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METHODOLOGY & ARCHAEOMETRY

Zagreb, 3rd – 4th December 2020

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FROM THE 8TH AND 9TH SCIENTIFIC CONFERENCE METHODOLOGY AND ARCHAEOMETRY



Ina Miloglav

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Archaeological surveying in karstic fields: the site of Balina Glavica

Miroslav Vuković, Mirjana Sanader, Ina Miloglav, Domagoj Tončinić, Joško Zaninović, Vinka Matijević, Mirna Cvetko, Domagoj Bužanić

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This research paper explores the application of a unique field survey approach designed to deal with site detection and interpretation in karst fields. The method has its limitations, and it is predominantly focused on detecting sites from antiquity because of the nature of the material remains left in the landscape from those times. Nevertheless, the approach provides a new layer of spatial information based on objectivity in contrast to the usual practices of archaeological reconnaissance. The general goals of the wider AdriaRom Project are described and the role of this particular case study in the wider survey within the scope of the project. Finally, the results of the field survey are presented and the efficiency and the drawbacks of the utilized methodology are discussed.

Keywords: field survey, ALS, antiquity, distribution, tegulae

Introduction

he Department of Archaeology of the Faculty of Humanities and Social Sciences of the University of Zagreb in the scope of the Croatian Science Foundation's project IP-2018-01-4934, Understanding Roman Borders: The Case of the Eastern Adriatic (AdriaRom), explores the archaeological remnants of Roman military infrastructure in the hinterland

of lader and Salona in order to ascertain whether or not these structures were components of a defensive border. For the purpose of conducting this research, test areas were chosen (the surroundings of the Roman legionary fortresses of *Burnum* and *Tilurium*, as well as the surroundings of the presumed forts (castella of *Promona, Magnum and Andetrium*) and a seven-step

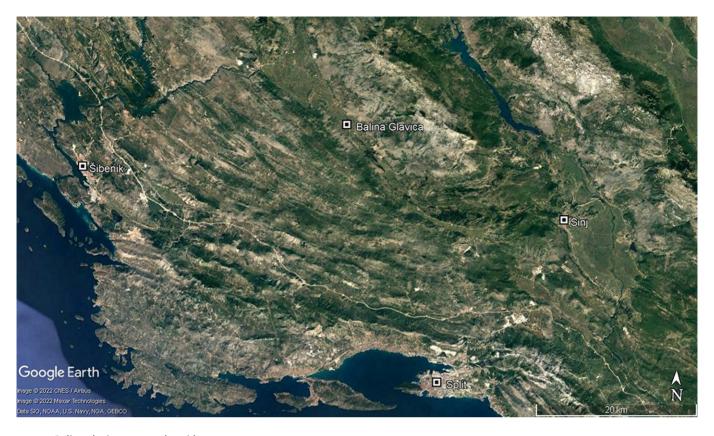


Figure 1. Balina glavica area on the wider area map.

methodological approach was adopted. The successful reconstruction of the defensive border first requires the establishment of the positions which may be assumed to have been military sites and then the formulation of structural indicators (roads, legionary fortresses, forts and sentry towers, moats, palisades, etc.). Two legionary fortresses (Burnum and Tilurium) are known in the hinterland of *lader* and *Salona*, and the existence of several forts between them has been presumed. Even though these forts are known from Roman-era literary sources, and their existence is backed by finds of epigraphic monuments, they were never archeologically excavated and their precise locations have yet to be pinpointed. Due to this current state of research, we conducted a series of ALS surveys aiming to discover traces of roman military infrastructure (roads, forts, watchtowers, etc.). Once we identified possible targets on the ALS data the second step was to conduct a field survey to confirm the identified features on the ground.

One of the main indicators of the presence of an archaeological site are large amounts of fragmented pottery and other material from the past visible on the surface. This material is in most cases deposited on the surface as a result of agricultural activities such as ploughing and field clearance. Although the ALS data revealed a number of potential roman forts during the field survey there was no visible material on the surface.

