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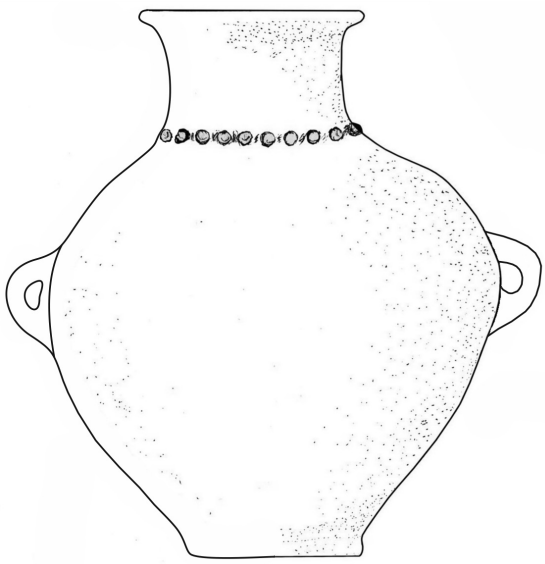

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The 2022 gridded surface collection on the outer settlement of the Toboliu tell

Alexandra Găvan, Marian Adrian Lie, Tobias L. Kienlin

Abstract: This paper presents the results of an intensive systematic survey campaign carried out in March 2022 on the outer settlement of the tell-based settlement complex at Toboliu (Bihor County, Romania). The main objectives of the survey were to gain a better understanding of the relative chronology and function of selected parts of the off-tell occupation, and to perform spatial analyses of the collected material in a GIS environment. Another important aim was to assess the degree of correlation between the distribution of surface finds and the geophysical anomalies visible on the geomagnetic plan of the site. All these aspects are discussed in the following paragraphs.

Keywords: Bronze Age; tell settlements; eastern Hungarian Plain; surface survey; spatial analysis.

Introduction

The Bronze Age site of Toboliu (Fig. 1) is a multi-component tell-based settlement complex located on the eastern edge of the Great Hungarian Plain, in present-day western Romania. Previous investigations have shown that the site consists of a central mound surrounded by an extensive outer settlement, which also dates to the Bronze Age[1]. Based on the results of an extensive surface survey conducted in 2015 over an area of 211.19 ha around the tell, the size of this outer settlement was estimated to be approximately 84 ha[2]. This estimate was later reinforced by the results of four geophysical survey campaigns carried out between 2016 and 2019 over a total area of 73.5 ha[3], which showed that subsurface structural remains were present in all locations where evidence of Bronze Age material had been recorded during the surface survey[4]. Furthermore, there was a good match between the distribution of settlement activity as shown by the 2015 surface survey and corresponding anomalies on the geophysical map of the outer settlement, which consisted of occasional burnt houses and numerous pits of varying sizes[5].

While the 2015 surface survey was instrumental in determining the horizontal extent of the outer settlement of the Toboliu tell, its resolution was rather low, as the main objective was to establish the boundaries of the site. In addition, due to time and manpower constraints, the surface material recorded during the survey was not collected, which negatively affected not only the evaluation of the temporal depth of the pottery assemblage, but also the assessment of the density of the surface finds. Therefore, in order to gain a better understanding of the chronological development and intensity of occupation at the settlement, as well as to carry out spatial analyses of the collected material in a GIS environment, we decided to conduct an intensive systematic surface survey on selected parts of the outer settlement of the tell at Toboliu. Another aim was to assess the degree of correlation between surface and subsurface remains at the site. For this reason, the surface collection was carried out on five representative grids from the area covered by the geophysical survey (Fig. 2). Attention was also paid to finds indicating craft production activities, as well as to artefacts usually considered as status symbols, since the spatial distribution of these particular finds may indicate possible differences in social, economic and functional terms between the different parts of the site.

[1] Lie *et al*. 2018; 2019.
[2] Fazecaș, Lie 2018.
[3] Kienlin 2021, 199.
[4] Găvan *et al.* 2021.
[5] Kienlin 2021, 199-202.

Fig. 1. Contemporary land use in the tell-based settlement complex at Toboliu.

Survey methodology

The intensive systematic survey was carried out between 21 and 24 March 2022 on an area of 1.2 ha. Today, the land on which the outer settlement of the Toboliu tell is located is divided into small fields belonging to different owners and is used for agricultural production (Fig. 1), with wheat, maize, and sunflower being the most common crops. Due to the intensive cultivation, only limited areas of the site were suitable for surface collection. Using the geophysical site plan as a guide, five 50 x 50 m grids were selected for intensive systematic survey. The grids were located between 260 m and 540 m to the west, north and east of the tell (Fig. 2) and were well distributed in parts of the outer settlement that were not covered by the 2021 and 2022 coring surveys undertaken at the site. Due to the presence of dense vegetation, the collection of artefacts on Grid 6 was limited to an area of 40 x 50 m. Grids 1 and 2 were located in areas where wheat was already growing, but the visibility of surface material was judged to be adequate for conducting a surface collection. The remaining grids were located on ploughed fields. In order to achieve sufficient spatial resolution and to be able to relate distinct clusters of surface finds to the geophysical anomalies, these larger grids were subdivided into smaller 5 x 5 m squares. This surface collection strategy has yielded significant results on other Bronze Age tells in the Carpathian Basin[6]. The survey of each grid square was timed to 10 minutes, with meticulous collection of surface finds by one surveyor. The survey team consisted of six archaeology students from the Universities of Cologne and Cluj-Napoca, who had some experience with the material assemblages from the site but no previous experience with surface collections. Pottery sherds, daub fragments, and small finds (consisting of stone, clay, metal, and bone or antler artefacts) found in the survey grids were all collected. Each grid square was numbered and recorded as a polygon shape file in GIS, in order to allow overlay with other data layers.

The finds from each grid were bagged and labelled. After an initial sorting (which consisted of excluding the very few sherds that were not of Bronze Age date), all the artefacts collected were then

[6] See, for example, Fischl *et al.* 2014; 2015a; Fischl, Pusztai 2018; Rassmann *et al.* 2018; Kienlin *et al.* 2019.

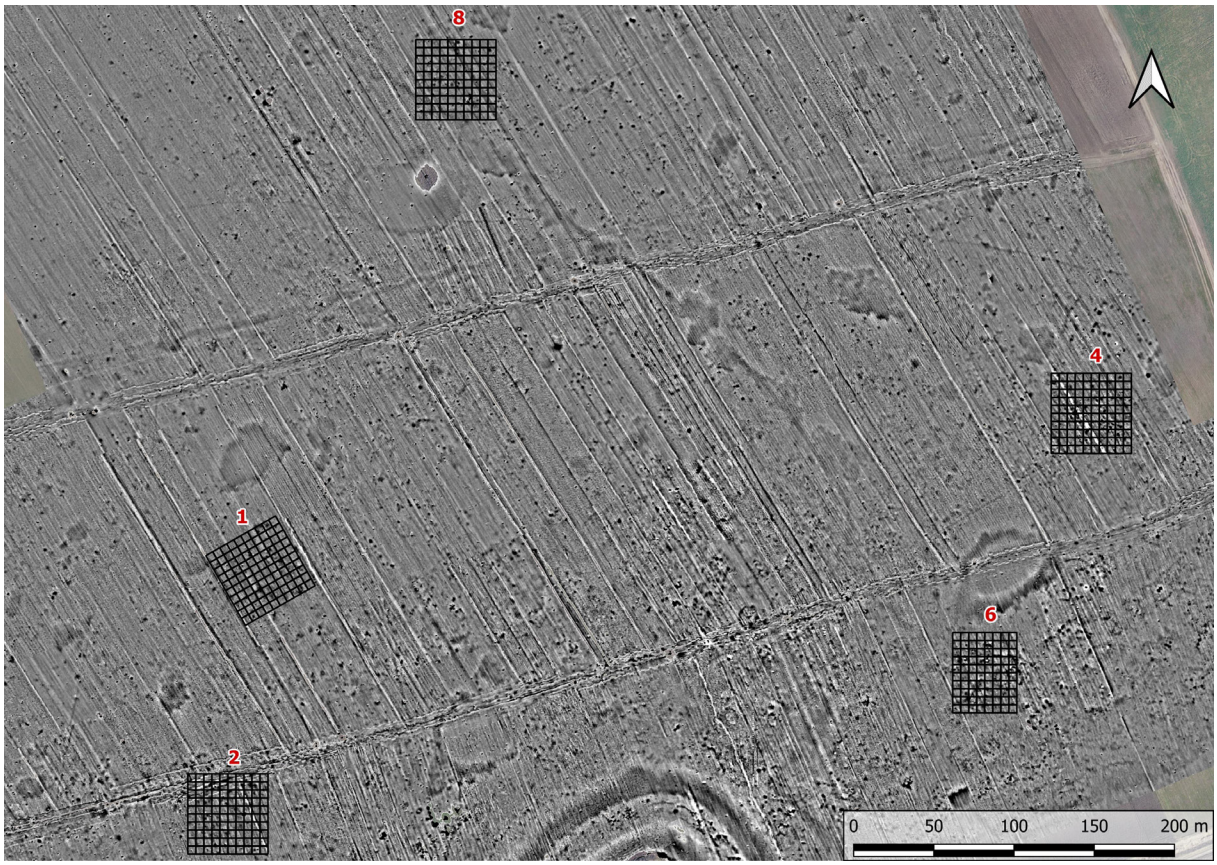

Fig. 2. Layout of the surface collection grids over the geophysical plan of the outer settlement of the Toboliu tell.

entered into a database. Each find was individually recorded by artefact category (pottery, daub, hearth, stone artefacts or small finds made of clay), and key attributes that could be observed macroscopically were also recorded; for sherds, these consisted of the part of the vessel they came from, the presence and type of decoration, and chronology; for daub, the presence of twig impressions was recorded. The collected artefacts were counted and weighed per collection unit, with pottery, daub, and small finds counted and weighed separately, in order to allow for subsequent quantitative and spatial analyses. The finds were then spatially plotted in a GIS environment, and the distribution patterns of artefact densities within each collection unit were analyzed. This was done for each major artefact category (pottery, daub, hearth fragments, and small finds – Figs. 4-5, 7-8). The density maps thus produced were overlaid on the geophysical map of the site in order to test whether there are correlations between the distribution of surface finds and geophysical anomalies. This method of visual overlay has been used in other studies discussing the relationship between the density of surface artefacts and magnetic anomalies[7]. Additional maps were also produced to show the fragmentation status of the collected pottery and daub (Figs. 9-10). The fragmentation status per collection unit was calculated by dividing the weight of the collected artefacts from a given square by the number of artefacts from the same grid. Thus, a low number indicates a greater fragmentation, while a high number represents less fragmentation. The next step was to carry out statistical analysis of the archaeological finds coming from the systematic surface collection.

Results

The 2022 surface collection at Toboliu covered a total area of 1.2 ha and yielded 20,548 artefacts weighing 119.783 kg. The distribution of surface finds was uneven across the grids, with Grid 1 yielding only 2,692 finds weighing 11.469 kg, while Grid 6, which was also smaller (see above), yielded 7,696

[7] Heron, Gaffney 1987; Music *et al.* 2000; Parkinson *et al.* 2010; De Clerq *et al.* 2013; Fischl *et al.* 2014; Fischl *et al.* 2015a; Rassmann *et al.* 2018; Kienlin *et al.* 2019; Marta *et al.* 2021.

finds weighing 51.997 kg. The assemblage is dominated by pottery sherds and daub fragments, with only a limited range of other artefact categories being present (Tab. 1).

Table 1. Artefacts from the 2022 surface collection.

Artefact category	No.	Percent
Pottery sherds	14887	72.44
Daub fragments	5527	26.90
Hearth fragments	101	0.50
Clay special finds	26	0.13
Stone artefacts	7	0.03
Totals	**20548**	**100.00**

Table 2. The pottery assemblage from the 2022 surface collection.

Sherd type	No.	Percent
Body sherd	14023	94.2
Rim	608	4.08
Handle	133	0.90
Base	123	0.82
Totals	**14887**	**100.00**

A total of 14,887 Bronze Age pottery sherds were collected during the survey, with an average sherd density (by weight) of 200 g per collection unit (25 m^2); the average pottery sherd density (by number) was 31 sherds per grid square. The pottery assemblage comprised 14,023 body sherds, 608 rim fragments, 133 handles, and 123 bases (Tab. 2). A number of 13,298 pottery sherds (amounting to 89%) are undiagnostic body sherds without any decoration, which could only be identified at a generic level as belonging to the Bronze Age on the basis of their fabric. Only 795 sherds (5.34 % of the total assemblage) were decorated using various techniques (Pl. 1-9). Of these, incised decorations are the most frequent (Fig. 3), followed by embossed or plastic decoration (Pl. 1/9-10; 2/8; 3/11; 4/5; 5/1; 8/7; 8/10; 9/13), notches, impressions, channeling (Pl. 1/8; 2/15; 3/5, 8; 4/5-6; 7/11; 9/8), stitching, broom-stroke (Pl. 4/11; 5/6; 7/3; 8/1-2), and comb-stroke decoration (Pl. 3/3, 12; 6/5; 7/14-15; 9/9). As it can be seen (Fig. 3), there is a clear preference for incised decoration, while broom stroke and comb stroke decorations are relatively rare. It is interesting to note that the sherds coming from Grids 1 and 2 were much more abraded and smaller in size than those from the other collection grids (a fact that can also be observed in their fragmentation state – see Fig. 9). On the other hand, all the sherds collected from Grid 6 were of finer quality than those from the other grids. Furthermore, while the surface sherds

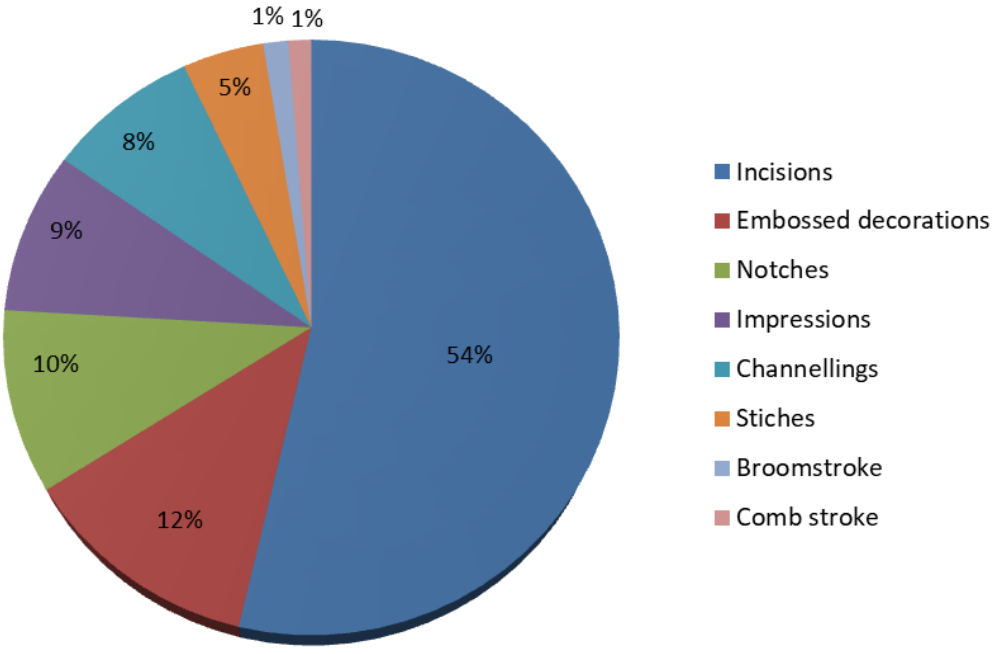

Fig. 3. Distribution of decoration techniques on the pottery from the 2022 surface collection.

