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FIELD SURVEY AND MATERIALS

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POTTERY KILNS FROM THE TRIPOLYE SETTLEMENT OF KAMENETS-PODOLSKIY, TATARYSKY, THE 2019 EXCAVATION CAMPAIGN: REGARDING THE ISSUE OF THE EVOLUTION OF TRIPOLYE POTTERY KILNS

ABSTRACT

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This paper presents two pottery kilns of an archaic construction, which were excavated at the Tripolye BII settlement of Kamenets-Podolskiy, Tatarysky, in 2019. The site, dated to the beginning of the 4th mil. BC, is attributed to the Mereshovskaya group of the Western Tripolye culture. Analysis of the construction details of our kilns compared to similar structures, which are known from other Tripolye sites and outside the Cucuteni-Tripolye cultural complex, made possible the typological specification of Cucuteni-Tripolye pottery kilns and a contribution to the issue of major trends in their evolution.

Keywords: Neolithic, pottery kilns, Cucuteni-Tripolye cultural complex, Western Tripolye culture, ceramics
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INTRODUCTION

Cucuteni-Tripolye cultural complex, and especially its northeastern, Tripolye component significantly differs from numerous earlier and later cultures and cultural complexes between the Carpathians and the Dnieper with regard to its well-made ceramics. Therefore, the issues of technology and scales of its production are being actively investigated, while the evolution of pottery kilns remains one of the most important issues influencing the overall state of debates (*e.g.* Ellis 1984; Ryzhov 2001; Tencariu 2010; Tsvek 1994; 2004; Videiko 2002; 2013). The goal of this paper is the detailed publication of pottery kilns excavated at the settlement of Kamenets-Podolskiy, Tatarysky, in 2019, allowing several important conclusions considering the evolution of ceramic production in the Western Tripolye culture.

For a long time the 'Tripolye perspective' on Cucuteni-Tripolye pottery kilns was framed by the view from the Eastern Tripolye culture (distinguished by E. Tsvek 1989; 2006; hereinafter – ETC) due to the finds made mainly during the excavations of sites attributed to this taxonomical unit (*e.g.* Tsvek 1994; 2004). The contribution from the Western Tripolye culture (distinguished by S. Ryzhov 2007; hereinafter – WTC) mainly focused on the structures excavated in Zhvanets (Movsha 1971). However, recent geophysical prospection, followed by the excavations at the WTC mega-sites Nebelevka, Dobrovody, Talianki and Maidanetske in Ukraine, led to the discovery of pottery kilns of previously unknown type (Fig. 1). Such structures are not subdivided into subterranean

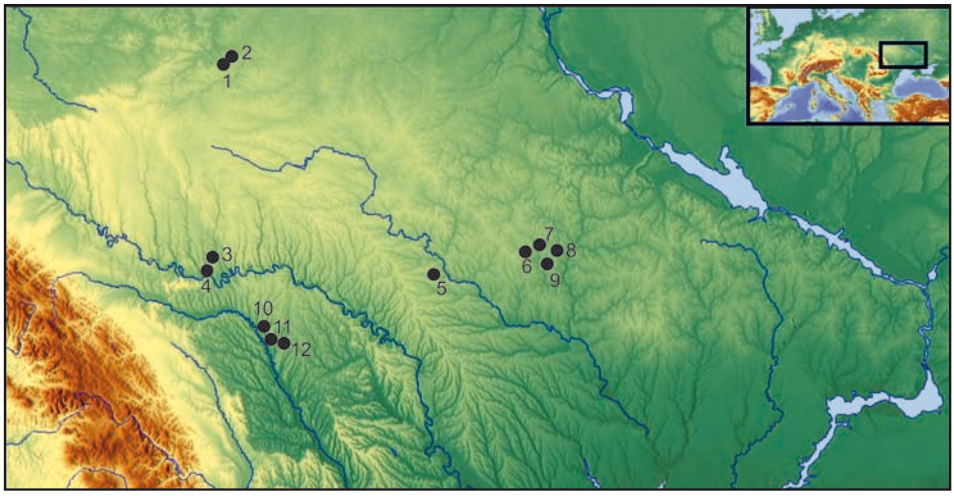

Fig. 1. Locations of the sites with pottery kilns that were considered in this paper. 1 – Novomalin-Podobanka, 2 – Ostrog-Zeman, 3 – Kamenets-Podolskiy, Tatarysky, 4 – Zhvanets, 5 – Trostianchyk, 6 – Dobrovody, 7 – Talianki, 8 – Maidanetske, 9 – Nebelevka, 10 – Trinca-Izvorul lui Luca, 11 – Hancăuți I – „La Frasin", 12 –Stolniceni I (base: https://maps-for-free.com/)

fueling chamber and elevated firing chamber placed over each other. Instead, fuel was burnt in pits located near the kilns or right on surface next to them, and passed through the channels made by supports and holes in the elevated platform to the firing chamber (Burdo and Videiko 2016; Korvin-Piotrovskiy *et al.* 2016; Videiko 2019; *cf.* Chapman and Gaydarska 2016). New finds also made possible the interpretation and re-interpretation of related structures from the excavations in Western Volhynian sites, Ostrog-Zeman (Pozikhovskyi 2019) and Novomalin-Podobanka (Videiko 2019: properly reassessed from Diachenko 2016). Reigniting interest in the topic, the discoveries at the Tripolye mega-sites led to the publication of kilns from the earlier excavations in Northern Moldova (Sîrbu 2015; Sîrbu and Bicbaev 2017), while new geophysical surveys and fieldwork in this region, among others, resulted in the investigation of double-chamber kilns in Stolniceni I (Ţerna *et al.* 2016; 2017; 2019).

