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New Considerations on Spatial Analysis in the Research of Early Medieval Landscape: the Case Study of Bale region in Istria (Croatia)

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The results of the archaeological research of the monastery complex of St Mary the Great near Bale in Istria (Croatia) have greatly contributed to our understanding of the Frankish expansion along the Istrian peninsula at the end of the 8th century. A quarter of a century of the research has been followed by the evolution of research and documentation methodology. In the recent period, the team has been more intensively focused on the archaeological interpretation of the surrounding region in the context of landscape archaeology, and the study of the research potential of various historical cartographic sources for future archaeological research. Although the area of the research is geographically limited, such perspective permits us to reconstruct the original features of the landscape which have persisted in the landscape and have formed a medieval spatial network of the area between the monastery of St Mary the Great and Bale settlement. The objective of this paper is to present the results of spatial analysis of this area carried out at two levels - macro and micro - through the use of geographic information systems, as well as to discuss the research possibilities offered by the ever-growing datafication of the various cartographic material.

Keywords: *historical landscape, landscape archaeology, spatial analysis, Istria, St Mary the Great, centuriation, Early Middle Ages*

Introduction

The monastery complex of Saint Mary the Great (Sveta Marija Velika, Fig. 1) near Bale in Istria is an archaeological site which has greatly contributed to our understanding of the Frankish expansion along the Istrian peninsula at the end of the 8th century (Jurković et al. 2008; Jurković and Caillet 2008; Jurković et al. 2009; Jurković and Caillet 2011). A quarter of a century of systematic research, led by the International Research Center for Late Antiquity and Middle Ages (IRCLAMA – University of Zagreb) and its director Miljenko Jurković, has been closely followed by the evolution of research and documentation methodology.

Figure 1. Monastery complex of St Mary the Great near Bale, aerial photo. (Photo: I. Kranjec).

The long-lasting and complex workflow of the research of such a significant site can be divided into three main phases. After the completion of the excavation of the early medieval church (atop of which today stands the late 18th century building) with extraordinary finds of early medieval sculpture, the team has turned its attention to the research and the immediate conservation of the quadrangular outer perimeter of the monastery complex, as well as the monastery chapel located in its southwestern part. With the second phase of the research having been almost finished, the preparations for the execution of the final stage - that is, the research of the interior of the monastery complex (the cloister and the interior of the buildings) - began in 2019. However, due to global circumstances the research team had to reorganize its research strategy, and, instead of field excavation, started a revised and more profound study of the monument's position in the context of the archaeological landscape, as well as the study of the survived surrounding spatial features which could be dated to the medieval, or even earlier periods. A more complete understanding of the spatial context of the monastery complex would most certainly expand our knowledge of the role the monastery had in the medieval period in Istria and could even contribute to the comprehension of the historical transformations of the Istrian landscape in general.

This paper will present the results of the archaeological interpretation of the surroundings of the monastery complex and the area around the historical settlement of Bale, realized primarily through the desk-based spatial analysis using geographic information system (henceforth GIS) where numerous cartographic sources (historical and contemporary) were analysed and compared with archive data and spatial data acquired in the field. The main objective of the archaeological interpretation is to examine if the selected sources are dependable enough to draw conclusions relevant for further archaeological research of the site and the surrounding area, and if it is possible to reconstruct some features of the landscape which have persisted and have formed a medieval spatial network of the area between the monastery of St Mary the Great and Bale settlement.

Theory: Approaches to the study of Istrian landscape

More than a century of extensive studies of the Istrian landscape have helped the process of a slow transition from a site-oriented approach towards a contemporary post-processual landscape-oriented approach (Novaković 2008: 39-40; Campana and Piro 2009). In the recent period, more and more scientific initiatives implement state-of-the-art technological tools which speed up the processes of documentation, analysis, and interpretation of the historical features of the landscape. Together with the contemporary practices in archaeological and spatial data organization and analysis, advanced trends in spatial data acquisition, such as the use of LiDAR data (although it could be argued that in 2022 it is far from new; for more, see Štular 2022: 111-114), are also being followed in the research of Istrian archaeological sites (Čučković 2015; Matijašić and Gerometta 2018; Bernardini and Vinci 2020; Popović et al. 2021). Such technological tools for 3D spatial data acquisition, which are yet to be implemented in the research of the area surrounding the monastery, offer us data of outstanding precision and objectivity, so much in fact that they have already transformed the field of landscape archaeology.

Aware of the fact that this is not the place to enter deeply into the explanation of each of the methods used in the field of landscape archaeology, it is our intention to mention several methods that were considered and used in our research, but also some of the methods that are to be applied in the future (more on the question of the contemporary methods and approaches see in Kluiving and Guttmann-Bond 2012; Remondino and Campana 2014; Kokalj et al. 2018; Gillings et al. 2019; Howard et al. 2019; Harvey and Wilkinson 2019; McKeague et al. 2019). The question of scale has been present in the discourse of landscape archaeology from the mid-20th century when the well-known concept of the basic levels of scale: 'macro', 'semi-micro' and 'micro' was thoroughly explained by D. L. Clarke (1977: 9-15) and then complemented in the following decades (see Campana 2009: 5-7). Each of the scale perspectives carries its own wide range of survey methods and technologies, from the aerial photography (both vertical and oblique), satellite imagery and airborne scanning (including today's almost indispensable multispectral and LiDAR data acquisition) to the more 'down to earth' methods such as the non-invasive geophysical methods and the more traditional surface collection survey but also the invasive ones, much needed when the (non)visibility conditions do not allow any other method and/or when it is necessary to better understand the studied material and its immediate spatial context. In our case, the usage of aerial photography is of exceptional value, especially when we are able to compare historical and recent datasets. Furthermore, both aerial and terrestrial photography allows us to continue with the photogrammetric processes accompanied by 3D modelling and the reconstruction of the studied materials. In the latter case (if not always) it is necessary to establish and understand the final objective, the purpose of the survey which consequently determines the scale level.

