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Content

Volume density of antique and late antique pottery and spatial analysis of the late antique settlement in Lobor – preliminary results

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The hilltop settlement at the site of Lobor - Majka Božja Gorska (Hrvatsko zagorje, Croatia) has been in use since the Middle Bronze Age. The continuous building activity, as well as medieval and post-medieval burials, have disturbed the archaeological strata of the site to a great extent. Prehistoric and antique layers suffered the most damage by later interventions. Pottery sherds are the most numerous finds belonging to antique and late antique periods, dating from the end of the 2nd or the beginning of the 3rd until the first quarter of the 6th century, but they are rarely found in intact archaeological contexts. The comparison of the volume density of pottery finds (the number of sherds per excavated volume unit) on different parts of the site is a method used for its spatial analysis. The analysis focuses on the pottery finds from two trenches located almost at opposite sides of the Sanctuary of Our Lady of the Mountain (Majka Božja Gorska), the one from 2010 located south-east of the enclosure wall and the one from 2014 located north of the enclosure wall. The two trenches were selected because of their similar excavation circumstances and almost the same average pottery fragmentation. The 1998 trench 3 was selected as a control trench. Since area density isn't as correct, due to the lack of depth data, volume density is the more accurate method of analyzing pottery distribution in a settlement with disturbed layers or in an area where a suspected settlement is still to be located. The exact position and size of the antique and late antique settlement at the Lobor – Majka Božja Gorska site is still unknown and will be determined by the use of this method.

Keywords: *Lobor, hilltop settlement, pottery, volume density*

Introduction

In this paper, a part of the research of pottery finds from the archaeological site of Lobor - Majka Božja Gorska will be presented. Pottery research has been carried out as part of the project „Lobor - Early Medieval Center of Power" (LearlyCoP IP-2016-06-6622) and the „Young Researchers' Career Development Project – Training New Doctoral Students" (DOK-2018-09-5720), both with the financial support of the Croatian Science Foundation. Considering the time period covered by the projects, the research has been focused on antique, late antique and early medieval pottery, which is sometimes hard to differentiate, especially if the fragments are very

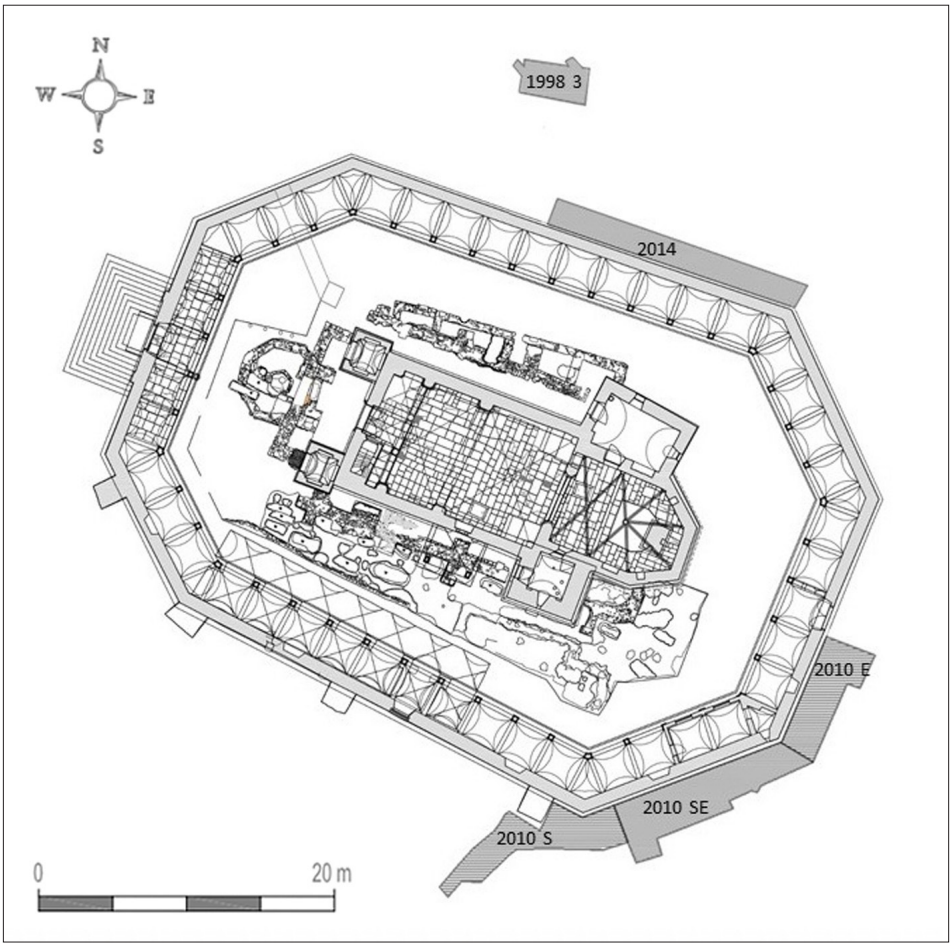


Figure 1. Plan of the Sanctuary of Our Lady of the Mountain (Majka Božja Gorska) with trenches mentioned in the text. (Made by: P. Nikšić, after: Arheo Plan d.o.o.).

small. More precisely, the pottery analyzed in this paper has been dated from the end of the 2nd or the begging of the 3rd until the first quarter of the 6th century. It is important to emphasize that the research results presented here are only preliminary. In other words, the pottery finds from just two archaeological trenches were used to test a model for spatial analysis that will, hopefully, as the research continues, be successfully applied to the rest of the site, and not only on pottery but also on other groups of archaeological finds, such as metal, stone, glass, animal and human bones, etc. The third trench, chosen as a control trench, was supposed to confirm the results. The raw numbers of collected sherds are combined with the total volume of excavated deposit, which provides the number of sherds per meter cube of deposit (volume density) for each trench or, when possible, certain stratigraphic units. After mapping the gathered data, the clusters of finds are supposed to form, which should indicate any particular parts of the site occupied at certain periods.

