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ARTICLES

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BESIDE OR BY TURN? THE BUH-DNISTER FORAGERS AND THE LINEAR BAND POTTERY FARMERS ON THE SOUTHERN BUH RIVER (UKRAINE)

ABSTRACT

Haskevych D. 2021. Beside or by turn? The Buh-Dnister foragers and the Linear Band Pottery farmers on the Southern Buh River (Ukraine). *Sprawozdania Archeologiczne* 73/1, 9-55.

For a long time, finds of the Linear Band Pottery culture (LBK) on the Southern Buh numbered only two bowls from the Buh-Dnister culture site of Bazkiv Ostriv. After the recent discovery of a few more vessels and four stationary LBK settlements, some scholars have assumed the Neolithic incomers regularly inhabited the most of the region. However new direct AMS dates on the Buh-Dnister pottery have shown the existence of the indigenous hunter-gatherers here from 5300 to 5000 BC. Therefore, today, the cluster of four sites is the only verified area that was settled by the early farmers near the town of Zavallia. The occurrence of the settlements at very this place is explained by the fertile local soil and the desire of the inhabitants to control the huge deposit of graphite, which was a centre of an extensive exchange network for the North-Pontic indigenous groups. This could have given the local LBK community significant social prestige through the active production and exchange of valuable goods.

Keywords: Neolithic, Linear Band Pottery culture, Southern Buh River basin, radiocarbon, ceramic imports, graphite

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INTRODUCTION

The Linear Band Pottery culture (LBK) is one of the most studied Neolithic cultures in Europe. Its bearers were the first farmers, settling large areas where the hunter-fisher-gatherer lifestyle predominated before. Therefore, the periphery of the culture is the most fertile ground for examining the interaction between societies of these two types during the classical Neolithization processes. Recently, they have been well studied for the northern LBK border in Poland and Germany (*e.g.*: Terberger and Kabaciński 2005; Czekaj-Zastawny *et al.* 2013; Czerniak *et al.* 2016; *etc.*). On the eastern border, in Ukraine, such works are at the initial stage now. A newly discovered cluster of LBK sites on the Southern Buh River (Kiosak 2017a) has raised the issue of the spatial and temporal relationship of the farming newcomers and the indigenous foragers of the Buh-Dnister culture (BDC). For a long time, it was believed only the latter populated the region, interacting and exchanging with their western neighbours as seen in the archaeological materials. But now, it is increasingly believed that the Southern Buh basin is a part of the LBK area (Kiosak 2013; Kiosak *et al.* 2014; Kiosak 2017a). In some publications, this region is included in the map of the LBK oecumene. Moreover, the disappearance of the Buh-Dnister traditions began to be considered as a possible result of the expansion of the LBK bearers there about 5300 BC. Therefore, finds that were previously treated as evidence of exchange came to be regarded as possible mixing of materials from different periods in collections of both cultures (Kiosak 2013, 77; 2016a, 143; 2017b, 131). This paper focuses on analyses of such cases and presents new facts, as well as the results of radiocarbon dating, in order to shed new light on the discussion of the natural-geographical and social context of the distribution of the LBK on the eastern border of its area.

1. CURRENT STATE OF ART

1.1. Possible evidence of interaction

During the last decades, many researchers have more or less exhaustively listed the finds providing evidence of contacts between the BDC and LBK groups (*e.g.*: Zvelebil and Dolukhanov 1991, 253; Bezusko and Kotova 1997, 148; Larina 1999, 99; Zvelebil and Lillie 2000, 74; Larina and Dergachev 2017, 132-133; Tovkailo 2005, 41; Haskevych 2007, 121; 2014, 5; Kiosak 2017a, 256; 2017b, 119-122, 129-131; Saile 2020). But here, all these finds will be reviewed again with an emphasis on some controversial and poorly elucidated issues regarding to both the artefacts themselves and the context of their discovery. They are given in chronological order according to the first publications, because this is important for understanding the creation of current views on the problem under discussion.

1.1.1. BAZKIV OSTRIV

48°33'07"N, 29°21'30"E (approximately)

Skybyntsi village, Haisyn district, Vinnytsia region, Ukraine (hereinafter, a location is given according to the new administrative division of Ukraine adopted in 2020).

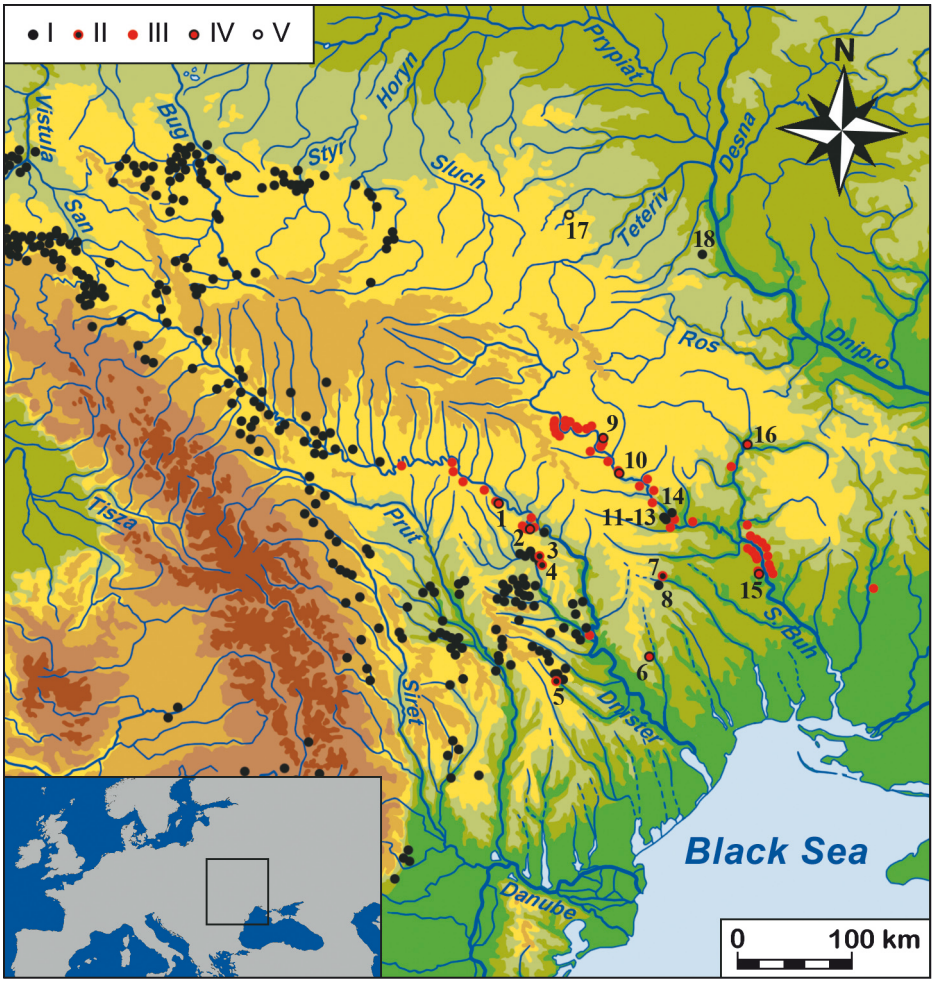


Fig. 1. The LBK and BDC sites between the Vistula, Danube and Dnipro (distribution of LBK sites after Lenartovych 2013, fig. 2, 3; Saile 2020, fig. 2, 9, 11; supplemented and with alterations). Only the main sites mentioned in the article have been numbered. Legend: I – LBK site; II – LBK site with BDC pottery; III – BDC site; IV – BDC site with LBK pottery; V – isolated find of LBK pottery. Sites: 1 – Tătăreuca Nouă XV; 2 – Soroca V; 3 – Gura Camencii VI; 4 – Ţâra II; 5 – Ruseştii Noi I; 6 – Hirzhove; 7 – Mainova Balka and Mainova Balka III; 8 – Ananiv; 9 – Shchurivtsi-Porih; 10 – Bazkiv Ostriv; 11 – Kamiane-Zavallia; 12 – Hnyla Skelia; 13 – Synie Ozero; 14 – Zhakchyk III; 15 – Gard; 16 – Dobrianka-3; 17 – Fasova; 18 – Vita Poshtova 2

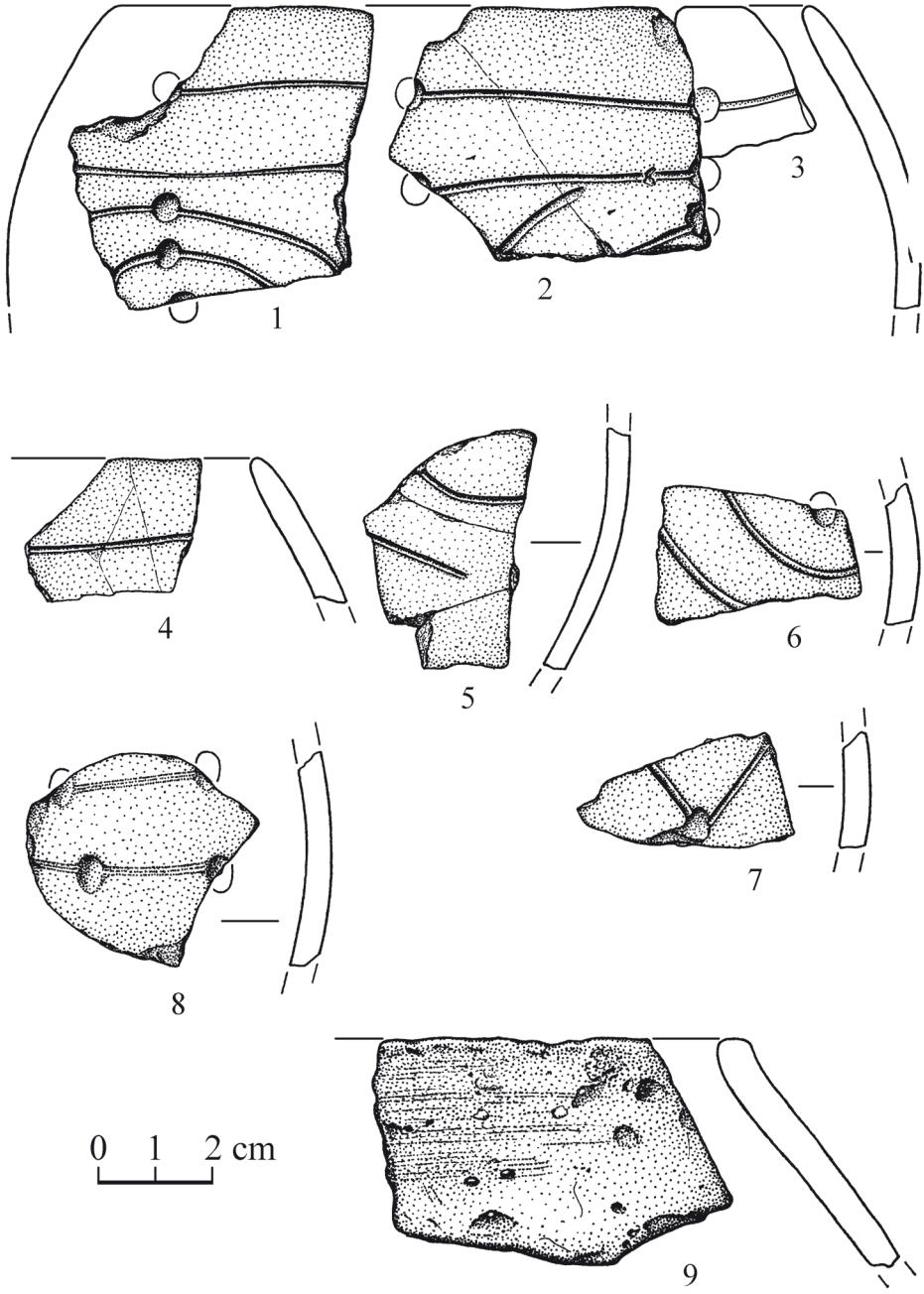


Fig. 2. The LBK pottery from the sites of Bazkiv Ostriv (1-7 – vessel No. 82; 8 – vessel No. 83) and Shchurivtsi-Porih (9). 3 – after Passek and Chernysh (1963, 13, fig. 3), 9 – after Haskevych (2008, 164, fig. 4: 1). Illustrations by D. Haskevych

The first of the materials of interest are the fragments of two LBK bowls with the "music-note" decoration from the BDC site of Bazkiv Ostriv, situated on the island of the same name in the middle of a rapid part of the Southern Buh (Fig. 1). One of these potsherds was found during the surveys in 1959. This provoked large-scale excavations on an area of more than 300 m², carried out by Valentine Danilenko the same year (Danilenko 1969, 62-70; Haskevych 2017). He discovered at least 9 more LBK fragments of small and medium size scattered in the northern and eastern parts of the excavation at a depth of 0.6-0.9 m. The distance between the potsherds most remote from each other is at least 20 m. There are 9 LBK fragments (3 of them are joined in one) in the collection now (Fig. 2: 1, 2, 4-8). Another potsherd is known only from a published drawing (Fig. 2: 3).

Tatiana Passek and Kateryna Chernysh published 3 fragments of one bowl in 1963 (Passek and Chernysh 1963, 13, fig. 3). However, they mistakenly interpreted these finds as fragments of two vessels. Afterwards, Danilenko graphically reconstructed them in the same way (Danilenko 1969, 66, fig. 16: 12, 13). Later, this mistake was corrected by Nadezhda Kotova (2002, 20, 168, fig. 44: 5; 2003, 28, 210, fig. 44: 5), but she did not identify the only fragment of the second vessel, a photo of which was published previously (Danilenko 1969, 68, fig. 19: 1).

At the turn of millennium, seven conventional radiocarbon dates were measured on animal bones from the site (Telegin *et al.* 2000, 63, 64; Burdo 2002, 433; Kotova 2002, 104; 2003, 139-140). They cover a range of 6426-5374 years BC; in this article, all ^{14}C dates have been calibrated using OxCal v 4.3.2 software (Bronk Ramsey 2009) and the IntCal13 atmospheric curve (Reimer *et al.* 2013), and are given with a 95.4% confidence level. Information about seven new AMS dates obtained in 2019 will be presented below.

1.1.2. RUSEŞTII NOI I

46°55'22"N, 28°40'08"E

Ruseştii Noi village, Ialoveni district, Republic of Moldova

There is a lower LBK layer in the multilayered site of Ruseştii Noi I, situated on the left bank of the Botna River (Fig. 1). Vsevolod Markevich excavated the site on a total area of 308 m² in 1960 and between 1962-1964 (Larina and Dergachev 2017, 229-232). Among the Neolithic finds, one fragment of a vessel made of paste tempered with a graphite and vegetation admixture and decorated with coupled strokes was regarded by him as BDC pottery (Markevich 1973, 24-25; 1974, 117, 130). Later, Kotova published an outlined drawing of one potsherd from the site. She described it as being decorated with "imprints of a comb stamp" (Bezusko and Kotova 1997, 149, 150, fig. 1: 1). However, it is not clear whether Markevich previously mentioned just this fragment or some other.

1.1.3. ȚÂRA II

47°50'05"N, 28°24'37"E

Țâra village, Floreşti district, Republic of Moldova

The LBK settlement of Țâra II, situated on the left bank of the Reut River (a right tributary of the Dnister), was discovered by Markevich in 1958 and excavated by Passek in 1959-1960 (Fig. 1, Passek and Chernysh 1963, 29-30; Larina and Dergachev 2017, 167-169). Her oral report about one potsherd of a BDC vessel found on the surface was published by Markevich (1973, 22). Any information about it is missing.

1.1.4. SOROCA V

48°07'54"N, 28°19'14"E

Soroca city, Soroca district, Republic of Moldova

The next published LBK vessel in a BDC context was found at the site of Soroca V, situated on the right bank of the Dnister (Fig. 1). Markevich discovered and excavated the site on an area of 60 m^2 in 1966 (Markevich 1974, 102-118). Its date, estimated by one conventional ^{14}C measurement on charcoal of *Fraxinus sp*. from a fireplace, falls into the time span of 5631-5235 years BC (Quitta and Kohl 1969, 250). The find in question was described as *"a fragment of a thin-walled vessel <...> decorated with a thin drawn line with a pit"* (Markevich 1974, 116, 130). Many authors mentioned this potsherd, but its repre-sentation has never been published.

Much later, a group of researchers saw a "clear LBK influence" in the shape of one pot from the site (Larina *et al.* 1999a, 19; Larina and Dergachev 2017, 132). According to Markevich (1974, 116, fig. 65: 3), this vessel was made using typical Buh-Dnister technology. Interestingly, Mykola Tovkailo associates such a shape with the early Trypillia culture (Tovkailo 2005, 32). In addition, it occurs in both fine ("table") and coarse ("kitchen") ware of the Criş sites in Moldova (Dergachev and Larina 2015, 152, 157, fig. 105: 11, fig. 109).

1.1.5. MAINOVA BALKA

47°43'13"N, 30°03'05"E

Ananiv town, Podilsk district, Odesa region, Ukraine

For a long time, Mainova Balka was the easternmost known site of the LBK. Serhiy Dvorianinov discovered it in 1976, to the north-east of the town of Ananiv, on the bank of a small brook that flows along the bottom of a ravine to the Tyligul River, which flows into the Black Sea between the Dnister and Southern Buh estuaries (Fig. 1). The finds collected on the surface were published in his article, where the author suggested that the population of the LBK "forced out" the population of the BDC from the Buh-Dnister interfluve

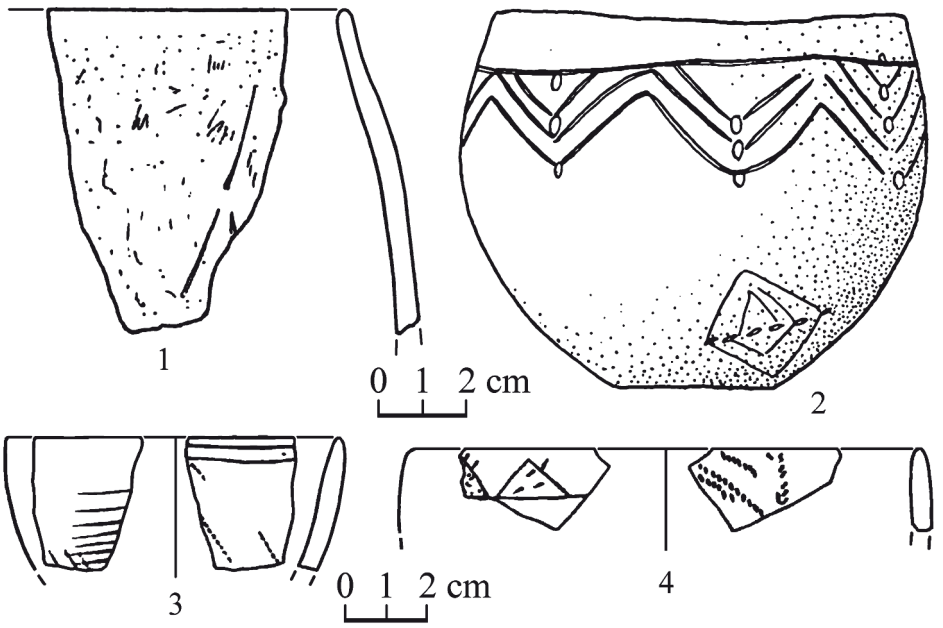


Fig. 3. 1 – The BDC vessel from the LBK site of Mainova Balka (after Larina *et al.* 1999a, 13, fig. 2: 10); 2 – the LBK bowl from the BDC site of Gard (after Tovkailo 2014, 202, fig. 11: 3); 3, 4 – syncretic (?) vessels from the LBK site of Gura Camencii VI (after Larina and Dergachev 2017, 277, fig. 27: 4, 5)

(Dvorianinov 1982). Ihor Sapozhnikov and Vladislav Petrenko excavated a test-trench of 10 square meters on the site in 1989. The trench opened a part of some deeper feature. Among the finds within, some potsherds of the BDC pottery were identified. Only one of them was published (Fig. 3: 1). It is a fragment of the cylindrical upper part of a vessel with a rim 20 cm in diameter. There is an abundant admixture of organic fibres as well sand and graphite in its clay. Incised diagonal lines are scarcely observable on its outer surface (Petrenko and Dvorianinov 1991; Petrenko and Sapozhnykov 1993; Larina *et al.* 1999a, 13, 19, fig. 2: 10; Larina *et al.* 1999b, 27, 31, fig. 2: 10). Two conventional ^{14}C dates measured on animal bones from the test-trench fall into the wide time span of 5630-4906 years BC (Sapozhnykov and Sapozhnykova 2005, 91, tab. 1).