In the case of the archaeological site near Balina glavica situated in the Petrovo polje we had a completely contrary situation to the one above. Due to intense agricultural activity there were no identifiable features visible on the ALS data in the fields below the hill of Balina glavica.. Due to the fact that the site is situated near the Čikola river, it is susceptible to seasonal flooding, and ground water is commonly found in abundance in the fields surrounding Balina glavica. This fact limits the use of geophysical prospection and other corroborating methods and approaches should be explored. The common field surveying techniques of analyzing surface pottery finds are also not possible due to the fact that agricultural activities in the region have dropped significantly in recent years, and what were once ploughed fields, have now turned to heavily overgrown grass meadows. For this reason, we were forced to come up with a field surveying method focused on analyzing drywalls and clearance mounds, which could allow us to determine the approximate boundaries of the site.

The aim of this paper is to present our approach to surveying sites in karst polje where agricultural activity has seen a significant drop in the past few decades. The area that will be presented revolves around the site of Balina glavica (Fig. 1) in Petrovo Polje next to the Čikola river. The site itself is recognized in scientific literature as the probable location of the Roman municipium of Magnum situated at an elongated narrow strip of the Petrovo polje next to the Čikola river, leading towards the south pass to Central Dalmatia. Right next to the probable remains of the Roman Magnum lies a steep hill called Balina glavica which is categorized as a prehistoric gradina (hillfort) site. The landscape was subjected to major changes with land divisions and terracing which have subsequently changed the micro topography, and only a small number of archaeological features are visible on the ALS data. The site could provide important information regarding the Roman military actions in the area, Roman urbanization and the extent of the prehistoric settlement. Since archaeological prospection methods have given limited results in this area, our first goal was to try to define the extent of the potential sites and the results will be presented in this paper.

Previous research

Multiple smaller excavation campaigns over the years have confirmed the existence of Roman buildings (Zaninović 2000; Glavaš 2010) at the foothills of Balina glavica. In scientific literature the site is interpreted as the remains of the Roman municipium Magnum, which is confirmed by multiple epigraphic inscriptions¹ and the fact that the site is shown on Tabula Pointigueriana² (Glavaš 2011: 69). Large amount of archaeological material present on the drywalls and the clearance mounds are mentioned in THE literature (Glavaš 2011: 70) The drywalls themselves are in numerous places constructed from pre-shaped stones rather than the standard irregular stones. Although the former fields have mostly turned to grasslands there are large quantities of Roman building material (tegulae and imbrex) and fragments of Roman amphorae strewn across the drywalls serving as land divisions. This fact provided us with an opportunity to implement a field surveying methodology initially developed for another area in the Dalmatian Hinterland with a similar geological and agricultural backdrop.3 The

goal of archaeological field surveys is to gather information about the surface distribution of archaeological artefacts and reconstruct settlement patterns of the past (Sanader et al. 2021: 120). The traditional surveying methods where the archaeologist relies on intuition and assumptions was supplanted by a field survey approach that focuses on defining a predetermined research plan (Novaković 1996), which makes it a more systematic and objective method of gathering data. The methodology of this survey is based on the assumption that most of the archaeological material deposited on the drywalls is a direct consequence of field clearing, and that the material has been removed from the subsurface layers during the ploughing process. During the numerous surveys conducted in the wider area of Dalmatian Hinterlands it was noted that the quantity of material present on the drywalls and clearance piles is not always the same. This fact could have numerous explanations but one of the possible interpretations is that the amount of material present reflects the amount of archaeological material present in the surrounding land plots and in the direct proximity of the drywalls. It should be noted that the traditional field survey methodology was already applied in Croatian karst fields, but it deliberately targeted fields that are still being worked on today to achieve the desired results (Bintlif & Gafney 1988; Slapšak 1988; Čučković 2012). This field survey approach could be defined as a subcategory of intensive field survey where circles or grid squares are treated as survey points (Van de Velde 2001: 34). The approach of documenting scatters of small finds and material was previously utilized during surveys conducted in the Starigrad field where this methodology was instrumental in expanding our knowledge of landscape use in antiquity (Slapšak 1988). Some of the reasonings used in the 1984-1985 wall survey can be directly applied to our research area, namely, the concepts that the presence of material on drywalls is indicative of a nearby structure, and that in the case of low field surface visibility (meadow, olive field, abandoned arable land) walls and stone heaps could be the only places where the material is visible (Slapšak 1988). While systematic and intensive field surveys are primarily used as a survey technique within the context of landscape archaeology, our approach is more focused on answering the questions of spatial relations within a single "site", similar to research done on the hillfort Grad at Nakovana (Forenbaher & Rajić-Šikanjić 2006).