The archaeological site

The archaeological site of Lobor - Majka Božja Gorska is located in Hrvatsko zagorje, on the southern slopes of the mountain Ivanščica, north of today's center of Lobor. The site shares the hill with the Sanctuary of Majka Božja Gorska, which consists of a Gothic church, a Baroque crypt and an enclosure wall of the same period (Fig. 1). The Roman site in the center of the village has been known since the middle of the 19th century (Brunšmid 1908-1909: 165-166, fig. 360; Migotti 2009), and the medieval one on the hill since the middle of the 20th century when parts of stone monuments belonging to the early medieval church were found built into the Gothic church and the walls of surrounding houses (Strahuljak 1950: 260). After those finds, at least two field surveys of the plateau and the southern slopes of the hill were conducted (Gorenc 1977-1978: 265-266; Tomičić 1999: 50, f.n. 9), during which large quantities of prehistoric, antique and medieval pottery sherds were found. Unfortunately, those finds were never quantified, published

or, maybe, even collected. The history of archaeological research before the excavations started was presented in detail in the exhibition catalogue (Filipec and Jurica Turk 2002).

Archaeological excavations at the site have been conducted by Dr. Krešimir Filipec of the Department of Archaeology (Faculty of Humanities and Social Sciences, University of Zagreb) almost continuously since their beginning in 1998 (Filipec 2010). The main purpose of the excavations was to provide a cleared space where it was necessary to build a drainage system, designed to help preserving the existing walls of the sanctuary. Therefore, the excavations were focused on the area around the church and around the enclosure wall, although nine trenches of various sizes were excavated outside of the drainage system plan. Along with the remains of the early Christian church and baptistery buildings and pre-Romanesque and Romanesque churches (Filipec 2008; 2009; 2017b; 2020), more than one thousand more or less intact graves dating from Late Antiquity to the 19th century were found, some of which were analyzed and published (Filipec 2009; 2016; Vrančić and Perušina 2018). Construction activity, and burial pits, even more, damaged the layers that preceded them and made the processing of the archaeological material more difficult.

Methodology

Vertical stratigraphy of the site consists of three main layers: humus, debris connected with the levelling of the site for the construction of the Gothic church, and the layer with burials. Other stratigraphic units are mostly grave pits, postholes, and other small parts of architectural remains. Unfortunately, the composition of the soil from the grave pits does not differ from the composition of the soil of the layers in which the grave pits were dug. Since the graves are mostly without any architectural elements, the borders of the grave pits are impossible to detect, as is the walking surface used at the time they were dug. Apart from the remains of the church and baptistery buildings, no other larger late antique or medieval fixed structures were found. Only a small part of the northern stone rampart was detected. Therefore, the spatial analysis of the site using stratigraphic units, mostly buildings or their parts, in the current state of research is, unfortunately, impossible. As a result of that, a model using pottery as the main indicator of the late antique settlement's size and structure was selected.

Quantification of pottery alone does not contribute to spatial analysis of an archaeological site without a context, especially if the sherds were not found within closed and well-defined stratigraphic units. To make the picture of the site clearer, it is necessary to combine raw numbers of sherds with units of measurement, such as area or volume (Fig. 2 a-d). By doing so, the density with which pottery sherds occur is estimated and can be used as a measure of the size and development of the site, in chronological order, depending on the type of pottery found in particular parts of the site. Density can be expressed in two ways: as density per excavated area or as density per excavated volume (SDAC 2020). Although area density is easier to calculate and more widely used due to the greater availability of the data, volume density seems to be a more accurate method because it includes the variable of depth into the calculation, which changes significantly at this site. The main disadvantage of this method is the relative inaccuracy that can occur because, due to the irregularity of the trench itself and the stratigraphic units, the calculation of the volume of excavated deposit depends on the precision of documenting (field drawing, surveying, etc.) during the excavation. Nevertheless, precisely because the depth is taken into account when calculating the volume density, large differences in density between volume and area density are possible, as can be seen from the following hypothetical calculation for the same number of fragments (1000):

Case 1: $A_1 = 1\ m^2 \rightarrow A_1d = 1000/1 = 1000\ sherds/m^2$,
$dep_1 = 1\ m$, $V_1 = 1\ m^3 \rightarrow V_1d = 1000/1 = 1000\ sherds/m^3$

Case 2: $A_2 = 1\ m^2 \rightarrow A_2d = 1000/1 = 1000\ sherds/m^2$,
$dep_2 = 2\ m$, $V_2 = 2\ m^3 \rightarrow V_2d = 1000/2 = 500\ sherds/m^3$

Case 3: $A_3 = 2\ m^2 \rightarrow A_3d = 1000/2 = 500\ sherds/m^2$,
$dep_3 = 1\ m$, $V_3 = 2\ m^3 \rightarrow V_3d = 1000/2 = 500\ sherds/m^3$

Thus, with increasing depth, the volume density for the same surface area decreases, while the volume density can be the same despite the different surface area if the volume of the excavated deposit is the same. Calculating and mapping the area of volume density is sometimes found under the term quantitative analysis (Vágvölgyi 2015).

