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From the Editor

It's that time of the year again when the field season is over and everybody is back in their office or lab, getting ready their reports, analyses, or lecture plans for the next year. As usual, the new volume of Studia Praehistorica is already available online Open Access, and in print just before festivities of the year's end started. This issue will treat you with papers on a broad range of topics including re-examination of Neolithic to Bronze Age occupation at caves in northern Bosnia and Herzegovina; in-depth discussion of zooarchaeological results from a Late Neolithic site in the Maritsa River Valley; examination of new radiocarbon dates for the Chalcolithic and Bronze Age at a site in southeast Bulgaria; interdisciplinary analyses of a Yamnaya culture barrow grave in northeast Bulgaria; comprehensive study of personal ornaments from a Bronze Age cemetery in northeast Serbia; and re-kindling of the debate on human sacrifice in first-millennium BC Thrace. The lively review of an international conference that was just held ends the line. Enjoy reading.

KB

Studia Praehistorica 19, 2025, 1–31

Caves in northern Bosnia: Between ritual and the profane

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Abstract

Caves are an important element of ancient landscapes. They are a type of topographic features where social action took place, and symbolic behavior and ideas about the world were expressed. The vast majority of caves of archaeological significance in Bosnia and Herzegovina are multi-period sites, with evidence revealing use by people across different eras and for a variety of purposes. In northern Bosnia, caves are not particularly widespread topographic phenomenon, due to the morphology of the terrain. Post-Paleolithic material assemblages from four caves are considered in this paper: Rastuša Cave near Teslić, Vukovića Cave near Stanari, Mišarica near Banja Luka, and Hrustovača Cave near Sanski Most. The archaeological material recovered from the sites is examined, and the evidence on the use of these natural features from the Neolithic to the Bronze Age is described and discussed.

Keywords: *Caves – northern Bosnia – ritual – landscape – Neolithic – Copper Age – Bronze Age.*

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Introduction

Caves, in addition to their ecological and natural values, have played a prominent role in the study of human cultural evolution. Since the earliest times of human (pre)history, these geological formations were used for a variety of reasons, including as places of permanent or temporary residence, for production and/or storage, dumps, water sources, mines/quarries, animal pens or shelters, cult and ritual sites, and refuges in times of danger. As ambiguous spaces, caves offer both protection and shelter, but they can also trap and imprison. They have been entered and explored for a wide range of reasons (Janković et al. 2021, 9). In an evolving landscape, caves have become places associated with people's changing ideas about their environment. It seems likely that such places were seen as gateways to the underworld, places of danger and liminality where the realms of the living and the dead collided, and where gods, spirits, and ancestors could be addressed and appeased. As dangerous meeting points between the worlds of darkness and light, caves could have been considered suitable places to conduct rites of passage. Although we tend to classify such sites as 'natural' places, they have, of course, often been altered – in both subtle and dramatic ways – by human intervention. Caves, therefore, can play prominent role in the study of various aspects of human experience, such as those listed above (Bergsvik & Skeates 2012, 3; Moyes 2014, 6).

The history of cave exploration in Europe can be traced in some regions back to the first half of the nineteenth century, when a number of prominent scientists began to investigate caves and their deposits as part of a wider geological, paleontological, and antiquarian interest. They were soon recognized as sites with a rich archaeological record, containing keys to unlocking the human past. Caves are considered an important resource for archaeological study, often containing excellently preserved artifacts in deep stratigraphic layers, which facilitated the relative chronological arrangement of faunal remains and cultural material, as well as for their often-protected and non-acidic sedimentary environments that have ensured a relatively good level of preservation of inorganic and organic materials; values that endure to the present day. Over the years, a wide range of professionals and enthusiasts have made archaeological discoveries in hundreds of caves across Europe. Sometimes such discoveries have been accidental. However, since the mid-1990s, systematic archaeological study – some of which has specifically focused on caves – has contributed significantly to our contextual understanding of the relationship between culture and landscape. All these forms of occupation have left traces and objects; some archaeological remains are clearly visible to everyone, while others' significance can only be grasped by scientists using specialized analyses. The main reason for caves being such an important window into the past lies in the fact that, unlike open spaces, they are partially protected from natural and human activities (Janković et al. 2021, 10). Their study is now experiencing a revival in various parts of Europe, particularly as part of the multidisciplinary study of natural and cultural landscapes. During the long history of cave archaeology, a diversity of theoretical and methodological approaches has been devel-

oped, in part linked to broader traditions of archaeological research associated with different periods and regions of study. Despite the information that can be extracted from the stratigraphic layers, the sites themselves, their functions, and their contexts are often misunderstood. It has long been assumed that caves were used primarily as profane spaces, an idea that has become so prevalent that it has reached the status of an interpretive paradigm (Moyes 2014, 5). Cave studies have mainly focused on establishing chronology and identifying occupation phases or uses. Although this aspect of cave research is crucial for documenting historical contexts, it should be considered merely a tool for further exploring the significance of such sites. Ethnographic approaches have shown that there is no universal pattern that can be applied to the use of cave space. The variability observed depends on how the occupants perceived and experienced the space, as well as on their social composition and identity (Bergsvik & Skeates 2012, 2). The aim of this paper is to interpret the use of caves in northern Bosnia from the Neolithic to the Bronze Age, i.e., to investigate their function and purpose through different temporal and cultural periods. These unique topographical phenomena are not numerous in the subject area, but even their small number testifies to their active use by human populations, and represents a wealth of paleontological, archaeological, and anthropological evidence. Caves and other natural sites do not exist independently; they are part of a wider system of human movement in the landscape, attesting to the fact that, during the prehistoric and later periods, an important range of activities took place outside of typical settlements. In this sense, caves represent ideal cases for the study of such activities. Throughout this discussion, caves will also be considered as ritual, sacred, ceremonial, or liminal spaces, i.e., spaces used not only for profane dwelling.

Geographical scope

Most of northern Bosnia is an integral part of a wider geographical area defined as southern Pannonia or the peri-Pannonian region. The relief of this macro-region was formed in the basin of the river Sava, the youngest structural unit of the Inner Dinarides (Leperica 2013, 36; Jovanović et al. 2014, 17). The landscape here is characterized by the vast lowland valleys of the Sava (Posavina) and valleys in the lower reaches of the Vrbas and Bosna Rivers, as well as the low mountain area in the south to the rivers Tinja, Usora, and Spreča. To the west, this area is delineated by the river Una, and to the east by the large plains of the Drina (Semberija). In their middle courses, these rivers are characterized by hard-to-pass sections and deep canyons, which act as a clearly defined transition zone towards the mountainous area of central Bosnia. From a geomorphological perspective, two areas are individualized in the narrower part of northern Bosnia: horst-anticlinal mountain elevations of Majevica (915 m), Kozara (976 m), Motajica (652 m), Prosara (368 m), Trebava (692 m), and Vučjak (359 m) – the so-called 'island mountains' – and the plains along the Sava (Basler 1979, 301; Šparica 2007, 22; Jovanović et al. 2014, 18). At the beginning of the Pleistocene, tectonic activities gave rise to the uplift of the mountain areas

of Prosara, Motajica, and Vučjak, which were also geomorphologically modeled at the time. They consist mainly of Tertiary flysch and Triassic shale formations. In the warm, or interglacial, periods of the Pleistocene, due to the intense mechanical destruction of rocks in the area of central and northern Bosnia, the high-power Vrbas and Bosna Rivers as well as numerous other watercourses introduced huge amounts of alluvial and proluvial sediments of debris and sand to the Posavina region, especially in the area around the present-day towns of Brod and Šamac (Šparica 2007, 24). At the end of the Pleistocene and during the early Holocene, strong tectonic movements were renewed along the edges of the mountain massifs. These movements resulted in the lowering of geotectonic blocks, thus creating the Sava basin (Bačani et al. 1999, 145). The newly created basin was filled with thick riverine sediments, through which the course of the Sava gradually formed in the early Holocene. The best-known Younger Pleistocene in the wider Pannonian area is its loess. This was created by drifts of small particles via wind over an already indented relief, but also by embankment in residual lake and marsh environments, where it mixed with fluvial drifts creating the so-called swamp loess (Šparica 2007, 24; cf. Bačani et al. 1999, 145). The relatively modest concentration of limestone and dolomite rocks, i.e., the karst Dinaric landscape, resulted in the lack of many cave and sub-cave formations in this area (Dujaković 2004, 17).

Caves in context

Caves should be considered an important element of ancient landscapes. They are a type of topographic features where social action took place, and symbolic behavior and ideas about the world were expressed. Although the term 'cave' can be used to describe a variety of space types, their specific definitions depend on the type(s) of human interactions with them. Because the definition of caves is so broad, it conveys little useful meaning, and must be defined according to type (and reason) of use. The relationship between the landscape and the cave is not a binary opposition between the 'outside' landscape and 'inside' of the cave; while caves are spaces that are different and separate from the landscape, at the same time they are integral parts of it. A whole spectrum of different cave shapes exists, from cliffs and rock shelters to shafts and hidden underground cavities, rendering any clear distinction between 'a cave' and the rest of the landscape arbitrary (Mlekuž 2019, 48). When people inhabit them, they do so for specific reasons that are largely determined by how they undertake their livelihoods, the scale at which they move across the landscape, and the socioeconomic advantages offered by occupying a particular location. The logic of adaptive cave use, so hard to deny for mobile seasonal foragers, is rather harder to accept for many other survival and mobility regimes (Tomkins 2009, 126). As a result, caves are prime subjects for exploration because they are such exotic environments and produce such profound phenomenological experiences based on their morphological characteristics. In this sense, cave studies are viable candidates as 'proofs of concept' for demonstrating ideas relating to their characterization on the basis of archae-

ological interpretations and findings (Moyes 2023, 321). Most caves of archaeological significance in Bosnia and Herzegovina are multi-period sites, with evidence revealing use by people in different eras for a variety of purposes (Dujaković 2004, with ref.). Four caves in northern Bosnia were analyzed in this paper, the only ones known to date through archaeological research: Rastuša Cave near Teslić, Vukovića Cave near Stanari, Mišarica near Banja Luka, and Hrustovača Cave near Sanski Most (fig. 1). The archaeological material recovered from these sites is examined, and the evidence on the use of these natural places from the Neolithic to the Bronze Age is described and discussed.

Rastuša Cave

Rastuša Cave, a well-known Paleolithic site, is situated in the village Rastuša, near Teslić, at the base of a limestone ridge at an altitude of 370 m amsl. The cave entrance is

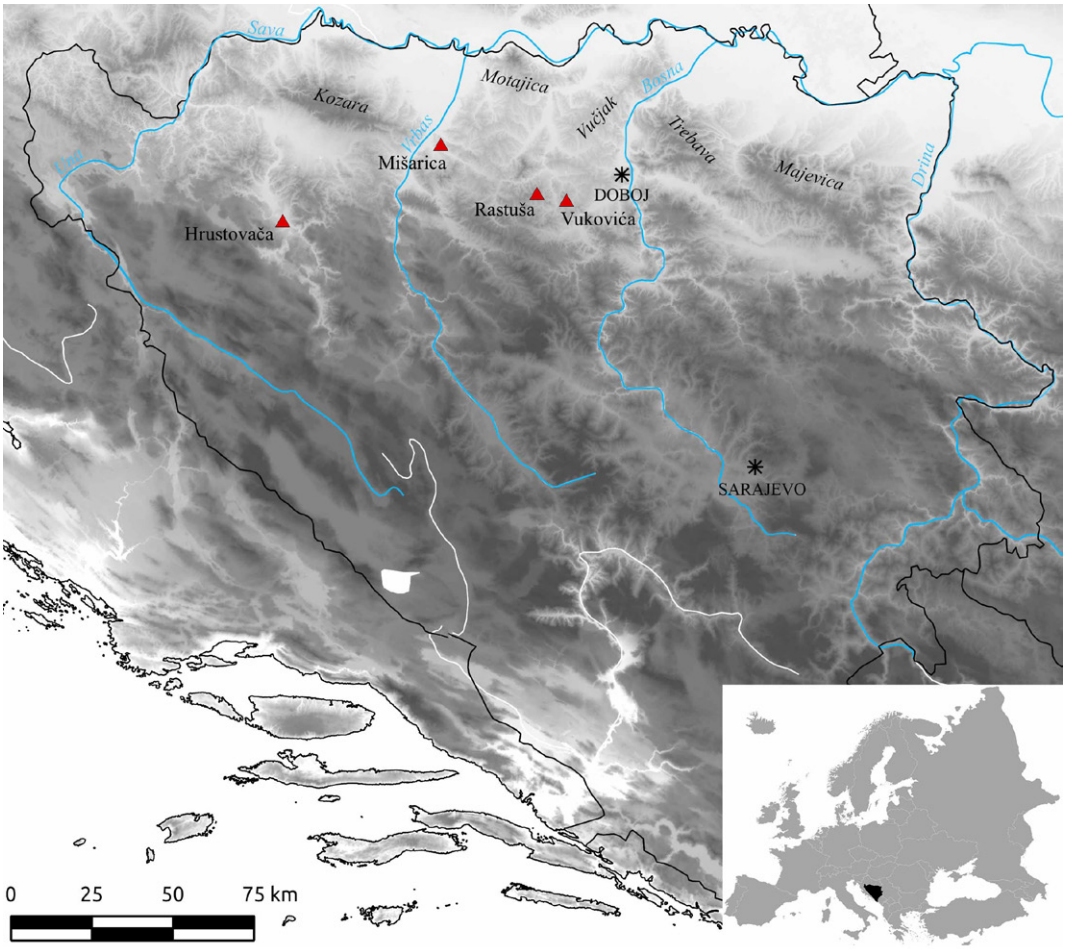


Figure 1. *Geographical position of cave sites in northern Bosnia. Image Credit: Regional Museum in Doboj and the author.*

located in a small dispersive valley on the northeastern slopes of the Hrnjin Hill, which is composed of Triassic limestones (Malez 1980, 13; Jovanović et al. 2014, 39f). From a morphological perspective, it consists of horizontal corridors and tunnels connected with chambers. Based on a morphological analysis, the following parts of the cave have been defined: entry tunnel, main tunnel, and side tunnel, including the abyss about 35 m in from the cave entrance (fig. 2). The total length of cave tunnels is 440m (Malez 1980, 15; Malez et al. 1978, 6, 9; Dujaković 2004, 221; Jovanović et al. 2014, 40). At the end of

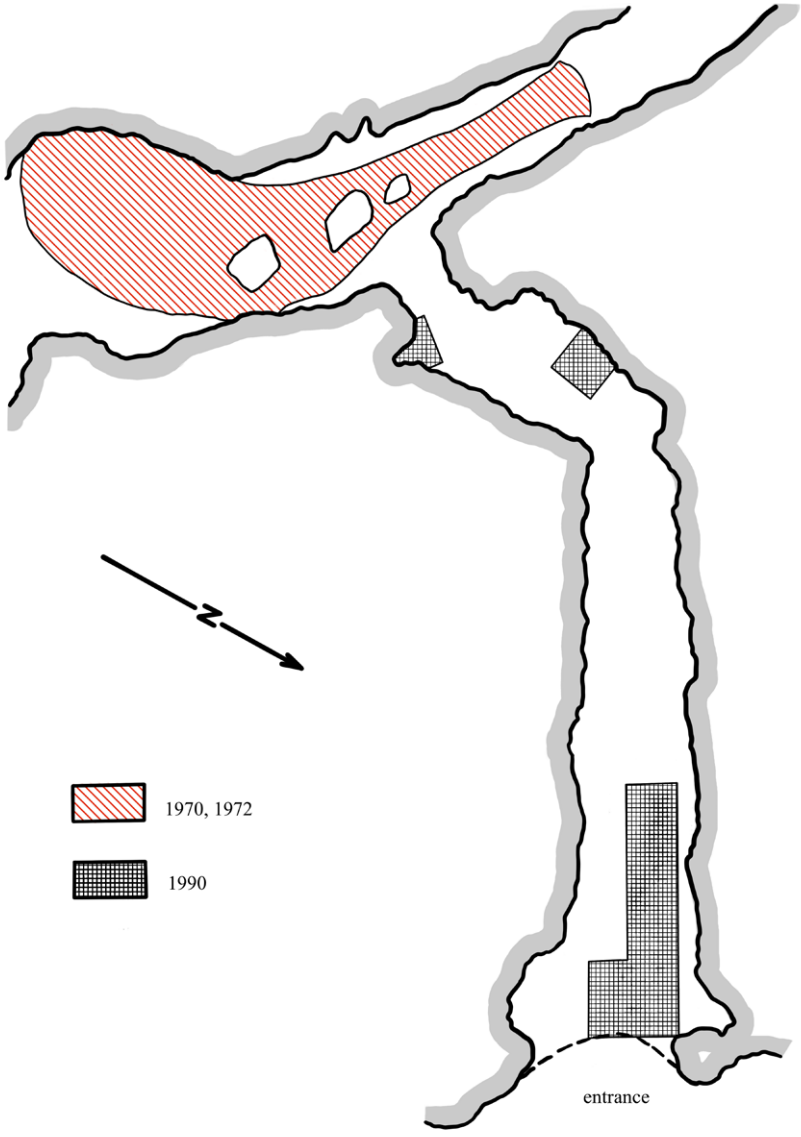


Figure 2. *Rastuša Cave plan and trenches. Image Credit: Z. Kujundžić-Vejzagić.*

the main tunnel, there is a big chamber with a large number of speleothems, stalagmites, and stalactites, and numerous draperies hanging down from ceiling cracks and sidewalls. The first excavations were carried out in the early 1970s under the direction of Mirko Malez, during which only few chipped stone pieces were found, identified as Mousterian and/or Aurignacian artifacts (Malez et al. 1978, 11; Basler 1979, 326; Malez 1980, 13f; Jovanović et al. 2014, 40). The next phase of archaeological research was carried out in 1990 ahead of the construction of tourist infrastructure in the cave. This research focused on the first entrance hall, and was conducted under the direction of Zilka Kujundžić-Vejzagić on behalf of the National Museum of Bosnia and Herzegovina in Sarajevo. The results are presented here for the first time. A main trench was placed at the entrance measuring 10 x 2 m, with a smaller lateral extension. Two additional trenches were placed along the side edges of the cave wall at the end of the large entrance hall. The research was time-limited, and its planned continuation was never realized due to outbreak of the 1992–95 war in Bosnia and Herzegovina and the disintegration of the Socialist Federal Republic of Yugoslavia. For these reasons, only the Holocene layer was investigated. The first three stratigraphic units were disturbed by modern activities, and consist of mixed layers. The fourth layer was formed of greasy, dark soil with large stone inclusions. A major characteristic of this layer is the relatively high concentration of hearths, along with remains of iron slag and ceramic sherds. One major chronological indicator is a sherd of a Roman-period vessel with painted decoration (fig. 4/10); such painted, whitish ceramics were classified as luxury ceramic tableware made in one of the provincial workshops and dated to the second half of the third century and the first half of the fourth century (Žigić 2017, 141). A more intensive distribution of material culture was recorded in the fifth layer. It was formed from clayey sediment with stones. The intensity of finds is indicative of occasional occupation during the late Eneolithic (fig. 4/4–7). The layer was rich in faunal remains, especially large quantities of wild boar tusks (fig. 4/3, 8, and 9). The bottom of the fifth layer lying at a depth at a depth of 2.5 m, was never reached by the end of the excavation (fig. 3).

The next excavation project in Rastuša Cave was carried out from 2010 to 2014, under the direction of Preston Miracle, during which 424 chipped stone artifacts were recovered. This material was extracted from three trenches whose total excavated surface area stood at 11 m^2 (Jovanović et al. 2014, 40f). The main focus of these investigations was on the Pleistocene layers and the formation of the general cultural stratigraphy of the cave. This, latest and best documented project provided new details on the occupation phases of the cave, including Middle and Upper Paleolithic, Mesolithic, and Neolithic layers. The Neolithic findings are of particular interest for this study. The material found in horizon 2 from trench 2 is characteristic of the Late Neolithic, which, in addition to the pottery finds, is indicated by the presence of a core for making blades and bladelets, a greater number of blades, as well as a high percentage and repertoire of retouched tools. A retouched bifacial arrowhead with a tang deserves special attention, and can be dated

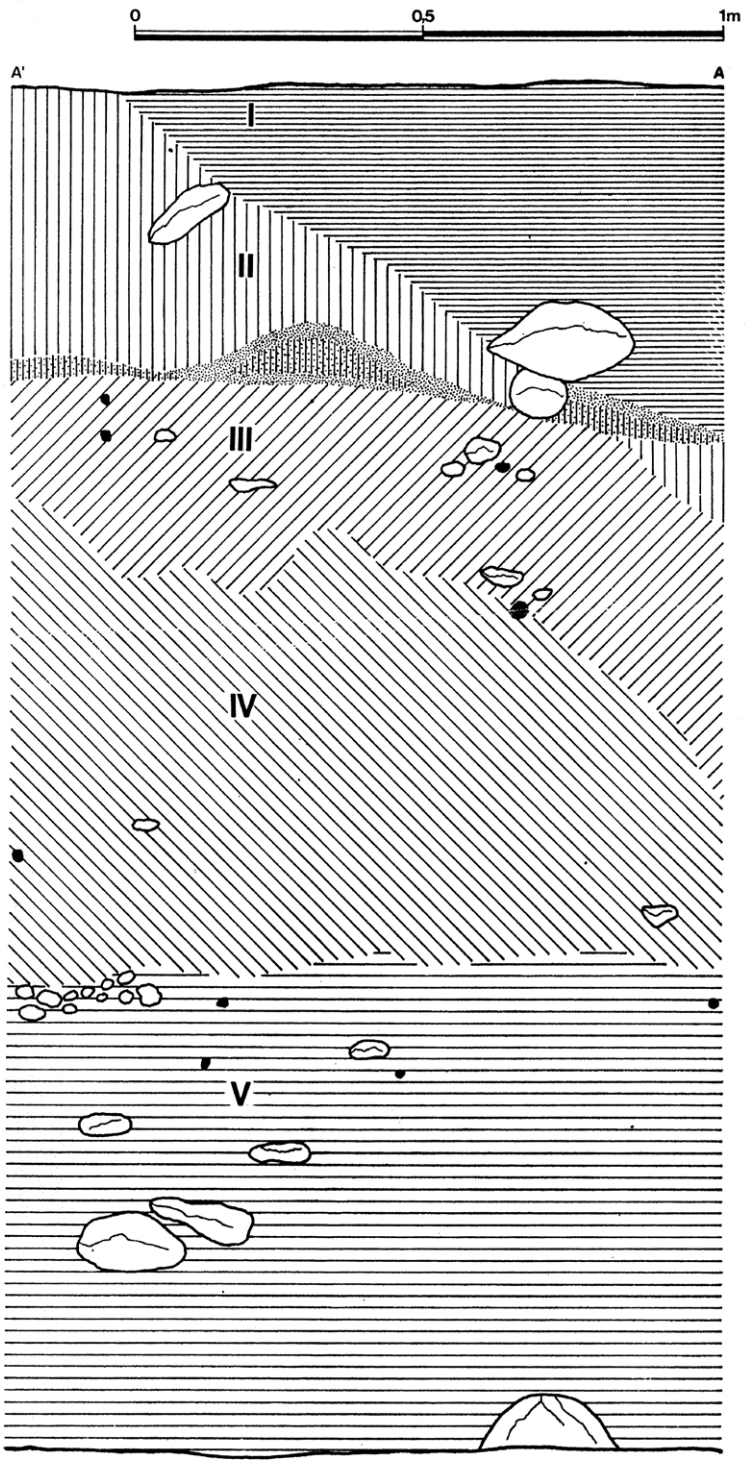


Figure 3. *Rastuša Cave. South profile, trench 1. Image Credit: Z. Kujundžić-Vejzagić.*

with certainty to the Late Neolithic (Jovanović et al. 2014, 118, t. XI/8; see fig. 4/2). The Late Neolithic and Eneolithic occupation of the cave was also confirmed by the chance find of a copper chisel in front of the cave entrance (fig. 4/1). Chisels or wedges of this and similar types represent the earliest copper tools in northern Bosnia. Current knowledge does not yet allow a clear chronological classification of the copper tool from Rastuša Cave; however, this type has parallels in similar forms that appeared at the turn of the Late Neolithic to the Eneolithic (Antonović 2014, 35; Govedarica 2016, 19).

Vukovića Cave

Vukovića Cave is located on the southern slopes in the foothils of the Krnjin Mountain, in the village Cerovice, some 5 km east of Rastuša Cave. Spacious, long slopes are the main characteristics of the terrain. A relatively small, simple, open cave is situated on one of those slopes at the base of a limestone escarpment, at an altitude of 250 m amsl. A steep path leads to the cave, while the plateau in front of the cave is very small and the terrain descends sharply to the west, below which there is a natural spring. Today, the entrance is 1 m high and 3.3 m wide, with a sharp, steep downward slope toward the interior. The total length of the cave is 96 m. The cave consists of an entrance hall and a corridor (fig. 5).

The main chamber is filled with a large amount of sediment from the entrance and fallen stones from the ceiling, while the sediments forming the floor of the central part of the cave are composed of thick clay deposits and rocks formed by the process of calcification. On the eastern cave wall is an opening from a small spring. During periods of heavy rainfall, this chamber was (and continues to be) flooded with water. The water flows through a small clay bed and quickly sinks deep among the rocks. Due to water dripping from the ceilings and the consistent temperature, the cave is humid throughout its entirety. The only parts that do not flood are an elongated small terrace on the western corner walls and the corridor. To the east of the main hall is a long and straight corridor that branches into smaller channels. The cave is dark, and despite the archaeological evidence of human activity, it's not suited for extended habitation. On the other hand, it is extremely interesting as a speleological, geological, and biological site, being decorated with stalactites and stalagmites or other calcite formations, and is actively inhabited by bats (*R. hipposideros* and *R. ferrumequnium*), insects, and small predators (Presetnik et al. 2017, 32). During the 2014 field survey in, a moderate number of ceramic sherds was found on the ground surface of the cave, mostly in its corners. Additionally, a fragment of a human skull was recovered from the ground surface in the entrance part (fig. 6).

This formed the basis for the 2015 excavations of the Regional Museum in Doboj. Based on the concentration of ceramic sherds on the ground surface, a trench measuring 2 x 3 m was opened on a small elevated terrace between the western and southern walls of the main chamber. Ceramics were found at a depth of just ca. 15 cm in a layer of gray clay, with yellow sterile clay and large stones below this, situated directly above the bedrock. No other artifacts were found. The space in front of the corridor and the corridor itself

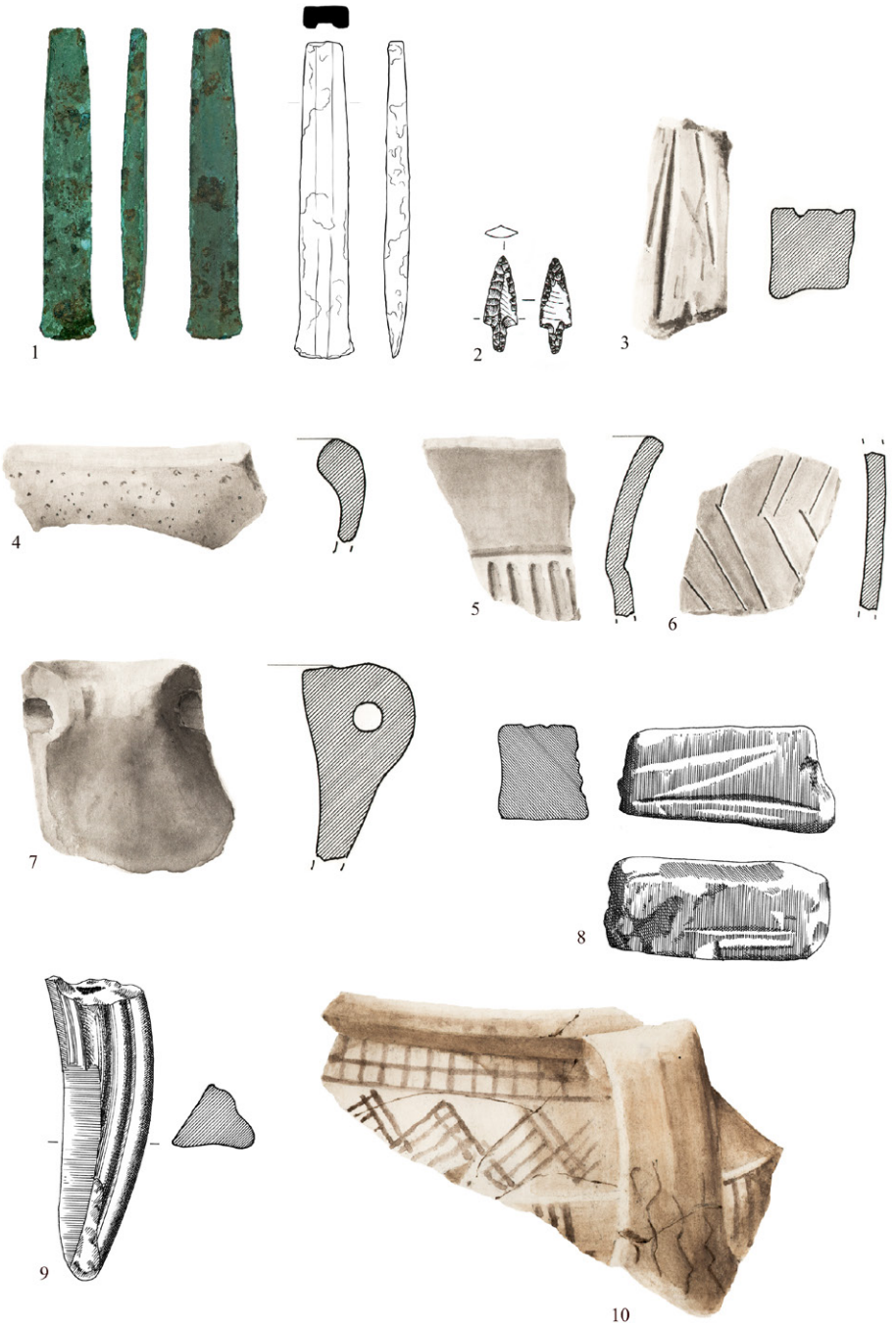


Figure 4. *Selection of material from the Rastuša Cave excavation: (1) Neolithic copper chisel; (2) Neolithic retouched arrowhead; (3, 8, and 9) boar tusks; (4–7) prehistoric pottery; (10) Roman-period painted pottery. Image Credit: M. Bešlagić and the author (1), I. Jovanović (2), S. Kudra (3–10).*

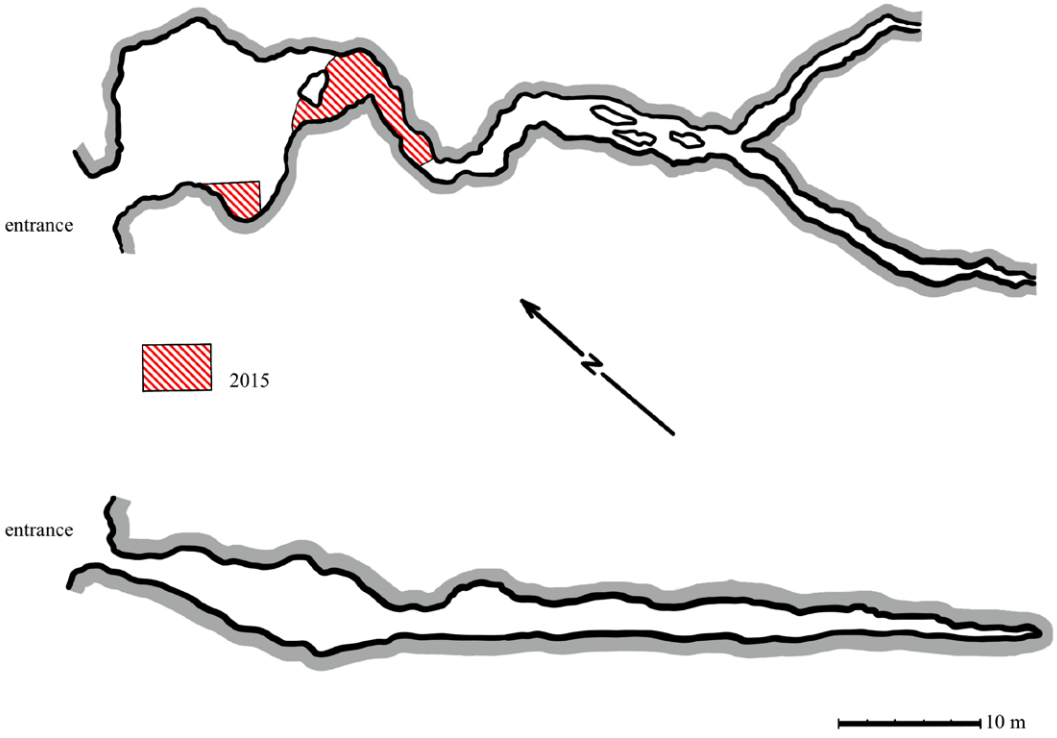


Figure 5. *Vukovića Cave plan and trenches. Image Credit: the author.*



Figure 6. *Fragment of a human skull. Image Credit: the author.*

were considered as promising areas for archaeological study, with these being the only other parts of the cave in which archaeological material was found. The situation was identical to that of trench 1, with ceramics found only in the excavation layer down to a depth of 10 to 15 cm. Due to the more intensive dripping of water from the ceiling, the level of calcification on the finds was more pronounced. No evidence of anthropogenic activity was uncovered beyond the corridor. No faunal remains were recorded, nor were any remains of hearths or evidence of the use of fire for lighting. Although the cultural layer is extremely shallow, a surprisingly large number of pottery sherds was found. They were mostly fragmented, but in spite of this it was possible to identify and record certain typo-chronological characteristics. The basic chronological framework for most prehistoric periods in the different regions of Bosnia is usually based solely on the development of pottery styles. This is especially the case in areas where metal finds are absent or badly preserved, and pottery is the most common find category serving as primary source of information. Most pottery sherds from Vukovića Cave are rims of different types of bowls, pots, cups, and storage jars (pithoi). Bowls are traditionally important elements of household pottery inventories and therefore, the most frequent vessel type; they are mostly of conical shape, with turban-shaped or faceted rim and flat base (figs. 11/1–8 and 12/9 and 10). Such bowls are particularly widespread throughout the region in the final stages of the Late Bronze Age (9th–8th century BCE; Gavranović 2011, 46ff; Jašarević 2018, 38). The bowls from the cave were made of quality refined clay tempered with powdered stone and sand that increased the hardness of the walls and prevented their breaking in the process of food preparation. They are well-fired, with black or brown, polished surface, and lack any decoration. The large storage jars are of biconical shape, with cylindrical or conical neck and small everted rim (fig.12/11–13); the fabric is similar to that of the bowls. The color varies from black to reddish, with the same type of polished surfaces. They are decorated only with incised lines between the neck and the shoulders. Of great interest and a rather rare occurrence is a pithos sherd with twisted rim (fig. 13/17). Pots and cups were infrequent, but examples with slightly conical or biconical shape were found (fig. 13/14–16, 19, and 20). A single sherd is decorated with a vertical, fingertip-impressed cord (fig. 13/16). Also, there is a fragment – unique for this region – of a twisted handle from a cup or beaker (fig. 13/20). The largest number of settlement sites in the area can be dated to the Final Bronze Age (Ha B2–3) based on their characteristic decorated ceramics (Jašarević 2018, with ref.), but this does not seem to be the case with the material from the Vuković Cave. Even though certain ceramic forms bear similarities, the pottery from the cave lacks decoration, which is common and incredibly varied at other sites, and can therefore be used as a chronological indicator. It is possible to approximately date the pottery, and thus the cave's occupation solely on the basis of the typo-chronological characteristics of the bowls to the eight century BCE, or the HaB3 period according to the Central European chronology. As the cultural deposits in the cave are badly preserved and lack evidence of long-term habitation, the assumption

is that this was a single, short period of occupation; this assumption will be discussed further below.

Mišarica Cave

In Debeljaci, south of Banja Luka, in the wider area of the lower course of the Vrbas River, there are two caves that yielded evidence of occupation. The Hajdučka Cave was temporarily or occasionally used by people who inhabited this area in the Late Bronze Age, while Mišarica Cave bears traces of a ritual activity from the same period (Periša 2002, 91). In this paper, special attention is paid to Mišarica Cave. It's located in the karst massif of Bijela stijena, on the left bank of the Čelinski. The entrance to the cave is from the east side and measures 7 m high and 8 m wide. The entrance hall leading to the first chamber is 15 m long, 6–7 m wide, and 5–7 m high, and is oriented in an east-west direction. In this part of the cave, several large stone blocks have fallen from the ceiling. The cave is decorated with stalactites of various size. The first chamber is connected to a second one by a corridor measuring 10 m long, 2.5 m wide, and 2.5–4 m high. The second chamber has a circular shape with a diameter of 9 m. The maximum height of the hall is 5 m. From this part, a narrow side channel – 6 m long, 1.5 m wide, and 1 m high – branches off to the north, at the end of which lies a siphon spring. This is also the end of the cave, which has a total length of about 65 m (fig. 7). The floor of the cave is flat, and is covered with a light brown sandy clay and sharp-edged rocks of various size (Periša 1991, 79; 2002, 92f). The cave is hydrologically active for most of the year. The water that springs from its mouth flows as a shallow stream towards the exit (entrance to the cave), from where it flows as a waterfall into the stream.

The entire ground surface of the cave is always flooded, except in the summer (Periša 1991, 81). A small-scale archaeological excavation was carried out in 1983 at the cave's mouth, next to the northern wall, and the entire cave was surveyed at the same time. In a trench measuring 4 x 2 m, which was excavated to a depth of about 0.7 m, a small amount of archeological material was found, mostly from the early modern period. At the far end of the cave, immediately beside the spring, a bronze axehead was found, while a second one was recovered from the spring pool (fig. 8; Periša 1991, 81, figs. 3 and 4; 2002, 94, fig. 6; Jamaković 2011, 100, fig. 6/1). Both of them belong to the canonic type of Late Bronze Age socketed axes with V-shaped ribs. Its main distribution area includes Transdanubia and the Western Balkans, with the highest concentration being found in the Sava–Drava interfluve area, where such axeheads first made their appearance at the beginning of the Br D period, increasing in number in the later Ha A period (Žeravica 1993, 96ff; Hansen 1994, 182; König 2004, 37ff; Jovanović 2010, 27; Gavranović 2011, 130ff; Blečić Kavur & Jašarević 2014, 38f; Gavranović & Jašarević 2017, 105; Dietrich 2021, 546). The territorial distribution of axeheads – especially in hoards in northern Bosnia – shows that many local and foreign stylistic elements were incorporated into newer types (Gavranović 2011, 130ff). This may well also be the case

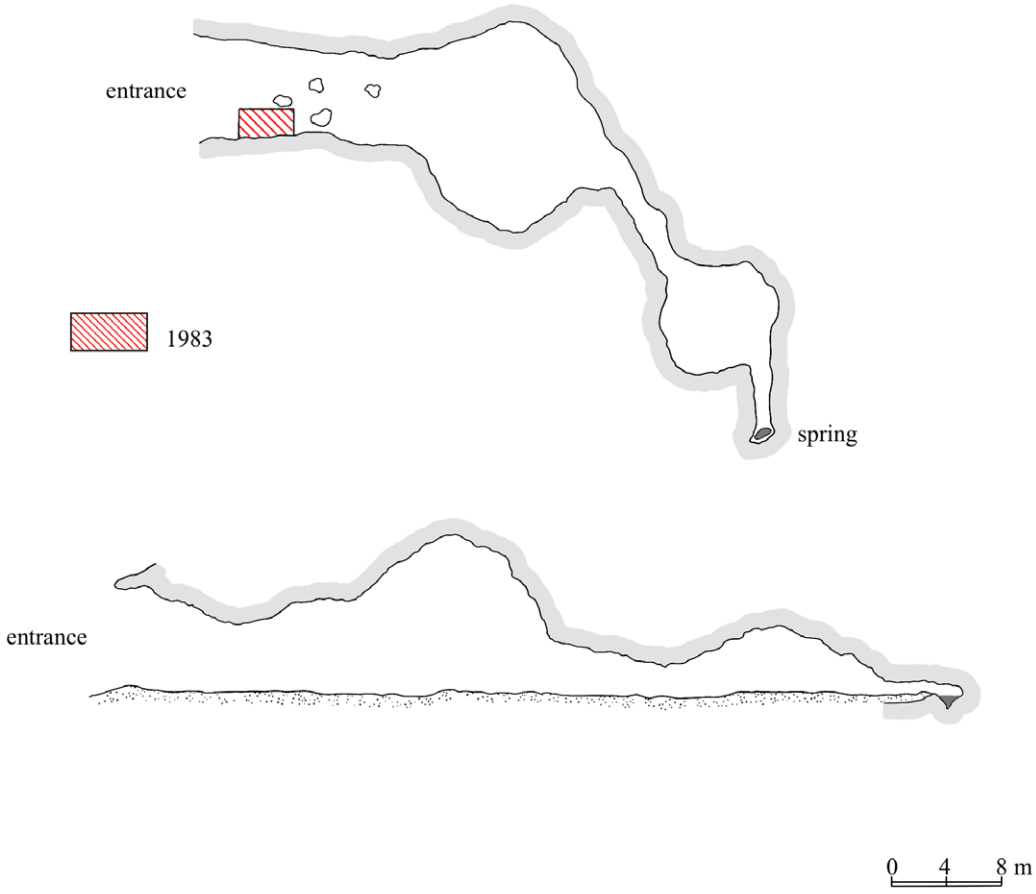


Figure 7. *Mišarica Cave plan and trench. Image Credit: D. Periša.*

for the somewhat unusual design of the first axehead, with its slightly curved outer V rim ornamentation.