Rapidly accumulated empirical evidence made possible generalizations considering specific construction details, as well as the chronology and evolution of pottery kilns discovered at the WTC mega-sites in the Southern Bug and Dnieper interfluve (*e.g.* Korvin-Piotrovskiy *et al.* 2016; Videiko 2019). In this respect, we should especially note the recent publication of V. Rud and his co-authors (2019), extending and specifying the information from the preliminary report on excavations at the Tripolye BII settlement of Trostianchyk in the Bug region (Rud 2016). The latter two papers present the analysis of clay discs and units ('truncated-pyramidal clay objects'), which were found in one of the pits and interpreted as construction elements of a pottery kiln, questioning the archaic stages in the evolution of such structures. Contributing to the discussion raised by V. Rud, we will present the context of similar finds from the settlement of Kamenets-Podolskiy, Tatarysky, which were only briefly described in the preliminary report (Diachenko *et al.* 2019), and then suggest the reconstruction of evolutionary trajectories of Tripolye pottery kilns. However, let us begin with the information on excavations in Kamenets-Podolskiy, Tatarysky, and the discussion of chronology of this and related sites.

EXCAVATIONS AT THE SETTLEMENT OF KAMENETS-PODOLSKIY, TATARYSKY: RESEARCH AIMS AND POSITION OF THE SITE IN THE CHRONOLOGICAL AND TAXONOMICAL DIVISION OF CUCUTENI-TRIPOLYE SETTLEMENTS

Fieldwork at the WTC settlement of Kamenets-Podolskiy, Tatarysky, in 2019 was conducted as part of the research project 'Dynamics of prehistoric culture: Comprehensive analysis of records from Southeastern and Central Europe' funded by the National Science Center of Poland (2018/29/B/HS3/01201; Iwona Sobkowiak-Tabaka, PI). Excavations were preceded by geophysical surveys (Diachenko *et al.* 2019). Fieldwork aimed the for-

mation process of archaeological records, reduction of information and accumulation of material remains in discrete time. Due to these goals, we have chosen to excavate the Tripolye ploschadka, *i.e.* the rectangular-shaped structure, including burnt daub, ceramics, tools and animal bones, which represents the remains of a burnt house, and pits in its close vicinity. In a certain way, the ploschadka encompases the construction of a dwelling, activities conducted by inhabitants within, and its ritual burning after the placement of vessels, tools and figurines in various parts, as well as the possible deliberate destruction of the 'heart of the house' – a hearth (*e.g.* Gershkovich 2003; Kruts 2003; *cf.* Chernovol 2012).

In the search for a particular Tripolye site to excavate, we have chosen the settlement of Kamenets-Podolskiy, Tatarysky, located in the Middle Dniester region. This site was chosen in consideration of an imbalance in fieldwork in different areas of the Cucuteni-Tripolye cultural complex (hereinafter – CTCC) after the discovery of mega-sites in the Southern Bug and Dnieper interfluve, and their subsequent large-scale excavations, accompanied by geophysical prospection and regional surveys since the 1970s (for the recent overview see: Chapman *et al.* 2014; Menotti and Korvin-Piotrovskiy 2012; Müller *et al.* 2016; Videiko 2013). Moreover, material culture of the Middle Dniester region and the Southern Bug and Dnieper interfluve is characterized by the development of two 'genetic lines' (using a term suggested by V. Dergachev 1980), both rooted in the Rakovetskaya local group of the Middle Dniester region (Chernysh 1973; Popova 1989; Ryzhov 2007; Sorokin 1990; Tkachuk and Shevchuk 2007). Let us briefly consider the discussion on the taxonomy and chronology of the related sites.

V. Sorokin suggested two subsequent site types in the development of the first half of Tripolye BII sites in the Middle Dniester region, the Rakovetskiy and Mereshovskiy types, respectively, seeing their origin in the sites of the Yablona type (Sorokin 1990). This division is generally followed by S. Ryzhov; however, he considers the Zaleschitskaya and Solonchenskaya groups as the bases of formation of the Rakovetskiy type, and refers the site of Yablona to the latter (Ryzhov 2007). T. Tkachuk considers the differences in ceramic assemblages of the related sites as being significant enough to distinguish the Rakovetskaya and Mereshovskaya local groups (*e.g.* Tkachuk and Shevchuk 2007). In this respect, we should note that in the Cucuteni-Tripolye taxonomy, the duration of a unit's existence, its territorial extension and the difference in pottery styles increase from 'site type' to 'local group'. Based on the analysis of ceramics, Ryzhov (2007) suggested that part of the population of the Rakovetskiy type and later populations of the early phase of the Mereshovskiy type migrated to the east and formed the settlements of the Voroshilovka type and the later Nemirov type in the Bug region, as they were distinguished by S. Gusev (1993). Mixing with the populations of the Eastern Tripolye culture and Post-Klischev groups further to the east, those populations formed the sites of the Vladimirovskaya, and later the Nebelevskaya group in the Southern Bug and Dnieper interfluve. The core area of the Mereshovskiy type, already in the early phase of its development, became the base of the formation of the Petrenskaya local group (Ryzhov 2007). The migratory hypothesis find its confirmation in

population and environmental proxies (Diachenko 2012; 2019; Diachenko and Menotti 2017; Harper 2017; Harper *et al.* 2019; Weninger and Harper 2015). According to T. Tkachuk and S. Ryzhov, populations of the Mereshovskaya group extended their territory from the Middle Dniester region to the Middle Dniester and Prut interfluve and the southern part of the Bug region. According to T. Tkachuk, the second phase of their development may be synchronized with the early sites of the Shypinetskaya group, while the third phase was the time of the migration of populations of the Mereshovskaya group further to the east (Tkachuk and Shevchuk 2007).