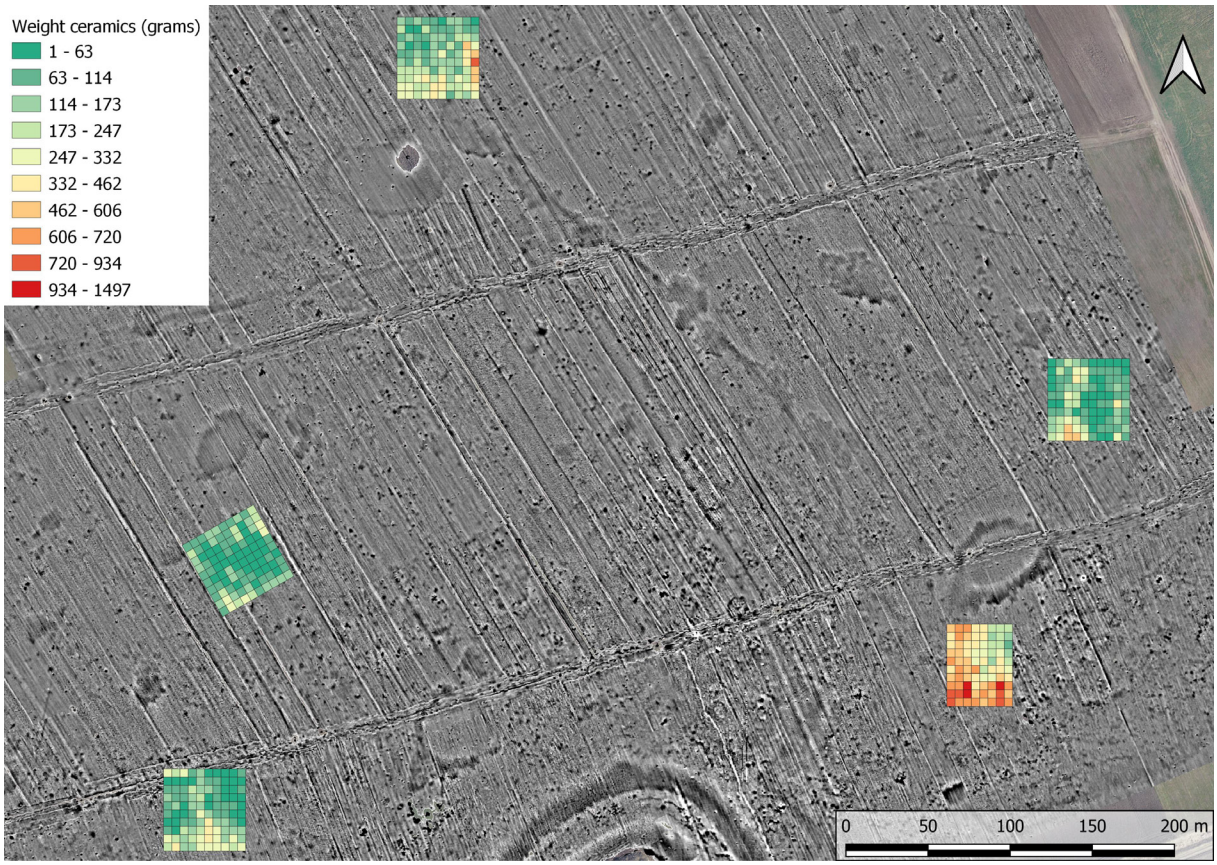

Fig. 4. Distribution of ceramic densities by weight from the 2022 surface collection overlaid on the geophysical map.

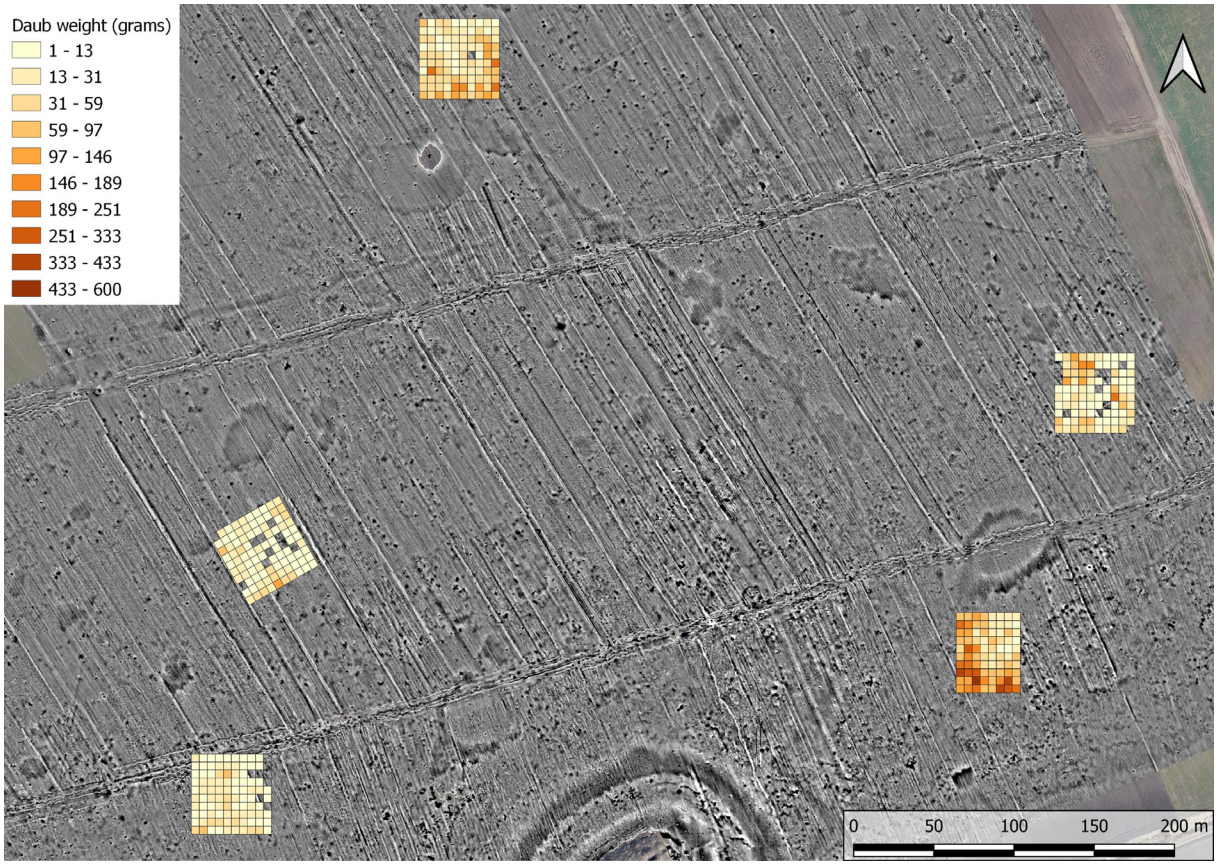

Fig. 5. Distribution of daub densities by weight from the 2022 surface collection overlaid on the geophysical map.

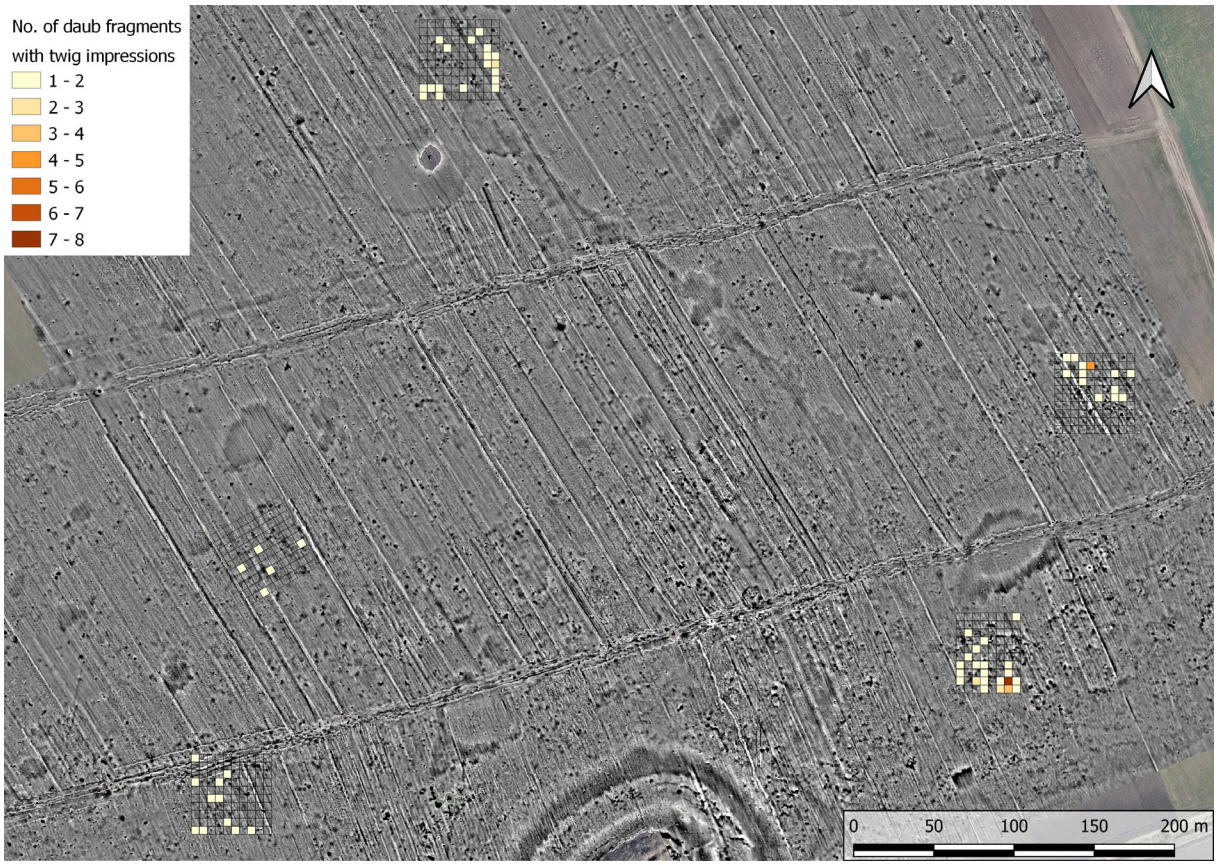

Fig. 6. Distribution of daub with twig impressions from the 2022 surface collection overlaid on the geophysical map.

coming from the other grids were tempered with grog, most of the sherds from Gird 6 were tempered with sand.

The distribution of daub fragments within the collection units mirrors that of the pottery (Figs. 4-5). A total of 5,527 daub fragments were collected from the five grids laid out on the outer settlement of the Toboliu tell, with an average of 11 daub pieces per grid square; the average daub density by weight was 40 g per collection unit (25 m^2). Of the collected daub, 103 fragments had clear twig impressions and are most likely originating from the walls of wattle-and-daub constructions. Although they were found in all the grids surveyed, indicating the presence of house structures in these areas, their highest density was in Grid 6, followed by Grid 8 (Fig. 6). The low numbers of daub with twig impressions in Grids 1 and 2 could also be explained by their much higher fragmentation (Fig. 10), as the majority of daub fragments from these grids were very small and highly abraded, making the identification of twig impressions much more difficult.

The next category of artefacts is that of hearth fragments, which include fragments of hearth plaster. They are indicative of settlement activities such as heating and food preparation. Again, the highest numbers of hearth fragments were found in Grid 6, followed by Grid 8 (Fig. 7). An interesting fact is the complete lack of hearth fragments in Grid 4, which could potentially indicate that this area was not used for residential purposes. However, it is worth noting that fragments of portable hearths were found in this location (see Fig. 8). Other small finds collected consisted of clay artefacts such as portable hearths (13), wheel models (3), miniature vessels (2), spindle whorls (2), a wagon model, a figurine fragment, and a loom weight. Stone artefacts were poorly represented in the surface assemblage (with only 7 finds) and consisted entirely of ground stone such as grinding stones and strikers. The distribution of all collected small finds made of clay and stone artefacts is shown in Fig. 8. With the exception of Grid 1, where no special artefact was found on the surface, the small finds are present in all the other grids surveyed (Figs. 8, 18). Again, it could be observed that their highest number was in Grid 6. The lack of any special finds in Grid 1 is somewhat surprising, although this could be explained by the fact that the presence of wheat in the area significantly reduced the visibility of artefacts on the surface.

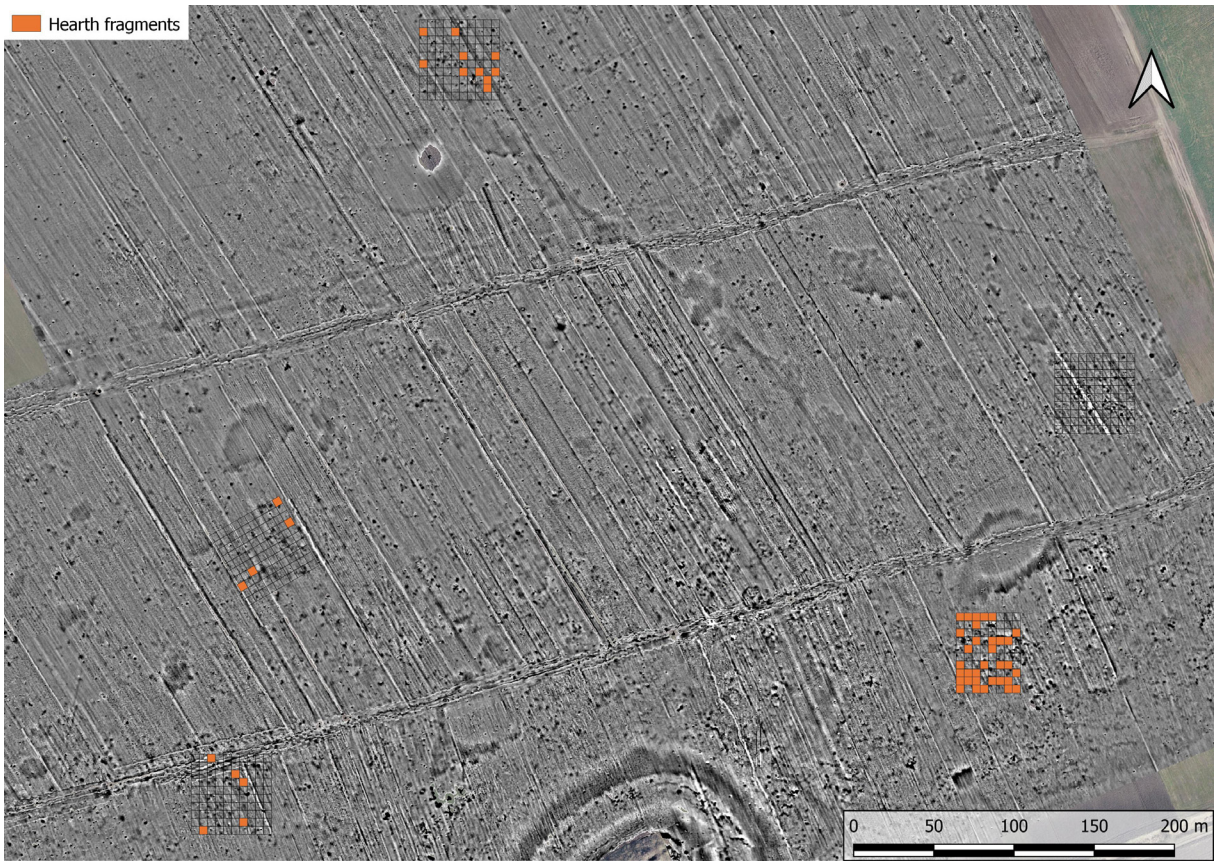

Fig. 7. Distribution of hearth fragments from the 2022 surface collection overlaid on the geophysical map.

