Bulgarian Academy of Sciences
National Institute of Archaeology and Museum

# STUDIA PRAEHISTORICA

## Volume 17



2023

Bulgarian Academy of Sciences
**National Institute of Archaeology and Museum**

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## Volume 17

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# STUDIA PRAEHISTORICA 16

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Printed by Bulged Ltd.

ISSN 0204-9880 (Print); ISSN 2815-2697 (Online)
https://doi.org/10.53250/stprae17

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# From the Editor

Come this festive time of the year, the papers of the latest volume of Studia Praehistorica have already been neatly bound in the familiar – also festive – green cover and are ready for the attention of the public, both in paper or digitally. The seventeenth issue of the journal includes a selection of essays that explore the territories of both the western and eastern Balkans, from northwestern Bosnia through the Lower Danube to Eastern Thrace, and range in time from the Upper Paleolithic to the Late Bronze Age. Topics include a new theory for the spread of Anatomically Modern Humans, an evaluation of ditch filling practices, investigations on house construction and use, different approaches in the analysis of finds, a reconsideration of a transitional period, and a discussion on connections between central and peripheral communities. This year's volume also offers a special treat – a review of a much fussed over theoretical book on the history of humanity.

As always, the digital version's full content is available to read or download open access at our website. I hope you enjoy reading the papers as much as I did.

KB

Studia Praehistorica 17, 2023, 1–16

# The Aurignacian in northern Bosnia revisited

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**Abstract**

*Northern Bosnia is characterized by a large concentration of Paleolithic open-air sites; among them, 13 were dated as Early Upper Paleolithic or Aurignacian. This paper will consider their discovery, excavation, and publication in the second half of the twentieth century, and will reevaluate previous knowledge of Aurignacian in North Bosnia based on a comparative definition of Aurignacian variability. The analysis of the excavation reports and the other publications demonstrates that some assemblages have undoubtedly Aurignacian characteristics. Published material indicates the presence of classical Aurignacian, while elements of Proto-Aurignacian facies are not detected. Since the sites are mostly concentrated on the banks of the Sava River and its tributaries, the geographical position of northern Bosnia undoubtedly shows potential for different scenarios for the spread of Anatomically Modern Humans along the Southern Peripannonian Zone and the Sava corridor. This paper shows the importance of the study area for future research and opens up further opportunities for investigating alternative routes of the spread of Anatomically Modern Humans towards the west, rather than seeking to confirm the hypothetical corridor.*

**Keywords**: *Northern Bosnia – Pannonian plain – Sava corridor – Aurignacian – Homo sapiens.*

https://doi.org/*10.53250/stprae17.1-16*

## Introduction

Northern Bosnia includes only a 100 km wide belt, which stretches between the Dinaric Alps in the south, and the Sava River in the north. It is bordered on the west side by the mountains Posara and Kozara, and on the east by the Majevica. In geographical and geomorphological terms, this territory belongs to the southern part of the Pannonian Plain, and its Peri Pannonian belt (Basler 1979b, 331).

Although it covers a relatively narrow area, northern Bosnia abounds with Paleolithic sites. Unlike the neighboring areas (Serbia and Croatia), where cave sites predom-

inate, this territory is characterized by numerous open-air sites (Pandžić 2014, 46). The history of the Paleolithic research of northern Bosnia began in 1949 when the first Paleolithic site was discovered. In the next three decades, abundant surveys and excavations were carried out. By the 1980s, more than 100 sites were discovered, dated to the Middle and Upper Paleolithic (Basler 1979a, 309ff; Pandžić 2014, 27ff). The research on the Paleolithic was resumed in 2006 in cooperation with the University of Cambridge and lasted until 2014. This project resulted in the discovery of 50 new sites (Pandžić 2014, 10).

Even though it has been known for a long time and abundant research has been conducted, the Paleolithic in northern Bosnia was rarely referred to in literature and taken into wider regional studies in consideration of the Middle or Upper Paleolithic in Southeast Europe. The main reason for this can be found in the fact that a large number of these sites were exposed to the effects of erosion, which resulted in disturbed stratigraphy, so most of the sites are missing intact Paleolithic layers (Pandžić 2014, 45).

Even though the existing problems affect the possibilities for interpretation of this area, it is necessary to consider the territory in regional studies. One of the periods that should certainly be considered is the Early Upper Paleolithic or Aurignacian. The existence of sites with typical Aurignacian inventory undoubtedly testifies to the settling of this area by Anatomically Modern Humans (AMH). Since a greater number of northern Bosnian sites are located in the Sava Valley and its tributaries, the Sava corridor arises as one of the potential directions for the spread of AMH as some authors have already suggested (Mihailović 2020, 59; Cortés-Sánchez et al. 2019, 208; Floss et al. 2016).

This paper will try to reconsider the published evidence and to reevaluate previous knowledge of Aurignacian in the region – how the sites were discovered and published in the second half of the twentieth century – in terms of conditions of sites and collections, and to discuss this region based on newer knowledge and interpretations of Aurignacian in Europe. The final aim of this study is to evaluate the potential of northern Bosnia in the broad regional framework of the Early Upper Paleolithic, and to check out the hypothesis of the Sava River Valley corridor as a direction of the spread of AMH.

**The Aurignacian in northern Bosnia**

According to the published evidence, Aurignacian has been identified at 13 sites in northern Bosnia. All sites are of the open-air type, situated on dominant hills above river valleys: Bosna, Ukrina, Usora, and Vrbas. It has been proposed that this settlement pattern was chosen by Paleolithic communities because of terrain visibility, great hunting potential in river valleys, as well as the abundance of raw materials in the riverbeds (Basler 1980, 97f). All the assemblages interpreted as Aurignacian are presented in the following text, while the positions of the sites are shown in figure 1.

(1) The site of *Brdašce* is located at the Laktaši village, in Vrbas Valley[1]. It was discovered in 1960 during the excavation of the homonymous Bronze Age settlement. Elev-

[1] The numbering of the sites corresponds to the numbers in figure 1.

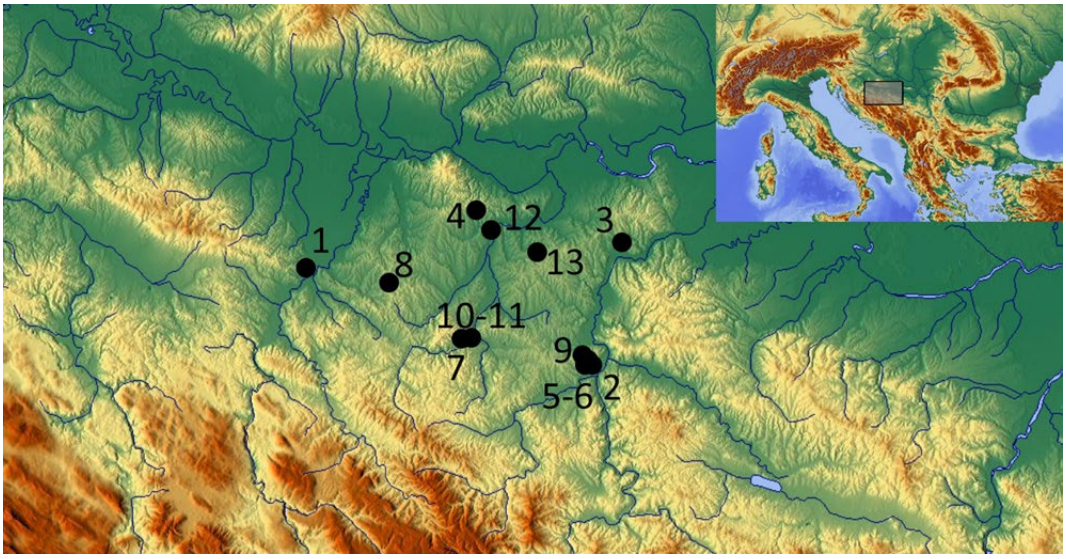



**Figure 1.** *Aurignacian sites in Northern Bosnia. (1) Brdašce; (2) Crkvine; (3) Danilovića brdo; (4) Dubočko brdo; (5) Hendek; (6) Kamen; (7) Krčevnica; (8) Krndija; (9) Lonđa; (10) Luščić; (11) Mala Gradina; (12) Tučići; (13) Visoko Brdo. Image Credit: https://maps-for-free.com/ and the author.*

en artifacts were recovered from a 0.5 $m^2$ test pit, at a depth between 1.93 and 2.05 m (Basler 1963/1964 & 1979b). The assemblage has been interpreted as Aurignacian based on the retouch type and undistinguished bulbs on the artifacts (Basler 1963/1964).

(2) The site of *Crkvine* is located at the Makljenovac village near Doboj, at the influx of the Usora into the Bosnia River. In the archaeological literature, it has been known since 1889 as a stratified site with finds dated to the Early Neolithic, Bronze Age, Roman times, and the Middle Age (Basler 1960). In 1955, Paleolithic artifacts were found *in situ* in a dark brown, 8–10 cm thick clay layer and between larger limestone rocks. It has been suggested that the better part of the Paleolithic layer was destroyed by erosion (Basler 1960). According to the excavation reports, all artifacts were uncovered in the southern part of the site. It was assumed that only this part of the site was occupied during the Paleolithic (Basler 1960). The assemblage numbers 276 artifacts, from which 162 were analyzed, including both groups of materials: the finds found in the Paleolithic layer, and those collected in the eroded sediment. Most of them are made of jasper and flint, while a small percentage of the collection is made from sandstone. According to the excavators and published evidence, both Upper Paleolithic and Middle Paleolithic materials were found. The Middle Paleolithic artifacts are represented by a few Levallois flakes (Basler 1957 & 1979b), and the Upper Paleolithic assemblage contains cores with lamellar negatives, blades, bladelets, and burins and has been interpreted as Aurignacian (Basler 1957).

(3) The site of *Danilovića brdo* is located at the village of Podnovlje, in the Bosna Valley. During the excavations in 1959, 1960, and 1963, an area of 48 m² was investigated (Basler 1962a; Belić 1963). It was partially destroyed by erosion (Basler 1979b). Based on the characteristics of the assemblage, Danilovića brdo has been interpreted as a stratified site with layers from the Middle and the Upper Paleolithic or Aurignacian (Basler 1979b). A reevaluation of the assemblage was published in 2017. Based on the technological study, the presence of Middle (11%) and Upper Paleolithic artifacts (40%) has been confirmed. The rest of the assemblage consists of technologically and chronologically non-diagnostic artifacts (Dragosavac 2017).

(4) *Dubočko brdo* is located at the Smrtići village near Derventa. Three Paleolithic artifacts were accidentally discovered there in 1930, and were attributed to the Aurignacian. This material has been neither studied, nor published (Basler 1979b).

(5) *Hendek* is also located at Makljenovac. In 1963, an area of 6 m² was investigated. Paleolithic artifacts are discovered 30 to 40 cm below the surface. Based on the Upper Paleolithic character of the assemblage, such as a typical nosed end-scraper, it has been attributed to the Aurignacian (Basler 1979b).

(6) *Kamen* is the third Paleolithic site at Makljenovac. It was discovered in 1949 during quarrying. In 1951, a rescue operation was carried out that only collected finds from excavated sediments, so that the original position of the artifacts is unknown. A total of 5000 artifacts were discovered and analyzed (Brodar 1953). More than 50 percent of the assemblage are byproducts, which indicates a reduction at the site. The rest of the sample are cores, flakes, blades, and retouched tools (Brodar 1953). It has been proposed that the Paleolithic layers were destroyed by erosion because the assemblage shows mixed characteristics of Middle Paleolithic and Aurignacian, and even some bifacially retouched tools (Brodar 1953; Basler 1953 & 1979b). In the published drawings, a nosed end-scraper, a carinated bladelet core, and an Aurignacian blade were identified, which suggests an Aurignacian attribution (fig. 2/1, 4, and 8).

(7) The site of *Krčevnica* is located at the village of Popovići, near Doboj. It was identified in 1963 during agricultural works. In the next year, an area of 8 m² was excavated. Some 100 artifacts were found and attributed to the Aurignacian, mostly based on the laminar component of assemblages, such as uni-platform and carinated cores (Basler 1973).

(8) The site of *Krndija* is located at the Potočani village, near Odžak. During the 1960 excavation, an area of 16 m² was investigated and it was confirmed that the site was destroyed by agricultural work. The assemblage consists of 14 artifacts, which have been interpreted as Aurignacian, based on an Aurignacian blade (fig. 2/5; Basler 1970).

(9) *Londža* is also located at Makljenovac. It was discovered in 1955 during test trenching. Systematic research was conducted in several campaigns (1961, 1963, and 1965), when an area of 224 m² was excavated (Basler 1979b). The bottom 25 cm part of the 70–80 cm thick deposits contained Mousterian artifacts, while the artifacts in the upper part were Aurignacian (Basler 1979b).

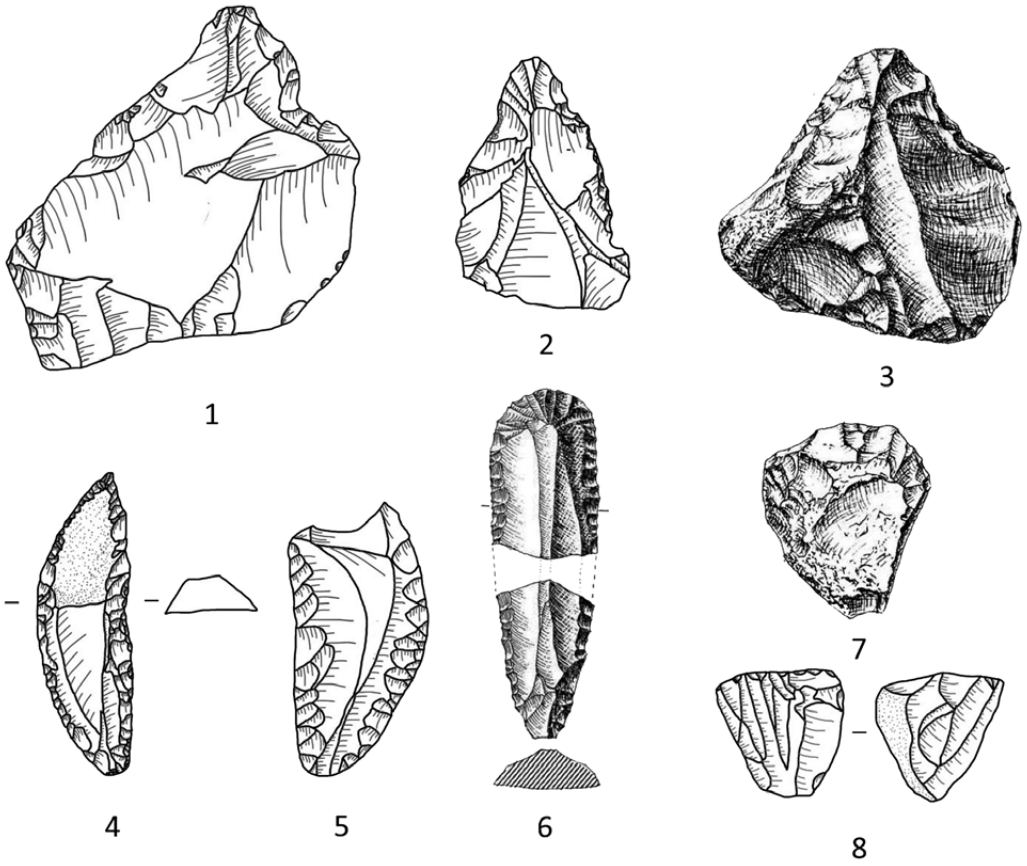



**Figure 2.** *Typical Aurignacian finds from sites in Northern Bosnia: Kamen (1, 4, and 8); Krndija (5); Luščić (2); Mala Gradina (3, 6, and 7). Image Credit: the author (1, 2, 4, 5, and 8), after Brodar 1953; Basler 1951, 1970 & 1978 (3, 6, and 7).*

(10) The site of *Luščić* is located at the Kulaši village. Systematic archaeological excavations were conducted in 1958 and 1959, when an area of 128 m² was investigated. From layer 3b, 1774 artifacts were recovered at a depth between 85 and 95 cm below the surface. Like all other sites, Luščić also shows disturbed stratigraphy. More than 400 artifacts were analyzed that show the characteristics of the Aurignacian. Thirteen cores were identified in the assemblage, while 22 pieces were interpreted as bladelet cores in the form of scrapers. Flakes dominated (131), while blades (80) and bladelets (70) were also represented. In the group of retouched tools, ten burins, three nosed end-scrapers (fig. 2/2), and four end-scrapers on blades were identified. Bladelets were usually not retouched. Based on the structure of the assemblage, the site has been interpreted as Aurignacian, while some elements of the Gravettian have been recognized too (Basler & Janeković 1961).

(11) *Mala Gradina* is the second Paleolithic site located at the Kulaši village, at the influx of the Mala into the Velika Ukrina River. The site was discovered in 1959 while excavations were conducted between 1961 and 1963. An area of 320 $m^2$ was investigated. In layer 5, more than 3500 artifacts were discovered (Basler 1978). It is important to note that the stratigraphy of the site was partially disturbed in the Bronze Age. It is possible to distinguish two groups of finds within the assemblage: Middle Paleolithic and Aurignacian, including such typical Aurignacian finds as blades and a nosed end-scraper, end-scrapers, burins as well as retouched blades (fig. 2/3, 6, and 7; Basler 1978). A re-evaluation of part of the assemblage demonstrated that the analyzed blades and bladelets show similar production technology to the other Aurignacian assemblages in the area (Dragosavac 2022).

(12) The site of *Tučići* is located at the Popovići village, near Prnjavor, where Paleolithic artifacts were discovered in Bronze Age tumuli. No details about the size of the assemblage were given in the publication, but based on its contents and on parallels at Mala Gradina, the site has been interpreted as Aurignacian (Basler 1979b).

(13) *Visoko Brdo* is located at the village of Ljupljanica, near Derventa. It was discovered in 1958 when the first archaeological excavations were carried out. Systematic research was conducted in 1970 and 1971. During the excavations, the assemblage of 187 artifacts was divided into two groups: Middle Paleolithic and Aurignacian, the latter consisting of cores, blades, and bladelets. However, no different layers have been distinguished during the excavation (Basler 1962b, 9).

**Reevaluation of published evidence on the Aurignacian in northern Bosnia**

The reevaluation of published evidence suggests that only five sites show obvious Aurignacian elements: Hendek, Kamen, Mala Gradina in Kulaši, Luščić, and Krndija. These assemblages contain common Aurignacian types such as Aurignacian blades and nosed end-scrapers, leaving no doubts about the existence of Aurignacian in this region.

The rest of the assemblages are questionable. For some of them, there is no description of the finds or other data, such as Dubočko brdo and Tučići. Considering the lack of description of the finds, re-verification of their attribution to Aurignacian is impossible. On the other hand, the description and drawing of the artifacts from the Brdašce assemblage (Basler 1963/1964) show non-diagnostic features.

The rest of the assemblages – Crkvine, Danilovića brdo, Krčevnica, Londa, and Visoko brdo – show Upper Paleolithic elements, but the lack of diagnostic types makes their attribution to the Aurignacian questionable. There are several reasons which make their interpretation more difficult. As it can be seen from the literature, all these northern Bosnian sites have yielded mixed materials as the result of erosion and disturbed stratigraphy. Most assemblages contain Middle and Upper Paleolithic/Aurignacian artifacts, while the assemblage from Luščić contains Aurignacian and a small percentage of Gravettian artifacts. All this is due to erosion, which led earlier researchers to generalized interpretations

and conclusions. Hence, the attribution of the assemblages to the Aurignacian without typical Aurignacian finds is leaving some doubts.

Besides disturbed stratigraphy, publications with insufficient results of technological analysis represent the second major problem in the interpretation of the Aurignacian at these sites. Detailed technological studies have not been conducted for the majority of the assemblages. The information is often given in the form of preliminary reports or is based only on the analysis of part of the assemblages. For example, 1300 out of the 1700 artifacts in the assemblage of Luščić were discarded during the first analysis as culturally and technologically non-diagnostic (Basler & Janeković 1961). Brief publications make impossible the reevaluation of the assemblages from Visoko brdo, Danilovića brdo, Crkvine, Lonđa, and Krčevnica, and thus limit the possibilities of discussion of Aurignacian assemblages (Hendek, Kamen, Mala Gradina, Luščić, and Krndija), because their exact contents and numbers are unknown.

The third major problem in the interpretation of the Aurignacian is the lack of organic material (Basler 1979c, 341). On the one hand, bone points are crucial in Aurignacian interpretations, while on the other hand, they can be radiocarbon dated. The reevaluation of some sites shows that the preservation of organic material was not influenced by soil acidity but by the exposure of finds to erosion, which leaves some hope for future research (Pandžić 2014, 13).

Even though all of these problems limit significantly the possibilities for interpretation of the Aurignacian in northern Bosnia, some conclusions can be drawn. Based on published evidence, typical characteristics of the Proto-Aurginacian are missing from the assemblages in northern Bosnia, e.g., Krems points, Dufour bladelets, and pyramidal cores. That it is not an oversight by earlier researchers is demonstrated by the fact that Đuro Basler (1979c, 341) discussed the lack of 'Krems-Dufour' bladelets back in 1979.[1]

On the other hand, the presence of nosed and carinated end-scrapers, as well as of Aurignacian blades indicate classical Aurignacian facies at northern Bosnian sites. Even though typical Aurignacian finds are not so numerous in the assemblages of northern Bosnia, they are indicative of its attribution. However, both nosed end-scrapers and Aurignacian blades were identified in the earlier and later stages of the Aurignacian. In the earlier stages, blades with Aurignacian retouch are much better represented, while their frequency in the later stages decreases. Contrary to this, the presence of nosed end-scrapers increases in later stages (Bordes 2006; Bordes & Tixier 2002; Moreau et al. 2015). The possibility that northern Bosnian sites can be attributed to the earlier stages is supported by the presence of blades with Aurignacian retouch (at Krndija, Kamen, and Mala Gradina) and nosed-end scrapers (at Kamen, Hendek, Mala Gradina, and Luščić), as well as by the lack of carinated burins which are diagnostic for the evolved stages of Aurignacian (Bordes 2006; Moreau et al. 2015).

[1] He probably meant the characteristics of the Krems-Dufour facies of the Aurignacian, as was the Proto-Aurignacian termed before.

The sites' distribution also corresponds to the proposed Aurignacian settlement dynamic in the Carpathian Basin. It has been suggested that Aurignacian communities occupied open-air sites with the possibility of accessing different ecozones: dry lowland mammoth steppe and the taiga forest in the higher mountain range (Hauck et al. 2018).

The lack of Proto-Aurignacian elements at Bosnian sites could be explained by the hypothesis that the differences between the Proto- and Early Aurignacian are neither technological nor chronological but are a question of adaptive strategies as Batallie et al. (2018) have suggested.

**The Sava corridor hypothesis: the Aurignacian of northern Bosnia in regional context**

The geographical position of northern Bosnia and confirmed Aurignacian sites allow us to consider this territory in a wider regional context and in the light of the Sava corridor /subalpine/cisalpine hypothesis.

Current archeological evidence (geographical position and dates) suggests that AMH entered Europe from the East, and two corridors of their spread have been proposed so far. The first is the northern one, along the Danube River (Conard & Bolus 2003; Chu 2018). The second is the southern or the Mediterranean corridor (Mellars 2006). The Danube corridor is supported by well-studied and dated Aurignacian sites in the lower, middle, and western Danube regions (Chu 2018). Opposite to that, on the Mediterranean route, sites are concentrated mostly in the western part, extending from northern Italy to the Atlantic coast of northwestern Spain. Sites on the east Mediterranean are not documented. Considering the Adriatic coast of the Balkan Peninsula, Aurignacian sites are absent from the Peloponnese to the northern Adriatic – Istria (Mihailović 2020).

Considering the lack of sites along the Mediterranean as well as the topography of the terrain, several authors proposed the Sava and subalpine/cisalpine corridor (fig. 3; Mihailović 2020; Cortés-Sánchez et al. 2019; Floss et al. 2016). Based on its geographical position, the Sava River Valley forms a natural communication in the east-west direction, connecting the Lower Danube on the east and the Slovenian Alps and northern Italy on the west. By mapping the sites, Floss et al. (2016) advocate that the spread of AMH was more possible along this corridor than along the Mediterranean coast.

When Paul Mellars (2006) proposed the Mediterranean corridor as a potential route for the dispersal of AMH, he suggested that this route was used for the dispersal of Proto-Aurignacian, while the northern – Danube route – was used by Early Aurignacian communities. In this case, as an alternative to the Mediterranean corridor, northern Bosnia does not fit in such hypothesis, because as already has been said, Proto-Aurignacian elements were not identified. Along the cisalpine corridor on the territory between Kozarnika on the east (Tsanova et al. 2011) and the Fumane (Falcucci et al. 2017) on the west, there are no sites that show elements of Proto-Aurignacian.

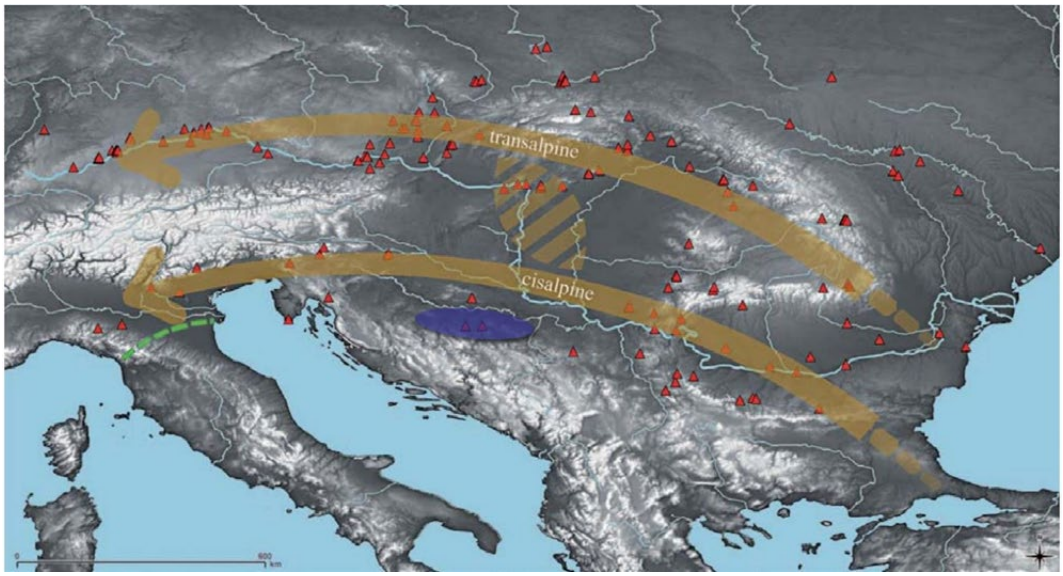



**Figure 3.** *Trans- and cisalpine passageways of early Modern Human dispersal. The region of Northern Bosnia is highlighted in blue. Image Credit: Floss et al. 2016, 25, fig.14, and the author.*




**Figure 4.** *Map of the Sava/cisalpine corridor with Aurignacian sites. The numbers correspond to the sites in table 1. Image Credit: https://maps-for-free.com/ and the author.*

Elements of classical Aurignacian such as nosed end-scrapers and Aurignacian blades were recorded in northern Bosnia, as well as along the cisalpine corridor (fig. 4; table 1), and the available radiocarbon dates indicate both earlier and later Aurignacian stages. If we take into consideration that northern Bosnian sites correspond with the early phase of the Aurignacian (according to the lack of carinated burins) and that the cisalpine corridor was used by AMH to spread towards the west, the proposed dating of these sites could be in the period between 39 to 38 ka BP, because of the dates of the sites in the subalpine region (table 1).

| No. | Site | Site type | Date (ka BP) | Nosed end-scrapers | Aurignacian blades | References |
|---|---|---|---|---|---|---|
| 1 | Hendek | open air | / | + | | Basler 1979b |
| 2 | Kamen | open air | / | + | + | Brodar 1953; Basler 1953; 1979b |
| 3 | Mala Gradina | open air | / | + | + | Basler 1978 |
| 4 | Luščić | open air | / | | + | Basler & Janeković 1961 |
| 5 | Krndija | open air | / | + | | Basler 1970 |
| 6 | Riparo Mochi (unit F) | cave | 30.8–29.7; 31.0-30.4; 37.7–36.5; 36.8–35.6 | | + | Douka et al. 2012; Grimaldi et al. 2014; Tejera & Grimaldi 2015; Kuhn & Stiner 1998 |
| 7 | Barma Grande | cave | / | | + | Mussi et al. 2006 |
| 8 | Lemignano | open air | / | + | | Mussi et al. 2006 |
| 9 | Grota di Fumane | cave | 41.2–40.4; 38.9–37.7 | + | + | Falcucci et al. 2020 |
| 10 | Divlije Babe I | cave | 33.12–31.6* | | | Moreau et al. 2015 |
| 11 | Potočka Zjalka | cave | 37.07–33.6 | + | + | Moreau et al. 2015 |
| 12 | Mokriška jama | cave | 38.13–35.64 | | | Moreau et al. 2015 |
| 13 | Šandalja II | cave | 38.67–37.16 | + | + | Karavanić 2003; Richards et al. 2015; Mihailović 2020 |
| 14 | Radovin-Dračice | open air | / | + | | Karavanić & Vukosavljević 2019 |
| 15 | Bukovac, Croatia | cave | ~34 | | | Karavanić & Vukosavljević 2019; Karavanić et al. 2018 |
| 16 | Velika pećina | cave | 37.32–35.1 | | | Karavanić et al. 2018 |
| 17 | Vindija | cave | 32.32–3107 | | + | Karavanić 1995; Deviése et al. 2017 |
| 18 | Šalitrena pećina | cave | 36.67-33.64 | + | | Marin-Arroyo & Mihailović 2017 |
| 19 | At | open air | 36.4±2.8 | + | + | Mihailović 1992; Chu et al. 2014; Nett et al. 2021 |
| 20 | Crvenka | open air | 36.4±2.8 | + | + | Mihailović 1992; Chu et al. 2014; Nett et al. 2021 |
| 21 | Tincova | open air | / | + | | Anghelinu et al. 2012; Anghelinu & Niță 2014 |

| No. | Site | Site type | Date (ka BP) | Nosed end-scrapers | Aurignacian blades | References |
|---|---|---|---|---|---|---|
| 22 | Coşava | open air | / | + | + | Anghelinu et al. 2012; Anghelinu & Niță 2014 |
| 23 | Românești Dumbrăvița | open air | 45.1±4.9; 35.5±3.9 | | + | Anghelinu et al. 2012; Anghelinu & Niță 2014; Sitlivy et al. 2012 |
| 24 | Tabula Traiana | cave | 40.06–36.34 | | | Borić et al. 2012; Mihailović 2020 |
| 25 | Bukovac, Serbia | cave | / | | | Dogandžić et al. 2014 |
| 26 | Orlovača | cave | / | | | Dogandžić et al. 2014 |
| 27 | Baranica | cave | 41.18–39.7 | | | Mihailović et al. 2011; Mihailović 2020 |
| 28 | Kozarnika | cave | 43.95–41.00 | | | Mihailović 2020 |
| 29 | Temnata | cave | 39.25–34.8 | + | + | Drobniewicz et al. 2000; Tsanova 2008 |
| 30 | Bacho-Kiro | cave | 40.0–35.5 | | + | Kozlowski et al. 1982; Mihailović 2020 |
| 31 | Peştera cu Oase | cave | 41–39 | | | Anghelinu & Niță 2014 |
| 32 | Cioclovina Cave | cave | 33–32 | | | Anghelinu & Niță 2014 |
| 33 | Muierii Cave | cave | 34–33 | | | Anghelinu & Niță 2014 |

**Table 1.** *List of sites along the cisalpine corridor. * Date calibrated using OxCal 4.4 Interface: version170, IntCal20 (Bronk Ramsey 2009; Reimer et al. 2020).*

Without reevaluation, excavations, detailed technological studies, and radiocarbon dating of the sites, the Sava corridor and the proposed dating of northern Bosnia in the Early Upper Paleolithic of Southeast Europe remains only an educated guess.

## Conclusion

Early excavations of sites, without developed methodology, the disturbed stratigraphy, and insufficient publications left northern Bosnia inadequately known and rarely referred to in literature, nor considered in regional studies of the Aurignacian in Southeast Europe. Despite the existing problems, this paper briefly reevaluated the available information about Aurignacian sites in northern Bosnia, based on a comparative definition of Aurignacian variability.

Even though there are only elements of the Aurignacian, their existence and geographical position undoubtedly show the potential of this territory for future research. The position of northern Bosnia, i.e., the concentration of sites that yielded Aurignacian material, enables the consideration of different scenarios about the spread of AMH. Even though the Sava corridor/cisalpine corridor could be considered only as an alternative, the hypothesis of this route seems more acceptable with the inclusion of the Aurignacian sites in Northern Bosnia.

The goal of this paper is not to present a conclusive identification of the corridor for the spread of AMH, because it deserves a more detailed study, reevaluation of excavation results, and radiocarbon dating, and thus, it aimed at representing the corridor's potential for future research, as well as of northern Bosnia, a territory which has long been neglected in the archaeological literature.

**Acknowledgments**

The research for this paper was conducted with the support of the Science Fund of the Republic of Serbia, 7746827 Neanderthal and Early Modern Human interactions in the Central Balkans – NEEMO.

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Studia Praehistorica 17, 2023, 17–34

# Enclosing the settlement or filling the ditch: The case of Aşağı Pinar

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**Abstract**

*Ongoing research in the Balkans is revealing the importance of Early Neolithic ditches that enclosed settlements. As the research continues, more information is being uncovered about the ditches. The initial settlement at Aşağı Pinar, layer 7, also features ditches, with two ditches and associated pits found in the last two phases of this layer. However, none of these ditches had any association with settlement units. The stratigraphy and context of the fills suggest a refilling process was involved. The stratification of the fills, along with a large quantity of pottery sherds found in the fills and other finds, strongly suggest that a complex activity involving material culture led to the refilling process. This paper discusses the refilling processes and the purposes of the ditches in the context of Aşağı Pınar. Evidently, the Neolithic ditches were part of a more intricate activity than a mere enclosure system in the beginning of the Neolithic in Balkans.*

**Keywords:** *Early Neolithic – Eastern Thrace – Aşağı Pınar – ditches – enclosures.*

https://doi.org/*10.53250/stprae17.17-34*

## Introduction

The integrity of a settlement is determined by the cohesion of the buildings and open spaces. Additionally, the location, boundaries, and duration of the settlement are also directly related to the conceptual composition of a settlement. The boundaries of prehistoric settlements are not always visible. However, these boundaries should gradually encompass the production and consumption habits of a community and settlement. They may be limited and defined by natural topographical features or distance. It is also possible to extend these boundaries within the context of communication and exchange networks or even to consider them as intertwined boundaries. However, from the very beginning of sedentary life, there are examples of concrete boundaries of prehistoric settlements, though they are not numerous. These boundaries are determined by walls and/or ditches, which generally only enclose certain areas of the settlement rather than its entirety. In Southwest

Asia, there are three known examples of this phenomenon. An enclosure wall associated with a monumental tower at Jericho (Kenyon 1981) at the beginning of the Pre-Pottery Neolithic, another wall at Tell Maghzaliyah (Bader & Aurenche 2009) which is supposed to have surrounded the settlement, and another one built on the part of the settlement facing the Euphrates at Mezraa Teleilat (Özdogan M. 2011). Additionally, there is a ditch located in front of the walls at Jericho. The stone wall dated to the Pre-Pottery Neolithic at Aşıklı Höyük (Esin & Harmankaya 2007) limits the areas in the settlement.

To the northwest of the Anatolian Peninsula, there are complex examples of settlement enclosures. Circular settlements are formed with buildings lined up side by side to form a circular boundary, the rear façade of the buildings forming a line of enclosure from the outside, and there is also a parallel ditch (Karul 2020). The earliest example of this settlement layout is Barcın (Geritsen & Özbal 2016). In layer IV, dating back to 6400 BCE, a ditch runs behind the buildings forming a linear sequence. However, Aktopraklık provides a clear observation of the relationship between the ditch and the settlement (Karul 2017 & 2020). At this site, the buildings of the settlement from the first half of the sixth millennium BCE are arranged in a circular line and surrounded by a ditch. The existence of a boundary in the settlement is reinforced by the fact that the back façade of the building sequence runs parallel to the ditch. This emphasizes the ditch and the border phenomenon. Other nearby settlements featuring ditches are those of Ilıpınar and Pendik. A ditch in Ilıpınar passes between the buildings. There is also a row of buildings in layer VI. Although the later layer VA was excavated in a smaller area, the continued layout is suggested by the adjacent buildings in this location (Roodenberg & Alpaslan-Roodenberg 2013). Another ditch was found at Pendik, but its direction and surrounding area are not fully understood (Özdoğan M. 1983).

No ditches have been found yet in western Anatolia. Nevertheless, instances of enclosure systems have been documented. At Ege Gübre (Sağlamtimur & Ozan 2012), located near the Aegean coast, a wall bordered the settlement. The wall, characterized by a stone foundation and a wooden superstructure, borders the settlement on one side only. During the late seventh and early sixth millennia BCE, the settlements in the Lakes Region were surrounded by a series of building façades and walls, as pointed out by Mellaart (1970) and Duru (2008). In Hacılar II and Kuruçay 11, the settlements were designed as a quadrangle rather than a circular layout. Sometime later, in Hacılar I, the buildings were arranged in a circular plan, as is typical of northwestern Anatolia, and the boundaries were formed by the body of the buildings.

It is likely that in the Early Neolithic of the Balkans, the ditch phenomenon became more significant. Ditches rather than walls are the main feature and can be found in the first settlements dated to the late seventh and early sixth millennium BCE (cf. Nikolova 2022). Circular enclosures have become increasingly widespread over time and are a distinctive element of the Neolithic in central and western Europe as well, being associated not only with settlements but also with ritual sites (Řídký at al. 2019).

In the Early Neolithic settlements in Thrace, ditches are a common structural unit (Nikolova 2018, 2021, and 2022). They are frequent components of a system of enclosures and boundaries, marking off the entire settlement or merging with another natural feature. Additionally, they typically comprise multiple ditches rather than just one. Similar ditches have been discovered in the earliest layer at Aşağı Pınar. The two ditches in layer 7 are similar to their Thracian contemporaries in terms of their structural features. However, they also possess distinctive features concerning the filling process and their relationship to the settlement. This paper will discuss these features of the ditches at Aşağı Pınar and will draw conclusions about their possible use.

**Aşağı Pınar**

Aşağı Pınar is situated in eastern Thrace, on the slopes of the Istranca Mountains that descend into the Ergene Basin, near the Şeytandere, one of the tributaries of the Ergene River that irrigates the basin. The settlement encompasses eight layers dating from 6000 to 4700 BCE. and has a total deposit of up to three meters at its thickest part (fig. 1). The two earliest layers, 7 and 6, are defined as Early Neolithic in Balkan terminology and as Late Neolithic – Early Chalcolithic in Anatolian terminology. Layers 5 to 2 above are equivalent to the Middle – Late Neolithic in the Balkans and the Middle Chalcolithic in Anatolia. An intermediate phase denominated as a transitional layer,



**Figure 1.** *Ditch II in the north area. View from the east. Image credit: Aşağı Pınar Project Archive.*

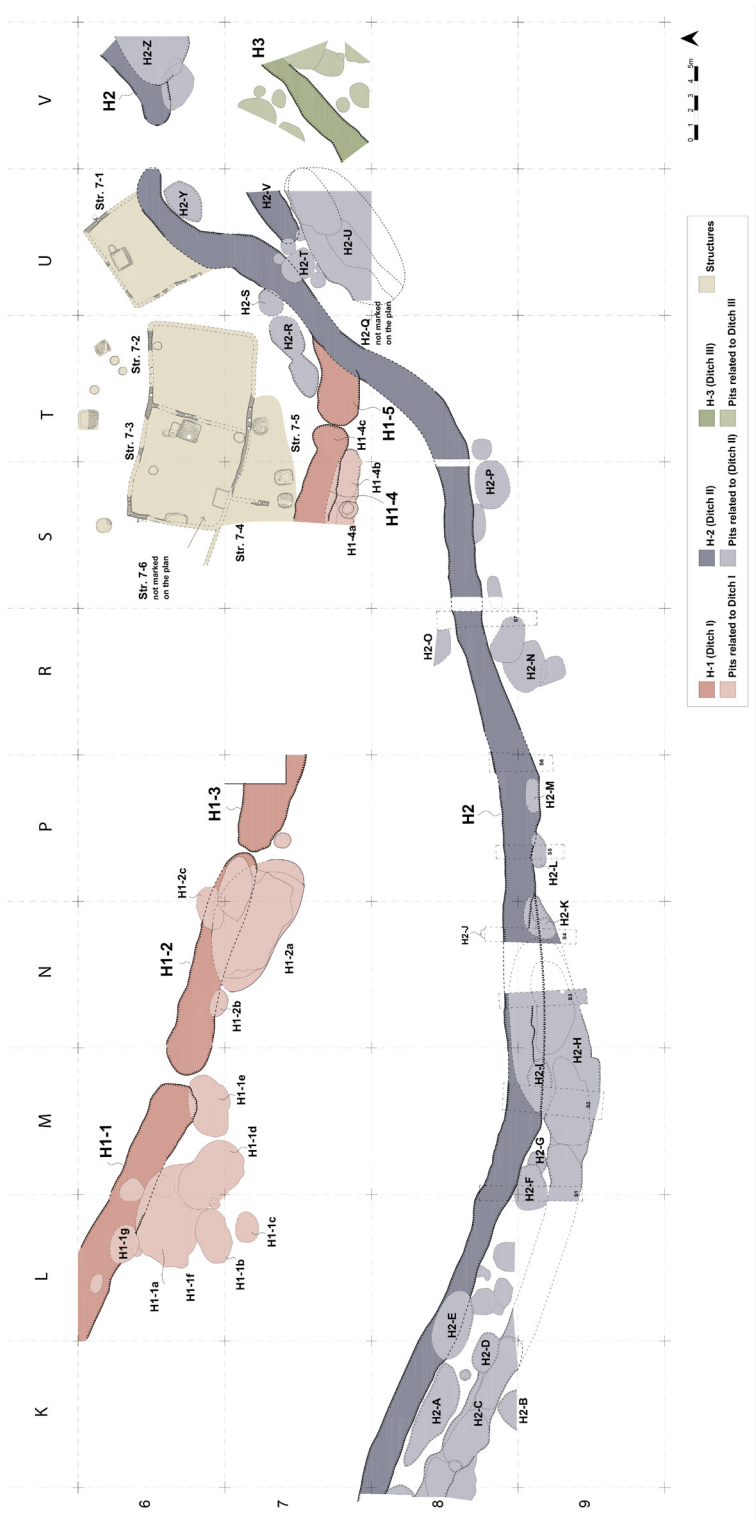



**Figure 2.** *Layout of layer 7. Each phase is highlighted in different colors. Image credit: Aşağı Pınar Project Archive.*

5–6, exists between the Early and Middle / Late Neolithic horizon (Özdoğan M. 2013; Özdoğan & Schwarzberg 2020).

The initial layers (7 and 6) represent the early stages of the first settled village life in Thrace. These layers indicate an uninterrupted process and are represented by quadrangular, adjacent, or neighboring dwellings built with wattle and daub techniques in the northern and northeastern parts of the mound (Özdoğan E. 2016; Özdoğan & Schwarzberg 2020). Layer 7 comprises three successive phases, in the lowest of which only wattle and daub dwellings have been identified that are adjacent and/or close to each other. No ditches are known. However, the two later phases can only be identified through ditches.

**The formation of layer 7**

The initial settlement in layer 7 was situated in the northeast parts of the mound, at the highest topography during that time and next to a small stream called Haydardere (fig. 2). The excavations uncovered dwellings and courtyards, but no units surrounding the settlement. Haydardere serves as the northern boundary of this early settlement, while the southern boundary of this phase is difficult to determine due to the destruction of the buildings by the ditches dug in later phases. The structures were excavated in an area covering 450 m² (fig. 3). Three large buildings were unearthed, two of them adjacent to

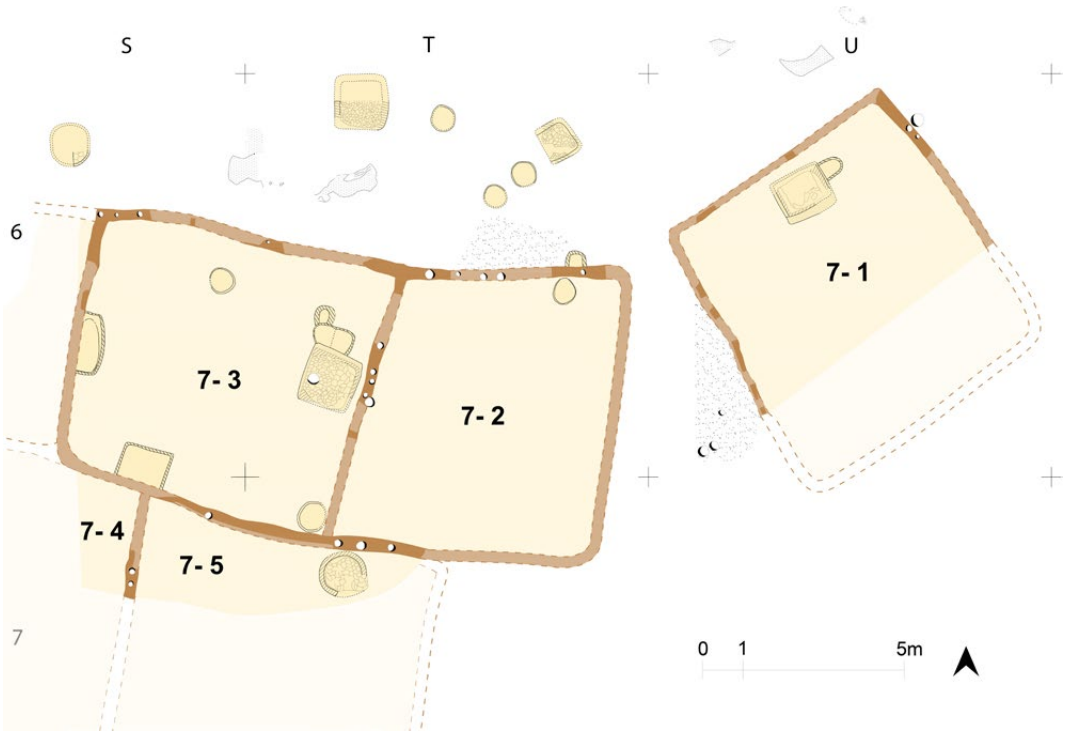



**Figure 3.** *Layout of earliest phase of layer 7. Image credit: Aşağı Pınar Project Archive.*

each other. Additionally, at the back of the adjacent structures, two possibly small rooms were excavated, most of which were destroyed by later ditches. The area was leveled before the buildings were constructed. Following the construction of the wattle and daub walls, the building floors were carefully made with earth fills and clay or lime plasters. Traces of red ochre surfaces remain on some of the floors. The westernmost building is the best-preserved of the existing structures (fig. 3). Within it, a hearth with a square platform near the eastern wall and platforms adjacent to the hearth were discovered. There are some platforms and storage units located next to the west and south walls of the building. It has been renovated in two main phases and all the elements, except the hearth, have been rearranged during the renovation of the floor.

The rooms' interiors are clean, probably related to the abandonment process. To the north of the buildings is an open area with hearths and storage pits. It appears that the open space was intensively used considering the presence of numerous artifacts and layers of clay and lime debris in contrast to the buildings.

After the abandonment of the buildings, ditch I was dug, cutting through the architectural elements of the earlier phase. The ditch consists of elongated pits oriented from northwest to southeast and running in a straight line in the same direction. Numerous pits, particularly to the south, were dug along with it.

Ditch II was likely excavated after the previous ditch was filled. This new ditch is more southwest oriented and has a slightly concave arc to the north. Unlike the preceding one, which consists of multiple ditch segments, this ditch was made as a single unit. At the northeast end, there is a short gap followed by a continuation that is only partially excavated. While it differs from the previous ditch in direction and geometry, it is quite similar to it in terms of the pits dug south of it and of the filling process.

During the time of layer 6, a row of buildings was constructed north of ditch II, running parallel to it with some extension above it. This indicates that ditch II was filled before layer 6. However, the ditch and building line are tangent to each other in some places, especially in the western central parts of the excavation area, and the burnt daub rubble accumulated on the upper side of the ditch in these sections indicates that the depression of ditch II was preserved in some places within the layer 6 settlement pattern.

The ditches and pits in layer 7 overlap in the northeast parts of the mound, and a large depression was revealed in this area (fig. 2). This section is reminiscent of a slope or flood cut in the prehistoric topography of the site, as it cuts a small hill slope that gradually descends towards the stream in the north. It is probable that the prehistoric settlers dug initially ditch I, intersecting the depression, and made subsequently ditch II, which runs through this slope to the northeast. The depression to the northeast was also a limiting element in layer 6 in that direction. After the time of layer 6, the northeast depression and sloping surfaces in the transitional layer 5–6 suggest that this slope was still intact, particularly in the line where ditch II passes, while in layer 5, the area was completely covered by the remains of activities such as lime processing or preparation of building materials,

and the mound gained a relatively flat topography. In layer 5, the area of the mound was extended to the south and southwest, and was at least three times larger than in the Early Neolithic. Additionally, the Early Neolithic deposits were wholly buried. For this reason, no Early Neolithic material was found in the surveys carried out before the excavations at Aşağı Pınar.

**Ditch I (The north ditch)**

Ditch I consists of a series of elongated narrow segments. They form a more or less straight line in a northwest-southeast direction (fig. 2). Its eastern continuation is not discernible, as it is cut by ditch II. The ditch gradually ends in the west, as evident from the decline of the present-day topography. A total of five sections of the ditch were excavated, and when combined with the unexcavated intervals in between, the overall length of the investigated part of the ditch measures ca. 65 m. The narrow and elongated ditch segments are connected in a NW–SE direction with gaps between them not exceeding 0.20 or 0.30 m. In several locations, the edges of the ditch are tangential to each other, almost as if they were attached back-to-back. The ditch cuts the virgin soil and has a U or V profile. The sides of the ditch do not follow a regular pattern. The average depth of the segments is about 2 m, with some shallower areas.

There are numerous pits in certain areas south of the ditch that often truncate it (fig. 4). The fills of these pits are very similar to those of the ditch. Some of them are single, while others are in clusters and intersect each other. Few of the pits were cut by the ditch, but most of them cut it, i.e., the ditch was dug earlier and the pits were dug later, but both were used/filled together for some time.

Whether ditch I served as a settlement boundary or enclosed it is not known. No evidence was found linking it to a settlement. It cuts the buildings in the lowest phase and was cut by ditch II to the southeast. This indicates that it represents an intermediate phase between ditch II and the buildings. The additional evidence that ditch I and its associated pits were dug before ditch II is related to the process of covering them. While the fill above the ditch II was mixed with layers 6, 5–6 (transitional layer), and 5 in most places, ditch I itself was covered by the fill of layer 7. Therefore, it appears that ditch II was filled at the end of layer 7 and ditch I was filled sometime during the timespan of layer 7.

**Ditch II (The south ditch)**

Ditch II extends in an irregular line in an east-west direction and forms a concave arc to the north in the northern part of the mound (fig. 2). It was investigated to a total length of 112 m and appears to consist of two parts. A large area of the western part was excavated (102 m; fig. 5). A length of only 7 m was excavated of the eastern part. The two parts of the ditch are separated by 3 m. There is a remarkable convergence between the two segments at the junction; the western part curves to the south in an S-shape, while the eastern part of the ditch forms an S that curves to the north (fig. 6) at an angle oppo-



**Figure 4.** *The western segments of ditch I. View form the east. Image credit: Aşağı Pınar Project Archive.*

site to the other. Even though the end points were not revealed in either the east or west direction, the ditch doesn't end by gradually rising its bottom level, but the bottoms at the ends where the two segments meet are even.

Ditch II is also dug into the virgin soil, its average width being ca. 2 m, even though some parts are wider or narrower. The walls are steep and the ditch has a V or U profile. The difference in the bottom's profile is random; there are sections close to each other that turn from V to U shape and then again to V. The depth measures approximately 2.0–2.5 m.

As with the previous ditch, this one also has associated pits (figs. 7 and 8). The pits are concentrated to the west, and in the east they appear to have cut the ditch. The filling of the latter suggests that they were made after the ditch was filled to a certain level. The



**Figure 5.** *Ditch II. View from the northeast. Image credit: Aşağı Pınar Project Archive.*



**Figure 6.** *The eastern end of ditch II. View from the east. Image credit: Aşağı Pınar Project Archive.*



**Figure 7.** *Ditch II with its associated pits. View from the south. Image credit: Aşağı Pınar Project Archive.*



**Figure 8.** *The western end of ditch II. View from the north. Image credit: Aşağı Pınar Project Archive.*

density of the pits in the western part of ditch II and the fact that they run parallel to the ditch in a chain is remarkable and reminiscent of a third ditch. However, the continuing of the fills into the ditch where they intersect implies their simultaneous use.

The lack of Early Neolithic deposits south of ditch II and that the pits were dug south of the ditch indicate the possible presence of a settlement to the north. There is a topographic reason, which prevents a circular layout for the ditch; a small stream flows to the west of it. Therefore, it can be inferred that ditch II functioned as a boundary running parallel to the stream. It is probable that a settlement might have existed between the stream and the ditch, on the one side bounded by a natural feature and on the other by an artificial border. However, no evidence of a settlement surrounded or enclosed by ditch II was found; there are no remains of dwellings in the excavated area. Moreover, the geophysical surveys conducted both before and during the excavation in the northern area did not yield adequate information regarding a possible settlement.

**The filling process**

The filling process includes successive phases (figs. 9 and 10), which can be observed both in the ditches and in the associated pits. After the ditches were dug, they must have remained open for an unknown period of time, probably not very long. When they were open, the soil falling from the walls accumulated irregularly at the bottom. The soil consisted mainly of fragments of the yellow clay deposit into which the ditches had been dug, and dark brown soil from the brown deposit above the virgin soil, which contained no archaeological material. The archaeological material in this lower layer of the fill is sparse; it contained a few large animal bone pieces and sherds.

The lime layers above the lowermost level comprise the main fill of the ditches and the related pits. Within and between these layers, particularly to the west, numerous surfaces were uncovered that consisted of small rocks, especially in ditch I. Brown soil fills, as well as some burned daub layers, are also present between the layers. Red ocher or charred surfaces (fig. 11) can be observed, albeit infrequently. At the northern edge of the ditch, the lime layers appear most intact throughout the entire ditch sequence, implying that the deposits were likely dumped from the north.

Above the lime layers in the ditches, there is a deposit which contains hearths; three of them were found in ditch I and one in ditch II. They were built when the depression of the ditch was still preserved (fig. 12). Occasionally, the surface of the ditch was plastered with clay and earth before the heart construction, while in other instances, the hearths were built directly on top of the main fill. Remains from walls were uncovered in two areas. It seems that at some point, when the ditches were not yet filled completely, certain sections were converted into closed structures and repurposed for activities related to the hearths.

Fills composed of thicker soil layers cover the hearths and the lime layers. Their thickness and general characteristics indicate a rapid filling process.



**Figure 9.** *Section of ditch I, with the unexcavated part behind it. View from the east. Image credit: Aşağı Pınar Project Archive.*

Ditch I was covered by a stone deposit to the west and by a thick layer of clayey soil in the east within layer 7. The stone fill spread across a gently sloping area to the west. The scraping and levelling of the area between both ditches in layer 6 resulted in a damage to the layer 7 deposits. After having been filled in completely, ditch II appears to have remained an open space for some time.

**Find assemblages**

The densest level of archaeological material in the ditches is the middle (main) fill, which is characterized by multiple lime layers. Both faunal and botanical material is abun-



**Figure 10.** *Section of ditch I. View from the east. Image credit: Aşağı Pınar Project Archive.*



**Figure 11.** *Red ocher on the surface of the filling of ditch I. Image credit: Aşağı Pınar Project Archive.*




**Figure 12.** *A hearth and a storage bin in the almost filled ditch I. Above: view from above. Below: section. Image credit: Aşağı Pınar Project Archive.*

dant there, and the pottery and other finds mainly come from this layer. Some human bone fragments were also found scattered in the fill.

The pottery discovered in layer 7 comprises more than 130,000 sherds, with a substantial portion found in the ditch and related pit fills (Akyol et al. 2022). A quarter of this quantity was uncovered in layer 6, which was explored in the same location and contained well-defined domestic contexts. The sherd ratios in ditches I and II and the associated pits are nearly identical. Quality wares and open forms are more frequent. A distinct pattern is noted in the earliest phase of layer 7, where the remains of a settlement where uncovered. The proportion of materials is significantly lower, while there are numerous coarse wares. In contrast, the pottery discovered in the ditches is of superior quality and has more intricate designs than the pieces unearthed in the lowest phase's living areas.

Two-thirds of the pottery is of high-quality ware with a smaller proportion of coarse ware. The main forms include plates, bowls, cups, tulip vessels, jars, and small jars, with more than half of the vessel forms being open forms. Concerning the decoration, the red-on-white paint is reminiscent of the contemporaneous parallels in Thrace, but the remarkable intensity of the spiral motifs sets it apart. The presence of decorations in layer 7 pottery reflecting a tradition from Anatolia, particularly Central Anatolia in the first quarter of the sixth millennium BCE, is intriguing. The decoration of line and dot incisions on dark, black, or dark gray vessels is a unique feature not found in contemporary Balkan settlements.

Stone axes and grindstones are rare. Chipped stone material is also scarce. However, bone tools are plentiful and diverse. Pointed tools are common. Although there aren't many personal ornaments, they vary in terms of raw material and typology. Cult vessels and figurines are abundant. Clay rings are one of the most frequently found types of artifacts. Special findings, including quadrangular vessels adorned with human faces, non-utilitarian clay artifacts, and ornaments, were also uncovered within the ditches.

**Conclusion**

In the late seventh and early sixth millennia BCE, sedentary societies based on food production established numerous settlements in a vast area stretching from the Halaf region to the western Balkans. In this period, common subsistence strategies, everyday objects, symbolic elements, and living spaces demonstrate extensive communication despite variations in cultural components across a broad geographic region. The initial phase of layer 7 at Aşağı Pınar shows the main characteristics of the period with the well-arranged house contexts and open spaces. The quadrangular structures and the assemblage of finds reflect the simple village life. What distinguishes layer 7 are the ditches that postdate the structures. The ditches at Aşağı Pınar are not linked to any settlement and were filled shortly after having been dug, indicating deliberate action. Filling a ditch negates its presumed function as a boundary and defense. Furthermore, a consistent pattern was observed in the horizontal and vertical characteristics of the fill and the archaeological material found in it.

The existence of multiple ditches with associated pits, their prolonged use for almost 200 years, the absence of any clear connection to a settlement area, and the intentional filling have raised issues concerning the original purpose and function of the ditches. They are located in the northwest part of the mound. It is possible that a settlement exists in the unexplored eastern section of the mound. However, considering the positioning and orientation of the ditches, even assuming the presence of a contemporary settlement, the ditches do not appear to surround it. This is what sets the Aşağı Pınar ditches apart from neighboring settlements that share similar characteristics.

The ditches were dug with extensive labor and refilled after a short period of time. The accumulation of fill indicates a consistent pattern of filling both horizontally and vertically. As filling progressed, irregular pits were dug along the southern edge of both ditches and were filled in along with the ditches. In certain areas, these pits were made as if to form a third series of ditches.

The main fill of the ditch, consisting of multiple thin layers, is located in the middle. These fills were thrown into the ditch, mostly from the northern edge of the ditch, to form smooth and thin layers. The layers of lime, soil, daub, and charcoal vary in thickness. Despite the relatively large area excavated around the ditch, no lime-containing remains were found that could have fallen in the ditch. This suggests that these materials were intentionally transported to this area and disposed of in the ditch.

Most of the artifacts have been found in the main fill. Moreover, plant and animal remains are rarest in the bottom layer accumulated in the time when the ditches were briefly open, and the artifact density is highest in the main fill. Additionally, human bones were also found there, but their random distribution doesn't show an identifiable pattern.

In particular, the material in the ditch has specific characteristics in both density and type, as opposed to the random material that should be found in a settlement midden. The most unusual type of material found in the ditch is pottery. Almost the same areas of layers 7 and 6 at Aşağı Pınar were excavated. Layer 6 comprised primarily of dwellings, whereas ditches were excavated in layer 7. The quantity of sherds discovered in layer 7 exceeds that of layer 6 by more than four times. The type and shape of the vessels is also noteworthy. Although the number of everyday types of vessels, such as storage and cooking vessels, is minimal, the number of service vessels, plates, and open-shaped vessels is predominant. This indicates that the material found in the ditch was not waste from the settlement. The large size of the sherds suggests that they were broken at their original location.

Despite the abundance of pottery, bone finds, and clay rings, there are very few stone tools, especially axes and grindstones, compared to the other settlement layers.

The radiocarbon dates on material from the ditches are insufficient for precise dating of the ditch stratigraphy, potentially due to the re-digging of the fill and occasional overturning in the Neolithic. Nevertheless, the earliest and latest dates fall within a timeframe of almost 200 years, suggesting a relatively short use. Additionally, the successive digging of ditch I and II suggests a shorter use for each ditch.

In conclusion, layer 7 at Aşağı Pınar yielded extensive architectural and material evidence of a typical Balkan site. It is the earliest dated site in the interior of Eastern Thrace, and shares many similarities with contemporaneous sites in Bulgaria. However, the dark pottery featuring dotted decoration – absent in the Balkans but prominent in Anatolia's interior – suggests different communication networks. Undoubtedly, the presence, construction, and purpose of ditches distinguish the earliest occupation of Aşağı Pınar from others, as evidenced by the material in the ditches. It is clear that the ditches of Aşağı Pınar were excavated for the specific purpose of filling, with special efforts being made for achieving this, and that fill and material forming a specific context were deposited in them. It is evident that this process was repeatedly carried out over time, implying the ditches were linked to ritual practices, although their purpose remains unclear. As excavation continued at Aşağı Pınar, subsequent layers revealed feasting pits, followed by offering pits. The latter were a customary activity in the Balkans between the late sixth millennium and fifth millennium BCE; it thus becomes possible to argue that the ditches were precursors to this tradition.

**Acknowledgments**

The research at Aşağı Pınar is being supported by the General Directorate of Cultural Heritage and Museums, the Research Fund of the Istanbul University (Project No. 2019-34649), the German Archaeological Institute (DAI Berlin), and the German Research Foundation (DFG; Project No. GZ. HA2410/19-1). We would like to express our gratitude to all supporting institutes.

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Studia Praehistorica 17, 2023, 35–102

# The transition from the Late Neolithic to the Early Eneolithic in northwestern Serbia: Reconsideration and suggestions for future work

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**Abstract**

*The paper analyzed 364 sites from the fifth millennium BC in northwestern Serbia in order to observe the process of population fission from the large Late Neolithic settlements and the formation of smaller settlements tightly integrated with one another in the Early Eneolithic. Special attention was paid to the chronology, size, pedology, and topography of the settlements. Lowland-valley microregions were densely populated, while hilly and highland areas were sparsely populated. Larger sites are concentrated in the microregions of Mačva, Posavina, Pocerina and Tamnava, while the smaller ones are distributed across all microregions. The largest and most numerous settlements were oriented towards very fertile soil types and microregions, such as Mačva, while settlements on soils unsuitable for cultivation prevail in the microregions of Rađevina and Azbukovica, which are characterized by hills and mountains, as well as in the most populated microregion of Mačva. Hard-to-reach settlements of dominant elevations (hillfort – Gradina type) in the hilly and mountainous areas and slightly elevated settlements enclosed by ditches in the plain areas (Obrovac type), i.e., the formation of small and very small settlements was viewed from the perspective of the transformation of the Neolithic and the establishment of a new, Eneolithic way of life. The analysis showed the necessity of modern archaeological prospection for a precise positioning of all sites in order to increase the quality of pedological and topographical data, as well as for geomagnetic research and targeted projects in order to evaluate the site areas, human activities in the settlements and to control the chronology by dating as many excavated sites with secure contexts as possible.*

**Keywords:** *Neolithic/Eneolithic transition – Vinča culture – northwestern Serbia – settlements – chronology – site area – pedology – topography – future projects.*

https://doi.org/10.53250/stprae17.35-102

**Introduction**

The transition from the Late Neolithic (LN) to the Early Eneolithic (EE) in the Central Balkans (CB) in previous research conducted in Serbia was most often characterized as a period of great turmoil and conflict due to large migrations that led to the decline and collapse of the Vinča culture (Garašanin 1979, 204f; Srejović 1981; Jovanović 1994; Tasić 1995, 28; cf. Borić 2015, 158f). Most researchers in Serbia believed that due to the intrusions of new populations from the north (Tisapolgár and Bodrogkeresztúr cultures) and the east (Bubanj–Sălkuța–Krivodol cultural complex, BSK) the territory of the Vinča culture gradually decreased and that, because of those turbulent times, numerous settlements were formed on naturally protected and elevated locations, the so-called Gradina. Milutin Garašanin singled out this horizon in his periodization of the Vinča culture as a transitional period from the earlier Vinča–Tordoš phase to the later Vinča–Pločnik and labeled it as the Gradac phase (Garašanin 1979), after the eponymous site in Zlokućani, near Leskovac, southern Serbia (fig. 1). Later, Borislav Jovanović (1994) expressed the opinion that the entire later Vinča culture (C–D) in the southern regions of Serbia developed through phases Gradac I–III. During Gradac II phase, which this author synchronizes with the final level of burnt houses at the site of Divostin in central Serbia, the Vinča culture had already disappeared in the Danube Basin farther in the north. Gradac III phase is associated with the southernmost areas of the Vinča culture distribution, especially the Kosovo variant as well as in southern Serbia (Pločnik near Prokuplje). This phase at the eponymous site of Gradac in Zlokućani was not radiocarbon dated. In terms of topography, the site belongs to settlements on an elevated plateau along the Južna Morava River, with an elevation of about 10 m (in relation to the north and east sides; fig. 2), and not to hillfort settlements in the true sense of the word (see further in the text). Additionally, it follows that the Gradac phase, as defined by Garašanin, should be dated to the transitional period from the earlier to the later Vinča culture, i.e., ca. 5000 cal. BC. However, the earliest Tiszapolgar and BSK settlements had not been established before 4600–4500 cal. BC. Therefore, the expansion of EE cultures occurred at a later point than the so-called Gradac phase of the Vinča culture – as it was originally defined – and its origin cannot be a consequence of the expansion. On the other hand, a certain number of researchers believed that there was an economic and social crisis and internal tensions between different components of the Vinča society at the end of the Vinča culture (Glišić 1968, 30; Tringham 1992; Borić 2015), which led to the formation of new regional groups, such as the BSK (Chapman 1981, 138), as well as the subsequent collapse of the Vinča culture. John Chapman (1990), Ruth Tringham (1992), and Dušan Borić (2015) suggested models of population dispersion from the LN settlements that include tensions and conflicts.

**Figure 1.** *Distribution map of LN and EE sites mentioned in the text. (1) At, Vršac; (2) Staro selo, Selevac; (3) Grivac, Knić; (4) Šanac, Pločnik; (5) Usek, Banjica; (6) Spasovine, Milina; (7) Okolište, Visoko; (8) Divostin, Kragujevac; (9) Gradac, Zlokućani; (10) Bodnjik, Družetić; (11) Velika Humska Čuka, Hum; (12) Liga, Telish. Image Credit: Map derived from QGIS. Base map: Esri Topo World. Scale not given. http://services.arcgisonline.com/ArcGIS/rest/services/World_Topo_Map/MapServer/tile/{z}/{y}/{x}[09/28/2023]*



**Figure 2.** *LN and EE Gradac site at Zlokućani near Leskovac (southeastern Serbia). View from the south. Image Credit: the authors.*

**Population fission from Late Neolithic settlements, settlements of peripheral areas and marginal soils, and the formation of smaller and tightly integrated settlements in the Early Eneolithic of the Central Balkans**

Chapman stated that changes that occurred during the transition from the early to the late phase of the Vinča culture (phases III and IV) were accompanied by the disappearance of large settlements (such as Selevac) and dispersion of the population in the hitherto peripheral areas, which were characterized by a greater diversity in the choice of locations for settlements and nearby resources. According to the same author, this enabled the introduction of the plow in the previous phase III (Chapman 1990, 40). The adoption of that innovation enabled the cultivation of larger sections of land (i.e., fields instead of gardens), population growth and further expansion of settlements into forest soils, as well as the cultivation of hard to work soil types, such as chernozems and vertisols (Chapman 1990, 43).

Tringham believed that during the early Vinča B culture, there was a change in the social organization of production in which households in the village became the primary units of social and economic cooperation (Tringham & Krstić 1990, 602ff). This change culminated in the beginning of the later phase C of the Vinča culture and this social transformation enabled the creation of large, densely populated settlements with a large number of inhabitants and more intensive economic production (Tringham & Krstić 1990, 580f). Population growth had ultimately reached the limits of the carrying capacity of settlement territories, which had caused competition and inequality among households. These changes finally led to the abandonment of LN settlements and forming of smaller settlements on 'marginal soils' during the late phase D of the Vinča culture (Tringham & Krstić 1990, 567ff; Tringham 1992). According to Tringham, such a population fission occurred due to a change in the organization and power structures in the society and the collapse of exchange networks during the Vinča C2 phase, which in the absence of a dominating central structure, through which households could be organized into an integrated political unit, led to the fission of economically independent co-residential households. She stated that at the time of the final Vinča D phase, the settlements were smaller, ceramic styles became uniform, and the frequency of ritual items and symbolic expressions decreased (e.g., figurines, marine shells, obsidian). Thus, scattered smaller groups in the newly founded settlements mastered new skills and economic strategies over time, and also gained new contacts and allies. The same author believes that this process weakened the cohesion and social power of the Vinča culture and ultimately led to the abandonment of large, long-term settlements (Tringham & Krstić 1990, 610ff; Tringham, 1992).

Borić believes that tensions and conflicts in LN Vinča settlements were resolved by fission and the establishment of new settlements with households, houses, or their social segments and members who moved away from the imposed restrictions and power structure of large Vinča settlements. He sees an explanation for this in the social dynamics between different components within communities (Borić 2015, 194).

A recent study on the spatial distribution of Vinča and BSK settlements in the valleys of the rivers Velika and Južna Morava and in eastern Serbia showed that in the EE, i.e., in the second half of the fifth millennium BC, settlements were most numerous in eastern Serbia, where they were relatively rare during the Vinča culture (Milanović 2017, 306; and 2019).

BSK settlements are often in the immediate vicinity of copper ore deposits, which was not the case in the LN. It was concluded that the entire settlement strategy in the EE was focused on eastern Serbia – a peripheral region up to that point – which was rich in copper deposits. Another important point in the EE, brought forth by the aforementioned study, was the appearance of settlements focused only on soils unsuitable for agriculture. Such settlements were very rare in the Vinča period (three out of 87 noted, but only one was definitely a Vinča settlement), and relatively common when it comes to the BSK complex (12 out of 53) (Milanović 2019). It was pointed out that Vinča settlements were significantly larger, usually covering several hectares, and in some cases several dozens of hectares (Milanović 2017, 267ff). According to the available data, primarily the radiocarbon dates and characteristics of the material culture, it can be sustained that most of the largest settlements, which had mostly been founded during the early Vinča, also existed in the late Vinča (cf. Borić 2009). It remains unknown, however, whether the size of certain settlements and the number of their inhabitants decreased, as was established by the research conducted at the LN site near Okolište in the valley of the Bosna River (Hofmann 2015). Recent work at the site of Adžine Njive – Brajkovo, near Klenak, suggests the same trend (fig. 3). This site was previously qualified as a settlement on a slightly elevated terrain with a surface of ca. 1 ha (Popović & Vasiljević 1970), and new research has shown that the early Vinča settlement occupied a significantly larger area, while in the late Vinča the settlement was reduced to an area of ca. 2-2.5 ha.[1] Smaller Vinča settlements are rare; they occupy a surface between 0.5 and 3.75 ha and mostly belong to the late Vinča (Milanović 2017, 267ff). However, their chronology is questionable because they have not been archaeologically investigated for the most part, and some of them may actually date to the EE, which refers primarily to those that were identified as hillforts (Gradina type; fig. 4). In the EE, sites are significantly smaller compared to the LN. Their size varies between 0.045 and 5.4 ha, and those with a very small surface are the most common ones (out of 23 sites, 19 are smaller than 2.7 ha), hence, it is certain that these settlements consisted of a significantly smaller number of houses compared to the previous period (Milanović 2017, 277ff). Previous research activities indicate that single-layer sites and relocations of settlements predominate in the microregion, and two, three or four spatially close sites have been recorded in certain microregions (Milanović 2017, 280).

[1] New data come from rescue project conducted in 2021–22 and directed by Dragan Milanović and Miroslav Kočić, when over 4 ha surface was excavated.

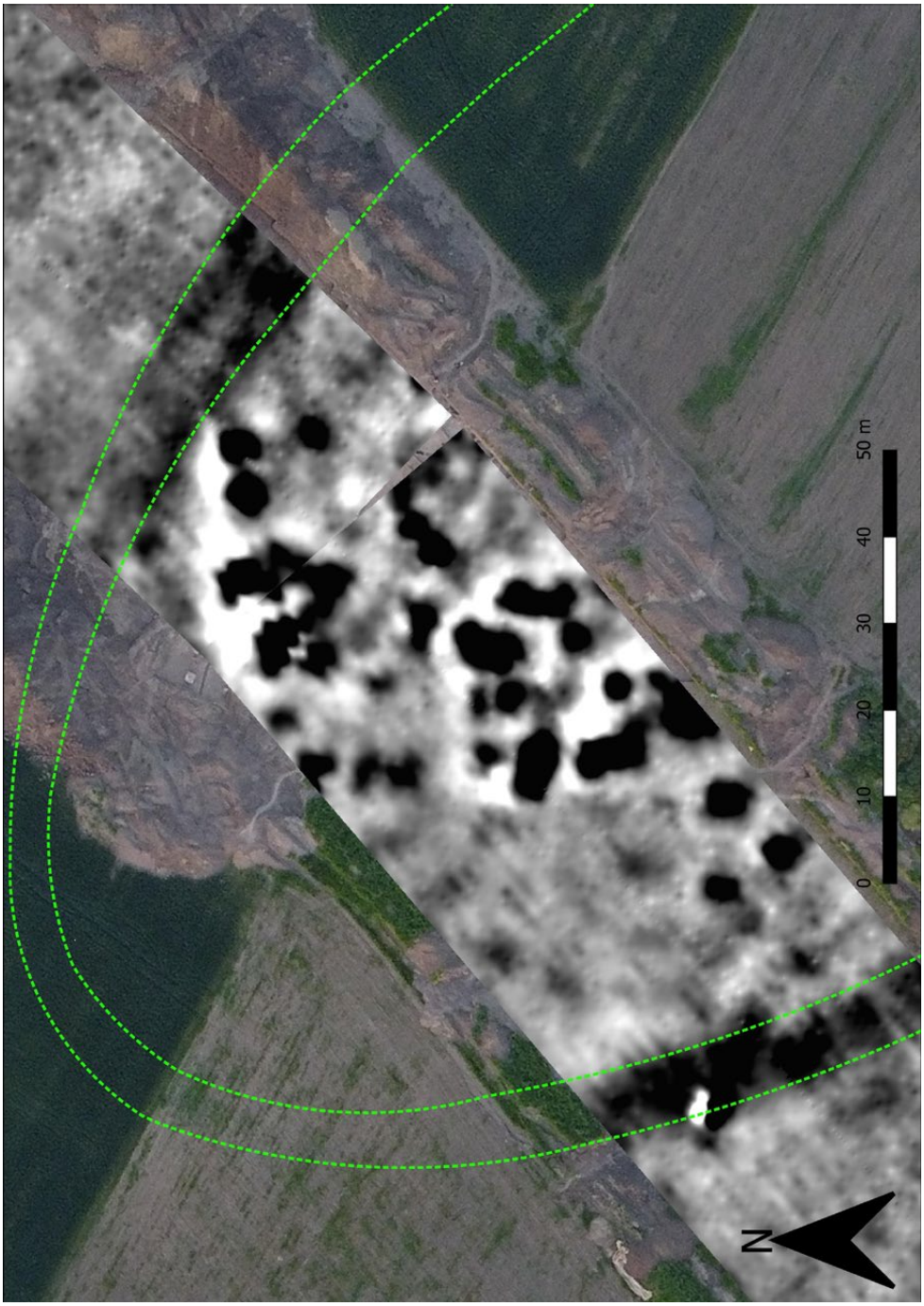



**Figure 3.** *Fluxgate gradiometry of the LN fortified settlement of Adžine njive – Brajkovo 2 at Klenak near Šabac (northwestern Serbia) ovelaid on a satelite image. Image Credit: the authors and Vimimacium Center for New Technologies.*



**Figure 4.** *FThe EE site of Velika Humska Čuka near Niš (southeastern Serbia). View from the southwest. Image Credit: the authors.*

### The end of the Neolithic and the beginning of the Early Eneolithic in the Central Balkans and neighboring regions according to radiocarbon dates

In two papers, Borić (2009 & 2015) provided a strong argument that the Vinča culture lasted until 4600/4500 cal. BC, while other authors had previously expressed the opinion that it lasted until ca. 4000 cal. BC (Ehrich & Bankoff 1992, 382), or until 4250 cal. BC (Obelić et al. 2004). After that, several more papers were published indicating that the Vinča culture ended in the middle of the fifth millennium BC (Orton 2012; Whittle et al. 2016). The end of the Neolithic cultures in the Carpathian Basin was also determined to the middle of the fifth millennium BC. However, certain radiocarbon dates from sites in Hungary indicate a longer duration of the LN – up to ca. 4300 cal. BC, while the Proto-Tisapolgár and Tisapolgár cultures, which represent manifestations of the EE in the Carpathian Basin, appeared already at ca. 4600 cal. BC, i.e., 4500 cal. BC (Yerkes et al. 2009; Raczky & Siklósi 2013). It was long believed that the BSK cultural complex was formed in Western Bulgaria ca. 4500/4450 cal. BC, and that in its later stages it spread to the areas of southwestern Romania, eastern and southeastern Serbia (Nikolov 1981, 12; Nikolova 1999; Georgieva 1990, 172; Todorova 1995). The early dates for the end of the Vinča culture show a hiatus between its final phase and the early phase

of the BSK cultural complex. Additionally, the absence of the early BSK phase in Serbia and Romania, or rather the lack of radiocarbon measurements from those sites was noted, thus, it became questionable how the early BSK settlements could have been the cause of the disappearance of Vinča culture. Nonetheless, new and some of the earlier radiocarbon measurements at certain Vinča sites, such as At near Vršac, Staro Selo near Selevac, Gruža near Grivac, Šanac near Pločnik, Usek near Banjica and others, clearly indicate that the Vinča culture lasted longer in some settlements than Borić suggested (table 1).

| No. | Site, village/city, region | cal. BC | Relative chronology | Context/ number of samples | Reference |
|---|---|---|---|---|---|
| 1 | At, Crvenka/Vršac, northern Serbia | 4701– 4489 and 4653–4373 (95.4% prob.) | Vinča D2-D3 | ?/2 | Chu et al. 2016, fig. 5 |
| 2 | Staro Selo, Selevac/ Smedervska Palanka, central Serbia | 4606–4375 (68.2%) or 4690–4355 (95.4%) | Vinča D2-D3 | BH3 or 4/1 | Borić 2015, 214 |
| 3 | Grivac, Knić/ Kragujevac, central Serbia | 4614–4274 (68.2 %) or 4785–4072 (95.4 %) | Vinča D2-D3 | ?/2 | Borić 2015, 208 |
| 4 | Šanac, Pločnik/ Prokuplje, southern Serbia | 4605–4461, 4493–4365, 4454–4356, and 4448–4330 (95.4 %) | Vinča D3 | BH1/4 | Marić et al. 2021, Table 1 |
| 5 | Usek, Banjica/Belgrade, central Serbia | 4652–4369 (68.2 %) or 4792–4270 (95.4 %) | Vinča D2-D3 | ?/2 | Borić 2015, 203 |
| 6 | Spasovine, Milina/ Loznica, northwestern Serbia | 4577–4509 (68.2%) or 4611–4461 (95.4%) | Vinča D2 | ?/2 | Bulatović et al. 2020, fig. 8 |
| 7 | Velika Humska Čuka, Hum/Niš, southeastern Serbia | 4447-4373 (68%) or 4490-4340 (95.4%), and 4450-4340 (95.4%) 4370-4345 (47%) 4442-4421 (37%) | Early and Middle BSK | BH1/2 | Bulatović et al. 2020, fig. 8; Bulatović & Milanović 2021, table 1 |
| 8 | Družetić, Bodnjik/ Koceljeva, northwestern Serbia | 4448–4369 (68.2%) or 4468–4347 (95.4%) | Early BSK | BH2/1 | Živanović 2013, 54 |
| 9 | Lîga, Telish/Pleven, north central Bulgaria | 4600–4350, 4460–4320 and 4460–4240 (95.4%) | Early and Middle BSK | BH1(?)–2 (Lîga 1?–2)/3 | Merkyte 2005, 33ff, fig. II.12 |

**Table 1.** *Late Neolithic Vinča culture sites that yielded very late radiocarbon dates and certain Early Eneolithic BSK sites with early radiocarbon dates.*

It has been shown that certain EE sites such as Velika Humska Čuka near Niš, southern Serbia (fig. 4), and Družetić near Koceljevo, northwestern Serbia, had already

been inhabited between 4500 and 4350 cal. BC, hence, in the early phase of the BSK. Additionally, at the site of Lîga in Teliš, one date indicates the possible existence of an even earlier BSK horizon (4600–4350 cal. BC; Merkyte 2005, 33ff).