Hrustovača Cave

This cave is located ca. 12 km south of Sanski Most, below the slopes of the Grmeč Mountain in the area of Hrustovo. Its entrance lies above the source of the Glibava Stream, which, after a short course, flows into the Sana River. This is the largest and most significant archaeological and speleological site in the study area. Morphologically, the cave consists of Triassic and Cretaceous limestones. The entrance and the greater part of the main channel lie in banked Triassic limestones (Upper Triassic), while the end of the cave is set into Cretaceous limestones (Polić 1940, 1f). Hrustovača Cave is very simple in shape, and consists of a long underground corridor and a smaller side channel. The length of the main channel is 725 m, while the width of the corridor is ca. 10 m, although there

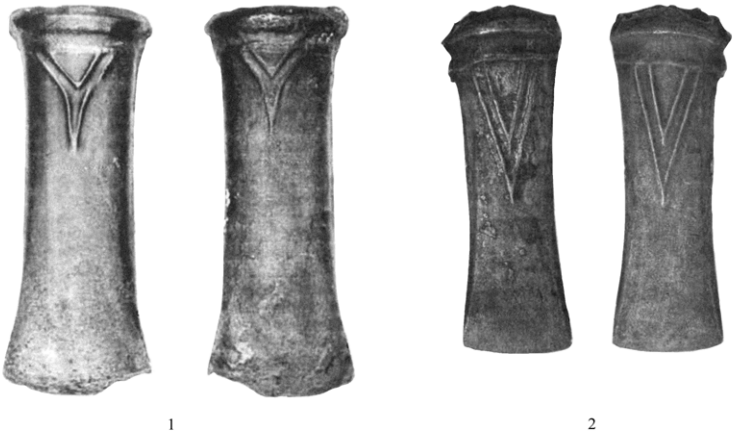


Figure 8. *Mišarica Cave, bronze axeheads. Image Credit: D. Periša.*

are several larger chambers measuring between 20 and 40 m wide. The height of the channel ranges from 3 m at the entrance to about 20 m in a hall located approximately one-third of the way down the corridor (fig. 9). The average height of the corridor is between 6 and 8 m. The profile of the main corridor has the shape of a tunnel with clearly profiled sides along almost its entire length. There are also several larger cracks through which water once flowed into the main underground flow. The cave floor is mostly flat and covered with a reddish–brown to black cave clay (Malez et al. 1988, 69; Mulaomerović 2001, 155f).

The cave was also the subject of paleontological research by Mirko Malez. Relatively rich paleontological material was collected in stratum b in the excavated test trench, but this almost exclusively consisted of the skeletal remains of cave bears (Malez et al. 1988, 74). The earliest description of Hrustovača Cave, as far as is known, was published by O. Krifka in Vienna (1886, 30f). The first scientific research was undertaken by the curators of the National Museum of Bosnia and Herzegovina in Sarajevo. With the research undertaken by Mihovil Mandić in 1939, Hrustovača Cave became one of the most notable archaeological sites of the Late Eneolithic Vučedol culture in Bosnia (Mandić 1939, 67f; Korošec 1946, 7; Benac 1964, 136; Dimitrijević 1979, 308; Marijanović 2003; Miloglav 2018, 114). Immediately after the end of World War II, the significance of the findings encouraged archaeologists to begin a large-scale excavation in the area of the cave's entrance. In 1947, Alojz Benac continued the excavation of the entrance area and provided a revised general stratigraphy of the site (Benac 1948, 5ff). Although the then methodology of archaeological excavations was significantly flawed from today's perspective, apart from the rich collection of artifacts, the chronological occupation of the cave was also partially problematic. While the upper layers were heavily disturbed, archaeological material indicates occasional occupation in the Roman and medieval periods (Benac

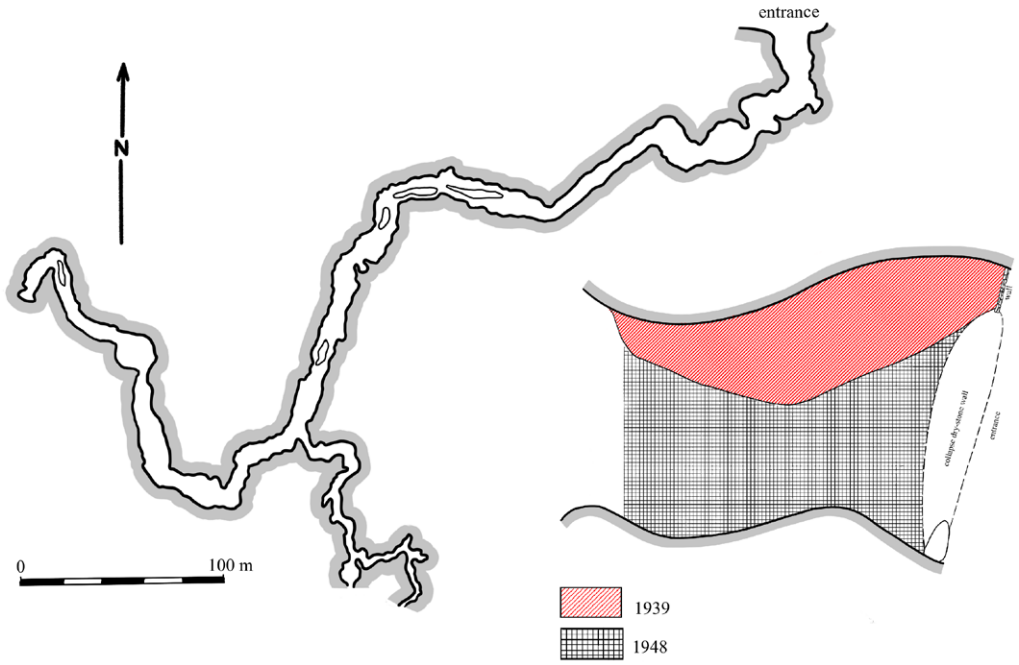


Figure 9. *Hrustovača Cave plan and trench. Image Credit: A. Benac.*

1948, 9). Evidence of occupation in the Late and Final Bronze Age was also recorded in the upper layers (Benac 1948), but the concentration of materials and the selected objects hint to ritual use of the site rather than profane, apart from occasional occupation related to cattle herding. The thickest and best-documented layers belong to use associated with the Vučedol culture (Mandić 1939; Korošec 1946; Benac 1948), defined in later literature as the Bosnian or Debelo Brdo–Hrustovača type of the late-phase Vučedol culture (Dimitrijević 1979, 308; Tasić 1995, 77). The maximum depth of the cultural layer was 1.7 m, with different cultural deposits distributed across different depths and zones (Benac 1948, 8f). For the purposes of this paper, particular attention is paid to the Late Bronze and Final Bronze Age horizons. The first traces of these layers were recorded by M. Mandić, who, on that occasion, defined them as belonging to a Hallstatt horizon. Among the ceramic and faunal finds, a bronze pin (fig. 10/4) and a silver spiral ring (fig. 10/5) were also found in the layer (Mandić 1939, 68f). Most of the bronze objects from the excavations of A. Benac were found in the entrance part of the cave, in the upper layers among the rocks (Benac 1948, 8).

Most of the bronze objects can be chronologically attributed to the Late Bronze Age with a high degree of certainty. A bronze pin with a disc and biconical ribbed thickening can be classified as belonging to the Myslechovice type (fig. 10/4; Říhovský 1979, 102), although, due to its individual characteristics, it represents an isolated variant. Such pins

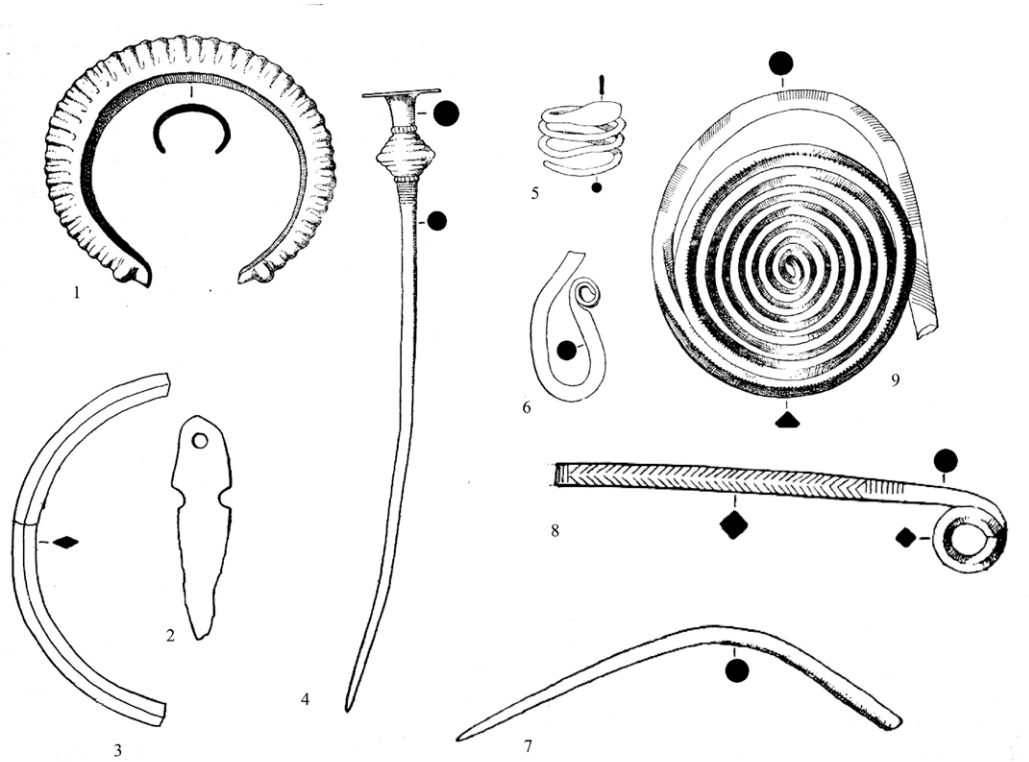


Figure 10. *Selection of bronze finds from Hrustovača Cave. Image Credit: F. Stare.*

are characteristic of the Moravia–Bohemia region, and are mostly dated to the Early Urnfield period, Blučina-Kopčany horizon – Br D (Říhovský 1979, 102ff; Salaš 2005, 108; cf. Gavranović 2011, 163). No comparable findings from neighboring regions are known for this pin (Gavranović 2011, 163). A hollow bracelet with a C-shaped cross-section and a ribbed or transversely grooved exterior also found at Hrustovača is among the most important finds of the Early Urnfield period in the southern Carpathian Basin (fig. 10/1; Stare 1953, 50; Gavranović 2011, 203). Several comparisons from Croatian hoards can be made to this bracelet, which was preserved in a complete state, while all the others were found fragmented and in hoards of mixed composition (Otok-Privlaka, Veliko Nabrđe, Gornja Vrba, Brodski Varoš, Podcrkavlje-Slavonski Brod, Malička: Vinski-Gasparini 1973. t. 28/32, t. 44/35 and 37, t. 51/17, t. 59/23–27, t. 79/17; Balen-Letunić 1985, 38). In terms of the regional distribution of this type of jewelry, the two Bosnian sites (Hrustovača and Kućišta, the latter being the find site of a Late Bronze Age hoard from northern Bosnia) are located on the southern periphery (König 2004, t. 4/80; Gavranović 2011, 203). Based on typo-chronological analysis, such bracelets can be attributed to the Ha A1 phase. Their use is characteristic of Bosnian hoards of the second phase (König 2004, 19), in hoards of phase II of continental Croatia – Veliko Nabrđe horizon (Vinski-Gasparini

1973, 87; Clausing 2004, 117; Perkić & Ložnjak Dizdar 2005, 74), in Serbian hoards belonging to phase II (Jovanović 2010, 66), or Hungarian hoards of the Kurd horizon (Mozsolics 1975, 20f). A less specific form is an undecorated bracelet with a rhomboid cross-section preserved in two fragments (fig. 10/3). Analogies are present in finds from hoards of the Early Urnfield period, with the territorial distribution being concentrated around the interfluve of the Sava and Drava Rivers (Perkić & Ložnjak Dizdar 2005, 76). The fragment of a violin bow fibula from Hrustovača Cave represents a unique find not only in the area, but also in the context it was recorded in (Stare 1953, 47; Vinski-Gasparini 1974, t. 5/1; Gavranović 2011, 176). Part of the fibula bow decorated with a fir branch pattern and incised bundles as well as the spring coil are preserved (fig. 10/8 and 9). The fibula has a conical foot end, which was probably once the head of a needle from which the fibula was then bent, with the bow having an unusual square cross-section. The most comparable fibulae examples to that from Hrustovača can be found in Slavonia and Syrmia (Vinski-Gasparini 1973, t. 90/1–4; Vinski-Gasparini 1974, 27; Vasić 1999, 12ff; Gavranović 2011, 176). The fragment from Hrustovača belongs to a smaller group that is distributed south of the Sava and across to the Adriatic coast (Gavranović 2011, 176). On the basis of typo-chronological analysis, the fibula has been placed in the Br D/ Ha A1 phase, or the thirteenth and early twelfth centuries BCE (Pabst 2018, 162). A less specific form of jewelry is a fragment of smooth wire of circular cross-section, with hammered and twisted ends (Stare 1953, 48), most likely a piece from a torc (fig. 10/6). Most parallels of twisted torcs with circular ends in the area south of the Sava date to the Ha B1 stage (11th–10th centuries BCE); examples include finds from the hoards from Tešanj and Bokavić (Gavranović & Sejfuli 2015, 77; König 2004, t. 32/3 and 4, t. 43/127–129). A bronze amulet belongs to a related category of ornaments whose precise function is not known (fig. 10/2). The upper part is perforated, presumably to allow it to be suspended, while the sides have characteristic circular cutouts, and the end is pointed (Stare 1953, 52). Among the bronze finds, an ingot fragment was also recorded (Benac 1948, 12, t. IV/12). Ingots of this type are present primarily in hoards of the Early Urnfield period (cf. König 2004).

Between profane and ritual

Caves are dark places, with no light. Engagement with darkness is a key aspect thereof. In order to see in a cave, one must rely on technology, usually lamps or torches (Mlekuž 2019, 49). The quality of light in such environs can be divided into three zones: light, twilight, and darkness (Moyes 2023, 319). The distinction between caves and shelters and their respective qualities of light are crucial to understanding cave contexts and to constructing convincing archaeological interpretations. Although rock shelters may be used for habitation, the use of dark zones of caves as living spaces is rare. According to William Farrand (1985, 23), the dark zones of true caves are useless even for temporary habitation except under extreme or desperate conditions (cf. also Moyes 2023, 319).

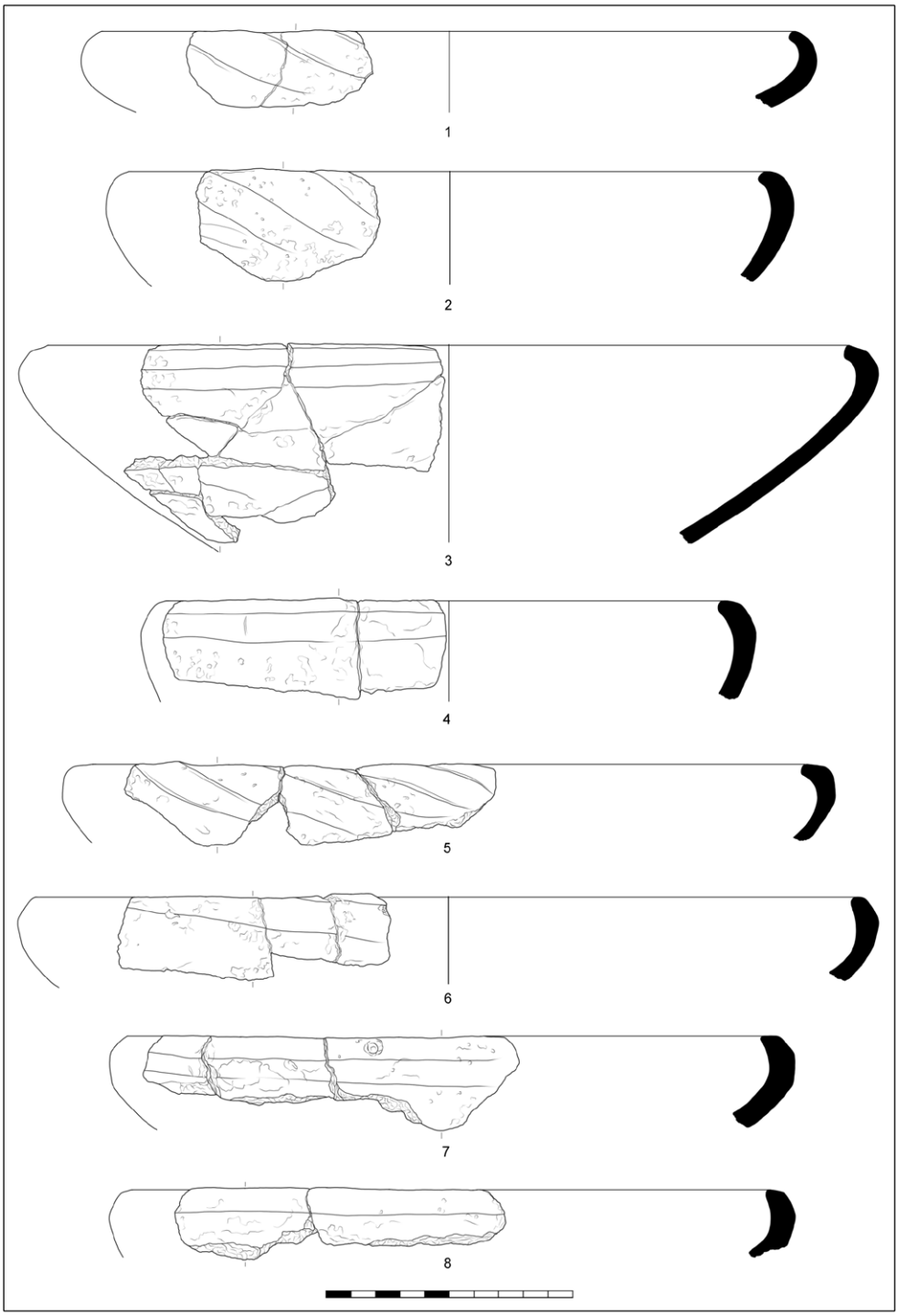


Figure 11. *Final Bronze Age pottery from Vukovića Cave. Image Credit: M. Bešlagić.*

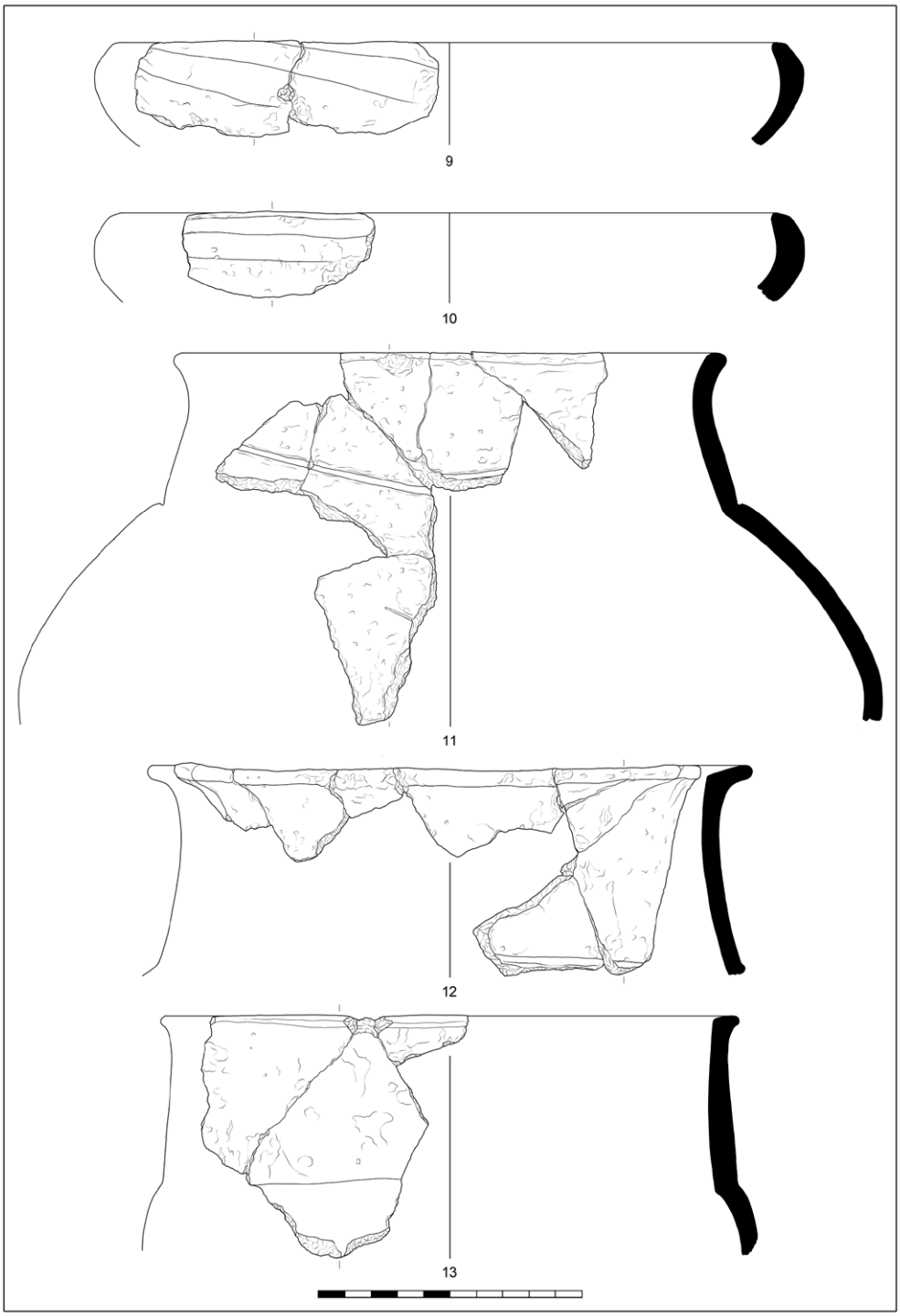


Figure 12. *Final Bronze Age pottery from Vukovića Cave. Image Credit: M. Bešlagić.*

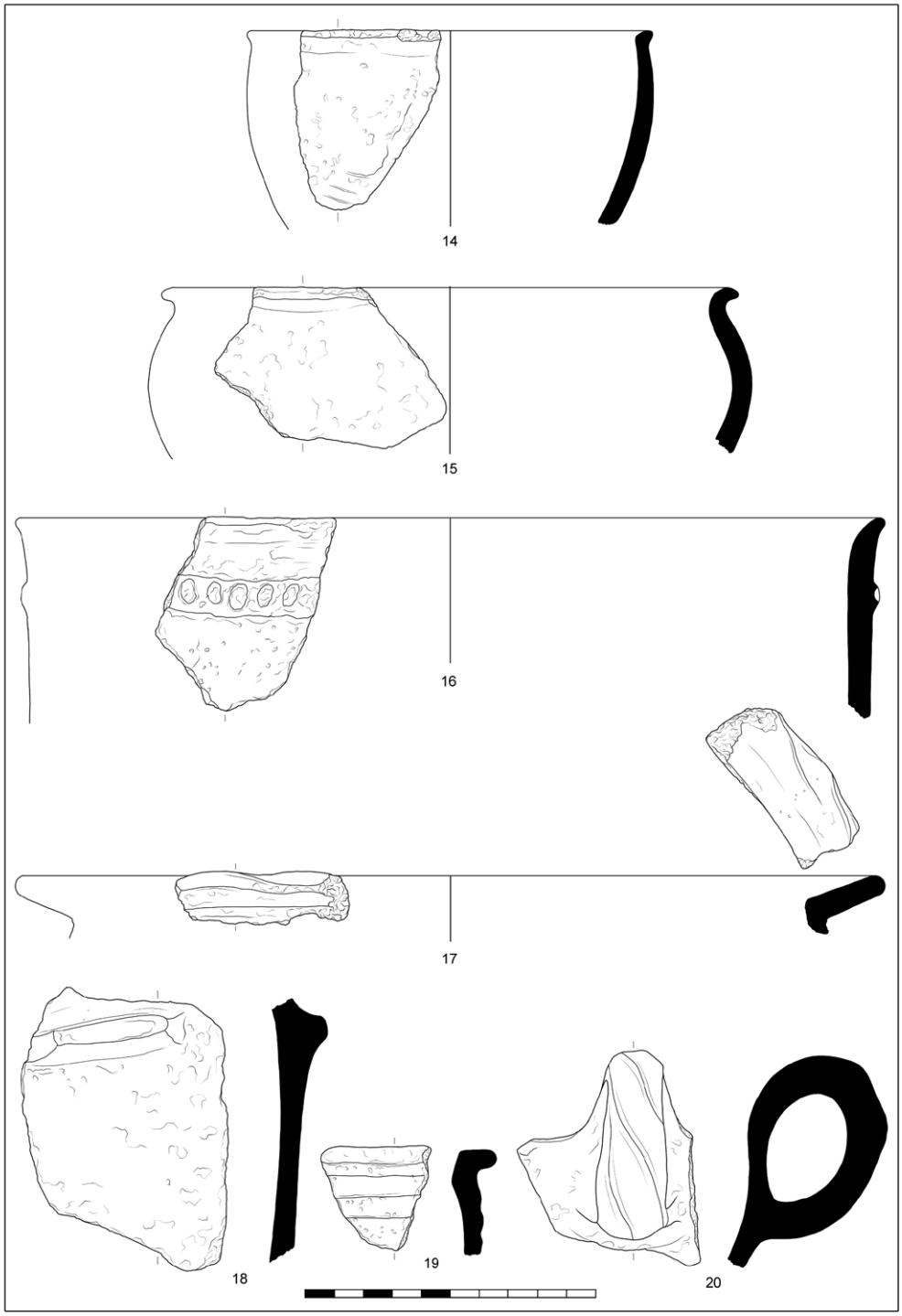


Figure 13. *Final Bronze Age pottery from Vukovića Cave. Image Credit: M. Bešlagić.*

Examples of such might include refuge in times of war or as shelters in extremely cold conditions. This is such a rare occurrence that if prehistoric people lived in dark zones, the question must be asked: Why? Why were caves so attractive to prehistoric people? In terms of human habitation, in caves, where light ceases, life ceases, and although evidence of 'prosaic' activities in the dark zones of the caves is relatively well known, in almost all cases intensive evidence of domestic activity is limited to the areas to which light can penetrate and their immediate exteriors (Moyes 2014, 6). This is certainly the case for the Neolithic and Eneolithic occupation of Rastuša and Hrustovačka Caves. Hrustovačka has yielded an incredible amount of artifacts from the Vučedol period, although all the material comes from the entrance part, and it is unknown whether the intensity of activity was comparable outside the cave. In fact, during the Neolithic and Eneolithic, cave and open-air dwellings would have coexisted as logical parts of a seasonal foraging strategy where caves offered convenient shelter near important sources of livelihood. In contrast, the types of caves bearing evidence of occupation in the Bronze Age usually lie on or beyond the margins of agricultural production; they are often situated on high hills and steep slopes, and could therefore never have competed with the proximity, locational flexibility, and efficiency offered by open-air settlement types. As a result, it is difficult to see how caves could have formed a logical element within agricultural survival strategies in this period. The surviving archaeological assemblages make it difficult to establish the exact nature of Late Bronze Age cave activities and the frequency with which caves were visited. The concentration of preserved bronze objects from Hrustovača and Mišarica Caves indicates their specific character. The find circumstances and makeup of the bronze artifacts from Hrustovača suggest that they are parts of a Late Bronze Age metal hoard of a mixed character; characteristic of northern Bosnia in the Late Bronze Age (König 2004). On the other hand, individual finds of two bronze socked axeheads from Mišarica cave also hint at the ritual activity in the context in which they were found. The deposition of bronze axeheads deep in the cave, in and beside the spring can be interpreted as a highly ritualized act in which object and space both play key roles. Ritual practice is therefore identified as something fundamentally different from (or even in opposition to) other types of activity. Water is the original source of all forms of life, a symbol of rebirth and regeneration. The cult of springs, rivers, lakes, and streams is a universal feature of all ancient cultures. As Ricardo Olmos argues, water plays a fundamental role in most rituals in all known religions. In the Mediterranean basin, the interiors of many caves are associated with water, and are directly linked to rituals of transmission and initiation in prehistoric and protohistoric communities (Olmos 1992, 132).

Much debate exists as to how – and to what extent – archaeology can distinguish between 'ritual' and 'profane' behavior, and how such ritual practices should be understood (Fontijn 2002, 13; Dietrich 2014, 470; Szabó 2019, 194). It is more appropriate to speak of different traditions in the interpretation of Bronze Age hoards, of which interpretation in ritual terms is but one (Bradley 1990, 15ff). In Central and Western Europe,

there has traditionally been less enthusiasm to see the deposition of hoards as an act of deliberate abandonment of objects, with interpretations of bronze finds as ritual deposits having been predominantly developed in Northern Europe (Kristiansen 2005). Others, however, have considered bronze hoards to be an important source of information on the organization of crafts, metalworking, and trade (Bradley 1990, 11ff; Huth 2024, 21f). Interest has particularly been focused on their content, and for this reason it seems that the study of hoards consisting of several objects is preferable to the study of the deposition of a single object (Fontijn 2002, 13). Throughout the Bronze Age, metal deposition in hoards is documented over a wide area covering Europe and extending into Eurasia. Hoarding particularly flourished in the Late Bronze Age, when the number of metal deposits – in the form of hoards or individual objects – increased spectacularly (Gori 2014, 270; Hansen 2016, 27; Borgna 2024, 11). Bronze Age hoards were composed according to certain patterns and norms. In some cases, the specific function of the deposited objects, their ornamentation, or their biography played a role in their selection; in others, the emphasis was on their weight and quantity (Turk 2001, 250f; cf. Hansen 2016, 25). Carefully selected objects were often subjected to specific treatment: bent, chopped, or broken into smaller pieces. Such intentional damaging of objects also followed certain patterns; in some cases the object was fragmented into pieces of approximately the same size or weight, in others, deposited jewelry, weapons, and bronze vessels were mercilessly smashed or dismembered to render them unusable. Similar 'violent behavior' toward objects often recorded in hoards belonging to different metallurgical circles is likewise the subject of a diverse range of interpretations, from that of ritual character (Nebelsick 2000, 163) to that of functional nature, as scrap fragments ready for recycling (Huth 2024, 24). The patterns of deposition did not only determine the composition of the hoard; there is increasing evidence that certain types of artifacts were deposited in an environment-specific manner (Brück 2016, 79; Szabó 2019, 192). The main argument for the ritual nature of the hoards was their 'selectivity', i.e., their contents having been selected according to specific cultural criteria, with the stored objects being carefully arranged; although the composition of the hoards varies from one region to another and from one period to another, certain patterns can still be identified, which stands as a strong argument for the interpretation of acts of deposition having been regulated by rituals. Hoarding can be understood as a ritual action: repetitive, formalized, involving bodies and objects, framing time and space, transformative and transformable, and thus socially – but also spatially – efficient. Comparison between a large number of hoards can allow us to reconstruct 'scripts'; i.e., the biographies of artifacts and the rituals to which they related. The deposits being compared must be temporally and spatially linked and part of the same cultural network of meaning (Gramsch & Meier 2013, 194). Scholars who favor a ritual background have repeatedly emphasized that the lavish array of valuables chosen for sacrifice was not simply a display of supernatural or mundane powers; behind the sacrality were rational economic and social interests. The individual or community making the deposit

simultaneously displayed its economic power and generosity through the abundance of sacrificial goods withdrawn from everyday use and circulation (Gramsch & Meier 2013, 195f; Turk 2024, 43). Seen from this perspective, Bronze Age hoards resemble what ethnographic studies call 'competitive exchange'; the greater the wealth an individual or community is able to destroy, the greater the prestige and social status that can be acquired from such an act. Some studies of the motives behind deposition have argued for strictly economic interests in the burial of sacrificial hoards. According to this model, if there was too much bronze in circulation, the burial or sacrifice of significant hoards equated to the deliberate withdrawal of significant quantities of metal from the exchange system, which stabilized and maintained the value of the bronze raw material and certain types of prestige objects. The main question relating to this is how hoards that could be attributed to either of these categories can be distinguished from each other, and how the reason behind their deposition can be identified (Szabó 2019, 195)? Hoards are conceptualized as sacrificial or votive deposits that were strongly intertwined with the social relations that characterized the world of chieftaincy and with the chains of gift exchange that were crucial to the economy and circulation of certain commodities. The study of the cultural biographies of deposited artifacts – how they were used, their original function, and their treatment during deposition – plays an important role in this. New studies have suggested that acts of deposition most likely played a key role in the construction and maintenance of cultural memory. Acts of deposition gave a place in the landscape a certain identity, ritual acts sacralized the chosen site, while ceremony and the assembly of special or highly valued objects created emotional and social memory. In this sense, hoards were significant building blocks of collective memory and imbued a given community with a sense of cohesion (Brück 2016, 76; Szabó 2019, 196). In recent years, interest in ritual practices in the past has grown, as archaeologists have sought to move away from narrowly functionalist interpretive frameworks. The way(s) in which 'ritual' has been used within archaeological discourse demonstrates the difficulties surrounding extreme positivist and idealist positions. Archaeologists have generally followed anthropological definitions of ritual, describing ritual action as 'highly formalized or structured modes of behavior' (Brück 2016, 314). Certain objects are defined as objects that have a ritual role because archaeologists were unable to understand them from a functional perspective. Thus, artifacts or actions that could not be assigned a practical role were often interpreted as evidence of ritual practice. What actually happens is that interpretation often defaults to 'ritual'; if sites or artifacts cannot be explained by contemporary functionalist reasoning, then they become relegated to the residual ritual category (Renfrew, 1985, 20). In the archaeological literature, it is common for the term ritual' to be used as an all-encompassing label for everything that defies a crude utilitarian explanation. Ritual is first of all a set of practices. If we term that which is everyday, familiar, and common 'domestic', then 'ritual' is something intentionally strange, in the sense that it defies functional or economic explanation and is unusual, striking, and symbolic when placed within its temporal and

spatial context (Hodder 1982, 164; Brück 1999, 319). There are no unusual objects in the hoards; they all have a functional role in everyday life. But, in the archaeological record, their collective biographies, the way they were deposited, treated individually or in groups, alongside their spatial and temporal contexts, confer upon them an unusual ritual act, which is outside the domain of the profane. William Walker explicitly argued against a simple division between utilitarian and non-utilitarian artifacts. Instead, he argued that the ritual aspects of artifacts are a product of their use in a ritual context; that normal, everyday artifacts take on special ritual meaning based on ritual use during the artifact's life (1998, 246). Ritual can also be treated as a special type of communication. Although ritual actions do not have to be repeated, they almost always are, and this is a key mechanism behind memory formation. In practical terms, if they are repeated, rituals have a greater chance of being identified archaeologically, as when we find material remnants of actions that were repeatedly performed over a certain period of time (Blake 2005, 104).

Conclusion

It is clear that ritual behavior can occur in a variety of contexts across a range of temporal, spatial, and social scales. Central to this approach is the notion that ritual practices and sites will be identified by their distinctly different and unusual formal characteristics (e.g., unusual spaces, dedicated 'ritual assemblages' of specialized implements or votive items). Prehistoric ritual was intentionally ambiguous, drawing on elements of domestic life and providing new insights and emphasis through distinctive types of performance or forms of ritualization. Ritual thus offered a different way of experiencing the domestic, and through it people could develop an understanding of their world that linked the everyday with the cosmological. Understanding ritualization is therefore key to identifying and interpreting prehistoric ritual in the archaeological record. Eating and drinking are everyday activities, but also part of ritual. In addition to temporality, spatiality, and social context, food consumption can become ritualized by consuming everyday foodstuffs in combination with special or highly valued types of objects, by consuming unusual forms of food, or by preparing food or ingredients in a special way (Tomkins 2009, 131ff). Viewed from a certain perspective, the set of vessels from Vukovića Cave can be interpreted as rather unusual. The cave is dark, extremely humid, with seasonal flooding, and limited interior and exterior space. No traces of a hearth or the use of artificial lighting have been confirmed. However, if the vessels were used as part of a ritual, this would have been temporally limited; there is no evidence of a longer stay or repetition of actions. Similar can be said for the deposition of metal goods in Hrustovača and Mišarica Caves; it seems likely that these are individual actions. But these actions are part of the broader cultural context of the Late Bronze Age, and it is in this milieu that they should be interpreted.

Caves occupy a distinctive place in the world of landscape and sensorial experiences due to their special morphological properties. Holley Moyes argued that the dark zones of caves do not offer high-quality opportunities for habitation but do offer high-quality

opportunities for hiding and secrecy. Due to the sensory deprivation brought on by darkness and silence, the dark zones of caves can help to invoke meditative states or stimulate otherworldly experiences, a type of affordance. Interestingly from an archaeological perspective, what we can observe is that cave dark zones were used almost solely as places of ritual or special function from the earliest stages of human development. Archaeological research on cave sites brings into focus the implicit and explicit uses of phenomenology in interpreting the archaeological record – perhaps more so than any other subfield of archaeology – because of the unneglectable properties of the cave environment itself. Caves are dark, cold, enclosed, often dank, and stunningly quiet or full of reverberation when humans are present. Bats often inhabit caves and the smell of guano is pungent and unmistakable. Speleothem formations adorn many caves, often serving as natural partitions of space. They may be labyrinthine and difficult to navigate due to the fact that, in the shadowy darkness, features in the environs are difficult to recognize and identify. However, in spite of their various morphologies and special characteristics, the one property of caves that is perhaps most impactful upon the human experience and behavior within them is darkness (Moyes 2023, 319). Interest in caves as potentially important sites in terms of archaeology remains somewhat modest in the history of archaeological research in Bosnia and Herzegovina, with their potential remaining largely unrecognized and inadequately valued. Research to date has been mostly limited in terms of both methodology and research questions, with typo-chronological interpretation of the material recovered having dominated interpretive approaches and discussion thus far.