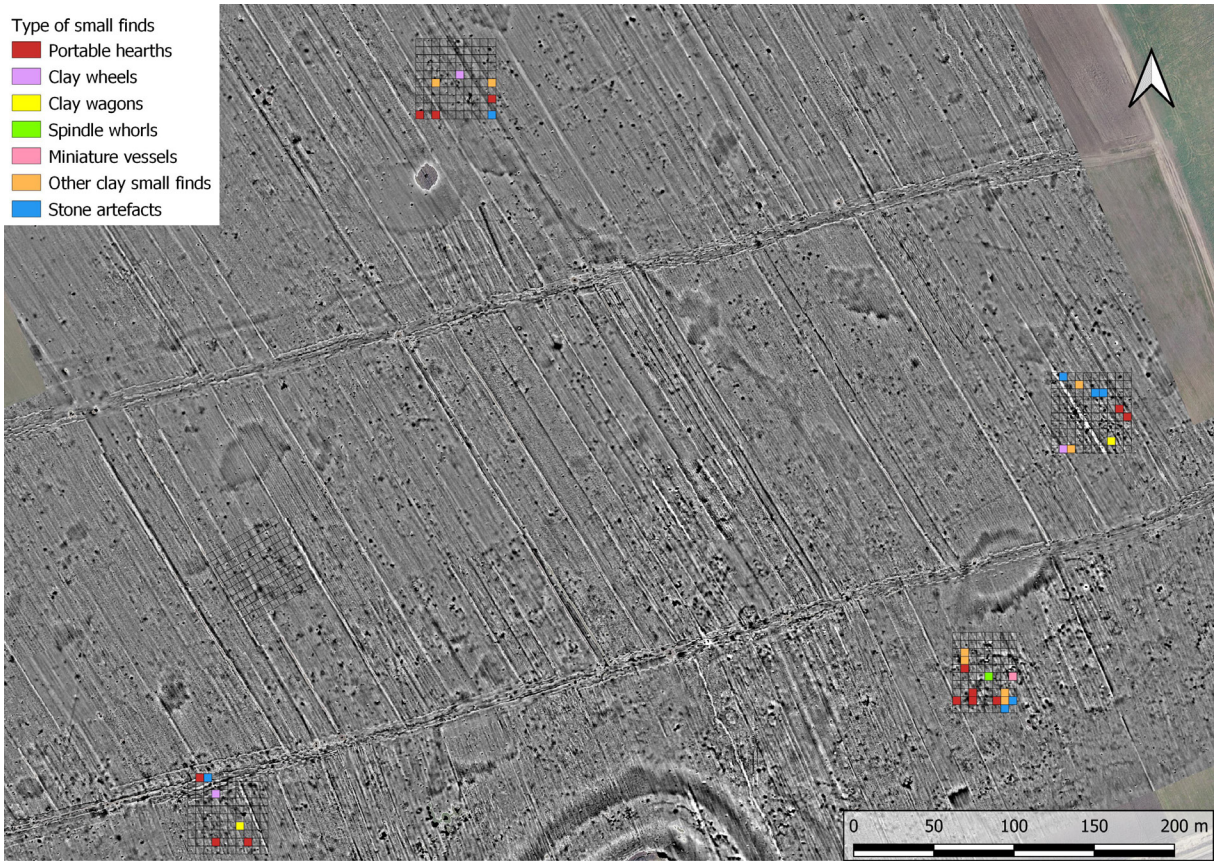

Fig. 8. Distribution of small finds (by type) from the 2022 surface collection overlaid on the geophysical map.

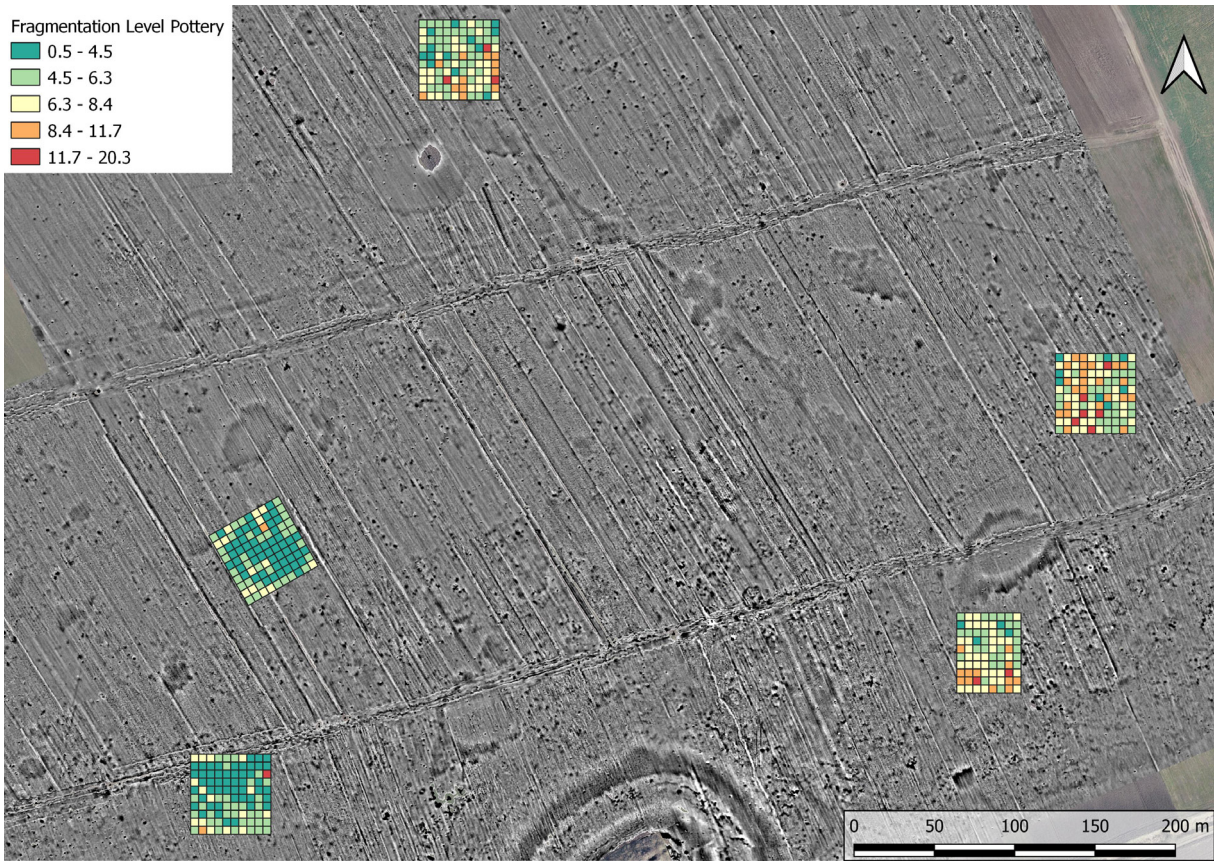

Fig. 9. Fragmentation level of the pottery sherds from the 2022 surface collection.

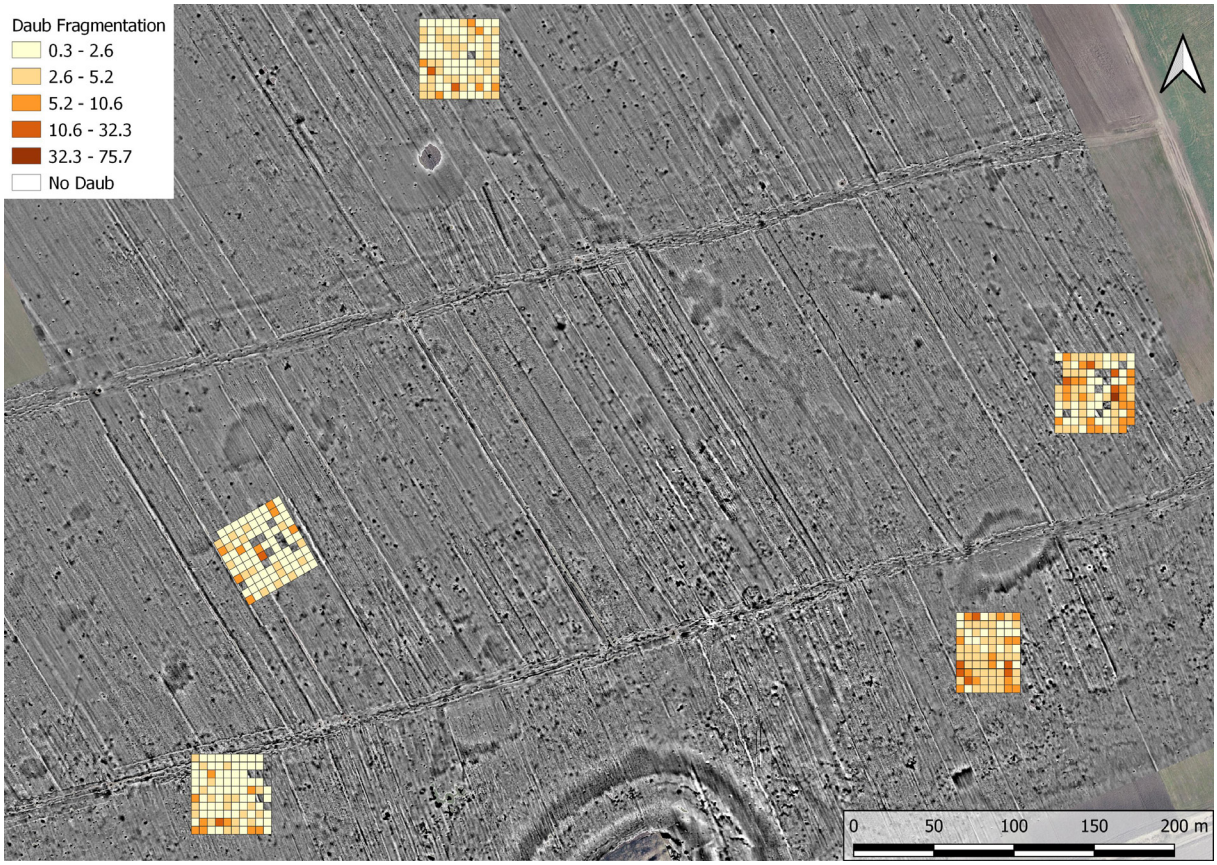

Fig. 10. Fragmentation level of the daub from the 2022 surface collection.

Discussion

Before proceeding to a more detailed analysis of the surface assemblage collected from the outer settlement of the tell at Toboliu in March 2022, it is worth pointing out from the outset that there are several factors that can influence the distribution of surface artefacts, the most important being variable surface visibility and post-depositional disturbance[8]. These factors have also influenced the overall pattern of surface scatters at Toboliu, a site that has been used for centuries for intensive agricultural production. Past and present anthropogenic disturbance is therefore relatively high. The low number of finds from Grids 1 and 2 is most likely due to the fact that they were located in areas where wheat had already grown, resulting in a lower surface visibility than in other grids. Having outlined these limitations, the distribution of surface artefacts does however reveal significant differences between the grids surveyed (Figs. 4-5, 7-8). This is also illustrated by the heatmaps of daub and pottery densities by weight (Figs. 11-12), which also show a similar distribution of these two artefact categories. Overlaying the distribution of burnt daub and pottery fragments shows that there is a very high overall correlation between the densities of these two artefact categories even at the grid level, with very few square grids where the density of daub was high and that of the pottery was low (see Figs. 13-15, 17). In Grid 6 there are no such cases at all (Fig. 16). The fact that the distribution patterns of daub and pottery were very similar in all the grids surveyed reinforces the accuracy of the survey and makes us more confident in the results obtained. The locations with high densities of pottery and daub are the most likely candidates for former houses and households in the outer settlement of the Toboliu tell, although a surface displacement of these clusters must be taken into consideration.

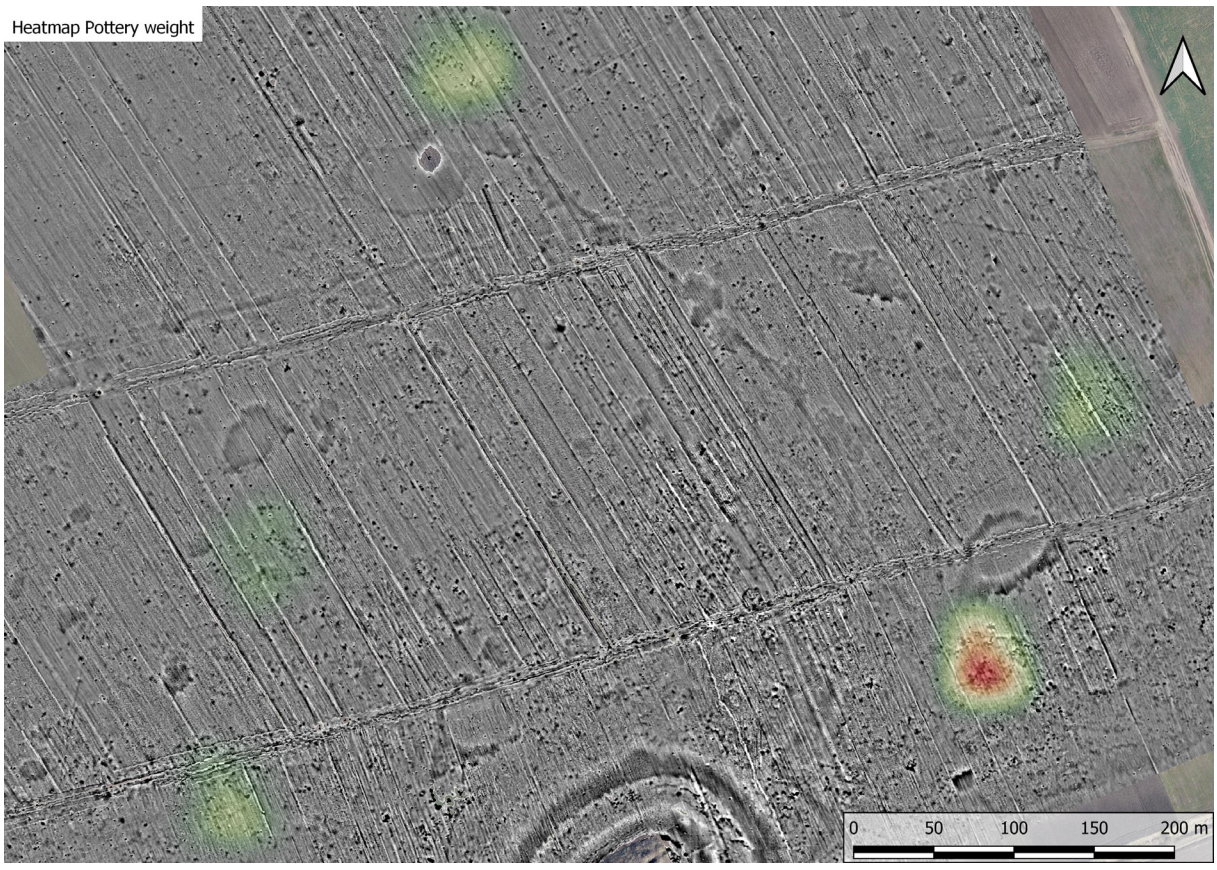

Fig. 11. Heatmap of pottery density (by weight). Color ramp: green (lowest values) to red (highest values).

By far the highest density of pottery and daub fragments was found in Grid 6 (see Figs. 4-5, 11-12), located at about 270 m ENE of the tell, which had an average sherd density of 70 ceramic fragments per collection unit (25 m^2) and an average daub density of 26 daub fragments per grid

[8] Redman 1987; Francovich, Patterson 2000; Wright 2023.