All this suggests that the complex disintegration process of the LN and the emergence of the EE settlements in the CB and in the Carpathian Basin occurred at approximately the same time. Important elements of this process were, apparently, a size reduction of the sites and establishment of complementary settlements in terms of geomorphology, pedology and topography (Milanović 2017; forthcoming a and b; Bulatović & Milanović 2020, 245f; and 2021).

**Aims and methods**

The aim of the paper is to provide an overview of the process of population fission from large Vinča settlements and the formation of smaller settlements in the EE, tightly integrated with one another, in northwestern Serbia. Special attention was paid to the chronology, size, pedology and topography of the settlements. A very important aspect of this paper is the analysis of the stratigraphy of the site of Benske Bare/Jela, as previously registered sites in northwestern Serbia were chronologically determined on its basis (Trbuhović & Vasiljević 1983).

The sites were positioned in the microregions of northwestern Serbia, on the modern pedological map. Their size, soil types and topography were accounted for. Such data were collected from the scientific literature, and the topography was verified on the topographic maps of the Military Geographical Institute at a scale of 1:25,000. In this paper, a diameter of 1 km around the settlements' areas was examined in order to understand the types of soils that the inhabitants were oriented towards. Attention was paid to sites oriented towards the so-called marginal soils for agriculture, which were seen as favorable for animal husbandry, hunting and gathering, and not for agriculture. As such, vertisols, chernozems, eroded parapodzol, deluvium, brown and skeletal soils were taken into consideration.[1] Those oriented towards mineral bog soils and parapodzol were especially treated. Those oriented towards alluvium and/or eutric cambisol, or their combinations with others, were considered as very favorable for agriculture and animal husbandry.

The sites were divided into flat sites, on a plateau with a lower elevation, hillforts or the Gradina type, and the Obrovac type. Flat settlements are formed on flat or gentle slopes of river banks or streams. The term highland site is often encountered in recent publications when it comes to Vinča culture settlements (cf. Bulatović et al. 2017), and such sites are designated in this paper either as the flat sites (if they are situated on gentle slopes) or as sites on a plateau of small elevations (if it is explicitly stated in the text that they are located on a higher or a lower hill rising above the surrounding terrain). Settle-

[1] For more details on the properties of soil types in the Neolithic and Eneolithic of the CB, cf. Milanović 2019 & 2020, 20ff.

ments of the hillfort type, the origin of which was long associated with the later phases of Vinča culture, when an intensification of cattle breeding and a spread of metallurgical knowledge occurred, are characterized by a dominant, naturally protected position of at least three sides, while only one, often easily defended side is being accessible (Chapman 1981; Trbuhović & Vasiljević 1983, 67; Tripković 2013; Borić et al. 2018; Kapuran et al. 2018; Milanović 2019, 62). Sites of the Obrovac type occur in northwestern Serbia, primarily in Mačva. They represent circular natural elevations in lowland areas, fortified by a massive ditch, and in some cases by a palisade (Trbuhović & Vasiljević 1975 & 1983; Chapman 1981, 100f; Tripković 2013, 212f). This site type was usually dated to the late Vinča-Pločnik I-II phase by earlier research, while more recent studies and reconsideration of finds indicate that Copper Age, Bronze Age, Iron Age and historical periods are also often present at Obrovac sites (Trbuhović & Vasiljević 1983; Tripković 2013; Tripković & Penezić 2017; Tripković et al. 2017). The basic division of the Obrovac type sites, made by all researchers, refers to their diameter. Thus, Trbuhović & Vasiljević (1983) divided them into three groups: (1) with a diameter of 300 to 500 meters, enclosed by a ditch and a palisade; (2) up to 50 meters in diameter, with a circular depression in the middle and a ditch around it; and (3) up to 50 meters in diameter, without a depression in the middle, and surrounded by a ditch. Based on the former division, Boban Tripković (2013, 222ff) made a more detailed one, introducing certain subtypes. This site type is very similar to the settlements on elevated plateau, and the difference lies in the fact that the Obrovac sites were usually enclosed by a ditch and in some cases a palisade, although this is yet to be verified by archeological excavations.

All this enabled an overview of the mentioned process in the Neolithic/Eneolithic transitional period and brought forth suggestions for improving the results of future research.

**Geomorphology and pedology of northwestern Serbia**

Northwestern Serbia includes the Pannonian part of the Sava River Valley (microregions of Mačva, Posavina, Pocerina and the Lower Kolubara with the Tamnava and Ub Rivers), the northern and part of the southern half of northwestern Peripannonian Serbia (Podrinjska Serbia and Podgorina – microregions of Lešnica, Jadar, Rađevina and Azbukovica; Marković 1980, 246ff).

Mačva is the largest microregion in northeastern Serbia and its northernmost end, as well as the most extensive lowland and plain of Serbia. It is bounded by the flows of the Sava and the Drina and the section of Mačva towards Pocerina. This macro-fluvial accumulative-structural surface is being transformed by recent erosion of smaller waterflows and denudation into an erosive river surface with shallow valleys of the Bela Reka, Jerez, Bitva and Zasavica (oxbow lakes; Marković 1980, 246). Formerly, when the waters of the Sava and the Drina would rise, ca. a third of Mačva used to be flooded. Floods in Mačva are also caused by high underground water, as well as torrents from the part of Pocerina in the region of Šabac (Marković 1980, 250).

Posavina is the area of the gently undulating right bank of the Sava River and it stretches between the Posavina section and the watershed towards the Tamnava. It consists of the valley of the Sava near Šabac and near Obrenovac, with three fluvio-denudation surfaces, formed by three tributaries of the Sava: Dumača, Dobrava, and Vukodraž (Marković 1980, 247).

Pocerina includes Cer and its northern hills. Cer (687 m amsl) is a plutonite, laccolith, horst mountain. It is the northernmost island mountain of the southern rim of the Pannonian Basin (Marković 1980, 246). The mountain relief is made of granite, and the foothills are of schist and limestone. The Lešnica River separates Cer from the lower and more southern Iverak.

The microregions of the lower course of the Kolubara River, a right tributary of the Sava River, and of the rivers Tamnava and Ub represent a part of the bottom of the Pannonian Basin, while the upper course of the Kolubara belongs to Podgorina in the region of Valjevo (Marković 1980, 247).

The extreme southwestern part of the territory which is the subject of this paper, from the Drina and south of Cer, Iverak and Vlašić to the watershed in the mountains of Podrinje (Gučevo, Boranja, Jagodnja and Sokolske Planine) and Valjevo (Medvednik, Jablanik and Povlen), belongs to the Podrinje of the region of Peripannonian Serbia, while the extreme southeastern part belongs to the upper flow of the Kolubara River, i.e., Podgorina in the region of Valjevo (Marković 1980, 257f).

The microregion of the Jadar comprehends the basin of the Jadar River between the Iverak, Gučevo, Boranja, Jagodnja and Vlašić Mountains. Lešnica is a microregion formed by the basin of the Lešnica River between Cer and Iverak. Rađevina is a part of the basin of the Jadar around the basins of the Krupnja, Bela Crkva and Pecka, and the microregion of Azbukovica is a narrow zone between the Drina, the mountains of Sokolske Planine and Povlen (Marković 1980, 258).

According to *The soil map of Western and North-western Serbia with Neighbourhood of Belgrade* (Tanasijević & Pavlović 1967; fig. 5), the most abundant soils in the northern part of Mačva are alluvium of the rivers Sava and Drina, eutric cambisols (*gajnjača*), mineral bog soils and chernozem, and to a lesser extent vertisols (*smonica*) and parapodzol. In the southern part of Mačva, parapodzol and, to a lesser extent, alluvium of the river Drina prevails. In Posavina, the most abundant are parapodzol, alluvium of the Sava River and eutric cambisols, and to a lesser extent mineral bog soils and humogleys. Parapodzols are the most common in Pocerina, and eroded parapodzols in the area of the mountains of Cer and Iverak. In the microregions of the lower Kolubara, Tamnava and Ub, parapodzol, eroded parapodzol, alluvium of the lower Kolubara, Tamnava and Ub and eutric cambisols are represented the most, and to a lesser extent mineral bog soils, humogleys and deluvium (colluvium). Parapodzol, brown soil on limestone (calcocambisol), brown skeletal soil (lithosol) on schist, brown acid soil (distric cambisol) on granite and diabase and eroded parapodzol are the most abundant in the Jadar mi-

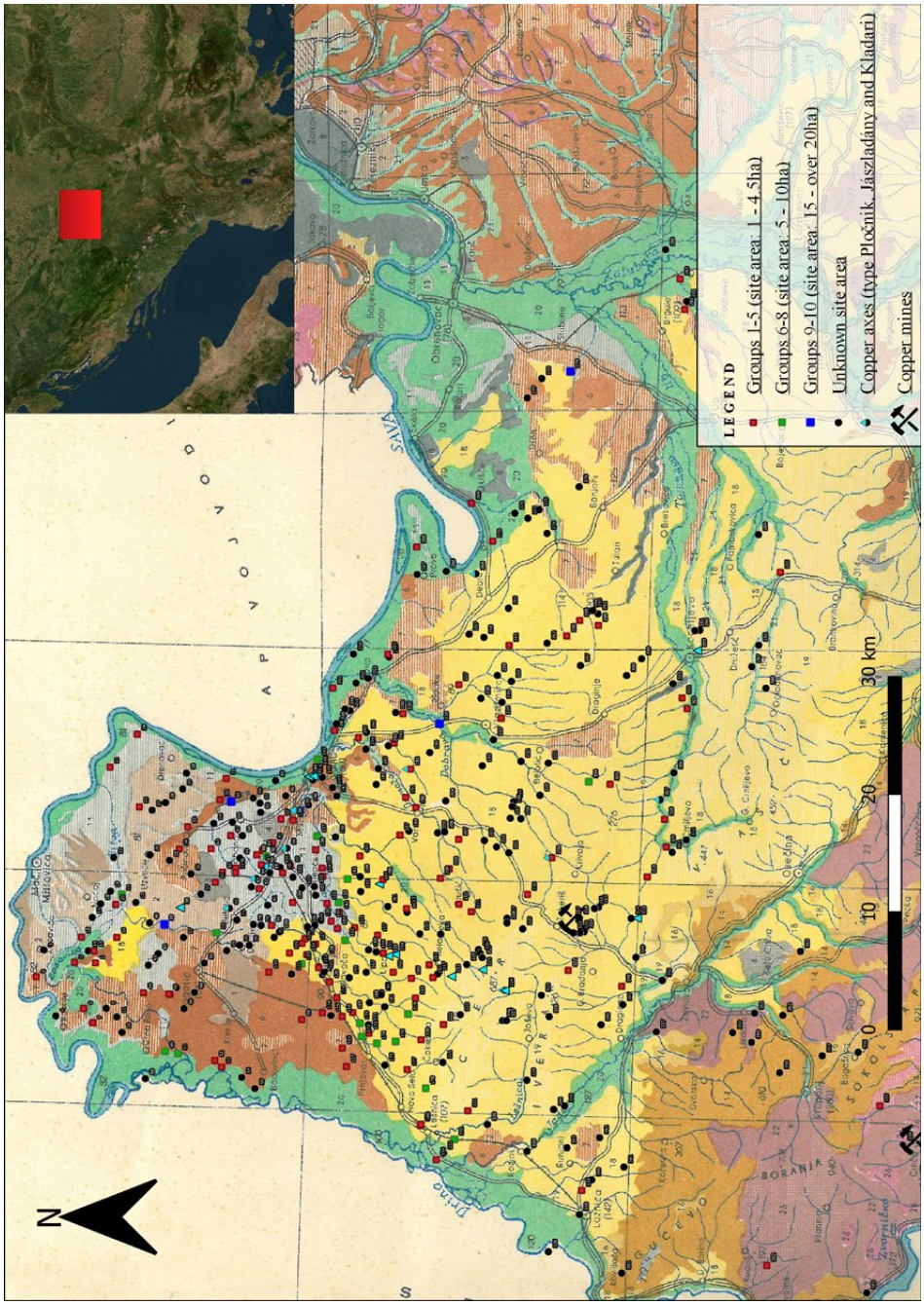



**Figure 5.** *Distribution map of the sites in the study area with known surface area, locations of Pločnik and Jászladány types copper axe finds, and potential copper mines. Image Credit: The soil map of Western and North-Western Serbia with neighbourhood [sic] of Belgrade (Tanasijević & Pavlović 1967) and the authors.*

croregion, and to a lesser extent alluvium of the rivers Drina and Jadar, eutric cambisols, brown acid soil on sandstone and deluvium. In the Lešnica microregion, parapodzol and eroded parapodzol predominate, and to a lesser extent eutric cambisols and alluvium of the river Sava. In Rađevina, brown skeletal soil on schist, brown soil on limestone, parapodzol, and to a lesser extent eroded parapodzol, vertisols, deluvium, and skeletal soils are the most common. In Azbukovica brown skeletal soil on schist, brown soil on limestone, brown acid soil on granite and diabase, and to a lesser extent skeletal soils, alluvium of the river Drina, deluvium, parapodzol and brown acid soil on sandstone are the most common.

The most fertile types and the most favorable ones for farming in today's conditions are alluvium and chernozem, to a lesser extent vertisols, eutric cambisols, and humogleys, followed by parapodzol and mineral bog soils (Antić et al. 1980; Ćirić 1986). The remaining soil types are not favorable for farming, even in conditions enabled by modern technology (cultivation with heavy machinery, melioration, etc.).

**The excavation project at the site of Benske Bare/Jela and its importance in recognizing the Neolithic–Eneolithic transition in northwestern Serbia**

The site is located in the very center of today's Šabac, on an elevated part of the terrain in the once swampy area of Benske Bare (Appendix, 147). It was researched for the first time in 1962, when smaller trench excavations were carried out. The thickness of the deposits measured ca 2.5 m (Trbuhović & Vasiljević 1972, 15; 1983, 26). Excavations followed in 1967 (Vasiljević 1967, 23) and 1970, when more than 1500 m² were explored (Trbuhović & Vasiljević 1970, 24f; 1983, 26). After the first excavations, the earliest layer of the site was determined to belong to the Vinča–Tordoš phase, the second layer was attributed to the Vinča-Pločnik phase with influences of the Lengyel culture, the third layer was defined as a mixture of Vinča and 'elements of the Bubanj–Hum group of the Early Bronze Age (Bubanj–Hum I)', while the final layer was defined as a mixture of the Vinča group with distinct elements of the Baden group (Vasiljević 1967; table 2). After the research in 1970, four layers were distinguished: first as the final phase of Vinča–Tordoš, second and third as the Vinča–Pločnik phase, and fourth as a cultural layer of the Bubanj–Hum and Baden cultures (Trbuhović & Vasiljević 1970, 24f). At a later point, a different interpretation was presented and five or six layers were singled out, and a summary description of the materials found was given; however, this does not allow for making any relevant conclusions about the character of the material culture in certain settlement horizons. The two earliest layers was dated to the phase Vinča–Tordoš, the third layer was divided into segments A and B and determined to the phase Vinča–Pločnik I, the fourth was assigned to the phase Vinča–Pločnik II with elements of the Bubanj–Hum I group, and the fifth to the Baden culture (Trbuhović & Vasiljević 1972, 15f).

| Layers | Published | | | |
|---|---|---|---|---|
| | Vasiljević 1967 | Trbuhović & Vasiljević 1970 | Trbuhović & Vasiljević 1972 | Trbuhović & Vasiljević 1983 |
| I | Vinča–Tordoš | Final Vinča–Tordoš | Vinča–Tordoš | Benska bara I |
| II | Vinča–Pločnik with elements of Lengyel culture | Vinča–Pločnik I | Vinča–Tordoš | Benska bara IIa |
| III | Vinča–Pločnik with elements of Bubanj–Hum I culture | Vinča–Pločnik II | III/A: Vinča–Pločnik I<br>III/B: Vinča–Pločnik I | Benska bara IIb |
| IV | Vinča with elements of Baden culture | Bubanj–Hum I and Baden cultures | Vinča–Pločnik II with Bubanj–Hum I culture as a foreign import | Benska bara III |
| V | / | / | Baden culture | Baden culture |

**Table 2.** *Stratigraphy of the site of Benske bare/Jela with references.*

Considering the fact that Trbuhović & Vasiljević (1983) recorded ca. 340 sites in Podrinje, which we analyze in this paper, and that they dated them according to the stratigraphy of the Benske Bare/Jela site, the question of the stratigraphy of this site is very important. In the cited monograph, most of the Vinča sites were dated to the Vinča–Pločnik phase, a smaller number to the final phase of the Neolithic, a larger number to Benske Bare II and especially to Benske Bare III, or rarely to the transitional period from the Neolithic to the Eneolithic (table 3).

| Vasiljević 1972 | |
|---|---|
| **LateVinča / Vinča–Pločnik** | 21; 42; 49; 51; 53; 54; 61; 78; 88; 92; 93; 106; 109; 135; 139; 164; 187; 232; 241; 243; 246; 266; 268; 287 |
| **Neolithic** | 95 |
| **Neolithic–Eneolithic transition** | 292–294; 302; 309 |
| **Starčevo and Vinča** | 233 |
| **Trbuhović & Vasiljević 1983** | |
| **Starčevo** | 13; 14; 20; 30; 49; 77; 112 |
| **Vinča** | 1; 12 |
| **Vinča–Tordoš** | 147 |
| **Vinča–Pločnik** | 6; 7; 9; 10; 15–17; 19; 20; 24; 27; 31; 32; 34; 36; 37; 40; 42; 43; 45–47; 50; 51; 55; 57; 59; 63; 65; 67; 68; 74; 75; 81; 82; 88; 90–93; 96–100; 102; 103; 108; 111–120; 123; 124; 128–131; 133; 134; 147; 151; 153; 155–157; 160; 161; 163–169; 171; 173–177; 181–185; 190; 191; 194; 198; 199; 203; 205; 209; 212; 215; 219; 225; 232; 234; 235; 239; 240–246; 248; 250–252; 254; 257; 259; 261–263; 270; 271; 274; 287; 288; 290; 295; 296; 301; 322–324; 329; 330; 332–334; 339–341; 343; 347 |

| | |
|---|---|
| **Benske bare I** | 260 |
| **Benske bare II** | 61; 106; 147; 178; 226; 238; 269; 272; 318; 353 |
| **Benske bare III** | 26; 35; 49; 70; 101; 106; 140; 147; 149; 178; 188; 189; 195; 200; 202; 207; 208; 214; 216–218; 220; 222; 223; 226; 227; 230; 238; 253; 256; 258; 260; 269; 275; 286; 297; 298; 304; 305; 308–311; 314–316; 318; 320; 326; 337; 342; 348; 349; 355; 357; 358; 361–363 |
| **The end of the Neolithic** | 2; 5; 22 |
| **Vinča–Pločnik and La Tene** | 52 |
| **Neolithic** | 69 |
| **Baden/Kostolac** | 67; 144; 149 |
| **BSK** | 177 |
| **Roman period** | 113; 195; 252; 263 |
| **Neolithic–Eneolithic transition** | 344 |
| **Chapman 1981** | |
| **Vinča** | 1; 2; 5; 10; 12; 14; 16; 17; 19; 20; 25; 26; 32–35; 39; 40; 44; 47; 49; 53; 55–59; 61–63; 68–70; 72; 81–83; 87–89; 91–94; 96–98; 103; 106; 109; 111; 114–120; 122; 124–126; 129–134; 137–143; 145; 150; 152; 153;164; 165; 167; 168; 170; 173–176; 179; 183; 184; 187–190; 194; 195; 198; 199; 201–204; 207; 208; 210; 211; 215; 219; 221; 227; 230; 232–235; 237; 239; 240–243; 245–248; 251; 252; 255–257; 265; 297;298; 309; 310; 314; 315; 318; 329; 330; 343 |
| **Early Vinča** | 147 |
| **Late Vinča** | 21; 24; 26; 64; 80; 110; 136; 147; 192; 200; 226; 238; 253; 258; 326 |
| **Post-Vinča** | 21; 140; 147; 226 |
| **Stojić & Cerović 2011** | |
| **prehistory** | 23; 102; 116; 165; 174; 223; 227; 256; 288; 309; 340; 355 |
| **Starčevo** | 13; 14; 31; 85; 118; 122; 143; 145; 147; 154; 168; 173; 178; 226; 230; 236; 239; 248; 260; 262; 302; 308; 330; 352 |
| **Neolithic** | 35; 94; 95; 99; 161; 167; 210?; 249; 250 |
| **Late Neolithic** | 69; 211; 351 |
| **Vinča** | 1–4; 7–12; 16; 17; 20; 22; 25–30; 32; 38–40; 44–45; 47; 49; 50; 51; 53; 55; 56; 58–62; 64–66; 68;70; 72–77; 80–83; 85–93; 96; 98; 103–105; 107; 109–111; 114; 115; 119–121; 123; 125; 126; 129; 130; 133; 134; 136; 137; 139–141; 143; 145–150; 152; 154–158; 164; 166; 170; 173; 175–186; 188; 190–192; 194–196; 198–203; 206; 208; 209; 212–216; 219–221; 224; 225; 228; 229; 231; 232; 236; 238; 239; 241; 243; 246–248; 252; 253; 258; 260; 261; 263–265; 267; 268; 270–274; 287; 295; 297; 302; 304; 305; 307; 308; 310; 311; 314–316; 318; 320; 322; 325; 326; 333; 334; 337; 339; 341–348; 351–353; 357; 358; 361; 362 |
| **Bubanj–Hum I** | 13; 14; 33; 177; 226; 358 |

| | |
|---|---|
| **Copper Age (Bubanj culture)** | 18; 321; 350; 352 |
| **Early Eneolithic** | 70; 84; 254; 286 |
| **Middle Eneolithic** | 8; 39; 144; 145; 147; 149; 231; 248; 254; 352; 362 |
| **Sălkuța** | 137 |
| **Late Eneolithic** | 21; 39; 231; 362 |
| **Copper Age** | 67; 68; 80; 99; 117?; 187; 195; 210?; 217; 251; 255; 290? |
| **Early Bronze Age** | 39; 73; 298; 352 |
| **Middle Bronze Age** | 201; 207; 262; 325; 326 |
| **Bronze Age** | 70; 94; 99; 133; 260; 352 |
| **Iron Age** | 5; 19; 28; 29; 49; 53; 55; 58; 64; 91; 94; 101; 122; 134; 137; 147; 173; 187; 218; 248; 251; 260; 318; 325; 351; 352; 358; 362 |
| **Late Iron Age** | 229; 264; 358 |
| **Metal Age** | 40; 42; 97; 128; 153; 204; 257 |
| **Bulatović et al. 2017** | |
| **prehistory** | 317 |
| **Early Neolithic** | 178; 330; 357 |
| **Late Neolithic** | 178; 179; 318; 319; 322; 329; 331–334; 336; 338–341; 343; 345?; 347; 348; 351–354; 356; 359; 360 |
| **Neolithic–Eneolithic transition** | 314–316; 320; 326; 327; 342; 344; 346; 349; 355; 357; 361; 363? |
| **Early Eneolithic** | 178; 313; 321; 324; 325; 328; 331; 363? |
| **Eneolithic** | 323; 351; 354; 358; 362 |
| **Bronze Age** | 323; 325; 337; 339; 358 |
| **Late Bronze Age** | 73; 328; 331 |
| **Bronze–Iron Age transition** | 325; 331; 336; 337; 351; 362 |
| **Iron Age** | 328; 358 |
| **Late Iron Age** | 318 |
| **Middle Age** | 331 |
| **Živanović 2022** | |
| **Vinča–Pločnik** | 287; 290; 291; 299; 300; 303; 306; 312 |
| **Early Neolithic** | 286; 288; 289; 292-294; 297; 301; 307; 308; 311 |
| **Neolithic** | 306 |
| **Neolithic–Eneolithic transition** | 309 |

**Table 3.** *Relative dating of the sites according to Vasiljević 1972; Trbuhović & Vasiljević 1983; Chapman 1981; Stojić & Cerović 2011; Bulatović et al. 2017; and Živanović 2022. Numbers in the right-hand column refer to the sites in the Appendix.*

It could be inferred that Benske Bare III formed an EE horizon, in which a strong influence of the Vinča tradition can be noted. A similar observation was made for the ceramic vessels from the site of Bodnjik in Družetić (cf. Palavestra et al. 1996). Essentially, the problem is, firstly, that the third layer of Benske Bare was treated as a mixture of the Vinča and Bubanj–Hum groups (Vasiljević 1967), then the fourth layer was treated as belonging to Bubanj–Hum and Baden (Trbuhović & Vasiljević 1970); after the introduction of another layer for Vinča–Tordoš (now Benske Bare I–II) and dividing layer 3 into segments A and B (Vinča–Pločnik I), the layer 4 remains, but now as Vinča–Pločnik II with elements of the Bubanj–Hum I group, while the layer 5 belongs to the Baden culture (Trbuhović & Vasiljević 1972). Finally, in the 1983 monograph, layers 1, 2a-b, and 3 are mentioned as belonging to the Vinča culture (Trbuhović & Vasiljević 1983, 26f). In that monograph, the authors connected the hillfort sites in Podrinje with the end of phase IIb and with phase III (Trbuhović & Vasiljević 1983, 67). In phase IIb, a horizon of burnt houses appeared at the site of Benske Bare (Trbuhović & Vasiljević 1983, 26), copper objects were also associated with phase IIb of Benske Bare, and most of them to phase III (Trbuhović & Vasiljević 1983, 85f). Sites of the Obrovac type were also linked to phases II and III (Trbuhović & Vasiljević 1983, 78). From all this, it could be inferred that the authors have given up the idea that the two earliest layers belong to Vinča–Tordoš, and that there was only one instead (Benske Bare I), hence, the division of layer II into segments a and b would refer to the phase Vinča–Pločnik I (Benske Bare IIa–b), and layer III would refer to Vinča–Pločnik II with elements of the Bubanj-Hum I group (Benske Bare III).

At a later point, Milorad Stojić and Momir Cerović concluded, on the basis of the analysis of findings, that settlements of the Starčevo, Vinča and Baden cultures, of the Iron Age Ib, IIa and III, as well as of the Late Iron Age, were located at the site of Benske Bare, while the EE was not mentioned at all (Stojić & Cerović 2011, 149). The authors believe that the LN settlement was characterized by an intertwining of the Vinča and Tisza cultures to a greater extent, with lesser influences of the Sopot, Lengyel and Butmir cultures. Conclusions about the stratigraphy and chronology of the Vinča settlements were made on the basis of anthropomorphic figurines, certain types of vessels and prosopomorphic lids that have parallels at the eponymous Vinča site (Stojić & Cerović 2011, 150ff). They stated that no vessels corresponding to the final phase D of the Vinča culture had been found at the site, but that the settlement most likely survived until the beginning of the Vinča C phase (Stojić & Cerović 2011, 152). They also believe that the hillfort sites were settled during the Vinča culture period. Bulatović et al. (2017, 42) considered phase III of Benske Bare, as defined by the researchers of the site, as a transitional period from the Neolithic to the Eneolithic or as EE. In the absence of radiocarbon dates from the site and considering the fact that the finds were not published in detail by the separate layers, but only given all together instead (Trbuhović & Vasiljević 1983), it is difficult to clarify which period belongs to which phase, and this is especially unclear for phase III. The only solution is to process the material from the old excavations and to determine the

period to which they belong using radiocarbon dating. The great similarities in the material culture between the end of the LN and EE significantly complicate the usual methods of comparing archaeological material, especially when it comes to the establishment of a relative chronology based on ceramic shapes and decoration (cf. Bulatović et al. 2020), i.e., on their small sherds found at surveyed sites in northwestern Serbia.

**Northwestern Serbia in the fifth millennium BC**

In the study area, 364 sites[1] have been recorded that were occupied in the fifth millennium BC (fig. 5; Appendix),[2] with excavations carried out at 39 sites (Nos. 21, 39, 56, 70, 112, 138, 139, 143, 147, 164, 169, 173, 195, 197, 215, 226, 229, 238, 253, 264, 276–284, 286, 298, 302, 323, 331, 337, 350, 351, 358, and 364),[3] while geoarchaeological coring and sediment analysis was done at seven sites (Nos. 70–72, 80, 109, 125, and 127) (Tripković & Penezić 2017; Tripković et al. 2017; Veselinović et al. 2021). Out of the 364 sites in total, 350 were considered as settlements in this paper, and 176 were recorded in Mačva, 54 in Pocerina, 41 in Posavina, 39 in the Tamnava and the Kolubara microregion, 27 in the Jadar and the Lešnica microregion, and 13 in Rađevina and Azbukovica (fig. 6). Sites where group or individual finds of copper objects (heavy copper tools-axes) were recorded (Nos. 38, 86, 144, 146, 158, 159, 186, 213, 224, 289, 313, 324, and 335) and two sites marked as potential copper mines (Nos. 317 and 354) were excluded from the analysis. According to Chapman's (1981, 50) division in geomorphological entities, Mačva, Posavina, Tamnava and Kolubara belong to the lowland-valley microregions, while Pocerina, Jadar, Lešnica, Rađevina, and Azbukovica represent hilly and highland microregions. The location of most sites was registered approximately, and only a smaller part of the sites was precisely or very approximately detected (Appendix). Uneven dating is illustrated by excavations at several sites (table 3). Thus, for example, the large site of Lanište in Glušci (No. 21, 10 ha) was dated to the later Vinča (Vasiljević 1972, 165; Vasiljević & Popović 2002, 13) or the Late Eneolithic (Stojić & Cerović 2011, 90). The very large Obrovac site of Staro Selo – Ribarica in Glušci (No. 39, 19.6 ha) was dated to phases II and III of Benske Bare (Trbuhović & Vasiljević 1983, 78f), the Middle and Late Eneolithic and the Early Bronze Age (Stojić & Cerović 2011, 91f). The large Obrovac site of Šor–Motovilo in Majur (No. 139, 20 ha) was dated to phases II and III of Benske Bare (Trbuhović & Vasiljević 1983, 84), i.e., roughly to the Vinča culture (Stojić & Cerović 2011, 110). The very small Obrovac site of Likićka Šuma, near Bogosavac (No. 56, 0.07 ha) was dated to phase III of Benske Bare (Trbuhović & Vasiljević 1983, 84), i.e., to the Vinča culture period, the EE and the Bronze Age (Stojić & Cerović 2011, 70f). The hillfort site of Crkva

[1] Site no. 272 most likely is the same as no. 269, but as it doesn't affect the analytical results significantly, it was nonetheless used in the analysis and was included in the Appendix.

[2] Due to their proximity, several sites were combined as one (Nos. 44, 47, 87, 136, 179, 106, and 190), so the total number would be 375.

[3] Site Nos. in the Appendix.

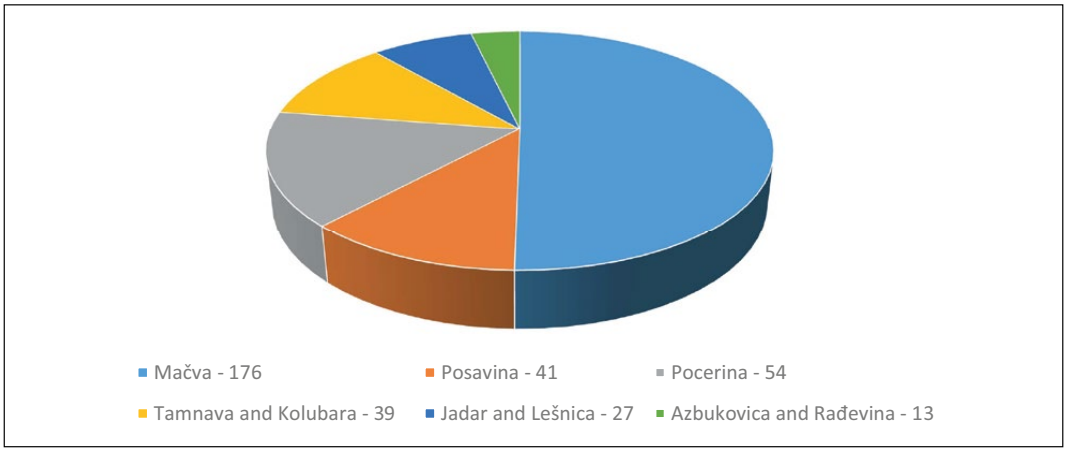



**Figure 6.** *Total number of sites in all microregions (copper finds and copper mines not included). Image Credit: the authors.*

in Nakučani (No. 195) was dated to phase III of Benske Bare (Trbuhović & Vasiljević 1983, 71), i.e., Vinča culture and the Copper Age (Stojić & Cerović 2011, 117f), while the hillfort of Kik III in Svileuva (No. 298) was dated to phase III of Benske Bare (Trbuhović & Vasiljević 1983, 73), i.e., the Early Bronze Age (Stojić & Cerović 2011, 144f) or the transitional period from the Late Eneolithic to the Early Bronze Age (Živanović 2013 & 2022, 70). The low research level and lack of absolute dates resulted in a situation where relative chronology, in most cases, was based on few or insufficiently recognizable ceramic sherds. Thus, for example, the recently investigated sites of Šančina in Parlozi (No. 226), previously dated to phases IIb and III of Benske Bare (Trbuhović & Vasiljević 1983, 70), and Šanac–Izba in Lipolist (No. 164), previously dated to the Vinča–Pločnik phase (Trbuhović & Vasiljević 1983, 54), are now considered to be from the EE (Stojić & Cerović 2011, 78f; Tripković et. al. 2017; Jevtić & Cerović 2022). The same cultural milieu includes Bodnjik in Družetić (No. 286; Palavestra et al. 1996), previously dated to Benske bare III (Trbuhović & Vasiljević 1983, 74), while Spasovina in Milina belongs to a slightly earlier horizon, determined to the very late Vinča D2 phase – Vinča-Pločnik II (table 1) (Bulatović et al. 2020).

According to their surface areas, sites are divided into 10 groups (fig. 7; table 4; Appendix). The surface area is known for 146 sites. Twenty-five sites have an area of more than 5 ha. They are concentrated in Mačva (19 in total), where the largest site is located (No. 65), two from group 9 (Nos. 39 and 139), eight from group 8 (Nos. 21, 90, 128, 122, 137, 123, 133, and 176), and eight from groups 6 and 7 (Nos. 51, 147, 173, 174, 178, 49, 170, and 59). One site each from group 9 is located in Posavina (No. 274) and Pocerina (No. 238), as well as one from group 8 (No. 182), and a large site from group 8 was also recorded in the Tamnava River Valley (No. 304). The largest site in the Lešnica microregion is from group 7 (No. 332), and one site from this group was recorded in

Pocerina (No. 219). Large sites have not been found in the microregions of the Kolubara, Jadar, Lešnica, Rađevina and Azbukovica. The smallest sites (less than 5 ha) make up the largest number of those with known surface areas. The largest number of sites belongs to the smallest group (121), and groups 1 (<0.38 ha) and 3 (1–2 ha) are especially numerous.

| Group | Site No. |
|---|---|
| 1 | 23, 33, 34, 44, 47, 53, 58, 61, 62, 70, 72, 80, 87, 89, 104, 109, 110, 125, 126, 127, 132, 135, 136, 138, 142, 162, 164, 172, 179, 180, 187, 208, 210, 237, 255, 265, 268, 285, 298, 302, 303, 309, 352 |
| 2 | 45, 222, 239, 331, 355 |
| 3 | 15, 20, 67, 82, 91, 99, 101, 112, 114, 117, 118, 119, 120, 134, 151, 165, 177, 188, 190, 191, 192, 209, 211, 214, 216, 218, 220, 234, 241, 251, 261, 282, 295, 296, 305, 310, 322, 339 |
| 4 | 2, 7, 13, 24, 32, 52, 116, 131, 160, 200, 207, 230, 283, 308, 334, 348 |
| 5 | 1, 5, 6, 16, 25, 31, 63, 88, 97, 124, 155, 157, 169, 185, 215, 245, 247, 269, 270 |
| 6 | 51, 173, 174, 178 |
| 7 | 49, 59, 147, 170, 219, 332 |
| 8 | 21, 90, 122, 123, 128, 133, 137, 176, 182, 304 |
| 9 | 39, 139, 238, 279 |
| 10 | 65 |

**Table 4.** *Surface area grouping of the sites in all microregions.*

Thirty sites of group 1 and 40 sites of groups 2–5 were registered in Mačva (fig. 8 and table 5), three sites of group 1 and eight sites of groups 2–5 were recorded in Posavina (fig. 9 and table 6), and four sites of group 1 and 17 sites from groups 2–5 were registered in Pocerina (fig. 10 and table 7).

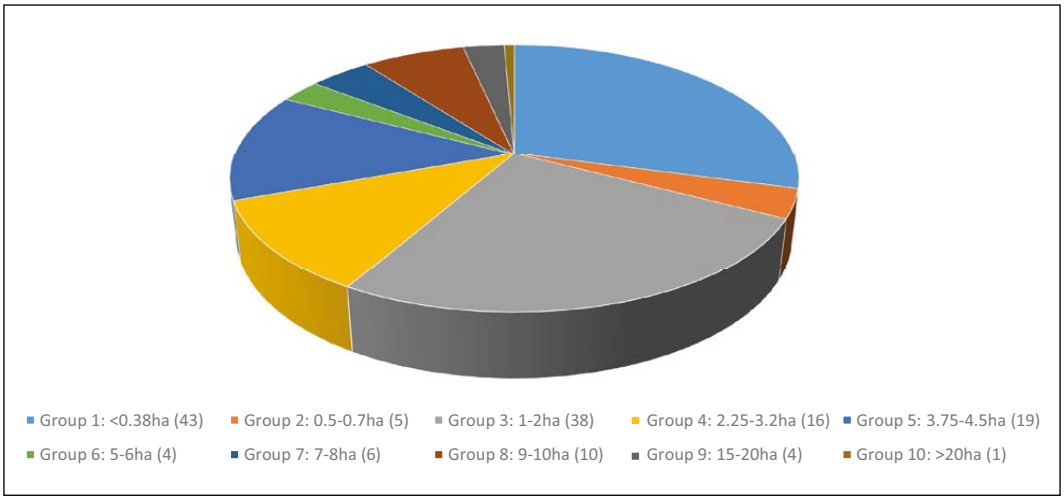



**Figure 7.** *Surface area of the sites in all microregions. Image Credit: the authors.*

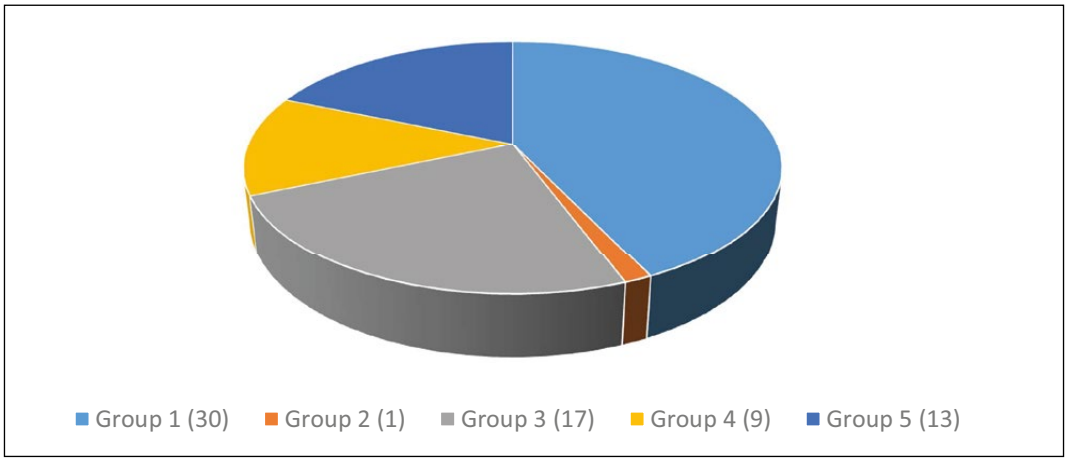



**Figure 8.** *Mačva: settlement area below 5 ha (groups 1–5). Image Credit: the authors.*

| Group | Topography and site No. | Soil type and site No. |
|---|---|---|
| **1** (<0.38 ha) | Obrovac: 23, 33, 34, 44, 47, 53, 58, 61, 62, 70, 72, 80, 87, 89, 104, 109, 110, 125, 126, 127, 132, 135?, 136, 138, 142, 162, 164, 172, 179, 180? | mineral bog soils (80, 70, 87, 89, 104, 136, 72, 132, 142, 135); parapodzol (125, 109, 126, 127, 179, 180); parapodzol/alluvium (162); alluvium/mineral bog soils (23); mineral bog soils/chernozem/eutric cambisol (33); eutric cambisol (58, 110, 138, 34); parapodzol/eutric cambisol (172); parapodzol/mineral bog soils (164); vertisol (61); vertisol/mineral bog soils (62); eutric cambisol/mineral bog soils (44, 47); alluvium/eutric cambisol (53) |
| **2** (0.5–0.7 ha) | Flat: 45 | eutric cambisol/mineral bog soils (45) |
| **3** (1–2 ha) | Flat: 15, 20, 99, 101, 112, 114, 117, 118, 119, 120, 134, 151, 165, 177<br>Plateau: 67, 82?, 91 | mineral bog soils (62, 82, 101, 134, 20, 99); parapodzol/eutric cambisol (118, 119, 120); parapodzol/mineral bog soils (151); vertisol/mineral bog soils (91); alluvium/eutric cambisol (117); parapodzol (112, 165, 177); alluvium/mineral bog soils (15); eutric cambisol (114) |
| **4** (2.25–3.75 ha) | Flat: 2, 7, 13, 24, 32, 52, 116, 131, 160 | eutric cambisol/mineral bog soils (7, 32); eutric cambisol (2, 116); alluvium/eutric cambisol (13, 52); parapodzol/mineral bog soils (131); parapodzol (160); alluvium/mineral bog soils (24) |
| **5** (3.75–4.5 ha) | Flat: 1, 5, 6, 16, 25, 31, 63, 88, 97, 124, 155, 157, 169 | parapodzol/mineral bog soils (1, 16); alluvium/mineral bog soils (5); alluvium/eutric cambisol (6); chernozem (25); eutric cambisol/mineral bog soils/alluvium (31); vertisol/mineral bog soils (63); mineral bog soils (88); vertisol/mineral bog soils/eutric cambisol (97); parapodzol (124, 155, 157); parapodzol/eutric cambisol (169) |

**Table 5.** *Topography and soil types in the vicinity of sites with settlement area below 5 ha (groups 1–5) in Mačva.*

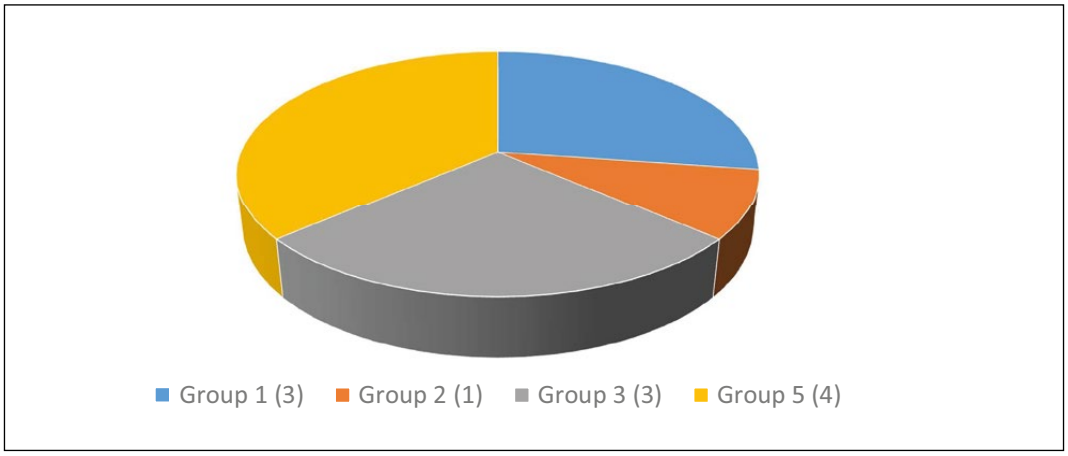



**Figure 9.** *Posavina: settlement area below 5 ha (groups 1–5). Image Credit: the authors.*

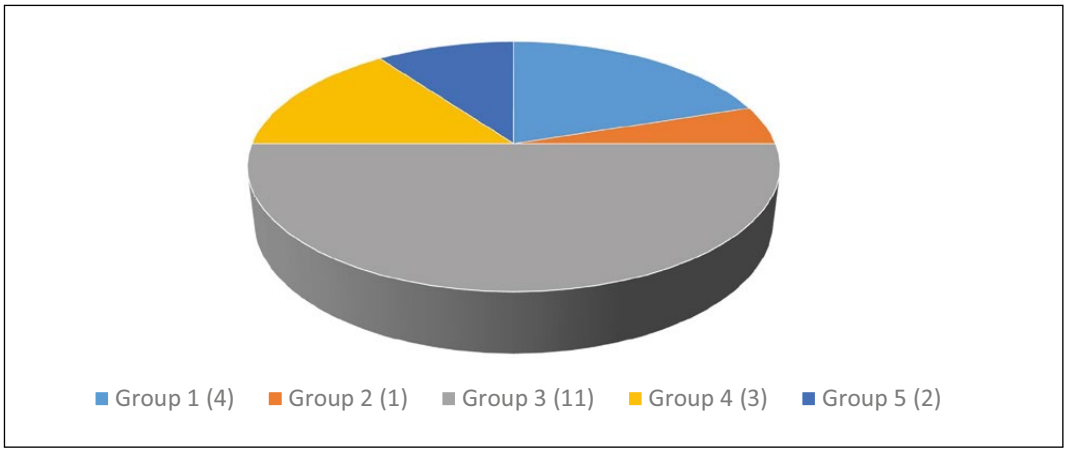



**Figure 10.** *Pocerina: settlement area below 5 ha (groups 1–5). Image Credit: the authors.*

| Group | Topography and site No. | Soil type and site No. |
|---|---|---|
| **1** (<0.38 ha) | Obrovac: 255, 265, 268 | alluvium/eutric cambisol (255, 265); alluvium/mineral bog soils (268) |
| **2** (0.5–0.7 ha) | Plateau: 239 | eutric cambisol/alluvium/parapodzol (239) |
| **3** (1–2 ha) | Flat: 241, 251<br>Plateau: 261 | alluvium (251); parapodzol (261); parapodzol/eutric cambisol (241); |
| **5** (3.75–4.5 ha) | Flat: 245, 247, 269, 270 | parapodzol/alluvium (245, 270); alluvium (247, 269) |

**Table 6.** *Topography and soil types in the vicinity of sites with settlement area below 5 ha (groups 1–5) in Posavina.*

| Group | Topography and site No. | Soil type and site No. |
|---|---|---|
| **1** (<0.38 ha) | Obrovac: 187, 210, 237)<br>Gradina: 208 | parapodzol (187, 208, 210, 237) |
| **2** (0.5–0.7 ha) | Gradina: 222 | parapodzol/eroded parapodzol (222) |
| **3** (1–2 ha) | Flat: 190, 191, 209, 211, 234<br>Gradina: 192, 214, 216, 218, 220<br>Plateau: 188 | parapodzol/eroded parapodzol (220); parapodzol (188, 190, 191, 192, 209, 211, 214, 216, 218, 234) |
| **4** (2.25–3.75 ha) | Gradina: 200, 207, 230 | parapodzol (200, 207, 230) |
| **5** (3.75–4.5 ha) | Flat: 215<br>Gradina: 185 | parapodzol (185, 215) |

**Table 7.** *Topography and soil types in the vicinity of sites with settlement area below 5 ha (groups 1–5) in Pocerina.*

In the microregions of the Tamnava and the Kolubara (fig. 11 and table 8), five sites from group 1 and seven from groups 2–5 were registered. In the microregions of the Jadar and the Lešnica, five sites from groups 2–5 were recorded (fig. 12 and table 9), and two sites of groups 1 and 2 were registered in the microregions of Rađevina and Azbukovica (fig. 13 and table 10).

| Group | Topography and site No. | Soil type and site No. |
|---|---|---|
| **1** (<0.38 ha) | Obrovac: 302, 303, 309, 285<br>Gradina: 298 | parapodzol/alluvium (302, 303); alluvium/parapodzol/eroded parapodzol (309); eroded parapodzol/deluvium (285); parapodzol (298) |
| **3** (1–2ha) | Flat: 295, 296<br>Gradina: 305, 310<br>Plateau: 282 | parapodzol (296, 295, 305, 310)<br>eutric cambisol/alluvium/parapodzol (282) |
| **4** (2.25–3.75ha) | Flat: 283<br>Gradina: 308 | eutric cambisol/alluvium/parapodzol (283); parapodzol/alluvium (308) |

**Table 8.** *Topography and soil types in the vicinity of sites with settlement area below 5 ha (groups 1–5) in Tamnava and Kolubara.*

| Group | Topography and site No. | Soil type and site No. |
|---|---|---|
| **2** (0.5–0.7 ha) | Gradina: 331 | parapodzol/eroded parapodzol (331) |
| **3** (1–2 ha) | Flat: 339, 322 | parapodzol (339); parapodzol/eroded parapodzol (322) |
| **4** (2.25–3.75 ha) | Undefined: 334<br>Gradina: 348 | alluvium (334); parapodzol (348) |

**Table 9.** *Topography and soil types in the vicinity of sites with settlement area below 5 ha (groups 1–5) in Jadar and Lešnica.*

| Group | Topography and site No. | Soil type and site No. |
|---|---|---|
| **1** (<0.38 ha) | Obrovac: 352? | brown acid soil on granite and diabase (352) |
| **2** (0.5–0.7 ha) | Gradina: 355 | brown skeletal soil on schist/skeletal soil (on limestone, schist, and serpentine) (355) |

**Table 10.** *Topography and soil types in the vicinity of sites with settlement area below 5 ha (groups 1–5) in Rađevina and Azbukovica.*

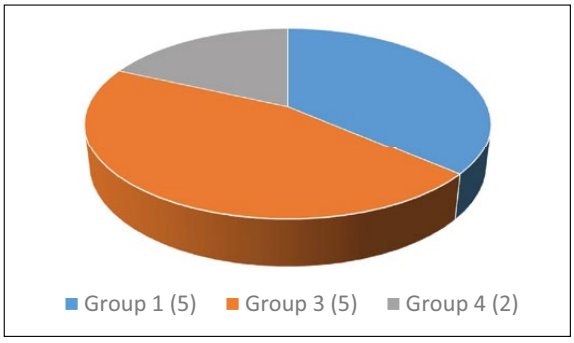



**Figure 11.** *Tamnava and Kolubara: settlement area below 5 ha (groups 1–5). Image Credit: the authors.*

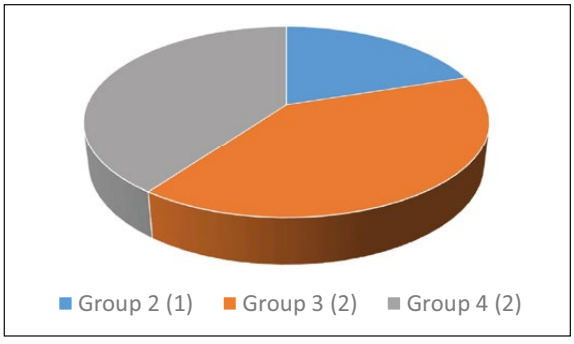



**Figure 12.** *Jadar and Lešnica: settlement area below 5 ha (groups 1–5). Image Credit: the authors.*

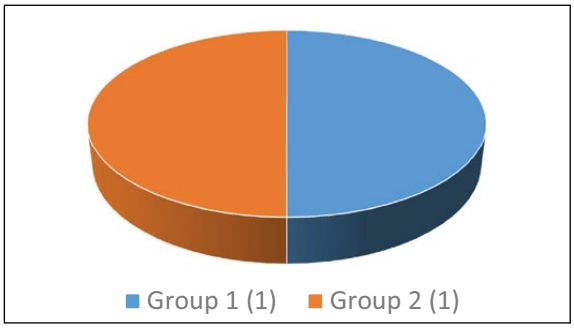



**Figure 13.** *Rađevina and Azbukovica: settlement area below 5 ha (groups 1–5). Image Credit: the authors.*

The largest site in northwestern Serbia, Samuilovača in Tabanović, is located in Mačva (No. 65) and is oriented towards eutric cambisol and mineral bog soils (fig. 7 and table 4). Large sites of group 9 in Mačva, Obrovac in Glušci (No. 39) are oriented towards mineral bog soils, chernozem and eutric cambisol, and Obrovac in Majur (No. 139) towards eutric cambisol. Sites of group 8 in Mačva are oriented towards mineral bog soils (Nos. 21, 90, and 137), parapodzol (No. 176), a combination of those two (Nos. 122 and 133), as well as eutric cambisol and parapodzol (Nos. 123 and 128). Gradina in Riđake in Pocerina (No. 238), from group 9, is oriented towards alluvium and parapodzol. The same group in Posavina includes a site on a plateau in Stubline (No. 279), oriented towards eutric cambisol and parapodzol. Sites from group 8 in Pocerina (No. 182) and Tamnava (No. 304) are oriented towards parapodzol.

The smallest sites in Mačva (groups 1–5) are oriented towards: a combination of alluvium and others soil types (including eutric cambisol) (Nos. 5, 6, 13, 15, 23, 24, 31, 52, 53, 117, 162, and 172); towards eutric cambisol, or in a combination of eutric cambisol and others (Nos. 2, 7, 32, 33, 34, 44, 45, 47, 58, 97, 110, 114, 116, 118, 119, 120, 138, and 169); towards mineral bog soils (Nos. 20, 62, 70, 72, 80, 82, 87, 88, 89, 99, 101, 104, 132, 134, 135, 136, and 142) to parapodzol (Nos. 125, 109, 112, 124, 126, 127, 155, 157, 160, 165, 177, 179 and 180); towards parapodzol and mineral bog soils (Nos. 1, 16, 131,151, and 164); towards vertisol and mineral bog soils (Nos. 62, 63 and 91); towards vertisol (No. 61); and towards chernozem (No. 25) (fig. 8; table 5). Such sites in Posavina are oriented towards alluvium or a combination with other soils (Nos. 239, 245, 247, 251, 255, 265, 268, 269 and 270), towards parapodzol and eutric cambisol (No. 241) and towards parapodzol (No. 261) (fig. 9; table 6). The smallest sites in Pocerina are oriented towards parapodzol (Nos. 185, 187, 188, 190, 191, 192, 200, 207–211, 214, 215, 216, 218, 230, 234 and 237) and parapodzol and eroded parapodzol (Nos. 220 and 222) (fig. 10; table 7). In the microregions of the Tamnava and the Kolubara, such sites are oriented towards a combination of alluvium and others (Nos. 282, 283, 302, 303, 308 and 309), towards parapodzol (Nos. 295, 296, 298, 305 and 310), and towards eroded parapodzol and deluvium (No. 285) (fig. 11; table 8). In the Jadar and the Lešnica microregions, the smallest sites are found on alluvium (No. 334), parapodzol (Nos. 339 and 348), as well as parapodzol and eroded parapodzol (Nos. 322 and 331) (fig. 12; table 9). In the microregions of Rađevina and Azbukovica, they are on brown acid soil on granite and diabase (No. 352) and on brown skeletal soil on diabase and skeletal soil – on limestone, schist, serpentine (No. 355; fig. 13 and table 10).

In the pedological analysis, 350 sites were considered. The sites in Mačva (176) are oriented towards alluvium or eutric cambisol, most often in combination with other soil types (70), mineral bog soils (38), parapodzol (31), a combination of the previous two (12), their combination with chernozem (2), mineral bog soils and chernozem or vertisol (13), towards vertisol (1), chernozem (8) or their combination (1) (fig. 14). All the large sites (groups 9 and 10) are oriented towards alluvium and/or eutric cambisol,

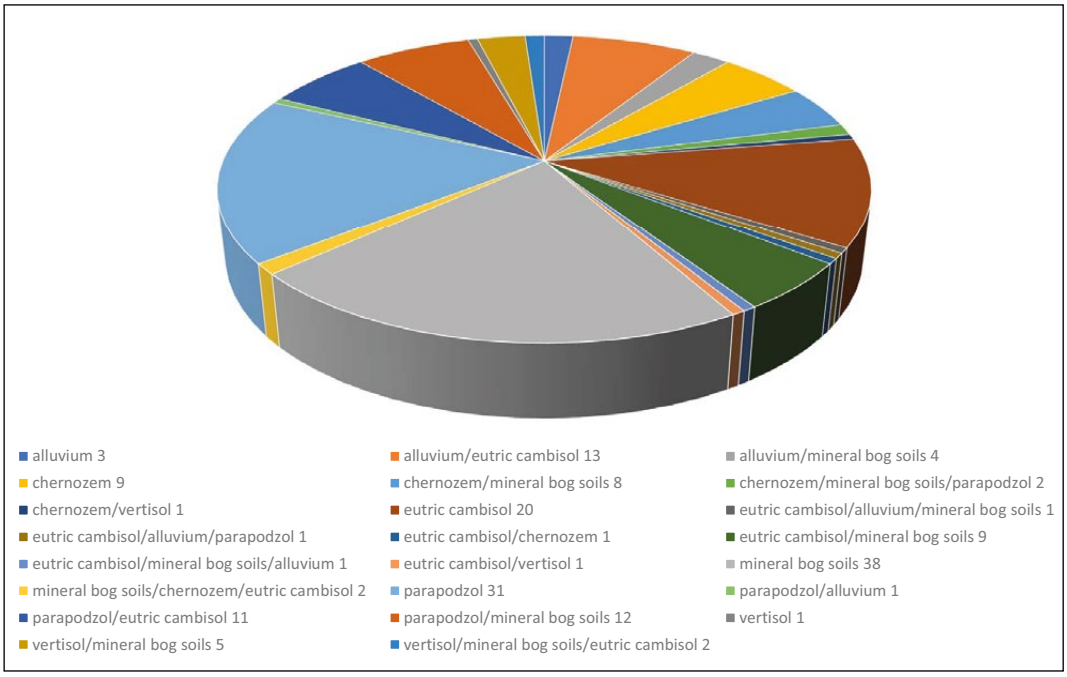



**Figure 14.** *Distribution of soil types in the vicinity of the sites in Mačva. Image Credit: the authors.*

often together with other soils. These large settlements (larger than 15 ha) were suitable for a mixed economy. Already in group 8 (9–10 ha), some are oriented exclusively towards parapodzol or mineral bog soils or in combination with the so-called marginal soils (96 in total). Only ten sites are oriented towards marginal soils (table 11). Eight are oriented towards chernozem, six belong to the flat type (Nos. 3, 25, 27, 74, 75 and 76), one is a settlement on the plateau (No. 26), while one is not defined (No. 28), one site of the Obrovac type is oriented towards vertisol (No. 61), and one flat site is oriented towards a combination of the two (No. 37). Šanac in Iovača (No. 61) belongs to very small settlements, with an area of 0.12 ha, and it was determined into phases II and III of Benske Bare (Trbuhović & Vasiljević 1983, 83), while the flat site in Ševarice (No. 25) was determined to smaller settlements, with an area of 4 ha, and dated to the later Vinča-Pločnik phase (Trbuhović & Vasiljević 1983, 47).

| Soil Type | No. of sites | Topography and site No. |
|---|---|---|
| chernozem | **8** | Flat: 3, 25, 27, 74, 75, 76<br>Plateau: 26<br>Undefined: 28 |
| chernozem/vertisol | **1** | Flat: 37 |
| vertisol | **1** | Obrovac: 61 |

**Table 11.** *Sites in Mačva oriented towards soil types unsuitable for cultivation.*

In Posavina, the sites (41) are oriented towards alluvium or eutric cambisol, most often in combination with other soil types (35), and towards parapodzol (6; fig. 15). The large site in Stubline (No. 279; group 9, 16 ha), is positioned on a plateau, on eutric cambisol and parapodzol, with three habitation horizons, and was dated into Vinča–Pločnik I–II (Vinča C–D; Todorović 1967). More recently, extensive geomagnetic research has been carried out at the site, and the most recent horizons were dated to the Vinča D1–2 phases (Crnobrnja 2014). Sites on marginal soils were not recorded.

In Pocerina, the sites (54) are oriented, to a lesser extent, towards alluvium and parapodzol (2) or eutric cambisol and parapodzol (1), and sites oriented towards parapodzol (42) or parapodzol and eroded parapodzol (9) predominate (fig. 16). Three large sites were recorded. The hillfort site in Riđake (No. 238; group 9, 15 ha), oriented towards alluvium and parapodzol, was dated to phases II and III of Benske Bare (Trbuhović & Vasiljević 1983, 73). The flat site in Bogosavac (No. 182; group 8, 10 ha), oriented towards parapodzol, was dated to the Vinča–Pločnik phase (Trbuhović & Vasiljević 1983, 62) and the site of the Obrovac type in Petkovica (No. 219; group 7, 7 ha), on parapodzol, was determined to the end of the Vinča–Pločnik phase (Trbuhović & Vasiljević 1983, 56). Sites on marginal soils were not recorded.

In the Tamnava and the Kolubara microregions, the sites (36) are oriented towards alluvium or eutric cambisol, most often in combination with other soil types (13), and there are quite a few sites oriented towards parapodzol (18) or together with other soils (2; fig. 17). A large hillfort site was recorded only in the microregion of the Tamnava, in Kaona (No. 304; group 8, 9 ha), oriented towards parapodzol, and dated to phase III of Benske Bare (Trbuhović & Vasiljević 1983, 77). Six sites are oriented towards marginal soils (table 12). Five sites are on eroded parapodzol and deluvium, and one is on eroded parapodzol. The size of the sites is known only for the site of the Obrovac type in Valjevska Slatina (No. 285). It belongs to the very small settlements (group 1, 0.07 ha,), oriented towards eroded parapodzol and deluvium, and dated to phases II–III of Benske Bare (Trbuhović & Vasiljević 1983, 80).

| Soil Type | No. of sites | Topography and site No. |
|---|---|---|
| eroded parapodzol | **1** | Flat: 290 |
| eroded parapodzol/ deluvium | **5** | Gradina: 286, 288<br>Obrovac: 285<br>Flat: 287, 291 |

**Table 12.** *Sites in Tamnava and Kolubara oriented towards soil types unsuitable for cultivation.*

In the Jadar and the Lešnica microregions, the sites (27) are often oriented towards alluvium or eutric cambisol, most often in combination with other soil types (11), and there are quite a few sites oriented towards parapodzol (7) or together with other soils (9; fig. 18). The largest site in the Lešnica microregion is of the flat type (No. 332; group 7,

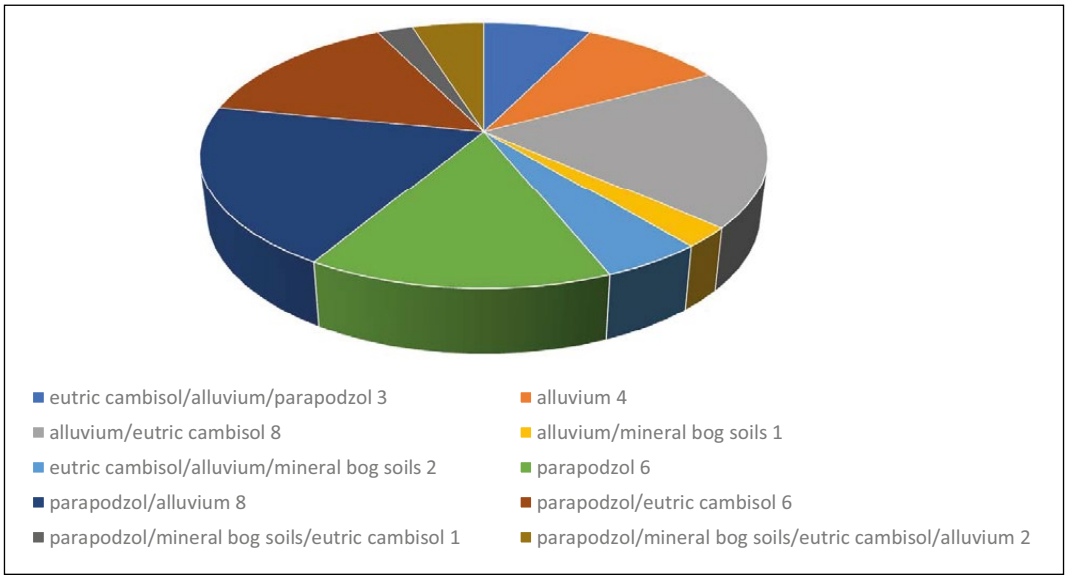



**Figure 15.** *Distribution of soil types in the vicinity of the sites in Posavina. Image Credit: the authors.*

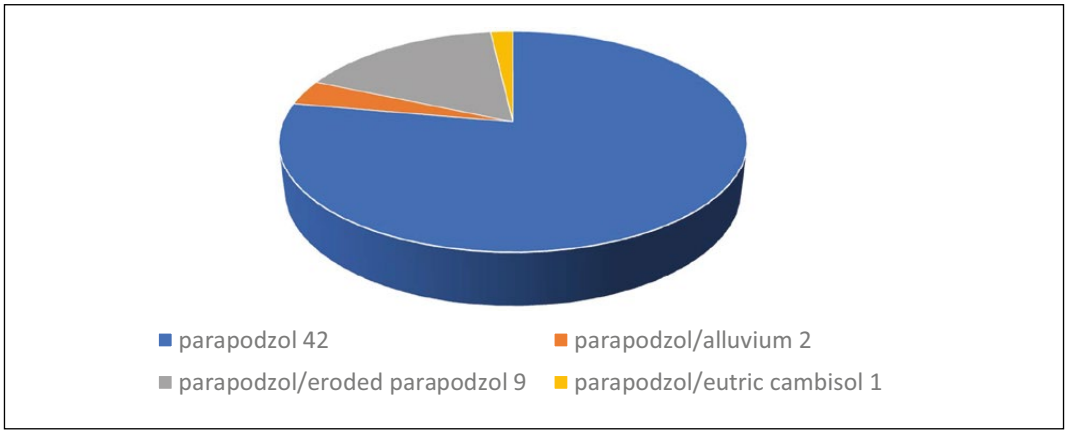



**Figure 16.** *Distribution of soil types in the vicinity of the sites in Pocerina. Image Credit: the authors.*

7.5 ha,), on parapodzol, and was dated to the Vinča–Pločnik phase (Trbuhović & Vasiljević 1983, 56). Sites on marginal soils were not recorded.

In Rađevina and Azbukovica, the sites (13) are rarely oriented towards alluvium or parapodzol in combination with marginal soils (3). Orientation towards marginal soils prevails (10; fig. 19). Large sites were not recorded. Ten sites are oriented towards brown and skeletal soils (table 13). Five sites are on eroded parapodzol and colluvium, and one is on eroded parapodzol. The site of the Obrovac type in Radalj (No. 352; group 1, 0.25 ha), oriented towards brown acid soil on granite and diabase, was dated to Vinča and the Copper Age Bubanj culture (Stojić & Cerović 2011, 129), i.e., to the LN and the Eneolithic (Bulatović et al. 2017, 231).

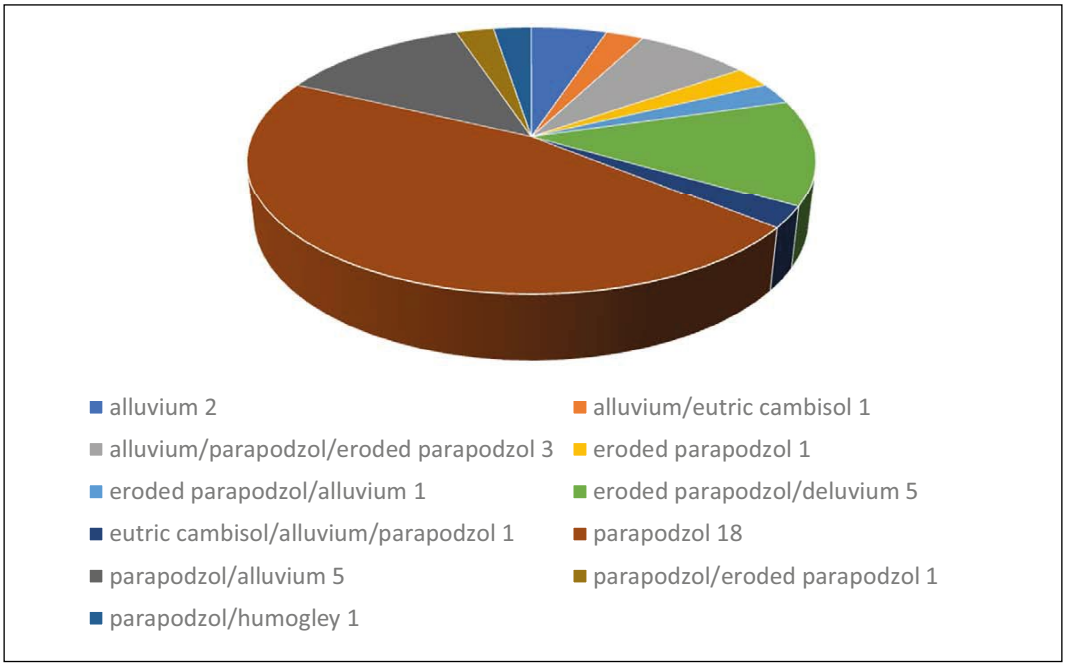



**Figure 17.** *Distribution of soil types in the vicinity of the sites in Tamnava and Kolubara. Image Credit: the authors.*

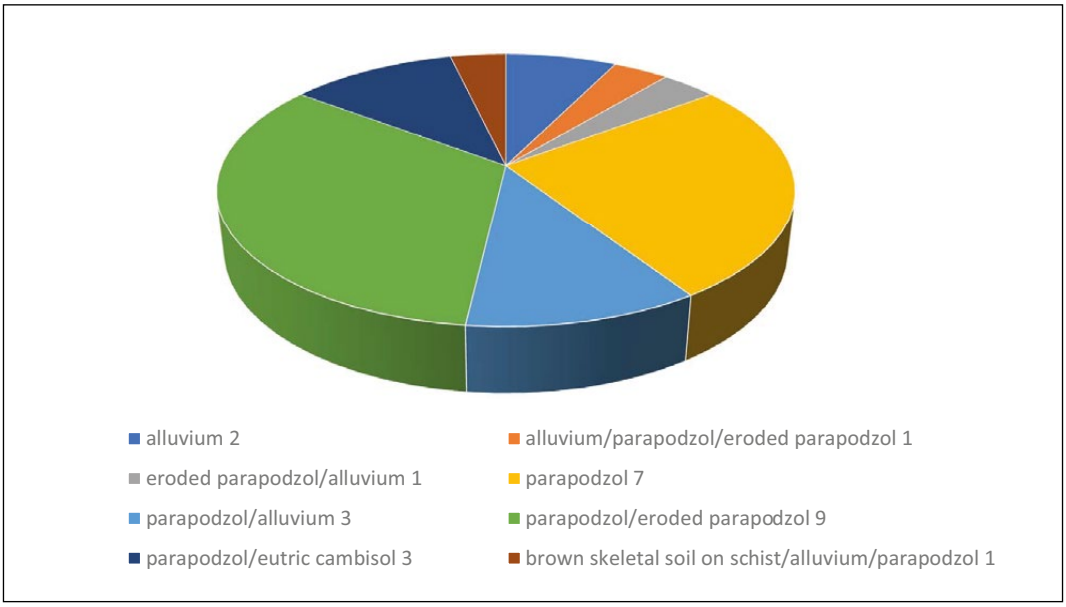



**Figure 18.** *Distribution of soil types in the vicinity of the sites in Jadar and Lešnica. Image Credit: the authors.*

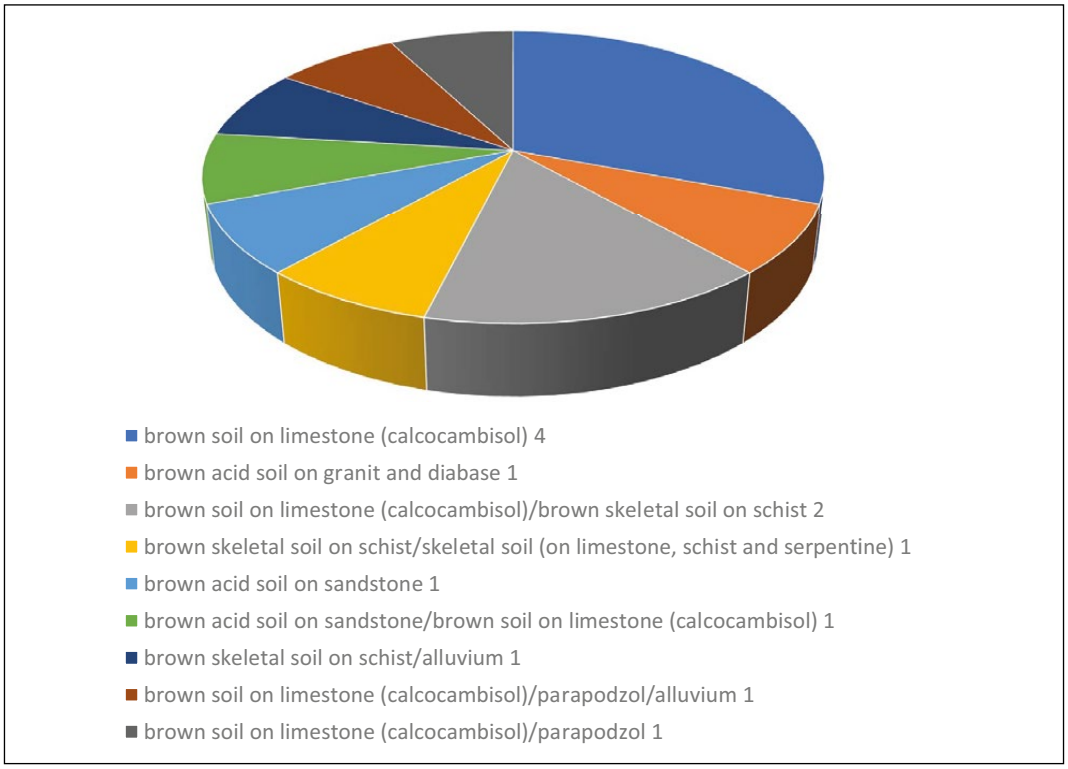



**Figure 19.** *Distribution of soil types in the vicinity of the sites in Rađevina and Azbukovica. Image Credit: the authors.*

| Soil Type | No. of sites | Topography and site No. |
|---|---|---|
| brown soil on limestone (calcocambisol) | **4** | Flat: 360<br>Gradina: 351<br>Plateau: 364<br>Cave: 358 |
| brown acid soil on granite and diabase | **1** | Obrovac: 352? |
| brown acid soil on sandstone | **1** | Flat: 356 |
| brown acid soil on sandstone/brown soil on limestone (calcocambisol) | **1** | Gradina: 357 |
| brown skeletal soil on schist/skeletal soil (on limestone, schist, and serpentine) | **1** | Gradina: 355 |
| brown skeletal soil on schist/brown soil on limestone (calcocambisol) | **2** | Flat: 359<br>Cave: 353 |

**Table 13.** *Sites in Rađevina and Azbukovica oriented towards soil types unsuitable for cultivation.*

Sites of the Obrovac type are represented mostly in Mačva, and to a lesser extent in other microregions; they were not found only in the Jadar and the Lešnica microregion

(fig. 20). The hillfort type is represented mostly in Pocerina, and to a lesser extent in the Tamnava, Kolubara and other microregions (fig. 21).

**Discussion and conclusion**

Fewer than 100 sites belong to the microregions of hilly and highlands areas, and about 260 to the lowland-valley microregions of northwestern Serbia. This study suggested the existence of very large settlements (five, measuring more than 15 ha, i.e., groups 9 and 10) in several microregions (one each in Pocerina and Posavina), and they were concentrated in Mačva (3). They are characterized by the presence of alluvium and/or eutric

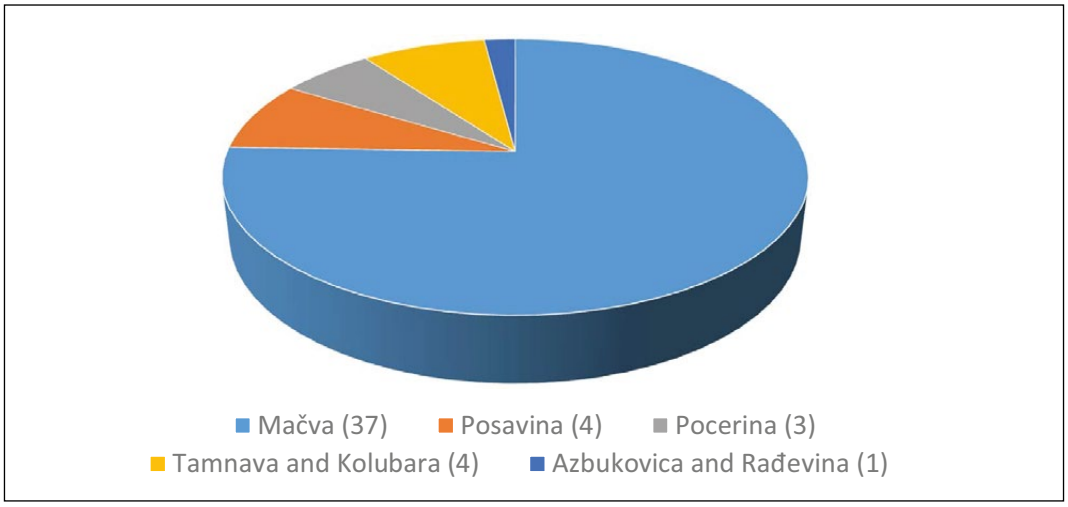



**Figure 20.** *Distribution of Obrovac type sites in the microregions of northwestern Serbia. Image Credit: the authors.*

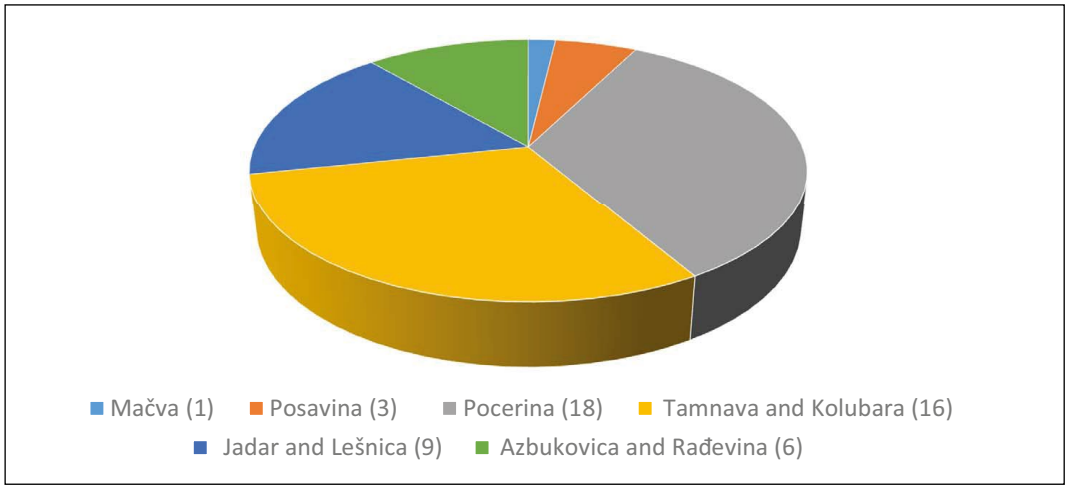



**Figure 21.** *Distribution of Gradina type sites in the microregions of northwestern Serbia. Image Credit: the authors.*

cambisol, which were considered the most favorable soil types for cultivation in this study. Their occupation dated mainly to the first half of the fifth millennium BC, but we should not exclude the possibility that they could have been settled earlier, and that some of them could have lasted longer. Smaller settlements existed in parallel to them, and they became especially numerous in the Vinča–Pločnik II phase, i.e., during the Vinča D period (ca. 4800–4600/4500 cal. BC). In the EE, their number increased, as other studies in the CB have shown, and in addition to flat sites, hillfort sites were also very common (Merkyte 2005; Kapuran et al. 2018). The process of colonization of the peripheral microregions and regions, as well as marginal soils, is becoming more archaeologically visible (Milanović 2019 & 2017). The analysis showed that phases IIb and III of Benske Bare should be determined roughly to the so-called transitional period (ca. 4700/4600–4300/4200 cal. BC), when most of the long-term Vinča settlements were gradually abandoned and the establishing of smaller hillforts and Obrovac type sites intensified. The orientation of the large settlements of groups 6–8 (5–10 ha) and smaller ones equally towards eutric cambisol and/or alluvium indicates the importance of agriculture. At this moment, it is not entirely clear how to interpret the orientation of large settlements (5–10 ha) and those smaller than 4.5 ha towards parapodzol and/or mineral bog soils, hence, it is left open to different interpretations. The large number of such sites suggests that these soil types may have been used for cultivation (Chapman 1981, 98). Small settlements, some of which less than 0.38 ha (group 1), often date to phase III of Benske Bare, such as many hillforts and Obrovac type sites, indicate that they were inhabited by a small population – they consisted of only a few or a dozen houses, and most probably date to the EE. In some cases, settlements on marginal soils were recorded. They are abundant mostly in the microregion of Rađevina and Azbukovica, and are dated to the Late Vinča period, often Benske Bare III, to the Neolithic/Eneolithic transition or the EE. This hilly and highland microregion can be considered a peripheral area during the LN. The frequency and distribution of Pločnik and Jászladány type axes in settlements or in their immediate vicinity (Nos. 60, 98, 139, 192, 200, 264, 272, 315, and 325), or outside the settlements as stray finds (Nos. 38, 60, 84, 86[1], 98, 139, 144, 146, 158, 159, 186, 192, 200, 213, 224, 264, 289, 313, 315, 324, 325, and 335)[2] (cf. Antonović 2014, Taf. 48–50), and their spatial relationship with potential copper ore deposits (Nos. 317 and 354) and settlements in northwestern Serbia, also indicate a similar process registered in the CB, i.e., an aspiration to settle and control regions rich with ores. Thus, for example, in the immediate vicinity of the mine of Srebrne Rupe (No. 317) were found the hillfort settlements of Crkvine in Rumska (No. 200) dating to phases II–III of Benske Bare, Kik in Tekeriš (No. 318), Veliki and Mali Bračinac (Nos. 315 and 316) dating to phase III of Benske Bare (Trbuhović & Vasiljević 1983, 70ff), the sites of Vodenčina, Škola, and Šarampov (Nos. 319–321) dat-

[1] A Kladari type copper axe was found at site No. 86.

