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The Origins and Chronology of the Usatove Culture

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Abstract. Usatove was an important southeast European culture, part of Gimbutas' kurgan cultures, that connected the world of farmers of Old Europe with the rising influence of steppe nomads at the Eneolithic–Bronze Age transition. While the Usatove culture is currently placed within the late Eneolithic–Early Bronze Age chronological period, emerging evidence suggests the culture formed genetically and culturally in the early part of the 4th millennium BCE. We propose that the biological and cultural foundations of Usatove lie at the juncture of the Suvorove–Novodanylivka branch of the Seredny Stig complex of the North Pontic Steppe, the Trypillian farmers of southeast Europe, with influences from Varna–Karanovo VI–Gumelniţa and late Stone Age cultures of the North Caucasus.
Key words: Kurgan culture, Usatove (Usatovo), North Pontic Steppe, Eneolithic, Bronze Age, chronology, reservoir effect, diet isotopes.

Usatovo (Usatove) kultūros kilmė ir chronologija

Anotacija. Usatovo kultūra – svarbi pietryčių Europos kultūra, M. Gimbutienės kurganų kultūrų dalis, eneolito ir bronzos amžiaus sandūroje, didėjant stepių klajoklių įtakai, sujungusi Senosios Europos žemdirbių ir gyvulių augintojų bendruomenių pasaulį. Usatovo kultūra šiuo metu datuojama vėlyvojo eneolito–ankstyvojo bronzos amžiaus laikotarpiu, tačiau atsiranda naujų įrodymų, kad ji genetiškai ir kultūriškai susiformavo IV tūkstm. pr. Kr. pradžioje dėl kitų kultūrų įtakos.
Reikšminiai žodžiai: kurganų kultūra, Usatovo kultūra, Šiaurės Ponto stepė, eneolitas, bronzos amžius, chronologija, rezervuaro efektas, izotopiniai tyrimai.

The Usatove culture occupies a prominent place in European prehistory. Maria Gimbutas designated Usatove as part of the second Kurgan wave of Kurgan cultures in her works on the spread of steppe populations into Europe (Gimbutas, 1997). Usatove displays cultural attributes borrowed or mixed from other groups, and yet it has its own distinctive footprint in the cultural landscape of the 4th to early 3rd millennium BCE in southeast Europe.

Usatove chronology currently spans from ca. 3550 to 2750 BCE, coinciding with the Trypillia stage CII of chronological periodization of the Pre-Cucuteni–Cucuteni–Trypillia Culture Complex (PCCTCC). There are over 50 sites known of Usatove in the west and northwest Pontic Region (Figue 1). The material culture of Usatove is represenred by pottery of various shapes, with painted and cord ornaments, anthropomorphic figurines, and metal products such as daggers from arsenical bronze (Figures 2–4). The two major Usatove culture sites in Ukraine, Usatove–Velykyj Kuyalnik and Mayaky, produce a picture of Usatove as an amalgam of steppe and