¹ CIL III, 6565 = 9798 = 14316, CIL III, 14957, CIL XIII, 6538.

² Tab. Peut, segmentum VI.

³ The methodology applied in this project was initially developed as a part of a PhD research by Miroslav Vuković, titled: "Archaeological prospection methods in karst landscapes: case study of the Muć valley"

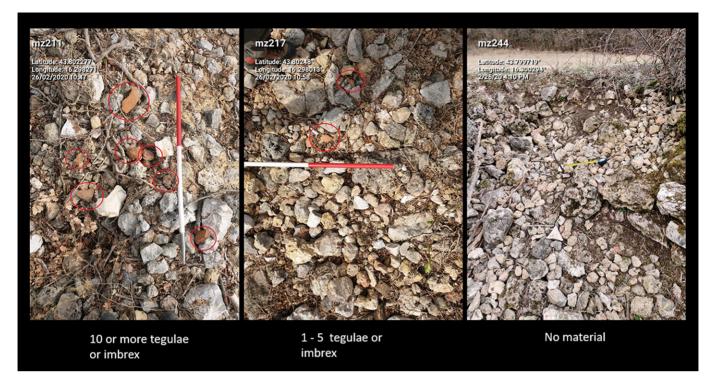


Figure 2. Different amounts of surface material present at the survey point. (Archive of the AdriaRom project).

Survey methodology

The initial research area was mapped out and it roughly amounted to the area enclosed by the modern D56 state road, Balina glavica and Čikola river measuring 0.51km². The project was prepared in QGIS where base maps, topographic maps of Croatia and aerial and satellite data were loaded. Additionally, we prepared a section of the Austro-Hungarian cadastral survey of Dalmatia from the 19th century for comparison of land divisions. One of the most obvious limitations of this survey method is that we are constrained by the number of drywalls and clearance mounds present in the field. Where the prevalence of drywalls stops our data also reaches its limit but this does not necessarily reflect the layout of the subsurface archaeological layers. In other words, the site could extend beyond the area where the drywalls are present but our methodology limits us from observing this in the field. By laying out a relatively even grid of survey points on the drywalls present in the field and maintaining proximally equal spacing between the survey points we got a relatively representative sample to work with. The survey points were chosen in a random selection while trying to maintain a relatively equal distance between individual points. This selection served

as a guide for choosing survey points in the field which were usually removed from their original location due to the accessibility of the individual drywall section and the dense vegetation that covers most of the surfaces. Each point designated by the field survey methodology was surveyed and the amount of archaeological material in a 2m radius was counted and recorded. The section of the drywall where the survey was conducted is described and the visibility of the drywall itself is introduced as a factor because some parts of the drywalls are covered by dense vegetation.

A photograph (Fig. 2) is taken of the surveyed section as well as a control GPS point. Most of the material finds are left on site, and only a few pieces of indicative and diagnostic material are gathered for further processing (Fig. 3). The fieldwork was organized in four teams consisting of two people. Each team had a map of predetermined survey points visible on their mobile phone along with all the other necessary equipment for recording the data in the field. The fieldwork also included recording data with respect to the type of surface we were surveying (e.g. drywall, clearance pile), and a subjective as-



Figure 3. A selection of material gathered during the field surveys. (Archive of the AdriaRom project).

sessment of the visibility. The survey was conducted in winter (February) when the foliage is at its lowest. Visibility was determined on site and valued by percentages from 50% - 100% where 50% represented the worst conditions (large amounts of vegetation and dry leaves covering the surveyed section of the wall), and 100% represented the best conditions (walls and clearance piles completely free of vegetation and leaves).