For the start of the application of this method, two trenches were selected, the one excavated in 2010, which is located southeast of the enclosure wall, and the one excavated in 2014, which is located north of the enclosure wall. The 2010 trench was chosen because it is

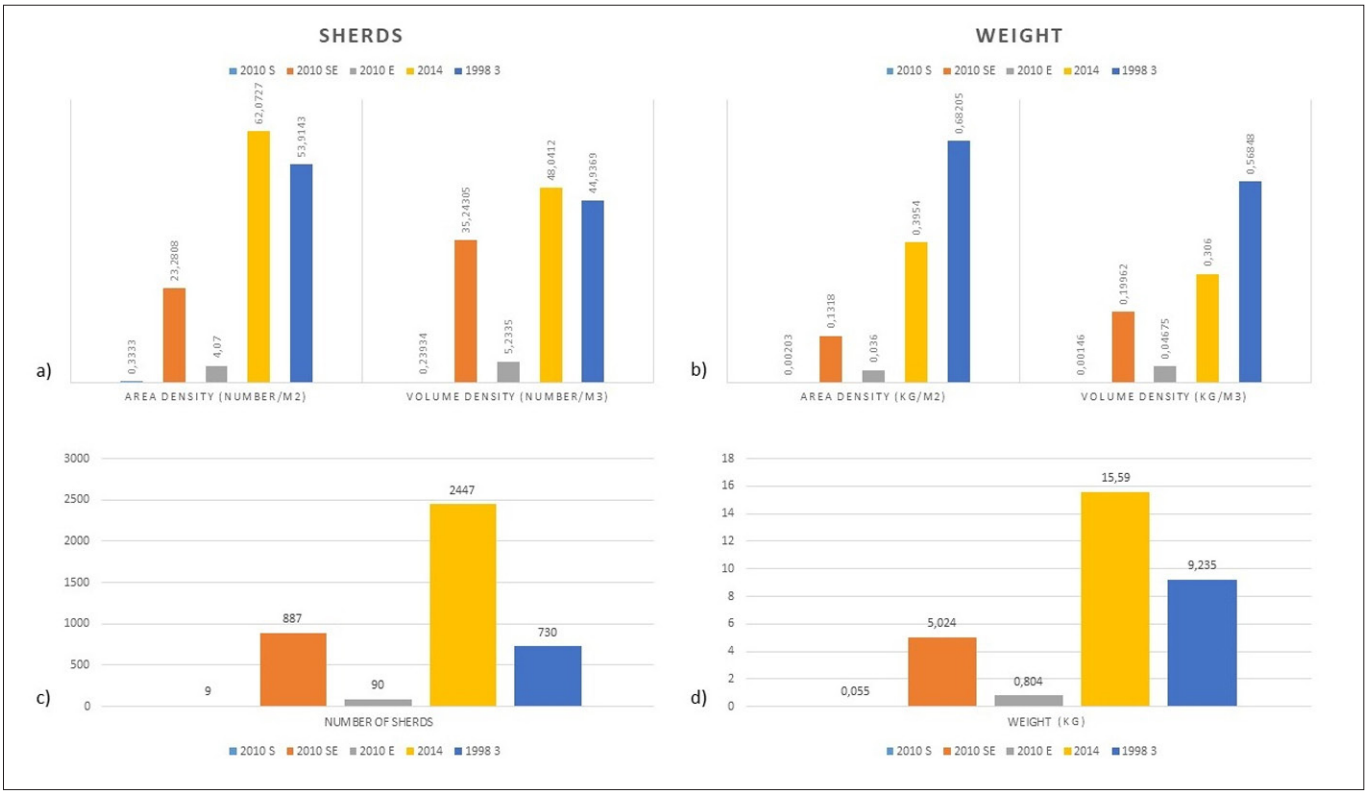


Figure 2. a) area density vs. volume density, total number of sherds, b) area density vs. volume density, total weight, c) total number of sherds, d) total weight. (Made by: P. Nikšić).

the only one located on the southern slopes of the hill, where the remains of ancient architecture and numerous pottery sherds were found during the field survey and none of which was mentioned for the northern part of the site (Gorenc 1977-1978: 265-266). It should be emphasized that M. Gorenc did not conduct the field survey according to the current standards, but inspected the places where the soil had already been tilted or excavated due to agricultural or construction works. The 2014 trench was chosen because it was located almost on the opposite side of the site in comparison to the 2010 one, and the data are easily comparable due to the same degree of average fragmentation. During the research, it was noticed that a larger quantity of antique and especially late antique pottery sherds was found in trench 3 excavated in 1998. This trench was located in the immediate vicinity of the 2014 trench, on the plateau further north. Data obtained by the quantification of the finds from the 1998 trench 3 was included in the study as a control element, which should further prove the existence of settlement pottery in larger quantities even between the church complex and the northern rampart, and confirm the accuracy of the results obtained by the analysis of the volume density of pottery finds from the 2010 and 2014 trenches, which were the first two areas selected for the comparison. The main difference between the pottery finds from the 1998 trench 3 and those from the other two mentioned trenches is the degree of pottery fragmentation caused by the presence or lack of the Baroque period construction activity in those trenches. The only interventions into the strata of the 1998 trench 3 after Late Antiquity were the medieval grave pits. Since the degree of pottery fragmentation in trench 3 is lower, the necessary corrections were made in relation to the number of fragments obtained by quantification. The correction factor was obtained on the basis of the hypothesis that, if the same amount of interventions into the antique and late antique strata had been present in the 1998 trench 3 as it was in the 2010 and the 2014 trenches, the same pottery fragmentation would occur. Therefore, using the difference in average sherd weight between pottery finds in the 2010 (the SE section) and the 2014 trenches, and those in the 1998 trench 3, the correction factor was estimated to be 2.17,