It is important to point out that in the case of the monastery of St Mary, traditional methods such as field survey could have not been fully implemented until very recently due to the fact that the majority of the surrounding terrain has been completely covered with very dense vegetation. The millennia-old forms, landscape patterns and features, which had shaped our perception of the traditional agricultural Mediterranean landscape, have been hidden by the dense vegetation during the period of the abandonment of traditional agricultural activities in the last decades of the 20th century, which is a phenomenon typical for the Adriatic and wider Mediterranean region. (Gams and Gabrovec 1999; Aničić and Perica 2003; Serra et al. 2008; Walsh 2013; Quintas-Soriano et al. 2022). Together with arable land, pastures and karstic ponds (*krške lokve* in Croatian), which served as the main agricultural resources of the area, a variety of man-made features have also been hidden under the vegetation canopy. The logical step in the continuation of the research would be the engagement of the LiDAR in order to document what is now undetectable. However (and while awaiting the results of the extensive LiDAR survey of the territory of Croatia) it is often that we tend to disregard other widely available sources which, albeit much more limited, can also be very helpful in the study of landscape and its historical transformations.

In the previous research which has been trying to define the traces of historical sites and infrastructure ramification of Northern Adriatic region, a systematic and comparative study of historical and contemporary cartographic material through the GIS platform has demonstrated its usefulness and has provided excellent results (Jurković 2019; Kranjec 2021). It is why we have decided to present the results of the implementation of a similar method here, on the case study of the Bale region, with a focus on the research potential of the use of 19th century cartographic material. While the use of contemporary base maps is obvious, as well as the use of archaeological documentation, the question if historical elements of the landscape, some of which have survived

in their traces for more than two millennia, could be observed through the prism of historical cartography - and observed with a level of relevance sufficient enough for the contemporary study of archaeological landscape - may seem challenging at first. For a successful interpretation of cartographic content, it is also necessary to be able to decode meanings, methods and norms which the cartographer followed and respected in his intention to represent physical space (Hodgkiss 1981; De Silva and Pizziolo 2004). Yet the limitations of the time when such sources were made - for example, the lack of planimetric precision, insufficient scaling or a substantial lack of geographical content - often limit our possibilities to analyse smaller elements of landscape, much needed in order to understand delicate long-lasting transformations of space. The answer to this question lies in a systematic quantitative and qualitative assessment of the cartographic content.

It is important to emphasize that the novelty of such an approach does not derive from the use of the historical material itself. Numerous researchers from different disciplines have already included it in their research, even before the cartographic content was digitised and made available to the public through various online services (for example Štular 2010; Slukan Altić 2016; Zupanc 2020). Yet there is a difference which we would like to point out, generated by the omnipresent processes of digital transformation in humanities. It is the depth of analysis of the historical material, as well as the wide array of materials used (digitised sources, spatial and attribute data), which has been made possible through the use of digital tools. Furthermore, it is the relatively recent large-scale datafication of the material itself which offers new possibilities and makes the research process much more efficient.

Methodology

A significant portion of research work carried out in the period 2020-2022 was based on the archaeological interpretation (for a detailed definition see Lozić and Štular 2021) and the desk-based assessment of the available cartographic and other sources. The main difference from the study carried out during the initial stages of the research of the site in the 1990s is the sheer availability of different data, as well as the fact that the material has been digitised and is ready to be computer processed. The first step of the archaeological interpretation carried out during the most recent research period was the integration of all available data sources in GIS (QGIS 3.16-3.22). The data used for analysis was based on the assessment of the possible information it could offer for the realization of the other objective of the work, which is the valuation of the research potential for future archaeological work. The data used for the research presented here can be divided into following groups:

1) Contemporary cartographic sources: contemporary topographic map (*TK25*, scale 1:25000); Croatian base map (*HOK*, scale 1:5000);

2) Digital orthophotos of Croatia: digital orthophoto from 2018 (*DOF5*, scale 1:5000); historic orthophoto from 1950-1968, digitised by the State Geodetic Administration of the Republic of Croatia (*DOF68*, scale 1:5000);

3) Digital elevation data: STRM (NASA *Shuttle Radar Topography Mission*) v3 30m dataset; EU-DEM v1.1 digital surface model dataset;

4) Contemporary Croatian cadastral map;

5) Historical cartographic sources: topographical map of the 2nd Military Survey of the Habsburg Empire (*Franziszeische Landesaufnahme*, scale 1:28800) available through the Mapire.eu portal (Biszak et al. 2017: 204-208); cadastral map of the 2nd Military Survey (scale 1:2880, see footnote in chapter 4.3);

6) Digital orthophotos and digital elevation models of the monastery complex made from aerial and terrestrial photogrammetry in the period 2014-2022;

7) Digitised planimetry of the St Mary the Great archaeological site (1995-2019);

8) Roman centuriation schematics (after Bulić 2012; Bernardini and Vinci 2020; Popović *et al.* 2021).