Publishing his results, Dvorianinov mentioned in passing that one LBK "music-note" potsherd was found by him to the south of Ananiv. But, in the figure, he illustrated 15 fragments of pottery and 3 flint artefacts from the site, which he called "Ananiv" in the caption (Dvorianinov 1982, 94, 95, fig. 1: 20, 25-40, 42). Later, the discovery of LBK materials at the site of Mainova Balka III, situated a little bit to the north, across the small intermittent brooklet from Mainova Balka, was mentioned. It has not been ruled out that these sites are two parts of one settlement (Petrenko *et al.* 1993, 106).

1.1.6. TĂTĂREUCA NOUĂ XV

48°19'26"N, 27°58'52"E

Tătăreuca Nouă village, Donduşeni district, Republic of Moldova

A team headed by Valentine Dergachev and Klaus-Peter Vechler discovered and explored the BDC site of Tătăreuca Nouă XV on the right bank of the Dnister (Fig. 1) between 1996-1997 (Larina *et al*. 1997, 107-109). Remains of 50-60 vessels were found in the excavations, which covered a total area of 150 m^2. Analyzing them, Larina vaguely describes 12-13 vessels as *"connected with the LBK tradition through decorations"*, *"made in the LBK traditions"*, or as containing *"the LBK component"*. In the figure captions, she labelled three vessels as linear-band ones, and 12 others as linear-band "derivates" (Larina 2006, 42-44, 46, fig. 5). As a result, she decided that the site reflects some syncretic phenomenon, comprising traditions of the local BDC and the final LBK population, influenced by incomers from northern territories of the mixed forest zone of the Upper Dnister and/or Volhynia (Larina 2006, 50-52). Recently, 54 fragments of 14-16 vessels from the site were similarly called linear-band (Larina and Dergachev 2017, 235, 349, plate 99).

Four ^{14}C dates on three samples from the site were measured at the Kiel and Gliwice Laboratories. The AMS date of charred residue on the surface of a vessel indicated a time span of 5478-5081 BC, and another on antler yielded a date of 4882-4690 BC. One conventional date from animal bone fell into the middle Eneolithic (Wechler 2001, 29, 30).

1.1.7. GURA CAMENCII VI

47°53'02»N, 28°22'21»E

Gura Camencii village, Floreşti district, Republic of Moldova

The LBK settlement of Gura Camencii VI, situated on the left bank of the Reut (Fig. 1), was discovered by Markevich in 1960 and excavated by Makarova in 1974 (Passek and Chernysh 1963, 29; Larina and Dergachev 2017, 161-166). Potsherds of two semi-spherical bowls (Fig. 3: 3, 4), described as having been made with LBK technology and decorated with thin, incised lines as well as long imprints of a multitoothed stamp on the inside and outside, were found among the surface materials from the site. Larina treats them as indicators of eastern influence from the BDC area or from the even more distant territory of the Surskyi culture (Larina 1999, 81, 104, fig. 88: 1, 2; Larina *et al*. 1999a, 18, fig. 5: 1, 2; Larina and Dergachev 2017, 133, 277, plate 27: 4-5).

1.1.8. DOBRIANKA-3

48°46'19"N, 30°53'19"E

Pishchana village, Zvenyhorodka district, Cherkasy region, Ukraine

The multilayered site of Dobrianka-3 was discovered by Stanislav Smirnov in 1972. It is situated on a 17 m high granite elevation of the left bank of the Tikych River, which flows

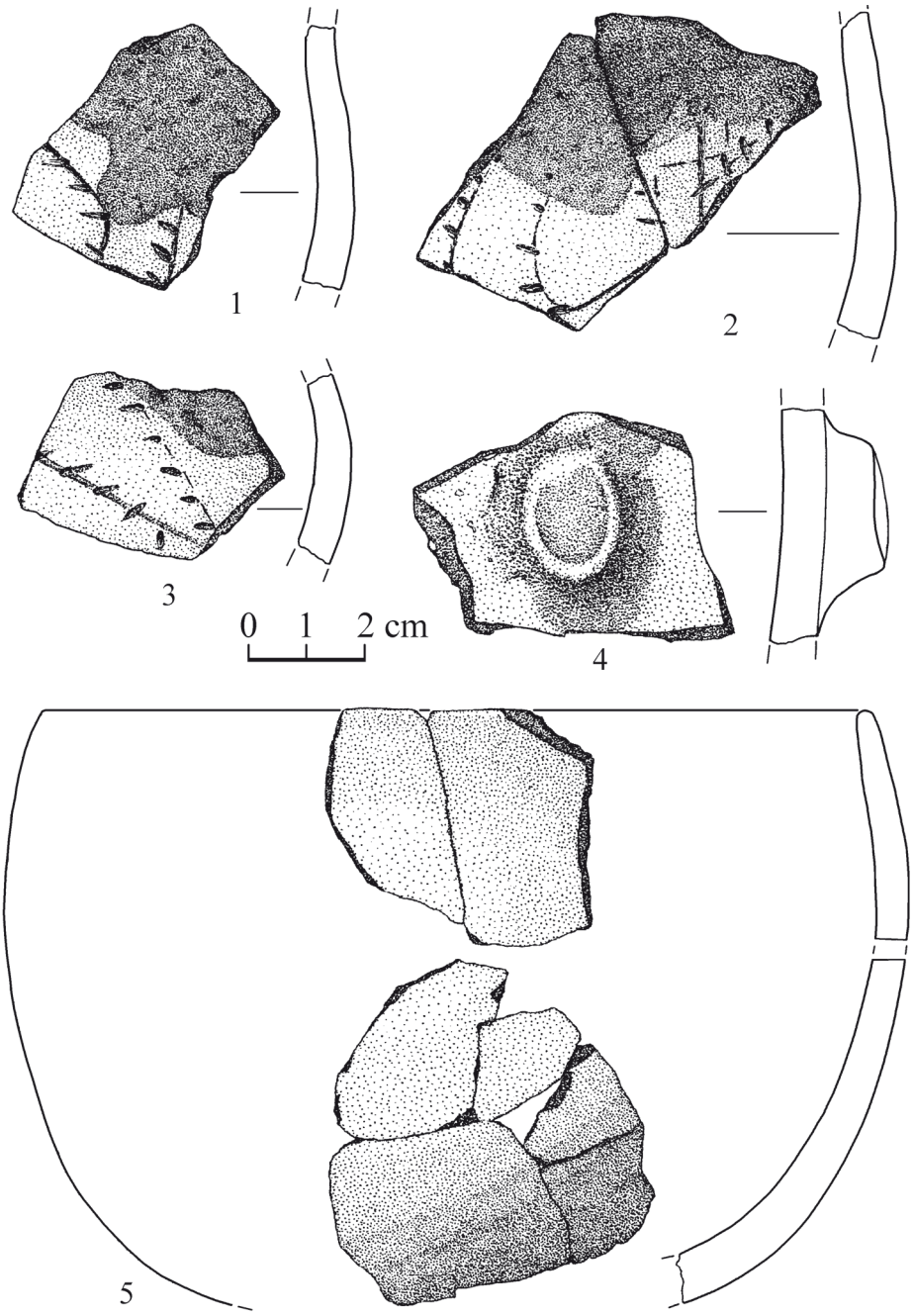


Fig. 4. The LBK vessels (1-5) from the BDC site of Dobrianka-3 (after Zalizniak *et al*. 2013, 228, fig. 25: 4-8). Illustrations by Andrii Sorokun

to the Syniukha River – a left tributary of the Southern Buh (Fig. 1). Leonid Zalizniak and Tovkailo excavated the site on a total area of about 185 m² in 2003-2006. In December 2004, viewing the BDC finds from there, the author of this paper attributed two potsherds to one fine LBK bowl with Šárka decoration (Fig. 4: 1-3). This was reflected in some articles by the excavators (Zalizniak *et al.* 2005a, 12, 13, fig. 4: 14; Zalizniak *et al.* 2005b, 99, 112, fig. 6: 14). But in their last, more complete publication of the site, 12 fragments of three LBK vessels (Fig. 4) were already mentioned (Zalizniak *et al.* 2013, 228, 234, fig. 25: 4-8).

In total, 10 radiocarbon measurements date the site. Six of them are conventional, obtained at the Kyiv laboratory on samples of animal bones and organic inclusions in ceramic paste. They cover the period from the middle of 7th to the middle of the 6th millennium BC (Zalizniak and Manko 2004, 141, 145). An AMS date measured at the Oxford Laboratory on a human bone from an individual buried stretched on his back, also fell into this period. Another AMS Oxford date on an auroch bone points to the Preboreal (Lillie *et al.* 2009, 260). Two AMS dates on animal bones measured at the Groningen Laboratory fall into the late Eneolithic and the middle Bronze Age (Biagi *et al.* 2007, 27). The fact that the last two samples were taken from the "Mesolithic" layer confirms the mixing of materials from different periods, previously noted by Zalizniak and co-authors (Zalizniak and Manko 2004, 138, 141, 142; Zalizniak *et al.* 2005a, 9; Zalizniak *et al.* 2005b, 97, 100).

1.1.9. SHCHURIVTSI-PORIH

48°49'57"N, 29°08'04"E (approximately)

Shchurivtsi village, Haisyn district, Vinnytsia region, Ukraine

The BDC site of Shchurivtsi-Porih, located on the left bank of the Southern Buh (Fig. 1), was discovered and investigated by Pavlo Khavliuk and Valentine Danilenko in 1955 and 1957. They cleaned off an outcrop on a steep edge of the lower river terrace, about 100 m long (Danilenko 1969, 117-118; Haskevych 2008, 169-173). The author of this paper attributed one, non-decorated potsherd to the LBK, after viewing collection of the site in 2007 (Haskevych 2008, 164, 170, fig. 4: 1). This is a fragment of the upper part of a coarse vessel with a strongly inverted rim 15 cm in diameter. The lip is flat and straight. The wall is 0.5-0.7 cm thick. The ceramic paste contains an admixture of gruss and a small amount of sand. The inner and outer surfaces are dark gray and uneven, with traces of smoothing and deep, cone-shaped defects (Fig. 2: 9). The fractures are dark grey too. Kiosak has also described this find as LBK (Kiosak 2017b, 120), but Saile considers it dubious (Saile 2020).

1.1.10. KAMIANE-ZAVALLIA

48°11'59"N, 29°59'58"E

Kamiane village, Podilsk district, Odesa region, Ukraine

This site, with flint finds from an indeterminate period of the Stone Age, was found by Volodymyr Stanko on the loess terrace of the right bank of the Southern Buh (Fig. 1),

across from Zavallia (Holovanivsk district, Kirovograd region) in 1974 (Smolianinova and Stanko 1976, 121). Prospecting by the survey team of the Odesa archaeological museum revealed many fragments of LBK pottery with "music-note" decorations at the same place in 2011 (Kiosak 2013; Kiosak *et al.* 2014). Since then, Kiosak has excavated a large area with some LBK features there (Kiosak 2017a; 2017b, 122-128). Two ^{14}C dates on animal bone and an ash (*Fraxinus*) charcoal fragment encompass a time span of 5295-4960 BC (Kiosak and Salavert 2018, 122, 124).

Furthermore, a local amateur archaeologist and history teacher at the Zavallia secondary school, Oleksander Peresunchak, recently found three more LBK sites in the vicinity of Kamiane-Zavallia (Kiosak 2017a, 254; 2018). These are the sites of Hnyla Skelia and Synie Ozero on the right bank of Southern Buh, and Zhakchyk III on the right bank of the Mohylnianka rivulet. All four mentioned sites have yielded no BDC materials so far. But two known BDC sites, Zavallia and Zhakchik, are just about 2 and 3 km, respectively, from Hnyla Skelia. Thus, the fact that the indisputable LBK settlement cluster was located directly on the Southern Buh next to the BDC sites has strongly influenced the discussed issue.

1.1.11. GARD

47°48'14"N, 31°10'15"E

Bohdanivka village, Voznesensk district, Mykolaiv region, Ukraine

The first BDC materials found at the multilayered site of Gard, situated in the valley of the Southern Buh, on the right bank of the river in an area with rapids (Fig. 1), were excavated between 1930-1931. Danilenko continued that research in 1949 (Danilenko 1969, 139). Tovkailo has been excavating the site on a large area since 2006 (Tovkailo 2010; 2014). He discovered one LBK bowl with "music-note" decorations (Fig. 3: 2) in the BDC layer (Tovkailo 2014, 201-203, fig. 11: 3). Six conventional ^{14}C dates, measured in the Kyiv laboratory on organic inclusions in the BDC pottery and humus soil from this layer, fall into a time span of 6006-5210 years BC (Tovkailo 2010, tab. 2; 2014, 233, tab. 3).

1.1.12. HIRZHOVE

47°05'45"N, 29°49'19"E (approximately)

Hirzhove village, Rozdilna district, Odesa region, Ukraine

The multilayered site of Hirzhove, situated on a hillock on the right bank of the Kuchurhan River, a left tributary of the Dnister (Fig. 1), was discovered by Pavel Boriskovskiy and Volodymyr Stanko in 1961 and excavated by them on a total area of 216 m^2 between 1962-1963. A very few ceramic and flint finds from there were attributed to the BDC at that time (Stanko 1966; 1967). Much later, reviewing the collection, Petrenko clearly referred 92 potsherds to the Neolithic. Moreover, he believed that one of them was an undecorated piece of the wall of an LBK vessel, based on its close similarity to the finds from Mainova

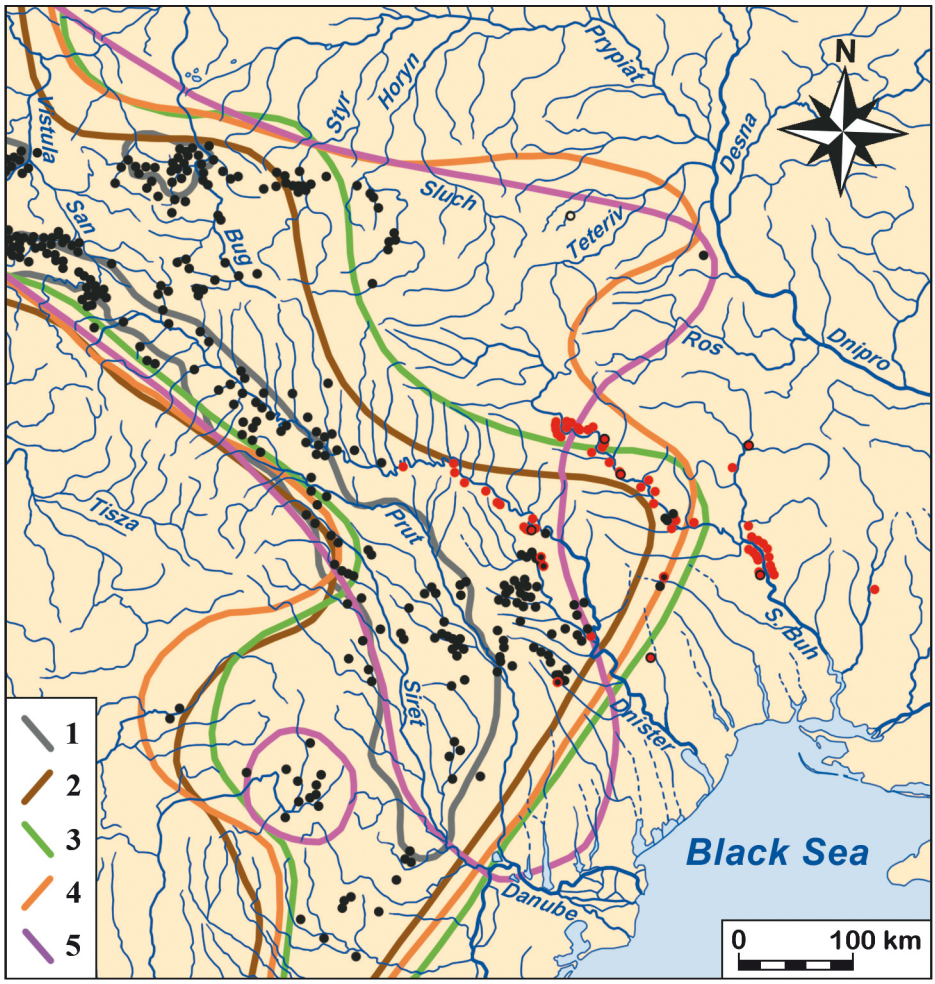


Fig. 5. The LBK and BDC sites between the Vistula, Danube and Dnipro (for detail, see Fig. 1) and some examples of the mapping of the eastern border of the LBK area. Legend: 1 – According to J. K. Kozłowski and S. K. Kozłowski (1977, 251, mapa 17); 2 – according to Lüning (1988, fig. 4); 3 – according to Bogucki (2000, 198, fig. 8: 1); 4 – according to Czekaj-Zastawny (2008, 33, fig. 1); 5 – according to Kadrow and Rauba-Bukowska (2017, 262, fig. 1)

Balka (Petrenko 2012, 234-236). Haskevych (2014, 5; Gaskevych 2015, 191) and Kiosak (2017a, 256; 2017b, 119-120) mentioned this in their publications, but Saile considers that attribution unconvincing (Saile 2020).

Two conventional ^{14}C dates on organic inclusion in one fragment of the BDC pottery from the site were measured at the Kyiv laboratory. They fall into a time span of 6465-5668 years BC, which agrees with the conventional dates on two animal bones that had

previously been connected with the Mesolithic materials (Stanko and Svezhentsev 1988, 117; Manko 2006, 19).

The mention of two more finds not itemized here may also have influenced the views of some researchers. Zbenovych saw a fragment of a thick-walled vessel with a pattern that reminded him of the Šárka decoration among pottery from the BDC site of Savran, excavated by Danilenko on the Southern Buh in 1949 and 1955. Thanks to the thorough description of this potsherd, published by Zbenovich in 1989 (176), the author of this paper was able to confidently identify it in the collection. It turned out to be a rim of a rare vessel with a typical *Cardium* decoration. An abundant admixture of the valves of brackish seed shrimps of *Cyprideis torosa littoralis* in its ceramic paste indicates that it was made on a seashore (Gaskevych 2011, 277, fig. 1: 1). The second such find included some LBK pottery at the BDC settlement of Tsekynivka on the Dnister, which Marek Zvelebil and Malcolm Lillie (2000, 74) briefly mentioned without any specified information or references.