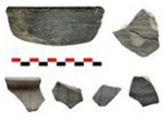
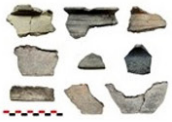
GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6	GROUP 7
Glazed pottery	Slipware	Burnished pottery	Gray fineware	Red fineware	Gritty pottery	Coarse pottery
						
- glazed pottery - glazed pottery with slip - glazed pottery with burnished surface or decoration	- terra sigillata - PGW - ARS/LRC - red, orange, brown, gray, black slipware	- pottery with burnished or semi burnished surface - pottery with burnished decoration	- light to dark gray fine or very fine pottery	- yellow, orange and red very fine or fine pottery	- fine-grained coarse pottery	- large-grained coarse pottery
- mortars - bowls/plates - cups - jugs	- bowls/plates - jugs	- jugs - pots - bowls	- jugs - pots - lids	- jugs - pots	- pots - bowls - jugs	- pots - bowls - jugs

Figure 3. Pottery groups 1-7. (Made by: P. Nikšić).

and the number of sherds from the 1998 trench 3 was multiplied by that number. The quantitative data from the 1998 trench 3, their analysis and results are also important because it is one of few trenches excavated at the site in Lobor that was not connected with the preservation of the present-day structures or the construction of the drainage system, and as such should confirm the higher density of pottery finds in the northern part of the site than in the southern, where the position of the antique and late antique settlement at the site of Lobor – Majka Božja Gorska was previously assumed.

Pottery groups

For the purpose of the research, antique and late antique pottery sherds found at the site of Lobor - Majka Božja Gorska were divided into groups (Fig. 3), as were the sherds from many other sites (Ottományi 1997-1998; Ladstätter 2000: 204-205, fig. 70, 71; Grabherr and Kainrath 2011; Zagermann 2015; Roksandić 2018: 57, fig. 9). It is important to create groups for each site, but also to make them easily comparable with the groups from other sites. The seven main groups form Lobor are: 1) glazed pottery, which includes glazed pottery with orange, red and brown slip, as well as glazed pottery with burnished surface or decoration, 2) slipware, which includes terra sigillata and its imitations, and orange, red, gray, brown and black slipware, as well as slipware with burnished surface or decoration, 3) burnished pottery and pottery with burnished decoration, 4) fine gray reduction fired pottery, 5) fine oxidation fired pottery, which is in the ranges of yellow, orange and red, 6) fine-grained coarse pottery and 7) large-grained coarse pottery. Certain groups, such as group one, two or three, can provide a quite precise dating for the parts of the site where they were found, unlike groups six and seven, which were in use for longer periods. The difference in fabric, size and wall thickness of the pottery that belonged to the mentioned groups is the main reason why weight alone was not taken into account when calculating the volume density of antique and late antique pottery from Lobor, especially since not all groups were equally represented at the various parts of the site in Lobor. For example, a sherd of similar size will weigh more if it belonged to a coarse, thick-walled pot than the one that belonged to a fine, thin-walled jug. Also, thin-walled pottery breaks more easily and into more fragments, which reduces the weight of a single sherd. Since a significantly larger amount of fine pottery sherds was found in the 2014 trench, the weight of the pottery was used to make the aforementioned corrections of the data from the 1998 trench 3.

