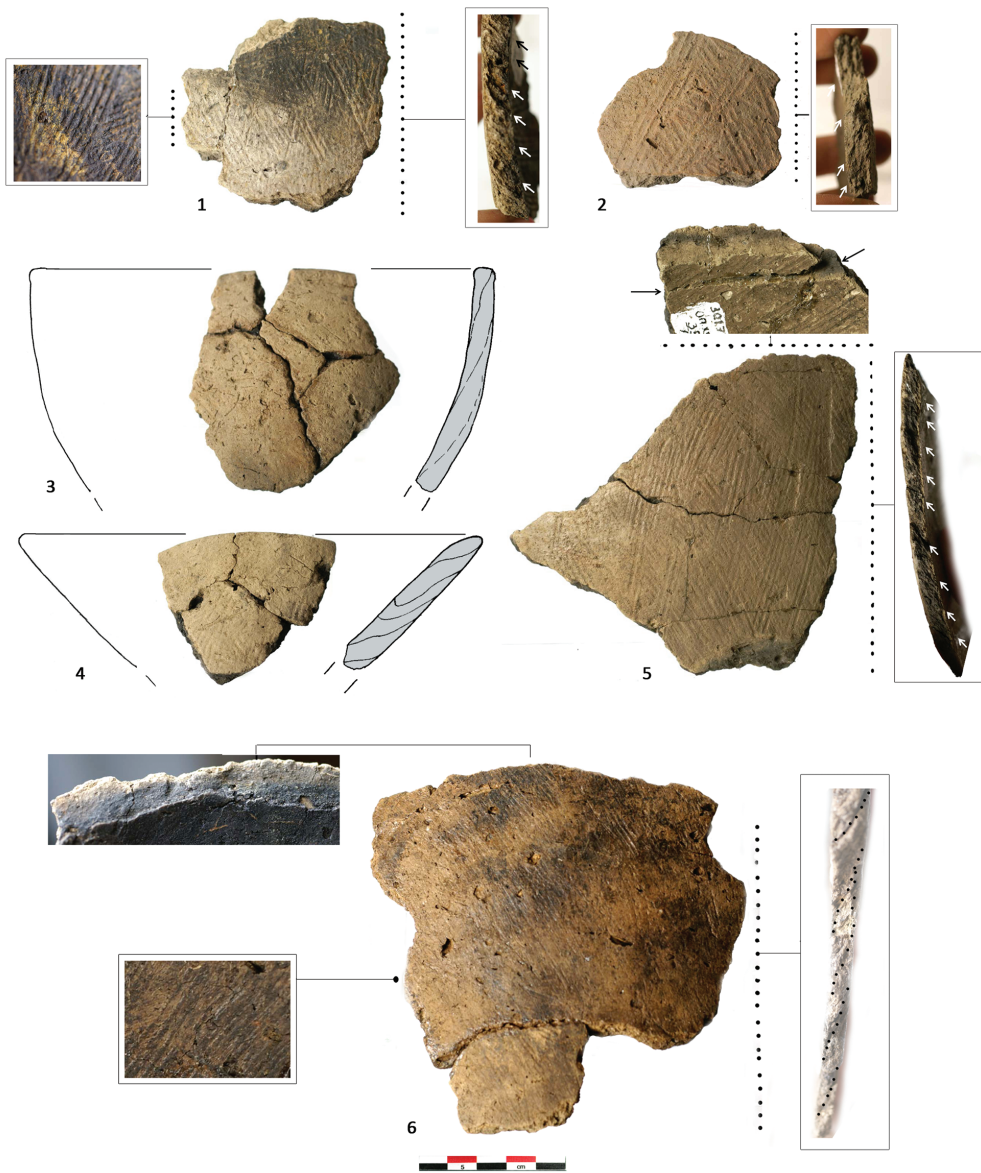


Fig. 7. Pottery fragments of phase 'd-1' (1, 3, 4–6 Serteya XIV; 2 Usviaty II) with indication of traces left during surface treatment (1, 6) and coils juncture (1, 2, 5, 6).



was deposited in a layer of sandy gyttja with charcoal inclusions, located between bluish and brownish gyttja. Vessel fragments of phases 'd' and 'd-1' were recorded in different parts of the site. The radiocarbon dates obtained probably reflect several stages of site occupation. Fragments of worked wood, deposited in close proximity to the ceramics of the Rudnya culture, are dated to 5210–4952 cal BC (first group) (Mazurkevich, Miklyaev 1998). The charcoal from the base of the oval ground structure of Serteya XIV site can also be dated to this time (5332–4944 cal BC).