Two conclusions are possible from the above overview:

1) only five of the twelve examined cases are connected to the Southern Buh catchment (Bazkiv Ostriv, Dobrianka-3, Shchurivtsi-Porih, Kamiane-Zavallia and Gard);

2) among them, two LBK bowls from Bazkiv Ostriv, first published in 1963, remained the only evidence of the possible BDC – LBK contacts in this region until 2005.

However, already at the end of the 20th century, most of the Southern Buh basin began to be mapped as part of the LBK area (Fig. 5). Why?

1.2. The Southern Buh area on the LBK distribution maps

Upon first publishing the bowls from Bazkiv Ostriv in the catalogue of LBK settlements from the territory of the Soviet Union, Passek and Chernysh correctly called this site a "place of an isolated find" of the linear-band ware (Passek and Chernysh 1963, 6, fig. 2: 1). However, later, Telehin mapped Bazkiv Ostriv with the same mark as the rest of the LBK settlements (Telegin 1979, 230, fig. 1: 32). Moreover, he placed this mark about 50 km upstream of the real location of the site. It should be stressed that Bazkiv Ostriv is not mentioned in the text of his article, and the number of the mark is omitted in the explanation of the LBK affiliation of the sites in the caption under the map. However, some researchers did not pay attention to this nuance. Janusz K. Kozłowski republished Telehin's figure without the numbers and list of mapped sites (Kozłowski 1985, 68, fig. 12). As a result, the only mark on the Southern Buh is perceived here as a full-fledged LBK settlement without any restriction. It seems that this was a reason for expanding the LBK area to the middle reaches of the Southern Buh on the well-known maps of Jens Lüning (1988, fig. 4) and Peter Bogucki (2000, 198, fig. 8: 1).

Unlike the Central European archaeologists, researchers from Ukraine and Moldova definitely connect Bazkiv Ostriv with the BDC. Thus, Larina mapped one unnamed site with the *"LBK materials in a foreign cultural environment"*, situated on the Middle Buh,

in some of her works. Following Telehin, she marked it northwest of the real location of Bazkiv Ostriv. This error is about 60, 90 and 100 km in a straight line in the different publications (Larina 1999, 11, fig. 1, 2; 2006, 53, fig. 7; 2009, 51, fig. 1; Larina and Dergachev 2017, 9, fig. 3). The fact that all these cases pertain to the same settlement is confirmed by another map, on which it is called "Bazkiv Ostriv" and marked even further, on the right bank of the upper reaches of the Southern Buh near town of Khmelnyk, approximately 155 km in a straight line from its actual location (Larina 2009, 58, fig. 4: 35). On the other hand, Bazkiv Ostriv is mapped absolutely correctly in Larina's other works published at the same times (Larina 1994, 58, fig. 1: 6; Larina and Kuzminova 1994, 238, fig. 1: 6; Larina *et al.* 1999b, p. 30 fig. 1: 3).

The previous confusion over the location of Bazkiv Ostriv has passed into publications by Agnieszka Czekaj-Zastawny. According to a caption under her LBK distribution map, it was drawn up using the data of both Bogucki and Larina. As a result, she included both the Upper and Middle part of the Southern Buh basin in the LBK area (Czekaj-Zastawny 2008, 33, fig. 1). Maciej Dębiec and Thomas Saile mapped one unnamed LBK site on the upper reaches of the Southern Buh, and the second one somewhat to the north (Dębiec and Saile 2015, 16 Abb. 15; Saile 2020, fig. 2). The grounds for this were also the marks on Larina's maps (Dębiec, personal communication 15.10.2020). The LBK area covers the upper part of the Southern Buh catchment on the map published by Sławomir Kadrow (Kadrow and Rauba-Bukowska 2017, 262, fig. 1; Kadrow 2019, 319, ryc. 1).

The given cases of the reiterated errors in the interpretation and mapping of Bazkiv Ostriv could leave the impression of a steady presence of LBK communities at different places on the Southern Buh banks. This impression could become yet stronger after the discovery of several LBK shards at Dobrianka-3 and Shchurivtsi-Porih. The erroneous treatment of Mainova Balka as being located in the Southern Buh basin (Dolukhanov *et al.* 2009, 102; Kiosak 2013, 75; 2017b, 121, fig. 4: caption; Kiosak *et al.* 2014, 85) could also have played a negative role. That is why the discovery of the first real long-term LBK settlement of Kamiane-Zavallia has promptly led to the supposition that *"two-thirds of the Bug-Dniester cultural territory <...> was a regular region settled by the LBK people rather than a rare invasion into the domain largely belonging to the Bug-Dniester culture. We expect more LBK sites to be found in this area"* (Kiosak 2017b, 128). The contradictions in the absolute chronology of the BDC were also used to support this view.

1.3. Problems in the absolute chronology of the BDC

The radiocarbon dating of the BDC is analyzed in several special publications (Haskevych, 2007, 2014, Haskevych *et al.* 2019), as well as in publications on other topics (*e.g.*: Tovkailo, 2005, 2014; Kiosak 2017b; Kiosak and Salavert 2018). A brief summary of how the problem that rose within this sphere at the turn of the millennium has influenced issue of LBK – BDC contacts is given below.

Only a few dates were measured on samples from BDC sites before 1997. They cover the period of the 60th-47th centuries BC, confirming the traditional view that the local Southern Buh and Dnister foragers lived side by side and had contact with the LBK farmers over several hundred years. A large series of dates encompassing the time span of the 65th-54th centuries BC was derived from bones from the Southern Buh BDC sites between 1997-2000 (Kotova 2002, 22-24, 103-104, table 9; 2003, 31, 32, 130-133, 139-140, table 9). Based on these dates, Kotova created her own periodization scheme, according to which the culture disappeared around 5300 BC. The previous dates, which contradict these views, were simply ignored by her without explaining the reason (Kotova 2002, 24, 40; 2003, 32, 58). However, some sites of the North steppe Southern Buh area, which yielded pottery that combined the traditions of the late BDC and the early Trypillia culture, were published in subsequent years (Tovkailo 2005, 37-39). Explaining this syncretism, Kotova supposed the BDC population existed up to 5000 BC despite the absence of relevant ^{14}C dates in the series she used (Kotova 2015, 46).

The divergent views regarding the BDC dates of 5300-5000 BC cast doubt on the existence of the indigenous, Southern Buh population at the time indicated by two dates from Kamiane-Zavallia. Therefore, Kiosak has questioned the organic linkage of the Linear Band "imports" with the rest of the materials found at the BDC sites (Kiosak 2016a, 143; 2017b, 137). Not least, this became possible due to the recent revision of the stratigraphy of the main BDC sites, explored by Danilenko on the Southern Buh in the 1950s.

1.4. Problems in stratigraphy of the BDC sites

Most of the BDC sites are situated in a river valley on the edge of periodically flooded river terraces, or just on riverbanks and islands at places well-suitable for fishing. Therefore, they were settled many times, and thick cultural levels, rich in materials of different times and cultures, arose there. It was these places that had attracted Danilenko, who was trying to get more finds from smaller areas during his rescue excavations before the construction of a cascade of reservoirs on the Southern Buh (Haskevych 2013; Haskevych *et al.* 2019, 217-219). However, in his publication of these sites, he always divided each into clear cultural layers with finds of distinctive types (Danilenko 1969, 62-139). This allowed him to propose a three-period chronological scheme of the BDC as a sequence of one non-pottery and six pottery phases. The researcher believed that the design of the pottery of each phase was characterized by a unique style (Danilenko 1969, 150-155). For example, at Bazkiv Ostriv, he clearly attributed the LBK bowls to the layer containing vessels decorated with the so-called "Samchyntsi" style (Danilenko 1969, 66).

A careful analysis of field reports and finds from a number of old sites, as well as new excavations carried out on some of them, has shown a lack of features and clearly distinguishable cultural layers there. Materials of different types and ages are mixed in most of the settlements that had been previously considered to be sites yielded reference collections of

certain periods and phases of the culture (Haskevych 2013; 2017). This enabled the following three conclusions to be drawn, which are important for the discussed issue.

1. The synchronicity of the LBK and BDC materials that were found nearby at the same depth in Bazkiv Ostriv, Dobrianka-3 and Gard, may be doubtful. Kiosak referred it to support his supposition.

2. The correlation of ^{14}C dates measured on bone with the finds of BDC pottery found near respective samples may also be erroneous. So, Kotova's scheme becomes questionable. Some vessels, which were considered by her as early, may actually be late, and vice versa. The start of the BDC around 6400 BC and its disappearance around 5300 BC become unconvincing too.

3. The future acquisition of new ^{14}C dates from bones or charcoal found in mixed contexts at sites explored decades ago and submerged afterwards (Bazkiv Ostriv, Shchurivtsi-Porig), or from recently excavated sites (Dobrianka-3, Gard), cannot provide a solution to the problem.

Based on the above, there are two more or less reliable ways to check the synchronicity of the BDC finds and the possible LBK "imports" in the Southern Buh catchment: a) direct radiocarbon dating of BDC pottery from sites with LBK potsherds; b) searching for syncretic vessels combining characteristic traits of the BDC and one of the other cultures, reliably dated to a time after 5300 BC, in collection of these sites.

The first data of both kinds have been recently obtained during research on materials from the site of Bazkiv Ostriv.

2. NEW DATA FROM THE BAZKIV OSTRIV SITE

2.1. New direct radiocarbon dates on BDC pottery

To begin addressing the problem in the BDC chronology, 11 direct AMS dates on pottery were measured within the framework of a special Japanese-Ukrainian archaeobotanical project at the Radiocarbon Dating Laboratory of the University Museum at the University of Tokyo in 2019. Nine fragments of BDC vessels with organic inclusions in their ceramic paste and two samples of carbonized crust on the surfaces of the potshards were selected from the collections of three sites: Shumyliv-Cherniatka, Hlynske I and Bazkiv Ostriv (Haskevych *et al.* 2019). The last site yielded seven dates, which cover a wide period between 6597-4847 BC (Tabl. 1, Fig. 6, 7).

An examination of the reliability of the new dates in light of the probable "old" carbon and freshwater reservoir effect (Haskevych *et al.* 2019, 230-232) has shown that the measurements on samples of vessel No. 23 (Fig. 6: 1), and vessel No. 21 (Fig. 6: 4) with a CO_2 content of 0.7% are the most questionable. It is noteworthy that one of them yields the earliest, very controversial date of the late first half of the 7th millennium BC (Fig. 7). The

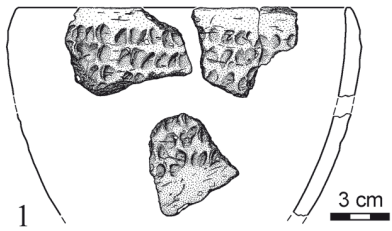
Table 1. Results of direct AMS radiocarbon dating on the BDC pottery from the Bazkiv Ostriv site (after Haskevych *et al.* 2019)

Lab No	Material	^{14}C age BP	Calibrated age cal BC (2σ)	CO_2 content (%)
Shumyliv-Cherniatka				
TKA-20826	Charred residues (inner)	5725±30	4683–4491	49.0
TKA-20827	Organic inclusions in the ceramic paste	5805±25	4723–4558	3.5
Hlynske I				
TKA-20828	Organic inclusions in the ceramic paste	7080±30	6016–5899	1.1
TKA-21090	Organic inclusions in the ceramic paste	7795±30	6686–6532	0.6
Bazkiv Ostriv				
TKA-20829	Organic inclusions in the ceramic paste	7710±25	6597–6477	0.7
TKA-20830	Organic inclusions in the ceramic paste	6855±30	5807–5666	1.1
TKA-20831	Organic inclusions in the ceramic paste	6625±25	5621–5514	2.4
TKA-20832	Organic inclusions in the ceramic paste	6970±25	5972–5769	0.7
TKA-20833	Organic inclusions in the ceramic paste	6190±35	5288–5030	1.1
TKA-20834	Organic inclusions in the ceramic paste	6040±25	5003–4847	5.6
TKA-21091	Charred residues (inner)	6145±35	5211–5000	21.3

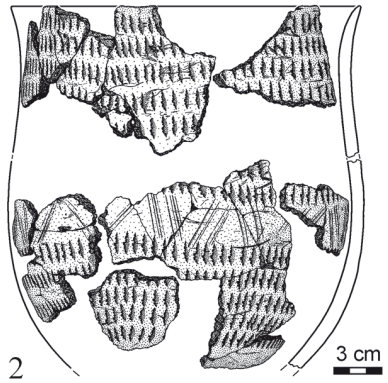
reliability of two measurements on samples of vessel No. 1 (Fig. 6: 2) and vessel No. 2 (Fig. 6: 5), both with a CO_2 content of 1.1%, is moderate. Finally, only three measurements on vessel No. 22 (Fig. 6: 3) and No. 39 (Fig. 6: 6) should be recognized as the most reliable. The partial overlap of the intervals of two dates from samples of different materials (organic inclusions and carbonized crust) taken from the same vessel (No. 39) confirms this too (Fig. 7).

Thus, the date of 5288-5030 BC (TKA-20833), of moderate reliability, as well as the dates of 5003-4847 BC (TKA-20834) and 5211-5000 BC (TKA-21091), of high reliability, indicate a time after 5300 BC. The period covered by them together accurately corresponds to the time of the two dates from Kamiane-Zavallia (Kiosak and Salavert 2018, 122). It should also be emphasized that the fragments of both vessels (No. 2 and No. 39) that yielded these dates were found in several compact clusters in the same part of the excavation with large fragments of LBK bowl No. 82.

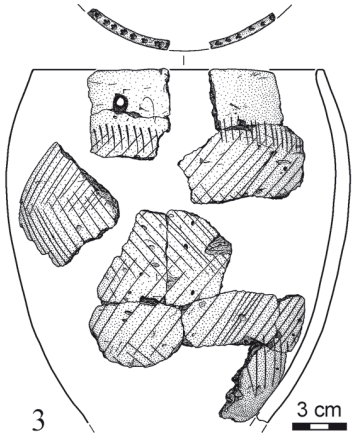
Typologically, both vessels are typical "Samchyntsi" ware, which was defined by Danilenko (1969, 118, 119). In general, vessels of this type are pots with rounded or pointed bottoms and slightly S-shaped, cylindrical, or oblong spherical bodies. They are mostly made of raw material with an abundant coarse-grained mineral admixture of quartz and



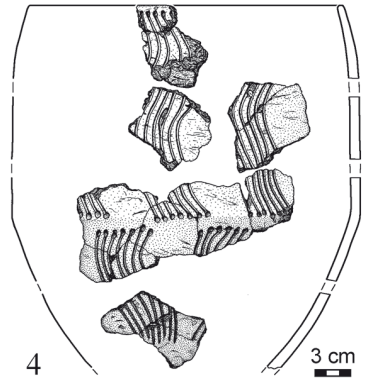
TKA-20829 – 7710±25 uncal BP (6597–6477 cal BC)



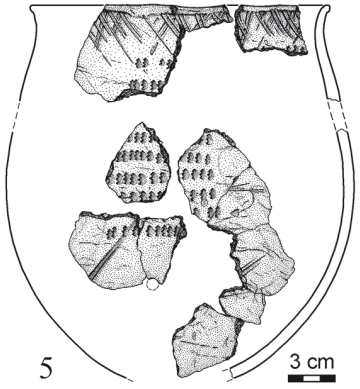
TKA-20830 – 6855±30 uncal BP (5807–5666 cal BC)



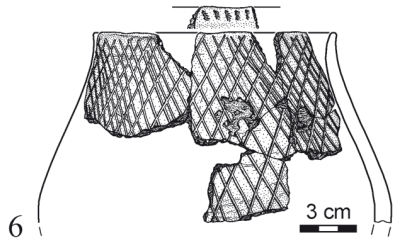
TKA-20831 – 6625±25 uncal BP (5621–5514 cal BC)



TKA-20832 – 6970±25 uncal BP (5972–5769 cal BC)



TKA-20833 – 6190±35 uncal BP (5288–5030 cal BC)



TKA-20834 – 6040±25 uncal BP (5003–4847 cal BC)
TKA-21091 – 6145±35 uncal BP (5211–5000 cal BC)

Fig. 6. Bazkiv Ostriv. The sampled BDC vessels and their direct AMS radicarbon dates; 1 – vessel No. 23; 2 – vessel No. 1; 3 – vessel No. 22; 4 – vessel No. 21; 5 – vessel No. 2; 6 – vessel No. 39 (after Haskevych *et al.* 2019). Illustrations by D. Haskevych

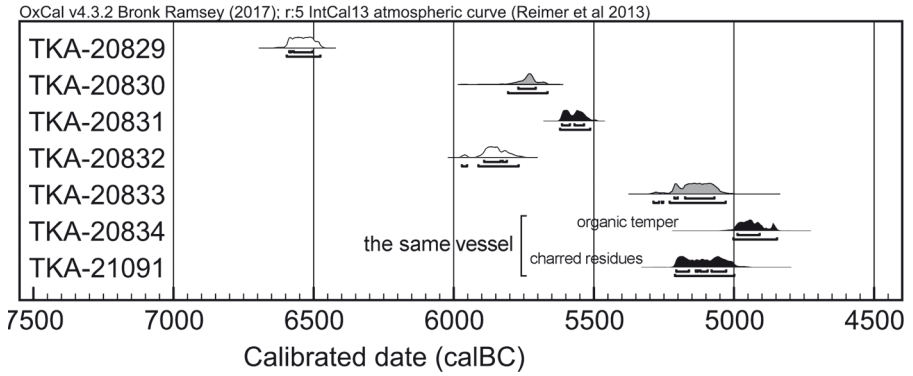


Fig. 7. Bazkiv Ostriv. Plot of the AMS dates, measured the samples with a CO_2 content of: white – 0.7%, grey – 1.1%, black – 2.4% or more (after Haskevych *et al.* 2019, 232, fig. 14)

feldspar gruss and a small admixture of fibrous organic remains. Inclusions of graphite, micaceous sand and crushed shells are more rare. The external surface is usually slightly burnished and most frequently dark grey or dark brown, and less often fulvous or reddish. Almost all vessels are decorated, frequently only on their upper part. The specific Samchyntsi-style design consists of rows of the elongated impressions of a notched stamp (including a comb), imprinted with the stab-and-drag technique, and arranged into an encircling horizontal belt or vertical zone. Sometimes, these belts or zones are separated off by horizontal or diagonal bunches of lines drawn with a notched stamp, or by such lines arranged into a grid or herringbone pattern. Another characteristic trait is the decoration of internal rims by one row of these impressions. Less frequent are a grid or some irregular angular figures applied with single, narrow, superficial lines (Haskevych 2008; Gaskevych 2011, 280-283).

Both the previously measured direct radiocarbon dates on pottery from the site of Dobrianka-1 (Manko 2013, 216; 2016, 271, 278) and the new date from vessel No. 1 from Bazkiv Ostriv indicate that the "Samchyntsi" ware appeared in the first half of the 6th millennium BC. Therefore, it was a customary type of ceramics for the local hunter-fisher-gatherers, and its production was ongoing at the time when the LBK groups settled the Southern Buh banks. Based on this, the sought-for syncretic vessels must combine some of the above characteristics with traits of pottery of the western cultures of the last quarter of the 6th millennium BC or later.