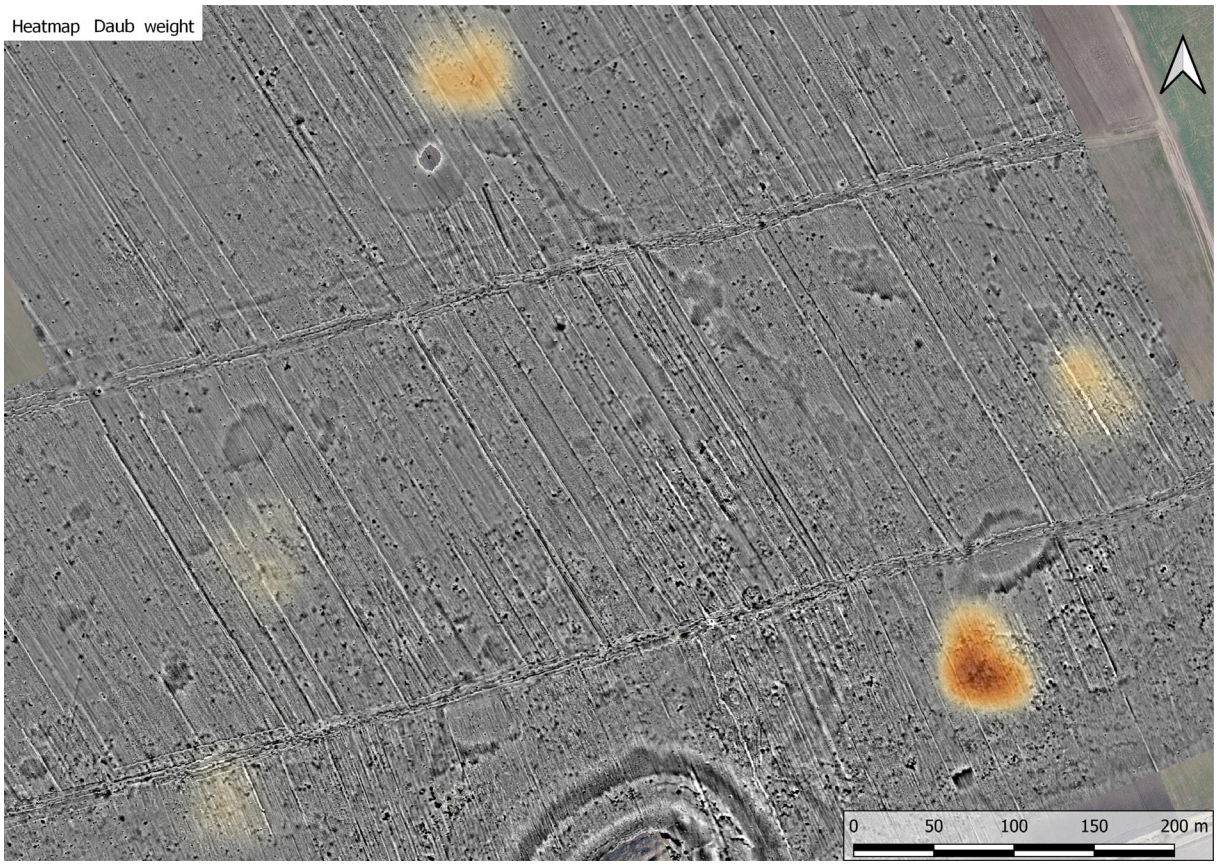

Fig. 12. Heatmap of daub density (by weight). Color ramp: light orange (lowest values) to brown (highest values).

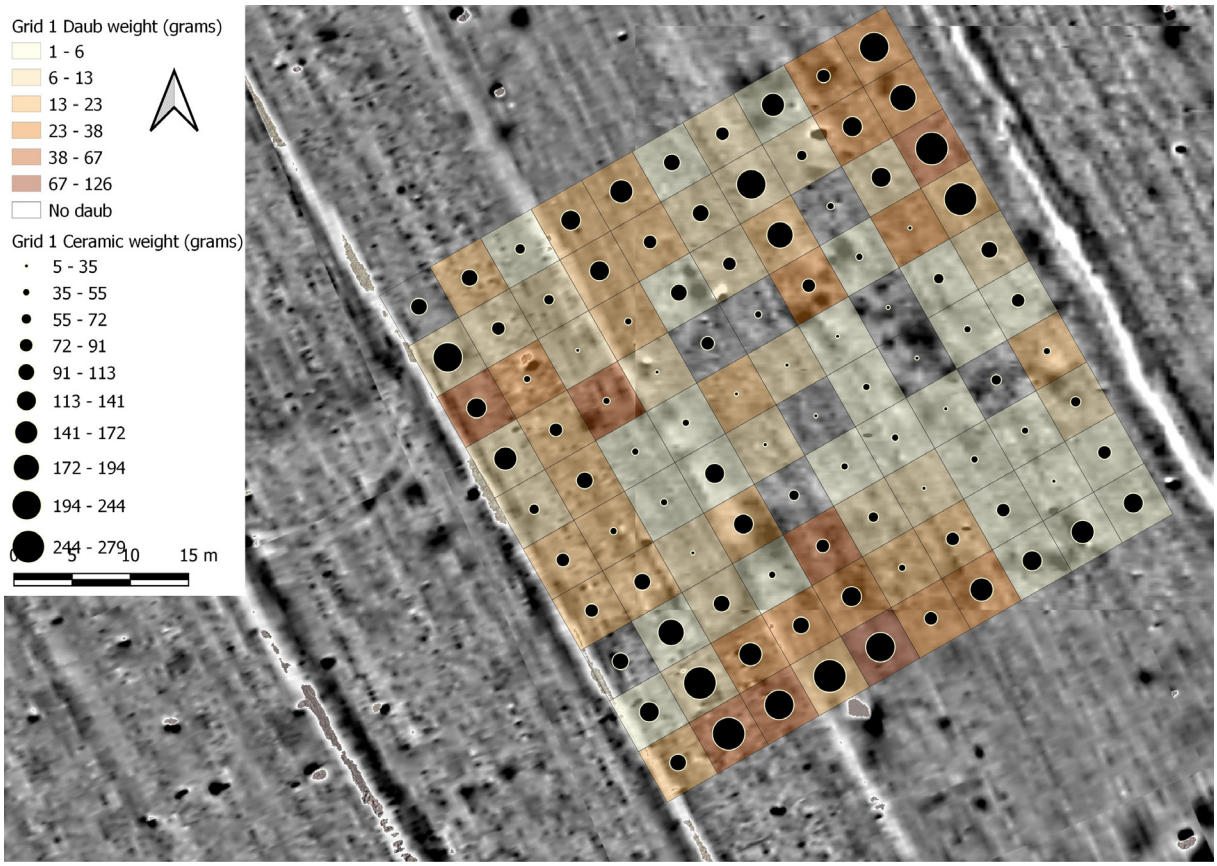

Fig. 13. Overlay of the distribution of pottery and daub densities in Grid 1.

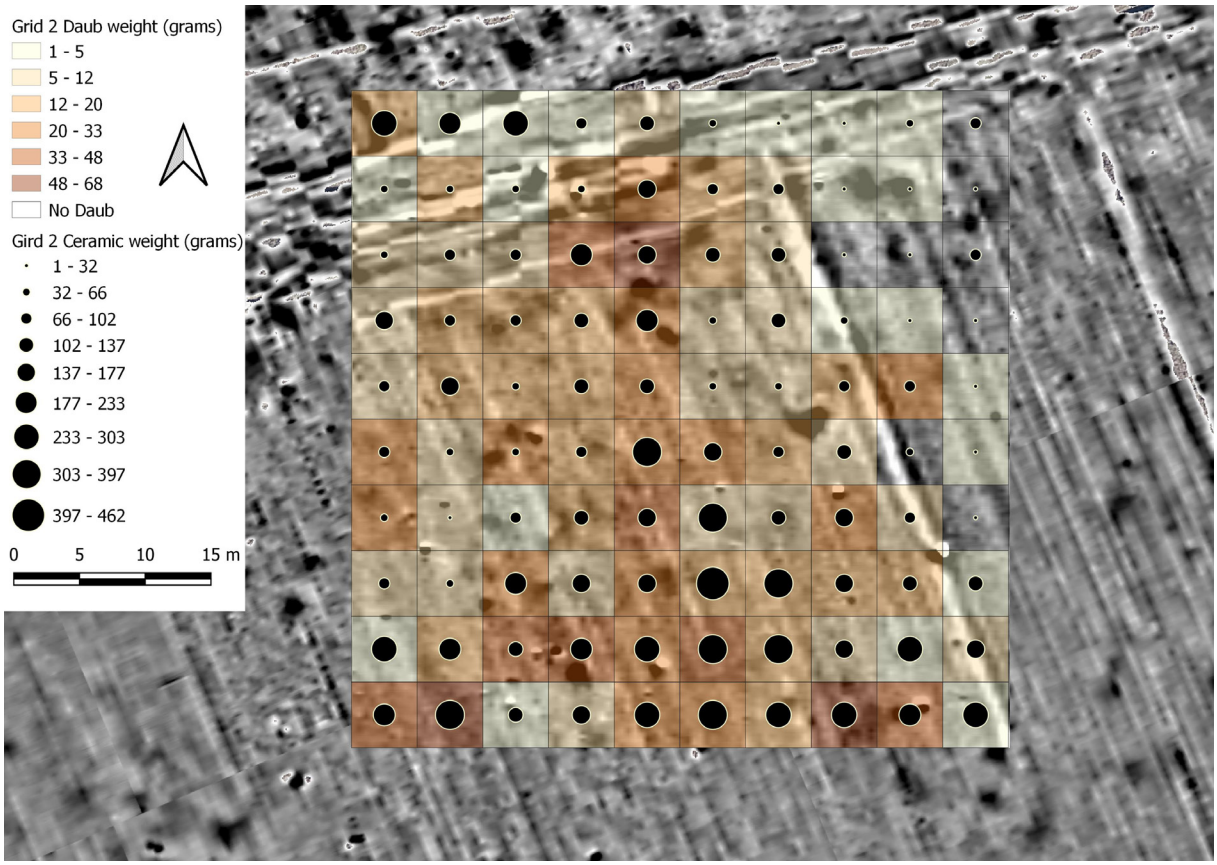

Fig. 14. Overlay of the distribution of pottery and daub densities in Grid 2.

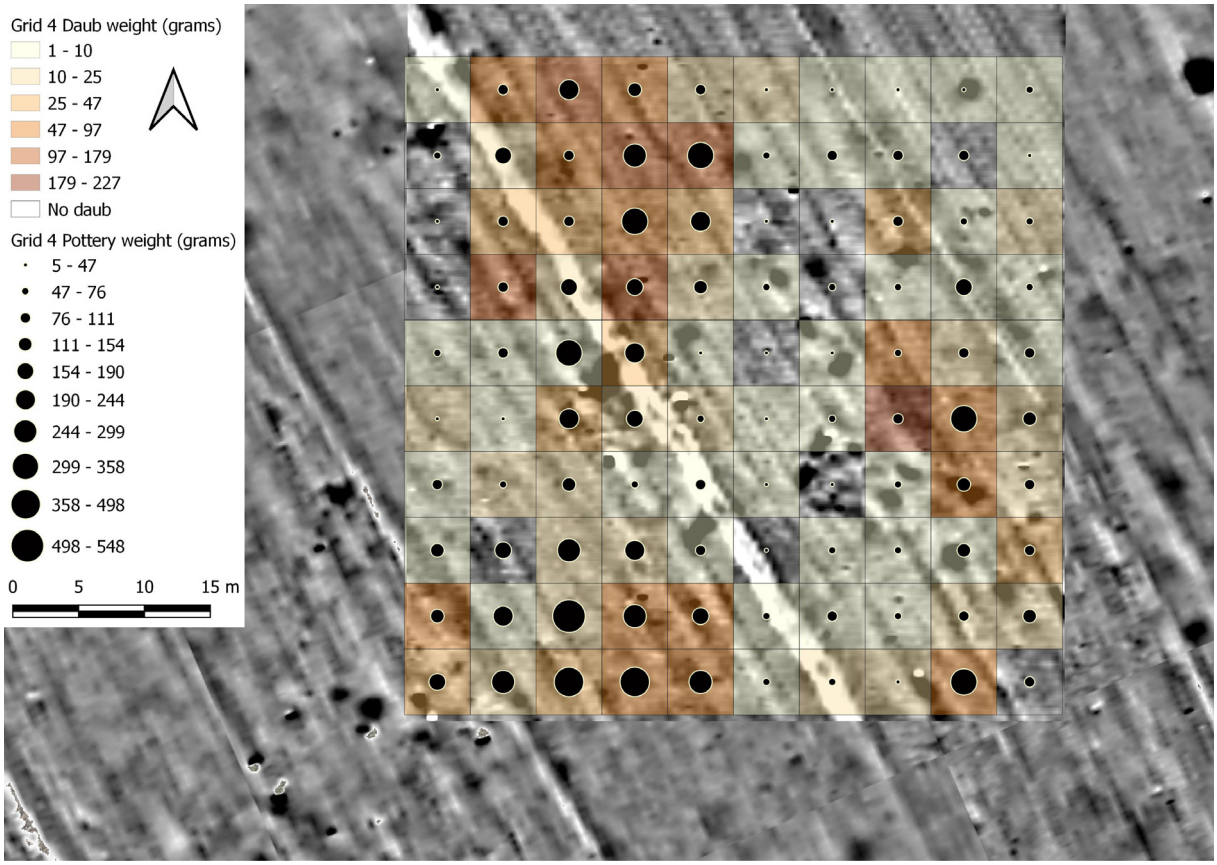

Fig. 15. Overlay of the distribution of pottery and daub densities in Grid 4.

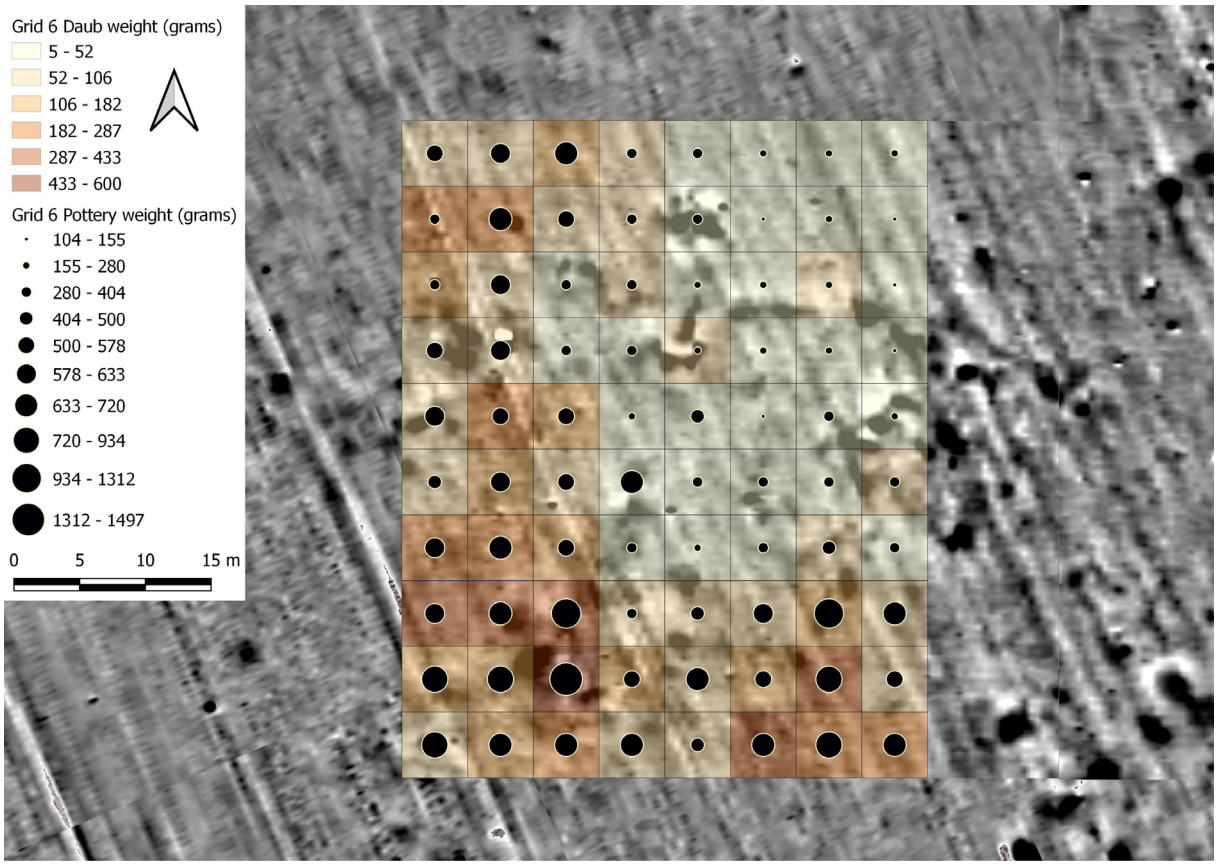

Fig. 16. Overlay of the distribution of pottery and daub densities in Grid 6.