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Meat production, hunting strategies, and settlement organization of the Late Neolithic site of Chavdarova cheshma, southeast Bulgaria

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Abstract

This paper discusses the zooarchaeological results from the excavation project at the Late Neolithic site of Chavdarova cheshma located on a flat terrace along the ancient bed of the Maritsa River, southeast Bulgaria (Simeonovgrad, municipality of Haskovo). The site yielded a remarkably rich assemblage of faunal remains deriving from domestic refuse, with animal bones found in close association with numerous ovens situated on the slopes of an ancient gully. These concentrations indicate that butchering, processing, and cooking activities were conducted predominantly outside of the houses.

Cattle are the dominant domestic species, underscoring their key role in the subsistence economy, while sheep and goats form a substantial secondary component. Domestic pigs are present in smaller numbers, and dog remains are rare, reflecting the presence of small domestic dogs of little economic importance. Kill-off pattern analysis indicates that livestock were primarily slaughtered at ages optimal for meat yield, suggesting that animal husbandry at the site was geared mainly toward meat production rather than secondary products such as milk or wool.

*Among wild taxa, the extraordinarily high proportion of fallow deer (*Dama dama*) is particularly significant, surpassing the typically dominant red deer (*Cervus elaphus*) in Neolithic assemblages from Bulgaria. This pattern points to targeted hunting strategies and favorable local habitats for fallow deer.*

The spatial clustering of faunal remains around the spring, riverbank, and oven concentrations suggests a dedicated processing zone, possibly linked to mobility and exchange along the Maritsa River. Imported marine shells and Aegean-type painted pottery further support the interpretation of Chavdarova cheshma as a small riverine waypoint integrated into wider networks of movement and interaction during the Late Neolithic.

Keywords: *Late Neolithic – zooarchaeology – hunting – husbandry – Balkan prehistory – animal remains – fallow deer.*

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Introduction

During the Late Neolithic (ca. 5500/5450 – 4950/4900 cal. BC), notable transformations occurred in societies across the Balkan Peninsula. These changes are reflected in settlement organization, pottery production, flint technology, and subsistence strategies. Around the mid-sixth millennium BC, these developments marked the transition from the Early to the Late Neolithic according to the currently used chronology in Bulgaria. Upper Thrace and particularly the Maritsa River Valley represents a key region for tracing these cultural and economic processes (Boyadzhiev 2020, 47f).

Chronologically, the Neolithic in Upper Thrace spans the sixth millennium BC, with the transition from the Early to the Late Neolithic – defined as the Karanovo II–III period – dated to ca. 5550/5500–5450/5400 cal. BC (Nikolov 1998, 206ff and 214ff; 2004, 20; Boyadzhiev 2000, fig. 2; 2009, 25ff). Based on the stratigraphy of Tell Karanovo, this framework remains the principal reference for understanding regional developments despite certain local variations across Thrace.

Within this context, the site of Chavdarova cheshma stands out as one of the most significant Late Neolithic settlement sites in the Maritsa River Valley. The exceptionally large amount of animal remains discovered there provides valuable evidence for daily life and subsistence practices as well as for reconstructing the natural environment of the period. Notably, the faunal assemblage is dominated by fallow deer (*Dama dama*) rather than red deer (*Cervus elaphus*), which predominates at most other prehistoric sites (Manhart 1997, 716ff; Ninov & Stanev 1992, 121ff; Ninov 1999, 131ff; Gorczyk & Karastoyanova 2017, 523ff; Nobis & Ninov 2002). This pattern reflects the well-documented substantial population of fallow deer in southeast Bulgaria during the Neolithic and illustrates regional environmental particularities (Karastoyanova et al. 2020, 8ff).

The evidence from Chavdarova cheshma not only enhances our understanding of human–animal relationships and environmental conditions in Upper Thrace but also highlights the growing importance of hunting as a component of the subsistence economy during the Late Neolithic.

The site's excavations

The site of Chavdarova cheshma (5450–5200 BC) is located in the Zlati Dol quarter of the town of Simeonovgrad, near the railway station, on two non-flooded terraces – the so-called central (II) and western (I) terraces – south of an ancient channel of the Maritsa River (fig. 1). There is evidence that the settlement stretches further south of the modern railway line. However, this area is now built over and cannot be investigated.

The rescue excavation project was carried out in 2014–2015. Earlier research includes three test trenches excavated in 1968 by D. Aladzhov of the Haskovo Historical Museum as well as excavations at the Early Neolithic settlement on the Central Mound conducted by A. Raduncheva between 1979–1982 (2002). More trenches were excavated in 2005 ahead of the construction of the high-speed Plovdiv–Svilengrad Railway

(Boyadzhiev et al. 2008). The 2014–2015 rescue excavations significantly expanded the investigated area to 1,400 m² along a 10–20 m wide strip crossing the settlement east–west (fig. 2; Boyadzhiev et al. 2015 and 2016).

The excavations revealed an extensive settlement of a dispersed type, with structures spaced 50–60 meters apart. The remains of nine structures were identified, most of which were heavily disturbed by later intrusions. Some of them had two levels, and specific structures – such as building 5 – show evidence of up to five construction phases. Both the stratigraphic sequence and the ceramic assemblage indicate long occupation in the first half of the Late Neolithic (Karanovo III period). A distinct zone of features developed along the slope of an ancient ravine, apparently linked to the proximity of the Maritsa River, which at that time formed a convenient bay supplied with abundant spring water (fig. 3; Boyadzhiev et al. 2016, 100).

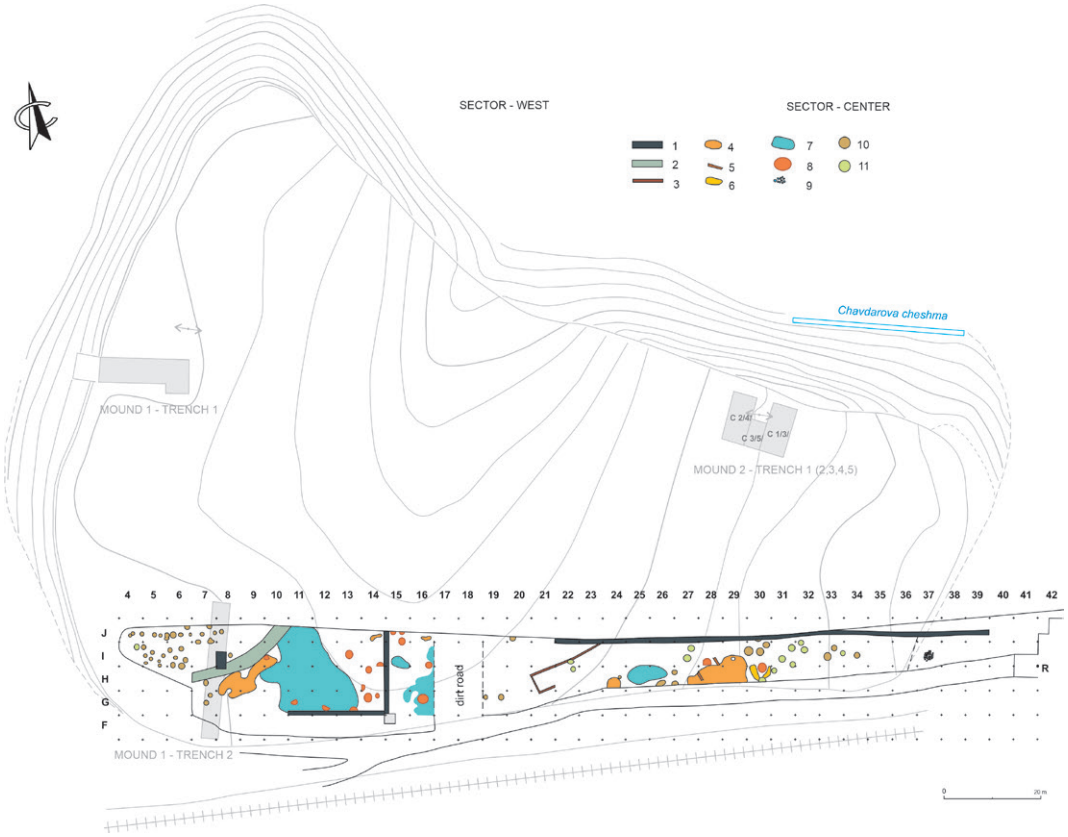


Figure 1. *Layout of the excavated area at Chavdarova cheshma in 2014–2015. Key: (1) recent disturbances; (2) Early Bronze Age ditch; (3) Neolithic trench; (4) Late Neolithic burnt structural debris; (5) remains from house walls; (6) packed house floor; (7) accumulation of stones, pottery, and animal bones; (8) thermal installation; (9) stone construction from Antiquity; (10) pit; (11) clay-plastered pit. Image Credit: Y. Boyadzhiev.*



Figure 2. *Panoramic view of the west part of the excavated area in 2014–2015. Image Credit: Y. Boyadzhiev.*

The area between the houses was used for various economic activities. More than one hundred negative features were recorded: pits of different size, depts, and fill, many of which truncated or overlapped. Along the eastern slope of the west terrace, an extensive concentration of stones, pottery, and animal bones was documented, spanning more than 250 m^2. Beneath this deposit, two occupation levels with hearths and ovens were uncovered, many of them remarkably well preserved, with several successive replastered base surfaces each.

On the slopes of the ravine separating the two terraces, a series of flattened platforms were identified that were constructed of packed yellow clay (fig. 4). Measuring ca. 5 or 6 m long and wide, they were arranged in a step-like pattern at different levels, indicating periodic terracing of the terrain. Numerous ovens – 29 in total – were constructed both on these platforms and directly on the cultural deposits (fig. 5). The earliest oven lay directly above river sand. Most of these installations had several layers of base plastering demonstrating their long use (fig. 6). More dug-in installations were found around them. In the upper part of the terraces, the remains of nine structures were uncovered.

Stratigraphic evidence suggests at least two or three settlement stages during the Karanovo III phase, while the natural was not reached on the slopes (Boyadzhiev et al. 2014 and 2016).

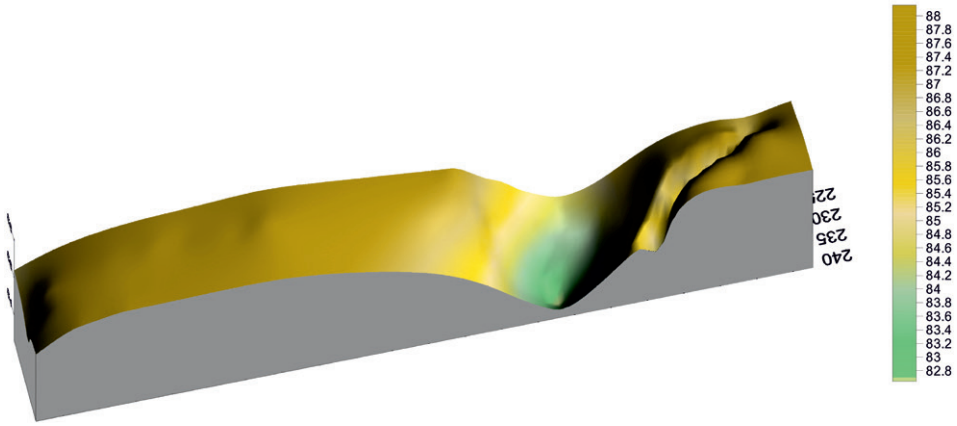


Figure 3. *Computer generated reconstruction of the ancient terrain. Image Credit: Y. Boyadzhiev.*



Figure 4. *Packed and clay-plastered working surfaces on the eastern slope of the gully. Image Credit: Y. Boyadzhiev.*

The faunal assemblage, which is the focus of this paper derives from the cultural deposits, pit fills, and associated structural remains of these occupation levels. It consists of a large number of well-preserved animal bones of both domestic and wild species, providing valuable evidence for reconstructing subsistence strategies, butchery practices, and human–animal interactions in the Late Neolithic of Upper Thrace.



Figure 5. *Remains of ovens on the west slope of the gully. Image Credit: Y. Boyadzhiev.*



Figure 6. *Repeatedly renovated oven. Image Credit: Y. Boyadzhiev.*

Materials and methods

During the rescue excavations at Chavdarova cheshma, a substantial amount of faunal material was recovered. In total, 9,074 animal remains were recorded, of which 8,954 belong to the Late Neolithic occupation, five to a Chalcolithic pit, 54 to an Early Bronze Age context, and 74 to Late Antique deposits. In this paper, we consider only the Late Neolithic assemblage. The rescue project was carried out in two field seasons (a total of five months) under the direction of Yavor Boyadzhiev and Antonia Andonova. Most of the faunal remains originate from structural features, ceramic concentrations, and pits located around houses and hearths. The Late Neolithic assemblage constitutes by far the largest portion of the faunal material, representing approximately 74% of all identified remains from the site (cf. fig. 16).

A total of 8,954 animal remains were analyzed from the Late Neolithic layers and features, of which 8,305 were identified to the species level (NISP – Number of Identified Specimens; table 1, fig. 7). The minimum number of individuals (MNI) was also calculated. Most of the bones are highly fragmented, and some show traces of low-temperature burning. The assemblage is generally well-preserved, with minimal weathering, suggesting a short exposure time before burial. Fine tools were used during feature excavation, and partial sieving was applied.

Identification was carried out using the comparative collections of the National Museum of Natural History, Bulgarian Academy of Sciences, and standard reference works (Barone 1976; Schmid 1972). Diagnostic criteria from Boessneck et al. (1964), Prummel & Frisch (1986), and Zeder & Pilaar (2010) were applied to differentiate species. Age estimation was based on epiphyseal fusion and dental eruption/wear, following the methods of Schmid (1972), Payne (1973), and Grant (1982).

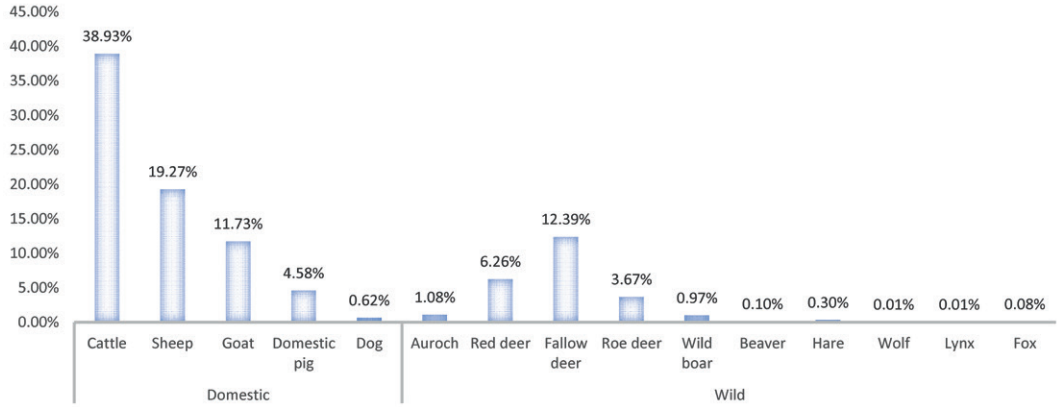


Figure 7. *Relative proportions of domestic and wild taxa in the Late Neolithic faunal assemblage from Chavdarova cheshma (percent NISP). Image Credit: N. Karastoyanova.*

	Cattle	*Sheep*	*Goat*	*Dom. pig*	*Dog*	*Aurochs*	*Red deer*	*Fallow deer*	*Roe deer*	*Wild boar*	*Fox*	*Lynx*	*Wolf*	*Hare*	*Beaver*	*Bos sp.*	*Sus sp.*	*Caprine*	*River mussel*	*Goose*	*Great bustard*	*Griff vulture*	*Golden eagle*	*total*
antler							12	30	9															51
horncore	43	10	28			2										1								84
cranium	21	31	24	3	2	1	3	14	2								5							106
maxilla	47	41	22	22	1	1	5	15	2	9					1									166
mandible	106	337	244	35	17	1	21	43	8	6	2		1	3	2			1						827
teeth	18	12	9	4	2		8	2	3	2														60
atlas	20	8	5	8		1	4	20	1	2														69
axis	22	15	4	3	1		7	15		1						1		1						70
cervical vertebra	69	12	1	8	1		17	16	2								3	14						143
scapula	102	145	66	17		2	26	64	17	6				5	2	1		30						484
humerus	217	153	99	74	2	11	35	87	13	5	1			2		1		22					1	723
radius	178	138	72	31	6	7	16	63	20	4	1	1		3		2		23						565
ulna	67	26	14	4	5	2	15	20	3	6						1	2	7						172
carpal	14	2					5	1																22
metacarpal/ carpometacarpus	159	106	82			1	21	51	14							2		16			2	1		455
metacarpal I										2														2
metacarpal II				5						4														9
metacarpal III				2						3														5
metacarpal IV				4						1	1													6
rib	315	11	2	11		4				2							4	22						371
thoracic vertebra	88	6	6	1	2		5	13									2	2						125
lumbar vertebra	58	6	2		1	1	8	15	2								3	4						100

	Cattle	*Sheep*	*Goat*	*Dom. pig*	*Dog*	*Aurochs*	*Red deer*	*Fallow deer*	*Roe deer*	*Wild boar*	*Fox*	*Lynx*	*Wolf*	*Hare*	*Beaver*	*Bos sp.*	*Sus sp.*	*Caprine*	*River mussel*	*Goose*	*Great bustard*	*Griff vulture*	*Golden eagle*	*total*
Pelvis/coracoid	158	82	36	31		3	17	57	6	3				4	2			5		1				405
sacrum	12			1		1		1									3							18
femur	62	18	9	4	1	4	37	54								2		9						200
patella	7						4	3																14
tibia	206	107	62	25	4	8	76	118	20	2				1	1	4		38						672
calcaneus	146	38	17	6		9	26	71	8							3		1						325
tarsal	25	1					6	7		1														40
talus	104	10	2	10			14	37	14	3						1								196
metatarsal	176	47	34			1	27	38	10					2		2		8						345
metatarsal II				2																				2
metatarsal III				2						1														3
metatarsal IV				1						2														3
metatarsal V																								
1st phalanx	236	32	15	14		3	12	27	31	2	1			2		2								377
2nd phalanx	93	3		2			6	5	8	2														119
3rd phalanx	67			2			14	18	3	1														105
shell																			865					865
Total	**2837**	**1397**	**850**	**332**	**45**	**63**	**447**	**905**	**203**	**70**	**6**	**1**	**1**	**22**	**7**	**23**	**22**	**204**	**865**	**1**	**2**	**1**	**1**	**8305**
Number by class	**Mammals**	7435	**Birds**	5	**Mollusks**	865																		

Table 1. *Number of identified skeletal elements by taxon and anatomical category from the Late Neolithic at Chavdarova cheshma.*

Measurements were taken according to von den Driesch (1976). The withers height of small ruminants (sheep and goats) was calculated using coefficients proposed by Tsalkin (1961) and Schramm (1967), for wild boar by Teichert (1969), and for cattle following Tsalkin (1960), Vasilev et al. (1979), and Vasilev (1985). The anatomical distribution of skeletal parts was evaluated following Uerpmann's (1973) three-zone model: (A) meaty elements (vertebrae, upper limb bones, scapulae, pelvis); (B) less meaty elements (lower limbs, cranium, jaws, ribs, sternum); and (C) elements without meat (phalanges, horns, tail bones, teeth). The relative ratio of these zones in a complete skeleton is approximately balanced.

The identification of burning stages was carried out following the criteria outlined in Nicholson (1993, 414, table 1).

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Results

Domestic mammals

Domestic animals comprise ca. 74% of the total faunal assemblage, indicating well-developed animal husbandry in the region. Cattle, sheep, and goats were the main domesticated species. The large proportion of cattle remains suggests that cattle breeding was the most significant branch of livestock management (fig. 7 and table 1). According to the mortality profiles, artiodactyls were exploited for meat, while sheep were likely also used for their wool. Dog remains are very few and belong to small-sized individuals. The proportion of bones gnawed by carnivores (dogs) is minimal.

Dog *(Canis familiaris)*

A total of forty-five dog remains were identified, representing about 0.62% of the total assemblage (fig. 7). Most of the elements belong to the mandibles and ulnae. Adult individuals over four years of age predominate, while only two fragments derive from juvenile specimens. Based on the size of mandibles, the dogs were small. The minimum number of individuals (MNI) is 11. Due to the high degree of fragmentation, most bones could not be measured; only the teeth provided measurable dimensions.

Comparison of mandibular M1 (first molar) lengths with other Late Neolithic sites shows that most sites, including Kapitan Andreevo and Sarnevo (Gorczyk & Karastoyanova 2017, 528ff), contain consistently small dogs with closely grouped measurements. In contrast, Chavdarova cheshma displays a wider range of M1 values, suggesting the presence of both very small and somewhat larger individuals. This variation likely reflects normal size diversity within a small-bodied dog population rather than distinct morphotypes (table 2).

Site	n	First molar length of mandible (in mm)
Kapitan Andreevo	7	19–22
Chavdarova cheshma	7	17–36
Koprivets B	1	17.5
Sarnevo	4	18–21

Table 2. *Measurements of the length of the M1 (first lower molar tooth) on the mandible from various Late Neolithic sites in Bulgaria (Manhart 1998; Gorczyk & Karastoyanova 2017).*

The skeletal morphology and size correspond to *Canis familiaris* forma *palustris* – the so-called Peat Dog, a small, gracile domestic form typical of Neolithic Europe. This morphotype is characterized by a narrow skull, slender long bones, and an overall body height of ca. 40–45 cm at the withers. Dogs of similar proportions are typical for the Neolithic and Eneolithic Balkans and were widespread in prehistoric Bulgaria (Spassov & Iliev 1994, 297).

Cattle (*Bos taurus*)

Cattle account for approximately 35% of all identified animal remains (2,837 fragments; MNI = 78), representing the most numerous domestic species at the site. This dominance indicates an advanced level of cattle husbandry during the Late Neolithic in the Maritsa River Valley.

The bones are highly fragmented, and long bones were deliberately broken to extract marrow. Several partially preserved horn cores and limb bones were also found. Only two complete metapodials were available for direct calculation of withers height. For the remaining specimens, withers height was estimated using the Vasilev–Atanasov–Tsonev index (1979) and Tsalkin (1960), which is based on measurements of proximal and distal breadth fragments of metapodial bones. At Chavdarova cheshma, a total of 411 metapodial fragments were included in these calculations, and the values derived from the two complete bones are incorporated into the final dataset presented in the table. Measurements suggest relatively large animals, with an estimated withers height of approximately 114–122 cm (mean around 118 cm). These values indicate that the cattle from Chavdarova cheshma were larger than modern brachyceros breeds and some contemporaneous Neolithic populations in Bulgaria (table 3).

Site	Period	Withers height (cm)	n	Mean
Chavdarova cheshma	Late Neolithic	114.20 – 121.30	413	117.75
Kapitan Andreevo	Late Neolithic	115.4 – 110.3	54	112.91
Akladi cheiri	Late Neolithic	99.5 – 140	74	121
Rhodopean shorthorn cattle	recent	♀97 – 110	–	103.5

Table 3. *Withers heights (cm) of cattle from Late Neolithic sites in Bulgaria (Spassov & Iliev 2021).*

The highest proportion of skeletal elements comes from the trunk and upper limb regions (zone A), which carry the largest muscle masses and thus the highest meat yield. Elements with less meat (zone B) are represented in similar proportions, while bones without meat (zone C) are rare. This pattern suggests that the animals were butchered and consumed on or near the settlement. The bones were fractured for marrow extraction and possibly used as blanks for tool production. The scarcity of zone C elements may indicate that the phalanges were removed together with the hides (fig. 8).

Mortality profiles show that most cattle were slaughtered during the juvenile and adult stages. According to Payne's (1973) mortality models, this pattern suggests an exploitation strategy for meat. The small difference between the proportions of young and mature individuals suggests a balanced approach to herd management (fig. 9).

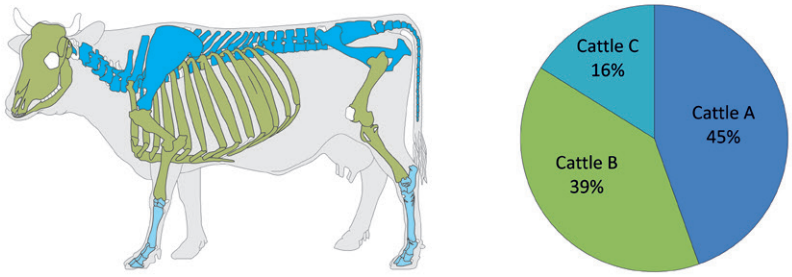


Figure 8. *Anatomical distribution of cattle skeletal elements according to Uerpmann's A–B–C grouping, showing the proportional representation of high-meat (A), low-meat (B), and meatless (C) elements at Chavdarova cheshma. Image Credit: N. Karastoyanova and © 1996 ArcheoZoo.org / Michel Coutureau (Inrap), Vianney Forest (Inrap) D'après : Barone (Robert). — Anatomie comparée des mammifères domestiques, Tome I Ostéologie – atlas. Paris : Vigot, 1976, pl. 7, p. 22.*

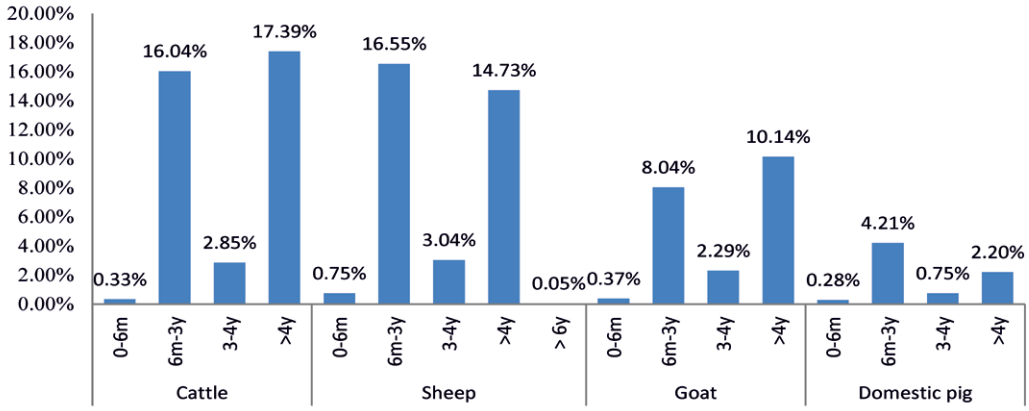


Figure 9. *Epiphyseal fusion profiles of cattle, sheep, goats, and pigs from the assemblage. Image Credit: N. Karastoyanova.*

Goat/Sheep (*Capra hircus /Ovis aries*)

A total of 2,451 remains belonging to sheep and goats were identified: 1,397 of sheep, 850 of goat, and 204 specimens too fragmentary for specific identification. Overall, sheep predominate, forming the second-largest domestic taxon at the site, after cattle (fig. 7). The ratio between sheep and goats is approximately sixty-two to thirty-eight per cent. Horn cores of both species were recorded. Most of the bones are heavily fragmented.

The estimated mean withers height of sheep is 52.45 cm, which indicates relatively small animals compared to other sites such as Yabalkovo (mean 57.6 cm: Spassov & Iliev 2015, 426) and Golyamo Delchevo (mean 57.2 cm). These values are close to those of the primitive Zackel-type sheep, a long-tailed mountain breed preserved in parts of Southeast Europe, with an average height between 55–60 cm. Two individuals with an estimated height of about 60 cm were identified and are likely males.

Goats appear considerably larger than sheep, with a mean wither's height of approximately 70 cm. Most of these remains probably belong to male individuals; however, even accounting for sexual dimorphism, the goats from Chavdarova cheshma were relatively large compared to those from other Late Neolithic sites. Their size is close to that of some modern local goat breeds (table 4).

Site	Min.	Max.	Mean	n
Chavdarova cheshma	59	76	65.78	5
Kapitan Andreevo	54	58	56.70	3
Golyamo Delchevo	50	63	57.82	17
Ovcharovo	59	64	61.10	10
Recent breeds	70	80	–	–

Table 4. *Withers height (cm) of goats from Chavdarova cheshma compared to other Late Neolithic and Chalcolithic sites in Bulgaria (Vasilev 1985; Ivanov & Vasilev 1975).*

Regarding skeletal-part representation, the highest proportions in both species correspond to zones A and B – elements bearing large and small quantities of meat – which are almost equally represented. Bones without meat, such as horns, teeth, and phalanges (zone C), are least frequent. This pattern suggests that butchery and consumption took place within or near the settlement (fig. 10).

The age-distribution pattern reconstructed from mandibular tooth wear stages shows a pronounced concentration of slaughtered animals in the 3–4 and 4–6 year age groups, accompanied by relatively low frequencies of very young (0–12 months) and early adult (1–3 years) individuals. This structure contrasts sharply to slaughter regimes targeting primarily meat (Payne's model A), which typically show a strong peak in the first year of life, and with milk-oriented systems (model B), where most surplus animals are culled before or shortly after weaning (fig. 11).

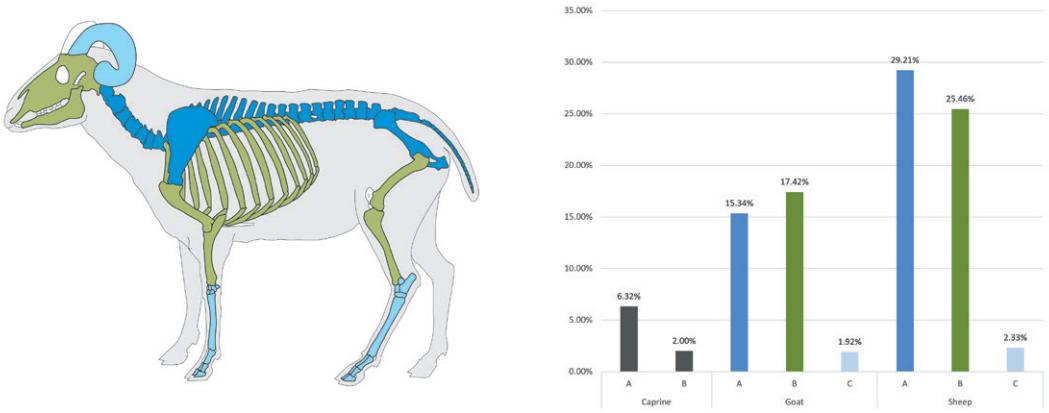


Figure 10. *Anatomical distribution of caprines skeletal elements according to Uerpmann's A–B–C grouping, showing the proportional representation of high-meat (A), low-meat (B), and meatless (C) elements at Chavdarova cheshma. Image Credit: N. Karastoyanova and © 1996 ArcheoZoo.org / Michel Coutureau (Inrap), Vianney Forest (Inrap) D'après : Barone (Robert). — Anatomie comparée des mammifères domestiques, Tome I Ostéologie – atlas. Paris : Vigot, 1976, pl. 8, p. 23.*

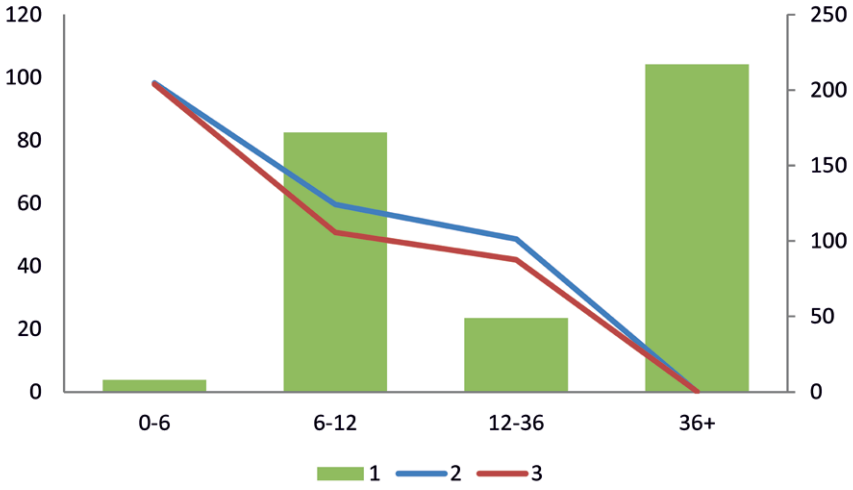


Figure 11. *Kill-off pattern by age groups based on mandibular tooth wear stages converted according to Payne (1973). Columns represent the number of individuals in each age class, with 95% Poisson confidence intervals; the line indicates the overall mortality curve. Key: (1) caprine; (2) goat; (3) sheep. Image Credit: N. Karastoyanova.*

Domestic pig *(Sus scrofa domesticus)*

Remains of domestic pig are represented by 332 specimens, accounting for about 4% of all identified faunal remains (cf. fig. 7). The minimum number of individuals (MNI) is sixteen. Most of the elements belong to zone A – bones bearing large quantities of meat, particularly forelimbs and vertebrae. Cranial and mandibular fragments are also numerous (fig. 12).

Most individuals were slaughtered between six months and three years of age, while a few remains belong to older animals (over four years). The absence of measurable adult bones, due to unfused epiphyses, prevents the precise reconstruction of body size (cf. fig. 9).

The skeletal-part distribution shows that meat-bearing elements dominate, followed by those with less flesh, while bones without meat (teeth, phalanges) are least represented. This pattern suggests that pigs were slaughtered and processed locally, and their meat formed a supplementary yet regular component of the diet during the Late Neolithic occupation of the site (cf. fig. 12).

Wild fauna

The wild fauna from Chavdarova cheshma is diverse and well-represented, reflecting a rich and varied environment during the Late Neolithic. Although domestic animals dominate the assemblage, the proportion of wild taxa is relatively high, which is typical of Late Neolithic sites in southeast Bulgaria. The species composition includes large and medium-sized game such as aurochs (*Bos primigenius*), red deer (*Cervus elaphus*), fallow

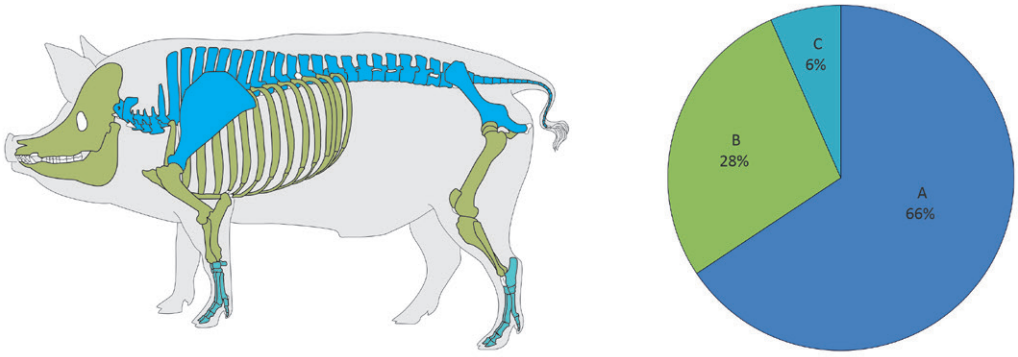


Figure 12. Anatomical distribution of domestic pig skeletal elements according to Uerpmann's A–B–C grouping, showing the proportional representation of high-meat (A), low-meat (B), and meatless (C) elements at Chavdarova cheshma. Image Credit: N. Karastoyanova and © 1996 ArcheoZoo.org / Michel Coutureau (Inrap), Vianney Forest (Inrap) D'après : Barone (Robert). — Anatomie comparée des mammifères domestiques, Tome I Ostéologie – atlas. Paris : Vigot, 1976, pl. 9, p. 24.

deer (*Dama dama*), roe deer (*Capreolus capreolus*), and wild boar (*Sus scrofa*), as well as smaller mammals including fox (*Vulpes vulpes*), wolf (*Canis lupus*), lynx *(Lynx lynx*), beaver (*Castor fiber*), badger (*Meles meles*), and hare (*Lepus europaeus*). Remains of birds, mollusks, and reptiles were also identified. The presence of such a wide range of wild species indicates the exploitation of multiple ecological zones – riverine, forested, and open landscapes – and demonstrates the important role of hunting in the local subsistence economy.

A total of 865 shells of the freshwater mussel (*Unio crassus*) were recovered. Many exhibit signs of heating, indicating their use as food, although some may also have been collected for ornamental purposes. Bird bones are rare (NISP 5), representing only a very small fraction of the assemblage. Identified species include lesser white-fronted goose (*Anser erythropus*), great bustard (*Otis tarda*), griffon vulture (*Gyps fulvus*), and a large eagle, probably golden eagle (*Aquila chrysaetos*). The presence of great bustard (*Otis tarda*) at Chavdarova cheshma likely indicates its use as a valuable game bird. These finds confirm that Thrace was among the main regions of the species' distribution in the Neolithic and Chalcolithic, documenting its formerly wide presence across Bulgaria. Remains of large diurnal raptors, such as *Gyps fulvus* and *Aquila chrysaetos*, are also common at Neolithic, Chalcolithic, and Bronze Age sites. The site's proximity (10–15 km) to the Sakar and East Rhodope Mountains provides suitable rocky habitats for these species (Boev 2017, 110f).

Among mammals, large game is dominant. Aurochs are represented by 63 bones belonging to at least three individuals. The size of the horn cores suggests that they belonged to robust, large-bodied animals (table 5). Limb bones are most common, and the individuals were mainly adults, with one juvenile specimen. Red deer constitute about five and a half per cent of all remains (447 bones, MNI = 29) and include both males and females. Most antlers are 'trophy' specimens from hunted animals rather than shed ones, and some limb bones indicate large individuals. The mortality profile, which encompasses both juvenile and adult deer, indicates year-round hunting with no discernible seasonal preference (fig. 13).

Site	Procc. corunales (diameter)	Calcaneus (GL)	Humerus (Bd)
Chavdarova cheshma	230–236	156–178	107–113
Kapitan Andreevo	–	136–180	–
Ovcharovo	205–225	146–148	95–130
Golyamo Delchevo	183–242	145–183	95–129
Koprivets B	–	160–168	–

Table 5. *Comparison of aurochs (*Bos primigenius*) bone elements (mm) with those from other sites in Bulgaria (Vasilev 1985; Ivanov & Vasilev 1975; Manhart 1998).*

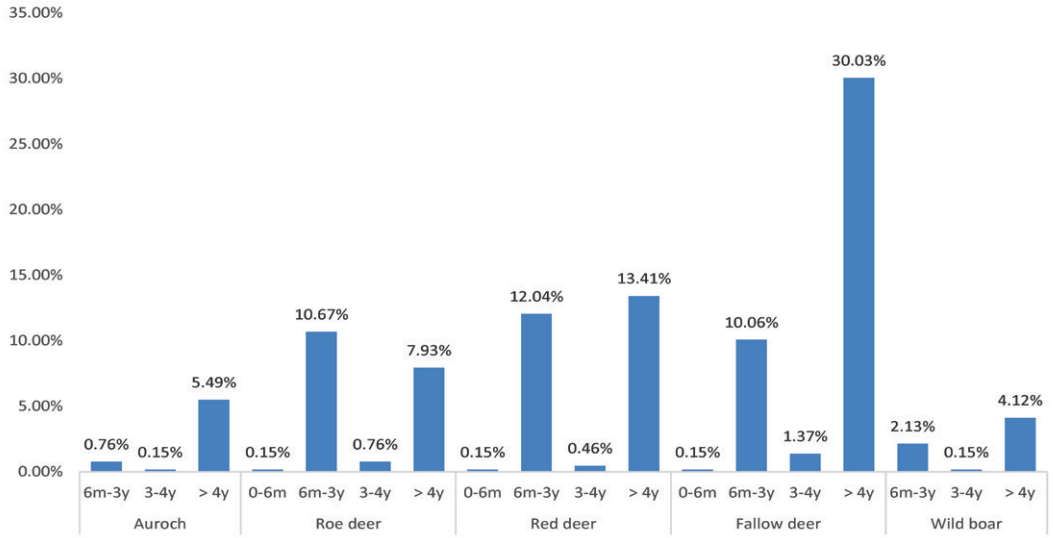


Figure 13. *Epiphyseal fusion profiles of game animals from the assemblage. Image Credit: N. Karastoyanova.*

Fallow deer is the most numerous wild species, represented by 905 remains (MNI = 51). This high proportion indicates intensive hunting in the Late Neolithic, a pattern similar to that observed at sites such as Sarnevo (Gorczyk & Karastoyanova 2017, 529ff), Kapitan Andreevo, and other Late Neolithic sites in southeast Bulgaria. The majority of remains come from tibiae, upper limbs, and antlers (cf. table 1). Adult individuals predominate (table 6), but juveniles are also present. Many antler fragments bear traces of cutting and polishing, reflecting their use as raw material for tools or ornaments. Fallow deer were predominantly distributed in and around the Sakar Mountains in southeast Thrace and the southern Black Sea coast, both areas with a mosaic of forest and open areas where a transient Mediterranean climate prevailed (Spassov & Iliev 1994, 293f; Karastoyanova et al. 2020, 8).

n	Mandibular wear stage	Age in months
1	D	5–12
3	E	13–20
1	F	20–33
7	G	33–54
2	H	44–147
4	I	61–183
10	J	118–189 +

Table 6. *Fallow deer age classes after Bowen et al. (2016).*

Roe deer are represented by 266 bones (ca. 3% of the assemblage), with all skeletal regions present. Meat-bearing elements dominate, and several antler fragments suggest trophy collection. Both young and adult individuals were hunted (fig. 13).