[2] A copper chisel was found at site 99.

ing to the Neolithic, the Neolithic–Eneolithic transition and EE (Bulatović et al. 2017, 235), as well as Spasovina in Milina (No. 323) in the plains dating to the very late Vinča D (Bulatović et al. 2020), suggesting a close connection of stray finds with settlements of the Neolithic–Eneolithic transition.

More recent research indicates that the intrusion of steppe populations into the Danube Valley actually took place in the middle of the fifth millennium BC (Anthony 2010), and that the steppe influence in the Balkans is manifested by the 'horse-headed scepters' and specifically decorated ceramics (Govedarica & Manzura 2011; Bulatović 2011). That first wave coincides with the period when a whole series of new cultures emerged in the Carpathian Basin and the Balkans. Therefore, the influence of the newly arrived population should not be ignored in the context of the disintegration of the Neolithic way of life. On the other hand, the ability of societies to transform should not be ignored, and it is likely that the Vinča population, under the influence of new trends and demands of new exchange networks, accepted a new, Eneolithic way of life. It would seem that certain LN settlements lasted alongside the EE ones, i.e., that a part of the Neolithic population gradually accepted the novelties and started establishing new small settlements, while at the same time it strove to maintain the old values and way of life in certain settlements over a long period. It appears that the complex process of the disappearance of the Vinča culture was accompanied, on one hand by the expansion of certain settlements, such as Selevac or Divostin, and on the other hand, by the reduction of the population in most other settlements, such as, e.g., Adžine Njive–Brajkovo in Klenak, and the establishment of numerous new smaller settlements. In that process, the main role was played by groups of houses, not autonomous households (cf. Tringham & Krstić 1990, 567ff; Tringham 1992; Crnobrnja 2012, 159ff; Rassmann et al. 2021; Milanović forthcoming a).

If we consider the situation from the perspective proposed on the basis of absolute dates, it follows that the process of displacement of the population from Vinča settlements began between 4700 and 4600 cal. BC. Based on the available dates, it follows that this process lasted at least until ca. 4350 cal. BC, and perhaps even longer. All this strongly suggests that the intensive settling of safe places, such as hillfort sites, caves and Obrovac type sites, should be chronologically determined to the period after 4700 cal. BC, with their continuous use carrying on in the EE. Complementary neighboring settlements and neighboring microregions, when it comes to the geomorphological, topographical and pedological properties of the immediate surroundings of the settlements, which were noted in the CB (Milanović 2017; forthcoming b; Bulatović & Milanović 2020, 245f; and 2021), strongly suggests that numerous small flat and Obrovac type settlements in the very fertile and often swampy environment of Mačva, as well as the numerous neighboring hillfort settlements in the microregions of Pocerina, Tamnava, Kolubara, Jadar, Lešnica, Rađevina, and Azbukovica, should be viewed in a similar context.

The analysis of the fifth millennium BC sites in northwestern Serbia showed the necessity of modern archaeological prospection for a precise positioning of all sites. In

this manner, it would be possible to increase the quality of pedological and topographical data, which would improve the quality of results of this study to some extent. The distribution of surface finds based on earlier field surveys is certainly not a reliable indicator for the size of all sites, and the same can be said for the chronological determination based on few surface finds. It is necessary to introduce geomagnetic surveys, sediment analysis using geoarchaeological coring and trench excavations to verify the data about the site area and human activities in the settlements. In doing so, one should take into account possible horizontal movements of settlements from different periods, which could make the site itself significantly larger than the area of certain settlements actually was. It is necessary to control the chronology by dating as many excavated sites with secure contexts as possible, such as Benske Bare in Šabac, and to conduct targeted excavations at selected sites, with particular focus on the research of ditches and palisades that enclose the settlement area.

**Acknowledgements**

This paper is the result of research done within the project 'Archaeology of Serbia: cultural identity, integration factors, technological processes and the role of the Central Balkans in the development of European prehistory' (no. OI177020) supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia. The text was translated in English by Jelena Vitezović, Marinko Antonijević, and Dragan Milanović.

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# Appendix

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 1 | Virovlje, Radenković | Mačva | very approximately | flat | 4 ha | Stojić & Cerović 2011, 131; Trbuhović & Vasiljević 1983, 45 |
| 2 | Grobnice, Gornja Zasavica | Mačva | precise | flat | 3 ha | Stojić & Cerović 2011, 94; Trbuhović & Vasiljević 1983, 44 |
| 3 | Potes, Zasavica | Mačva | very approximately | flat | undefined | Stojić & Cerović 2011, 94 |
| 4 | Zasavica, Ravnje | Mačva | very approximately | flat | undefined | Stojić & Cerović 2011, 133 |
| 5 | Runjića brdo, Radenković | Mačva | precise | flat | 4 ha | Stojić & Cerović 2011, 130f; Trbuhović & Vasiljević 1983, 45 |
| 6 | Vukića njive in Trebljevine, Ravnje | Mačva | precise | flat | 4 ha | Trbuhović & Vasiljević 1983, 45 |
| 7 | Krčevine in Trebljevine, Ravnje | Mačva | precise | flat | 2.25 ha | Stojić & Cerović 2011, 133; Trbuhović & Vasiljević 1983, 45 |
| 8 | Veliko polje, Banovo polje | Mačva | precise | undefined | undefined | Stojić & Cerović 2011, 60 |
| 9 | Kućište I, Duvanište | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 88; Trbuhović & Vasiljević 1983, 54 |
| 10 | Prekrajak, Crna bara | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 75f; Vasiljević 1972, 178f; Trbuhović & Vasiljević 1983, 49 |
| 11 | Žurica greda, Banovo polje | Mačva | approximately | undefined | undefined | Stojić & Cerović 2011, 60 |
| 12 | Segedin, Glušci | Mačva | very approximately | flat | undefined | Stojić & Cerović 2011, 91; Vasiljević 1972, 180; Trbuhović & Vasiljević 1983, 46 |
| 13 | Jelensko brdo, Radenković | Mačva | very approximately | flat | 3 ha | Stojić & Cerović 2011, 130; Trbuhović & Vasiljević 1983, 19 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 14 | Skelica, Radenković | Mačva | very approximately | undefined | undefined | Stojić & Cerović 2011, 131 |
| 15 | Preseka, Noćaj | Mačva | precise | flat | 2 ha | Trbuhović & Vasiljević 1983, 45 |
| 16 | Stari Radenković, Radenković | Mačva | approximately | flat | 4ha | Stojić & Cerović 2011, 130; Trbuhović & Vasiljević 1983, 45 |
| 17 | Češljuška Bitva, Glušci | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 90; Trbuhović & Vasiljević 1983, 46 |
| 18 | Livade, Noćaj | Mačva | very approximately | flat | undefined | Stojić & Cerović 2011, 119 |
| 19 | Jasenik in Anovača, Uzveće | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 188; Trbuhović & Vasiljević 1983, 46 |
| 20 | Savića brdo, Glušci | Mačva | approximately | flat | 2 ha | Stojić & Cerović 2011, 90; Trbuhović & Vasiljević 1983, 46 |
| 21 | Lanište, Glušci | Mačva | precise | plateau | 10 ha | Stojić & Cerović 2011, 90; Vasiljević 1972, 165; Vasiljević & Popović 2002, 13 |
| 22 | Kupusna greda, Noćaj | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 119; Trbuhović & Vasiljević 1983, 45 |
| 23 | Tadića zidine, Ševarice | Mačva | very approximately | Obrovac | 0.12 ha | Stojić & Cerović 2011, 178; Trbuhović & Vasiljević 1983, 84 |
| 24 | Šiljak, Drenovac | Mačva | precise | flat | 2.25 ha | Trbuhović & Vasiljević 1983, 47 |
| 25 | Široka mlakva, Ševarice | Mačva | approximately | flat | 4 ha | Stojić & Cerović 2011, 178; Trbuhović & Vasiljević 1983, 47 |
| 26 | Janjići in Bogojevača, Uzveće | Mačva | very approximately | plateau | undefined | Stojić & Cerović 2011, 187ff; Trbuhović & Vasiljević 1983, 46 |
| 27 | Školski šor, Ševarice | Mačva | very approximately | flat | undefined | Stojić & Cerović 2011, 178; Trbuhović & Vasiljević 1983, 46 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 28 | Čevrntija - Pumpna stanica, Ševarice | Mačva | very approximately | undefined | undefined | Stojić & Cerović 2011, 177; Vasiljević & Popović 2002, 25 |
| 29 | Kalovica, Ševarice | Mačva | very approximately | undefined | undefined | Stojić & Cerović 2011, 177 |
| 30 | Lipa - Kućište, Drenovac | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 82; Trbuhović & Vasiljević 1983, 20 |
| 31 | Bara Veljača, Mačvanski Pričinović | Mačva | precise | flat | 4 ha | Stojić & Cerović 2011, 107; Trbuhović & Vasiljević 1983, 47 |
| 32 | Panjevi in Kutovi, Mačvanski Pričinović | Mačva | precise | flat | 3 ha | Stojić & Cerović 2011, 108; Trbuhović & Vasiljević 1983, 47 |
| 33 | Vrtlog in Tolić, Mačvanski Pričinović | Mačva | very approximately | Obrovac (?) | 0.12 ha | Stojić & Cerović 2011, 108 |
| 34 | Kovačev breg, Uzveće | Mačva | approximately | Obrovac (?) | 0.38 ha | Vasiljević 1972; Trbuhović & Vasiljević 1983, 46 |
| 35 | Paljevine, Mačvanski Pričinović | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 107; Trbuhović & Vasiljević 1983, 47 |
| 36 | Kotlina, Mačvanski Metković | Mačva | precise | flat | undefined | Trbuhović & Vasiljević 1983, 48 |
| 37 | Suva Bara, Mačvanski Metković | Mačva | approximately | flat | undefined | Trbuhović & Vasiljević 1983, 48 |
| 38 | Njiva Erić Slavoljuba, Mačvanski Metković | Mačva | very approximately | copper axe | undefined | Stojić & Cerović 2011, 106 |
| 39 | Staro selo - Ribarica, Glušci | Mačva | very approximately | Obrovac (multilayered site) | 19.6 ha | Stojić & Cerović 2011, 91f; Vasiljević 1972, 180; Trbuhovic 1972, 165; Trbuhović & Vasiljević 1983, 78f; Vasiljević & Popović 2002, 13f |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 40 | Spomenik on Bubanja, Glušci | Mačva | very approximately | flat | undefined | Stojić & Cerović 2011, 91; Vasiljević 1972, 180; Trbuhović & Vasiljević 1983, 46 |
| 41 | Krivača 1, Skrađani | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 140; Trbuhović & Vasiljević 1983, 54 |
| 42 | Kruglica in Paljevine, Bogatić | Mačva | precise | flat | undefined | Stojić, Cerović 2011, 69; Vasiljević 1972, 177; Trbuhović, Vasiljević 1983, 48 |
| 43 | Keca III, Belotić | Mačva | approximately | flat | undefined | Vasiljević 1972, 177; Trbuhović & Vasiljević 1983, 48 |
| 44 | Keca I, Belotić | Mačva | approximately | Obrovac (2) | 0.12 ha | Stojić & Cerović 2011, 69; Trbuhović & Vasiljević 1983, 83 |
| 45 | Veliko polje, Sovljak | Mačva | precise | flat | 0.7 ha | Stojić & Cerović 2011, 144; Vasiljević 1975, 165f; Trbuhović & Vasiljević 1983, 49 |
| 46 | Gajevi, Belotić | Mačva | approximately | flat | undefined | Trbuhović & Vasiljević 1983, 65 |
| 47 | Keca II, Belotić | Mačva | approximately | Obrovac (2) | 0.12 ha | Stojić & Cerović 2011, 69; Trbuhović & Vasiljević 1983, 83 |
| 48 | Kaluže, Bogatić | Mačva | precise | flat | undefined | Trbuhović & Vasiljević 1983, 48 |
| 49 | Lug in Rubnjača, Crna bara | Mačva | approximately | undefined | 7.5 ha | Stojić & Cerović 2011, 75; Trbuhović & Vasiljević 1983, 49 |
| 50 | Usće Drine - Parašnica, Crna bara | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 76; Trbuhović & Vasiljević 1983, 49 |
| 51 | Staro selo - Selište, Crna bara | Mačva | approximately | flat | 6 ha | Stojić & Cerović 2011, 88; Vasiljević 1972, 178f; Trbuhović & Vasiljević 1983, 49 |
| 52 | Batar III, Badinovci | Mačva | precise | flat | 3 ha | Trbuhović & Vasiljević 1983, 50 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 53 | Brestine, Badinovci | Mačva | approximately | Obrovac | 0.12 ha | Stojić & Cerović 2011, 58; Vasiljević 1972, 179; Trbuhović & Vasiljević, 1983, 84 |
| 54 | Batar II, Badinovci | Mačva | approximately | flat | undefined | Vasiljević 1972, 179 |
| 55 | Batar I, Badinovci | Mačva | approximately | undefined | undefined | Stojić & Cerović 2011, 57; Trbuhović & Vasiljević, 1983, 49 |
| 56 | Grabovac, Grabovac | Mačva | very approximately | undefined | undefined | Stojić & Cerović 2011, 69 |
| 57 | Kućerine, Bogatić | Mačva | very approximately | flat | undefined | Trbuhović & Vasiljević 1983, 48 |
| 58 | Kuzmanov breg, Klenje | Mačva | approximately | Obrovac | 0.12 ha | Stojić & Cerović 2011, 98; Trbuhović & Vasiljević 1983, 83 |
| 59 | Crkvina - Mali Bitvić, Bogatić | Mačva | approximately | flat | 8 ha | Stojić & Cerović 2011, 68; Vasiljević 1972, 168; Trbuhović & Vasiljević 1983, 48 |
| 60 | Mlin, Belotić | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 65; Trbuhović & Vasiljević 1983, 85 |
| 61 | Šanac in Iovača, Belotić | Mačva | approximately | Obrovac | 0.12 ha | Stojić & Cerović 2011, 65; Vasiljević 1972, 168 |
| 62 | Šanac at Livada, Belotić | Mačva | very approximately | Obrovac | 0.12 ha | Stojić & Cerović 2011, 65; Trbuhović & Vasiljević 1983, 83 |
| 63 | Ruma in Ratkovica, Mačvanski Pričinović | Mačva | precise | flat | 4 ha | Trbuhović & Vasiljević 1983, 47 |
| 64 | Obrovo, Tabanović | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 183; Vasiljević 1972, 186; Vasiljević & Popović 2002, 22 |
| 65 | Samuilovača, Tabanović | Mačva | precise | flat | 40 ha | Stojić & Cerović 2011, 184; Trbuhović & Vasiljević 1983, 52 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 66 | Tabanović, Tabanović | Mačva | approximately | undefined | undefined | Stojić & Cerović 2011, 182 |
| 67 | Gaj II, Tabanović | Mačva | approximately | plateau | 1.5 ha | Trbuhović & Vasiljević 1983, 52 |
| 68 | Gaj I, Tabanović | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 183; Trbuhović & Vasiljević 1983, 52 |
| 69 | Lug, Štitar | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 180; Trbuhović & Vasiljević 1983, 51 |
| 70 | Likićka suma, Bogosavac | Mačva | precise | Obrovac | 0.07 ha | Stojić & Cerović 2011, 70f; Vasiljević 1972, 184; Vasiljević & Popović 2002, 12; Trbuhović & Vasiljević, 1983, 84 |
| 71 | Obrovac in Lipovac, Dublje | Mačva | precise | Obrovac | 0.7 ha | Tripković & Penezić 2017, 40f |
| 72 | Šanac at Obrva, Belotić | Mačva | precise | Obrovac | 0.12 ha | Stojić & Cerović 2011, 65; Trbuhović & Vasiljević 1983, 80 |
| 73 | Kuište in Grmik, Belotić | Mačva | very approximately | flat | undefined | Stojić & Cerović 2011, 64f |
| 74 | Kućište in Svinjčine, Belotić | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 70; Trbuhović & Vasiljević 1983, 48 |
| 75 | Bitvena glava, Dublje | Mačva | very approximately | flat | undefined | Trbuhović & Vasiljević 1983, 50 |
| 76 | Livade, Dublje | Mačva | very approximately | flat | undefined | Stojić & Cerović 2011, 85 |
| 77 | Tobolac I, Majur | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 110; Trbuhović & Vasiljević 1983, 52f |
| 78 | Krivi Šor, Dublje | Mačva | very approximately | Obrovac (?) | undefined | Vasiljević 1972, 181 |
| 79 | Tadića polje, Belotić | Mačva | approximately | flat | undefined | Trbuhović & Vasiljević 1983, 50 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 80 | Šanac at Obrovčine, Dublje | Mačva | precise | Obrovac | 0.04 ha | Stojić & Cerović 2011, 87 |
| 81 | Bojinovka - Ambarine, Dublje | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 84; Trbuhović & Vasiljević, 1983, 50 |
| 82 | Velika Gradina II, Štitar | Mačva | approximately | plateau? | 1 ha | Stojić & Cerović 2011, 182; Trbuhović & Vasiljević 1983, 50 |
| 83 | Jerez, Štitar | Mačva | very approximately | flat | undefined | Stojić & Cerović 2011, 180 |
| 84 | Gačevo, Štitar | Mačva | precise | undefined | undefined | Stojić & Cerović 2011, 179 |
| 85 | Sokina mehana, Štitar | Mačva | very approximately | undefined | undefined | Stojić & Cerović 2011, 181 |
| 86 | Njiva Nikole Maksimovića, Štitar | Mačva | very approximately | copper axe | undefined | Stojić & Cerović 2011, 181 |
| 87 | Tufegdžića zabran, Štitar | Mačva | very approximately | Obrovac (3) | 0.07 ha | Stojić & Cerović 2011, 182; Trbuhović & Vasiljević 1983, 84 |
| 88 | Potes, Štitar | Mačva | approximately | flat | 4 ha | Stojić & Cerović 2011, 181; Vasiljević 1972, 187; Trbuhović & Vasiljević 1983, 51 |
| 89 | Šargića brdo in Kalem, Štitar | Mačva | very approximately | Obrovac | 0.07 ha | Stojić & Cerović 2011, 182; Trbuhović & Vasiljević 1983, 84 |
| 90 | Jasenovica, Štitar | Mačva | approximately | flat | 10 ha | Stojić & Cerović 2011, 180; Trbuhović & Vasiljević 1983, 51 |
| 91 | Belajevac, Štitar | Mačva | approximately | plateau | 1.76 ha | Stojić & Cerović 2011, 178; Vasiljević & Popović 2002, 25; Trbuhović & Vasiljević 1983, 51 |
| 92 | Omeđak, Tabanović | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 183; Vasiljević 1972, 185; Trbuhović & Vasiljević 1983, 52 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 93 | Borino brdo, Tabanović | Mačva | precise | plateau | undefined | Stojić & Cerović 2011, 182; Trbuhović & Vasiljević 1983, 52; Vasiljević 1972, 185 |
| 94 | Tolić, Tabanović | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 184; Vasiljević 1972, 185; |
| 95 | Krsmanovača, Šabac | Mačva | precise | undefined | undefined | Stojić & Cerović 2011, 109; Vasiljević 1972, 185 |
| 96 | Ciganište in Kitog, Majur | Mačva | very approximately | plateau | undefined | Stojić & Cerović 2011, 108; Trbuhović & Vasiljević 1983, 52 |
| 97 | Tobolac II, Majur | Mačva | precise | flat | 4 ha | Stojić & Cerović 2011, 110; Trbuhović & Vasiljević 1983, 52f |
| 98 | Istočna crkvina, Štitar | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 179; Vasiljević 1996, 17; Trbuhović & Vasiljević 1983, 51 |
| 99 | Crna bara, Štitar | Mačva | precise | flat | 2 ha | Stojić & Cerović 2011, 178f; Trbuhović & Vasiljević 1983, 51 |
| 100 | Seosko groblje, Štitar | Mačva | approximately | flat | undefined | Trbuhović & Vasiljević 1983, 51 |
| 101 | Jašarevača, Štitar | Mačva | approximately | flat | 1 ha | Stojić & Cerović 2011, 180; Trbuhović & Vasiljević 1983, 50 |
| 102 | Grmik, Štitar | Mačva | approximately | plateau | undefined | Stojić & Cerović 2011, 179; Trbuhović & Vasiljević 1983, 51 |
| 103 | Ševar, Slepčević | Mačva | precise | plateau | undefined | Stojić & Cerović 2011, 143; Trbuhović & Vasiljević 1983, 53 |
| 104 | Šanac at Kulina bara, Dublje | Mačva | very approximately | Obrovac (?) | 0.07 ha | Stojić & Cerović 2011, 86; Trbuhović & Vasiljević 1983, 83 |
| 105 | Osredak, Slepčević | Mačva | very approximately | flat | undefined | Stojić & Cerović 2011, 142 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 106 | Salašine I-IV, Dublje | Mačva | precise | flat (4) | undefined | Vasiljević 1972, 173; Trbuhović & Vasiljević 1983, 50 |
| 107 | Slepčević, Slepčević | Mačva | very approximately | plateau | undefined | Stojić & Cerović 2011, 141 |
| 108 | Bela bara, Dublje | Mačva | precise | flat | undefined | Trbuhović & Vasiljević 1983, 50 |
| 109 | Lizalovica, Dublje | Mačva | precise | Obrovac | 0.12 ha | Stojić & Cerović 2011, 84; Vasiljević 1972, 174 |
| 110 | Šanac at Livade - Penjive, Dublje | Mačva | very approximately | Obrovac | 0.12 ha | Stojić & Cerović 2011, 86; Trbuhović & Vasiljević 1983, 83 |
| 111 | Taborište, Zminjak | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 193; Trbuhović & Vasiljević 1983, 58 |
| 112 | Vranovača I, Zminjak | Mačva | precise | flat | 2 ha | Trbuhović & Vasiljević 1983, 58 |
| 113 | Vranovača II, Zminjak | Mačva | precise | flat | undefined | Trbuhović & Vasiljević 1983, 58 |
| 114 | Džombe, Petlovača | Mačva | precise | flat | 1 ha | Stojić & Cerović 2011, 123; Trbuhović & Vasiljević 1983, 58 |
| 115 | Polje, Petlovača | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 123; Trbuhović & Vasiljević 1983, 58 |
| 116 | Ćemerovac, Ribari | Mačva | precise | flat | 2.25 ha | Stojić & Cerović 2011, 134; Trbuhović & Vasiljević 1983, 57 |
| 117 | Perina međa, Ribari | Mačva | very approximately | flat | 1 ha | Stojić & Cerović 2011, 135; Trbuhović & Vasiljević 1983, 57 |
| 118 | Martićevka, Ribari | Mačva | very approximately | flat | 1.5 ha | Stojić & Cerović 2011, 135; Trbuhović & Vasiljević 1983, 57 |
| 119 | Kućište, Petlovača | Mačva | precise | flat | 2 ha | Stojić & Cerović 2011, 123; Trbuhović & Vasiljević 1983, 58 |
| 120 | Jerez, Skrađani | Mačva | precise | flat | 1.5 ha | Stojić & Cerović 2011, 139; Trbuhović & Vasiljević 1983, 54 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 121 | Kucište II, Duvanište | Mačva | approximately | flat | undefined | Trbuhović & Vasiljević 1983, 54 |
| 122 | Obrovac at Duvanište, Duvanište | Mačva | precise | Obrovac | 9.62 ha | Stojić & Cerović 2011, 88; Vasiljević 1972; Trbuhović & Vasiljević 1983, 79 |
| 123 | Stari Skrađani, Skrađani | Mačva | precise | flat | 9 ha | Stojić & Cerović 2011, 140; Trbuhović & Vasiljević 1983, 53 |
| 124 | Selište, Duvanište | Mačva | approximately | flat | 4 ha | Trbuhović & Vasiljević 1983, 54 |
| 125 | Obrovčine 2 at Lug (Obrovčine in Ratkovača), Dublje | Mačva | precise | Obrovac | 0.07 ha | Stojić & Cerović 2011, 85; Tripković & Penezić 2017 |
| 126 | Prokića šanac, Dublje | Mačva | approximately | Obrovac (?) | 0.12 ha | Stojić & Cerović 2011, 85; Vasiljević 1972 |
| 127 | Obrovčine 1 at Lug, Dublje | Mačva | precise | Obrovac | 0.12 ha | Trbuhović & Vasiljević 1983, 82f; Tripković & Penezić 2017, 39f |
| 128 | Jerez, Zminjak | Mačva | precise | flat | 10 ha | Stojić & Cerović 2011, 192; Trbuhović & Vasiljević 1983, 59 |
| 129 | Bećino groblje, Skrađani | Mačva | approximately | plateau | undefined | Stojić & Cerović 2011, 139; Trbuhović, Vasiljević 1983, 53 |
| 130 | Šančine, Duvanište | Mačva | approximately | Obrovac (?) | undefined | Stojić & Cerović 2011, 89; Trbuhović & Vasiljević 1983, 54 |
| 131 | Kućište I, Lipolist | Mačva | approximately | flat | 3 ha | Trbuhović & Vasiljević 1983, 54 |
| 132 | Obrovac - Kućište, Slepčević | Mačva | approximately | Obrovac | 0.12 ha | Trbuhović & Vasiljević 1983, 84 |
| 133 | Požar, Slepčević | Mačva | precise | flat | 9 ha | Stojić & Cerović 2011, 142; Trbuhović & Vasiljević 1983, 53 |
| 134 | Vrtine in Crvena bara, Slepčević | Mačva | precise | flat | 1 ha | Stojić & Cerović 2011, 143; Trbuhović & Vasiljević 1983, 53 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 135 | Krušik, Slepčević | Mačva | approximately | Obrovac (?) | 0.38 ha | Vasiljević 1972, 184 |
| 136 | Stari Slepčević, Slepčević | Mačva | very approximately | Obrovac (3) | 0.07ha | Stojić & Cerović 2011, 142f; Trbuhović & Vasiljević 1983, 84 |
| 137 | Obrovac I, Majur | Mačva | very approximately | Obrovac 1 | 9.62 ha | Stojić & Cerović 2011, 110f; Trbuhović & Vasiljević 1983, 79 |
| 138 | Obrovac II, Majur | Mačva | very approximately | Obrovac | 0.12 ha | Trbuhović & Vasiljević 1983, 81 |
| 139 | Šor-Motovilo, Majur | Mačva | precise | Obrovac | 20 ha | Stojić & Cerović 2011, 110; Vasiljević 1972, 185; Trbuhović & Vasiljević 1983, 79. |
| 140 | Doktorovača 1, Šabac | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 146f; Trbuhović & Vasiljević 1983, 59 |
| 141 | Alfirevića brdo - kasarske livade, Šabac | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 146; Vasiljević 1973, 152 |
| 142 | Segedin, Lipolist | Mačva | precise | Obrovac | 0.12 ha | Trbuhović & Vasiljević 1983, 82 |
| 143 | Kanal at kasarske livade, Šabac | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 173f; Vasiljević 1968, 13f; |
| 144 | Bair-etivaža, Šabac | Mačva | precise | Copper axe hoard | undefined | Stojić & Cerović 2011, 68; Trbuhović & Vasiljević 1983, 48 |
| 145 | Kamičak - Pijaca, Šabac | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 173 |
| 146 | Hala ''Proizvođač'' Đeneralovaca, Šabac | Mačva | approximately | copper axe | undefined | Stojić & Cerović 2011, 148; Cerović 2002, 40f; |
| 147 | Benske bare/ Jela, Šabac | Mačva | precise | plateau | 7.5 ha | Stojić & Cerović 2011, 149ff; Trbuhovic & Vasiljević 1970, 23ff; Chapman 1981; Trbuhović & Vasiljević 1983, 26ff |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 148 | Ulica Janka Veselinovića, Šabac | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 175 |
| 149 | Hipodrom, Šabac | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 148; Trbuhović & Vasiljević 1983, 67 |
| 150 | Zabran, Šabac | Mačva | approximately | undefined | undefined | Stojić & Cerović 2011, 176 |
| 151 | Stamenića - Kućište (III), Lipolist | Mačva | approximately | flat | 1.5 ha | Trbuhović & Vasiljević 1983, 55 |
| 152 | Stari Bogosavac, Bogosavac | Mačva | approximately | plateau? | undefined | Stojić & Cerović 2011, 72; Trbuhović & Vasiljević 1983, 61 |
| 153 | Babojević, Lipolist | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 102; Trbuhović & Vasiljević 1983, 55 |
| 154 | Borina, Lipolist | Mačva | very approximately | flat | undefined | Stojić & Cerović 2011, 102 |
| 155 | Utrina, Lipolist | Mačva | precise | flat | 4 ha | Stojić & Cerović 2011, 104; Trbuhović & Vasiljević 1983, 55 |
| 156 | Brdanjak/ Bradnjak, Lipolist | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 102; Trbuhović & Vasiljević 1983, 56 |
| 157 | Vučje polje, Lipolist | Mačva | precise | flat | 4 ha | Stojić & Cerović 2011, 105; Trbuhović & Vasiljević 1983, 55 |
| 158 | Kućni plac Janka Topalovica, Lipolist | Mačva | very approximately | copper axe | undefined | Stojić & Cerović 2011, 103 |
| 159 | Poljanice, Lipolist | Mačva | approximately | copper axe | undefined | Trbuhović & Vasiljević 1983, 85 |
| 160 | Kućište 1, Lipolist | Mačva | precise | flat | 3 ha | Trbuhović & Vasiljević 1983, 54 |
| 161 | Doluša, Lipolist | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 102; Trbuhović & Vasiljević 1983, 55 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 162 | Obrovac at Milačka, Lipolist | Mačva | very approximately | Obrovac | 0.07 ha | Trbuhović & Vasiljević 1983, 85 |
| 163 | Breg in Milačka, Lipolist | Mačva | precise | flat | undefined | Trbuhović & Vasiljević, 1983, 55 |
| 164 | Džudžin šanac/Šanac-Izba, Lipolist | Mačva | approximately | Obrovac | 0.2 ha | Stojić & Cerović 2011, 103; Vasiljević 1972, 188; Trbuhović & Vasiljević 1983, 54 |
| 165 | Studenac, Lipolist | Mačva | very approximately | flat | 1 ha | Cerović 2011, 104; Trbuhović & Vasiljević 1983, 55 |
| 166 | Krivača 2, Skrađani | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 140; Trbuhović & Vasiljević 1983, 54 |
| 167 | Selište, Lipolist | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 104; Trbuhović & Vasiljević 1983, 55 |
| 168 | Kućište at Lug, Ribari | Mačva | precise | flat | undefined | Stojić & Cerović 2011, 135; Trbuhović & Vasiljević 1983, 57 |
| 169 | Bećirevača, Ribari | Mačva | precise | flat | 4 ha | Trbuhović & Vasiljević, 1983, 57 |
| 170 | Brdanjak, Ribari | Mačva | very approximately | Obrovac | 7 ha | Stojić & Cerović 2011, 134; Trbuhović & Vasiljević 1983, 79 |
| 171 | Češlja, Ribari | Mačva | precise | flat | undefined | Trbuhović & Vasiljević 1983, 58 |
| 172 | Crkvine, Ribari | Mačva | approximately | Obrovac | 0.12 ha | Trbuhović & Vasiljević 1983, 85 |
| 173 | Ševar, Prnjavor | Mačva | very approximately | undefined | 6 ha | Stojić & Cerović 2011, 126; Trbuhović & Vasiljević 1983, 56 |
| 174 | Krkovača, Ribari | Mačva | precise | flat | 5 ha | Stojić & Cerović 2011, 135; Stojić & Cerović 2011, 135 |
| 175 | Selo - Ribića plac, Prnjavor | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 125; Trbuhović & Vasiljević 1983, 56 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 176 | Vranđi bara, Ribari | Mačva | very approximately | flat | 9 ha | Stojić & Cerović 2011, 136; Trbuhović & Vasiljević 1983, 57 |
| 177 | Avlište, Prnjavor | Mačva | approximately | flat | 2 ha | Stojić & Cerović 2011, 125; Trbuhović & Vasiljević 1983, 56 |
| 178 | Lipovica, Novo selo | Mačva | precise | Gradina | 6 ha | Bulatović et al. 2017; Stojić & Cerović 2011, 120; Trbuhović & Vasiljević 1983, 67 |
| 179 | Kleje, Novo selo | Mačva | precise | Obrovac (2) | 0.12 ha | Bulatović et al. 2017, 217; Stojić & Cerović 2011, 120; Trbuhović & Vasiljević 1983, 82 |
| 180 | Kleje (Šanac), Novo selo | Mačva | approximately | Obrovac (?) | 0.19 ha | Stojić & Cerović 2011, 100 |
| 181 | Lagatovica, Ribari | Mačva | approximately | flat | undefined | Stojić & Cerović 2011, 135; Trbuhović & Vasiljević 1983, 58 |
| 182 | Okno, Bogosavac | Pocerina | approximately | flat | 10 ha | Stojić & Cerović 2011, 71; Trbuhović & Vasiljević 1983, 62 |
| 183 | Gaj, Gornja Vranjska | Pocerina | approximately | plateau | undefined | Stojić & Cerović 2011, 93; Trbuhović & Vasiljević 1983, 61 |
| 184 | Rudo polje, Bogosavac | Pocerina | precise | flat | undefined | Stojić & Cerović 2011, 71; Trbuhović & Vasiljević 1983, 61 |
| 185 | Krčevnine, Bogosavac | Pocerina | precise | flat | 4 ha | Stojić & Cerović 2011, 71; Trbuhović & Vasiljević 1983, 62 |
| 186 | Dvorište Ekonomije, Dobrić | Pocerina | very approximately | copper axe | undefined | Stojić & Cerović 2011, 79; Trbuhović & Vasiljević 1983, 85 |
| 187 | Bus, Maovi | Pocerina | approximately | Obrovac | 0.12 ha | Stojić & Cerović 2011, 112; Vasiljević 1972, 188; Trbuhović & Vasiljević, 1983, 84 |
| 188 | Imnjača, Dobrić | Pocerina | precise | plateau | 1.6 ha | Stojić & Cerović 2011, 79; Trbuhović & Vasiljević 1983, 62 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 189 | Turske bašče, Maovi | Pocerina | approximately | undefined | undefined | Trbuhović & Vasiljević 1983, 61 |
| 190 | Kitog I and II, Varna | Pocerina | approximately | flat (2) | 1 ha | Stojić & Cerović 2011, 189; Vasiljević & Popović 2002, 61; Trbuhović & Vasiljević 1983, 61 |
| 191 | Trnjaci, Varna | Pocerina | approximately | flat | 1.5 ha | Stojić & Cerović 2011, 190; Trbuhović, Vasiljević 1983, 61 |
| 192 | Jusupovac, Gornja Vranjska | Pocerina | very approximately | Gradina (?) | 1 ha | Stojić & Cerović 2011, 190; Vasiljević & Popović 2002, 13; Cerović 2002, 40; Trbuhović & Vasiljević 1983, 86 |
| 193 | Popovića brdo, Zablaće | Pocerina | approximately | plateau | undefined | Garašanin & Garašanin 1951 |
| 194 | Lipovica, Vukošić | Pocerina | very approximately | undefined | undefined | Stojić & Cerović 2011, 191; Trbuhović & Vasiljević 1983, 65 |
| 195 | Crkva, Nakučani | Pocerina | precise | Gradina | undefined | Stojić & Cerović 2011, 117f; Trbuhović & Vasiljević 1983, 71 |
| 196 | Njiva Save Zivanovića, Nakučani | Pocerina | very approximately | flat | undefined | Stojić & Cerović 2011, 118 |
| 197 | Nakučani at Volujac, Nakučani | Pocerina | very approximately | flat | undefined | Vasiljević 1974 |
| 198 | Krčevine in Stojica mala, Nakučani | Pocerina | precise | flat | undefined | Stojić & Cerović 2011, 118; Trbuhović & Vasiljević 1983, 63 |
| 199 | Đurićevka in Stojica, Nakučani | Pocerina | very approximately | flat | undefined | Stojić & Cerović 2011, 118; Trbuhović & Vasiljević 1983, 63 |
| 200 | Crkvina, Rumska | Pocerina | precise | Gradina | 3 ha | Stojić & Cerović 2011, 137; Trbuhović & Vasiljević 1983, 70f |
| 201 | Paljevine, Metlić | Pocerina | precise | Gradina | undefined | Stojić & Cerović 2011, 114; Trbuhović & Vasiljević 1983, 71 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 202 | Bugarine, Sinošević | Pocerina | approximately | Gradina | undefined | Stojić & Cerović 2011, 139; Trbuhović & Vasiljević 1983, 71 |
| 203 | Gaj in Rečanska mala, Bojić | Pocerina | precise | flat | undefined | Stojić & Cerović 2011, 72; Trbuhović & Vasiljević 1983, 62 |
| 204 | Orlovac, Slatina | Pocerina | precise | flat | undefined | Stojić & Cerović 2011, 141 |
| 205 | Potes, Varna | Pocerina | approximately | plateau | undefined | Trbuhović & Vasiljević 1983, 61 |
| 206 | Požar, Slatina | Pocerina | very approximately | flat | undefined | Stojić & Cerović 2011, 141 |
| 207 | Dvokatuša-Kajmakčića Vinograd, Bojić | Pocerina | precise | Gradina | 3.14 ha | Stojić & Cerović 2011, 72; Trbuhović & Vasiljević 1983, 71 |
| 208 | Varoško brdo, Pocerski Metković | Pocerina | precise | Gradina | 0.02 ha | Stojić & Cerović 2011, 124; Trbuhović & Vasiljević 1983, 69f |
| 209 | Selište, Pocerski Pričinović | Pocerina | precise | flat | 2 ha | Stojić & Cerović 2011, 123; Trbuhović & Vasiljević 1983, 62 |
| 210 | Kalinovac, Grušić | Pocerina | very approximately | Obrovac | 0.07 ha | Stojić & Cerović 2011, 95; Trbuhović & Vasiljević 1983, 85 |
| 211 | Kulina, Grušić | Pocerina | precise | flat | 1 ha | Stojić & Cerović 2011, 95; |
| 212 | Đalmuša, Culjković | Pocerina | approximately | flat | undefined | Stojić & Cerović 2011, 77; Trbuhović & Vasiljević 1983, 62 |
| 213 | Osoje, Bela Reka | Pocerina | very approximately | copper axe | undefined | Stojić & Cerović 2011, 63; Trbuhović & Vasiljević 1983, 85 |
| 214 | Varošište, Bela Reka | Pocerina | precise | Gradina | 1 ha | Stojić & Cerović 2011, 64; Trbuhović & Vasiljević 1983, 69 |
| 215 | Stražionica, Bela Reka | Pocerina | precise | Gradina | 4 ha | Stojić & Cerović 2011, 64; Trbuhović & Vasiljević 1983, 69 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 216 | Crkvina - Lipik, Bela Reka | Pocerina | precise | Gradina | 1 ha | Stojić & Cerović 2011, 63; Trbuhović & Vasiljević 1983, 69 |
| 217 | Logor at Crveno brdo, Lipolist | Pocerina | precise | Gradina | undefined | Stojić & Cerović 2011, 103f; Trbuhović & Vasiljević 1983, 69 |
| 218 | Belo brdo, Petkovica | Pocerina | precise | Gradina | 1.8 ha | Stojić & Cerović 2011, 122; Trbuhović & Vasiljević 1983, 69; Vasiljević & Popović 2002, 18 |
| 219 | Šančina, Petkovica | Pocerina | precise | flat | 7 ha | Stojić & Cerović 2011, 122; Trbuhović & Vasiljević 1983, 56 |
| 220 | Granik, Petkovica | Pocerina | precise | Gradina | 1.5 ha | Stojić & Cerović 2011, 122; Trbuhović & Vasiljević 1983, 68 |
| 221 | Svinjčine, Čokešina | Pocerina | very approximately | undefined | undefined | Bulatović et al. 2017, 263; Stojić & Cerović 2011, 77 |
| 222 | Gradište, Petkovica | Pocerina | approximately | Gradina | 0.5 ha | Trbuhović & Vasiljević 1983, 69 |
| 223 | Grabovac, Petkovica | Pocerina | precise | Gradina | undefined | Stojić & Cerović 2011, 122; Trbuhović & Vasiljević 1983, 69 |
| 224 | Šuma iznad Manastira, Radovašnica | Pocerina | very approximately | copper axe | undefined | Stojić & Cerović 2011, 131f; Trbuhović & Vasiljević 1983, 85 |
| 225 | Strelačka, Radovašnica | Pocerina | precise | flat | undefined | Stojić & Cerović 2011, 131; Trbuhović & Vasiljević 1983, 62 |
| 226 | Parlozi-Šančina-Paripovac, Desić | Pocerina | precise | Obrovac site type and a rondel | undefined | Stojić & Cerović 2011, 78f; Trbuhović & Vasiljević 1983, 70 |
| 227 | Krčevine, Miloševac | Pocerina | approximately | Gradina | undefined | Stojić & Cerović 2011, 114; Trbuhović & Vasiljević 1983, 70f |
| 228 | Presadi, Miloševac | Pocerina | very approximately | undefined | undefined | Stojić & Cerović 2011, 115 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 229 | Konjuša, Dvorište | Pocerina | very approximately | undefined | undefined | Stojić & Cerović 2011, 89 |
| 230 | Mirovača, Miloševac | Pocerina | approximately | Gradina | 3.14 ha | Stojić & Cerović 2011, 115; Trbuhović & Vasiljević 1983, 70 |
| 231 | Gajevi, Sovljak | Pocerina | very approximately | undefined | undefined | Stojić & Cerović 2011, 143 |
| 232 | Luke, Matijevac | Pocerina | precise | flat | undefined | Stojić & Cerović 2011, 112; Vasiljević 1972; Trbuhović & Vasiljević 1983, 65 |
| 233 | Deonice, Lojanice | Pocerina | approximately | flat | undefined | Vasiljević 1972, 172; Trbuhović & Vasiljević 1983 |
| 234 | Krušik, Vladimirci | Pocerina | precise | flat | 2 ha | Trbuhović & Vasiljević 1983, 64 |
| 235 | Rovine, Zvizd | Pocerina | precise | flat | undefined | Trbuhović & Vasiljević 1983, 63 |
| 236 | Vračevac, Mehovine | Pocerina | precise | flat | undefined | Stojić & Cerović 2011, 112f |
| 237 | Ada, Skupljen | Pocerina | approximately | Obrovac | 0.07 ha | Trbuhović & Vasiljević 1983, 82 |
| 238 | Đipovi, Riđake | Pocerina | approximately | Gradina | 15 ha | Stojić & Cerović 2011, 136; Trbuhović & Vasiljević 1983, 73 |
| 239 | Brdo in Mirkovača, Cerovac | Posavina | approximately | plateau | 0.5 ha | Stojić & Cerović 2011, 74; Trbuhović & Vasiljević 1983, 60 |
| 240 | Groblje, Žabar | Posavina | precise | flat | undefined | Trbuhović & Vasiljević 1983, 60 |
| 241 | Lipovica, Mala Vranjska | Posavina | precise | flat | 1 ha | Stojić & Cerović 2011, 111; Vasiljević 1972, 188; Trbuhović & Vasiljević 1983, 60 |
| 242 | Đukanovića mala, Mala Vranjska | Posavina | approximately | flat | undefined | Trbuhović & Vasiljević 1983, 60 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 243 | Šanac-Šancina, Gornja Vranjska | Posavina | approximately | Obrovac (?) | undefined | Stojić & Cerović 2011, 94; Vasiljević 1972, 187; Trbuhović & Vasiljević 1983, 61 |
| 244 | Dumača, Pocerski Pričinović | Posavina | precise | flat | undefined | Trbuhović & Vasiljević 1983, 60 |
| 245 | Ulice, Jelenča | Posavina | approximately | flat | 4 ha | Trbuhović & Vasiljević 1983, 59 |
| 246 | Vrbovac, Mala Vranjska | Posavina | precise | flat | undefined | Stojić & Cerović 2011, 111; Vasiljević 1972, 187; Trbuhović & Vasiljević 1983, 60 |
| 247 | Obala Dumače, Šabac | Posavina | approximately | flat | 4 ha | Stojić & Cerović 2011, 176; Trbuhović & Vasiljević 1983, 59 |
| 248 | Dumača - Šljunkara, Šabac | Posavina | precise | flat | undefined | Stojić & Cerović 2011, 115f |
| 249 | Staro selo, Mišar | Posavina | precise | flat | undefined | Stojić & Cerović 2011, 117 |
| 250 | Groblje, Mišar | Posavina | approximately | flat | undefined | Stojić & Cerović 2011, 116; Trbuhović & Vasiljević 1983, 60 |
| 251 | Savsko polje, Orašac | Posavina | precise | flat | 1.5 ha | Stojić & Cerović 2011, 116; Trbuhović & Vasiljević 1983, 60 |
| 252 | Ulice, Orašac | Posavina | precise | undefined | undefined | Stojić & Cerović 2011, 121; Trbuhović & Vasiljević 1983, 60 |
| 253 | Kućiste/ Utrine, Orid | Posavina | precise | Gradina | undefined | Stojić & Cerović 2011, 121f; Vasiljević 1968; Trbuhović & Vasiljević 1983, 71f |
| 254 | Begluk - Bara II, Šabac | Posavina | approximately | flat | undefined | Stojić & Cerović 2011, 146; Trbuhović & Vasiljević, 1983, 59 |
| 255 | Svračjak (A), Miokus | Posavina | very approximately | Obrovac | 0.07 ha | Stojić & Cerović 2011, 115; Trbuhović & Vasiljević 1983, 85 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 256 | Janjića brdo, Miokus | Posavina | precise | Gradina | undefined | Stojić & Cerović 2011, 115; Trbuhović & Vasiljević 1983, 72 |
| 257 | Ćelije, Jalovik | Posavina | precise | Obrovac (?) | undefined | Stojić & Cerović 2011, 95; Trbuhović & Vasiljević, 1983, 64 |
| 258 | Grad Gračarac, Jalovik | Posavina | approximately | Gradina | undefined | Stojić & Cerović 2011, 95f; Trbuhović & Vasiljević 1983, 73 |
| 259 | Selište, Provo | Posavina | very approximately | flat | undefined | Trbuhović & Vasiljević 1983, 63 |
| 260 | Crkvine, Provo | Posavina | precise | flat | undefined | Stojić & Cerović 2011, 126f; Trbuhović & Vasiljević 1983, 63 |
| 261 | Trnovac, Jalovik | Posavina | precise | plateau | 2 ha | Stojić & Cerović 2011, 96; Trbuhović & Vasiljević 1983, 64 |
| 262 | Kisela voda, Krnić | Posavina | precise | plateau | undefined | Stojić & Cerović 2011, 100; Trbuhović & Vasiljević 1983, 64 |
| 263 | Petkovac, Vlasanica | Posavina | approximately | flat | undefined | Stojić & Cerović 2011, 191; Trbuhović & Vasiljević 1983, 64 |
| 264 | Gradužina, Debrc | Posavina | precise | flat | undefined | Stojić & Cerović 2011, 77f; Trbuhović & Vasiljević 1983, 86 |
| 265 | Svračjak (B), Miokus | Posavina | very approximately | Obrovac | 0.07 ha | Stojić & Cerović 2011, 115; Trbuhović & Vasiljević 1983, 85 |
| 266 | Crkvina - Duboka mala, Provo | Posavina | precise | flat | undefined | Stojić & Cerović 2011, 127; Vasiljević 1972, 169 |
| 267 | Donji Čagalj, Provo | Posavina | approximately | flat | undefined | Stojić & Cerović 2011, 127; Vasiljević 1972, 169 |
| 268 | Ada - Pesadin, Provo | Posavina | very approximately | Obrovac | 0.19 ha | Stojić & Cerović 2011, 126; Vasiljević 1972; |
| 269 | Graduština, Beljin | Posavina | precise | flat | 4.5 ha | Trbuhović & Vasiljević 1983, 63 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 270 | Ravnice, Beljin | Posavina | precise | flat | 3.75ha | Stojić & Cerović 2011, 67; Vasiljević & Popović 2002, 63; Trbuhović & Vasiljević 1983, 63 |
| 271 | Grčka bara, Mesarci | Posavina | very approximately | flat | undefined | Stojić & Cerović 2011, 113; Vasiljević 1972, 171; Trbuhović & Vasiljević 1983, 64 |
| 272 | Bair, Beljin | Posavina | approximately | flat | undefined | Stojić & Cerović 2011, 67 |
| 273 | Kuće, Beljin | Posavina | very approximately | flat | undefined | Stojić & Cerović 2011, 67 |
| 274 | Mađar groblje, Suvo selo | Posavina | approximately | flat | undefined | Stojić & Cerović 2011, 144; Vasiljević 1972, 171; Trbuhović & Vasiljević 1983, 64 |
| 275 | Tokalićevka, Beljin | Posavina | approximately | flat | undefined | Trbuhović & Vasiljević 1983, 63 |
| 276 | Jasenje, Vukićevica | Posavina | approximately | plateau | undefined | Todorović 1967a; Ružić & Pavlović 1988 |
| 277 | Đurića Vinogradi, Grabovac | Posavina | approximately | plateau | undefined | Todorović 1967b, 1968 & 1969; Ružić & Pavlović 1988; Bulatović & Spasić 2019 |
| 278 | Novo selo, Stubline | Posavina | approximately | flat | undefined | Mihailović 2001 |
| 279 | Crkvine, Stubline | Posavina | precise | plateau | 16ha | Todorović 1967; Ružić & Pavlović 1988; Crnobrnja et al. 2009; Spasić 2013; Crnobrnja 2014 |
| 280 | Male livade, Ub | Tamnava and Kolubara | precise | flat | undefined | Blagojević 2005 |
| 281 | Jaričište 1, Lajkovac | Tamnava and Kolubara | precise | plateau | undefined | Blagojević & Arsić 2008; Arsić 2011 |
| 282 | Masinske njive, Mali borak | Tamnava and Kolubara | approximately | plateau | 2 ha | Blagojević & Arsić 2008a; Arsić 2011 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 283 | Crkvine, Mali borak | Tamnava and Kolubara | precise | flat | 2.5 ha | Živanović & Spasić 2008; Blagojević & Arsić 2008 |
| 284 | Ilića brdo, Čučug | Tamnava and Kolubara | precise | plateau | undefined | Jež & Starović 1995 |
| 285 | Vodice - Beljinovača, Valjevska slatina | Tamnava and Kolubara | precise | Obrovac | 0.07 ha | Trbuhović & Vasiljević 1983, 80 |
| 286 | Bodnjik - Obodnjik, Družetić | Tamnava and Kolubara | precise | Gradina | undefined | Stojić & Cerović 2011, 83f; Trbuhović & Vasiljević 1983, 74; Palavestra et al. 1993; Palavestra et al. 1996; Živanović 2013 & 2022, 62 |
| 287 | Voće, Bresnica | Tamnava and Kolubara | precise | flat | undefined | Stojić & Cerović 2011, 73; Vasiljević 1972, 182f; Živanović 2022, 45; Trbuhović & Vasiljević, 1983, 65 |
| 288 | Vis, Družetić | Tamnava and Kolubara | precise | Gradina | undefined | Stojić & Cerović 2011, 84; Trbuhović & Vasiljević 1983, 74; Živanović 2022, 65 |
| 289 | Dragina mala, Koceljeva | Tamnava and Kolubara | precise | copper axe | undefined | Živanović 2022, 57 |
| 290 | Orašje, Koceljeva | Tamnava and Kolubara | precise | flat | undefined | Stojić & Cerović 2011, 99; Živanović 2022, 47; Trbuhović & Vasiljević 1983, 65 |
| 291 | Šume, Zukve | Tamnava and Kolubara | precise | flat | undefined | Živanović 2022, 47 |
| 292 | Debelo brdo II, Batalage | Tamnava and Kolubara | precise | Gradina | undefined | Vasiljević 1972, 182; Trbuhović & Vasiljević 1983, 73f; Živanović 2022, 60 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 293 | Debelo brdo, Batalage | Tamnava and Kolubara | precise | flat | undefined | Živanović 2022, 60; Trbuhović & Vasiljević, 1983, 73f |
| 294 | Debelo brdo I, Batalage | Tamnava and Kolubara | precise | Gradina | undefined | Vasiljević 1972, 182; Trbuhović & Vasiljević 1983, 73f; Živanović 2022, 60 |
| 295 | Vukodraž, Jazovik | Tamnava and Kolubra | precise | flat | 1 ha | Stojić & Cerović 2011, 96; Trbuhović & Vasiljević 1983, 64 |
| 296 | Dolovo, Jazovik | Tamnava and Kolubara | precise | flat | 1.3 ha | Trbuhović & Vasiljević 1983, 64 |
| 297 | Rtovi, Svileuva | Tamnava and Kolubara | precise | Gradina | undefined | Stojić & Cerović 2011, 145; Živanović 2022, 65; Trbuhović & Vasiljević 1983, 73 |
| 298 | Kik III, Svileuva | Tamnava and Kolubara | precise | Gradina | 0.4 ha | Stojić & Cerović 2011, 144f; Trbuhović & Vasiljević 1983, 73; Živanović 2013 & 2022, 70 |
| 299 | Puretići, Svileuva | Tamnava and Kolubara | precise | flat | undefined | Živanović 2022, 49 |
| 300 | Kućerine II at Ristivojčevića mala, Svileuva | Tamnava and Kolubara | precise | flat | undefined | Živanović 2022, 48 |
| 301 | Ćevkića brdo, Koceljeva | Tamnava and Kolubara | precise | Gradina | undefined | Živanović 2022, 66 |
| 302 | Barič, Subotica | Tamnava and Kolubara | precise | Obrovac | 0.04 ha | Stojić & Cerović 2011, 144; Vasiljević 1972, 183 |
| 303 | Barič 2, Subotica | Tamnava and Kolubara | precise | Obrovac | 0.04 ha | Živanović, 2022, 52 |
| 304 | Kućerine, Kaona | Tamnava and Kolubara | approximately | Gradina | 9 ha | Stojić & Cerović 2011, 98; Trbuhović & Vasiljević 1983, 77 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 305 | Debelo brdo, Kaona | Tamnava and Kolubara | precise | Gradina | 1 ha | Stojić & Cerović 2011, 97; Trbuhović & Vasiljević 1983, 74 |
| 306 | Cvetkovac, Goločelo | Tamnava and Kolubara | precise | flat | undefined | Živanović 2022, 45 |
| 307 | Ćukovine-Klenovica or Ćukovine - Ušće Klenovice, Ćukovine | Tamnava and Kolubara | precise | flat | undefined | Stojić & Cerović 2011, 77; Živanović 2022, 58 |
| 308 | Grad II, Gradojević | Tamnava and Kolubara | precise | Gradina | 3 ha | Stojić & Cerović 2011, 94; Trbuhović & Vasiljević 1983, 74; Živanović 2022, 61 |
| 309 | Kulača, Gradojević | Tamnava and Kolubara | precise | Obrovac | 0.04 ha | Stojić & Cerović 2011, 94; Vasiljević 1972, 183; Trbuhović & Vasiljević 1983, 74; Živanović 2022, 51 |
| 310 | Baščina Radivojevića, Bukor | Tamnava and Kolubara | precise | Gradina | 1 ha | Stojić & Cerović 2011, 73; Trbuhović & Vasiljević 1983, 74f |
| 311 | Glavičica - Jagodina, Galović | Tamnava and Kolubara | precise | Gradina | undefined | Stojić & Cerović 2011, 89; Trbuhović & Vasiljević 1983, 74; Živanović 2022, 60f |
| 312 | Đuričića brdo, Donje-Crnjevo | Tamnava and Kolubara | precise | flat | undefined | Živanović 2022, 46 |
| 313 | Rimsko groblje, Gornja Sipulja | Tamnava and Kolubara | precise | copper axe | undefined | Bulatović et al. 2017, 163 |
| 314 | Stepanovo brdo, Gornja Sipulja | Tamnava and Kolubara | precise | Gradina | undefined | Bulatović et al. 2017, 164; Stojić & Cerović 2011, 93; Trbuhović & Vasiljević 1983, 75 |
| 315 | Veliki Bračinac, Pomijača | Tamnava and Kolubara | precise | Gradina | undefined | Bulatović et al. 2017, 230; Stojić & Cerović 2011, 124; Trbuhović & Vasiljević 1983, 75 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 316 | Mali Bračinac, Pomijača | Tamnava and Kolubara | precise | Gradina | undefined | Bulatović et al. 2017, 229; Stojić & Cerović 2011, 124; Trbuhović & Vasiljević 1983, 75 |
| 317 | Srebrne rupe, Tekeriš | Tamnava and Kolubara | precise | copper mine | undefined | Bulatović et al. 2017, 236 |
| 318 | Kik, Tekeriš | Tamnava and Kolubara | precise | Gradina | undefined | Bulatović et al. 2017, 234; Stojić & Cerović 2011, 184; Trbuhović & Vasiljević 1983, 75 |
| 319 | Vodenčina, Tekeriš | Tamnava and Kolubara | precise | undefined | undefined | Bulatović et al. 2017, 235 |
| 320 | Škola, Tekeriš | Tamnava and Kolubara | precise | plateau | undefined | Bulatović et al. 2017, 235; Stojić & Cerović 2011, 185; Trbuhović & Vasiljević 1983, 67 |
| 321 | Šarampov, Tekeriš | Tamnava and Kolubara | very approximately | undefined | undefined | Bulatović et al. 2017, 235; Stojić & Cerović 2011, 184 |
| 322 | Ševarine at Đukanovica, Trbosilje | Jadar and Lešnica | precise | flat | 2ha | Bulatović et al. 2017, 241; Stojić & Cerović 2011, 186; Trbuhović & Vasiljević 1983, 66 |
| 323 | Spasovine, Milina | Jadar and Lešnica | precise | flat | undefined | Bulatović et al. 2017, 213f & 2020, fig. 8 |
| 324 | Detinji Potok, Milina | Jadar and Lešnica | precise | copper axe hoard | undefined | Bulatović et al. 2017, 212f; Vasiljević 1967, 129f; Trbuhović & Vasiljević 1983, 86 |
| 325 | Staro selo, Milina | Jadar and Lešnica | very approximately | undefined | undefined | Bulatović et al. 2017, 214f; Stojić & Cerović 2011, 114 |
| 326 | Baština Nenadovića, Joševa | Jadar and Lešnica | approximately | Gradina | undefined | Bulatović et al. 2017, 175; Stojić & Cerović 2011, 97; Trbuhović & Vasiljević 1983, 75 |
| 327 | Prosečena kosa, Joševa | Jadar and Lešnica | approximately | Gradina | undefined | Bulatović et al. 2017, 176 |
| 328 | Kamenica, Joševa | Jadar and Lešnica | approximately | flat | undefined | Bulatović et al. 2017, 175 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 329 | Ante, Lešnica | Jadar and Lešnica | precise | flat | undefined | Bulatović et al. 2017, 173; Trbuhović & Vasiljević 1983, 66 |
| 330 | Kućerine, Donji Dobrić | Jadar and Lešnica | approximately | flat | undefined | Bulatović et al. 2017, 172; Stojić & Cerović 2011, 81; Trbuhović & Vasiljević 1983, 66 |
| 331 | Vidin grad, Cer | Jadar and Lešnica | precise | Gradina | 0.6 ha | Bulatović et al. 2017, 242ff |
| 332 | Lopatar, Lešnica | Jadar and Lešnica | approximately | flat | 7.5 ha | Bulatović et al. 2017, 180; Trbuhović & Vasiljević 1983, 56 |
| 333 | Zabran, Lešnica | Jadar and Lešnica | approximately | flat | undefined | Bulatović et al. 2017, 181; Stojić & Cerović 2011, 101; Trbuhović & Vasiljević 1983, 56 |
| 334 | AIK or PIK Gučevo, Lešnica | Jadar and Lešnica | approximately | undefined | 2.25 ha | Bulatović et al. 2017, 181; Stojić & Cerović 2011, 100; Vasiljević 1972, 156; Trbuhović & Vasiljević 1983, 56 |
| 335 | Brešće, Kozijak | Jadar and Lešnica | approximately | copper bracelet | undefined | Trbuhović & Vasiljević 1983, 86 |
| 336 | Bojića Ada, Loznica | Jadar and Lešnica | approximately | flat | undefined | Bulatović et al. 2017, 193ff |
| 337 | Mali gradac, Cikote | Jadar and Lešnica | precise | Gradina | undefined | Bulatović et al. 2017, 259ff; Stojić & Cerović 2011, 75; Trbuhović & Vasiljević 1983, 76 |
| 338 | Vladića brdo, Loznica | Jadar and Lešnica | approximately | flat | undefined | Bulatović et al. 2017, 205ff |
| 339 | Vidojevica, Runjani | Jadar and Lešnica | precise | flat | 1ha | Bulatović et al. 2017, 234; Stojić & Cerović 2011, 137; Trbuhović & Vasiljević 1983, 66 |
| 340 | Kovanluci, Klupci | Jadar and Lešnica | very approximately | flat | undefined | Bulatović et al. 2017, 176f; Stojić & Cerović 2011, 98; Trbuhović & Vasiljević 1983, 66 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 341 | Velika livada, Tršić | Jadar and Lešnica | approximately | flat | undefined | Bulatović et al. 2017, 241; Stojić & Cerović 2011, 186; Trbuhović & Vasiljević 1983, 66 |
| 342 | Crkvina, Donje Nedeljice | Jadar and Lešnica | precise | Gradina | undefined | Bulatović et al. 2017, 171; Stojić & Cerović 2011, 80; Trbuhović & Vasiljević 1983, 76 |
| 343 | Priljevska crkva, Lipnica | Jadar and Lešnica | precise | flat | undefined | Bulatović et al. 2017, 192; Stojić & Cerović 2011, 102; Trbuhović & Vasiljević 1983, 66 |
| 344 | Kućerine, Bradić | Jadar and Lešnica | approximately | plateau | undefined | Bulatović et al. 2017, 115f; Stojić & Cerović 2011, 73; Trbuhović & Vasiljević 1983, 66 |
| 345 | Mramorje, Bradić | Jadar and Lešnica | precise | Gradina | undefined | Bulatović et al. 2017, 116; Stojić & Cerović 2011, 73 |
| 346 | Kulina, Jarebice | Jadar and Lešnica | precise | Gradina | undefined | Bulatović et al. 2017, 174; Stojić & Cerović 2011, 96 |
| 347 | Velike livade, Jarebice | Jadar and Lešnica | precise | flat | undefined | Bulatović et al. 2017, 174; Stojić & Cerović 2011, 96; Trbuhović & Vasiljević 1983, 67 |
| 348 | Orlovac - Jerinin grad, Gornja Badanja | Jadar and Lešnica | precise | Gradina | 3ha | Bulatović et al. 2017, 155ff; Stojić & Cerović 2011, 92; Vasiljević 1980, 216; Trbuhović & Vasiljević 1983, 76 |
| 349 | Staro selo, Donja Sipulja | Jadar and Lešnica | precise | Gradina | undefined | Bulatović et al. 2017, 170; Trbuhović & Vasiljević 1983, 75 |
| 350 | Metlik, Donja Badanja | Jadar and Lešnica | precise | tumulus? | undefined | Stojić & Cerović 2011, 79f |
| 351 | Gradac, Banja Koviljaca | Azbukovica and Rađevina | precise | Gradina | undefined | Bulatović et al. 2017, 89ff; Stojić & Cerović 2011, 61 |
| 352 | Kopiljuša, Radalj | Azbukovica and Rađevina | very approximately | Obrovac (?) | 0.25ha | Bulatović et al. 2017, 231; Stojić & Cerović 2011, 129 |

| Site No | Site name, municipality | Microregion | Location | Topography (no. of sites or copper axe finds) | Site area | References |
|---|---|---|---|---|---|---|
| 353 | Cave Radašnica, Donja Trešnjica | Azbukovica and Rađevina | precise | cave | undefined | Bulatović et al. 2017, 170f; Stojić & Cerović 2011, 80; Trbuhović & Vasiljević 1983, 77 |
| 354 | Hram, Ljubovija | Azbukovica and Rađevina | very approximately | copper mine | undefined | Bulatović et al. 2017, 234 |
| 355 | Rid, Rujevac | Azbukovica and Rađevina | precise | Gradina | 0.7 ha | Bulatović et al. 2017, 231; Stojić & Cerović 2011, 136f; Trbuhović & Vasiljević 1983, 77 |
| 356 | Sklopovi, Krupanj | Azbukovica and Rađevina | approximately | flat | undefined | Bulatović et al. 2017, 115 |
| 357 | Turska karaula - Busija, Banjevac | Azbukovica and Rađevina | precise | Gradina | undefined | Bulatović et al. 2017, 107; Stojić & Cerović 2011, 61; Trbuhović & Vasiljević 1983, 77 |
| 358 | Kovačevicева pecina, Cerova | Azbukovica and Rađevina | precise | cave | undefined | Bulatović et al. 2017, 249ff; Stojić & Cerović 2011, 74; Trbuhović & Vasiljević 1983, 77 |
| 359 | Matići, Krasava | Azbukovica and Rađevina | precise | flat | undefined | Bulatović et al. 2017, 180 |
| 360 | Glavica, Krasava | Azbukovica and Rađevina | approximately | flat | undefined | Bulatović et al. 2017, 179 |
| 361 | Prosek, Krasava | Azbukovica and Rađevina | precise | Gradina | undefined | Bulatović et al. 2017, 180; Stojić & Cerović 2011, 100; Trbuhović & Vasiljević 1983, 76 |
| 362 | Ostenjak, Likodra | Azbukovica and Rađevina | precise | Gradina | undefined | Bulatović et al. 2017, 182ff; Stojić & Cerović 2011, 101; Trbuhović & Vasiljević 1983, 76 |
| 363 | Varoš, Bela Crkva | Azbukovica and Rađevina | approximately | Gradina | undefined | Bulatović et al. 2017, 115; Garašanin 1986, 65; Trbuhović & Vasiljević 1983, 76 |
| 364 | Anatema, Balinović | Azbukovica and Rađevina | precise | plateu | undefined | Mihailović 2001 |

Studia Praehistorica 17, 2023, 103–131

# Wood construction at the Copper Age tell site of Hotnitsa, north central Bulgaria: Four Late Chalcolithic case studies

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**Abstract**

*Between 2000 and 2017, the research project at the Copper Age tell site of Hotnitsa, located just a stone's throw from the banks of the river Bohot, uncovered several levels of occupation dated to the Late Chalcolithic. During the last two excavation seasons of 2016 and 2017, architectural remains were systematically examined, in particular the wooden floors of four buildings (horizons 4–5). A xylological study was also undertaken. The specific preservation of the material hinders identification, but new approaches could enable the timber palaeobotanical study and a better understanding of the conservation process undergone by the remains. Our main objectives were to reconstruct the* chaîne opératoire *involved, from the selection of the wood (species, dimensions, etc.) to the assemblies used to construct the buildings. Focusing on wooden floors, our analysis revealed three principles of floor construction based on the timber's organization and dimensions. The* chaine opératoire *approach also allows for an understanding of the planning process which starts from the raw materials acquisition step while highlighting the woodworkers' technical finesse. Through construction techniques, the study also sheds light on larger scale concerns as the site's organization.*

**Keywords:** *Balkan Copper Age – timber – construction techniques – wooden floor – woodworking.*

https://doi.org/*10.53250/stprae17.103-131*

## 1. Introduction

The present-day village of Hotnitsa is located approximately 15 km northwest of Veliko Tarnovo in north central Bulgaria (fig. 1). The Chalcolithic tell site of Hotnitsa is situated at the northwest exit of the village, on the left bank of the river Bohot. It covers an area of approximately 0.95 ha and is 5 m high. The site, identified in 1956 during earth removal, was first excavated as part of a rescue archaeology operation (Angelov 1958).




**Figure 1.** *Location of the Copper Age tell site of Hotnitsa (in red). Image Credit: background (zoom) map: Esri, NASA, NGA, USGS; Main map: the author.*

Subsequently, the Veliko Tarnovo Museum decided to launch an archaeological operation consisting of three excavation seasons, carried out in 1957, 1958, and 1959 under Nikola Angelov (Angelov 1959 & 1961).

Over the course of four years, Angelov's excavations achieved two main objectives. First, an initial stratigraphic sequence of the site was determined, thanks to a 10 x 4 m trench dug in the southern part of the tell (Chohadzhiev & Chohadzhiev, forthcoming). Fourteen occupation levels were identified, numbered from top to bottom and dated to the first three quarters of the fifth millennium BCE (Todorova 1986, 78; Chohadzhiev 2009, 67; Chohadzhiev & Chohadzhiev, forthcoming). The second objective was to excavate entirely the highest stratigraphic level. Thus, the general layout of the site during its last period of occupation could be established. Twenty-one burnt quadrangular buildings were uncovered ranging from a dozen square meters to 57 m$^2$. Unfortunately, part of the field records of the earlier excavations was missing and some of the information cannot be verified or used (Chohadzhiev 2009, 67–68; Chohadzhiev & Chohadzhiev, forthcoming). All the buildings of the upper level appear to have been built of daub on wooden frames. Angelov described a few wattle and daub imprints. Whenever information on the wall thickness is

provided, it is around 0.40 m (Chohadzhiev & Chohadzhiev, forthcoming).

Before the end of the twentieth century, the site was slowly reclaimed by nature and remained forested until 2000, when Stefan Chohadzhiev resumed the excavations within an archaeological operation of the St. Cyril and St. Methodius University of Veliko Tarnovo and the Veliko Tarnovo Regional Museum of History. The 2nd and 3rd occupation levels were excavated from 2000 to 2005, and the 4th level was excavated until 2009. Finally, level 5 was excavated until 2017, which marked the end of the investigation project (Chohadzhiev & Chohadzhiev 2005, 9; and 2017, 94–95; Chohadzhiev 2009, 68; Chohadzhiev et al. 2018, 1). It was during that phase, more specifically in 2016 and 2017, that I was offered the chance to study the architectural material.

Two areas were studied: North and South (fig. 2). Our evidence comes from four structures: features 112, 124 and 99 in the North area, and feature 132 in the South area. These four houses belong to horizons 4 and 5, dated between 4600 and 4400 BCE, which were not destroyed by fire, and the elements made of daub[1] were poorly preserved; the material has disintegrated, and the structures were badly damaged and difficult to study. As for the wood, it was preserved in an unusual form, which will be discussed below.

The analyzed structural remains were mainly floor parts, but some roof and wall framing was also uncovered, providing evidence on the assembly techniques of the superstructures. A total of 393 pieces of wood were studied and 51 samples were taken, including 49 wood samples for identification and two charcoal samples for radiocarbon dating.

## 2. Xylological examination

### *2.1. Macroscopic study*

Timbers preserved at Hotnitsa were close to a layer of agglomerated wood particles 1 to 5 mm thick (fig. 3). These wood residues formed a thin, relatively continuous layer over the impressions left by the pieces of wood in the sediment.

Two types of wood remains were recorded. The first type is a light-colored material, with a few fibers still visible. Fragments measuring several centimeters long and several millimeters wide and thick were preserved. The second type is brown, of a powdery texture, and has no distinct fragments (fig. 4). These forms of wood preservation have also been recorded at other sites in north Bulgaria, e.g., Tell Petko Karavelovo and Tell Sushina (Bacoup 2020, 25f; and 2022a, 43; Chohadzhiev 2021; Chohadzhiev et al. 2021, 289f).

The macroscopic examination of the wood remains did not identify the main anatomical structure of wood. Based on previous archaeobotanical analyses (Popova 2009), hardwood (oak, ash, etc.) could have been used in construction. Looking at the distribution of the two types of remains on each wood piece, it seems that the lighter form is what is left from heartwood, while the brown material reveals the presence of bark/sapwood.[2]

[1] In this paper, 'daub' is used as a synonym for the French term *terre à bâtir*.

[2] Without knowing if the trees were striped from their bark, macrodifferentiating between the two anatomical parts seems difficult.

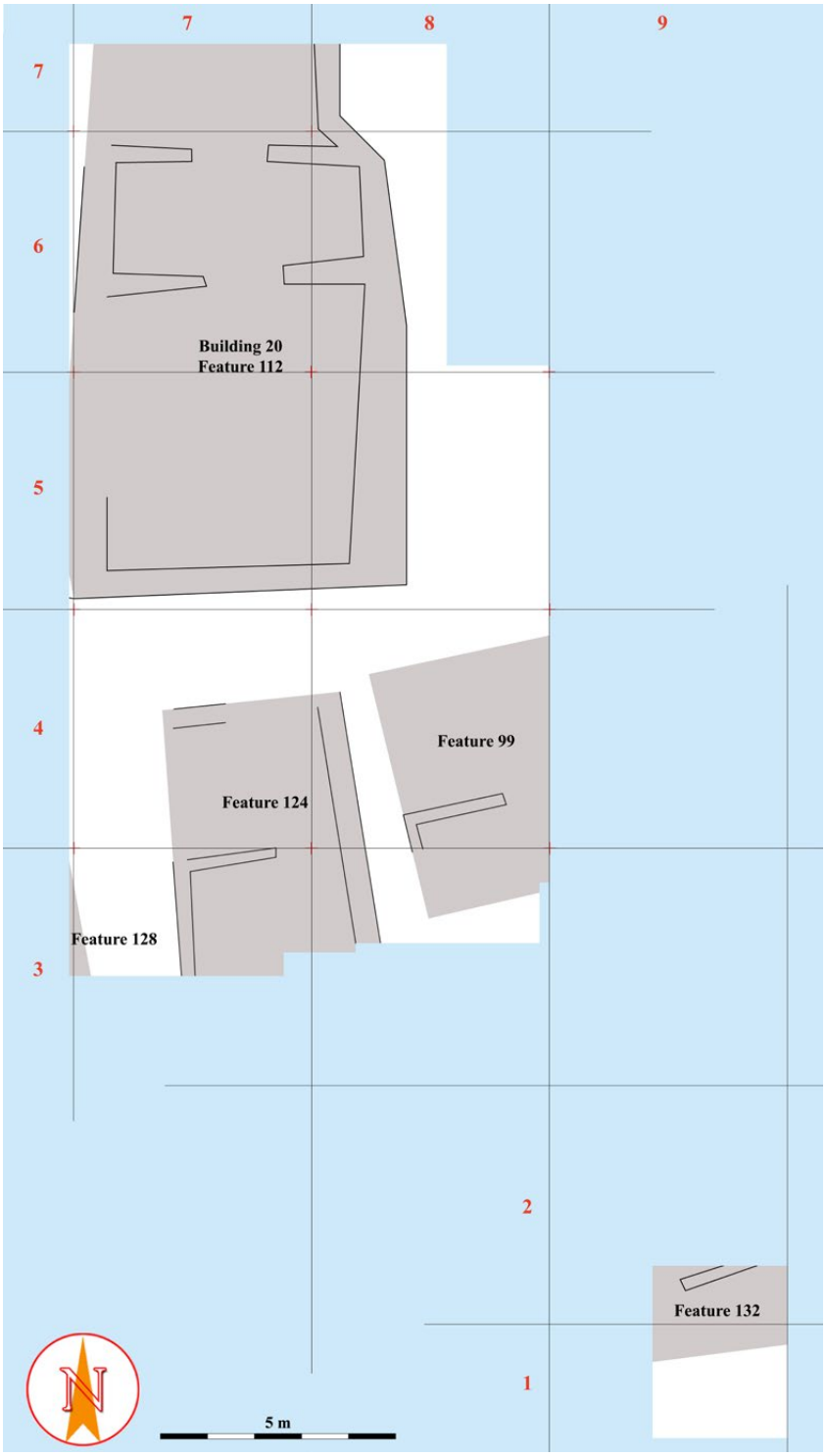



**Figure 2.** *Layout of the excavated areas. Image Credit: A. Chohadzhiev & the author.*




**Figure 3.** *Thickness of the wood layer after a sampling with a die-cutter. Image Credit: the author.*




**Figure 4.** *Half log showing both types of wood remains. Image Credit: the author.*

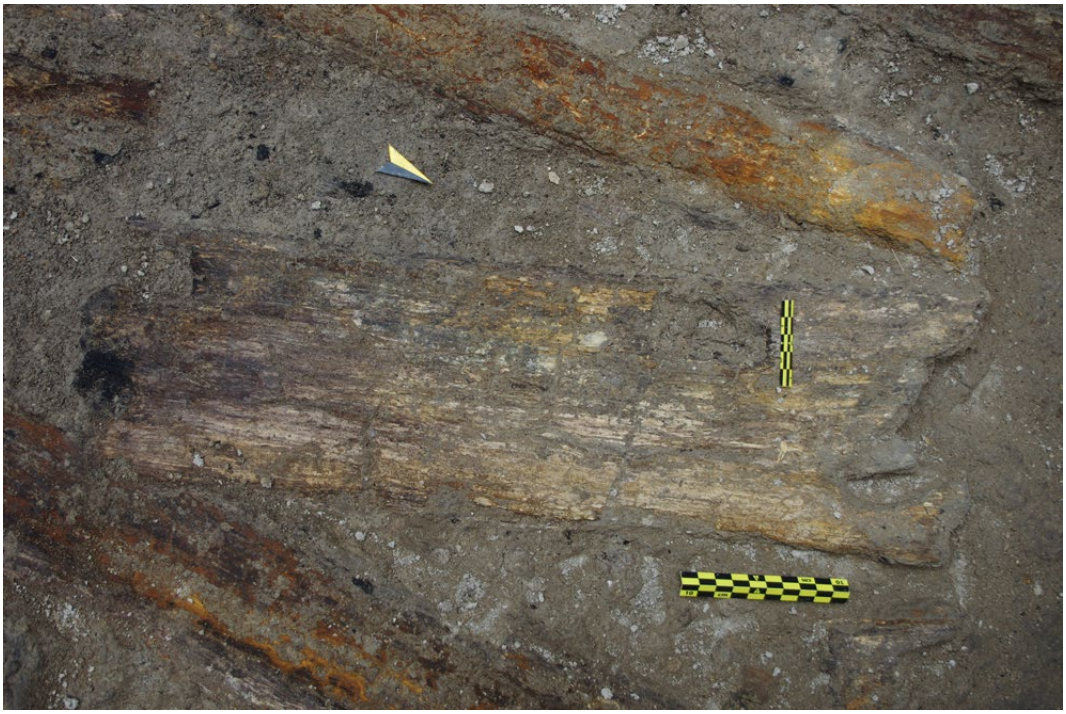


**Figure 5.** *Light remains of the squared-off wood piece 092-027. Image Credit: A. Chohadzhiev.*

Taking the example of a squared piece of timber, 092-027,[1] it would have been cut entirely from heartwood as it consisted only of lighter material (fig. 5). On the half-logs used for wooden floors, both types of preservation could be observed. The brown material was located above the lighter one, which might suggest that these pieces of wood had a flat surface (mainly composed of heartwood) facing downwards, while their bark/sapwood was facing upwards (fig. 4).

### *2.2. Laboratory analysis*

During field sampling, wood fibers were visible in what appeared to be heartwood, which might suggest that a xylological identification of the wood species, even rough, would be possible by analyzing at least the tangential planes of the wood horizontal pieces. The wood compression by sediment and past occupation, which is significant at a tell site, had reduced them to layers a few millimeters thick. This situation, noticed after sampling, makes for a much more complicated analysis of the radial and transverse planes.

Our doubts were confirmed as soon as we observed the first samples under a reflection microscope.[2] The transverse and radial planes showed a confused cellular structure,

[1] During the investigation, each wood piece received a label. As No. 092-027 will be discussed extensively below, it would be easier to use its label, even though no other labels of wood pieces are given in the text.

2 Analysis attempted with the help of Dr. Claire Alix, Assistant Professor at the Paris 1 Panthéon-Sorbonne University, UMR 9086 ArchAm.

both fragmented and compressed, which made it impossible to identify the wood rings or pores. We were slightly more successful when we switched to reflective microscopy of the tangential planes, since a few cells could be observed, although they were not well preserved. However, we were unable to identify them. When we tried to observe some samples with a transmission microscope lens, we also hit a (mud)brick wall. The fragments were too crumbly for suitable slides to be extracted. What is more, no characteristic anatomical features were visible. A few samples were nevertheless sent to the radiocarbon dating center in Lyon.

It is more than likely that the Hotnitsa wood might have gone through a more or less complete mineralization process. This hypothesis was then confirmed by the 'dating' results: after the acid-base treatments, which removed all the mineral elements, the samples were entirely dissolved.[1]

Therefore, the prospects for analyzing the Hotnitsa samples seemed limited. Tests of microscopic observation and discussions with several specialists, including Dr Anais Boura,[2] a specialist in the study of wood and leaf fossils, enabled us to discover a new avenue of analysis. The observation of the samples using a scanning electron microscope was envisaged, and we have contacted the microscopy laboratory at the *Maison des Sciences de l'Homme Mondes René Ginouvès* to carry this out in the near future. Finally, micromorphological sampling could have been another solution, for example by taking a core sample of the sediment including the pieces of wood. Such a study could have provided us with evidence on the types of wood used, as well as with information on the material degradation process. Similar samples have been taken from Tell Petko Karavelovo but have not yet been processed.

