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Multidisciplinary Research on the Sabatinìvka 1 Site: History and State of Art

Abstract

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The article examines the history and results of research at the site of Sabatinìvka 1, which comprises two cultural layers: the Cucuteni-Trypillia complex and the Late Bronze Age layer. The site has been investigated through a long-term, multidisciplinary collaboration involving radiocarbon AMS dating, as well as paleopedological analyses. Archival materials from the Odesa Archaeological Museum and the Institute of Archaeology of the National Academy of Sciences of Ukraine have been revisited and systematized. The paper summarizes the results of excavations conducted in 1938–1939, 1947–1949, and 2011–2018, which revealed architectural remains and buried features associated with both cultural layers. In addition, new AMS dates are presented, refining the chronology of the Cucuteni-Trypillia and Late Bronze Age occupations at the site.

Keywords: Southern Bug Area, Chalcolithic, Cucuteni A-Trypillia B1, Late Bronze age, AMS-dating, paleopedological analysis

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Introduction

Sabatinìvka 1 is a well-known multi-layered site representing both the Cucuteni A-Trypillia B1 phase and the Late Bronze Age Sabatinìvka culture, located in the middle Southern Bug region (Fig. 1). The first excavations at the site were conducted in 1932 (Kozubovs´kij 1933, 71). In some parts of the settlement, two distinct cultural layers have been identified, while in others, only a single layer – either Chalcolithic or Bronze Age – is present. Although the material culture of the Cucuteni-Trypillia complex predominates, archaeologists also recorded ceramics characteristic of the Late Bronze Age during excavations. The cultural attribution of these Late Bronze Age materials was established only several years later.

The settlement of Sabatinìvka 1 is the eponymous site for a local group of the Cucuteni A-Trypillia B1 stage, known for its unique ceramic traditions and cultural interactions. The pottery consists of items with incised decoration, as well as the first appearances of painted vessels and evidence of increasing contact with neighbouring steppe populations. Beyond its significance for the Eneolithic period, the site also lent its name to the Sabatinìvka culture of the Late Bronze Age, which became widespread across the steppe zone of the North Pontic area.

Between 2011–2018, the Podillia-Pontic archaeological expedition excavated more trenches at the settlement, conducted a paleopedological analysis, and obtained several AMS dates. These efforts were aimed at determining the chronological timeline of the Cucuteni-Trypilla and Late Bronze Age popula-

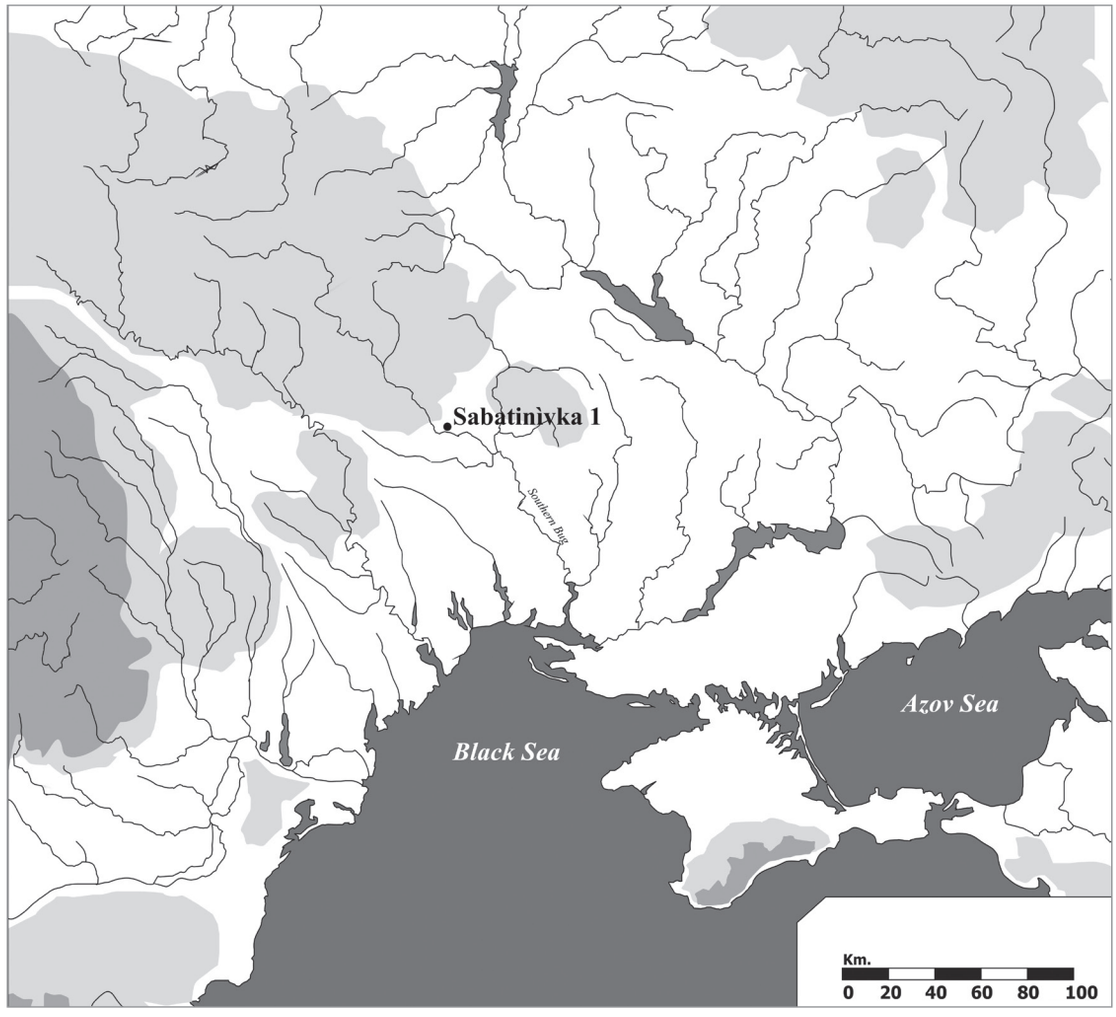

Fig. 1. The settlement of Sabatinìvka 1 in the Southern Bug valley (edited by M. Lobanova).

tion on the settlement (Kiosak and Siekerska 2021). Due to the complex history of the study, the materials from this stratified settlement have been spread across various museums in Ukraine and have not been thoroughly researched or published.