Wild boar is represented by seventy bones, mostly from meaty limb elements. The animals were medium to large in size, similar to those from other Neolithic and Chalcolithic sites in Bulgaria. Several large tusks, belonging to adult males, were identified. Most of the hunted individuals were mature, over four years old, while juveniles were less frequent. This suggests selective hunting focused on obtaining large game for meat and tusks. Beaver remains (seven bones, from at least two adults) include mandibles, scapulae, and pelvis fragments. Although beaver is common in Neolithic faunal assemblages across the Balkans, its low frequency here suggests opportunistic rather than targeted hunting.

Small and medium predators are also present. Hare is represented by 22 bones, mostly from adult individuals. Badger is represented by a single scapula fragment from a young individual, while six bones, including two mandibles, represent a fox. A complete right mandible of a wolf indicates a large adult male, suggesting the occasional presence of the species in the vicinity of the settlement, possibly scavenging near human activity areas. The lynx is represented by a single complete ulna, an exceptionally rare find for this region. Previously, the species had been recorded only at Late Chalcolithic sites in northeast Bulgaria such as Golyamo Delchevo, Ovcharovo, Salmanovo, and Durankulak (Vasilev 1985, 23; Manhart 1998, 178). The Chavdarova cheshma specimen represents the first evidence of lynx in southeast Bulgaria and belongs to a large adult male.

Overall, the wild fauna from Chavdarova cheshma reflects a balanced and diverse ecosystem of the Late Neolithic. The predominance of large herbivores, the presence of carnivores and aquatic species, and the evidence for antler processing all indicate a mixed economic system that combined well-developed animal husbandry with active hunting and the utilization of riverine resources. The selective targeting of mature individuals and the widespread working of antler and bone indicate that hunting was not only a subsistence activity but also a source of raw materials for tool and ornament production. This evidence suggests that the inhabitants of Chavdarova cheshma practiced a flexible, sustainable economy that effectively integrated pastoralism, hunting, and craft production within the dynamic environmental setting of the Late Neolithic Maritsa Valley.

Taphonomic analysis

The faunal assemblage from Chavdarova cheshma exhibits a wide range of taphonomic modifications reflecting both human activities and post-depositional processes. Cut marks were documented on 58 bone fragments, representing a variety of domestic and wild taxa, including aurochs, cattle, sheep, goat, red deer, roe deer, fallow deer, domestic pig, and wild boar. Although this number is modest relative to the total assemblage, it likely underestimates the true frequency of butchery traces. Many bones are covered with a thick, compact, and often organic patina that obscures fine surface modifications and

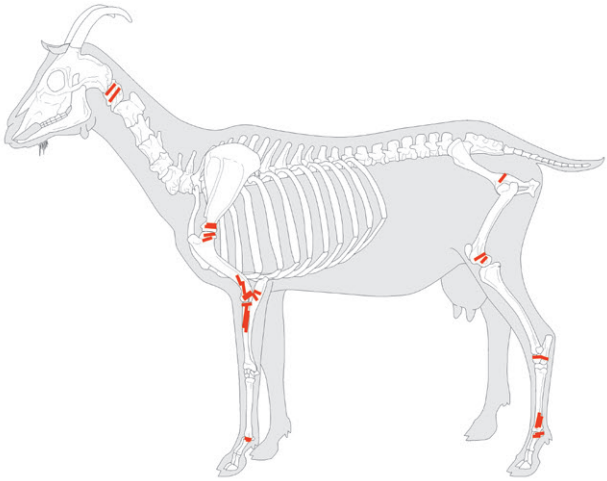


Figure 14. *Common butchery cutmark locations on the animal skeleton (schematic). Image Credit: N. Karastoyanova and © 1996 ArcheoZoo.org / Michel Coutureau (Inrap), Vianney Forest (Inrap) D'après : Barone (Robert). — Anatomie comparée des mammifères domestiques, Tome I Ostéologie – atlas. Paris : Vigot, 1976, pl. 8, p. 23.*

complicates microscopic examination. The presence of such patina suggests that numerous butchery marks may remain undetected. Where visible, the cut marks follow clear patterns associated with carcass processing: decapitation, disarticulation of major joints, and defleshing. They occur predominantly on long bones such as the humeri, femora, and tibiae, as well as on smaller elements such as phalanges. Cattle and deer bones exhibit the highest frequency of cutting traces. Additionally, several bones bear shallow, fine, and repetitive incisions characteristic of tool manufacture, indicating that selected skeletal elements were repurposed as raw material after primary butchering (fig. 14).

Only 14.29% of the bones were recovered intact, most of which are carpals, tarsals, and phalanges – elements belonging to group C that carry little or no meat. All remaining bones were intentionally fragmented during cooking and marrow extraction, as well as broken through food processing and consumption. Among the long bones, those of cattle show the highest degree of fragmentation, whereas in small ruminants, a limited number of complete forelimb elements (humerus and radius) were preserved, and in domestic pigs, mainly hind limb bones (tibia, femur, and metatarsals). The complete bones of these taxa generally belong to young individuals up to 1 year old.

Thermal alteration is another recurrent taphonomic feature, affecting approximately 70% of the assemblage. Most burnt bones exhibit dark brown coloration indicative of low-temperature heating around 300°C, typically associated with roasting rather than prolonged burning. About 13% display mixed color patterns – dark brown combined with black patches or mottled surfaces – suggesting exposure to fluctuating temperatures,

likely within domestic hearths or open fires. Only a small proportion reached higher thermal thresholds: around 1.6% of the bones are grey, corresponding to temperatures of roughly 400°C, while 0.43% are calcined white, indicating exposure to temperatures exceeding 500°C. These high-temperature alterations may reflect localized intense burning events, accidental structural fires, or secondary refuse practice. Overall, the combined evidence of cut marks, burning patterns, and bone fragmentation reveals systematic carcass processing, frequent heat exposure linked to food preparation, and taphonomic overprinting by strong patina. Together, these observations provide a nuanced understanding of the butchering practices, domestic activities, and depositional conditions that shaped the faunal remains at the site.

Description of the faunal remains by context

The distribution of faunal remains across the excavated area reveals clear spatial and contextual patterns. The highest concentration of animal bones was recorded in the west central part of the site, around houses 3 and 5, and near the ovens. Approximately 8% of all faunal remains come from this zone, which extends over squares J13–14, I12–15, H12–14, and G13–14 (fig. 15). The density of remains gradually decreases toward the periphery. This concentration, situated near the ancient bed of the Maritsa River, suggests that bones were likely discarded in or near the riverbed. The distribution pattern suggests that this area served as a butchering and meat-processing zone, where carcasses were dismembered, meat portions were distributed, and bones were subsequently broken for marrow extraction.

The largest concentration of animal remains is from the Neolithic deposits, which was recorded in a dense accumulation extending across squares G11–14, H11–14, I11–17, and J11–15 (figs. 15 and 16). This assemblage comprises 5,403 identifiable specimens. The species distribution mirrors that of the site as a whole, dominated by cattle, sheep, goat, and fallow deer. The location of this concentration – In a shallow depression between the houses and ovens – strongly suggests a specialized butchering area. Here, carcasses were processed, meat and hides removed, and bones broken for marrow extraction. The presence of numerous bone tools and preforms indicates that part of this material was subsequently reused for craft production. The body zones show a pattern in which zone A is predominant across all features and the layer. (fig. 16).

Additional faunal concentrations were identified near the ovens, within packed base deposits. A total of 207 identified elements belong to cattle, sheep, goats, fallow and red deer, roe deer, wild and domestic pigs, aurochs, and hares. The faunal composition and relative abundance of species correspond to the general pattern observed at the site, with cattle, sheep, and fallow deer predominating. The skeletal elements from all body regions are represented, with zone A elements being the most frequent.

Within the areas corresponding to houses, faunal remains are less numerous. House 3 produced 55 identifiable specimens, mostly from cattle, with smaller numbers of sheep, goat, pig, red and fallow deer, and roe deer. The bones represent all parts of the skeleton,

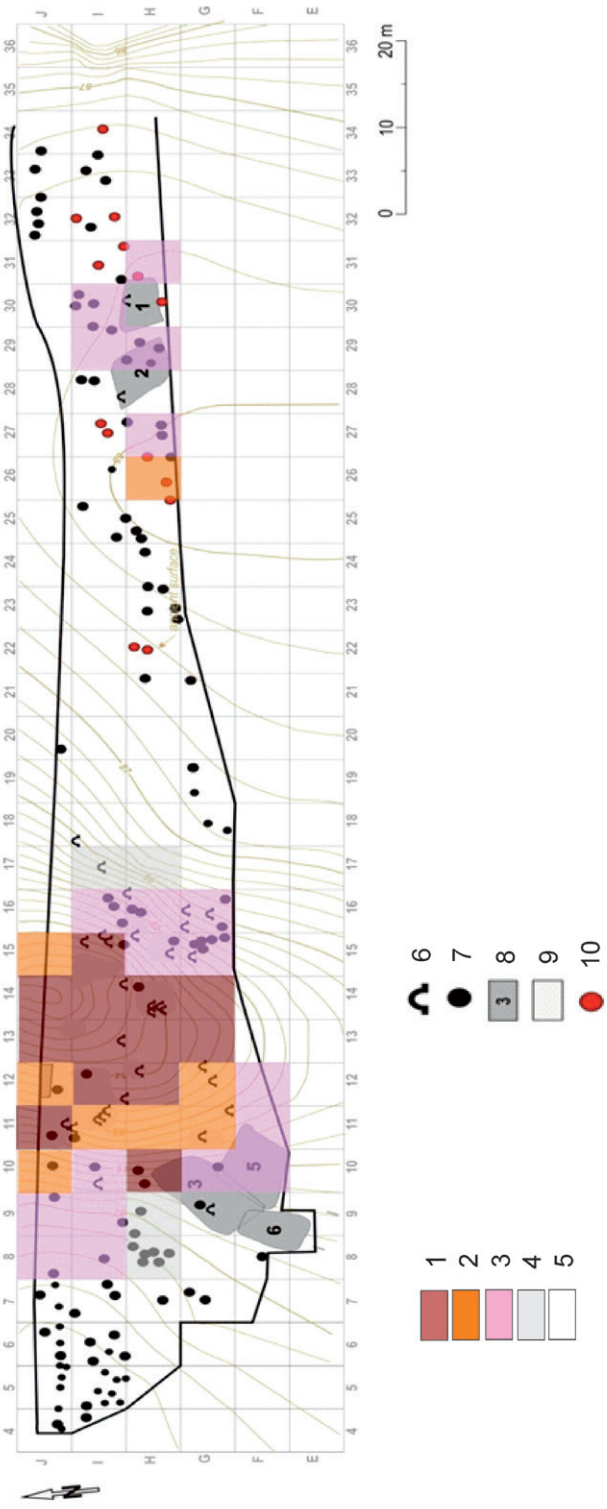


Figure 15. *Density map of animal bone concentrations (high–medium–low) overlaid on the excavation layout of Chavdarova cheshma. Key: (1) Concentration of animal remains ranging from 200 to 600 fragments per square (5x5m); (2) concentration of animal remains ranging from 200 to 100 fragments per square (5x5m); (3) concentration of animal remains ranging under 50 per square (5x5m); (4) concentration of animal remains ranging under 10 fragments per square (5x5m); (5) concentration of animal remains ranging under 5 fragments per square (5x5m); (6) fireplace; (7) Neolithic pits; (8) Neolithic structures; (9) clay platforms; (10) Chalcolithic pits. Image Credit: N. Karastoyanova.*

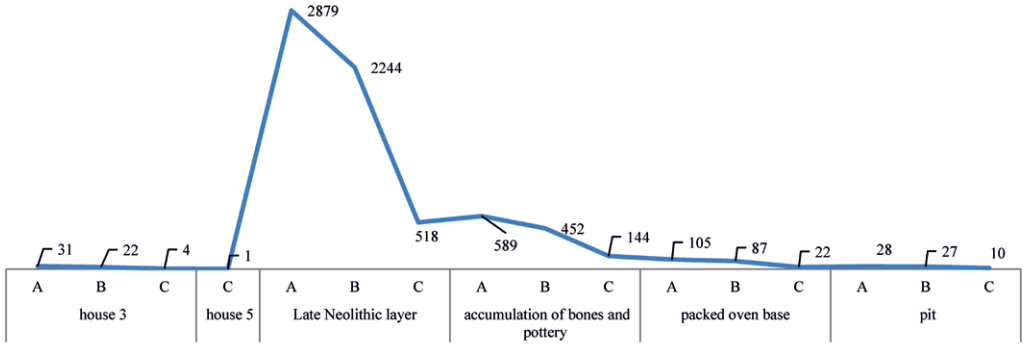


Figure 16. *Variation in faunal quantities by context and carcass part representation (Uerpmann A–C Groups) at Chavdarova cheshma. Image Credit: N. Karastoyanova.*

suggesting general domestic refuse rather than specialized activity. Most individuals were young or subadult. In contrast, house 5 yielded only a few highly fragmented bones, including a proximal phalanx of cattle.

Smaller clusters of bones were also identified in various pits across the settlement area. These contexts contained remains of both domestic and wild species. The faunal material from these pits is generally fragmentary and unevenly preserved. Some bones bear traces of low-temperature burning, around 300°C, while others show no thermal or cut marks. Several pits contained isolated, well-preserved elements, such as a complete roe deer tibia or phalanges of fallow deer, often from adult individuals. These scattered deposits probably represent secondary refuse from domestic activities or the disposal of butchering waste.

Another group of faunal remains was associated with daub pieces and structural debris. These deposits contained 22 identified bones, mainly from cattle and fallow deer, with additional remains of sheep, goat, pig, roe deer, and red deer. The assemblage consists largely of limb bones and mandibles, including a fragment of a fallow deer antler. All specimens are heavily fragmented, and a few display traces of burning.

In summary, the spatial and contextual distribution of animal remains at Chavdarova cheshma indicates intensive domestic processing and discard activities concentrated near the houses and ovens. The faunal material reflects multiple stages of carcass processing – butchering, marrow extraction, and raw material selection – suggesting that meat consumption, secondary product exploitation, and craft production were closely integrated in the daily life of the settlement's inhabitants.

Discussion

Although the sites differ not only chronologically but also in settlement type, their comparison remains valuable. Karanovo and Kapitan Dimitrievo are tell sites, Sarnevo and Kapitan Andreevo are pit sites, whereas Chavdarova cheshma is a dispersed flat site. Despite the chronological variation, all flat sites display settlement structures distinct from the tells.

In most cases, no clear above-ground buildings were identified; instead, a variety of dug-in features of different sizes and fills were recorded. Some researchers have suggested that the large cut features – often filled with burnt daub, hearth fragments, and broken vessels – represent the subterranean components of Late Neolithic houses. According to other scholars, however, such flat sites with numerous cut features were not settlements at all, but ritual complexes (pit sanctuaries), such as Lyubimets–Dana Bunar 2 (Nikolov et al. 2007), Kapitan Andreevo (Nikolov et al. 2014), and Sarnevo (Bacvarov et al. 2017, 17).

Comparison of the sites indicates a consistent tendency toward higher proportions of wild fauna in the assemblages of flat sites. This pattern contrasts to that observed at tell sites such as Karanovo (Ninov 2002, 181ff), Kapitan Dimitrievo (Ninov 1999, 134), and Yasa Tepe (Ivanov 1959, 83ff), where the percentage of wild species declines over time. In contrast, flat sites, including Chavdarova cheshma, Sarnevo, and Kapitan Andreevo show a marked increase in wild taxa, suggesting a broader shift in hunting practices and resource exploitation compared to Early Neolithic sites such as Yabalkovo (fig. 17; Spassov & Iliev 2015).

Even though Akladi cheiri is another flat site, it represents the only notable exception, with wild fauna comprising only about 11% of the total assemblage (cf. Spassov & Iliev 2021; these results are also based on an unpublished assessment of material, which was not included in the latter paper).

In terms of domestic species, the comparative evidence reveals a clear trend; the relative importance of cattle increases from the Early to the Late Neolithic, while the role of

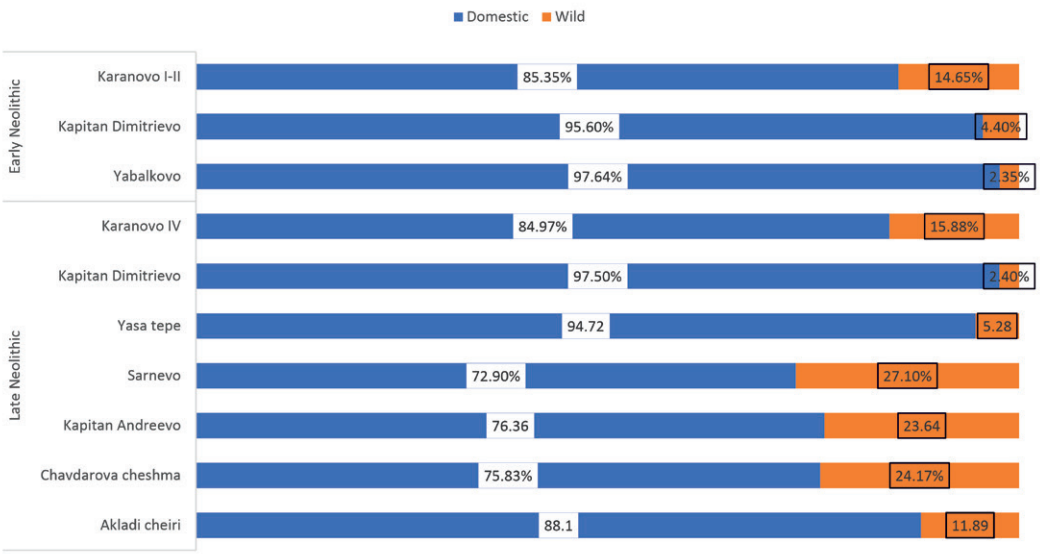


Figure 17. *Comparative proportions of domestic vs. wild faunal remains across selected Early and Late Neolithic sites in Bulgaria (Spassov & Iliev 2015; Ninov 1999 and 2002; Ivanov 1959; Spassov & Iliev 2021; Gorczyk & Karastoyanova, 2017). Image Credit: N. Karastoyanova.*

caprines diminishes (fig. 18). This shift may reflect climatic changes, evolving subsistence strategies, or broader socio-economic transformations within Neolithic communities.

The comparison of caprine kill-off patterns between Kapitan Andreevo and Chavdarova cheshma reveals two distinct herding strategies. At Chavdarova cheshma (red line), the curve declines very steeply after the 0–2 and 2–6 month age classes, indicating intensive early slaughter and a management system focused primarily on meat production. Only a small proportion of animals survive beyond one year, and very few reach older age categories. In contrast, Kapitan Andreevo (orange line) shows a much more gradual decline, with noticeably higher percentages of individuals in the 3–4, 4–6, and 6–8 year classes. This pattern reflects a husbandry system oriented toward secondary products, in which animals are kept longer for milk, wool, and reproduction. The same situation was observed in the kill-off pattern for Sarnevo (Gorczyk & Karastoyanova 2017, 525). The differences suggest that while Kapitan Andreevo and Sarnevo maintained more stable, multi-purpose herds, Chavdarova cheshma relied heavily on rapid turnover and meat-oriented exploitation, likely shaped by the site's economic and functional role within the wider Late Neolithic landscape (fig. 19).

In the Early Neolithic assemblages (Yabalkovo, Karanovo I–II, Kapitan Dimitrievo), red deer dominate, typically accounting for 20%–33% of all wild species. Roe deer

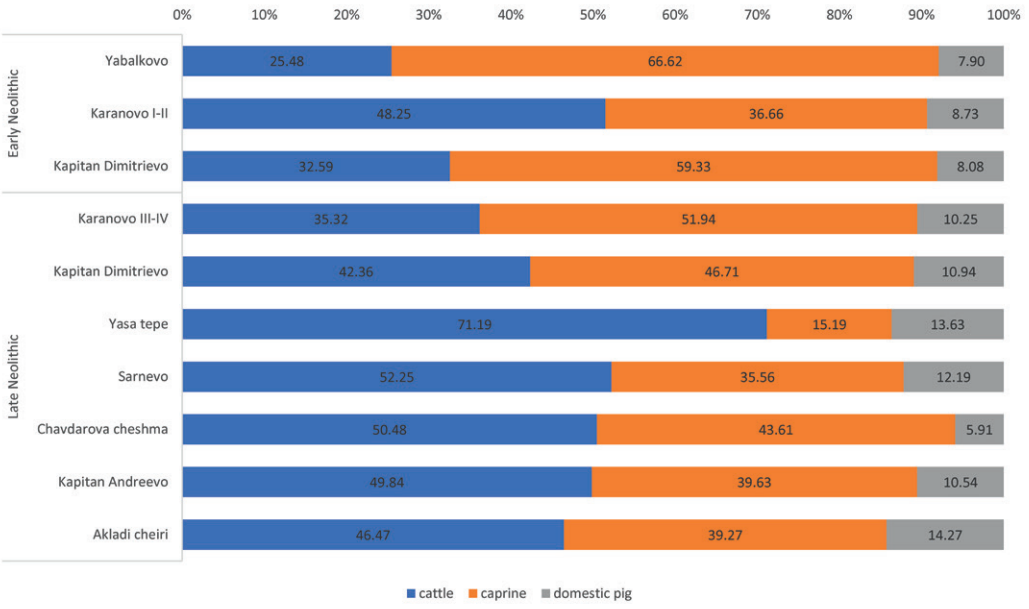


Figure 18. *Comparative distribution of major domestic taxa (cattle, caprines, domestic pig) across selected Early and Late Neolithic sites in Bulgaria (Spassov & Iliev 2015; Ninov 1999 and 2002; Ivanov 1959; Spassov & Iliev 2021; Gorczyk & Karastoyanova, 2017). Image Credit: N. Karastoyanova.*

and wild boar occur in moderate proportions, while fallow deer are either absent or minimally represented. The predominance of red deer in these sites reflects the exploitation of mixed woodland environments typical of the early Holocene landscape in Upper Thrace.

A notable shift emerges during the Late Neolithic at flat sites. Sites such as Kapitan Andreevo, Chavdarova cheshma, Akladi cheiri (Spassov & Iliev 2020), and Sarnevo show a dramatic rise in fallow deer, in some cases exceeding 50%–60% of the wild assemblage (e.g., Sarnevo). This pattern is consistent with the species' known ecological preference for mosaic 'parkland' habitats and its restricted natural distribution in southeast Bulgaria during prehistory. The strong representation of fallow deer at multiple Late Neolithic sites suggests either intensified hunting pressure, deliberate targeting of this species, or increased local population densities (fig. 20).

The Maritsa River – which was navigable until the nineteenth century – and its tributaries would have facilitated easy contact between Thrace and the neighboring regions, including the Aegean coast. The excavation at Chavdarova cheshma has revealed an unusual situation; around 80% of all faunal remains (both domestic and wild) were concentrated within a relatively small area of about 500 m² (approximately 27% of the area excavated in 2014–2015). This zone lies on the slopes of an ancient gully dividing the two river terraces on which the settlement was located, precisely where an exception-

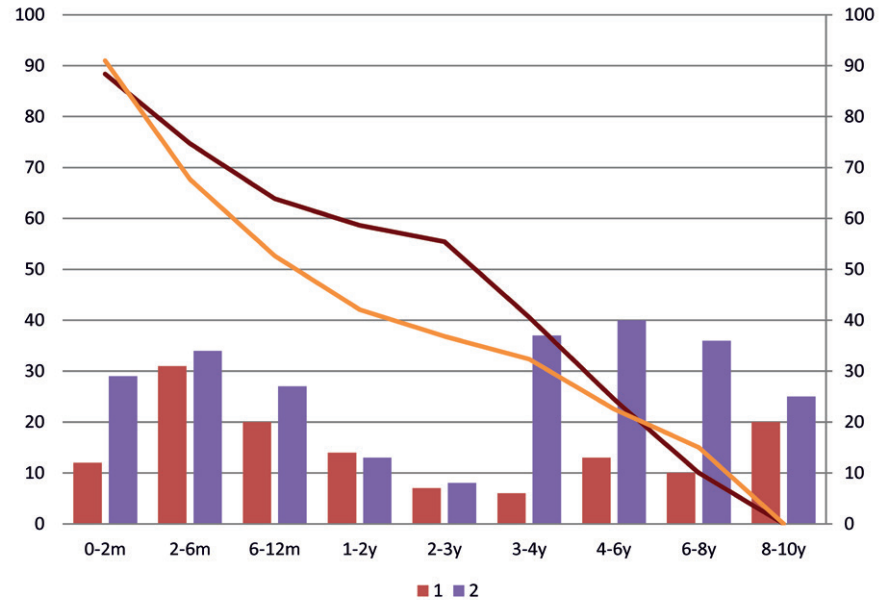


Figure 19. *Kill-off patterns of caprines at Kapitan Andreevo and Chavdarova cheshma based on Payne's (1973) method. Key: (1) Chavdarova cheshma; (2) Kapitan Andreevo. Image Credit: N. Karastoyanova.*

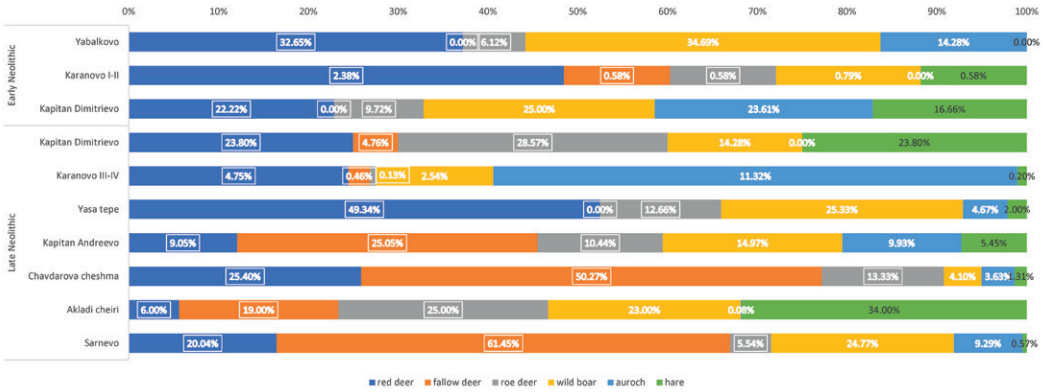


Figure 20. *Comparative distribution of wild fauna (red deer, fallow deer, roe deer, wild boar, auroch, hare) across Early and Late Neolithic sites in Bulgaria (Spassov & Iliev 2015; Ninov 1999 and 2002; Ivanov 1959; Spassov & Iliev 2021; Gorczyk & Karastoyanova, 2017). Image Credit: N. Karastoyanova.*

ally dense cluster of ovens was documented – 29 in total (cf. fig. 5). Several ovens show multiple resurfacing episodes, indicating long-term and intensive use (cf. fig. 6). Thermal alterations observed on the bones confirm food preparation activities. Although ovens were also found inside houses, cooking appears to have been concentrated outside, in this restricted and rather difficult-to-access location on the steep slopes.

Two explanations are possible. The first relates to the availability of running water. It is likely that in the Neolithic, a stream flowed through the gully into the Maritsa (cf. fig. 3). The area lies adjacent to the river, and today a large spring still issues at the base of the second terrace (cf. fig. 1). Such water sources would have been indispensable for slaughtering, butchering, and washing meat before cooking.

The second explanation concerns the unusually high number of ovens. Where the gully met the Maritsa, the erosion created a small, sheltered inlet with a gently sloping, sandy bank, unlike the steep riverbanks typical of the terrace edges. This location would have been ideal for docking vessels such as boats or rafts. Evidence for contact with the Aegean coast includes shells of marine mollusks (fig. 21), fragments of a Mediterranean Sea mollusk (Cerithium sp.), and ceramic sherds decorated in the Akropotamos style, previously unknown in the region. These finds support the hypothesis that in the Late Neolithic, the Maritsa functioned as a transport corridor linking Thrace to the Aegean.

In this context, Chavdarova cheshma may have served as a kind of river station or stopping point for travelers navigating the river. The sheltered inlet could have acted as a landing place known to boatmen and merchants. Visitors could rest, eat, and perhaps stay overnight, possibly offering goods or services in exchange. The local population evidently had the capacity to supply large quantities of meat, not only for their own needs but also for travelers.

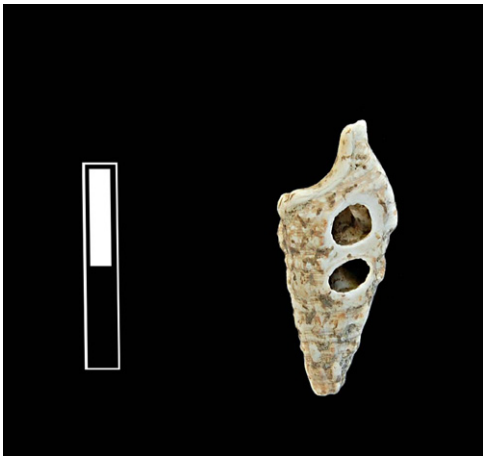


Figure 21. Shell of a marine Mediterranean mollusk (Cerithium sp.) drilled for use as an ornament. Image Credit: Y. Boyadzhiev.

Such a hypothesis may initially appear speculative, but the continually accumulating archaeological and interdisciplinary evidence increasingly suggests that life seven millennia ago was more complex and interconnected than previously believed.

Conclusion

Chavdarova cheshma is a flat Late Neolithic settlement site situated on the Maritsa River. The site yielded a large assemblage of animal remains from both domestic and wild species, most of which reflect food waste associated with butchering, processing, and cooking activities. These activities appear to have taken place outside the houses, primarily around the numerous ovens concentrated on the slopes of the ancient gully.

Among the domestic animals, cattle dominate overwhelmingly, indicating that bovine husbandry played the most important role in the subsistence economy. Sheep and goats are also well represented, while domestic pig appears in smaller quantities. Dog remains, in contrast, occur in negligible numbers and likely reflect the presence of small-sized domestic dogs rather than any substantial economic role. Kill-off pattern analysis shows that most domestic animals were slaughtered at ages optimal for meat production, indicating that livestock at Chavdarova cheshma was raised primarily for meat rather than for secondary products such as milk or wool.

The exceptionally high proportion of fallow deer (*Dama dama*) is particularly noteworthy. At Chavdarova cheshma, this species surpasses red deer (*Cervus elaphus*), which is otherwise the most characteristic wild ungulate in prehistoric assemblages from Bulgaria. This pattern suggests that fallow deer played a significant role in local hunting strategies and that the surrounding environment supported habitats favorable to this species.

The spatial distribution of faunal remains – densely clustered around the spring, riverbank, and concentrations of ovens – indicates that this area functioned as a butchering and cooking zone. Its location at the interface between the terraces and the ancient bed of the Maritsa River raises the possibility that food processing was also connected

to river-based mobility and exchange. The presence of imported marine shells and Aegean-type painted pottery further supports the interpretation that Chavdarova cheshma may have operated as a small riverine waypoint where groups traveling along the Maritsa could stop, obtain supplies, rest, and engage in local exchange.

Overall, the zooarchaeological evidence reveals a settlement with a well-developed meat-based subsistence economy, integrated into broader regional networks of movement and communication in the Late Neolithic.

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New radiocarbon dates for the Chalcolithic and Bronze Age at Drama, southeast Bulgaria

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Abstract

I discuss here radiocarbon dates from the sites of Drama–Merdzhumekya and Drama–Kayryaka that were obtained after 2011. The ^{14}C dates from Merdzhumekya were measured on charred plant remains from cultural deposits in the structures 006A and 041, which were dated in the final publication to the Early Chalcolithic (Karanovo V). In the case of structure 006A, the radiocarbon ages correspond to the expectations. The sample from structure 041 however, obviously comes from a much later feature dating to the second millennium BC. A connection between it and the nearby Bronze Age enclosure 009 cannot be ruled out. Particularly important are the dates from enclosure 009 itself. They are earlier than expected and fall in the first half of the third millennium BC, corresponding to the Early Bronze Age 2 period (EBA 2) or even earlier. That contradicts the typo-chronological approach to the pottery found in the ditch fill and affects all previous interpretations on chronology and cultural connections related to the enclosure. However, the dating results fit well into the emerging broader picture of the Bronze Age enclosures in Thrace. In contrast to previous interpretations, the Merdzhumekya enclosure was probably used and maintained for a long period of time. The Bronze Age grave 27 at Kayryaka can be dated to the very end of the third millennium BC, i.e., the transition from the EBA 3 period to the Middle Bronze Age (MBA). This result narrows previous estimates based on ceramic typology.

Keywords: *Drama – Merdzhumekya – Kayryaka – Karanovo V – EBA 3 – MBA – ritual enclosure.*

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Background of research

In 1983, a joint Bulgarian-German research project was launched to explore archaeological sites in the middle Kalnitsa River Valley, near the village of Drama. The excavations were carried out without interruption until 2002 (Fol et al. 1989; Lichardus et al. 1996, 2000, and 2003; Echt 2008) and were directed by Jan Lichardus (Saarland University, Saarbrücken) and Iliya Iliev (Yambol Regional Museum of History). In the 1980s, the excavations were focused on a small, stratified 'tell settlement' atop a flat natural elevation called Merdzhumekya, and on a flat site in the nearby Gerena locality. Both sites were located at the bottom of the valley near the modern bed of the Kalnitsa River. Gerena yielded features and finds dating back to the Late Neolithic (Karanovo III and III/IV). The settlement remains on top of Merdzhumekya can be dated to the Karanovo V and the very beginning of the Karanovo VI period (Early and Late Chalcolithic). As early as 1983, a much later feature was uncovered at Merdzhumekya, which is one of the main focuses of this paper: the circular enclosure 009, initially dated to the MBA. In the early 1990s, the southern and eastern slopes of the Kalnitsa Valley were increasingly included in the research efforts. At the southern edge of the valley, a long-used ritual site was discovered in the Kayryaka locality. The following multi-year excavations yielded two Bronze Age graves, one of them also being part of this study (grave 27), an Iron Age pit field, and a Roman-period cemetery with flat graves and at least one burial mound.

No comprehensive final publications are available for any of these sites. Moreover, for two decades, radiocarbon dating has never been the main research target at Drama. For the first time in 1999, a total of 48 samples were selected for measurement consisting of faunal remains (studied by Norbert Benecke) and wood from features at Gerena and Merdzhumekya. These materials were analyzed at the former ^{14}C laboratory of the German Archaeological Institute in Berlin directed by Jochen Görsdorf. It turned out that only six of the 48 samples were in a state of preservation that enabled ^{14}C dating. The reason for this was the low collagen content of the bones. Similar problems arose with the preservation of the wood samples. When the material had been processed, the carbon contents in almost all cases were too low to enable reliable measurements. Therefore, after the end of the 2002 field season, only these six radiocarbon dates were finally available from the two decades of investigations. This situation changed in the next decade. In 2006, fourteen animal bones were selected for measurement as part of a project on the chronology and periodization of the Karanovo VI settlement site at Merdzhumekya (directed by Rudolf Echt) funded by the German Research Foundation. The measurements were carried out at the former AMS laboratory of the University of Erlangen directed by Andreas Scharf. Between 2008–11, further funding from the German Research Foundation enabled the publication of the excavation results at the southeast slope of Merdzhumekya (directed by Ralf Gleser). A total of 21 samples were selected in 2009 and 2011 and submitted for measurement to the lab in Erlangen. They were animal bones from the Late Chalcolithic and the earliest Bronze Age (or the so-called 'transitional period', i.e., Cernavodă III)

settlement remains discovered at the southeast slope of Merdzhumekya, as well as animal bones from cultural deposits atop that hill. Combined with the Berlin dates, these radiocarbon measurements were discussed in detail in two publications (Gleser 2011; Gleser & Thomas 2012, 283ff). The dates of the Chalcolithic were as expected. Those of the Cernavodă III period, however, were something completely new that partially closed the wide gap that had previously divided the Final Chalcolithic and the beginning of the EBA (i.e., EBA 1 or the Ezero stage) in Upper Thrace.

After 2011, further radiocarbon dates of a limited number became available thanks to funding from the German Research Foundation and the University of Münster. In particular, the evaluation of plant remains from the Bronze Age enclosure 009 on Merdzhumekya by Elena Marinova-Wolff provided an opportunity for this at the *Social Dimensions of Food in the Prehistoric Balkans* conference in Heidelberg in 2015. However, the radiocarbon dates could not yet be considered in the publication of the results based on the archaeobotanical research (Gleser & Marinova 2018). They are presented in this contribution. As a monograph on the burials at Kayryaka including the charred plant remains analyzed by Elena Marinova-Wolff is nearing completion (Gleser & Hessel 2026), the radiocarbon dating has also become possible for graves of that site. In what follows, the date of the Bronze Age grave 27 is presented here. Two further dates, of an Early Iron Age and a Roman period burial will be published in the monograph announced.

Merdzhumekya

Overview of the Chalcolithic settlement site

At Merdzhumekya, on an area of about 13,000 m², several settlement phases were unearthed on top of each other protected by a circular ditch enclosure (feature 360). All in all, the remains of more than 60 houses from the Early Chalcolithic (Karanovo V; cf. Fecht 2016) and at least 25 houses from the Late Chalcolithic (early Karanovo VI) were excavated and recorded. Radiocarbon dates set the beginning of the Merdzhumekya settlement around the 48th or 47th century cal. BC (Gleser 2011; Gleser & Thomas 2012, 285, fig. VIII/2). It existed without interruption until the 44th century cal. BC, at the very least. The settlement seems to have been abandoned after the mid-fifth millennium, at the time of the second phase of the Karanovo VI period. However, house remains of this phase that had initially been present at Merdzhumekya were completely eroded. Their ruins were only found in the upper filling of the Chalcolithic ditch 360 and in the colluvial soils at the foot of the hill to the southeast. Loss of cultural deposits of unknown thickness on top of the hill in the last millennia had therefore to be presumed. The still preserved structures and cultural deposits of the early Karanovo VI were badly affected by erosion, burrowing animals, and modern agriculture. The settlement layers and organic materials of the Karanovo V period were much better preserved.