Results

During the field survey, large deposits of Roman pottery and tegulae were found on the drywalls and stone mounds which were created as a consequence of land clearance. These factors point us to the presence of a large archaeological site dating back to Roman times. A small amount of surface finds was gathered which were all attributed to the Roman period and consisted mostly

of tegulae, imbrex and some amphorae fragments. Most of the finds fall into the category of Roman building material (tegulae and imbrex), which is expected since that type of material is large enough to pose a problem to the farmers who probably removed it from their soil during the ploughing process. The smaller material such as pottery fragments wasn't as big of an obstacle for the farmers and their presence on the drywalls is significantly smaller than the presence of larger materials. The second limitation of our methodology becomes obvious at this point as the process itself is heavily biased toward material deposits from antiquity, and if a site is multilayered horizontally or vertically most other material remains will not show up in our surveys simply because they weren't large enough for the farmers to remove. After data processing and transcribing the field survey data to a QGIS attribute table, we were able to visualize our survey in the vicinity of Balina glavica. More than 250

Figure 4. Visualization of survey points with heatmap visualization zoomed in and individual survey points with extrapolated results are visible. (Made by: M. Vuković).



GPS points were recorded during the survey. The survey points with their attribute data reflecting the amount of material present at each location were visualized in a heatmap style (Kernel Density Estimation, QGIS 2022) overlaying the base maps for the area. The amount of material was categorized into five distinct categories:

Amount of surface material present	Heatmap intensity
0 fragments	0 (transparent)
1 – 5 fragments	1
5 – 10 fragments	2
10 – 15 fragments	3
15+ fragments	4

Table 1. Amount of surface material present divided into five categories for the heatmap visualization.

The heatmap visualization itself was tweaked to show the points where the value is zero as completely transparent and the subsequent categories with an increasing amount of material as a shifting colour from orange to red. The optimal view for the visualization is when the entire survey area is visible as a whole dataset because the detailed view provides only a small heatmap surrounding individual points where the material was detected (Fig. 4).

The final distribution of material covers an area of approximately 18 ha and it is concentrated around the eastern part of the site while the first slopes to the south and the east have shown little or no material present. The distribution also suggests that the site extends from the base of Balina glavica toward the Čikola river, but the drywalls abruptly end along the way and the only confirmation of this hypothesis comes from a single ploughed field next to the river where fragments of pottery and tegulae were found. The river also represents a natural boundary which was probably used during antiquity. The heatmap also revealed a higher concentration of archaeological material in a small radius at the center covering an area of 1 ha (Fig. 5). The higher concentration in this area could point to the possibility that the center of the Roman municipium was situated at this location.

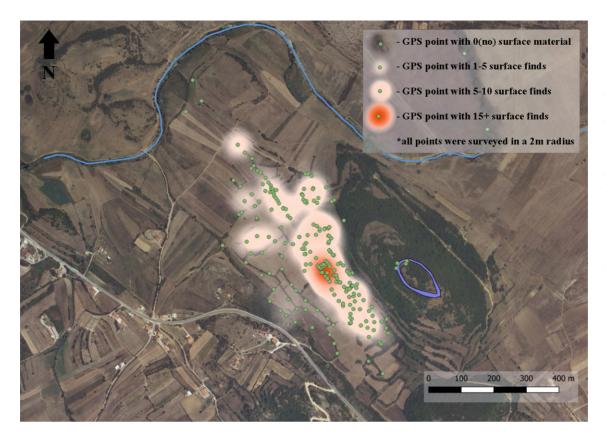


Figure 5. Final distribution overlayed with survey points represented by green dots, a quantity of surface finds within a single survey point is expressed by the strength of the heatmap colour ranging from transparent to deep orange. A possible prehistoric terrace identified on ALS data is marked in purple on the Balina glavica hill. (Made by: M. Vuković).