History of the field research

The site was discovered by a local resident, S. Čub, who began submitting materials to the Pervomajs´k Museum in 1928 (Kozubovs´kij 1933, 71). Finds from both cultures have been published in major comprehensive works (Passek 1949; Černâkov 1985; Geršković 1997). A detailed study of the site commenced in 1932 with excavations supervised by P. Harlampovič and T. Movčanivs´kij as part of rescue archaeological work for the future construction of the Boh power plant.

Excavations continued in 1938–1939 by the Odesa State Historical Museum (now the OAM NAS of Ukraine) under the supervision of O. Lagodovs´ka and A. Dobrovol´skij. During this phase of work, an area of 360 m² was uncovered (Fig. 2, 3). While the findings included artefacts from the Sabatinìvka culture of the late Bronze Age alongside materials from the Cucuteni-Trypillia culture, this aspect of the research has not been discussed in detail in the current publications (Dobrovol´skij [1941] 2016).

Later, in his reports, A. Dobrovol´skij highlighted his interest in finds different from the Trypillia culture during the 1938 excavations. Even so, it was not possible at that time to identify the material (Dobrovol´s´kij 1947, 3). The author also noted the presence of Late Bronze Age artefacts in the western part of the 1938 excavation, which was characterized by numerous animal bone finds.

Since the 1930s, the settlement was studied with an interdisciplinary approach and this helped to consider the cultural layer of the Bronze Age in more detail. The only archaeozoological definitions from the

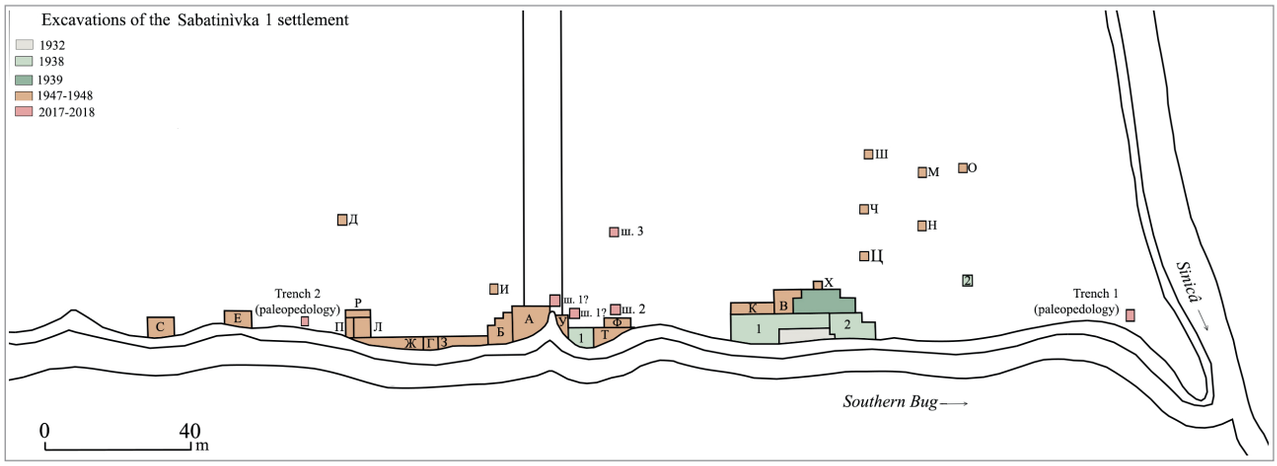

Fig. 2. Plan by A. Dobrovol´skij showing the location of excavations during the works in 1938–1939 and 1947–1948 (Dobrovol´s´kij 1952, fig. 1) with the addition of the location of the trenches carried out in 2017–2018 (drawn by M. Lobanova).

Fig. 3. Work at the Sabatinìvka 1 settlement (1938–1939) (source: the archive of the Odesa Archaeological Museum [OGIM 69040/90]).

settlement materials are known from the unpublished work of 1941 by O. Brauner (1941). Unfortunately, the identification was made without context, making it difficult to define the cultural attribution of the remains.

Work on the settlement continued in the post-war years of 1947–1948 (Dobrovol´s´kij 1952, 78). During the research, two cultural layers were discovered – A and B. According to A. Dobrovol´skij, the first corresponds to the Trypillian culture layer while the second, B, corresponded to the late Bronze Age (during the excavations, eight building remains were discovered (Dobrovol´s´kij 1952, 84). One of the key tasks was to identify areas where these horizons spread. The work concluded that Trypillian material predominates in the eastern part of the settlement (towards the Sinicâ River).

The next stage of field research at Sabatinìvka 1 only began in the 2010s and also focused on the localization of sites near the village of Sabatinìvka (Kiosak and Golovko 2013). Thanks to the analysis of archival materials and the survey of the hypothetical locations of the sites, assumptions were made about the location of settlements from different periods. As a result of the work, three trenches were opened in the central part of the settlement and two profiles were cleaned (in the western and eastern parts of the site; Fig. 2). Two cultural layers can be traced in the profiles and trenches, documenting many finds attributed to the Cucuteni-Trypillia and Sabatinìvka cultures. The Sabatinìvka culture includes ceramic fragments and tools (Kiosak *et al*. 2010) and a bronze needle (?) (Kiosak *et al*. 2018, fig. 19). In 2018, during the study of sections at Sabatinìvka 1, a paleopedological analysis was conducted by Ž. Matviišina (Lobanova *et al*. 2021).

Stratigraphy and plan

Thanks to the availability of archival documents and collections from the Sabatinìvka 1 site in the Odesa Archaeological Museum and the Institute of Archaeology of the National Academy of Sciences of Ukraine, it is possible to reconstruct the stratigraphy and develop a scheme of the location of cultural layers. Unfortunately, these sources are not exhaustive, but it is possible to study the plan and reconstruct the stratigraphy of cultural layers based on these sources.

The site is located along the Southern Bug River, and the eastern part of the settlement is bordered by the Sinicâ River, which flows into it. Thus, two geomorphological forms can be observed in the settlement's territory: the terrace of the Southern Bug River and the floodplain terrace of the Sinicâ River. Sabatinìvka 1 is located on a slope that rises from the river's edge, increasing from 3 to 12–15 m. This location of the settlement contributed to the partial destruction of objects and the mixing of cultural layers.