## 3. Architecture studies

### *3.1. Feature 112 / building 20*

Feature 112, also known as building 20, is located in the northern part of the North area, squares 75-85 and 77-87 (fig. 6). It was excavated between 2015 and 2017. It is oriented north-south and measures 7 m wide, with a length of at least 12 m; its north wall was not excavated (fig. 7). Excavations revealed a building consisting of three adjoining rooms. The southern room was 6 m long, the central room 2 m long and the northern room at least 2.7 m long. These rooms were separated by partition walls whose posts were founded in holes, apparently without foundation trenches. These partitions, 0.30 m thick, may have been built of daub on a wattle frame.[3] The perimeter walls, also built of daub on a wooden

[1] Personal discussion with Z. Tsirtsoni (CNRS, UMR 7041 ArScAn) who received the results from the laboratory.

[2] Assistant Professor at the Paris 6 University Pierre et Marie Curie, UMR 7207 Paleodiversity and environments research center.

[3] To date, there is no evidence of the use of wattle framing at Hotnitsa, horizons 4-5, even though this appears to have been the most common type in the region.




**Figure 6.** *Layout of building 20. Key: (1) ceramics; (2) floorboard; (3) joist; (4) main beam; (5) wood piece from wall or roof frame; (6) rock; (7) posthole; (8) posthole with wood remains; (9) wall; (10) foundation trench; (11) thermal installation's base; (12) unexcavated debris layer. Image Credit: A. Chohadzhiev.*




**Figure 7.** *Different views of building 20: (a) view to the northeast of the north half of the building; (b) view to the north of the north half of the building; (c) view to the northeast of the building at the end of the 2016 season. Black lines = 1 m. Image Credit: A. Chohadzhiev.*

frame, have a maximum thickness of almost 1 m at their base. Their posts are founded in holes dug in wide trenches, 0.50 to 0.60 m deep (Chohadzhiev et al. 2018, 48).

*3.1.1. Timber: morphology and function*

The study of timber in building 20 focused mainly on the floor elements. We had very little evidence about the walls and roof. There were eight unidentified pieces from the roof framing or walls, as well as several postholes. The postholes only allowed for an estimation of posts' maximum diameter. Their alignment and spacing about 15 cm apart suggests the use of loose wattle as framing (well-known from Tell Petko Karavelovo; Bacoup 2022a & 2022b, 177).

Similar construction processes were identified for the floors in the three rooms. The floor surfaces were made of boards that were almost all laid side by side. The average width of a floorboard is 9.7 cm (maximum 18 cm, minimum 4 cm). In most cases, the small gaps between some of the boards could reveal bad preservation.

These boards rested on joists running north-south. In the central and southern rooms, the five or six rows of joists allowed the builders to use boards that were shorter than the width of the building. A single, wide and squared central joist was uncovered in the north room. There may have been two more joists along the long walls but no evidence of their existence was uncovered. When uncovered, the central joist supported only the boards of the eastern part of the floor, and the floorboards in the western part had fallen from this joist (fig. 8). We can therefore deduce that the floorboards were shorter than the width of the room. In addition, the north room was slightly narrower than the other two rooms.

The floor joists had two different shapes: two of them were squared and the others were round. The two squared pieces were 13 and 17 cm wide. The others were between 5 and 15 cm in diameter (10.7 cm on average). Finally, the joists rested on main beams (binders) with diameters between 10 and 12 cm. Only two main beams could be identified. The floors were not dismantled at the end of the excavation project in 2017, and the lower elements of the timber frame could not be fully observed.

These floors appear to have been heightened. On the one hand, if they were built directly on the ground, the three-level wooden framework (main beam, joist, and board) would not have been necessary, as was the case at the tell site of Omurtag, for example (Angelova 1999, 66f). Furthermore, the sagging shape of the floors seems to indicate that they were raised and have collapsed (figs. 6 and 8).[1] Moreover, the discovery of a two-story house model at Hotnitsa seems to prove the existence of such raised floors (Chohadzhiev & Yordanova 2014, fig. 1). Nevertheless, the height of floors is not easy to determine, but the fact that they were preserved in connection to most of the timbers indicates that their collapse was neither sudden nor high. As the floors were not dismantled during the excavation, it was not possible to uncover the substructure but one can assume that some posts were strategically placed to support the raised floor.

It is complicated to assess the original diameter of the trunks used to make the boards, as we cannot determine whether they were done by radial or tangential splitting (for more information on the two types of splitting, cf. Darrah 2006, 118; Bacoup 2022b, 352ff). The same applies to the squared joists. However, if we consider only the size of the wood pieces used, it should be noted that they are of similar dimensions, regardless of their architectural function (see fig. 22 below). Thus, the timber pieces appear to have been mostly interchangeable and could have been used for several architectural functions.

[1] Alternatively, the sagging could have been the result of a pit underneath that served as a basement for the house. For the moment, however, we decided to stick to the term 'raised floor', meaning that it was not in contact with the ground surface and had a supporting framework.




**Figure 8.** *Different views of building 20: (a) view to the south of the south part of the building; (b) view to the northeast of the northwest part of the building; note that the planks have fallen under the joist; (c) floor-level view to the east of the northwest side of the building. Black line = 1 m. Image Credit: A. Chohadzhiev.*

*3.1.2. Assembling the wood pieces*

There is very little evidence of how each piece of timber was joined together in building 20. The boards couldn't have been fixed to the joists, a technique still common in parquet flooring until the twentieth century.[1] As for the superstructure of the building, a single fixture was identified: a mortise and tenon T-joint with an almost quadrangular

[1] Personal comment by F. Bacoup, woodworker.

cross-section and rounded corners, 11.5 cm long and 2.5 cm thick (fig. 9). The piece of wood showed traces of squaring. It might have been part of the roof structure, fitted into a post where the corresponding mortise was made.

*3.1.3. Entry between rooms*

The floor of the north room appeared to be slightly higher than those of the south and central rooms. No evidence of the entry between the latter two rooms is available, not least because it was partially located in the north-south balk. However, the entry between the central and the north room was investigated (fig. 10a). The study of the timbers and their layout revealed a small three-step staircase with three risers (fig. 10b). The pieces of wood appear to have been planks 6 or 7 cm wide.

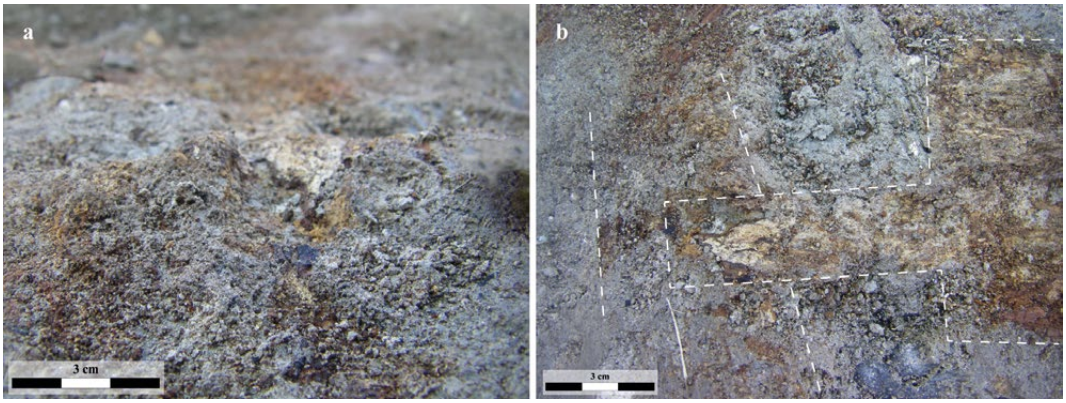



**Figure 9.** *Assembling through mortised tenon identified in the ruins of building 20: (a) tenon's profile, view to the west; (b) view from above at the two assembled pieces. Image Credit: the author.*

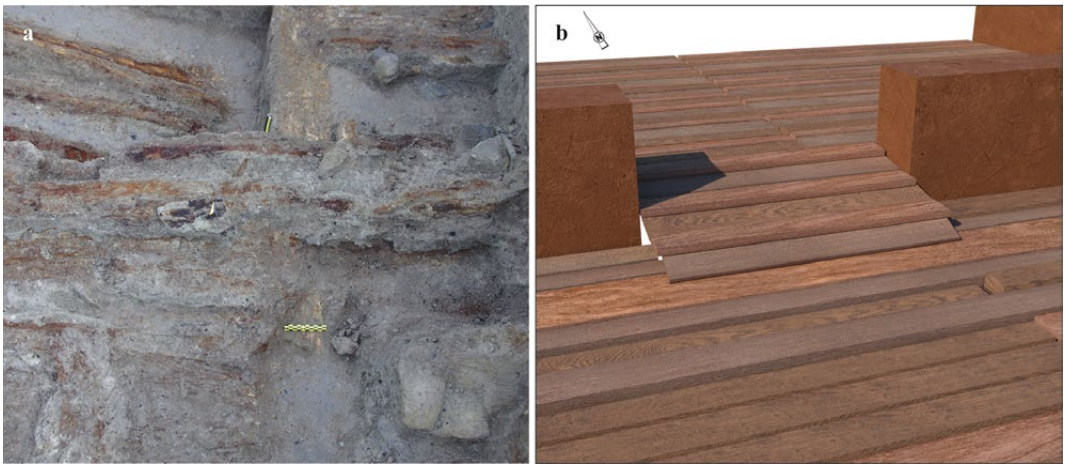



**Figure 10.** *Entry between the central and north rooms. Image Credit: A. Chohadzhiev (photo) & the author (3D rendering).*

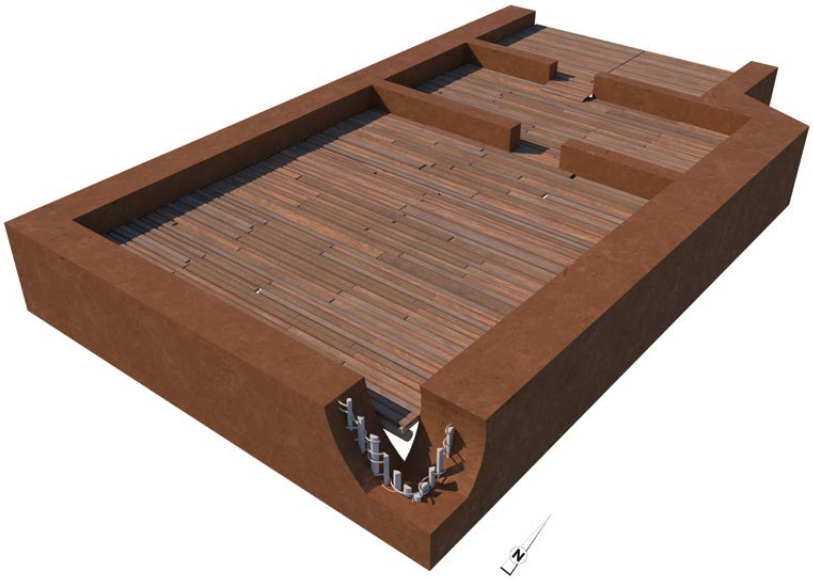


**Figure 11.** *3D model of the lower part of building 20. The white elements indicate interpretative hypotheses. Image Credit: the author.*

*3.1.4. Architectural synthesis and reconstruction*

Building 20 is therefore a structure with walls of daub on a wooden frame, comprising three communicating rooms separated from each other by partition walls. While there's no doubt that all three rooms were parts of the same house (doorways between rooms), the contemporaneity of their construction remains uncertain. The wooden frameworks of the floors in the south and central rooms are similar. They both feature several rows of joists, and the height of these floors seems to have been the same (fig. 11). This suggests that the construction of the south and central rooms was a single event. The 8.6-meter-long building might initially have consisted of two 5.5-meter-wide rooms (interior space).

However, the north room may have been added at a later date. The state of wood preservation excluded dendrochronological dating, which would have been the only way to precisely assess the chronology of each room. However, technical and architectural data offer some arguments that could confirm the existence of two periods. The first point would be the building's east wall, which was best investigated and shows an offset in its alignment to the north room suggesting that the perimeter walls of the north room were not built simultaneously with those of the other rooms. Second, the construction strategy for the floor in the north room is different. Unlike the floors of the other two rooms, it rested on a large central joist. What is more, the planks appeared to be butt-jointed on the joist, which differed from the construction strategy for the other floors.

What about the entrance to the house? Its location is not easy to determine.

1. If we consider the layouts of the twenty-one buildings of occupation level 1 excavated by Angelov, their entrances face either south (19) or west (2) and are always situated along the structures' length (Chohadzhiev & Chohadzhiev, forthcoming). No gaps in the foundation trench of the south wall of building 20 were found, unlike the investigated buildings at Petko Karavelovo, e.g., building 127 (Chohadzhiev 2021; Bacoup 2022a). However, building 20 at Hotnitsa was not a single-story building and the wall might have been built to a small height below the entrance opening. Thus, it could have been in the south wall, where two post holes were uncovered at the border between squares 75 and 85. These posts would have supported a structural element at the entrance.

2. Of the buildings of Hotnitsa's occupation level 1, three had two rooms each. In two of them, the rooms were of a similar size (houses 9 and 10[1]). In the third, house 12, the first room was very narrow compared to the second: 2.00 x 5.80 m, and 6.50 x 5.80 m, respectively. This structure could have been similar to an earlier phase of building 20, when the latter had only two rooms. In this case, the building's entrance would have been positioned to the north, and when the third room was built, it would not have been necessary to break through the north wall of the central room to make an entry to the new room as the old entrance could have simply been used.

Finally, the floors consisted of wooden boards running east-west across the width of the building, resting on perpendicular joists that rested on main beams. The widths and diameters of these pieces were quite similar. The main beams were slightly elevated, perhaps to provide a crawlspace, as well as security against flooding from the river Bohot.

### *3.2. Feature 124*

Feature 124 is located in the southern part of the North area (squares 73 and 74) and corresponds to the wooden floor of a building that was approximately 3 m wide on the inside. Its total length is not known as the building continues further south, out of the excavation area, but it was at least 6 m long (fig. 12). The building is oriented north-south, with a slight northwest-southeast deviation. There are two main orientations of the floor's wood pieces: east-west in the south half of the building and north-south in the north half (figs. 12 and 13). A west-east line of postholes separates the two floors starting from the west wall and running in the western two-thirds of the room. The foundation trench of the east wall was uncovered measuring 60 to 70 cm thick. It was not excavated. The north wall of the building was marked by three postholes aligned east-west. The west wall of the building was made of daub on a wooden frame; it was 20 to 30 cm thick and was preserved between 15 and 18 cm high, with numerous post imprints (fig. 13; Chohadzhiev et al. 2014, 85; Chohadzhiev & Chohadzhiev 2017, 95f).

#### *3.2.1. Timber: morphology and function*

Remains of the superstructure of the building's west wall were only uncovered. The imprints left by the posts in the daub likely reflect the size of the wood pieces. Eighteen

[1] To avoid confusion, the structures excavated by Angelov are referred to as 'houses', and those excavated by Chohadzhiev are referred to as 'buildings'.




**Figure 12.** *Layout of feature 124. Key: (1) ceramics; (2) floorboard; (3) joist; (4) rock; (5) post-hole; (6) foundation trench; (7) cut; (8) clay installation. Image Credit: A. Chohadzhiev.*

post imprints were preserved, their average diameter being 7.6 cm (maximum 12.6 cm, minimum 5.1 cm). The state of daub preservation does not allow to determine whether the timbers were split or worked. Nevertheless, the posts' arrangement suggests the use of wattle as an internal framework for the wall, even if no wattle sticks were identified during the excavation.

The floor in the south room was made of boards running east-west almost side by side, with widths ranging from 2.3 to 16.5 cm (average: 6.2 cm; see fig. 22 below). Same as in building 20, it is difficult to determine the original diameter of the logs used to make



**Figure 13.** *View from above of the south floor of feature 124 excavated in 2016. Image Credit: A. Chohadzhiev.*

the boards. Without any known assembly, they rested on three joists spaced 1.50–1.60 m apart. The joists were made of small logs measuring 7.5, 7.9, and 8.9 cm in diameter.

The wood pieces of the floor in the north room were worse preserved. The floorboards ran north-south and had an average width of 6.9 cm (maximum 10.4 cm, minimum 4 cm; see fig. 22 below). Only three joists were preserved over a short length in this structure, but they were not distributed in the same way as in the south room. Spaced about forty centimeters apart, they form a mesh that seems tighter than in the south room. These round joists were made of logs measuring 4, 6.3, and 10.4 cm in diameter.

If we consider the size of the wood pieces used, it seems obvious that, as in building 20, they have a very similar average width/diameter in both rooms. However, the joists

vary less in diameter than the floorboards. This can be explained by their limited number and by the builders' objective of obtaining a relatively flat floor surface, which would not have been possible with joists of too varied sizes. Moreover, the floors in both rooms were made of wood pieces of very similar sizes.

*3.2.2. Structural interpretations*

The relatively small number and diameter of the joists in the south room indicate that the floorboards covered the entire width of the room. In the case of the north room, it is possible that a larger number of joists were used to form a 'grid-base' for the planks across the whole area. This means that each floorboard did not necessarily cover the entire length of the room.

Unlike building 20, the floors of feature 124 showed no sagging. It is therefore not certain if the floor of this building was raised, and only an excavation of the underlying levels would help to confirm or refute this hypothesis.

The evidence is too fragmentary to enable the reconstruction of the building's entrance. The partition wall between the rooms could have not been daubed; a simple wooden (wattle?) partition wall could have been used to separate the spaces. Finally, the entry between the rooms was located at the east wall (fig. 14).

It is highly likely that the floors in both rooms were built as a single event, as suggested by the similar size of the timbers which had the same functions. However, the strategy for placing the timbers is different, as we discussed above; the boards in the south room covered the entire width of the area, while those in the north room did not. This would indicate that the floor builders made a practical choice. They reserved all the boards long enough for the south room, which required the use of only three joists of similar size, and then made do with the shorter boards for the north room.



**Figure 14.** *3D model of the lower part of the building whose floor is labeled as feature 124.*

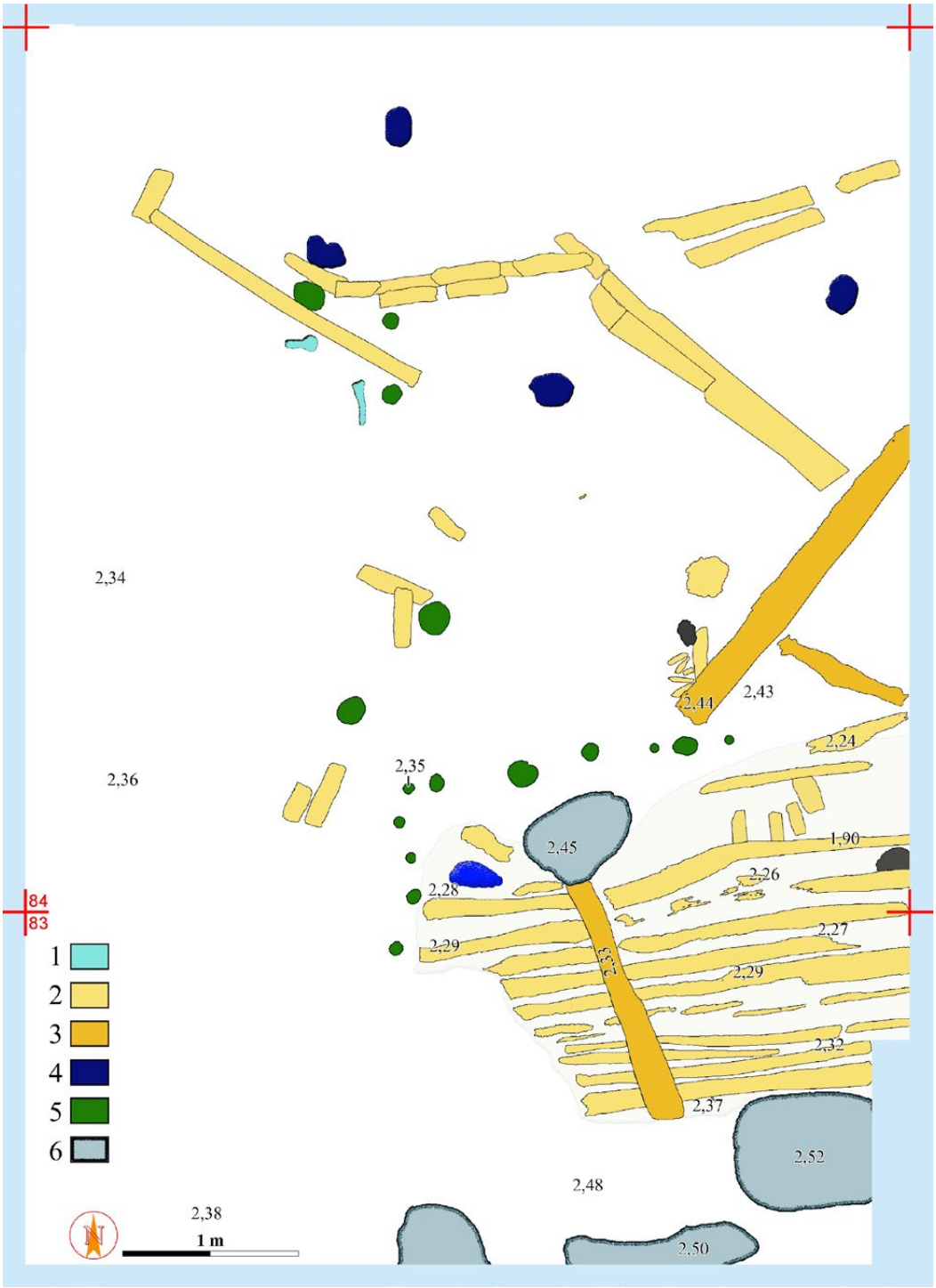



**Figure 15.** *Layout of feature 99. Key: (1) animal bones; (2) floorboard; (3) a wood piece from a wall or roof frame; (4) rock; (5) posthole; (6) cut. Image Credit: A. Chohadzhiev.*

### *3.3. Feature 99*

The badly preserved remains of feature 99 were uncovered in squares 83 and 84 of the North area (figs. 15 and 16). An east-west row of postholes (with a slight north-east-southwest deviation) divided the structure in two rooms, similarly to the layout of feature 124. Another row of postholes aligned roughly north-south forms an angle with the first row pointing to the northwest. These postholes yielded no evidence on the posts' diameter, and even though it seems that they outline the northwest corner or the south room, it is impossible to assess the size of the building.

Only wood remains were preserved from the north room, and not very informative at that. The remains in the south room, however, suggest that the floor was built of boards ranging in width from 2.2 to 16 cm (8.6 cm in average). As with feature 124, it is not possible to say whether the floor of feature 99 was raised, but the total absence of joists does not seem to suggest such a construction.

### *3.4. Feature 132*

Feature 132 is located in squares 91 and 92 of the South area (figs. 17 and 18). Most of the wood pieces there were the remains of a floor which extended further west and



**Figure 16.** *View to the north of the floor of the south room of feature 99. Image Credit: A. Chohadzhiev.*

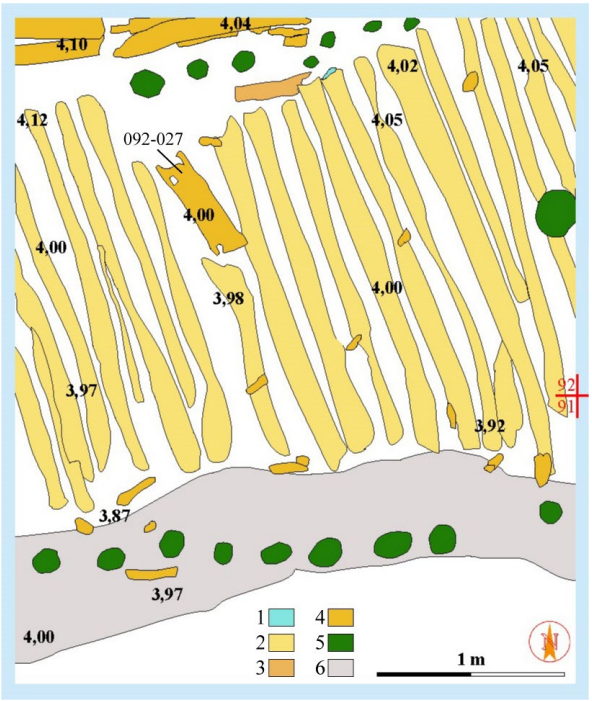



**Figure 17.** *Layout of feature 132. Key: (1) animal bones; (2) half-round logs; (3) a wood piece from a wall or roof frame; (4) rock; (5) posthole; (6) cut. Image Credit: A. Chohadzhiev & the author.*



**Figure 18.** *View from above of feature 132. Image Credit: A. Chohadzhiev.*

east, out of the excavation area. A later, east-west running trench cut the south end of the floor. Most of the central part of the feature was occupied by wood pieces aligned south-east-northwest. A northeast-southwest row of postholes was uncovered at the north end of the area that seem to have been contemporary to the floor. The wood pieces that were found north of them ran parallel to the postholes' row (Chohadzhiev et al. 2018b, 46).

*3.4.1. Timber: morphology and function*

The central part of the feature was occupied by a floor whose boards were oriented southeast-northwest. These were half-round logs lying on their flat sides (fig. 19). Their diameter varies between 4.5 cm and 15 cm (9.1 cm on average). The upper sides of some of them showed traces of work with a stone adze or axe (fig. 20). These marks indicate that the height of the boards making up the floor was adjusted to produce a flat surface, and/or that the logs were delimbed.

A single piece of wood was preserved that was long enough (ca. 50 cm) to be clearly defined as a joist, a small round log measuring 7 cm in diameter. No evidence is available as to how the boards were joined to the joist, but it seems highly likely that they were simply laid on top.

The northeast-southwest oriented wood pieces at the northern end of the area did not belong to a floor. They overlapped and appeared to have fallen from above. The same applies to piece 092-027 (figs. 5, 17, and 18). They could have fallen either from the roof frame or from the walls.

Four of these wood pieces were squared off, making it impossible to reconstruct the original trunk from which they were cut. Their width varies between 2 and 16 cm. The others were round logs with diameters ranging from 2.7 to 8 cm (4.6 cm on average).

*3.4.2. Assemblies*

As soon as the feature was excavated, several holes were identified in the timbers. Some of them, particularly those found in the floorboards, could be linked to the disappearance (decayed or simply come off) of dead knots. At the same time, six other holes appear to have been mortises: two circular and four quadrangular. The first circular mortise has a regular shape and measures 4 cm in diameter (MT-003; fig. 21a). The second has a more irregular outline and a diameter of 3 cm (MT-005; fig. 21b). The quadrangular mortises are quite distinct. Two have similar dimensions: 5 by 3 cm and 6 by 3.5 cm (MT-002a and b; fig. 21c1 and c2). The other two are smaller: 3.5 by 2.3 cm (MT-004; fig. 21d) and 4 by 3 cm (MT-001; fig. 21e).

One example of a tenon, very poorly preserved, was found very close to the MT-001 mortise. It is 8.5 cm long and 2.5 cm wide (TN-001). Although we cannot be certain that these are two elements of the same assembly, their size and proximity support this hypothesis.

*3.4.3. Conclusions about feature 132*

The small surface area of this feature makes it impossible to reconstruct the morphology and dimensions of the building it comprises.



**Figure 19.** *Floor-level view (to the north) of feature 132. Note the half-round shape of the logs. Width of the trench 3 m. Image Credit: A. Chohadzhiev.*

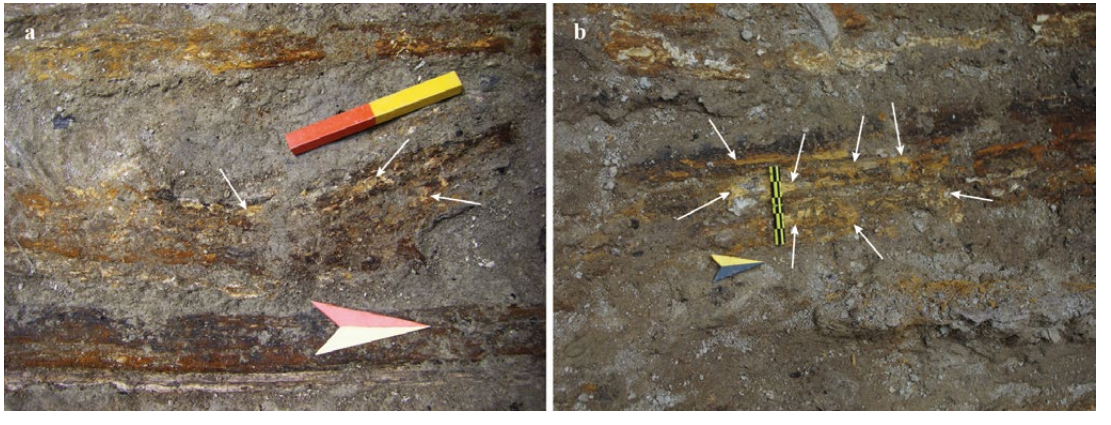



**Figure 20.** *Wood pieces bearing work traces, probably from ground stone tools (marked with white arrows). Image Credit: A. Chohadzhiev & the author.*




**Figure 21.** *Mortises identified in feature 132: (a) circular mortise MT-003; (b) circular mortise MT-005; (c) quadrangular mortises MT-002a (c1) and MT-002b (c2) on the wood piece 092-027; (d) quadrangular mortise MT-004; (e) quadrangular mortise MT- 001. Image Credit: A. Chohadzhiev & the author.*

This floor is the only one studied made up of half-round timbers, all the others being made up of planks. The single joist makes it impossible to compare the dimensions of the timbers in terms of their structural function. However, its diameter is of the same order of magnitude as the average diameter of the half-round logs (7 and 9.1 cm).

Last, this study enabled us to identify a variety of traces of woodworking within the same feature. Indeed, several pieces clearly bear traces of squaring. Stone adzes or axes have probably been used for delimbing or levelling half-round logs as also for squaring. There is also evidence of the shaping of a tenon and several mortises, indicating mostly the use of chisels (bone or stone). Finally, there is evidence of splitting to shape floor pieces.

**4. Interpretations and conclusion**

The study of these four features has enabled us to reconstruct the techniques used for the construction of wooden floors. The buildings, which were not destroyed by fire, did not leave much trace of their superstructure.

From the point of view of the layout of the site, the structural study provides few answers, as the plans of the buildings have not been uncovered in their entirety (fig. 2). Features 99, 124 and 128 (unexcavated) are three small parallel buildings whose walls may have been very close to each other, as is known for horizon I of the site (Chohadzhiev & Chohadzhiev forthcoming). Concerning building 20, its north room was very probably not built during the first phase of the building's life. The east wall was slightly offset to the west, a potential indication of a nearby building in the unexcavated area.

The raising of floors also remains an unresolved issue for several buildings. Only building 20 showed clear evidence of raised floors. In other excavation contexts, even when the wood material is better preserved, it is often difficult to be sure that floors were raised, since the connections between the beams, joists and posts are not known (see for example Lundström-Baudais et al. 1989, 128f).

In all, 326 of the 393 pieces of wood investigated could be linked to an architectural function and give a measure of their width or diameter. The most significant pieces are those used in the frames of the floors (fig. 22). It is quite clear that the sections of the floor pieces in feature 112 (building 20) are larger than those of the other ones. The other three structures have wood pieces which, regardless of their structural function, have similar widths or diameters. The examination of the dimensions of the wood pieces for each function separately suggested a desire to obtain flat levels for each stage of construction: leveled beams, equivalent joists and a regular floor. It could also reflect a fairly standardized timber sourcing strategy from trees whose diameters rarely exceed 13 or 14 cm. Experimental work carried out on the felling of trees with stone axes reveals that a hardwood tree such as oak, ash or maple (species attested on the site) with a diameter of less than 14 cm can be felled in about three times less than a tree larger than 14 cm (Bacoup 2022b, 322ff). However, the use of boards (as well as squared timbers) does not allow us to get the dimensions of the tree used to make them.

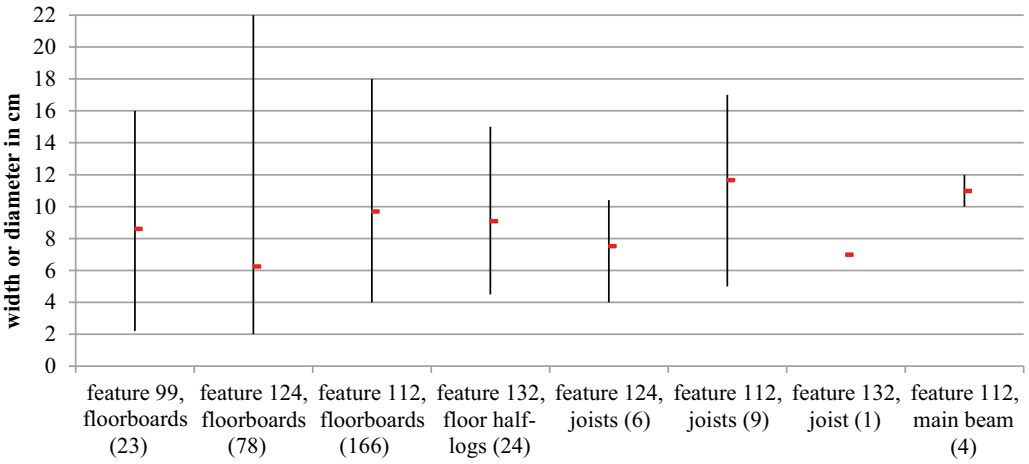



**Figure 22.** *HLC chart showing average diameters or widths (in red) and their ranges (from minimum to maximum diameters/widths) for timber used for different structural functions in each feature. Image Credit: the author.*

The regularity of the wooden floors also provides an answer to one of the questions asked during the excavation: were these floors used to support a layer of daub, as was the case at other Neolithic sites such as Dikili Tash, Stara Zagora and Promachonas-Topolnitsa (Bacoup 2022b, 80ff and 103ff; Kalchev 2013, 23 and 90f; Aslanis 2010, 38 and 41)? Our impression at the time of excavation was that there was no daub on these floors, like those at Omurtag (Angelova 1999, 66f). The sediments found on these structures seems to have come from the walls. Furthermore, the presence of animal bones, lithic material, and a few pottery sherds directly on these floors also makes us believe that the occupation deposits cover directly the wooden surfaces. Another argument is the regularization of the half-round logs in feature 132 with a stone adze or axe. If these wood pieces had been covered with daub, there would have been no point in standardizing their thickness.

It is highly probable that adzes or axes were used for squaring, as attested by the remains of all excavated buildings, but also for shaping tenons and mortises, as attested by the experimental work, which combined stone adzes and bone chisels and the use of fire (Guillonnet 2021, 41f, figs. 6 and 7). The splitting of the logs for feature 132 most probably involved the use of wooden tools that have not been preserved (Darrah 2006; Bacoup 2022b, 352ff; Muigg et al. 2023).

Several floor construction schemes have been identified. (1) The first is related to the construction of the floor of the south room of feature 124 and potentially of feature 132. This involves the use of floorboards as long as the width of the room. In this case, the floorboards rest on just three joists, two of which are placed along the walls and a third halfway between the first two. (2) The second scheme is related to the construction of the floor of the north room of feature 124, the floor of the south room of feature 99

and the floors of the south and central rooms of feature 112 (building 20). In this case, the floorboards vary in length. This means that they lay on more joists, which were less widely spaced, so that all the boards rested on at least two supports. (3) The final scheme is related to the floor of the north room of feature 112 (building 20). Here we see the use of two categories of distinct lengths of floorboards. The shorter pieces were laid parallel to each other, with one end resting on a joist along one of the walls and the other end resting on a wide joist inside the room. The longer pieces perfectly covered the remaining width between the wide joist on which they also rested and a third joist along the opposite wall.

The first and third schemes show that the lengths needed to build the floor were anticipated before the wooden trunks were cut. This does not mean, however, that the lengths were standardized, unlike the widths. The second pattern shows that the attempt to anticipate the lengths of the pieces was not always successful, perhaps because of mistakes during the splitting process. It turns out that the builders did not throw away boards that did not correspond to the lengths required for schemes 1 and 3 and used them to make the floor of other rooms. This demonstrates the adaptability of the builders when faced with certain situations. Anticipation and adaptability therefore seem to be two important concepts (Berthoz 2003; Pigeot 2011; Procopiou 2011) in the use of wood to make floors.

Finally, it is worth discussing how the pieces of wood were joined together. During the excavation of these structures, when two pieces of wood were placed one on top of the other, it was rare for the wooden material to have been preserved, which explains why, on the plans, the floorboards stop at the joists (fig. 13). This lack of preservation has not yet been fully explained and results in a loss of information about the techniques used to join the boards to the joists, even though it seems very likely that no joint was used.[1] In addition to the floors, the joints found at the site relate to the walls or roofs of the buildings. The use of mortise and tenon assembly is attested for building 20 (feature 112). In the other cases, these are either tenons or unassembled mortises. The latter indicates the use of cylindrical and parallelepipedal tenons, as known from other sites in the Balkan, Aegean, and European Neolithic/Chalcolithic (for examples, cf. Bocquet 2010, 27; Tegel et al. 2012, figure 4; Bacoup 2022b, 70ff).

**Acknowledgements**

This article is based on the doctoral studies carried out by the author at the University of Paris 1 Panthéon-Sorbonne and the UMR 7041 ArScAn (Aegean Prehistory team), under the supervision of Prof. Hara Procopiou and Dr. Zoï Tsirtsoni. The author would particularly like to thank the directors of the archaeological operations at the Chalcolithic tell site of Hotnitsa, Stefan Chohadzhiev and Alexander Chohadzhiev, for

[1] Personal communication with A. Chohadzhiev; where two wooden pieces were in contact, it seems that the disintegration process usually occurred quicker than the mineralization process and this can explain the missing links too.

their trust, their help, and the free access to all the unpublished site records without any restrictions.

Finally, this article is the first to appear since the death of the person at the origin of my family's love for wood, Mr. Roger Bacoup, carpenter, joiner. May he receive a tribute with these words.

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Studia Praehistorica 17, 2023, 133–216

# The Late Copper Age building BII-21B at Tell Yunatsite, south central Bulgaria

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**Abstract**
*This paper considers the structure investigated at the largest area (labeled as BII-21B) in the Chalcolithic level BII of Tell Yunatsite, located in the western parts of the Upper Thracian Plain. It collapsed during a sudden fire, which did not affect the neighboring house to the west. The debris sealed a large number of fragmented vessels, plant remains, and even some of the inhabitants. Detailed analysis of the materials found allows for a reconstruction of diet and storage practices, research on vessels' function and technology, decoration styles, etc. The plant remains are abundant and demonstrate a diverse species composition. The complex is dominated by lentils, barley, and einkorn wheat. Of particular interest is the evidence on purposeful gathering of grapes for producing a drink, perhaps wine.*
*The investigation of the ceramic assemblage shows that it belongs to a developed – but not final – stage of the Late Copper Age in Upper Thrace. It also provides new information about the contact zone between the Karanovo VI and Krivodol cultures in this area.*

**Keywords**: *Late Copper Age house – storage practices – pottery styles – residue analysis.*
https://doi.org/*10.53250/stprae17.133-216*

## Introduction

Tell Yunatsite is situated in south Bulgaria, in the western part of the Upper Thracian Plain. Its base measures 110 x 100 m and it stands 12 m high. The tell developed on a low terrace on the then bank of the Topolnitsa River. It is located in a fertile plain bounded by the Rhodope Mountains to the south, Rila and Ihtimanska Sredna Gora Mountains to the west, and Sashtinska Sredna Gora Mountain to the north (fig. 1).

The first excavations at the site were carried out by Vasil Mikov in 1939. A systematic excavation project at the tell's eastern area began in 1976 and is ongoing (Katincharov et al. 1995; Boyadzhiev et al. 2011; Mazanova 2011). So far, the excavations have yielded evidence of occupation from the fifth millennium BC until the sixth century AD, including Copper Age, Early Bronze Age, Iron Age, and Roman occupations, as well as a medieval cemetery. Long-term habitation was identified for two periods: the Chalcolithic (fifth millennium BC) and the Early Bronze Age (third millennium BC).

Only the last Chalcolithic settlement (level BI) was investigated over the entire eastern area of the site (Mazanova 2011). Excavations since 2012 have mostly focused on the Chalcolithic sequence below level BI in the east central part, which includes Mikov's Trench and the area further south (fig. 2).

This paper focuses on the structure investigated at the largest area in the Chalcolithic level BII, which provides important evidence on the house construction planning, subsistence practices, and the ceramic assemblage.

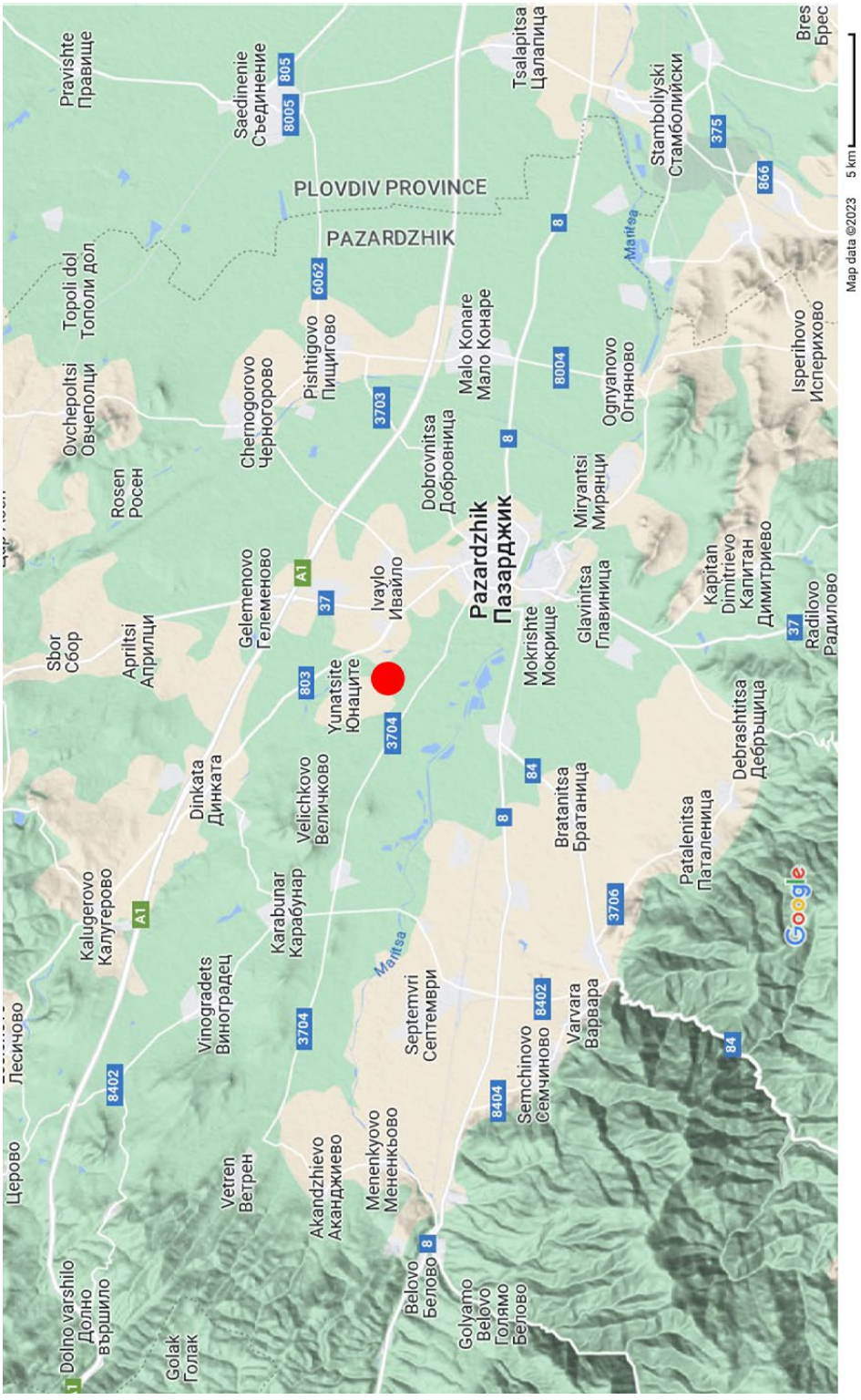



**Figure 1.** *Map showing the location of Tell Yunatsite. Image Credit: Google Earth.*



**Figure 2.** *Aerial view of Tell Yunatsite with the area investigated in 2012–19. Mikov's Trench is outlined in yellow and building BII-21B is outlined in red. View to the west. Image Credit: Tell Yunatsite Project.*

**Building BII-21B**

***Stratigraphic sequence***

So far, the remains of six Chalcolithic 'building levels' (BI–BVI)[1] were partially excavated in the east central part of the site. Evidence of at least four more is recorded in a section profile along the eroded east periphery of the tell (Boyadzhiev et al. 2021).

Building BII-21B is located in grid squares O4–O5, П4–П6, and P5 (figs. 2 and 3) and dates to the initial stage of level BII. The comparison of its stratigraphic position with the area to the west suggests that it was built simultaneously with building BII-20 in grid squares П6, O6, and O7. This is clearly evidenced by the greenish clay leveling, which was identified under the southwestern part of building BII-21B, under the southeastern part of building BII-20, and in the space between them. Several successive layers of floor plaster covered this leveling layer, and the burnt debris of building BII-21B lay on top of

1 The term 'building level' is used here only provisionally as different buildings may have been built or destroyed at different times, had a different period of use and/or went through different interior reconstruction events.
The Chalcolithic layer is labeled with the Cyrillic letter B, while its consecutive levels are marked with Roman numerals (top to bottom). The grid is labeled with Cyrillic letters and Arabic numbers (cf. fig. 3).

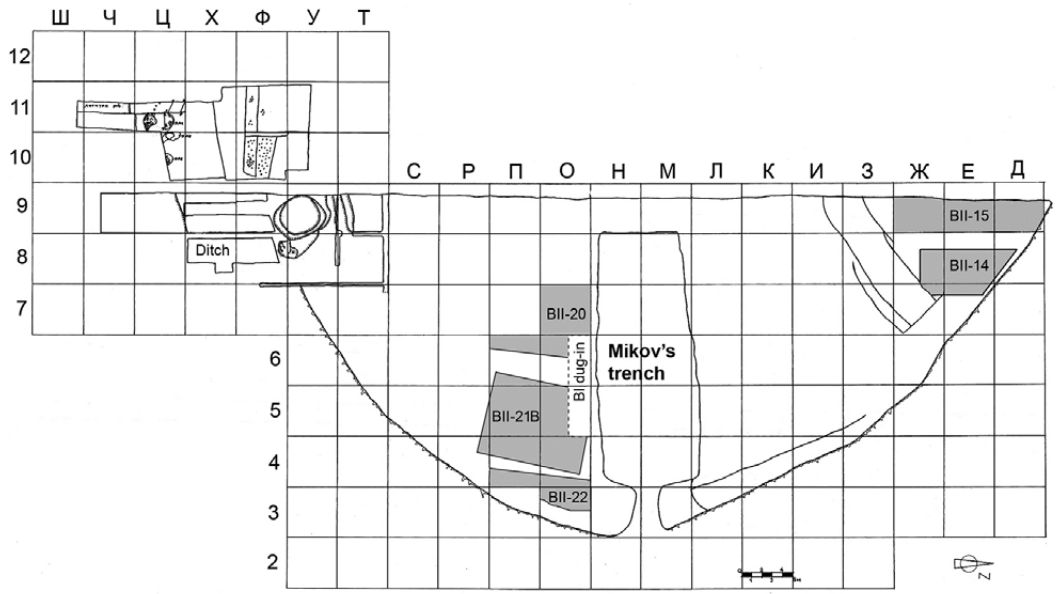



**Figure 3.** *Tell Yunatsite, plan of building level BII. Image Credit: Tell Yunatsite Project.*

them. However, the fire that destroyed the house did not affect the neighboring building BII-20, which continued to be used. Apparently, level BII had a long period of occupation, but with a different life-spans detectible in different parts of the settlement.

Above the debris of building BII-21B, mainly in its northeastern part, there was a dark brown layer with a concentration of burnt daub pieces (context 356). Above, and in some places directly on the debris, lay a 'package' of several layers of clay plaster. Above this leveling, followed in succession a homogeneous layer of black clayish sediment, gray-green clayish sediment, and burnt debris that were spread and leveled (fig. 4). There were no installations in these layers, and the archeological materials were few. Several trenches and other cut features related to this stratigraphic stage (designated as BIIA) were uncovered. The interpretation of the context is ambiguous, but there is no definite evidence of occupation. Above the upper debris layer lay the base of the last Chalcolithic settlement (BI).

***House layout, architecture, and interior***

Most of the area of building BII-21B was excavated. A large cut feature from level BI truncated its northwestern part (figs. 3–6); several other disturbances from upper levels were revealed (trenches, pits, postholes). The structure's eastern wall was investigated almost entirely. The foundation trench measured 0.30–0.35 m wide and ca. 0.20 m deep, with postholes of 0.10–0.12 m in diameter. They are mainly concentrated in its northern part, in grid square O4. Parts of the western and southern walls were excavated in two



**Figure 4.** *Grid square П5, west section profile: the stratigraphic sequence of levels BIIA and BIIB. Image Credit: Tell Yunatsite Project.*

stages, the latter having been revealed when the balk between grid squares П5 and П6 was removed.[1] Their substructures are similar to the eastern wall: foundation trenches about 0.30 m wide. In the southern trench, postholes of 0.10–0.12 m in diameter were uncovered set at 0.12–0.15 m from one another. Only the post at the southwestern corner had been larger, the posthole being 0.30 m in diameter. The eastern part of the wall in grid square P5 was largely destroyed by later pits. In the western trench, postholes were only recorded in its northern part in grid square O5 (fig. 5). Small parts of the aboveground clay construction of the southern and western walls were also revealed. The southern wall was better preserved; at the southwestern corner, it stood to a height of ca. 0.15 m and was ca. 0.15 m thick.

The northern wall was not found, but the lack of evidence of the building in the southern wall of Mikov's Trench suggests that it remains entirely below the balk between grid square O4 and the trench.

The burnt debris of the building is highly fragmented and provides scarce information about the construction of the house. Few imprints of posts and twigs were preserved. The daub pieces measured maximum 0.10 m and contained a large amount of chaff.

The building measures ca. 10.60 m long and ca. 7.50 m wide, with a total area ca. 80 square meters. It's NNE–SSW oriented and had at least two rooms. The main room was in its southern part, in grid squares П4–5 and in the southern parts of O4–5. Approximately 1 m west of the east wall, a ca. 2 m row of small-diameter (5 or 6 cm) postholes was uncovered in the southeastern part of the structure running parallel to the wall (fig. 5). They are probably the remains of a partition that partially divided the large southern room, similarly to the layout of building BIII-1.

The floor of the southern room is covered by a package of 8 or 9 layers of plaster, while a single plastering was identified east of the partition wall in the southeastern part. The uppermost layer was made of fine green clay (fig. 6). There is a pronounced difference

[1] This took place in 2023, when the paper was already in preparation. The main new information has been added here.

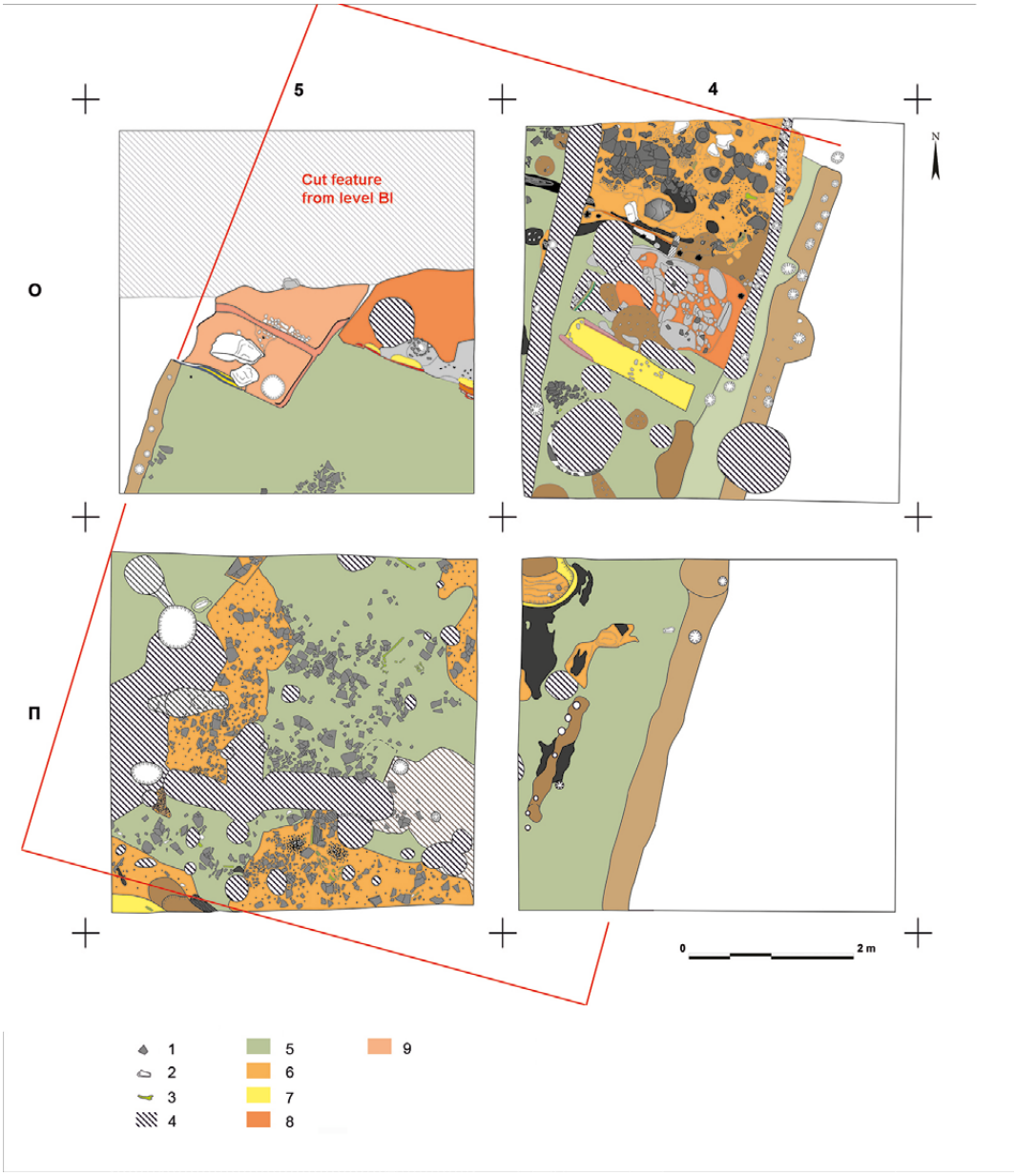



**Figure 5.** *Layout of building BII-21B. Key: (1) pottery; (2) stones; (3) bones; (4) later pits / postholes; (5) green clay – floor plaster; (6) burnt debris; (7) yellow clay; (8) debris of daub installations; (9) daub installations (contexts 376 and 377).*
*Image Credit: Tell Yunatsite Project.*



**Figure 6.** *Aerial view of building BII-21B. North points to the top. Image Credit: Tell Yunatsite Project.*

in the elevation of the southern and the northern part – from 7.30 to 7.55 m BD, respectively.[1] Most of the floor in the southern room was covered by broken pottery and charred grain (figs. 7 and 8); some were scattered directly on the floor, while others were found on a thin layer of charred organic matter. Vessels were missing east of the partition wall. Also, articulated human skeletal remains were uncovered in the southern part of the building lying under burnt structural debris and pottery sherds (fig. 9).

A fragmented ceramic model of an oven (fig. 66/11), ceramic anthropomorphic figurine (fig. 66/10), and a grindstone were found at a close distance from each other under the burnt debris in the southwestern corner of the southern room, in the balk between grid squares П5 and П6. The position of the first two artifacts seems to suggests that they have fallen from some height, possibly from a 'domestic altar'.

Several installations were revealed in the northern part of the southern room. Next to the western wall of the house, there were two adjacent installations with a common clay wall (contexts 376 and 377; fig. 5). The south one is rectangular and measures 1.60 x 1.00 m. Its base lay ca. 0.30 m below the uppermost plaster surface of the floor of the building, and its walls were preserved at least ca. 5 or 7 cm high. It had vertical walls and flat base,

[1] The datum is located at the top of the tell.



**Figure 7.** *Aerial view of grid square П5, the southern room of building BII-21B. North points to the top. Image Credit: Tell Yunatsite Project.*



**Figure 8.** *Grid square П5. Concentration of fragmented vessels on the floor of building BII-21B. View to the west. Image Credit: Tell Yunatsite Project.*



**Figure 9.** *Burnt skeletal remains of a child under the debris of building BII-21B, southern room, grid square П5. North points to the bottom. Image Credit: Tell Yunatsite Project.*

both made from light brown clay. Two large slab stones were found on it. The northern installation was disturbed by a cut feature from level BI. The preserved part of the walls and the base were similar to the south one. A foundation of small pebbles lay under the clay plaster of the base. These installations might had served as storage bins, but there are no finds to prove this beside a few animal bones (fig. 18). So far, no similar features were uncovered in the settlement.

Immediately east of the northern facility, the remains of another installation were uncovered: highly fragmented burnt debris, including two or three plaster fragments from a thermal installation's base. It seems possible that the oven of the building could have been located there, its upper part having been destroyed during later leveling of the area. South of the burnt clay debris, there was a clay wall, preserved to a height of 0.10 m, the exterior of which was decorated with red paint. This was probably the south wall of the oven. Its eastern wall was partially identified in 2023 when the balk between grid squares O4 and O5 was removed. The northern wall was destroyed by the cut feature from level BI. The preserved part of the oven measured ca. 1.60 x 1.40 m.

Northeast of the thermal installation, a podium was revealed in the middle of grid square O4 (fig. 10). It had a roughly square outline measuring 1.80 x 1.70 m and ca. 0.15 m high. Its upper surface was flat. It was built of daub with a large amount of organic temper (chaff) that covered a wooden frame made of parallel, horizontal logs with a diameter of 6–8 cm (fig. 11). Imprints of planks could be seen in some of the daub pieces in its periphery. Its southern wall was made of yellow clay, with traces of red paint on the outside. No finds were uncovered on the podium.

Its northern side was attached to a partition wall which separated the southern and northern rooms of the building. Remains of charred posts with diameter of ca. 0.10 m were preserved in the foundation trench (figs. 6 and 10). The north room was quite narrow, probably about 1.70 m. Its length was at least 3.50 m, but to the west it was truncated by the cut feature from level BI. Its preserved part was completely covered by burnt debris, broken vessels, charred grain and fruit, and several rocks, including a mortar and three grindstone fragments (figs. 12–14). Some of the vessels were found in relatively compact areas standing upright on the floor. The sherds of others (like the vessel labeled as I in fig. 13) were scattered over a greater area (up to 2.00–2.50 m) among or above the burnt debris. The mortar also lay on top of burnt daub and a burnt plank (fig. 15).

In both rooms, some of the vessels were found standing upright on the floor, while others had obviously fallen from a certain height, which suggests that the latter might have been kept on shelves.[1] In some of the cases, however, the sherds lay on debris or human skeletal remains. It seems that the rooms had a wooden ceiling – above the northern room, it appears to have been daubed, but not above the southern one – and that this second level was used for the storage of vessels and food supplies. There is no evidence of

[1] Use of shelves has been theorized for level BI buildings by Mazanova et al. 2021, 227.

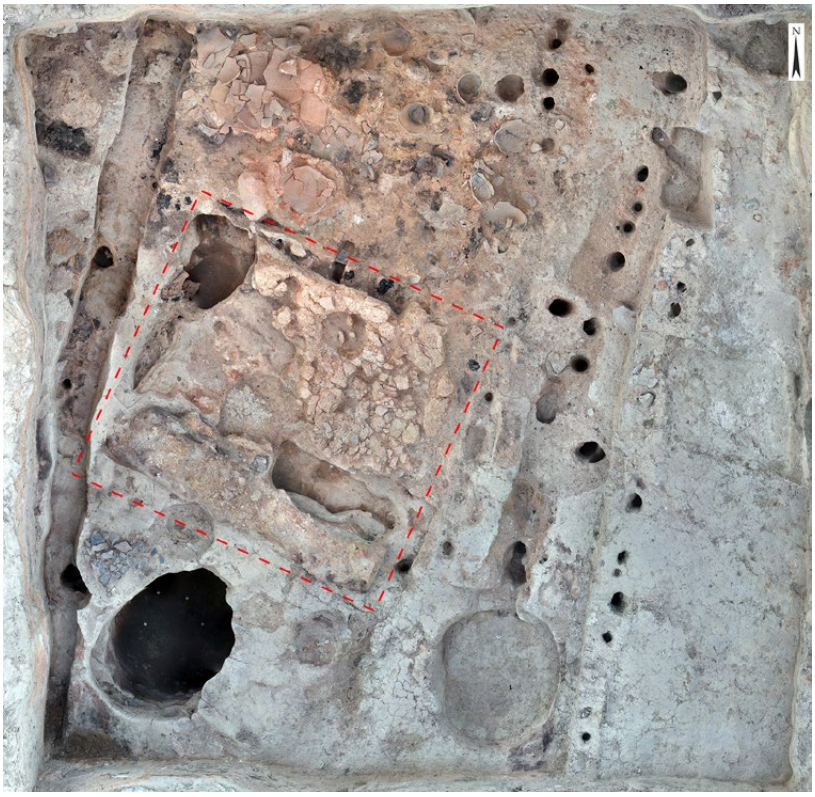


**Figure 10.** *Grid square O4. Podium in the northeast part of the southern room (outlined with a red punctured line) and fragmented vessels in the north room. North points to the top. Image Credit: Tell Yunatsite Project.*



**Figure 11.** *Grid square O4. Podium in the northeast part of the southern room: detail of its construction. View to the south-southwest. Image Credit: Tell Yunatsite Project.*



**Figure 12.** *Grid square O4. Northern room of building BII-21B: uppermost level of burnt debris with fragmented vessels among them. North points to the bottom. Image Credit: Tell Yunatsite Project.*

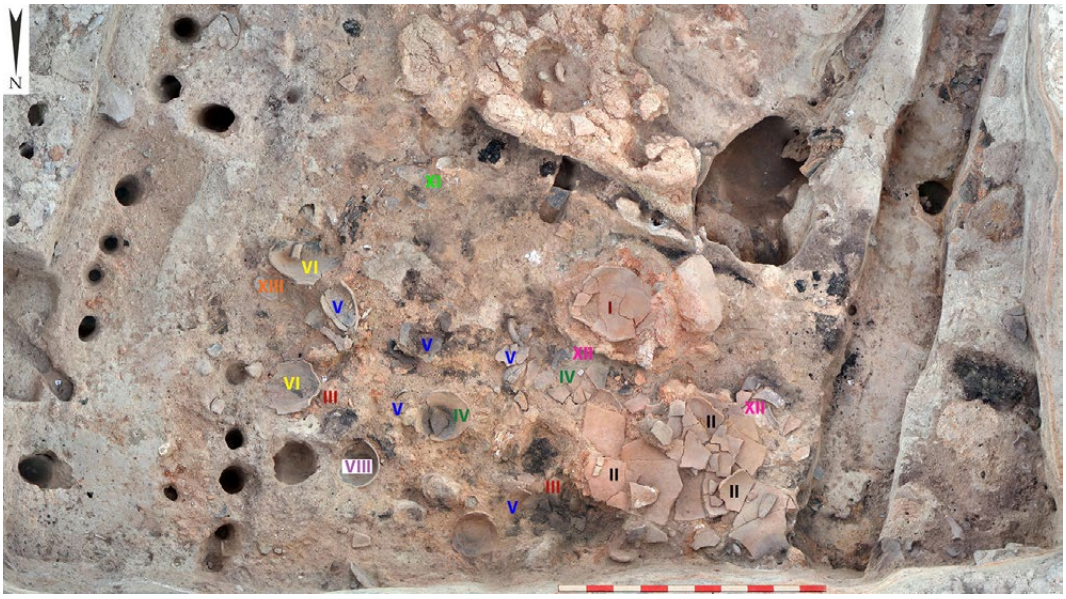



**Figure 13.** *Grid square O4. Northern room of building BII-21B, with some of the fragmented vessels among burnt debris. North points to the bottom. Image Credit: Tell Yunatsite Project.*




**Figure 14.** *Grid square O4. Northern room of building BII-21B: fragmented vessels on the floor. North points to the bottom. Image Credit: Tell Yunatsite Project.*



**Figure 15.** *Grid square O4. Northern room of building BII-21B: stone mortar on top of debris and a burnt plank. Image Credit: Tell Yunatsite Project.*

the height of this space and it's not clear whether it was a second floor or rather an attic.

The building was burnt down by a sudden fire. This is evidenced by the many fragmented ceramic vessels and charred plant supplies, as well as by the human skeletal remains found under the debris. The fire was stronger in the northern room and in the northeast part of the southern room. The analysis of fragments of the podium shows that the firing temperature was about 870° C. The faunal remains from this area also demonstrate evidence of a more significant thermal impact compared to the southern part of the building: above 500° C for most bones, and above 700° C for some of them (fig. 16). It is noteworthy that debris was not recorded over the entire area of the building, but mainly in its northeast and southwest part, while it was almost absent in the middle. This could be explained by the direction in which the walls collapsed and by the lighter construction of the roof, which did not leave clearly identifiable remains.

***Faunal remains***

A total of 74 faunal remains of mammals, fish, and mollusks were uncovered in the building. Twenty of them came from the topmost layer of dark brown sediment (context 356). Their connection to the building is not entirely secure. They also show evidence of thermal impact, but it's drastically lower than in the layer of compact debris below them.

The bones from the debris layer are very fragmented and badly preserved. Most of them show thermal impact, obviously as the result of the fire that burnt down the house; it's lower in the south room (ca. 200–300° C) and higher in the north room (fig. 16).

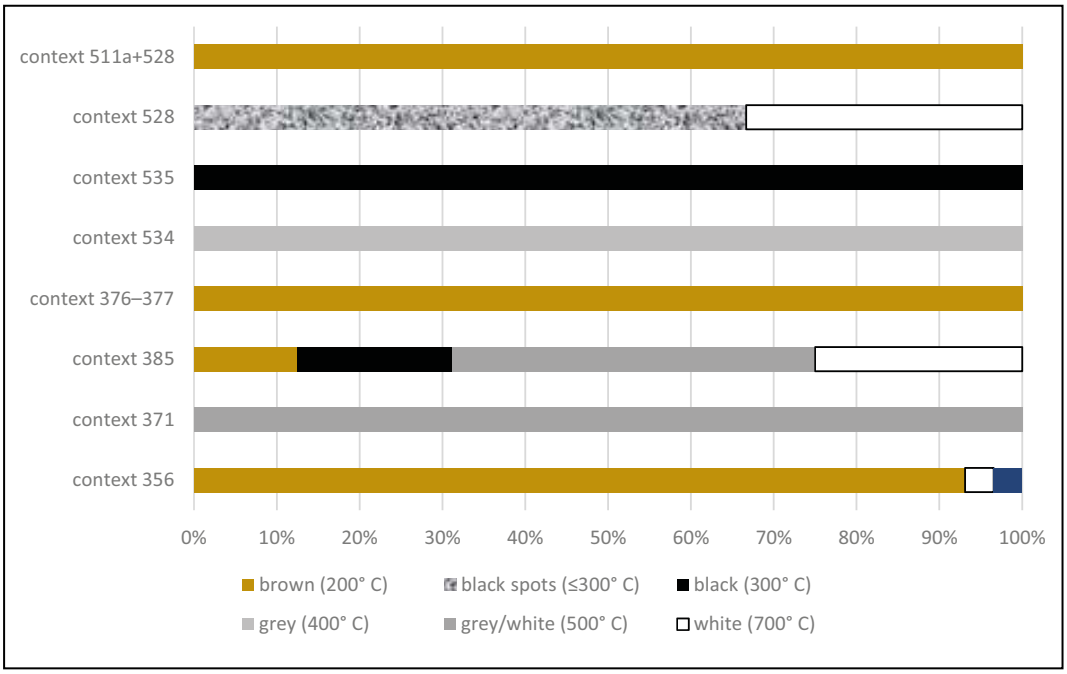



**Figure 16.** *Distribution of faunal remains by thermal impact and finding context (following Nicholson 1993). Image Credit: N. Karastoyanova.*

Sixty-nine of the analyzed remains were determined by species, family, or genus. The bones of domestic animals largely predominate, comprising over 80 percent of the identifiable remains. Among them, the largest number are those of sheep and goats, followed by cattle and domestic pigs (approximately equally), and dogs. Wild animals are represented by single bones of red deer, roe deer, wild boar, hare, and wild cat. A fragment of a rodent skull, two vertebrae of small fish and several shells of river mussels were also found (figs. 17 and 18).

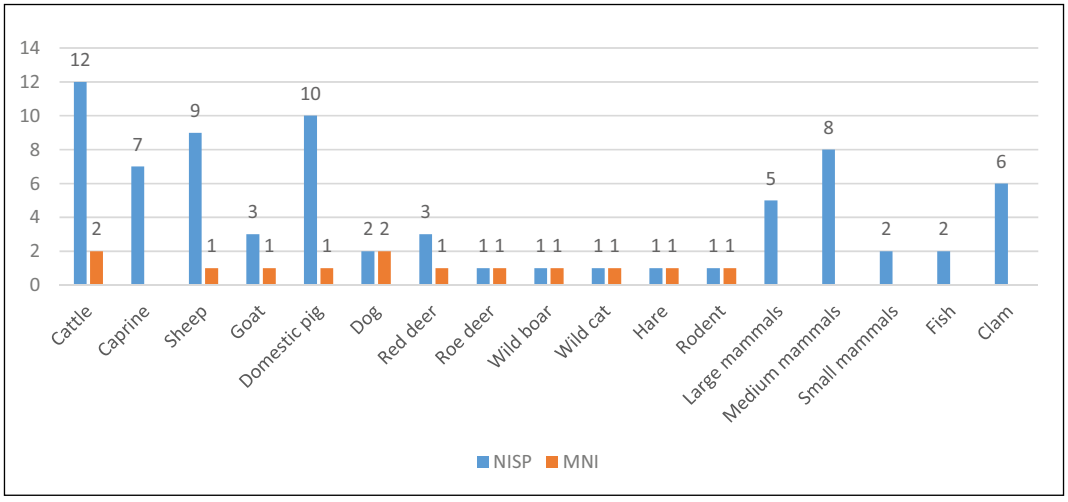



**Figure 17.** *Distribution of faunal remains by species: number of identified specimens (NISP) and minimum number of individuals (MNI). Image Credit: N. Karastoyanova.*

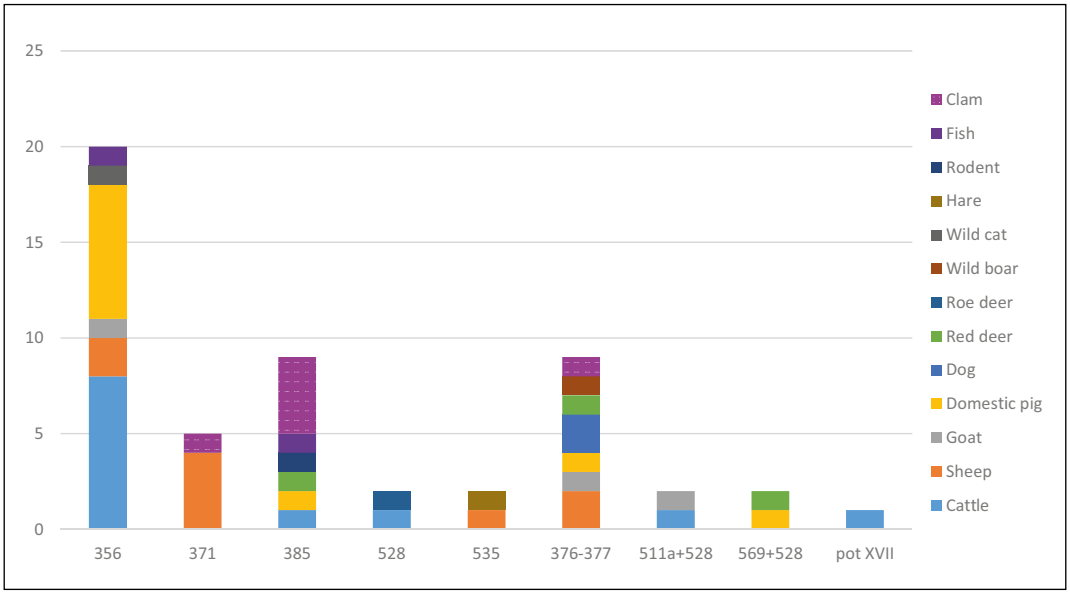



**Figure 18.** *Distribution of faunal remains by contexts. Image Credit: N. Karastoyanova.*

The bones of domestic animals are mainly phalanges and parts of the lower limbs. Most of the remains belong to adult individuals. Only the bones of domestic pig and a single bone of a dog come from young individuals. In terms of anatomy, the bones of the limbs and the head predominate (fig. 19). Several fragments of cattle and goat horn cores and red deer antlers were also uncovered, as well as a large male boar tusk.

Probably most of the animal remains are related to the diet of the building's inhabitants. Butchering cut-marks were identified on a single scapula of a domestic pig. Alternatively, the list of bones seems to suggest the possibility of stockpiling raw materials for bone tools.

***Human skeletal remains***

Human skeletal remains of at least four individuals were discovered in the building. Near the southern wall, the badly preserved articulated remains of a child aged 5 or 6 years were found, including fragments of the parietal bone, fragments of bones of the lower and upper limbs, ribs and vertebrae (fig. 20/1–4). Some of them show black to gray coloration (fig. 20/1) resulting from high temperature, but there is no clear evidence of cremation fractures.

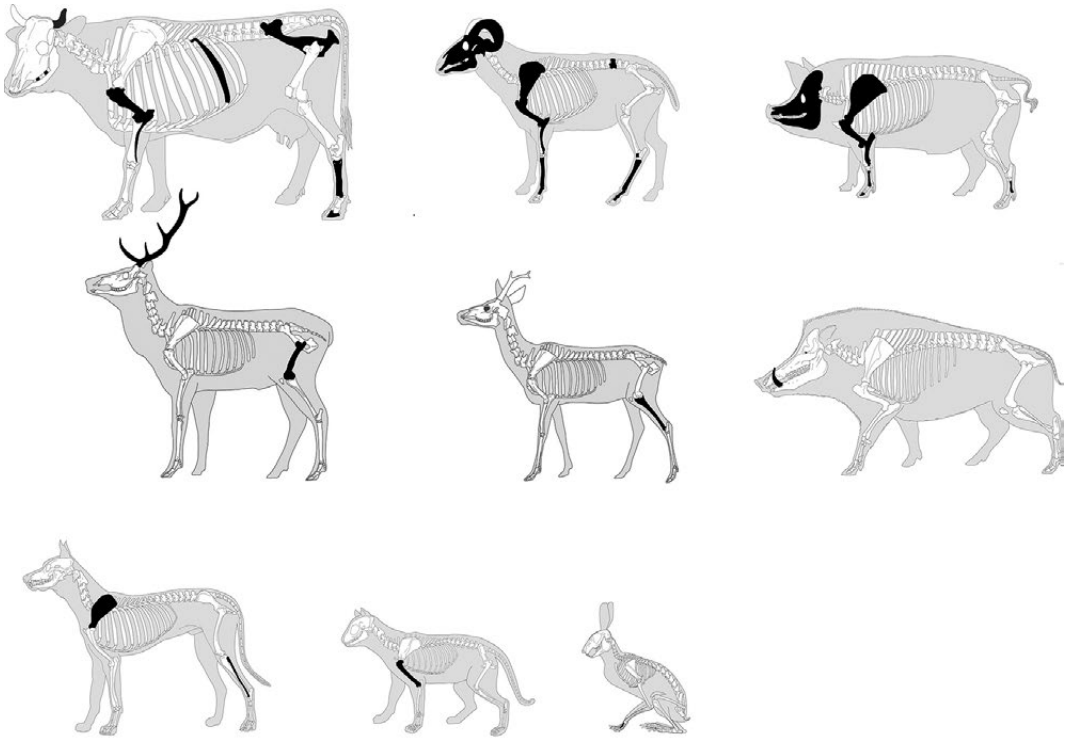


**Figure 19.** *Faunal remains found in the building by species and parts of the skeleton. Image Credit: N. Karastoyanova.*

Parts of a skeleton, single bones or bone fragments were also found in the northern part of the southern room (context 528), near the western wall (context 373), and in the layer above the debris (context 356). These include (fig. 20/5–9): the epiphysis of a femur and a fragment of the pubic bone with incomplete skeletal growth (context 356); fragments of




**Figure 20.** *(1–4) Human bone fragments, individual from context 580a, child aged 5 or 6 years: (1) vertebrae, fragments; (2) femoral epiphysis, unfused, fragment of right ilium; (3) metatarsal bones, unfused distal epiphyses; (4) right talus and calcaneus, unfinished development; (5–9) bones and bone fragments from contexts 528 and 528/511a: (5) first cervical vertebra and cervical vertebra; (6) right fibula and left ulna; (7) right fibula, distal end, detail, bone reaction; (8–9) tarsals, metatarsals and phalanges. Image Credit: V. Russeva.*

the cranium and dentition and fragments of pelvic bones (context 373); bones of the lower (right fibula and bones of the right and left foot) and upper (left ulna and wrist bones) limbs (context 528); bones of the foot (left heel and right third metatarsal bones) and spine (first cervical vertebra and single vertebra of the cervical area; context 528/511a).

It is possible that the two bone fragments of the postcranial skeleton from context 356 came from a single juvenile. The unfused epiphysis to the diaphysis revealed, and the overall bone size correspond to an age generally determined around the *Infans II* group, 7–14 years at death (Shaefer et al. 2008). The cranial skeleton and dentition fragments from context 373 (upper left deciduous central incisor and both molars and first permanent molar and the crown of developing second molar) can also be associated with this individual, pinpointing its age to the lower limit of ca. 7 or 8 years (Zubov 1968; Ubelaker 1989).

The pelvic bone fragments from context 373 indicate an older individual, ca. 17–20 years, based on the unfused epiphysis of the iliac bone and the fused pelvic bones in the acetabulum according to the tables of McKern-Stewart and Shaefer (Shaefer et al. 2009, 244f). The shape of the major sciatic notch is described as rather sharp, characteristic to the male gender of the individual according to Walker's standard table (White & Folkens 2005). It is possible that both cervical vertebrae from context 528/511a belonged to this individual as well. The dimensions of the first cervical vertebra are characteristic of males according to the research techniques used (table 1; Marino 1995). The age at death of the individual can be determined at about 16–21 years by the other cervical vertebra, according to the tables of McKern-Stewart and Shaefer (Shaefer et al. 2009, 115ff).

| **Measurement** | **mm** |
|---|---|
| Maximum length superior facet (LSF) | 27 |
| Maximum width superior facet (WSF) | 16 |
| Maximum length of inferior facet (LIF) | 18 |
| Maximum width of inferior facet (WIF) | 16 |
| Maximum length of the vertebral foramen (LVF) | 30 |
| Maximum width of fovea (WFV) | 13 |

**Table 1.** *First cervical vertebra, context 528/511a; measurements in mm.*

The metatarsals and single upper and lower limb bones from context 528 show completed skeletal growth, indicating an age at death of 20 years and above. Whether they can be associated with a single skeleton remains uncertain, but a possible hypothesis can be formed. The ulna and fibula are gracile, more characteristic of the female sex. The length dimensions of the metatarsal bones are also closer to the average for females (table 2; Bidmos et al. 2021). The foot bones from context 528/511a may have also belonged to this individual. The two calcaneus bones are relatively massive, with a developed relief, more characteristic of the male sex. Their measured maximum lengths present close values

and fall between the male and female averages according to the standardized tables used (Gualdi-Russo 2007; Scott et al. 2017). It is possible that the skeleton belonged to an individual of very short stature and proportionally small metatarsal sizes, in which case the results would show values closer to the female average. It is also possible that the ulna and fibula belong to another skeleton, an adult female. No duplication of any of the fragments was found. The lengths measured on both bones reconstruct the heights of 157.47 (153.9÷161.04) and 163.66 cm (159.36÷167.96) according to the Trotter-Gleser formulas for a female, Caucasian race (Alexeev 1966). Difference in reconstructed heights is not big and could be a consequence of different proportions between lower and upper limbs of one individual. In this case, the used methods regard the height reconstruction after the lower limb's bones with priority. The results for stature reconstruction could be also after origin of both measured bones from different skeletons.

| Context | Side | Bone | Measurement | mm |
|---|---|---|---|---|
| 356 | – | femur, proximal epiphysis | diameter | 44 |
| 528 | R | fibula | length | 334 |
| | L | ulna | length | 248 |
| | R | calcaneus | length | 75.8 |
| | R | MT1 | length | 56.9 |
| | R | MT2 | length | 68 |
| 511a–528 | R | MT3 | length | 65.5 |
| | L | calcaneus | length | 76 |
| 528 | L | MT1 | length | 58 |
| | L | MT2 | length | 65.8 |
| | L | MT3 | length | 65.1 |
| | L | MT4 | length | 62.5 |
| | L | MT5 | length | 69/55* |
| 580a | R | femur, proximal epiphysis | diameter | 21 |
| | R | calcaneus | length | 39.4 |
| | R | MT1 | length | 39.6 |

**Table 2.** *Measured bones, limbs. MT – metatarsal; *functional length measured from the medial edge of the articulation facet between articulations with fourth metatarsal and cuboid.*

***Plant remains***

The excavation of building BII-21B yielded a large amount of plant remains. Two main concentrations were identified that coincide with the concentrations of fragmented vessels and burnt debris: more in the north room (nearly 24,000 seeds) and less in the southern part of the south room (fig. 6). Charred plant remains were found both

among and below the debris. Some of them were scattered over a large area, but compact concentrations were also recorded. Some of the latter were associated with fragmented ceramic vessels and in some cases were revealed directly on large fragments (fig. 21/1). In the north room, a few small, compact clusters were uncovered lying among or under burnt debris, without any immediate connection to sherds (fig. 21/2). It seems that plant supplies were stored both in ceramic vessels and in small containers of non-durable material, like leather or cloth sacks.