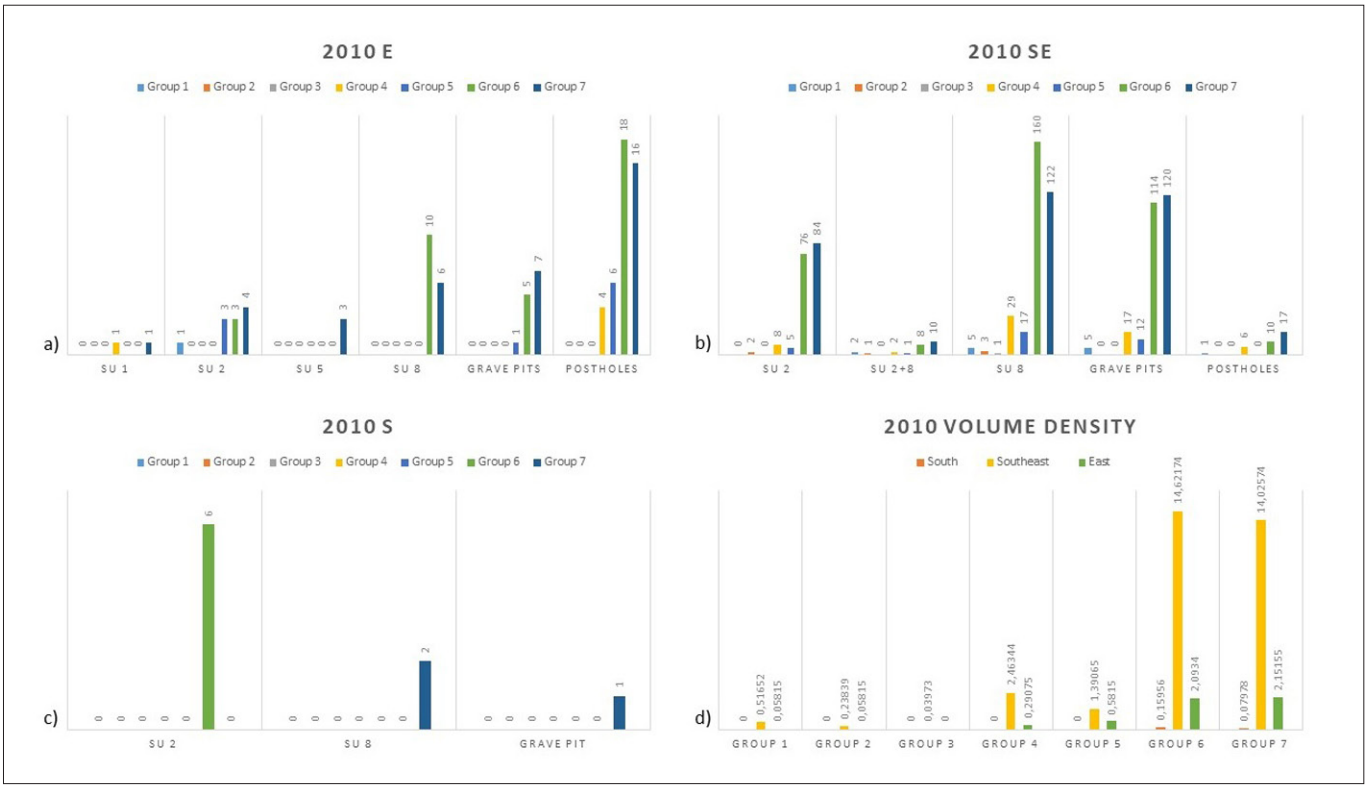


Figure 4. a) total number of sherds in stratigraphic units, section E, b) total number of sherds in stratigraphic units, section SE, c) total number of sherds in stratigraphic units, section S, d) volume density in sections S, SE and E. (Made by: P. Nikšić).

Preliminary results

The trench excavated in 2010 was located outside of the enclosure wall by its southeastern part. It was divided into three sections: southern, southeastern and eastern (Fig. 1). The southern section was excavated in preparation for the construction of the drainage system outflow and it seems that this part of the site had been used for the secondary mass burial of the skeletal remains from the Baroque crypt. A significant find from that year's campaign was a corner part of a stone building found in the southeastern section, showing characteristics of late antique architecture which could be interpreted as the remains of another early Christian church or some other public building (Filipec 2020: 292, fig. 1). Unfortunately, the biggest part of the building is located under the contemporary houses of a nearyby hamlet. That was the reason why the trench was only partially expanded towards those buildings. In all three sections of the 2010 trench, coarse pottery dominates, although the number of sherds found in the southern and eastern sections is much smaller than the number found in the southeastern section. Both groups of coarse pottery are almost equally represented. The majority of sherds were found in the stratigraphic unit 8 and grave pits, which were, in most of the cases, dug into that same stratigraphic unit (Fig. 4 a-c). Since the total number of sherds in the southern and eastern sections is small, the volume density in those sections is very low. In comparison, the southeastern section has a much larger number of sherds, so the difference in volume density between the sections and groups appears to be almost the same as the difference in the number of sherds (Fig. 4 d).

The trench excavated in 2014 was located outside of the enclosure wall by its northern part (Fig. 1). It was of rectangular shape and somewhat smaller than the one from 2010, so there was no real need to section it, although in cases of spatial analysis smaller sections or a square grid make the sorting and processing of finds easier, especially of those finds that were not recorded digitally. A significant find from that year's campaign was a small S-shaped fibula, dated to the end of the 5th and the first third of the 6th century, and usually attributed to the Lombards (Filipec 2020: 297, fig. 4). Although the fibula was not found in a closed archaeological context, its finding indicates the possible existence of a destroyed late antique grave nearby, as well as the possibility that

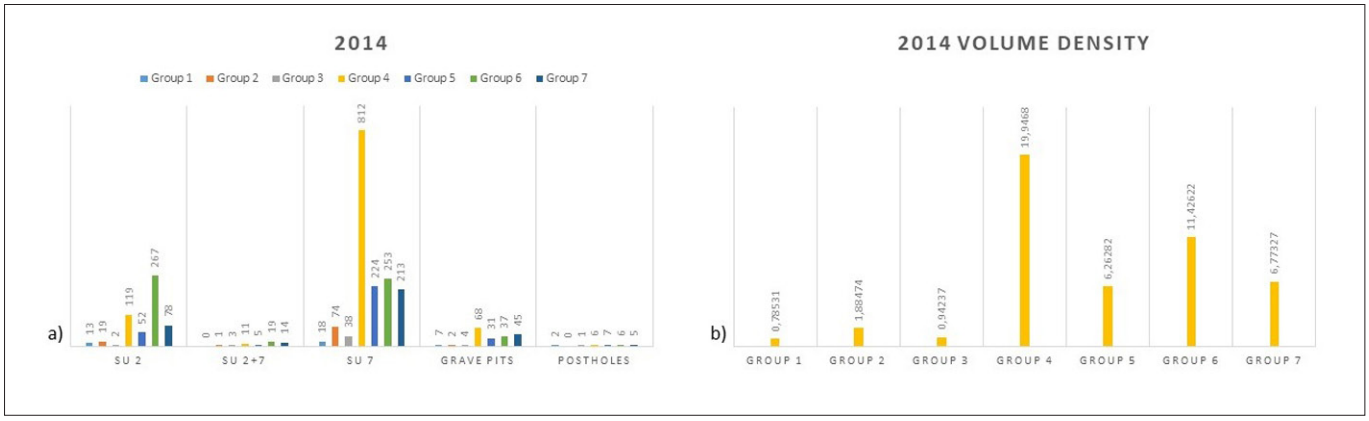


Figure 5. a) total number of sherds in stratigraphic units, b) volume density. (Made by: P. Nikšić).

the settlement relocated from that part of the site in the 6th century and gave place to the cemetery, maybe after the church was built. That theory can be partially proven by the ratio of sherds in pottery groups because, as far as pottery is concerned, the trench excavated in 2014 is the only one where fine gray pottery was found in a much larger quantity than any other pottery group. More than half of the total amount of sherds belong to fine gray tableware, mostly undecorated drinking vessels, such as jugs, beakers and cups, which can be dated to the 5th century at the latest. The biggest number of sherds was found in the stratigraphic unit 7 (Fig. 5 a) that corresponds to the stratigraphic unit 8 in the southeastern section of the 2010 trench. Relating to the number of the sherds, the volume density of group 4 is high, while the volume density of other groups is low for groups 5 to 7 and very low for groups 1 to 3 (Fig. 5 b).