2.2. Pottery with traits of the Linear Circle

During excavation, the explored area of 247 m^2 was drawn on the field plans of the Bazkiv Ostriv site. Also marked on the plans are 1353 fragments of pottery. But today, the

collection of the Institute of Archaeology of the NAS of Ukraine includes only 701 potsherds of different times and cultures, recognised by the author of this article as comprising 90 vessels, which have been numbered for a renewed inventory list. The rest of the ceramic finds are considered to have been lost in the 1970s. About a dozen BDC vessels, identified as possibly syncretic, are subdivided into four groups by their dominant western feature.

2.2.1. PLASTIC APPLICATIONS

This kind of pottery decoration is absolutely non-typical for the Eastern European sub-Neolithic population, but characteristic for their western and southern agro-pastoral neighbours. At Bazkiv Ostriv, among the pottery made of ceramic paste with admixtures of abundant coarse minerals and relatively little vegetation, only vessel No. 64 is decorated with small knobs at the very edge of rim, as well impressions and incised lines below (Fig. 8: 1). No fewer than 9 of its fragments were found at a depth of 0.8-1 m in the western part of the excavation. Fragments with the knobs are absent in the collection now. One of them, however, is known from a published photo (Fig. 8: 1a). Describing the vessel, Danilenko calls the knobs "densely placed" (Danilenko 1969, 66, 68, fig. 18: 4). The photographed knob is flattened (lens-shaped?), vertical and about 1.5 cm large. Knobs of this shape, size, orientation and location rarely occur on pottery from LBK sites. For example, at Zwięczyca 3 in southeastern Poland, similar, densely placed knobs are reported on a vessel decorated with a human-face motif and regarded as "imported" from the Bükk culture area (Sebők 2014, 80, 81, 83, Abb. 20: 7). Also, vertical knobs about 2.5 cm to 5 cm large, applied beneath the rims of the vessels, were noted on wares from that site (Dębiec 2014, 214, 221, 237, Taf. 55: 3, Taf. 62: 7, Taf. 78: 13). The row of impressions is rather traditional for BDC pottery. A zone filled with diagonal incised lines arranged into a herringbone pattern occurred on pottery of the both the cultures of the Eastern Linear circle (*e.g.*: Kalicz and Makkay 1977, 301, 330, 338, Taf. 93: 1, Taf. 126: 9, Taf. 137: 9, 12) and the late BDC sites in the Southern Buh basin (Danilenko 1969, 125, fig. 98; Tovkailo 2005, 129, 130, fig. 47: 13, fig. 48: 7). A shape of vessel No. 64 may be restored very approximately.

2.2.2. CARINATED SHAPE

In the 6th-5th millennium BC, biconical vessels were not made by hunter-gatherers in the territory of Ukraine; rather, preference was given to more easily produced conical and cylindrical shapes. At Bazkiv Ostriv, among the ware designed with Samchyntsi technology, vessel No. 76, published by Danilenko (Danilenko 1969, 66, fig. 16: 10), has the sharpest body corner. Just two joined fragments found on the surface represent it. Double horizontally incised lines run around the vessel above and below the rib, which has a diameter of 15-16 cm. Groups of diagonally incised lines extend up and down from them

(Fig. 8: 3). The less pronounced, more rounded body corner is visible on vessel No. 50 that is firstly published here. It is scantily decorated with two rows of fingernail imprints under the outside rim, and one row of such imprints on the very edge of the inner rim (Fig. 8: 2). Five fragments of this vessel were found in the western part of the excavation, at a depth of 0.7-0.8 m.

It is believed that in Southeastern Europe, the spread of biconical pottery is associated with the emergence of the Vinča culture. As Agathe Reingruber has pointed out, although this happened about 5300 BC (according to the radiocarbon dates from the eponymous tell), earlier carinated vessels are known to the east and north of the Danube (Reingruber 2018, 85-92). In particular, they were found at some Körös sites in Eastern Hungary

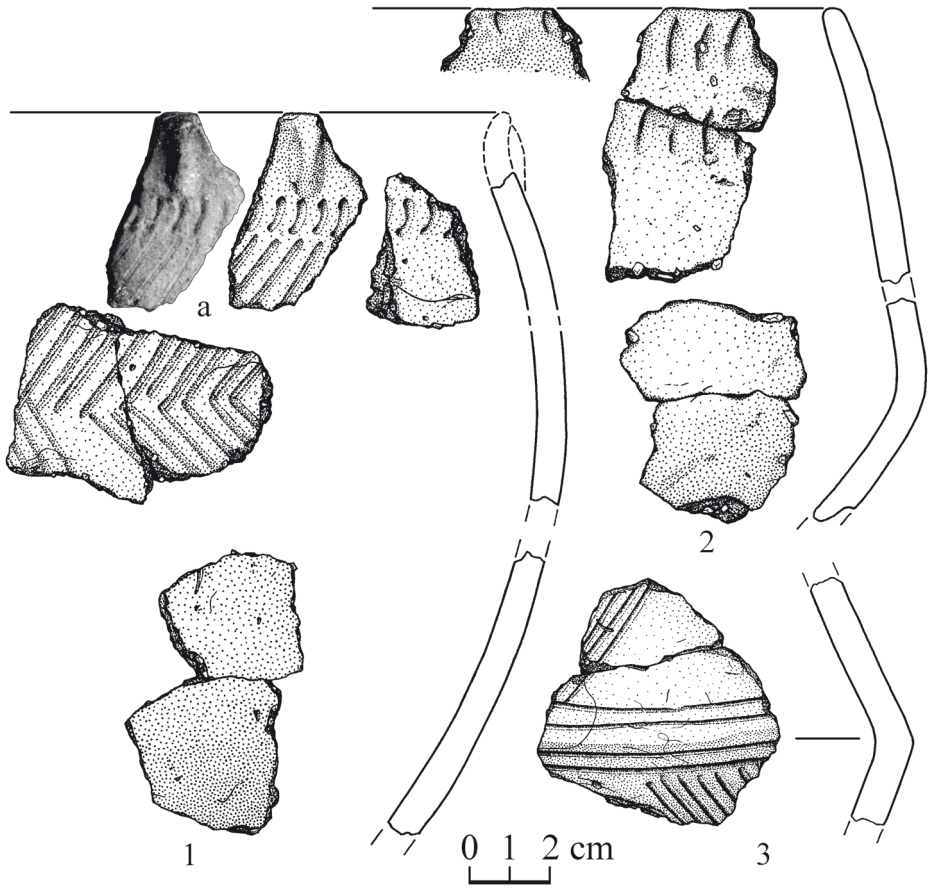


Fig. 8. Bazkiv Ostriv. 1 – vessel No. 64 with plastic applications (1a – after Danilenko 1969, 68, fig. 18: 4); 2 – vessel No. 50 with rounded body corner; 3 – vessel No. 76 with sharp body corner. Illustrations by D. Haskevych

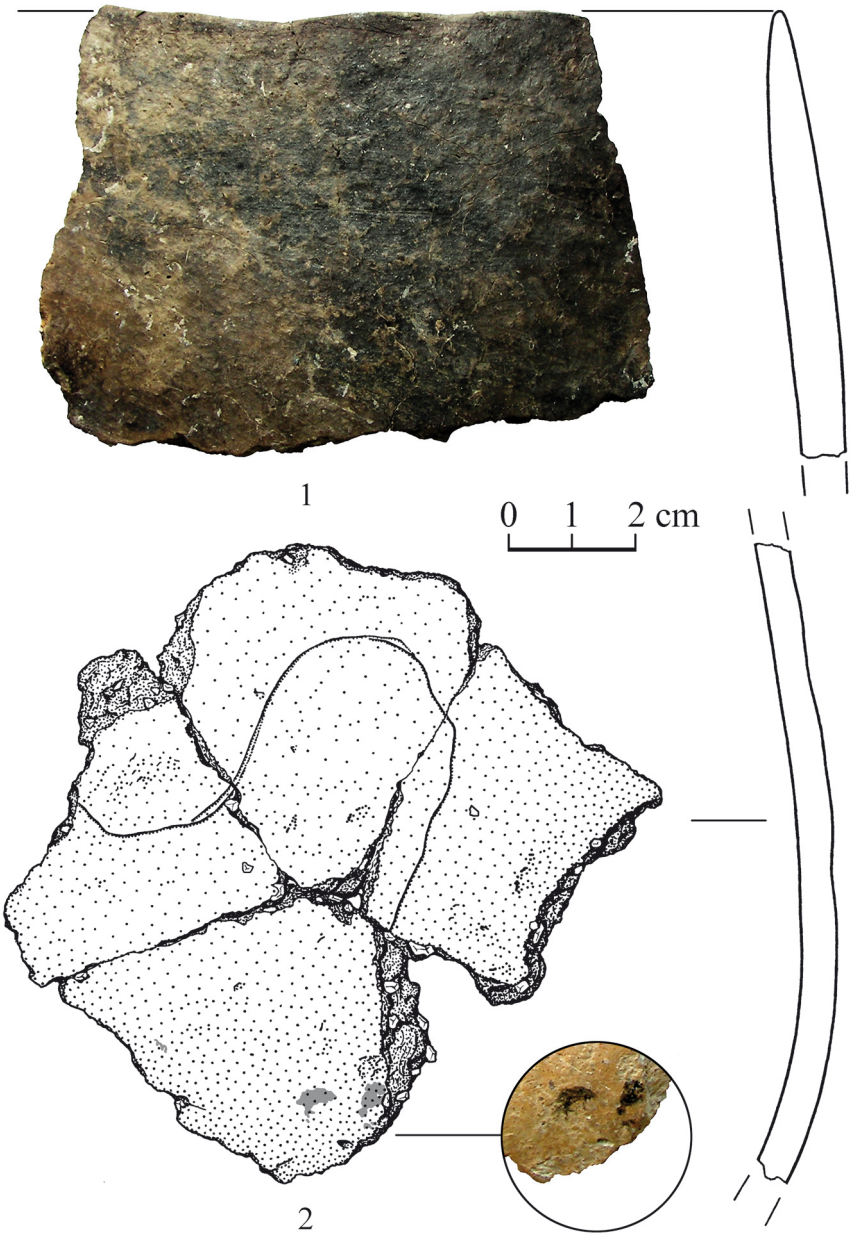


Fig. 9. Bazkiv Ostriv. 1-2 – vessel No. 47 (after Gaskevych 2017a, 241, fig. 6).
The colouring and painted decoration are marked with grey. Illustration and photos by D. Haskevych

(Makkay 1990) and the Criş sites in Romania (Ursulescu 2000, 211, 214, fig. 1) and Moldova (Dergachev and Larina 2015, 135, 157, fig. 92, 109), dated between the early – middle 6th millennium BC (Yanushevich 1989, 609; Wechler 1998, 74; Larina 1999, 98; Kovalenko 2017, 157, 158). Therefore, there is no certainty that vessels No. 76 and No. 50 are younger than 5300 BC. However, this also cannot be ruled out, due to the bundles of incised lines that are not typical for Criş and Körös pottery but are widespread in the further cultures of the Eastern Linear Circle.

2.2.3. COLOURING AND PAINTED DECORATION

Here, the word "colouring" refers to any ancient dyeing of the vessel surface, including accidental contamination by gleing and waterproofing agents, food, *etc*. "Painting" is one of the colouring manifestations, when the intentional dyeing creates a semantic effect discernable through the elements of decoration, arranged into compositions.

The first potsherd with probable painting was found by Danilenko. He drew it among the fragments of the Samchyntsi vessels without comments in the text (Danilenko 1969, 66, fig. 16: 6). Strips of different widths arranged into a spiral-like (?) motif are discerned on this figure. Examining the collection, the author of the current article discovered this potsherd (Fig. 9: 1) as well fragments of six more vessels with traces of red to dark brown painting and/or colouring. Their detailed characteristics are stated in a special publication (Gaskevych 2017a), the main facts and conclusions of which are presented here.

There are a few cases of easily identifiable painted decorations: a volute-like (?) end of some figure on vessel No. 66 (Fig. 10: 2), straight parallel stripes on vessel Nos. 73 (Fig. 10: 3) and 79 (Fig. 10: 4), and one curved stripe on vessel No. 17 (Fig. 12: 1). The preservation of the painting is very bad. But the difference in elemental composition between the painted and unpainted surfaces of vessel No. 66, recorded by X-ray fluorescence analysis, has eliminated doubts. The search for analogies to these decorations is pointless due to their simplicity. However, the incised decorations reported on some of these vessels (sometimes directly under the painting) attract attention. These include decorations with a single, very thin, straight vertical line (Fig. 11: 5), a meander shaped by such a line (Fig. 9: 2), as well as short segments of single, wider, deep lines (Fig. 11: 2, 3). Also of interest are herringbone compositions of parallel diagonal lines (Fig. 10: 4), rounded and angular figures filled with vertical lines, and frequent, short incisions on the inner rim (Fig. 13: 1-3). They are characteristic of the Eastern Linear Circle Neolithic, especially of the Szakálhát culture. It should be emphasized that two of these vessels have a flat bottom (Fig. 12: 4; 13: 5). On the other hand, rows of imprints of a short comb stamp, used for decorating Samchyntsi wares, have been applied to one of the vessels with colouring (Fig. 12: 2, 3). All vessels with colouring are made of very similar ceramic paste of the typical Samchyntsi composition.

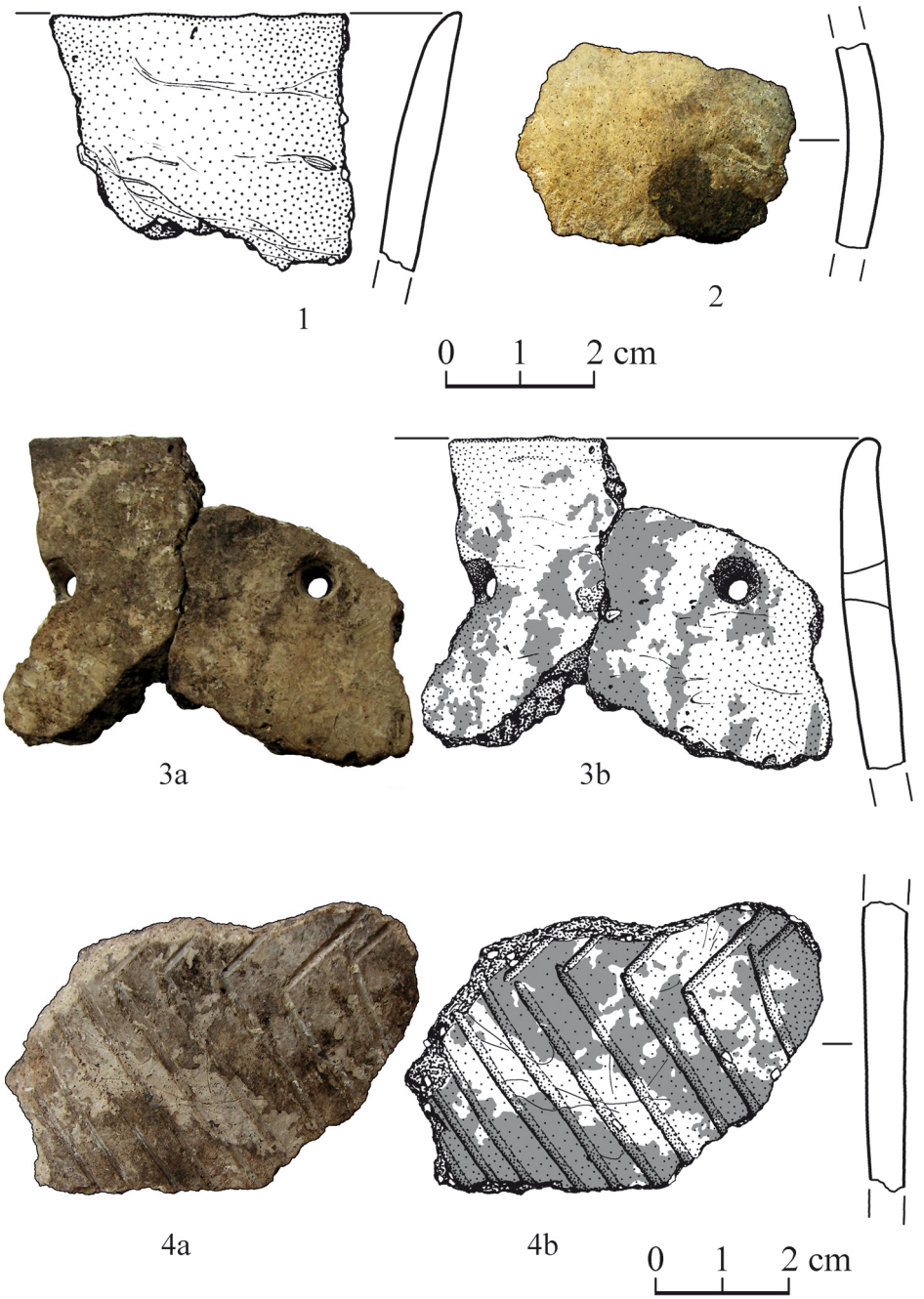


Fig. 10. Bazkiv Ostriv. 1, 2 – vessel No. 66; 3 – vessel No. 73; 4 – vessel No. 79 (after Gaskevych 2017a, 242, fig. 7). The colouring and painted decoration are marked with grey. Illustrations and photos by D. Haskevych