The data integration served as a basis for interpretative mapping of various spatial features that could be detected from the cartographic sources from the 19th to the 21st century. This 'spatio-temporal' dimension (to cite the phrase of Eduardo Boria; see Boria 2012) spanning across two centuries must be taken into account because their comparison can demonstrate the extent of the transformations the area has survived since the beginning of the 19th century. The appearance and position of the digitised spatial features would then be compared to known historical and archaeological data so that any eventual patterns of spatial distribution could be detected and interpreted. This interpretation is the final step of our research. In order to achieve that objective, four main categories of spatial features were to be analysed: 1. built objects documented on maps (sacral and housing objects, objects for various economic purposes); 2.

communication lines (roads, pathways etc.) and linear structures (drywalls, field boundaries); 3. areas of exploitation (fields, pastures, forested areas, built areas); 4. various other points of interest (e.g. water sources).

It is important to emphasize the different scales used in the analysis. The broadest, macro perspective would focus on the entire wider southern part of the Istrian peninsula, where the general positioning of the sites in the landscape can be observed (e.g., in relation to the general morphology of the terrain, coastline, main communication lines etc.). The second scale of the study aims at the smaller area from the western surroundings of the monastery to the area east of Bale settlement. The second, micro scale, takes into account more direct relations between various spatial features, such as the relation of a single object in the landscape - in the case of this paper the monastery (with a total area of around 2500 m2) - with its immediate surroundings.

Discussion

The work will be presented through three specific research questions, all of which follow the basic premise of multi-scaled perception of space through digitised cartography.

Accuracy assessment of the 19th century topographical maps

The geopolitical importance of the Istrian peninsula has secured its continuous inclusion in relevant cartographic works throughout history, from the earliest known classical sources to the later medieval, early modern and modern accomplishments (Altić 2013; Kozličić 2005). However, it was not until the second half of the 18th century when the first systematically applied topographical survey with an established mathematical basis was carried out. It is the First Military Survey of the Habsburg Empire (the *Josephine* survey) which has resulted in the production of detailed topographical maps in scale 1:28800. The scale was based on historical Austrian measurement units, *zoll* and *klafter* (1 *zoll*, or 2.63 cm : 400 Austrian *klafters*, or 758.6 m, which corresponds to the metric scale of 1:28800; Slukan Altić 2003: 144). The maps featured an unprecedented level of detail of geographical content. However, because of their mathematical deviation, a direct comparison of the historical and contemporary content is significantly limited.

Precisely because of the lack of precision, the Habsburg Empire conducted the Second Military Survey (the *Franciscan* survey) at the beginning of the 19th century, which was finished in 1869 (Slukan Altić 2003; Timar et al. 2006). It resulted in two outputs of great value for our research. New, much more precise topographical maps were created, respecting the same scale. The sheets covered all the territory of the then-Empire, and for the first time, the entire area of the Istrian peninsula has been included in the survey (Slukan Altić 2003; Timar et al. 2006). The scale let the surveyors show the majority of important housing, sacral or public structures. The road network has not only been shown, but it included the categorization of land communications. Basic categorization of vegetation has also been applied (forests, cultivated fields and grasslands, even the boundaries of agricultural parcels). The relatively precise terrain imaging was done through the method of hatching. Another useful feature is the extensive toponymic content, sometimes referring to objects which today are not known.

Because of the precision and the quality of the geographic content, a single Franciscan topographical map sheet was chosen in order to study if the geographical content documented in the 19th century could be relevant and precise enough for a contemporary spatial analysis of the area and the definition of archaeologically significant spatial features in the landscape. The chosen map sheet *Königreich Illyrien, Küstenland, Istrianer Kreis. Section N16 Colonne NIV* (as stated on the sheet) was made in the period 1821-1824 (the exact year of production has not been written). It measures 63x42 cm (24x16 *zoll*) and shows an area of around 210 km^2 in scale 1:28800. **(Fig. 2)** The fact that the settlement of Bale is positioned at the very centre of a map sheet showed to be very convenient for the research.

The first step was to assess its geographical relevance by conducting a quantitative analysis of specific features which are expected to be seen both in the landscape and to be depicted on the map. Churches were chosen as the most prominent landmarks of the 19th century rural landscape. The digitised sheet was rectified and georeferenced in the Croatian HTRS96 coordinate reference system, using the coordinates already available via map browser on the *Mapire* online platform (for an alternative approach, see Štular 2010: 88). Finally, it was inspected visually so all the symbols which depicted churches could be found, vectorized and joined with attribute data (17 categories in total, so the later classification could be carried out).