The settlement of Kamenets-Podolskiy, Tatarysky, is located on the hill-shaped ledge of a plateau to the south of Kamenets-Podolskiy castle. The site has been known since 1926. Collections from surface surveys are kept by the State Historical Museum-Preservation of Kamenets-Podolskiy and the Archaeological Laboratory of the Ivan Ohienko National University of Kamenets-Podolskiy (Levinzon 2018; 2019). Analysis of surveyed ceramics allowed S. Ryzhov (2003) to attribute the site to the formation phase of the Petrenskaya local group. Later on T. Tkachuk (2015) referred Kamenets-Podolskiy, Tatarysky, to the second phase of the development of the Mereshovskaya local group, hence suggesting its similar chronological position. However, his attribution of the site in cultural taxonomy confronts Ryzhov's opinion.

Considering the location of the settlement and numerous fragments of Tripolye pottery annually found on its modern surface, we decided to begin fieldwork by testing the intensity of erosion processes influencing the preservation of the cultural layer. For this purpose, a 10 m long and 1 m wide trench was excavated on the eastern slope of the hill-shaped ledge of the plateau. Remains of two pottery kilns were found at the bottom of the trench. Therefore, the latter was included in excavation site I in order to investigate these structures completely. Ploschadka was investigated in excavation site II, located in the other part of the site.

Unfortunately, painted ornamentation was not preserved on the vast majority of vessels in the ceramic assemblage obtained in the 2019 excavation campaign. Nonetheless, we may note some archaic pottery traditions in this sample. These include the nearly equal relative number of conical and spherico-conical bowls, funnel-shaped rims, the predominance of spherico-conical vessels over biconical ones, goblets with metopic ornamentation of early variations, and painting on both sides of bowls (Figs. 2 and 3). Some of the listed archaic shapes and ornaments were already noted at the site by T. Tkachuk (Tkachuk 2015; also see Tkachuk and Shevchuk 2007 for the chronological indicators). Moreover, the ceramic assemblage includes four fragments of pottery with incised decoration, which, according to V. Sorokin, accounts for 2-4 % of the all ceramic assemblages of the Rakovetskiy type, but is not noted by him for the Mereshovkiy type (Sorokin 1990). It should be highlighted that the aforementioned percentage 'increases' when it is estimated using the total number of table pottery as counted by S. Ryzhov and T. Tkachuk and their followers, including the authors of this paper. Additionally, taking into account the territorial and spatial

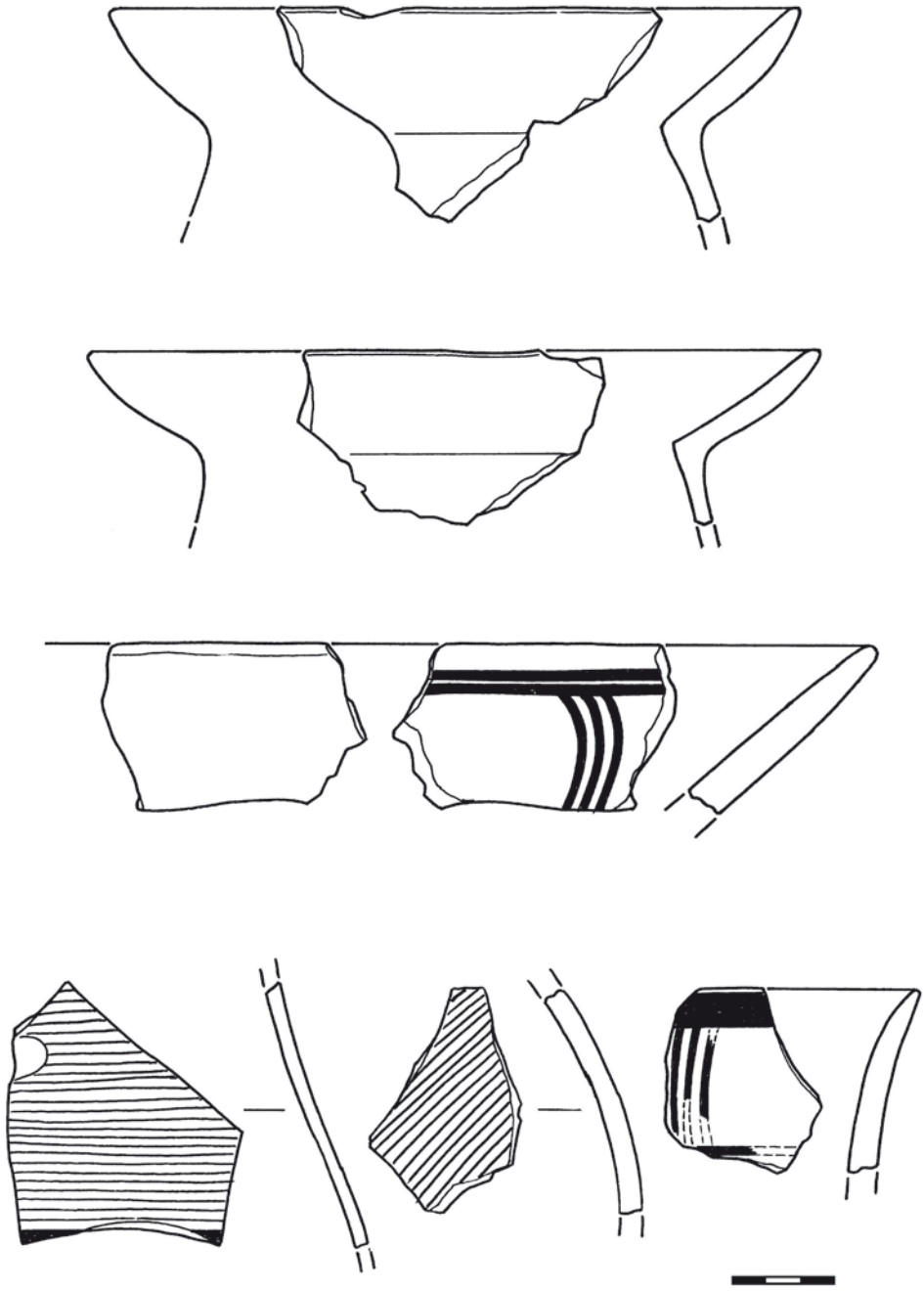

Fig. 2. Kamenets-Podolskiy, Tatarysky. Examples of table pottery from excavation site I (drawings by D. Kushtan)