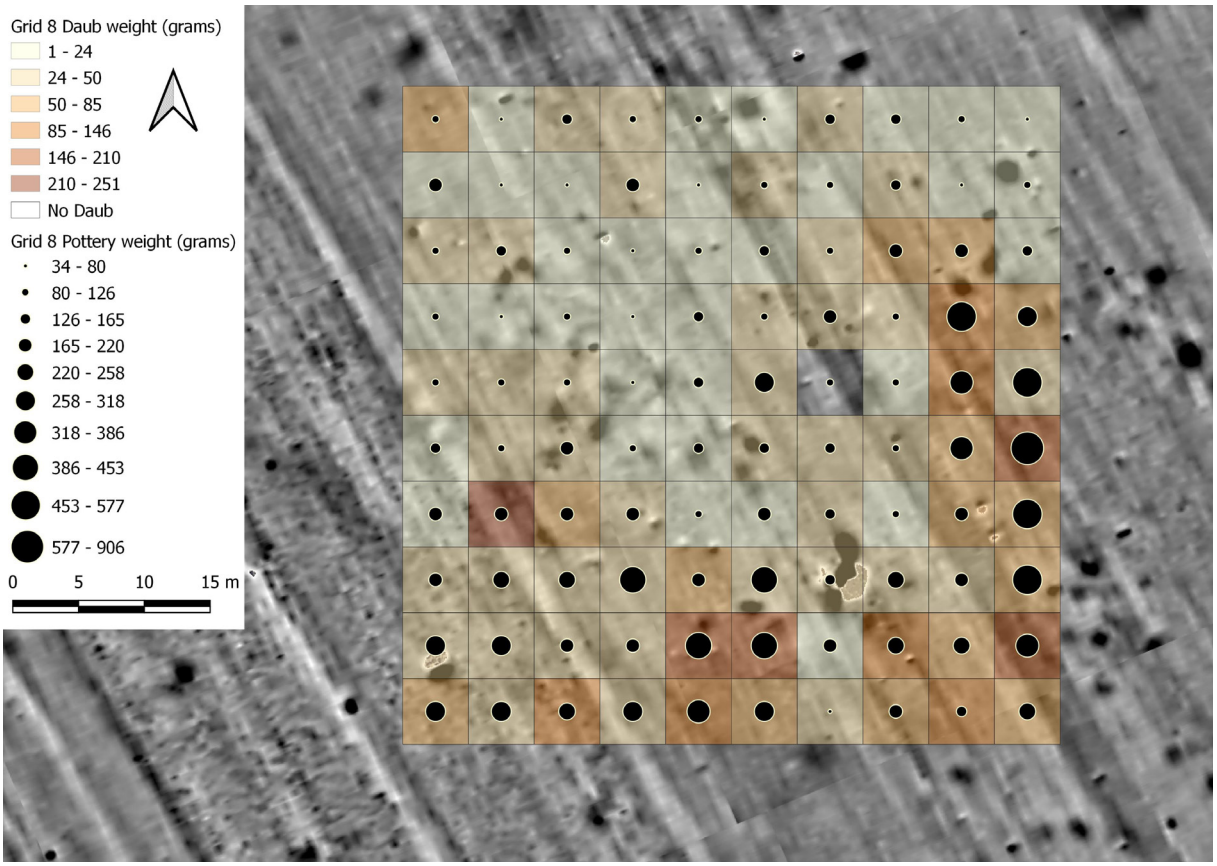

Fig. 17. Overlay of the distribution of pottery and daub densities in Grid 8.

square. Surprisingly, Grid 6 was followed by Grid 8, which was laid out 540 m to the north of the tell, suggesting that there was intensive settlement activity even at this greater distance from the settlement mound. The average pottery density here was 29 sherds per grid square, and the average daub density was 16 daub fragments per collection unit. In contrast, Grid 4, located 430 m ENE of the tell, had the lowest average pottery and daub density in terms of numbers (16 sherds and 5 daub fragments per grid square, respectively). However, due to the fact that the fragmentation of daub and ceramics was not as high in this part (see Figs. 9-10), the total weight of all collected artefacts from this grid was higher than that of the surface assemblages from Grids 1 and 2. On the other hand, if we look at the average sherd densities of Grids 1 and 2 in terms of number, they are slightly higher than those of Grid 4 (with 20 and 27 sherds per grid square, respectively). The same is true for average daub densities, with both Grids 1 and 2 having an average of 7 daub fragments per collection unit. This discrepancy in pottery and daub densities reflects the much more intense settlement activity in the area of Grid 6. This correlates well with the geophysical results, which show a higher density of geophysical anomalies where Grid 6 is located. Interestingly, the 795 decorated sherds from the surface collection at Toboliu were also not evenly distributed across the surveyed area. The highest percentage of decorated sherds (amounting to 42.8 %) was again found in Grid 6, followed by Grids 4 and 8 (with 18.7% and 18.2 % respectively). In addition, the overall quality of the surface pottery recovered from this grid was much higher than that found in the rest of the surveyed area.

In terms of the distribution of special finds, they were found in all the grids surveyed with the exception of Grid 1 (Fig. 8). The lack of these artefacts in Grid 1 could also be related to the lower surface visibility here and to the overall lower number of finds in this grid (see above). Similar "special finds" have also been unearthed within the tell itself, showing that there are not many differences between the activities carried out within the tell and those taking place in the outer settlement. Furthermore, the accidental discovery of several metal artefacts on the surface of the outer settlement[9] indicates that access to metal artefacts was not limited to the inhabitants of the settlement mound, and that

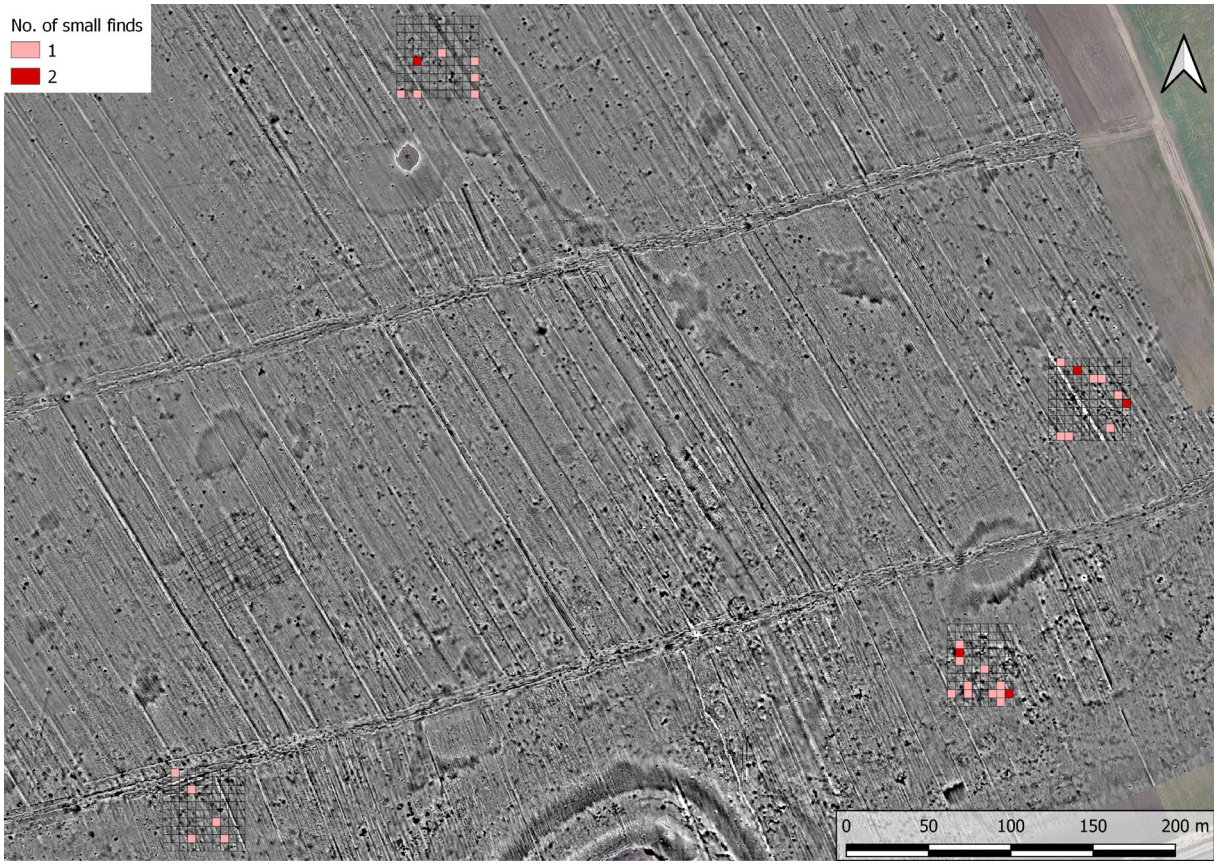

Fig. 18.Distribution of small finds (by number) from the 2022 surface collection overlaid on the geophysical map.

[9] See Găvan, Lie 2020. Another bronze artefact (a funnel-shaped pendant) was found by chance on the surface of the outer settlement during the 2021 coring survey. The 2022 metal detector survey carried out here also led to the discovery of a

households in the outer settlement were also able to acquire such artefacts. The distribution pattern of "special finds" in the outer settlement of the Toboliu tell (Figs. 8 and 18) does not indicate any distinct areas dedicated to specialized activities, nor does it suggest any major differences in social, economic and functional terms between the different parts of the site where the survey was conducted. Although there are more finds of this type in Grid 6, the differences between the surveyed grids are not that great (Fig. 18). It is also worth keeping in minds that Grid 6 yielded the highest number of finds in general. If we look at percentages, the small finds make up only 0.18% of the finds in Grid 6, while they amount to 0.51 % of the total number of surface artefacts in Grid 4.

As mentioned above, an important objective of the 2022 surface survey conducted on the outer settlement of the Toboliu tell was to determine the degree of correlation between the distribution of surface finds and the geophysical anomalies visible on the geomagnetic site plan. Surprisingly, the highest densities of finds in the surface collection units did not always correlate well with the geophysical anomalies (Figs. 13-18). While it is true that within the more densely occupied parts of the outer settlement (as indicated by the density and intensity of the geophysical anomalies) the number of surface finds increases, the highest densities of ceramic sherds and daub fragments do not always overlap with distinct house anomalies. For example, in the eastern central part of Grid 6, where geophysical anomalies are clearly visible, the number of pottery sherds and daub fragments is relatively low (Fig. 16), whereas in the SW part of the same grid there is a concentration of ceramic and daub fragments that overlaps with the SW corner of a house anomaly. However, this concentration does not cover the entire area of the house as seen in the geophysics. On the other hand, there are areas of high density of pottery and daub fragments within the grid, particularly in its SE part, which do not overlap with any house anomalies. The same is true for Grid 8, where the highest concentrations of surface artefacts occur mostly outside the area interpreted as a house anomaly in the geomagnetic data (Fig. 17). In Grid 1, the part covered by the presumed house anomaly is conspicuous by the absence of daub fragments and only a limited number of pottery sherds (Fig. 13). A similar situation is found in Grid 4, where there are few ceramic and daub fragments in the area occupied by a presumed house anomaly in the SE part of the grid (Fig. 15). Slightly more artefacts were found over the other anomaly located in the western central part of Grid 4. A better overlap between surface scatters and geophysical anomalies can be found in Grid 2 (Fig. 14).

The relatively weak correlation between the highest densities of surface finds in the collection units and the underlying geophysical anomalies has also been noted at other Copper and Bronze Age sites in the Carpathian Basin, such as Vráble-Fidvár[10], Emőd-Nagyhalom[11], Căuaș-Sighetiu[12], and Körösladány-Bikeri[13]. Several explanations have been offered for this, the most common being the displacement and relocation of surface finds and their concentration as a result of post-depositional processes such as intensive ploughing and agricultural production, as well as later human activities at the site. Other reasons given were the possible presence of unburnt houses and structures in the areas of high surface artefact densities that do not show up in the geomagnetic survey, or the decay of the surface assemblages as a result of frost and weathering. All of these explanations might apply to our situation, especially considering that past and present anthropogenic disturbance at the site is relatively high. It is therefore likely that most of the artefacts have been moved around on the surface as a result of decades of intensive ploughing and agricultural activities. This account is also supported by the distribution of daub fragments with twig impressions coming from wattle and daub structures, which in almost all cases are not located directly above the house anomalies (Fig. 6). However, although intensive agriculture may affect the distribution of surface materials, it has been emphasized that these artefacts are not commonly moved over large distances by agricultural processes[14].

With regard to the chronological development of the various parts of the outer settlement at Toboliu that were investigated by surface survey, this can only be reconstructed in broad strokes, as the

miniature disc-butted axe and a nail-shaped chisel. Furthermore, the 2021, 2022 and 2023 excavation campaigns on the outer settlement led to the discovery of several metal artefacts.

10 Rassman *et al.* 2018, 226.

11 Kienlin *et al.* 2019, 214.

12 Marta *et al.* 2021, 362, 367.

13 Yerkes *et al.* 2022, 61.

14 Wright 2023, 974.

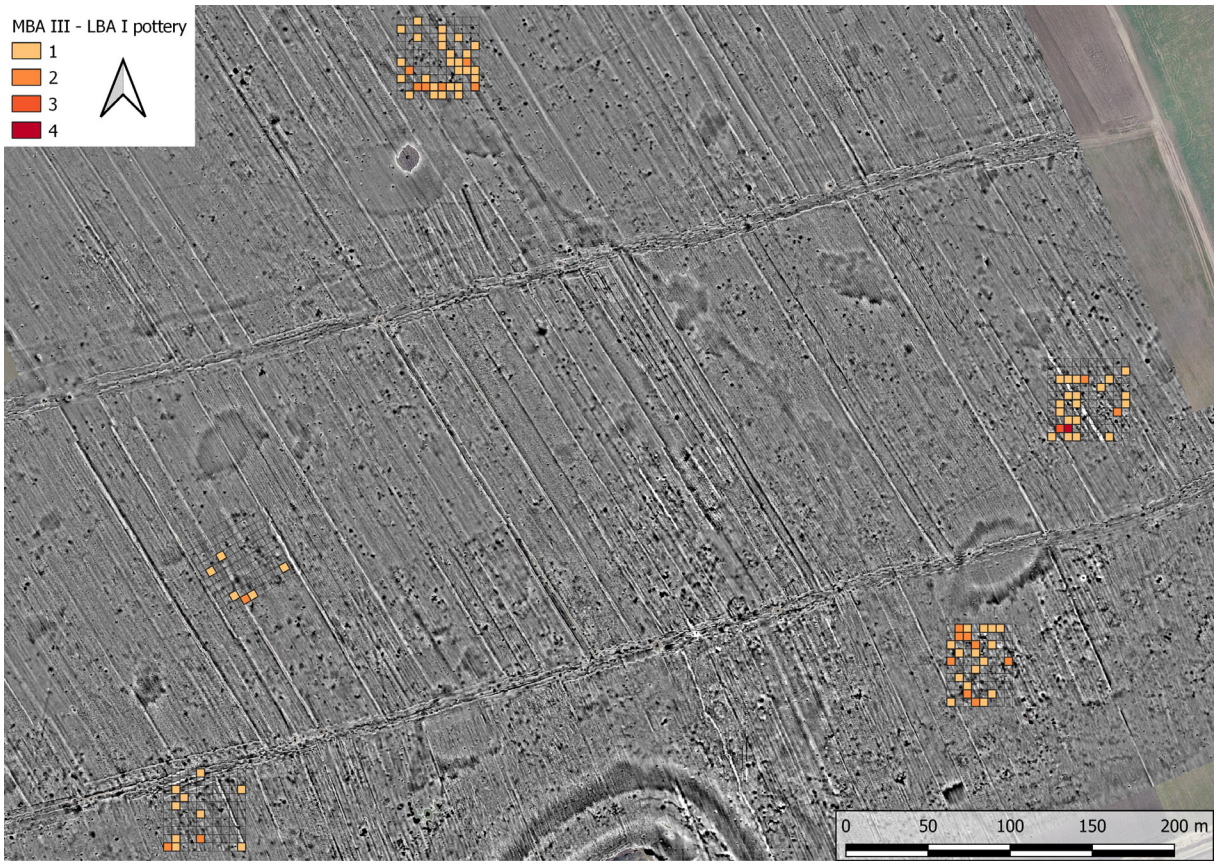

Fig. 19. Distribution of late MBA – early LBA pottery sherds within the survey grids.

surface pottery assemblage is limited in its ability to provide a fine-scale chronological definition. The diagnostic pottery sherds (Pl. 1-9) indicate an occupation of the surveyed areas throughout the Middle Bronze Age (MBA) and perhaps even into the beginning of the Late Bronze Age (LBA) according to the chronological system used in the region[15]. Although broom-stroke decoration was initially thought to be characteristic only of the first phase of the Otomani pottery style (early MBA)[16], the presence of pottery decorated with this technique throughout the entire MBA sequence of the Toboliu tell is a strong indication that this is not the case. It is interesting to note, however, that broom-stroke decoration is much more common on the tell than in the outer settlement of Toboliu, where only a few sherds decorated with this technique were found (see Fig. 3). The situation is similar for the comb-stroke decoration, which is also found on the Toboliu tell from the earliest phases (6-7) to the later ones (2-3). It is therefore not possible to attribute with certainty any of the surface sherds collected from the outer settlement of the Toboliu tell to the earlier part of the MBA, although this possibility cannot be excluded either. 117 pottery sherds (representing 7.26 % of the diagnostic pottery sherds) could be associated with the end of the MBA and/or the beginning of the LBA (Fig. 19) on the basis of their decoration techniques (channelings, elongated knobs, etc.). It is difficult to distinguish these two phases on the basis of surface pottery assemblages alone, as certain stylistic elements are common to both periods. Furthermore, it has been posited that channelings can also be found earlier in the MBA, such as in the cemetery at Turia, where channeled pottery has been associated with an early Wietenberg phase[17]. This is important because in the surface assemblage from the outer settlement at Toboliu there are many pottery sherds bearing typical Wietenberg-style decoration (Fig. 20). Most of these can be attributed to the classical Wietenberg phase[18] on the basis of their decoration (such as simultaneous stiches and triangular impressions: pl. 1/6; 2/2-4, 12, 14; 4/7, 10; 5/4,11; 6/12; 9/2),

[15] See Fischl *et al*. 2015b; Gogâltan 2015; Gogâltan 2019; Kiss *et al*. 2019.