Wood fragments overlying the layer B are dated to c. 4932–4608 cal BC – the time when gyttja accumulated over the Rudnya culture remains during the transgression phase. The second group of dates made on wooden items (including the remains of a fishing trap) (c. 4727–4497 cal BC) possibly correlates with the appearance of sites on mineral shores with materials of the 'e' phase.

Ceramic fragments of the Rudnya culture on the Serteya II site were found in its western part (II-2 area), which is a multilayer complex with several succeeding phases of occupation (Mazurkevich et al. 2020; Kittel et al. 2018). A very dynamic local hydrological system and palaeolake shore conditions had a considerable influence on the formation of archaeological layers and distribution of finds. The oldest ceramics attributed to the Serteya culture were found in the lowermost sandy layer, attesting to a coastal activity zone during the Early Neolithic. Rudnya culture fragments were found in a dark brownish-grey sandy layer with organic remains and in brown gyttja (see Kittel et al. 2020). The fragments were eroded which could indicate the redeposition of the archaeological layer and organic matter in the lake shore zone. They could have been washed away from higher parts of the site. The bone arrowheads attributed to the Rud-

nya culture deposited in the dark brownish-grey sand and black gyttja layers may be evidence of hunting. Two heavily eroded wooden items (one of them probably a paddle) are dated to c. 5208–4849 cal BC. A wooden stake – evidence of coastal activities – was dated to 5373–5213 cal BC.

The results from the macrobotanical study show a gradual shallowing of the lake level after 6900 cal BC. During this time, the palaeolake already seems to be rich in faunal and floral aquatic resources, and thus attractive for exploitation. In the further course of time, a transgression phase occurred between c. 5550 and 3600 cal BC (Wieckowska-Lüth et al. 2021). Natural accumulation of minerogenic and or-



**Fig. 9. Early Neolithic bone industry: 1–2 Serteya II; 3, 7–9, 10 Rudnya Serteyevskaya; 4, 5, 6 Serteya X.**

ganic material in the transition zone between the lake and land, fluctuations in lake water level (inflow of minerogenic material, wave erosion), and periodic drying was recorded for this time period (Kittel et al. 2020).

### Distribution of Rudnya culture sites in the Dnieper-Dvina Basin

*Upper Western Dvina basin.* The vessels of phase 'd-1' are known on the Rudnya Serteyskaya, Serteya

II-2, X, XIV, XXXIV sites (Fig. 3) located at low hypsometric levels, and archaeological layers are buried under wetland deposits.

Vessels of the Rudnya culture are found much less frequently at the sites located on drylands. These are mostly vessels of the 'c-1', 'c-2' and 'e' phases. There are a few fragments of 'd-1' and 'd' phases, found in the sandy deposits at the Uzmen and Usvyaty II sites, Shugailovo, and Mochary sites. Vessels of phase 'e' are found within sandy sediments at the

