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This volume is dedicated to Florin Drașovean at 70 years

Acest volum este dedicat lui Florin Drașovean cu ocazia împlinirii a 70 de ani

Contents / Cuprins

Field reports / Rapoarte asupra cercetărilor de teren

Reviews / Recenzii

Excavations at the Late Bronze Age Mega-Fort at Sântana – *Cetatea Veche*. The 2018 Field Campaign

Victor Sava, Florin Gogâltan, Marian Adrian Lie

Abstract: The 2018 excavation campaign at Sântana-*Cetatea Veche* focused on the northeastern section of the third fortification, part of a large Late Bronze Age defensive system. Investigations revealed the main structural components of this fortification: an earthen rampart, two ditches, and the remains of two palisades destroyed by fire. Stratigraphic observations combined with AMS radiocarbon dates indicate that the fortification was first built in the 15th century cal BC. It was damaged by fire in the following century, then rebuilt, and most likely destroyed during the mid-13th century cal BC. Artifacts such as clay sling projectiles, burned construction debris, and a bronze arrowhead point to the likelihood of an assault on the fortification during its final phase. In addition, traces of a Copper Age settlement were documented, dating to the mid-43rd to mid-41st centuries cal BC. These observations contribute to a better understanding of long-term settlement dynamics, construction methods, and conflict-related activity in the Lower Mureș region during the Late Bronze Age.

Keywords: Copper Age; Late Bronze Age; Lower Mureș Region; mega-forts; defensive system; chronology; sieges.

Introduction

For over 15 years, efforts to investigate the Late Bronze Age in the Lower Mureș region have focused on the mega-fort of Sântana-*Cetatea Veche*. Excavations carried out in various parts of the mega-fort have provided us with the opportunity to understand some of the site's main components. From the very first excavations in 1963, the aim was to check the fortification systems[1]. Continuing the investigation of the fortification systems has been one of our priorities since 2009[2]. Alongside the excavations of the defensive system, we also addressed some major objectives within the site, such as the central building and the mound located near the southeastern gate of the third fortification[3]. Taking into account the discoveries made, today we can argue what in 2009 we could only assume. The four complex fortification systems encompass an area of approximately 130 hectares[4]. Within these, 29 buildings have been identified, some of very large dimensions[5]. In addition to the fortifications and buildings mentioned, the numerous gold and bronze items, glass beads, and graphite-coated ceramic vessels depict a flourishing centre. The site's evident prosperity was confirmed from the very beginning of the first constructions, dated to the middle of the 15th century cal BC. The fort thrived until the first half of the 13th century cal BC, when it was besieged and destroyed[6].

This article presents the results of the 2018 excavation campaign. The primary objective was to investigate the northeastern side of *Fortification System III*. The aim was to identify the structural elements of the fortification, to better understand its construction method, and to collect samples for absolute dating. To achieve the objectives of the 2018 excavation campaign, Trench S5 was laid out, oriented approximately east–west, with dimensions of 62 × 3 meters (Fig. 1-2). The trench was positioned perpendicular to *Fortification System III*, about 150 meters south of the eastern corner of the earth rampart and approximately 400 meters east from Trench S1 excavated in 2009.

Given that the discoveries at *Cetatea Veche* belong to two different chronological horizons (Copper Age and Late Bronze Age), this article is structured according to the chronological phases identified

[1] Rusu *et al*. 1996; Rusu *et al*. 1999.
[2] Gogâltan, Sava 2010; Sava *et al*. 2019.
[3] Gogâltan *et al*. 2023; Gogâltan *et al*. 2024.
[4] Gogâltan *et al*. 2019.
[5] Krause *et al*. 2022a; Krause *et al*. 2022b; Krause *et al*. 2025.
[6] Gogâltan, Sava 2018.

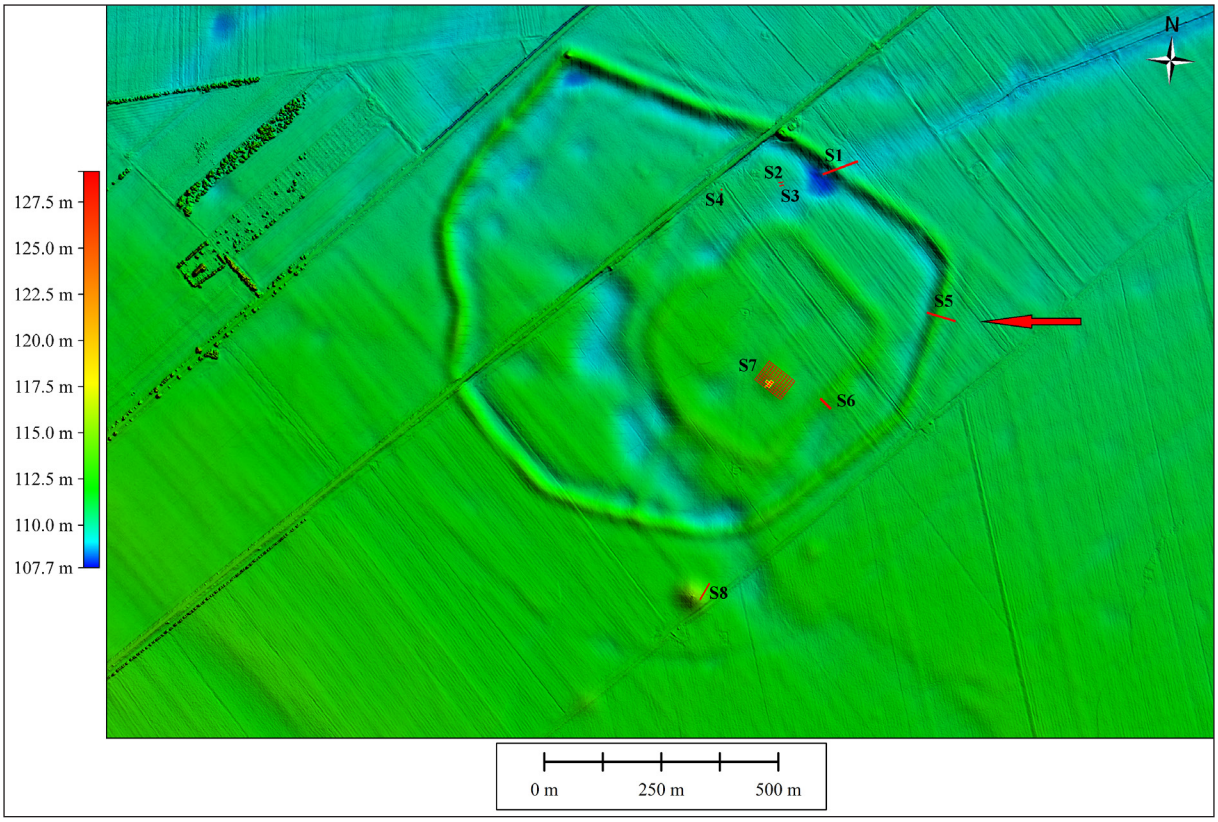

Fig. 1. Digital elevation model (extracted from LiDAR scanning) of the Sântana-*Cetatea Veche* mega-fort, indicating the research units (source: authors).

Fig. 2. Aerial photography of trench S5; July 2018 (photo by the authors).

during the 2018 excavation. The most substantial portion will be dedicated to *Fortification System III*, a key component of the Late Bronze Age mega-fort. To better understand this extensive fortification system, the archaeological data from Trench S5 will be supplemented by results from Trenches S1/1963 and S1/2009, which also investigated *Fortification System III*.

Analysis of the Stratigraphic Sequences

The chronostratigraphic organization of the contexts identified in Trench S5 was formalized through the construction of a Harris Matrix, resulting in the definition of nine stratigraphic phases. Among these, one corresponds to a geological layer (Phase I) (Fig. 3). The geology layer is represented by two types of yellow sediment, Cx. 34 and Cx. 54, and constitutes the first phase of the stratigraphic model.

Phase II marks the earliest anthropogenic deposition identified in Trench S5, associated with an Early Copper Age settlement. At the base of the settlement's depositional level (Cx. 67), a series of shallow pits (Cx. 44, Cx. 46, Cx. 47, Cx. 48) were documented.

The next phase, Phase III, marks the construction of the Late Bronze Age mega-fort, specifically the establishment of the fortification system, conventionally called *Fortification System III*. This phase comprises several intermediate stages and encompasses a substantial portion of the Late Bronze Age contexts. During this time, the rampart was built, consisting of 26 contexts, most of which represent sediment lenses of varying colours, added from the interior outward. It is evident that the material used to build the rampart was extracted from the pit located behind it, as well as from the two defensive ditches. The two ditches and the first palisade (Cx. 24) were also constructed during this phase. Stratigraphically, Palisade 1 cannot be directly associated with any structural element of the rampart, as only its burned remains, collapsed into Ditch 1 (Cx. 36), have been preserved. It can be reasonably assumed that, following the destruction of Palisade 1, the section of the rampart in which it had been anchored was removed to make way for the construction of Palisade 2 (Cx. 5 and all related contexts). This likely explains the absence of contemporaneous

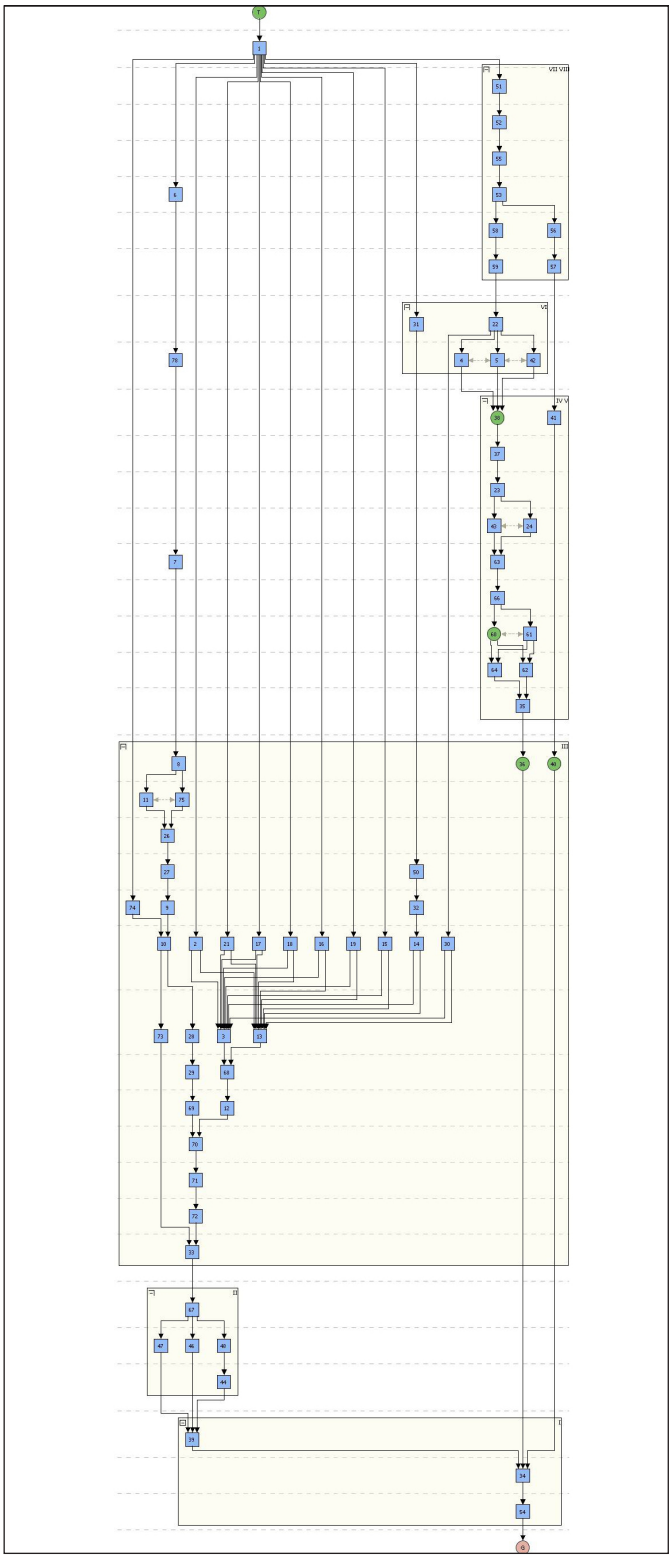

Fig. 3. The stratigraphic matrix of contexts identified in S5/2018 (graphics by the authors).

fixtures within the rampart's structure, apart from the rampart itself. Thus, following the destruction of the first palisade, the outer part of the rampart was rebuilt and a new palisade was raised. This second palisade is stratigraphically connected to the reworked rampart (Cx. 22, Cx. 3/13, Cx. 31, Cx. 32, Cx. 2) and to the postholes identified along the crest of the rampart.

Phase IV, represented by contexts Cx. 23, Cx. 35, Cx. 37, Cx. 41, Cx. 60, Cx. 61, Cx. 62, and Cx. 64, corresponds to episodes of warping and redevelopment of the two defensive ditches during the usage of the fortification. This phase can itself be subdivided into several sub-phases. Ditch 1 (Cx. 36), by far, underwent the most transformations throughout the lifespan of the fortification. The first stage of warping is visible at the base of the ditch, represented by context Cx. 35, followed by the gradual collapse of the lateral slopes (Cx. 60 and Cx. 64). At this point, the ditch narrows significantly at the base and takes on a "V"-shaped profile. The warping process continues with deposits documented as Cx. 66 and Cx. 63, both occurring prior to the destruction of Palisade 1 (Cx. 24). After the aforementioned palisade was destroyed, the ditch continued to narrow as the burned remains were covered by a layer of yellow clay (Cx. 23), followed by further warping (Cx. 37). Ditch 2 (Cx. 40) was filled in a single stage (Cx. 41), also before the destruction of the fortification.

Phase V marks the moment when Palisade 1 (Cx. 24) was destroyed, and its remains collapsed into Ditch 1 (Cx. 36). A sub-phase is represented by the reworking of the rampart and the ditch, through the covering of the burned remains (Cx. 23) and the formation of a new ditch bottom (Cx. 37).

The destruction of Palisade 2 (Cx. 5) occurred during Phase VI. At this point, the fire consumes the entire structure, built of wood and clay, which subsequently collapses into Ditch 1 (Cx. 36). This marks the moment when *Fortification System III* is abandoned.

After the fortification was abandoned, Ditch 1 (Cx. 36) was gradually silted with sediment containing small fragments of daub eroded from the rampart (Cx. 58, Cx. 59); this deposition is attributed to Phase VII.

In the following phase, Phase VIII, a relatively uniform infill is observed covering both ditches. Subsequently, in Phase IX, traces of modern and contemporary agricultural ploughing are documented, which can be chronologically traced back to the 18th century.

The Early Copper Age finds

As early as the initial excavations conducted in 1963, several discoveries from this earlier period, preceding the construction of the Late Bronze Age fortification, were documented. The excavation report briefly mentions a grave containing a Tiszapolgár ceramic assemblage: *Between meters 96–97 [of Trench S2], a crouched human skeleton was discovered, accompanied by five nearly complete ceramic vessels [...] characteristic of the Tisa III (Tiszapolgár) culture*[7]. From the published photograph of the *in situ* grave, it is clear that the preservation state of the deceased was poor; furthermore, a number of details—such as the orientation of the body, the exact position of the limbs, or the placement of the skull cannot be determined[8]. The grave inventory consists of five ceramic vessels: a tall, footed cup with perforations; another deep cup with a short, perforated foot; both decorated with sharp, perforated projections placed below the rim; and three additional truncated conical vessels adorned with perforated circular handles. Based on the published image, the vessels appear to have been deposited in front of the deceased, in the upper part of the skeleton. Unfortunately, the illustrated grave inventory in the report lacks a scale[9]. Additional ceramic fragments, including handles characteristic of Tiszapolgár pottery, were recovered from Trench S1/2009[10]. These were found among the sediment lenses that formed part of the defensive rampart of the Late Bronze Age fortification. During the 2018 excavation campaign, a series of pottery fragments characteristic of the Early/Middle Copper Age period (Fig. 5/1–10), along with two chipped lithic artifacts (Fig. 5/11–12), were recovered from among the earth lenses of the rampart and the burnt remains of the palisade, both integral components of the fortification system of the Late Bronze Age mega-fort. Following the removal of the earthen rampart, a depositional layer was identified that preserved Early Copper Age ceramic material. Associated with this layer, designated as Context 67,

[7] Rusu *et al*. 1996, 18.
[8] Rusu *et al*. 1996, Pl. II.1/Fig. a.
[9] Rusu *et al*. 1996, Pl. V.
[10] Sava 2015a, Pl. 98/4-7.