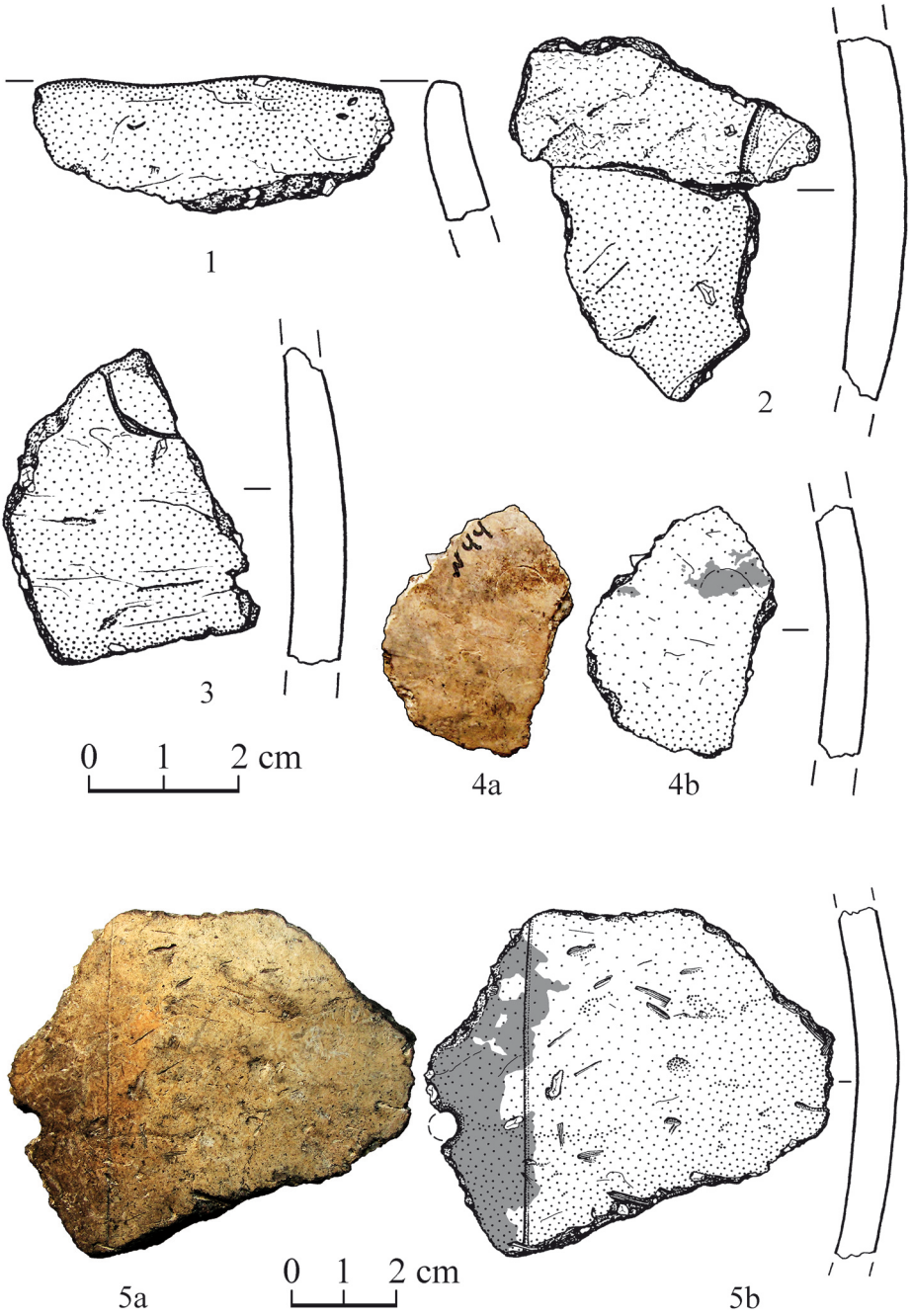


Fig. 11. Bazkiv Ostriv. 1-4 – vessel No. 81; 5 – vessel No. 17 (after Gaskevych 2017a, 237, 243, fig. 3, 8). The colouring and painted decoration are marked with grey. Illustrations and photos by D. Haskevych

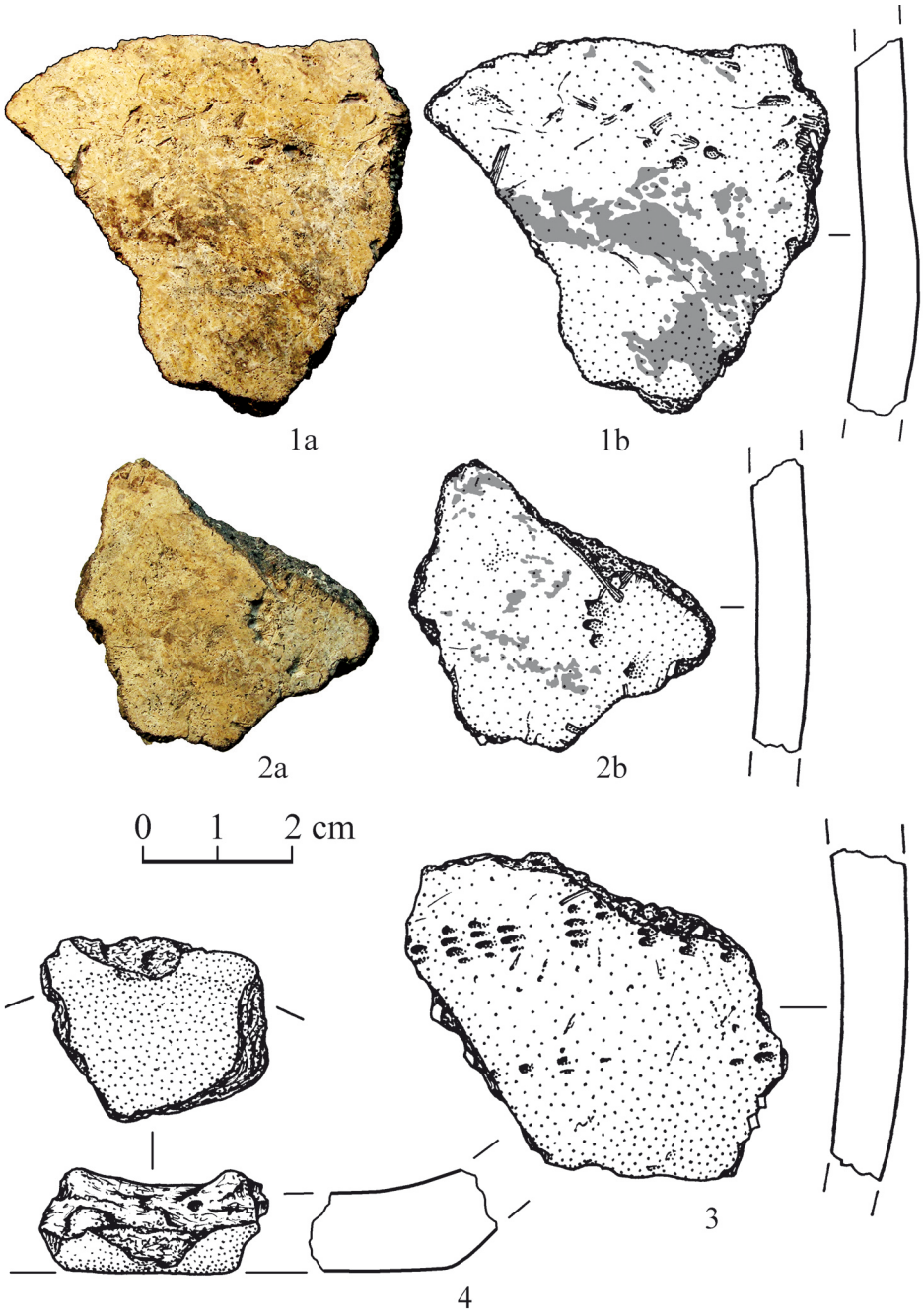


Fig. 12. Bazkiv Ostriv. 1-4 – vessel No. 17 (after Gaskevych 2017a, 238, fig. 4). The colouring and painted decoration are marked with grey. Illustrations and photos by D. Haskevych

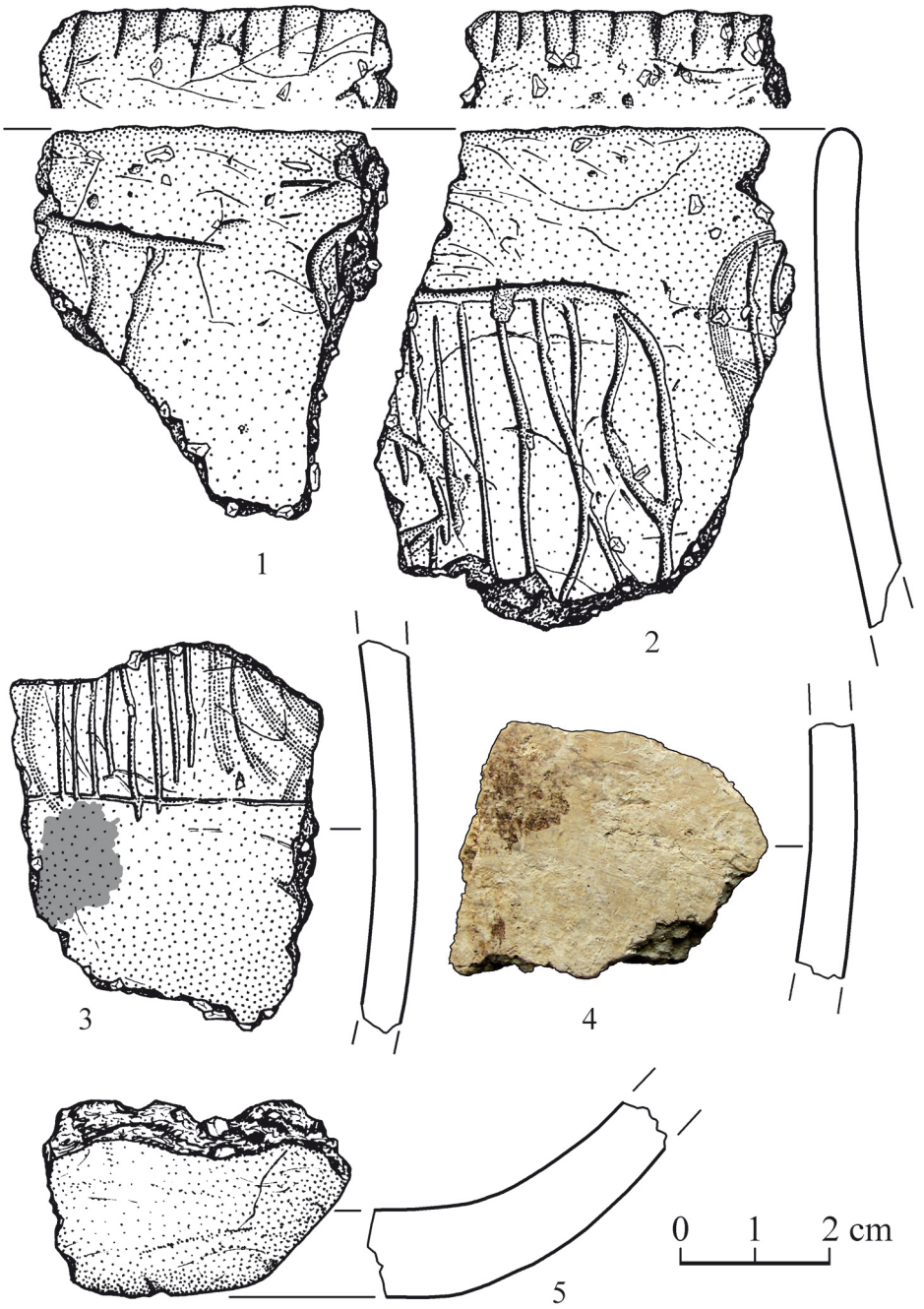


Fig. 13. Bazkiv Ostriv. 1-5 – vessel No. 44 (after Gaskevych 2017a, 239, fig. 5). The colouring and painted decoration are marked with grey. Illustrations and photo by D. Haskevych

2.2.4. MEANDER DECORATION

In addition to the aforementioned fragment with a meander shaped by a single, very thin, incised line, the meander decoration is also on vessel No. 38. No fewer than 26 fragments of it were found at a depth of 0.7-1 m (with a higher concentration at 0.9 m) in the western part of the excavation. Shortly after their discovery, they were reconstructed with plaster into an entire vessel. The image of this restoration (Fig. 14) is probably the most referenced one when it comes to BDC pottery. Its clearest traits are its flat lip, somewhat thinned and inverted rim, straight walls and pointed bottom. However, the proportions of the restored shape and the presence of a rounded body corner in the lower part can be questioned. The rim diameter is about 20 cm. The walls are 0.5-0.7 cm thick. The maximum thickness of the bottom is 2.2 cm. The outer surface is smooth and is slightly burnished with a reddish, reddish grey, brown, and greyish brown colour. The meandered band of 5-6 parallel incised lines, each 2-3 mm wide, the loops of which are alternately left empty or filled with a fine, diagonal mesh grid of 1-mm-wide incised lines, covers the top of the vessel. The ceramic paste, tempered with a small amount of fine sand and thin organic fibres, is very different from the Samchyntsi paste with a coarse-grained mineral admixture. The only Samchyntsi feature of the vessel is its pointed bottom (Haskevych 2008, 281; 2017, 198, 199).

Fig. 14. Bazkiv Ostriv. Vessel No. 38 with meander decoration
(after Haskevych 2008, 280, fig. 4: 2b).
Illustration by D. Haskevych

The chronological position of vessel No. 38 is contradictory. On the one hand, first Danilenko, and then Kotova considered it one of the most ancient vessels on the Southern Buh, attributed to the pre-Criş time (Danilenko 1969, 150-151; Kotova 2002, 39; 2015, 60-62). However, neither they nor any other researcher have so far shown any close analogies to this pot in the Early Neolithic of the Balkans or Eastern Europe outside the BDC area. On the other hand, Danilenko wrote that *"precisely such ornamental compositions, despite their exceptional ancientry, are already close to the early Trypillia ones"* (Danilenko 1969, 69). Nicolae Ursulescu and Dergachev saw in this vessel signs of "Vinčazation", by which they very broadly mean to be the spread of some Anatolian-Balkan influences during the Early to Middle Neolithic transition (Ursulescu 2000, 212). Indeed, in the Middle Neolithic of the Danube-Carpathian region, a zone filled with a fine, diagonally incised mesh grid is characteristic of Dudeşti pottery, and a meandered band of parallel incised lines is characteristic of all the Linear Pottery cultures. But their combination occurs on the richly ornamented vessels of the relatively late Bükk culture (*e.g.*: Kalicz and Makkay 1977, 305, 314, Taf. 98: 8, Taf. 108: 8). Thus, vessel No. 38 can be considered as the most striking syncretic BDC pot due to combination of the "western" meander decoration with the pointed bottom of the local foragers' pottery.

3. DISCUSSION

The new radiocarbon dates from Bazkiv Ostriv indicate that the indigenous BDC groups populated the Southern Buh area during the time that the LBK settlements existed near Zavallia. In addition, it seems, there are traits that imitate the traditions of the distant Szakálhát and Bükk cultures in the syncretic pottery from Bazkiv Ostriv. Obviously, any contacts between the inhabitants of the Southern Buh and the inner portion of the Carpathian arc were impossible without the active or passive participation of the LBK communities of the Dnister basin, which separates the Southern Buh from the mountains. Therefore, the previous view that the seven LBK vessels found at the BDC sites of Bazkiv Ostriv, Shchurivtsi-Porih, Dobrianka-3 and Gard were "imports", reflecting such contacts, is correct.

Thus, only four sites situated on the Southern Buh near Zavallia are actual evidence of the migrations of the LBK groups in this river's catchment. They form a triangle, covering an area of about 15 km^2 (Fig. 15). Therefore, the portion of the Southern Buh area described by Kiosak as "a regular region settled by the LBK people" is of just such a size today. To understand whether other, similar clusters of LBK sites could exist on the Southern Buh, the reasons that contributed to the emergence of the settlements around Zavallia should be clarified. An analysis of the natural conditions of the mentioned region is necessary for this in the first place.

3.1. Landscape

The problem of relating LBK colonization with certain ecological niches and landscapes has long attracted researchers. Larina has developed it in detail for the eastern periphery of the area of this culture (Larina and Kuzminova 1994; Larina 2009).

According to Larina, all settlements in the extreme eastern area of the LBK are located within the forest-steppe zone. At the same time, a general tendency to settle on the most fertile soils of each part of the region is observed. In Volhynia, these are typically podzolized chernozem-like soils. On the Upper and Middle Dnister, preference was given to chernozems (black earth) in the river valleys and on the flat plateaux covered with meadows of broad-leaf herbs (forb meadows). Between the Prut and the Southern Buh, the typical, leached, and carbonate chernozems were formed under cereal-grass meadow steppes. Soils of all these types are characterized by a very high natural fertility. However, it should be noted that they were just beginning to form during the existence of the LBK settlements there.

The preference for certain soils also accounts for the high settlement concentration. Frequently, sites are clustered at distances ranging from 0.2 to 1.5 km. This is especially clear in such microregions as the valleys of the Great and Middle Ciuluc rivers, as well the upper reaches of the Reut within the Bălți bunchgrass-cereal steppe in the Prut-Dnister interfluve, and along the Chornoguzka River in Volhynia (Larina 2009, 66, 67). Almost the same, high concentration is observed for the settlements of the cluster near Zavallia, where the distance between sites ranges from 2 to 7 km.

Complex archaeobotanical studies carried out on the site of Kamiane-Zavallia has not yet provided a clear understanding of the characteristics of the surrounding ancient landscape (Salavert *et al.* 2020, 8). Thus, it is necessary to turn to the low-resolution maps of modern landscapes and soils to analyze the environmental conditions of the settlements of the LBK and BDC groups on the Southern Buh. The landscape map of Ukraine shows that the entire upper reaches and almost the entire middle reaches of the Southern Buh are situated within the forest-steppe zone. Most of this territory is covered by deciduous forest landscapes with light grey, grey, dark grey and brown forest soils, as well as podzolized chernozems on the elevated loess plains. From the north and south, they are surrounded by two wings of meadow-steppe landscapes with typical, carbonate, and leached chernozems, which had been forming under the forb meadow steppes with islets of oak groves, forested gullies, light forests and bushes. This is one of the oldest landscapes in the region, preserved only on the poorly dissected watershed-adjacent areas of the loess plains (Loza 2010, 31, 32, fig. 1.08). The cluster of the LBK sites near the town of Ananiv is located within the southern wing of these landscapes. Also, the sites near Zavallia are located in the place where the Southern Buh crosses the strip of these landscapes (Fig. 15). According to the online map of soils from the web portal of the Public Cadastral Map of Ukraine (https://map.land.gov.ua), these sites are located on deep, meagre-humic carbonate cherno-

zems. At the same time, chernozem-meadow and meadow gley soils are nearby them within the Southern Buh valley, as well as meadow-marshy soils at the mouth of the Mohylnianka rivulet.

The strip of chernozems stretches further, deep into the interfluvial plateaus to the southwest and northeast of Kamiane-Zavallia. In particular, Mainova Balka, which is located 53 km to the south, occupies an area covered by chernozem-meadow soils and is

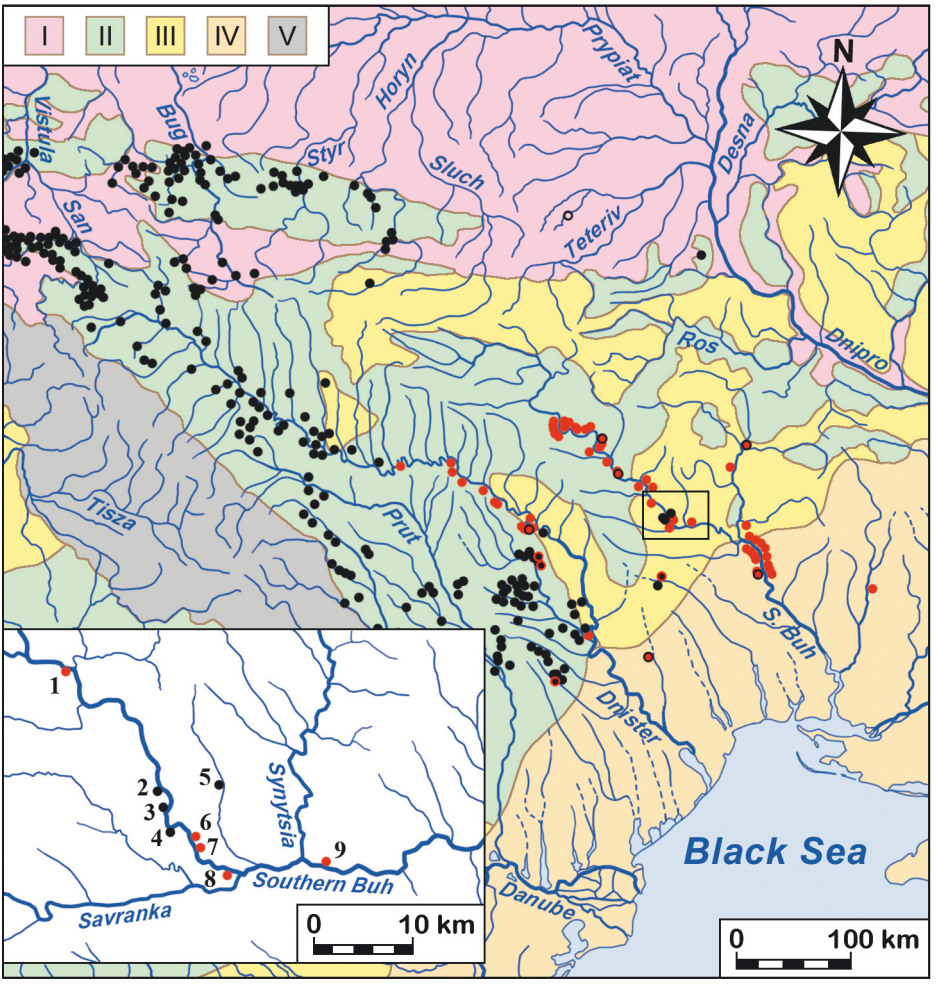


Fig. 15. Distribution of the LBK and BDC sites (for detail, see Fig. 1) on a map of the present-day landscapes. Base map: Loza 2010, 30, 31, fig. 1.08; with simplification.
Legend: I – Coniferous-deciduous forest landscapes; II – broadleaf forest landscapes; III – meadow-steppe landscapes; IV – steppe landscapes; V – mountain-forest and mountain-meadow landscapes. Sites: 1 – Haivoron-Polizhok (Solhutiv Ostriv); 2 – Synie Ozero; 3 – Kamiane-Zavallia; 4 – Hnyla Skelia; 5 – Zhakchyk III; 6 – Zavallia; 7 – Zhakchyk; 8 – Savran; 9 – Melnychna Krucha

surrounded by deep medium-humic chernozems. But chernozems come to an end further upstream of the Southern Buh, a little to the west of Kamiane-Zavallia. And it is there the high concentration of BDC sites, surrounded by grey podzolized soils, which were formed under the forest, are visible (Fig. 15). Therefore, the automatic inclusion of the non-chernozem part of the Southern Buh region in the area of the LBK, the bearers of which preferred chernozems, seems inconsistent in itself, and even more so taking into account the absence of LBK sites there.