Date (BP)	Date (cal BC)	Index	Material	Site	Context	Attribution (culture)
5770±60	4730-4488	Le-2570	wood	Rudnya Serteyskaya	peaty gyttja with wooden remains and algae, wood from fishing construction	Rudnya culture
5780±40	4723-4535	Le-7182	charcoal	Serteya XIV	sq. A/14, yellow sand	-//-
5780±50	4727-4497	Le-2577	wood	Rudnya Serteyskaya	peaty gyttja with wooden remains and algae, wood from fishing construction	Rudnya culture
5850±150	5057-4362	SPb-1197	food crust	Serteya XXXIV	ceramic belly fragment undecorated (No. 1726-1728)	Rudnya culture
5890±60	4935-4605	Le-2586	wood	Rudnya Serteyskaya	wood from the horizon above layer B	Rudnya culture
5900±40	4850-4686	Le-7173	charcoal	Serteya XIV	sq. 6/3, dwelling, base layer	-//-
6090±40	5081-4896	Poz-146276	wood	Serteya II-2	treated and eroded wood (w405), lying in horizontal position, on whitish sand	Rudnya culture
6090±40	5081-4896	Poz-146882	wood	Serteya II-2	treated and eroded wood (paddle?) (9814)	Rudnya culture
5940±130	5137-4537	Le-2566	wood	Rudnya Serteyskaya	sandy gyttja with charcoals, layer B, sq. D/1	Rudnya culture
5940±130	5137-4537	Le-4101	wood	Rudnya Serteyskaya	sandy gyttja with charcoals, layer B, sq. B/9	Rudnya culture
6050±40	5053-4837	Le-9764	wood	Serteya XXXIV	sq. D/2, low part of ferruginized sand	Rudnya culture
6130±30	5210-4988	Le-9763	wood	Serteya XXXIV	sq. D/2, No. 2254, low part of ferruginized sand	Rudnya culture
6130±40	5210-4952	Le-2579	wood	Rudnya Serteyskaya	sandy gyttja with charcoals, layer B, sq. B/4	Rudnya culture
6130±50	5215-4935	Le-7175	charcoal	Serteya XIV	yellow sand with charcoal, sq. b/13	-//-
6180±40	5218-5003	Le-2569	wood	Rudnya Serteyskaya	sandy gyttja with charcoals, layer B, sq. D/1	Rudnya culture
6320±40	5373-5213	Poz-146296	wood	Serteya II (part 2)	sharpened stake (W454) in vertical position	Rudnya culture
6210±80	5332-4944	Le-7176	charcoal	Serteya XIV	dwelling's floor, yellow sand	-//-
6230±40	5306-5054	Le-2568	wood	Rudnya Serteyskaya	sandy gyttja with charcoals, layer B, sq. D/1	Rudnya culture
6240±60	5326-5028	Le-3054	wood	Rudnya Serteyskaya	sandy gyttja with charcoals, layer B, sq. B/3	Rudnya culture
6388±38	5417-5306	Le-7174	charcoal	Serteya XIV	sq. b/13, fish-trap	-//-
6640±110	5738-5372	SPb-750	burnt bones	Serteya XXII	located nearby early neolithic vessels (phase 'b-1'/'b-5')	Serteya culture
6792±120	5913-5482	SPb-748	burnt bones	Serteya XXVII	sq. M-L/4, located nearby early neolithic vessel (phase 'b-5')	Serteya culture
7300±120	6419-5983	SPb-749	burnt bones	Serteya XXIV	sq. B/1, located nearby early neolithic vessel (phase 'b-4')	Serteya culture
7350±180	6571-5885	Le-5260	wood	Serteya X	bluish sandy gyttja layer with shells, cultural remains of early neolithic Serteya culture	Serteya culture

Tab. 1. Radiocarbon dates of materials attributed to Serteya and Rudnya culture.

Uzmen, Usvyaty II, Serteya II $\alpha$  sites, Shugailovo, and Mochary sites. The pottery of phase 'c-1' was found on sites situated on mineral terraces of palaeolakes in the southern (Serteya X, Serteya XII) and northern lake basin (Serteya XIV, XXVII), on shores of palaeolakes in the northern basin of the Serteya micro-region (Serteya XXI, XXII, XXIV, 3-3, and 3-2). The pottery of phase 'c-2' was found on sites situated in mineral terraces of palaeolakes (field above Rudnya Serteyeskaya No. 3 (PRS3), Serteya XIV) and also on the shore of palaeolake in the northern lake basin (Serteya 3-3, XXXVI, XXXVII, XLIV).

*Upper Dnieper Basin.* Pottery of phase 'c-1' was found at the Katyn 9 site, and of phase 'e' at the Katyn 17 and Kozichino sites. These are the most south-eastern sites of the Rudnya culture.