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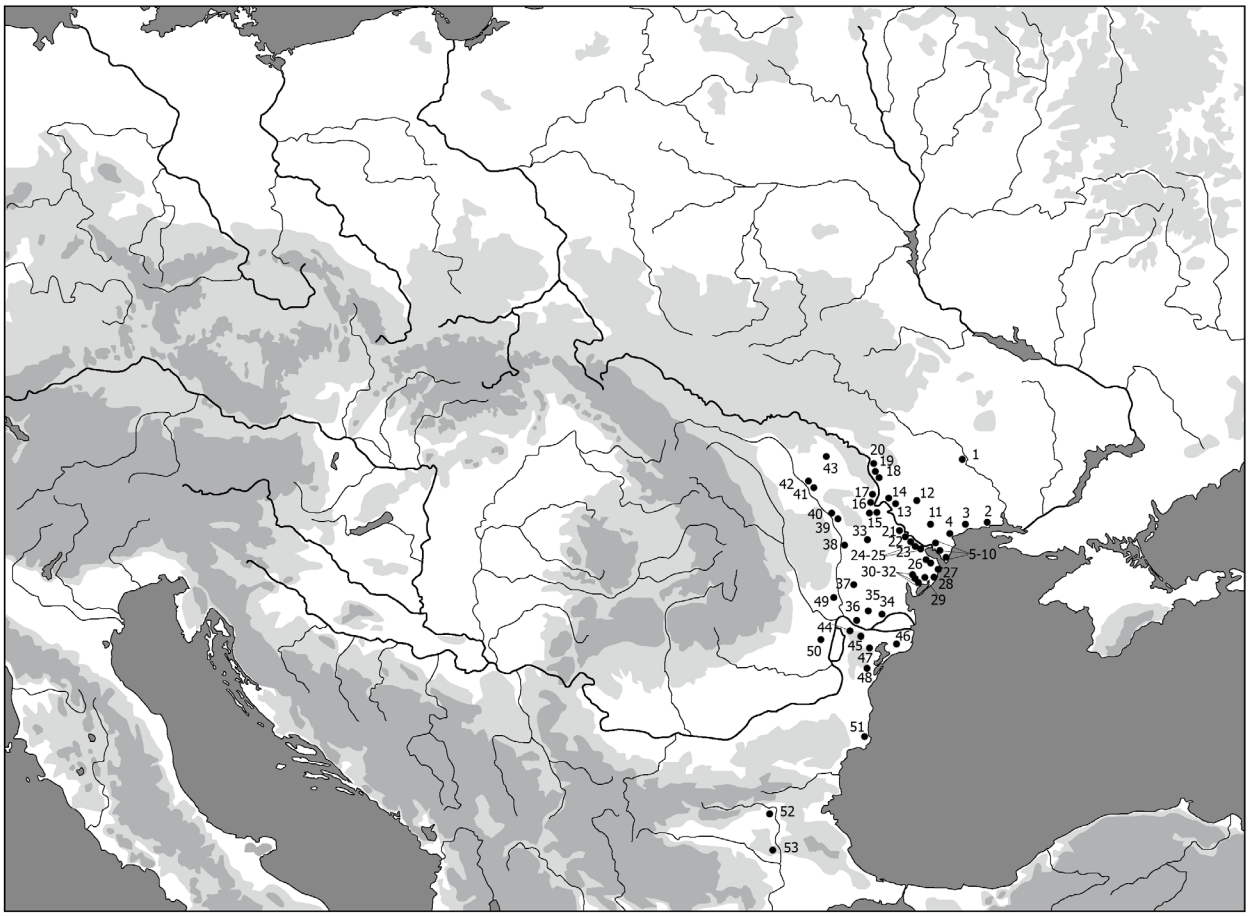

Figure 1. Distribution map of Usatove culture monuments. After Petrenko, 2013, supplemented by the authors. 1 – Gard; 2 – Koshary II – Zmeina Balka; 3 – Usatove; 4 – Oleksandrivka; 5 – Karolino-Bugaz; 6 – Dalnik II; 7 – Mykolaivka; 8 – Efymivka; 9 – Mayaky; 10 – Mayaky – Myrne; 11 – Gradenyci; 12 – Nicolscoe; 13–14 – Tiraspol; 15–17 – Tîrnauca; 18 – Ploskovskoj; 19 – Crasnogorca; 20 – Speia; 21 – Răscăieți; 22 – Purcari; 23 – Olănești; 24 – Tudora; 25 – Palanca; 26 – Sadovoe – Mologa; 27 – Popova Mogyla; 28 – Shabolat; 29 – Alkaliya; 30 – Zhovtyj Yar; 31 – Zaharkina Mogyla; 32 – Dyviziya; 33 – Berezyno; 34 – Kyslycia; 35 – Utkonosivka; 36 – Orlovka; 37 – Găvănoasa; 38 – Râșești; 39 – Tochile-Răducani; 40 – Sărata-Răzeși; 41–42 – Dancu 1–2; 43 – Dănceni; 44 – Luncaviţa-*Drumul Vacilor*; 45 – Isaccea; 46 – Murighiol; 47 – Mihai Bravu; 48 – Tariverde; 49 – Stoicani; 50 – Brăiliţa; 51 – Dyadovo; 52 – Golyama Detelina.