The plant remains demonstrate a diverse species composition. Cereal crops are represented by three species of wheat – einkorn (*Triticum monococcum*), emmer (*Triticum dicoccum*), and free-threshing wheat (*Triticum aestivo/durum*) – as well as barley (*Hordeum hexastichon*), rye (*Secale cereale*), millet (*Panicum miliaceum*) and oats (*Avena* sp.), while legumes are represented by lentils (*Lens culinaris*), bitter vetch (*Vicia ervilia*) and grass pea (*Lathyrus sativus*). Flax (*Linum usitatissimum*), grapes (*Vitis sylvestris*), cornelian cherry (*Cornus mas*), pears, apples, walnuts, blackberries, and acorns were also identified. The weed flora is represented by milkweed (*Euphorbia helioscopia*), common knotgrass (*Polygonum aviculare*), soapwort (*Saponaria officinalis*), and goosefoot (*Chenopodium album*). All of them are common weeds and are found in fields. Their amount in the samples is insignificant.

The complex is dominated by lentils, barley, and einkorn wheat, which makes up over 98 percent of the cereals and legumes. They are followed by rye and free-threshing wheat. Spatial differences in the spread of the three main crops were identified. Barley dominates the assemblage in the north room (over 8,700 grains compared to over 1,600 of einkorn), while in the south room it is practically absent (only 6 grains) and the main cereal crop is einkorn wheat. Lentils are well represented in both rooms, slightly outnumbering barley in the north room and einkorn wheat in the southern room.

The high degree of fragmentation and spread of the vessels and the scattering of the plant remains make it difficult to analyze the individual supplies in detail. However, cer-




**Figure 21.** *Grid square O4. Northern room: (1) charred wheat on sherds; and (2) concentration of charred wheat among burnt debris. Image Credit: Tell Yunatsite Project.*

tain specifics are visible. Both pure stocks of the three main crops (barley, einkorn wheat, and lentils) and mixtures of barley with lentils and einkorn with lentils were recorded in the compact concentrations of grains. The analysis of the remains in the north room also shows the separate storage of barley in different stages of the *chaîne opératoire*. In one of the samples, it is completely uncleaned, with the chaff remaining. In many of the samples it was found crushed, suggesting that it was prepared for grinding. Finely ground barley in the form of bulgur was found in one sample. Barley may also have been prepared as tarhana.

Several fragments of charred mass with traces of grains in it, which probably represent the last phase of cereal processing, are of particular interest. Through the application of a scanning electron microscope (SEM), component analysis of the internal structure can be performed and important information can be extracted about preparation techniques and the changes that occur during the cooking process. SEM analysis produces highly magnified images of the analyzed samples and shows their composition on a microscopic scale. The possible magnification is significantly greater than with visible light microscopy (VLM), from 5x to 200,000x or more, giving a much greater depth of contrast so that more of the specimen is in focus (Frahm 2014).

Using a Bresser ICD Advance stereomicroscope and a Novex stereomicroscope, the external surface of three samples were examined that represented charred remains of processed cereal food and a bread-like fragment. Their size and characteristics were documented. The following procedure was carried out using a SEM (JEOL JSM 5510) at the Laboratory of Scanning Electron Microscopy (Faculty of Chemistry and Pharmacy, St. Kliment Ohridski University of Sofia). The samples were first broken manually into smaller fragments, then coated with a thin layer of gold. Their inner structure and different informative components were examined under magnification between 150x and 25,000x. Transverse cells that are typical for *Triticum* species were clearly visible in all the examined fragments (figs. 22–24). However, the remains were highly deformed and definite conclusions cannot be made about whether it was bread, tarhana, or bulgur.

Regarding the additional plant resources exploited, the analysis shows an extremely successful use of the local environment. The presence of nearly 160 flax seeds, which are very rarely found in prehistoric deposits, suggests a deliberate collection. Whether the flax was used for oil extraction, weaving, or both, is not possible to answer.

Among the fruits, the grape seeds are of greatest interest (fig. 25). Their quantity is impressive, numbering nearly 3,000 pips, mostly concentrated in the north room. According to their morphological characteristics, they belong to wild grapes, with certain differences having been observed: some pips are larger while others are smaller. They were probably collected from different places. In some of the samples, whole grapes were found, as well as their stalks. Traces of maceration were identified by the presence of crushed seeds and seeds with remains of the fleshy part. It is entirely possible that they were intended to produce grape juice or another beverage, e.g., wine. This is very similar

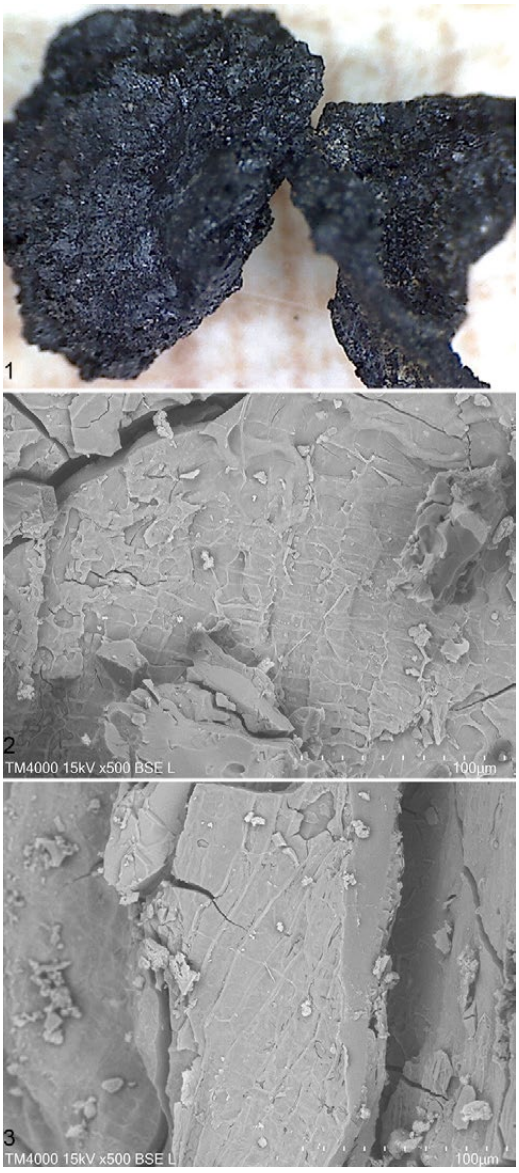



**Figure 22.** *Charred food fragments from the southern room: (1) macroscopic overview, low magnification, stereomicroscope Novex; (2 and 3) Transversal cell of Triticum sp.; magnification x500 SEM Hitachi TM3030 PLUS. Image Credit: S. Todorova.*

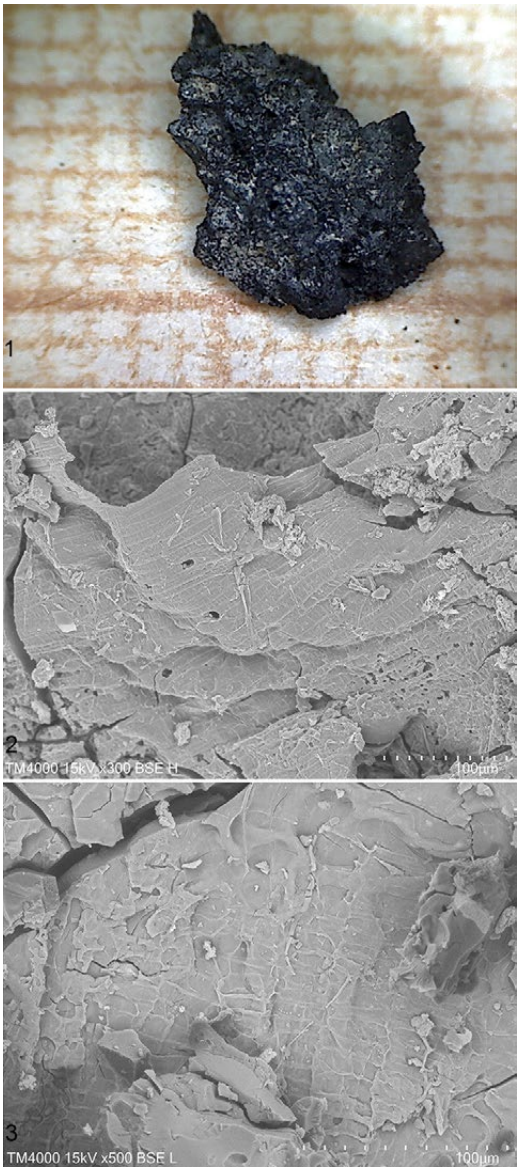



**Figure 23.** *Charred food fragments from the southern room: 1) macroscopic overview, low magnification, stereomicroscope Novex; 2) Transversal cell of Triticum sp.; magnification x300; 3) close view magnification x600, SEM Hitachi TM3030 PLUS. Image Credit: S. Todorova.*

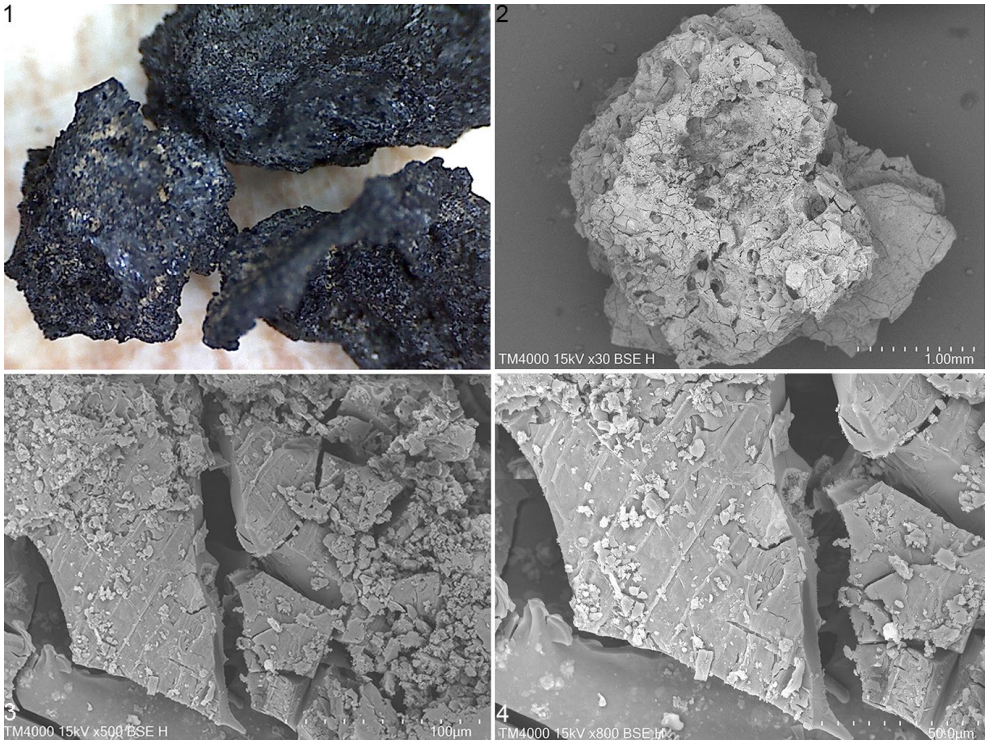



**Figure 24.** *Charred food fragments from the southern room: (1) macroscopic overview, low magnification, stereomicroscope Novex; (2) macroscopic overview of a food fragment – SEM (x30 magnification); (3) transversal cell of Triticum sp.; magnification x500; (4) close view, magnification x800, SEM Hitachi TM3030 PLUS. Image Credit: S. Todorova.*



**Figure 25.** *Charred grape from the northern room. Image Credit: Tell Yunatsite Project.*




**Figure 26.** *Grid square O4. Northern room: charred acorns and fruits. Image Credit: Tell Yunatsite Project.*

to what was recorded at Tell Dikili Tash in northern Greece, based on which the earliest wine production in the Aegean has been suggested by Vallamoti et al. (2007).

Cornelian cherry, walnuts, pears, apples, blackberries, and acorns were also gathered (fig. 28). The most common fruit remains are cornelian cherry stones (*Cornus mas* L.): 31 whole and 140 fragments. They were all found in the north room. Of particular interest are the whole charred fruits of apple and pear, which are preserved extremely rarely in the archaeological record. Apples were found only in the north room, and pears in both, with a concentration of about 10 fruits recorded in the southern room.

The finds of acorns number about 50. It is worth mentioning that a compact concentration of a dozen acorns was uncovered among the debris in the northern part of the south room (grid square O4), where a golden ring-idol[1] was also found (fig. 66/4). They were probably kept in a container of perishable material.

***Pottery***

The pottery from building BII-21B was completely processed. It was initially examined by archaeologists and a restorer, along with the pottery from all features cut into the

[1] For similar artifacts, cf. Leusch et al. 2015.

structure's remains. The finds from context 356 were also included. Some of the sherds found in later cut features (mainly foundation trenches) come from vessels from the building, indicating that they were backfilled, at least partially, with the excavated earth. At the same time, most of the restored vessels miss sherds, which is probably due to later disturbances and materials remaining in the balks.

After this stage, all restored vessels and single sherds that could be reliably attributed to the building were entered into a Microsoft Access database. It was developed by the research team to process the ceramic assemblage from Yunatsite and other Copper Age sites in the area (cf. Boyadzhiev et al. 2022). It contains detailed information on the context of discovery, the technological, metrical, and morphological characteristics, and the decoration of each vessel or sherd.

After the restoration was completed, the total number of ceramic units from the building (restorable vessels and single sherds) was 1833. Some of them apparently originate from the same vessels, and in these cases, they were entered as a single record in the database. As a result, the database includes a total of 1720 records. Twenty-two of them are completely reconstructible vessels (labeled as 'whole vessels') and six more are certainly reconstructible, with the bottom or the rim-edge missing (fig. 27). Among the rest, wall sherds predominate: 1000 in total.

Based on typologically diagnostic material, minimum number of vessels should be 140.

*Typology*

The investigation of the ceramic assemblage aims at representing the major categories and types of vessels discovered in the building, their relationship with various decoration techniques and patterns, and with certain technological characteristics, and finally, their possible function. The classification scheme used here was developed by the project team and is based on published schemes in which the main criteria used were ratios between the main metric characteristics: rim diameter, maximum diameter, base diameter, and height (Petrova 2003; Georgieva 2012). At the same time, due to the fragmentary state of a large part of the material, specific morphological criteria were also used for the additional differentiation among the variety of vessels.

Nine vessel categories were distinguished: plates, bowls, jars, jugs, cups, storage vessels, lids, vessels with perforated walls, potstands, as well as an intermediate category of plates/bowls and miniature vessels.

(I) Plates. Open shapes with their maximum diameter being at the rim. Based on the shape of the rim, types and subtypes have been distinguished (figs. 28, 31, 32, and 33/1–4).

(II) Plates/bowls. The shape of some vessels is transitional between plates and bowls (figs. 28, 33/5 and 6, and 34). In some of them, the maximum diameter is at the rim, but the height and the angle of the wall towards the base indicate that they are deep vessels (II.1). At the same time, the upper part is higher and more emphasized than that of the 'common' plates. In other cases, the maximum diameter is at the carination, but is similar

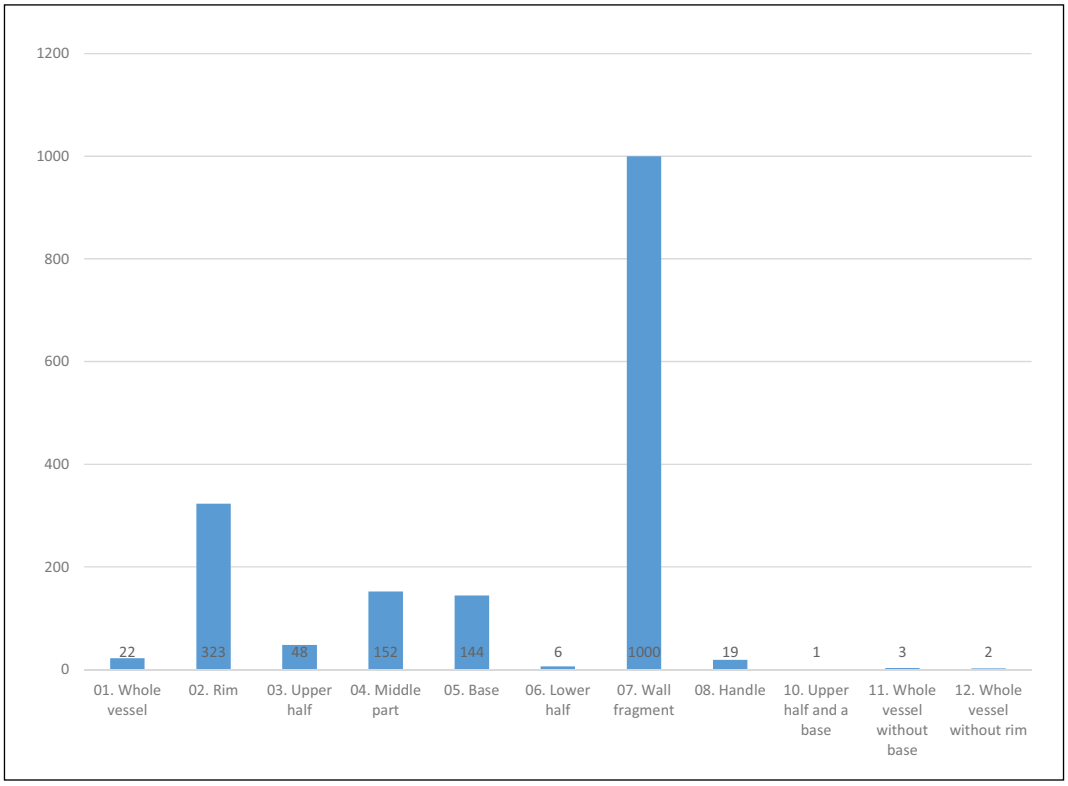



**Figure 27.** *Ceramic assemblage of building BII-21B: distribution by preserved parts of the vessels. Image Credit: Tell Yunatsite Project.*

to that of the rim (II.2 and II.3).

(III) Bowls. This category comprises vessels of two or three morphological parts whose rim diameter is equal to or smaller than the maximum diameter, but not smaller than 2/3 of it. The height is less than or equal to 2/3 of the maximum diameter. Based on morphological specifics of the carination and the upper part of the vessel, types and subtypes have been distinguished (figs. 29 and 35–40).

(IV) Jars. This category comprises pots of two or three morphological parts whose rim diameter is less than 2/3 of the maximum diameter. The height is less than or equal to the maximum diameter. The body is rounded. Based on its shape, and on the presence of a distinct neck, types and subtypes have been defined (figs. 30, 41, and 42).

(V) Jugs. High necked, elongated body pots of three morphological parts with handle(s) (fig. 43/1 and 2).

(VI) Cups. These vessels are defined by their small size and small capacity, which determine their specific function.

(VII) Storage vessels. Large pots of three morphological parts, with their height greater than the maximum diameter, often with handles (figs. 32 and 44–49).

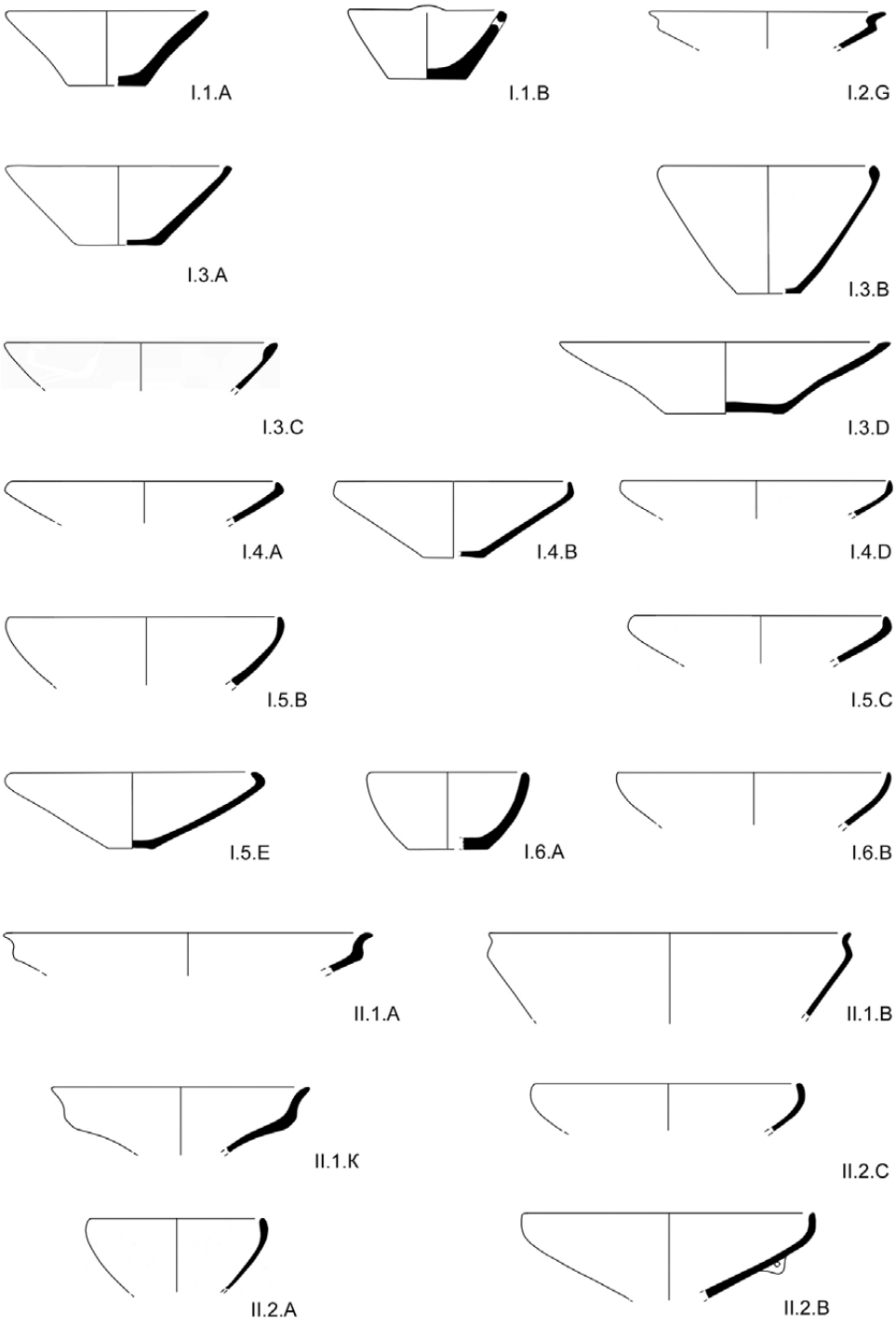



**Figure 28.** *Typology of plates found in building BII-21B. Image Credit: Tell Yunatsite Project.*

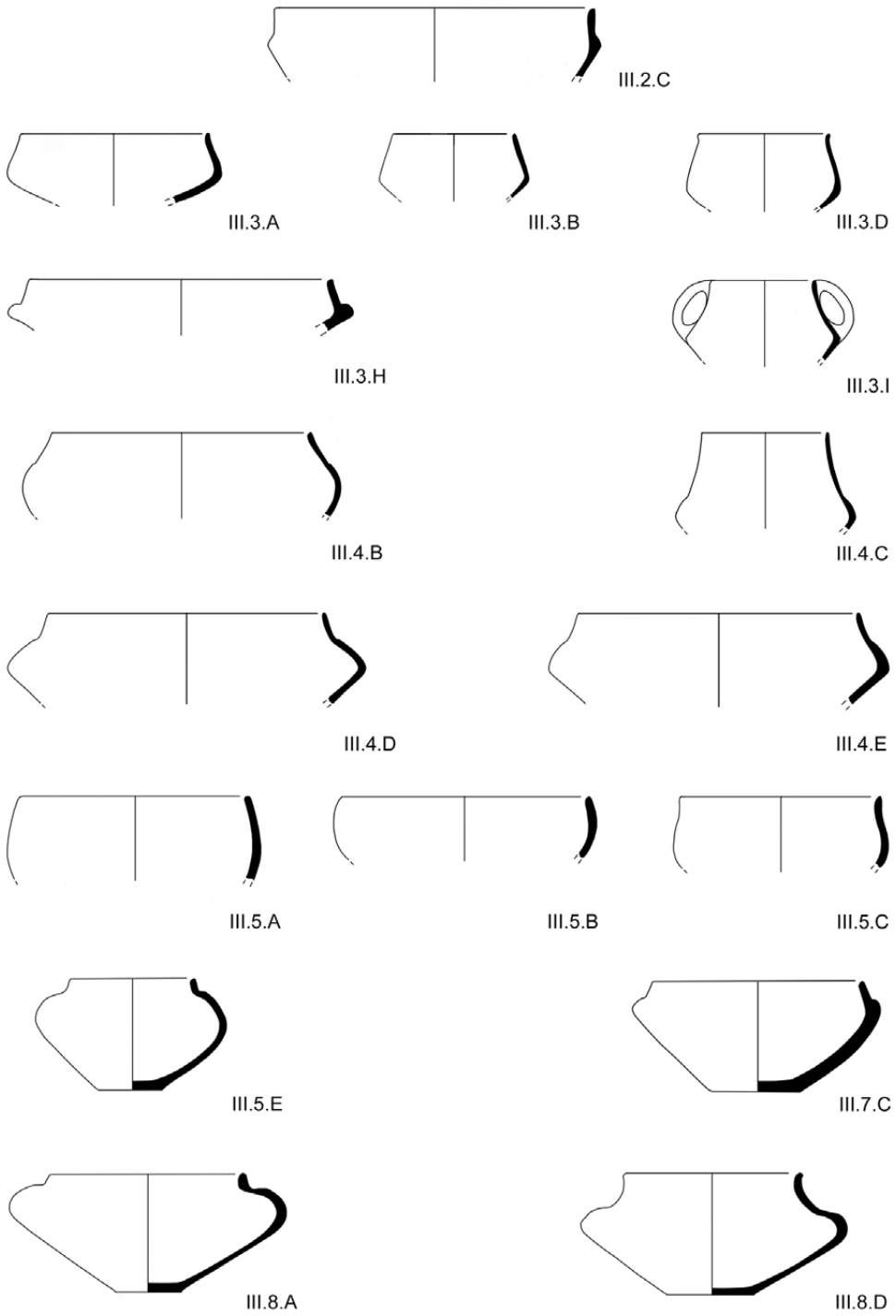



**Figure 29.** *Typology of bowls found in building BII-21B. Image Credit: Tell Yunatsite Project.*

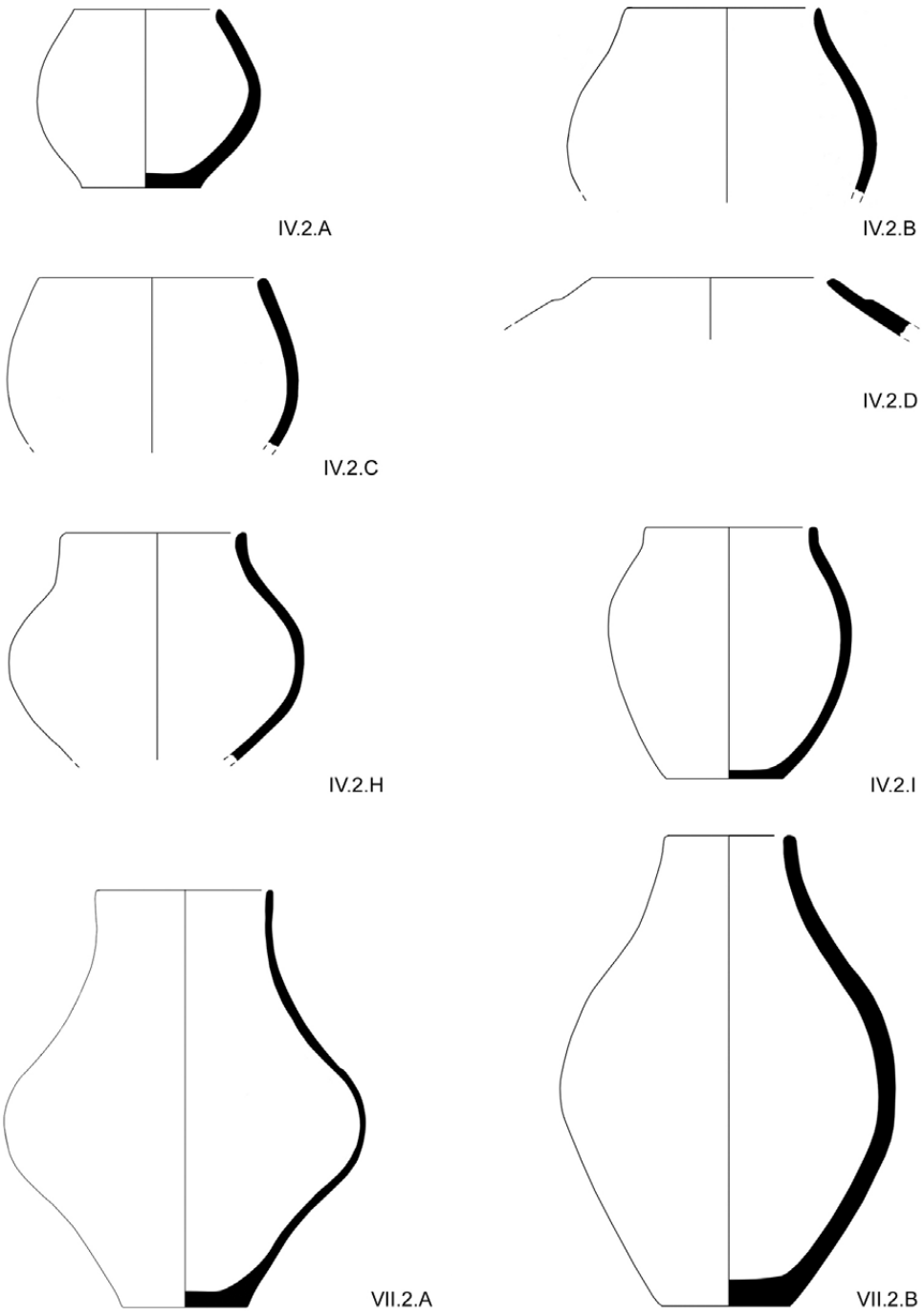



**Figure 30.** *Typology of jars and storage vessels found in building BII-21B. Image Credit: Tell Yunatsite Project.*

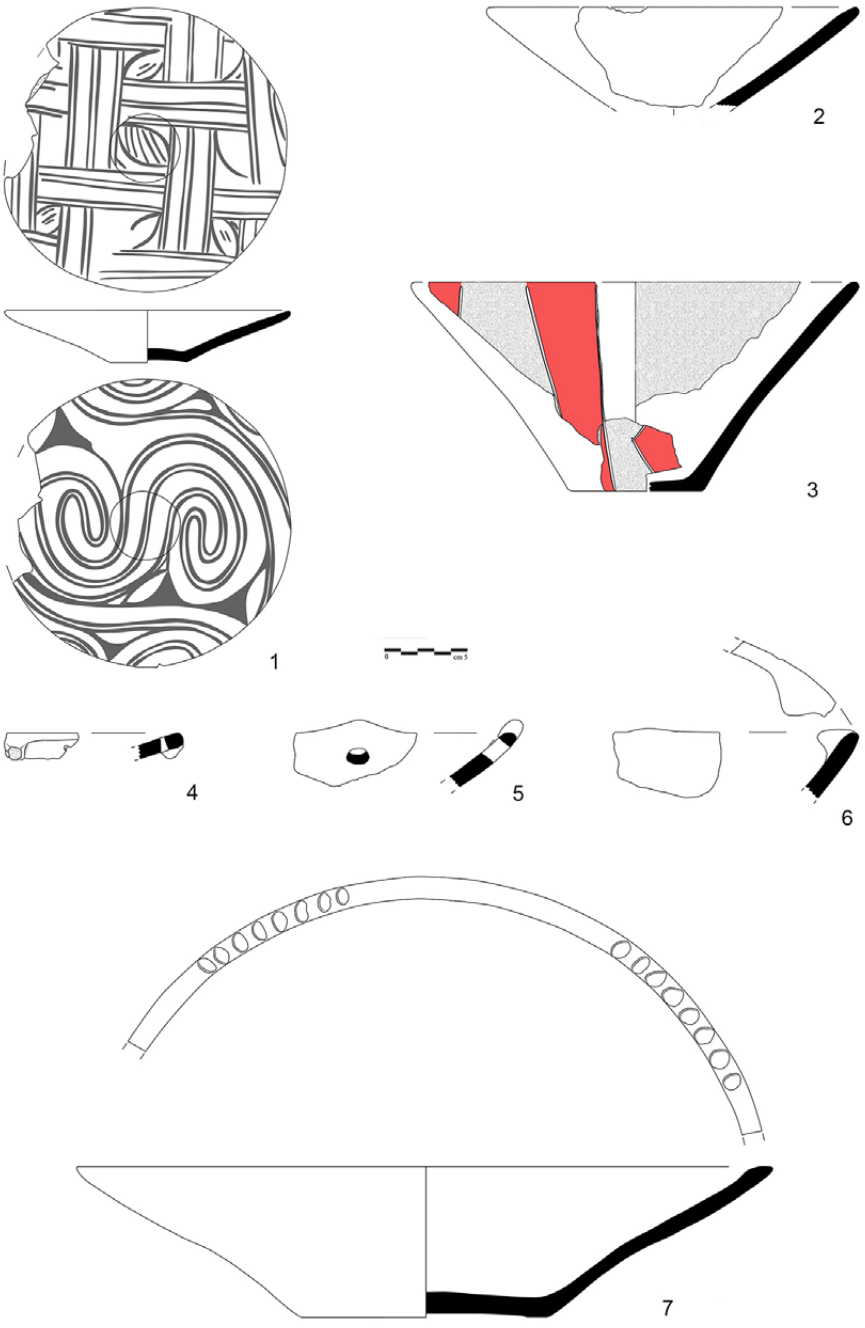



**Figure 31.** *Plates, type 1 (1–6) and 3.D (7). Vessels XIII (1), XXX (2), XLVIII (3) and XX (7). Image Credit: Tell Yunatsite Project.*

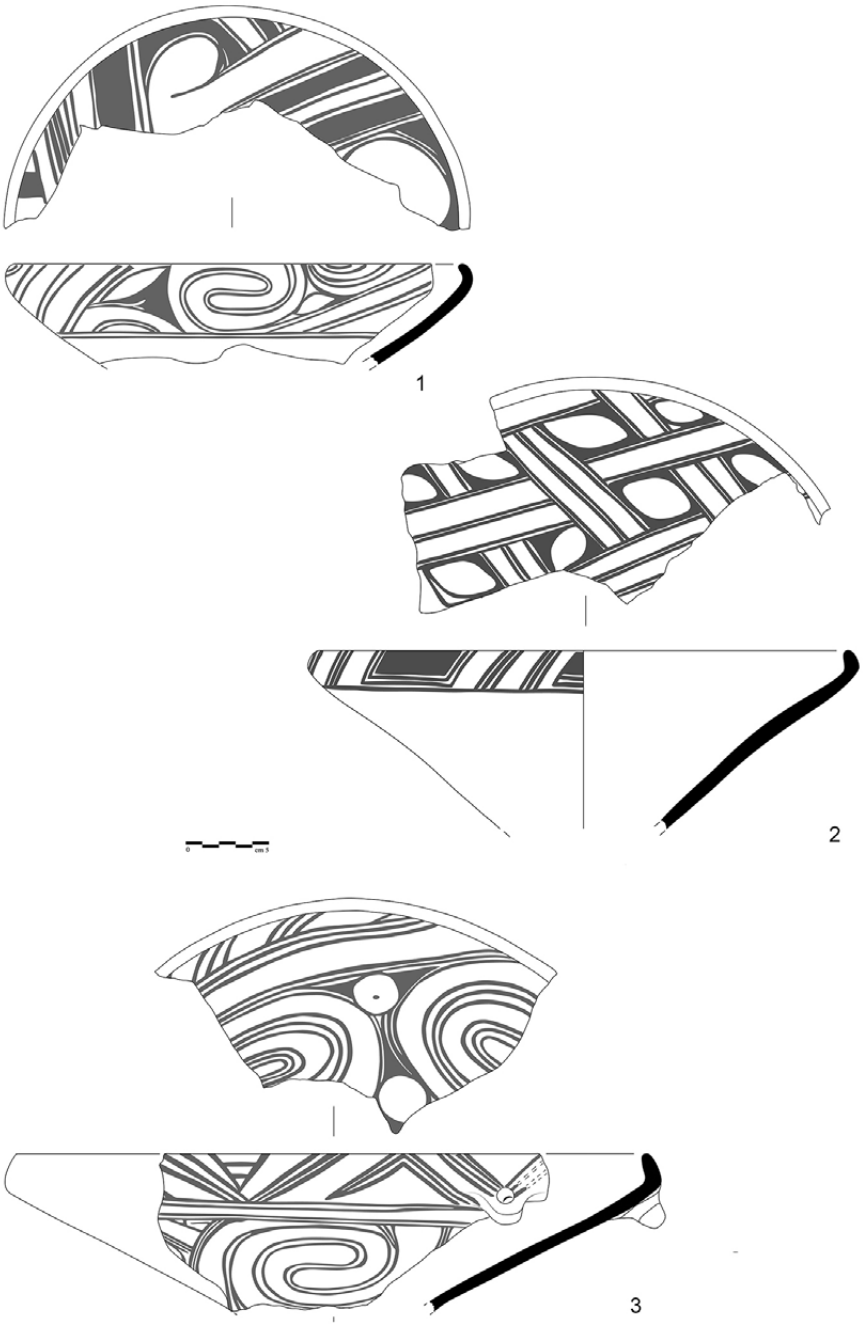



**Figure 32.** *Plates, type 4 and 5. Vessels XI (1) and XLVI (3). Image Credit: Tell Yunatsite Project.*

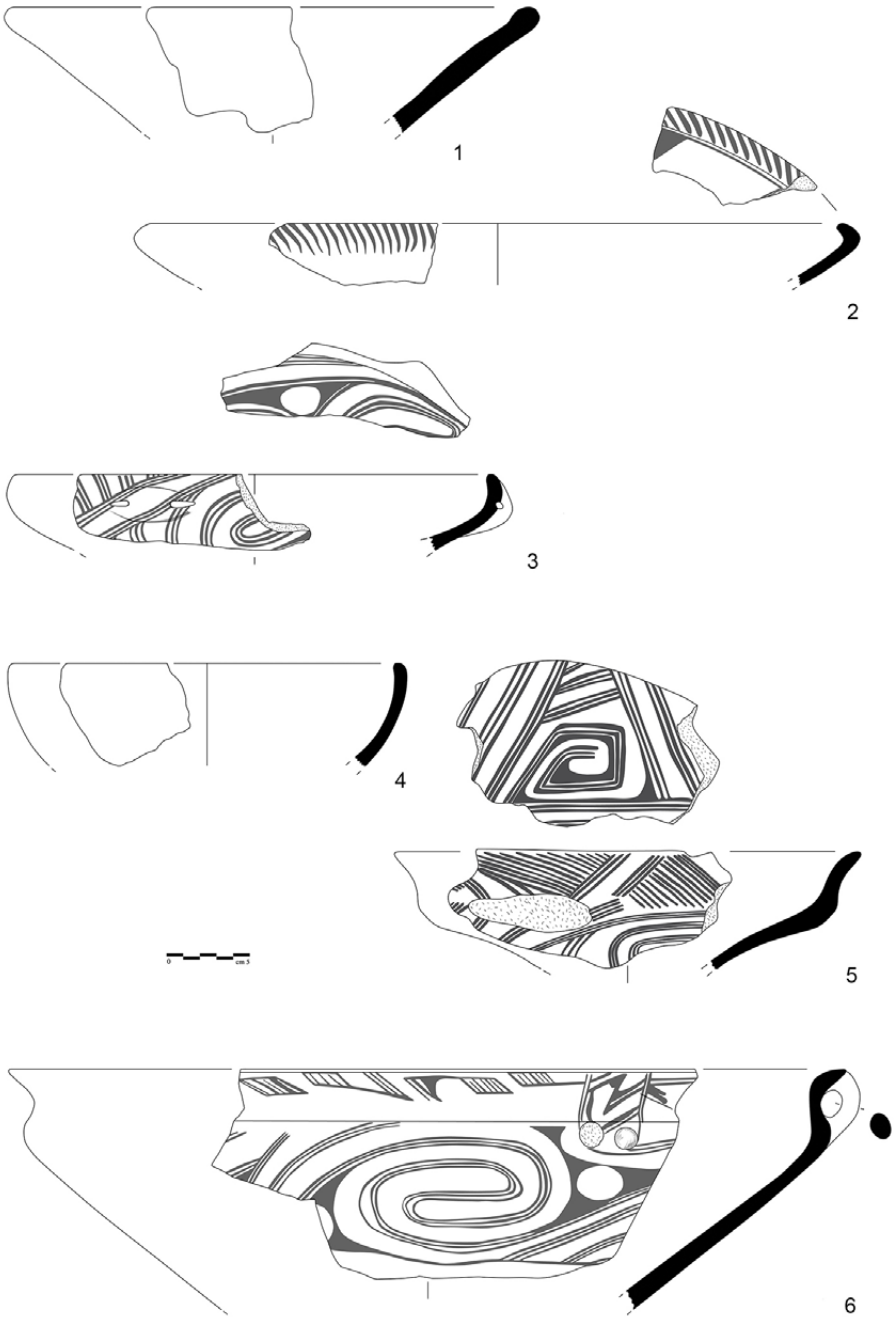



**Figure 33.** *Plates, type 3 (1), 5 (2 and 3) and 6 (4), and plates/bowls, type 1 (5 and 6). Image Credit: Tell Yunatsite Project.*

(VIII) Lids. No whole lids were found. The sherds identified as lids have a slightly pronounced conical shape, in one case with a very low cylindrical part. Their distinction from the plates is sometimes uncertain and is based on the rougher treatment of the inner surface.

(IX) 'Strainers'. There are no reconstructible vessels of this kind. This prevents a more detailed morphological division and determination of their function.

(X) Potstands. These are vessels open at both sides, and probably used to place other vessels on top of them. The potstands from the building have an approximately cylindrical shape, but with distinctly concave walls.

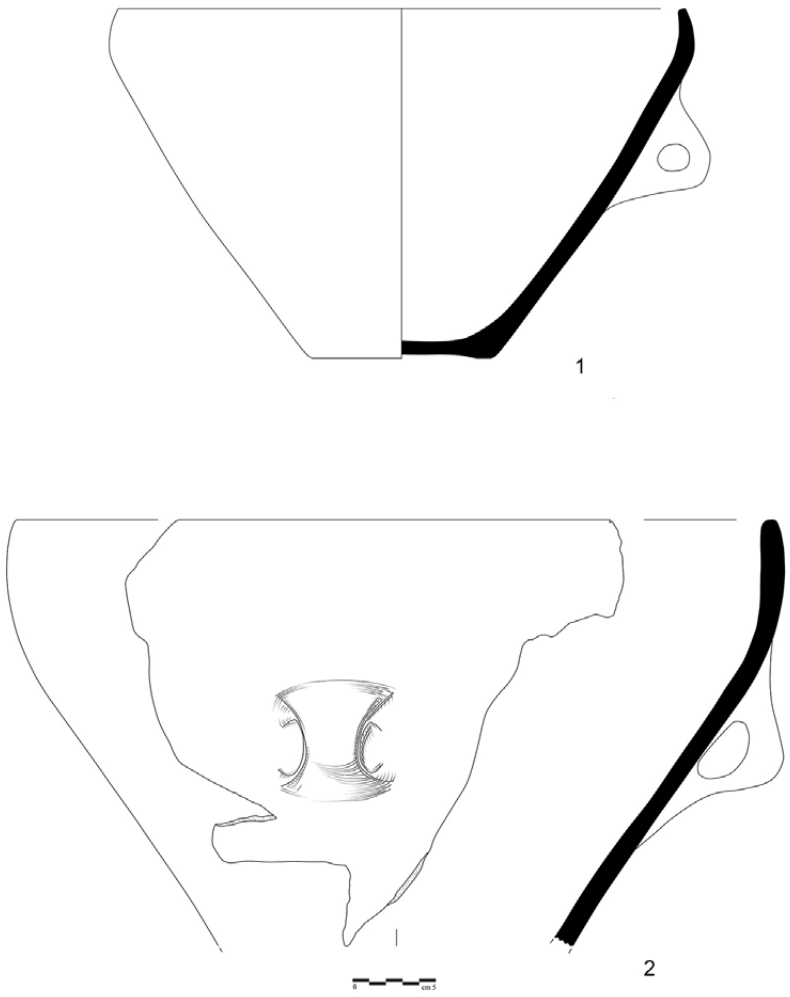



**Figure 34.** *Plates/bowls, type 2. Vessels XXV (1) and XXIV (2). Image Credit: Tell Yunatsite Project.*

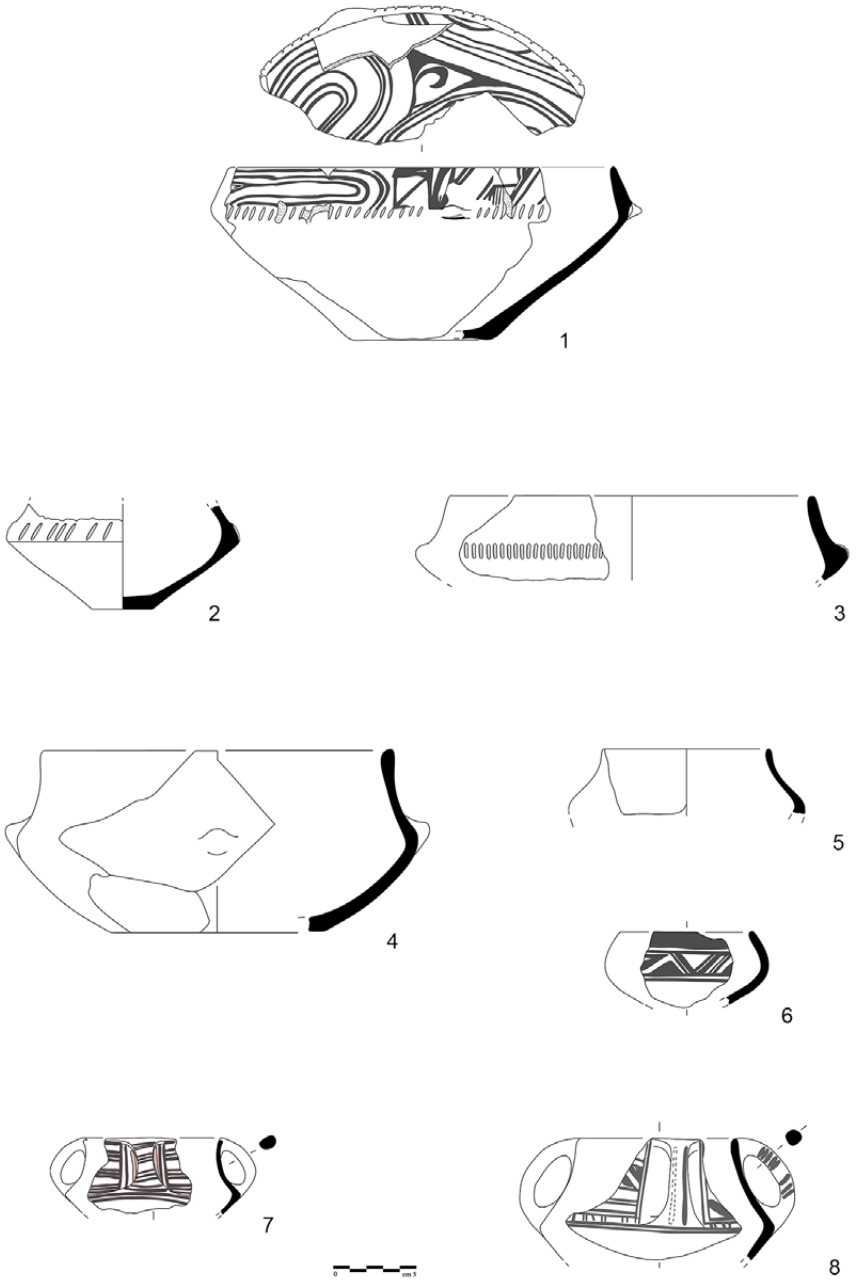



**Figure 35.** *Bowls, type 3. Image Credit: Tell Yunatsite Project.*

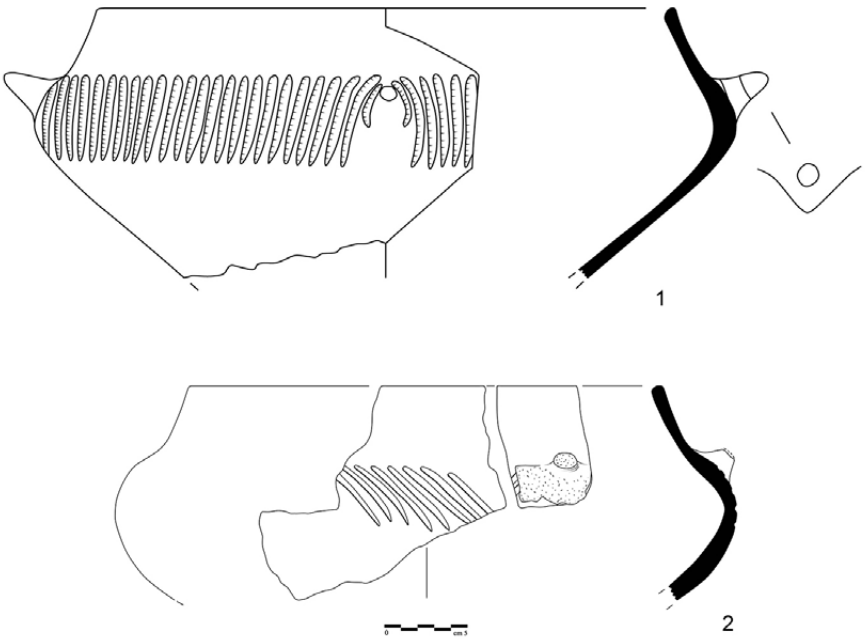



**Figure 36.** *Bowls, type 4.B. Vessel XLVII (1). Image Credit: Tell Yunatsite Project.*

(XI) Miniatures. Ceramic vessels whose size (and especially their volume) is so small that they cannot be used as regular vessels (fig. 43/3). The diameter and the height of the miniatures are less than 4 or 5 cm. Their surfaces are usually roughly treated.

Bowls, plates, and storage vessels slightly dominate among the completely reconstructible vessels, being almost equal in numbers (fig. 50). They are followed by jars, cups, jugs, and plates/bowls, represented by a small number of pots. If we include the upper halves that provide information about the shape of the respective vessels in the analysis, the picture is different: bowls predominate, second come plates, followed by almost equal numbers of plates/bowls, jars, and storage vessels. The situation is relatively similar when all typologically diagnostic sherds are considered. Among them, bowls (35%) and plates (29%) predominate, far behind them are storage vessels (14%), plates/bowls (8%) and jars (4%), while jugs, cups, potstands, 'strainers', lids, and miniatures are represented by one to eight pieces and occupy a total of 10 percent (fig. 51).

However, the majority of the sherds (1395) were not identified typologically during the initial processing. It is possible that a large number of them originated from storage vessels, as well as from jars. The analysis of the restored or recognizable storage vessels shows that they usually have wall thickness of more than 0.8 cm, which is less common among other vessels (fig. 52). Their rim diameter is more than 15 cm, and in most cases exceeds 30 cm, and the angle of the neck to the rim varies between 85° and 115°. Specif-

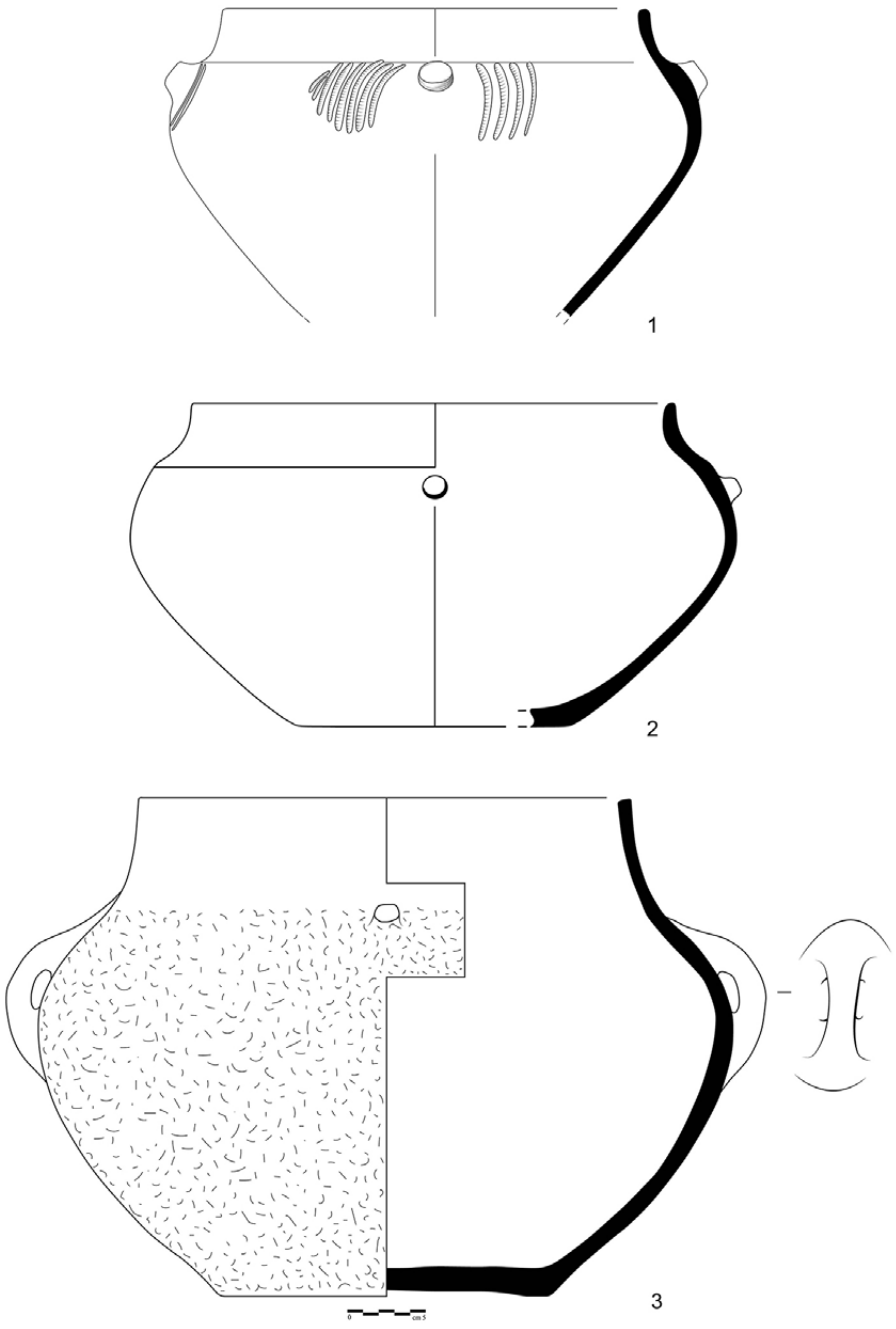



**Figure 37.** *Bowls, type 4 and 5. Vessels XXI (1), VI (2), and XXXVIII (3). Image Credit: Tell Yunatsite Project.*

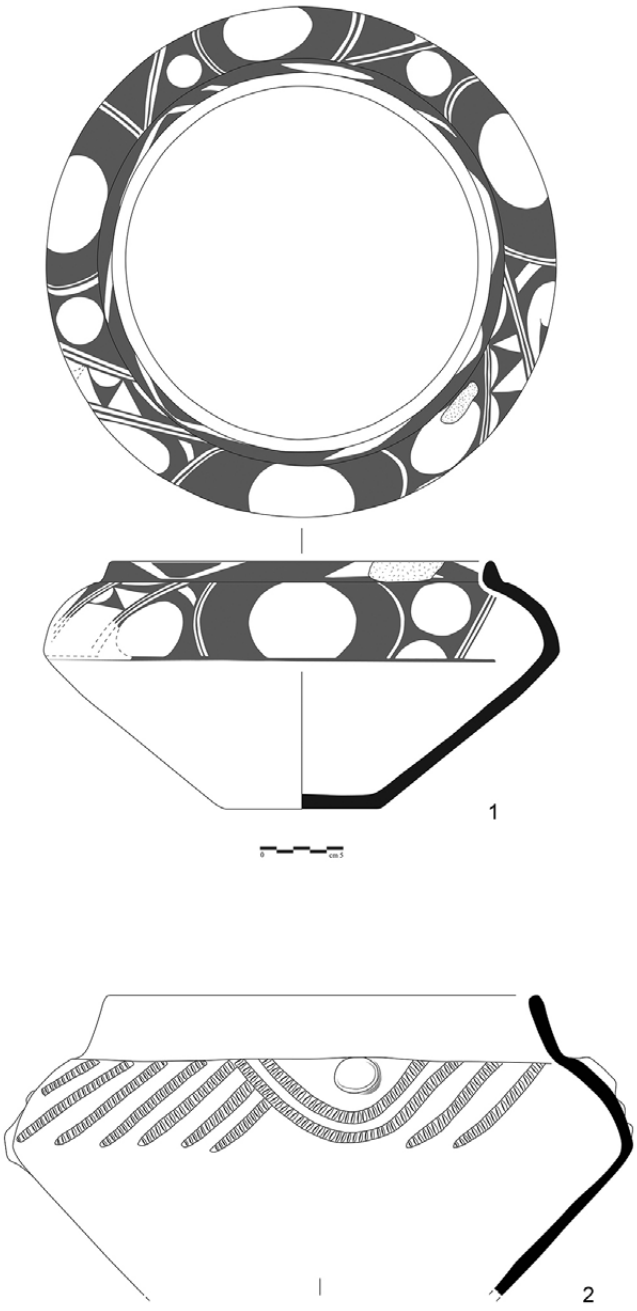



**Figure 38.** *Bowls, type 4.D. Vessels XII (1) and XXVI (2). Image Credit: Tell Yunatsite Project.*

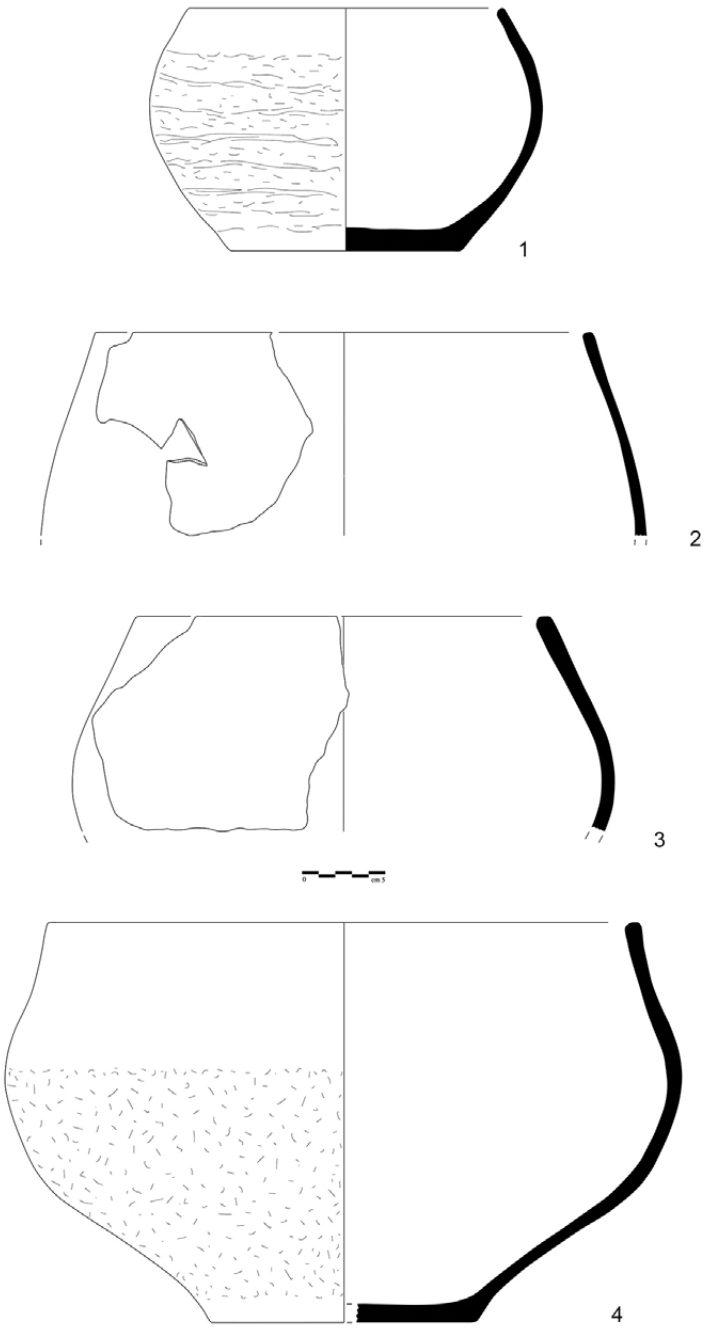



**Figure 39.** *Bowls, type 5. Vessels XXXIX (1), XVI (2), and XLII (4). Image Credit: Tell Yunatsite Project.*

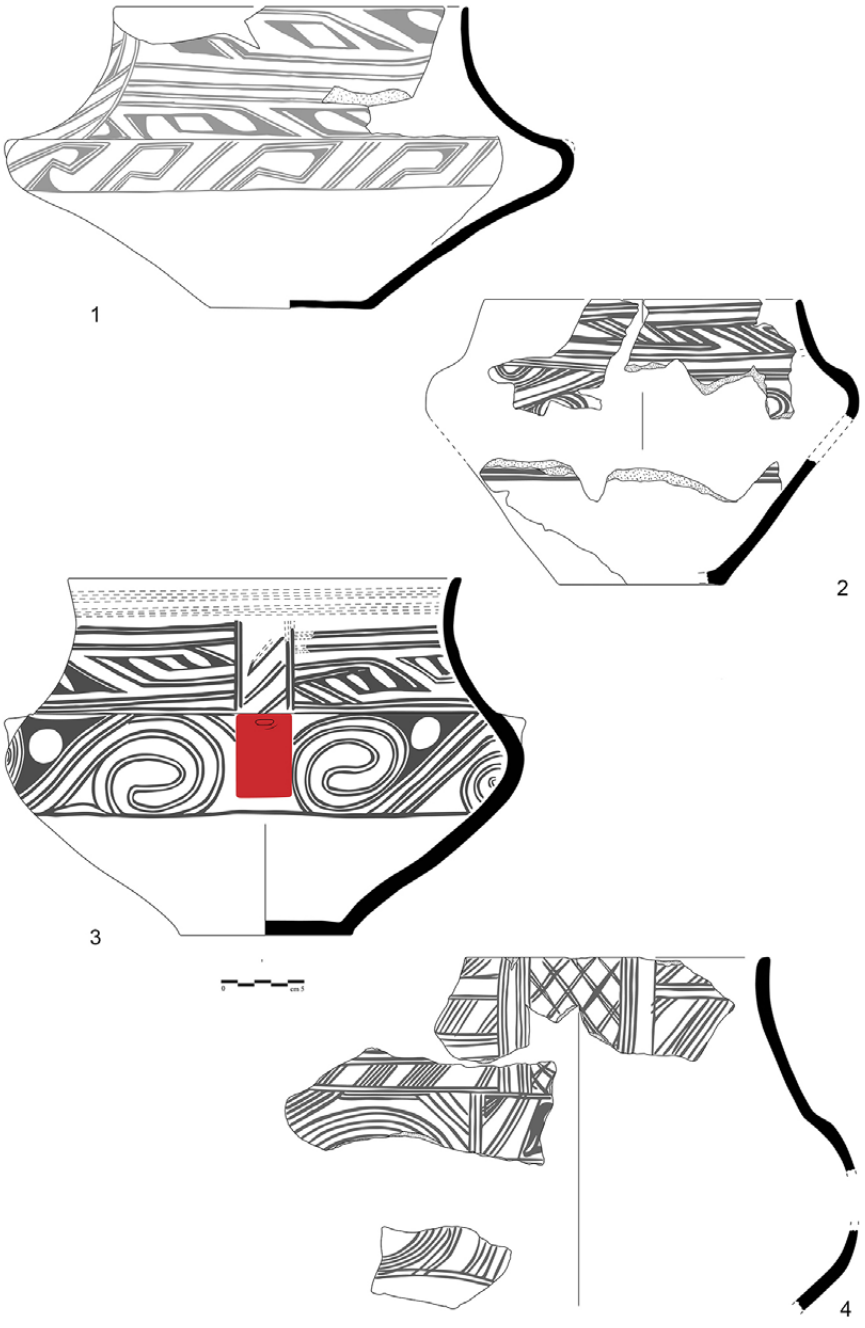



**Figure 40.** *Bowls, type 4.C and 8.D. Vessels IX (1), XXVIII (2), V (3), and XIV (4). Image Credit: Tell Yunatsite Project.*

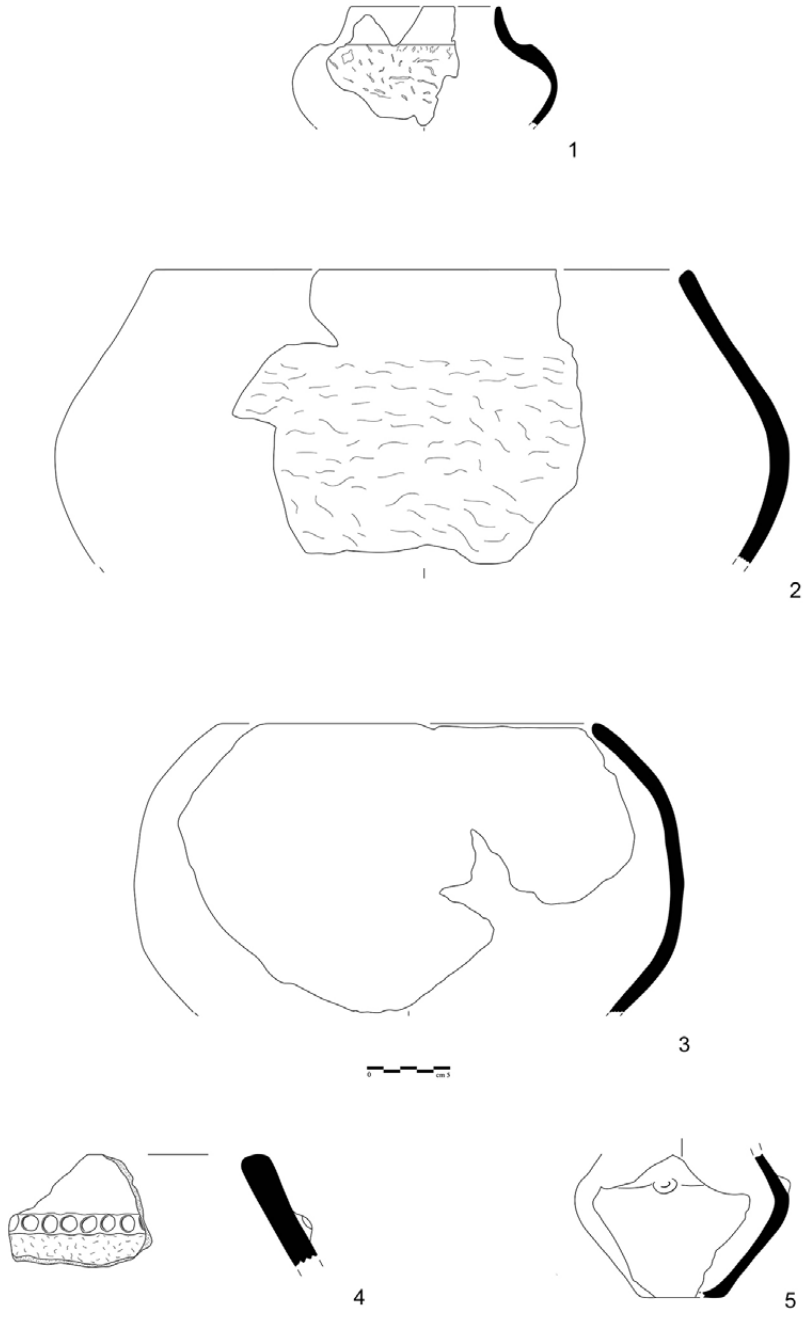



**Figure 41.** *Jars. Image Credit: Tell Yunatsite Project.*

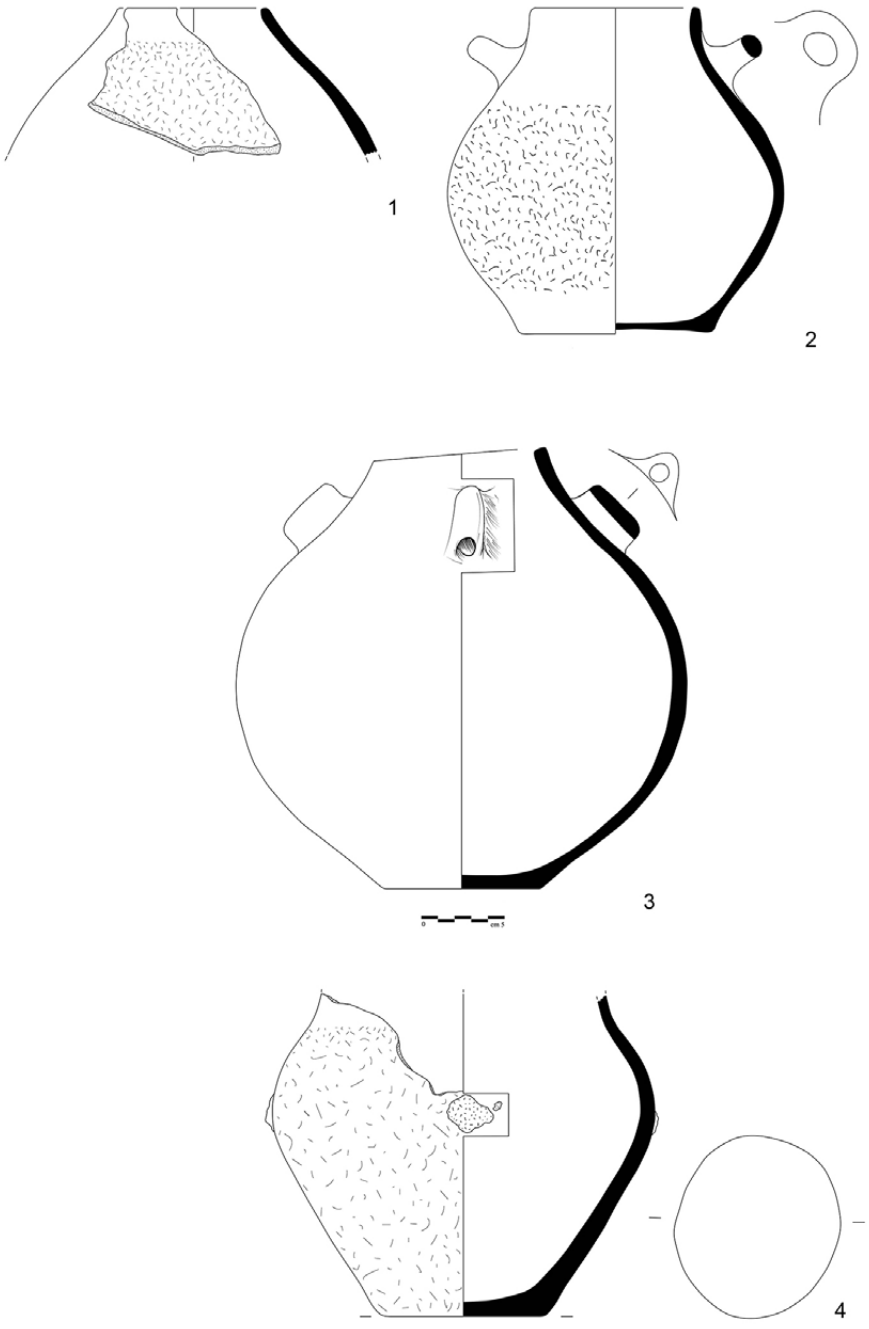



**Figure 42.** *Jars. Vessels VII (2) and VIII (3). Image Credit: Tell Yunatsite Project.*

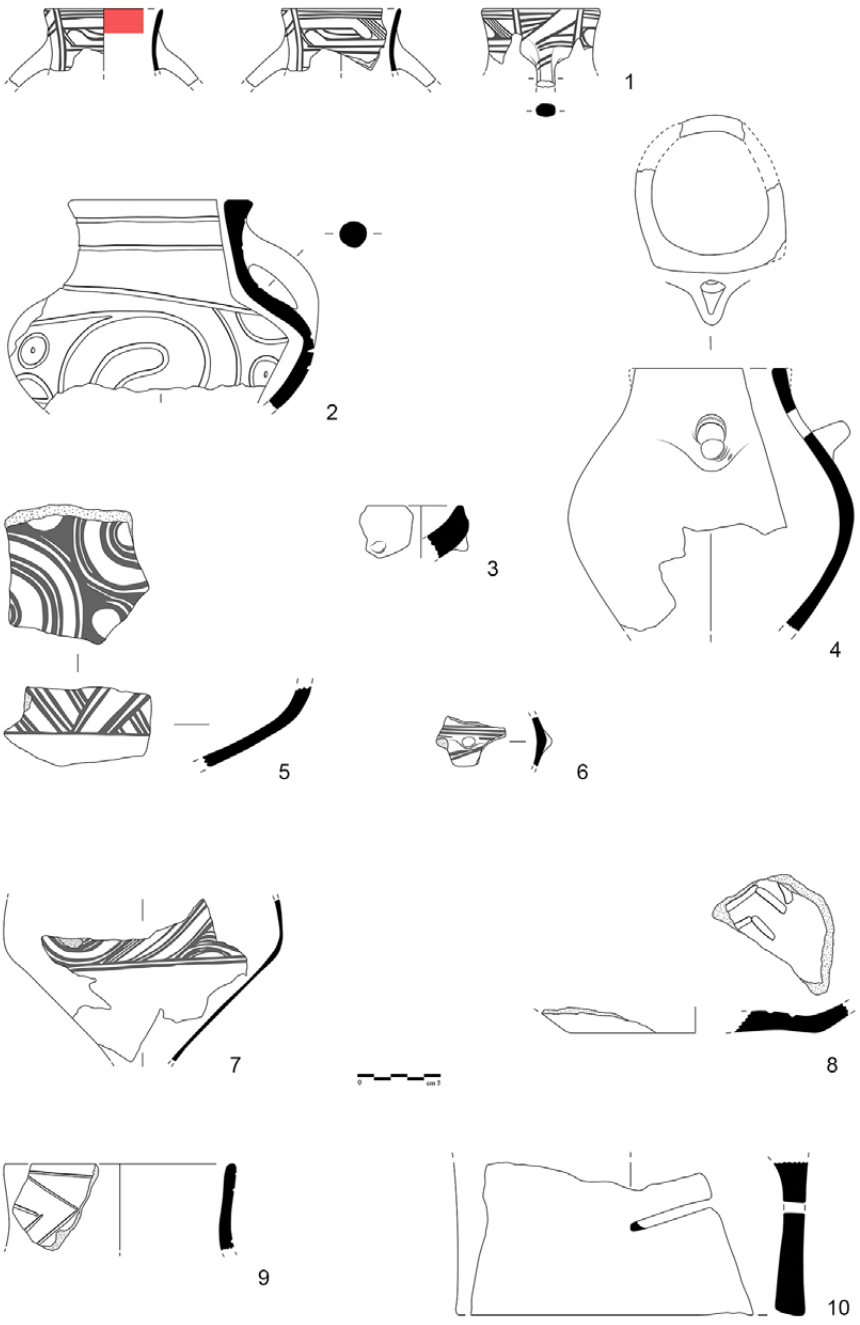



**Figure 43.** *Jugs (1 and 2), miniature (3), spouted vessel (4), bowl sherds (1–7), base with incised decoration (8), potstand (9), and pedestal? (10). Image Credit: Tell Yunatsite Project.*