Trench 3 is one of the smaller trenches on the site. It is one of the three trenches excavated in 1998 outside of the enclosure wall in the northern part of the site and it is located quite near the 2014 trench. It is important to mention that this is one of few locations on the site with potential residential architectural remains that could be dated to the antique period. Parts of daub and roof tiles were found in a layer with prehistoric, antique and late antique pottery, but above a layer of prehistoric flooring and a layer of prehistoric pottery. These findings could be interpreted as the antique or late antique house remains. Three joining sherds of a glazed cup with roulette decoration, found in layer 18, grave 2 and grave 8, show how much graves disturbed the strata. Related to that, the biggest number of sherds was found in stratigraphic units 18 and 18+32, but none in the stratigraphic unit 32 alone (Fig. 6 a). Coarse pottery is dominant in trench 3 excavated in 1998, but not as dominant as it is in the southeastern section of the trench from 2010. Volume density of pottery groups in trench 3 is gradually increasing from the groups of fine pottery to those of coarse pottery, which is different than in the other trenches. Volume density of groups 1 to 3 is very low, although group 1 somewhat stands out. Volume density of groups 4 and 5 is low, and groups 6 and 7 high, as was mentioned before (Fig. 6 b).

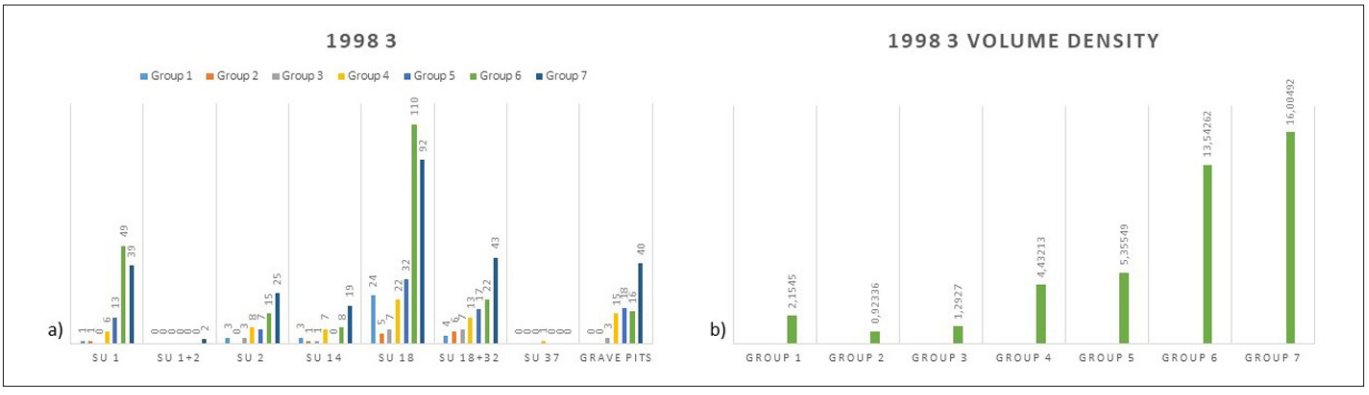


Figure 6. a) total number of sherds in stratigraphic units, b) volume density. (Made by: P. Nikšić).

Figure 7. a) number od sherds for groups 1-7, b) average sherd weight in kilograms, c) area density for groups 1-7, d) volume density for groups 1-7. (Made by: P. Nikšić).

When the volume density of pottery sherds in those three trenches is compared (Fig. 2 a-b, 7 d), it becomes apparent that the volume density of trench 2014 is the highest. The volume density of the SE section of the 2010 trench is significantly lower, while that in sections 2010 S and 2010 E is almost insignificant. It is obvious that subsequent interventions of secondary burials from the Baroque crypt in section 2010 S reduced the number of finds almost to zero.

The volume density of the 1998 trench 3 is higher that the one of trench 2010. When it comes to groups, coarse pottery dominates, that is groups 6 and 7, especially in the 1998 trench 3 and southeastern section of the 2010 trench. However, the highest individual volume density is that of group 4 in trench 2014, which in other cases has fairly low numbers, just as group 5 does. Groups 1 to 3 have very low numbers in all of the trenches, which corresponds to the fact that those groups represent a rarer or more exclusive pottery finds. Volume density of groups and in total, when mapped (Fig. 8), represent a start of the spatial analysis of the site in Lobor. It is visible from the color-coded plans of the analyzed trenches that a cluster of overall pottery finds is formed in the area north of the church complex, where the 1998 trench 3 and the 2014 trench were excavated. The fact that gritty and course pottery dominate, with the exception of the dominance of fine reduction fired pottery in the 2014 trench, could signify that both the northern and the southern parts of the site in Lobor followed the general pattern of large quantities of kitchenware. However, in the area excavated in 2014, there must have been a temporary or permanent structure that served for the consumption of food and/or drink, which caused such a deviation of the number of fine pottery sherds. This theory might be proven with further archaeological research and excavation of the surrounding area.

The difference between area and volume density (Fig. 7 c-d) is significant in trenches with larger differences in depth. With the trenches discussed in this paper, this is not the case as much as it will be with some trenches that have been excavated within the enclosure wall.