Vessels of the Rudnya culture were found on the sites located in the immediate vicinity of the paleolacustrine shoreline, which were most likely seasonal one (testified by avifauna at the Rudnya Serteyeskaya site (Sablin et al. 2011)). The supposed settlement system differs from the previous time, when various types of sites were recorded: summer and winter camps, long-term and specialized hunting or fishing sites (Mazurkevich, Dolbunova 2009). Vessels of the Rudnya culture are accompanied by finds of single bone arrowheads, the remains of fishing traps, strongly eroded wood items with traces of processing (one of which may be a paddle), and wooden stakes, testifying to household activity on the ancient shoreline (Serteya II and XIV sites).

### Discussion

The cultural space, formed in the late 6<sup>th</sup> to 5<sup>th</sup> millennium BC in the Circum-Baltic region, includes the Ertebølle culture and the Dąbki site in the west, Narva and Neman

cultures in the east, and Sperrings and Sär 1 in the north (Gurina 1967; Rimantiene 1992; Timofeev 1998a; Loze 1988; Kriiska 1996; Kriiska et al. 2017; Charniauskis 1979; 2017; Piličiauskas 2002; German 2018; Torvinen 2000; Kotula et al. 2015). A number of regional and regional-chronological groups have also been distinguished within these (Kriiska 1996; Kriiska et al. 2017; Vankina et al. 1973; Rimantiene 1973; Miksaite 2005; Piezonka 2015; Tkachou 2018; Wawruciewicz 2013).

The hunter-gatherer-fisherman cultures of the Western and Eastern Baltic existed at the same time as agricultural communities to the south. Thus, the origin of pottery in the Ertebølle culture has been suggested to be a local innovation, the influence of hunter-gatherer communities from the East (Gronen-



**Fig. 10.** Early Neolithic bone industry (1, 3-7), and wooden arrowhead (2). Serteya X site.

born 2011), or of Neolithic farming groups (Povlsen 2013). The emergence of pottery among hunter-gatherer tribes of the Swifterbant culture *c.* 5200/5000 cal BC was explained by the influence of neighbouring agricultural groups (Raemaekers 2011). The influence of local farming communities on the formation of hunter-gatherer pottery complexes in the 5<sup>th</sup> and 4<sup>th</sup> millennia BC was also noted for Central Europe (Nowak 2017; Guminski 2020). The origin of the Narva culture early ceramic complex is still under discussion. The asynchrony of the processes of ceramics acquisition in different regions by hunter-gatherer communities is evidenced by the differences in time of the pottery's appearance and significant variations in the ceramic technology. The differences in the *chaînes opératoires* of ceramic manufacture testify to major differences between various cultural traditions of hunter-gatherer communities of the Circum-Baltic world (Dumpe et al. 2011; Glykou 2010).

The widespread S-profiling of the vessels in early complexes forced researchers to look for the eastern origin of these in the Elshanskaya culture, where S-profile vessels are known (Timofeev 1998; Gronenborn 2011; Andreev, Vybornov 2021). However, the differences in technology, chronology and morphology (Courel et al. 2021, Fig. S2) indicate the more different nature of these complexes.

Studies into ceramics contents and their use (through traces of use) point to different functional patterns of vessel use among foraging communities (Courel et al. 2020; 2021; Papakosta et al. 2019; Pääkkönen et al. 2016). A predominance of vessels used for aquatic products was found typical for Narva (including vessels from the sites located in the Serteya microregion (Courel et al. 2020)). Vessels of the Rudnya culture were found on sites with rather specific contexts – oriented towards the use of water resources – with finds of fishing traps and paddles located in the shoreline zone, associated with fishing grounds or household activity in the shoreline area.

Specific technological, morphological and ornamental features of ceramic phases ('c-1', 'c-2', 'd', 'd-1' and 'e') and the particularities of their deposition within archaeological layers allow us to identify several groups within Rudnya culture. These may reflect penetration of various traditions from different territories, which are also testified by comparison with different Narva complexes. The flint complex of the Rudnya culture does not have any similarities with the preceding stone industry, bone and antler

items find analogies both in the Late Mesolithic and Early Neolithic materials of Eastern European forest zone sites, and in the Lubana basin (Loze 1988; Vankina 1999).