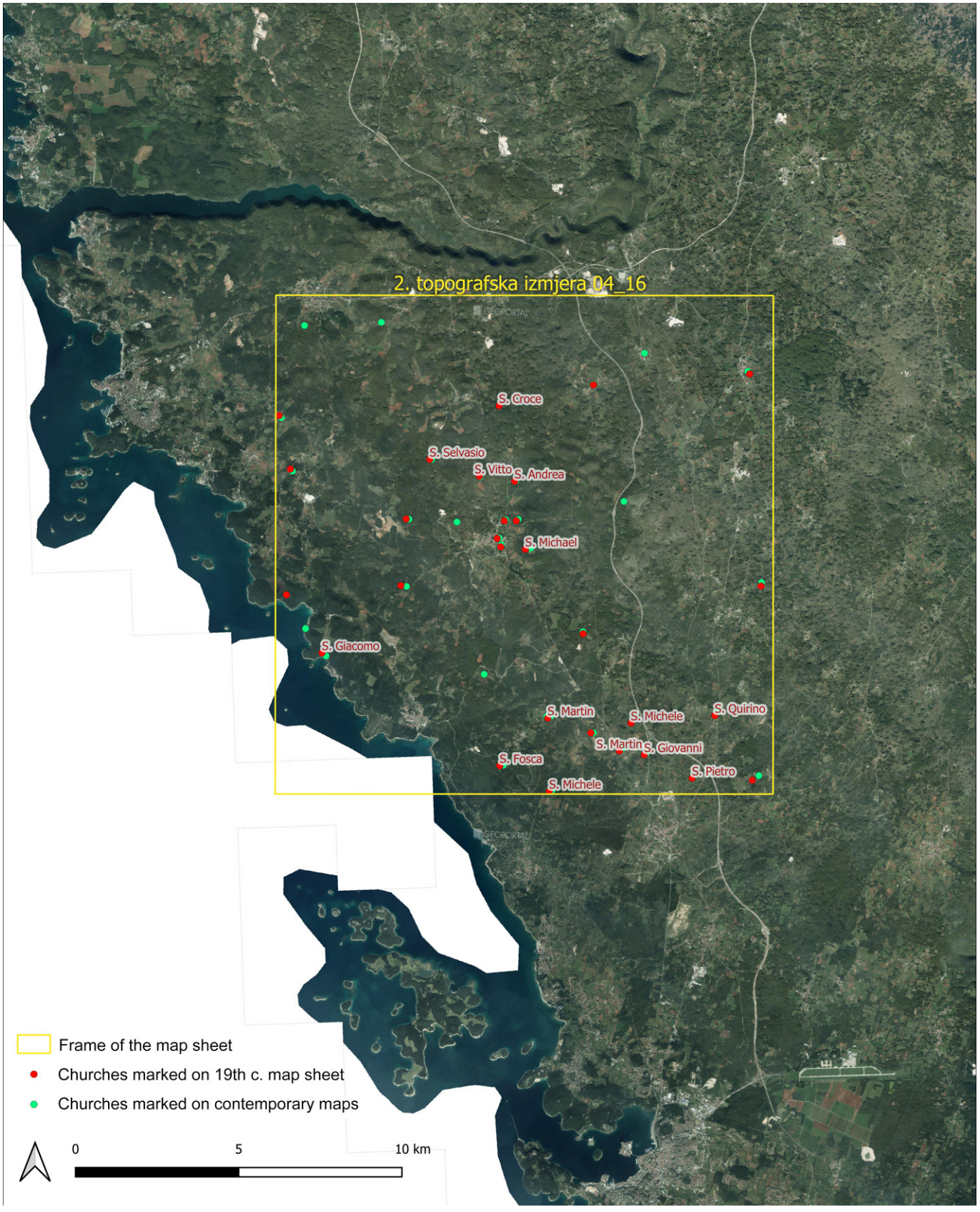

Figure 2. Area of research (step 1). Frame of digitized 19th century topographical map sheet.

Figure 3. Examples of church symbols found on 19th century topographical map sheet

This has resulted in finding 32 churches clearly documented in the 19th century on a single sheet. As opposed to the later cartographic achievements, the maps of the 2nd survey still feature a certain level of subjectivity (or a lack of uniformity?) which is shown by the heterogenous depiction of church symbols. (Fig. 3) There are different interpretations of this problem, such as the methodology of the original survey, state of preservation of built objects and their possible use, subjective interpretation of the situation in the field of specific surveyors and/or information the surveyors were given by some local informants. It is important to have in mind the key fact that the central interest of the 19th-century surveyors were features which could be useful for military purposes. Only the features which were important for the movement and the offensive or defensive actions of the army troops have been precisely surveyed and mapped, as opposed to the other contextual landscape features and subjective additions (Štular 2010: 87). Furthermore, names standing beside the positions of the church (15 of them on the map sheet) - could imply whether the church was in use or recognized by the people then as a place of cult. If we compare the documented sacral sites to the ones presented in the contemporary cartographic sources, we find that the geographic content is indeed relevant enough. The contemporary maps show only 7 more or 39 churches in total. With the presumption that all of them were in some form standing there 200 years ago, this shows that 82% of today's known sacral objects were documented by the old cartographers. Even more interesting is the precision of their accomplishment. If we simply calculate the average distance of the location of the churches documented in the 19th century from their real positions, we come to a median of 103 metres. In some cases (e.g., church of St Eliseus in Krmed), the error measures only around 30 meters which is precise enough to be able to consider these maps as a relatively reliable source for a field study.

Analysis of the road network

Having established from the analysis of the depiction of sacral objects that the information provided by the 19th century sheet indeed corresponds to the contemporary sources to a great extent, it was possible to move to the next, scaled-down and more precise step in the research. The objective here was to investigate the credibility of the land communication network and to compare the geographical content of the old maps with the contemporary ones so the rate of the transformation of the rural landscape around Bale could be established. For this purpose, a smaller rectangular area of research was established, measuring 11 km^2. (Fig. 4) As opposed to single points in the landscape from the first step (churches), the communication lines serve as both physical and symbolical links between places of activities, areas of interest, even societies (here the term "line" encompasses both roads and routes, even "corridors of movement"; for the differentiation, see e.g. van Lanen et al. 2018: 1038). The understanding of the development of such lines of movement across the landscape can be of great benefit for our understanding of the historical transformations of the society in general since they are a direct reflection of individual and communal practices and are directly related to the physical places of human activities.