During the excavations in 1932, two trenches were made – A and B. They were arranged in two parallel lines along the shore cliff. The total area of the excavation was 100 m^2. The excavations were completed at a depth of 1.95 m. The authors of the excavations (P. Harlampovič and T. Movčanivs´kij) characterized (according to F. Kozubovs´kij) the horizons as follows: from 0.2 m to 1.60 m – chernozem mixed with sand and ash (mixed cultural layer); from 1.6 m to 1.95 m – also chernozem mixed with sand and ash ("stable Trypillian layer") (Kozubovs´kij 1933, 73). At this stage of the research, the Cucuteni-Trypillian layer was described in detail.

For a more accurate identification of the layers, a trench was made in 1939, which was attached to the northern edge of the 1938 excavation. The following description of the layers is available from A. Dobrovol´skij's field diaries: 1. 0–0.80/0.95 m – humus (black soil); 2. 0.80/0.95–2.10 m – sandy layer; 3. 2.10–2.90/3.0 m – loam; 4. 2.90/3.0 m and below – clay loam (Dobrovol´skij 1939).

During the 1947–1948 research, a series of trenches were made along the shore cliff, in the western part of the settlement (to study the Late Bronze Age layer) and in the eastern part (to study the Trypillian layer), and an extension was made to the northern edges of the 1930s excavations (excavations B and K) (Dobrovol´s´kij 1952, 78–79). A slightly different stratigraphy was discovered in these areas: 1. 0–0.25 m – modern chernozem; 2. 0.25–0.70 m – lumpy chernozem; 3. 0.70–1.0 m – transition from chernozem to loam; 4. 1.0–1.6 m – humus loam; 5. 1.6–2.2 m – light humus loam; 6. 2.2 m and below – loess (Dobrovol´s´kij 1947, 8).

During the 2010s, three trenches were opened in the central part of the settlement (Fig. 2). The available descriptions of the sequence of layers at Sabatinìvka 1 differ significantly and cannot be integrated without additional research. As noted above, cultural layers belonging to the Sabatinìvka culture, Cucuteni-Trypillia complex may be found at the site under consideration.

Despite the stratigraphic recording of finds during the 1938–1939 excavations and the availability of planigraphic data, the archival materials remain incomplete. No profiles or detailed photographs of the features have been preserved, which reflects the methodological standards of the period. As a result, the discovered objects cannot be interpreted with greater precision.

Analysis of archival sources on the Sabatinìvka 1 site made it possible to reconstruct the plan of this Cucuteni-Trypillia settlement with objects discovered during research in the 1930s and 1940s (Lobanova 2021; Fig. 4). The largest number of them was recorded at the 1938–1939 excavation site. Four groups of objects were identified that are connected by a logical link: 1) platforms at the excavation site with squares 1AB–4AB and excavations T and Ф, 2–3) two probable structures (1938 and 1939) and household pits next to them, and 4) numerous clusters of shells (excavations of 1932 and 1938).

Late Bronze Age materials were particularly numerous at depths of 0.9–1.3 m in the 1938–1939 excavations. Cucuteni-Trypillia objects are associated with depths of 1.4–2 m in this section of the site, where two layers were present. In the western part of the site, remains of the houses of the Sabatinìvka culture were found at depths of 1.3–1.5 m (Dobrovol´s´kij 1952, 84).

In addition, analysing the ceramic collection from the 1938–1939 excavations at the Odesa Archaeological Museum of the NAS of Ukraine made it possible to identify a small number of fragments of Sabatinìvka culture ceramics from the Late Bronze Age (Fig. 5). They are largely outnumbered by the Trypillian materials (46 fragments of Late Bronze Age ceramics, compared to more than 2,000 shards of Trypillia culture). The highest concentration of these finds was observed in the upper part of the excavation at a depth of up to 1.45 m. The finds were also located in the lower layers, possibly due to destruction and mixing of the layers.

Paleopedological investigations

During the survey work of the Podillia-Pontic expedition in Sabatinìvka 1, the above-mentioned paleopedological analysis was carried out by Ž. Matviïšina (with the participation of L. Sorokina). Two profiles were opened to study the ancient soils at Sabatinìvka 1. The results of this analysis allowed conclusions to be drawn about the ancient soils, the environment of the Trypillian population, and subsequent climatic changes in the region (Lobanova *et al*. 2021). The profiles are located in different parts of the settlement at a distance of 230 m from each other (Fig. 2).

According to Ž. Matviïšina 's description, the materials from the two profiles were different. Profile 1 is characterized by a light to medium loamy granulometric composition of the material (Lobanova *et al*. 2021, fig. 11). The soil-forming material was lake-alluvial deposits of medium to heavy loamy granulometric composition. The second profile is located at a higher geomorphological level – on a river terrace. The profile's material was significantly sandy, and the subsoil was formed on loose alluvial sands.

In profile 1, three Holocene soils were examined, which were separated by layers of loess-like and other loams. Ž. Matviïšina describes them as follows (Lobanova *et al*. 2021, 42): topsoil – 0.0–1.15 m (Pk to a depth of 1.5 m), which is separated by a layer of loess-like loam (1.15–1.5 m Pk), followed by soil with Trypillian material (1.5–2.5 m), and lake-alluvial deposits (2.5–3.5 m) at the bottom level. From top to bottom, there is a developed meadow-chernozem soil (0.0–1.1 m), where the bulk of the bone artefacts can be traced. The horizon with Trypillian materials is ordinary, carbonate (presumably secondary) chernozem. On the surface, and below it, there are floodplain lake-alluvial stratified loams.

Thus, these soils developed under meadow vegetation during a period of moisture and active grass growth, which allowed for the formation of thick humus horizons. Such processes could have taken place in the temperate climate of the forest-steppe and northern steppe. The soils could have been meadow-chernozem silty, light to medium loamy, deeply humus-rich, with loess-like loams as the parent material.

Unlike the topsoil, the "Trypillian" soil was distinguished by its greyish-blue tones, significantly lower humus content, heavier granular composition, and stratification with elements of a fragmentary-lamellar structure. It was assumed that the primary material was somewhat more leached. Considering that the soil was formed on lake-alluvial deposits in the floodplain, with stratification, but without clear differentiation into genetic horizons and only partially supplemented with humus, it can be classified as floodplain-soddy (Lobanova *et al.* 2021, 44). The conditions for the formation of such soil were somewhat warmer than modern ones, probably in the conditions of natural zones shifted to the north.