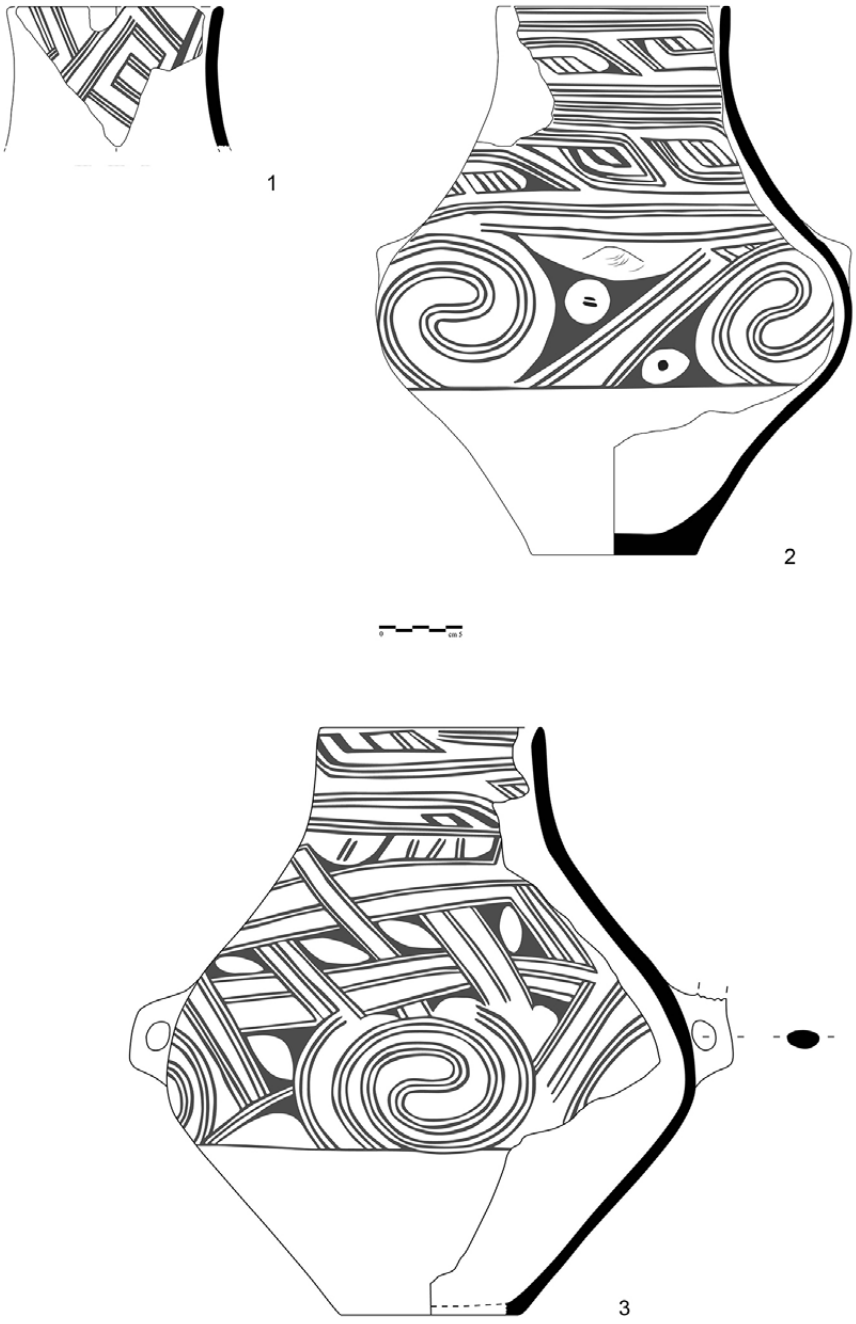



**Figure 44.** *Storage vessels, IV (1) and XLIV (2). Image Credit: Tell Yunatsite Project.*

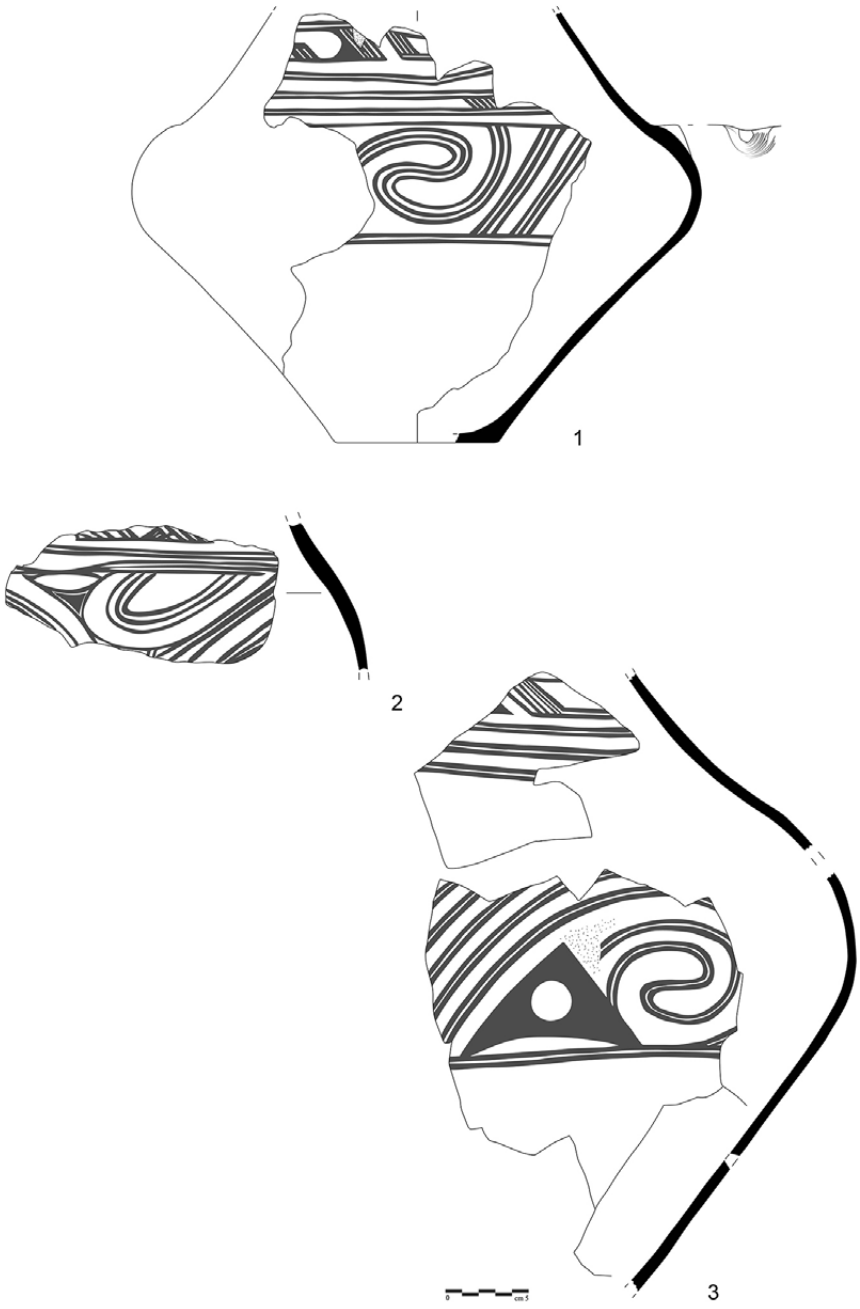



**Figure 45.** *Storage vessels, XXXV (1) and XXIII (3). Image Credit: Tell Yunatsite Project.*

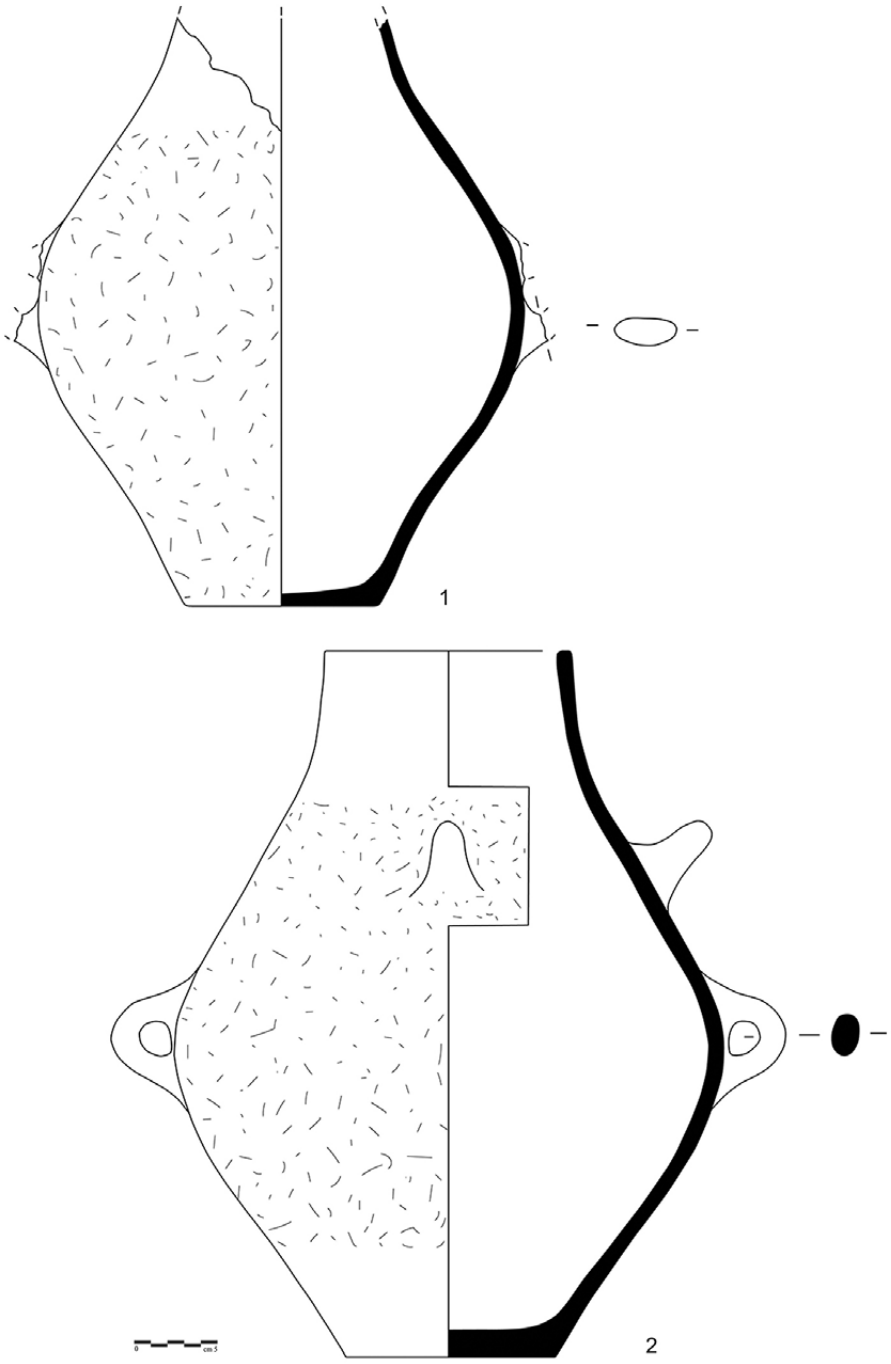



**Figure 46.** *Storage vessels, I (1) and III (2). Image Credit: Tell Yunatsite Project.*

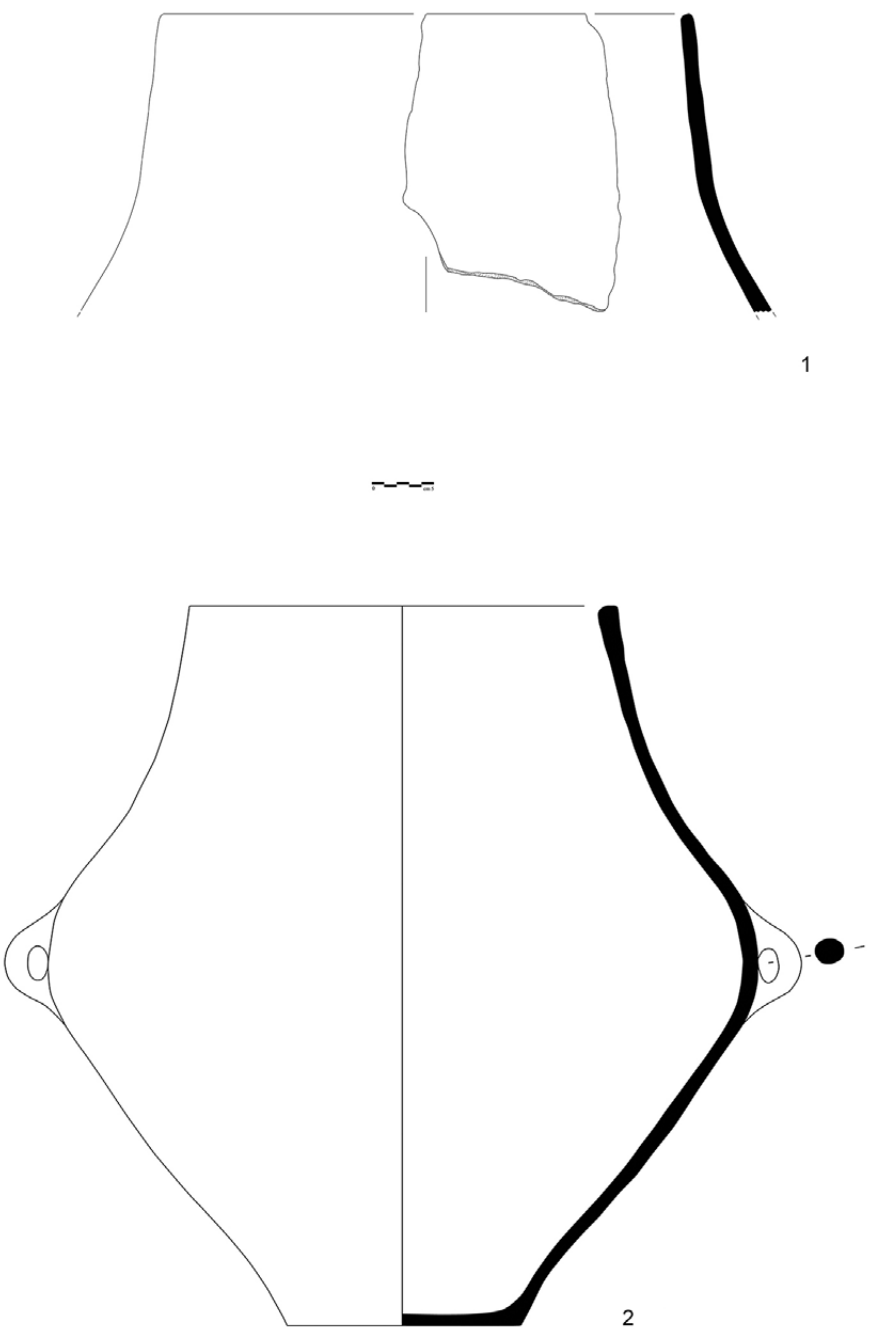



**Figure 47.** *Storage vessels, II (2). Image Credit: Tell Yunatsite Project.*

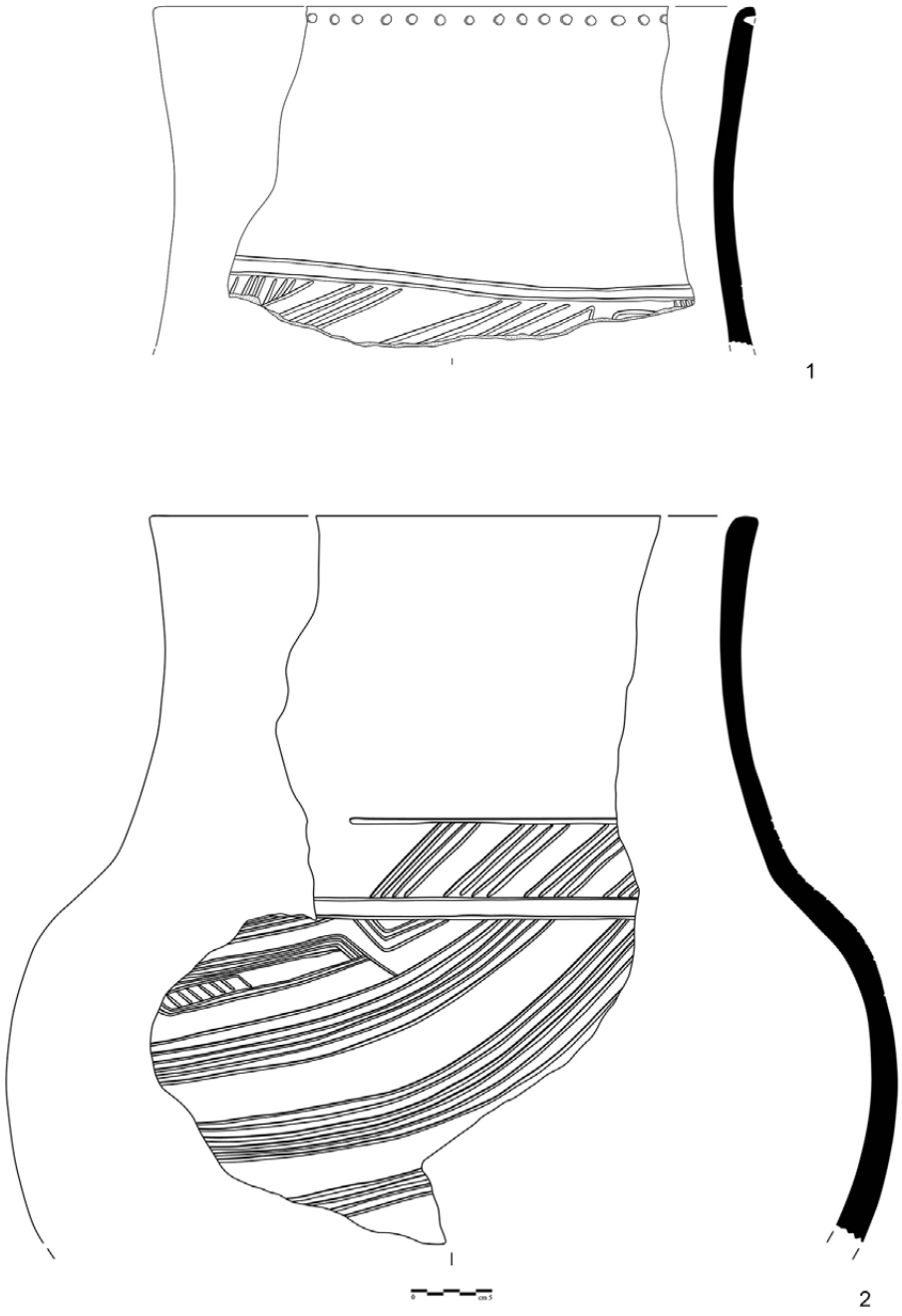



**Figure 48.** *Storage vessels, XLIII (1) and XLI (2). Image Credit: Tell Yunatsite Project.*

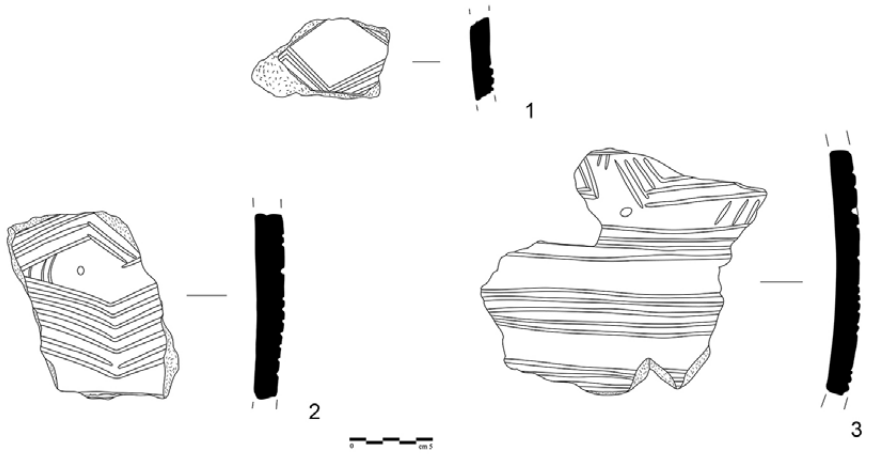



**Figure 49.** *Sherds from storage vessels with incised decoration. Image Credit: Tell Yunatsite Project.*

ic incised or graphite decoration is often found (these observations are based on vessels from other buildings at the site, as well). Thirty-five of the unidentified rim sherds meet these conditions. When we consider the wall sherds, 565 are over 0.8 cm and 326 over 1 cm thick; 78 of those that are over 0.8 cm have incised decoration (fig. 49) and 71 have graphite decoration. Considering some other characteristics of these fragments, we could assume that a minimum of 400 (and probably more than 500) of the unidentified sherds originate from about 6 or 8 storage vessels, a large part of which is however missing. It is important to note that some of the restored storage vessels include over 200 sherds.

At the type and subtype level, considerable diversity is observed, particularly among the plates and bowls (figs. 30–48 and 53).[1] Conical plates predominate (type I.1), followed by plates with thickened (I.3), curved (I.5) or inverted rim (I.4), with convex walls (I.6), and finally plates with S-shaped rims (I.2). The angle of the wall to the rim, and the depth of the vessels accordingly, varies significantly: from about 30° to 80°.

Among the bowls, shapes of three morphological parts with a distinct middle part and neck predominate (III.4), followed by biconical (III.3) and rounded vessels (III.5). The more complex type III.8 shapes of three morphological parts and the cylindrical-conical bowls (III.2) are represented by smaller numbers.

The jars are dominated by almost spherical shapes. In some cases, a neck is formed, but the junction with the main body is rounded and not well-emphasized (IV.2.H and

[1] The types and subtypes presented in the figures include only those attested in the ceramic assemblage from building BII-21B. The codes noted follow the general classification developed by the team for Copper Age sites in Upper Thrace. Therefore, a number of codes are missing.

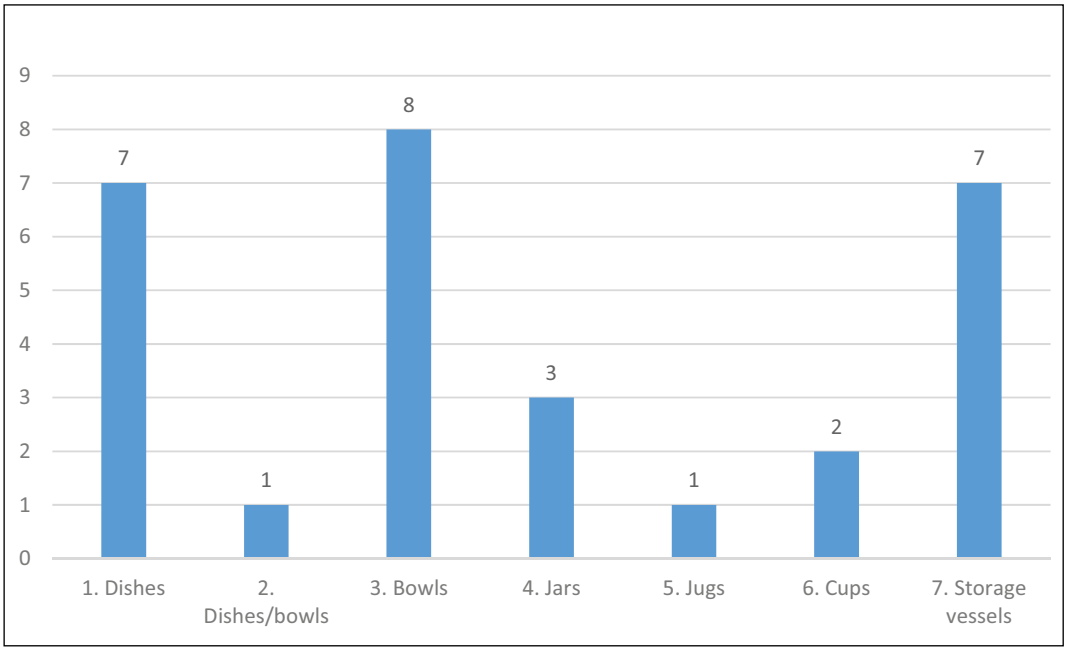



**Figure 50.** *Distribution of whole vessels by categories (main shapes). Image Credit: Tell Yunatsite Project.*

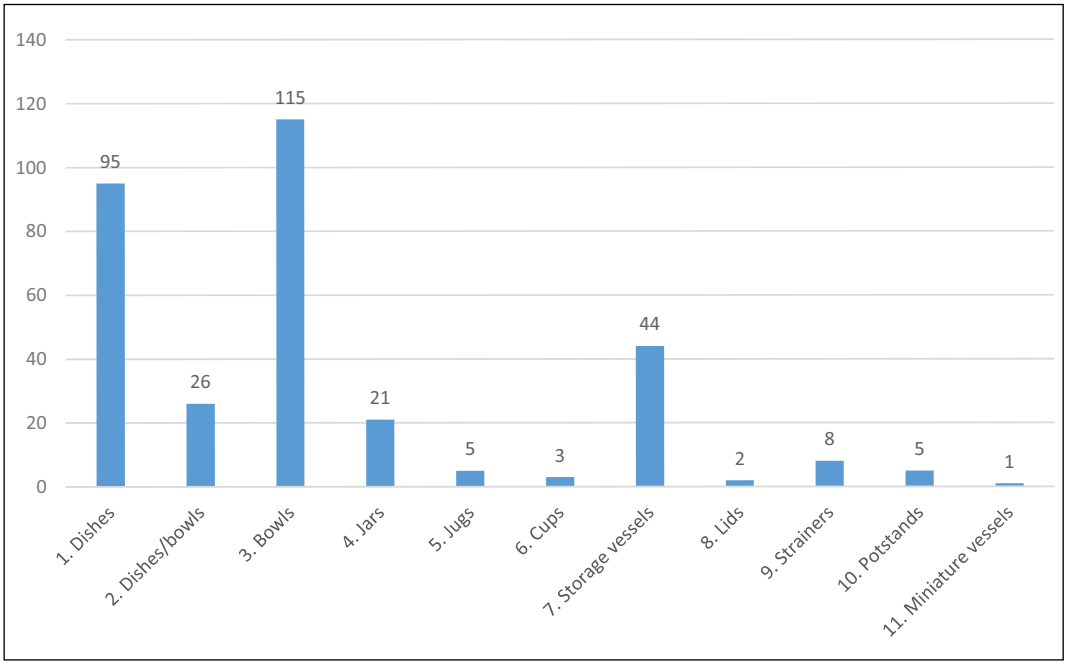



**Figure 51.** *Distribution of all identified vessels by categories. Image Credit: Tell Yunatsite Project.*

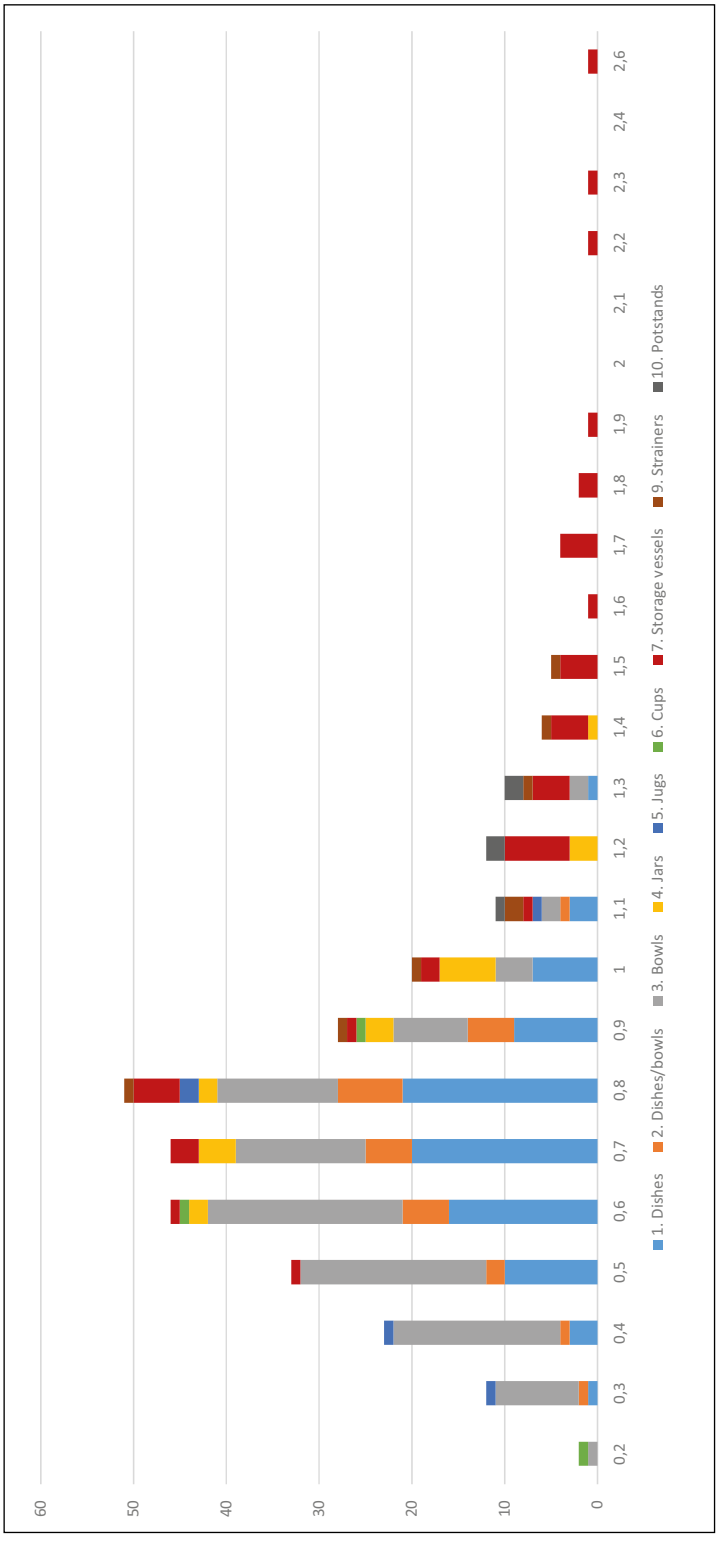



**Figure 52.** *Distribution of wall thickness by categories. Image Credit: Tell Yunatsite Project.*

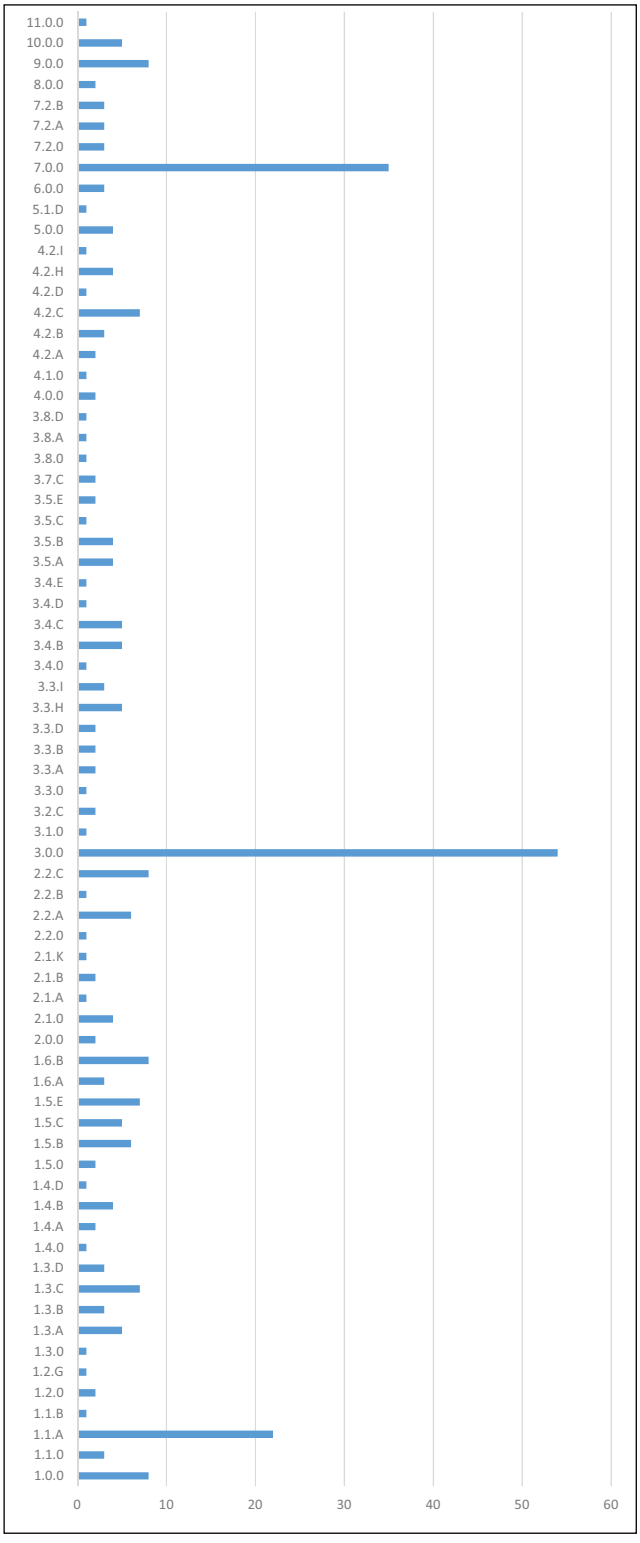



**Figure 53.** *Distributions of all identified vessels by types and subtypes. Codes match the ones in figures 28–30, the Roman numerals having been replaced by Arabic. Image Credit: Tell Yunatsite Project.*

IV.2.I). One almost spherical jar with two vertical tunnel handles on the neck is worth pointing out (fig. 42/3). Only one jar sherd has a clearly defined neck (type IV.2.D).

The storage vessels have shapes of three morphological parts with a rounded middle part. Based on their proportions (height versus maximum diameter), two types have been distinguished (fig. 32). A significant difference in size is observed in type VII.2.A: between 8 and 70 liters for the whole vessels. Specimens of type VII.2.B fall mainly in the lower part of this range. In both types, some of the vessels have two vertical handles at the maximum diameter (figs. 44/3, 46, and 47/2).

*Technology*

The technological analysis of the pottery is based both on macroscopic observations and statistical analysis of the characteristics recorded in the database (type and size of temper, fracture, treatment of both surfaces, color), and on microscopic observations performed on 19 thin sections, representing vessels of various sizes, shapes, and decoration techniques.

The macroscopic analysis shows a homogeneity of the fabric used to produce vessels. Small mineral temper significantly dominates, sometimes combined with small organic inclusions or small pieces of grog (*chamotte*). Predominant use of medium-sized (1–2 mm) or large mineral temper is very rare and attested mainly in storage vessels.

Ceramic petrographic analysis of thin sections has been able to distinguish four fabric groups, which are further divided in up to two sub-groups (table 3 and fig. 54). Most of the fabrics contain coarse polycrystalline inclusions composed of feldspar (often plagioclase), quartz and mica with moderate relief and usually diamond shaped or elongated, fractures at 120°, second order interference colors and greenish to neutral colors in Plain Polarised Light (PPL). Many of the mica fragments have been identified as amphibole although some are difficult to distinguish from pyroxene and clinopyroxene. These minerals suggest that the clays contain amphibolite, which is also suggested by the granoblastic texture of the polycrystalline inclusions, indicating these are of metamorphic origin.

| No. | Fabrics description | Vessels or sherds (s.) presented |
|---|---|---|
| 1A | amphibolite temper | XIX, XXXII, XXXVII, s. 44 |
| 1B | mica schist | XX, XXXIV, XXXIX |
| 2A | amphibolite and TFs* | XIV, XXIII, XXVII, XXVIII, XLI, s. 42 |
| 2B | amphibolite and TFs in ferruginous matrix | s. 43 |
| 3 | self-tempered fabric | XXXV |
| 4A | amphibolite in fine matrix | XXVI, XXXVI, XLIII |
| 4B | amphibolite in fine matrix with calcareous inclusions | XXXVIII |

**Table 3.** *Fabric groups, distinguished by petrographic analysis of thin sections. * TF stands for textural feature.*

Most of the fabrics have a bimodal grain size distribution suggesting that crushed amphibolite was added to similar heterogeneous mixed clay, which generally contains similar inclusions as those that constitute amphibolite with the addition of clay pellets and lathy mica, which could be muscovite. The inclusions in fine fraction have the same profile as the amphibolite inclusions, suggesting that we are perhaps dealing with secondary clays deposited through riverine activity in an amphibole-rich geology or that residual clays were used which formed upon amphibolite geology. The first option seems most likely because of the proximity of Tell Yunatsite to riverine clay-beds. The angularity and freshness of the amphibolite fragments further suggests that clay and temper mixing took place, as more rounded and weathered inclusions would be expected in the context of self-tempered fabrics.

The matrices of the different sub-groups vary slightly with some samples containing more reddish matrix colors and more abundant ferruginous inclusions (i.e. 2B). Such variation could occur within the same clay bed.

The sample representing fabric 3 contains a clearly unimodal grain size distribution, fewer hornblende, and no coarse amphibolite, suggesting that this clay base was left untempered. As such, this fabric suggests that the base clay used in other samples also could contain abundant fine feldspar and quartz and that the higher abundance of amphibole and coarse polycrystalline fragments is due to tempering.

Samples of fabric 2 are distinguished from the other fabrics through the presence of streaks of dark, ash-like material in the matrix and the occasional presence of burnt out, lentil-shaped organic inclusions (fig. 54/c and d). It has not been possible to confirm if the streaking resulted from the addition of dung, because no spherulites have been identified. The crystalline structure of the particles inside the greyish streaks resembles crystals of ash pseudomorphs which are calcium oxalates from plants that form calcite crystals after exposure to temperatures higher than 450° C (Amicone et al. 2021; Canti & Nicosia 2018).

Samples of fabric 4 have a finer matrix than the other fabrics, suggesting that finer clays were used (fig. 54/g and h). It is likely that variation in the abundance of inclusions in different matrices relates to natural variation in the same secondary clay source. However, samples of this fabric stand out due to the very clear bimodal grain size distribution resulting from the smaller size and lower abundance of minerals in fine fraction. Fabric 4B contains altered calcareous inclusions, which, due to their coarse size, could have been added alongside the crushed amphibolite temper.

The different fabrics identified suggest that a uniform clay procurement strategy was adhered to as well as a common idea of using amphibolite temper in the production of most ceramics. The main variation on this clay recipe is the addition, in samples of fabric 2, of plastic or non-plastic material such as ash or dung, which could have further optimized the plasticity of the vessels during the forming process.

No absolute relationship between certain shapes and sizes of vessels and a specific clay fabric is apparent. However, certain regularities are observed. Fabric 2 is attested

mainly in storage vessels, as well as large deep bowls with graphite decoration. It seems that this recipe was deliberately used for large vessels, probably to achieve better plasticity of the clay. Fabric 1 is mainly attested on smaller vessels (plates, bowls, and small jars), but there is also one storage vessel. Fabric 4 is small in the number of vessels represented, but diverse in the forms made. It includes a bowl, a jar, and a storage vessel. The only sample of fabric 3, without temper, comes from a storage vessel (No XXXV).

Among the ceramics from the building, there is almost no visible evidence of the crafting technology applied to construct the vessels. In a few cases, there are macroscopically discernible traces that coils were used, and this technique is also attested in one of the thin sections (fig. 54/f). Whatever technique was used, it is evident that the potters very skillfully obliterated the joints between the individual coils or parts of vessels. Such traces are rarely seen even along the carinations.

The main piece of evidence about the firing control of the vessels is provided by their fractures. Among them, the three-part fracture is significantly predominant (75% of all cases), followed by the single-part one (18%).

The surfaces of the vessels are usually carefully treated. Polished surfaces (55%) dominate the outer ones, followed by smoothed (29%) and roughened varieties (13%). The remaining types of treatment (including various combinations) are represented by a small number of specimens. Inner surfaces are usually smoothed (70%), and more seldom polished (27%). The carefully treated surfaces had not only aesthetic but also practical function, to reduce the absorption of moisture in the vessel. It is noteworthy that, among the identifiable vessel shapes, roughened and roughly smoothed outer surfaces and the various combinations with their participation (mainly smoothed or polished upper part and roughened middle and lower part) are mainly found on jars (fig. 55). This probably has to do with the potentially hot cookware being easier to grip.

The secondary firing of the vessels during the burning of the building caused significant changes in the color of their surfaces. Radical differences between sherds of the same vessel have been observed. For this reason, color cannot be used as a reliable technological criterion.

The analysis of the ceramic assemblage speaks to a well-mastered and standardized production technology, including all its stages: purposeful use of specific clay sources and temper, extremely skillful shaping of the vessels and treatment of the surfaces, matching the technology with the function of the vessel, good firing control and considerable skill in applying the decoration, especially the painted one. This was obviously the work of a specialist artisan(s).

*Decoration*

Most of the vessels from building BII-21B were decorated. Decoration is attested on 48 percent of all sherds, but when just the reconstructible shapes ('whole' vessels and upper halves, a total of 76 specimens) are considered, it reaches 74 percent. This number is probably closer to the real situation. The following decoration techniques were iden-

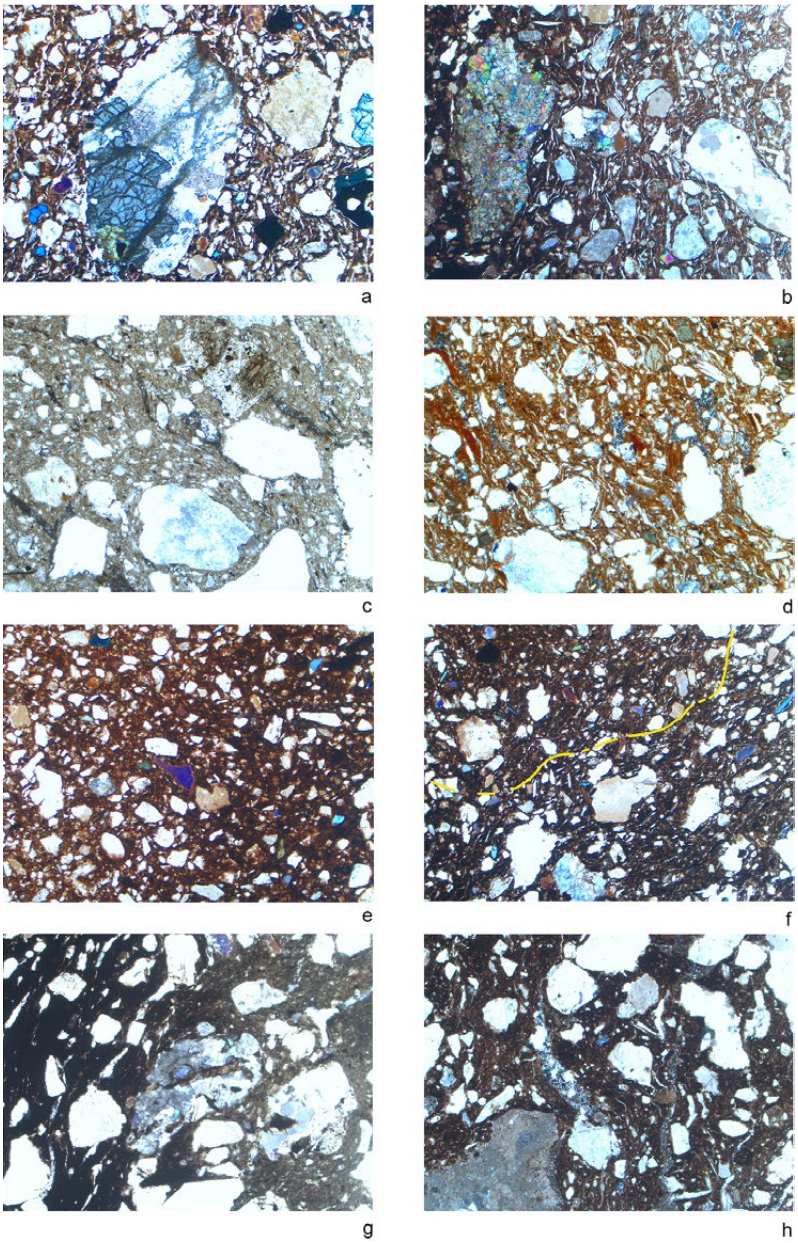



**Figure 54.** *Fabrics: (a) amphibolite fragment in sample 31 (vessel XXXII). XPL,* field of view = 3.0 mm; (b) mica schist fragments in sample 38 (vessel XXXIX). XPL, field of view = 3.0 mm; (c) streaks of ash-like material in the matrix of sample 42. PPL,** field of view = 3.0 mm; (d) sample 43. PPL, field of view = 3.0 mm; (e) sample 34 (vessel XXXV). XPL, field of view = 3.0 mm; (f) sample 26 (vessel XX) showing border of relic coil of same fabric as sample 34. XPL, field of view = 3.0 mm; (g) bimodal grain size distribution in sample 28 (vessel XXVI). XPL, field of view = 3.0 mm; (h) large calcareous inclusion in bottom left of microphotograph, sample 37 (vessel XXXVIII). XPL, field of view = 3.0 mm. *XPL: Crossed polarized light. ** PPL: Plain polarized light.*

tified: painted (graphite and red paint), incised, impressed (made with a shell, tool, or fingernail), fluting, dimples, cordons, and pellets. Barbotine is also included here, though it probably had not just aesthetic but practical function, as well.

The painted decoration slightly predominates over all the others combined (54% versus 46% of all pieces; 50% each in the reconstructible specimens). In terms of particular techniques, however, graphite decoration significantly dominates, with a total of 52 percent of all decorated pieces. It is followed by barbotine (25%), incised lines (12%), and pellets (5%). The remaining techniques are represented by up to 1 percent of the pieces (fig. 56). Indeed, the percentage of the first three techniques in the overall assemblage is probably distorted by their use on large and highly fragmented storage vessels. The analysis of the reconstructible vessels alone also shows a predominance of graphite decoration, but to a lesser extent: 45 percent of the decorated ones. However, the distribution of the other techniques is different: pellets hold the second place (21%), followed by barbotine (12%), fluting (8%), incised lines (7%), cordons and red paint (3%), and impressed decoration (1%). A combination of different decorative elements is often observed on the reconstructible pots (on nearly 25% of the decorated ones), which is difficult to detect in the fragmented material. The combination of graphite and pellets predominates (figs. 44/2 and 45/1), followed by pellets and flutes (figs. 36/1 and 37/1). The other combinations are represented by single examples: graphite, incised lines, and pellets (fig. 35/1); graphite, red paint and pellets (fig. 40/3); graphite, cordons, and pellets; graphite and impressed ornaments; incised lines and paint (fig. 31/3); pellets and cordons (fig. 38/2); pellets and barbotine (fig. 37/3).

The preference for graphite decoration is also evident in the variety of vessels on which it was used. It is the predominant technique on plates, plates/bowls, bowls, and jugs, and is also well represented on storage vessels (fig. 57). It is absent only on jars and potstands. In some cases, it was used in combination with other techniques (most often pellets) or with red paint (figs. 35/1 and 7, 40/3, 43/1, and 44/2). Painted decoration was often used to decorate both the outer and inner surfaces of plates and plates/bowls. Usually, the entire inner surface is covered and only the upper part of the outer surface (figs. 32/1 and 2 and 35/3), but there are also cases where both surfaces are completely painted (figs. 31/1, 32/3, and 35/5). Graphite decoration on both surfaces is also attested on some of the bowls (fig. 35/1).

The analysis of painted motifs and compositions is based mainly on the reconstructible vessels. Characteristic of the storage vessels and large bowls are the groups of lines forming a spiral, as well as rhombuses with an ellipse, rhombus, or group of lines in the middle connected in a meander (figs. 40/1 and 3, 44/2 and 3, and 45/1). These two motifs are often combined: the spirals on the middle part of the vessel and the 'rhomboid meander' above it. Groups of lines forming a spiral, as well as a rhombus with an ellipse or lines in the middle are also common in other categories, such as plates and plates/bowls (figs. 31/1, 32, and 35/6). A swastika-like organization of the composition is attested

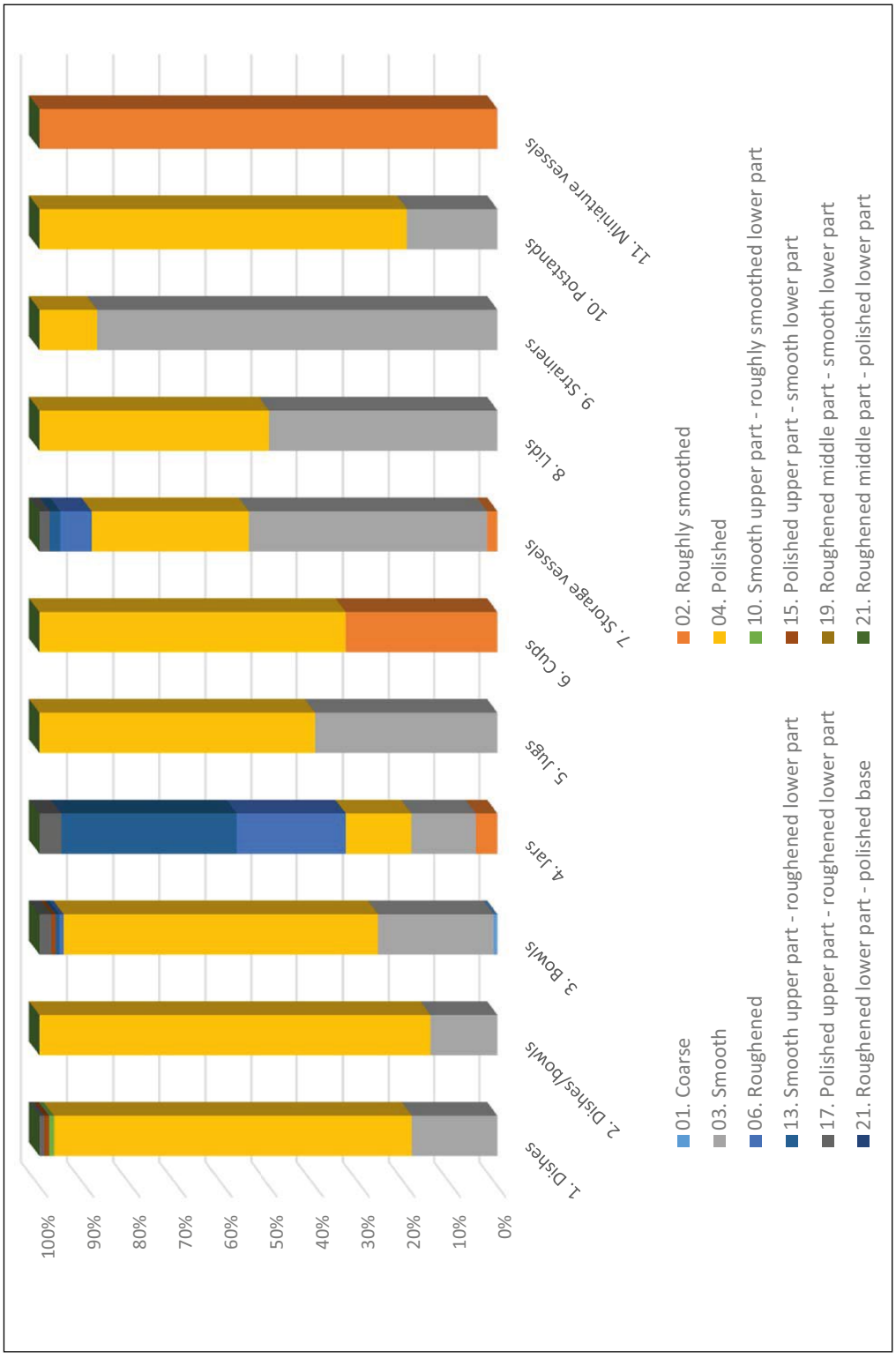



**Figure 55.** *Distribution of outer surface treatment by category. Image Credit: Tell Yunatsite Project.*

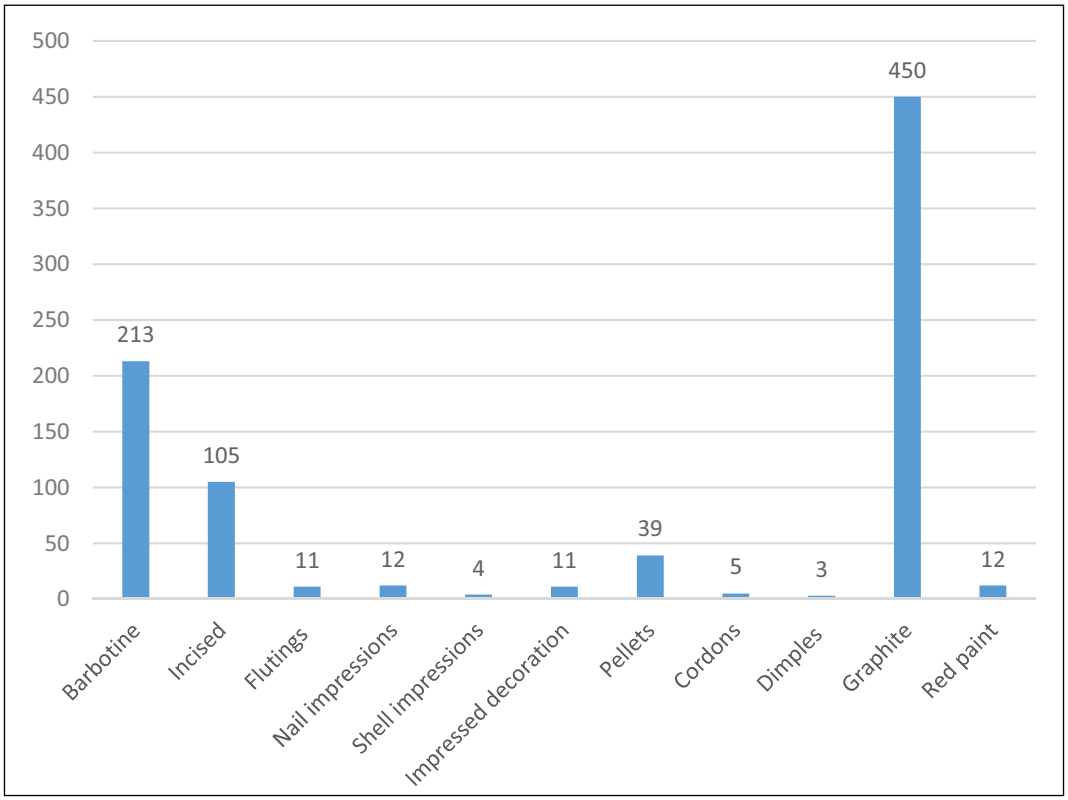



**Figure 56.** *Distribution of pottery decoration techniques. Image Credit: Tell Yunatsite Project.*

on the inside of some plates (fig. 31/1). The variety of motifs is greater among plates and bowls, but the fragmentary state of most of them does not allow for detailed conclusions.

The other decoration types are used predominantly on the outer surface, usually on the middle part of the vessel. On one base, probably from a plate, a decoration of wide incisions is attested on the inside (fig. 43/8). Several sherds from a large, closed vessel(s), with roughened inner surface and deep wide incisions on it are a notable exception (fig. 58). Similar sherds were found in other contexts from levels BII and BIII at Yunatsite, but no shape has been reconstructed so far. These appear to be specific vessels with a particular function that is unclear at this stage.

Some preferences are observed in the use of certain decoration techniques on certain vessel categories (fig. 59). Incised decoration was mainly used on storage vessels (figs. 48 and 49). The motifs attested include bundles of parallel lines: horizontal, arc-shaped, forming rhombuses or meanders, and spirals. Sometimes incrustation with white paste is visible. In contrast to the incised decoration, barbotine was used mostly on jars, less often on storage vessels and only in single cases on other vessel types (figs. 37/3, 39/1 and 4, 41/1 and 2, 44/1, 2, and 4, and 46). Pellets are attested mostly on the middle part of bowls (types 4.B, 5.E, 8.D; figs. 35/1 and 4, 36, 37, 38/2, and 40/3), less often on pots

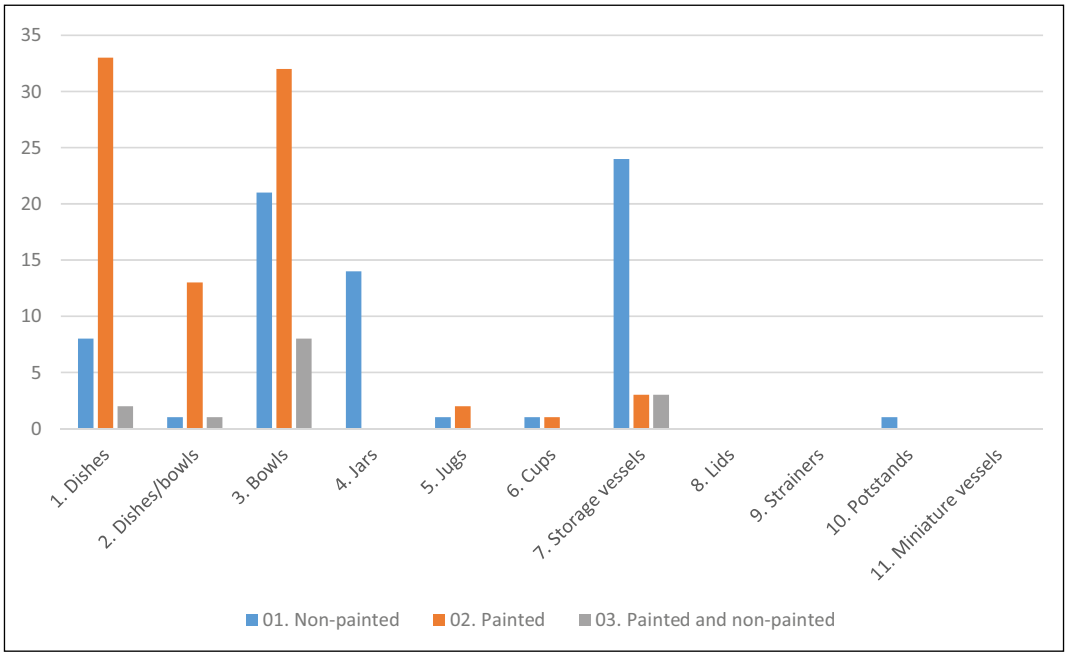



**Figure 57.** *Distribution of painted and non-painted decoration by category. Image Credit: Tell Yunatsite Project.*

and storage vessels (fig. 44/2); cordons, on bowls, pots, and storage vessels (figs. 38/2 and 41/4); and fluting, mainly on the middle part of bowls (types 3.H, 4.B and 5.E, sometimes together with pellets; figs. 36/1 and 37/1) and on the rims of plates (in two cases, on thickened rims). Most sherds with impressed decoration cannot be reliably associated with specific vessel shapes and types. Shell impressions are an exception. They are found only on the middle part of four bowls. Circular impressions are attested on storage vessels combined with incised decoration (as part of complex motifs), or as a horizontal row below the rim (fig. 48/1).

*Function*

The study of the function of ceramic vessels is often left out of the analyses of prehistoric ceramic assemblages, and the formal definitions of plates, bowls, jars, jugs, and storage vessels have a purely morphometric meaning. In attempt to overcome this problem, we addressed three different sources of information: a detailed analysis of the ceramic assemblage from building BII-21B in order to establish certain relationships between shape, decoration, and surface treatment of the vessels; analysis of the context of discovery and relationship between vessels and plant remains; and residue analyzes of sherds from some of the vessels.

Shape, decoration, and surface treatment

The morphological categories of plates, plates/bowls and bowls show the greatest typological diversity as well as the most lavish and most varied decoration. A greater va-




**Figure 58.** *Sherds from a large closed vessel/vessels (?), with roughened inner surface and deep wide incisions on it. Image Credit: Tell Yunatsite Project.*

riety of overall dimensions and wall thickness is observed in them (fig. 52). Plates range from 10 to 50 cm in diameter. Almost 80 percent of them are concentrated in the 20 to 37 cm range. The inclination of the wall to the rim varies from 25° to 70°, suggesting vessels of varying depth. Only seven plates were reconstructed and their height is between 3.4 and 12 cm. Forty percent of the plates have decoration on the inner surface. Presumably, plates were used for serving food. It is possible that the metrical differences observed, as well as the presence or absence of decoration, are related to the type of food served, the age of those using them (i.e., the existence of dishes for children), and perhaps the occasion for their use: the exquisitely decorated dishes may have not been intended for everyday use, but for special occasions. Typological differences in plates affect the rim and in most cases are related to its curving or thickening towards the interior (figs. 32 and 35). This shaping may have had a purely practical purpose: to prevent spillage of the contents.

The most significant differences are observed among the bowls. The maximum diameter of all analyzed pieces varies between 9 and 59 cm, and of the reconstructed bowls, between 24 and 38 cm. The height of the reconstructed bowls varies between 10.4 and 24 cm. Certain relations are visible when we compare different types of bowls. Biconical bowls (type 3) generally have smaller dimensions: the maximum diameter varies between 9 and 18 cm in five out of eight cases (fig. 35/2–8). Polished outer surfaces predominate. They are often decorated with graphite, pellets, or short incisions along the carination.

Bowls of type 4 (figs. 36–38) show certain differences compared to type 3. The maximum diameter is attested for six of them and it varies between 39 and 52 cm. The rim diameter was measurable in 15 cases, and in 14 of them, it was between 20 and 39 cm. Polished and smoothed outer surfaces are represented almost equally, and two vessels have a roughened lower part. Graphite decoration is attested in five cases, and six others have

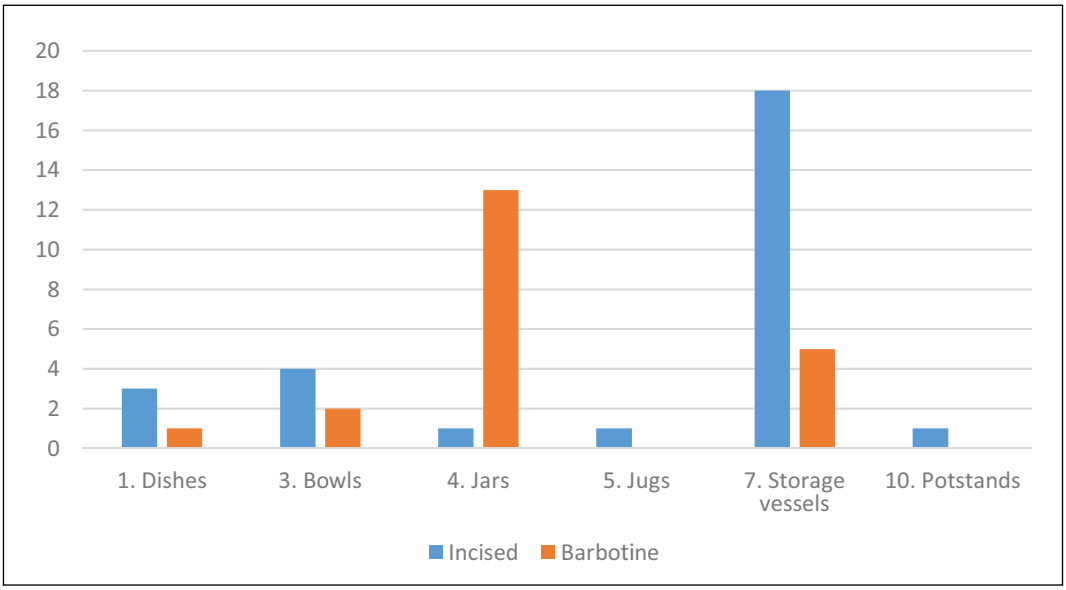



**Figure 59.** *Distribution of incised decoration and barbotine by category. Image Credit: Tell Yunatsite Project.*

pellets and flutes, pellets and cordons, or barbotine; in two cases there is a combination of graphite and pellets. It is noteworthy that non-painted decoration, as well as smoothed and roughened surfaces are mainly found in vessels of subtype 4.B.

The maximum diameter of type 5 bowls (fig. 39) varies between 18 and 38 cm (five cases, four of which are over 24 cm). The rim diameter was recorded in nine cases and varied between 16 and 40 cm, in seven of them, over 26 cm. The polished outer surfaces predominate, in two cases combined with a roughened lower part. Only non-painted decoration was used, mainly pellets and barbotine.

The bowls that have been certainly designated as types 7 and 8, are too few to draw definite conclusions (two of each type) but are distinguished by their large size and the presence of graphite decoration (in three of four cases). In type 8 vessels, the ornamentation is similar to the graphite-painted storage vessels in terms of position and motifs (fig. 40/1 and 2). A couple of bowls with intermediate shape between type 8.D and 4.C are very close to them (fig. 40/3 and 4).

The sizes of jars are also within a wide range, but some grouping into two ranges is evident (figs. 41 and 42). The maximum diameter of most vessels is between 27 and 45 cm, and the rim diameter is between 22 and 36 cm. Four pieces are of much smaller size: maximum diameter between 17 and 20 cm and rim diameter between 8 and 10 cm. Subtype 2.B prevails among them. A characteristic feature of the jars of both metric groups is the treatment of the outer surface: in most cases roughened/barbotined or a combination between a polished/smoothed upper part and a roughened lower one (figs. 41/1,

2, and 4; and 42/1, 2, and 4). Decoration of pellets is observed in three cases. Jars were presumably used for cooking. Their 'decoration' – barbotine and pellets – probably had a functional role in gripping their hot surfaces. One of the jars (fig. 42/3) has a specific shape, with an oblique rim and two lugs on the neck, which suggests that it might have had different function: for storing and pouring liquids.

The observations made suggest that the category of bowls, identified based on metric and morphological characteristics, probably includes vessels with different functions. A number of them, mainly vessels of type 3 and some of type 4, were probably used for serving (liquid?) food. Vessels of type 5 and subtype 4.B, whose morphometric characteristics, as well as surface treatment and decoration, are quite similar to those of jars, may have been used for cooking food. Bowls of types 7 and 8, as well as some of type 4 (subtypes D and E), which often have a relatively large volume (7–9 liters) and purely aesthetic decoration (mostly graphite) may have been used for storage. Some of the smallest bowls, mainly of subtype 3.I, with two vertical handles suitable for gripping (fig. 35/7 and 8), may have been used as cups (cf. Todorova & Matsanova 2000, 337).

Vessel context

The context for each vessel was analyzed to establish the potential relationship between certain vessels and charred plant remains, as well as possible differences between the pottery in both rooms.

In the north room, a certain distribution pattern of the plant remains was identified; in its western part, in the area of vessels I-IV (figs. 13 and 14), barley and wheat predominate, and lentils predominate in the eastern part. Barley was recorded on some sherds of vessel III, and a mixture of barley and lentils was uncovered among the sherds of vessel V. Grape seeds were concentrated in the NE corner of grid square O4, close to sherds of vessels II, III, IV, and VII. However, we were not able to establish a more specific relationship. Charred remains of bread or porridge were found on part of the outer surface of vessel XVIII; lentil seeds were uncovered below and above the vessel sherds. The shape of this vessel suggests that it was used for cooking, but it is not sure whether the porridge-like substance discovered is related to it.

The distribution analysis of the ceramic assemblage shows no significant differences between the rooms. The number of sherds from the southern room slightly exceeds that from the north room. However, the north room exceeds the southern as a concentration of sherds per area. In terms of shapes attested, the situation in both rooms is similar. Plates, bowls, and storage vessels slightly predominate in the southern room, while jars slightly predominate in the northern room, if the percentage of sherds in each of them is regarded (fig. 60). In the case of 'whole' vessels, however, plates and bowls are equal in number, storage vessels slightly predominate in the northern room, and jars in the southern room (fig. 61). On this basis, differences in the ceramic assemblages of the two rooms cannot be established. In terms of the types and subtypes represented, a greater diversity is evident in the southern room, especially in the fine ware categories: plates and bowls

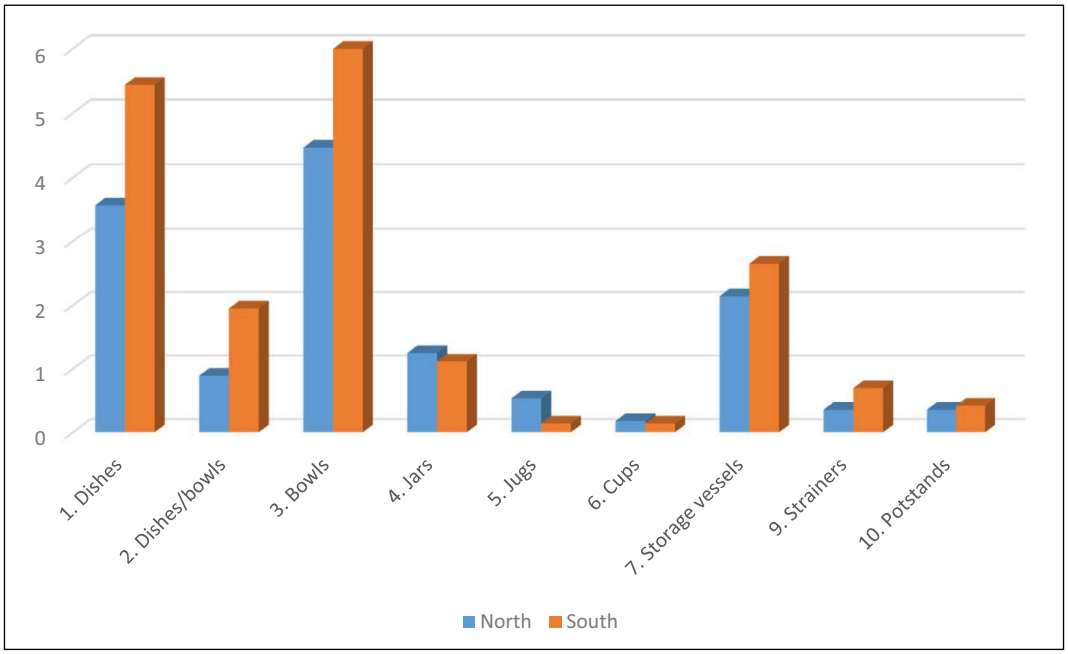



**Figure 60.** *Distribution of vessel categories by rooms in building BII-21B (all identified pieces). Image Credit: Tell Yunatsite Project.*

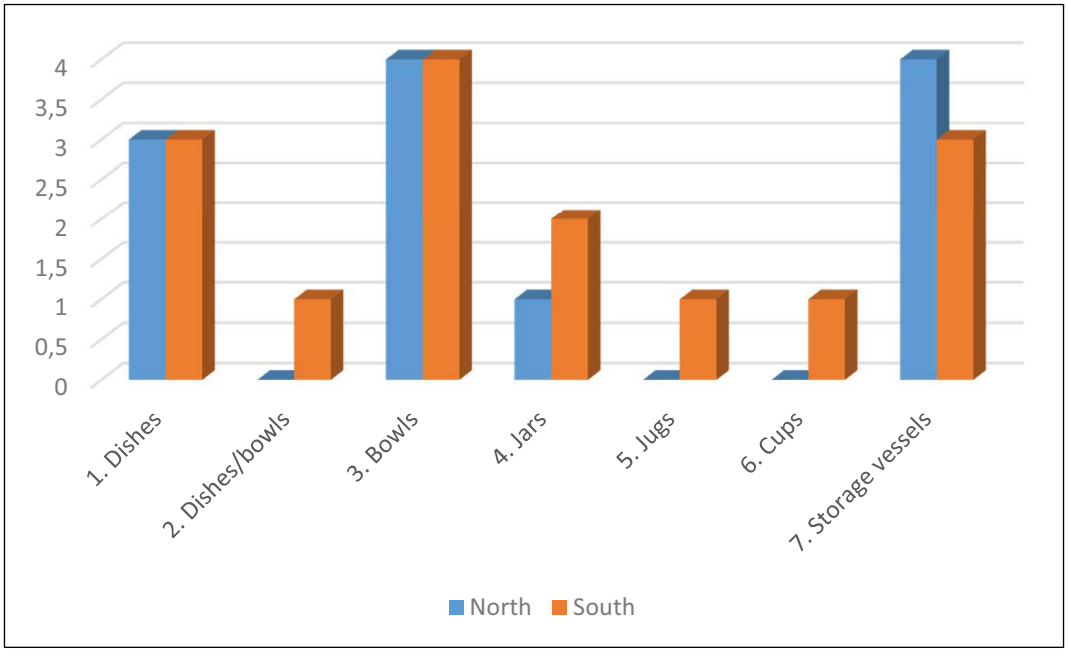



**Figure 61.** *Distribution of vessel categories by rooms in building BII-21B ('whole' vessels). Image Credit: Tell Yunatsite Project.*

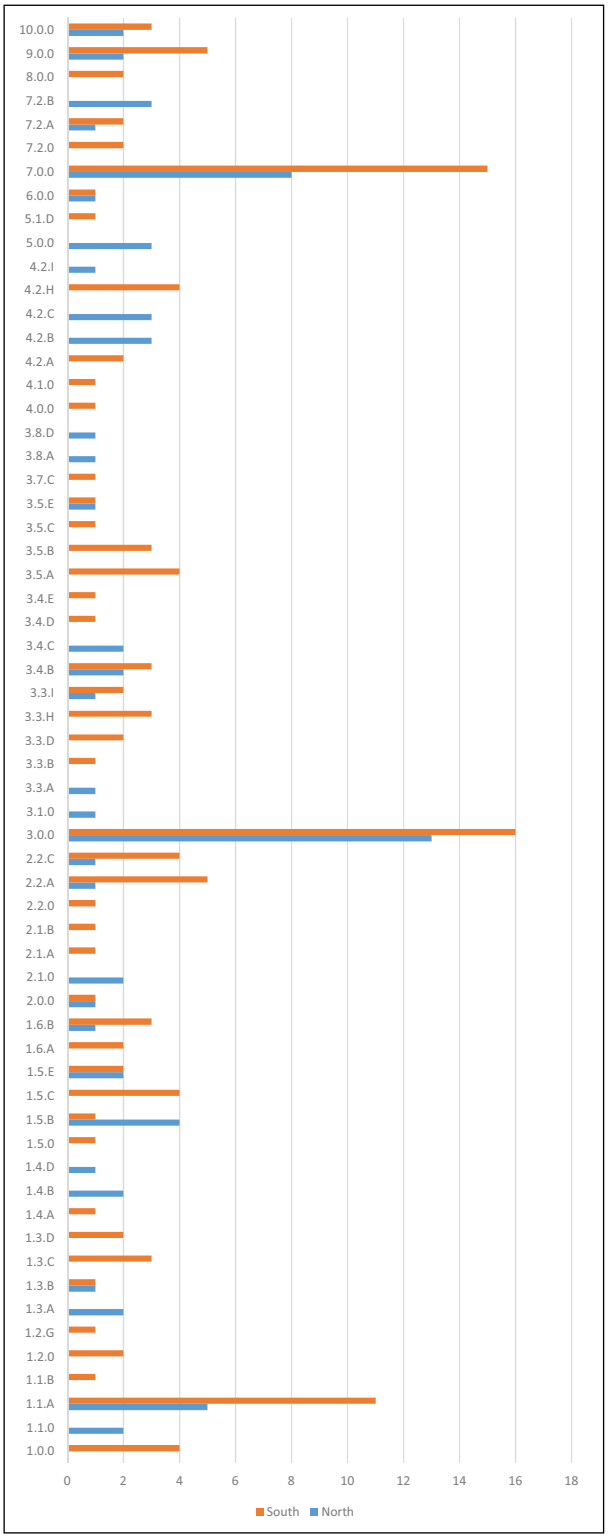



**Figure 62.** *Distribution of types and subtypes of vessels by room in building BII-21B (all identified pieces). Codes match the ones in figures 28–30, the Roman numerals having been replaced by Arabic. Image Credit: Tell Yunatsite Project.*

(fig. 62). In the northern room, relatively large bowls predominate, having rim diameter over 20 cm and maximum diameter over 30 cm.

Residue analyses

In order to establish the relationship between certain vessels and the plant remains found, as well as the function of the vessels, 16 sherds were selected for phytolith and starch remains analysis. They include various groups of vessels from both rooms: bowls, deep plate/bowls, jars, and storage vessels.

Sampling, processing, and analysis of microbotanical remains took place at the Bio-GeoPal Laboratory, IMF-CSIC (Barcelona, Spain) following the protocols described in García-Granero et al. (2017). Residue recovery from the inner wall of the vessels consisted of a two-step process in which the outer layer of sediment was first dry brushed from the inner surface of the vessel (dry sample), and then the inner layer of sediment was brushed with deionised water (wet sample; Hart 2011). Once the outer layer of sediment is removed, the chances of contamination from the surrounding archaeological matrix decrease considerably (Hart 2011); for this reason, the analysis focused on the wet samples. Additionally, two sediment control samples from the contexts where the vessels were embedded were collected to further check against contamination from the archaeological matrix (table 4; for the detailed protocol, cf. García-Granero et al. 2017).

| Sample No | Square | Context | Type of sample and vessel No | Weight (g) |
|---|---|---|---|---|
| 1 | O4 | 385 | wall – vessel I | <0.0010 |
| 2 | O4 | 385 | wall – vessel V | 0.0033 |
| 3 | O4 | 385 | base – vessel XII | 0.0080 |
| 4 | O4 | 385 | wall – vessel III | 0.0030 |
| 5 | O4 | 385 | wall – vessel XVIII | <0.0010 |
| 6 | П5 | 580A | base – vessel XXVI | 0.0023 |
| 7 | П5 | 528 | rim – vessel XXV | 0.0036 |
| 8 | П5 | 580A | base – vessel XXVIII | 0.0190 |
| 9 | П5 | 580A | base – vessel XLV | 0.0148 |
| 10 | П5 | 528 | base – vessel XXIX | 0.0044 |
| 11 | П5 | 528 | base – vessel XXXII | 0.0197 |
| 12 | П5 | 580A | vessel XXXVIII | 0.0022 |
| 13 | O4 | 385 | control sample | 6.6401 |
| 17 | O4 | 385 | base, not connected to whole vessel | 0.0097 |
| 18 | O4 | 385 | base, not connected to whole vessel | <0.0010 |
| 19 | П5 | 580A | middle part, not connected to whole vessel | 0.0564 |
| 20 | П5 | 528 | base, not connected to whole vessel | 0.0082 |
| 21 | П5 | 528 | control sample (samples 6-12, 19-20) | 3.5758 |

**Table 4.** *Samples analyzed for starch and phytoliths remains.*

Starch grains and phytoliths were analyzed using a Zeiss Axioplan and an Olympus BX51 microscopes equipped with plain and cross-polarized transmitted light and Zeiss Axiocam 208 color cameras for microphotography connected to computers running Zeiss Zen Blue 3.4 software for capturing images and measuring microbotanical remains. Starch slides containing 50 percent of the starch residue were wholly scanned at x200 magnifications and all grains were photographed at x400 magnifications for posterior analysis, whereas phytolith slides containing c. 1 mg of the phytolith residue were scanned at x400 magnifications until 250 individual phytoliths had been identified or until 10 percent of the slide had been scanned. Starch grain and phytolith identification relied on comparison with the modern reference collections housed at the BioGeoPal Laboratory. Starch nomenclature follows the recommendations of the International Code for Starch Nomenclature (ICSN 2011), whereas phytolith nomenclature generally follows the recommendations of the International Code for Phytolith Nomenclature 1.0 (Madella et al. 2005).

Starch grains were scarce in all samples from pottery vessels (0–6 grains per sample) and absent from the sediment control samples (table 5). The most commonly observed morphotype (n=24) is polyhedral and medium/large-sized (fig. 63/a), a morphotype commonly associated with certain taxa within the Panicoideae subfamily (Poaceae, grass family), in particular large-seeded panicoid grasses such as maize (*Zea mays*), Job's tears (*Coix lacryma-jobi*), sorghum (*Sorghum bicolor*) and finger millet (*Pennisetum galucum*) (Madella et al. 2016), none of which are native to Southeast Europe. Panicoid grasses na-

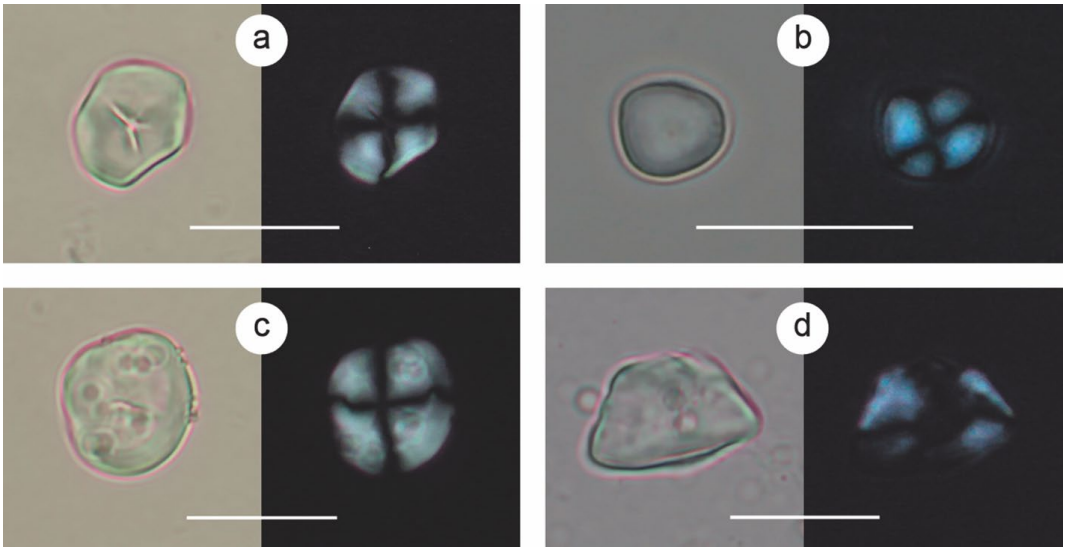



**Figure 63.** *Starch morphotypes identified in pottery vessels from building BII-21B: (a) Panicoideae starch grain from sample Y5; (b) type 1 (undiagnostic) starch grain from sample Y3; (c) type 2 (unidentified) starch grain from sample Y5; and (d) type 3 (unidentified) starch grain from sample Y18. Scale bar: 20 µm. Image Credit: J.J. García-Granero & M. Jovanović.*

tive to this region (e.g., bristly foxtail, *Setaria verticillata*) produce morphologically similar but smaller starch grains (Madella et al. 2016; Yang et al. 2012). Starch grains from panicoid grasses often become enlarged when ground (Li et al. 2020; Ma et al. 2019); it might then be argued that the Panicoideae starch grains from Yunatsite could belong to a native wild/weedy grass that had been subjected to grinding (or other processing technique resulting in the enlargement of the starch grains) before been trapped and preserved in the pottery vessels. However, panicoid grasses are a very minor component of the phytolith assemblage from Yunatsite, suggesting that the Panicoideae starch grains did not enter the pottery vessels as a result of their use but as a result of modern contamination. Maize is the most common source of modern starch contamination, as maize starch is used in a variety of industries, including the manufacture of gloves and other laboratory consumables (Crowther et al. 2014); therefore, the Panicoideae starch grains from Yunatsite probably entered the vessels during their collection, sampling or processing and should not be considered archaeological. Beyond maize, the most common sources of modern starch contamination are from wheat types and, to a lesser extent, potato (Crowther et al. 2014). Therefore, all other starch morphotypes found are likely the result of vessel use and not modern contamination.

| **Sample No** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **17** | **18** | **19** | **20** | **21** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type of sample** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **c** | **v** | **v** | **v** | **v** | **c** |
| Panicoideae | 0 | 2 | 1 | 0 | 4 | 0 | 1 | 3 | 1 | 1 | 2 | 0 | 0 | 0 | 3 | 0 | 5 | 0 |
| Type 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Type 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Type 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Total starch grains | 0 | 2 | 2 | 0 | 5 | 0 | 2 | 3 | 1 | 1 | 3 | 0 | 0 | 0 | 4 | 0 | 6 | 0 |

**Table 5.** *Results of the starch grain analyses; v: pottery vessel; c: control sample.*

The starch assemblage from Yunatsite (excluding the Panicoideae grains) is poor. All samples from pottery vessels had very low weights (<0.1 g, and occasionally <1 mg), which may have impacted the likelihood of recovering starch grains. Moreover, starch deposition and preservation in artefacts depends on a series of variables, ranging from the force that causes starches to being trapped in an artefact to the artefact's porosity. In general, the higher the force and the bigger the porosity, the more starches are preserved. In particular, within pottery vessels starch grains are more abundant in rough cooking vessels, in which food is subjected to mechanical forces that aid starch release, than in fine storage/serving vessels, in which foodstuffs are not subjected to any mechanical or physical processes (García-Granero et al. 2021). Therefore, the starch assemblage from Yunatsite suggests that the vessels analyzed were mostly used for storing food and not preparing it.