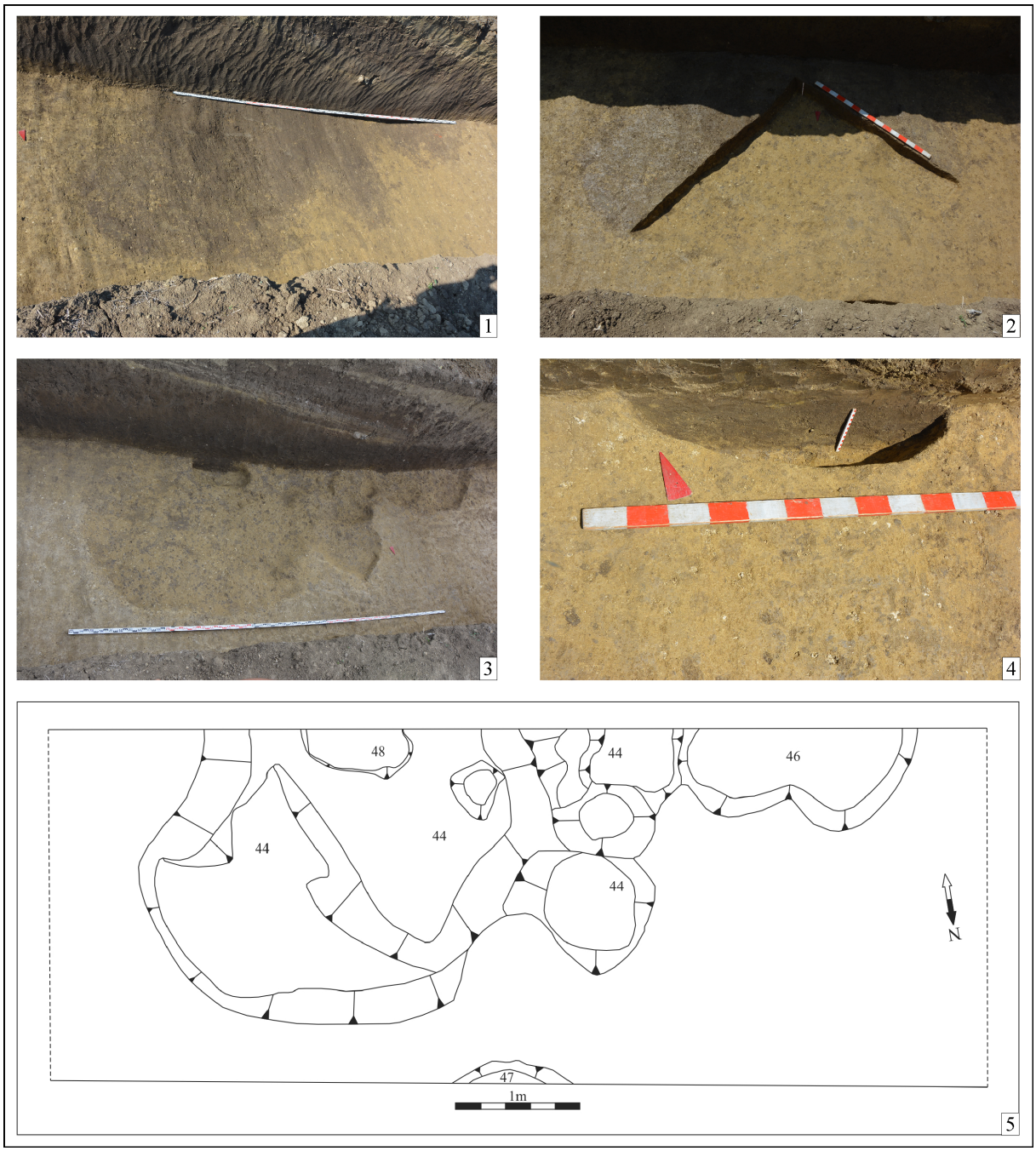

Fig. 4. 1. Cx. 44 and Cx. 46 Early Eneolithic pits, during outlining; 2. Cx. 44 and Cx. 46 Early Eneolithic pits, during cross-sectioning; 3. Cx. 44 and Cx. 46 Early Eneolithic pits, during excavation; 4. Early Eneolithic pit Cx. 47, during excavation (source: authors).

two pits were identified, reaching the geological layer: Cx. 44/Cx. 46/Cx. 48 and Cx. 47 (Fig. 4). The pit Cx. 44/Cx. 46/Cx. 48 was outlined in the yellow clay and intersects the southern profile of the trench (Fig. 4/1–3, 5). Its fill contained pottery fragments (Fig. 6), several pieces of daub and a few animal bones.

To achieve a more precise chronological assignment of the discoveries, two samples of animal bone were collected for absolute dating[11]. Both samples originate from Pit Cx. 44/Cx. 46/Cx. 48, specifically from Context Cx. 46. The results of the two samples show clear agreement, placing the context chronologically between the mid-43rd and mid-41st centuries cal BC (Fig. 7; Tab. 1). It is worth noting that the obtained dates are consistent with the morphology of the few Early Copper Age pottery fragments, some decorated in the Bodrogkeresztúr style, identified in Trench S5.

[11] To eliminate any doubts regarding the reliability of the data, stable carbon and nitrogen isotope analyses were conducted on the animal bone samples. As a result of this procedure, the presence of a reservoir effect can be confidently excluded.

Tab. 1. List of ^{14}C dates sampled from Cx. 46.

Lab no.	Sample prep. no.	14C age [yr BP]	±	Cal 1-sigma calBC	Cal 2-sigma calBC	Mean	Material	Context
DeA-41939	I/3355/8	5334	22	4241-4064	4314-4052	4155	Animal bone	S5/Cx. 46
DeA-41940	I/3355/9	5309	23	4230-4055	4239-4049	4140	Animal bone	S5/Cx. 46

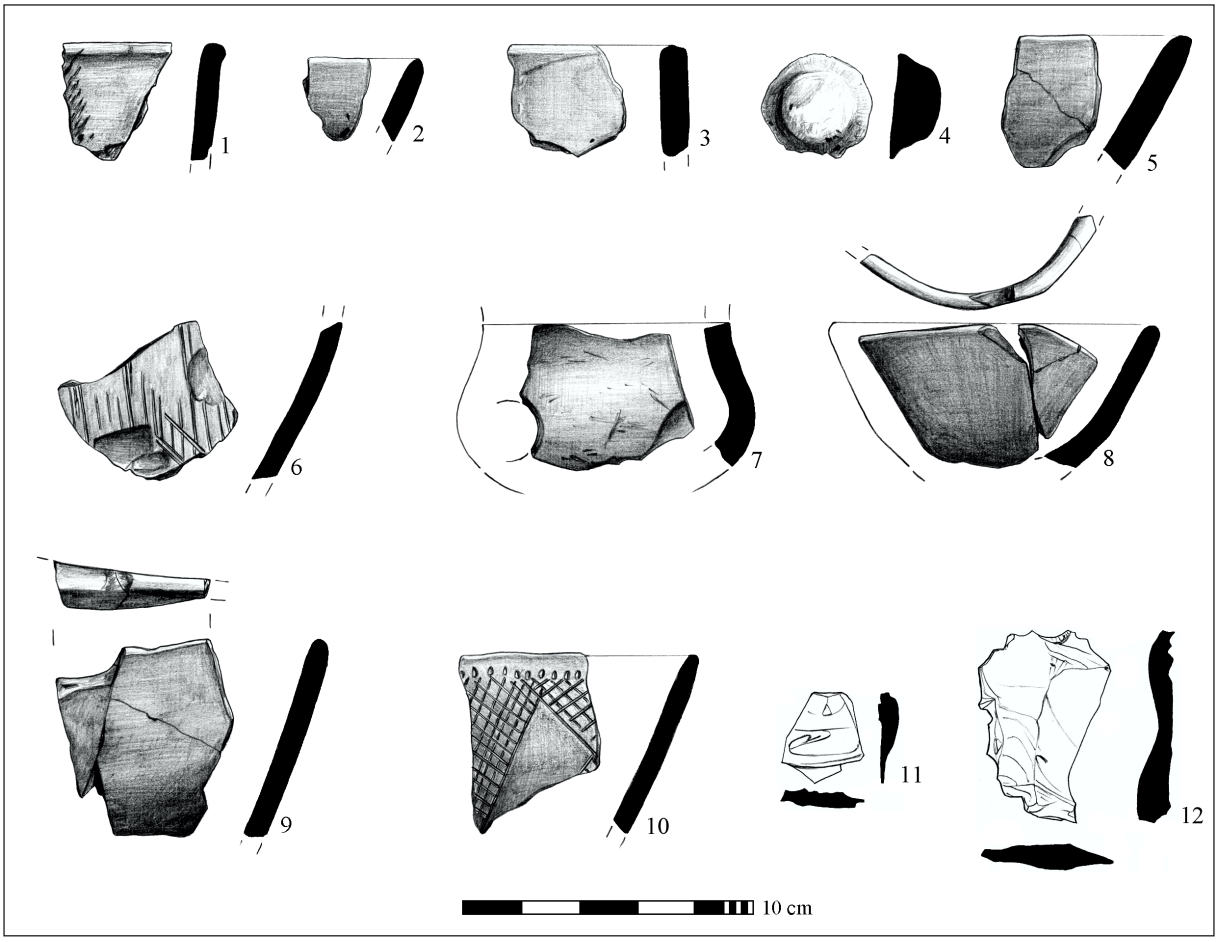

Fig. 5. 1. Early Eneolithic pottery discovered in Cx. 5 (the debris of the second palisade/wall);
2. Early Eneolithic pottery discovered in Cx. 9 (earth lens that is part of the structure of defense wall III);
3-9. Early Eneolithic pottery discovered in Cx. 11 (earth lens that is part of the structure of defense wall III);
10. Early Eneolithic pottery discovered in Cx. 12 (earth lens that is part of the structure of defense wall III);
11. Lithic finds discovered in Cx. 33 (earth lens that is part of the structure of defense wall III);
12. Lithic finds discovered between m. 41-42 (structure of defense wall III) (drawings by Cristian Ioan Popa).

Considering a recent analysis of the absolute dating of funerary contexts containing conical cups of types A1c/Diaconescu 2009 and A2b/Diaconescu 2009, it has been established that these vessels date to the 44th century cal BC[12]. A conical cup of this kind was also found in the funerary inventory of the Tiszapolgár individual from *Cetatea Veche* and was included in the aforementioned analysis. The likely dating of the grave to the 44th century cal BC suggests the existence of an initial early Copper Age chronological sequence. A second chronological sequence of Copper Age discoveries at *Cetatea Veche* may be attributed to an occupation phase most likely dated between the mid-43rd and mid-41st centuries cal BC.

In addition to the Early Copper Age discoveries, parts of a settlement dated to the Late Copper Age have also been uncovered at Sântana-*Cetatea Veche*. The first mention of Baden-style ceramics identified on the surface of the site dates back to 1976, in a study dedicated to late Copper Age finds from Arad County[13]. Petre Roman, the author of the study, illustrated a ceramic fragment decorated in

[12] Sava *et al*. 2023, 73, Pl. X-XI; XIII.
[13] Roman 1976, 31, Pl. 2/5.

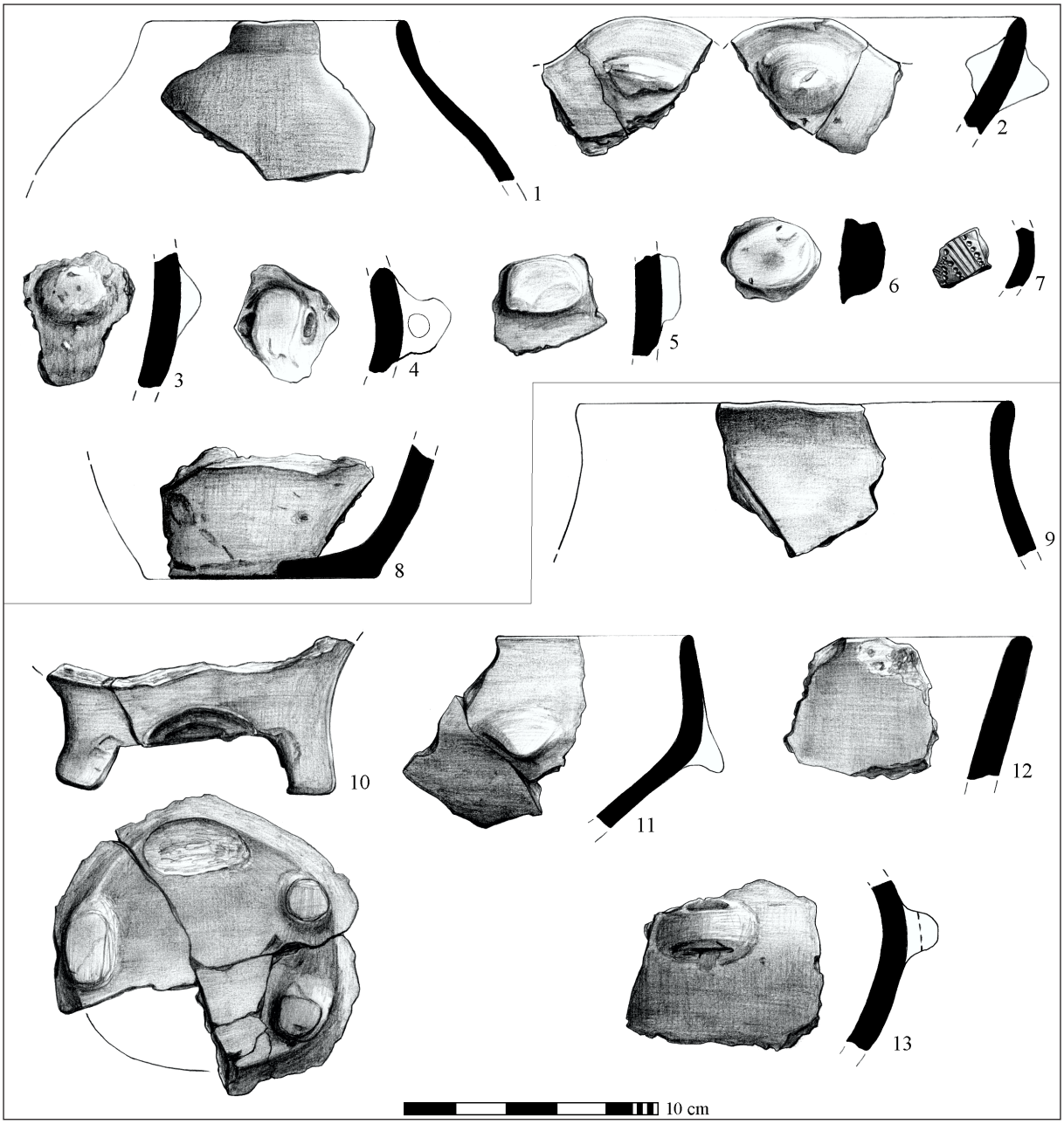

Fig. 6. 1-8. Early Eneolithic pottery discovered in Cx. 44; 9-13. Pottery discovered in Cx. 46 (drawings by Cristian Ioan Popa).

the Baden style, discovered in 1957 by Egon Dörner. This information was subsequently cited in later publications as well[14]. More recent research conducted at Sântana has led to the discovery of more substantial evidence, confirming the existence of an extensive settlement. These contexts have been published in detail on another occasion[15].

The Late Bronze Age Mega-Fort: *Fortification System III*

The primary objective of the 2018 excavation campaign was to investigate the eastern side of *Fortification System III*. Although it is not the largest of the fortifications within the mega-fort, it remains the most impressive fortification system due to its remarkable state of preservation[16]. In

[14] Roman, Németi 1978, 12, Pl. 4/6; Vasiliev, Barbu 1999, 113-114, pct. 4; Sava 2008, 56, pct. 65.

[15] Sava *et al*. 2014; Sava 2015a, 51-54, 227-230, 233-234; Sava 2015b, 49-53, 112-113, 114-116.

[16] The scale of Fortification III was noted as early as the end of the 17th century, when the Italian scholar Luigi Ferdinando Marsili was commissioned by the imperial court in Vienna to lead the boundary commission between the Habsburg and Ottoman Empires (Marsili 1726, 63, Fig. XXXII). In his work dedicated to describing the frontier between the Habsburg and

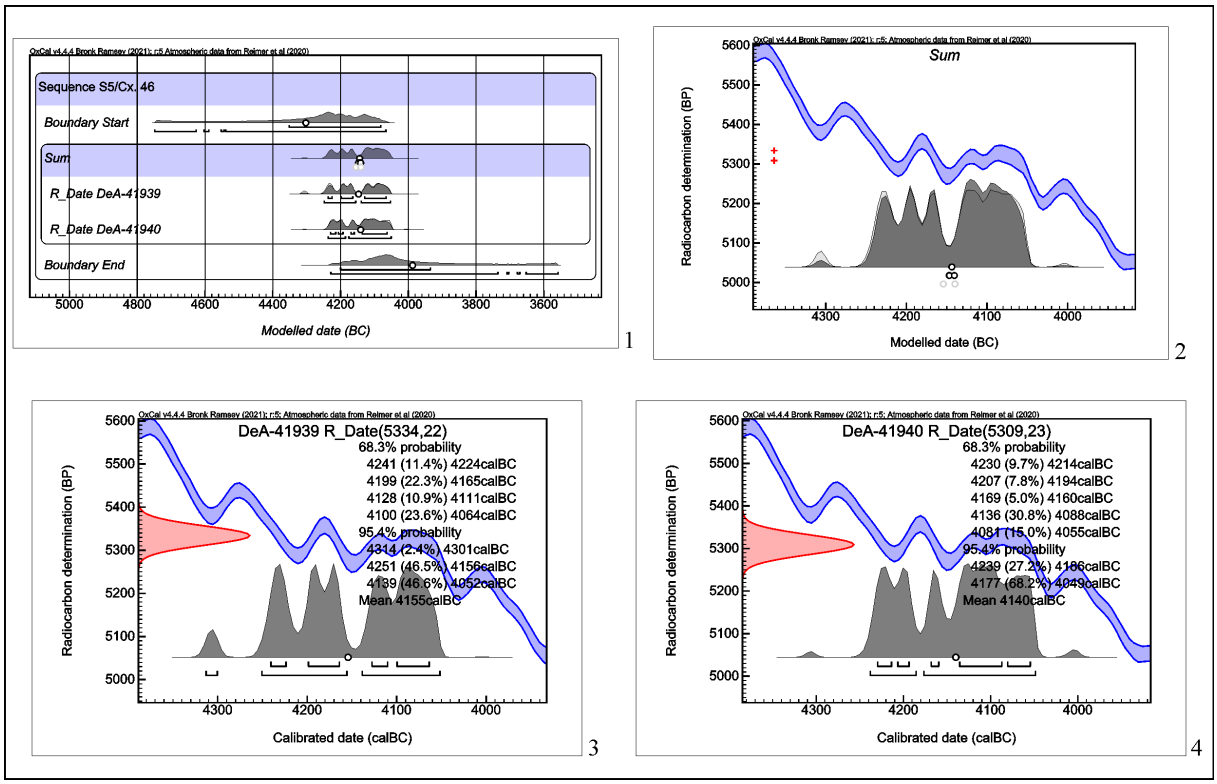

Fig. 7. 1. Bounded sum of AMS data from context Cx. 46; 2. Bounded sum (single plot type) of AMS data from context Cx. 46; 3-4. Individual calibration of AMS data from context Cx. 46 (source: authors).

the area selected for the placement of Trench S5, the fortification system is both well-preserved and clearly visible. Surface surveys conducted along the entire length of *Fortification System III* allowed us to assess areas of highest daub concentration. The fragments of daub identified on the ground surface

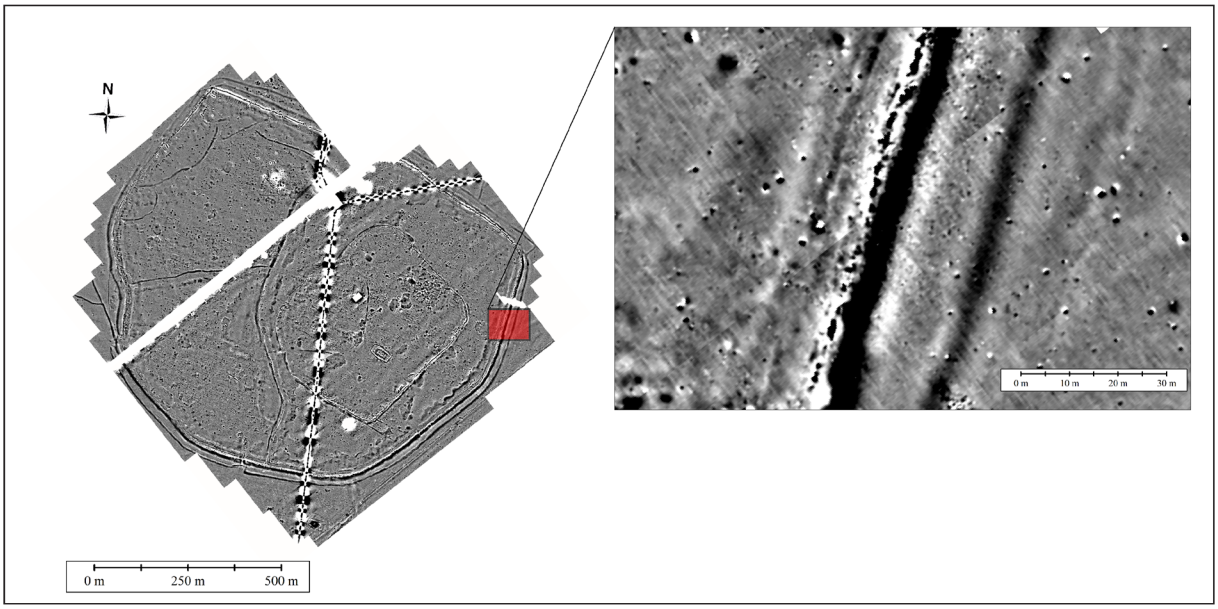

Fig. 8. The magnetometric survey of the fortification, detailing the northeast side of the third fortification (source: authors).