New radiocarbon dates from the Chalcolithic settlement site

In his dissertation on the Early Chalcolithic settlement site at Merdzhumekya,

Frank Fecht (2016, 32) demonstrated that the Karanovo V period structures had been arranged in two different spatial patterns and that both represent several stages in the settlement's development. A concentration of buildings in the center consists of 29 houses that were built close together and partially overlapped each other. There, he identified five stages of construction (Fecht 2016, 175ff, fig. 80). This central concentration was surrounded by a peripheral rectangular belt consisting of 31 houses (fig. 1). Nor were all these structures in contemporaneous use, too. Overlaps which are best recorded at the western corner of the exterior structure belt indicate a multiphase development. This settlement pattern seems to have been maintained during the Karanovo VI period (Lichardus et al. 2000, 51, fig. 19; 2004, 41, figs. 4 and 5). In 2012, three more samples from the Merdzhumekya settlement site were measured at the AMS lab of the University of Erlangen. The resulting dates on charred plant remains supplement the series of radiocarbon dates already published in the 2012 monograph by Gleser & Thomas. Two of them (Erl-16665 and Erl-16666) were already mentioned by F. Fecht (2016, 244). They are connected to the structure 006A which belongs stratigraphically to the second stage of the central building concentration atop the hill. Sample Erl-16665 consisted of cereal grains that were recovered in 1984 next to the thermal installation 013 in sector G09, at a depth of 1.31 m BD (cf. Fecht 2016, 245). Sample Erl-16666 consisted also of cereal grains that were found in 1985 in sector H09, ca. 3 m to the east and 3 m to the north, at a depth of 1.25 m BD. According to F. Fecht, that area and the sample were also connected to the building 006A. In this case, however, the spatial correlation can only be described as a conjecture. Nevertheless, both measurements correspond to each other (table 1) and they also fit well into the series of dates already available from Merdzhumekya, all of them on animal bones. The results also meet expectations regarding the absolute chronology of samples from the Karanovo V period or the 'Maritsa culture' in Upper Thrace that can be dated to approximately between the 49th and the 47th century BC (Krauß 2008, 140, fig. 45; 2020, 36, fig. 7). However, the number of radiocarbon dates from the central structure concentration at Merdzhumekya with its stratigraphical overlaps is too small to allow further conclusions to be drawn through statistical modelling.

The third sample submitted to Erlangen in 2012 (Erl-16667) does not fit into the range of what would be expected for the Chalcolithic. Obviously, it is related to a period that is usually difficult to grasp in Upper Thrace. This is the MBA, i.e., the first half of the second millennium BC. The sample material (remains of a short-lived plant) and its ^{13}C content suggest reliability of the dating result. The plant remains were uncovered in 1988 during the excavation of a feature initially related to a structure labeled as 014, at the western edge of the built-up area of the settlement, and conceived as belonging stratigraphically to the Karanovo VI period (Lichardus et al. 1996, 16, fig. 3; 2000, 51, fig. 19). According to the field records, the material was collected when digging a feature labeled as 'posthole P1' in sector E11. After a re-evaluation of the initial documentation, the feature was finally classified as 'P041/10', i.e., postpit 10 in the structure 041 of the Karanovo

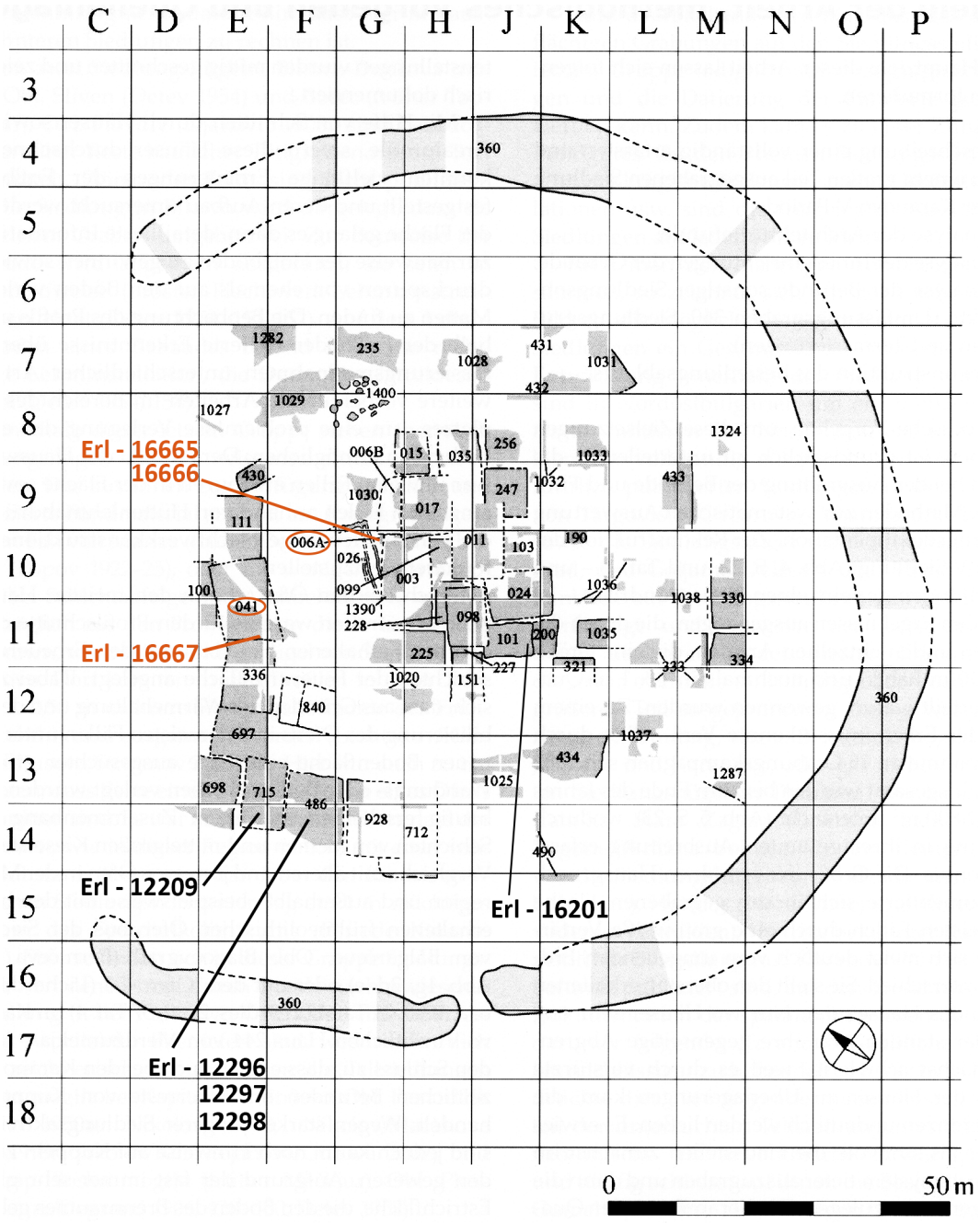


Figure 1. *Layout of the Early Chalcolithic structures and ditch 360 at Drama–Merdzhumekya showing the houses, from which were taken samples for radiocarbon dating (cf. Gleser 2011; Gleser & Thomas 2012, 286ff). The dates discussed in this article are marked in red. Image Credit: Fecht 2016, 22, fig. 4, and the author.*

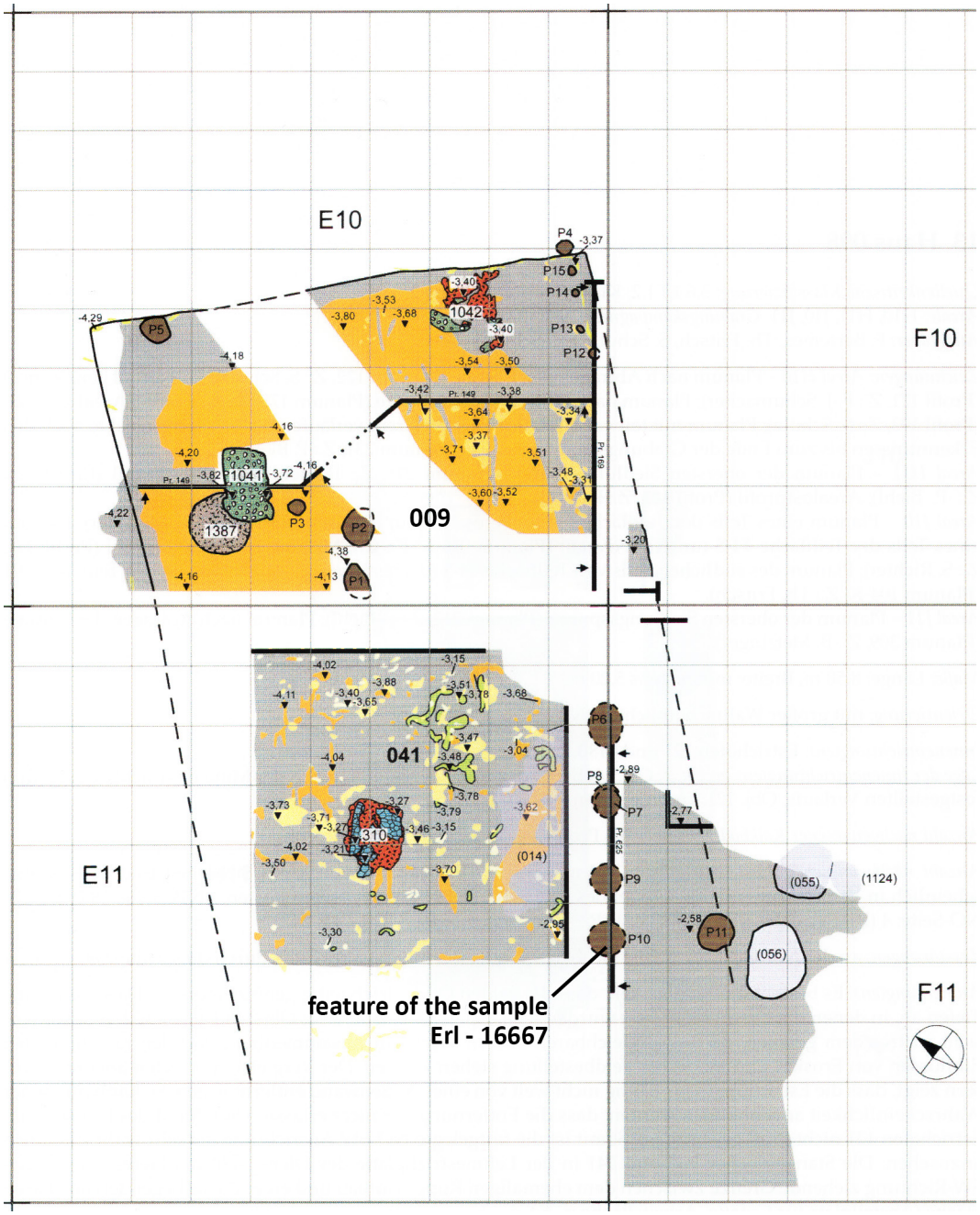


Figure 2. *Layout of structure 041 at Drama–Merdzhumekya. The feature labeled as P10 is shown that yielded the sample of barley grains. Image Credit: Fecht 2016, 269, and the author.*

V period (Fecht 2016, 268). The location of this feature in the area of the structure 041 is shown in figure 2. The northern and eastern area of the structure 041 was truncated by the enclosure 009. Feature P10 is located nearby the ditch, ca. 3 m from its southern edge, and was recorded together with other pits that form a row. The radiocarbon date indicates activities in this area of the settlement during the MBA. P10 could thus belong even to several pits within or the outside the enclosed area that were already dated to the MBA at the time of excavation (Bertemes 2002, 131, fig. 5).

Lab code	Material	PMC	PMC error	^{14}C age BP	Delta C13	^{14}C age cal. BC (2σ)
Erl-16665	charred grains (*Hordeum vulgare*)	48.84	0.39	5756±65	-23.5	4780–4753 (2.3%) 4728–4452 (93.2%)
Erl-16666	charred grains (*Hordeum vulgare* and *Triticum*)	48.74	0.41	5774±67	-22.4	4786–4488 (93.3%) 4476–4458 (2.2%)
Erl-16667	charred seeds (*Vicia ervilia*)	66.54	0.47	3273±57	-22.9	1687–1427 (95.4%)

Table 1. *List of radiocarbon dates from Drama–Merdzhumekya measured at Erlangen in 2012. The 2021 version of OxCal v4.4.4 program was used for ^{14}C age calibration applying the IntCal 20 calibration curve (Reimer et al. 2020).*

Overview of enclosure 009

Enclosure 009 consisting of a single circular ditch with a diameter of nearly 40 m and the contemporaneous structure 370 were unearthed on top of the Merdzhumekja hill and on its northwest slope. More MBA features were discovered sporadically at the tell site, including remains of a palisade that stretched along the foot of the hill (Bertemes 2002, 125, fig. 2). However, due to erosion, it is no longer possible to determine whether Merdzhumekya was regularly occupied in the MBA or not. Between 1984 and 1986, ditch 009 was completely excavated and recorded under the direction of François Bertemes who submitted a habilitation thesis on the subject at the Saarland University in 1997 (Bertemes 1997 and 1998). Due to erosion, the width and depth of the ditch varied considerably. The depth was up to 3 m at the highest point of the slope and 1.20 m at the lowest. Neither were there remains of an accompanying rampart or palisade nor evidence of a gate structure. In the highest area of the elevation, a single interruption of the ditch provided access to the interior. Several pits were found inside and outside the enclosed area that were probably contemporaneous to the circular ditch (Bertemes 2002, 131, fig. 5). During the excavations, the 'negative' digging technique for cuts was practiced: the fills were removed by following the natural configuration of the layers whenever possible. To obtain transverse sections, baulks were set up at regular intervals. Longitudinal sections were not recorded. A total of 56 cross-sections were recorded. Several phases of digging

and filling were identified. The following four layers were distinguished throughout the entire feature (from top to bottom): a, bc, d1, and d2. In terms of color and compactness, further differentiation was possible. Two more layers, e and f, were only identified at some spots at the bottom of the ditch. With exception of layer bc and the lower part of layer a, the sediments resulted from natural filling processes of seasonal erosion caused by wind and rain. The sediments of layer bc and the lowest a (a6) appeared to be mostly very coarse, and they contained, among others, debris of burnt daub, charred plant remains, and rocks that had been exposed to fire. These layers were interpreted as the result of final activities related to an intentional filling of the ditch. The time interval between these events and the digging of the ditch or the timespan of its primary use as a cut feature remained undetermined.

According to F. Bertemes, a detailed analysis of the preservation of artifacts in the ditch fill and their find contexts made it possible to distinguish between intentionally deposited objects and discarded items or refuse (Bertemes 1998, 324). The intentionally deposited objects included, for example, pottery vessels found individually or in associated groups at the base of layers bc and a, as well as associated groups of loom weights, spindle whorls, and perforated pottery sherds. Many artifacts ended up in the ditch with the burnt debris from layer bc, what was recorded in numerous drawings of layouts and cross-sections. These include fragments of 'life-size' ceramic figurines of humans and animals as well as clay bins (unfortunately never published), pottery sherds, faunal remains, and so on. These objects were found in obvious concentrations. Deposits were usually identified left and right of the entrance, and east, west, and north of the enclosure (Bertemes 2002, 128f, figs. 3 and 4; 2019, 116, fig. 2). Packed layers of rocks and daub pieces covered the depositions. Artifacts of an earlier date were usually found in the ditch fill mainly where it cut Chalcolithic and later cultural deposits; they were intrusive due to the erosion of its sides. The single radiocarbon date available for enclosure 009 so far (Bln-5116) was measured on a bone recovered from sector H08 at the level of layer b. It falls in the Cernavodă I period of the early fourth millennium BC and thus demonstrates that layer b was mixed with earlier materials (Gleser 2011, 191f). According to F. Bertemes, only 13% of the material found in enclosure 009 proved to be from the Bronze Age at all.

The circular enclosure was interpreted as a sanctuary, and there are several Thracian parallels to its constructional concept (Bertemes 1998, 2002, and 2019; Nikolova 2021). The well-preserved vessels were interpreted as offerings containing liquids and food. The botanical investigations support this suggestion in some cases. Inside some vessels, very pure concentrations of seeds were found confirming the hypothesis that it might have been food offerings. However, only a small selection of artifacts was published in the preliminary reports on the Drama excavations. These are mainly well-preserved ceramic vessels and a few loom weights. They all originate from layers bc or a. A schematic representation of the distribution of published vessels found in the ditch fill is shown in figure 3; they were found in sectors F07, F11, G07, and H09.

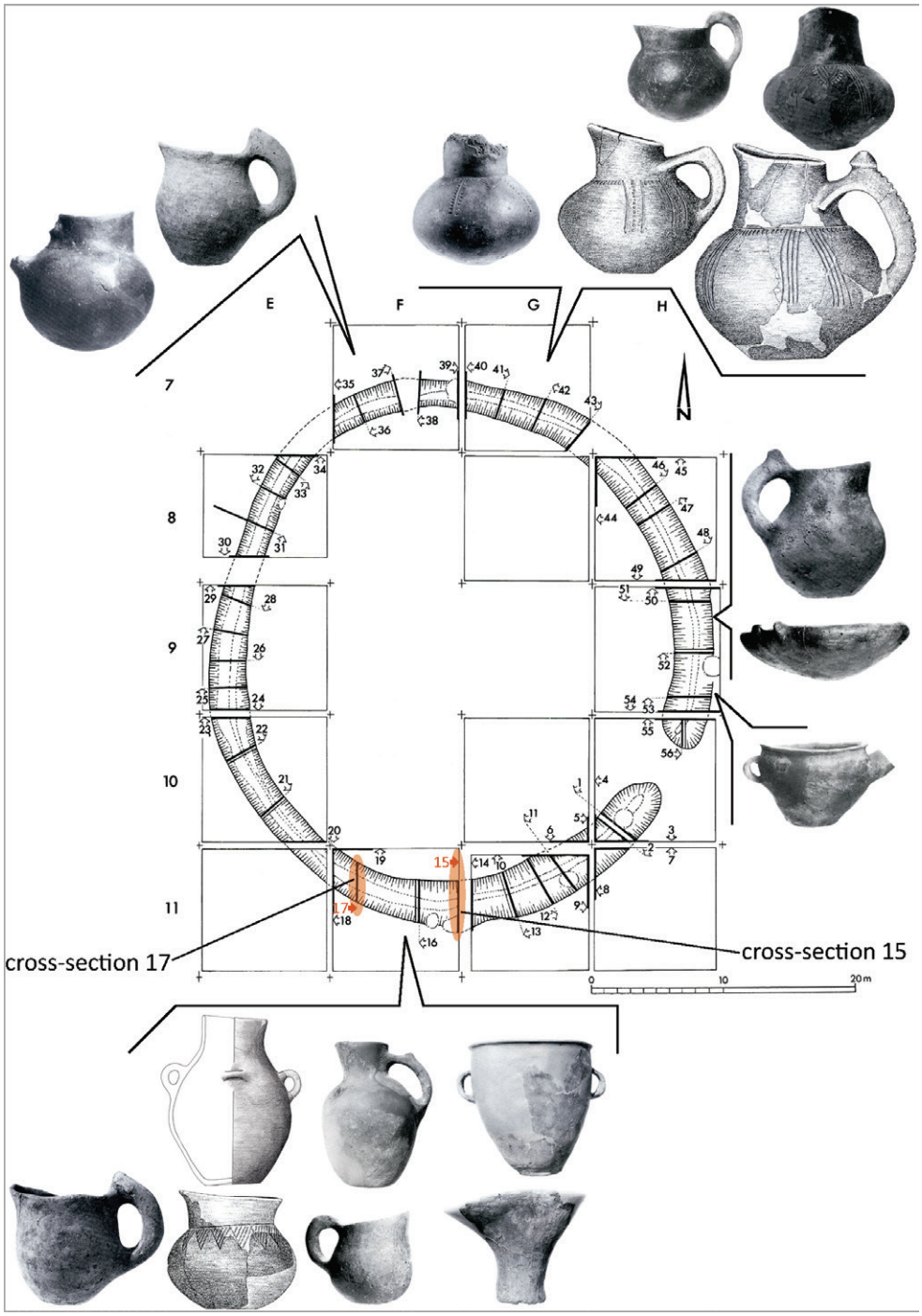


Figure 3. *Spatial distribution of published vessels from enclosure 009 at Drama–Merdzhumekya. Cross-sections 15 and 17 are marked in red (cf. figs. 6 and 7). Image Credit: Fol et al. 1989, Gleser & Marinova 2018, and the author.*

Terminology and dating of enclosure 009

In the 1980s and 1990s, the pottery vessels discovered in the fill of the enclosure 009, i.e., in layers bc and the lowest a, were compared generally to ceramics from Nova Zagora, Dyadovo, Yunatsite, Sveti Kirilovo, and Veselinovo (Fol. et al. 1989, 32). Although there were numerous indications of renovations along the ditch course and in the fill, its use has always been considered to have been limited to a short period of time. Based on typological criteria, the artifacts were considered to be later than the materials excavated at Tell Ezero and earlier than those from Tell Galabovo. F. Bertemes (1997, 326, fig. 2) synchronized the ceramics mainly with those from building levels 3 to 1 at Tell Nova Zagora. Therefore, enclosure 009 was initially dated to an early MBA phase or the so-called 'Nova Zagora culture', in accordance to the terminology of Rumen Katincharov. Since R. Katincharov (1991, 98; cf. Leshtakov 2015, 15) – the excavator of Tell Nova Zagora and at the time the biggest authority on the Bronze Age in Thrace – drew parallels between Nova Zagora in south Bulgaria and layers Troy III to V/VI, and synchronized the latter with the Middle Helladic I period in Greece, this is the explanation not only for Katincharov's use of the term MBA in relation to Nova Zagora in Thrace but also for its use by the excavators in Drama. Although seen as parallel to Troy III to V, too (Fol et al. 1989, 88, fig. 29), the latter nevertheless drew parallels to the Early Helladic II and III periods (EH II and III; Lichardus et al. 2004, 51; Echt 2008, 240).

According to the terminology commonly used for Bulgarian Thrace today, the 'Nova Zagora culture' is no longer referred to. The respective finds from Tell Nova Zagora are now dated to the EBA 3 (or Sveti Kirilovo) period of the second half of the third millennium BC, while the building levels 9–5 at Tell Ezero are dated to the EBA 1 and 2 periods; these terms were introduced by Krassimir Leshtakov (1993a and 2015, 12ff) in the early 1990s during his research at Tell Galabovo. Based on the now numerous radiocarbon dates, the EBA 3 is set between 2500/2400 and 2100/2000 BC (Alexandrov 2020, 251, fig. 1; Tsirtsoni 2021). According to this terminology and keeping in mind the absolute dating of the EH II and III periods in the Aegean between ca. 2700–2000 BC (cf. among others Shelmerdine 2008, 4, fig. 1/1), the enclosure at Drama would also date to the EBA 3. Various authors have already taken it into account and implemented it (e.g., Leshtakov 1996, 425 and 2021, 17; Gleser 2011, 191; Gleser & Marinova 2018; Bertemes 2019, 101; Nikolova 2021, 129). However, since the EBA finds from many tell sites in Upper Thrace have not been thoroughly published – and this applies to Nova Zagora in particular – and the eponymous tell site at Kirilovo is greatly underresearched, it's difficult to attempt at synchronizing the finds from Drama to EBA 3 sites in Upper Thrace. It should be noted that Tell Galabovo shows continuous settlement life throughout the EBA 3 and the next period; in this respect, this is the only tell site in Upper Thrace for the time being (Leshtakov 2002, 2015, and 2021, 14/20). The uppermost building levels 3 to 1 are attributed to the MBA *stricto sensu*, that is estimated to have begun at the very end of the third millennium BC (Tsirtsoni 2021, 244).

The published artifacts from Drama may be slightly later than were initially dated by F. Bertemes, especially compared to the pottery assemblages from Tell Galabovo. As early as 1993, K. Leshtakov (1993b, 210/219) pointed out stylistic similarities between ceramics from building level 2 at Galabovo and the circular enclosure at Drama. Thanks to the very good publication record, such stylistic parallels can now be demonstrated even for building levels 5 to 1 at Galabovo (figs. 4 and 5). In terms of shape and decoration, nearly all published vessels from Drama show significant parallels in the late EBA 3 and the MBA layers of Tell Galabovo (cf. Leshtakov 2015, figs. 13–34). This applies to both decorated and undecorated jugs (figs. 4 and 5/2) as well as to a bowl (fig. 5/4), a spouted bowl (fig. 5/6), a funnel (fig. 5/8), and a two- handled jar (fig. 5/10). However, bottles or 'amphorae' also appear in ditch 009 (fig. 5/1) that have no parallels at Galabovo. To my knowledge, they are rare even in Upper Thrace, Turkish Thrace, and the neighboring regions. They are undecorated but feature two handles placed horizontally facing each other at the shoulder in combination with oblong horizontal knobs or vertical handles. Bottles also appear with four vertical handles (cf. Fol & Lichardus 1988, 249, cat. No. 153 and fig. 188).

Two samples on charred plant remains from ditch 009 were measured in 2016 at the radiocarbon lab of Beta Analytic Inc. in Miami, Florida (table 2). In order to avoid the problem of earlier intrusions as far as possible, samples were selected that could be firmly related to the ditch fill's anthropogenic deposits. One sample (Beta-838401) consisted of *Lallemantia iberica* seeds, an oil plant that apparently originated in Anatolia and areas further east and was spread throughout the Aegean and the Balkans in the Bronze Age (Gleser & Marinova 2018, 241f). A lump of ca. 40 recognizable seeds and several fragments were stored in the bottle shown in figure 5/1 (cf. Gleser & Marinova 2018, 241, fig. 14/5). The bottle was found in 1988 during cleaning of sector F11, 8.28 m north of the western cross-section of this sector, 3.36 m BD, in the contact zone of layers a and b (Bertemes 1997, 546, list 6). There is no doubt about the intentional deposition of the bottle in the ditch.

The second sample (Beta-838402) consisted of charred barley grains recovered from sector F11 in 1984, 2.50 m BD. To illustrate the find context, figure 6 shows a drawing of cross-section 15, which is the eastern cross-section of sector F11. Based on the level of sampling, it is obvious that the barley grains come from the lower part of layer a, where debris of burnt daub and rocks was concentrated. The grains seem to have ended up in the fill together with these materials, which suggests stratigraphical correlation and thus temporal connection between them. The barley grains were found ca. 0.80 m higher but obviously in the same anthropogenic deposits as the bottle, which was uncovered somewhat further west. The elevation difference could be explained by the slope of the terrain, which is between 10 and 12%.

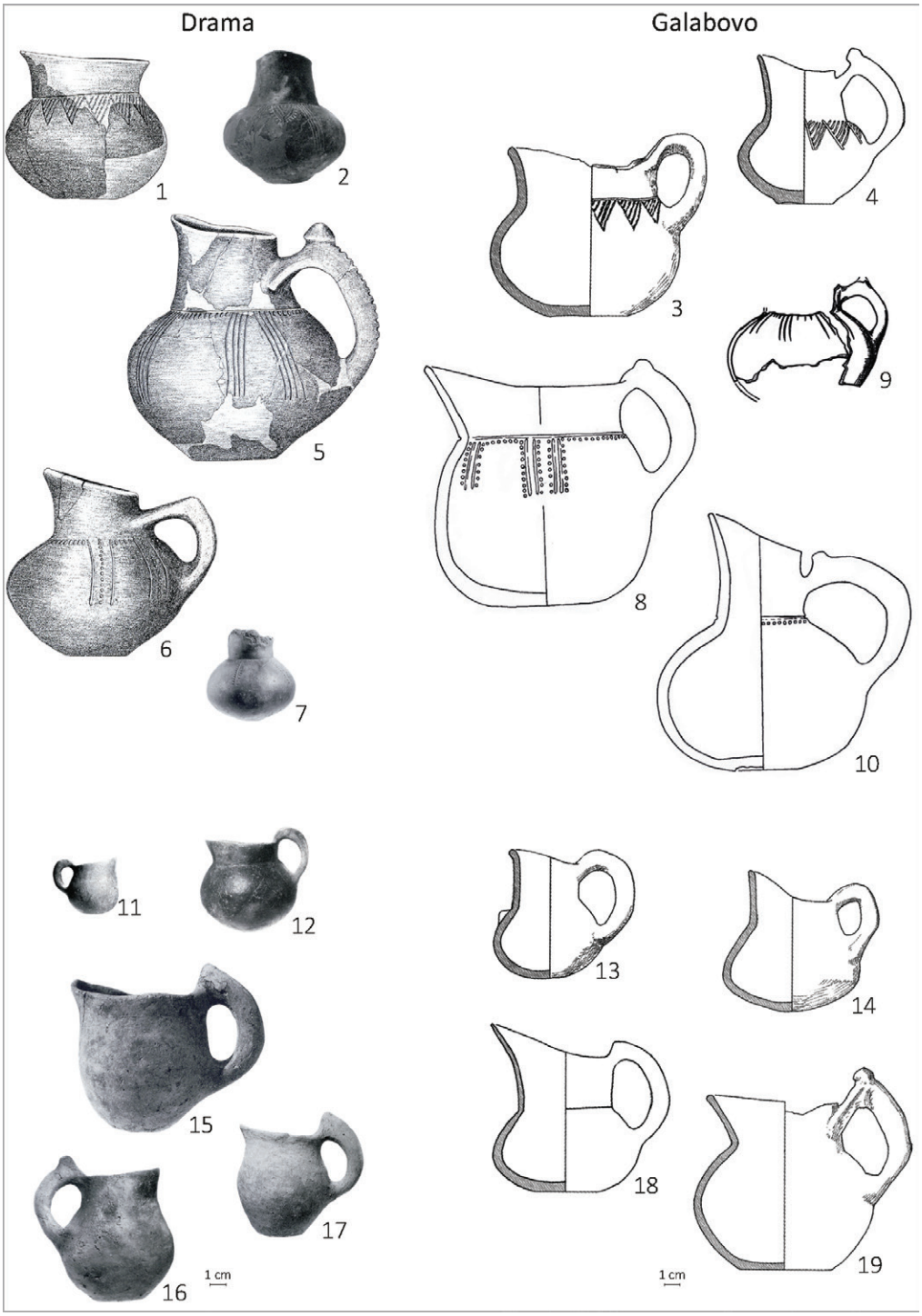


Figure 4. *Comparison of jugs from enclosure 009 at Drama–Merdzhumekya and Tell Galabovo. Image Credit: Fol et al. 1989; Leshtakov 2021, figs. 4, 5, and 9; Ilieva 2021, fig. 4, and the author.*

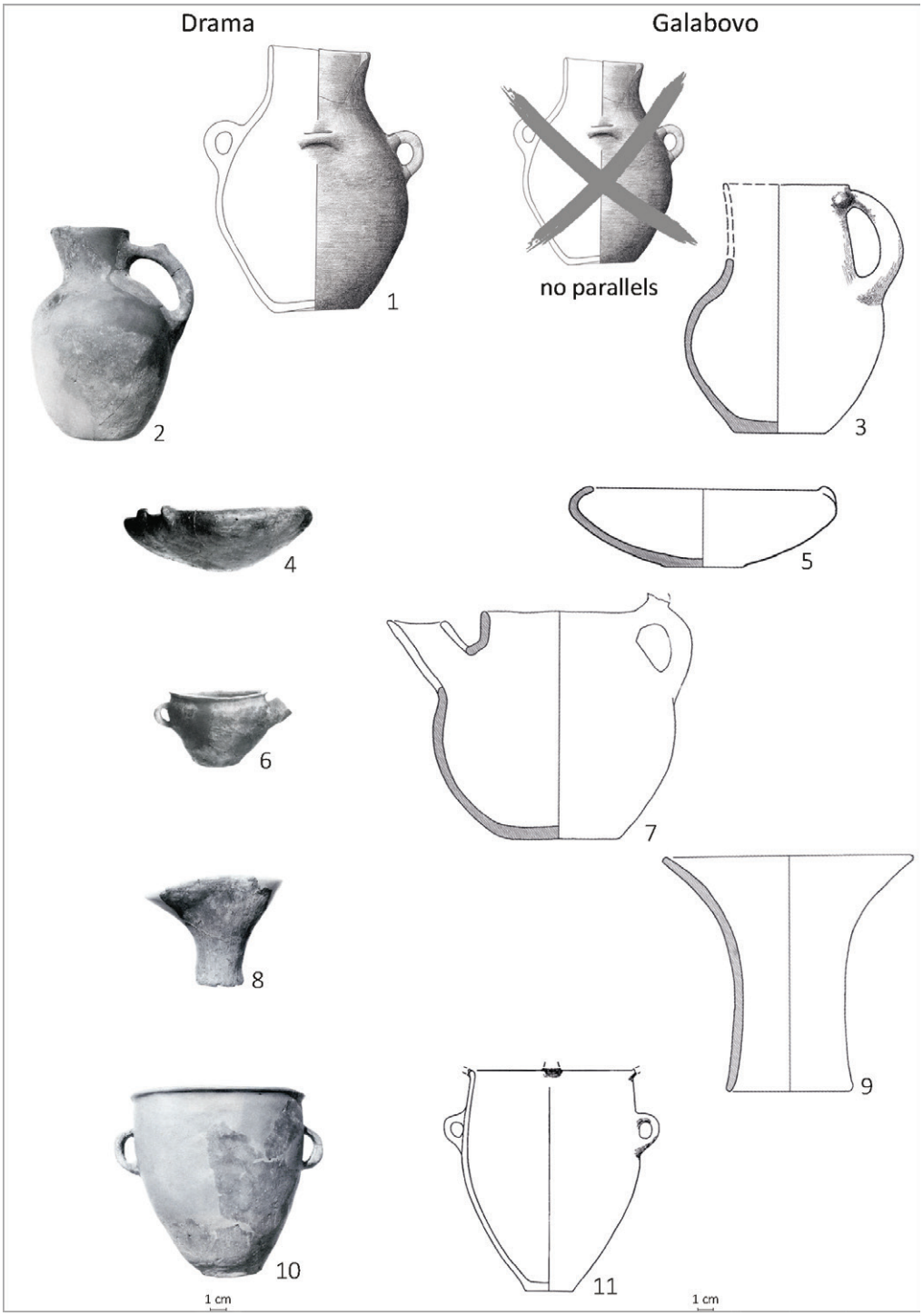


Figure 5. *Comparison of pottery from enclosure 009 at Drama–Merdzhumekya and Tell Galabovo. Image Credit: Fol et al. 1989; Leshtakov 2021, figs. 4 and 5; and the author.*

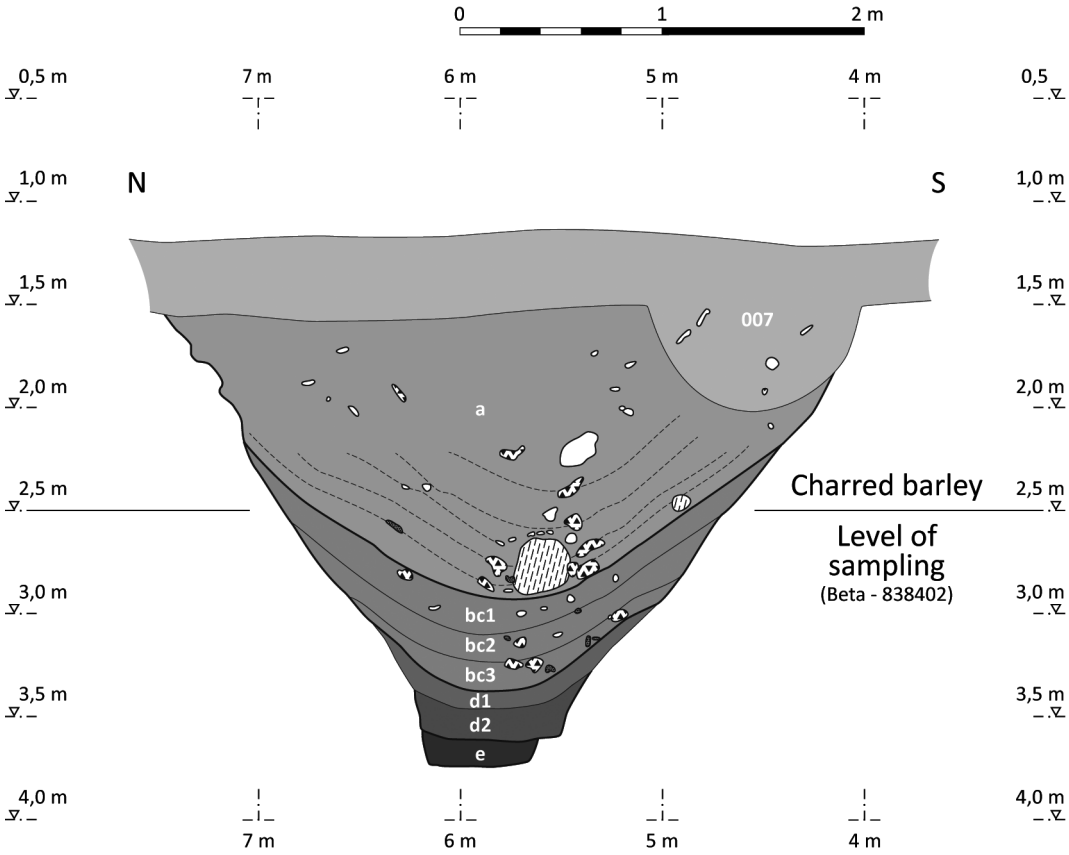


Figure 6. *Cross-section 15 of enclosure 009 at Drama–Merdzhumekya showing the level of the sample collection. Image Credit: Fol et al. 1989, 25, fig. 7; F. Bertemes; and the author.*

Lab code	Material	^{14}C age BP	Delta C13	^{14}C age cal. BC (2σ)
Beta-838401	charred seeds of *Lallemantia Iberica*	4130±30	-22.4	2871–2799 (28.3%) 2781–2617 (61.2%) 2611–2581 (6.0%)
Beta-838402	charred barley grains	4180±30	-23.9	2887–2836 (21.8%) 2819–2666 (72.0%) 2648–2636 (1.7%)

Table 2. *Radiocarbon dates from the Bronze Age enclosure 009 at Drama–Merdzhumekya measured at Beta Analytic in 2016. The 2021 version of OxCal v4.4.4 program was used for 14C age calibration applying the IntCal 20 calibration curve (Reimer et al. 2020).*

Discussion of enclosure 009

Since no radiocarbon dates were ever measured during or soon after the excavation project, the dating of the enclosure and the possible periodization of activities related to it have always remained uncertain. Before the fieldwork was completed in 2002, it was usually assumed that the enclosure was contemporaneous with the A1 stage of the Central European EBA terminology (Lichardus et al. 2004, 51). However, since the concept of the 'short' radiocarbon chronology was adopted by the Drama research team due to refusing the Central European EBA radiocarbon chronology established in the 1990s, the ditch was dated to the first half of the second millennium BC instead of considering the period between 2200–2000 BC, which had already then been comparable to the Central European EBA A1 stage (Lichardus et al. 2003, 210, fig. 3). It was only in the latest publication when the start of the 'Nova Zagora culture' was dated to ca. 2100 BC (Lichardus et al. 2004, 60). Based on radiocarbon dates available for the EBA 3 period in Thrace today (Tsirtsoni 2021, fig. 11 and table 1), it seems plausible to assume that the enclosure was constructed and maintained in the second half of the third millennium BC, or that the final deposits in the ditch were made during this period, at the very least. Given that the pottery found at Drama bears strong stylistic similarities to the pottery from the upper layers of Tell Galabovo (building levels 3 to 1) that has been attributed to the MBA, a dating to the first half of the second millennium cannot be also ruled out. However, the results of the stylistic dating approach for the Drama pottery based on a comparison with Galabovo show clear differences to the radiocarbon dates in table 2.