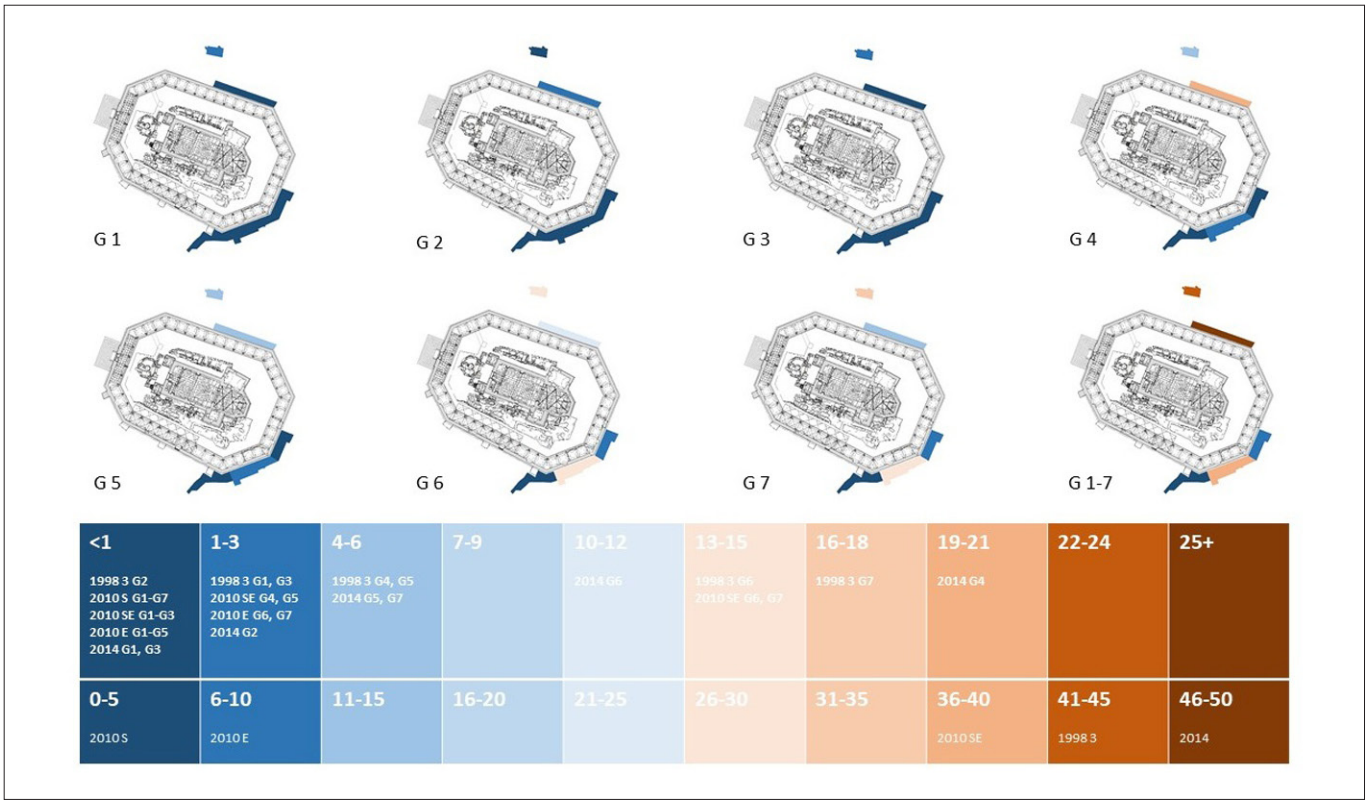


Figure 8. Color-coded mapping of antique and late antique pottery groups and pottery in total. (Made by: P. Nikšić).

It is important to note that the degree of fragmentation in the 2010 and 2014 trenches is almost the same, only slightly higher in trench 2010 E, but given the small number of fragments found there, this difference becomes insignificant when studying the entire trench. In contrast, the degree of fragmentation in the 1998 trench 3 is somewhat lower and the pottery fragments are larger (Fig. 7 b). When the correction factor (2.17) is applied to the number of pottery sherds in the 1998 trench 3, the volume density becomes the highest in the 1998 trench 3. This leads to the conclusion that the center of the cluster of pottery finds is in the central part of the northern plateau between the sanctuary and the northern rampart. The analysis of the volume density of pottery finds from the trenches located near the northern rampart should confirm this result. The current state of research implies that the residential part of the settlement had been located in the same place where the early Christian church complex was built and north of it after its construction.

Conclusion

Although the current state of publication has put emphasis on the exsistence of antique or late antique settlement elements in the southern part of the site and the small plain south of the hill where the field surveys were conducted, the preliminary results of pottery research show a more significant presence of pottery sherds, dated at least from the end of the 2nd or the beginning of the 3rd century until the first quarter of the 6th century, in the northern part of the site. The pottery finds in all three trenches were found alongside late antique poorly preserved architectural remains or small finds. A cluster of antique and late antique pottery finds is visible in the area north of the church complex, where the 1998 trench 3 and the 2014 trench were excavated, while the 2010 trench in comparison does not show particular volume density of pottery finds, either of groups or in total. Gritty and course pottery groups (G6, G7) dominate in all trenches and sections, with the exception of the 2014 trench, where fine reduction fired pottery (G4) is the group with most sherds found. New clusters of an-

tique and late antique pottery finds could, and probably will be, discovered when this model of spatial analysis is applied to the entire part of the site that has been excavated so far. If the results of further analyses are satisfactory, the research will be extended to other groups of archaeological finds. This will, hopefully, solve the problem of the non-existence of a larger number of closed stratigraphic units and provide a much clearer picture of the antique, late antique and early medieval settlement at the site of Lobor - Majka Božja Gorska.