[16] As defined by I. Ordentlich on the basis of the pottery assemblages from Otomani and Sălacea (Ordentlich 1973, 36-40, 177-180.)

[17] See Bălan *et al*. 2016.

[18] As defined by Bălan *et al*. 2016.

although wide successive stitches created within a channel (pl. 2/6; 4/1; 7/16; 8/6; 9/12), usually considered to be specific to a later phase[19], are also present. However, some words of caution are in order regarding the dating of surface sherds based on decoration alone, especially since certain motifs and decoration styles appear in different phases. This observation has been stressed repeatedly in several papers dealing with Bronze Age pottery in the Carpathian Basin[20]. Since only the relative frequency of certain motifs and decoration styles within the pottery assemblages associated with each period differs, the assignment of surface sherds to a particular phase on the basis of these attributes alone is not possible.

Concluding remarks

The survey data collected from the outer settlement of the tell at Toboliu in March 2022 has provided new insights into the intensity and timeframe of settlement activities at the site, with clear differences in the number and frequency of finds between the five grids surveyed. The largest quantity of surface material comes from Gird 6, located 270 m ENE of the center of the tell. The diagnostic sherds recovered from this grid suggest a longer period of occupation in this part of the site, spanning several generations, with both earlier (broom-stroke) and later (channelings and elongated knobs) decoration present. Furthermore, the very large number of hearth fragments in this area (making up to 74 % of the total assemblage of hearth fragments collected from the site in 2022) also indicates more intensive domestic activities such as heating, baking and food preparation. Surprisingly, a significant amount of surface finds were also collected from Grid 8, located approximately 540 m N of the center of the tell, demonstrating that there was also intensive settlement activity further away from the settlement mound[21]. Although the other grids yielded less surface material, they still produced a variety of finds attesting to a wide range of settlement and domestic activities in

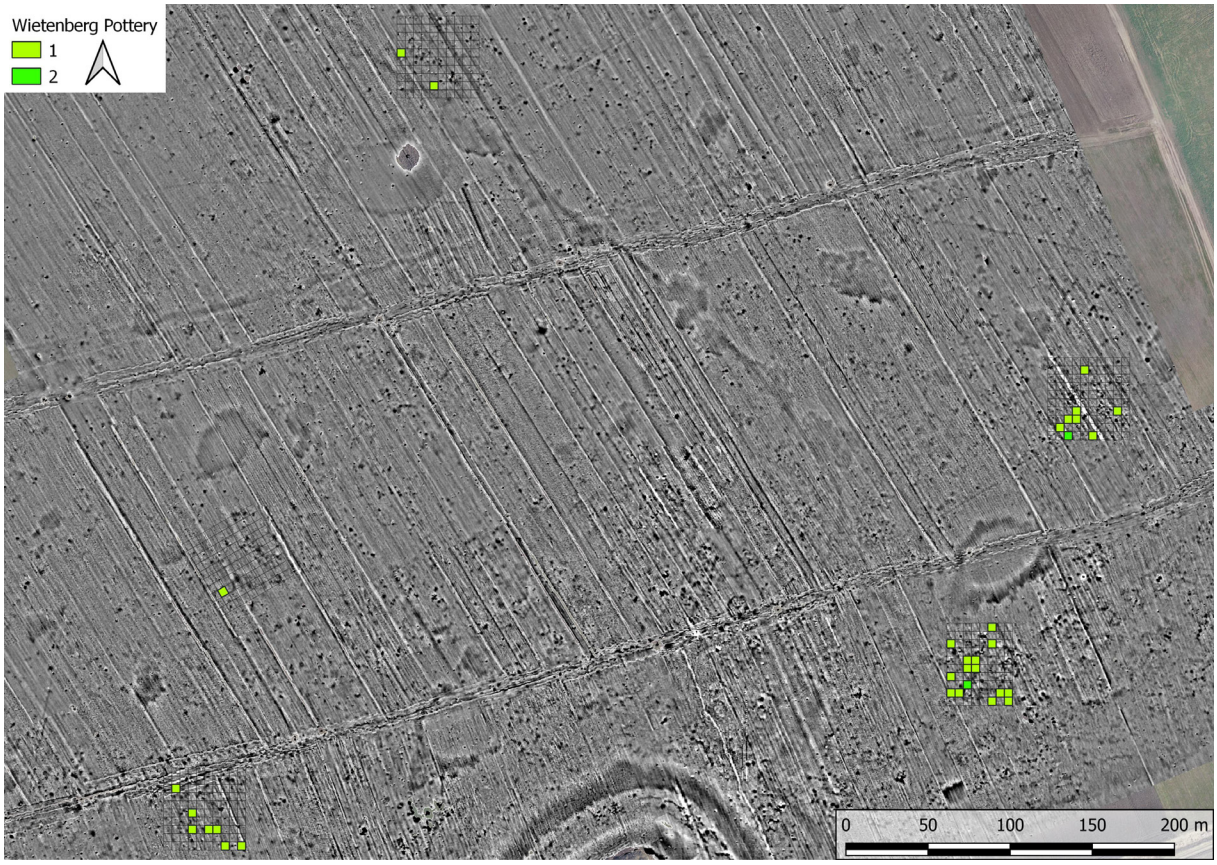

Fig. 20. Distribution of pottery sherds bearing Wietenberg-style decoration within the survey grids.

[19] Boroffka 1994; Bălan *et al*. 2016.
[20] See, for example, Duffy *et al*. 2019; Quinn *et al*. 2020; Sava 2020.
[21] As also suggested after the 2019 excavation conducted at a distance of 630 m N of the mound (Găvan *et al*. 2020).

different parts of the outer settlement of the tell-based settlement complex at Toboliu. In terms of the relationship between surface assemblages and subsurface anomalies, the distribution of surface material at Toboliu did not always provide a direct correlation with geophysical anomalies. Although at the site level the density of surface artefacts does indeed reflect the density of subsurface features as indicated by the geomagnetic map, within individual grids there wasn't always a strong correlation between the highest density of finds and individual geophysical anomalies. Regarding the lifespan of the outer settlement and its chronological relation to the tell, the surface survey results indicate that it was occupied during the local MBA (corresponding to the occupation of the tell) and most likely also during the first part of the local LBA.

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REFERENCES

Bălan *et al*. 2016 — G. Bălan, C.P. Quinn, G. Hodgins, *The Wietenberg culture: periodization and chronology*. Dacia N.S. 60, 2016, 67–92.

Boroffka 1994 — N. Boroffka, *Die Wietenberg-Kultur. Ein Beitrag zur Erforschung der Bronzezeit in Südosteuropa*. Bonn: Habelt 1994.

De Clercq *et al*. 2013 — W. De Clercq, J. De Smedt, J De Reu, *Unravelling a complex of enclosures. An integrated prospection approach for a deserted historic farmcomplex at Kleit, Maldgemem (Flanders, Belgium)*. In: W. Neubauer, I. Trinks, R. Salisbury, C. Einwögerer (eds), Archaeological Prospection. Proceedings of the 10th International Conference. Ludwig Boltzmann Institue for Archaeological Prospection and Virtual Archaeology.Vienna 2013, 123–125.

Duffy *et al*. 2019 — P. Duffy, G. Parditka, J. Giblin, L. Paja, *The problem with tells: Lessons learned from absolute dating of Bronze Age mortuary ceramics in Hungary*. Antiquity 367, 2019, 63–79.

Fazecaș, Lie 2018 — G. Fazecaș, M. Lie, *Determinarea suprafeței sitului arheologic de epoca bronzului de la Toboliu Dâmbu Zănăcanului*. Crisia 47, 2018, 29–38.

Fischl *et al*. 2014 — K. P. Fischl, T. L. Kienlin, T. Pusztai, H. Brückner, S. Klumpp, B. Tugya, G. Lengyel, *Tard- Tatárdomb: An Update on the Intensive Survey Work on the Multi-Layer Hatvan and Füzesabony Period Settlement*. In: T. L. Kienlin, P. Valde-Nowak, M. Korczyńska, K. Cappenberg, J. Ociepka (eds.), Settlement, Communication and Exchange around the Western Carpathians. International Workshop Held at the Institute of Archaeology, Jagiellonian University, Kraków October 27–28, 2012. Oxford 2014, 341–379.

Fischl *et al*. 2015a — K. P. Fischl, T. L. Kienlin, B. Tugya, *Bronze Age Settlement Research in North-Eastern Hungary*. ArcheometriaiMühely 12, 2015, 117–134.

Fischl *et al*. 2015b — K.Fischl, V. Kiss, G. Kulcsár, V. Szeverényi, *Old and new narratives for Hungary around 2200 BC*. In: H. Meller, H. W. Arz, R. Jung, R. Risch (eds.), 2200 BC – Ein Klimasturzals Ursache für den Zerfall der alten Welt? 2200 BC - A climatic breakdown as a cause for the collapse of the old world?7. Mitteldeutscher Archäologentag vom 23.bis 26. Oktober 2014 in Halle (Saale). 7th Archaeological Conference of Central Germany October 23-26, 2014 in Halle (Saale). Halle 2015, 503–523.

Fischl, Pusztai 2018 — K. P. Fischl, T. Pusztai, *II. Aerial Photography and Surface Survey*. In: T. L. Kienlin, K. P. Fischl, T. Pusztai, Borsod Region Bronze Age Settlement (BORBAS). Catalogue of the Early to Middle Bronze Age Tell Sites Covered by Magnetometry and Surface Survey. Universitäts forschungen zur prähistorischen Archäologie 317. Bonn 2018, 93–145.

Francovich, Patterson 2000 — R. Francovich, H. Patterson, *Extracting Meaning from Ploughsoil Assemblages*. The Archaeology of Mediterranean Landscapes 5. Oxford 2000.

Găvan, Lie 2020 — A. Găvan, M.A. Lie, *A casting mould uncovered in the Bronze Age tell settlement from Toboliu. Notes on the origin and distribution of socketed chisels*. Ziridava. Studia Archaeologica 34, 2020, 157–168.

Găvan *et al*. 2020 — A. Găvan, M. A. Lie, T. L. Kienlin, *Preliminary Report on the 2019 Excavation Undertaken on the Outer Settlement of the Tell from Toboliu (Bihor County)*. Crisia 50, 2020, 59–74.

Găvan *et al*. 2021 — A. Găvan, T. L. Kienlin, A. Röpke, N. Nolde, T. Zerl, M. Zickel, M. A. Lie, G. Fazecaș, F. Gogâltan, *Living together or apart? Unravelling the development, internal organization and social structure of a complex Bronze Age tell settlement at Toboliu, western Romania*. Crisia 51, 2021, 59–76.

Gogâltan 2015 — F. Gogâltan, *The Early and Middle Bronze Age chronology on the eastern frontier of the Carpathian Basin.Revisited after 15 years*. In: R.E. Németh, B. Rezi (eds), Bronze Age Chronology in the Carpathian Basin. Proceedings of the International Colloquium from Târgu Mureș 2–4 October 2014.Târgu Mureș 2015, 53–95.

Gogâltan 2019 — F. Gogâltan, *The Chronology of the Bronze Age Tell and Tell-like Settlements in the Carpathian Basin. Revisited after 15 Years*. Studia Hercynia XXIII/2, 2019, 198–214.

Heron, Gaffney 1987 — C. P. Heron, C. F. Gaffney, *Archaeogeophysics and the site: Ohm Sweet Ohm?* In: V. L. Gaffney, C. F. Gaffney (eds), Pragmatic Archaeology: Theory in Crisis? BAR British Series 167. Oxford 1987, 71–81.

Kienlin 2021 — T. L. Kienlin, *Diversity rather than Uniformity: Bronze Age Tell Settlement in North-Western Romania. Part II: Catalogue of Sites Covered by Magnetometry in Bihor and Satu Mare Counties*. In: T. L. Kienlin, A. Găvan (eds), Bronze Age Tell Settlements in North-Western Romania. Current Approaches and Recent Investigations. Universitäts forschungen zur prähistorischen Archäologie 364. Bonn 2021, 79–216.

Kienlin et al. 2019 — T. L. Kienlin, M. A. Lie, K. P. Fischl, Emőd-Nagyhalom. A Non-Invasive Approach to the Multi-phase Enclosure and Outer Settlement of a Bronze Age Tell Site in North-eastern Hungary. In: K. P. Fischl, T. L. Kienlin (eds), Beyond Divides – The Otomani-Füzesabony Phenomenon. Current Approaches to Settlement and Burial in the Northeastern Carpathian Basin and Adjacent Areas. Universitätsforschungen zur prähistorischen Archäologie 345. Bonn 2019, 195–229.

Kiss *et al*. 2019 — V. Kiss, M. Csányi, J. Dani, K. P. Fischl, G. Kulcsár, I. Szathmári, *Chronology of the Early and Middle Bronze Age in Hungary.New results*. Studia Hercynia XXIII/2, 2019, 173-197.

Lie *et al*. 2018 — M. Lie, C. Cordoș, A. Găvan, G. Fazecaș, T. L.. Kienlin, F. Gogâltan, *An overview of the Bronze Age tell-settlement in Toboliu (Bihor County, Romania)*. Gesta 17, 2018, 63–76.

Lie *at al*. 2019 — M. Lie, A. Găvan, C. Cordoș, T. L. Kienlin, G. Fazecaș, F. Gogâltan, *The Bronze Age tell settlement at Toboliu (Bihor County, Romania). A brief outline of recent investigations*. In: K.P. Fischl, T. L. Kienlin (eds), Beyond Divides – The Otomani-Füzesabony Phenomenon. Current Approaches to Settlement and Burial in the North-Eastern Carpathian Basin and Adjacent Areas. Bonn: Habelt 2019, 351–368.

Marta *et al*. 2021 — L. Marta, T. Kienlin, E. Rung, *Late Bronze Age Settlement in the Ier Valley: The Large Fortified Site of Căuaș-Sighetiu in Context*. In: T. L. Kienlin, A. Găvan (eds), Bronze Age Tell Settlements in North-Western Romania. Current Approaches and Recent Investigations. Universitäts forschungen zur prähistorischen Archäologie 364. Bonn 2021, 339–380.

Music *et al*. 2000 — B. Music, B. Slapsak, V. Perko, *On-site distributions and geophysics: The site of Rodik-Ajdovscina*. In: R. Francovich, H. Patterson (eds), Extracting Meaning from Plough soil Assemblages. Oxford 2000, 132–146.

Ordentlich 1973 — I. Ordentlich, *Cercetările de la Otomani și Sălacea și locul lor în contextual culturii Otomani*. Unpublished PhD Thesis, Iași 1973.

Parkinson *et al*. 2010 — W. Parkinson, R. Yerkes, A. Gyucha, A. Sarris, M. Morris, R. Salisbury, *Early Copper Age settlements in the Körös Region of the Great Hungarian Plain*. Journal of Field Archaeology 35, 2010, 164–183.