1 pav. *Usatovo kultūros objektų paplitimo žemėlapis. Pagal Petrenko, 2013, papildytas autorių. 1 – Gard; 2 – Koshary II – Zmeina Balka; 3 – Usatove; 4 – Oleksandrivka; 5 – Karolino-Bugaz; 6 – Dalnik II; 7 – Mykolaivka; 8 – Efymivka; 9 – Mayaky; 10 – Mayaky – Myrne; 11 – Gradenyci; 12 – Nicolscoe; 13–14 – Tiraspol; 15–17 – Tîrnauca; 18 – Ploskovskoj; 19 – Crasnogorca; 20 – Speia; 21 – Răscăieți; 22 – Purcari; 23 – Olănești; 24 – Tudora; 25 – Palanca; 26 – Sadovoe – Mologa; 27 – Popova Mogyla; 28 – Shabolat; 29 – Alkaliya; 30 – Zhovtyj Yar; 31 – Zaharkina Mogyla; 32 – Dyviziya; 33 – Berezyno; 34 – Kyslycia; 35 – Utkonosivka; 36 – Orlovka; 37 – Găvănoasa; 38 – Râșești; 39 – Tochile-Răducani; 40 – Sărata-Răzeși; 41–42 – Dancu 1–2; 43 – Dănceni; 44 – Luncaviţa-Drumul Vacilor; 45 – Isaccea; 46 – Murighiol; 47 – Mihai Bravu; 48 – Tariverde; 49 – Stoicani; 50 – Brăiliţa; 51 – Dyadovo; 52 – Golyama Detelina*

agrarian influences. The steppe group in the foundation of Usatove is sought to be coming from the Seredny Stig horizon of Pontic steppe nomads, while the agrarian roots are considered to be derived from Cucuteni–Trypillia (Anthony, 2008, 2007; Gimbutas, 1965, 1956). Influences of other Eneolithic culture groups of the northwest Pontic such as Cernavodă I have also been proposed (Manzura, 2020). Until recently, the refinement of the Usatove ancestry beyond it being a Trypillia-steppe hybrid has not been offered and the Usatove chronology has not been challenged, despite a series of the late 5th to early 4th millennium dates obtained on human bone from the Usatove site at Mayaky (Petrenko et al., 2018; Petrenko and Kaiser, 2011).