In profile 2, it was possible to describe two sod soils, which were separated by a lighter light grey loamy-sandy soil, and the lower soil was formed on loose alluvial sands. The soil in the upper part of the profile is dusty-sandy-light loamy to sandy loam in terms of granulometric composition, but more sandy. Based on these characteristics, this soil is defined as meadow-turf deep humus. It was formed under abundant grass cover during meadow processes (Lobanova *et al.* 2021, 46).

The lower soil with gradual transitions between horizons becomes lighter towards the bottom. It is less humus-rich and more sandy than the soil in the upper part of the profile. A lumpy-crumbly structure characterizes it. Similar to samples from cleaning 1, this soil is identified as floodplain-soddy, light loamy-sandy loam of medium thickness, formed on carbonate sandy loam and alluvium, and below – carbonate-free alluvium (Lobanova *et al.* 2021, 46).

In profile 2, as in profile 1, the sequence of soil changes is preserved: the lower soil is floodplain-soddy, with carbonates in the profile and short-term loess accumulation; the upper soil is soddy, with carbonates throughout the profile, sandy, and more

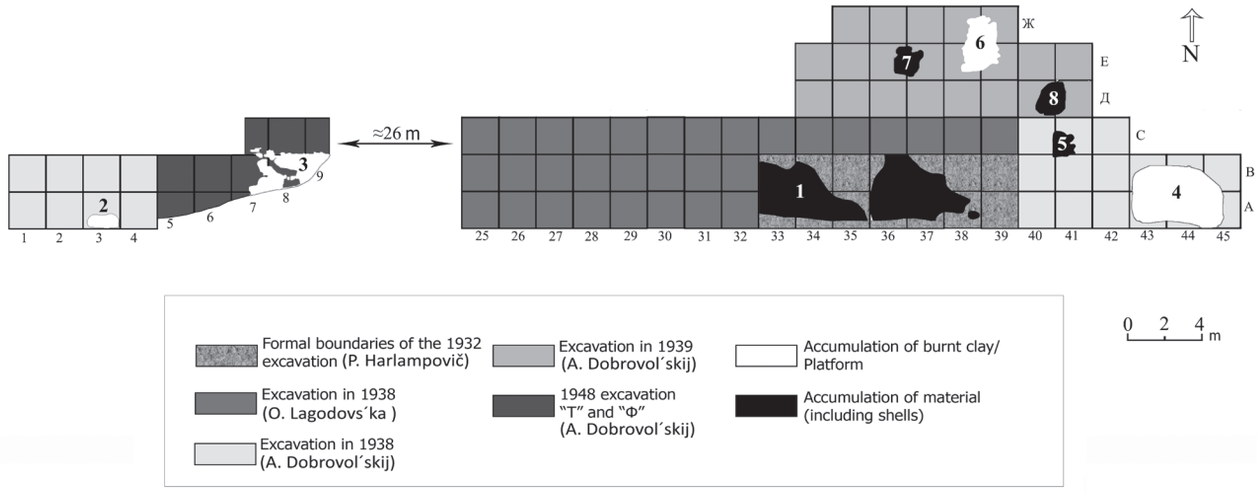

Fig. 4. Sabatinìvka 1. Excavations in 1932, 1938–1939, and 1948 with identified objects (Lobanova 2021, fig. 1).

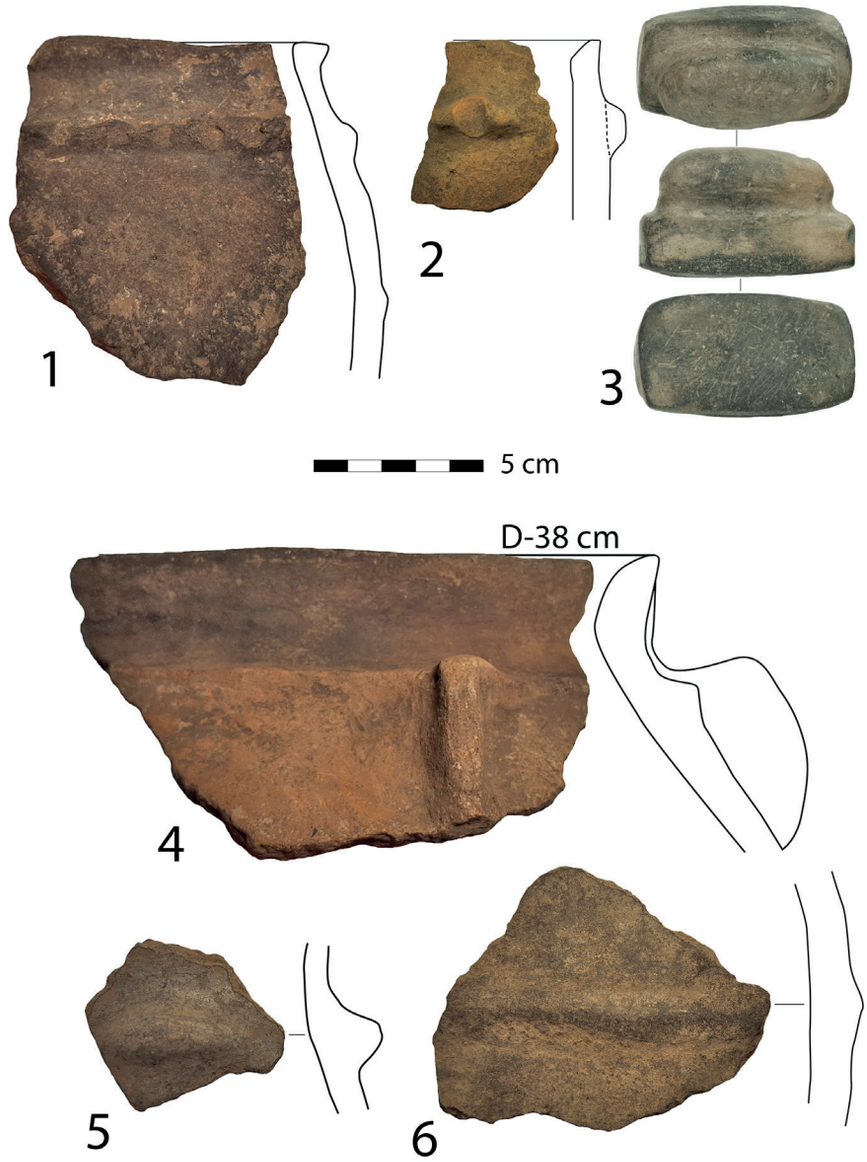

Fig. 5. Finds from the Late Bronze Age layer (Sabatinìvka 1) (photo by M. Lobanova and O. Katašins´kij).