Quinn *et al*. 2020 — C. Quinn, H. Ciugudean, G. Bălan, G. Hodgins, *Rethinking time, culture and socioeconomic organisation in Bronze Age Transylvania*. Antiquity 94, 2020, 44–61.

Redman 1987 — C. Redman, *Surface collection, sampling and research design: a retrospective*. American Antiquity 52, 1987, 249-265.

Rassmann *et al*. 2018 — K. Rassmann, J. Bátora, N. Müller-Scheeßel, S. Reiter, M. Ivanova, A. Behrens, K. Radloff, M. Bača, *Tracing taphonomic processes. Multiple layer analysis of ceramic distribution from surface collection and excavation at the Early Bronze Age settlement of Vráble-Fidvár*. Slovenská Archeológia 66/2, 2018, 219–234.

Sava 2020 — V. Sava, *The Late Bronze Age Pottery in the South-Eastern Carpathian Basin*. Slovenská Archeológia 68, 2020, 253–296.

Wright 2023 — J. Wright, *Approaches to Archaeological Surface Survey*. In: A. M. Pollard, R. A. Armitage, C. A. Makarewicz (eds.), Handbook of Archaeological Sciences, Second Edition (ETSU Faculty Works 2023) 969–983.

Yerkes *et al*. 2022 — R. Yerkes, W. Parkinson, A. Gyucha, *Archaeological Surface Collections*. In: W. Parkinson, A. Gyucha, R. Yerkes (eds), Bikeri: Two Copper Age Villages on the Great Hungarian Plain. Monumenta Archaeologica 46. Los Angeles 2021, 55–64.

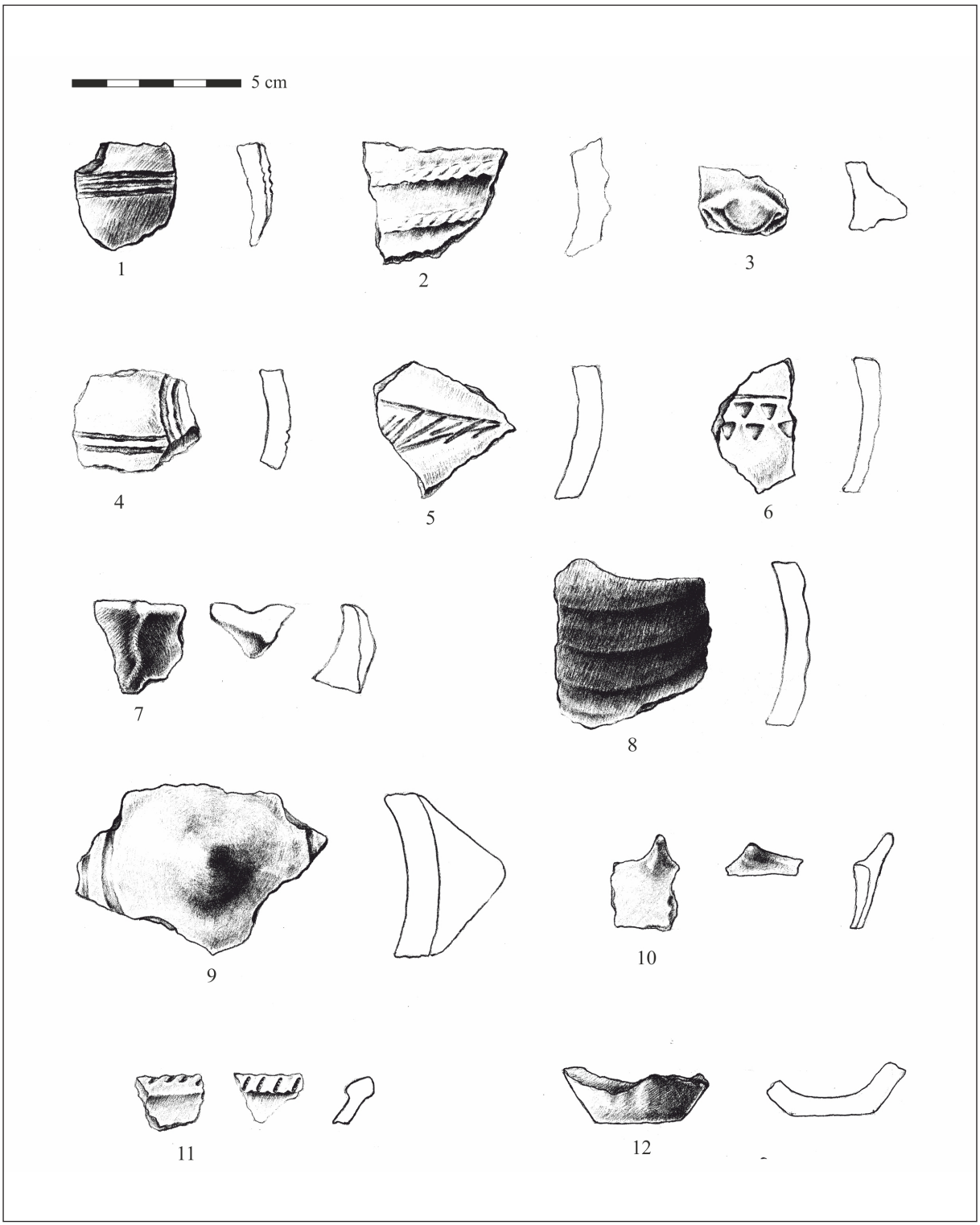

Plate 1. Pottery fragments from grids Gl (1-3) and G2 (4-12).

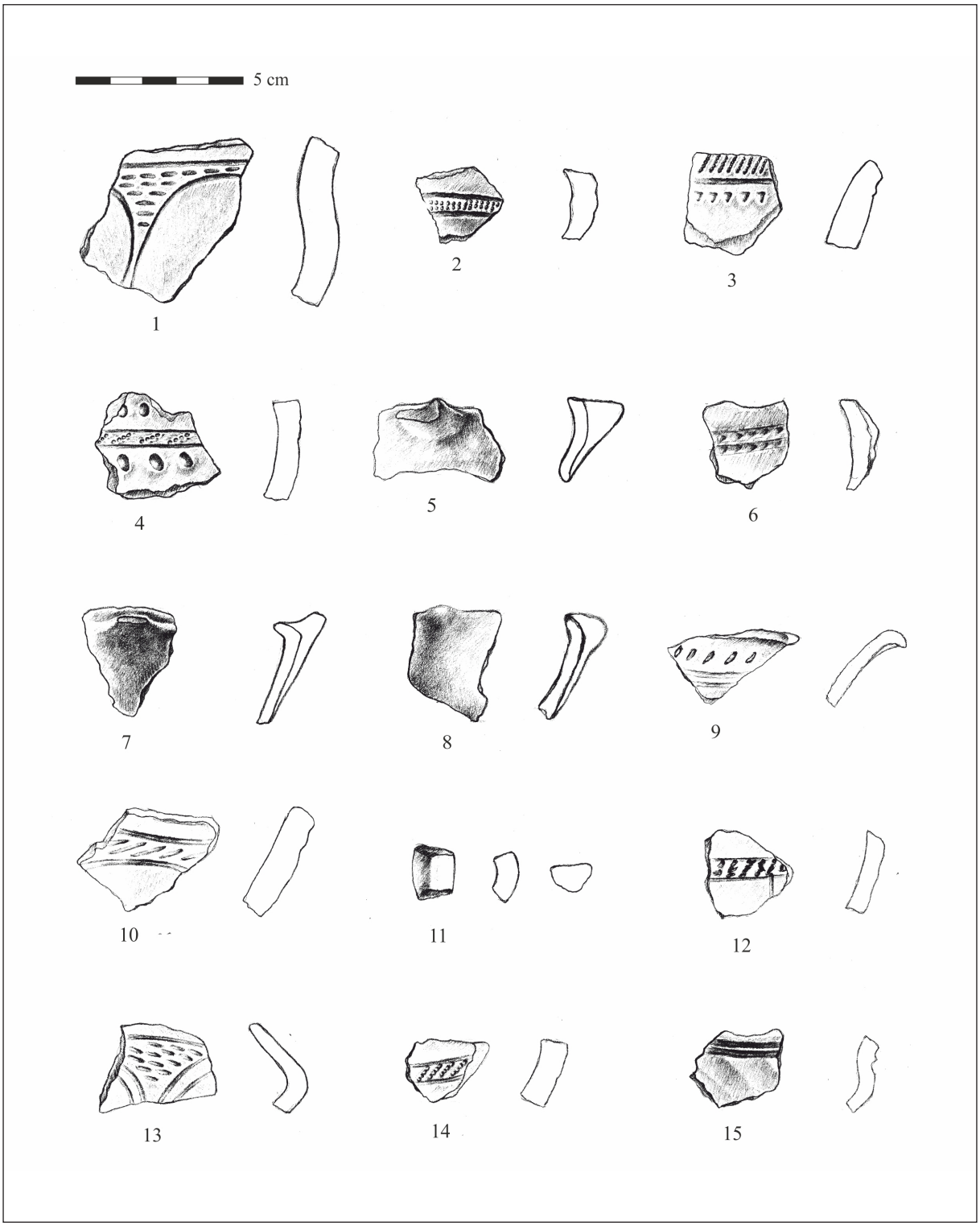

Plate 2. Pottery fragments from grids G2 (1-13) and G4 (14-15).

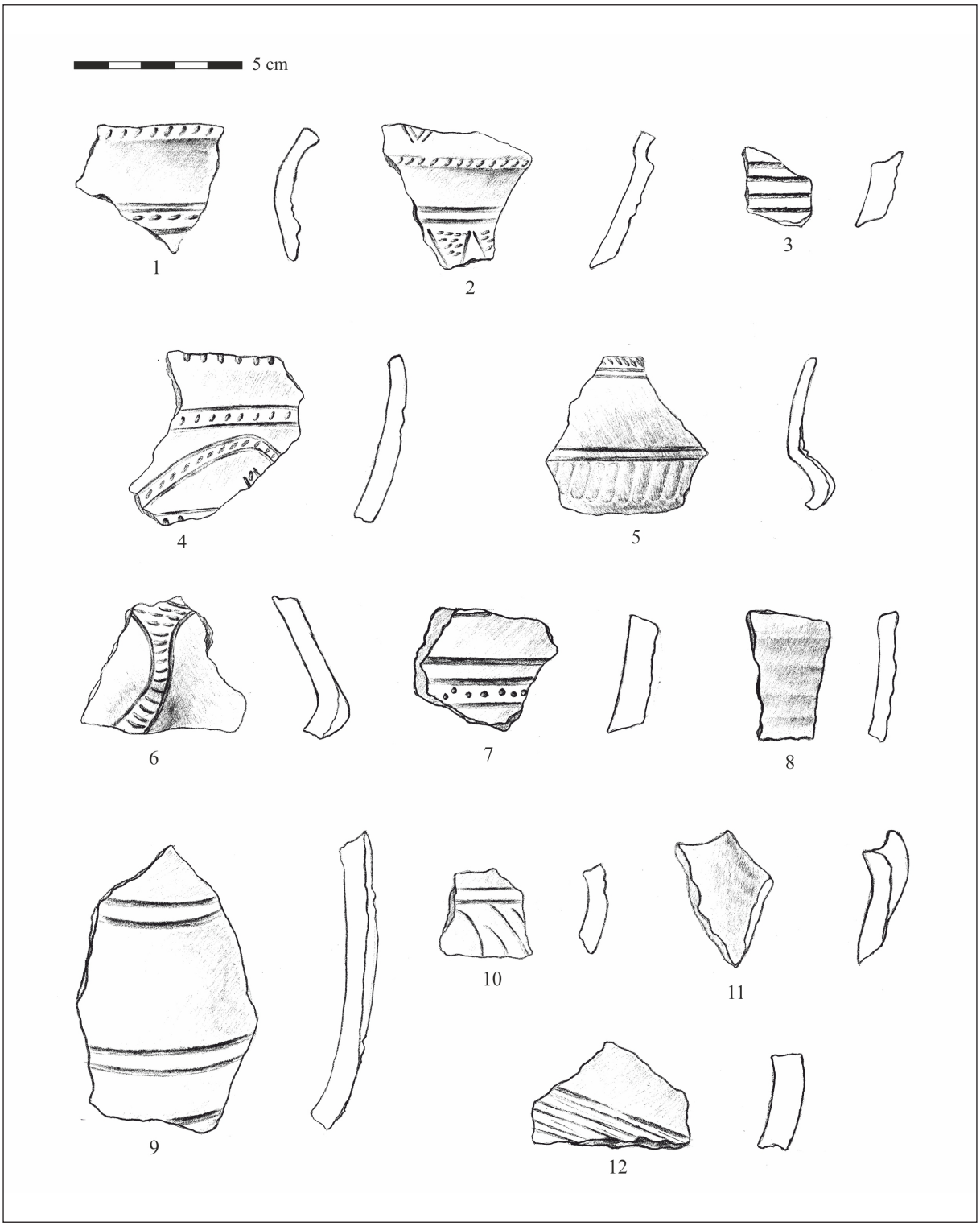

Plate 3. Pottery fragments from grids G4 (l-6) and G6 (7-12).

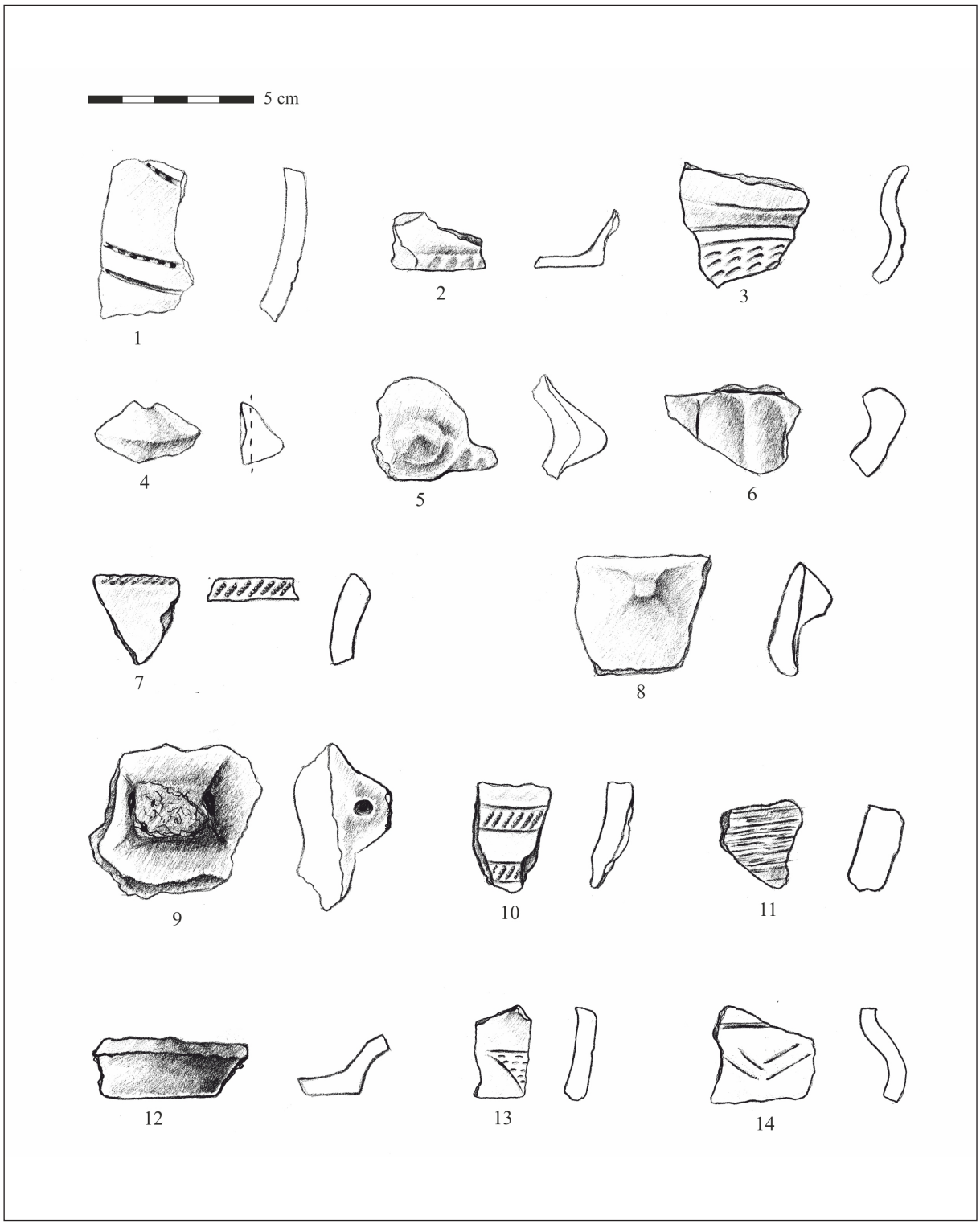

Plate 4. Pottery fragments from grids G6 (1-14).