Additionally, a short reconnaissance was undertaken at the hill of Balina glavica as well. The site is mentioned in literature as the possible location of the Dalmatean settlement of Synodium (Kos 2002; Glavaš 2010) and in the 19th century a small hoard of Celtic coins was found on the site potentially proving the importance of the site as a place where either trade or travelers have brought the coins (Kos 2002.) The entire hill seems to be terraced with large drywalls whose exact origin is hard to place in time. The terracing could be a consequence of more recent agricultural activities or alternatively, they could represent the remains of prehistoric terracing related to the proposed prehistoric settlement situated on the hill. The fact that the modern and 19th century cadastral plans show little evidence of field divisions on the hill could point to the fact that at least some of the terracing could potentially be of prehistoric origin. If that is the case the prehistoric settlement at Balina glavica could be the location of a major prehistoric settlement with an approximate surface area of 4 ha. Besides the terracing, the most prominent feature visible on the ALS data at the site are the ditches and dug-in bunkers from the 20th century conflicts which left their trace in the area. One of the dug-in bunkers revealed the stratigraphy of the archaeological layers beneath 30cm of topsoil and numerous finds of fine, black and ornamented prehistoric pottery. The pottery was found in the northern ditches as well as the southern ditches on top of the hill. Unfortunately, besides the bunkers and the trenches, there is no other obvious way to reach the archaeological material underneath the topsoil besides digging. A magnetometer survey should be considered as a possible technique to extract as much information as possible before proceeding with actual excavations.

Discussion and conclusion

The field survey approach described above aimed to determine the possible extent of the Roman site at the foothills of Balina glavica. The data seems to show obvious boundaries in material distribution suggesting an absence of subsurface archaeological layers dated to antiquity to the east, the south and the west of the proposed settlement center. The boundary to the north reaching up to the Čikola river is less clear since it was not a consequence of a lack of material present on the drywalls but rather a consequence of an abrupt end to drywalls present in the field. The question of the correlation between the distribution of Roman building mate-

rial on the surface and the actual building remains in the subsurface soil is still open. It could be argued that some of the material present on the drywalls was dispersed and that the wide distribution is a consequence of agricultural activity, but this argument would have more merit in landscapes where the division lines between fields aren't physical as is the case with drystones in karst fields. The best method for corroborating the distribution data would be to conduct a wider GPR survey of the site, but the effect and presence of the large amounts of underground water detected at the site could potentially affect the results of such a survey. This field survey approach is limited by a few factors which need to be taken into account when utilizing this method.

- 1/ The survey area is limited to areas in karst polje where drywalls and clearance mounds are present
- 2/ The method completely excludes archaeological data related to time periods older than antiquity
- 3/ The material distribution should be corroborated by at least one other independent archaeological prospection method

It is our opinion that this method can provide a good starting point for determining the extent of Roman sites detected in karst fields. It could serve as a base map for further research and it should ideally be combined with another archaeological prospection method. Nevertheless, the method presented in this paper did provide us with another layer of information pertaining to the extent of the Roman site at the foothills of Balina glavica despite the fact that the fields have been transformed to grasslands. This transformation of karst fields is especially evident in Dalmatian Hinterlands where an increasing number of people are leaving the rural landscapes and moving to the coastline, which leaves us with landscapes that were at one point transformed by agricultural activities but are now overgrown with dense vegetation and the land is no longer actively worked on. Since the trend of depopulation and decreased agricultural activity has only been increasing in recent years it is evident that the development of these types of methodologies could prove crucial for further archaeological research in the karst landscapes of Dalmatian Hinterlands.

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CIL - Corpus Incriptionum Latinarum, Berlin.

HD – Epigraphische Datenbank Heidelberg (Heidelberger Akademie der Wissenschaften; http://edh-www.adw.uni-heidelberg.de/home)

Source

Tab. Peut, segmentum VI.

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