Phytoliths were generally scarce in pottery vessels but abundant in control samples (table 6). Most identified phytoliths belong to the Poaceae family; samples from pottery vessels further include a few phytoliths from the *Cyperaceae* family (sedges) and dicotyledonous (woody) plants, as well as non-diagnostic (indetermined) phytoliths – morphotypes present in several plant taxa (fig. 64). Within the grasses, most short cells (which can be attributed to different grass subfamilies) belong to the *Pooideae* subfamily (rondels and different types of trapeziforms), which includes wheat and barley, with a minor presence of morphotypes characteristic of the *Panicoideae* (bilobates, trilobates and crosses) and *Chloridoideae* (saddles) subfamilies, which in this area indicate the presence of wild/weedy species. Anatomically, most grass phytoliths come from leaves and culms (~60–85%, including all the grass phytoliths that can be ascribed to leaves and/or culms: elongate psilates, elongate sinuates and bulliform cuneiforms), with a comparatively lower presence of phytoliths from grass inflorescences (~15–40%, including elongate echinates, elongate dendritics and papillae). Some of the observed grass inflorescence phytoliths show features (overall breadth and shape of the protuberances) characteristic of domestic wheat and/or barley (for example, the elongate dendritic phytolith shown in Figure 64/k resembles phytoliths documented in modern *Hordeum vulgare* inflorescences; see e.g., Portillo et al. 2017, fig. 3a).

| **Sample No** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **17** | **18** | **19** | **20** | **21** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type of sample** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **v** | **c** | **v** | **v** | **v** | **v** | **c** |
| Poaceae (grasses) | | | | | | | | | | | | | | | | | | |
| Elongate psilate | 42 | 5 | 10 | 0 | 2 | 3 | 23 | 3 | 42 | 30 | 77 | 1 | 44 | 74 | 1 | 1 | 82 | 53 |
| Elongate sinuate | 6 | 2 | 2 | 0 | 1 | 0 | 3 | 0 | 7 | 6 | 15 | 0 | 11 | 6 | 0 | 0 | 7 | 6 |
| Elongate echinate | 8 | 4 | 4 | 0 | 0 | 0 | 10 | 0 | 7 | 13 | 24 | 1 | 32 | 26 | 0 | 0 | 15 | 25 |
| Elongate dendritic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 3 | 6 |
| Saddle | 3 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 5 | 8 | 0 | 8 | 5 | 0 | 0 | 8 | 13 |
| Bilobate | 0 | 0 | 5 | 0 | 0 | 0 | 7 | 0 | 4 | 3 | 7 | 1 | 12 | 9 | 0 | 0 | 10 | 11 |
| Trilobate | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Cross | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Trapeziform sinuate | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 4 | 2 | 13 | 0 | 6 | 10 | 0 | 0 | 5 | 15 |
| Trapeziform polylobate | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Trapeziform ovate | 7 | 1 | 4 | 0 | 0 | 0 | 8 | 1 | 9 | 5 | 15 | 1 | 19 | 21 | 0 | 0 | 32 | 25 |
| Trapeziform elongate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 1 | 0 | 0 | 4 | 4 |

| Sample No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rondel | 10 | 5 | 24 | 0 | 0 | 3 | 19 | 0 | 21 | 22 | 49 | 4 | 51 | 48 | 1 | 0 | 77 | 31 |
| Trapeziform | 3 | 4 | 3 | 0 | 0 | 0 | 5 | 0 | 5 | 6 | 32 | 0 | 25 | 27 | 0 | 0 | 16 | 19 |
| Trapeziform bilobate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Cork cell | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bulliform cuneiform | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 2 | 0 | 7 | 3 | 0 | 0 | 5 | 4 |
| Trichome | 2 | 2 | 5 | 1 | 2 | 1 | 5 | 0 | 7 | 5 | 23 | 2 | 15 | 17 | 0 | 1 | 27 | 25 |
| Trichome base | 5 | 3 | 0 | 0 | 1 | 1 | 3 | 0 | 5 | 3 | 16 | 1 | 11 | 5 | 0 | 0 | 14 | 13 |
| Papilla | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| Cyperaceae (sedges) | | | | | | | | | | | | | | | | | | |
| Tabular cone | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Dicotyledonous (woody) plants | | | | | | | | | | | | | | | | | | |
| Globular psilate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Globular granular | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Indetermined phytoliths | | | | | | | | | | | | | | | | | | |
| Parallelepipedal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Tracheid | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total identified phytoliths | 90 | 27 | 65 | 1 | 6 | 8 | 89 | 4 | 123 | 106 | 285 | 11 | 256 | 254 | 2 | 2 | 312 | 254 |
| Phytolith concentration (in M per gram of AIF) | – | – | – | – | – | – | – | – | – | – | – | – | 1.1 | – | – | – | – | 4.1 |

**Table 6.** *Results of the phytolith analyses. v: pottery vessel; c: control sample. Phytolith concentration calculated per gram of Acid Insoluble Fraction (AIF) following the formula proposed by Albert & Weiner (2001).*

Among the plant taxa identified in the macrobotanical assemblage recovered from building BII-21B only the cereals produce phytoliths in abundance; all other taxa either do not produce phytoliths or produce limited amounts of taxonomically non-diagnostic phytoliths (e.g., grapes; Tyree 1994). It is, therefore, not surprising that the phytolith assemblage is dominated by cereal taxa, mostly comprising morphotypes found in pooids (including wheat and barley). The macrobotanical wheat and barley remains found were

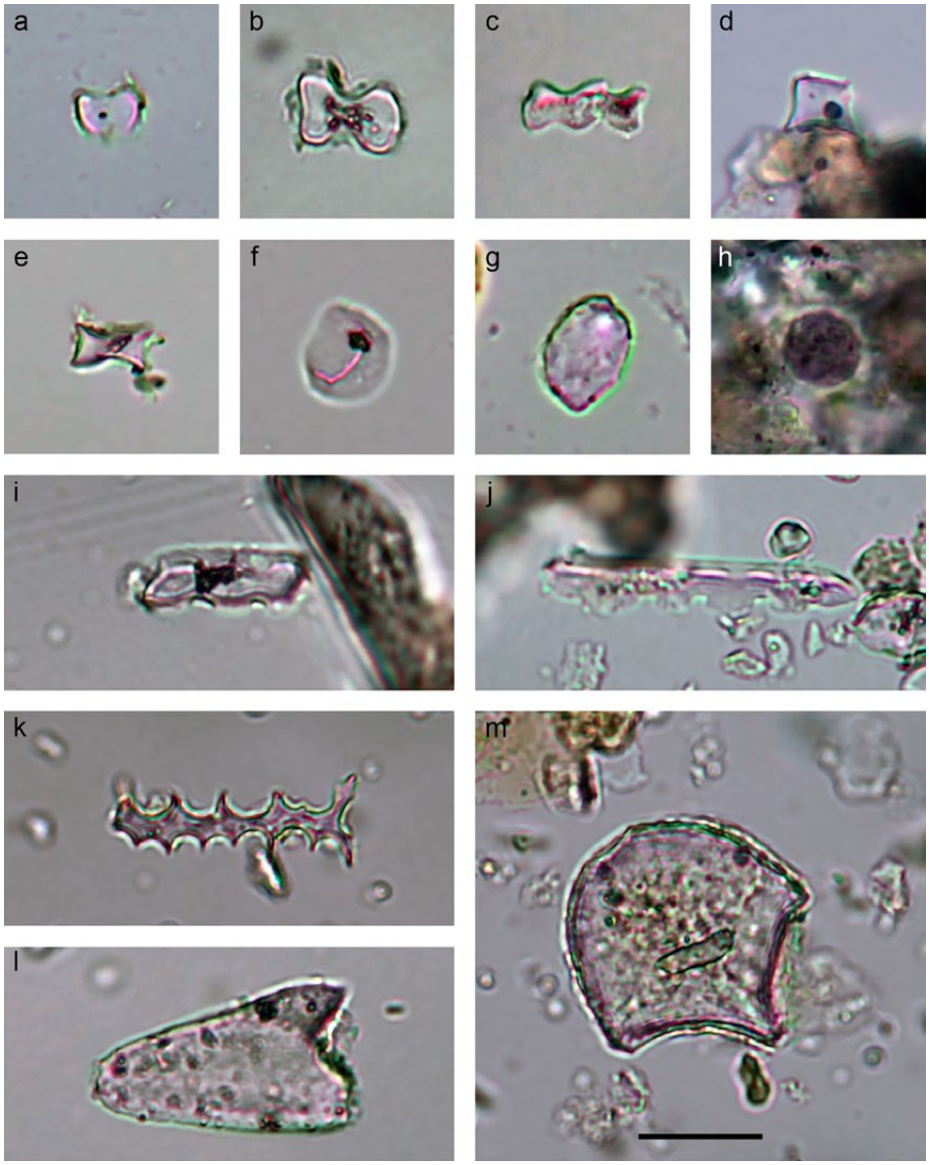



**Figure 64.** *Phytolith morphotypes from grasses (a–g and i–m) and woody plants (h) identified in pottery vessels and control samples from building BII-21B: (a) saddle (Chloridoideae) from sample Y1; (b) bilobate (Panicoideae) from sample Y9; (c) trilobate (Panicoideae) from sample Y3; (d) rondel (Pooideae) from sample Y1; (e) trapeziform (Pooideae) from sample Y3; (f) trapeziform ovate (Pooideae) from sample Y7; (g) papilla (Poaceae inflorescence) from sample Y1; (h) globular granular (Dicotyledonous plant) from sample Y3); (i) trapeziform sinuate (Pooideae) from sample Y10; (j) trapeziform polylobate (Pooideae) from sample Y21; (k) elongate dendritic (Poaceae inflorescence, Hordeum-type) from sample Y13; (l) trichome (Poaceae) from sample Y9; and (m) bulliform cuneiform (Poaceae leaf) from sample Y21. Scale bar in (m) is 20 μm and applies to all the photographs. Image Credit: J.J. García-Granero & M. Jovanović.*

quite clean; the widespread presence of *Pooideae* phytoliths in pottery vessels and control samples may thus come as a surprise. However, it must be noted that cereals produce millions of phytoliths per gram of plant material, and that phytoliths remain attached to 'clean' cereal samples even after dehusking has taken place (Portillo et al. 2017). In the same vein, the minor presence of sedges and panicoid and chloridoid grasses in the vessels is not surprising; they are common weeds in Southeast Europe and likely represent a small amount of weeds still present in the clean crop product after processing. Finally, the woody phytoliths found in the pottery vessels but, importantly, not in the control samples, could represent vegetation 'background noise' or could represent the remains of the food stored in the vessels (e.g., Saul et al. 2013), but their small number precludes any further interpretation.

To conclude, the starch and phytolith assemblages from the pottery vessels from building BII-21B indicate that they were probably used to store unprocessed food, including (but likely not limited to) cereal crops.

Function of vessels – conclusions

Although none of the presented analyzes alone provides definite results about the function of the vessels, a complex look at them allows for certain conclusions. Some of the large pots, determined *a priori* as storage vessels, were found together with a concentration of charred cereal plants (barley and wheat), mainly in the western part of the north room: vessels I, II and III (figs. 13, 46, and 47/2). Residue analysis of fragments from two of the large vessels (I and XLV) support their use for grain storage. Similar evidence is available for three more sherds, which may have originated from storage vessels (samples 10, 17, and 20). Phytoliths were not recorded only in vessel III, which was found among a concentration of barley. The volume of these vessels varies between 12 and 20 l. Among the reconstructed pots, only vessel II (fig. 47/2) stands out by significantly larger dimensions: ca. 70 l. However, some of the sherds also suggest similar or even larger sizes, e.g., vessels XLI and XLIII (fig. 48).

Phytolith remains of cereals, although in low concentration, were also found in some of the analyzed sherds from large, deep bowls, of types 4.D-E and 8, often decorated with graphite: vessels V, XII, XXVI, and XXVIII (figs. 39 and 42/2 and 3). The archaeological context suggests a possible connection of vessel V with a mixture of barley and lentils. The volume of these vessels varies between 4 and 9 l. The available evidence suggests that they were used to store grain. It is likely that the large vessels were used for long-term storage, and the bowls for short-term storage, including grain in some initial stage of the preparation of bread or food (the attested mixing of cereals with lentils, as well as ground barley in the form of bulgur). This is also supported by the archaeobotanical observations of grain stocks in various degrees of processing, from raw to prepared for cooking. The similar motifs of graphite decoration on these two groups of vessels also support similar functional relationship and seem to have certain meaning possibly related to the protection of the harvest.

The discovery of phytolith remains on a deep plate/bowl (vessel XXV; fig. 34/1) of similar volume (ca. 7 l) suggests that such vessels may have also been used for food storage.

The function of the jars with roughened surface and similar bowls of types 5 and 4.B remains questionable. The specific surface treatment suggests an association with a specific function, possibly cooking. The discovery of a fragment of bread/porridge together with fragments of such a vessel (XVIII; fig. 41/3) could be used as evidence in this direction. In two analyzed sherds from such vessels (XVIII and XXXVIII; fig. 37/3), phytolith remains were found, but in a very low concentration.

The storage of food products in pottery vessels also implies their closure, in order to protect against moisture and rodents. In the analyzed assemblage, however, lids are almost absent. Various hypothetical explanations are possible. On the one hand, some of the sherds (especially of smaller sizes) identified as plates may originate from objects used as lids. On the other hand, it is possible that wooden covers were used. Theoretically, the issue of covering the vessels could have been solved by arranging them and placing smaller vessels on top of the larger ones.

From a functional point of view, the structure of the analyzed ceramic assemblage poses another problem, namely the small number of vessels for storing, pouring and consuming liquids (jugs and cups). The identified jugs are also notable for their small size (fig. 43/1 and 2), i.e., they were used for pouring rather than storage. It is probable that some of the storage vessels were used to store liquids, especially the water needed for drinking and household activities: probably those of smaller sizes and equipped with handles. One specific vessel is of interest: a deep 'pot' with a spout, with a white coating on the inner surface (fig. 43/4). The coating has not been analyzed yet, but it looks like scale. The vessel was probably used for boiling water. In the entire assemblage from the building just one more spout was found, on a bowl sherd (vessel XXXII). The residue analysis attested abundance of phytoliths on it, which suggests that it was not (only) used to contain water but rather some cereal-based beverage.

Bearing in mind the botanical evidence suggesting the storage of grapes for the preparation of a drink, the question arises in what vessel they were stored. Regarding the concentration of grapes in the northwest part of grid square O4, the possible 'candidates' are vessels I, II, III, IV, VII and XIV. Given the presence of phytoliths from cereals in vessel I, it should be excluded, as well as probably vessels VII and XIV in view of their smaller sizes. At this stage, however, it cannot be answered which of the others, and whether any of them, were used for this purpose.

***Small finds***

The small finds from building BII-21B are relatively few. Flint artifacts predominate, numbering 16 in total. They were found mainly in the southern room, with no apparent concentration. Most (if not all) of these are tools: five scrapers (fig. 65/12–16), four blade fragments with a distinctive polish (fig. 65/1–4), probably elements of composite tools such as sickles, one retouched flake (fig. 65/11), and six blade fragments (fig.

65/5–10). Their visual characteristics suggest the use of both imported 'Ludogorie flint' from northeast Bulgaria, and 'local' Rhodope raw materials.

Stone, bone, and antler tools include a stone mortar (fig. 15), four fragments of grindstones, a small stone grinder (?) (fig. 65/23) and a stone polisher (fig. 65/22), two fragmented bone tools, probably awls (fig. 65/17 and 18), and a highly fragmented antler tool. It is possible that one awl was an unfinished blank. Bone artifacts include also two astragali with smoothed sides and a bone 'ring' of unclear function (fig. 65/19–21).

Two ceramic items were discovered: a pyramidal object with a smooth surface and a roughly shaped ceramic disk (fig. 66/7 and 8).

Artifacts that may be related to the beliefs and rituals of the inhabitants are represented by a ceramic model of an oven (fig. 66/11), a fragment of a ceramic anthropomorphic figurine (fig. 66/10), and a fragment of a flat bone anthropomorphic figurine (fig. 66/9). The first two objects were found next to each other in the southwestern corner of the building. The oven model was scattered in few pieces among the burnt debris and probably fell from some height. Small part of it is missing.

The ornaments include three beads made of *Spondylus* and *Dentalium* shells and two fragments of *Spondylus* bracelets (fig. 66/1–3, 5, and 6). They come from different parts of the building. A particularly unexpected and impressive find is a golden ring-idol found among the debris of the building in the NE part of the southern room (fig. 66/4).

***Relative and absolute chronology***

The main pieces of evidence for clarifying the chronological position of building BII-21B are its stratigraphic position, the available radiocarbon dates, and the specifics of the ceramic assemblage.

As it was pointed out, the building belongs to an early stage of level BII. It was destroyed by fire earlier than the neighboring building BII-20, which continued to be used. It precedes the last Chalcolithic settlement of the tell (level BI), the destruction of which is associated with the end of the Copper Age in Upper Thrace (Boyadzhiev et al. 2021, 4f; Boyadzhiev & Boyadzhiev 2022, 18ff and references therein).

Two radiocarbon dates from building BII-21B have been made in two different laboratories, both obtained from charred grains: Poz-109086: 5590 ± 40 BP and SUERC-102500: 5614 ± 26 BP. They correlate well with each other. Two more $^{14}$C dates are available for level BII: Poz-108890: 5620 ± 40 BP from BII-21A, above the debris of BII-21B, and Poz-108910: 5660 ± 40 BP from building BII-20. The three dates from the Poznan laboratory are part of a series of 16 $^{14}$C dates from 11 successive Early to Late Chalcolithic levels in the tell (Boyadzhiev et al. 2021). The series provides grounds to follow the development of the Chalcolithic dates in Yunatsite on the basis of a secure stratigraphic sequence. The dates from level BVIIId to level BVI develop according to the stratigraphic sequence, from 5860 ± 40 BP to 5630 ± 40 BP. However, the dates for levels BV and BIII 'drop back' and their values are slightly higher than those for levels BVII and BVI, and are close to BVIIIa. The Poznan dates are also confirmed by the three most




**Figure 65.** *Small finds from building BII-21B: flint blade fragments with a distinctive polish (1–4); flint blade fragments (5–10); retouched flake (11); flint scrapers (12–16); bone awls (17 and 18); astragali with smoothed sides (19 and 20); bone 'ring' (21); stone polisher (22), and small stone grinder? (23). Image Credit: V. Petrovska-Takieva (drawings); P. Panchov and K. Boyadzhiev (photos).*

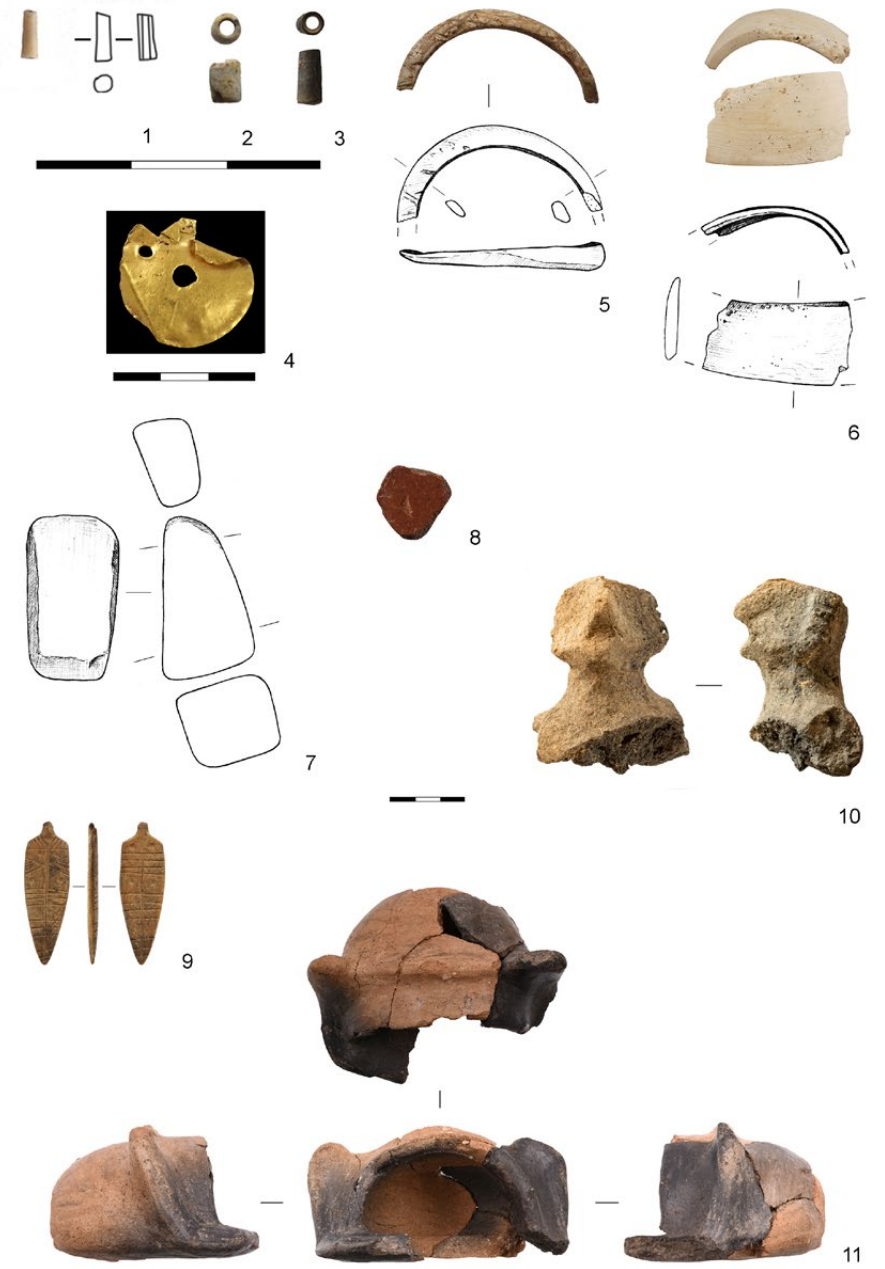



**Figure 65.** *Small finds from building BII-21B: Spondylus and Dentalium beads (1–3); gold ring-idol (4); Spondylus bracelets (5 and 6); pyramidal clay object (7); chipped disk (8); bone anthropomorphic figurine (9); ceramic anthropomorphic figurine (10); and ceramic model of an oven (11). Nos. 1–3 are in 2:1 scale; No. 4 is in 1:1 scale; Nos. 6–11 are in 1:2 scale. Image Credit: V. Petrovska-Takieva (drawings); P. Panchov, K. Georgiev, and K. Boyadzhiev (photos).*

recent dates: SUERC-102500: 5614 ± 26 BP from building BII-21B; SUERC-102501: 5673 ± 28 BP from building BIII-1 of level BIII; SUERC-102502 5768 ± 23 BP from building BV-1 of level BV.

Similar 'drop-back' is witnessed at all dated sites from the end of the Early and Middle Chalcolithic in Bulgaria. In most cases the radiocarbon dates reach significantly higher values, up to 5950–5900 BP. The earlier studies on the topic are confirmed by the new AMS dates on human bones from Middle Chalcolithic graves at the Durankulak and Varna II cemeteries (Boyadzhiev 1995, 168f; Honch et al. 2013, table 2; Krauß et al. 2017, 284). As a result of this anomaly, the dates from the Late Chalcolithic, without those from its final stage, overlap with the dates from the Early Chalcolithic. For this reason, the calibration of Late Chalcolithic dates from the region is imprecise. Dates with values close to those of building BII-21B (between 5700 and 5600 BP) can be found throughout most of the Late Chalcolithic. They are slightly earlier than the dates for the end of the Karanovo VI culture at Tell Yunatsite.

Bearing in mind this problem, the specifics of the ceramic assemblage of building BII-21B is also important in determining its chronological position. A detailed analysis of the development of the pottery during the Copper Age at Yunatsite is not yet possible due to the smaller amount of material from the earlier levels (especially those under BIII) and its ongoing processing. However, some initial observations can be made. Some elements of both shapes and decoration had a long lifespan and continued to exist since the Early Chalcolithic (at least from level BVI onwards). These include plates and plates/bowls with a smoothly incurved rim (types I.5.B, I.6, II.2), plates/bowls with a smooth S-shaped profile (type II.1), storage vessels with spherical middle part and graphite or incised decoration, the rich graphite decoration that often covers both surfaces of plates and plates/bowls, some of the motifs of painted and incised decoration (spirals, angular meander, rhombuses, etc.). Other elements are first attested in the transitional phase between the Early and Late Chalcolithic (level BIV) and develop during the Late Chalcolithic, e.g., biconical bowls with a pronounced middle part (type III.3.H). A number of vessels seem to appear in level BIII, including plates with a thickened and with inverted rim (types I.3 and I.4), some types of biconical bowls and bowls with three morphological parts (Boyadzhiev & Boyadzhiev 2022).

At the same time, some of the vessels from building BII-21B have no predecessors in the earlier levels, like biconical bowls/cups with two handles (type III.3.I), bowls III.4.D, III.4.E and III.8.

The ceramic assemblage of the uppermost level BI (excavated over 1/3 of the tell's area), is the only one more comprehensively studied and published (Todorova & Mazanova 2000; Todorova 2003). The pottery from building BII-21B shows significant similarities to it. The new shapes identified in the building continued to develop. Gradually, some of the shapes characteristic of the earlier levels died out, such as plates and plates/bowls with a smoothly incurved rim and graphite decoration on both surfaces

(types I.5.B, I.6, II.2), and bowls of type III.2. At the same time, some elements are present in BI that are currently missing in the earlier settlements, like the rich impressed nail decoration on jars consisting of three morphological parts (cf. Todorova 2003, 293f), bowls A.VIII.3 in Todorova & Mazanova 2000, askoi, etc. In general, the pottery repertoire of level BI is more varied than the one studied here, but this is probably due not so much to chronological reasons as to the significantly larger area and amount of pottery from it.

The researchers of the pottery from level BI have dated it to the end of the Chalcolithic in Upper Thrace (Todorova & Matsanova 2000, 341; Petrova 2004, 427). They have also pointed out the symbiosis of features characteristic of both the Karanovo VI culture to the east and the Krivodol culture to the west. Tell Yunatsite and the western parts of the Upper Thracian Lowland are thus defined as a contact zone between the two cultures (Todorova & Matsanova 2000, 341; Petrova 2009, 233f; Georgieva 2012, 179).

At the same time, Petya Georgieva pointed out parallels of certain elements of the complex with earlier (including Early Chalcolithic) assemblages in western Bulgaria, on the one hand suggesting the presence of earlier materials among the published assemblage from the last Chalcolithic level of Yunatsite, and on the other hand synchronizing it with the first phase of the Krivodol culture (Georgieva 2012, 170, 179, and 182). On this basis, she questioned the synchronization between the two cultures.

Indeed, some elements from both level BI and building BII-21B find good parallels even in the last levels of the Early Chalcolithic site of Slatino, Kyustendil region. A vivid example are the tall, elongated storage vessels with lavish graphite decoration, including rhombuses and spirals (cf. fig. 44/2 and 3, and Chohadzhiev 2006, 193, fig. 123/1). However, as we pointed out, a number of elements at Yunatsite show long-lasting continuity and existed throughout several levels. Using them for general conclusions and synchronizations could be misleading.

The comparative review with sites to the east shows that the ceramic assemblage of building BII-21B generally fits into the characteristics of phases IIIa–b of the Late Chalcolithic in Thrace, Karanovo VI culture, according to the periodization proposed by Viktoria Petrova (Petrova 2004). However, some features of the Karanovo VI assemblage are missing at Yunatsite, BII-21B, including the characteristic sharp carination of the biconical bowls, the bowls of three morphological parts with a profiled carination, the specific cylindrical-conical bowls, and the vessels on *Fussboden*. On the other hand, potstands with incised decoration and biconical bowls with two vertical handles are present. According to Petrova, the latter are characteristic of the end of the Copper Age in Thrace (Petrova 2008, 172). There are also differences in the graphite decoration. The most important one concerns the ornament of a rhombus with an inscribed circle or ellipse, often associated with a meander, characteristic of storage vessels and deep bowls at tell Yunatsite. According to Margarita Popova, it is missing in the main territory of the Karanovo VI culture (Popova 2015, 26).

At the same time, both the specified elements missing in the area of Karanovo VI, as well as a large part of the other shapes from building BII-21B find parallels in the Krivodol culture.

At this stage of research, building BII-21B should be assigned to a developed but not final stage of the Late Chalcolithic in Upper Thrace. For a more precise synchronization with cultural phenomena in the eastern and western direction, however, a more comprehensive study of the lower levels at Tell Yunatsite itself is needed, as well as the accumulation of a larger database of fully published Late Chalcolithic ceramic assemblages from successive levels from sites in both Thrace and Western Bulgaria.

**Conclusions**

The complex analysis of building BII-21B at Tell Yunatsite and the remains found in it allows for a number of observations.

In terms of settlement patterns, ongoing research in this part of the tell shows an almost identical position and orientation of buildings in levels BII and BIII. At the same time, certain differences are observed between levels BII and BI, expressed in the displacement of buildings to the east and south and the digging of a large cut feature in the east central part of the tell, which truncated the northwest part of building BII-21 and the northeast part of building BII-20.

The excavations of building BII-21B provided evidence on the interior and the use of living space, which is almost absent for the last Chalcolithic settlement, despite the considerable excavated area (see Matsanova & Mishina 2018, 128). At least two rooms were uncovered, one of which was used for different household activities and the other had mainly storage function. There is also evidence of storing vessels in an attic or second floor (?). At the same time, the excavation of other buildings from levels BII and BIII illustrated a different division and use of space. It is likely that individual households had personal approach to the internal layout and functional distribution of the buildings, not necessarily following a common pattern.

Analysis of the vessels and plant remains provided valuable insights into food storage practices. For this purpose, special storage containers were used in the building. Evidence is available on the use of vessels for long- and short-term storage. The total volume of reconstructible vessels that may have been used for storage (storage vessels and bowls with a volume of more than 3 l) is about 240 liters. Remains of several more (at least 4, possibly 7 or 8) large storage vessels were found, at least part of them having volume of over 60 l. It is possible that there were more storage vessels in the missing northwest part of the building, which could have been part of the storage room uncovered in the northeastern part of the house. On the other hand, some of them were probably used for liquids. Despite these problems, it seems likely that the total volume of stored food supplies was over 500 l.

Certain spatial differences in the storage of main products were ascertained: wheat mainly in the southern room, barley in the western part of the north room, lentils in the eastern part of the north room.

Another important finding is the presence of certain symbols (spirals and rhombuses connected by an angular meander), which appear to have been closely associated with storage vessels and deep bowls. Obviously, they had certain meaning for the Copper Age people.

Archaeozoological and archaeobotanical evidence testifies for a diverse diet. Although few, the animal remains are quite varied and demonstrate both advanced animal husbandry and hunting. The animal remains from the building obviously do not reflect the volume of meat consumed, since most bones were not left in the houses. The plant remains are much more numerous in quantity and also diverse (cereals and legumes, fruits, nuts, flax). They testify to the well-developed agriculture and gathering. Of particular interest is the data on purposeful gathering of grapes for producing a drink, perhaps wine. It fits well in the evidence from the tell site of Dikili Tash (Vallamoti et al. 2007) and suggests an early spread of wine production in a wider area, including Upper Thrace and the north Aegean coast.

Among the small finds, the absence of items related to spinning and weaving (loom weights and spindle whorls) should be noted. It is likely that these activities were not carried out by every household.

The almost complete absence of artifacts traditionally associated with the beliefs and rituals of the population – e.g., anthropomorphic and zoomorphic figurines, 'altars', etc. – is also worth noting. However, it is possible that this is also due to 'missing parts' of the building due to later disturbances. At the same time, the close position of two of these objects in the southwestern corner of the building suggests the presence of a 'domestic altar' there.

Tell Yunatsite is especially instructive because of its geographic position, as well; it's situated on the routes connecting Upper Thrace with the Struma and Iskar River valleys, and the Aegean coast with the Danube River valley. Long-distance trade with flint from NE Bulgaria and *Spondylus* shell from the Aegean coast has been identified (cf. Boyadzhiev & Boyadzhiev 2022, 40f), while the ceramic assemblage provides grounds to trace contacts between the Karanovo VI culture to the east and the Krivodol culture to the west.

**Acknowledgments**

We are grateful to Maya Nikolova of the Mieczysław Domaradzki Archaeological Museum in Septemvri, who restored the vessels from building BII-21B; to Maria Kostadinova-Avramova of the National Institute of Geophysics, Geodesy and Geography, Bulgarian Academy of Sciences, who analyzed clay samples for burning temperature; and to Brent Whitford (PhD student at the University at Buffalo, USA), who produced the

photogrammetry models used in the paper. Since 2012, the excavation project at Tell Yunatsite is supported by the Ministry of Culture of Bulgaria, the Balkan Heritage Foundation, and the Pazardzhik Regional Museum of History. Some of the analyses for this paper were supported by the National Institute of Archaeology and Museum, Bulgarian Academy of Sciences. JJGG's contribution was funded by the Spanish Ministry of Science, Innovation and Universities (IJC2018-035161-I).

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Studia Praehistorica 17, 2023, 217–242

# Encrusted Pottery Culture ceramic imports in northwest Bulgaria

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**Abstract**
*This paper discusses the Encrusted Pottery Culture ceramics discovered outside the Danube River strip in northwest Bulgaria. These imports, coming from 15 sites, cover the whole spectrum of the ceramic production: pottery, figurines, small finds, etc. Geographically, they are spread across the entire territory of northwest Bulgaria, reaching a distance of 40 km south of the Danube River. The imports appear in both settlements (dwellings, pits) and cemeteries. Chronologically, these finds date to the second half of the fifteenth–thirteenth century cal. BC period that corresponds to the Orsoya/Baley phase of the Encrusted Pottery Culture. Similar material north of the Danube is discussed as well. While in northwest Bulgaria, the Encrusted Pottery Culture 'imports' appear in Gamzigrad–Gramada or Zimnicea–Plovdiv milieu, north of the river they are related to Late Verbicioara sites. The nature of these intensive contacts between the 'Danubian' Encrusted Pottery Culture and 'inland' communities is also considered.*

**Key words:** *Late Bronze Age – Lower Danube – Encrusted Pottery Culture – imports – Baley – Verbicioara – Zimnicea–Plovdiv – Gamzigrad – Bistreț.*

https://doi.org/*10.53250/stprae17.217-242*

## Introduction

The Encrusted Pottery Culture (EPC), also referred to as 'Novo Selo – Gârla Mare' or 'Žuto Brdo – Gârla Mare' Culture, is a Late Bronze Age (LBA) phenomenon spread

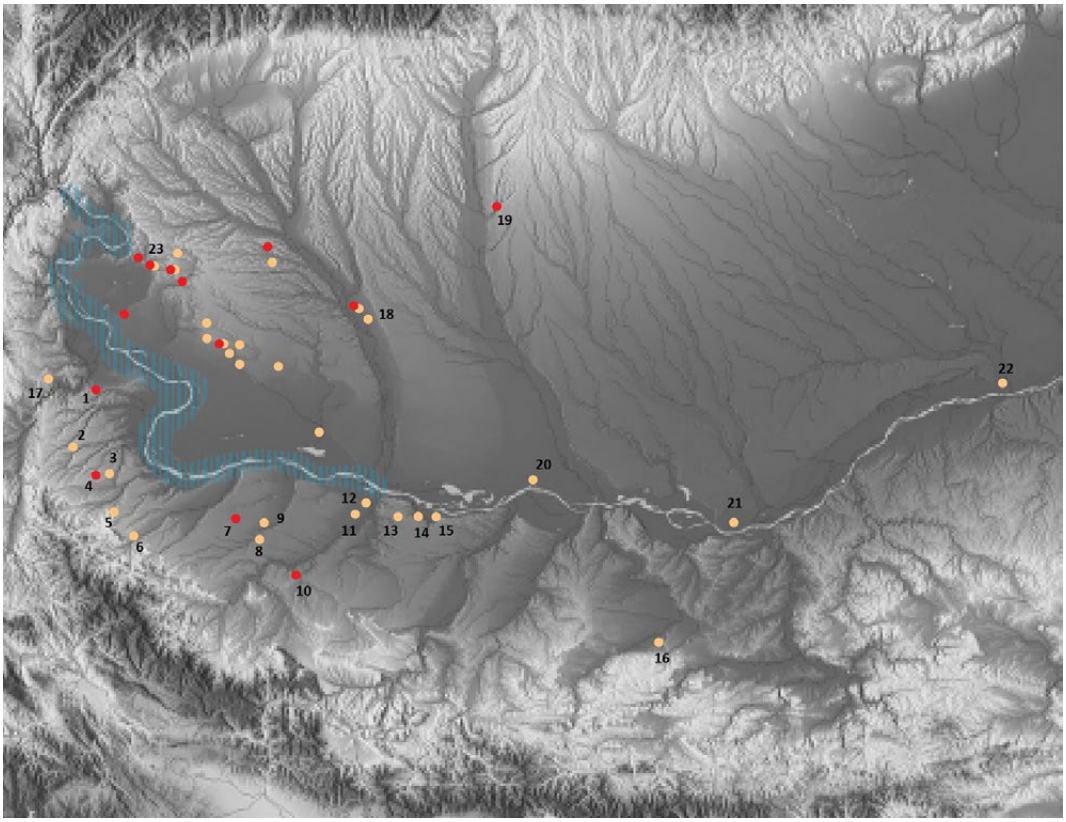



**Figure 1.** *Map of the sites with EPC ceramic imports in the Lower Danube: (1) Bregovo; (2) Kula; (3) Gramada–Gladnika; (4) Gramada; (5) Oreshets; (6) Ruzhintsi; (7) Rasovo; (8) Yakimovo; (9) Valchedram; (10) Gradeshnitsa; (11) Glozhene; (12) Harlets; (13) Oryahovo; (14) Oryahovo–Kaleto; (15) Ostrov; (16) Chavdartsi; (17) Rogljevo; (18) Cârcea; (19) Vultureşti; (20) Corabia; (21) Zimnicea; (22) Oltenița; (23) Oreviţa Mare. Yellow dots show EPC pottery and red dots show EPC figurines. Image credit: OpenStreetMap and the authors.*

in a thin strip along the Serbian and Bulgarian–Romanian part of the Danube River. The EPC is known mainly by its large necropolises, some of the investigated sites consisting of hundreds of cremation graves such as Cârna, Orsoya, etc. Settlements have also been explored (Ostrovul Corbului, Ghidici etc.), but the available information from these sites remains insufficient. At the beginning of the twenty-first century, the EPC western border was set in Kovin (Belgrade area) while the eastern end was proposed to be the influx of the rivers Olt and Iskar into the Danube. In this long 'band' along the river, two main territorial groups were distinguished: a western one named *Dubovac* that spread from Belgrade to the Iron Gates, and an eastern one labeled *Gârla Mare* and situated east of the Iron Gates. For the eastern region, an internal division of the EPC development into three chronological phases was proposed. While the earliest was supposed to be presented at the sites of Ostrovul Corbului and Ghidici, the second (the 'classic' phase) can be

found at almost every EPC site in the region. The last phase was identified at the necropolis of Orsoya. Due the lack of radiocarbon dates, the chronological position of the EPC was established using parallels from the neighboring regions. Thus, the time-span for the existence of the EPC was set in 1650–1250/1200 BC period. In the Lower Danube area (particularly north of the river), the EPC was supposed to be followed by the Bistreț–Işalnița group that presumably ceased to exist around 1100 BC (*Şandor-Chicideanu* 2003; Crăciunescu 2022).

The EPC is instantly recognizable by its ceramics. Some of its pottery shapes as well as the anthropomorphic, ornithomorphic and zoomorphic figurines, alongside with their sophisticated encrusted decoration, are unique for the LBA Northern Balkans. However, recent investigations in northwest Bulgaria showed that the EPC phenomenon was much more complex than previously thought. The site of Baley – the only EPC complex consisting of a settlement and necropolis investigated so far – provided a compact series of radiocarbon dates that secured the timeframe of the EPC 'classic' and last phases. The coexistence of encrusted and fluted pottery styles was clearly seen in many 'closed complexes' from the site (dwellings, pits, graves), showing a fluent transition from the former to the latter decoration technique (Shalganova 2005; Alexandrov et al. 2016 & 2018). On the other hand, recent excavations at Gramada, Oreshets, Rasovo and other LBA sites in northwest Bulgaria provided, along with the 'local' ceramics, vessels/pottery sherds and figurines that could be related to or seen as 'imports' from the EPC area.

Some of these 'imports' will be presented here. It should be emphasized that subject of analyses are pottery and figurines with EPC encrusted decoration only. As mentioned above, the LBA site of Baley provided significant arguments that the Bistreț group pottery could be considered as part of the EPC development and thus, vessels with fluted decoration should be regarded as part of EPC ceramics repertoire as well (Alexandrov et al. 2016 & 2018). However, the Bistreț problematic requires more detailed and focused analyses; therefore, such ceramics will not be discussed in this paper.

From a contextual point of view, the EPC encrusted ceramics south of the Danube River could be separated into three groups: finds with secure archaeological context, finds without such context, and finds coming from surveys or 'stray' finds.

**Finds with secure archaeological context**

- The settlement and necropolis of *Gramada – Gladnika* seem to be very important in the present context. The site is situated at the Gladnika locality, southeast of Gramada, Vidin District, some 15 km west of the Danube River. A part of the site was investigated during a rescue project in 2019. At a surface of approximately 10 000 m², a large number of archaeological features were investigated dating to the Late Neolithic, Middle Bronze Age, Late Bronze Age, Early Iron Age, Roman Imperial Age, and the Middle Ages. In the southwestern part of the area, a Late Bronze Age necropolis was discovered. Thirty-five funerary features were investi-

gated. They revealed that cremation had been practiced outside the necropolis; part of the bones were collected and buried in amphoroid or kantharoid vessels used as urns/containers. The urns/containers were surrounded and covered by stones (Alexandrov et al. 2020). Most of the graves showed mortuary practices and grave inventory (fig. 4) that have their best parallels in northeast Serbian sites (cf. Kapuran et al. 2022).

EPC pottery was found in two of the graves. In feature 3 (fig. 2), four vessels were placed near the urn: two kantharoi, a cup and a richly decorated EPC kantharos with a rectangular horizontal section (fig. 2/4). In feature 14, a severely damaged grave (fig. 3), sherds from a decorated kantharos and an EPC cup/kantharos were found near the urn (fig. 3/3). Two more sherds come from the necropolis area: from a typical decorated lobed bowl and from a cup/small kantharos (fig. 3/1 and 2).

The LBA settlement was located in the central part and north of the excavated area. Unfortunately, it was almost completely destroyed by the Roman Age constructions and the medieval cemetery. However, that area yielded at least 11 EPC sherds from large bowls with inverted rim, bowls with lobed rim, amphorae, and cups/kantharoi (fig. 5/4–14) associated with 'local' pottery decorated with linear incisions (fig. 5/1–3). A radiocarbon date from a pit was obtained, placing the LBA site in 1398–1216 cal. BC period (95.4% probability).

- *Gradeshnitsa* is the second necropolis that yielded EPC materials. It is situated at the Malo Pole locality, some 30 km northwest of Vratsa, 40 km south of the Danube River. Bogdan Nikolov (1978) excavated part of the necropolis in 1973 and published five cremation graves from the site. In graves 2–5, kantharoi were used as 'containers' for the bones, all four being covered with bowls (fig. 6/1–6). In graves 4 and 5, other vessels were also found, but only a small jug from grave 4 was illustrated (fig. 6/7). Grave 1 is of particular interest. It was discovered at a depth of 0.80 m below the ground surface. An amphoroid vessel was used as 'container' that contained 'ashes, charcoal, burnt human bones', and the upper part of an anthropomorphic figurine (fig. 6/8–10). Nikolov dated the five graves to the LBA, and mentioned some parallels in the necropolises of Cârna, Orsoya, and Zimnicea. From a culture-historical point of view, the author related the necropolis to the EPC.

  The necropolis of Gradeshnitsa was subject to multiple analyses and different approaches. Georgi Georgiev and later Ivan Panayotov and Darina Valcheva related the finds to the EPC (Georgiev 1982, 192ff; Panayotov & Valcheva 1989, 8ff). On the other hand, Tanya Shalganova believed that they should be related to the last (V) phase of Verbicioara culture, grave 1 showing their contacts to the EPC. The anthropomorphic figurine belongs to Shalganova's type III of group I that according to her is common for the necropolis of Orsoya and is to be found in the upper building horizons of the settlement of Baley, and therefore should be dated to the

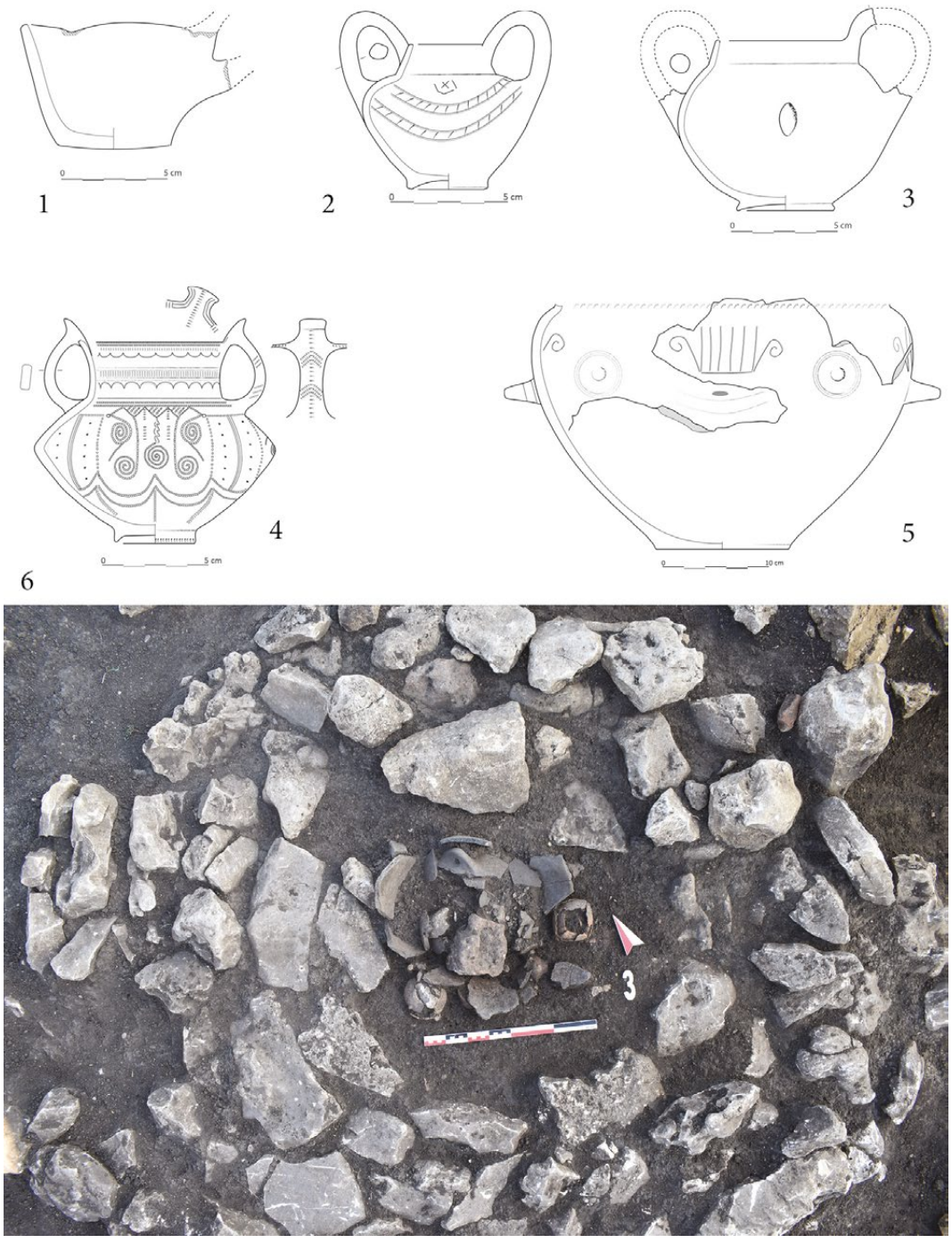



**Figure 2.** *The LBA necropolis of Gramada–Gladnika. Above: pottery from feature 3. Below: Feature 3, view from above. Image Credit: S. Alexandrov.*

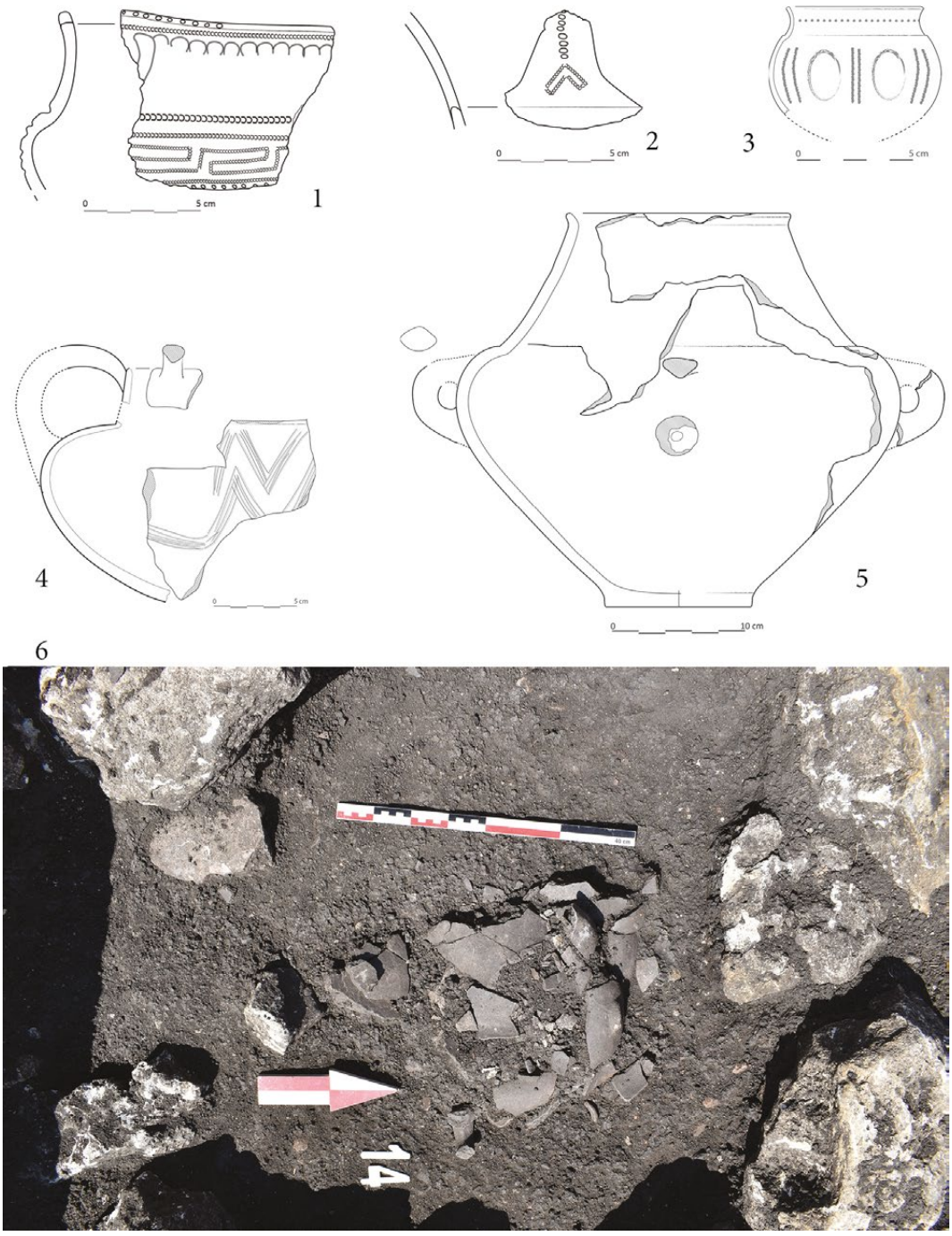



**Figure 3.** *The LBA necropolis of Gramada–Gladnika. Above: EPC sherds from the area of the cemetery (1 and 2) and from feature 14 (3–6). Below: feature 14, view from above. Image Credit: S. Alexandrov.*

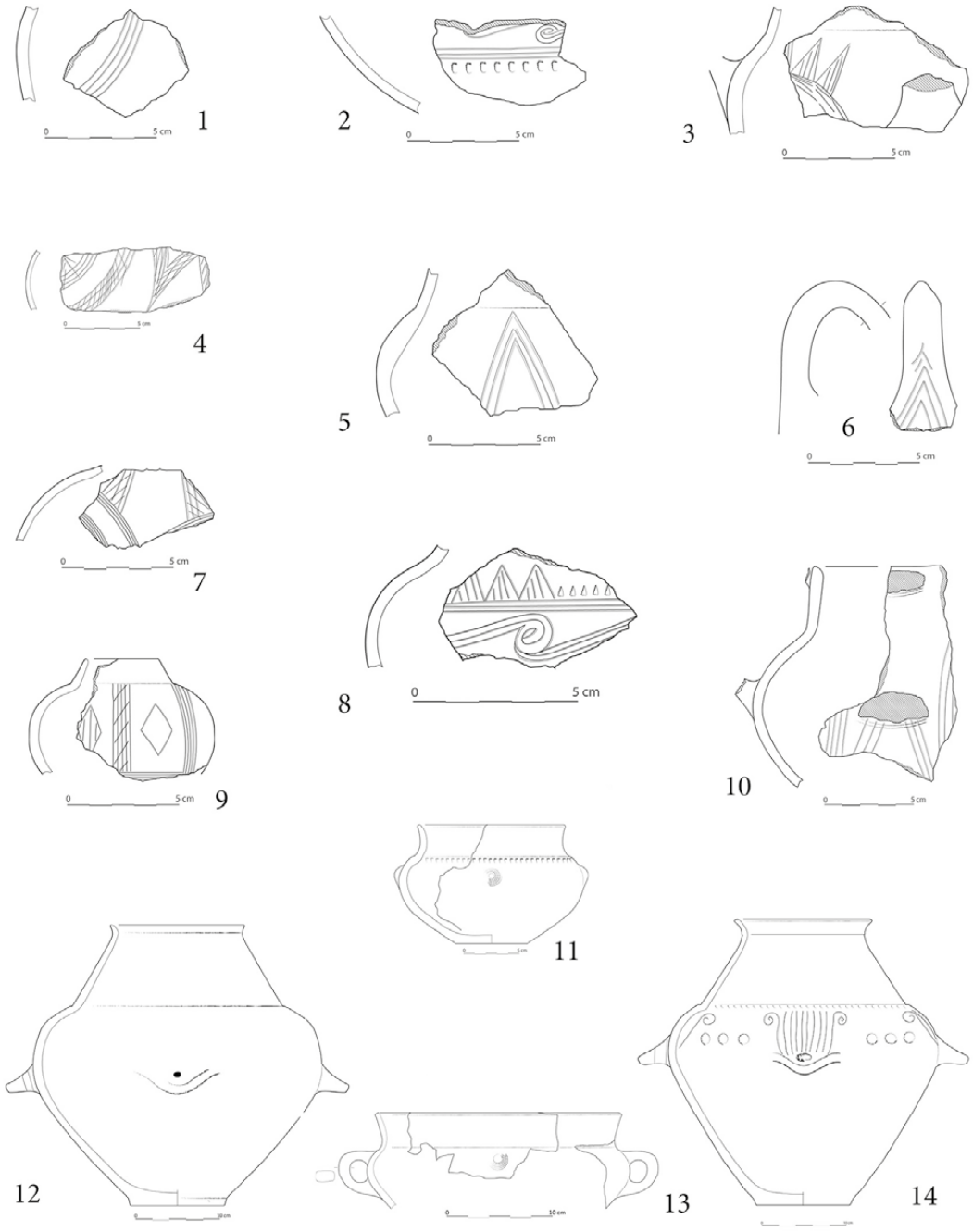



**Figure 4.** *Local pottery from the LBA necropolis of Gramada–Gladnika. Image Credit: S. Alexandrov.*

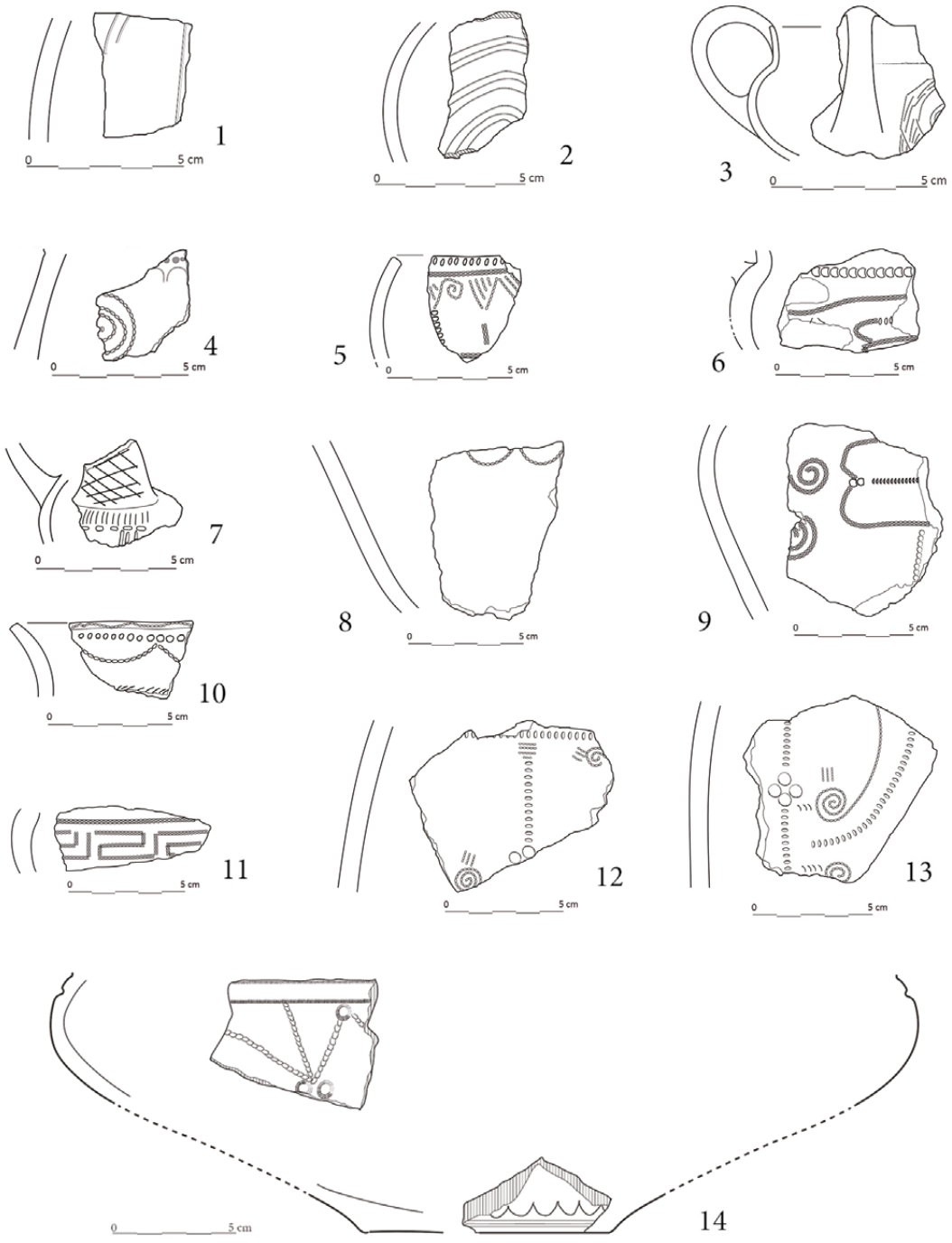



**Figure 5.** *The LBA necropolis of Gramada–Gladnika: local pottery (1–3) and EPC sherds (4–14). Image Credit: S. Alexandrov.*




**Figure 6.** *Pottery from the LBA necropolis of Gradeshnitsa – Malo pole: from grave 5 (1 and 4); grave 2 (2 and 5); grave 3 (3 and 6); grave 4 (7); and grave 1 (8–10). No scale: 1–7 and 9. Image Credit: The Archives of the National Institute of Archaeology and Museum, Bulgarian Academy of Sciences (1–6) and S. Alexandrov (7–10).*

last EPC phase (Shalganova 2005, 62f and 177f). Aleksandar Bonev also sought parallels in Cârna and Orsoya and, in the Zimnicea–Plovdiv phenomenon as well. He further argued that the necropolis of Gradeshnitsa shows 'interaction between two cultures: the EPC and Plovdiv–Zimnicea–Asenovets–Cherkovna' (Bonev 1988, 15). Cultural affiliation with Verbicioara IV–V for the graves of Gradeshnitsa was argued by Tanya Dzhanfezova as well (2010, 27ff).

In her typology of the EPC pottery, Monica Şandor-Chicideanu (2003, 49) assigned the amphora from the grave to type A8. Chicideanu-Şandor & Chicideanu (1990, 67ff) defined the figurine as type ΦIIC – 'Orsoya' variant that was dated to a pre-Bistreț–Işalnița period. However, Şandor-Chicideanu (2003, 109, 233, and 325) admitted that grave 1 had yielded 'typical Gârla Mare pottery'. The cemetery itself is included in Ion Motzoi-Chicideanu's (2011, 108 and 498, cat. No. 412) catalogue of EPC necropolises as well.

- The third necropolis that provided EPC ceramics is *Glozhene*, located some 10 km south of the Danube River. Rescue excavation in 2019 revealed six graves: two cremation and four inhumation burials (Zaneva & Petkov 2021). An amphoroid vessel as well as a large bowl were discovered in the two cremation graves. The inhumation burials revealed 'multiple graves' with more than three individuals buried in a single grave. Grave goods consisted of vessels that are typical for the Zimnicea–Plovdiv style (fig. 7.1–3, 5, 6, 8, and 9). Related to the topic of this article are two other vessels discovered at this necropolis.[1] These are a lower part of a pyxis and a large cup/jug, distinctive for the EPC ceramic repertoire (fig. 7/4 and 7). Several radiocarbon dates from the inhumation graves secure the chronological position of the necropolis from the second half of the fifteenth to the beginning of the thirteenth century BC.
- *The cremation necropolis of Harlets*. It is located at the Kaleto locality, beneath the Roman and Medieval fortress of Augustae, north of the modern village of Harlets, Vratsa District, some 3 km south of the Danube River. During the excavations at the fortress in 1977, three cremation graves were discovered east of its western defense wall (Mashov 1980). Three different types of vessels were used as 'containers': a two-handled amphoroid vessel in grave 1 (fig. 8/9), a bowl in grave 2 (fig. 8/6 and 7), and an asymmetrical jug in grave 3 (fig. 8/8).[2] During the 2006 excavations at the fortress, in the area of *Cardo Maximum*, two LBA vessels were found at a depth of 1.60 m (fig. 8/1 and 2). More LBA sherds were discovered mainly in the ancient fortress' southern area that could be related to the settlement of the necropolis discovered in 1977 (Alexandrov & Alexandrova 2009).

  Spas Mashov (1980, 8) dated the three graves to 'the end of the Bronze Age and

[1] A large part of the necropolis was destroyed by later, mostly Roman Age constructions.

[2] Information from the Archives of the National Institute of Archaeology and Museum, Bulgarian Academy of Sciences.

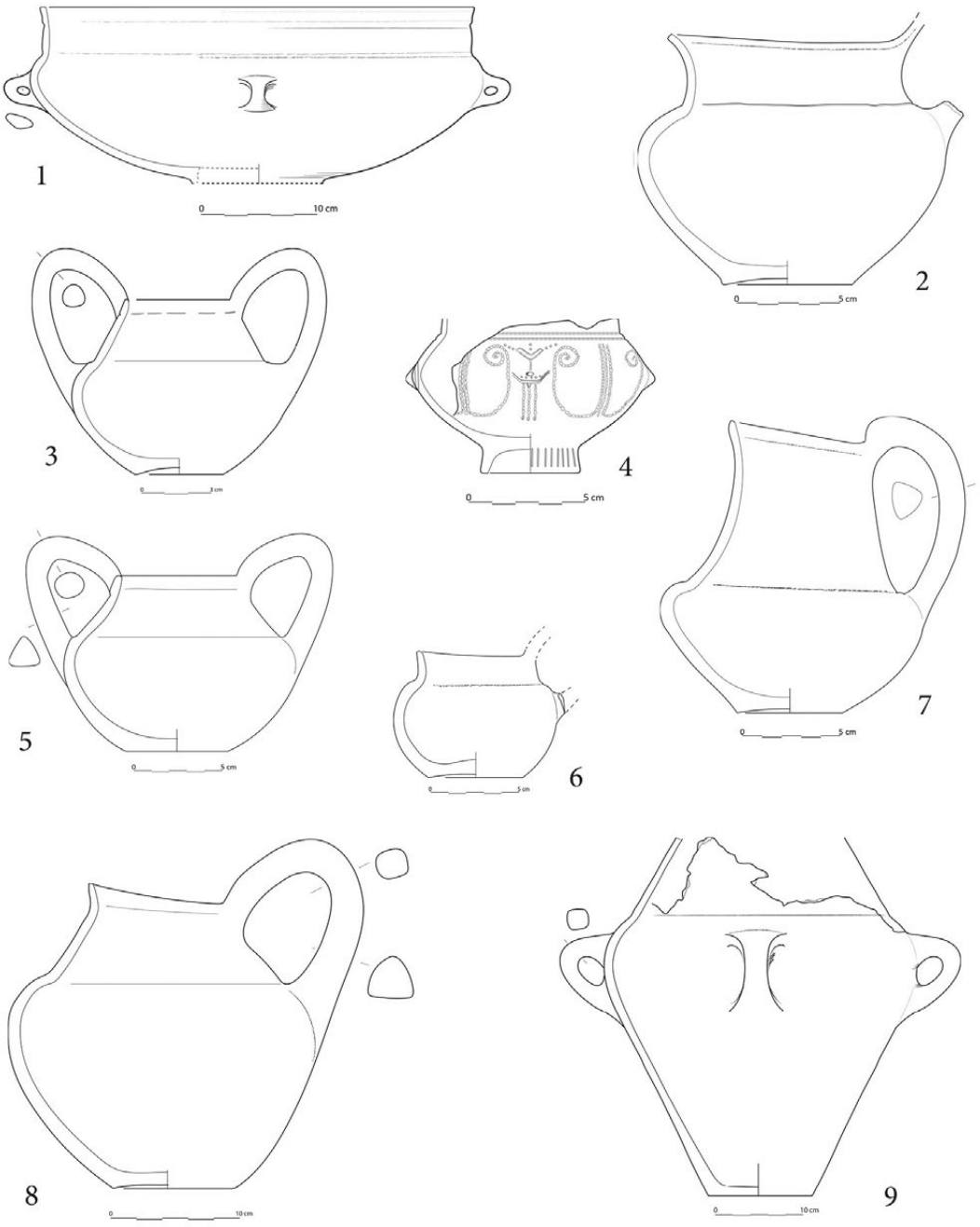



**Figure 7.** *Pottery the LBA necropolis of Glozhene: from graves (1, 3, and 5–9) and EPC vessels from the area of the cemetery (2 and 4). Image Credit: S. Alexandrov.*

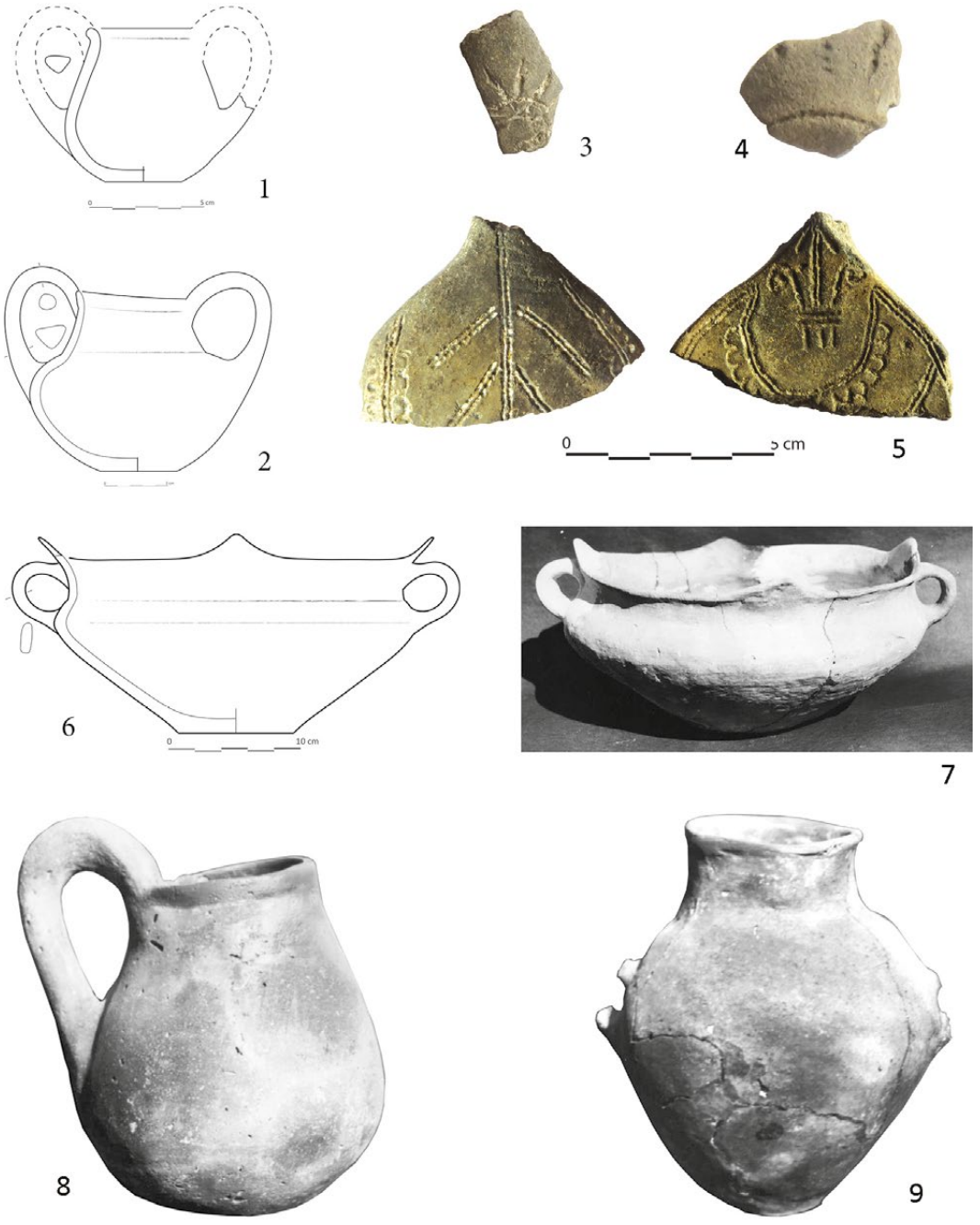



**Figure 8.** *Harlets–Augustae: vessels from the settlement site (1 and 2); urn from grave 2 (6 and 7); urn from grave 3 (8); urn from grave 1 (9). Gramada – Yasova bara: EPC ceramics (3–5). No scale: 3, 4, 8, and 9. Image Credit: S. Alexandrov (1, 2, and 6), G. Ganetsovski (3–5), and the Archives of the National Institute of Archaeology and Museum, Bulgarian Academy of Sciences (6–9).*

the beginning of the Early Iron Age, the end of the second millennium BC'. Shalganova also discussed the finds from the necropolis. While the bowl from grave 2 was related to the Mokresh find (Alexandrov 1981, 40) and, therefore to the Bistreț–Işalnița group, the jug from grave 3 was assigned to the Plovdiv–Zimnicea–Cherkovna group. The three graves were connected to a 'contact zone with different cultural traditions' (Shalganova 2005, 178). The materials from the settlement were dated to the Zimnicea–Plovdiv chronological horizon as well (Alexandrov & Alexandrova 2009).

- The settlement of *Oreshets* is located some 30 km south of the Danube River. Rescue excavations were carried out there in 2021. They revealed a settlement site; parts of dwellings, pits, and other features were investigated. Two periods have been identified: – the first dated to nineteenth–seventeenth century BC and, the second to the fifteenth–twelfth century BC. The later material has parallels mainly at the already discussed LBA site of Gramada (Ivanov et al. in print).
  Feature 40 – a pit with burnt daub pieces, sherds, and animal bones – revealed a bowl sherd typical for the EPC based on its shape and decoration (fig. 9/7). The local pottery found in the pit includes sherds from kantharoi, cups, jugs, pyranoi, etc. (fig. 9/1–3, 5, 6, and 8). A bronze hairpin was also found there (fig. 9/4). A radiocarbon date with calibrated range between 1299–1112 cal. BC (95.4% probability) secures the chronological position of the feature.

**Finds with unclear archaeological context**

Four such sites provided EPC ceramics as follows:

- The site of *Gramada – Yasova bara*. It is located some 3 km west of Gramada – Gladnika. Rescue excavations were carried out in 2019. In the C area, features from the Middle and Late Bronze Age, Early Iron Age, the Hellenistic period, and the Roman Age were uncovered (Ganetsovski & Miteva 2020). It also yielded an upper part and another small fragment from an anthropomorphic figurine as well as a sherd from an EPC cup without clear archaeological context (fig. 8/3–5).
- The settlement site of *Ruzhintsi* is located 30 km south of the Danube River. Rescue excavations were carried out there in 2021 revealing a LBA settlement and parts of dwellings, pits, and other features (Zhivkov & Stoichkov, in print). The ceramic assemblage from the site relates to the Gamzigrad–Gramada style (fig. 10/2–7). An EPC sherd was found in the western part of the excavated area, probably from a deep lobed bowl (fig. 10/1).
- The settlement of *Rasovo* is located 20 km south of the Danube River. Rescue excavations were carried out there in 2019. A LBA settlement with a part of a dwelling as well as a LBA inhumation grave, Early Iron Age and later features were investigated there (Aladzhov et al. 2020). Along with the local LBA pottery, bowl sherds,

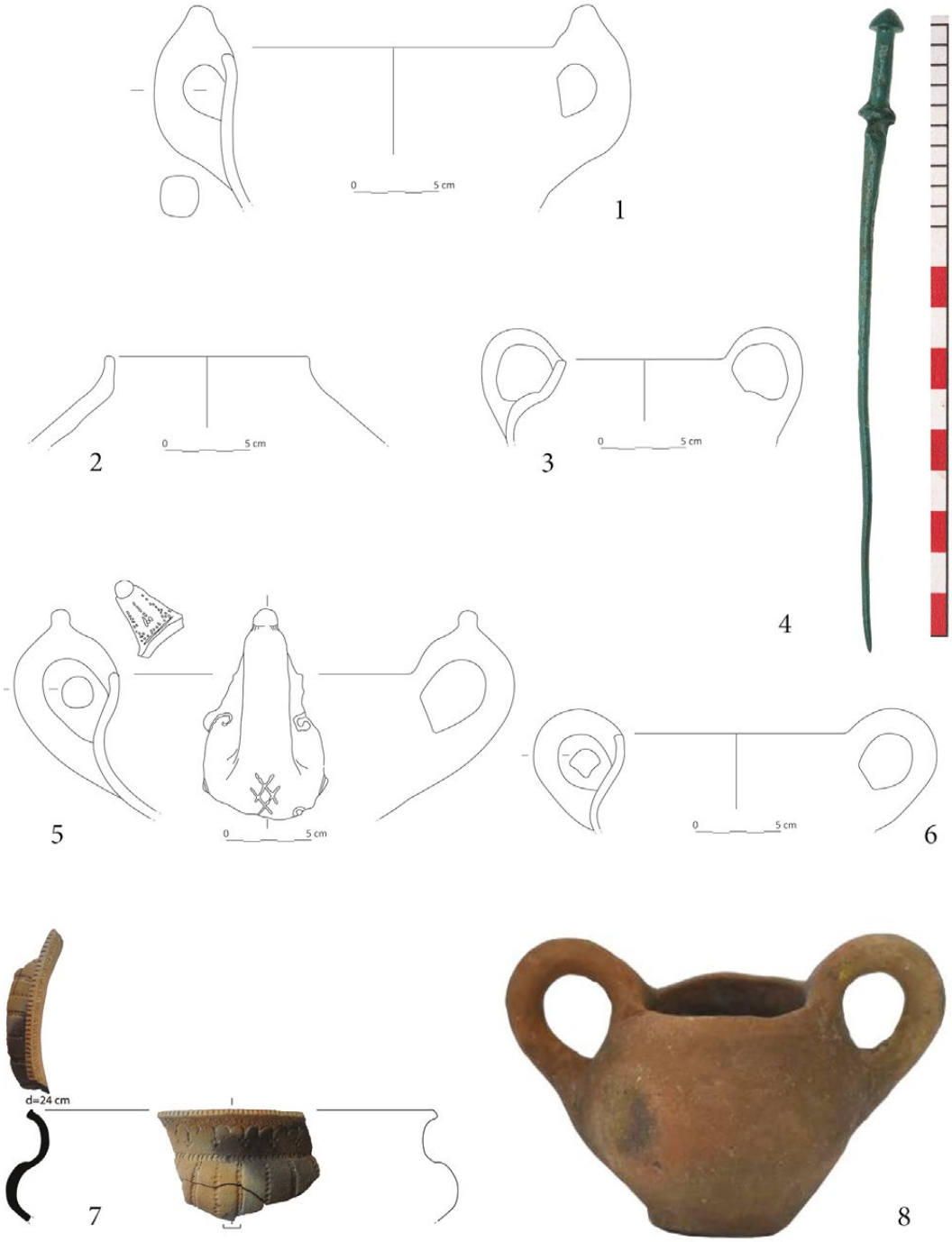



**Figure 9.** *Oreshets, feature 40 (pit): local pottery (1–3, 5, 6, and 8); bronze hairpin (4); EPC sherd (7). No scale: 8. Image Credit: G. Ivanov.*

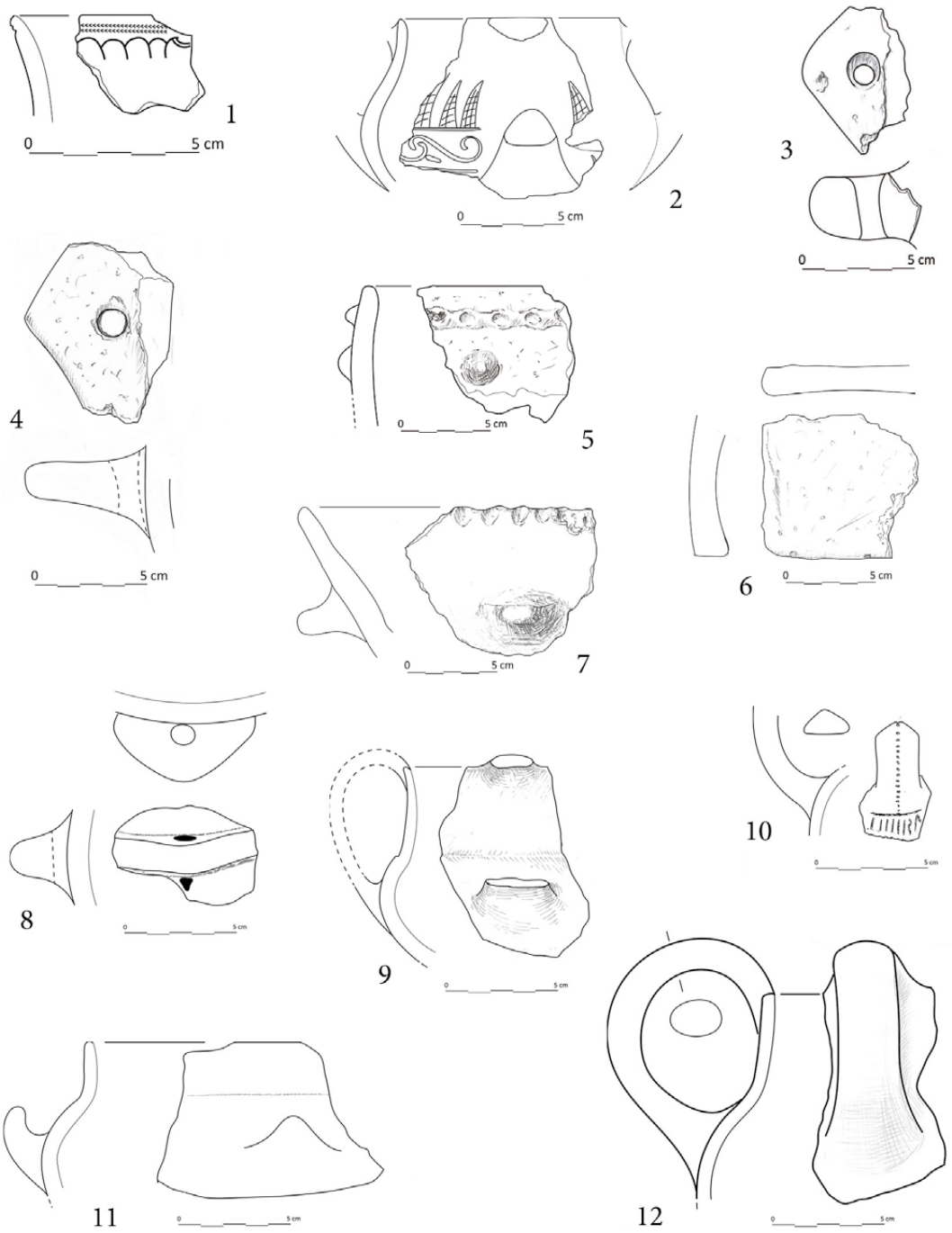



**Figure 10.** *Ruzhintsi: EPC sherd (1) and local pottery (2–7). Kula: local pottery (8, 9, 11, and 12) and EPC sherd (10). Image Credit: V. Danov (1–7) and S. Alexandrov (8–12).*

part of a figurine and other EPC ceramics were also found at the site (fig. 11/6).[1] A radiocarbon date from the skeleton places the LBA site in the thirteenth–twelfth century cal. BC period.

- *Kula.* Archaeological material from earlier periods was found under the foundations of the Roman fortress of Castra Martis, at a depth of 2.30–2.60 m (Iotsova 2005). Some of the sherds kept at the Vidin Museum of History, date to the LBA and are related to Gramada LBA material (fig. 10/8, 9, 11, and 12). A LBA sherd from a small kantharos/cup could be related to the EPC tradition (fig. 10/10).