Here as well the study started with the vectorization of the features of interest on the topographical map sheet (*Section N16 Colonne NIV*, see the previous chapter), i.e. the land communication lines. It was possible to digit-

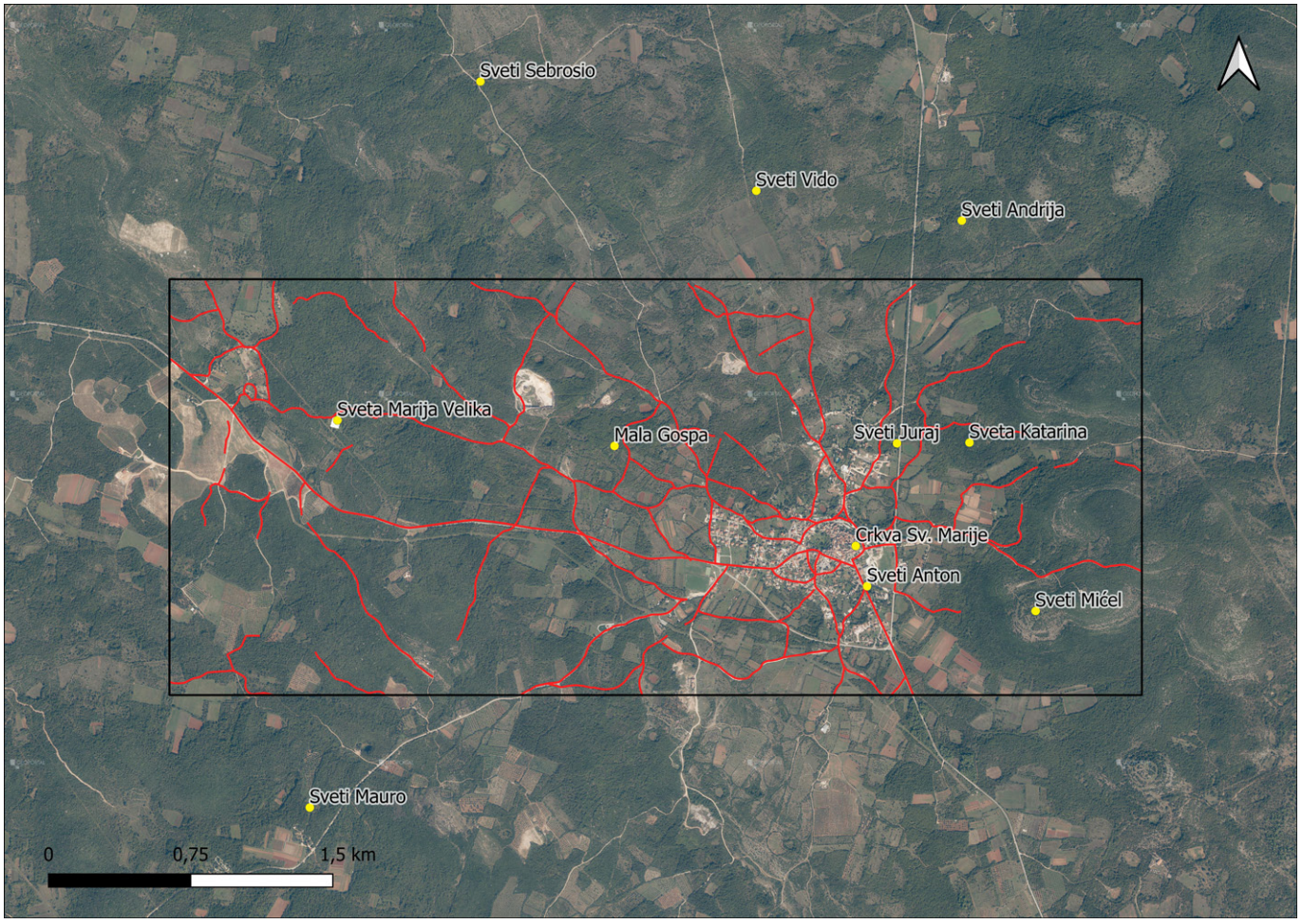

Figure 4. Area of research (step 2). Road network from 1968 ortho marked in red. Base map: ©DGU RH.

ise a total of 45.9 km of communication lines - paved roads, dirt roads, field trails etc. The depiction offers the possibility of differentiating types of roads according to their state and width. Since one of the main purposes of the topographical survey was its use in the military, such insisting on the precise depiction of possible corridors of military movement does not surprise. (Slukan Altić 2003: 181) The next step was to try and recognize the same roads, or paths, on the contemporary available map sources. However, since the flourishing vegetation is a phenomenon characteristic for the recent period of the last 50 years or so due to the abandonment of traditional agricultural activities, the orthophoto image used for the direct comparison of the land communication network was not the contemporary one (*DOF5*), but the one produced from 1950 to 1968 in scale 1:5000 (*DOF68*), which shows the state of the landscape before the transformations of the 20th century. The main objective of this step was to confirm how much of the paths documented in the 19th century could be recognized on the orthoimage from the 20th century. Digitised road network extracted from the black and white orthoimage shows almost 42 kilometres of roads and paths, which overlap with the 19th century ones rather precisely, with a medium error of some 75-100 metres. (Fig. 5) The fact that in the second half of the 20th century it was still possible to follow over 90% of the roads visible on the 19th century maps confirms the assumption about the minimal changes of the rural landscape which have occurred in that period of time. Most of the roads can be traced down easily, by following then-existing dirt roads or the modernised ones, but sometimes it is possible to track the historical road only when it is indicated by vegetation or a drywall. During the process, some distinguishable archaeological features, such as the immediately recognizable concentric structures of Istrian hillforts, could be followed to a