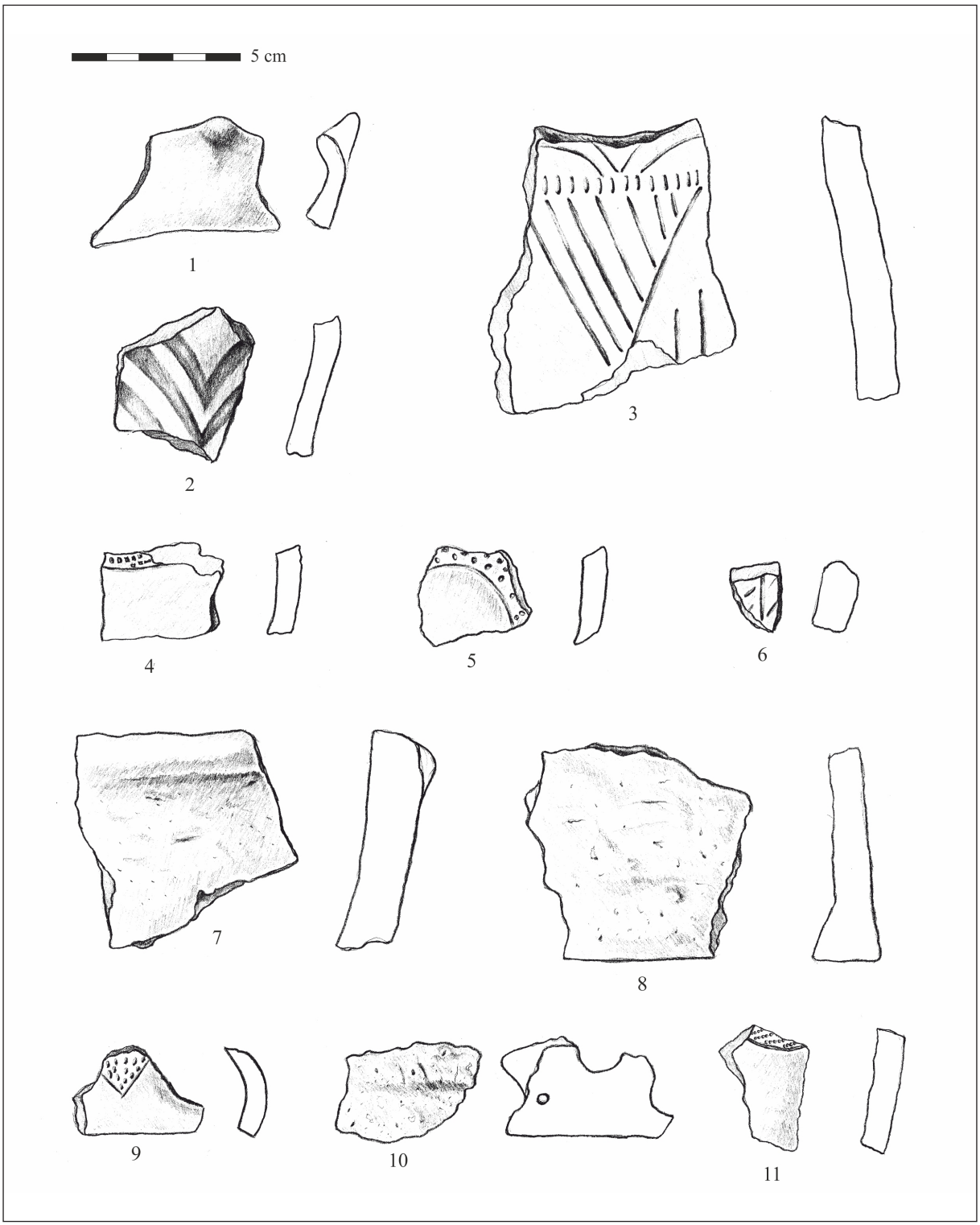

Plate 5. Pottery fragments from grid G6 (1-11).

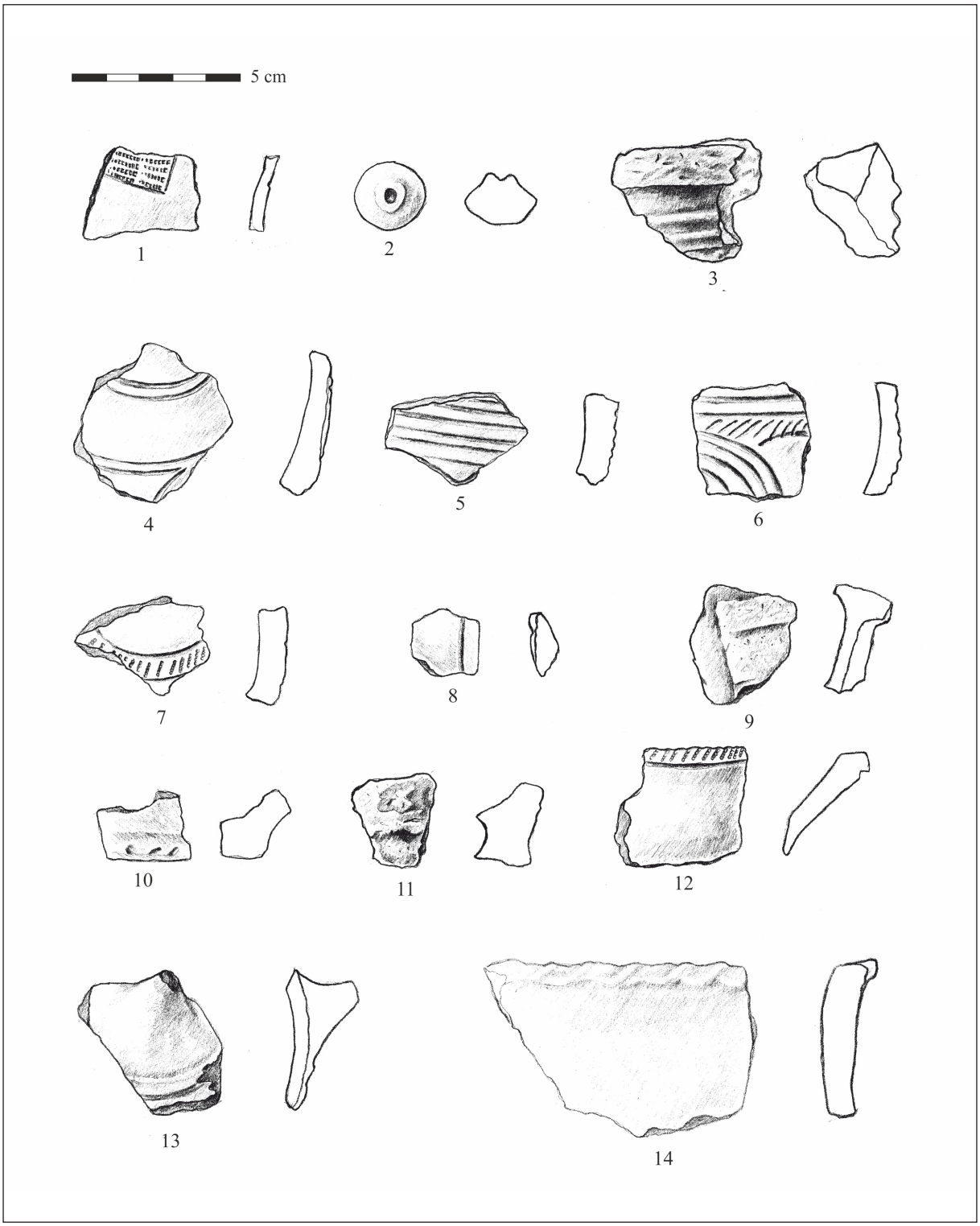

Plate 6. Pottery fragments from grid G6 (1-14).

Plate 7. Pottery fragments from grid G6 (1-16).

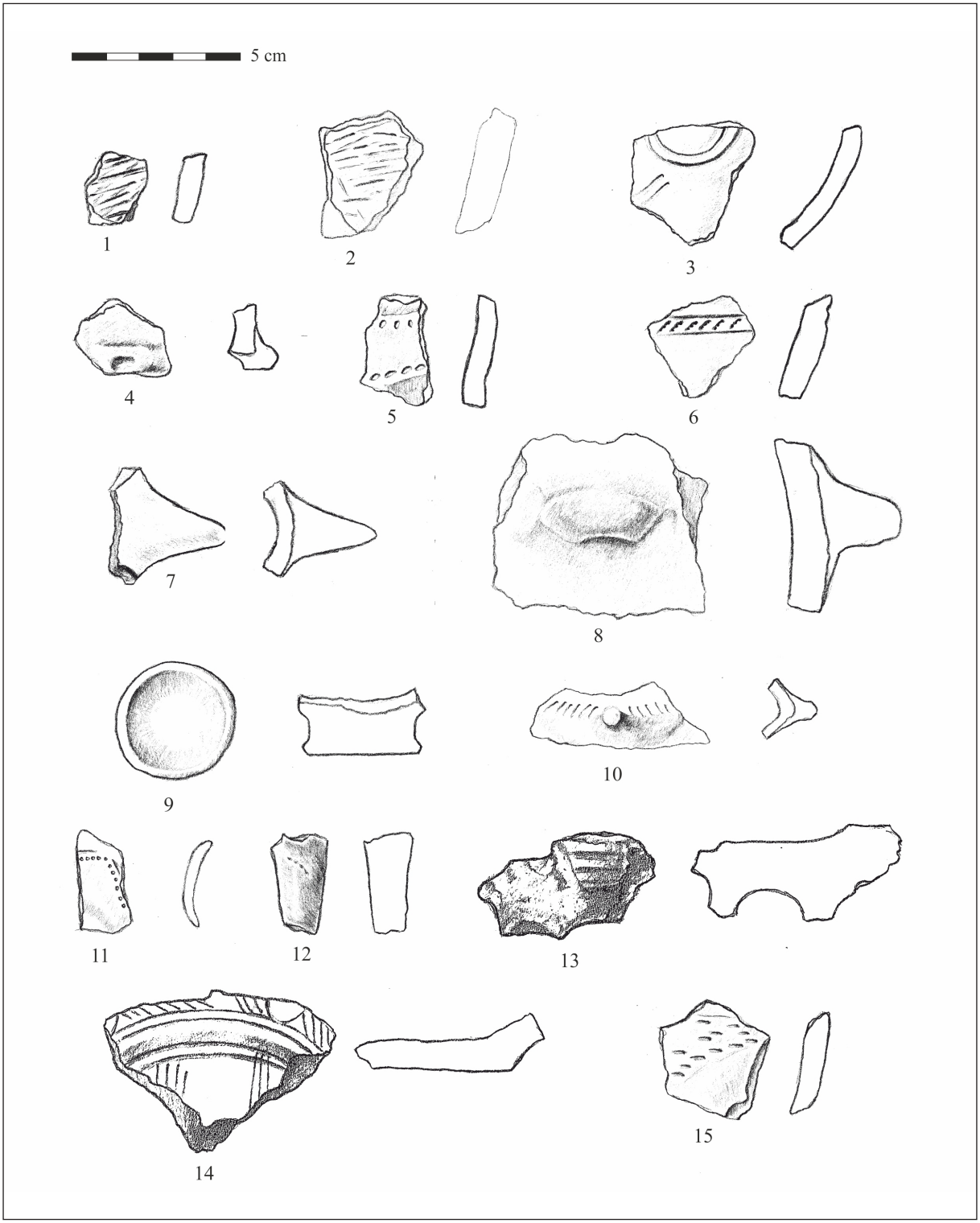

Plate 8. Pottery fragments from grid G6 (1-15).

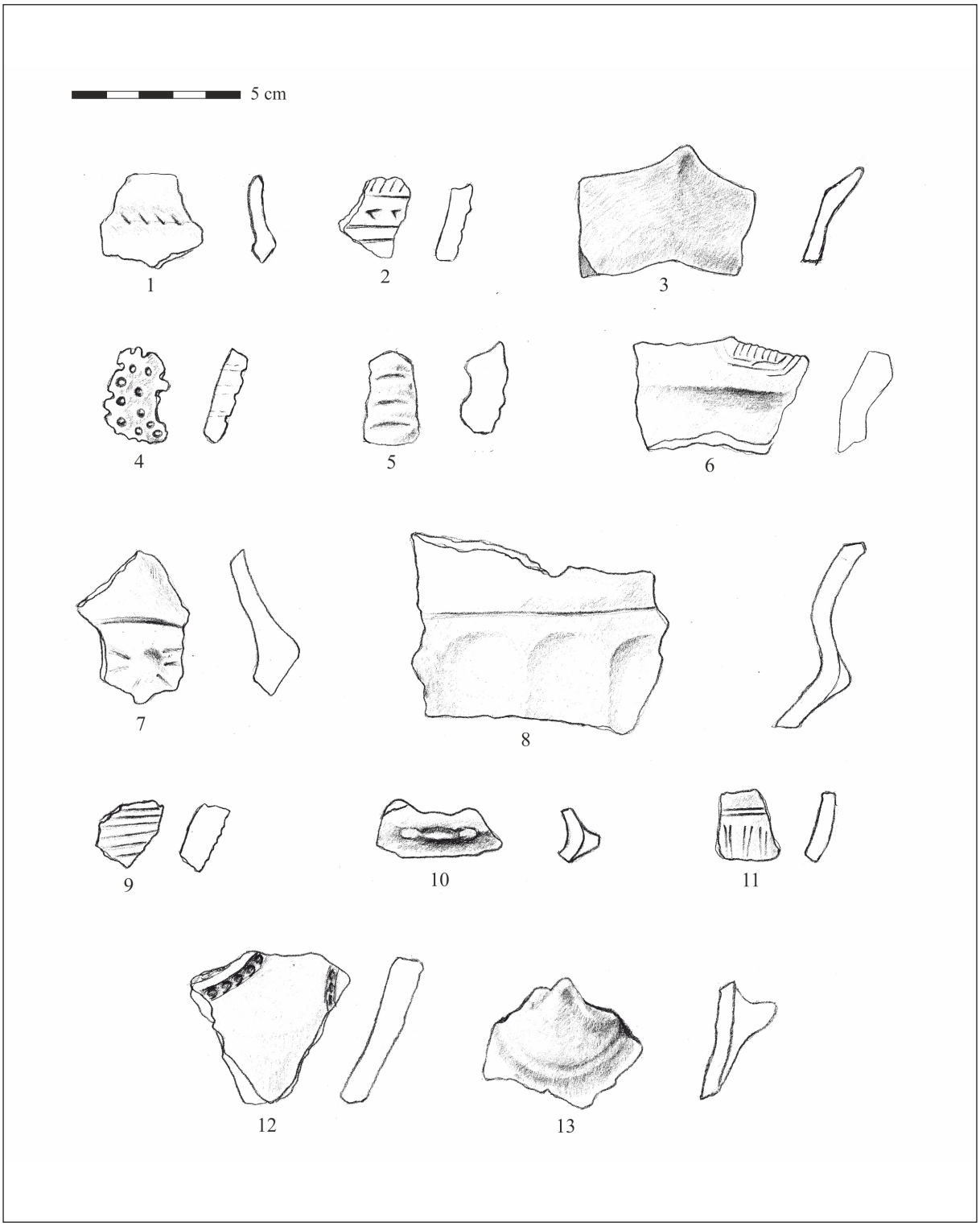

Plate 9. Pottery fragments from grid G8 (1-13).