**Stray finds**

EPC ceramics were found during surveys or are kept at museum collections from six other locations as follows:

- The necropolis of *Ostrov*. Nikolov (1964, 71ff) published four vessels from cremation graves found at the Dhzamiyskoto locality, some 3 km west of the village port. One of the pots could be dated to the Early Bronze Age (EBA; Alexandrov 1993, 47). A small jug richly decorated with encrusted patterns (fig. 11/8) is typical for the EPC (type C9/C10 in Şandor-Chicideanu's typology; 2003, pl. 195). A kantharos (fig. 11/9) has been regarded as belonging to the Zimnicea–Plovdiv–Cherkovna complex (Hänsel 1976, 78; Şandor-Chicideanu 2003, 247) or to the Verbicioara, Tei, and Cherkovna Groups (Shalganova 2005, 179). The fourth vessel dates to a later period. In fact, Nikolov (1964, 73) mentioned at least one more vessel from this site that is to be related to the EPC but it had not been illustrated. Some authors regard Ostrov as the easternmost EPC site south of the Danube River (Hänsel 1976, 78; Şandor-Chicideanu 2003, 247).
  During surveys in 1999, a Bronze Age site was discovered at the *Barza nakla/Beglika* locality, some 4.5 km west of Ostrov village. Materials from EBA (Coțofeni Culture) and LBA were recovered from the site. The LBA materials were related to EPC; a single sherd, a handle from a cup/kantharos, is illustrated in the preliminary report (Ganetsovski & Naidenova 2000, 230f, tabl. XII/3). However, the illustrated LBA pottery has morphological characteristics common for the North Balkan LBA pottery rather than to the EPC, and the relation of the site to the EPC is thus uncertain. The authors believed that this was the site of *Leskovets – Branishte*, from which Nikolov (1964, 70f, fig. 2/b and v) had published two bronze celts, and therefore they related the settlement to the necropolis discussed above (Ganetsovski & Naidenova 2000, 231).
- Stray EPC finds from several other locations in northwest Bulgaria are also known. An upper part of a plane figurine comes from *Bregovo*, Vidin District, some 10 km south of the Danube River. It was found together with fluted sherds similar to

[1] The EPC materials are still being processed.

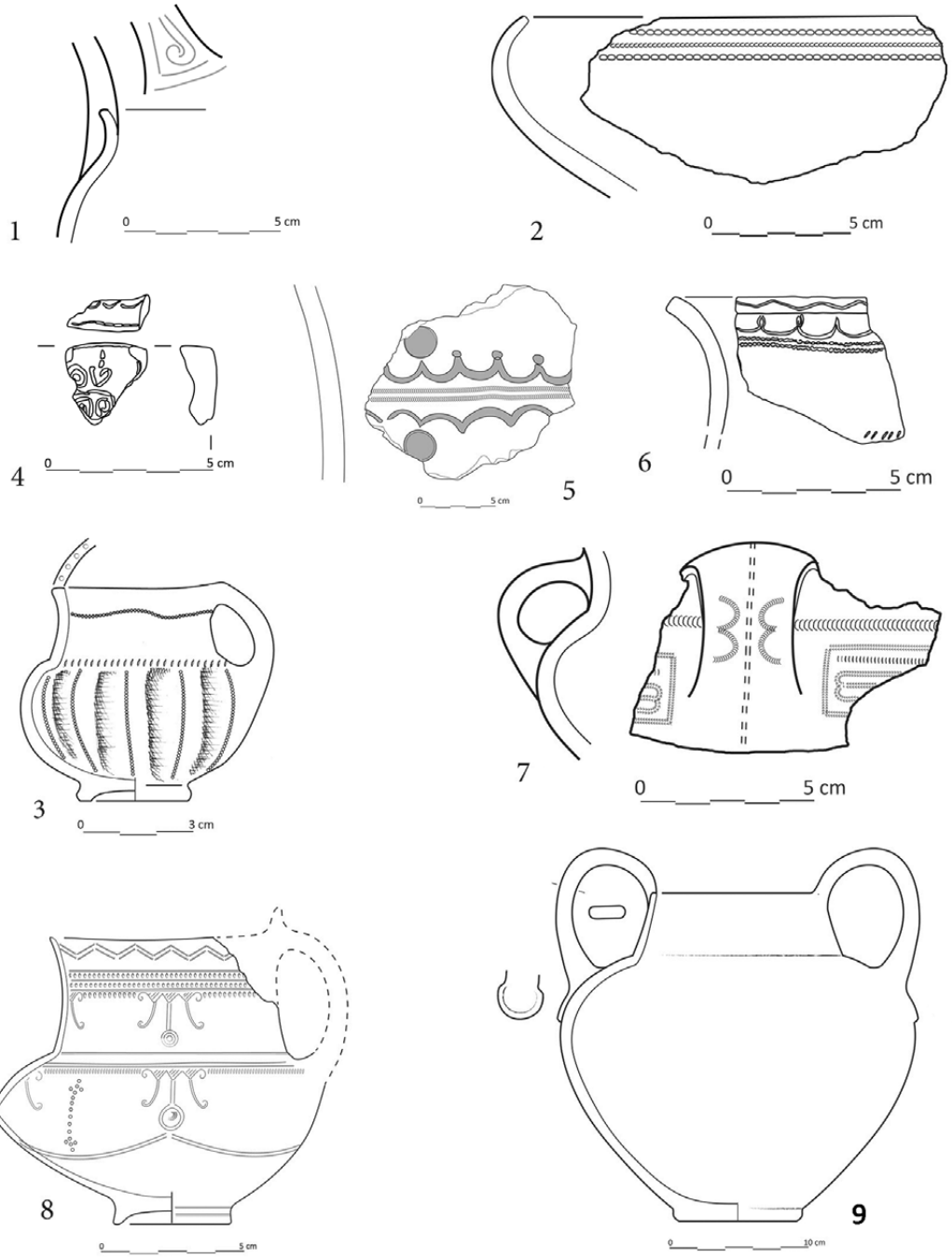



**Figure 11.** *EPC pottery: Valchedram (1–3); Oryahovo–Orehite (4); Oryahovo–Kaleto (5); Rasovo (6); Yakimovo (7); Ostrov (8). Zimnicea type kantharos (9). Image Credit: S. Alexandrov (1–3, 5, 7, and 8) and G. Ivanov (4 and 6).*

pottery from Baley, levels III and II.[1] In fact, the site of Baley is located some 5 km northwest of the location of the find. An EPC bowl sherd comes from *Yakimovo*, Montana District, 25 km south of the river (fig. 11/7). An EPC cup, bowl sherd and another cup were found near *Valchedram*, Montana District, 15 km south of the river (fig. 11/1–3). Vessels with Zimnicea–Plovdiv characteristics are also kept at the local collection. From the Kaleto locality (a high elevation above the Danube River), 3 km east of *Oryahovo*, also comes a neck sherd from an EPC amphora (fig. 11/5; Ganetsovski & Naidenova 2000, 220, t. II/7). Another sherd (probably from a cult table) was found east of Oryahovo, at the Orehite locality (fig. 11/4).

**Discussion**

So far, fifteen 'inland' sites in northwest Bulgaria yielded EPC ceramics. We can add to the list an EPC sherd, probably of a bowl, from the site of *Yarak* at Rogljevo (Negotin Municipality, northeast Serbia; Bulatović et al. 2013, 172, t. LXXXIV/2). Taking into account the site of *Chavdartsi* in north central Bulgaria, the total number of LBA sites with EPC ceramic imports in the southern part of the Lower Danube totals up to 17. 'Imports' appear at both settlements (Gramada, Oreshets, Rasovo, and Ruzhintsi) and necropolises (Gramada, Gradeshnitsa, Harlets, and probably Ostrov). In our opinion, grave 1 from Gradeshnitsa could be regarded as a genuine EPC grave.

It seems that these sites are evenly spread in northwest Bulgaria (fig. 1) but this picture could be the result of the current stage of investigations. In Oltenia, north of the Danube River, the number of the 'inland' sites with EPC ceramics is considerably higher in the regions closer to the EPC territory (*Şandor-Chicideanu* 2003; Crăciunescu 2018 & 2022). As shown in figure 1, out of over 40 sites with EPC ceramics north and south of the river, only seven are located east of the Ogosta–Jiu Rivers line. North of the Danube, these are: (1) 'Gârla Mare and Bistreț–Işalnița finds' from the necropolis of *Corabia* (Şandor-Chicideanu 2003, 224); (2) an upper part of an anthropomorphic figurine from *Vultureşti* (Berciu 1976, fig. 5/1); (3) an EPC cup from grave 41 at the necropolis of *Zimnicea* (Alexandrescu 1973, 80f, pls. V/3, X/5, and XI/4); (4) an unillustrated sherd from *Popeşti–'Nucet'*, Giurgiu region (not shown in the map; Palincaş 2012, 29); and (5) a sherd of a typical EPA tiered amphora from *Oltenița*, Călăraşi region (Morintz 1978, 80f, figs. 46/1 and 47/4). South of the river, these are: (5) Oryahovo; (6) Ostrov; and (7) Chavdartsi.[2] This is an additional reason to argue that the influx of these two rivers into the Danube should be considered as the eastern border of the 'genuine' EPC area.

The distance between the discussed sites west of the Jiu–Ogosta line and the Danube River (the 'genuine' EPC area) is not longer than 40 km, a range that could be covered in a day walk. However, quite a few sites are located at a much longer distance from the nearest EPC site: Cârcea (65 km), Vultureşti (80 km), Chavdartsi (110 km), Zimnicea (130 km),

[1] Material kept at the Vidin Museum of History.

[2] A rescue operation is still in progress and the finds are unpublished.

and Oltenița (250 km), the distance for the former three sites having been calculated as the crow flies and for the latter two, along the Danube River. This raises questions about the LBA exchange or cultural contacts in the LBA Lower Danube, but they need further investigation.

The EPC 'imports' include pottery, figurines, small finds, etc., i.e., the whole spectrum of ceramic production.

*Pottery*

So far, seven complete vessels come from sites out of the EPC area: an amphora from Gradeshnitsa (grave 1), a lobed bowl from Harlets, a kantharos from Gramada, two large cups/jugs from Glozhene and Ostrov, a small cup from Valchedram, and a pyxis from Glozhene. EPC sherds are much more numerous: from lobed bowls (type S/ in Şandor-Chicideanu's typology); bowls with inverted rim, type S/14; cups/kantharoi, types C/7–9 and K/7; globular amphorae, etc. Most of them are richly decorated with common EPC techniques and patterns. The pottery types discussed were assigned to the 'classic' (Cârna) EPC phase (Şandor-Chicideanu 2003, 184ff), but the excavation results at Baley demonstrated that they are common for the late EPC (Orsoya) phase as well. Similar picture is to be seen north of the Danube. In fact, all the common EPC shapes and decorations are represented there, at Late Verbicioara sites (Crăciunescu 2022, 201ff). Most of the pottery 'imports' north of the Danube come from settlement sites. The only published complete vessel was found at a necropolis: the already mentioned cup from grave 41 in Zimnicea. It is worth mentioning that a kantharos related to Bistreț group was also found in grave 11 at the same cemetery (Alexandrescu 1973, figs. X/7 and XI/3).

*Anthropomorphic figurines*

Four EPC figurines were found in the study area, from funerary context (Gradeshnitsa) or settlement sites (Gramada and Rasovo). A stray find from Bregovo probably also comes from a settlement context. Only the figurine from Bregovo is plain; the other three are well manufactured and lavishly decorated. Based on the cross-section of the figurines' 'heads', it is possible to assign all of them to Shalganova's type 3, which is considered a later development common for the upper horizons at the settlement of Baley and the necropolis of Orsoya (Shalganova 2005, 62ff).

North of the Danube, fragments from 13 figurines were found out of the EPC area, their number decreasing from west to east. Nine pieces come from Mehedinți District, three from Dolj District, and one from Olt District (fig. 1). The latter is the most distanced find of such figurines. It comes from Vultureşti located some 80 km north of the Danube (Berciu 1976, fig. 5/1). According to the publications, all of them were recovered from settlements. It is interesting to note that all are from the upper parts of the figurines (Crăciunescu 2018; Nica 1994, figs. 11/9 and 15/14 & 1997, figs. 6/22 and 9/13 and 17; Berciu 1952, 159f, fig. 18 & 1976, 171ff, fig. 5/1). Şandor-Chicideanu assigned all Romanian figurines discussed above to her types ΦI and ΦII. Since these are the most numerous figurine types in EPC, this seems quite normal. According to the same author, type ΦI is earlier (Br. B–C period) and type ΦII is later (Br. D period; Şandor-Chicideanu

2003, 101ff and 320ff).

Five out of these eleven sites were excavated. In Oreviţa Mare (Mehedinţi District, 15 km southeast of the Danube River) a Late Verbicioara site yielded two fragments of figurines as well as EPC sherds. The context of finding was not specified, but the local pottery shows Verbicioara V and Bistreţ characteristics (Crăciunescu 2018, 75, pl. VI/42–43 & 2004, 41, pls. LXX/1–5, LXXI/3 and 4, and LXXVIII/1–3). Almost nothing is known of the LBA site of Rogova – La cazărmi (Mehedinţi District) as only EPC ceramics were published from it. The site itself was dated to 'a late stage of the Verbicioara Culture' (Crăciunescu 2022, 204, pls. LXXIV/3–5 and LXXV & 2018, 75, pl. VII/44). The figurine from Cârcea–Hanuri was reported as coming from a level related to the last Verbicioara phase (Nica 1997, fig. 6/22). The one from Verbiţa was found in the plowzone. However, pits with Verbicioara material were explored there, and one of them yielded an EPC pottery sherd (Berciu 1952, 159f). Similarly, a site with Verbicioara IV–V material was investigated at Vultureşti, even though no closed complexes have yet been reported (Berciu 1976, 171ff).

*Miscellanea*

Several types of EPC small finds were found at the sites discussed. The pyxis from Glozhene (fig. 7/4) belongs to type P/1–2 in **Ş**andor-Chicideanu's typology (2003, pl. 195/1 and 2). Similar pyxides were uncovered in features 161 and 163 at the necropolis of Baley, radiocarbon dated to 1369–1217 cal. BC and 1378–1215 cal. BC period, respectively (68.3% probability).[1] A fragment of a cult table comes from the site of Oryahovo–Orehite (fig. 11/4). Small lids and other small finds specific for the EPC come from Rasovo.[2] Such materials were found at Late Verbicioara sites north of the Danube River as well (Crăciunescu 2022, 201ff).

South of the Danube River, the EPC imports appear at sites that yielded Zimnicea–Plovdiv or Gramada–Gamzigrad style pottery. In fact, all the excavated sites of this group yielded EPC ceramics. In those investigated at a larger area (such as Gramada–Gladnika and Rasovo), the number of imports is considerable. Based on radiocarbon dates, the discussed EPC ceramics generally appear in the second half of the fifteenth–thirteenth centuries cal. BC period. It is noteworthy, that no EPC materials were so far discovered at earlier (Verbicioara IV) or later (Vârtop) sites.

North of the Danube, such finds were reported from sites generally described as 'late Verbicioara' or 'Verbicioara IV–V'. As mentioned by Gabriel Crăciunescu, '*Žuto* Brdo – Gârla Mare materials are frequently found at the late Verbicioara settlement sites.' For the site of Oreviţa Mare, a high number of EPC ceramics was noted, one of the possible explanations being the large excavation area (Crăciunescu 2022, 204f and note 781). The very intensive relations between Verbicioara V and Gârla Mare were emphasized by Marin Nica as well (1998, 152f). In Romanian literature, the EPC relations with

[1] 2022 excavation directed by S. Alexandrov, G. Ivanov, and T. Hristova.

[2] The EPC materials are still being processed.

Verbicioara, Zimnicea–Plovdiv and Tei have been discussed, more or less, in terms of relative chronology. The relations with Verbicioara IV have been sought in material from Cârcea–Viaduct and Secu (Craiova region). However, both Verbicioara IV and V phases were identified at the site of Cârcea–Viaduct. At Secu, the EPC imports were associated with Verbicioara V material.

More reliable is the evidence from the necropolis of Cârna, where graves 104 and 18 yielded kantharoi related by most authors to Verbicioara IV or the Govora group (Şandor-Chicideanu 2003, 199ff). Moreover, a Zimnicea–Plovdiv kantharos was found in grave 33/33bis (Dumitrescu 1961, 46, pl. XLVII/121). Generally, inland ceramics has rarely been found at EPC sites. At the settlement of Baley, several sherds could be distinguished, based on their fabrics, shape, and decoration, as 'foreign' for the local ceramic production. Their shapes and decorations find parallels in Verbicioara V and Zimnicea–Plovdiv pottery (fig. 12/1–5). These sherds come from levels III–II (fig. 12/5–14). The Bayesian chronological modelling of radiocarbon dates from Baley[1] shows a 1421–1203 cal. BC range for levels III–Ib that generally corresponds to the absolute dating of the sites with EPC ceramics in northwest Bulgaria discussed here. Kantharoi from graves 25, 86, and 176 at the necropolis of Orsoya could be related to the Zimnicea–Plovdiv pottery style as well (Filipov 1976, pls. XV, XXXVIII, and LXV). According to Crăciunescu (2022, 202, pl. XIV/6), the only EPC site with inland ceramics in west Oltenia is Izvoarele where 'a half of a cup from a late Verbicioara phase' was discovered. In a monograph published in the beginning of the twenty-first century, the discussed cup was related to the Verbicioara IV phenomenon (Crăciunescu 2004, 189).

So far, the correlation between the number of sites with EPC imports as well as the number of EPC sites with inland ceramics leads to the conclusion that the direction of contacts was from the Danube River to the north and south. If these numbers are not merely a result of the current stage of investigation, we can assume that the contacts between the EPC and the inland communities were initiated and carried out mainly by the 'river' population. Such an assumption is supported by the use of EPC ceramics in 'inland' mortuary practices; grave 1 at Gradeshnitsa is, in fact, a genuine EPC funerary complex.

The intensive contacts of the EPC communities with their neighbors were not a characteristic feature for the population east of the Iron Gates only. Recent investigations revealed relations and intensive contacts of the western EPC group (Dubovac) with their neighbors to the west and northwest. The relations between EPC and the Belegiš–Cruceni phenomenon were 'observed at several necropolises and settlement sites in Banat and the Middle Danube region – Srem and Bačka' (Szentmiklosi 2006, 234ff). In fact, the northernmost Belegiš site that yielded EPC imports is Gradište Iđoš in northern Serbia located south of the confluence of the Mureş and Tisza Rivers, where two EPC sherds were found in trench 6, pit 6005. The ceramics from the pit was related primarily to the Belegiš II period. The two sherds were considered as 'imports with stamped solar motifs,

[1] Made by P. Włodarczak of the Institute of Archaeology and Ethnology, Polish Academy of Sciences, Kraków, based on dates available until 2021.

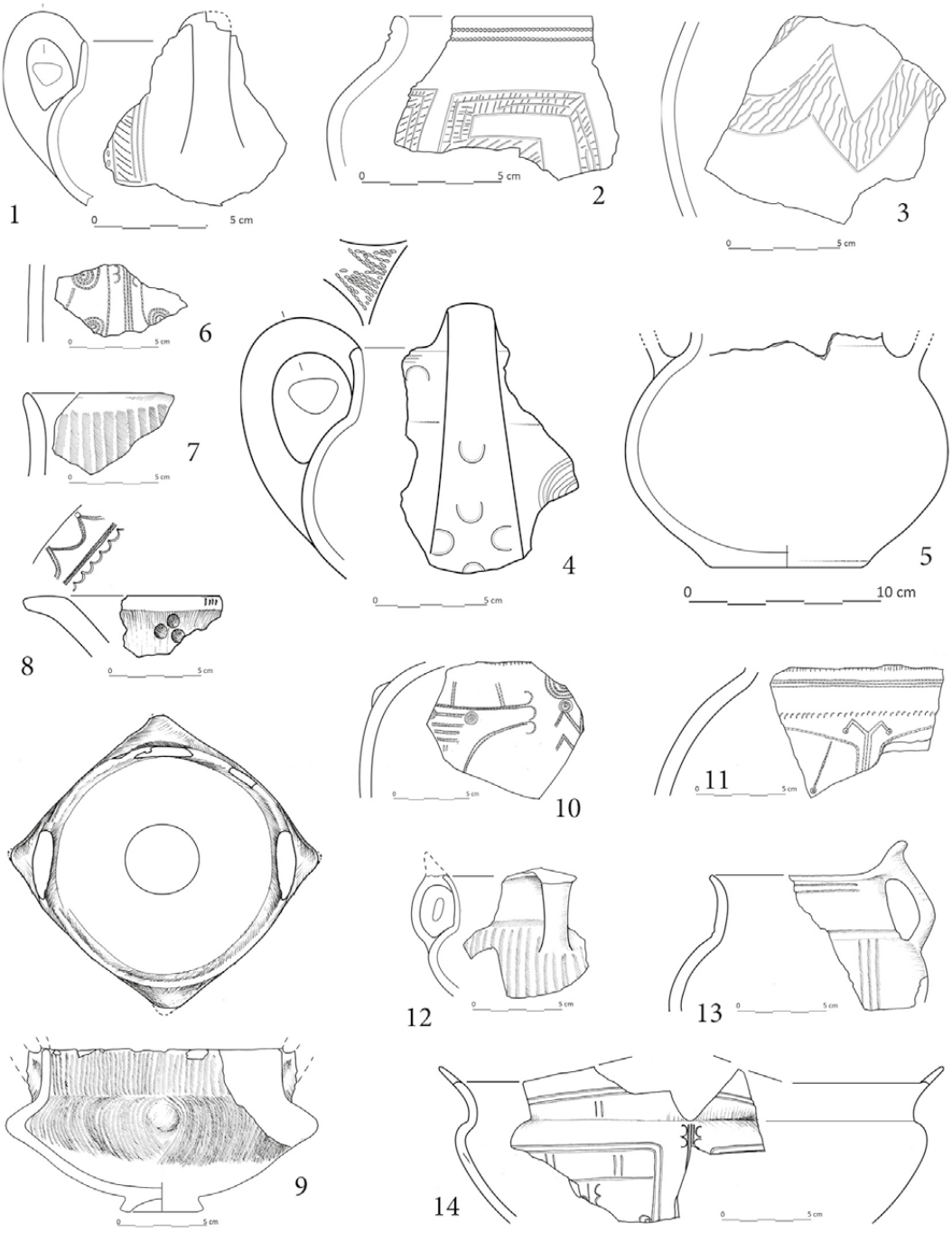



**Figure 12.** *The settlement of Baley, levels III and II: sherds with Zimnicea-Plovdiv and Verbicioara V characteristics (1–5); EPC pottery from level II (6–9); EPC pottery from level III (10–14). Image Credit: S. Alexandrov.*

probably coming from the south'. The two radiocarbon dates on samples from context 6006 – 1441–1304 cal. BC and 1406–1274 cal. BC (both of 95.4% probability) –secure the chronological position of the feature in the last decades of the fifteenth – the early thirteenth century cal. BC period (Molloy et al. 2020, 9f, table 3, fig. 10/M, obj. 6006).

EPC ceramics was recovered from the Middle Morava area in Serbia as well. Several sherds come from pit 128 at Panjevački rit, Jagodina region, related to the Paraćin group (Stojić 2004, 74ff and 144f, t. LIV/5 and 6). According to Milorad Stojić, a kantharos from the necropolis of Rajkinac – Lukićska Mala is decorated 'in the Žuto Brdo style.' The grave itself was related to the Paraćin and Brnjica phenomena (Stojić 1998, 84, t. IV/5 & 2004, 145). One more EPC sherd from the neck of an EPC globular amphora was found near Jagodina.[1]

Some authors have argued that these contacts reached northern Greece, as evidenced by an upper part of a figurine found at Dikili Tash (Deshayes 1970, 36, fig. 40). Although Şandor-Chicideanu (2003, 325) assigned it to her type ΦI B1, in our opinion its relation to the EPC still needs additional arguments.

**Conclusion**

Considering the EPC, in the LBA, the northwest Bulgaria 'inland' region showed contacts similar to what has been established for Oltenia, Banat, and Srem as follows:

- The contacts were intensive as evidenced by the ceramic imports;
- The imports cover the whole spectrum of ceramic products: pottery, figurines, small finds, etc.;
- Territorially, they cover almost entirely northwest Bulgaria up to a distance of 40 km south of the Danube River;
- In northwest Bulgaria, the EPC ceramic imports appear in Gamzigrad–Gramada or Zimnicea–Plovdiv cultural milieu;
- So far, no EPC ceramics have been found at Verbicioara IV sites in the region discussed;
- The EPC imports appear at settlement sites (dwellings, pits) and necropolises;
- Chronologically, these imports cover the second half of the fifteenth–thirteenth century cal. BC period;
- Based on the evidence from the settlement and necropolis of Baley, this period corresponds to the Orsoya/Baley phase of the EPC development;
- It could be assumed that the EPC communities initiated and carried out these contacts. Grave 1 at Gradeshnitsa could even be regarded as a genuine EPC grave;
- The existence of EPC imports at sites that are located at more than 100 km (sometimes 250 km) from the nearest EPC site raises questions related to the LBA exchange or cultural contacts in the Lower Danube.

[1] It is kept at the Jagodina Museum.

**Acknowledgements**

The authors would like to thank the following persons, for their kind permission to use unpublished EPC material in this paper: Georgi Ganetsovski, for the material from Gramada – Yasova bara; to Vladislav Zhivkov, for the material from Ruzhintsi; and to Ivo Cholakov, for the material from Chavdartsi. Thanks are also due to Sonja Perić, for the information about the amphora sherd from Jagodina.

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Studia Praehistorica 17, 2023, 243–252

# Gift of the River: A Late Bronze Age sword with cup-shaped pommel from the river Sava

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**Abstract**

*This paper presents a Late Bronze Age sword of the Schalenknauf type, or full-hilted sword with cup-shaped pommels, from the site of Poloj, near Gradiška in Northern Bosnia. Due to its unique features, the artifact cannot be attributed to any known specific variant. It is dated to the final phase of the Late Bronze Age (Ha B1 period or ca. tenth century BC). As with most stray finds, information on its archeological context is very scarce. In all likelihood, it was made in Central Europe and seems to have ended to the south through a long-distance exchange mechanism. Wear traces indicate prolonged use and maintenance as a functional weapon for an extended period of time. Like many contemporary swords, it ended its life by being deposited in the river or, more likely, in its marshy backswamps around the banks of the Sava in the vicinity of Gradiška. The presence of still-unrepaired traces of combat suggests that cycles of combat and repair ceased relatively shortly after a battle, when the deposition took place. The paper also discusses the symbolic language of metal-hilted swords as highly important transmitters of identities.*

**Keywords:** *Late Bronze Age – metal-hilted sword – Posavina – northern Bosnia – Ha B1 period.*

https://doi.org/*10.53250/stprae17.243-252*

## Introduction

Swords are one of the most precious forms of metal objects of the Bronze Age. Their importance derives from both their material value and their function as a weapon. Furthermore, the carrying of a sword indicated social rank and contributed significantly to the weapon's importance (Mödlinger 2011a; Molloy 2018, 204f; Molloy & Horn 2020, 138f). Late Bronze Age swords from Northern Bosnia mostly come from hoards, in the form of heavily damaged items, often broken in the ritual practices associated with hoard deposition, or as stray finds from rivers, which are also believed to be a form of ritual deposition (Vinski-Gasparini 1973; Harding 1995; König 2004).

To some extent, this is also the case for the exceptional artifact presented here, which ended its use-cycle in a watery context. This sword was found in 2001 by fishermen on the banks of the Sava, at the site of Poloj, near Gradiška in Northern Bosnia (fig. 1). This is one of the best-preserved swords of the Late Bronze Age in the area, and its characteristics certainly make it an object worthy of attention. Since its discovery, the sword has remained in the private possession of Alen Mešić from Gradiška. As with most stray finds, the information on its archeological context is very scarce. Poloj is located less than a kilometer north of the confluence of the Vrbaška and Sava Rivers, in a marshy area with a sandy bank. In the summer, the Sava recedes significantly, leaving a wide and accessible bank, while in periods of greater rainfall, a wide belt is flooded, creating a marshy landscape with the accompanying characteristic vegetation and swamps. Gravel and sand have been intensively quarried throughout the area over the

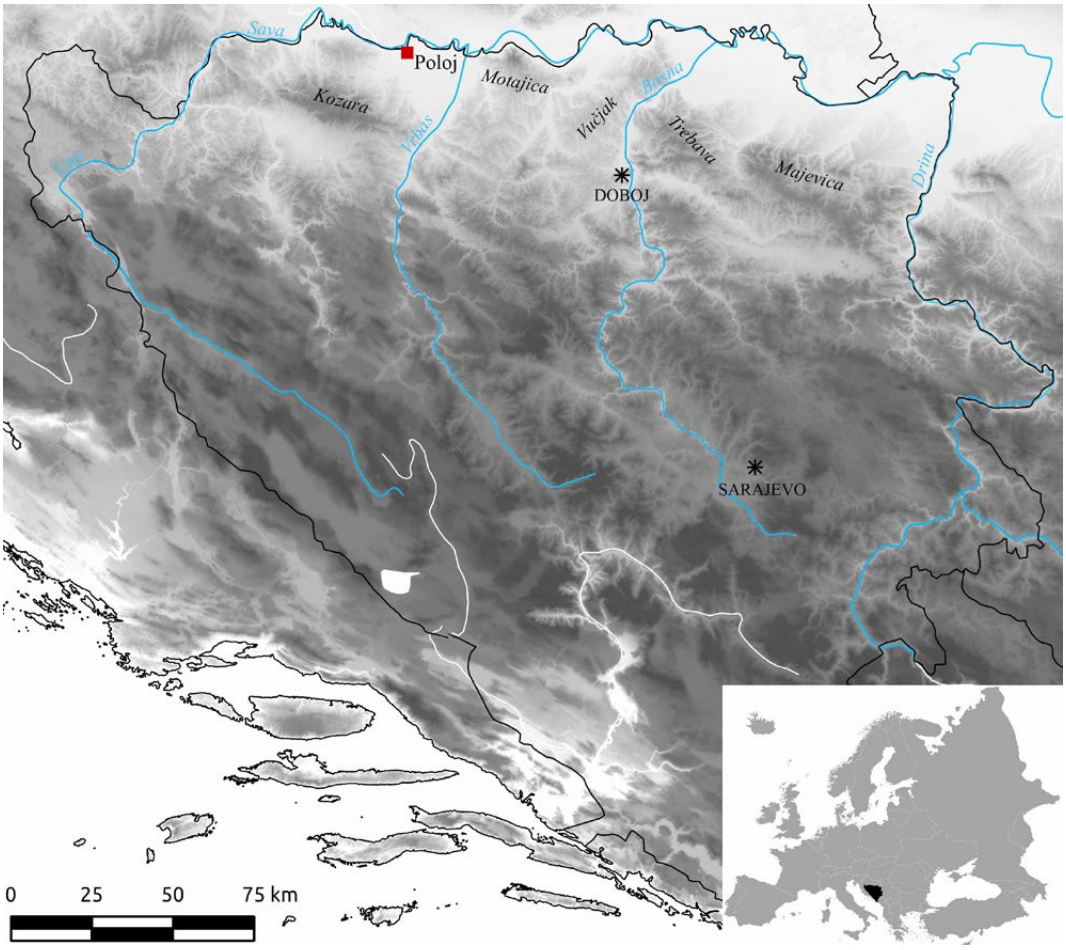



**Figure 1.** *Map showing the position of the site of Poloj in Northern Bosnia. Image Credit: Regional Museum in Doboj and the author.*

past decade, resulting in a massive extraction area that is in the process of evolving into a completely new landscape. These activities have also yielded many archaeological finds, among which are several artifacts dating to the Bronze Age.

**Description of the sword**

The sword weighs 870 g, and measures 61.4 cm long from the tip to the end of the cup-shaped pommel. The hilt is 11.8 cm long from the medial guards to the end of the pommel. The blade is broadest in its lower third, measuring 4.5 cm at its widest, and 3.4 cm right above the handle, where a smooth *ricasso* is situated. The maximum thickness of the blade is 1.1 cm, while the thickness of the handle is 3 cm. The upper part of the handle is cup-shaped, with a diameter of 5.3 cm. Inside the cup is a mushroom-shaped button or nub, with a small perforation running through the cup to its side (fig. 2). This is a typical feature of most swords of the type; a small pierced hole through the cup-shaped pommel, leading to its underside. It has been suggested by Kristian Kristiansen (2002, 320), based on the use of the sword according to its primary function as a weapon, that the sword was strapped to the wrist through this pierced hole, preventing its loss during a fight (see also Mödlinger 2011, 78; Soós 2015, 129). Another possible function, according to Jiří Řihovský (2000, 103), is that it may have been used to attach the sword to the belt.

The practical function of the sword may also be indicated by the *ricasso* present above the handle (Kristiansen 2002, 323). Metal-hilted swords of this type are made of a separate cast blade, which was joined to a hollow hilt by means of two rivets (Pola et all. 2015; Mödlinger 2011), as is the case here. The leaf-shaped blade has a ridged lens-shaped cross-section, and the sword is superbly crafted and exceptionally well cast. The handle is decorated with punched dots that are positioned in seven rows set at equal distance

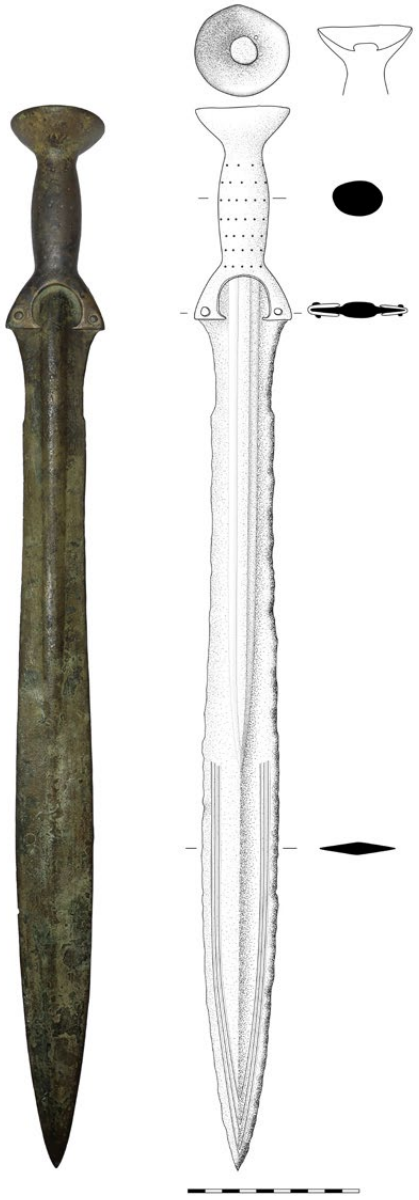


**Figure 2.** *Photo (left) and drawing (right) of the sword from Poloj. Image Credit: the author (photo) and V. Žigić (drawing).*

from one another across the entire surface of the handle. The blade is decorated with three groups of incised lines on each side, stretching from the tip to the end of the middle rib. The hilt is well-preserved, and is covered by a largely uniform dark brown patina. The patina of the blade has flaked off, exposing a greenish corrosion. It is unclear how this idiosyncrasy of preservation arose, but it must be mentioned that the sword has been regularly handled in recent times. Striation patterns on the middle rib cutting through the corrosion layers indicate that some of the patina has been mechanically removed in modern times, perhaps with a metal brush or some kind of metal file.

Numerous authors have defined the primary functions of cup-hilted swords as being both cutting and stabbing (cf. Řihovský 2000, 102f; Mödlinger 2011, 75). This highly functional sword bears evidence of use before the final deposition. A small notch can also be seen on the sword; this mark shows similarities to others found on Late Bronze Age swords, argued to represent sword-to-sword combat damage (Hermann et al. 2020). The notch is located in a heavily scraped area of the edge, and most of its surface has no patina. However, the patination inside the notch's fissure and the presence of cleaning striations only on the outermost part of the burr created by the impact suggest that the notch was produced in a phase pre-dating the mechanical cleaning of the sword.

**Classification and parallels**

This object belongs to the rare category of Late Bronze Age Schalenknauf type swords, which has appeared in the literature under a variety of names derived from different typological classifications (Müller-Karpe 1961; Bader 1991, 141f; Kemenczei 1991, 60; Harding 1995, 78; Stockhammer 2004, with ref.). The sword with cup-shaped pommel from Poloj has many unique features, which lead us to classify it as a unique type, or rather as a variant. Nevertheless, it can be classified amongst a wide group of metal-hilted swords that appear at the end of the Bronze Age. This sword type was among the most common ones from the eastern fringes of the Carpathian Basin to the eastern Alpine range during the eleventh and tenth centuries BC. The highest frequencies of similar weapons have been found in Eastern Hungary, east of the Tisza and in Transylvania (Szabó 2019, 164f). Its different variants have been found in various parts of present-day Europe, including southern Germany, Bohemia, Slovakia, southern Poland, Austria, Hungary, Romania, and Western Ukraine (Stockhammer 2004, 87, maps 31 and 32; Tarbay 2022, 34). In Hungary, similar weapons are known from Tibor Kemenczei's W-type (1991, 60, Taf. 59/254), variant 3, characterized by a leaf-shaped blade with ridged cross-section, smooth *ricasso* feature and the decoration of the lower part of the blade with incised lines, and are dated to the Hajdúböszörmény horizon, or Ha B1 period according to the Central European chronology (Soós 2015, 129; Siedlaczek 2015, 282; Tarbay 2018, 319; Puskás 2019, 204; Tarbay 2022, 35). An identical conclusion was reached by Amália Mozsolics (2000, 23) following an analysis of bronze swords discovered in Hungary. According to Tiberiu Bader's typology (1991, 150, Taf. 50/358) derived from an analysis of Late Bronze Age

swords from Romania, the closest parallels are found with swords of the Cobor type, variant 2. Another interesting find originates from the site of Zlatná na Ostrove in Slovakia. This stray find from the Danube River has all the morphological characteristics of the sword from Poloj, but is undecorated, and has been dated to the Ha B1 period or Hajdúböszörmény horizon (Bartík & Trugly 2006, 48, 50). There are also formal parallels beyond this territory, but most of these are – unfortunately – stray finds devoid of archaeologically secure contexts. Finds from the Western Balkans and the adjacent regions are certainly included within that group. Ksenija Vinski-Gasparini (1970, 161) was the first to draw attention to swords with cup-shaped pommels from this territory more than half a century ago. She published descriptions of two swords: one from Kastav, presumably discovered in a skeletal grave, and the second is a stray find from Grižane, both from the Kvarner area (Vinski-Gasparini 1970, 161; Blečić Kavur 2014, 96). They represent the most southern finds of this type of sword, with highly individual characteristics that reflect a stylistic variability formed by different regional and cultural influences (Glogović 1989, 40; Blečić Kavur 2014, 100). Both are also dated to the Ha B1 period, or the tenth century BC (Vinski-Gasparini 1970, 165). Only five swords with cup-shaped pommels were previously known from former Yugoslavia, described and classified by Anthony Harding (1995, 78f; see also Šinkovec 1996, 145).[1] He highlighted the fact that all of them lack direct or exact parallels, but considered them to be close to swords from Romania and Western Transdanubia (Harding 1995, 78f). In summary, it can also be assumed that the cup-shaped pommel swords were manufactured in eastern and western workshop circles (Stockhammer 2004, 126), with local designs being developed that incorporated foreign stylistic elements. In addition to direct exchange, we cannot exclude the possibility that local metalworkers borrowed certain attractive foreign stylistic features (Tarbay & Mitrović 2022, 140).

**Depositional context**

As with most stray finds, precise information on the depositional context of this sword is unknown. Its patina confirms that it remained in a waterlogged environment for an extended period of time. However, whether it was left in the flowing river itself, in marshy backswamps, or in a part of the river bed that remained dry in the summer, remains uncertain. The original brownish patina seems to best match a long period of deposition in a peaty environment, like the backswamps of a river. Since the majority of bronze swords with relatively certain archaeological contexts come from hoards in Northern Bosnia, with such swords being conspicuously lacking from burials and settlements, it is generally assumed that they were deliberately deposited in the context of ritual activities (König 2004, with ref.).

[1] In the same year, independently of Harding, Rastko Vasić (1995, 53) published a sword from the confluence of the River Morava and the Danube, classifying it amongst the broad group of Konigsdorf type swords.

Given their symbolic significance, most of the Late Bronze Age swords were deposited individually, by means involving specific rituals (Szabó 2019, 167). Given the unrepaired damage evident on this sword, it seems likely to have been deposited after combat, and its deposition may well relate to its role in such an event. So far, the present find is the first Late Bronze Age sword of this type known from the southern fringe of the Pannonian basin. Metal-hilted swords had been completely absent from the inventories of the hoards of Northern Bosnia (König 2004) until recently, when a fragment of a metal hilt was found in a hoard from Srebrenik, which has been classified as a metal-hilted sword of the Erlach or Schwaig type, and dated to the Ha A1 period. It is worth noting that this represents the southernmost example of this type of sword (Blečić Kavur et al. 2016, 58). Roughly thirteen kilometers east of Poloj along the river Sava lies the eponymous site of Donja Dolina, and across the river there is another site – Dolina. The distribution of certain bronze objects found both within these settlements, and also frequently discovered as isolated finds along the riverbank, indicates the inclusion of the Posavina communities within a communication network spanning from Eastern Austria, Moravia and Bohemia, all the way to Western Hungary (Gavranović & Ložnjak Dizdar 2019, 142).

**Conclusion**

The typical weapon of the Bronze Age warrior was the sword. European Bronze Age swords had a high functional and symbolic value, and, as a result, weapons were commonly exchanged across cultural borders, becoming useful indicators of group identities and craftsmanship due to the fact that they were perceived as prestige objects (Ling et al. 2019). The sword from Poloj can be classified as a Schalenknauf type, or sword with cup-shaped pommel, although, due to its individual features (form of blade, *ricasso*, and decoration), it cannot be attributed to any known specific variant. It is dated into the final phase of the Late Bronze Age (Ha B1 period, or c. tenth century BC), and, in all likelihood, it was made in Central Europe, most likely reaching the south through a long-distance exchange mechanism. Wear traces indicate prolonged use and maintenance as functional weapon, and, like many contemporary swords, it ended its life by being deposited in the river, or, more likely, in its marshy backswamps around the banks of the Sava River near present-day Gradiška. The presence of still unrepaired traces of combat suggests that cycles of combat and repair ceased relatively shortly after a battle, when the deposition took place. Although it is not as richly decorated as most other examples of this type, the reduced decorative elements indicate that certain final stylistic finishing elements, whether at the request of the owner or according to the craftsman's own tastes, were still needed. As Philipp W. Stockhammer elaborated, many locally popular decorative elements, which might also have borne a symbolic character, may not have been understood in other regions. Furthermore, in some regions there was not only a preference for certain types of swords, but also for particular lengths and shapes. Compared with the (metal) hilt, which is usually decorated, the blade, as the active part of the weapon during a fight, is more

conducive to technological change (Stockhammer 2004, 153).

The Sava Valley was an important point of communication between the Lower Danube, southwestern Pannonia and southeastern Alpine spheres. The distribution of particular types of bronze ornaments, tools and weapons indicates also connections with the wider Central European area. From the eleventh century BC onwards, at the beginning of the younger phase of the Late Bronze Age (Ha A2 – Ha B1), the communication network changed; regional differences became more prominent, and north-south communication gained in importance. An example of this can be seen in knives of the Kletnice and Pustiměř types (Gavranović & Ložnjak Dizdar 2019, 142) and razors of the Oblekovice type,[1] which were predominantly distributed across the territories of what is now Moravia, Czech Republic, Western Hungary and Eastern Austria, with finds from the Sava Valley often marking the southeastern edge of distribution (Gavranović & Ložnjak Dizdar 2019, 142).

Connections between the Balkans and the Carpathian Basin that impacted weapon craftsmanship persisted into the following period, between 1100 and 850 BC. During this time, a decrease in the number of weapons in the Northern and Central Balkans coincided with a dramatic decrease in metal hoarding. The geographic distribution of Late Bronze Age weapons may have been influenced by several other factors; in certain parts of the Northern Balkans, the metal objects' stylistic designs and the patterns of object selection and treatment in depositions were so similar to those of Central Europe that we can assume they were the product of communities that shared the same metallurgical and ritual traditions (Blečić Kavur 2014, 101). Local designs can be seen to have developed in combination with foreign stylistic elements. In addition to direct exchange, we cannot exclude the possibility that local metalworkers 'borrowed' certain attractive foreign styles, with weapons from the Northern and Central Balkans fitting such a hypothesis. As noted previously, the ritualized exchange of weapons across regions is also plausible, especially when the possession of a particular object afforded great prestige. The advanced weapon technology and the diversification and specialization of weapon types are strong indicators of the existence of professional warriors in the Northern Balkans during the Late Bronze Age.

Mobility has always been an essential part of a warrior's life, and Late Bronze Age warriors likely crossed vast areas, carrying their own equipment and looting goods, prestigious foreign objects and trophies. Weaponry and exotic goods recovered from the Northern Balkans, but more typical of northeastern Hungary, Italy, and Central Europe, may have been associated with the activities of these specialists, who participated in war campaigns of their own or served as mercenaries or military escorts of local chiefs (Tarbay & Mitrović 2022, 140). Finally, the appearance of this rare type of Late Bronze Age sword must also be viewed through the lens of different social identities that could have

[1] Unpublished finds from the Brčko District Museum.

been materialized through such objects, and were a result of the craftsman's own specificities relating to workshop traditions, kinship group, age, community-based traditions, and micro- and macro-regional trends. The specific features of a sword were primarily conditioned by the identities to which the craftsman was exposed and the social constraints imposed by potential customers and their according community-based traditions, etc., and therefore a sword cannot be considered an entirely 'free' artistic creation. The attributes given to a sword by any individual craftsman are therefore – so to speak – but symbols, the meaning(s) of which remain almost entirely lost in our time, to the extent that they essentially constitute a form of non-decodable 'symbolic language'. Yet it is to be noted that this symbolic language also undergoes distinct phases of development as the Late Bronze Age progressed (Stockhammer 2004). When it comes to Schalenknauf type swords of the Ha B1 period, it is to be noted that not only the ornamental but – to a certain degree – also the formal shaping of these swords achieves a level of diversity that had previously been unseen, with the symbolic language of metal-hilted swords becoming a key transmitter of identity.

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Studia Praehistorica 17, 2023, 253–262

# Morphometric analysis of Bronze Age funerary vessels from the necropolis of Mokrin

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**Abstract**
*Archaeologists commonly use subjective classifications to group ceramic vessels into different classes, but the usefulness of such tools for creating narratives about the past is seldom questioned. After noticing that certain ceramic classes from the Bronze Age necropolis of Mokrin have quite similar shape and size, we decided to undertake a morphometric analysis of vessels from this site. We show that some traditional classes largely overlap in both shape and size, and that the majority of funerary ceramics from Mokrin can be classified into two main morphological classes of vessels: (1) bowls; and (2) one- or two-handled beakers and amphorae. Our results go beyond this study, as they show how quantitative methods can be used in a complementary manner with more traditional tools to gain meaningful knowledge about the past.*

**Keywords:** *Bronze Age – necropolis of Mokrin – ceramics – morphometry – shape – size.*
https://doi.org/*10.53250/stprae17.253-262*

## Introduction

Ceramic typologies have an important place in knowledge production, especially in the culture-historical school of archaeology. They are among the basic tools that archaeologists use for creating relative chronologies, tracing interactions and migrations, making inferences about specialization, etc. When creating a ceramic typology, a researcher uses subjective assessment to classify vessels into groups based on their shape, size, number of handles, decoration, and other characteristics. Such classes are often introduced as 'functional', i.e., it is believed that they correspond to their use in the past.

However, while the classifications are useful for exploring general aspects of ceramic variability, such inferences should be made with caution and the classifications should be re-evaluated whenever possible using novel methods (e.g., lipid residue analysis when inferring function; Oras et al. 2017). During our work on the absolute and relative chronology of the Bronze Age necropolis of Mokrin (Radinović et al., forthcoming; see also Soroceanu 1975; Wagner 2009; O'Shea 1992), we noticed that certain classes of ceramic vessels overlap in shape to a certain degree (cf. Wilczek et al. 2014). There is also a degree of subjectivity; for instance, a vessel defined by Girić (1971) as a bowl looked more like a mug to us. Also, we noticed that 'bowls' and 'pots' can have very similar shapes but different labels. Finally, we noticed that certain vessel types have quite similar shapes, but seem to differ only in the number of handles. This seemed to be the case especially with the amphorae and one- or two-handled beakers.

There was one previous classification attempt for the ceramic vessels from all the Maros cemeteries. In his analysis of the shape and size of the Maros funerary ceramics, John O'Shea noted that both bowls and 'liquid containers' showed a strong trend of proportionality of the vessels, regardless of their size. The values of the Pearsons's coefficients for correlation between the maximum rim diameters and the height of the vessels for all vessel types show a strong correlation between the two (O'Shea 1996, 93). Since bowls were classed as 'chronologically insensitive', their shape and size were considered separately from the 'liquid containers', so no clear metric distinction was made between these two groups of vessels that could resemble our results. It was noted that there was a close correspondence in vessel height between Maros bowls and liquid containers (O'Shea 1996, 95), as the size criterion used to distinguish different liquid container classes (<12 cm = cups; 12–19 cm = pitchers; 20+cm = jugs) could be applied to distinguish small, medium, and large bowls. While this analysis did indicate that there was a presumed functional distinction between bowls and 'liquid containers', the difference was not shown using any metric criteria (O'Shea 1996, 84).

Thus, we decided to undertake a morphometric analysis of the entirely preserved ceramic vessels from the necropolis of Mokrin to answer the following questions:

- Can traditional vessel classes (e.g., bowls and amphorae) be distinguished based on their shape and size?
- Can we say something about the production process based on the ceramic morphometry?

**The necropolis of Mokrin**

The archaeological site of Lalina humka at the village of Mokrin, near Kikinda in the northern Banat, was first excavated in the 1960s and 1970s. During several campaigns, the team of Serbian and American archaeologists uncovered 312 Maros culture graves, making it, together with Ostojićevo, one of the biggest Maros necropolises (fig. 1). Most of the graves were oriented S-N/N-S, and contained a single burial of an individual

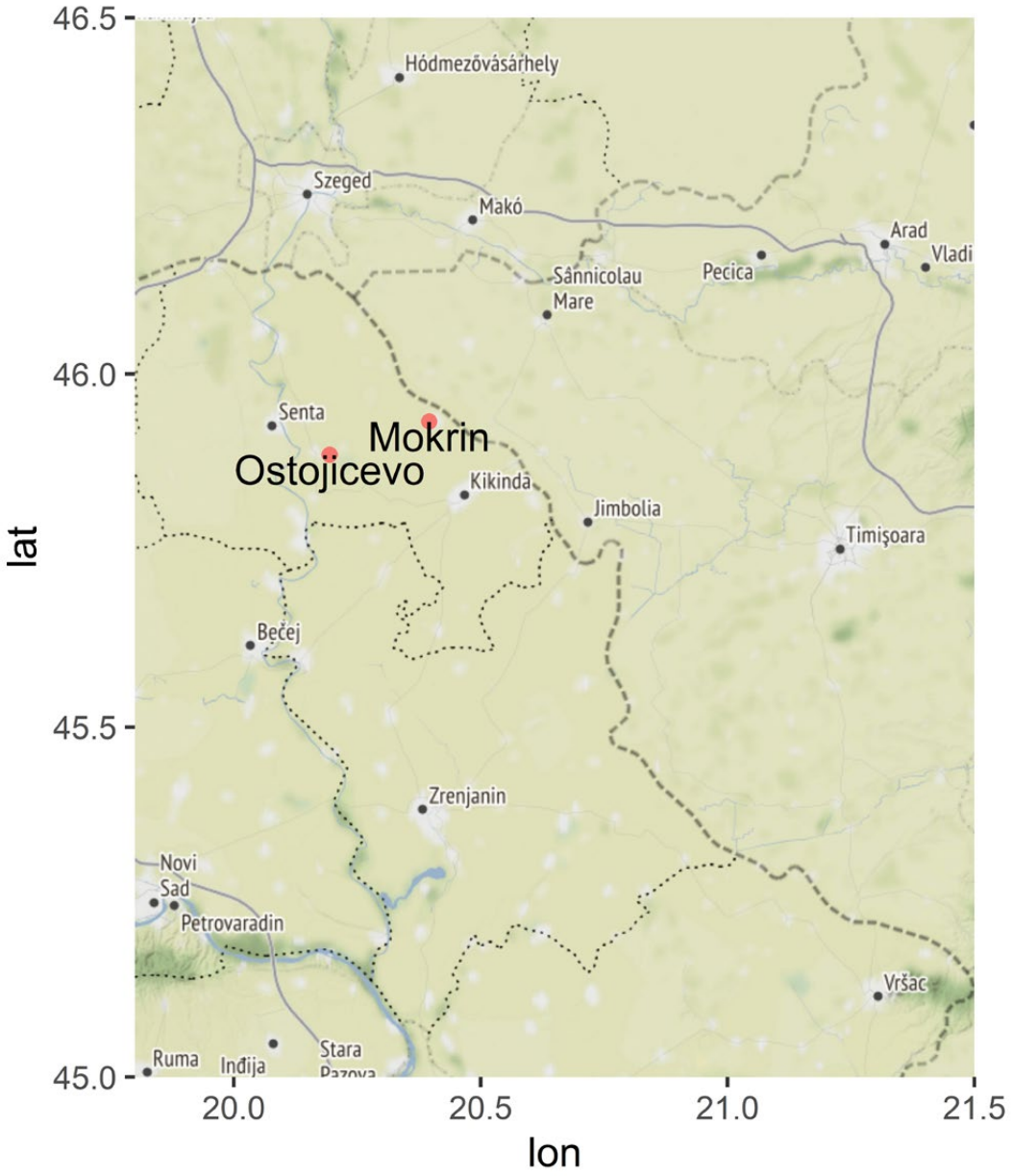



**Figure 1.** *Map showing the location of Mokrin and the nearby necropolis of Ostojićevo in the northern Banat. Image Credit: Generated by the authors with the R programming software (ggmap and ggplot2 packages).*

in a crouched position, with a wealth of different grave goods: pottery (fig. 2), weapons, animal bones and jewelry made of kaolin, animal teeth, seashells, bronze, copper and even gold (Girić 1971). Based on the artifacts found in the graves, the necropolis was first dated to the Early Bronze Age Maros culture (Girić 1971), which was subsequently confirmed by the radiocarbon dates (2100–1800 BC; O'Shea et al. 1992). Through the years, the material from Mokrin has been extensively analyzed and employed in studies on social differentiation (O'Shea 1996), physical activity (Porčić & Stefanović 2009; Stefanović & Porčić 2013), kinship (Žegarac et al. 2021), zooarchaeology (Blagojević 2020; Ljuština et al. 2019; Vitezović, 2017), and health (Krečković Gavrilović 2022). A new ongoing excavation campaign started in 2020 aimed at the establishing of the exact boundaries of the site, radiocarbon dating, as well as collecting samples for modern bioarchaeological and sediment analysis (Pendić et al. 2022). The results of the new radiocarbon measurements are still in preparation for publication (Radinović et al., forthcoming).

**Materials and methods**

A total of 227 graves with ceramics were found at the necropolis of Mokrin. However, for our research we focused on 282 whole vessels and excluded fragmented pottery from our analysis. Additionally, we noticed slight disparities in the ceramic classification of Girić (1971), with similar vessels having been assigned to different classes, or to different types in the Serbian text as opposed to the English version. (The original monograph




**Figure 2.** *Example of an entire vessel from the necropolis of Mokrin. Image Credit: Jugoslav Pendić.*

was published bilingually in Serbian and English). To amend this problem, we developed our own classification for this paper. To avoid small samples and to make our results more comprehensible, we selected only four vessel classes for our analysis: bowls (96), one-handled beakers (34), two-handle beakers (64), and amphorae (41). After doing these selections, we were left with the sample of 235 whole vessels for the morphometric analysis.

In order to generally describe the ceramic production, we recorded a number of attributes for these ceramic vessels based on the drawings and grave descriptions in Girić (1971): vessel class (as defined by us), presence of foot, decoration, pronounced shoulder, texture, vessel height, as well as perforations and lid in the case of amphorae. To quantitatively assess vessel shape, we measured 10 widths at equal distances from top to bottom (fig. 3; see Shennan 1997, 288). These measurements were made on drawings of ceramic pots from Girić (1971). They were done in several steps: (1) equidistant points were taken along the vertical axis using the tpsDig 2.32 software (Rohlf 2018); (2) widths were calculated by subtracting the x values of the corresponding two points; (3) widths were standardized by the height of the vessel for removing the effect of size; (4) as the drawings might be somewhat skewed, the ratios were calibrated by a known ratio between vessel height and rim diameter.

We used multivariate statistical methods to investigate the shape of whole vessels; principal component analysis (PCA; Shennan 1997) was applied to vessel widths. The PCA is appropriate for summarizing multivariate data in a lower number (usually two or three) of dimensions. To compare the vessel height among the classes, we used a box plot for visualizing our data and the appropriate statistical tests, the ANOVA test and the Tukey post-hoc tests, to assess the significance of differences in the height of vessels. All the statistical analyses and visualizations were done in R programming language (R Core Team 2022) and the following packages: caret (Kuhn 2008), MASS (Venables & Ripley 2002), ggplot (Wickham 2012), and ggpubr (Kassambara 2020). In the spirit of open access science (Marwick et al. 2017), our data and code are available at OSF platform (https://osf.io/mkwtv/).

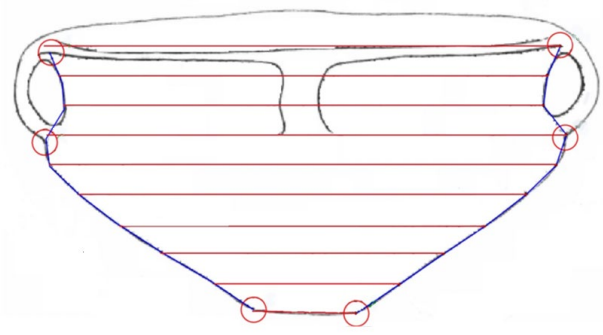


**Figure 3.** *Example of the position of widths and equidistant points. Image Credit: the authors.*

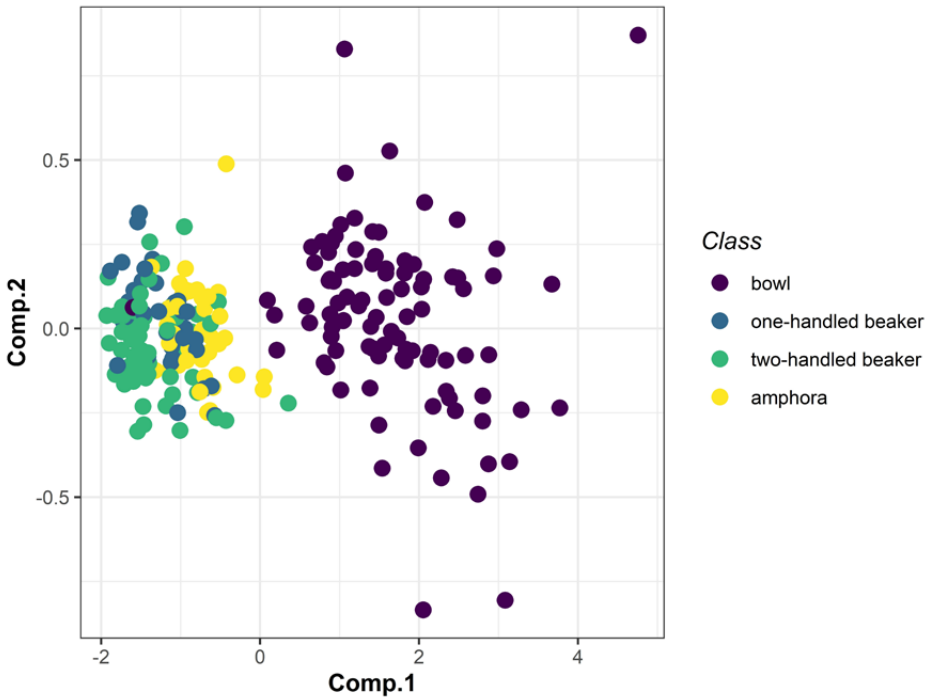



**Figure 4.** *A scatter plot of the first two principal components. Image Credit: the authors.*

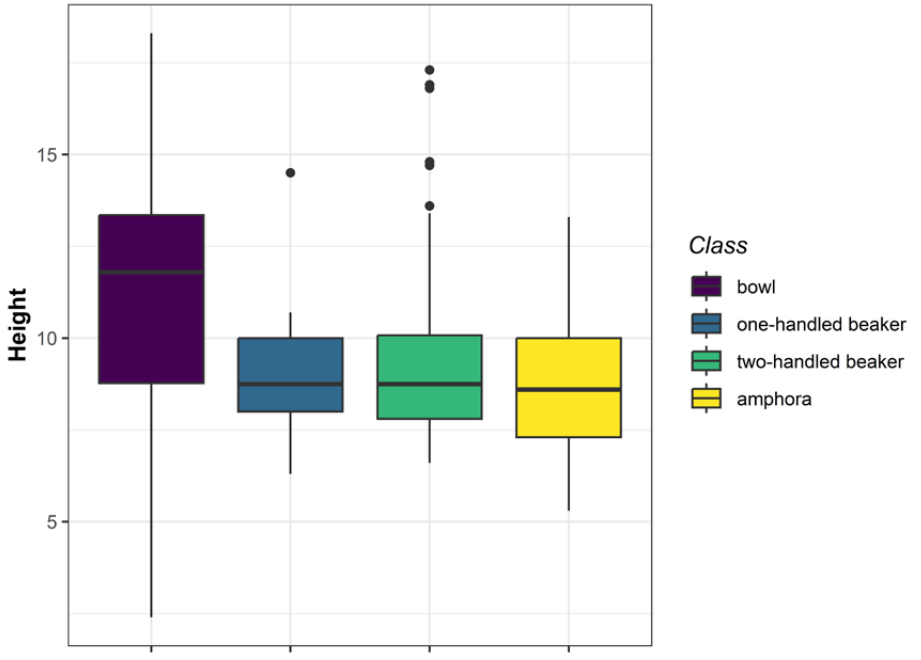



**Figure 5.** *A box plot comparing the height of different classes of vessels. Image Credit: the authors.*

**Results and discussion**

Girić did not systematically record the vessel texture. In the grave descriptions in his monograph, we noticed that 52 vessels (22.4%) are entirely or partly polished, three have fine texture (3.3%), and 19 (8.3%) have rough texture. We can tentatively guess that other vessels (around 66%) had medium texture. A foot is present in 103 out of 235 vessels (43.8%), while the pronounced shoulder is frequently present: in 64.7% of the vessels. Decoration is fairly common: 25.5% vessels.

Figure 4 shows the plot of the first two principal components for our sample of whole vessels, i.e., their widths. The first principal component clearly separates bowls from one- and two-handled beakers and amphorae. It is also clear that one- and two-handled beakers and amphorae overlap in shape. The second principal component mainly explains variation within these two broad groups, and indicates that bowls have higher diversity than the other three vessel classes. The existence of two broad classes is also true when we consider vessel size in figure 5. Bowls are generally larger than the other three classes, while beakers and amphorae are smaller and similar in size (more standardized). This is confirmed by the one-way ANOVA test ($DF(231,3)$, $F = 15.65$, $p < 0.01$), which indicates that at least some means differ significantly. The Tukey post-hoc tests show that the mean height of bowls is significantly different from the mean height of other classes of vessels, while for the other comparisons the null hypothesis of no difference is not rejected.

Thus, both vessel size and shape indicate that there are two main types of vessels at Mokrin: bowls and beakers/amphorae. Considering our results (PCA and ANOVA), bowls and amphorae/beakers could have had different functions, but this should be confirmed using organic residue analysis (cf. Heron & Evershed 1993). A similar presumption of distinction between bowls and 'liquid containers' was previously done by O'Shea (1996, 84), but the difference between the two groups of vessels was not expressed through any metric analysis.

The overlap of beakers and amphorae indicates that they could have been part of the same production process, which seemed to be significantly different from that for bowls. In this scenario, a vessel was first modified into desired amphora/beaker-like shape, while other features – handles, decoration, perforations, etc. – were added subsequently. Thus, depending on the specific goals of the study, they might not be separated in different classes as they could differ only in the number of handles.

In her analysis of the Maros pottery recovered from two settlements – Kiszombor-Új-Élet and Klárafalva-Hajdova – Kostalena Michelaki (2008) showed that bowl production required different skill levels of the potters, and indicates specialization in the case of this class. It was proposed that bowls and other larger vessels were made in parts which were later combined into one vessel (Michelaki 2008, 34), due to the clear visual separation in the profile of biconical bowls, as well as the distinct band of clay added to the surface of some vessels in lieu of decoration. Additionally, it was hypothesized that in the Late Maros, potters were specialized skilled workers, with a distinct social status,

evidenced by unmodified mussel shells, pebbles and bone spatulas, possible tools for the burnishing and decoration of ceramic vessels, which were found in a number of graves (Michelaki 2008, 376; O'Shea 1996, 227). While the significant difference in the shape of bowls as opposed to amphorae and beakers could be the result of differing production techniques, current evidence on chronology and social status at Mokrin is lacking any substantiated conclusion on possible 'higher status values' of the bowls. A detailed comparative and functional analysis of ceramic assemblages from funerary and settlement contexts is necessary for a better understanding of the use, function and life histories of different types of ceramic vessels in the Maros culture.

**Conclusions**

This simple analysis shows that the traditional subjective classifications and typologies are not suitable for every research. We showed that there might be no reasons to make distinctions between, for instance, one-handled and two-handled beakers, and that they might be part of the same production process. Depending on the goals of the study, it could be more suitable to group them differently than in the usual, traditional way. Like many other cases, quantitative methods show that artifact classification is more complex than generally assumed, and it gives novel and different insights in comparison to traditional methods. On the other hand, we are not arguing against qualitative methods such as technological analysis, which can be used as complementary to more formal, quantitative methods. They can both provide very useful insights about the past regarding the use, production, specialization, division of labor, etc.

It should be noted that here we analyzed only funerary vessels, and that the comparison of these vessels with pottery from settlements could be an important area for further research. Another prospective analytical tool would be the application of geometric morphometric analysis (cf. Wang et al. 2023).

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Studia Praehistorica 17, 2023, 263–269

# Utopias and myths in time

Review of *The dawn of everything: A new history of humanity* by David Graeber and David Wengrow. New York: Farrar, Straus & Giroux, 2021. Pp. 704. ISBN 9780374157357 (paper).

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https://doi.org/*10.53250/stprae17.263-269*

During my time in college, our anthropology professor used to tell us that world history was an unattainable goal. She was critical of any comprehensive synthesis of world history and disregarded all attempts to this end. Since then, I have often remembered this remark anytime I encounter ambitious syntheses that claim to provide a thorough account of the critical developments in humanity's history. My work in archaeology has taught me that the sheer diversity of human adaptations makes fitting the evidence in a singular narrative more an act of faith than proof.

The book by D. Graeber and D. Wengrow, with the flashy but catching title *The dawn of everything: A new history of humanity*, attempts to do precisely that. The title hints at the *Theory of everything*, recently popular in Physics and Philosophy, a totalizing theoretical compound of nature and abstract thought, setting the stakes very high. The question is, can we construct a single set of premises that would explain all things social and cover from the remote past of the *Homo sapiens* up to modern social life? In other words, can anthropology and archaeology find their own Holy Grail?

Several serious challenges need to be surmounted in such a synthesis. First, approaches to the social past are necessarily hampered by our inability to objectively analyze that which is integrally associated with us. Contemporary archaeological science asserts its ability to do so, but this often comes at the expense of the social and cultural context in which the archaeological material refers. This is not the way to reconstruct social and cultural history! Second, with such a rich spectrum of cultural adaptations, it is impossible to abstain from picking the most indicative of one's point of view. In this case, the synthesis of world history comes as close as it gets to politics. Without the support of evidence, it risks ending up as wishful thinking.

Broad, expansive synthesis was a mark of the nineteenth century. At that time, cherry-picking was impossible because so little anthropological evidence was available. Instead, in the spirit of the times, the discussion was based on universal concepts considered active on a deeper level, underneath the phenomenology of cultural occurrences. Engels' and Marx's theory of class struggle, Morgan's stages of social evolution, and Childe's study of developing production forces and relations were all of this ilk. At the height of modernism and following the paradigm of the scientific method, discovering the underlying cause of social phenomena was paramount, together with recognizing the timeless principles of human matters.

This type of causative single story is now rejected as obsolete and misleading. Social evolution is discredited as an imperial synthesis aiming at putting the white Western man on the dominating top step of the social evolution ladder. The second half of the twentieth century saw the challenge to modernity and the demolition of grand narratives such as evolutionism, Enlightenment, and Marxism. The style of this fierce criticism is worth noting; starting from the content, it soon extended to the method of modernity. As the discredited generalizing principles of modernity were replaced by the particulars of specific cases, the evolutionary stages and what actually comes with them fall to the same pervasive critique.

In this context, the book by Graeber and Wengrow makes its contribution. It sets out to dismantle the grand narrative of the stages of social evolution that ostensibly led to the emergence of the present-day state. Social evolution of this type naturalizes political formations and presents them as a natural conclusion of a long process. This is the core of the book. The authors want to demonstrate that this determinism associated with the stages of social evolution is erroneous and that things could have gone differently. Hunter-gatherers are not necessarily egalitarian; egalitarianism does not end with the emergence of agriculture, and hierarchical societies need not lead to the establishment of the state; the people of the urban centers could very well manage without the intervention of a ruling bureaucratic elite. In short, the argument is as political as it can be: if it did work in the past, it could very well work now. As the authors put it, it is an attempt to evaluate the 'possibilities for social change today.'

However, do the authors exaggerate here? Frankly, I don't know many scholars who would seriously maintain today that all these steps resulted from an inevitable necessity and followed a predetermined trajectory. This would be akin to the obdurate Soviet Marxism of the 1930s, whose application imposed so many human costs. Nowadays, social evolutionists are an almost extinct breed. On the contrary, the critical concept of contingency, already vastly discussed in history and archaeology, is well-established. It rejects the sequential process from step to step and accommodates indeterminacy in human decisions and -political- actions. So, why this book?

Indeed, old ideas die hard. There is a public that does not know about contingency or care about the different shades of esoteric academic debates. On reflection, why should they? This book is mainly addressed to this broader audience. The problem is that to do

that, it has to stretch from the Paleolithic origins of modern humans as foragers to the ruling elites and sovereigns in cities and complex states. Evidence is gathered for every corner of the Earth. This is where several problems start.

Such a vast expanse of space and time negates any contextualization. Simply, a book does not have enough space to include it. The evidence thus remains somehow hanging, although admittedly, the detailed and valuable bibliographic references at the book's end might help someone willing to delve deeper into it. The broad audience, however, may not realize the complexity of the evidence, especially for the specialized fields and the expert knowledge required to make sense of them.

For a book claiming – as its title indicates – to challenge in seven hundred pages everything that has been said in the macrohistory scholarship, it is strange that the implicit argument in the first five chapters is based on the confidence that the modern 'primitive' groups are 'fossils' of past societies, a rather nineteenth-century idea. Why else would the Northwestern Californian hierarchical hunter-gatherers Kroeber studied in the early twentieth century have anything to tell us about hunter-gatherers some tens of thousands of years ago? It may or may not, but this is pure speculation, not evidence. The only thing that follows is that hunter-gatherer societies and hierarchical structures are not mutually incompatible. Still, as previously said, this may be only significant to fend off nineteenth-century style social evolutionists if there are still any left.

More concerns are raised for the book's first part (Chapters 1 to 5), which mainly addresses the origins of human inequality. This is a fundamental issue. Noticeable is the absence of recent scholarship on human evolution, which has taken great strides in comparing primate and human adaptation. It is a serious omission that tallies with the absence of the role of gender, which is closely connected to the *Homo sapiens* making. The main argument that follows from the hierarchy in modern hunter-gatherers in Northwestern California is that hunter-gatherers generally possessed political capabilities and could form different political realities. The evidence presented is sparse and ambiguous and by no means, as described, overwhelming, unless someone forgets that it is merely a speculative interpretation. We fly from Krakow to Kyiv, Dolni Vestonice and Kostenki, Göbekli in Anatolia, sites in France, Italy and Brazil, and dash from the Upper Paleolithic to the present. I will leave with no comment the Central and South American cases discussed in later chapters, as they are far beyond my expertise.

This is vertiginous as it is, but it is also confusing. Placing many cases in one category varying in geography and time and under a blanket explanation weakens the argument. For instance, Göbekli can be a meeting place for hunter-gatherer groups to reinstate their communal solidarity, a political act for sure, but still within the egalitarian ethos. Alternatively, the impressive monuments could be a sign of conflict within or between communities. Such meeting places are still familiar in the Neolithic and are not affected by the alleged emergence of inequality in that period. Why was this monumental structure not the result of a collective decision? Furthermore, I doubt that Göbekli can be compared

to twentieth century Nambikawara groups in Brazil, which show seasonal, temporal administrative leadership. And I still don't see why the people of Göbekli would need a hierarchy to persuade them to work harder than the idyllic life pictured by Sahlins, Harrari, and Diamond.

I can't see how this evidence supports the view of 'self-conscious political actors capable of embracing a wide range of social arrangements.' We get no help from the authors, who avoid answering explicitly what they think these rare expressions of monumentality might represent. The only sure thing I can see in these examples is that in the Paleolithic, as in later periods, there was a vast variety of human adaptations to the social and natural environment, which remains to be discovered and studied. The fact that groups of hunter-gatherers were egalitarian does not mean they were insensitive to their social environment. This variability becomes invisible only to scholars who insist on squeezing social life into anthropology's predetermined stages. The hunter-gatherer's regime and the adaptation to social reality are two things that are not opposing and incompatible. If that was the reason for rambling in the four corners of the world, it would be easier to refer to the literature that has already noticed these oscillations in the prehistoric ways of life, for example, the book by Flannery and Marcus of 2012. Otherwise, it's dangerously close to preaching to the converted.

I need to add a small remark about the political dimension of the hunter-gatherer groups: everything is political. In fact, I would think that the split between the non-political and the political had not yet occurred. Even flint knapping, setting up a hut, or wearing a shell ring are political and require communication and cooperation. Small daily events build the political, not necessarily leaders, with capacities akin to politicians of the post-industrial era or judgments made by a council of executives. Politics in hunter-gatherer tribes would most likely be bottom-up rather than top-down. Finally, one comment on the argument that Paleolithic humans had, as sapiens, the same mental and cognitive capabilities as modern humans have. I am not at all proficient in cognitive science. Still, I find it difficult to accept that Paleolithic *Homo sapiens*' abilities are defined by an alleged mental roof set by the modern brain. Apart from the epigenetic effects on the DNA, which are environmentally induced, it is well-known that the deployment of cognitive capacities also depends on the social environment. Is it unreasonable to expect that hunter-gatherers' cognitive abilities may have varied significantly from modern humans, perhaps even outperforming them in some aspects? The tolerance of eccentricity mentioned in the book is one possible example but not the only one.

Chapter 6 is about the emergence of agriculture. This is a crucial part of the book's argument about the flexibility inherent in primitive societies. The point is to argue against the cataclysmic and far-reaching change conventionally attributed to agriculture's inception. The authors correctly point out that this was a slow process with many setbacks and retreats. However, instead of focusing on sites that really portray this change, like Abu Hureyra, they concentrate on Çatalhöyük, which does not represent the period of trans-

formation, as it is much later. I think the authors were carried away by the sheer amount of analytical work done there.

The thing is that Çatalhöyük is a unique case, unique in the size of the settlement and the symbolic expression inside the houses and in many other respects. Except for the monumental sculpture of Nevalı Çori, further to the East, there is no other Neolithic site displaying comparable art to Çatalhöyük. Anything that happens at Çatalhöyük is hardly representative of the entire Neolithic period.

Whether we call it a town or an – unusually – expanded village is perhaps immaterial. The real question is how a population of that unprecedented size (calculated at around 5000 people) manages to stay together without splitting apart. Something in this community's structure and organization must be accountable for this Neolithic oddity, but this review is not the place to go into it. Only one thing Çatalhöyük is not: a community practicing 'flood retreat' agriculture. According to recent detailed paleohydrology research and modelling at Çatalhöyük, agriculture was not of the flood-retreat type but rather an intensive gardening, heavily manured with dung for the plots, decreasing with the distance from the settlement. As recent specialized archaeobotanical research shows, intensive gardening was the usual practice for the Early Neolithic in the eastern Mediterranean, so there was nothing special in this respect there. The same holds for Abu Hureyra, where flood retreat agriculture has not been detected. By the way, research shows that intensive gardening farming was not at all 'play agriculture.' It required a lot of communal labor.

The presentation of agriculture's emergence has some noteworthy points. The chapter is well documented, with a wealth of knowledge reflecting Wengrow's expertise. The synthesis is inventive and enticing but occasionally stumbles on inadequate evidence. The divide of the 'fertile crescent' in the north uplands and the south lowlands is well established in the relevant literature since Braidwood's time. However, the clear separation proposed between the aggressive hierarchical highlanders with monumental architecture and the passive egalitarian lowlanders is too much of a generalization to be accommodated.

First, although later, the example of the Jericho Tower in the southern Levant is equally spectacular regarding monumentality and mobilized labor. Second, the aggressive character of the highlanders, based on the skulls of Göbekli and Nevalı Çori, is purely hypothetical. The skull ritual is also found in the southern lowlands, such as Jericho and Tell Aswad, and it stretches in time, as seen at Çatalhöyük much later. The skulls at that site, in fact, belonged to deceased members of the household, as evidenced by the digging of a pit to extract the skull of a woman buried beneath the house's bench. Why wouldn't the 'violent' highland people's collection of skulls imply a similar ritual? I don't see why the plastering of skulls in Jericho makes much of a difference or that it makes skulls unfit for trophies, as argued. To argue this, the authors have first to prove that the skulls of Gobekli or Nevali Cori were indeed trophies. It is well known that the manipulation of dead

bodies in the Neolithic, removing bones from skeletons, etc., is a widespread practice. In that case, the skull stash at Nevalı Çori and elsewhere might have been a sort of mortuary taxonomy. I believe the authors overstretch their interesting hypothesis of connections between North and South to fit with their Californian ethnographic model of Kwakiutl and Yurok. However, the fundamental obstacle to accepting fully the North-South hypothesis is the lack of a well-established archaeological record for the Late Paleolithic foragers in SE Anatolia and around the Göbekli site, which would give us some idea of the communities' features active in that region.

The model of 'trade' mobility (I would use the term 'exchange' instead) is fascinating with its geographic parameters, overcoming the stiffness of the conventional archaeological approach based on the style of artifacts and hypothetical migratory movements. It remains to identify the raw materials or artifacts that keep these bilateral exchanges running. The section on the relation of property with the field is another much older legacy of Jean-Jacques Rousseau. Only, it's likely that it's not the field that produces ownership rights but rather the labor and the eventual product. As the agricultural process involves cooperation, it commands a kind of reciprocity ties which sets up the social fabric.

The book's final part discusses the rise of urban centers and the social structures that theoretically go with them. I will not delve into that part, as my archaeological knowledge is not sufficient, especially, as said before, for the empires of Central and South Americas. Here, the authors extend their argument for the administration of every social formation free of any determining compulsion or even coercion coming from the social domain. As we have hunter-gatherers who can be hierarchical and agriculturalists who insist on egalitarianism, we have urban centers in Asia with no trace of administrative elites. We have agriculturalists who abandon agriculture and go back to hunting and gathering (though I still don't know how that could be confirmed). The message is that people were always free to experiment and apply a structure different from what the mythology of the past predicted, even revolting in some cases and going back to self-administration. Of course, there will always be exceptions in social formation. Whether those would be anything more than exceptions is another question. In any case, the book's political message is clearly and openly anarchic to the point of occasionally being a manifesto of social emancipation.

Come to think of it more closely, the connection of the past with politics represents a bizarre twist. Politics addresses the future, while archaeology aims at the past. Nevertheless, from Thucydides to Rousseau and Hobbes, and from there to Marx, all political thinkers exploited the benefit of hindsight and approached the origins as the conceptual incubator of political thought. Anthropologists know that in pre-modern societies, this role was played by mythology; modernity has set up its own myths based either on archaeology, or anthropology, or history, in any combination.

All political discourse aims to construct a narrative that naturalizes and legitimizes its content. It makes it look not like ideas conceived sometime in the present but as some-

thing prepared a long time ago and built from actions and decisions taken in the past, occasionally, as in the case of *The Dawn* from the remote past. This is the myth that is presented by archaeology with its power to poke the depths of the career of *Homo sapiens* on Earth, and anthropology with its thick description of alterity. It is as if *Homo sapiens* is unable to think outside the historical guidelines, as if homo is doomed to repeat the past, not in an eternal cycle but in a spiral, hopefully upwards.

The book *The Dawn of Everything* does just that. It presents a political argument based on a long and difficult trail of archaeological and anthropological evidence. The reunification of anthropology and archaeology is an old dream come true since their split at the beginning of the twentieth century, but it also shows its limits. However, the book is aimed at the general audience, not the scholars, and it couldn't be as exact and pedantic as the latter would like; it would take volumes. Scholars can learn a lot by reading it, even if, as I do, remain skeptical or even in disbelief for some of the oscillations between past and present or the speculative arguments and the occasional cavalier attitude towards evidence. Even with these flaws, the book poses intriguing questions in a captivating style, provoking a dialogue we rarely see within the discipline.

What I found brilliant, however, especially for the general audience the book aims at, is the effort to approach peoples of the past not as the dry abstractions we got used to in scholarly literature but as real people with real lives doing things with which we are familiar, despite the distance of time. This is the real fascination of the past. We are grateful to both authors for pointing that emphatically, particularly to the late Graeber, who is regrettably not with us anymore, to continue the dialogue.

ISSN 0204-9880 (Print)
ISSN 2815-2697 (Online)