Ottoman empires, Marsili provides a brief description and illustration of Fortification III at Sântana-*Cetatea Veche*. In the cited work, the fortification is referred to as *Farba* and is also marked on the general map accompanying the volume. Owing to its scale and excellent state of preservation, Marsili, clearly in error, attributed the fortification to the Roman period. We would also like to take this opportunity to thank our colleague Călin Timoc, who brought to our attention Marsili's reference to the Sântana-*Cetatea Veche* fortification.

delineate the course of the palisade built atop the earthen rampart. On the surface of the area selected for Trench S5, small daub fragments were observed precisely where the palisade was later uncovered. In comparison with the northern side of the fortification, the eastern side displays a lower density of daub fragments. These differences were also confirmed in the results of the geophysical surveys (Fig. 8). The geophysical measurements were carried out after the end of the 2018 excavation campaign; as a result, the segment corresponding to Trench S5 could not be surveyed. Nevertheless, the entire eastern side appears to have been constructed in a similar manner. The fortification system consists of an earthen rampart, atop which stood a palisade. In addition, two successive defensive ditches were placed in front of it (Fig. 8).

By correlating the LiDAR scan with the results of the geophysical survey, we were able to determine that *Fortification System III* encloses an area of approximately 76 hectares, and together with the entire fortification system, covers a surface of around 90 hectares. Its shape is roughly oval, with the northern side being nearly straight. Over time, this fortification system has been investigated on three occasions. The northern side is known from Trench S1 (1963) and Trench S1 (2009), both positioned in close proximity to each other, while the eastern side has been explored through Trench S5, excavated in 2018.

Excavation results

Considering the reported data in 2009, we expected to identify an earthen rampart, a palisade, and a defensive ditch. To some extent, these expectations were confirmed, but several differing features were also revealed (Fig. 9). As anticipated, a clay extraction pit was identified behind the rampart, used in the construction of the earthwork. This feature was not excavated in 2018, as it had already been investigated during the 2009 campaign. The rampart was constructed from compacted earth, similar to the northern segment, with the notable difference being the absence of a wooden beam and stone substructure[17]. On the eastern side, the rampart was built directly atop the depositional level of the Copper Age settlement, which likely served to stabilize the entire structure. Additionally, two construction phases of the palisade were identified, both destroyed by fire, as well as two defensive ditches positioned in front of the rampart. Among the remains of the fortification, various artifacts were recovered, including ceramic fragments and a small number of bronze items. Of particular

Fig. 9. Aerial photography of trench S5; July 2018 (photo by the authors).

[17] Gogâltan, Sava 2010, 29-30, Fig. 20, 23, 25.

interest are the sling projectiles, shaped from clay, which were discovered among the burned remains of the palisade.

The fortification system

At a depth of approximately –0.30 m, measured from the current ground surface, a thick layer composed of daub, charcoal, powdery grey clay mixed with compact yellowish-grey clay, heavily saturated with daub and charcoal, was discovered atop the crest of the rampart (Fig. 10/1–2; 11). A relatively thin

Fig. 10. Photographs of the remains of palisade 2 (Cx. 5), during identification (source: authors).

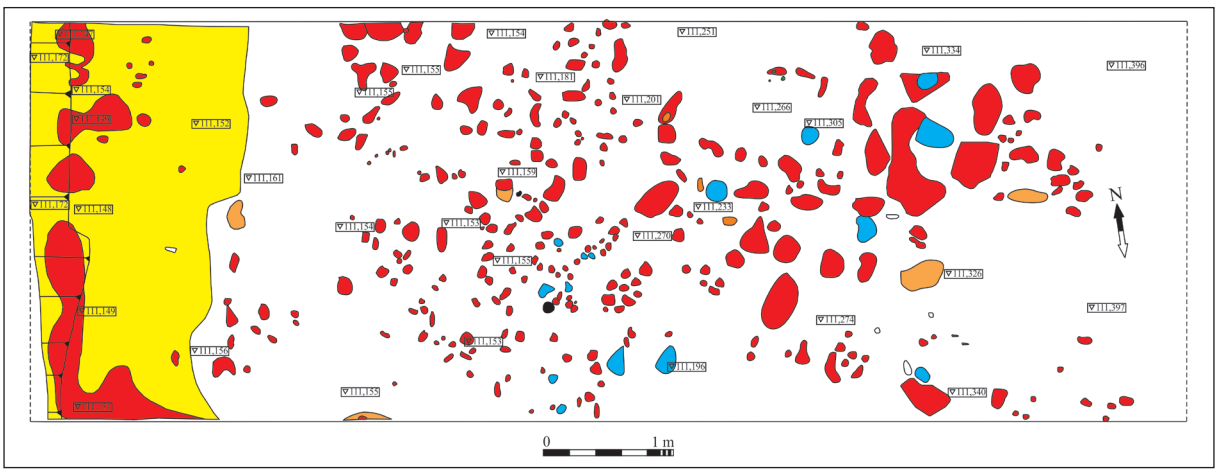

Fig. 11. Drawing of the remains of palisade 2 (Cx. 5), on identification (source: authors).

layer of small daub fragments and consistent burning was observed on the rampart's crest. Most of the daub fragments had slid into the defensive ditch at the base of the rampart (Fig. 10/3–5), where the layer reaches a thickness of approximately 60 cm (Fig. 10/6). Among the daub fragments were clay sling projectiles, stones of various sizes, a bronze arrowhead and a bronze *saltaleon*, as well as ceramic fragments. These finds represent the remains of Palisade 2 (Cx. 5). A study of the daub fragments reveals that many of them preserve impressions of twigs, planks, and posts (Fig. 12–13). Although the analysis of the daub from Sântana is still in its early stages, it is nonetheless possible to reconstruct the method of palisade construction. Wooden posts were driven into the earthen rampart, then connected by a network of wattle (woven twigs) and planks. This structural wall was subsequently coated with a thick layer of clay plaster.

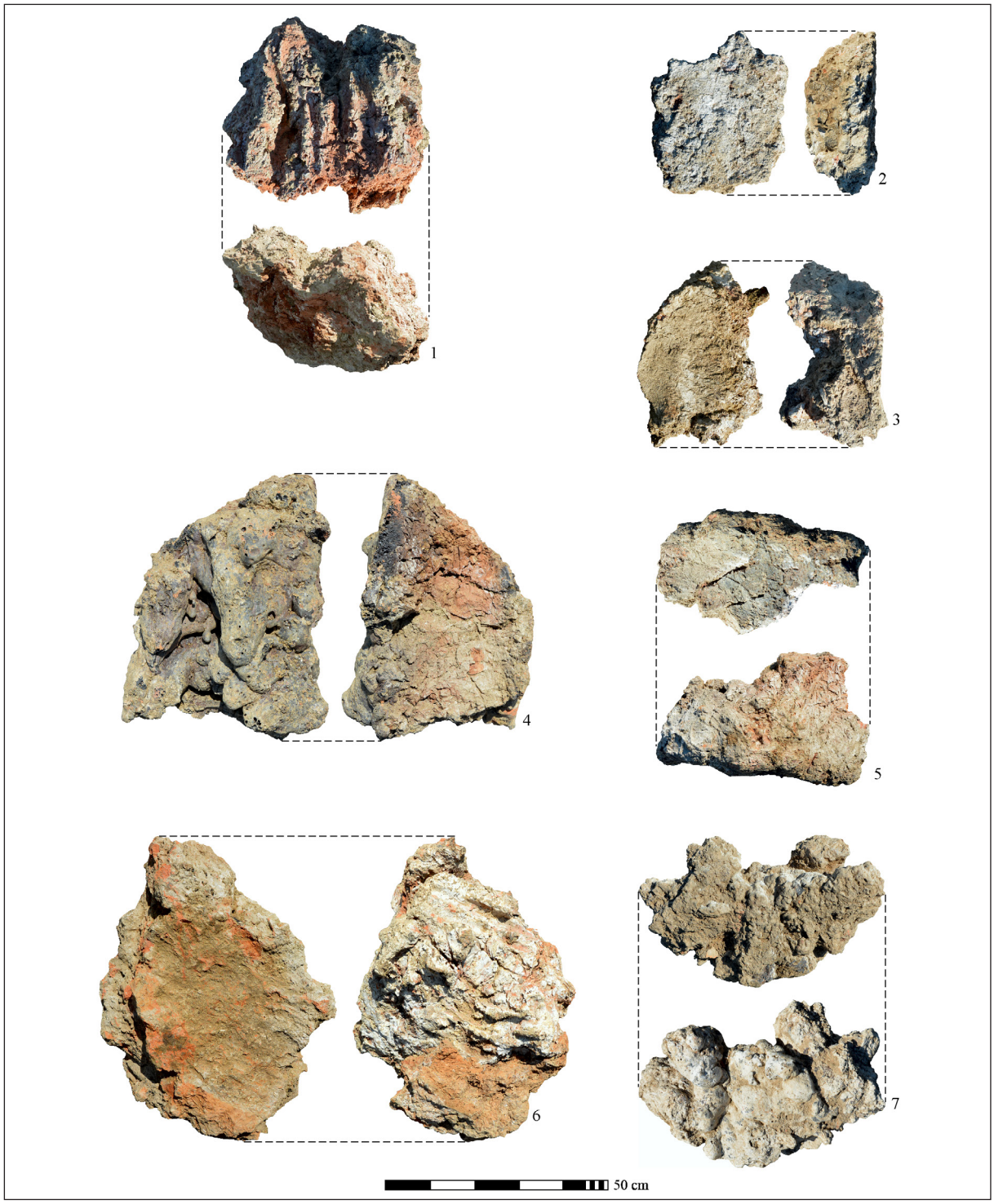

Fig. 12. Photographs of adobe fragments from palisade 2 (Cx. 5) (source: authors).

Fig. 13. Photographs of adobe fragments from palisade 2 (Cx. 5) (source: authors).

Another observation concerns the degree of burning observed in the remains of the palisade. It can be noted that most of the daub fragments were exposed to high temperatures, displaying a reddish exterior and, in some cases, a grey core (Fig. 14). Other daub fragments stand out due to the intensity of the burning, being fully vitrified and exhibiting a bluish hue. All of these are covered by a whitish coating, which is more visible on the non-vitrified daub. These two distinct levels of burning suggest that certain parts of the palisade were exposed to higher temperatures than others.

Following the documentation and removal of the remains of Palisade 2, traces of six postholes and a narrow ditch positioned in front of them were identified along the crest of the earthen rampart, near its outer slope (Fig. 15–16). This narrow ditch, Cx. 14, has a preserved width of approximately 0.40 m. The feature designated as Cx. 14 refers to the ditch itself, which consists of two distinct fill types:

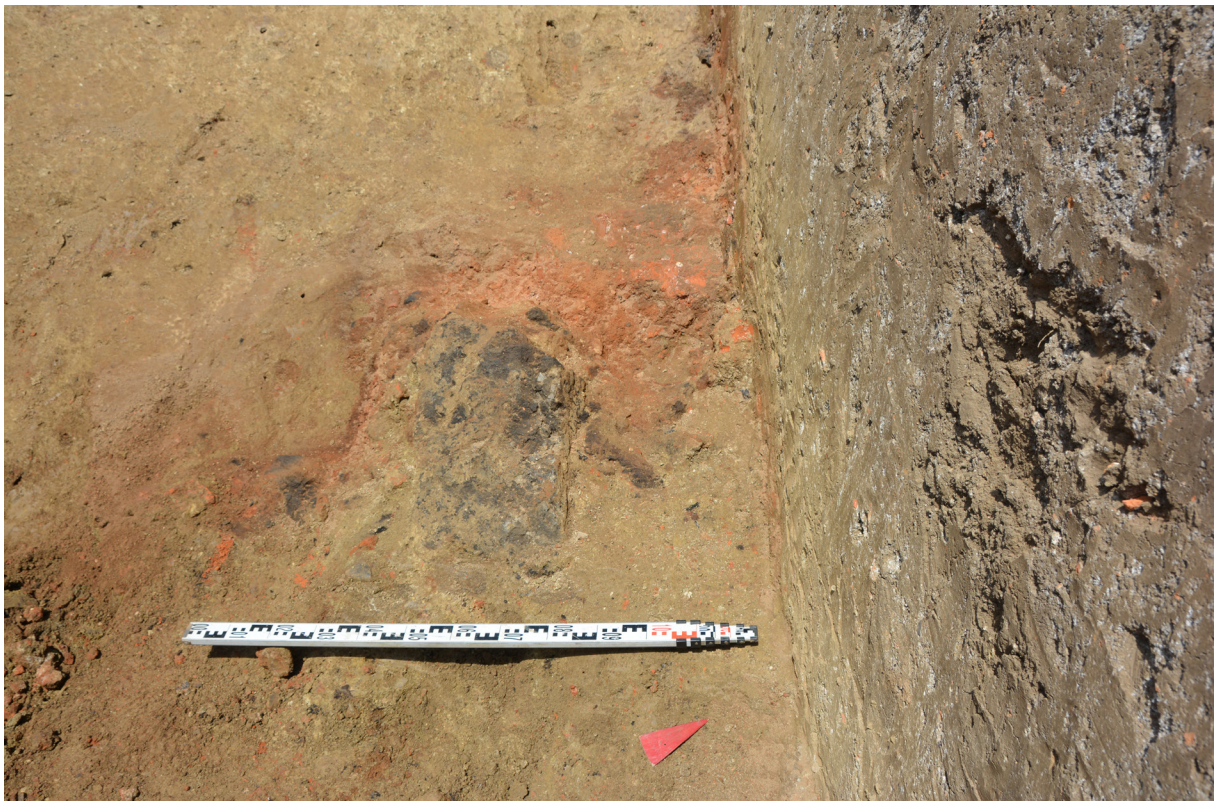

Fig. 14. Detail of an adobe fragment from palisade 2 (Cx. 5) (source: authors).

Cx. 31 and Cx. 32. It appeared as a long greyish stain containing small fragments of daub and charcoal, difficult to distinguish from neighbouring contexts Cx. 3 and Cx. 13 (Fig. 15/1). Outside the narrow ditch, three postholes were identified (Cx. 30, Cx. 49, Cx. 50), of which only Cx. 49 is notably larger. It is possible that this narrow ditch formed part of a palisade system, although a definitive interpretation of the feature cannot yet be provided. The postholes located behind the narrow ditch (Cx. 15–Cx. 19 and Cx. 21) ranged in diameter from 0.33 m to 0.54/0.56 m, with depths of up to 0.70 m.

Palisade 2 was set into compact, homogeneous soil with a Munsell color of 10YR 6/2, showing traces of thermal alteration (Fig. 17). Together with Cx. 2, Cx. 3, Cx. 22, Cx. 31 and Cx. 32, it forms a uniform clay mass that had been exposed to high temperatures. In the profile of the rampart, these contexts are clearly visible as a distinct block. It is possible that after the destruction of Palisade 1 (Cx. 24), the damaged portion of the rampart was entirely reworked: the remains of Palisade 1 (Cx. 24) were removed, along with the corresponding section of the rampart and subsequently replaced with new layers of sediments (Cx. 2, Cx. 3, Cx. 13, Cx. 22, Cx. 31, Cx. 32) into which Palisade 2 was set.

After the documentation and removal of the remains of Palisade 2 (Cx. 5), a clay layer was uncovered, exhibiting a Munsell colour of 10YR 6/4 and a compact, homogeneous, loamy texture with light pigmentation. Three thin charcoal lenses were discernible in its upper portion (Fig. 18). This layer had been applied along the outer slope of the rampart, continuing from Cx. 22 down to the base of Ditch 1. Beneath Cx. 23, the remains of Palisade 1 (Cx. 24) were observed. It is likely that this yellow clay layer functioned as a covering for the outer slope of the rampart following the destruction of Palisade 1.

After the removal of the yellow clay layer (Cx. 23) that covered the exterior of the rampart, a thick deposit consisting of large daub fragments (Cx. 43) and charcoal was revealed. This layer represents the burned remains of an earlier palisade (Palisade 1 / Cx. 24) (Fig. 19–20). These remains were concentrated at the base of the rampart and within the defensive ditch, clearly showing how they had slid down from the top of the rampart. The daub fragments are predominantly large in size. In contrast to the remains of Palisade 2, fewer daub pieces preserve impressions of wattle, posts, or planks. Based on the analysis of impressions preserved in the fired clay, it can be assumed that the construction technique of Palisade 1 was similar to that of the later Palisade 2, described above. Additionally, it can be noted that at the time of the destruction of Cx. 24, the ditch was only slightly silted.

Fig. 15. 1. Post holes of palisade 2, during identification; 2. Post holes of palisade 2, after excavation (source: authors).