humus-rich. Climate change trends involved a transition from warmer natural conditions to cooler ones with higher humidity. This shift, characterized by meadow landscapes with tall grasses, led to the development of humus accumulation processes and the formation of a deep humus horizon. Correlation with archival data allows us to assert that the cultural layer of the Trypillian period is associated with the surface and humus horizon of the lower soil. In contrast, artefacts from the Late Bronze Age are found in the upper soil.

Chronology

Recently, a series of new radiocarbon dates have been obtained from the archaeological deposits of Sabatinìvka 1. Prior to that, the age of Sabatinìvka was determined by typological parallels of both material remains complexes as a whole (Černâkov 1985; Burdo 2015) and some individual objects (Dobrovol´s´kij 1952). In addition, there was a conventional radiocarbon date for the Trypillian layer of Sabatinìvka from the Kyiv Laboratory (Burdo 2001–2002). Unfortunately, these particular series of dates from this institution did not coincide well with those from other laboratories (Rassamakin 2012; Gaskevič 2014) and require cross-laboratory validation and cannot be accepted as valid chronological data on their own (Kiosak *et al*. 2023).

For this purpose, a process was followed to select samples for examination in a laboratory in Poznań. Animal bone samples were chosen from depths that, based on preliminary stratigraphic research, were likely to correspond to the Trypillian layer. These assumptions were drawn from the analysis of collections from the settlement, research of archival documents, and paleopedological analysis. The samples were selected from a depth of 1.80–2.30 m, resulting in one date corresponding to the Cucuteni A-Trypillia B1 stage (Poz-160799) and two to the Bronze Age (Poz-160800, Poz-160801; Fig. 8). The challenges with the samples could be attributed to the site's destruction, the mixing of layers, and the research methods used in the 1930s.

Unfortunately, at this stage, few dates confirm the Cucuteni-Trypillia culture at the Sabatinìvka 1 settlement. In addition, there is a problem with synchronizing periodisations and the results obtained (Kiosak and Lobanova 2021). The new date (Poz-160799) shows a later chronology compared to the previously available date from the Kyiv laboratory (Ki-7202; Tab. 1). According to materials from the Kyiv laboratory, after calibration, the date varies between 4827 and 4496 calBCE (95.4%). The new date gives a later result of 4324–4049 calBCE (95.4%).

The sample comes from square 36B and a depth of 1.80 m. The dominance of the Trypillian finds characterized this area (Fig. 6, 7). At the same time, it was located in an area that was not completed during the 1932 excavations (Fig. 4). During the 1938 excavations, work was carried out in this area. The cultural layer was likely not fully explored in 1932. Due to the location of the 1932 excavation at the very edge of the cliff, the southern part (A) was destroyed by landslides in 1938. Therefore, excavations were continued from the floor level of the 1932 excavation in its northern part (B). Starting from a depth of 2.3 m, a large number of flint tools were found. According to the 1930s plan, this is the location of squares 32B–38B. Thus, despite the striking finds from the Trypillian layer, the 1932 research did not provide a complete stratigraphy of the site. However, during the 1932 excavations, only Cucuteni-Trypillia materials were found here.

A similar dating situation can be observed at another Cucuteni A-Trypillia B1 site in the region – the Berezivs'ka GES. The Kyiv dates yielded an earlier result, whereas the new AMS dates from different laboratories indicate results corresponding to the 2nd half of the 5th millennium BCE (Lobanova 2024, 57). Similar chronological intervals are shown by the results from the settlements of Kam'âne-Zavallâ 1 and Šamraï (Tab. 1; Fig. 9).

Moreover, the Bern AMS facility LARA produced two more dates on the Late Bronze Age complex of the site recovered in the pedological soil-section, when it was cleaned in 2018. In terms of calibration, they cover the time period of 1611–1462 and 1526–1438 calibrated BCE (calBCE, at two standard deviations (2σ), respectively, here and thereafter calibration with OxCal 4.4 and IntCal20 calibration curve (Bronk Ramsey and Lee 2013; Reimer *et al*. 2020). The dates are partially statistically simultaneous and form a fairly tight sequence. When combined, the dates indicate a timespan of 1596–1450 (calBCE,2σ). The combination probability criterion indicates the methodological correctness of this operation (X2-Test: df=1 T=1.8(5% 3.8)). When calculating the sum of dates, the graph will show two probability peaks, but with a smooth transition between them. The most likely time for the coexistence of both definitions is the period 1527–1497 calBCE (63.4% probability). One more novel date Poz-160800 (3230±35 BP) corresponds well with these dates. It comes from 2.10–2.30 depth. In fact, these three dates can be effectively