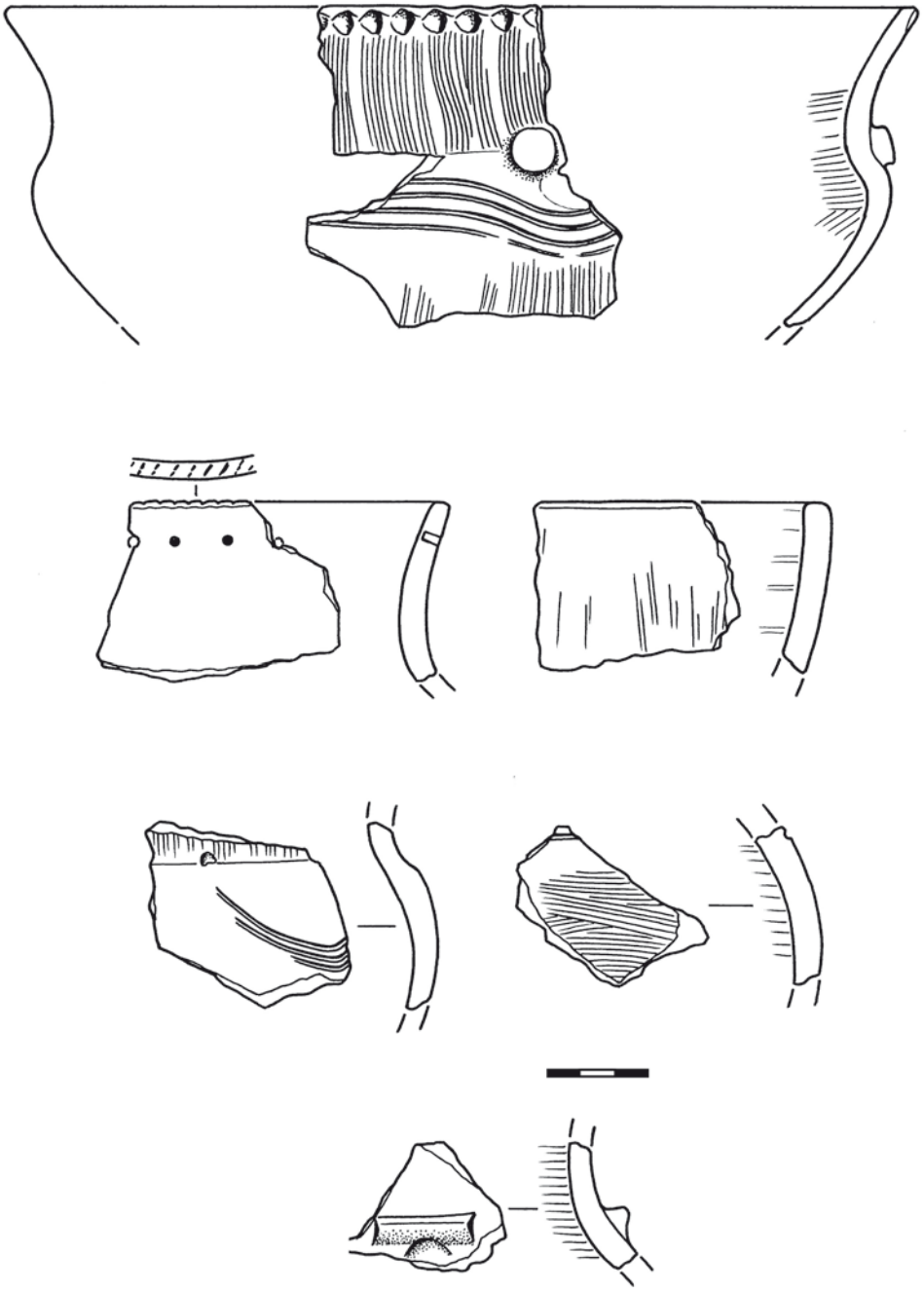

Fig. 3. Kamenets-Podolskiy, Tatarysky. Examples of kitchen pottery from excavation site I (drawings by D. Kushtan)

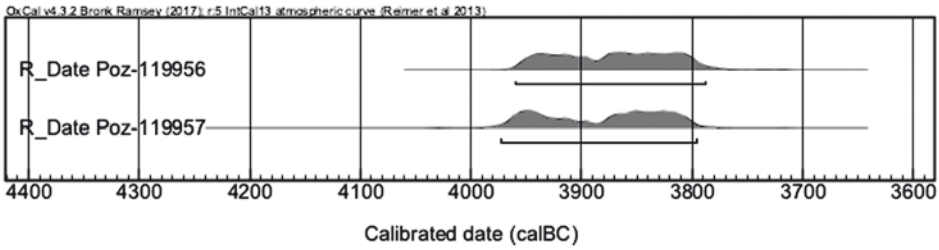

Fig. 4. Kamenets-Podolskiy, Tatarysky. Radiocarbon dates made on animal bones from excavation site II (*ploschadka*). Dates were calibrated according to the IntCal 13 Northern Hemisphere curve (Reimer *et al.* 2013) in OxCal (Bronk Ramsey 2017) version 4.3.2

extension as secondary taxonomical criteria in distinguishing local groups, we may preliminary agree with Tkachuk's division of the Middle Dniester Tripolye BII sites into the Rakovetskaya and Mereshovskaya local groups, referring the analyzed site to the latter.