In light of what has just been said, the dates in table 2 are earlier than expected. They roughly cover the first half of the third millennium BC and obviously indicate periods prior to the MBA or even the EBA 3. In order to illustrate this, table 3 includes selected radiocarbon dates from Tell Ezero and Tell Yunatsite – all of them measured decades ago at the radiocarbon lab in Berlin – that seem to be 'contemporaneous' to the Drama dates and that have stratigraphically been attributed to the EBA 1 and 2. On the other hand, dates from Tell Galabovo (building level 4) and Tell Nova Zagora are also presented that fall in the EBA 3, the latter with quite big statistical errors. The similarity of the Drama dates to Ezero and Yunatsite is obvious as well as their dissimilarity to Nova Zagora and Galabovo. They also precede the dates for Troy III to V (Easton & Weninger 2023, 403, table 2) and all the dates for Kanlıgeçit in Turkish Thrace (Özdoğan & Parzinger 2012, 276, table 64), even though the layers of the 2 and 3 periods of the latter site yielded ceramics, which are typologically comparable to those from enclosure 009 (Ambronn 2012, 126). It's difficult to find an explanation for the dating discrepancy; either the reliability of the dates should be questioned in general – what I do not assume – or the dated samples are indeed as old as they were measured to be. In the case of the bottle, the radiocarbon evidence of the seeds firmly dates the artifact itself and, with less security, the act of its deposition. In that case, the ditch could have existed during the period indicated by the radiocarbon dates, and the sediments labeled as layers bc and the lower a could have

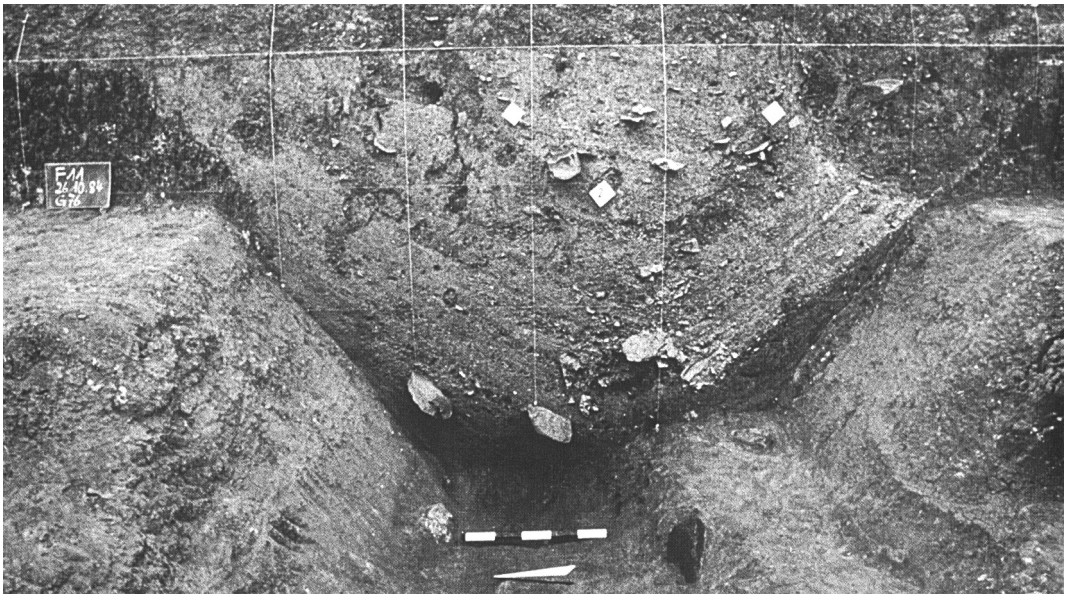


Figure 7. *Cross-section 17 of enclosure 009 in sector F11 at Drama–Merdzhumekya. Image Credit: Lichardus et al. 2004, 50.*

been deposited in it during this time span. With somewhat less certainty, this could also apply to the barley grains. In any case, the dates contradict the typo-chronological dating of the pottery from the ditch fill to the EBA 3 or the MBA, respectively. The question therefore is whether the dated samples could be strictly related to these periods. In any way, this is not the case: Keeping in mind the above-mentioned bones from layer b dated to the fourth millennium BC (Bln-5116), the barley grains could with some probability also be earlier, i.e., intrusive materials. As for the bottle with its distinct combination of vertical and horizontal handles at the shoulder, several parallels were published from two more sites in Upper Thrace: a few examples from Razkopanitsa and one from Ezero (Detev 1950, 176f, figs. 112 and 113/B; 1981, 178, fig. 49/2(?); Leshtakov 2014, 329, fig. 6/2 and 3; 1999, 80, fig. II/64). However, they are obviously not entirely accurate, and none of them have a secure stratigraphic position. According to Dr. Denitsa Ilieva (St. Kliment Ohridski University of Sofia), to whom I owe this information, it's not that this vessel type was particularly rare in Thrace, however, but rather that relatively few intact examples have been published. The storage container from Drama and its contents might have been valuable objects that were passed down through generations and eventually deposited in the EBA 3 period. However, the bottle is obviously not common for the EBA 2.

Leaving aside the uncertainties of the local find contexts, the enclosure's radiocarbon dating fits well into the emerging broader picture of the Bronze Age enclosure phenomenon in Thrace. According to Denitsa Ilieva, it '*...seems to have begun at the end of the Early Bronze Age II, as evidenced by some of the recently excavated sites such as Polski Gradets*

(Nikov & Georgieva 2022; Nikov 2024, 112), and it had already been mentioned in earlier publications, including on Cherna gora and Ovcharitsa II. Some of these sites continued to exist until the beginning of the MBA (Polski Gradets and Cherna gora), while others, such as Bikovo, are dated entirely to the MBA.'[1]

In conclusion, the enclosure at Drama was probably constructed, maintained, and used for a long period of time during the EBA and MBA *stricto sensu*, respectively. Considering the radiocarbon date of the *Vicia ervilia* seeds from Drama (Erl-16667), this seems all the more likely. Unfortunately, the 1980s graphical and written records for the ditch's stratigraphy provide no decisive evidence of a long-time and multi-period use of the enclosure. However, when comparing photos with drawings of cross-sections, indications of complex backfilling events are clearly visible. An illustration to this is shown in figure 7, a photo of cross-section 17 in sector F11 (cf. the drawing in figure 6). This is the only one that has been published to date.

Lab code	Site	Material	^{14}C age BP	^{14}C age cal. BC (95.4%)
Bln-3671	Yunatsite, level 13	seeds	4180±50	2896–2621
Bln-3664	Yunatsite, level 8	seeds	4140±50	2878–2581
Bln-3665	Yunatsite, level 9	charred wood	4100±50	2873–2496
Bln-3663	Yunatsite, level 8	seeds	4100±50	2873–2496
Bln-3669	Yunatsite, level 10	seeds	4090±50	2872–2491
Bln-1836	Ezero, level 12	charred wood	4160±55	2888–2581
Bln-1829	Ezero, level 7	charred wood	4165±40	2886–2624
Bln-1824	Ezero, level 4	seeds	4135±65	2888–2500
Bln-4101	Galabovo, level 4	charred wood	3890±80	2575–2139
Bln-4102	Galabovo, level 4	charred wood	3745±50	2332–1980
Bln-1576a	Nova Zagora, level 8	charred wood	4041±60	2866–2461
Bln-2239	Nova Zagora, level 8	charred wood	3840±40	2461–2155
Bln-1150	Nova Zagora, level 6	seeds	3972±100	2866–2201
Bln-1150 A	Nova Zagora, level 6	seeds	3913±100	2839–2046
Bln-1154	Nova Zagora, level 6	seeds	3886±100	2829–2036
Bln-1154 A	Nova Zagora, level 6	seeds	3900±100	2834–2041
Bln-1149	Nova Zagora, level 5	seeds	3872±100	2619–2033
Bln-1153	Nova Zagora, level 5	seeds	3826±100	2568–1980

Table 3. *Selected radiocarbon dates from Yunatsite and Ezero compared to dates from Galabovo and Nova Zagora (after Tsirtsoni 2021, table 1). The measurements for enclosure 009 at Drama (cf. table 2) match the date range of the EBA 1 and 2 periods highlighted in a darker shade. The EBA 3 dates are highlighted in a lighter shade.*

[1] E-mail correspondence from 5 October 2025.

Kayryaka

Kayryaka is a natural elevation formed by erosion situated directly southeast of the village of Drama. Large scale excavations were carried out there in 1992, 1994, 1995, and 2002 (Lichardus et al. 1996, 2000, 2002, and 2003). The same excavation methods were used as at Merdzhumekya. An orthogonal grid with square sectors separated by baulks was set up supplemented by smaller test trenches. At least 100 pits and many stone features from the Iron Age were found that were identified as elements of a ritual site. Eight human burials dating to the Iron Age were also uncovered. The ritual use of the site dates even further back; two Bronze Age graves also came to light (graves 27 and 53, the latter dating to the Late Bronze Age). The site preserved its symbolic significance until the time of Roman rule in Thrace. A cemetery of this period also was discovered and 57 graves were excavated. The burial ground at Kayryaka was in use from the first century AD until the Late Antiquity.

Overview of grave 27

Grave 27 was excavated in 1994; it was located in sector D08. A child aged between 8 and 9 years was interred in a pit. The body was placed in a crouched position on the left side, with the head facing southwest. The only grave offering was a plain juglet placed upside down in front of the upper body (fig. 8). Jugs were a common vessel type in Upper Thrace during the Bronze Age, from the early to the late periods, and the typological comparison is fraught with considerable uncertainty. The vessel shape, its short conical base, rounded belly and raised rim prompted Jan Lichardus to search for parallels in the lower Danube region. He pointed to jugs of the early Monteoru culture in Moldavia and ultimately narrowed down the dating range of the Drama piece to the Monteoru Ic3 phase (Lichardus et al. 2003, 210, table 3). Comparable forms would also occur with the jugs of stages II and III of the Tei culture in Muntenia that could be synchronized to the MH III / LH I stages in the Aegean and to the A2 and A3 stages of the Central European EBA chronology (cf. Lichardus et al. 2002, 135f). Based on these considerations, grave 27 would date to the end of the EBA or the MBA, respectively, in Upper Thrace, approximately in a time span between the 22nd/21st to the 17th/16th century BC (cf. Leshtakov 2009, 61; Leshtakov & Tsirtsoni 2016, 481ff; Alexandrov 2020, 251, fig. 1; Krauss 2024). However, research on this period in both Upper Thrace and Bulgaria as a whole is hampered by inconsistent terminology, and moreover, only a few sites are known (Krauss 2024, 182, fig. 9; Leshtakov & Tsirtsoni 2016, 484, fig. 4; Tsirtsoni 2021, 267, fig. 11). At a first glance, a look to Romania is making it possible to narrow down the absolute chronological framework of the typo-chronological approach. Radiocarbon ages imply that the Monteoru Ic3 phase in eastern Romania can be dated between ca. 2200 and 2000 BC (Palincaş 2010, 314, fig. 2; for Bulgaria, cf. Krauss 2024, 186, fig. 12), what would correspond to the end of the EBA 3 period in Upper Thrace. Regarding Tei II, however, contemporaneity with the A2 stage of the Central European EBA chronology

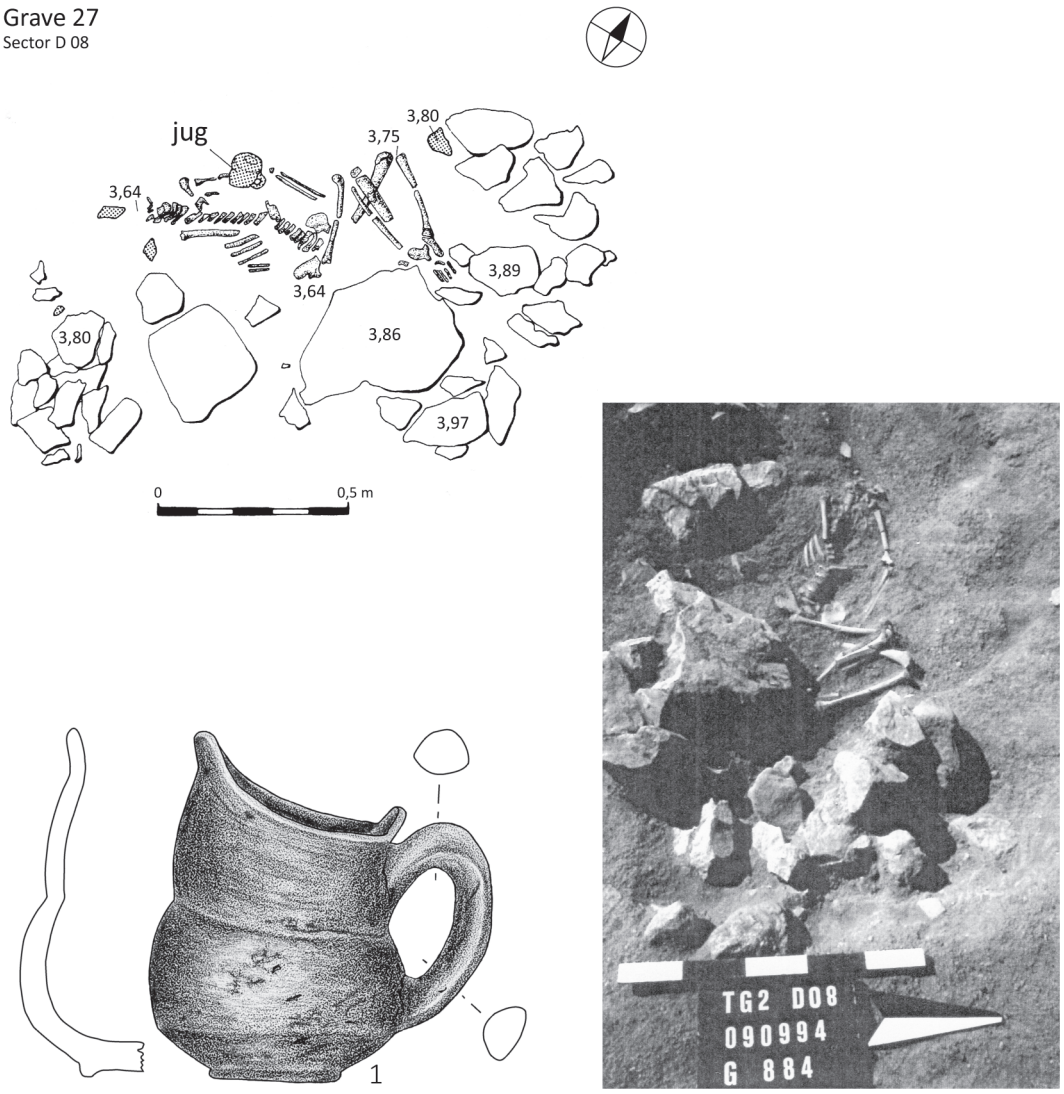


Figure 8. *Grave 27 at Drama–Kayryaka and the juglet found in it. Image Credit: Lichardus et al. 2000, 165, fig. 58; Drama Project of the Saarland University; and the author.*

has been proposed (Schuster et al. 2006, 107f), and the time span between 2000 to 1600 BC may thus be taken into consideration. In the last decades, however, some authors have also dated grave 27 to the Asenovets–Razkopanitsa VII phase of the Late Bronze Age (LBA 2 in Upper Thrace) what would imply a dating after the mid-second millennium BC (Nikov 2001, 69).

Radiocarbon dating of grave 27

A radiocarbon date was measured for grave 27 in 2025 at the Alfred Wegener Institute in Bremerhaven (table 4). The sample was charred twigs and buds from the contents of the juglet. E. Marinova-Wolff emphasized that a botanical assessment would have destroyed the plant remains making the radiocarbon dating impossible. They corresponded to 1–3 years of growth (short-lived) and were therefore very well suited for ^{14}C measurement. The result was 3742±24 BP, which yielded the time span between 2276 and 2037 cal. BC with a probability of 95.4%. This actually corresponds to the end of the EBA 3 period and the transition to the MBA according to the chronological terminology currently used in Upper Thrace (Alexandrov 2020, 251, fig. 1; Leshtakov 2021, 13f). Against this background, the modest 'standing ring' at the bottom of the juglet from grave 27 deserves attention as this feature is characteristic of the EBA 3 period indicating knowledge of wheel-thrown pottery (Leshtakov 2021, 22, figs. 4/11 and 14, and 9/2 and 3). Currently, only a few radiocarbon dates are available from Upper Thrace that fall in the 38th century BP, and can thus be compared directly to the date for grave 27. They are all listed in table 5. In addition to a radiocarbon date from building level 4 at Galabovo, several dates from building levels 5 to 3 at Tell Yunatsite should be mentioned as well as the dates from Chokoba 18 and 18A, Cherna gora, and Karasura (cf. Tsirtsoni 2021, 267, fig. 11 and table 1). However, it is uncertain whether there is a close temporal connection between the sample from the juglet and the vessel itself or the body buried in grave 27.

In conclusion, I have to add that the time span between 2300 and 2100 cal. BC (late EBA 3), or rather the early MBA *stricto sensu* (ca. 2000 cal. BC) seems be the most probable dating for grave 27 at Drama–Kayryaka.

Lab code	Material	$F^{14}C$	± (abs)	^{14}C age BP	weight (ugC)	^{14}C age cal. BC (2σ)
AWI-15236.1.1	charred twigs and buds	0.6276	0.0019	3742±24	995	2276–2256 (3.7%) 2206–2116 (62.8%) 2100–2037 (29.0%)

Table 4. *Radiocarbon date for grave 27 at Drama-Kayryaka measured in 2025 at Bremerhaven. The 2021 version of OxCal v4.4.4 program was used for 14C age calibration applying the IntCal 20 calibration curve (Reimer et al. 2020).*

Lab code	Site	Material	^{14}C age BP	^{14}C age cal. BC (95.4%)
Bln-5368	Cherna Gora	charred wood	3790±37	2397–2050
Bln-3658	Yunatsite, level 5	charred fruit(s)	3780±50	2433–2035
Bln-3657	Yunatsite, level 4	charred fruit(s)	3760±50	2345–2025
Bln-3656	Yunatsite, level 3	charred fruit(s)	3760±50	2345–2025
Bln-4102	Galabovo, level 4	charred wood	3745±50	2332–1980
AWI-15236.1.1	Drama–Kayryaka, grave 27	charred twig and bud	3742±24	2276–2037
Bln-5346	Cherna Gora	charred wood	3701±27	2197–1984
Bln-3659	Yunatsite, level 5	charred fruit(s)	3700±50	2274–1946
Lyon-13680 / Sac-48686	Chokoba, 18A	charred seeds	3700±30	2199–1981
Lyon-8559 / SacA-26532	Chokoba, 18	charred seeds	3695±30	2194–1980
Bln-3426	Karasura, rampart	charred wood	3690±50	2271–1937

Table 5. *Radiocarbon dates from selected EBA sites in Upper Thrace. The radiocarbon date for grave 27 at Kayryaka is placed in the center of the table and shaded. The comparative dates show low standard deviations. The mean values of the radiocarbon years for them are either a maximum of 48 years earlier or a maximum of 52 years later than the mean value of the radiocarbon years for grave 27. (After Tsirtsoni 2021, table 1).*

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New evidence on the Early Bronze Age mortuary practices in northeast Bulgaria

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Abstract

This paper discusses the interdisciplinary analyses of an Early Bronze Age secondary barrow grave related to the Yamnaya culture in northeast Bulgaria. The analytical results produced firm evidence of ritual practices in Yamnaya communities aiming at the preservation of skeletons by coating them with CaCO3 and/or by additionally painting certain skeletal elements with hematite. This practice could have been related to the preservation of ancestral memory associated with social power.

Keywords: *Early Bronze Age – Yamnaya culture – mortuary practices – secondary burial – pigments.*

https://doi.org/10.53250/stprae19.89-102

Introduction

In the last five years, a large-scale rescue excavation project was carried out in northeast Bulgaria, including five Bronze Age barrows located near the village of Vetrino, Varna District. Over a hundred Early Bronze Age (EBA) barrows are clustered in the area organized in four extensive cemeteries. They form curved lines (fig. 1), each consisting of several dozen tumuli, some of which are not visible on the ground due to recent agricultural land use (Paukkonen et al. 2025). Three barrows excavated in 2020 yielded 15 EBA graves, which provided new evidence on mortuary practices in northeast Bulgaria in the fourth–third millennium BC, especially regarding the diversity of body positions and the use of different elements in the ritual (Alexandrov et al. 2021).

In 2024, two more barrows were excavated in the area – barrow 20 in necropolis 1 and barrow 4 in necropolis 3 – adding 15 more EBA graves to the investigated lot. The former barrow measured ca. 2 m high and ca. 40 m in diameter (fig. 2), and yielded four EBA graves and a fifth burial dating to the MBA (fig. 3). This paper will focus on feature 6, an EBA burial, which produced new evidence on the use of pigments in mortuary practices as well as on the postmortem treatment of bodies.

The grave

Feature 6 was an inhumation burial cut in the already existing barrow without additional piling of barrow fill. The rectangular grave pit measured 0.73 by 0.59 cm, with a depth of 0.43 cm, oriented northeast-southwest. The body of a child (Infans I) was placed on the flat bottom in an articulated semi-supine position to the right (head to southwest), with the legs bent at the knees and fallen down to the right. Both arms were bent at the elbows, the left one was placed next to the body, and the right one was in front of the head (fig. 4). Phalanges and metatarsal bones of the right foot as well as phalanges and metacarpal bones of the right hand were found back of the skull (fig. 5). Two lumps of red pigment were placed in front of the face, and an askoid jug lay some 15 cm further south (fig. 6). The pit was covered with two rows of stone slabs measuring up to 0.50 m long (figs. 7 and 8). A sample on an infant's long bone (Poz-196215, 3%N 9.7%C, 9%col) provided an AMS date of 4390±40 BP that would place the grave in the 3100–2900 cal. BC period (fig. 9). Considering all the characteristics of the mortuary practices as well as the radiocarbon date, the burial should be related to the early phase of the Yamnaya culture in the northern Balkans.

The analyses

Upon examination of the skull, traces of white coating were clearly visible on the inner side of the parietal bones (fig. 10). A sample of the coating as well as the two lumps of red pigment were analyzed using scanning electron microscopy (SEM/EDS), X-ray diffraction (XRD), and optical microscopy. The main goal of the analyses was to obtain data on the morphology and colors of the surface, microstructure, elemental, and miner-

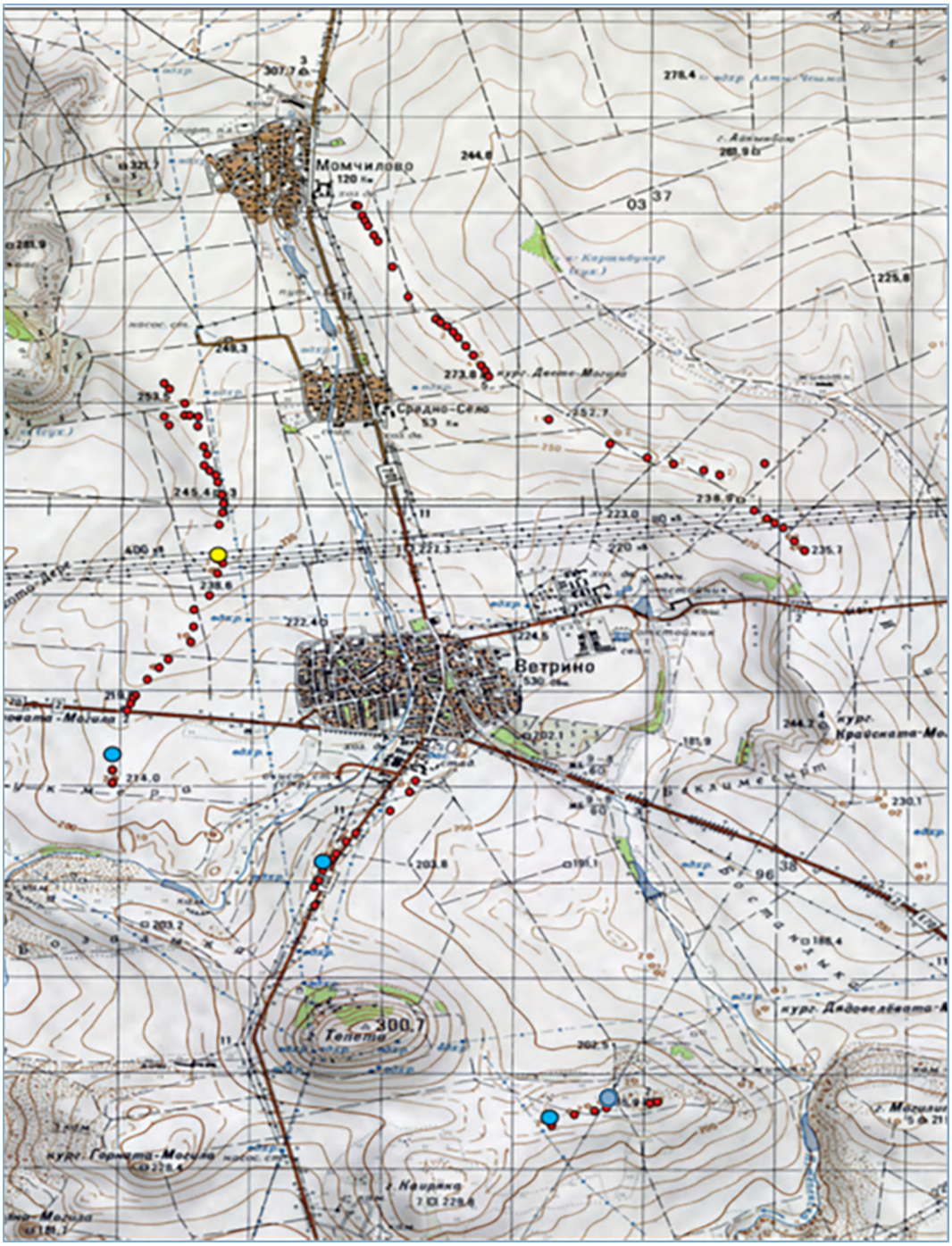


Figure 1. *EBA barrow cemeteries in the Vetrino area. Image Credit: https://map.bgmountains.org/ and Stefan Alexandrov.*



Figure 2. *Barrow 1/20 at Vetrino before the excavations. Image Credit: Radostina Yordanova.*

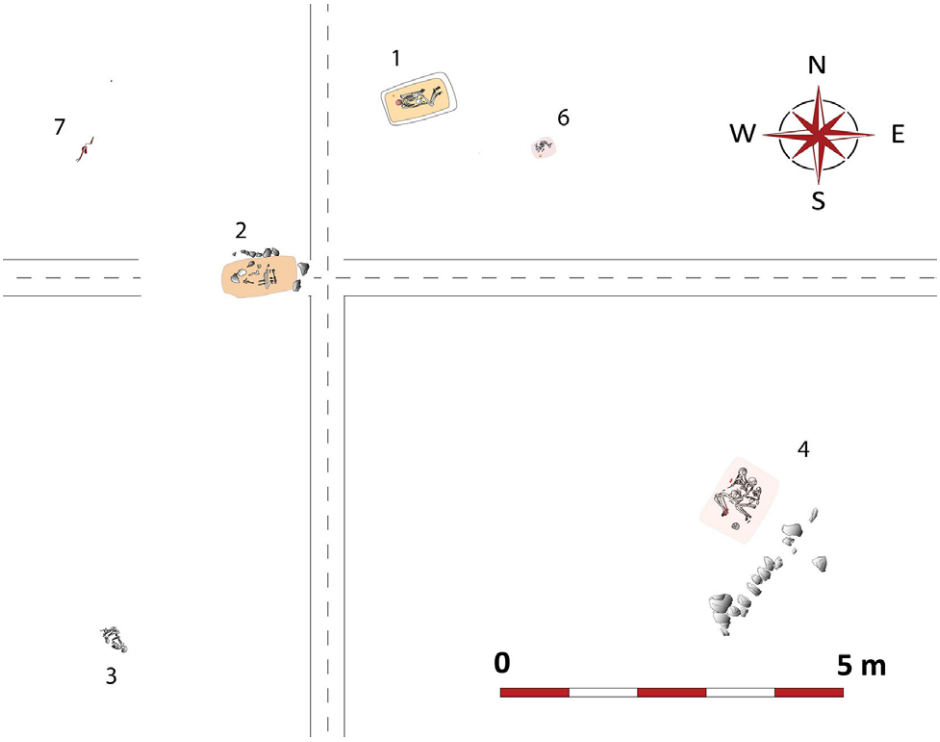


Figure 3. *Barrow 1/20, layout of the investigated feature. Image Credit: Stefan Alexandrov.*



Figure 4. *Barrow 1/20, feature 6. Image Credit: Radostina Yordanova.*

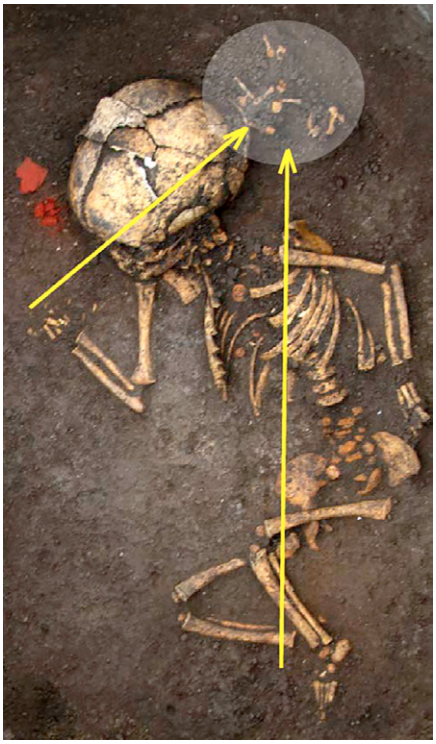


Figure 5. *Barrow 1/20 at Vetrino, feature 6, disarticulated bones. Image Credit: Radostina Yordanova.*



Figure 6. *Barrow 1/20 at Vetrino, feature 6, red ochre lumps and askos. Image Credit: Radostina Yordanova.*



Figure 7. *Barrow 1/20 at Vetrino, feature 6, stone covering of the grave. Image Credit: Radostina Yordanova.*

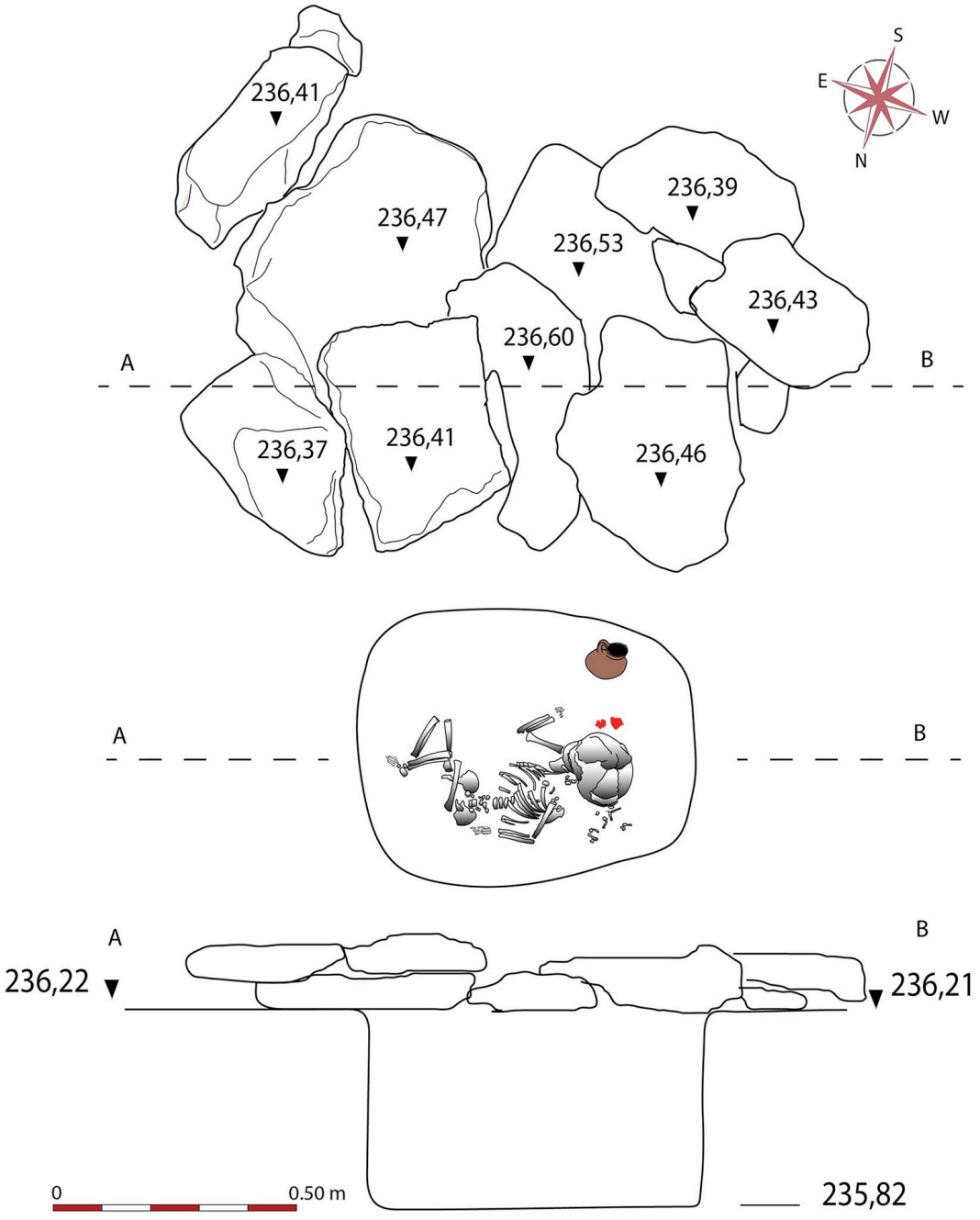


Figure 8. *Barrow 1/20 at Vetrino, feature 6. Image Credit: Stefan Alexandrov.*

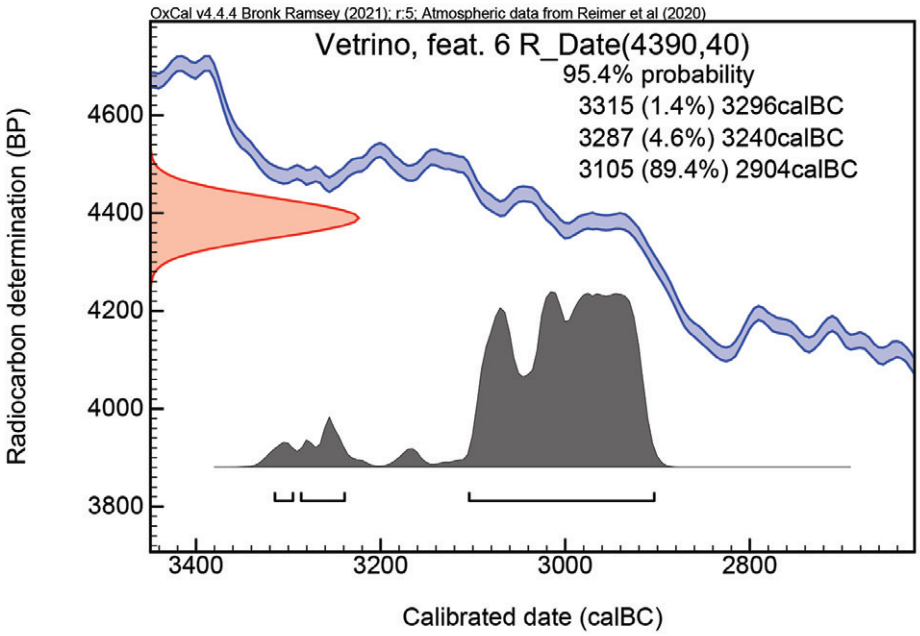


Figure 9. *Barrow 1/20 at Vetrino, feature 6, radiocarbon date. Image Credit: OxCal 4.4.*

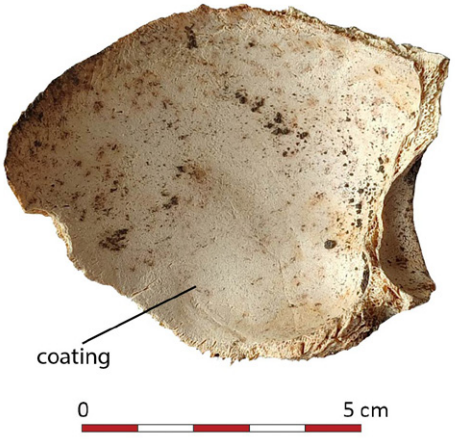


Figure 10. *Barrow 1/20 at Vetrino, feature 6, white coating of the inner surface of the parietal bone. Image Credit: Rositsa Manova.*

alogical composition of the samples, the technique of their preparation, and their possible source. The SEM/EDS analyses were performed with JEOL 6390 and INCA Oxford equipment; optical microscopy was performed with Zeiss Axioscope 5 and Zeiss Stemi 305 stereomicroscope, and XRD analyses were performed with a Panalytical Empyrean system. Phase analysis was performed using Match software, a freely accessible tool for comparing phase analysis with a database of reference models (https://www.crystalimpact.de/match). Additional reference data for analysis was taken from the Crystallography Open Database (https://www.crystallography.net/cod/). The samples were examined as powders. The results are presented below:

The red pigment

SEM-EDS analyses revealed that the main elements in the investigated sample are iron (Fe), aluminum (Al), silicon (Si), oxygen (O), and carbon (C); secondary elements are potassium (K) and calcium (Ca); magnesium (Mg) and titanium (Ti) were noted as microelements (table 1).

Result type	Weight %								
Statistics	C	O	Mg	Al	Si	K	Ca	Ti	Fe
Max	8.85	40.19	0.63	7.40	13.31	1.41	1.11	0.51	28.66
Min	7.82	39.35	0.55	7.24	12.44	1.25	0.96	0.39	27.72
Average	8.49	39.82	0.58	7.31	12.86	1.32	1.03	0.44	28.16
Result type	Atomic %								
Statistics	C	O	Mg	Al	Si	K	Ca	Ti	Fe
Max	16.19	55.20	0.58	6.14	10.61	0.81	0.61	0.23	11.49
Min	14.57	54.89	0.50	5.90	9.73	0.70	0.53	0.18	10.93
Average	15.63	55.05	0.53	5.99	10.13	0.75	0.57	0.20	11.16

***Table 1**. Vetrino, barrow 1/20. SEM-EDS analyses of the red pigment.*

The results of the X-ray diffraction (XRD) analyses (fig. 13) show that the mineral composition of the sample consists of hematite (Fe_2O_3), quartz (SiO_2), and muscovite ($KAl_2(AlSi_3O_{10})(OH)_2$). The morphology and intensity of the samples (figs. 11 and 12) as well as the data for elemental composition, atomic ratio and weight, and mineral composition give us reason to consider the red pigment as hematite obtained from natural deposits.

The white coating

SEM-EDS analyses revealed potassium (K), sodium (Na), magnesium (Mg), manganese (Mn), and barium (Ba), which may be related to the infant's diet; the aluminum (Al) and silicon (Si) may be attributed to soil composition, while the presence of iron (Fe) and titanium (Ti) could actually be red pigment particles that penetrated the skull.