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References

Brunšmid, J. 1908-1909. Kameni spomenici hrvatskog narodnog muzeja u Zagrebu, *Vjesnik Hrvatskog arheološkog društva*, n. s., sv. X, 151-222.

Filipec, K. and Jurica Turk, V. 2002. *Lobor: Majka Božja Gorska. Katalog izložbe.* Muzeji Hrvatskog zagorja, Muzej seljačkih buna, Gornja Stubica.

Filipec, K. 2008. *Arheološko-povijesni vodič po svetištu Majke Božje Gorske u Loboru*, Župa sv. Ane, Lobor.

Filipec, K. 2009. Slavenski paljevinski grob iz Lobora, *Archaeologia adriatica* III, 347-357.

Filipec, K. 2010. Drvena crkva u Loboru - najstarija franačka misionarska crkva u sjevernoj Hrvatskoj, *Starohrvatska prosvjeta* 37, 112-126.

Filipec, K. 2016. Pokopi u zgrčenom i poluzgrčenom položaju na groblju uz crkvu Majke Božje Gorkse u Loboru, In: S. Krznar, T. Sekelj Ivančan, T. Tkalčec and J. Belaj (eds.), *Groblja i pogrebni običaji u srednjem i ranom novom vijeku na prostoru sjeverne Hrvatske, Zbornik radova prvog međunarodnog znanstvenog skupa srednjovjekovne arheologije Instituta za arheologiju*, Zagreb, 4. lipnja 2014., Institut za arheologiju, Zagreb, 49-56.

Filipec, K. 2017a. Antički nadgrobni spomenici Lobora - prilog poznavanju antičke skulpture panonsko-noričkog žiteljstva i njegove sredine, *Arheološki radovi i rasprave* 17, 95-144.

Filipec, K. 2017b. The End of the Late Antique Fort in Lobor and the Beginning of the Slavic Seizing of Present Day Northwestern Croatia, *Konštantínove Listy* 10/2, 23-34.

Filipec, K. 2020. Ranokršćanska crkva u Loboru – Majka Božja Gorska, ortodoksna ili arijanska?, In: M. Sanader, D. Tončinić, I. Kaić and V. Matijević (eds.), *Zbornik I. Skupa hrvatske ranokršćanske arheologije (HRRANA)*, Arheološki zavod Odsjeka za arheologiju Filozofskog fakulteta Sveučilišta u Zagrebu, Zagreb, 291-301.

Gorenc, M. 1977-1978. Novi podaci s antičkih i ranosrednjovjekovnih lokaliteta Marija Gorska i Černičevina u Loboru, *Vjesnik Arheološkog muzeja u Zagrebu,* 3 s. sv. X-XI, 265-266.

Grabherr, G. and Kainrath, B. (eds.) 2011. *Die spätantike Höhensiedlung auf dem Kirchbichl von Lavant. Eine archäologische und archivalische Spurensuche*, IKARUS, Band 5, Innsbrucker Klassisch-archäologische Universität, Innsbruck.

Ladstätter, S. 2000. *Die materielle Kultur der Spätantike in den Ostalpen, Eine Fallstudie am Beispiel der westlichen Doppelkirchenanlage auf dem Hemmaberg*, Verlag der Österreichischen Akademie der Wissenschaften, Wien.

Migotti, B. 2009. Vojnička nadgrobna stela severskog razdoblja iz Lobora, *Archaeologia adriatica* III, 155-171.

Ottományi, K. 1997-1998. Late Roman Pottery in the Dunabogdány Camp, *ANTAEUS* 24, 333-373, 726-738.

Roksandić, D. 2018. *Vinkovci u kasnorimskom razdoblju. Keramika kao pokazatelj života u kasnorimskim Cibalama / Vinkovci in Late Roman Period. Pottery as an Indicator of Life in Late Roman Cibalae*, Gradski muzej Vinkovci, Vinkovci.

Strahuljak, T. 1950. Naučno-istraživački rad Konzervatsorskog zavoda od 1945. do 1949., *Historijski zbornik* III, 1-4, 260.

Tomičić, Ž. 1999. *Panonski periplus: arheološka topografija kontinentalne Hrvatske*, Hrvatski studiji, Institut za arheologiju, Zagreb.

Vágvölgyi, B. 2015. Quantitative and GIS-based archaeological analysis of the Late Roman rural settlement of Ács-Kovács-rétek, *Dissertationes Archaeologicae ex Instituto Archaeologico Universitatis de Rolando Eötvös nominatae*, Ser. 3. No. 3., 127-189.

Vrančić, N. and Perušina, V. 2018. *Forenzična arheometrija: zagonetni slučaj grofa Tome Keglevića*, Rektorova nagrada 2017./2018. god. Filozofski fakultet Sveučilišta u Zagrebu, Zagreb.

Zagermann, M. 2015. Terra sigillata, Feinkeramik, Gebrauchskeramik und Amphoren vom Säbener Burgberg (Ausgrabung 1978 bis 1982), In: V. Bierbrauer and H. Nothdufter (eds.), *Die Ausgrabungen in spätantik-frühmittelalterlichten Bischofssitz Sabiona-Säben in Südtirol I, Fruhchristliche Kirche und Gräberfeld*, Band 1-3, Münchner Beitrage zur vor- und frühgeschichte, Band 58, München, 603-635.

Internet sources

SDAC 2020 – San Diego Archaeological Center, Volume vs. area density:

https://www.sandiegoarchaeology.org/Laylander/Issues/method.density.htm (Accessed: 7.11.2020.)