The low frequency of table pottery with incised ornamentation (below 1%) noted for Kamenets-Podolskiy, Tatarysky, is also typical for the first phase of the development of the Nebelevskaya local group in the Southern Bug and Dnieper interfluve (Ryzhov 1993). Consideration of the ceramic seriation and ^{14}C dates (Fig. 4) allows the dating of the settlement of Kamenets-Podolskiy, Tatarysky, to the range of c. 3950-3900 BC. This suggests synchronicity of settlements belonging to the first phase of the Nebelevskaya local group and the Mereshovskaya group sites of Trostianchyk and Kamenets-Podolskiy, Tatarysky, with a certain extension of the duration of the mega-site of Nebelevka (Chapman *et al.* 2018; Rud *et al.* 2019; also see: Diachenko 2010; 2012; Harper 2017; *cf.* Chapman 2017; Chapman *et al.* 2018; 2019; Nebbia *et al.* 2018).

POTTERY KILNS FROM KAMENETS-PODOLSKIY, TATARYSKY

Let us now consider pottery kilns investigated at excavation-site I at Kamenets-Podolskiy, Tatarysky. These structures were sunken into the sterile earth, represented by limestone, which preserved them from later destruction by intensive erosion processes. Kilns were placed 2 m apart from each other along a NNE-SSW axis (Fig. 5). The difference in elevations at this part of the slope reached 1.3 m along the 10-meter-long west-east axis. The location of the analyzed kilns on the edge of the ledge of a plateau in Kamenets-Podolskiy, Tatarysky, has analogies in Zhvanets (Movsha 1971), Trinca-Izvorul lui Luca (Sîrbu 2015), Hancăuți I – „La Frasin" (Sîrbu 2015; Sîrbu and Bicbaev 2017) and other sites. Such placement decreased the risk of fire and supported the additional circulation of air in the kilns (Sîrbu 2015).

Pottery kiln 1 had a nearly square form with rounded corners. The size reached c. 2.2 m along the west-east axis and 2.1 m along the north–south axis. The entrance to the kiln was turned to the east (Fig. 6). A shallow pit of a depth of 0.08-0.15 m, 'dug out' by removing small blocks of limestone, was cleared in front of the entrance (Fig. 7). The surface, initially prepared by removing the sterile soil (the difference in elevation reaches 0.4 m along the west-east axis), was covered by a thin, 2-2.5 cm layer of clay. It was only partly preserved – probably in the places where the most hot air was passing through the channels formed by supports (also known as 'козлы' in Russian or 'goats' in articles on Tripolye pottery kilns – *e.g.* Korvin-Piotrovskiy *et al.* 2016; further in this paper, supports of kiln 1 are numbered from 1 to 6, counting from the south to the north – Fig. 8). More specifically, the clay layer placed over the bottom of the kiln was preserved near the entrance, along the channels in the middle of the structure, and also between the supports and the back wall. Additionally, this clay layer was joined to the vertical side of the supports, which can be seen on supports 3 and 4 (Fig. 9: A).

Exploration of support 4 has shown that it was placed on the clay bottom, which was already burnt during previous usage(-s) of the kiln (Fig. 8). This leads to the conclusion that kiln 1 functioned over multiple phases. Units composing a support that were damaged during the use of the kiln could be replaced by new ones. Therefore, the appearance of kiln 1 represents the construction details of this structure during the final stage of its functioning (Figs. 8, 10).

Unlike the contemporaneous kiln excavated in Nebelevka and later structures from the other sites in the Southern Bug and Dnieper interfluve and Western Volhynia, which number

Fig. 5. Kamenets-Podolskiy, Tatarysky. Pottery kilns at excavation site I, cleaning. Photo I. Sobkowiak-Tabaka

Fig. 6. Kamenets-Podolskiy, Tatarysky. Pottery kiln 1, cleaning. Photo I. Sobkowiak-Tabaka

Fig. 7. Kamenets-Podolskiy, Tatarysky. Shallow pit near the entrance to pottery kiln 1. Photo I. Sobkowiak-Tabaka