The Southern Buh valley intersects a strip with chernozem soils that are extremely favourable for agriculture, and at the same time sufficient moisture on an area about 200 km long. However, LBK settlements were found only in one place here. Kiosak believes that other, yet to be found sites exist within the rest of the Southern Buh region. If this is true, then why do LBK settlements in the Prut-Dnister interfluves, on the Dnister and in Volhynia together number in the hundreds, while only four sites are on the Southern Buh? Is the archaeological study of the region so bad? For an answer, it is worth looking at the study of another early farming culture in the region – Precucuteni-Cucuteni-Trypillia. Such an analysis is quite justified, because the nature of the economy and settlement strategy of the Trypillia and LBK communities was similar. This is confirmed by frequent finds of their materials at the same places, for example, in Mainova Balka, Zhakchyk 3, Ruseştii Noi I, Floreşti I, Nicolaevca V, Nezvisko and many other sites.

To date, a number of catalogues of Trypillia sites have been published for some administrative and geographical regions of Ukraine. For example, Serhii Husiev has counted 300 plus monuments of this culture throughout the Middle Southern Buh region (Husiev 1995, 24). According to Ivan Zaets, 198 Trypillia sites were discovered in the Vinnytsia region as of 2001 (Zaets 2001, 10-12, fig. 3). And, their number rises there year to year: 295 sites in 2004 (Kvitnytskyi 2004), 352 sites in 2008 (Maidaniuk 2008), and 403 sites in 2015 (Rud 2015, 135). In the Kirovograd region, among 66 Trypillia monuments discovered as of 2015, 63 were found within the Southern Buh catchment (Sobchuk 2015). At least 124 Trypillia sites are known in the Odesa region (Polishchuk 2004). Thus, in the discussed area, and particularly in ecological niches attractive to early farmers, the level of archaeological survey can be considered rather satisfactory.

So, the reason for the small number of LBK sites on the Southern Buh is their actual sparsity, or even singleness. In this regard, the mapping of only the early Trypillia sites (Precucuteni-Trypillia A) of the first half – middle of the 5th millennium BC is very demonstrative. Among the huge array of Trypillia settlements, they (without unverified finds or sites of the Luka-Vrublevetskaia, Borisovka, and Trostianets types, frequently assigned to the so-called "transitional", AIV-BI phase) make up a very small percentage. They are relatively numerous in the Prut-Dnister interfluve and along the middle reaches of the Dnister. Their number decreases in the Dnister-Buh interfluve. About a dozen settlements were found in the valley of the Southern Buh and its tributaries, the Mohylnianka rivulet and the Synytsia River. And only one settlement is located far to the east, in the Siniukha River

basin (Fig. 16). It is noteworthy that, on the Southern Buh, they are concentrated in the same region where Kamiane-Zavallia is located. The remains of Trypillia dwellings, so-called "ploshchadky," have been found at a number of sites here. Further upstream and downstream of the Southern Buh, Early Trypillia pottery occurs only as accidental, isolated finds, or among the materials of the BDC sites Shumyliv-Cherniatka, Puhach 1, Puhach 2,

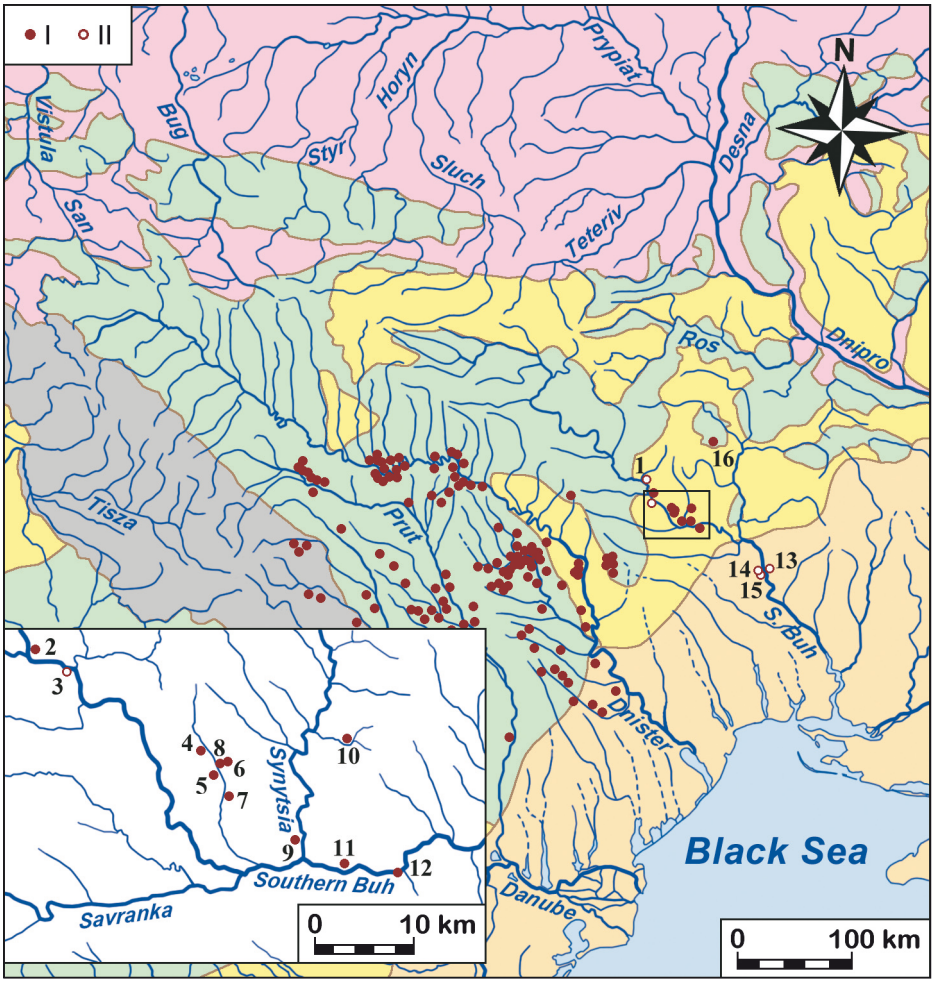


Fig. 16. Distribution of the Precucuteni-Trypillia A sites (based on Zbenovich 1989, 15, fig. 1; Burdo 2001, 196, 200, fig. 1, 2: 1; Sorochin and Dergaciov 2010, 235; supplemented and with alterations) on a map of the present-day landscapes (for detail, see Fig. 15). Legend: I – Precucuteni-Trypillia A site; II – Precucuteni-Trypillia A pottery at BDC sites. Sites: 1 – Shumyliv-Cherniatka; 2 – Haivoron; 3 – Haivoron-Polizhok (Solhutiv Ostriv); 4 – Mohylne I; 5 – Mohylne II; 6 – Mohylne III; 7 – Mohylne IV; 8 – Mohylne V; 9 – Sabatynivka II; 10 – Danylova Balka; 11 – Hrenivka; 12 – Krasnenke; 13 – Puhach I and II; 14 – Gard III; 15 – Gard; 16 – Hrebeniukiv Yar

Gard, Gard 3, and Gard 4 (Tovkailo 2005). It is significant that Early Trypillia dwellings have not been found there until now. Two new direct AMS radiocarbon dates with high reliability, which were taken from both organic inclusions in ceramic paste and charred residues on the surface of one BDC vessel from Shumyliv-Cherniatka, show that hunter-fisher groups continued to settle the region until the middle of the 5th millennium BC (Table 1, Haskevych *et al.* 2019).

The identical regularities in the locations of LBK and Early Trypillia sites, both in general and in the area under discussion, clearly show that, on the Southern Buh, the communities of the first farmers were strongly attached not to the entire strip of black earth, but only a small section of about 40 km long in a straight line between the present-day town of Haivoron and the village of Kosharo-Oleksandrivka. It can be assumed that other factors determined their choice of just this very place in addition to the fertile soils.

3.2. Graphite

It has previously been noted that the triangle formed by LBK sites on the Southern Buh clearly outlines the Zavallia graphite deposit (Gaskevych 2017b, 42). In terms of prospected resource and production scale, it is the largest in Europe and one of the largest in the world. It represents a synclinal fold, 5 × 2 km in area, bordered by granite and filled with limestone, stretching from the west to the east under both banks of the Southern Buh. The graphite-bearing gneisses lie along the northern and southern flanks of the fold (Ivant-

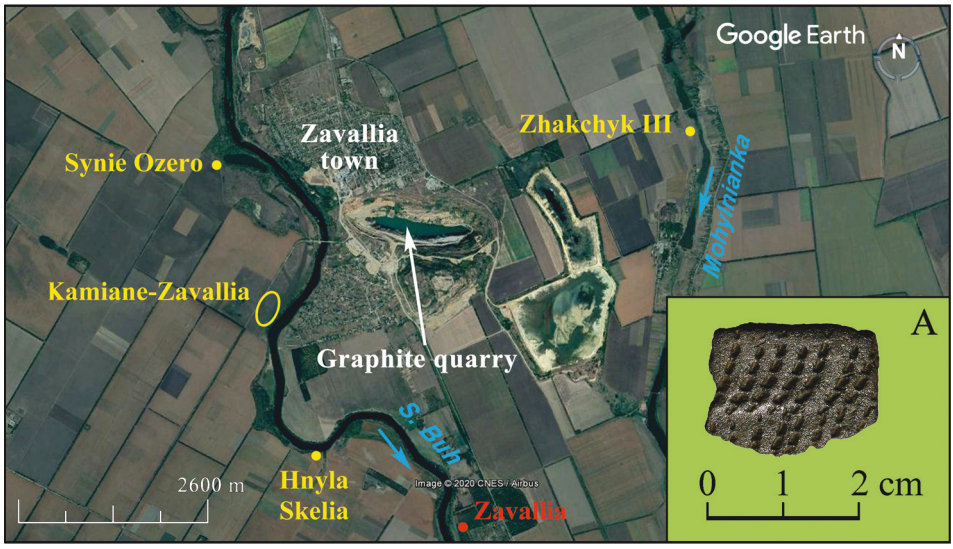


Fig. 17. The LBK (yellow) and BDC (red) sites near Zavallia. Base satellite photo: Google Earth. A – Potsherd tempered with graphite from the BDC site of Zavallia. Photo by D. Haskevych

siv 1972). On the left bank, their industrial development has been going on since the 1930s (Fig. 17). On the right bank, minor work was carried out nearby the Synie Ozero site. Operations in another section, located directly next to the Kamiane-Zavallia site, will begin shortly. A number of promising graphite ore occurrences are known at a distance of up to 30 km from here (Kropivnyi *et al.* 2019, 97). Some of them form outcrops and were being developed by hand as far back as the beginning of the 20th century (Shpylovyi and Biletskyi 2019).

No doubt, the local hunter-gatherers well knew the outcrops of graphite-bearing clays eroding by the Southern Buh. The BDC site of Zavallia was discovered on the left bank of the river, a little south of the current Zavallia quarry (Fig. 17). Here, Danilenko picked up seven flint artefacts and three fragments of two vessels decorated with comb imprints in 1955 (Danilenko 1969, 120). The ceramic paste of the vessels is oversaturated with graphite, which is why their surfaces shine like silver (Fig. 17A).

It is believed that BDC pottery made of clay with graphite admixture (hereinafter referred to as graphite pottery), found on sites in areas adjacent to the Southern Buh itself, and possibly in the Syniukha basin and on the Dnister (list of sites see: Gaskevych 2020, 339, fig. 5.32), was made of graphite ore from Zavallia. These vessels are mainly ornamented with comb imprints (Samchyntsi style) and zones filled with incised and channelled lines (Pechera and Savran styles, according to Danilenko). Also, one graphite vessel with incised meanders was found by Danilenko at the site of Haivoron-Polizhok (Danilenko 1969, 115, fig. 85: 2).

Danilenko thought that graphite vessels could get from the Buh far to the east, right up to the Dnipro River (Danilenko 1969, 120). In these remote areas, graphite pottery is known among the sub-Neolithic materials from the Inhul River basin (Novorozanivka), the middle reaches of the Dnipro (Uspenka, Buzky I), the Dnipro rapids region (Vovchok, Sobachky, Strilcha Skelia, Kizlevyi V, Mykilske II cemetery), and the Northern Azov Sea area (Kamiana Mohyla-1). The aforementioned sites are related to the Kyiv-Cherkasy, Surskyi and Azov-Dnipro cultures. Therefore, it is not surprising that some of the graphite pottery from there differs from that of the Southern Buh. Two explanations for this are possible. First, it was not ready-made graphite vessels that were brought there, but graphite-rich clay itself. However, finds of any graphite raw material are still unknown on the sites. Second, these vessels may have been made by local potters with other, non-Buh graphite raw materials, because there are three known major graphite-bearing zones: Buh-Teteriv, Inhul, and Azov within the Ukrainian Shield. The choice between these two explanations requires special mineralogical studies (Gaskevych 2017b; 2020).

Graphite was also used in the production and decoration of pottery of the more western cultures. In the Balkans, the fabrication of graphite-coated vessels emerged in the Struma River basin in the Neolithic (Sapareva Banja, Sitagroi I, Acropotamos-Topolnitsa, *etc.*). Later such wares were widespread in the areas of the Chalcolithic cultures of the Lower Danube area (Chokhadziev 2000; Leshtakov 2004). Graphite and graphite-coated pottery

is characteristic for some LBK sites within the Upper Danube area in Austria, Moravia and Bavaria (Tichý 1961; Pechtl and Eibl 2011; Kitzig and Ramminger 2016). A graphite pendant was found at the LBK site of Brzezie 17 in southern Poland (Czekaj-Zastawny 2014, 86-87, fig. 52; Trąbska and Wesełuchy-Birczyńska 2014). Finds of LBK graphite vessels from Moldova and Ukraine are not mentioned, with the exception of those from the Kamiane-Zavallia settlement (Kiosak 2017a, 258). Thus, this local tradition of the LBK group on the Southern Buh either appeared on-site under the influence of BDC potters, or it was brought by the natives of Bavaria or Bohemia, who preserved the traditional, Upper Danube attitude of graphite materials as prestige goods. A shoe-last adze, made of metabasite from the Iser Mountains in northern Bohemia, was found close by the Kamiane-Zavallia site (Saile *et al.* 2016, 7). This may indirectly indicate the possibility of such a distant but quick migration, which was intentionally aimed at the Zavallia graphite deposit (Gaskevych 2017b).

3.3. The LBK expansion and exchange networks

Wherever the residents of Kamiane-Zavallia may came from, on the Southern Buh, they found themselves in the very centre of a large exchange network of the indigenous population. Controlling the graphite deposit or simply being there, they possessed a significant advantage in the exchange. This exchange could have centred on one or both of the local graphite or the other natural resources from the LBK area (*e.g.*, high-quality flint from the Dnister and Prut deposits) or from the neighbouring regions of the Lower Danube (*e.g.* salt). The influence of the Dudeşti ceramic traditions in the pottery of Kamiane-Zavallia and the nature of the flint raw materials show the connection of its inhabitants with the populations of these regions (Saile *et al.* 2016, 7; Kiosak 2017a, 262-263). They could also have exchanged some agricultural products, which were probably highly valued by local hunter-gatherers, who, according to the latest data, did yet not practice farming (Endo *et al.* 2019; Haskevych *et al.*, 2020).

So, the LBK vessels found at the BDC settlements could have value not only in and of themselves but also as containers for some prestige goods, liquids or substances, including graphite. In this regard, attention is drawn to the mention of the easternmost finds, described as LBK pottery. These are fragments of several vessels discovered by Arkadii Dobrovolskyi at the Vovchok site in the Dnipro Rapids region in 1929. They are known only from drawings published by Danilenko, who assigned them either to the Linear Band ("Danube") culture or to the Dudeşti culture (Danilenko 1969, 22, 47, 188, 216, fig. 3-VI: 3-5, fig. 139: 1, 4, 7). But it is important to note that graphite pottery was also found at this site (Danilenko 1969, 47).

It seems that the tendencies that developed in the Neolithic continued in the subsequent periods. Graphite was found in the ceramic paste of some Early Trypillia vessels from the sites of the Gard group, as well as at the Sabatynivka II and Hrebeniukiv Yar sites

(Zbenovich 1989, 90; Tovkailo 2005, 34-35). At the beginning of the Trypillia BI stage, western farmers massively populated the entirety of the Southern Buh area and entered the Dnipro catchment. Among their very numerous sites, it is the settlements located along the Southern Buh, not far from Zavallia (Berezivka, Sabatynivka I), that are characterized by the strong impacts of the Gumelnița population (Tsvek 1999, 35), which made graphite-coated and graphite-decorated wares (Beilekchi 1978; Subbotin 1983; Leshtakov 2004). Moreover, materials of some North-Pontic Eneolithic steppe cultures are also abundant at these sites (Tsvek 1999, 35). According to Kiosak's calculations, at the Trypillia BI settlement of Shamrai, located nearby the Kamiane-Zavallia site, approximately every third fragment is either from the vessels of the steppe Skelia culture or has mixed Trypillia-"steppe" characteristics (Kiosak 2016b). The settlement of Berezivka yielded a horse-head pommel-sceptre (Danilenko 1974, 95).