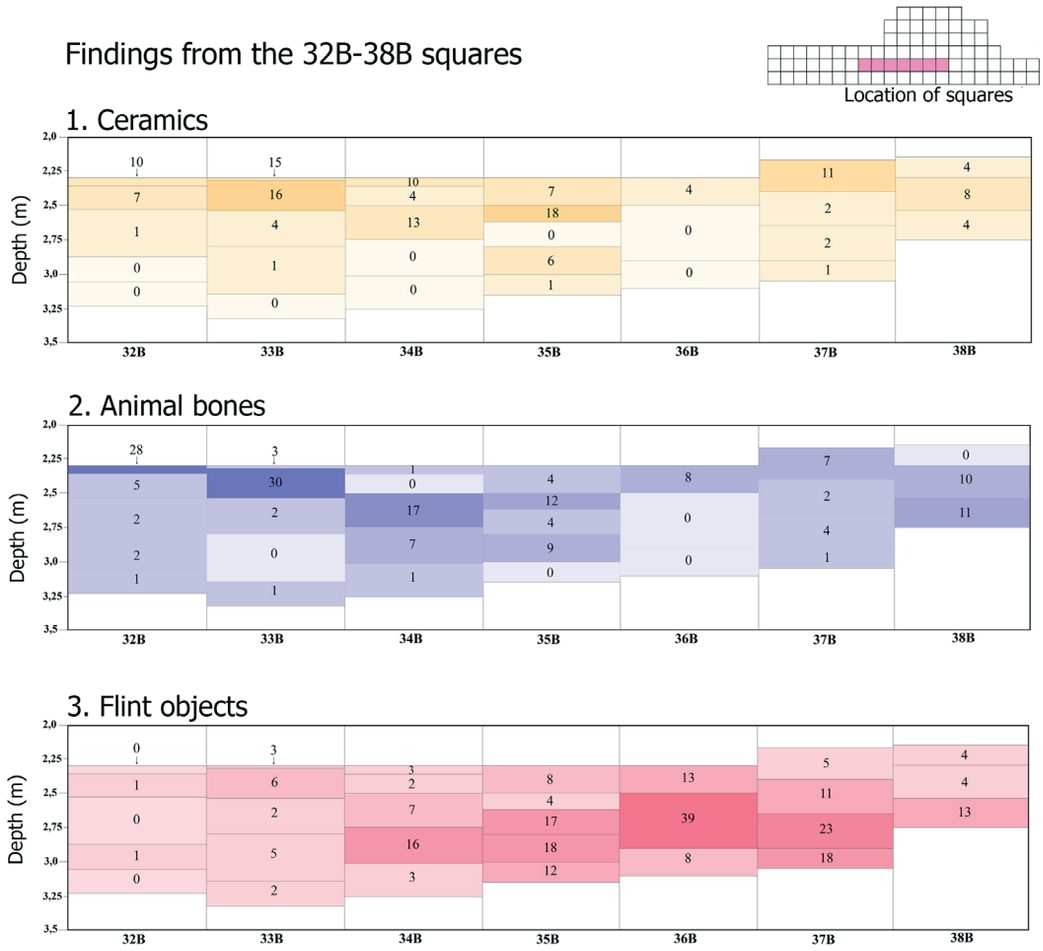

Fig. 6. Sabatinìvka 1 (1938). Location of finds in squares 32B–38B according to field diaries (edited by M. Lobanova).

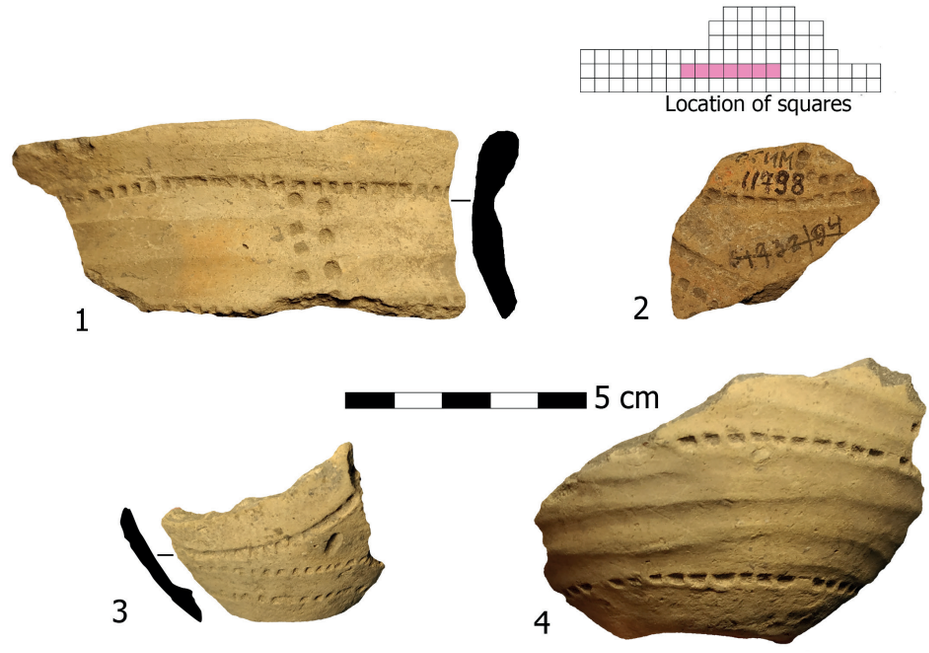

Fig. 7. Ceramic finds from squares 36–38B (photo by M. Lobanova).

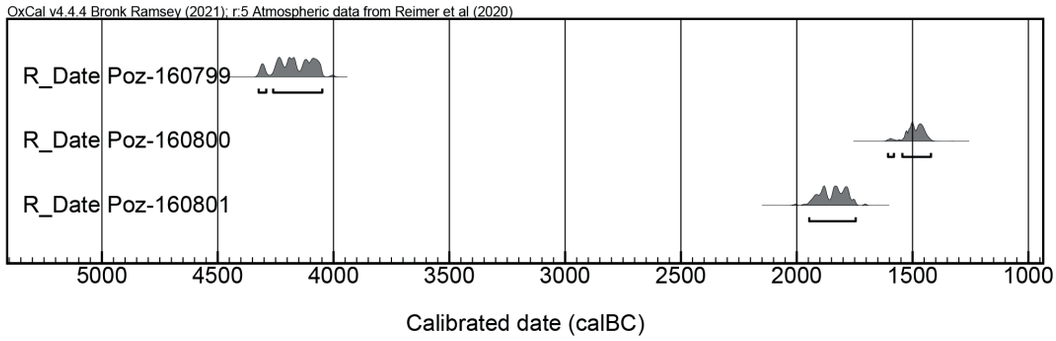

Fig. 8. Newly obtained AMS dates from the Sabatinìvka 1 settlement.