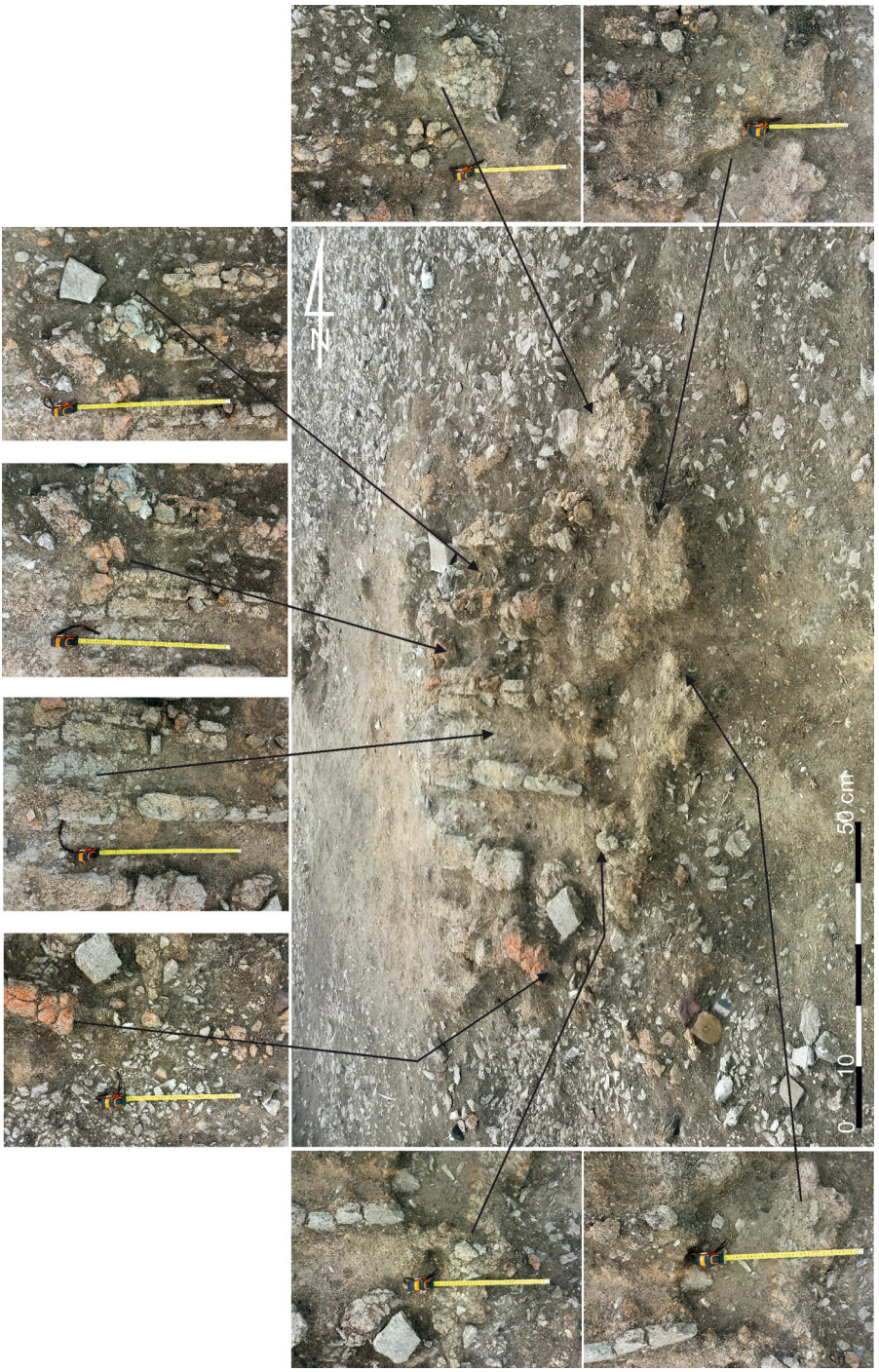

Fig. 8. Kamenets-Podolskiy, Tatarysky. Pottery kiln 1, exploration. Photo I. Sobkowiak-Tabaka

Fig. 9. Kamenets-Podolskiy, Tatarysky.
Construction details traced on channels and supports:
A – layer of clay covering the bottom of kiln 1 was joined to supports; B – possible placement of units (a unit found in the channel between supports 4 and 5 stands on support 5); C – an example of smoothed walls of the supports.
Photo I. Sobkowiak-Tabaka

Fig. 10. Kamenets-Podolskiy, Tatarysky.
Exploration of pottery kiln 1:
A – view from the east; B – view from the north; C – view from the south. Photo A. Diachenko

up to four supports, kiln 1 in Kamenets-Podolskiy, Tatarysky, included six supports. Together with the walls, they formed seven channels of an average width of c. 14-16 cm. Each support consisted of three units made of clay with an admixture of sand (one unit was not preserved in support 1 but was indicated by the remains of burnt clay on the surface, and one unit in support 5 along with two units in support 6 were significantly damaged). Units had a nearly rectangular shape with rounded edges and smoothed walls. In some cases, such units were produced as a single element over a relatively short period of time (*e.g.* in supports 1, 2 and 3). In some cases the units consisted of two (*e.g.* in support 6) or three parts (support 4), suggesting that those parts were joined together when the formed clay mass became dry (Fig. 8). Their size varied, reaching 24 x 9, 28 x 12, 28 x 10, 28 x 12, 29 x 13, 32 x 10, or 32 x 11 cm. Composing a support, the units were placed at a distance of c. 6-8 cm of each other, allowing the circulation of air and the uniform distribution of its temperature inside the kiln (Fig. 10). Notably, before the usage of this structure in its final stage, two such units were replaced by a fragment of previously used grinding stone (support 2) and the rim of a crater, *i.e.* a certain type of table pottery (support 6 – Fig. 8). None of the supports touched the walls of kiln 1, making possible the additional circulation of air. Clay units forming the supports had smoothed walls and a relatively thick, flattened top. One such unit was found in a channel between supports 4 and 5, lying on its vertical side. This suggests that the units were placed one on top of the other in the form of a 'chessboard'. Therefore, the height of the supports was at least 6-8 cm higher, reaching at least 12-16 cm (Fig. 9: B, C).

Fig. 11. Kamenets-Podolskiy, Tatarysky. Clay discs from kiln 1. Photo I. Sobkowiak-Tabaka

Supports were covered by round discs made of clay with an admixture of sand and relatively rare inclusions of organics (Fig. 11). This way, the discs formed a removable channel covering or, in other words, a removable platform for the placement of pottery before firing (Burdo and Videiko 2016; Korvin-Piotrovskiy *et al.* 2016; Ţerna *et al.* 2017; *cf.* Rud *et al.* 2019). In one case, a fragment of a clay disc was recorded on top of supports 2 and 3 (Fig. 6). However, considering the possibility of the greater height of supports, the location of this fragment could have resulted from its re-deposition after abandonment of the kiln. Microscopic observations on similar clay units and discs from Tronstianchyk by A. Rauba-Bukowska indicated that these construction elements were fired at a similar temperature as pottery from the site. This confirms the interpretation of the structures composed of such units and discs as pottery kilns (Rud *et al.* 2019). The high temperature of pottery firing in kiln 1 from Kamenets-Podolskiy, Tatarysky, is confirmed by the relatively thick layer of soil (up to 10 cm) affected by fire beneath the clay layer covering the bottom of the structure.