The above outline of the settlement pattern of the LBK and Trypillia communities in the Southern Buh area makes it possible to raise the question of the nature of their distant migrations. These first farmers poorly used the agricultural potential of the vast area of the Buh-Dnister interfluve with its extremely fertile soils, which is evidenced by the sparsity of the LBK sites and the small number of Trypillia A settlements found there. It is obvious that the factors of demographic pressure and simple agricultural colonization were not the leading ones. Therefore, models taking into account the factor of social prestige as a driving force of the first farmers' mobility (Hofmann 2016, 238-239; Spriggs 2016, 486-487) deserve more attention. Pursuit of the production and exchange of prestige goods, as well as control over key points on routes of their transportation through mountains, rivers and watersheds, might have determined the direction of the development of new lands. Success of such activities on the eastern LBK frontier is evidenced by signs of social stratification, recorded, for example, by the ritual-burial complex in Nezvisko (Dębiec 2016). Deep penetration of the LBK groups into foreign territories is demonstrated by the Vita-Poshtova-2 settlement, located on the outskirts of Kyiv (50°17'35.27"N, 30°23'21.95"E), at a distance of 10 km from the Dnipro valley, and about 275 km from the nearest known LBK settlements in Volhynia (Gaskevych 2006). Results of the exchange included the appearance of single vessels with typical linear-band decorations at the hunter-gatherer sites of Vovchok, Gard, Bazkiv Ostriv, Shchurivtsi, Dobrianka 3, and Fasova (Fig. 1).

A relatively recent historical analogue, illustrating the possible dynamics of the first stages of the Neolithization process in the territory between the Dnister and the Dnipro, is the initial European colonization of North America. It began with the penetration of groups of trappers, prospectors and merchants deep into the interior of the continent. There, they engaged in exchange with the indigenous population and founded a network of trading posts at the crossroads of communication lines. Over time, some such settlements became centres of the agricultural development of the territories, and even later – cities. It is no coincidence that the term "frontier" itself entered Neolithic archaeology from studies concerning American history, where it was used previously (*e.g.* Turner 1935).

CONCLUSIONS

For 40 years, archaeologists discussing the LBK finds in the Southern Buh catchment have mentioned only the discovery of two so-called "imported" bowls with "music-note" decorations from the BDC site of Bazkiv Ostriv. New, individual finds of some linear-band vessels in several sub-Neolithic sites at the start of the 21st century, as well as the discoveries, in the years since 2011, of the first LBK sites of Kamiane-Zavallia, Hnyla Skelia, Synie Ozero and Zhakchyk III on the Southern Buh near Zavallia, have allowed archaeologists to assume that two-thirds of the BDC area was *"a regular region settled by the LBK people"*. This supposition was enabled due to the imprecision of the chronological scheme, which indicated the disappearance of the BDC around 5300 BC, and publications with an erroneous mapping of Bazkiv Ostriv as a linear-band site in different locations along the Southern Buh, as well as the erroneous location of the LBK settlement of Mainova Balka within the Southern Buh basin.

New, direct radiocarbon dating of the organic inclusions in the ceramic paste and charred residues on surface of the vessels from the BDC sites of Bazkiv Ostriv and Shumyliv-Cherniatka have shown that the local sub-Neolithic groups continued to live in the middle reaches of the Southern Buh at the time of the existence of the LBK sites here and even later. The peculiarities of the pottery from Bazkiv Ostriv also confirm this. The syncretic vessels with plastic, painted and incised meander decorations, as well as carinated shapes, probably demonstrate the attempts of the local population to imitate the ware of its more western Neolithic neighbours – in particular the bearers of the Szakálhát and Bükk cultures. So, the previous opinion regarding the finds of two LBK vessels as "imports" looks more reasonable today. The same applies to five LBK vessels from three other BDC settlements, located in the Southern Buh valley (Shchurivtsi, Gard) and along its tributaries (Dobrianka-3). To date, therefore, the cluster of four sites, situated near Zavallia on an area of about 15 km^2, is the only verified region regularly settled by the LBK farmers here.

The sparsity of LBK sites in the Southern Buh region may not be explained by poor archaeological investigation, because several hundred settlements of the early farmer Trypillian culture have been discovered there over the last century. The latter are found in different landscapes with different soil fertility. However, the earliest of them, the Precucuteni-Trypillia A sites, occupy only a very narrow, about 40-km-long part of the middle reaches of the Southern Buh, at the same place where the LBK settlements were located before. It is possible that in addition to fertile soils, one reason for this is the local graphite deposits. The four aforementioned LBK sites surround the largest deposit of graphite in Europe. The finds of linear-band pottery tempered with graphite and an adze made of stone originating from the Jizera Mountains may suggest that people from the Upper Danube, where graphite was considered a prestige good in the Neolithic, intentionally migrated to this area. Graphite was also prestigious in the Northern Black Sea region, where an extensive network of exchange based on it and/or ware made of existed in the same period.

Control over this deposit of graphite, or even just living in close proximity to it, gave the local early farmer groups significant advantages as mediators in exchange. In addition to graphite, they could have exchanged natural resources (salt, high-quality flint), as well as some prestigious agricultural products from the LBK area or from the neighbouring regions of the Lower Danube. Connections with inhabitants of such regions have been recorded by finds of potsherds with Dudeşti-style decorations among the vessels from Kamiane-Zavallia. All of the above observations allow us to assert that the main motive for the migration of LBK communities was not demographic pressure or the search for new agricultural lands, but rather the effort to obtain social prestige through active participation in the production and exchange of prestigious goods, both within the area of the culture and beyond.

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References

Beilekchi V. S. 1978. *Rannii eneolit nizovev Pruta i Dunaia (Gumelnitckie poseleniia Vulkaneshty II i Lopatcika v iuzhnoi chasti Moldavskoi SSR)*. Kishinev: Shtiintsa.

Bezusko L. G. and Kotova N. S. 1997. Kultura lineino-lentochnoi keramiki na Ukraine i ee prirodnoe okruzhenie. In S. A. Bulatovich (ed.), *Arkheologiia i etnologiia Vostochnoi Evropy* (*Materialy i issledovaniia*). Odessa: Germes, 140-153.

Biagi P., Zaliznyak L. and Kozłowski S. K. 2007. Old problems and new perspectives for the radiocarbon chronology of the Ukrainian Mesolithic? In V. Yanko-Hombach, I. Buinevich, P. Dolukhanov, A. Gilbert, R. Martin, M. McGann and P. Mudie (eds), *Extended Abstracts of the Joint Plenary Meeting and Field Trip of IGCP 521 and IGCP 481, Gelendzhik (Russia) — Kerch (Ukraine), September 8-17, 2007*. Gelendzhik, Kerch: Southern Branch of the Institute of Oceanology, Russian Academy of Sciences and Demetra Beneficent Foundation, 27-30.

Bogucki P. 2000. How Agriculture Came to North-Central Europe. In T. D. Price (ed.), *Europe's First Farmers*. Cambridge: Cambridge University Press, 197-218.

Bronk Ramsey C. 2009. Bayesian analysis of radiocarbon dates. *Radiocarbon* 51/1, 337-360. DOI: 10.1017/S0033822200033865.

Burdo N. B. 2001. Rannii etap formirovaniia drevnezemledelcheskogo obshchestva mezhdu Dnestrom i Dneprom (Tripole A). In J. Czebreszuk, M. Kryvaltcevič and P. Makarovicz (eds), *Od neolityzacji do początków epoki brązu*. Poznań: Wydawnictwo Poznańskie, 195-214.

Burdo N. B. 2002. Novye dannye dlya absolyutnoj datirovki neolita i rannego eneolita na territorii Ukrainy. *Stratum plus* 2, 431-446.

Czekaj-Zastawny A. 2008. Linear Band Pottery culture in the Upper Vistula River Basin. *Sprawozdania Archeologiczne* 60, 31-72.

Czekaj-Zastawny A. 2014. *Brzezie 17. Osada kultury ceramiki wstęgowej rytej* (= *Via Archaeologica. Źródła z badań wykopaliskowych na trasie autostrady A4 w Małopolsce*). Kraków: Krakowski Zespół do Badań Autostrad.

Czekaj-Zastawny A., Kabaciński J., Terberger T. and Ilkiewicz J. 2013. Relations of Mesolithic hunter-gatherers of Pomerania (Poland) with Neolithic cultures of central Europe. *Journal of Field Archaeology* 38/3, 195-209. DOI: 10.1179/0093469013Z.00000000059.

Czerniak L., Pyzel J. and Wąs M. 2016. The beginnings of the Neolithic in Eastern Pomerania: a Linear Pottery culture settlement at site 13, Kościelna Jania, Smętowo Graniczne Commune. *Sprawozdania Archeologiczne* 68, 193-222.

Chokhadziev S. 2000. Development of the Graphite Ornamentation in the Copper Age (In the Light of Evidence from the Struma Cultures). In L. Nikolova (ed.), *Technology, Style and Society. Contribution to the Innovations between the Alps and Black Sea in Prehistory* (= *BAR International Series* 854) Oxford: BAR Publishing, 135-173.

Danilenko V. N. 1969. *Neolit Ukrainy. Glavy drevnej istorii Yugo-Vostochnoj Evropy*. Kiev: Naukova dumka.

Danilenko V. N. 1974. *Eneolit Ukrainy. Etnoistoricheskoe issledovanie*. Kiev: Naukova dumka.

Dębiec M. 2014. *Zwięczyca 3. Eine bandkeramische Siedlung am Wisłok*. Rzeszów: Oficyna Wydawnicza ZIMOWIT.

Dębiec M. 2016. The LBK ritual-burial complex from Nezvis'ko, Western Ukraine. In L. Amkreutz, F. Haack, D. Hofmann and I. van Wijk (eds), *Something Out of the Ordinary? Interpreting Diversity in the Early Neolithic Linearbandkeramik and Beyond*. Cambridge: Cambridge Scholars Publishing, 227-245.

Dębiec M. and Saile T. 2015. Zu den östlichsten Siedlungen der frühen Bandkeramik. *Praehistorische Zeitschrift* 90(1-2), 1-19. DOI: 10.1515/pz-2015-0008.

Dergachev V. A. and Larina O. V. 2015. *Pamiatniki kultury Krish Moldovy (s katalogom)*. Chişinău: Academy of Sciences of Moldova, Institute for Cultural Heritage.

Dvorianinov S. O. 1982. Poselennia kultury liniino-strichkovoi keramiky Mainova Balka na Odeshchyni. *Arkheolohiia* 38, 93-95.

Dolukhanov P. M., Shukurov A. M., Kovalyukh N. N., Skripkin V. V. and Zaitseva G. I. 2009. Early Neolithic in the South East European Plain. In P. M. Dolukhanov, G. R. Sarson and A. M. Shukurov (eds), *The East European Plain on the Eve of Agriculture* (= *BAR International Series* 1964). Oxford: Archaeopress, 99-107.

Endo E., Nasu H., Gaskevych D., Yanevich A., Pashkevich G. and Videiko M. 2019. Ukraine as the crossroad for agricultural dispersal in Eurasia. In G. Fiorentino and M. Primavera (eds), *18th Conference of the International Workgroup for Palaeoethnobotany (Lecce, 3rd-8th June 2019)*. Lecce: Università del Salento, 27.

Gaskevych D. 2006. Vita-Poshtova 2 – New The Easternmost Site of The Linear Band Pottery culture. *Sprawozdania Archeologiczne* 58, 205-221.

Gaskevych D. L. 2011. A new approach to the problem of the Neolithisation of the North-Pontic area: is there a north-eastern kind of Mediterranean Impresso pottery? *Documenta Praehistorica* 38 (= *Neolithic Studies* 17), 275-290. DOI: 10.4312/dp.38.22.

Gaskevych D. L. 2015. Pogrebeniia bugo-dnestrovskoi neoliticheskoi kultury: kriticheskii analiz istochnikov. *Stratum plus* 2, 181-206.

Gaskevych D. L. 2017a. Keramika s rospisiu v neolite Iuzhnogo Buga. *Stratum plus* 2, 231-255.

Gaskevych D. 2017b. Pottery With Admixture of Graphite and Exchange Networks in Neolithic of Ukraine: Problem Statement. In Y. Morozova and P. Shydlovskyi (eds), *Wetland Archaeology and Prehistoric Networks in Europe. NEENAWA International Scientific Conference, September 15th-18th, 2017 Kyiv – Kaniv, Ukraine*. Kyiv: Taras Shevchenko National University of Kyiv, Swiss National Science Foundation, 1-42.

Gaskevych D. 2020. Graphite in the Production of Pottery in the Ukrainian Para-Neolithic. In Gaydarska B. (ed.), *Early Urbanism in Europe: The Trypillia Megasites of the Ukrainian Forest-Steppe*. Berlin/Boston: Walter de Gruyter GmbH, 338-340. DOI: 10.1515/9783110664959

Haskevych D. L. 2007. Synkhronizatsiia buho-dnistrovskoho neolitu ta neolitu Tsentralnoi Yevropy: Problema radiovuhletsevykh dat. In M.Gierlach and L.Bakalarska (eds), *Wspólnota dziedzictwa archeologicznego ziem Ukrainy i Polski. Materiały z konferencji zorganizowanej przez Ośrodek Ochrony Dziedzictwa Archeologicznego. Łańcut (26-28 X 2005 r.)*. Warszawa: Krajowy Ośrodek Badań i Dokumentacji Zabytków, 115-147.

Haskevych D. L. 2008. Keramika «samchynskoho» typu ta problemy periodyzatsii buho-dnistrovskoi neolitychnoi kultury. *Kam'iana doba Ukrainy* 11, 157-187.

Haskevych D. L. 2013. V. M. Danylenko ta periodyzatsiia neolitu Pivdennoho Buhu: novi zapytannia do starykh dzherel. *Arkheologiya* 4, 3-17.

Haskevych D. L. 2014. Problemy radiovuhletsevoho datuvannia buho-dnistrovskoi neolitychnoi kultury. *Arkheolohiia* 4, 3-17.

Haskevych D. L. 2017. Reviziia stratyhrafii poselennia Bazkiv Ostriv yak osnovy periodyzatsii buho-dnistrovskoi neolitychnoi kultury. *Kamiana doba Ukrainy* 17-18, 188-215.

Haskevych D., Endo E., Kunikita D. and Yanevich O. 2019. New AMS dates from the Sub-Neolithic sites in the Southern Buh area (Ukraine) and problems in the Buh-Dnister culture chronology. *Documenta Praehistorica* 46, 216-245. DOI: 10.4312/dp.46.14.

Haskevych D. L., Endo E. and Nasu Kh. 2020. Novi arkheobotanichni doslidzhennia keramiky subneolitychnoho poselennia Bazkiv Ostriv na Pivdennomu Buzi (iz vykorystanniam Replica-SEM metodu). *Arkheolohiia i davnia istoriia Ukrainy* 1(34), 181-191. DOI: 10.37445/adiu.2020.01.11.

Hofmann D. 2016. Keep on walking: The role of migration in Linearbandkeramik life. *Documenta Praehistorica* 43, 235-251. DOI: 10.4312\dp.43.11.

Husiev S. O. 1995. *Trypilska kultura Serednoho Pobuzhzhia rubezhu IV-III tys. do n. e.* Vinnytsia: Anteks – ULTD.

Ivantsiv O. Ye. 1972. *Heolohiia ta henezys hrafitovykh rodovyshch Ukrainy*. Kyiv: Naukova dumka.

Kadrow S. 2019. Transformacja kulturowa we wczesnym neolicie południowo-wschodniej Polski w świetle wybranych aspektów technologii ceramiki. In M. Szmyt, P. Chachlikowski, J. Czebreszuk,

M. Ignaczak and P. Makarowicz (eds), *VIR BIMARIS. Od kujawskiego matecznika do stepów nadczarnomorskich. Studia z dziejów międzymorza bałtycko-pontyjskiego. Ofiarowane Profesorowi Aleksandrowi Kośko* (= *Archeologia Bimaris. Dyskusje* 5). Poznań: UAM, 313-322.

Kadrow S. and Rauba-Bukowska A. 2017. The selection of ceramic raw material: convenience or a technological idea? A case study of the Danubian cultures north of the Carpathians. *Archeologické rozhledy* 69, 261-280.

Kalicz N. and Makkay J. 1977. *Die Linienbandkeramik in der Grossen Ungarischen Tiefebene* (= *Studia Archaeologica* 7). Budapest: Akadémiai Kiadó.

Kiosak D. V. 2013. Pivdenne Pobuzhzhia – chastyna arealu kultury liniyno-strichkovoi keramiky. In S. M. Hladun (ed.), *IX Mykolaivska oblasna kraieznavcha konferentsiia «Istoriia. Etnohrafiia. Kultura. Novi doslidzhennia»*. Mykolaiv: Vydavnytstvo Iryny Hudym, 75-77.

Kiosak D. 2016a. Mesolithic 'Heritage' and Neolithic in Southwest Ukraine. In H. Floss and R. Krauss (eds), *Southeast Europe before Neolithisation. Proceedings of the International Workshop within the Collaborative Research Centres sfb 1070 "Ressourcen Kulturen", Schloss Hohentubingen, 9th of May 2014 (Tübingen 2016)*. Tübingen: Universität Tübingen 131-147. DOI: 10.15496/publikation-10762.

Kiosak D. V. 2016b. «Stepovyi vplyv» ta pam'iatky typu Sabatynivky I (za materialamy poselennia Shamrai). In I. V. Niemchenko (ed.), *Starodavnie Prychornomor'ia. Vypusk XI*. Odesa: Odeskyi natsionalnyi universytet im. I. I. Mechnykova, 226-232.

Kiosak D. 2017a. Kamyane-Zavallia, the easternost Linear Pottery culture settlement ever excavated. *Sprawozdania Archeologiczne* 69, 253-270. DOI: 10.23858/SA69.2017.010.

Kiosak D. 2017b. Settlements and Indigenous Populations at the Easternmost Fringe of the Linear Pottery culture. *Eurasia Antiqua* 20(2014), 117-141.

Kiosak D. V. 2018. Hnyla Skelia – nove poselennia kultury liniino-strichkovoi keramiky na pivnochi Odeshchyny. In O. V. Smyntyna (ed.), *Arkheolohiya, etnolohiya ta okhorona kulturnoi spadshchyny Pivdenno-Skhidnoi Evropy*. Odesa: Odeskyi natsionalnyi universytet imeni I. I. Mechnykova, 57-63.

Kiosak D. V., Bruiako I. V. and Denisiuk V. L. 2014. Kompleks arkheologicheskikh pamiatnikov «Kamennoe-Zavale» v Srednem Pobuzhe: raboty 2011-2012 gg. *Tyragetia* 8/23, 73-88.

Kiosak D. and Salavert A. 2018. Revisiting the chronology of two Neolithic sites in Eastern Europe: new radiocarbon dates from Melnychna Krucha and Kamyane-Zavallia (Southern Buh region, Ukraine). *Revista Arheologică* 2/14, 116-131.

Kitzig J. and Ramminger B. 2016 Use and distribution of colourants in Western LBK sites. *Anthropologica et Praehistorica* 126(2015), 179-186.

Kotova N. S. 2002. *Neolitizatsiya Ukrainy*. Lugansk: Shliakh.

Kotova N. S. 2003. *Neolithization in Ukraine* (= *BAR International Series 1109*). Oxford: British Archaeological Reports Ltd.

Kotova N. S. 2015. *Drevneishaia keramika Ukrainy*. Kiev, Kharkov: Maidan.