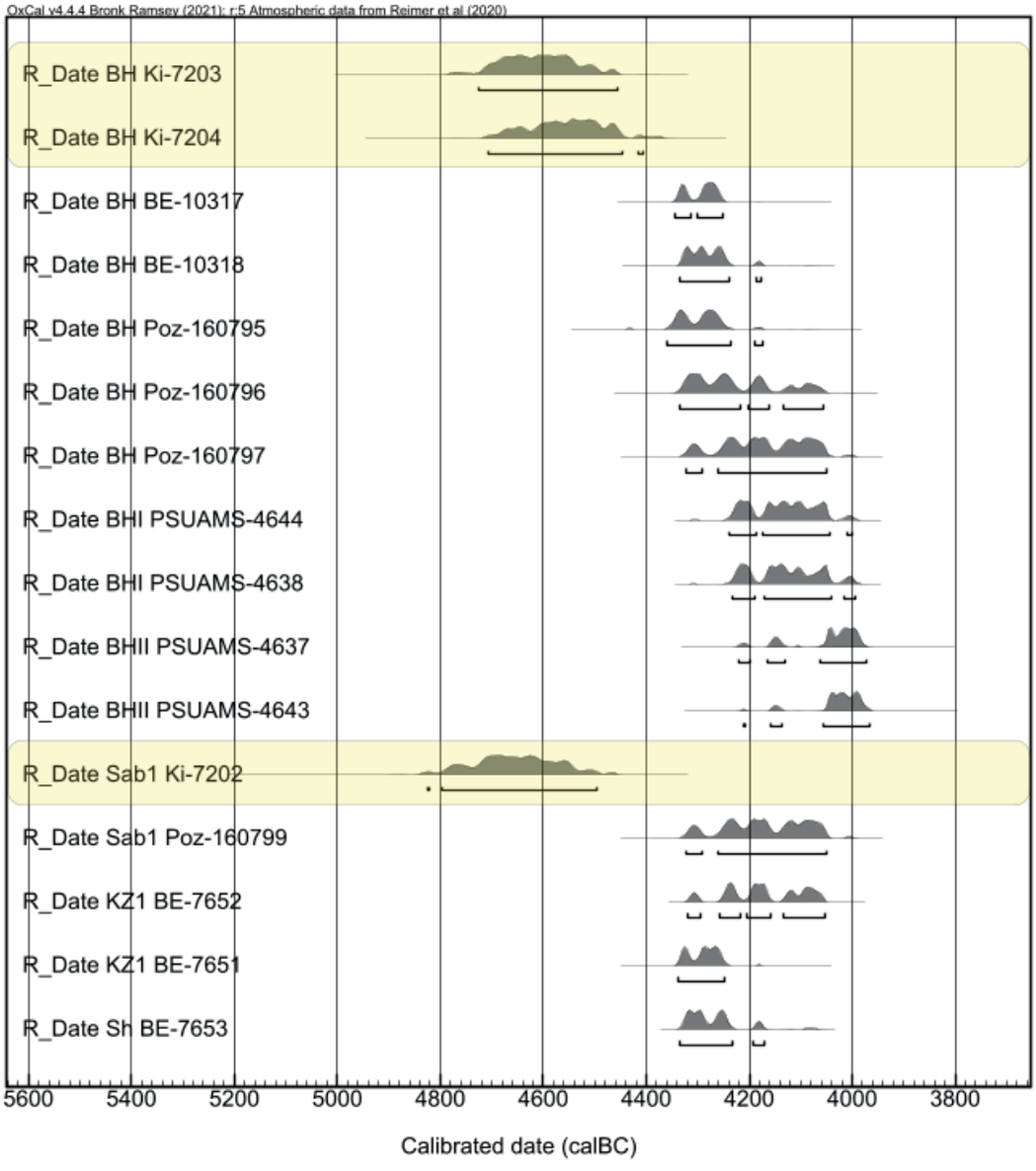

Fig. 9. AMS and conventional (highlighted in yellow) dates from the Sabatinìvka 1 settlement (Burdo 2001–2002; Kiosak *et al*. 2021; Harper *et al*. 2023; Lobanova 2024).

Table 1. Chronological data on the Sabatynivka group of settlements (Cucuteni-Trypillia cultural complex)

Site	Name	14C Date	Uncertainty	Sample	From (95.4%)	To (95.4%)	Reference
Berezivs'ka GES	Ki-7203	5760	55	Animal bone	4725	4456	Burdo 2001–2002
Berezivs'ka GES	Ki-7204	5710	60	Animal bone	4707	4408	Burdo 2001–2002
Berezivs'ka GES	BE-10317	5438	21	Animal bone	4344	4251	Kiosak *et al*. 2021
Berezivs'ka GES	BE-10318	5406	21	Animal bone	4335	4177	Kiosak *et al*. 2021
Berezivs'ka GES	Poz-160795	5450	40	Animal bone	4361	4174	Lobanova 2024
Berezivs'ka GES	Poz-160796	5380	40	Animal bone	4336	4056	Lobanova 2024
Berezivs'ka GES	Poz-160797	5340	40	Animal bone	4324	4049	Lobanova 2024
Berezivs'ka GES (I)	PSUAMS-4644	5295	25	Animal bone	4238	4000	Harper *et al*. 2023
Berezivs'ka GES (I)	PSUAMS-4638	5285	25	Animal bone	4235	3996	Harper *et al*. 2023
Berezivs'ka GES (II)	PSUAMS-4637	5235	25	Animal bone	4222	3973	Harper *et al*. 2023
Berezivs'ka GES (II)	PSUAMS-4643	5220	25	Animal bone	4212	3966	Harper *et al*. 2023
Sabatinìvka 1	Ki-7202	5805	65	Animal bone	4827	4496	Burdo 2001–2002
Sabatinìvka 1	Poz-160799	5340	40	Animal bone	4324	4049	
Kam'âne-Zavallâ	BE-7652	5346	21	Animal bone	4319	4054	Kiosak *et al*. 2021
Kam'âne-Zavallâ	BE-7651	5424	21	Animal bone	4339	4248	Kiosak *et al*. 2021
Šamraï	BE-7653	5394	21	Animal bone	4334	4171	Kiosak *et al*. 2021