Aside from those of relatively large discs, fragments of discs of a smaller diameter were found in kiln 1 as well. The latter ones were produced of clay with an admixture of sand. Considering the direct analogies of distinct finds of discs from Parcova (Bodean 2016), and indirect evidence from Talianki where smaller discs were 'replaced' by fragments of broken bowls (Korvin-Piotrovskiy *et al.* 2016), they could be used for controlling the temperature inside the kiln or controlling the flow of oxygen.

Besides some re-deposited pottery fragments, the filling of channels in kiln 1 also included small fragments of burnt daub with traces of thin sticks and twigs. Taking into account the analogies from other WTC kilns (*e.g.* Burdo and Videiko 2016; Korvin-Piotrovskiy *et al.* 2016), these fragments represent the walls and/or vault of the kiln.

Pottery kiln 2 had a rectangular shape with rounded corners, and was placed into a surface preliminary prepared by removal of the sterile earth (difference in elevations reaches 0.17 m along the west-east axis; Fig. 12). The size of this structure is estimated to be 1.4 m along the north-south axis and c. 0.7 m along the west-east axis. Two channels of c. 0.7 m long were 'dug out' by removing small limestone blocks in the northern part of the structure. This indicates that the location of the entrance was in the northern part of the kiln. However, no pit (*i.e.* firebox) was found there. In this respect, we should note that some of the excavated WTC pottery kilns were also not accompanied by pits, suggesting that fuel could have been burned on the ancient surface next to the entrance of the kiln (*e.g.* kiln A in Talianki, construction phases 2 and 3 of the Maidanetske kiln, *etc.* – Korvin-Piotrovskiy *et al.* 2016).

Sterile earth between the channels of kiln 2 was preserved for forming the base of a support. Remains of the latter are represented by a single unit, analogous to the ones found in kiln 1. This unit, of rectangular shape with rounded edges, was made of clay without organic admixtures. Its size is estimated to be 26 by 8 cm (Fig. 13).

A small firing chamber of c. 0.7 by 0.65 m in kiln 2 was somewhat sunken into the sterile soil. Vertical fragments of burnt daub (up to 6 cm thick) with substantial organic

Fig. 12. Kamenets-Podolskiy, Tatarysky. Pottery kiln 2, cleaning. Photo I. Sobkowiak-Tabaka

Fig. 13. Kamenets-Podolskiy, Tatarysky. Pottery kiln 2, exploration. Photo I. Sobkowiak-Tabaka

admixtures were explored near the southern and western wall of the chamber. This may suggest a relatively high temperature inside the kiln (Fig. 13). Fragments of a clay disc were found in the fill of the firing chamber of kiln 2. The fragments are analogous to the ones found in kiln 1. The fill of the firing chamber also included small fragments of burnt daub with substantial organic admixtures, which preserved traces of wood, and were interpreted as the remains of walls and/or the vault of the kiln. In the southern edge of the structure, fragments of clay with organic admixtures were placed over sterile soil. Most probably, they represent portions of the base of the walls.

Considering the location of this structure near kiln 1, and its size, which is comparable to the dimensions of related structures in the other WTC sites, it is difficult to explain the functional need for the location of a small kiln near the 'normal'/'large' one. According to S. Ryzhov (personal comment in July 2019), usage of this structure could be related to the firing of pottery with bichromic painting, *i.e.* black and white or red and white, which is seen on WTC sites of this time period at low frequencies. Black and red paint was made of ochre and required a higher temperature of firing, as compared to white paint made of chalk (the composition of paint and the temperature of firing is discussed in Ryzhov 2001). Therefore, ceramics with bichromic black and white or red and white ornamentation had

Fig. 14. Kamenets-Podolskiy, Tatarsky. Feature 3 in excavation site I: the structure sunken into the ground (preparation of area prior to the construction of a pottery kiln?), exploration. Photo A. Diachenko

to be fired twice, *i.e.* red or black paint was fixed in fire first, and white paintings were fixed subsequently. The proposed assumption finds indirect conformation in similar features, which are known from the site of Zadubravlje (Northern Croatia) and related to the white-painted Linear A phase of the Starčevo culture (Minichreiter 2007). The kilns at Zadubravlje were located within working pits 12 and 14. The smaller kiln with dimensions of 1.3 x 0.4 m was 0.3 m high, and the bigger one with dimensions of 2.7 (originally 2.0 m) x 0.35 m was 0.65 m high. Both of them were built of clay balls, yellowish and reddish in color (mosaic structure). The kilns were elongated, of 'cigar' shape, and were used for firing fine and painted pottery. At the same time, much larger structures, *i.e.* feature 9 (a cylindrically shaped kiln) were used for firing large, coarse vessels (Minichreiter 1992; 2001, Fig. 6).

To the west of kiln 1 in Kamenets-Podolskiy, Tatarysky, we excavated feature 3, of unknown function, sunken into the ground. In its central part, blocks of limestone were removed up to 8-10 centimeters deeper than the 'average' depth of the feature, giving an impression of the preparation of two channels and bases for supports (Fig. 14). Meanwhile, its fill did not include any layers of clay mixed with sand, fragments of daub with substantial organic admixture etc., leaving our assumption unproven.