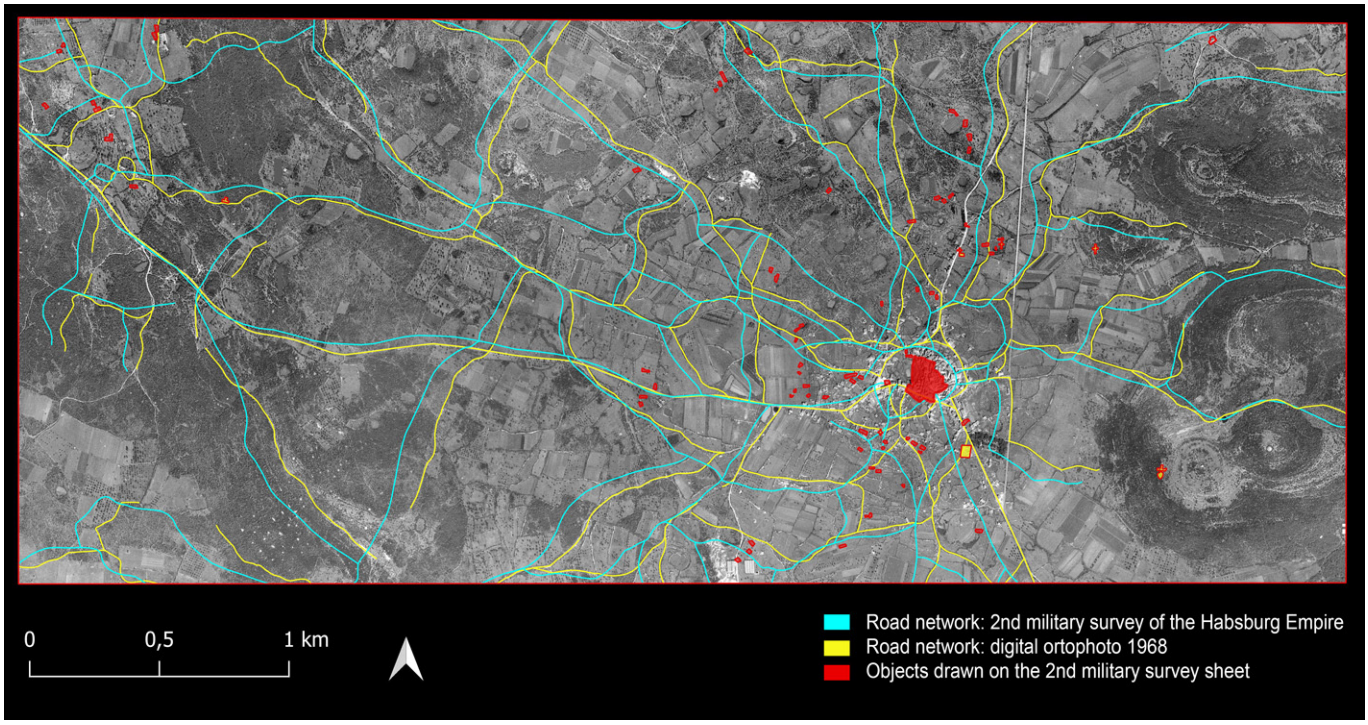

Figure 5. Comparison of digitized land communication lines. Base map: ©DGU RH.