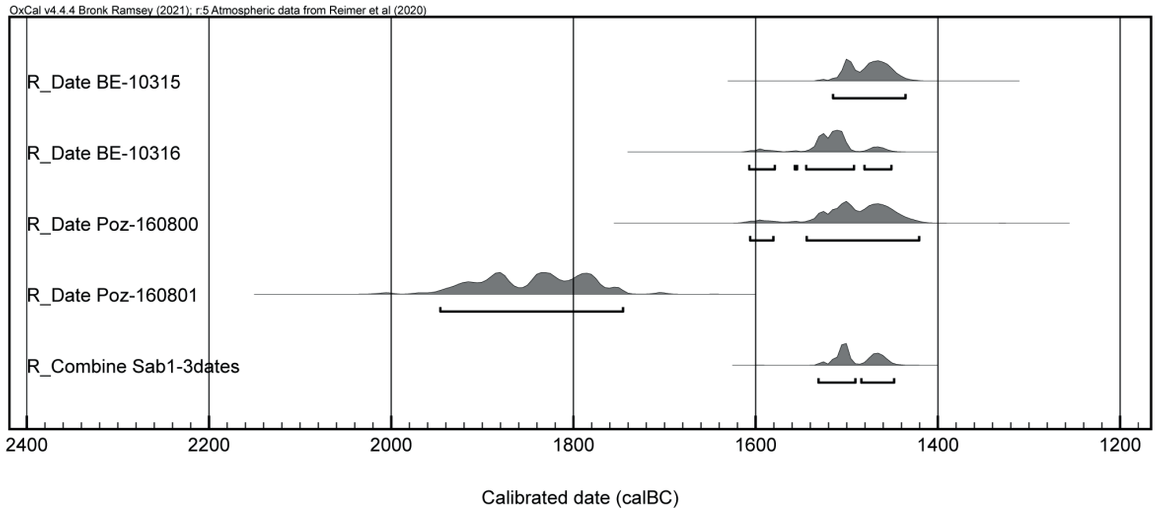

Fig. 10. Bronze Age dates from Sabatinìvka 1: calibration (Kiosak and Siekerska 2021).

combined (Fig. 10, 11). They encompass 1532–1448 calBCE at 95.4% probability or 1518–1458 at 63.4% probability (X2-Test: df=2 T=1.8(5% 6.0)). Thus, the horizon of Sabatinìvka culture dates to the very late 16th – the 1st half of 15th century BCE. This is in line with the typological expectations (Kiosak and Siekerska 2021).

Another new date (Poz-160801) is unexpectedly earlier. It can be calibrated to the timespan of 1946–1746 calBCE (95.4%). This period corresponds better to the timeframe of the preceding cultural aspects of the Middle Bronze Age, not that of the Sabatinìvka culture. In particular, Monteoru and Babyne cultures' sites produced similar dates in series (Mimohod 2010;

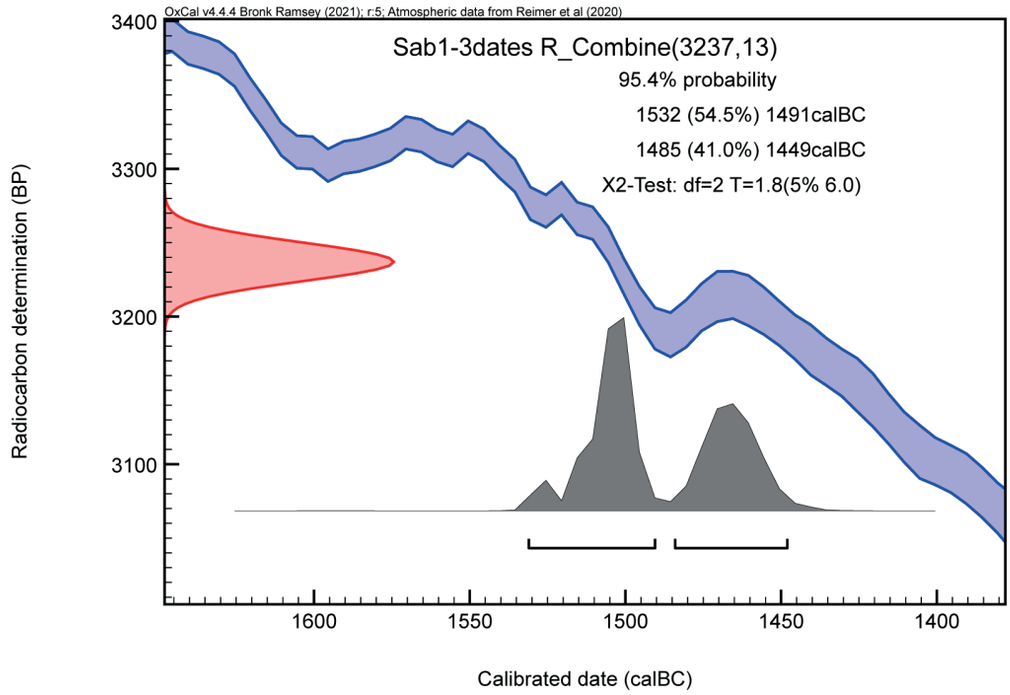

Fig. 11. Details of the combination of three late Bronze Age dates from Sabatinìvka 1 (Kiosak and Siekerska 2021).

Palincaș 2010; Bolohan *et al*. 2015; Staniuk 2021). The Babyne-like materials were reported from the Sabatinìvka cultural layer at the site (Černâkov 1985). However, they were believed to be an organic part of the Late Bronze Age assemblage giving an archaic outlook on the latter. Thus, this new radiometric evidence provides us with a reason to revise this interpretation and put forward the issue of the Middle Bronze Age habitation on the area of the Sabatinìvka 1 site.

Conclusions

Thus, archival and material archaeological sources partially enable us to reconstruct the chronology of Sabatinìvka 1. The site's location on a slope contributed to the destruction and mixing of cultural layers, making it impossible to determine the "peaks" of material distribution in some areas.

The results of paleopedological analysis revealed two stages of soil formation. New radiocarbon dating data allow us to place cultural layers and soil formation cycles on a chronological scale and link them to the stages of Holocene climate change.

The new date obtained from the Cucuteni A-Trypillia B1 layer corresponds to the new AMS dates from other settlements of the Sabatinìvka group. This group of sites, densely populated in the micro-region of the Middle Bug River, could have existed for several centuries in the 2nd half of the 5th millennium BCE, according to the results of accelerated mass spectrometry dating.

The new chronological data provide two closely correlated dates for the Late Bronze Age horizon of the Sabatinìvka 1 site, placing it within the very late 16th–1st half of the 15th century BCE, in agreement with typological expectations. Additionally, an unexpectedly earlier date suggests the presence of a Middle Bronze Age occupation at the site, prompting a reconsideration of its cultural sequence.

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