Another important component of the fortification system is the earthen rampart (Cx. 25) (Fig. 21–22), which remains easily identifiable in the landscape even today. Surprisingly, despite more than a century of intensive agricultural activity, the integrity of the rampart has been only minimally affected. As a result, we consider its preserved dimensions to be close to their original form. The rampart measures approximately 20 meters in width and 1.8 meters in height. It is important to note that the Late Bronze Age fortification rampart was constructed atop the depositional level of

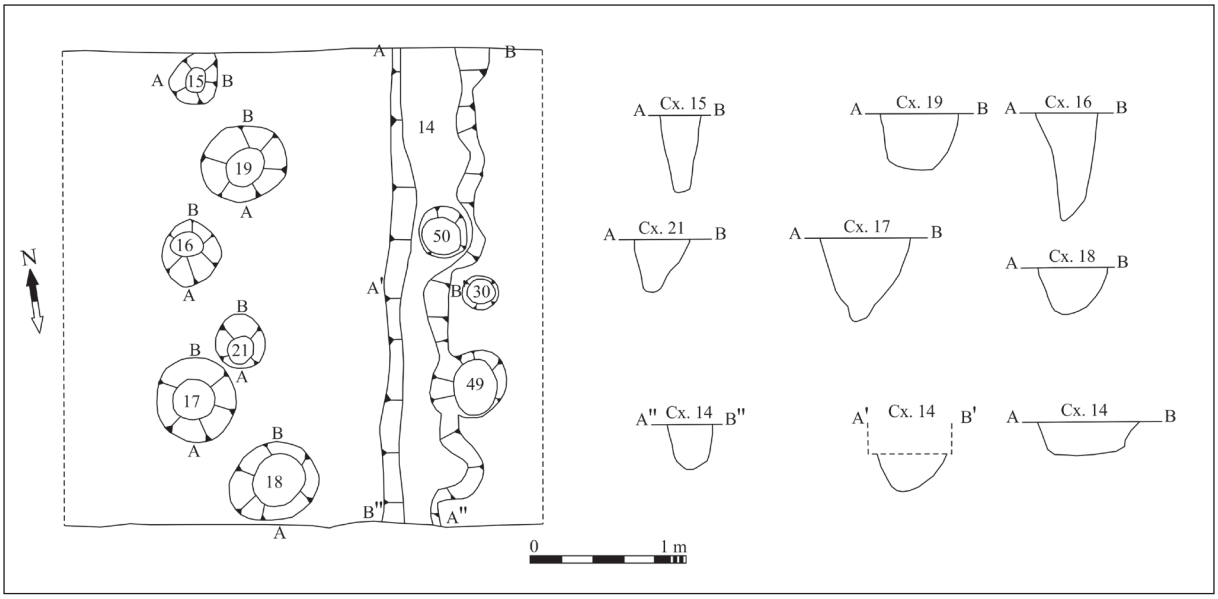

Fig. 16. Drawings of the post holes of the palisade 2 (graphics by the authors).

Fig. 17. Photograph of the earthen rampart (Cx. 25), detail (source: authors).

the Copper Age settlement. Of the approximately 1.80 meters in preserved height measured from the natural subsoil, only 1.10 meters consist of earth added above the Copper Age occupation layer. The construction method was straightforward: the rampart was built using soil excavated from the two defensive ditches and from the clay extraction pit located behind the rampart. This soil was applied around a central axis, each layer being moistened and compacted to ensure greater stability. As a result, the structure of the rampart consists of earth layers of varying colours. A noteworthy aspect is that the outer lens of the rampart, the layer forming its outer shell, is composed of yellow clay with numerous calcareous concretions, characterized by a very compact and homogeneous consistency (Cx. 8). It is worth mentioning that a similar outer clay coating was also documented in Trench S1 during the 2009

Fig. 18. Yellow clay layer (Cx. 23) applied to the outside of the rampart to cover the remains of palisade 1 (Cx. 24) (source: authors).

Fig. 19. Remains of palisade 1 (Cx. 24) (source: authors).

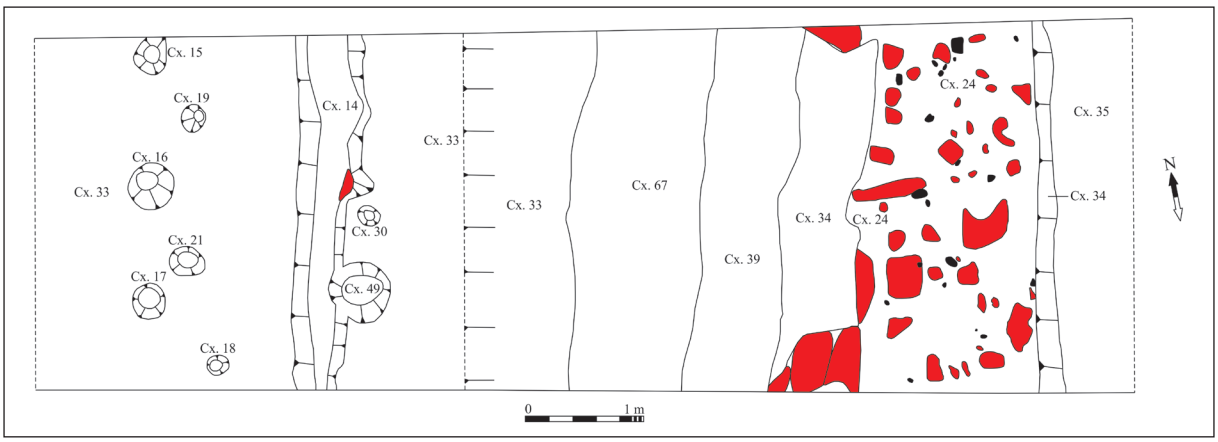

Fig. 20. Drawing of the remains of palisade 1 (Cx. 24), on identification (source: authors).

excavation. This recurrence is unlikely to be coincidental and may instead reflect a deliberate technique for sealing the rampart; as is well known, yellow clay serves as an effective protective material against water infiltration.

At the base of the earthen rampart, a defensive ditch, designated as Ditch 1 (Cx. 36), was excavated, measuring up to 6.5 meters in width and nearly 2.5 meters in depth (Fig. 23/1). Within its fill, the burned remains of both palisades were identified, along with clay sling projectiles, a few bronze objects, and several ceramic fragments. The stratigraphic analysis of the ditch's fill indicates that it was restructured at least once, following the destruction of Palisade 1 (see Cx. 37); this intervention resulted in the ditch acquiring a V-shaped profile. After the destruction of Palisade 2 and the collapse of its remains into the ditch, the entire fortification was abandoned, and the ditch gradually silted up.

Approximately 12 meters in front of Ditch 1, a second defensive ditch was identified, excavated parallel to the fortification system (Cx. 40) (Fig. 23/2). It measures 7.6 meters in width and 2.5

meters in depth. Only a few artifacts were recovered from this ditch. Following the destruction of the fortification, the ditch underwent natural silting.

Fig. 21. Photograph of the earthen rampart (Cx. 25) (source: authors).

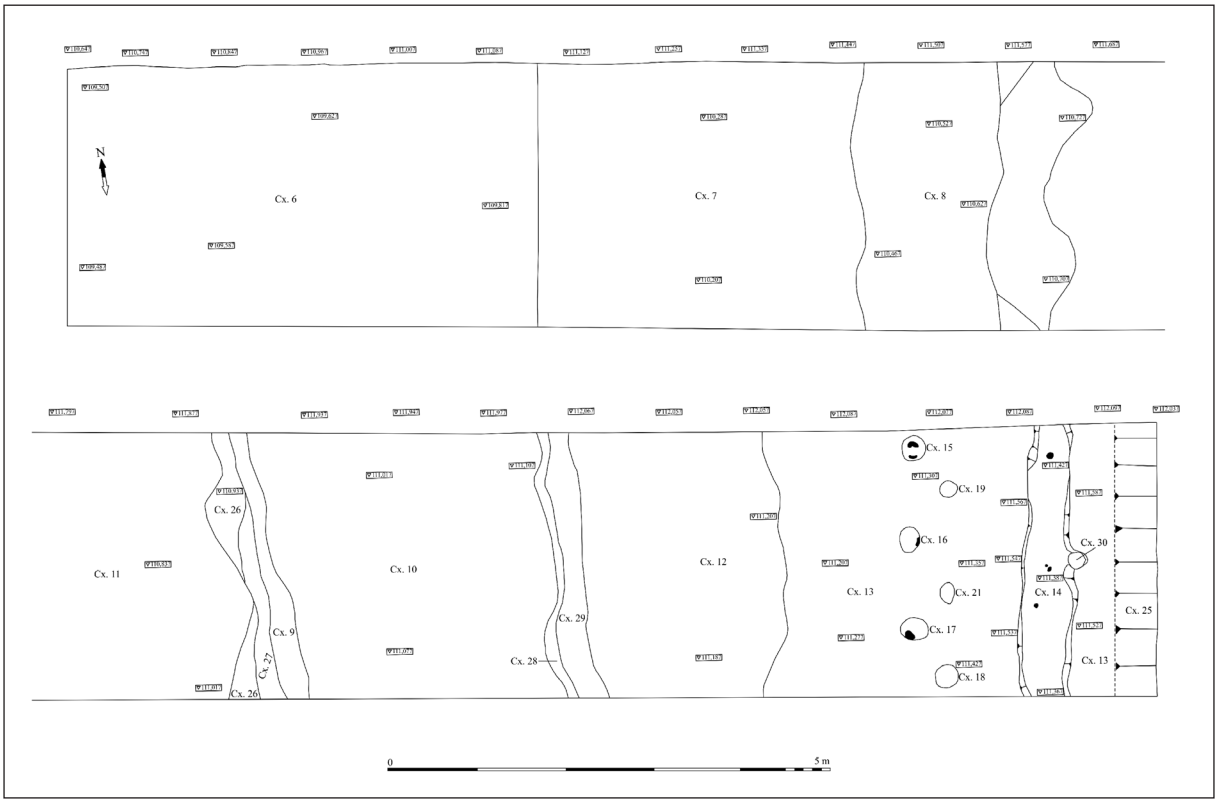

Fig. 22. Drawing of the earthen rampart (Cx. 25) (source: authors).

The Finds

As in the majority of cases Late Bronze Age sites in the Lower Mureș region, the most commonly encountered artifacts at Sântana-*Cetatea Veche* are ceramic fragments. As previously mentioned, the primary objective of Trench S5 was the investigation of *Fortification System III*; therefore, the recovered ceramic assemblage was not substantial. Most of the pottery unearthed during this excavation campaign was found among the burned remains of the second palisade (Cx. 5). A few sherds were identified within the clay lenses that constitute the rampart (e.g., Cx. 11). In the case of Cx. 11, the ceramic fragments likely reached their stratigraphic position as a result of the rampart's construction process, having been displaced along with the earth. The fragments recovered from the remains of the second palisade (Cx. 5) were recorded throughout the entire context. It is important to note that no clusters of pottery were observed. The sherds were likely scattered randomly among the debris during the collapse of the palisade into the defensive ditch. According to the available radiocarbon data, the second palisade (Cx. 5)

Fig. 23. 1. The defensive ditch 1 (Cx. 36); 2. The defensive ditch 2 (Cx. 40) (source: authors).

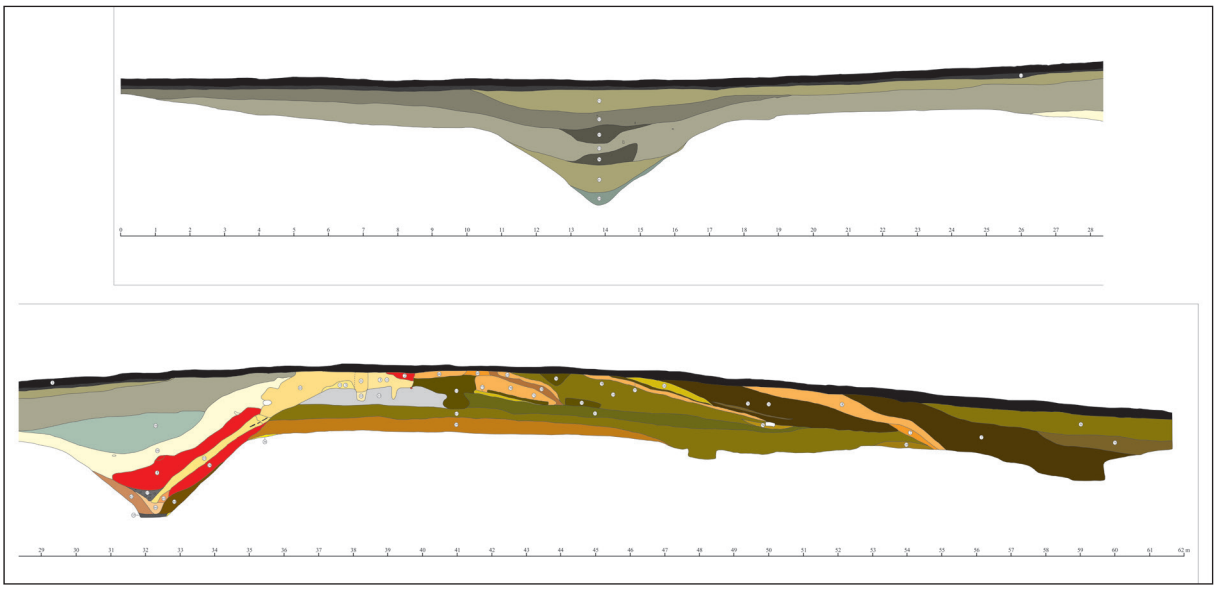

Fig. 24. Drawing of the southern profile of the S5 trench (source: authors).

was constructed during the 14th century BC. Consequently, it can be assumed that the ceramic fragments found among the debris of Palisade 2 postdate its construction.

Pottery

The analysis of the ceramic assemblage indicates that most of the pottery is highly fragmented (Fig. 25–28). The pottery is typically decorated with wide and narrow grooves arranged in garlands (Fig. 25/10, 12; 27/7), oblique lines (Fig. 26/4; 27/5), or horizontal bands (Fig. 25/13; 27/4), as well as circular knobs (Fig. 25/6–7; 26/2; 27/6), some of which are themselves decorated with grooves (Fig. 27/1, 8). In terms of vessel shapes, bowls are predominant, such as types 1H/Sava 2020 (Fig. 25/1, 9; 26/2) and 1D/Sava 2020 (Fig. 26/5). In addition to these bowls, the assemblage includes a variant of type 6/Sava 2020 (Fig. 25/12; 27/10) and a pot of type 3B/Sava 2020 (Fig. 26/7). All of these forms and decorative styles find close analogies in sites from the Lower Mureș region. The most stylistically comparable assemblages are those from Șagu-*Site A1_1*, contexts Cx. 35 and Cx. 26[18] and Zădăreni[19]. All the identified characteristics of the ceramic material recovered from the debris of Palisade 2 (Cx. 5) at Sântana-*Cetatea Veche* correspond to Late Bronze Age, Phase II. Based on the absolute dating of contexts Cx. 35 (1521–1406 cal BC, 2σ) and Cx. 26 (1416–1265 cal BC, 2σ) from Șagu-*Site A1_1*, these materials span the entirety of Phase II of the Late Bronze Age. Taking into account all available data, it can be concluded that the ceramic fragments found among the remains of the second palisade at Sântana most likely date to the 14th century BC, possibly extending into the early 13th century BC.

Clay projectiles

A distinct category of artifacts discovered at Sântana-*Cetatea Veche* consists of sling projectiles made of clay (Fig. 29). Such projectiles were already being collected from the surface of the fortification as early as the mid-20th century, when Egon Dörner and Nicolae Kiss recovered six such finds near the former railway stop. These were incorporated into the collection of the Arad Museum Complex and subsequently published[20]. Excavations conducted in 1963 at Fortification System III revealed additional projectiles[21]. It appears that three more such finds entered the collection of Primary School No. 1 in Sântana, while six are preserved in the museum collection of the same locality, being registered as stray finds.

The onset of new investigations has allowed for fresh interpretations regarding the functionality of these finds. In this context, additional finds were documented during the 2009 campaign[22]. The research of *Fortification System III* through Trench S1/2009 led to the discovery of 32 clay projectiles. Of these, 29 were recovered from the debris of the palisade (Cx. 6) located on the crest of the rampart, while three others came from the defensive ditch. Through surface survey, one projectile was found within the enclosure, a short distance behind the fortification system, and another was discovered on the rampart crest, south of the railway line that cuts across the fortification. These finds have been discussed on several previous occasions[23] and more recently a dedicated study has addressed this topic[24]. In the spring of 2017, a systematic field survey was carried out with the aim of identifying new clay projectiles and assessing the area from which they originated. On this occasion, 27 pieces were collected primarily concentrated along the northern side and more sporadically along the northeastern side of Fortification System III.

A substantial number of projectiles originates from the 2018 excavation campaign (Fig. 30–32). A total of 23 clay projectiles were recovered from the debris of the second palisade (Cx. 5), which, after being destroyed by fire, collapsed into the defensive ditch. In contrast to the projectiles discovered prior to 2018, those from Trench S5 display a significantly greater variety in typology. For the purpose of analysing the projectiles uncovered during the 2018 campaign, a database was created incorporating all 86 projectiles discovered at Sântana-*Cetatea Veche* to date. The comprehensive study

[18] Sava 2019, Pl. 11-14; 17-19.
[19] Sava, Grumeza 2018.
[20] Mureșan 2007.
[21] Rusu *et al*. 1996, Pl. VI/8.
[22] Gogâltan, Sava 2010, 33, Fig. 29.
[23] Gogâltan, Sava 2010, 33, Fig. 26, 28-30; Gogâltan, Sava 2012, 68-69.
[24] Gogâltan, Sava 2018.