Figure 11. *Barrow 1/20 at Vetrino. Mineral composition of the red pigment. Image Credit: Stela Atanassova-Vladimirova.*

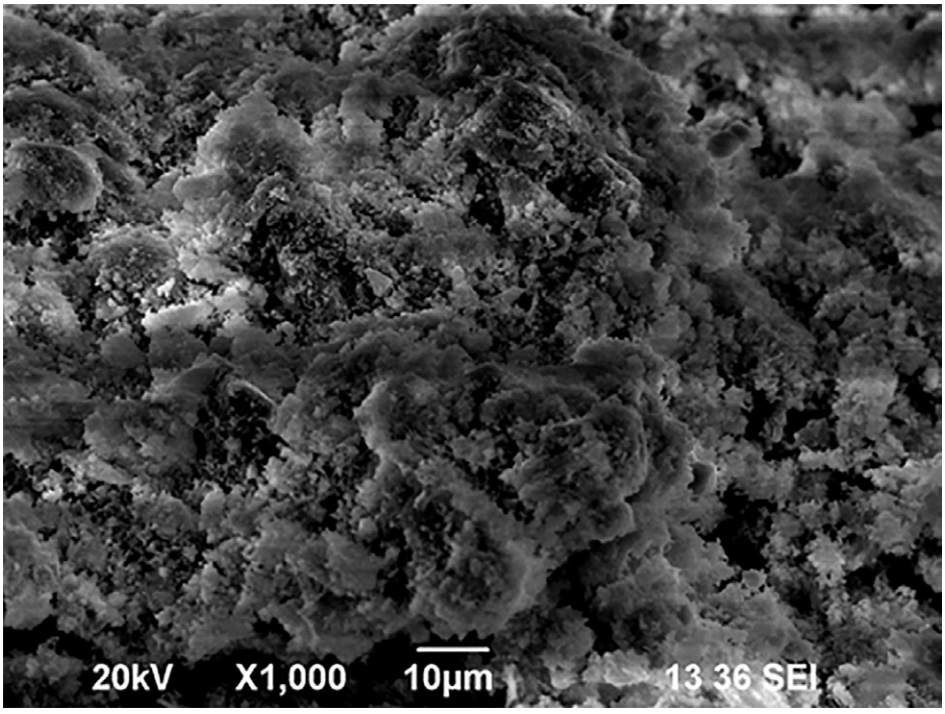


Figure 12. *Barrow 1/20 at Vetrino. Optical microscopy. Morphology and color density of the red pigment. Image Credit: Stela Atanassova-Vladimirova.*

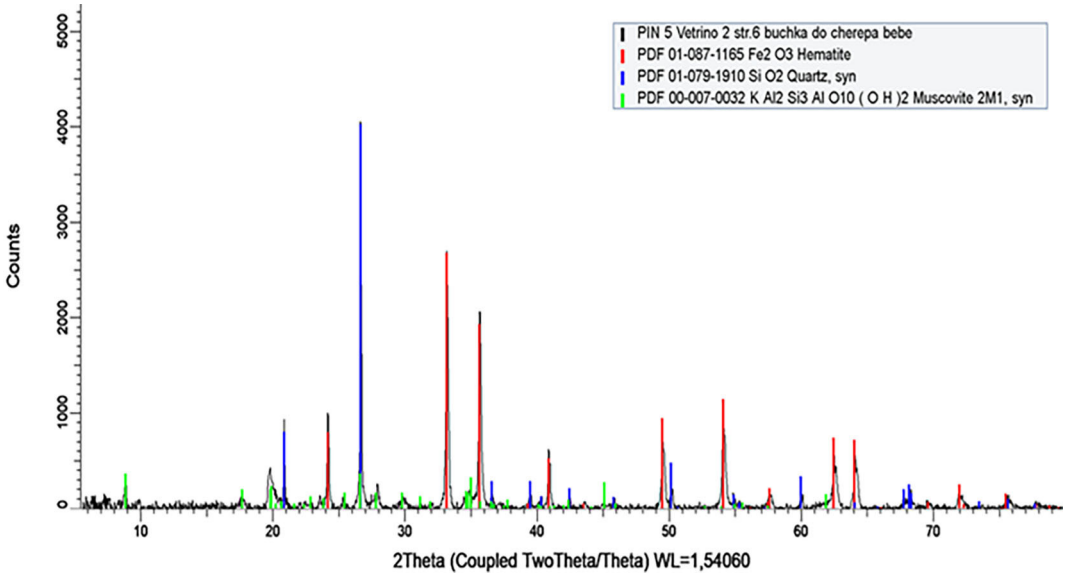


Figure 13. *Barrow 1/20 at Vetrino. Surface morphology of the red pigment; secondary electron image. Image Credit: Daniela Kovacheva.*

Table 2 shows the elemental composition of the skull coating as well as the elements of inorganic salts from the bone structure – mainly $CaSO_4$ and $CaCO_3$. The main elements are to be associated with the mineral component found in human bones – hydroxyapatite $Ca_5(PO_4)_3(OH)$ and vaterite ($CaCO_3$).

Result type	Weight %												
Statistics	C	O	Na	Mg	Al	Si	P	K	Ca	Ti	Mn	Fe	Ba
Max	12.94	50.88	0.72	1.34	6.90	17.78	3.61	1.47	9.08	0.30	0.17	3.11	0.59
Min	11.44	50.10	0.62	1.22	5.72	13.19	0.83	1.20	4.28	0.19	0.07	2.39	0.13
Average	12.27	50.52	0.69	1.26	6.25	15.38	2.19	1.32	6.76	0.23	0.12	2.67	0.33
Result type	Atomic %												
Statistics	C	O	Na	Mg	Al	Si	P	K	Ca	Ti	Mn	Fe	Ba
Max	20.00	59.81	0.58	1.02	4.73	11.70	2.19	0.69	4.26	0.12	0.06	1.03	0.08
Min	17.92	58.13	0.51	0.94	3.99	8.83	0.49	0.58	1.97	0.07	0.02	0.80	0.02
Average	19.02	58.80	0.56	0.97	4.31	10.18	1.32	0.63	3.15	0.09	0.04	0.89	0.04

Table 2. *Vetrino, barrow 1/20. SEM–EDS analyses of the white coating.*

The results of the X-ray diffraction (XRD) analyses (fig. 14) demonstrated that the mineral composition of the sample consists of hydroxyapatite $Ca_5(PO_4)_3(OH)$, silicon oxide (SiO_2), periclase (MgO), and vaterite ($CaCO_3$).

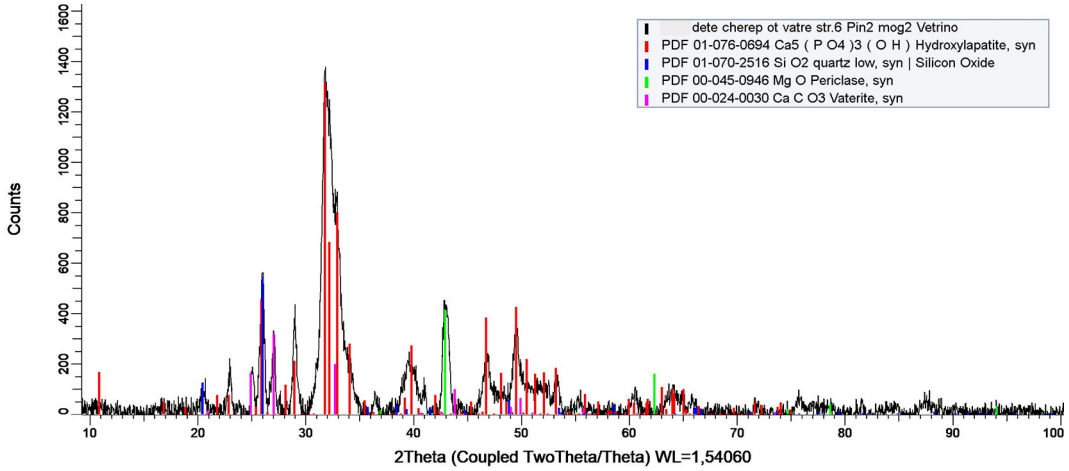


Figure 14. *Barrow 1/20 at Vetrino. Mineral composition of the white coating. Image Credit: Daniela Kovacheva.*

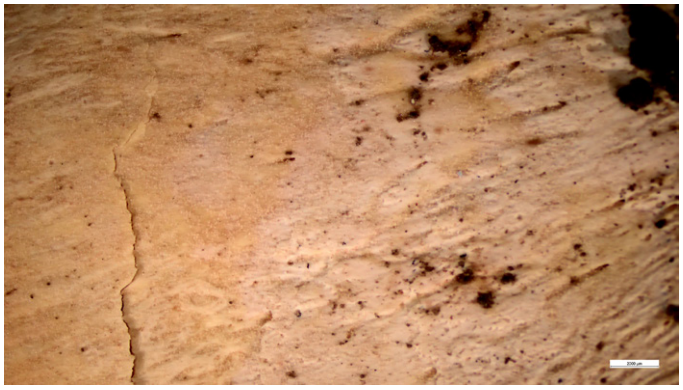


Figure 15. *Barrow 1/20 at Vetrino. Optical microscopy. Morphology and color density of the white coating. Image Credit: Stela Atanassova-Vladimirova.*

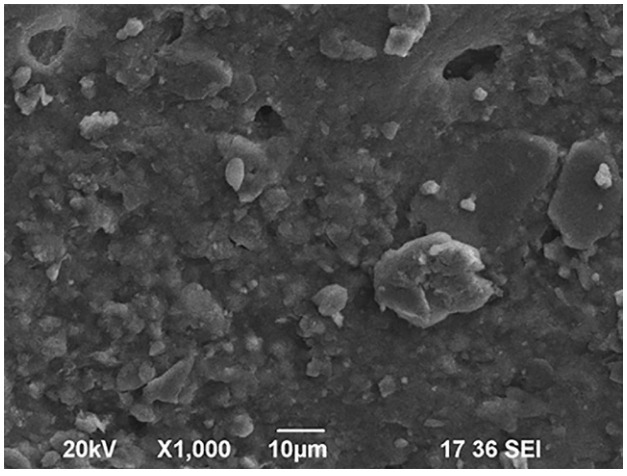


Figure 16. *Barrow 1/20 at Vetrino. Surface morphology of the white coating; secondary electron image. Image Credit: Stela Atanassova-Vladimirova.*

Discussion

Red ochre

As mentioned earlier, the infant grave should be dated to the 3100–2900 cal. BC timespan. This is the period of the largest use of red ochre in barrow graves in the northern Balkans. It is to be related to the religious beliefs of the cattle-breeding population known as the 'Yamnaya culture' that migrated from the northwest part of the Black Sea steppes, occupying regions with a 'steppe' landscape in northeast and north central Bulgaria (Panayotov 1989; Alexandrov 2021) and the Middle Tundzha River Valley (Alexandrov & Włodarczak 2024; Manova et al. 2024). A large-scale analyses of pigments from EBA barrow graves from Bulgaria, Romania, Moldova, Ukraine, and Serbia clearly showed that two types of red ochre were used in mortuary practices; the latter, with minimum amounts of titanium (Ti), was most likely extracted from a local source in northeast Bulgaria (Alexandrov et al., in print) Considering the results of the SEM/EDS analyses of the hematite from Vetrino and its unique titanium signature, we are inclined to relate it to the same source.

Vaterite

Feature 6 of barrow 1/20 at Vetrino would be the first case demonstrating the practice of coating the inner surface of the parietal bones of the skull with calcium carbonate ($CaCO_3$) published in Bulgaria. It is well known that calcium carbonate has a preservative function as it is very poorly soluble in water and neutralizes acids (forming carbon dioxide and the corresponding calcium salt). It repels microorganisms and protects against decay and decomposition. Inside coating of the skull was also attested at grave 5 of the Kriva bara barrow in northwest Bulgaria, where traces of red coating were clearly visible on the inner surface of the parietal bones of the skull, around the so-called lambda point. The grave is dated to 2900–2650 cal. BC and could be related to the late Yamnaya period.[1] Another example comes from the site of Chekon-2 (3300–3100 cal. BC) of the Majkop culture, where parietal bones of an adult male were painted from the inside with cinnabar (Korenevskii et al. 2015, 35ff).

On the other hand, applying pigments to the inner surface of the skull is impossible without removing it from the corpse. Considering the position the skeleton (figs. 4–6), we can assume that after having been painted on the inside, the skull was placed in its original position in the grave. The presence of disarticulated bones (metatarsal and metacarpal phalanges) that were not found in their original position is additional evidence of postmortem manipulation (secondary burial) at feature 6 of Vetrino. Such mortuary practices (dismemberment, also named 'demembration') are common for the EBA Yamnaya communities. For example, 31 such Yamnaya culture burials were excavated until 2010 in the Dniester–Prut Rivers region (Agul'nikov & Popovich 2010). Such practices are attested in Moravia as well as in other regions of Bronze age Europe (Pankowská 2018,

[1] 2024 excavations directed by Stefan Alexandrov.

with references). In Bronze Age Britain, such disarticulated bones are even considered as a clue for the possible mummification of the body (Booth et al. 2015).

In conclusion, the analytical results discussed here demonstrate that the Yamnaya culture communities practiced rituals that were aimed at the preservation of skeletons by coating them with CaCO3 and/or additionally painting of certain parts of the skeletons with hematite. This practice could be related to the collective social memory or to the '... growing role of deceased ancestors in the legitimation of rights over land and property' (Booth et al. 2015). As was suggested by Mircea Eliade, cultural memory is never lost but is passed down and modified from generation to generation (e.g., 1961). It's thus quite possible that mortuary practices discussed here were related to the process of preserving particular individual, or, in other words, preserving the ancestral memory associated with social power.

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Bone and shell beads from the Bronze Age necropolis at Mokrin (northern Serbia)

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Abstract

The Bronze Age cemetery at the site of Mokrin is situated in the northern Banat region, near the town of Kikinda, in northeast Serbia. Necropolis belonging to the Bronze Age Moriš (Maros) culture was first noted in the nineteenth century, and extensive excavations were carried out in the 1960s revealing over 300 graves. The burials at Mokrin contained rich archaeological material: ceramic vessels, jewelry and clothing accessories made from bronze, gold, osseous and lithic raw materials, copper and stone tools and weapons, and animal bones. The rich data provided by this necropolis, especially the diversity and richness of offerings and/or funerary equipment were used for assessing and analyzing the stratification and social organization of the communities buried at the Mokrin necropolis.

Personal ornaments made from osseous raw materials were recorded at almost one third of the graves, and the most common among them were different beads made from bones and mollusk shells. This paper presents the results of the analyses of technological traits, manufacturing procedure, and use wear traces. Traces of use and their position in graves showed that some beads were used as part of composite jewelry (necklaces, bracelets), but others were part of clothing items, probably attached to belts, head dressings, etc. Also, numerous beads display intensive use wear traces, meaning they were used for a long time, and were probably highly valued.

Keywords: *Bronze Age – Moriš (Maros) culture – Mokrin – personal ornaments – beads – osseous raw materials – burial inventory.*

https://doi.org/10.53250/stprae19.103-122

Introduction

Beads are one of the most common types of personal adornment. They were produced and widely used since the Paleolithic times until today, in wide geographical regions (cf. Barge 1982; Camps-Fabrer 1991; Taborin 2004; d'Errico et al. 2005; Vanhaeren et al. 2006; Cattelain 2012; Baysal 2014; Bar-Yosef Mayer 2020). They were generally combined into composite jewelry, such as necklaces and bracelets, or they were used to decorate clothing. Despite their morphological uniformity throughout time, they display wide variety of used raw materials, resulting in a variety of manufacturing procedures, but also appearance such as diversity in size, colors, or smoothness of the outer surfaces.

When it comes to the metal ages, decorative items made from metal received more attention from scholars than the ornaments made from other raw materials. The analyses of the production, appearance, and use of personal ornaments from osseous raw materials, however, may provide us with valuable insight into cultural choices and fashion, but also may reveal the presence of long-distance trade and exchange of exotic marine shells, as well as point to the symbolic aspects of ornaments.

Different beads from the Bronze Age necropolis of Mokrin will be analyzed in this paper that were made from bones and mollusk shells – their technological traits, manufacturing procedure and use wear traces, with focus on their possible symbolic meaning and mode of use.

The archaeological background

The Moriš or Maros culture of the Bronze Age was centered around the confluence of the Tisa (Tisza) and Moriš (Maros, Mureş) Rivers in southeast Hungary, northwest Serbia, and southwest Romania (Tasić 1974). Moriš culture sites included settlements, both flat and stratified tell sites, and separate cemeteries. The site of Pecica in Romania can be mentioned as one of the more extensively researched settlements (cf. O'Shea et al. 2005, 2006, and 2011). Cemeteries are better known; several cemeteries were excavated in Hungary: the sites of Szöreg, Pitvaros, Batanya, and others (Tasić 1974; O'Shea 1996). Chronologically, the Moriš culture may be placed in the period from around 2700 to around 1500 cal. BCE (Nicodemus et al. 2015; O'Shea 1992; O'Shea et al. 2019).

In Serbia, the Moriš culture is best known from two necropolises, Mokrin – Lalina Humka and Ostojićevo – Stari Vinogradi. Both sites were extensively excavated and both yielded a relatively large number of burials (Girić 1971; Tasić 1974; Milašinović 2009; Milašinović et al. 2024). The site of Mokrin is situated in in the northern Banat region, in northeast Serbia, 12 km from the town of Kikinda (fig. 1). Excavations were carried out in the 1960s by M. Girić from National Museum in Kikinda and a total of 312 graves were discovered (Girić 1971; Tasić 1974). These burials contained rich archaeological material: ceramic vessels, jewelry and clothing accessories, made from bronze, gold, osseous and lithic raw materials, copper and stone tools and weapons, and animal bones (Girić 1971; Tasić 1974). Since 2020, the National Museum in Kikinda renewed the ex-



Figure 1. *Map showing the position of the site of Mokrin in Serbia. Image Credit:* https://sh.wikipedia.org/wiki/Datoteka:Serbia_adm_location_map.svg *and the author.*

cavations and carried out four research campaigns, which uncovered eight new graves (Pendić et al. 2022). Also, new studies and re-evaluations of the excavated archaeological and anthropological material were initiated, focused on biophysical anthropology, DNA analyses, analyses of occupation stress markers, etc. (e.g., Porčić & Stefanović 2009; Krečković Gavrilović 2023). Absolute dates obtained from the necropolis at Mokrin in the twentieth century place it in the period between 2086 and 1807 cal. BCE (O'Shea 1992; Forenbaher 1993), while recent analyses of additional samples provided the range between 2073 and 1822 BC (Krečković-Gavrilović et al. 2025).[1]

One of the characteristics of the Moriš culture are metal artefacts; metal is now more common in comparison with previous periods, and metal artefacts increase in frequencies towards the end of the Early Bronze Age. However, only a relatively small proportion appears to be utilitarian; the majority were weapons and ornaments (Girić 1971; Tasić 1974; O'Shea 1996).

The Moriš culture is the period in which we may note changes in social structures. The rich data provided from the analyses of the necropolises, especially the diversity

[1] Full list of dates obtained from the necropolis at Mokrin are published in Forenbaher 1993, t. 1, 244; O'Shea 1992; 1995, 37 (samples analyzed in the twentieth century), and Krečković-Gavrilović 2025, table 1 (new and previously analyzed samples).

and richness of offerings and/or funerary equipment, also produced data for assessing and analyzing the stratification and social organization of the communities (Soroceanu 1975; Primas 1977). The most comprehensive analysis on the society was carried out by J. O'Shea (1996), who included the evidence from all excavated cemeteries of the Moriš group. He distinguished a 'normative' burial mode (flexed inhumation, facing east), which represents the standard form that a community member could expect on death, and a series of differentiated modes. He argued that some of the grave inventory, such as weapons and certain head ornaments, may be signs of hereditary social office, while other items, notably body ornaments, are seen as representing 'associative' wealth, that is, wealth derived from membership of a particular household by the person possessing it (O'Shea 1996, cf. Harding 2004, 386ff).

Beads from osseous raw materials

Materials and methods

As mentioned above, jewelry and clothing accessories were made from diverse materials: metal, kaolin, bone, and stone. Metal ornaments were relatively abundant, and include spiral pendants, rings, bracelets, decorative plaques, etc. (Girić 1971, Tasić 1974). Eighty-five out of a total of 312 graves (ca. 27%) contained ornaments made from osseous raw materials: bones, antler, teeth, and shells (Girić 1971; Vitezović 2017, 2021, and 2022). This is a relatively high ratio, considering that some of the graves contained only ceramic vessels and some graves were devastated, probably robbed.[2] This suggests that osseous raw materials were still valued for production of ornaments, and not simple 'cheap substitute' for metal ones (Vitezović 2017).

Osseous raw materials used for ornaments were both locally available – bone, antler, and animal teeth – or obtained from more distant regions such as mollusk shells. All the osseous ornaments kept today at the National Museum in Kikinda were analyzed by the author from the technological and typological viewpoint, with particular emphasis on the raw material selection, traces of manufacture, and traces of use (cf. Vitezović 2016 and references therein). They were examined with hand lens and Dino-Lite microscope with 5x–50x enlargements, and selected items were examined with the Scanning Electron Microscope (SEM) at the Faculty of Mining and Mineralogy, University of Belgrade. Typological repertoire included pendants, mainly made from perforated teeth, beads, decorative pins, diverse applications (Vitezović 2017 and 2022).

Beads were the most frequent type of ornaments made from osseous raw materials. As beads are classified small artifacts with centrally positioned, usually vertical perforation. Bead typology follows the typological classification offered by the *Fiches typologiques* publication series (Camps-Fabrer 1991), with some modifications. There are also some more elaborate typological classifications for prehistoric beads, created for the

[2] For more details on other funerary equipment, cf. Girić 1971.

assemblages with greater quantities and diversity (e.g., Baysal 2014). At Mokrin, several subtypes may be distinguished: (A) elongated cylindrical or barrel shaped beads, with two variants made from different raw materials (A1 and A2); (B) discoid; and (C) irregular beads (table 1). Criteria for analyses of use wear traces follow mainly those presented by S. Bonnardin (2008 and 2009; see also Camps-Fabrer 1991), as well as other published works (in particular, Cristiani et al. 2020; d'Errico 1993; Guzzo Falci 2015; Guzzo Falci et al. 2018; Mărgărit et al. 2018; Winnicka 2016; inter al.).

Beads were produced from bones and mollusk shells. The skeletal elements, animal species, and the species of the shells were determined by macroscopic analysis and following reference work for actual and archaeological bones and shells (Schmid 1972; Bar-Yosef Mayer 2008; Dance 1992; Taborin 1993, inter al.).[3]

Subtype A

The first and most common subtype are elongated beads, with more or less cylindrical or barrel-like shape. They were made from minimally modified Scaphopoda *(Dentalium)* shells (variant A1), or were cut from bones (variant A2).

Simple beads were made from minimally modified shells of the class Scaphopoda. These shells have an elongated, narrow shell, and are often labeled in literature as *Dentalium*. The ends of the shell may be broken off or cut off in order to use the mesial, widest segment, or already broken shell segments were simply collected and used. Certain weathering that can be noticed on surfaces may be the result of use, but it is more likely that it was caused by taphonomic agents (predating their use). The main criterion for distinguishing fossil shells from those collected fresh at the time when they were modified is the translucent color of fresh shells (cf. Dimitrijević 2014, 35). However, since some of these shells are poorly preserved, their origin cannot be determined with certainty, but it seems that at least some of these beads were made from fresh mollusks. These shells were obtained through trade and exchange, but the details are unknown. There is also possibility that the fossil shells were obtained from the area near the Sava–Danube confluence (cf. Dimitrijević 2014, and references therein).

Dentalium beads from Mokrin can be described as relatively large specimens; their length often exceeds 25 mm, and the diameter is often more than 5 mm (fig. 2). *Dentalium* shells were used in similar manner throughout prehistory, including the Mesolithic and Neolithic, as well as later prehistoric periods (e.g., Taborin 1993 and 2004; Borrello 2004; Dimitrijević 2014).

Usually, just one or a small number of *Dentalium* shells can be found in a single grave (table 1), and often along with other ornamental items, suggesting they were mixed and combined together into different jewelry types.[4] For example, beads from other ma-

[3] Selected items were double checked with Dr. Biljana Mitrović from the Natural History Museum in Belgrade. For details, cf. Ljuština et al. 2019. Also, the website http://www.marinespecies.org/ was consulted.

[4] See also below for *Columbella* beads.

Grave No.	Beads A1	Beads A2	Beads B	Beads C
grave No. 2	1		23	
grave No. 5		5		
grave No. 7			2	9
grave No. 8				11
grave No. 14				5
grave No. 15	1			
grave No. 16		1		
grave No. 27				1
grave No. 38	1			11
grave No. 45				1
grave No. 47	1		1	
grave No. 52	3			
grave No. 53			1	
grave No. 55		2		
grave No. 56	1			
grave No. 69	11	1		
grave No. 74				18
grave No. 90				1
grave No. 97	4	1		
grave No. 104		32		73
grave No. 108	22	1		
grave No. 122		1	1	
grave No. 123			1	1
grave No. 124			8	
grave No. 129				14
grave No. 136	3			3
grave No. 137	15	1		
grave No. 139	2			
grave No. 144	1			
grave No. 161	18			
grave No. 168				6
grave No. 171			6	16

Grave No.	Beads A1	Beads A2	Beads B	Beads C
grave No. 179	14			34
grave No. 180	4			
grave No. 181	1			
grave No. 182	1			
grave No. 187				3
grave No. 194	1			1
grave No. 198			1	
grave No. 199	14			
grave No. 200	23			8
grave No. 215	5			
grave No. 227	5			
grave No. 228	1	11		
grave No. 230		5		
grave No. 235	2	2		3
grave No. 237	4			
grave No. 240				3
grave No. 242				13
grave No. 245	5	15	1	
grave No. 246	5			16
grave No. 247	5			
grave No. 259				12
grave No. 267			1	
grave No. 274	2			
grave No. 283				17
grave No. 286	2	3		
grave No. 287	1			2
grave No. 288	1			
grave No. 300	4			
grave No. 302	13	25		2
grave No. 305				1
Total:	*197*	*106*	*46*	*285*

Table 1. *List of graves with beads.*

terials, including kaolin and metal, were found along with *Dentalium* beads in graves 2, 199, 237, etc. (Girić 1971, 37f, 132f, and 149f). The position of the beads in graves suggests they were most likely used as part of the composite necklaces, or perhaps they were part of the garment (see below).

Smaller long bones were also used to produce beads (variant A2; figs. 3 and 4). They were mainly or perhaps even exclusively made from tibiae and metapodial bones of smaller ungulates (mainly or even exclusively *Ovis/Capra*). They were produced by transversal division of the bone diaphysis; after the removal of epiphyses, a transversal groove was made with the aid of a wet abrasive fiber. After that, the bone was cut through by sawing and sometimes we may notice the traces of the sawing near the edge. Finally, the bone was either completely cut through, or a small portion was broken/snapped off. The surfaces of these beads are rarely well preserved due to unfavorable taphonomic conditions. Insufficient preservation and use wear traces do not allow determining with certainty the tools which were used, but it seems that these were chipped stone and not metal tools.[5]

These beads were usually cylindrical or slightly barrel shaped, i.e., their outer surface was straight or slightly biconical, depending on the portion of the bone that was used. There is no clear border between cylinder or barrel shaped beads; the differences are more gradual than sharp and this is the reason why they were grouped together. Not only this difference is barely noticeable, and it is difficult to assign them to one or either shape, but also it is not meaningful, since they share other technological traits and this final variations in shape were not intentional.

Sometimes, the transversal groove for dividing the bone was only initiated, but the bone was not cut completely, and thus the groove was retained as some sort of a decoration. This variant of beads may be relatively short and resembles the shape of figure 8, but rarely are quite elongated and resemble preforms. One unique, quite large segment of bone (66 mm long) with initiated grooves – practically, a preform used as a final object – was recorded in the grave 245 along with other, smaller beads (fig. 4).

The dimensions of these beads vary, suggesting there was no predetermined template for them. Their average length is 15–20 mm, and this means that several beads could have been produced from a single metapodial bone. The quantities of these beads also vary; for example, grave 104 contained 32 beads of this type, grave 245 yielded fourteen, in grave 228 there were eleven, etc.

The traces of use that can be observed on these beads are polish and shine, the result of contact with soft materials such as clothes. These beads could have been arranged on a string and be a part of a composite necklace, bracelet, sawn to clothes (dress, cloak, belt...), etc. Their locations in the graves with respect to the skeleton vary, but they seem to have been mainly used for decoration on clothes. For example, in grave 245 these beads were found in the waist area, along with other ornamental pieces (Girić 1971, 154f), so they

[5] Criteria for distinguishing chipped stone from metal tool marks follow Christidou 2008.



Figure 2. *Beads made from* Dentalium *shells (subtype A, variant A1). Image Credit: the author.*



Figure 3. *Bead made from long bone (subtype A, variant A2), with traces of manufacture. Image Credit: the author.*



Figure 4. *Various bone beads (subtype A) from grave 245. Image Credit: the author.*

may have been part of the belt or simply sawn to the clothes (fig. 4). Similar is the case of grave 228; a horizontal row of eleven such beads was uncovered in the waist area of the skeleton, along with one *Dentalium* bead and a clay object in the shape of a biconical spindle whorl (Girić 1971, 145).

These beads were relatively frequent at the necropolis of Ostojićevo (Vitezović 2021 and 2022). Morphologically, similar beads, elongated, cylindrical, or barrel shaped, sometimes with groove in the central part, were also discovered at other Bronze Age sites across Europe. Closely resembling beads were discovered in one of the graves at the site of Mačkovac situated in the Sava River basin in eastern Croatia, belonging to the Late Bronze Age group of Barice-Gređani (Kalafatić et al. 2016). The Early Bronze Age site of Kichary Nowe in southeast Poland, belonging to the Mierzanowice culture, yielded similar beads made from bones (Winnicka 2016).

Subtype B

The second subtype of beads are discoid in shape, relatively flat (i.e., their height is insufficient to be classified as cylindrical beads). They were made from shells or bone and were less frequent than other subtypes (table 1). However, it should be noted that they were produced from other raw materials as well, such as white stones – perhaps deliberately chosen to resemble shells.

Discoid beads from Mokrin are rather small, often less than 10 mm in diameter (fig. 5). The bad preservation of surfaces makes difficult to tell anything more on the manufacture or use wear. Bone discoid beads were probably made in the same manner as the cylindrical ones (see above), simply the cut segment was much smaller. Shell beads were made from smaller segments of shell valve, and they have central perforation made by drilling from both sides. However, they were found in small number and their surfaces are eroded, therefore, it is difficult to reconstruct the manufacturing procedure in detail, but it is possible that the blanks were obtained by breaking the shells, and even that the broken ornaments were recycled into small beads. Burnishing



Figure 5. *Discoid bead made from shell (subtype B). Image Credit: the author.*

was applied to obtain their final shape, and it is possible that it was used in earlier stages of production as well. Poor preservation as well as extensive modification also prevent the precise identification of shell species; Bivalvia shells were used, most likely Spondylus sp.

Usually, these beads were discovered near the neck area of the skeletons (Girić 1971), suggesting they were most likely combined into necklaces or perhaps sawn to the clothes.

Discoid beads from diverse materials were widespread in prehistory (e.g., Barge 1982; Baysal 2014; see also Camps-Fabrer 1991).

Subtype C

The third subtype includes irregular beads produced from almost entire shells of *Columbella* snails. *Columbellae*, mainly and probably exclusively *Columbella rustica*, were used minimally modified (see also Ljuština et al. 2019). The top part of the shells was removed and left open. In the central part of the shell, they have a perforation, usually of irregular circular shape, made by piercing. Most of them were intensively used; beside worn perforations, surfaces also display polish and weathering, with prominent parts sometimes abraded (figs. 6 and 7).

Columbella beads may be encountered in graves that are considered rich, i.e., that contained metal ornaments – for example, one *Columbella* bead was discovered in grave 123, along with several ornamental items made from gold (Girić 1971, 100).

Columbella beads were used combined with other ornamental items into composite jewelry such as necklaces (fig. 8); for example, a perforated animal tooth, three *Dentalium* beads, and three *Columbella* beads were discovered in the neck area of the skeleton in grave 136, along with 13 kaolin beads (Girić 1971, 106f). In grave 129, they were recorded behind the skull, so they could have been either part of the necklace or head garment.

Some of these *Columbella* shells were decorations on clothes, as suggested by the finds from graves 74 and 90, where they were discovered behind the back of the skeleton,



Figure 6. *Beads made from* Columbella *shells (subtype C). Image Credit: the author.*

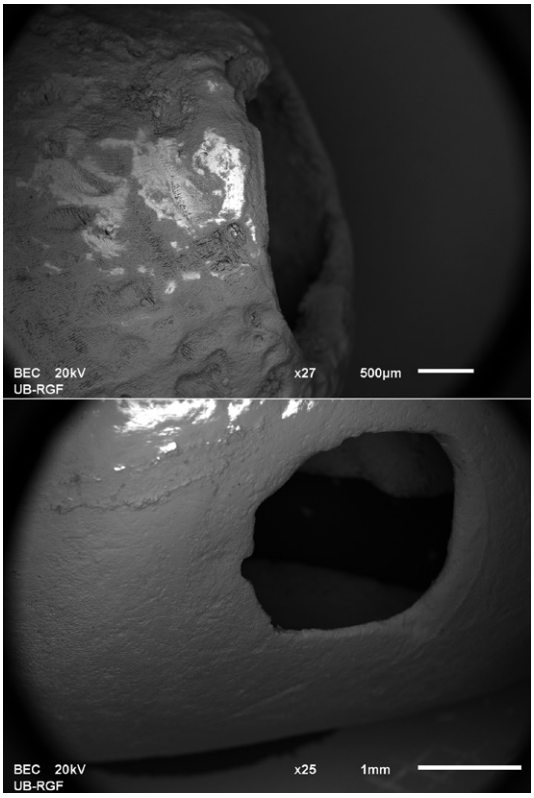


Figure 7. *SEM images of* Columbella *shells beads. Above: detail of the top part of the shell. Below: detail of the perforation. Image Credit: the author.*

along with bronze buttons (figs. 9 and 10; Girić 1971, 76 and 84). Remains of a belt, probably made from leather, were discovered in grave 242, with copper applications and buttons on it (fig. 11). Some buttons were scattered around, along with 13 *Columbella* beads that were most likely part of the same belt (Girić 1971, 152f).

The richest finding of *Columbella* beads comes from grave 104; 73 shells were discovered in the waist area, along with several hundred kaolin beads, over 70 perforated teeth, 32 bone beads, and ten salteleons made from copper, again, probably decoration on a belt or other clothing item (Girić 1971, 91).

This is also the type of ornaments that was widespread across Europe in prehistoric times, (e.g., Borrello 2004), and they are also encountered in the Bronze Age of the Carpathian basin. It should be noted that one such bead was discovered at the settlement site of Pecica-Şanțul Mare in Romania (Nicodemus & Lemke 2016, fig. 2b), showing that these items were worn daily and were not restricted to funeral equipment.

Discussion and concluding remarks

The beads discovered at the necropolis of Mokrin show diversity in the use of raw materials. We may note the occurrence of skeuomorphism – interchangeable raw materials, the occurrence of one variant made in different raw materials. For example, white



Figure 8. *M. Girić's reconstruction of an ornament from grave 8, including* Columbella *shells and a tooth pendant. Image Credit: the author.*

stones were sometimes used, mainly for small discoid beads – perhaps as a replacement for white shells, which must have been obtained through exchange (and therefore more difficult to obtain), or perhaps the white color was important.[6] Also, beads made from shell and bone may have the same or similar shape, as in case of the two variants of subtype A, elongated cylindrical beads.

The raw materials were obtained from diverse sources; bones were most likely obtained locally, while shells were obtained by trade and exchange. Bone beads were most likely produced locally, and discoid shell beads were also most likely local product. *Dentalium* and *Columbella* shells, on the other hand, may have been obtained through trade and exchange routes both unworked and already modified (Vitezović 2017 and 2022).

Use wear traces are not well preserved on these ornaments. Traces of intensive use are best preserved on beads from *Columbella* shells; their perforations are heavily worn and often deformed. On other beads, when the use wear traces are preserved, we may note

[6] The importance of white color was already suggested for some other ornaments in prehistory (e.g., Luik 2007; Vitezović 2012; Antonović et al. 2017).

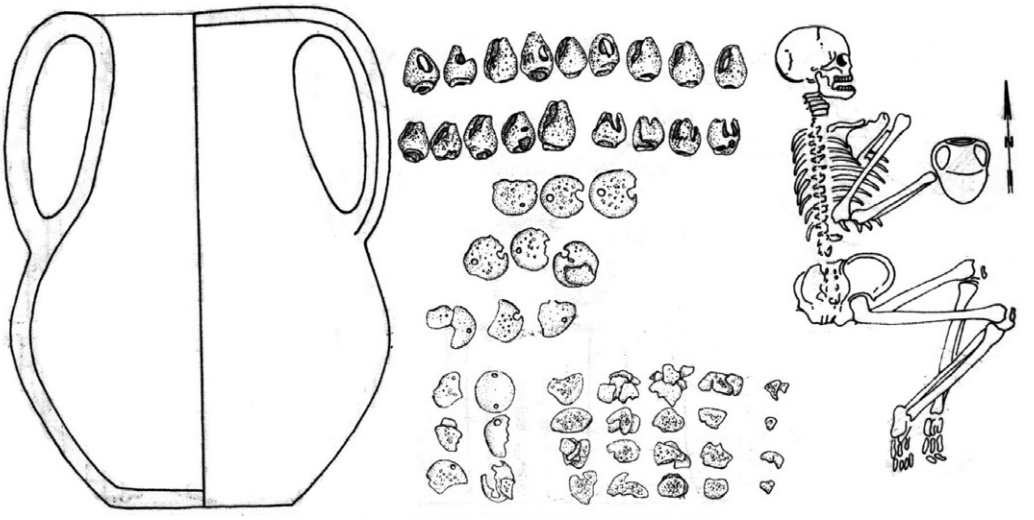


Figure 9. *Grave 74, skeleton and grave goods. Image Credit: Girić 1971.*

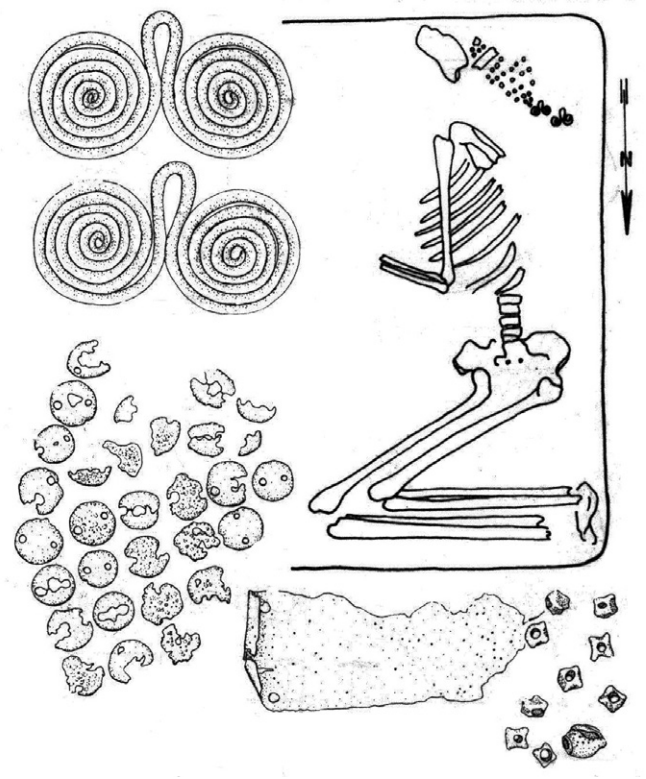


Figure 10. *Grave 90, skeleton and grave goods. Image Credit: Girić 1971.*

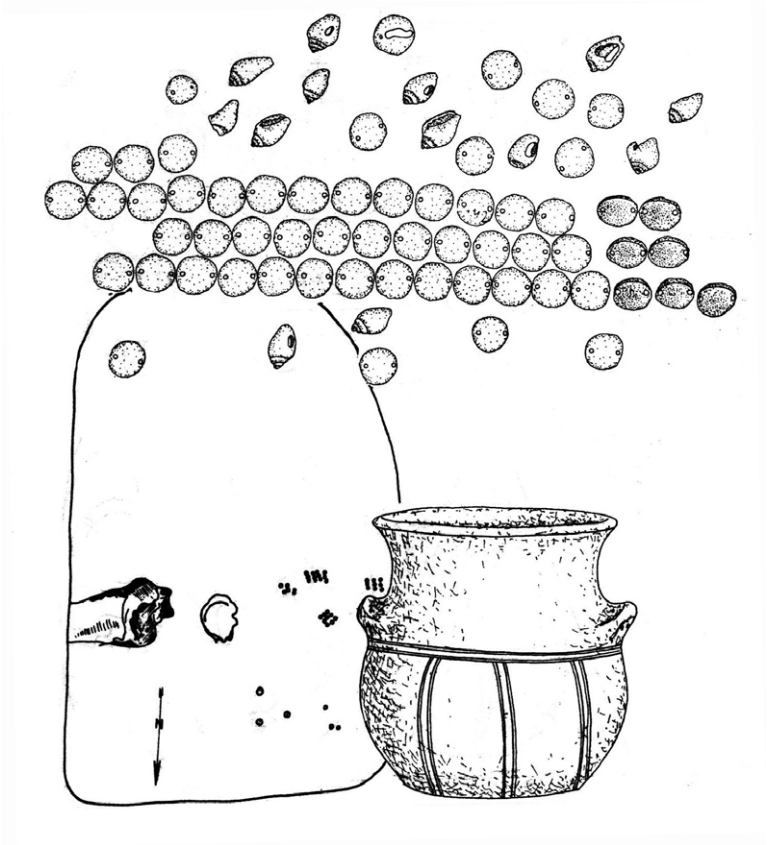


Figure 11. *Grave 242, skeleton and grave goods. Image Credit: Girić 1971.*

polished, worn surfaces. This suggests that the jewelry that contained these beads was not made for burial purposes only, but was used during life, and this is supported by the finds from settlements, such as a shell from the site of Pecica-Şanțul Mare (Nicodemus & Lemke 2016). Long use suggests that beads from osseous raw materials were valued. There is also a possibility that some of the ornaments were inherited, since some of the beads were found in graves of younger individuals. Personal ornaments may have been included in the burial as some sort of gift, offering, or sacrifice, and their symbolic value may involve display of status, wealth, and prestige, but their function might have also been apotropaic and prophylactic (these meanings are not mutually exclusive; on possible meanings of ornaments in burial contexts, cf. Härke 2014; Vitezović 2024, and references therein). Their presence in graves with richer funerary equipment, including gold jewelry (for example, grave 123) may suggest they were also used to display status and wealth.