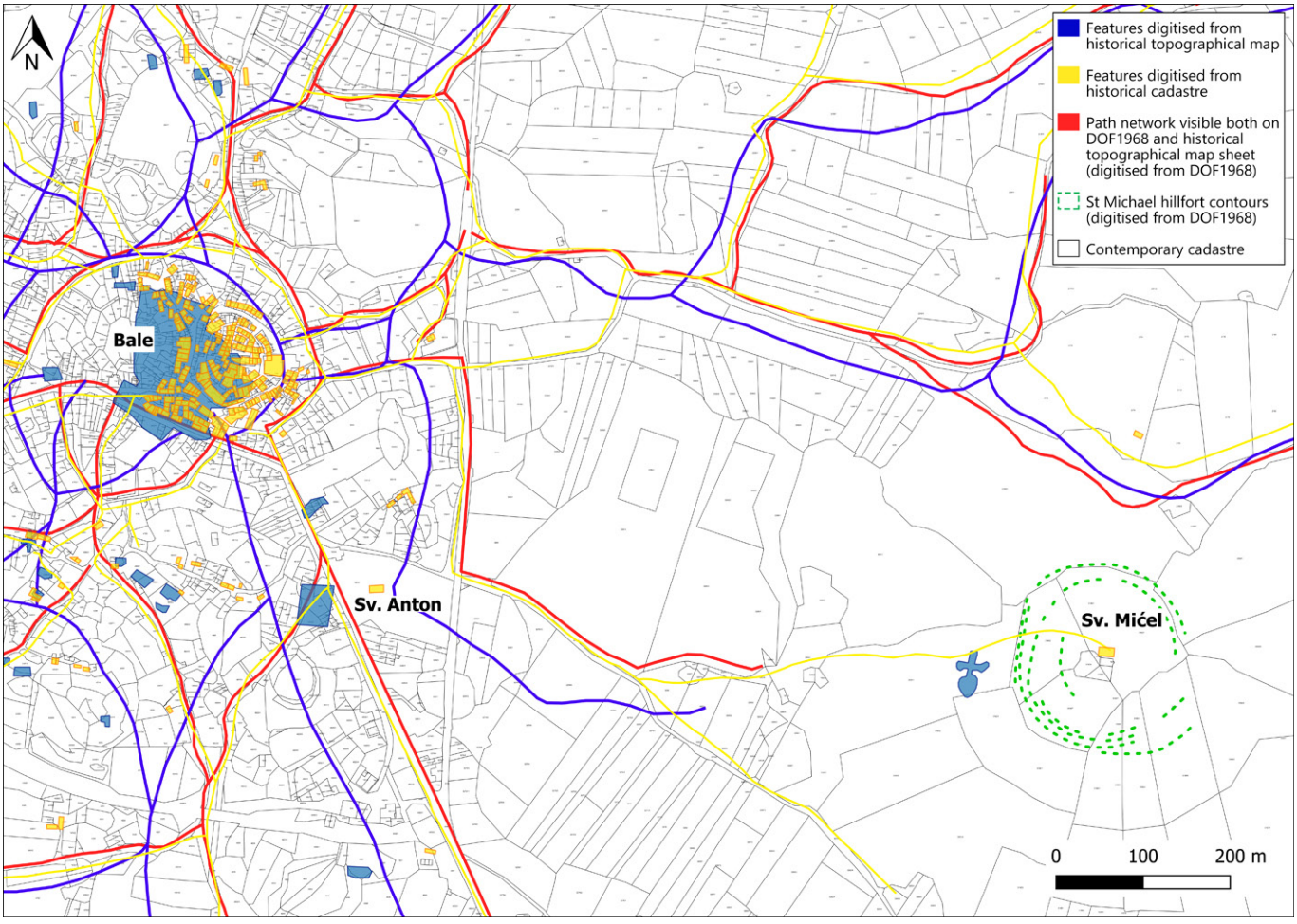

Figure 6. Comparison of road network and other digitized features east of Bale settlement.

great measure on a historical orthophoto (see the example of the St Michael/Sv. Mićel hill east of Bale, Fig. 6). However, it was possible to recognize only 65% of the same 19th-century network on the contemporary orthophotos (and only after the comparison with the 1968 orthoimages). The same applies for other Croatian base maps, such as topographical map 1:25000 where a great number of old communication lines can be followed only partially or following the basic land division (by drywalls for example). In some cases, such as in the area around St Vitus and St Andrew north of Bale, this historical network has completely disappeared in the last 50 years, as well as the original spatial context of these medieval churches.

Spatial analysis of the area surrounding Bale

The final and the most comprehensive phase included the results of the previous two steps, as well as the analysis of the additional geographic material. It is the second great accomplishment of the 2nd survey – a detailed cadastral layout in the scale 1:2880, started in 1817 (Slukan Altić 2001; Altić 2021). Although the geographical relevance of the topographical sheet has already been presented, its scale does not permit the depiction of the smallest features which hide a great potential for archaeological research. That is why cadastral sheets were used for a more detailed analysis of the spatial features in the area between the monastery of St Mary the Great, the settlement of Bale and the hill of St Michael east of Bale.[1] The preliminary comparison of the two sources shows the difference between the quantity of the geographical content which could be digitised: inside the rectangular area of research measuring 11 km^2, a total of 78 buildings outside the Bale settlement could be distinguished on the topographical sheet (the depiction of the urban raster is not adequate due to the scale). The cadastre shows a total of 384 buildings (240 in Bale, 144 outside its urban perimeter). Furthermore, a total length of land communication lines which could be digitised from the historical cadastre measures 50.55 km, and the length of the lines from the topographical sheet measures 45.9 km. This is, however, yet another confirmation that the two sources were created with different objectives in mind, and that any attempt of analysis - especially a direct comparative one – should not overlook the original context of their creation.[2]

While the previous two examples of the analysis were based on the quantitative approach, where the results served primarily for the confirmation of the quality of the sources, in this final phase a qualitative interpretation of the spatial features, their organization and distribution took place. Here the central question concerned the relation between the known archaeological sites and historical buildings (primarily churches and Bale settlement), road network, land division and the morphology of the terrain. But before such consideration could take place, it was needed to introduce another vital element into the equation – our understanding of the Roman centuriation system, which has, in many ways, formed the practices of land exploitation until today. The question of the Roman centuriation in Istria has been dealt with by a number of prominent scholars (Matijašić 1988; Starac 2000; Marchiori 2009; Bulić 2012; Bernardini and Vinci 2020; Popović et al. 2021), and we are still reconstructing the network of the land division which has transformed the previous life centred around the hillforts. Although the centuriation scheme has been partially reconstructed (Bernardini and Vinci 2020; Popović et al. 2021) (Fig. 7), the observation of all the input data from our research and the relation between the detected spatial features and the morphology of the terrain shows some interesting details which have not been interpreted so far.

The simultaneous implementation of the macro perspective (in this case, the consideration of the whole Istrian centuriation scheme) and micro perspective (the analysis of single isolated objects) offers us the possibility to reach some new conclusions, or at least to open new questions for future research. The first one is related to the position of the monastery complex of St Mary the Great. It stands on the road that connects Bale settlement with the town of Rovinj, located at about 110

[1] The sheets from the 2nd survey of the southern and central Istria are stored in the Archivio di Stato di Trieste (Trieste, Italy) and are available via the *Arianna4View* web application. The area of research was covered by a total of 8 cadastral sheets from the *Mappa catastale del Comune di Valle d'Istria* folder (names as stated in the online archive): *foglio XVIII, sezione XIX*; *foglio XIX, sezione XX*; *foglio XX, sezione XXI*; *foglio XXI, sezione XXII*; *foglio XXV, sezione XXVII*; *foglio XXVI, sezione XXVIII*; *foglio XXVII, sezione XXIX* and *foglio XXVIII, sezione XXX*.