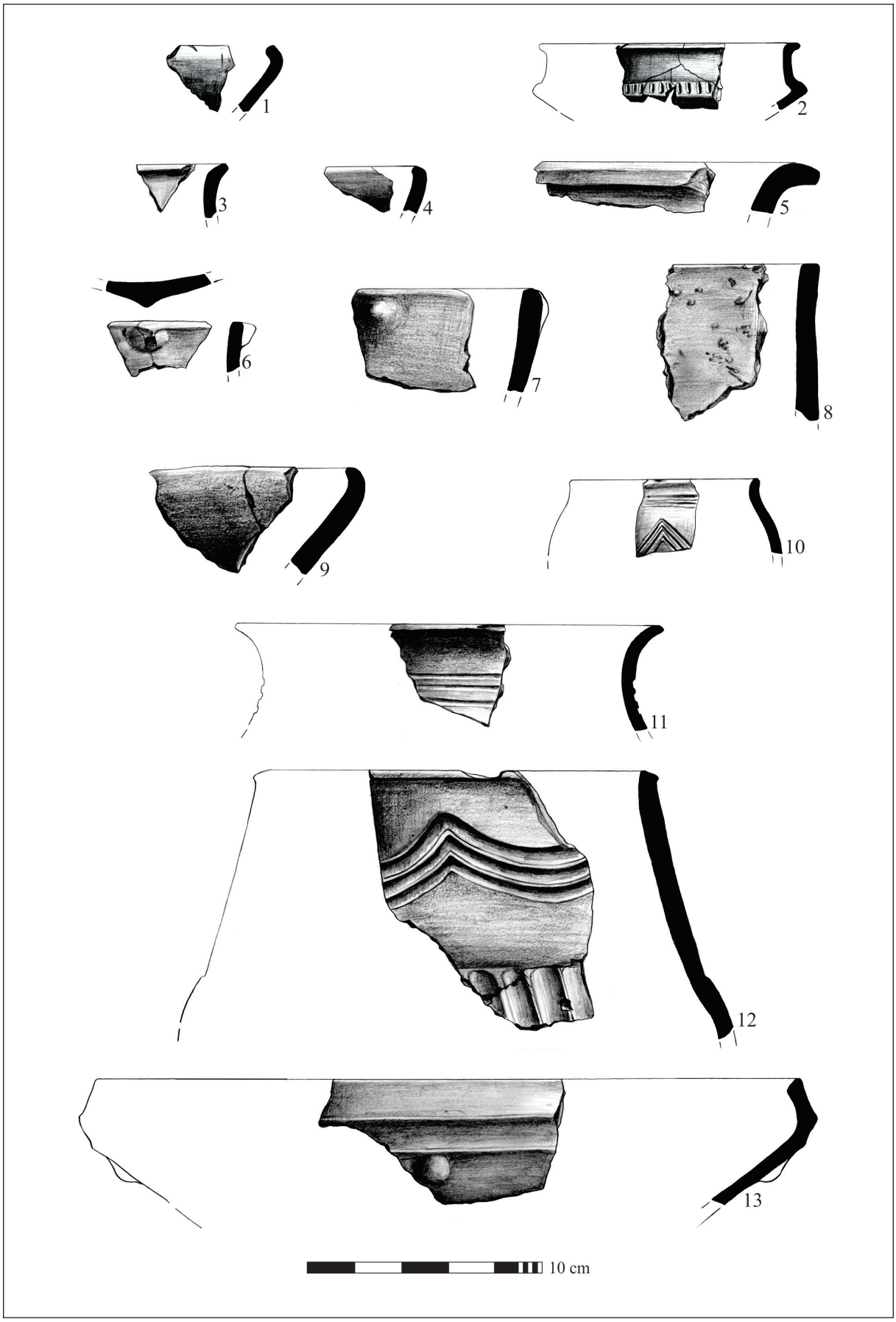

Fig. 25. 1. Pottery discovered in Cx. 5 (the debris of the second palisade/wall); 2. Pottery discovered in Cx. 11 (earth lens that is part of the structure of defense wall III); 3-13. Pottery discovered in Cx. 5 (the debris of the second palisade/wall) (drawings by Cristian Ioan Popa).

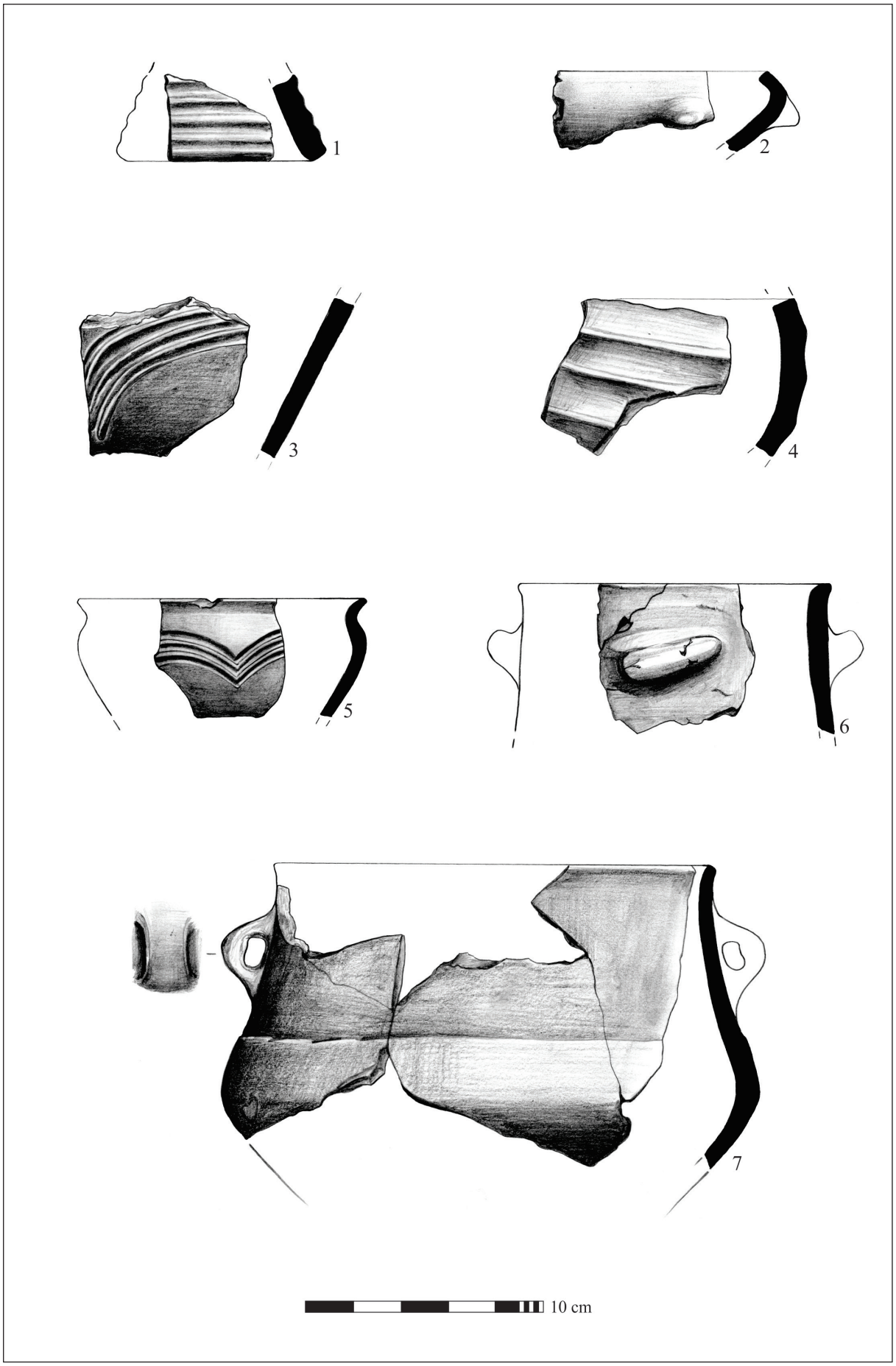

Fig. 26. Pottery discovered in Cx. 5 (the debris of the second palisade) (drawings by Cristian Ioan Popa).

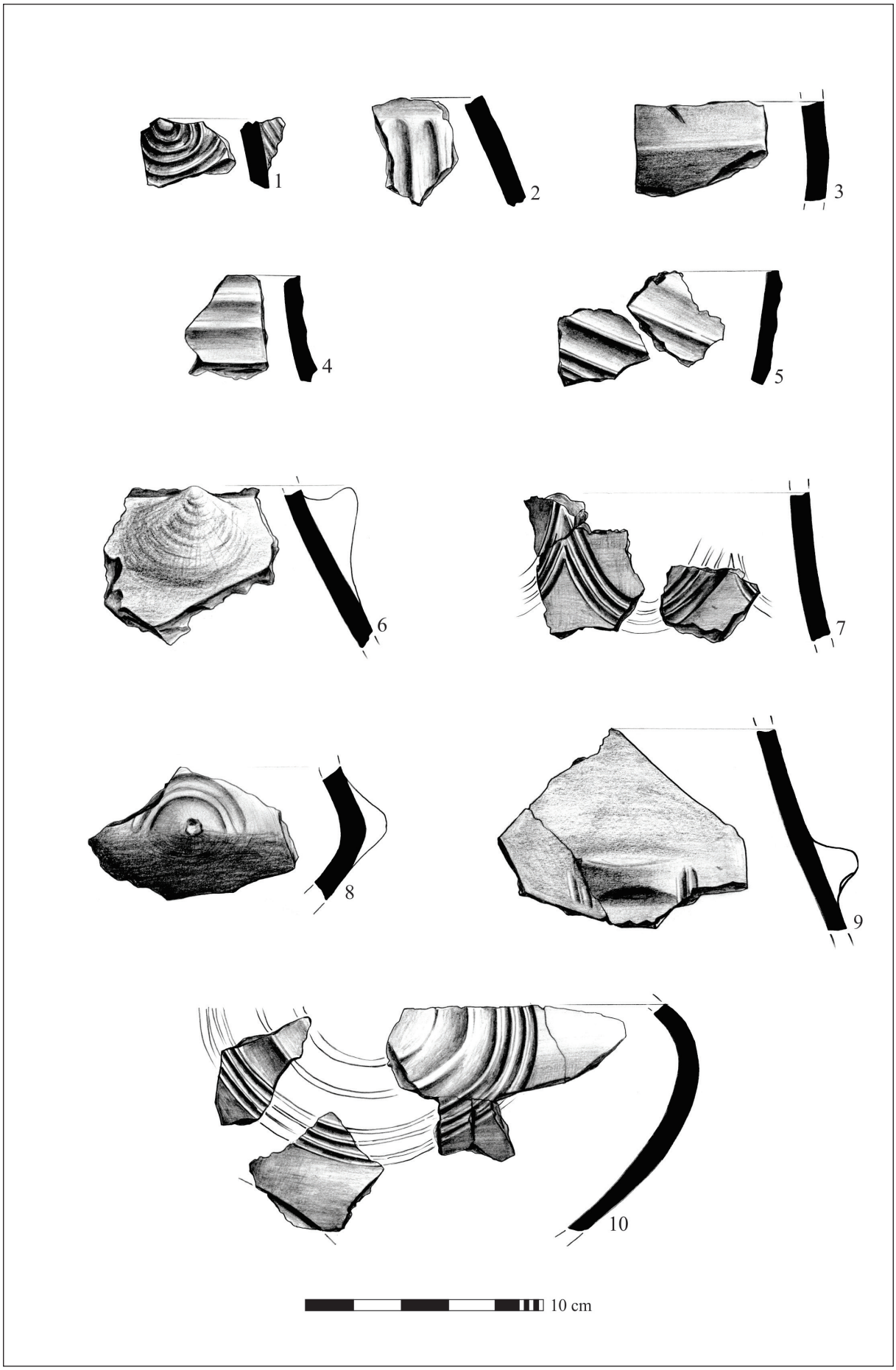

Fig. 27. Pottery discovered in Cx. 5 (the debris of the second palisade) (drawings by Cristian Ioan Popa).

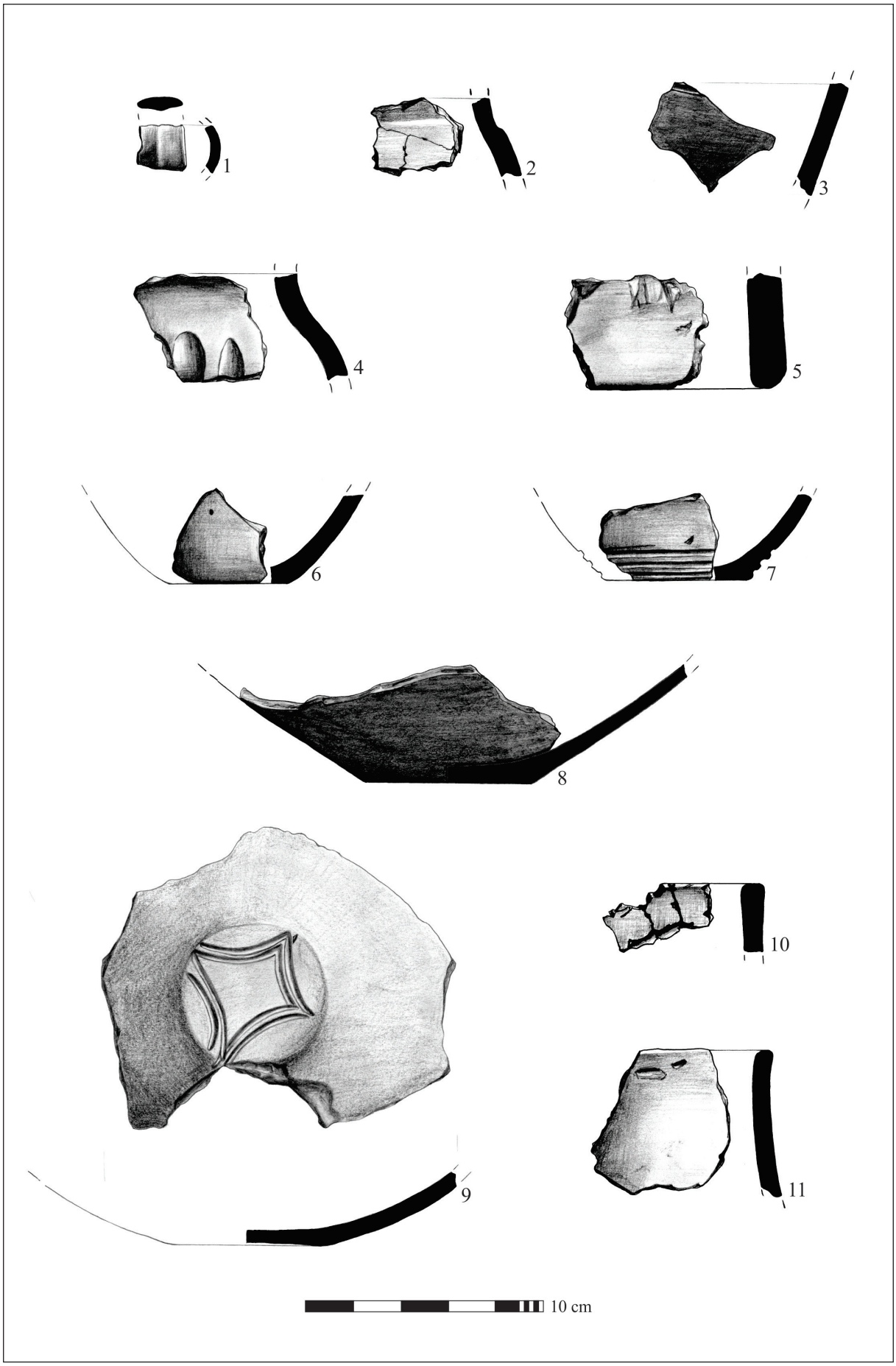

Fig. 28. Pottery discovered in Cx. 5 (the debris of the second palisade) (drawings by Cristian Ioan Popa).

Fig. 29. Clay sling projectiles (photo by Ioan Scripciuc).

of this assemblage, collected under various circumstances, reveals a series of parameters relevant to understanding the functional characteristics of these objects. Seven basic types have been identified: spherical, hemispherical, elliptical, rectangular, pyramidal, triangular, and conical (Fig. 33/1). It is likely that the selection of these shapes was influenced by both their intended use and the specific effects expected from each form. The most common examples are spherical projectiles, followed by hemispherical ones (Fig. 33/2). Rectangular, pyramidal, and triangular projectiles have been recorded exclusively along the northeastern side of Fortification III, specifically in Trench S5/2018.

Regarding their manufacture, the presence of fingerprint impressions on several examples suggests that they were hand-molded, individually crafted one by one. It is unlikely that molds were used to produce them in series. The amount of clay required for the manufacture of each projectile also appears to have been carefully measured. As a result, most projectiles have a diameter ranging between 7 and 8 cm (Fig. 33/3) and a weight between 200 and 300 grams (Fig. 33/4). However, larger specimens are also well represented, with diameters between 8 and 10 cm and weights ranging from 300 to 500 grams. The smallest projectile has a diameter of 6.7 cm and weighs 177 grams, while the heaviest piece measures 10.2 × 9.8 cm and weighs around 734 grams. From a technical perspective, it was observed that the clay used to shape the projectiles was tempered with organic matter and in some cases the organic inclusions were combined with gravel or sand. The ratio between fragmentary pieces and complete projectiles is nearly equal (Fig. 33/5). While some projectiles were broken, others exhibit only minor damage. Additionally, certain projectiles show traces of secondary burning and in some cases, vitrified clay fragments originating from the palisade are fused to their surfaces.

The available evidence concerning the production of the projectiles indicates that they were hand-molded from yellow clay, occasionally containing sand, gravel or organic inclusions. Some examples display well-smoothed exterior surfaces. After shaping, they were left to dry on a surface, likely covered with straws or other plant material. Today, the projectiles generally exhibit a reddish hue. In other cases, the surface shows pores, roughness, and cracks resulting from exposure to heat. It remains unclear whether the projectiles were intentionally fired as part of the manufacturing process or were burned incidentally during the destruction of the fortification[25].

[25] Our experiments indicate that firing the projectiles is not necessary for their effective use.

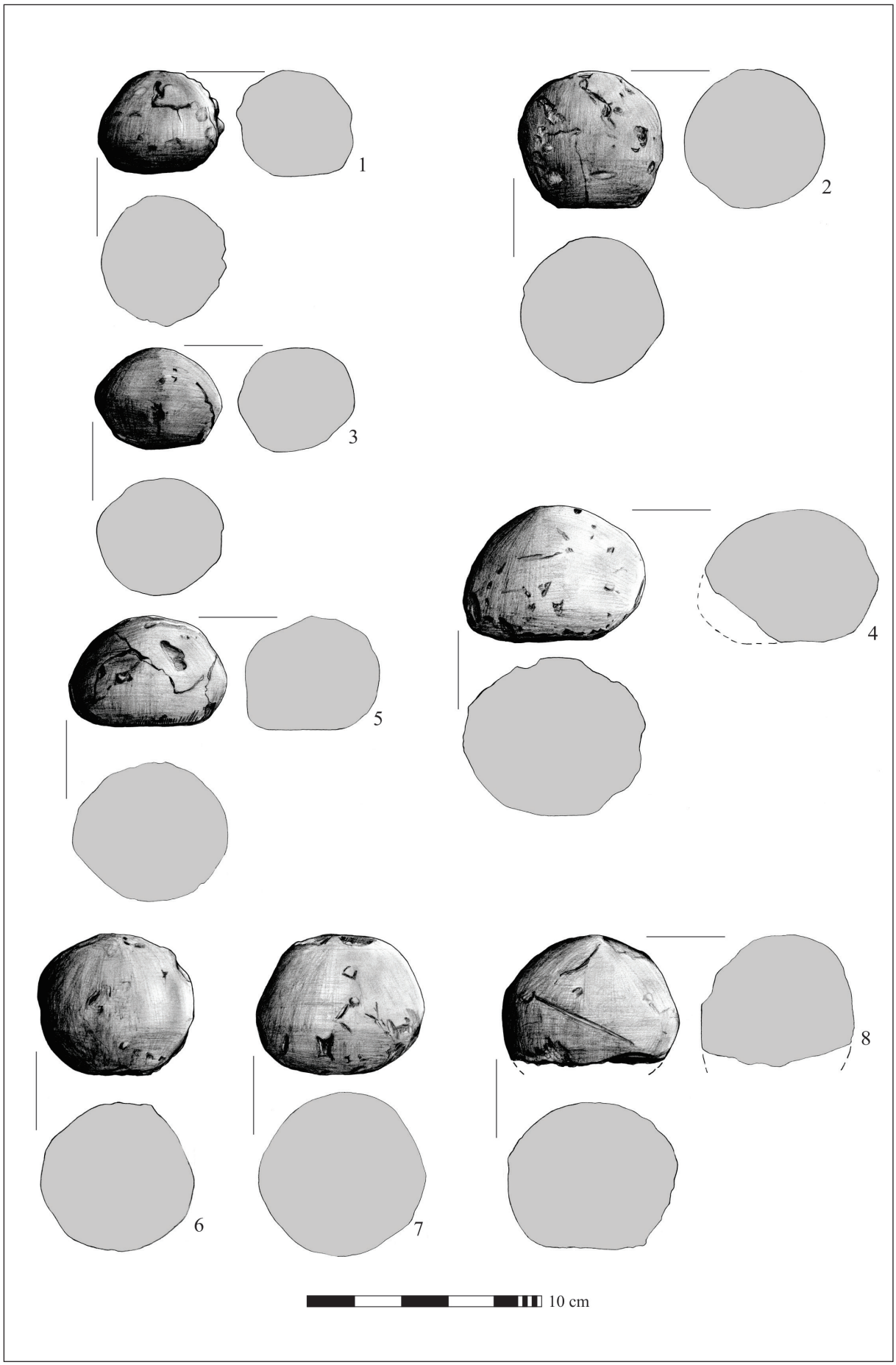

Fig. 30. Clay sling projectiles discoveres in Cx. 5 (the debris of the second palisade) (drawings by Cristian Ioan Popa).