These beads do not differ in raw material selection or other techno-typological traits from the beads discovered at the Moriš culture necropolis of Ostojićevo (Vitezović

2021), suggesting there was some common fashion and/or common symbolical meaning and value of these ornaments among the Moriš culture communities.

Beads are often interpreted as being used to create composite jewelry such as necklaces or bracelets. However, the evidence from the Mokrin necropolis shows that beads were used to decorate garments as well. In fact, we may note that elongated bone beads were often found in the waist area, suggesting that they were part of the ornament on clothing items, most likely belts, and at least some of the beads made from *Columbella* shells were worn in the same manner.

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Ritual pit with human remains from the mid-first millennium BC at Brestak, northeast Bulgaria

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Abstract

This paper discusses the results of the archaeological investigation of a pit with human remains dating to the mid-sixth century BC. Some 66 pits from three different periods – the Early Copper Age (early fifth millennium BC), the Early Bronze Age (early third millennium BC), and the Iron Age (sixth–fifth century BC) were uncovered during the 2021 rescue excavations at a pit site near the village of Brestak in northeast Bulgaria. Pit 2 is of particular interest due to the unusual context with bones of three human individuals: a complete skeleton of a pre-adolescent child, remains of a six-month baby, and leg bones of an adult (articulated femur and tibia bent sharply at the knee joint).

Human remains have been recorded at a number of pit complexes in the territory of Ancient Thrace, mostly dating to the first millennium BC. The opinions of modern researchers on the interpretation of such finds diverge greatly, with the two major theories opposing human sacrifice against unconventional graves.

The author proposes a set of characteristics which distinguish the material evidence of ritual human sacrifice from burial practices. With reference to the adduced parallels and excerpts from classical authors, the context in pit 2 at the site of Brestak is interpreted as a multiple human sacrifice with evidence of ritual dismemberment.

Keywords: *ritual pits – pit sites – human sacrifices – dismemberment – Thracian culture – ritual practices.*

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A rescue project was conducted in 2021 at an archaeological site, which had been identified during excavations for the construction of a gas pipeline. The site is located in a large plot of cultivated land, on a prominent hill with a gentle slope to the north and west, about 1 km south of the village of Brestak, Valchidol Municipality, Varna District, northeast Bulgaria (fig. 1).

The site

Over 70 features were recorded during the archaeological excavations at the site of Brestak (fig. 2). They belong to three different periods: the Early Copper Age (early fifth millennium BC), the Early Bronze Age (the early third millennium BC), and the Iron Age (sixth–fifth century BC). Most of them were cut contexts – pits, demonstrating not



Figure 1. *Map of ancient Thrace with the location of the archaeological site at Brestak. Image Credit: 1988–1998 Microsoft Encarta Reference Suite and P. Delev.*



Figure 2. *Aerial view of the site at Brestak. The position of pit 2 is shown with a red arrow. Image Credit: the author.*

only a topographic continuity, but also common ritual practices repeated over very large time lapses. The greatest number of excavated pits – a total of 43 – date to the sixth or early fifth century BC, followed by 12 pits from the Early Copper Age, and only three from the Early Bronze Age; the dating of eight pits remains undefined. All the excavated pits share similar characteristics, with small specific deviations. Although the dimensions vary considerably, the pits of medium depth, from 0.5 to 0.7 m, prevail in number. Quite a few of the cuts were, however, shallower, while some were as deep as 1.6 m. Earlier pits were never truncated by later ones. The pits from the Early Copper Age were mostly wider and shallower in comparison to the later contexts and did not contain any pieces of burnt daub, while the latter were common in the pits from the Early Bronze Age and from the sixth–fifth century BC. The pits were usually filled with black or dark grey sediment, different in composition and color from that of the subsoil into which they had been cut. The fill often contained ceramic sherds, small stones, and numerous animal bones; less frequent finds included household items such as spindle whorls, iron knives and spearheads, and flint flakes. Sealing of pits with piles of ceramic sherds and stones was a common practice for all three periods. Complete pots were found in some of the piles as well as in the pits.

Human bones and skeletons were revealed in three of the pits dated to the sixth–fifth century BC; one of these finds, which has rather specific characteristics, will be presented and discussed in the following pages.

Pit 2

The pit had a round opening and was rather deep (ca. 1 m), with almost vertical walls and a concave bottom (fig. 3). The fill was relatively homogeneous, consisting of dark sediment mixed with small stones, pieces of charcoal, and only a few ceramic sherds from hand-made and wheel-thrown household pots (figs 4 and 7). Bones from a small rodent were recorded in the southern periphery of the pit.

Human remains belonging to three individuals were uncovered at the bottom of the pit (figs 3, 5, and 6). The well-preserved skeleton of a pre-adolescent child (based on dental development, between 7 and 12 years old)[1] occupied the center, lying in supine position, with the legs flexed at the knee joint. The bones of the feet and the distal epiphyses of the lower leg bones were missing. The first metatarsal was found near the right knee joint. The skull was more or less intact, with a fragmented left side. The sex could not be determined adequately.

The remains of a second individual – a baby about six months old – were lying to the west, close to the first skeleton. The bones of one forearm were somewhat displaced relative to the humerus. Only the left femur was preserved of the lower limb bones.

Remains from a third individual were located north of the first skeleton, next to its

[1] The human bone material was assessed by Victoria Ruseva of the Institute of Experimental Morphology, Pathology and Anthropology with Museum, Bulgarian Academy of Sciences.



Figure 3. *Pit 2 at Brestak, view to the south. Image Credit: the author.*

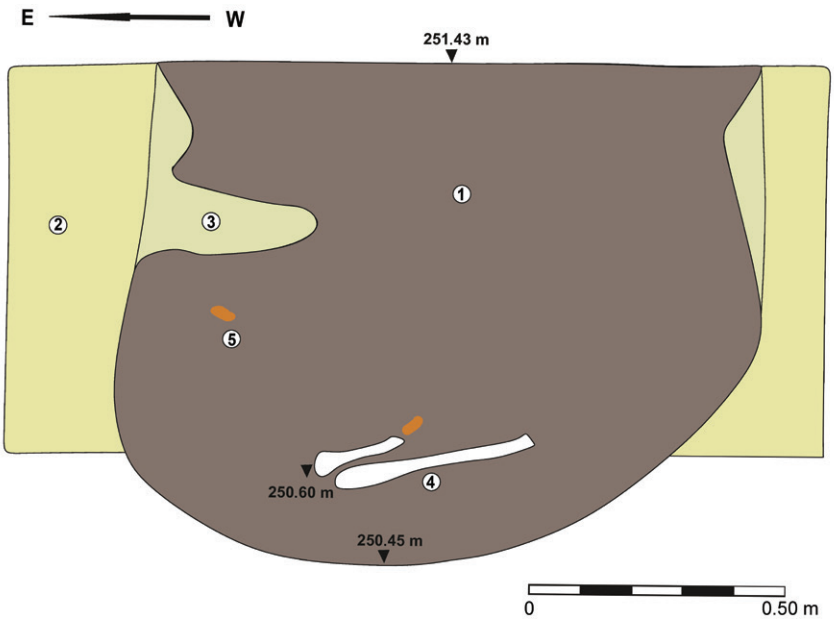


Figure 4. *Cross-section of pit 2 at Brestak. Key: (1) dark brown soil; (2) yellowish subsoil; (3) intrusion of yellowish subsoil; (4) human bones; (5) pottery sherds. Image Credit: the author.*

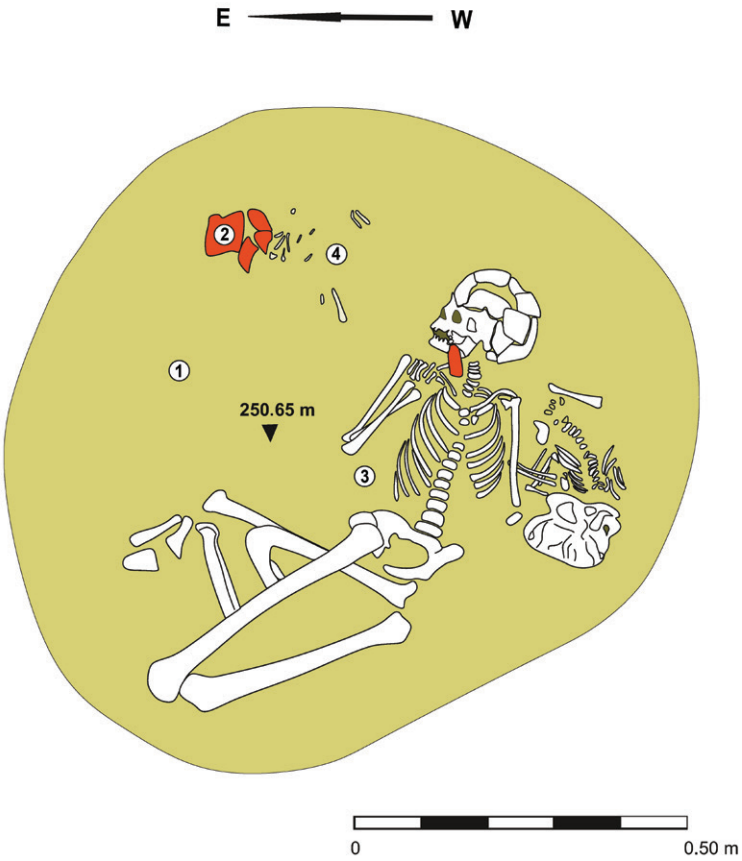


Figure 5. *Pit 2 at Brestak, layout at bottom level. Key: (1) yellowish subsoil; (2) pottery sherds; (3) human bones; (4) animal bones. Image Credit: the author.*



Figure 6. *Detailed view of the human bones in pit 2 at Brestak. Image Credit: the author.*

pelvis. Only an articulated femur and tibia from this body were present in the pit, flexed at the knee at a 30° angle. The size of the femoral head (48 mm) and the bone development suggest that the leg belonged to an adult male. Based on the articulation of the bones, they were placed in the pit before the decomposition of the soft tissues.

Based on the ceramic finds and on a radiocarbon date on a sample from the pre-adolescent individual (SUERC–103179 / GU59861: ca. 540 cal. BC), the pit can be dated roughly to the third quarter of the sixth century BC (figs. 7 and 8).

Analysis and discussion

The pit contained the relatively well-preserved remains of two individuals (a child and a baby) as well as the lower limb of an adult individual, probably a male. The context indicated that the pit was a completely closed complex, with no evidence of any secondary interventions. The pit was filled completely only after the remains of the three individuals had been laid to rest at its bottom, and had not been opened since, until the 2021 excavations.

Given the interpretation of the entire site (a pit site, a ritual place)[2] as well as the nature of the cut and the existing parallels, it must be assumed that this was a ritual pit containing the remains of human sacrifices. What are the grounds for such an interpretation?

Pits containing human skeletal remains were discovered at a number of pit sites excavated in recent decades in Bulgaria. A paper discussed this phenomenon in detail, supporting the human sacrifice theory with a number of examples, arguments, and parallels (Tonkova 2010). Such pits are not common; a pit site – or the excavated areas of a pit site – which might often include tens or hundreds of cuts, would usually yield a single feature with human remains or rarely two or more (Tonkova 2010, 507). According to Milena Tonkova, the whole or partial human remains found articulated in such pits are definite evidence of ritual killing (Tonkova 2010, 504). These arguments are also supported by the osteological assessment of the skeletons. Tonkova used examples from 10 sites excavated before the date of the paper's publication (Tonkova 2010, 503). Fieldwork has since provided new striking examples of pits with human remains dating to the first millennium BC; their number has grown by now to several dozen.

Doubts have been expressed in the meantime about the ritual interpretation of both the round pits with human remains and of the pit sites in general, even if no reasonable alternative theories seem to have been put forward. One such author asks whether these might not be unusual graves, while correctly listing all the arguments against such a claim (Georgieva 2015, 151; Nikov & Georgieva 2023, 165ff). Similar debate is now playing out in Romania on the pits with human skeletons found north of the Danube and their interpretation; for some authors, they are ritual in nature (Sîrbu 1995), while for others these are graves with special characteristics (Oanță-Marghitu et al. 2016).

[2] The conventional term for a pit site in Bulgaria is 'pit field'. For discussion on pit sites in Thrace, cf. Georgieva 2015 and Bozkova 2016.



Figure 7. *Pottery sherds from pit 2 at Brestak. Image Credit: the author.*



Figure 8. *Pottery from other pits of the sixth–fifth century BC at Brestak. Image Credit: the author.*

This is the real problem, and it's not purely terminological ('sacrificial pit' vs. 'grave'), but is rather essential. How should human skeletal remains, either whole or partially preserved, be explained when found in cut contexts which, on the one hand, are part of a pit site (not a cemetery) and, on the other hand, don't have the typological characteristics of the usual burials in the respective period? In my opinion, the most significant arguments for the interpretation of this feature type can be summarized as follows:

(1) The archaeological contexts of this specific type appear almost without exception at pit sites, among dozens, and often hundreds of other excavated and recorded cuts, identical in their principal characteristics, and regarded by a considerable number of authors as ritual places.

(2) The formal characteristics of these contexts – round pits of various depths –significantly differ from the rectangular graves typical of the first millennium BC inhumation burials in Thrace.

(3) The sacrificial pits containing human remains most often produce no evidence of reverence or demonstration of respect for the deceased, which is the principal characteristic of burial rituals in general, usually expressed in carefully arranged contexts containing personal belongings and other burial gifts.

(4) In some cases, the human remains found in circular pits show clear evidence of intentional homicide; e.g., a skeleton from a pit site at Yabalkovo showed traces of cutting with a heavy tool or weapon (Tonkova 2010, 508).

(5) The lack of associated finds in over 90% of these pits comes as a striking and suggestive observation. Complete finds such as pottery, jewelry, etc. are extremely rare (an iron fibula in a pit at Malko Tranovo: Tonkova 2010, 506; complete pots at Svilengrad: Iliev 2019, 124). The usual deposits in ritual pits in first-millennium BC Thrace contain mostly sherds of various ceramic vessels, small household items such as spindle whorls and loom weights (Tonkova 2010, 508), animal bones, and stones of various sizes; these differ widely from the standard inventories of contemporary burial contexts.

Atrocious and disturbing as it is from a modern perspective, human sacrifice has actually been practiced for millennia almost all over the world, from the Far East (China, Japan, India) to the lands of the Aztecs in America (see e.g., Bremmer 2007; Nagy & Prescendi 2013; Bonnechere & Gagné 2013; Walsch et al. 2024). The evidence is conclusive rather than speculative, and the scientific research is abundant. The ritual sacrifice of human beings was also practiced in Ancient Greece, as is demonstrated by written evidence and art monuments, if mainly in works of a legendary and mythological character (Bremmer 2013; Mylonopoulos 2013). Pits with human and animal remains, similar to the ones in Thrace, were also found in central Anatolia; in the publication they are defined as ritual sacrifices, dated to the Hellenistic period and ascribed to the Celtic (Galatian) population of the area in this age (Matsumura 2007).

The pit at the site of Brestak contained two skeletons of young individuals, a baby and a pre-adolescent; similar remains were recorded for other pit contexts of the

same age in Thrace. It seems that pits with child remains are a common and consistently present feature in the territories occupied by various Thracian tribal communities (Nehrizov & Tzvetkova 2008, 335f; Tonkova 2010) dating both to the Early Iron Age and the Classical Period. Many of them typically feature various types of disturbances in the integrity of the skeletal remains (Tonkova 2010, 507). Given such repetition, it is reasonable to assume that they were the result of deliberate actions related to the specifics of the ritual.

Besides the two children, the pit at Brestak yielded the surprising find of a single lower limb of an adult individual; the bones' articulation and the bent position of the leg suggest that the femur and tibia were not relocated from another place after the decomposition of the body. The only plausible explanation is that this was a case of deliberate dismemberment of the body and placing a part of it in the pit before the disintegration of the soft tissues. While some sort of a criminal act without religious connotations could be inferred theoretically, the context of the find suggests otherwise in my view. The dismemberment of the body was a traditional practice in Thracian culture, traceable both in pit finds (Tonkova 2010, 508) and in a number of grave complexes (Dimitrova 2023, 30ff). For example, the skeleton of an adult individual missing one upper and one lower limb was found at Gledachevo in south Bulgaria (Tonkova 2010, 504).

Some further interesting examples come from the northern Thracian territories (the lands of the Getae, where the site of Brestak is located). A disarticulated skull without other bones was found in a pit in the Shumen area (Madzharov & Bonev 2021, 490). A skull separated from the body (of which only a few bones were preserved) was found at the pit site of Durankulak, Dobrich region (Burow & Todorova 2016, 127: *Grube 18*). Skull fragments or entire human skulls were also found in south Thrace (Tonkova 2010, 506 and 510; Nikov & Georgieva 2023, 161ff).[3] Together with the remains from the pit at Brestak, all these and other similar finds testify to the persistent practice of dismembering human bodies and the placing of severed parts in ritual pits; both seem to have been an established tradition in the lands of the Getae (for human dismemberment and sacrifices, cf. Popov 1995, 59ff).

In connection with the finds from the Getic territories, it is worth recalling another, slightly different example from several burial mounds near Histria (again in northeast Thrace), where human remains were found around central graves with cremated corpses. The human skeletons were located on the periphery of the mounds, in a trench surrounding the cremation area or in particular pits, in some cases together with dismembered remains of horses and donkeys. According to the excavators, the human skeletons were either carelessly dumped or had unusual positions, suggesting a forceful death in place (Alexandrescu & Eftimie 1959, 146ff, 152f, and 157ff; Alexandrescu 1966, 146ff). Despite the continuing debate about the ethnic affiliation of the mounds (cf. Damyanov 2012,

[3] The severed head as a sacrificial offering is also attested in characteristic rituals of the Celtic cultural and religious tradition (Kaenel 2013).

42ff), most authors agree that these were undoubtedly human sacrifices (Fowler 2021).

These examples from north – and also from south – Bulgaria directly correspond to the well-known account of Herodotus about the religious customs of the Getae, who used to send periodically an envoy to the god Zalmoxis, killing him by throwing him onto upright spears (Hdt. 4.94). This is one of the most striking examples of a ritual involving human sacrifice, and it refers to a time that corresponds to the chronology of the pit at Brestak. Herodotus provides also another account of human sacrifice, this time in the lands of the Apsinthians in southeast Thrace; in 479 BC they caught a fleeing noble Persian named Oiobazos and sacrificed him to the local Thracian god Pleistoros 'in their special way', and slew his companions (Hdt. 9.119). Another ancient author, Diodorus Siculus, recounts that in the second century BC two young Greeks from Anatolia were captured by the king Diegylis of the Caeni (again in southeast Thrace), who killed them both with one stroke, like sacrificial animals (Diod. 33 fr. 14).

Although the literary evidence seems to confirm unequivocally the existence of rituals involving human sacrifice in the religious practices of the ancient Thracians, it offers little help in determining the criteria by which the victims were selected. Some of the adduced texts seem to suggest that at least in some cases they were foreigners or perceived enemies (the Persian Oiobazus, the Greek brothers killed by Dyegilis who was at war with the Attalid Kingdom at the time). According to Herodotus (4.94), the choice of the envoy to Zalmoxis was made by lot, while Clement of Alexandria mentions that only the worthiest men were chosen for such sacrifice (Clem. Al. *Strom*. 4.8.57.2–58.1). This, in turn, recalls the popular story about the funeral practices of the Thracians, who killed and buried the most deserving of the dead man's wives together with him (Hdt. 5.5; cp. Mela 2.2; Solin 10; St. Byz. s. v. Γετία) – an act that also represents a specific kind of sacrifice.

Similar reasons, however, cannot explain the significant presence of child skeletons in sacrificial pits. Most human skeletal remains found at some of the excavated pit sites belonged to children (Nekhrizov & Tsvetkova 2008, 335) – sometimes two or more individuals in the same pit (Tonkova 2010, 507). Unfortunately, there is insufficient evidence suggesting any physical or mental pathologies that may have been decisive for the selection of the victims. There is even less reason to consider in these cases causes such as atonement for mortal sins, family and other feuds, etc. Some authors have suggested that the skeletons of children found at pit sites may be related to the traditional practices of some ancient communities not to bury children under a certain age at the common cemeteries (Nekhrizov & Tsvetkova 2008, 336), but the absence of typical burial attributes such as grave goods contradicts the theory that these pits are regular burial complexes. An additional argument against their interpretation as 'non-standard grave features' comes from the fact that the remains of children are often accompanied by those of adults (Tonkova 2010, 505 and 508) – in the case of the pit at Brestak, just a lower limb, therefore considering it a grave doesn't make much sense.

Finally, it is important to note that human remains have been found in pits together

with similarly articulated animal bones (Tonkova 2010, 507; Iliev 2019, 124; Madzharov & Bonev 2021, 490). The archaeological contexts show very similar principles for both human and animal sacrifices in pits.

Pit 2 at the site of Brestak evidently doesn't provide final solutions and answers to many of the questions related to Thracian religious rituals, but it adds new evidence and arguments to the interpretation of this unusual and specific segment of Thracian history and culture.

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Methodology and Archaeometry in Focus: Review of the 13th MetArh, Zagreb

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The thirteenth edition of the International Scientific Conference *Methodology and Archaeometry* (MetArh) was held in Zagreb on 27–28 November 2025, continuing an uninterrupted tradition established in 2013 (fig. 1). Held annually at the end of November or early December, the meeting has become a recognizable forum for interdisciplinary research – scheduled in the coldest season, yet perhaps at the ideal time for focused academic exchange. The event is organized by the Department of Archaeology at the Faculty of Humanities and Social Sciences, University of Zagreb, and is supported by both the University and the Croatian Archaeological Society. Its driving force from the very beginning has been Ina Miloglav (fig. 2), Associate Professor at the Department of Archaeology, who has consistently shaped the conference's direction and spirit.

The conference emphasizes the value of interdisciplinarity in contemporary archaeological research, encouraging critical reflection, innovative perspectives and new theoretical directions. Its broad thematic scope fosters discussions that advance key methodological questions, from data collection and documentation to the interpretation of archaeological contexts. By bringing together archaeologists and specialists from related scientific fields, the meeting highlights how collaborative work enriches the understanding of past human lifeways. The Methodology section focuses on the essential role of data acquisition, showcasing modern tools and techniques that enhance both the accuracy and efficiency of archaeological interpretation. The Archaeometry section demonstrates how analytical approaches from the natural sciences expand the information gained from excavations, while also requiring careful coordination between analysts and archaeologists. Overall, the conference underscores the importance of integrating diverse scientific expertise to build more nuanced and comprehensive reconstructions of the past.



Figure 1. *Official poster of the MetArh 2025 Conference. Image Credit: Ina Miloglav.*

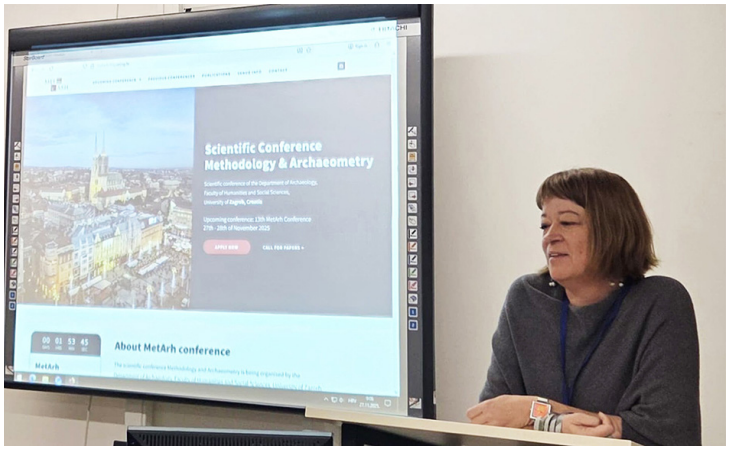


Figure 2. *Ina Miloglav at the opening ceremony. Image Credit: Ina Miloglav.*

Conference setting

The meeting was hosted by the Faculty of Humanities and Social Sciences of the University of Zagreb, the institution's oldest department – formerly the Faculty of Philosophy established at the founding of the university in 1669. The sessions were held in its dedicated conference hall, a venue well suited to focused presentations and discussion. Although originally conceived as a small and friendly gathering, the event continues to expand each year. This edition brought together around 110 authors and co-authors from 13 nations, with approximately half attending in person. Bulgarian participation comprised three contributions, all affiliated with the National Archaeological Institute and Museum of the Bulgarian Academy of Sciences (NAIM–BAS): one jointly presented by Atanas Tsurev and this author, and two others delivered by teams of co-authors, with Petar Minkov, Zheni Vasileva, Denitsa Sandeva, and Yana Dimitrova in attendance (fig. 3).

The Scientific Committee – Ina Miloglav, Jacqueline Balen, Rajna Šošić Klindžić, Marta Čović Mileusnić, Predrag Novaković, Dimitrij Mlekuž, Jasna Vuković, Michela Spataro, Duska Urem-Kotsou, Michael Doneus and Maja Miše – deserves recognition for ensuring the smooth organization and the consistently high academic standard of the program.



Figure 3. *Bulgarian participants in the conference. From left to right: Atanas Tsurev, Nikolina Nikolova, Petar Minkov, Yana Dimitrova, Denitsa Sandeva-Minkova, and Zheni Vasileva. Image Credit: Petar Minkov.*

The program was thoughtfully structured and deliberately kept at a manageable scale, extending over two days. In total, 25 presentations were distributed across seven sessions. One presentation had to be cancelled, while two were delivered online. Although the hybrid format is not my preferred approach, it is worth acknowledging the organizers' effort to provide remote participation for colleagues who were unable to attend in person. Each speaker was allocated fifteen minutes, followed by enough time for questions and comments. This format encouraged focused presentations and allowed for productive exchanges at the end of each session.

The sequence of sessions was interspersed with regular coffee breaks of fifteen to twenty minutes, held in the ground-floor lobby of the building. These intervals were well organized; hot drinks and pastries were readily available and the student volunteers ensured everything ran smoothly. The breaks also provided a relaxed setting for informal conversations.

The conference website (https://metarh.ffzg.unizg.hr/) proved very useful and user-friendly, providing clear access to the program, book of abstracts, application forms, and information from previous editions. It allowed participants to check details quickly and efficiently whenever needed. The site also offers open-access proceedings from the Methodology and Archaeometry conference series available since 2019 under the editorship of Ina Miloglav (https://openbooks.ffzg.unizg.hr/index.php/FFpress/catalog/series/MetArh). Contributions from two successive meetings are occasionally published together, offering researchers a comprehensive and readily accessible record of the presented work.

Program highlights

The conference opened with welcome addresses, beginning with Ina Miloglav who reflected on how the meeting began and developed over the years. Jacqueline Balen, President of the Croatian Archaeological Society, and Domagoj Tončinić, Dean of the Faculty of Humanities and Social Sciences, emphasized the significance of this gathering and shared memories from its early editions. The program then proceeded with the key-note lecture by Prof. Cristina Barrocas Dias from the Chemistry and Biochemistry Department, University of Évora, Portugal. Her presentation was both engaging and highly educational. She carefully explained key analytical methods – organic residue, isotopic, and proteomic analyses – including how lipid residues in pottery, isotopic values in human bone, and protein markers each contribute different insights into ancient diets. All terms, procedures, and their interpretive potential were presented in a way accessible even to non-specialist chemists, along with clear explanations of their limitations. Selected case studies from the Mediterranean illustrated how combining these approaches can reconcile apparently conflicting evidence and provide a more nuanced understanding of past foodways.

The conference program was well-structured and successfully balanced methodological discussions with case studies from ongoing research. One of the main the-

matic threads focused on the application of non-invasive methods, including LiDAR, magnetometry, and field surveys, often combined with spatial analyses. Several presentations highlighted the use of airborne laser scanning (ALS) and large-scale geophysical prospection, to investigate archaeological landscapes. Most studies were based in Croatia, which had recently completed a comprehensive national LiDAR survey covering the entire country. This extensive dataset, made publicly available under an open data policy (https://dgu.gov.hr/), allowed researchers to systematically detect, document, and interpret archaeological features across large areas, significantly expanding the scope of landscape research. In this context, Ivor Kranjec, Jelena Behaim, and Miljenko Jurković presented three case studies, offering new LiDAR-based insights into post-Roman landscape transformations in the Northern Adriatic. Tino Leleković examined how LiDAR and magnetometry revealed boundaries along the Croatian Limes, while Srđan Beck and Katarina Šprem explored the Roman centuriation of ager Polensis in southern Istria.

Continuing the focus on spatial analyses, several presentations demonstrated the integration of digital and quantitative approaches to archaeological survey. Kyriakos Sgouropoulos, Dushka Urem-Kotsou, and Apostolos Sarris presented a workflow from the MapFarm Project, integrating GPS-based recording of surface finds, machine learning analysis of drone imagery, and geophysical prospection for high-resolution mapping of spatial relationships. Complementing this, Boris Rozić examined Mousterian sites in Bosnia and Herzegovina, showing how site locations were shaped by the availability of primary chert, terrain morphology, and natural communication routes. Together, these studies demonstrated the value of combining advanced remote sensing, geophysical, and analytical methods to explore past landscapes.

Another aspect of the conference addressed heritage protection and public engagement. Marta Rakvin and Jacqueline Balen showcased an interdisciplinary project in the Požega Valley, using ALS data, VR visualizations, and Iron Age menu reconstructions to create trails and information boards offering immersive interpretations of cultural landscapes. Marin Buble and Lujana Paraman presented how archaeological site data from Trogir and surrounding municipalities were integrated into the Croatian Fire Association's tracking system to help fire commanders preserve heritage from wildfire damage.

A prominent theme at the conference was the application of archaeometric approaches to the study of ceramics and pigments, demonstrating how integrated analytical frameworks can illuminate technological choices and cultural practices. Andreja Kudelić and colleagues presented the first integrated archaeological–geological database in Croatia which combines archaeological, geological, and experimental materials to support interdisciplinary studies of pottery technology, provenance, and *chaînes opératoires*. Other studies applied a broad suite of complementary analytical methods – including macroscopic and microscopic observation, X-ray fluorescence (XRF), X-ray diffraction (XRD), scanning electron microscopy with energy-dispersive spectroscopy (SEM-EDS), Raman spectroscopy (Raman), Fourier-transform infrared spectroscopy (FTIR), μComputed

Tomography (μ-CT), and hyperspectral imaging – to investigate ceramic composition, firing conditions, tempering practices, and decorative techniques. For example, Katja Kavkler and her team studied white incrustations on third millennium BC pottery from the Ljubljansko barje, Atanas Tsurev and Nikolina Nikolova analyzed Early Neolithic polychrome pottery from Chavdar, and Bogdan Manea and collaborators examined shell-tempered Chalcolithic vessels from Săveni-La Movile.

Analytical approaches were similarly applied to pigment research. Massimiliano Puntin presented a non-destructive multi-analytical protocol for Roman painted plasters, combining the same range of methods to characterize pigments, painting techniques, and traces of application.

Collectively, these studies illustrate the central role of archaeometry in reconstructing prehistoric and historic ceramic technologies across Europe, fostering interdisciplinary collaboration and data integration. This theme also sparked some of the most extensive discussions at the conference, with participants offering valuable comments and questions. Even well-established methods, applied for decades, continue to be refined, yielding increasingly detailed information and enabling more nuanced interpretations.

Another group of presentations demonstrated the application of multi-analytical archaeometry to materials beyond ceramics. Valentina Lončarić and colleagues investigated over 500 Iron Age glass beads and pendants from the Pelješac region (Croatia), revealing multiple workshops and diverse compositions. Marin Šoufek and Iva Kaić applied SEM-EDS to green chalcedony Roman gems from Sisak (Croatia) to determine their mineralogical composition and chromium content. Tena Karavidović and her team studied Iron Age ironworking in northwest Croatia with XRD and pXRF, reconstructing production processes and metallurgical organization. Selena Vitezović and Gordana Jeremić analyzed Roman-period bone pins from northern Serbia, clarifying use-wear patterns and functional aspects.

Particularly notable was the presentation by Zheni Vasileva, Petar Minkov, and colleagues on a remarkable net from Devetashka Cave (Bulgaria), which had remained largely unstudied for over 70 years in the storage of the National Archaeological Museum in Sofia. Radiocarbon dating places the net at the beginning of the Late Chalcolithic, while archaeobotanical and microscopic analyses conducted by Hanna Aleksandrova indicate that it was made from hemp or bast fibers from woody taxa. Detailed study of the knotting and weaving techniques, complemented by photomicrographs, allowed a reconstruction of the net's structure. This research provides unparalleled insights into craft and subsistence strategies of the prehistoric Balkans, offering rare information on textile technology and fishing practices. The NAIM–BAS team that initiated and led this study deserves sincere congratulations for their outstanding results.

Almost the same group of co-authors, led by Petar Minkov, presented research on the Late Bronze Age site of Kamenovo (northeast Bulgaria), using an integrated

approach that combined remote sensing, GIS mapping, geophysics, excavation, and a broad range of laboratory analyses. Their study provides new insights into subsistence, raw material use, and technological practices in the generally unexplored Ludogorsko Plateau.

Two presentations addressed past diets. Mario Novak and colleagues applied $\delta^{13}C$ and $\delta^{15}N$ stable isotope analyses to Bronze and Iron Age human and faunal remains in Croatia, revealing inland–coastal differences in millet consumption. Complementing this, Marla J. Toyne and team used fuzzy c-means clustering on isotope data from an eight–ninth century Avar cemetery at Šarengrad (Croatia), highlighting nuanced dietary variation and community structure. Together, these studies demonstrate how innovative analytical approaches can reconstruct both subsistence strategies and social dynamics.

Several presentations showcased digital and automated approaches in archaeology. Martina Naso and colleagues presented the AUTOMATA project, which integrates 3D digitization with non-destructive analyses, including hyperspectral imaging, portable XRF (pXRF), and Raman spectroscopy, for lithics and ceramics. Combining robotic handling, automated scanning, and unified workflows, the system enhances speed, precision, and reproducibility while facilitating multi-proxy integration of geometry, surface, and analytical data. Although this 'automated pipeline' streamlines the study of small artifacts, human supervision remains necessary to refine measurements and ensure reliable results.

Marko Porčić presented a method for quantifying ceramic vessel shapes using profile drawings, combining geometric morphometrics with numerical taxonomy. The approach enables automated analysis of large datasets and grouping of vessels with similar profile syntax, offering greater objectivity in classification. The approach is innovative and largely automated, potentially saving time, allowing rapid generation of typologies. However, there is caution regarding its application to prehistoric hand-made ceramics, which often lack symmetrical profiles. The software relies on proportions and curvature lines, which, in the case of asymmetrical vessels, may produce an excessive number of types and subtypes for essentially identical forms. This method would likely be more suitable for mass-produced, standardized pottery, such as wheel-thrown vessels of the Ancient Greek and Roman Periods.

The conference program was complemented by a poster session, strategically located in the lobby where the coffee breaks were held – an arrangement that ensured excellent visibility and made the posters both convenient to consult and practically impossible to overlook. The twelve contributions covered a broad thematic spectrum, demonstrating the diversity of current archaeological research and its engagement with questions that extend well beyond methodological concerns. Several posters addressed wider historical and analytical issues, including the archaeology of megaliths, fortification studies, ceramic production and exchange, geochemical characterization of raw materials, and interdis-

ciplinary perspectives on salt. Others focused on subsistence practices or showcased the growing role of digital and imaging technologies in heritage research. The poster session also featured more innovative thematic directions, such as prehistoric filmmaking and recent *COST Actions* centered on computational approaches and the management of artificial intelligence in archaeology.

The Archaeological Museum and Cultural Scene in Zagreb

Located in the very heart of the lower city, the Archaeological Museum occupies the elegant Vranyczany–Hafner Palace on Zrinski Square, where it has been housed since 1945. The building – and its collections – suffered extensive damage during the earthquake that struck Zagreb on 22 March 2020, the most powerful in the region in more than a century. When I first attended this conference in 2022, the museum remained closed; however, following a long process of restoration, it reopened to the public on 17 July 2024, with the permanent exhibition newly reinstalled across three levels.

For me, the highlight of the visit was the prehistoric collection on the upper level, notable for its impressive artifacts from the Neolithic, Chalcolithic, and Bronze Age. Two objects stand out: the distinctive bird-shaped vessel from Vučedol, the so-called Vučedol dove, and the ceramic anthropomorphic figurine from Dalj, each belonging to different stages of the Bronze Age in terms of the Eastern Balkan chronological framework (https://www.amz.hr/hr/virtualni-muzej/3d-modeli-arheoloskih-predmeta/). The museum also features a substantial Egyptian collection, and it preserves the Zagreb Mummy together with the Linen Book of Zagreb (*Liber Linteus Zagrabiensis*), the longest surviving Etruscan text and the only extant linen codex from the third century BC.

We also had the chance to explore the temporary exhibition *Archaeology and Popular Culture*, curated by Jacqueline Balen and Daniel Rafaelić. It highlights how archaeology has shaped – and been represented – across a wide range of artistic and media forms, from visual arts and literature to film, comics, and digital gaming. The exhibition shows how creators from the fifteenth century to today have drawn inspiration from archaeological discoveries and how archaeology and archaeologists continue to appear in contemporary popular culture (https://www.amz.hr/en/exhibitions/archaeology-and-popular-culture/).

Zagreb, Croatia's capital and largest city, functions as the nation's main political, economic, and cultural center. The city is divided between the historic Upper Town, with its medieval streets and prominent landmarks, and the more modern Lower Town, featuring a mix of nineteenth and twentieth-century architecture, museums, and public parks. Nestled along the Sava River and at the base of the Medvednica mountains, Zagreb showcases a distinctive blend of Central European and Mediterranean cultural influences, reflecting its long and varied history.

Visiting Zagreb at the very beginning of December offers a unique experience, as the city embraces the Advent season with festive celebrations across the center. The

largest and most prominent market is held at Ban Jelačić Square, complemented by events such as Fuliranje on Strossmayer Square, a live nativity scene on Kaptol, and decorative displays in the Grič Tunnel. The streets are lively with numerous smaller markets, pop-up food and drink stalls, ice skating rinks, all contributing to a bustling, joyful atmosphere. Among the highlights are the aromatic mulled wines – offered not only in the traditional red but also in white varieties – and a broad selection of warm beverages, including teas, hot chocolate, and spiced alcoholic cocktails featuring sloe gin, whisky, or rum. The combination of festive lights, decorations, and the general bustle creates a particularly enchanting pre-Christmas ambiance, making Zagreb a memorable destination during this period.

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