Kozłowski J. K. 1985. The Eastern Areas of the Linear Band Pottery culture. In A. Kokowski (ed.), *Memoires Archeologiques*. Lublin: Zakład Archeologii, Uniwersytet Marii Curie-Skłodowskiej, 51-70.

Kozłowski J. K. and Kozłowski S. K. 1977. *Epoka kamienia na ziemiach polskich*. Warszawa: Państwowe Wydawnictwo Naukowe.

Kovalenko S. I. 2017. O kulturno-khronologicheskoi pozitsii finalno-mezoliticheskikh pamiatnikov v Pruto-Dnestrovskom mezhdureche. *Stratum plus* 1, 155-171.

Kropivnyi V. M., Molokost L. A., Kuzyk O. V. and Kropivna A. V. 2019. Porivnialna promyslova otsinka hrafitovykh rodovyshch ta rud Ukrainy, kharakterystyka zbahachennia rud. *Tsentralno-ukrainskyi naukovyi visnyk. Tekhnichni nauky* 1/32, 93-102. DOI: 10.32515/2664-262X.2019.

Kvitnytskyi M. V. 2004. Vinnytska oblast. Arkheolohichni pamiatky trypilskoi kultury na terytorii Ukrainy. Reiestr. In N. B. Burdo and M. Yu. Videiko (eds), *Entsyklopediya trypilskoi tsyvilizatsii* 1. Kyiv: Ukrpolihrafmedia, 566-583.

Larina O. 1994. Neoliticul pe teritorium Republicii Moldova. *Thraco-Dacica* 15/1-2, 41-66.

Larina O. V. 1999. Kultura lineino-lentochnoi keramiki Pruto-Dnestrovskogo regiona. *Stratum plus* 2, 10-140.

Larina O. V. 2006. Neoliticheskaia keramika poseleniya Tetereuka Noue XV (k probleme ischeznoveniia kultury lineino-lentochnoi keramiki). *Revista Arheologică* S. N. 2/1-2, 35-55.

Larina O. V. 2009. The extreme eastern periphery of the Linearbandkeramik: the landscape and geographical contexts. In D. Hofmann and P. Bickle (eds), *Creating Communities: New advances in Central European Neolithic Research*. Oxford, Oakville: Oxbow Books, 50-70.

Larina O. V. and Dergachev V. A. 2017. *Pamiatniki kultury lineino-lentochnoi keramiki Respubliki Moldova: (svod istochnikov)*. Chişinău: Akademiya nauk Moldovy, Institut kulturnogo naslediya.

Larina O. and Kuzminova N. 1994. The Late Neolithic Farming on the Territory of the Prut-Dnestr Interfluve. *Préhistoire Européene* 7, 225-240.

Larina O. V., Petrenko V. G. and Sapozhnikov I. V. 1999a. Kultura lineyno-lentochnoi keramiki v Dnestro-Bugskom mezhdureche (po materialam poseleniya Mainova Balka). *Starozhytnosti Pivnichnoho Prychornomoria i Krymu* 7, 10-21.

Larina O., Petrenko V. and Sapožnikov I. 1999b. Materialul ceramic al culturii ceramicii bandlineare. Aşezarea Mainova Balka din Ukraina. In T. Arnăut, A. Zanoci and S. Matveev (eds), *Studia in Honorem Ion Niculiță: Omagiu cu prilejul implinirii a 60 de ani*. Chişinău: Cartdidact, 21-34.

Larina O. V., Vekhler K.-P., Dergachev V. A., Kovalenko S. I. and Bikbaev V. M. 1997. Novye polevye issledovaniya pamiatnikov mezolita i neolita Moldovy. In V. Dergachev (ed.), *Vestigii arheologice din Moldova*. Chişinău: Tipografia Academiei de Ştiinţe RM, 62-110.

Lenartovych O. V. 2013. Kultura liniyno-strichkovoi keramiky u baseini verkhnoho ta serednoho Dnistra i Zakhidnoho Buhu. Dysertatsiya na zdobuttia naukovoho stupenia kandydata istorychnykh nauk. Kyiv: Instytut arkheolohii NAN Ukrainy. (Unpublished manuscript).

Leshtakov P. 2004. Graphite Deposits and Some Aspects of Graphite Use and Distribution in Bulgarian Chalcolithic In V. Nikolov, K. Băčvarov and P. Kalchev (eds), *Prehistoric Thrace. Proceedings of the International Symposium in Stara Zagora, 30.09-4.10.2003*. Sofia, Stara Zagora: Archaeological Institute with Museum BAS, Regional Museum of History, Stara Zagora, 488-496.

Lillie M. C., Budd C., Potekhina I. and Hedges R. 2009. The radiocarbon reservoir effect: new evidence from the cemeteries of the middle and lower Dnieper basin, Ukraine. *Journal of Archaeological Science* 36/2, 256-264. DOI: 10.1016/j.jas.2008.09.005.

Loza Yu. 2010. *Istorychnyi atlas Ukrainy. Naidavnishe mynule. Rus (Kyivska derzhava, Halytsko-Volynska derzhava)*. Kyiv: Vydavnytstvo "Mapa".

Lüning J. 1988. Frühe Bauern in Mitteleuropa im 6. und 5. Jahrt. v. Chr. *Jahrbuch Römisch-Germanischen Zentralmuseums Mainz* 35, 27-93.

Makkay J. 1990. The Protovinča Problem — as seen from the Northernmost Frontier. In D. Srejović and N. Tasić (eds), *Vinča and its World. International Symposium "The Danubian region from 6000 to 3000 B.C."*. Belgrade: Serbian Academy of Science and Arts; University of Belgrade, Faculty of Philosophy Centre for Archaeological Research, 113-122.

Manko V. O. 2006. *Neolit Pivdenno-Skhidnoi Ukrainy* (= *Kamiana doba Ukrainy* 9). Kyiv: Shliakh.

Manko V. O. 2013. *Finalnyi paleolit – neolit Krymu: kulturno-istorychnyi protses*. Kyiv: O. Filiuk.

Manko V. A. 2016. Absolutnoe datirovanie nekotorykh neoliticheskikh kultur na territorii Ukrainy. In A. N. Mazurkevich, M. A. Kulkova and E. V. Dolbunova (eds), *Radiouglerodnaya khronologiya epokhi neolita Vostochnoy Evropy VII-III tys. do n. e.* Smolensk: Svitok, 261-279.

Markevich V. I. 1973. *Pamiatniki epokhi neolita i eneolita* (= *Arkheologicheskaia karta MSSR* 2). Kishinev: Shtiintsa.

Markevich V. I. 1974. *Bugo-dnestrovskaya kultura na territorii Moldavii*. Kishinev: Shtiintsa.

Maidaniuk N. I. 2008. Karta pam'iatok trypilskoi kultury na Vinnychchyni. *Podilska starovyna* 4, 77-88.

Passek T. S. and Chernysh E. K. 1963. *Pamiatniki kultury lineyno-lentochnoy keramiki na territorii SSSR* (= *Arkheologiia SSSR. Svod arheologicheskih istochnikov* B1-11). *Moskva, Izdatelstvo AN SSSR*.

Pechtl J. and Eibl F. 2011. Die neolithische Graphitnutzung in Südbayern. In K. Schmotz (ed.), *Vorträge des 29. Niederbayerischen Archäologentages*. Rahden/Westf.: Verlag Marie Leidorf GmbH, 349-432.

Petrenko V. G. 2012. Stoyanka Girzhevo: nekotorye novye i maloizvestnye dannye. In A. A. Prigarin (ed.), *Chelovek v istorii i kulture, Vypusk 2*. Odessa: SMIL, 228-239.

Petrenko V. G. and Dvorianinov S. A. 1991. Novye dannye o neoliticheskom poselenii Mainova Balka. In E. V. Yarovoy (ed.), *Drevneyshiye obshchnosti zemledeltsev i skotovodov Severnogo Prichernomoria (V tys. do n.e. – V v. n.e.). Materialy mezhdunarodnoy konferentsii, Kishinev, 10-14 dekabria 1990 g*. Kiev: RAMUS AN USSR, 14-15.

Petrenko V. G., Polishchuk L. Iu. and Sapozhnikov I. V. 1993. Novye arkheologicheske pamiatniki v severnykh rayonakh Odesskoy oblasti (epokha kamnia i mednyi vek). In V. P. Vanchugov (ed.), *Drevnosti Prichernomorskikh stepey*. Kiev: Naukova dumka, 103-114.

Petrenko V. H. and Sapozhnykov I. V. 1993. Doslidzhennia poselennia Mainova Balka. In D. N. Kozak (ed.), *Arkheolohichni doslidzhennia v Ukraini 1991 roku*. Lutsk: Nadstyria, 92-93.

Polishchuk L. Yu. 2004. Odeska oblast. Arkheolohichni pamiatki trypilskoi kultury na terytorii Ukrainy. Reiestr. In Burdo N. B. and Videiko M. Yu. (eds), *Entsyklopediya trypilskoi tsyvilizatsii* 1. Kyiv: Ukrpolihrafmedia, 638-645.

Quitta H. and Kohl G. 1969. Neue Radiocarbondaten zum Neolithikum und zur frühen Bronzezeit Südosteuropas und der Sowjetunion. *Zeitschrift für Archäologie* 3, 223-255.

Reimer P. J., Bard E., Bayliss A., Beck J. W., Blackwell P. G., Bronk Ramsey C., Grootes P. M., Guilderson T. P., Haflidason H., Hajdas I., Hatté C., Heaton T. J., Hoffmann D. L., Hogg A. G., Hughen K. A., Kaiser K. F., Kromer B., Manning S. W., Niu M., Reimer R. W., Richards D. A., Scott E. M., Southon J. R., Staff R. A., Turney C. S. M. and van der Plicht J. 2013. IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0-50,000 Years cal BP. *Radiocarbon* 55/4, 1869-1887.

Reingruber A. 2018. Changing perspectives: Looking at the Neolithic in the Northwest Pontic region through radiocarbon dates. In T. Kashuba and E. Kaiser (eds), *Principles and Methods of Dating in Archaeology (Neolithic-Middle Ages)*. St. Petersburg: Institute for the History of Material Culture RAS, 81-96.

Rud V. S. 2015. Kartohrafuvannia pamiatok trypilskoi kultury Pivdenno-Skhidnoi Vinnychchyny. *Arkheolohiya i davnia istoriia Ukrainy* 4/17, 134-139.

Saile T., Dębiec M., Posselt M., Ţerna S. and Kiosak D. 2016. Zur Bandkeramik zwischen Pruth und Sudlichem Bug. *Praehistorische Zeitschrift* 91/1, 1-15. DOI: 10.1515/pz-2016-0001.

Saile T. 2020. On the Bandkeramik to the east of the Vistula River: At the limits of the possible *Quaternary International*. Available online 16 May 2020. DOI: 10.1016/j.quaint.2020.04.036.

Salavert A., Gouriveau E., Messager E., Lebreton V. and Kiosak D. 2020. Multi-proxy Archaeobotanical Analysis from Mesolithic and Early Neolithic Sites in South-west Ukraine. *Environmental Archaeology*, 1-13. DOI: 10.1080/14614103.2020.1746879.

Sapozhnykov I. V. and Sapozhnykova, H. V. 2005. Khronolohiya poselen ta kulturna poslidovnist mezolitu i neolitu Pivnichno-Zakhidnoho Prychornomoria. *Kamiana doba Ukrainy* 7, 87-95.

Sebők K. 2014. Bükk-Keramik in Zwięczyca. In M. Dębiec, *Zwięczyca 3. Eine bandkeramische Siedlung am Wisłok*. Rzeszów: Oficyna Wydawnicza ZIMOWIT, 80-83.

Smolianinova S. P. and Stanko V. N. 1976. Razvedki pamiatnikov kamennogo veka na severe Odesskoi oblasti. In Z. V. Parshina (ed.), *Arkheologicheske i arkheograficheske issledovaniya na territorii Yuzhnoy Ukrainy*. Kiev, Odessa: Vishcha shkola, 112-126.

Sobchuk V. V. 2015. Arkheolohichna karta pamiatok Kirovohradskoy oblasti. In M. Yu. Videiko, Dzh. Chapmann, I. A. Kozyr and V. V. Sobchuk (eds), *Na skhidnii mezhi Staroy Yevropy. Materialy mizhnarodnoy naukovoy konferentsii, Kirovohrad, Nebelivka, 12-14 travnia 2015 roku*. Kirovohrad, 65-68.

Sorochin V. and Dergaciov V. 2010. Cultura Precucuteni-Tripolie A. In V. Dergaciov (ed.), *Istoria Moldovei: Epoca preistorică şi antică: (până în sec. V)*. Chişinău: Acad. de Ştiinte a Moldovei, Inst. Patrimoniului Cultural, Centrul Arheologie, 234-242.

Spriggs M. 2016. Lapita and the Linearbandkeramik: What can a comparative approach tell us about either? In L. Amkreutz, F. Haack, D. Hofmann and I. van Wijk (eds), *Something out of the ordinary? Interpreting diversity in the Early Neolithic Linearbandkeramik and beyond*. Newcastle Upon Tyne: Cambridge Scholars Publishing, 481-504.

Shpylovyi L. V. and Biletskyi V. S. 2019.Ukrainska hrafitova promyslovist: istoriya i suchasnist. *Zbahachennia korysnykh kopalyn* 74/115, 18-32. DOI: 10.13140/RG.2.2.25487.82082.

Stanko V. N. 1966. Mezoliticheskaya stoyanka Girzhevo v Odesskoy oblasti. *Sovetskaya arkheologiya* 2, 96-103.

Stanko V. N. 1967. Nekotorye voprosy pozdnego mezolita Severo-Zapadnogo Prichernomoria. *Zapiski Odesskogo arkheologicheskogo obshchestva* 2, 155-168.

Stanko V. N. and Svezhentcev Iu. S. 1988. Khronologiya i periodizatciya pozdnego paleolita i mezolita Severnogo Prichernomoria. *Biulleten komissii po izucheniyu chetvertichnogo perioda* 57, 116-119.

Subbotin L. V. 1983. *Pamiatniki kultury Gumelnitsa Iugo-Zapada Ukrainy*. Kiev: Naukova dumka.

Telegin D. Ia. 1979. Novye pamiatniki kultury lineyno-lentochnoy keramiki na Ukraine. *Sovetskaya arkheologiya* 2, 229-234.

Telegin D. Ya., Kovaliukh N. N., Potekhina I. D. and Lillie M. 2000. Chronology of Mariupol type cemeteries and subdivision of the Neolithic – Copper Age cultures into periods for Ukraine. *Radiocarbon and Archaeology* 1, 59-74.

Terberger T. and Kabaciński J. 2005. The Neolithisation of Pomerania – a critical review. In D. Gronenborn und J. Petrasch (eds), *Die Neolithisierung Mitteleuropas. Internationale Tagung, Mainz, 24-26 Juni 2005*. Mainz: Verlag des Römisch-Germanischen Zentralmuseums, 375-406.

Tichý R. 1961. O používání tuhy v mladší době kamenné. *Památky archeologické* 52/1, 76-84.

Tovkailo M. 2005. *Neolit Stepovoho Pobuzhzhia* (= *Kamiana doba Ukrainy* 6). Kyiv: Shliakh.

Tovkailo M. T. 2010. Rannoneolitychnyi horyzont poselennia Gard i problema neolityzatsii Pivnichno-Zakhidnoho Nadchornomoria. *Kamiana doba Ukrainy* 13, 208-228.

Tovkailo M. T. 2014. Neolitizatsiya Yugo-Zapadnoy Ukrainy v svete novykh issledovaniy poseleniya Gard. *Stratum plus* 2, 183-245.

Trąbska J. and Wesełuchy-Birczyńska A. 2014. Badania fazowe i strukturalne grafitowej zawieszki ze stanowiska Brzezie 17, gm. Kłaj. In A. Czekaj-Zastawny, *Brzezie 17. Osada kultury ceramiki wstęgowej rytej* (= *Via Archaeologica. Źródła z badań wykopaliskowych na trasie autostrady A4 w Małopolsce*). Kraków: Krakowski Zespół do Badań Autostrad, 491-498.

Tsvek O. V. 1999. Struktura skhidnotrypilskoi kultury. *Arkheologiya* 3, 28-40.

Turner F. J. 1935. *The Frontier in American History*. New York: Henry Holt and Company. xroads.virginia.edu/~HYPER/TURNER/home.html.

Ursulescu N. 2000. Influenţe de tip vinčian în neoliticul vechi din Moldova. In N. Ursulescu, *Contribuţii privind neoliticul şi eneoliticul din regiunile est-carpatice ale României* 1. Iaşi: Editura Universităţii "Al. I. Cuza", 207-220.

Wechler K.-P. 1998. Zum Neolithikum der osteuropäischen Steppe und Waldsteppe (Dnestr-Donez-Gebiet). In B. Hänsel and J. Machnik (eds), *Das Karpatenbecken und die Osteuropäische Steppe. Nomadenbewegungen und Kulturaustausch in den vorchristlichen Metallzeeiten (4000-500 v. Chr.)*. München-Rahden/Westf.: Verlag Marie Leidorf, 71-89.

Wechler K.-P. 2001. *Studien zum Neolithikum der osteuropäischen Steppe* (= *Archäologie in Eurasien* 12). Mainz am Rhein: Philipp von Zabern.

Yanushevich Z. V. 1989. Agricultural evolution north of the Black Sea from the Neolithic to the Iron Age. In D. R. Harris and G. C. Hillman (eds), *Foraging and farming: the evolution of plant exploitation*. London, Winchester (MA): Unwin Hyman, 607-619.

Zaets I. I. 2001. *Trypilska kultura na Podilli*. Vinnytsia: Tezys.

Zalizniak L. L. and Manko V. O. 2004. Stoianky bilia s. Dobrianka na r. Tikych ta deiaki problemy neolityzatsii Serednoho Podniprovia. *Kamiana doba Ukrainy* 5, 137-168.

Zalizniak L. L., Tovkailo M. T. and Kukharchuk Yu. V. 2005a. Doslidzhennia stoyanok bilia s. Dobrianka na Cherkashchyni arkheolohichnoyu ekspeditsiyu NaUKMA u 2001, 2003, 2004 r. *Magisterium (Arkheolohichni studii)* 20, 6-17.

Zalizniak L. L., Tovkailo M. T., Manko V. O. and Sorokun A. A. 2013. Stoyanky bilia khutora Dobrianka ta problema neolityzatsii Buho-Dniprovskoho mezhyrichchia. In L. L. Zalizniak (ed.), *Naydavnishe mynule Novomyrhorodshchyny* (= *Kamiana doba Ukrainy* 15). Kyiv: Shliakh, 194-257.

Zalizniak L. L., Tovkailo M. T. and Zhuravlov O. P. 2005b. Stoianka Dobrianka 3 na r. Chornyi Tikych ta yii mistse u neoliti Buho-Dniprovskoho mezhyrichchia. *Kamiana doba Ukrainy* 7, 96-116.

Zbenovich V. G. 1989. *Ranniy etap Tripolskoy kultury na territorii Ukrainy*. Kiev: Naukova dumka.

Zvelebil M. and Dolukhanov P. 1991. The transition to farming in Eastern and Northern Europe. *Journal of World Prehistory* 5/3, 233-278. DOI: 10.1007/BF00974991.

Zvelebil M. and Lillie M. 2000. Transition to agriculture in eastern Europe. In T. D. Price (ed.), *Europe's First Farmers*. Cambridge: Cambridge University Press, 57-92.