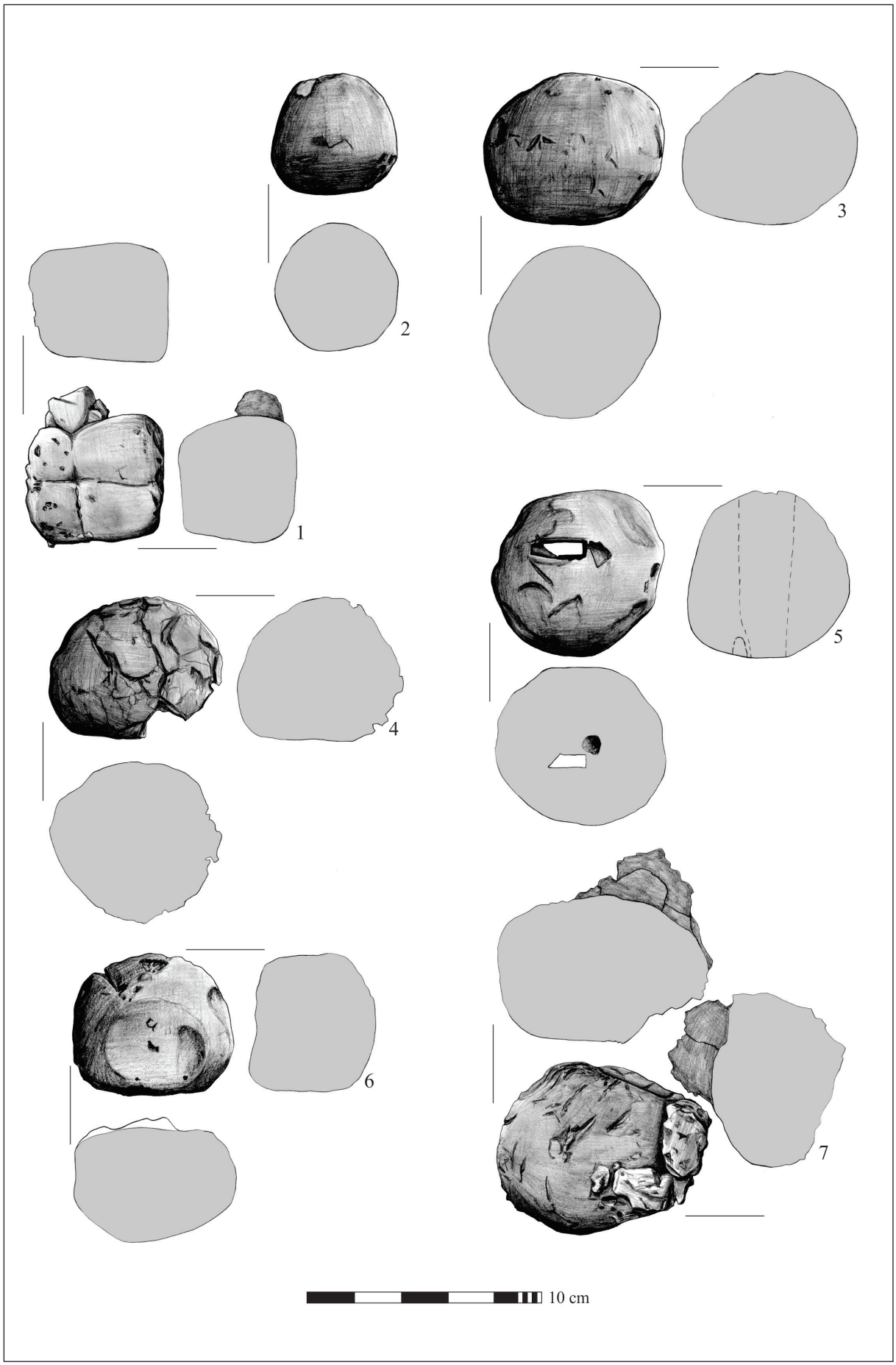

Fig. 31. Clay sling projectiles discoveres in Cx. 5 (the debris of the second palisade) (drawings by Cristian Ioan Popa).

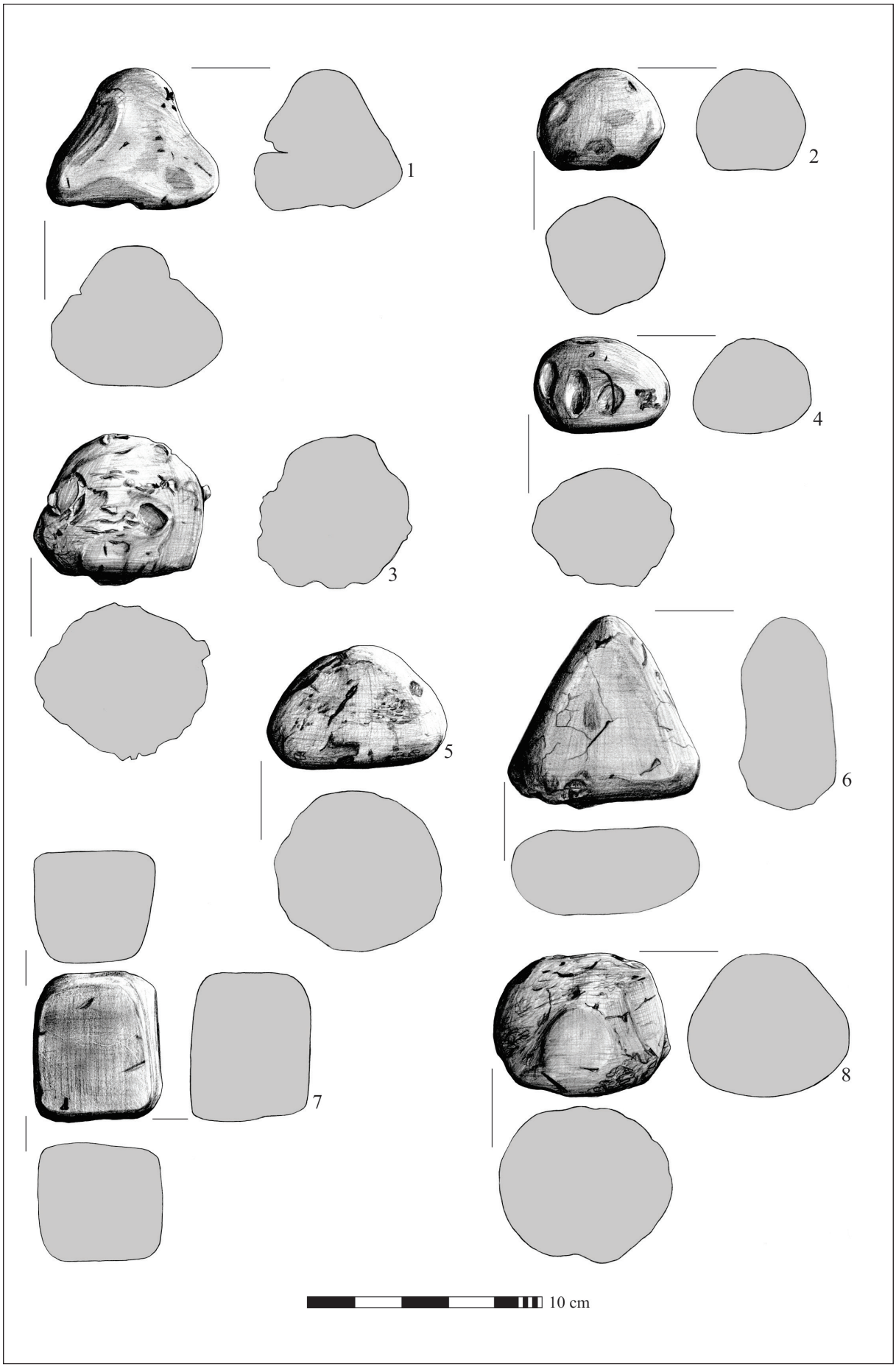

Fig. 32. Clay sling projectiles discoveres in Cx. 5 (the debris of the second palisade) (drawings by Cristian Ioan Popa).

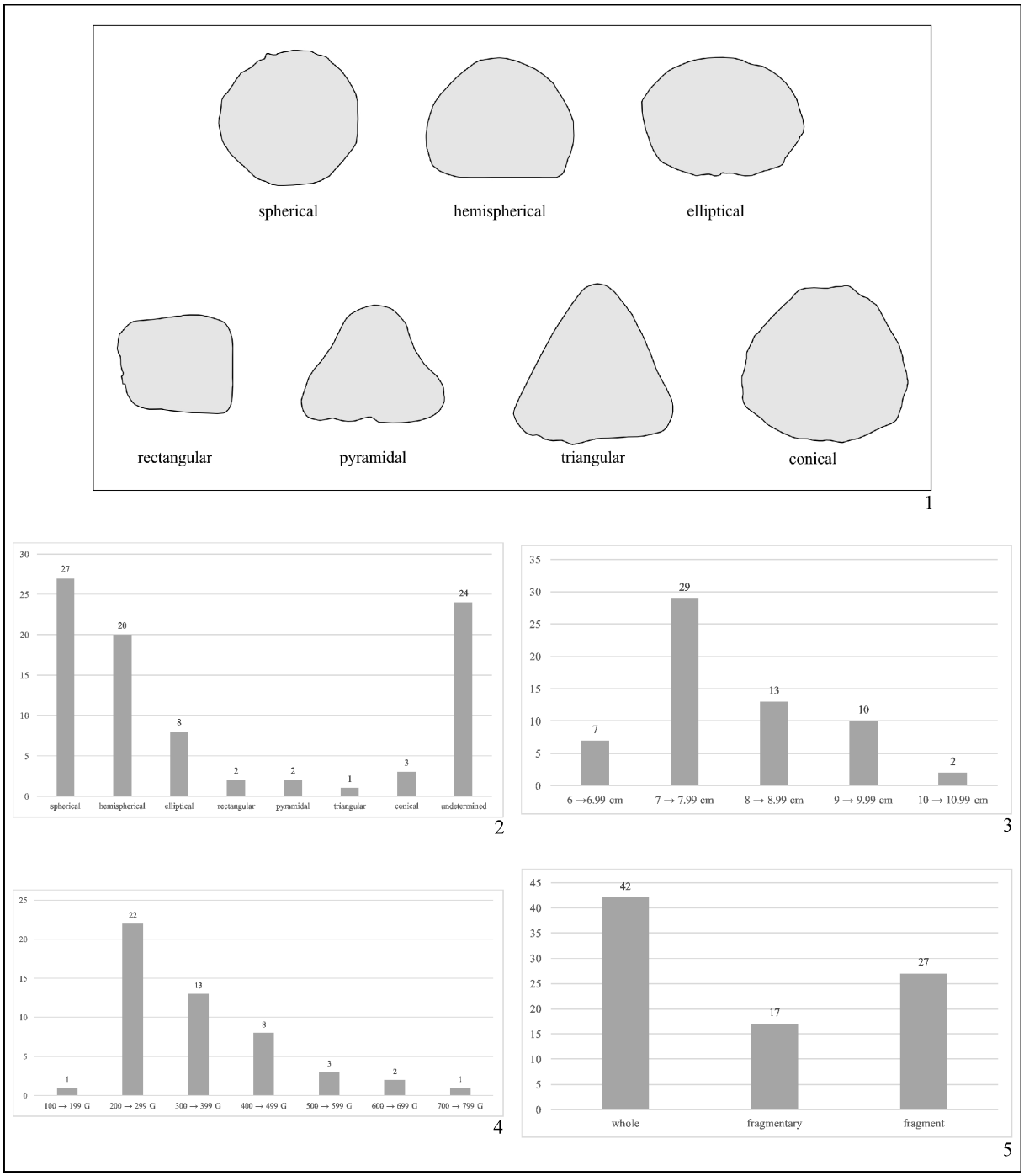

Fig. 33. 1. Typology of clay projectiles in Sântana-Cetatea Veche; 2. Distribution of the projectiles according to their shape; 3. Distribution of the projectiles according to their diameter; 4. Distribution of the projectiles according to their weight; 5. Distribution of the projectiles according to their state of preservation (source: authors).

The clay projectiles are closely associated with the final phase of Fortification III's existence. All such artifacts were discovered among the burned remains of the palisade, or more rarely, within the defensive ditch at the base of the rampart. This supports the hypothesis that the fortification was besieged and subsequently destroyed, and that during the siege, clay projectiles, most likely launched using slings, were employed. Initially, we believed that the primary assault on the Sântana mega-fort was directed at the northern side[26]; however, the 2018 excavation confirms that an equally intense attack also occurred on the northeastern side.

Although numerous sites contemporary with Sântana have been investigated in the Lower Mureș region, none have yielded evidence for the presence of clay projectiles. The closest analogies

[26] Gogâltan, Sava 2012, 68-69, Fig. 7.

for these artifacts are found in the Carpathian-Dniester area, within the Noua-Sabatinovka cultural milieu, which is contemporaneous with the mega-fort of the Lower Mureș[27]. In the Transylvanian area of the Noua culture, the only known analogy consists of several "balls" from Rotbav, which the authors interpret as having been used in food preparation[28]. It appears that the tradition of using clay projectiles in the context of sieges persisted in cultural environments following the destruction of Sântana. A compelling example comes from Teleac, where the fortification system was destroyed by fire during the 10th century cal BC. The discovery of both clay and stone projectiles among the burned remains of the palisade led the excavators to propose a hypothesis of a siege that culminated in the fortification's destruction[29].

Bronze artifacts

Among the debris of the second palisade (Cx. 5), alongside numerous fragments of daub, ceramic sherds, and clay projectiles, two bronze artifacts were also discovered. Both the arrowhead (Fig. 34/1) and the fragments of a *saltaleone* (Fig. 34/2) are associated with the destruction phase of Fortification III. The *saltaleone* holds no particular chronological or interpretive significance[30]. However, the arrowhead recovered from this context reinforces the hypothesis of a siege on Fortification III. Similar arrowheads have been identified at the LBA II fortification at Csanádpalota[31] and in Ungurului Cave at Șuncuiuș[32].

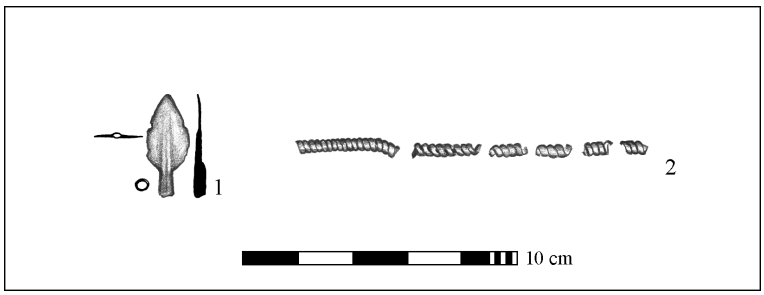

Fig. 34. Arrowhead (1) and saltaleone (2) made of bronze, discovered among the remains of the second palisade (Cx. 5) (drawings by Alexandra Sighete).

Chronological aspects of Fortification III

In order to construct an absolute chronological model for Fortification III, we had available 16 AMS radiocarbon dates. Of these, three were obtained from contexts within Trench S1/2009, which investigated the northern side of the fortification, while the remaining samples were taken from Trench S5/2018 (Tab. 2). Five of the dates were derived from the charred remains of Palisade 1 (Cx. 24). Two additional samples were taken from the charcoal preserved in the postholes of Palisade 2 (Cx. 16 and Cx. 17) and four more were extracted from the debris of Palisade 2 (Cx. 5). Two dates were obtained from the fill layers of Ditch 1, and three others from the fill of Ditch 2 excavated during the 2009 campaign.

The modelling of the available AMS data reveals a developmental sequence comparable to that previously reported[33]. However, in contrast to earlier publications, the increased number of radiocarbon dates and the structured nature of the model now provide a significantly more detailed chronological framework for the evolution of the entire fortification system. By correlating the stratigraphy of Trench S5/2018 with the AMS results, we were able to define absolute chronological intervals for the development of Fortification III. The Bayesian model was structured in accordance with the stratigraphic data obtained during the excavation (Figs. 35–38).

The initial phase in the development of *Fortification System III* involved the construction of the earthen rampart, the erection of the palisade and the excavation of the two defensive ditches. This

[27] Sîrbu 2012, 92, Fig. 93.
[28] Dietrich *et al*. 2018, Fig. 6.
[29] Uhnér *et al*. 2019, 188, Fig. 12.
[30] This type of artifact has been present in the region since the Middle Bronze Age (see for example Sava, Gogâltan 2022, Fig. 18, 22.
[31] Czukor *et al*. 2013, 14.
[32] Emődi 1997, 487, 502, no. 77.
[33] Gogâltan *et al*. 2019, 209.

Tab. 2. List of AMS data collected from the contexts of the third fortification.