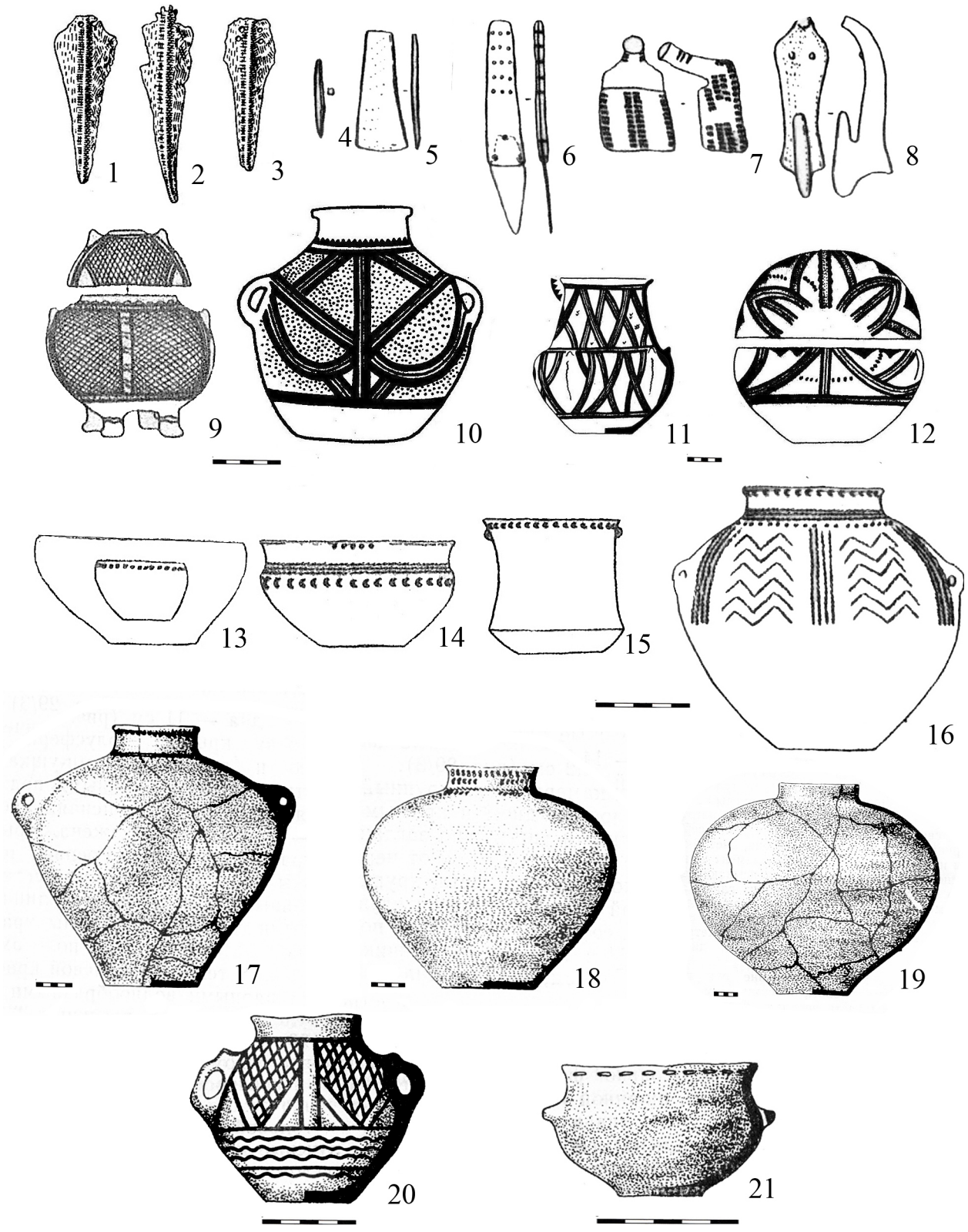

Figure 2. Material culture of Usatove. 1–16: after Dergachev, Manzura, 1991, p. 213, tab. 4; 17–21: after Yarovoy, 1990, p. 67, 76. 1–3 – daggers of the "Anatolian" type"; 4 – awl; 5 – adze; 6 – knife; 7, 8 – anthropomorphic figurines; 9–21 – pottery.

2 pav. *Usatovo kultūros materialinė medžiaga. 1–16: pagal Dergachev, Manzura, 1991, p. 213, lent. 4; 17–21: pagal Yarovoy, 1990, p. 67, 76. 1–3 – „Anatolijaus" tipo durklai; 4 – yla; 5 – kirvis; 6 – peilis; 7, 8 – antropomorfinės figūrėlės; 9–21 – keramika*

Figure 3. Material culture of Usatove. 1, 2, 4–6 – Mayaky; 3 – Usatove; 7–9 – Oleksandrivka Kurgan. After Petrenko, 2013, tab. 11.