The chronological timeframes of the Rudnya culture correlate with chronological periods identified for the Zvidze site, where the early Narva pottery was found in several archaeological layers, dated to *c.* 5409–4944 cal BC, 5211–4835 cal BC and 4850–4582 cal BC; the lower border of Narva culture here was attributed to 4446–4157 cal BC (Loze 1988: 73–74). The appearance of this ceramic complex around 5500–5300 cal BC is confirmed by stratigraphic observations, dating of accompanying materials (wood) (Loze 1988) and direct dating of charcoal found in the vessel fragments (Courel et al. 2020). A comparison of the radiocarbon chronology of the Lubana sites with those of the Rudnya culture shows that the latter appeared later in the east in the upper reaches of the Western Dvina River.

The similarity of the technological, ornamental, morphological and functional characteristics of the vessels of the Rudnya culture with the groups of the Narva culture makes it possible to consider the transfer of ceramics as one package resulting in the Rudnya culture formation: along with *chaînes opératoires*, ornamental and morphological traditions, the functional pattern was transferred. All of these may testify to the migration of people from different regions of the Eastern Baltic to the south-east.

There are single and rare evidences of Narva culture materials on other sites in northwestern Russia, but all these complexes are extremely sparse and could instead indicate single penetrations of individual groups to the east: Veksa 3 (Nedomolkina et al. 2015; Piezonka 2015), Kuzemkino 1–6, Galik 3–4, 6–7, 10 (Holkina 2019), Sjaberskaya III (Timofeev 1993), and in the Upper Dnieper basin (Fig. 1, 2).

## Conclusion

The emergence of pottery in hunter-gatherer-fisher communities in continental Europe may have followed different spatial and cultural trajectories, responding to different economic or cultural challenges. The emergence of pottery was accompanied by extensive development of the Eastern European territories, overlapping only in part with the preceding Mesolithic network. Destruction of this initial network is manifested through the disintegration of the oldest ceramic traditions that originated in the steppe and

forest-steppe zones. The role of pottery might have been different – as an important adaptive mechanism and innovation in some regions, and perhaps a non-utilitarian element in others (Courel et al. 2020). Societies that practiced pottery manufacture might have existed independently among Mesolithic societies on the territory of Eastern Europe, occupying free ecological niches, for a rather short period of time, and thus did not make any significant contributions to later ceramic traditions. The change of ceramic types, groups and cultures did not lead to the formation of hybrid ceramic types. The tradition of pottery making seems to be not of a widely used practice, which is evidenced in the small number of the earliest vessels found on a number of sites (Mazurkevich, Dolbunova 2015). The emergence of pottery outside the East European Plain in hunter-gatherer communities at a later time in Central Europe may refer to a completely different process – the borrowing of pottery-making skills from agricultural groups (Nowak 2017; Guminski 2020).

Ceramic complexes of the Rudnya culture are not the most ancient or first in the territory of the Dnieper-Dvina Basin, unlike in the Eastern Baltic. This cultural group follows the earlier ceramic traditions (Mazurkevich, Dolbunova 2015), which originated in the Upper and Middle Don, Desna River, Bug-Dniester Basin. The closest analogies to the Rudnya culture ceramic complex can be found in the lower course of the Western Dvina River in the Lubana Basin. Thus, the Rudnya culture can represent an independent phenomenon within a larger cultural entity of the Narva culture. The bone industry of the Dnieper-Dvina region shows some items existed through-

out the Neolithic (e.g., knives made from elk long bones) and other particular for only the Early Neolithic – pendants with a grooved suspension and specific types of bone arrowheads. The latter fits into the evolutionary scheme of arrowhead development from the Mesolithic to Early Neolithic following the common trajectory of the size getting smaller. The shortening of bone projectile points could reflect the appearance of a new hunting strategy as the role of bows increased, and may indicate the increasing importance of fur hunting. Analogies in both the Upper Volga area and the Baltic may reflect this common trend.

Different areas of origin evidenced for the Serteya and Rudnya cultures testify to changes in the directions of cultural interactions at the end of the 6<sup>th</sup> millennium BC from south-north to west-east. This could be a marker of the destruction of the established network that existed before, during the late 7<sup>th</sup> and 6<sup>th</sup> millennia BC. Such a significant change in material culture was due not only to the cultural impulse, but possibly the penetration of a new population from the western territories, which likely established a new system of cultural and social relations.

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