Nr. Crt.	Lab no.	Sample name	14C age [yr BP]	±	ϱ13C AMS [‰]	Cal 1-sigma	Cal 2-sigma	Mean	C:N	C [%]	Kollagen [%]	Material	Context
1	MAMS 33944	1_Santana, Cetatea Veche S1,70A	3064	27	-22,5	calBC 1390-1282	calBC 1412-1235	calBC 1331	2,7	19,5	2,2	human bone	Trench S1/2009, 70A, defense ditch
2	MAMS 33946	3_Santana, Cetatea Veche S1,62A	3066	24	-18,0	calBC 1390-1286	calBC 1412-1262	calBC 1334	2,4	24,4	5,7	human bone	Trench S1/2009, 62A, defense ditch
3	MAMS 33948	5_Santana, Cetatea Veche Cx38	3131	23	-19,6	calBC 1436-1324	calBC 1492-1306	calBC 1398	3,2	39,6	0,5	animal bone	Trench S1/2009, cx. 38, defense ditch
4	MAMS 37708	San_18_9_24_ ditch 1	3227	20	-25,0	calBC 1513-1454	calBC1591-1439	calBC 1478	-	49,7	-	charcoal	Trench S5/2018, palisade 1, cx. 24
5	DeA-41506	I/3355/6	3148	27	-	calBC 1451-1401	calB 1498-1318	calBC 1427	-	-	-	Charcoal	Trench S5/2018, palisade 1, cx. 24
6	MAMS 37710	San_18_12_24_ ditch 1	3147	20	-27,6	calBC 1440-1409	calBC1493-1324	calBC 1426	-	60,1	-	Charcoal	Trench S5/2018, palisade 1, cx. 24
7	MAMS 37709	San_18_11_24_ ditch 1	3047	19	-26,3	calBC 1377-1266	calBC1393-1232	calBC 1309	-	57,6	-	charcoal	Trench S5/2018, palisade 1, cx. 24
8	DeA-41507	I/3355/7	3035	28	-	calBC 1380-1228	calBC 1399-1212	calBC 1292	-	-	-	Charcoal	Trench S5/2018, palisade 1, cx. 24
9	MAMS 37707	San_18_31_17_ posthole 17	3104	19	-27,2	calBC 1414-1315	calBC1427-1302	calBC 1377	-	57,7	-	charcoal	Trench S5/2018, posthole cx. 17
10	MAMS 37706	San_18_30_16_ posthole 16	3087	25	-23,6	calBC 1406-1303	calBC1417-1282	calBC 1344	-	51,5	-	charcoal	Trench S5/2018, posthole cx. 16
11	MAMS 37712	San_18_21_5_ ditch 1	3081	19	-28,6	calBC 1397-1303	calBC1410-1286	calBC 1342	-	52,1	-	Charcoal	Trench S5/2018, palisade 2, cx. 5
12	MAMS 37711	San_18_23_5_ ditch 1	3055	20	-26,7	calBC 1383-1277	calBC1397-1236	calBC 1324	-	42,1	-	Charcoal	Trench S5/2018, palisade 2, cx. 5
13	DeA-41505	I/3355/5	3035	28	-	calBC 1380-1228	calBC 1399-1212	calBC 1292	-	-	-	Charcoal	Trench S5/2018, palisade 2, cx. 5
14	DeA-41504	I/3355/4	3017	27	-	calBC 1371-1218	calBC 1387-1131	calBC 1264	-	-	-	Charcoal	Trench S5/2018, palisade 2, cx. 5
15	MAMS 37714	San_18_24_36_ ditch 1	3102	24	-19,1	calBC 1414-1308	calBC1428-1296	calBC 1362	2,0	11,7	1,2	animal bone	Trench S5/2018, ditch 1 (Cx. 66)
16	MAMS 37713	San_18_28_36_ ditch 1	3087	20	-26,8	calBC 1405-1305	calBC1413-1291	calBC 1344	-	41,0	-	Charcoal	Trench S5/2018, ditch 1 (Cx. 66)

corresponds to Phase III in the Harris Matrix established for the contexts in Trench S5. In order to date the construction phase, five charcoal samples were collected from the remains of Palisade 1 (Cx. 24)[34]. Two of these samples (MAMS 37709 and DeA-41507) yielded later dates and were contemporaneous with Palisade 2; therefore, they were excluded from the model. The results indicate that Palisade 1 was constructed between 1498 and 1395 cal BC (2σ). Both ditches appear to have been in use contemporaneously with Palisade 1. One supporting argument is the observation that, at the time of its collapse into Ditch 1, the ditch had already undergone partial silting (Cx. 62–63, 66). The dating of the silting lens Cx. 66, upon which Palisade 1 collapsed, to between 1411 and 1315 cal BC (2σ) suggests that the destruction of Palisade 1 occurred within this interval, most likely by the end of the 14th century cal BC. The three radiocarbon dates obtained from Ditch 2, excavated in 2009, place its period of use between 1436 and 1347 cal BC (2σ), by which time it had already begun to silt up[35]. The use of Palisade 1 and the initial infilling of the ditches correspond to Phase IV in the Harris Matrix. Following the destruction of Palisade 1, its remains, along with the outer slope of Ditch 1 and the rampart, were covered by a layer of yellow clay, sealing the earlier contexts (events grouped within Phase V). Based on the stratigraphic sequence in Trench S5/2018, it is likely that these events occurred within a relatively short timeframe. Palisade 2 was constructed between 1391 and

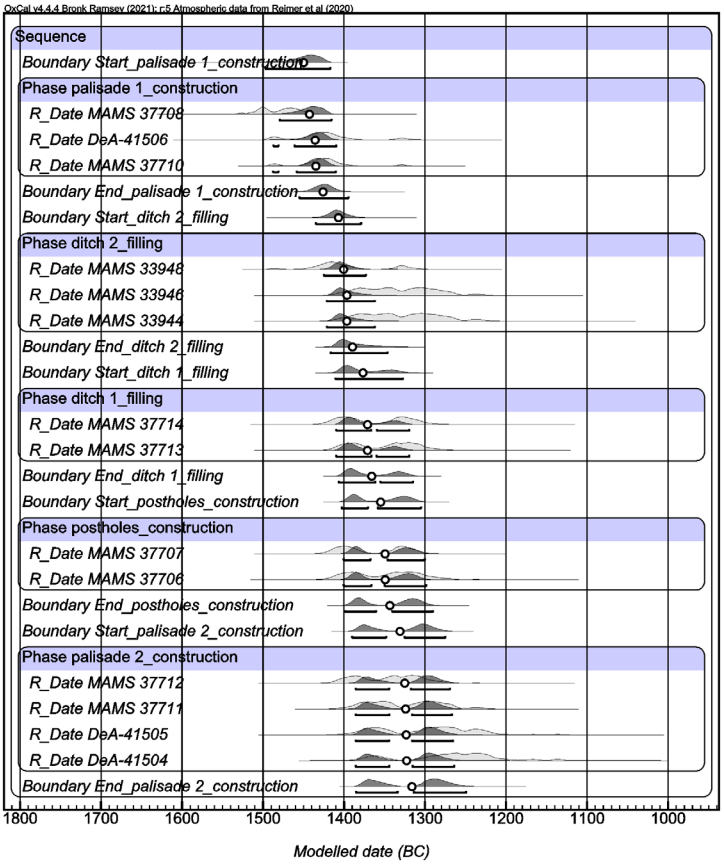

Fig. 35. The Bayesian chronological model built using the stratigraphic data of the IIIrd fortification sistem (source: authors).

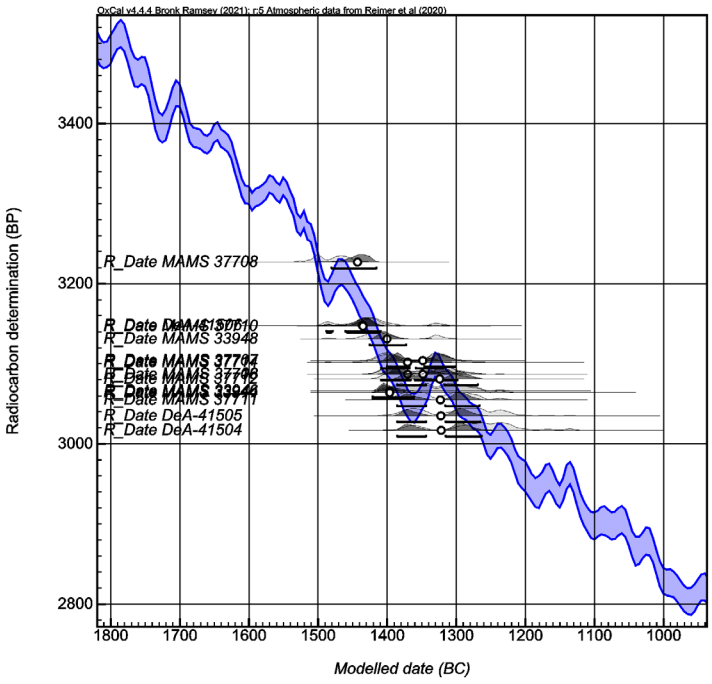

Fig. 36. AMS data from the third fortification contexts, plotted on the calibration curve (source: authors).

[34] The analysis of 91 AMS dates obtained from Cornești-*Iarcuri* reveals only negligible differences between the 50 samples derived from macro-remains and the 41 samples from charcoal (Lehmphul et al. 2019, 262, Fig. 7). Consequently, the authors convincingly argue for the reliability of the charcoal-based dates and the absence of a significant old wood effect.

[35] Sava *et al*. 2019, Fig. 4.

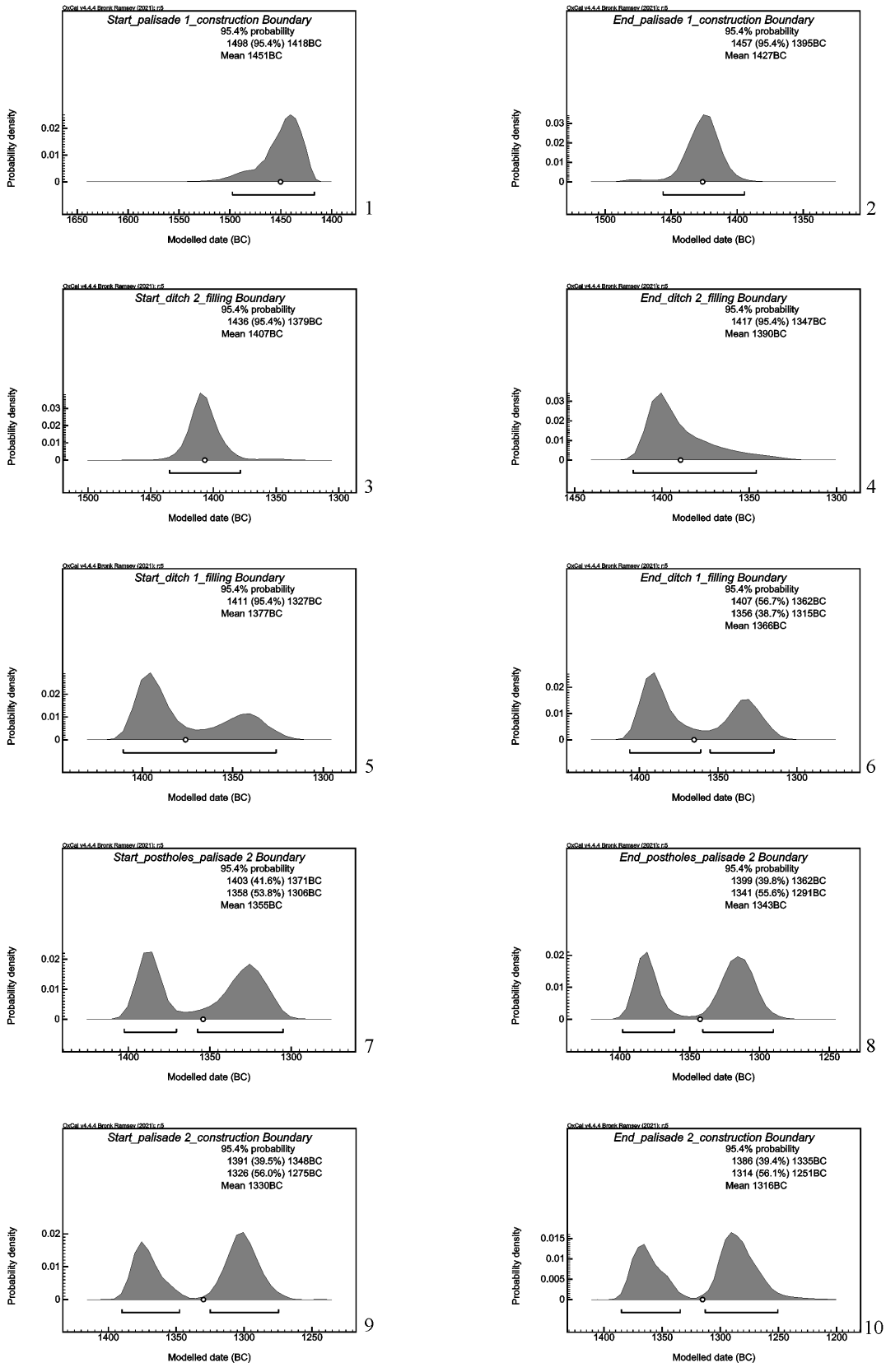

Fig.37. The modelling of the AMS data (source: authors).

1251 cal BC (2σ), as indicated by four radiocarbon dates obtained from its charred remains (Cx. 5). A similar time frame (1403–1291 cal BC, 2σ) is provided by the samples taken from the in situ remains of Palisade 2, specifically from postholes Cx. 16 and Cx. 17. The moment of the siege and the destruction of Palisade 2 and of the entire fortification system (Phase VI) could not be directly dated.

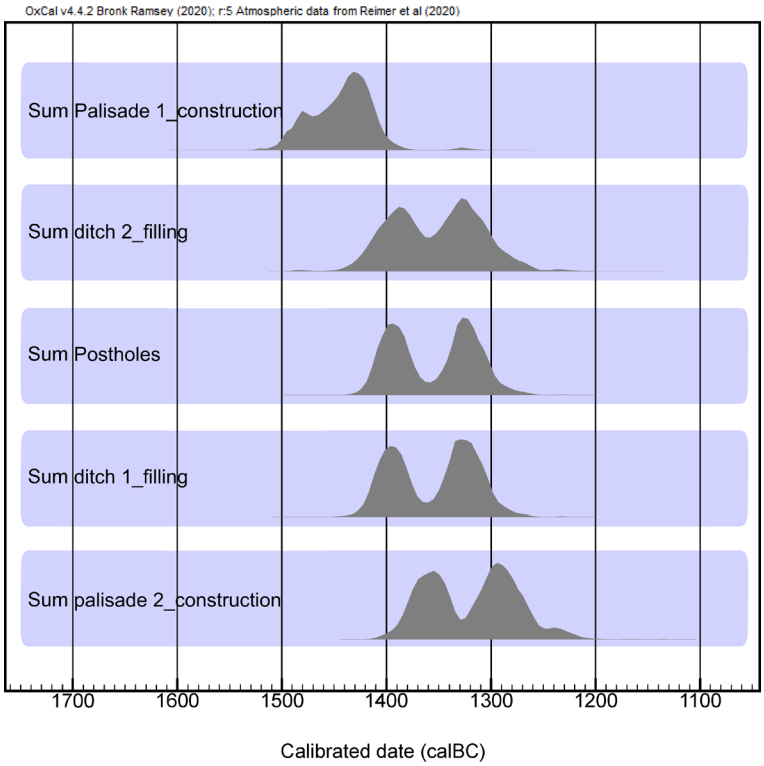

Fig. 38. The bounded sums of the main chronological phases of the third fortification (source: authors).

To summarize the absolute chronological development of Fortification III, as indicated by the available data, it can be stated that the fortification was constructed during the 15th century cal BC, most likely in the second half of the century. In the 14th century cal BC probably around its middle, Palisade 1 was destroyed. Shortly after this event, a second palisade was erected. In the absence of conclusive archaeological contexts, the precise timing of the siege and destruction of Palisade 2, along the entire fortification system (Phase VI), could not be determined. Nevertheless, it is plausible that the entire fortification was destroyed no later than the mid-13th century cal BC. The total lifespan of the fortification is thus estimated at a maximum of 150–200 years.

A similar developmental pattern can be observed in the case of the Cornești-*Iarcuri* mega-fort[36]. The first two enclosures exhibit two distinct construction phases. The initial building of the fortifications took place during the 15th century cal BC, followed by episodes of destruction and reconstruction throughout the 14th century cal BC. Both enclosures were ultimately destroyed in the first half of the 13th century cal BC. It is likely that the mega-forts at Csanádpalota-*Földvár*[37] and Gradište Iđoš[38] followed a comparable trajectory.

A Critical Reassessment of the Archaeological Interpretation of Section S1/1963[39]

Due to its scale and significance, Fortification System III has been the subject of several publications. However, since different areas were excavated at considerable chronological intervals (1963, 2009, 2018), the interpretations regarding the fortification exhibit certain inconsistencies. In the context of publishing the results of the 2018 excavation, we consider it appropriate to briefly revisit the 1963 investigation, highlighting several key aspects and providing necessary clarifications for a better understanding of the archaeological situation.

During the 1963 archaeological campaign, four excavation trenches were opened in the central-northern sector of the fortification. Trench S1, measuring 80 × 2 m, was positioned approximately 150 m east of the former railway station building. The objective of the research team was to investigate the defensive system of Enclosure III. The trench was laid out perpendicular to the earthen rampart, oriented north-northeast to south-southwest. It appears that this area was selected due to the rampart being less prominent in elevation. We now know that this particular sector was constructed within the

[36] Lehmphul *et al*. 2019.
[37] Szeverényi *et al*. 2022, 236-240, Tab. 2, Fig. 21.
[38] Molloy *et al*. 2020, Tab. 2; Molloy *et al*. 2023, 30-34, Fig. 13-14; Bruyère *et al*. 2024, Tab. 2, Fig. 2.
[39] The data was drawn from Rusu *et al*. 1996 și Rusu *et al*. 1999.

bed of a former watercourse; both S1 from 1963 and S1 from 2009 were aligned along this former riverbed.

Following the excavation and documentation of the findings in Trench S1, the research team identified the main elements of the fortification system. The first component consisted of a defensive ditch located at the base of the earthen rampart. This ditch measured 3.5 m in width and had a depth of "over" 3 m, being filled with dark-colored soil. It appears to have been cut into a layer of greyish soil interpreted as ancient humus. A second ditch was identified approximately 5 m outward from the first. This second ditch was nearly 12 m wide and approximately 3 m deep. Based on the stratigraphic profile, the upper part of the ditch was filled with dark grey soil containing charcoal and fragments of daub, while a distinct lens was noted at the bottom of the feature.

The rampart was constructed using soils of various colours: light yellow, light brown, light grey, and dark grey-black. It is presumed that this earth, employed in the elevation of the rampart, originated from the excavation of the two defensive ditches[40]. The excavation team proposed the existence of two construction phases for the rampart; each associated with a presumed palisade. In the initial phase, the rampart extended between meters 33.5 and 52, with a width of 18.5 m; during the second phase, it was broadened to approximately 25 m. The rampart was built exclusively from compacted earth lenses, laid successively atop one another[41].