3 pav. *Usatovo kultūros materialinė medžiaga. 1, 2, 4–6 – Mayaky; 3 – Usatove; 7–9 – Oleksandrivka Kurgan. Pagal Petrenko, 2013, tab. 11*

We propose that Usatove was formed by the Suvorove–Novodanylivka (SuNo) branch of the Seredny Stig groups of the North Pontic Steppe (NPS) interacting with incoming Varna–Karanovo VI–Gumelniţa (VKG) migrants, who were fleeing the flooding of the west Pontic coastal areas at the end of the Atlantic Climatic Optimum (Nikitin and Ivanova, 2022), and Trypillia BI-II, expanding to the border of steppe and forest steppe in southwest Ukraine. The VKG migration and Trypillia expansion happened between 4200 and 3900 BCE. 3900 BCE is the end of SuNo and the beginning of the Post-Stig/Katarzhino type phase of cultural periodization in the North Pontic. It is likely that the Katarzhino type represents post-SuNo steppe population in the northwest Pontic, continuing the SuNo nomadic lifeways. At the same time, the combined ancestries of SuNo and Trypillia/VKG (with addition of the North Caucasus ancestry, discussed below) establish the Usatove culture, settled around the brackish estuaries of the northwest Pontic after 3900 BCE.

SuNo were a Seredny Stig group involved in the Eneolithic circum-Pontic trade network (Nikitin and Ivanova, 2022). SuNo connected the north Caspian groups of the Khvalynsk horizon and the Eneolithic North Caucasus with west Pontic and Thrace. SuNo were likely highly skilled flint-workers. They worked with the Donetsk raw material base, producing prestige flint items for a wide exchange. The SuNo craftsmen/tradesmen distributed their flint products from their original homeland in southeast Ukraine far across the Dnipro, to the Dniester and the Lower Danube. SuNo would exchange their long flint blades and other flint goods for copper in west Pontic, which would then travel along the exchange network to east Pontic and, from there, to Khvalynsk. SuNo also maintained close contacts with the North Caucasus, from where porphyrite-made artefacts such as personal adornments and status symbols like mace heads, zoomorphic scepters and axes may have come to the Pontic steppe. Alternatively, mace heads and scepters may have originated in the Cucuteni–Trypillia culture (Govedarica, 2004, and references therein), from where they entered the circum-Pontic trade network, mediated by SuNo merchants. Zoomorphic stone scepters found in SuNo burials marked a special social status, given the rarity of the finds and the eccentricity of many burials in which the scepters were found. The shape of bracelets found at the Mariupol cemetery, where SuNo interments have been found amongst the Neolithic Mariupol-type burials, is similar to the bracelets from the earliest burials at the Nal'chik necropolis in the North Caucasus (Makarenko, 1933). The style of mace heads and bracelets found at the Mariupol cemetery was suggested to be derived from Mesopotamia (Makarenko, 1933; Munchayev, 1975). SuNo ceramics shows similarities with pre-Maykop ceramics of Svobodnoe in the Kuban region, which indicates the existence of exchange ties between the SuNo and Kuban populations of the North Caucasus piedmont (Telegin, 1991). Considering the extent of cultural exchanges between SuNo and the North Caucasus, biological exchanges likely took place between these groups as well.

The VKG migrants that started to appear in the northwest Pontic by the late 5th millennium BCE, were coming from the coastal west Pontic settlements where salt production was a major part of local economy (Nikitin and Ivanova, 2022). SuNo, who by then extended their presence to the Northwest Pontic, recognized the importance of salt in trade with their agrarian neighbors, and soon entered the business of salt gathering on the Dniester estuaries, for trade with the growing Trypillian "market". In addition to salt, SuNo maintained herds of sheep for fleece production and exchange with Trypillia. From Trypillia they obtained objects of prestige such as painted pottery, raw materials such as native copper of Volyn and cuprous sandstones of the Outer Subcarpathia as well as Volynyan/Carpathian flint, copper smithing technology, and other items, which may not be archaeologically visible. Biological connections with Trypillia likely followed, leading to the formation of the Usatove genetic ancestry in the early part of the 4th millennium BCE.