DISCUSSION AND CONCLUSIONS

The results of our excavations support V. Rud's interpretation of clay units and discs from the contemporaneous site of Trostianchyk as elements of pottery kilns of archaic construction (Rud 2016; Rud *et al.* 2019). Moreover, exploration of such kilns in Kamenets-Podolskiy, Tatarysky, allows for the specification of construction details and several assumptions related to the evolution of pottery production among populations of the CTCC.

Taking into account the relation between fuel, draught and vessels, and the position of the chamber(s) in reference to the soil's surface, F.-A. Tencariu (2010) distinguished five main types of Neo-Eneolithic pottery kilns. The first type (A), represented by open firing (with/without isolation), is known only from ethnographic studies. The second one (B) comprises firing pits (a series of pits of different shapes and dimensions), which are known from the Early and Middle Neolithic and the Middle Chalcolithic. The third type (C), which includes surface-level, one-chambered kilns (with/without lateral opening for fueling the fire; with lateral extended opening in the shape of a tunnel), occurred in the Cucuteni culture, the Middle Neolithic and the Middle Eneolithic. The fourth type (D) is represented by subterranean kilns with lateral fueling tunnels and access holes (one-chambered, or with two connected chambers for vessels) known from the Early and Middle Neolithic. The last type (E) comprises kilns with two chambers, placed vertically and separated from each other by a perforated grid made of clay. This is the most complex type of firing pottery workshop known from the Middle Chalcolithic. It is worth noting that there is no linear

evolution of these installations, since different types – more simple and more complex – were being used simultaneously by communities related to the same culture (Tencariu 2010).

This scheme may be contributed by the evolutionary trends of pottery kilns we have analyzed in this paper. Despite the similarity in construction, we tend to attribute kiln 1 and kiln 2 from Kamenets-Podolskiy, Tatarysky, to different variations, considering differences in their size, which probably indicates functional differences.

As noted above, 'large' structures are characterized by supports consisting of clay units or solid supports, and removable (*i.e.* represented by clay discs) or solid platforms for standing vessels. Since a solid platform may be placed only on solid supports, correlation of these variations provides three groups of kiln construction, which are also visible in the archaeological data. The first group comprises the structures with removable supports and a removable platform. Kilns of the second group have solid supports and a removable platform. The third group includes structures with both solid supports and platforms. The available data indicates chronological differences between pottery kilns of these groups.

Ceramic seriation and ^{14}C dates indicate the synchronous usage of the analyzed structures attributed to the first and second groups (group 1: Kamenets-Podolskiy, Tatarysky, and Trostianchyk, group 2: Nebelevka). Meanwhile, taking into account the archaic elements in pottery assemblages of the Mereshovskaya group, we could assume that these ceramics were also fired in kilns of archaic construction. Therefore, group 1 includes the earliest variations of kilns of the analyzed type, which for a certain period of time coexisted with the structures attributed to group 2. The question of when kilns attributed to group 1 originated remains open. Structures belonging to group 2 are dated to Tripolye BII and CI (*e.g.* Nebelevka – see Burdo and Videiko 2016; Chapman and Gaydarska 2016; Maidanetske – Korvin-Piotrovskiy *et al.* 2016). However, their earlier development should not be excluded. Structures included in group 3 are known from Tripolye CI sites (*e.g.* Talianki – Korvin-Piotrovskiy *et al.* 2016). Most probably, kilns of group 1 were no longer being constructed by the time of the appearance of structures attributed to group 3. Kilns belonging to groups 1 and 2 are characterized by a greater number of supports (four to six) than the later structures of group 3 (up to four). This numerical difference may be a function of the requirements of the removable or solid platform. A greater number of supports was needed for clay discs of larger diameters.

In summary, we can suggest the following evolutionary trend for Tripolye pottery kilns with supports and multiple channels. The most archaic group (1) includes structures with removable supports and platform. Already at the end of the first half of Tripolye BII, earlier kilns coexist with structures characterized by solid supports and removable platforms. By Tripolye CI, kilns of group 1 were most likely not being constructed anymore. However, the new modification, *i.e.* kilns with solid supports and platform, appear simultaneously with the structures attributed to group 2, as exemplified by the kiln from Maidanetske (Korvin-Piotrovskiy *et al.* 2016). The double-chamber kilns, which are attributed to type 'E' after Tencariu (2010) and known from Tripolye CI and CII (respectively, Stolniceni I,

2016-2017 campaigns – Țerna *et al.* 2019; and, for example, Zhvanets, Trinca-Izvorul lui Luca, Hancăuți I – „La Frasin" – Movsha 1971; Sîrbu 2015; Sîrbu and Bicbaev 2017), seem to originate from groups 2 and 3 of the analyzed structures or their combination with a type of firing pit (type 'B' after F.-A. Tencariu). It should be noted that kilns from Stoniceni I are attributed to type 'E,' because their fueling chamber was completely sunken into the ground below the firing chamber, similar to the construction of later structures listed above. This technological solution significantly impacts the firing process (Ryzhov 2001).

Most probably, the genesis of small-sized Tripolye kilns, represented by kiln 2 in Kamenets-Podolskiy, Tatarysky, is linked to the modification of even more archaic 'cigar'-shaped structures, such as were discovered at the site of Zadubravlje in Starčevo (Minichreiter 1992). It is important to note that structures of a similar shape (which, however, does not necessarily mean similar function!) were recorded in a number of chronologically different and spatially distinct Neolithic sites – *e.g.* the Butmir culture settlement Okolište (Hofmann *et al.* 2006, 95, fig. 40) and the Tripolye BI settlement Ozhevo-Ostrov (Chernovol 2014; Chernovol and Radomskyi 2015, 368, fig. 1). Therefore, we would not exclude the functioning of 'cigar'-shaped kilns in Tripolye settlements and their coexistence with more complex firing structures. This issue will be solved with further accumulation of empirical data.

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