Regarding the palisade, two construction phases were documented, each marked by a row of postholes[42]. The outer row of posts was identified in front of the palisade; these had a diameter of 0.40–0.50 m and *were presumably up to 6–8 m tall, matching the height of the earthen rampart*. It is assumed that the palisade featured a parapet walkway (*chemin de ronde*) along its crest, protected by a front barrier *designed to shield defenders from enemy arrows*. At a later point, the wooden structure erected atop the rampart was destroyed by fire. Based on the information provided, both the palisade and the *wooden framework* composed of horizontal and transverse beams[43] displayed an orange coloration, indicative of exposure to intense heat. In a second chronological phase, following the fire outbreak, the rampart *was 'heightened and widened using earth extracted from a defensive ditch'*[44] (the second ditch). The palisade of this second construction phase was initially identified by its remains, large fragments of daub scattered across a width of approximately 4 m and with a thickness ranging from 0.3 to 0.8 m. In this construction phase as well, *the rampart was supported by a wooden framework resting on external vertical posts with diameters exceeding 50 cm*.

Regarding the construction system of the earthen rampart at Sântana, comparisons were drawn with the fortifications at Cornești, based on the 1939 excavation conducted by Marius Moga[45]. However, recent investigations have shown that the defensive ramparts of the two sites were not built in the same manner[46]. Based on both the published excavation reports from 1963 and the data from recent campaigns, we can now reinterpret the construction of the northern section of the third fortification at Sântana. The rampart was built from compacted earth, without internal reinforcement structures, and had a width of approximately 25 meters. Its base was partially reinforced with stones and wooden beams, likely to stabilize the entire structure, which effectively blocked the paleochannel running across the site. The palisade was made up of two rows of posts set at an angle, with the outer row leaning outward. These posts were bound together with a framework of wattle and planks, which was then plastered with clay. The whole structure was subjected to intense burning. In contrast to the

[40] It appears that the clay extraction pit located behind the rampart was not identified during the 1963 excavation. However, in the 2009 campaign, such a pit was documented, measuring 33 meters in width and 2 meters in depth. Subsequent non-intrusive investigations revealed that this clay extraction trench encircles the entire defensive system of Enclosure III.

[41] According to the existing documentation, no portion of the rampart appears to have been constructed on a stone or wooden platform, as observed in Section S1 from the 2009 excavation.

[42] It should be noted that recent investigations have demonstrated that the two rows of posts belong to a single construction phase and represent an elaborate structure, equivalent to a complex palisade.

[43] In this paragraph, the text is somewhat confusing. Initially, it states that the rampart was built from compacted clay lenses, but later it also refers to a "wooden framework" composed of horizontal and transverse beams. It should be clarified that no such internal wooden structures within the rampart were identified during the 2009 excavation.

[44] No visible evidence of the alleged "raising and widening" of the rampart with additional earth can be identified in the profile of Section S1 from the 1963 excavation.

[45] Medeleț 1993.

[46] Within this regard for Cornești: Szentmiklosi *et al*. 2011; 823-829, Figs. 5-7.

northern section of Fortification System III investigated in 1963 and 2009, the eastern side shows some notable differences. These include a less complex palisade and the absence of a wooden and stone substructure at the base of the rampart. Considering the available evidence, it is reasonable to conclude that the builders of Fortification System III adapted their construction techniques to the local micro-topography to achieve their objectives.

Conclusions

Following the excavation campaign conducted in 2018, traces of an early Copper Age settlement were identified. AMS data confirm that this settlement was occupied between the mid-43rd and mid-41st centuries cal BC. However, the most significant results of the campaign relate to the Late Bronze Age mega-fort. The excavation of the northeastern side of Fortification System III led to the documentation of the main structural elements of the defensive system, the identification of its principal construction phases, and their absolute dating. The earthen rampart, the palisade and the two defensive ditches were built during the 15th century cal BC. In the course of the 14th century cal BC, the entire fortification was destroyed by fire. It was subsequently rebuilt in its entirety and was likely besieged and destroyed again around the middle of the 13th century cal BC.

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ANNEX

Description of the archaeological contexts

General and geological contexts

Cx. 1/S5. Recent ploughing layer extending across the entire area of trench S5. This compact deposit, color 10YR – 2/1, yielded several ceramic fragments characteristic of the Late Bronze Age. On the crest of the rampart, where the palisade had been located, numerous heavily fired pieces of daub were preserved, some retaining various types of impressions.

Cx. 1.1/S5. Layer of soil, color 10YR – 2/1, representing deep ploughing. This deep ploughing occurs only outside the rampart, as also noted in trench S1 in 2009. Excavations in 2009 and 2018 confirmed that below a depth of 0.25–0.30 m, the rampart and palisade structure remain unaffected by agricultural activity. It is likely that deep ploughing was not possible along the crest of the third fortification rampart due to its high degree of compaction.

Cx. 34/S5. Clay of color 10YR – 8/6, archaeologically sterile.

Cx. 54/S5. Yellow clay, archaeologically sterile. Unlike Cx. 34, it is more clayey, compact, and contains traces of iron oxides. Stratigraphically, it lies beneath Cx. 34.

Early Copper Age contexts

Cx. 44/Cx. 46/Cx. 48/S5 (Fig. 4/1–3; 5). Large pit, apparently oval but irregular in outline, which could not be fully exposed as part of it extended into the southern profile of the trench. It extends from m 47.72 to m 54.04 of trench S5. The feature appeared in the yellow clay as a patch of color 10YR – 4/1 with small intrusions of yellow clay and a few calcareous concretions; the matrix is homogeneous and clayey in consistency. Sectioning revealed a single fill layer identical to the one visible at the outlining stage, with the exception of a smaller pit (Cx. 48) which deepens and cuts into the trench profile; this has the same consistency but a different color, 10YR – 3/1. The shallow pit has sloped sides and an uneven base. The fill contained several ceramic sherds, small pieces of daub, and a few animal bones. Identified length: 4.42 m; identified width: 2.40 m; internal depth: 0.45 m.

Cx. 47/S5 (Fig. 4/4; 5). Small pit, probably circular in plan, only partially exposed as it extended into the northern profile of the trench. It was identified between m 50.26 and m 51.28 of trench S5. The feature appeared as a patch of color 10YR – 3/1 with very few yellow clay intrusions, homogeneous, compact, and clayey in consistency. Excavation revealed a single fill layer identical to that observed at the outlining stage. The fill contained a few ceramic fragments. Identified length: 1.02 m; identified width: 0.20 m; internal depth: 0.24 m.

Cx. 67/S5. Depositional layer of the Copper Age settlement. Color 2.5Y – 5/3, very slightly pigmented, loose in consistency; contained ceramic fragments and a few animal bones. From this layer originate pits Cx. 44, Cx. 46, Cx. 48, and Cx. 47. This surface was later overlain by the rampart of the third fortification, built in the Late Bronze Age.

Late Bronze Age contexts

Cx. 2/S5. Fired clay, color 5YR – 5/6, compact in composition, located behind the palisade. This deposit forms part of the structure into which Palisade 2 was set (see Cx. 5).

Cx. 3/S5. Clay, color 10YR – 6/2, less intensely fired than Cx. 2 but equally compact; slightly pigmented with small pieces of daub. The main difference between Cx. 2 and Cx. 3 is in the intensity of burning and the resulting color. This deposit also forms part of the structure into which Palisade 2 was set (see Cx. 5).

Cx. 4/S5. (Fig. 10–11, 12–13). Daub fragments from the collapse of Palisade 2 (Cx. 5), most heavily fired to an intense red, with others vitrified to a blue hue. After removing the thick layer of daub, which represented the burnt remains of Palisade 2, it was observed that many pieces preserved impressions of a wooden framework. Wattle impressions, intersections of wattle with planks and posts, were clearly visible, indicating the timber skeleton of the palisade, which had been coated with a thick layer of clay after construction.

Cx. 5/S5 (Fig. 10–11). Burnt remains of Palisade 2 (described in the main text of the article).

Cx. 6/S5. Soil, color 2.5Y – 5/3, compact and relatively homogeneous, with calcareous concretions. Represents slow natural silting of the clay extraction pit located behind the rampart.

Cx. 7/S5. Soil, color 2.5Y – 3/2, unpigmented, compact, and more clayey than Cx. 6. Represents gradual fill of the clay extraction pit behind the rampart.

Cx. 8/S5. Lens of yellow clay (2.5Y – 6/3) with numerous calcareous concretions, very compact and homogeneous. Represents the exterior casing of the rampart.

Cx. 9/S5. Slightly clayey lens, homogeneous and compact, containing calcareous concretions; part of the rampart structure. Color 2.5Y – 6/2.

Cx. 10/S5. Large, homogeneous, compact lens, color 2.5YR – 5/3; part of the rampart structure.

Cx. 11/S5. Large, homogeneous, compact lens, color 2.5YR – 3/2; part of the rampart structure.

Cx. 12/S5. Lens, color 2.5Y – 4/3, homogeneous; part of the rampart structure. In its lower profile, the outline of a bell-shaped pit is visible, the function of which remains unclear.

Cx. 13/S5. Very compact, homogeneous clay, color 10YR – 6/2, containing traces of burning. Together with Cx. 2, Cx. 3, Cx. 22, Cx. 31, and Cx. 32, it forms a distinct clay block, fired at high temperature, into which the wooden posts of Palisade 2 were set. This block is clearly distinguishable in the rampart profile. It is possible that, after the destruction of Palisade 1 (Cx. 24), the damaged section of the rampart was reworked: the remains of Palisade 1 were removed, along with the affected rampart section, and replaced with the clay deposits (Cx. 2, Cx. 3, Cx. 13, Cx. 22, Cx. 31, Cx. 32) used to construct Palisade 2.

Cx. 14/S5 (Fig. 15–16). Small trench in front of the postholes of Palisade 2 (described in the main text of the article).

Cx. 15/S5 (Fig. 15–16). Posthole, part of Palisade 2; fill consists of charcoal and soil, color 10YR – 4/1, with charcoal pigmentation and a little yellow clay. Approximately circular in plan, narrowing towards the top, and cutting into the northern profile. Diameter: 0.32 × 0.33 m; depth: 0.50 m.

Cx. 16/S5 (Fig. 15–16). Posthole, part of Palisade 2; approximately oval in plan, with a "V"-shaped profile. Fill color 10YR – 5/1, with slight traces of burning and charcoal. Diameter: 0.44 × 0.40 m; depth: 0.70 m.

Cx. 17/S5 (Fig. 15–16). Posthole, part of Palisade 2; approximately circular in plan, with a "V"-shaped profile. The fill consists of charcoal and burnt material, color 2.5YR – 5/8. Diameter: 0.54 × 0.50 m; depth: 0.54 m.

Cx. 18/S5 (Fig. 15–16). Posthole, part of Palisade 2; approximately circular in plan, with a "U"-shaped profile. The fill consists of soil, color 10YR – 5/1, and burnt material, color 2.5YR – 5/8. Diameter: 0.50 × 0.56 m; depth: 0.30 m.

Cx. 19/S5 (Fig. 15–16). Posthole, part of Palisade 2; approximately circular in plan, with a "U"-shaped profile. The fill consists of soil, color 10YR – 5/1, with a small amount of burnt material (2.5YR – 5/8) and charcoal. Diameter: 0.54 × 0.50 m; depth: 0.36 m.

Cx. 21/S5 (Fig. 15–16). Posthole, part of Palisade 2; approximately circular in plan, with a "V"-shaped profile. The fill consists of burnt material, color 2.5YR – 5/8, and charcoal. Diameter: 0.34 × 0.32 m; depth: 0.36 m.

Cx. 22/S5. Clay, color 10YR – 6/2, compact in structure, containing abundant traces of burning and several large fragments of daub. Together with Cx. 2, Cx. 3, Cx. 13, Cx. 31, and Cx. 32, this section of the rampart belongs to the reconstruction phase of the second palisade/wall.

Cx. 23/S5 (Fig. 18). Clay layer sealing the remains of Palisade 1 and the outer face of the rampart (described in the main text of the article).

Cx. 24/S5 (Fig. 19–20). Burnt remains of Palisade 1 (described in the main text of the article).

Cx. 25/S5 (Fig. 21–22). Entire surface of the rampart (described in the main text of the article).

Cx. 26/S5. Clay lens of color 2.5YR – 6/2, positioned towards the inner part of the rampart.

Cx. 27/S5. Clay lens of color 10YR – 3/1, compact, with few intrusions of yellow clay, part of the rampart structure.

Cx. 28/S5. Clay lens of color 2.5YR – 6/3; part of the rampart structure.

Cx. 29/S5. Clay lens of color 2.5YR – 7/3; part of the rampart structure.

Cx. 30/S5 (Fig. 15–16). Small posthole located at the edge of trench Cx. 14, approximately circular in plan, with straight walls and a flat base. The fill is color 10YR – 3/1. Diameter: 0.24 × 0.22 m; depth: 0.12 m.

Cx. 31/S5. Upper fill of trench Cx. 14, color 10YR – 6/8, pigmented with small pieces of daub.

Cx. 32/S5. Lower fill of trench Cx. 14, color 10YR – 6/8, compact, slightly pigmented with small pieces of daub.

Cx. 33/S5. Soil lens of color 10YR – 4/1, part of the lower structure of the rampart.

Cx. 35/S5. First silting level of ditch 1, color 10YR – 6/6, slightly pigmented with daub and charcoal.

Cx. 36/S5 (Fig. 23/1). Surface of ditch 1 at the time it was dug (this context is described in the main text of the article).

Cx. 37/S5. Clay layer, color 10YR – 7/6, containing numerous river stones; part of the silting sequence of Ditch 1 (Cx. 36). The base of this silting layer represents a cleaning of the ditch bottom carried out after the destruction of Palisade 1 (Cx. 24) and the reorganization of the fortification (Cx. 23).

Cx. 38/S5. Surface of ditch 1 at the time of the destruction of palisade 2 (Cx. 5). This context also represents the final stage of functioning of the third fortification system, at least in the investigated section.

Cx. 39/S5. Layer of color 2.5Y – 5/3, old humus, located above the archaeologically sterile layer and below the Copper Age depositional level Cx. 67, into which the Copper Age settlement pits (Cx. 44, Cx. 46, Cx. 47) were dug.

Cx. 40/S5 (Fig. 23/2). Surface of ditch 2 at the time it was dug (this context is described in the main text of the article).

Cx. 41/S5. Silting level of ditch 2, color 5Y – 5/4, pigmented with daub; the silting occurred before the final destruction of the fortification.

Cx. 42/S5. All clay sling projectiles discovered among the burnt debris of palisade/wall 2 (Cx. 5).

Cx. 43/S5. Pieces of daub from the burnt debris of palisade 1, Cx. 24.

Cx. 49/S5 (Fig. 15–16). Posthole identified on the outer side of trench Cx. 14. The pit appeared as a dark grey patch, pigmented with small pieces of daub and charcoal; approximately circular in plan, with nearly vertical sides and a slightly sloping base. Diameter: 0.50 × 0.44 m; depth: 0.50 m.

Cx. 50/S5 (Fig. 15–16). Small pit with fill composed of yellow soil pigmented with daub, similar to that of trench Cx. 14, in which it was identified. The pit was visible at a depth of approximately 0.05 m below the outlining level of the trench. Its function remains undetermined. Diameter: 0.30 × 0.34 m; depth: 0.05 m.

Cx. 51/S5. Layer of soil, color 5Y – 5/3, homogeneous and clayey. This represents gradual deposition over the fortification system, observed towards the middle of Ditch 1 and filling the upper part of Ditch 2 (Cx. 40).

Cx. 52/S5. Layer of soil, color 5Y – 6/3, with a few small daub fragments; compact and clayey. It covers the entire surface of Ditch 2 and is also present outside the fortification.

Cx. 53/S5. Lens of soil, color 5Y – 6/4, compact and clayey, identified both in the upper part of Ditch 2 (Cx. 40) and at the base of the rampart (Cx. 25), as well as above Ditch 1 (Cx. 36)

Cx. 55/S5. Small lens, color 5Y – 3/2, located in the upper part of ditch 2 (Cx. 40).

Cx. 56/S5. Lens of color 5Y – 3/2, located in the upper part of ditch 2 (Cx. 40).

Cx. 57/S5. Surface of ditch 2 (Cx. 40) at the moment when the fortification was abandoned, identified between Cx. 53, Cx. 56, and Cx. 41.

Cx. 58/S5. Lens of color 5Y – 5/2, compact and clayey, pigmented with small pieces of daub, identified above ditch 1 (Cx. 36), mainly in its central area. This represents a natural silting lens, subsequent to the destruction of the fortification.

Cx. 59/S5. Lens of soil, color 5Y – 7/4, compact and clayey, pigmented with small daub fragments; identified above Ditch 1 (Cx. 36) across its full width. Represents a natural silting lens, deposited after the destruction of the fortification.

Cx. 60/S5. Surface of ditch 1 (Cx. 36) at the time of the destruction of palisade 1 (Cx. 24).

Cx. 61/S5. Surface of the restructured ditch 1 (Cx. 36), before the destruction of palisade 1 (Cx. 24).

Cx. 62/S5. Soil of color 5Y – 4/3, clayey, compact, and homogeneous. Represents a silting of ditch 1 (Cx. 36), prior to the destruction of both palisades.

Cx. 63/S5. Yellow soil, pigmented with daub and burning. Represents a silting of ditch 1 (Cx. 36).

Cx. 64/S5. Soil of color 5Y – 4/3, clayey, compact, and homogeneous. Represents a silting of ditch 1 (Cx. 36), prior to the destruction of both palisades; contemporaneous with Cx. 62.

Cx. 66/S5. Dark yellow soil pigmented with daub. Represents a silting of Ditch 1 (Cx. 36), prior to the destruction of both palisades but after the silting of Cx. 62 and Cx. 64.

Cx. 68/S5. Small lens of color 2.5Y – 6/4, part of the rampart structure.

Cx. 69/S5. Small lens of color 2.5Y – 5/4, part of the rampart structure.

Cx. 70/S5. Lens of color 2.5Y – 6/4, part of the rampart structure.

Cx. 71/S5. Lens of color 2.5Y – 4/3, part of the rampart structure.

Cx. 72/S5. Lens of color 2.5Y – 6/6, part of the rampart structure.

Cx. 73/S5. Lens of color 2.5Y – 4/3, part of the rampart structure.

Cx. 74/S5. Small lens of color 2.5Y – 5/6, part of the rampart structure, identified beneath the ploughing level; has a "V" shape.

Cx. 75/S5. Narrow lens of soil of color 2.5Y – 4/2, charcoal, small pieces of daub, and ash, part of the rampart structure.

Cx. 76/S5. Small lens of color 2.5Y – 5/3, part of the rampart structure.

Cx. 77/S5. Surface of the clay extraction pit, located behind the rampart, at the time of excavation.

Cx. 78/S5. Natural fill lens of the clay extraction pit, color 2.5Y – 4/2, slightly pigmented.

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