The connection between Seredny Stig in general and SuNo in particular with Usatove is evident from the finds of Seredny Stig ceramics at Usatove–Velykyj Kuyalnik and the presence of SuNo graves at Mayaky (Patokova, 1979; Petrenko and Kaiser, 2011). Burials in kurgans and burial plots that are presumed to be kurgans at the Mayaky necropolis (Patokova et al., 1989) date from the last third of the 5th to first quarter of the 4th millennium (Petrenko et al., 2018; Petrenko and Kaiser, 2011), although these dates are viewed as anomalous and are currently not considered for the establishment of the Usatove chronology (Manzura, 2020).

Figure 4. Usatove-type anthropomorphic figurines from Mayaky (1–4) and a bronze or copper dagger (5) from the vicinity of the city of Ismail (Ukraine). After Petrenko, 2013, tab. 12.

4 pav. *Usatovo tipo antropomorfinės figūrėlės iš Mayaky (1–4) ir bronzinis arba varinis durklas (5) iš Ismailo miesto apylinkių (Ukraina). Pagal Petrenko, 2013, tab. 12*

Mitochondrial DNA lineages point to the core of the Mayaky Usatove population descending from the maternal lines of the north Pontic steppe (Ivanova et al., 2018). Mitochondrial DNA lineages associated with the Neolithic Anatolian-derived European farmers, such as VKG and Trypillia, are likely to be present in the Eneolithic burials of the northwest Pontic (Nikitin et al., 2017) as well, including those interred at Mayaky. At the whole-genome level, burials attributed to the Usatove culture at Mayaky display a mixture of steppe, Trypillia and North Caucasus ancestries (Nick Patterson, personal communication, 2021). The North Caucasus ancestral component, associated with the Caucasus Hunter Gatherer (CHG) ancestry, likely comes from the Novodanylivka branch of the SuNo group (Mathieson et al., 2018).

The Usatove attribution of the Usatove-designated burials at Mayaky comes from the archaeological designation based on the pottery topology and a series of dates from the ditches at the Mayaky sanctuary adjacent to the necropolis. However, radiocarbon dating on human remains from some of these burials produced dates in the 4450–4239 cal BCE range, several hundred years older than the current Usatove chronology (Petrenko et al., 2018; Petrenko and Kaiser, 2011). It is possible that these dates are influenced by a Reservoir Effect (RE), which ages the dates due to the consumption of "old" carbon coming from aquatic systems (freshwater and marine) in AMS radiocarbon assays, where a ratio of carbon isotopes is used for chronological age determination.

One of the indicators of a RE influence is elevated ratios of stable isotopes of nitrogen, ^{15}N:^{14}N, expressed as $\delta^{15}N‰$ (permille). In organic tissue, nitrogen comes from dietary protein. In humans, the diet based on plants and mostly domesticated herbivores, aka. typical Neo-Eneolithic "farming" diet such as that of the LBK and Trypillia groups, produces nitrogen ratios between 8.9 and 10.8‰ (Goslar et al., 2017; Lillie et al., 2018; Nikitin et al., 2019), reflecting a ca. 3‰ enrichment between herbivores and herbivore consumers. Nitrogen ratios above 11‰, in combination with ratios of stable isotopes of carbon atypical for terrestrial sources, indicate a subsistence based on aquatic proteins. $\delta^{15}N$ ratios of the Usatove-attributed interments at Mayaky reach almost 16‰ (Petrenko et al., 2018; Petrenko and Kaiser, 2011), ranking them among the highest of all European human populations studied to date.

The most apparent reason for high $\delta^{15}N$ ratios in the Usatove-attributed human remains at Mayaky is the consumption of freshwater and brackish fish. Fish bones compose 20% of all osteological remains at Mayaky (Patokova et al., 1989). Paleozoological analysis revealed that the dominant fish species at Mayaky were Cyprinidae at 21.58% of total fish remains, followed by catfish at 16.1% and sturgeon at 8.51% (Petrenko and Kaiser, 2011). It was also noted since the early Usatove excavations that the diet of Usatove inhabitants incorporated ample quantities of marine, brackish and freshwater mollusks (Zbenovich, 1974). It has been shown that the $\delta^{15}N$ ratio in marine bivalves can reach around 10‰ in shallow waters (Gillikin et al., 2017). The ca. 20% of dietary protein coming from freshwater fish would lead to a reservoir offset of around 250 years (Allentoft et al., 2022). However, if aquatic protein was mostly coming from the Black Sea or brackish sources, this offset can be as high as 545±70 years (Cook et al., 2009). At the same time, to reliably estimate the actual reservoir offset at Mayaky, contextual animal remains would need to be used for comparison, which is currently not available. As we look forward to the comparative faunal remains from Mayaky to become available at some point in the future, we would like to propose, in the meantime, the influence of marine/brackish/freshwater RE on absolute dates from the human remains at Mayaky, based on the presence of the evidence of aquatic protein consumption at the site. Thus, the absolute ^{14}C dates from Usatove-attributed human remains at Mayaky (Petrenko et al., 2018; Petrenko and Kaiser, 2011) should be adjusted using the 475–615 years reservoir offset, placing them in ca. 3835–3765 cal BCE range.

There are several other factors that could have led to the high $\delta^{15}N$ values at Mayaky. Among these are the water and nutrient stress, reliance on sedges (Cyperaceae) and other marsh plants as well as marine algae in animal diet. It has been shown that algal/sedge consumption can elevate $\delta^{15}N$ values in two full trophic levels (Adams and Sterner, 2000). Cyperaceae grow in abundance along the Dniester estuaries. In addition, seaweed consumption by domestic livestock (sheep) was proposed to have been part of the animal herd subsistence at Mayaky (Patokova et al., 1989). Modern-day North Ronaldsay Sheep, the oldest breed of sheep in Northern Europe from the coastal areas of the Orkney Archipelago in Scotland, have been reported to sustain and thrive on a seaweed diet ("Farmers to help preserve uniqueness of North Ronaldsay sheep," 2019). The consumption of meat from animals feeding on algae/sedges would likely lead to the enrichment in old carbon through the food chain, thus contributing to a RE on radiocarbon dates obtained on the biological remains of the consumers.

Another reason for the high $\delta^{15}N$ ratios is the consumption of salted fish and animal meat. Animals preferentially accumulate ^{15}N nitrogen isotopes during amino acid synthesis (Adams and Sterner, 2000). Theoretically, food preservation such as salting desiccates the tissue, leading to protein fibers becoming more compact, thus leading to higher intake of ^{15}N isotopes per unit of animal protein compared to consuming fresh animal tissue.

Thus, consuming preserved food can, in theory, elevate the $\delta^{15}N$ ratios. Mayaky contains evidence of fish processing on an industrial scale (Petrenko an Kaiser, 20111; Zbenovich, 1974), which would most likely require salting and smoking the fish for preservation of large quantities of fish meat.

Taken together, we propose that Usatove culturally and biologically began as an amalgam of cultural and biological ancestries of SuNo, Trypillia, VKG, and North Caucasus, that came together in the northwest Pontic steppe at the end of the 5th to beginning of the 4th millennium BCE, leading to the formation of Usatove by the end of the first third of the 4th millennium BCE, RE-adjusted. The AMS dates from human remains at Mayaky attributed to the Usatove culture are affected by the RE, offsetting the absolute ^{14}C dates by over 600 years. Based on pottery topology and ^{14}C dates from the Mayaky sanctuary, Usatove existed at least till the end of the 4th millennium. It is likely that Usatove, much like their Trypillian relatives, was absorbed/transformed by the expanding Yamna groups in the early 3rd millennium BCE.

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