[2] We would like to thank the reviewers for this, and all the other suggestions and comments which helped to improve the paper.

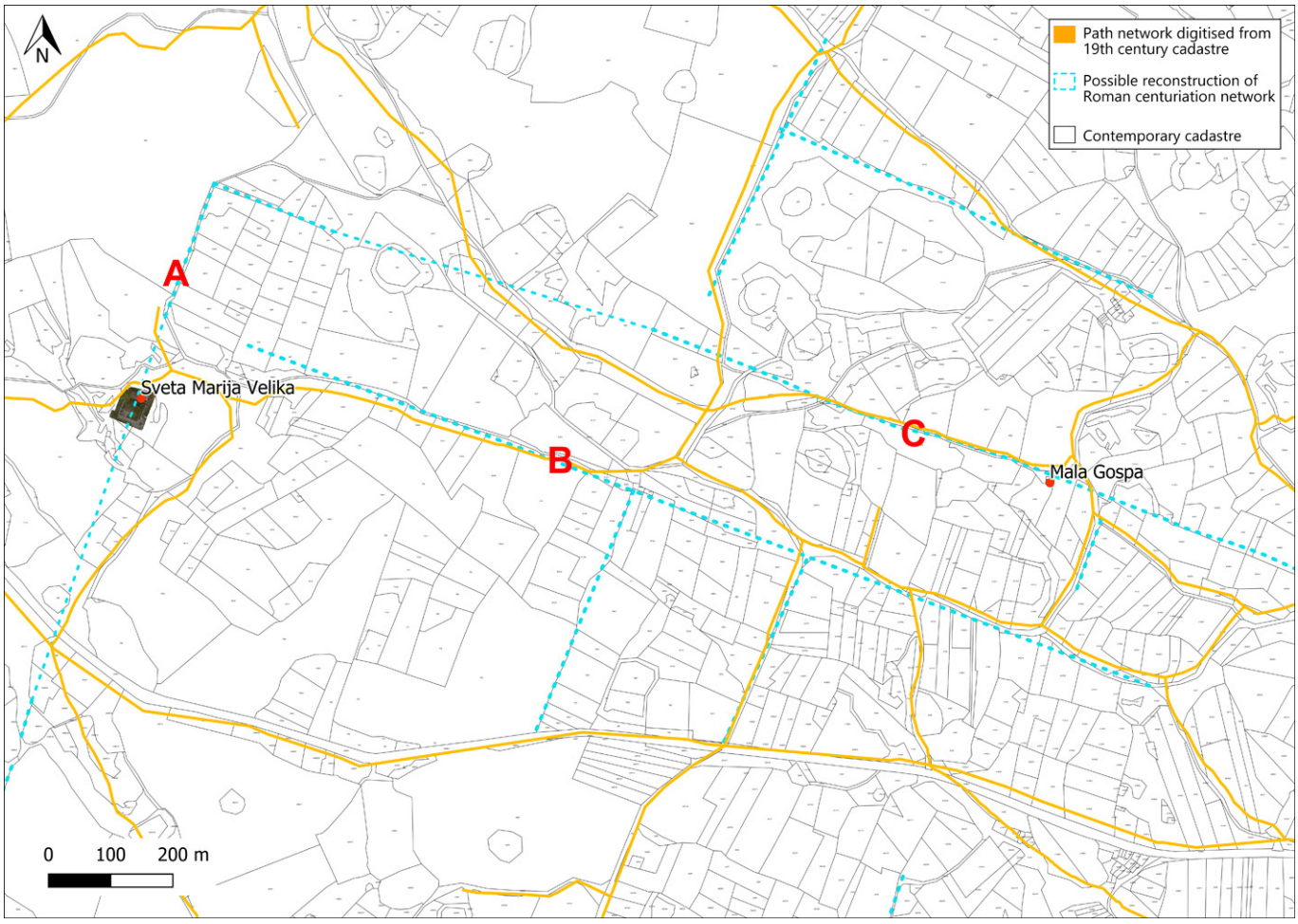

Figure 7. Possible Roman centuriation west of Bale settlement.

metres above sea level, on a gentle slope of the hill from which the view today reaches to a 4 kilometres distant coast over olive groves. The questions and the reflections that the research of this site posed in many ways marked the shift in Croatian art history from traditional notions and understandings of the profession and heritage. Since our knowledge about the early medieval monastery complexes in Istria is still very scarce, thus the greater the importance of the site of St Mary the Great actually is. There is no doubt that the control of the surrounding territory from this complex was easily achievable. Furthermore, the continuity of the site since Roman times was proved by the findings of the walls and tesserae of mosaics preceding the construction of the church and monastery. During the early medieval period, the Monastery of St Mary the Great was just one of a series of monasteries that complemented the Carolingian network of checkpoints in the area. These points, at least judging by the current state of research, consisted primarily of fortified settlements, monasteries and the estates of the newly established elites.

However, although its prominent role in the strategic control of the surrounding territory is well known (Jurković et al. 2008: 137-138; Behaim 2021: 110-111, 148-150), it is interesting to see how the monastery has positioned itself directly on the border between *centuriae*. (Fig. 7) This relation between the early medieval structures and the much older general land division scheme still has much to offer in the context of our understanding of how the monastery – the only early medieval monastery which has been systematically studied - functioned and what was the area it directly affected. The Roman foundations (cistern and other structures preserved only in their foundations, see Jurković and Caillet 2011: 128), as well as the Early Medieval church and the structures of the monastery also follow the basic orientation of the

centuriation (at least to some extent in the case of the outer wall of the monastery). We can only presume the organization of this (for now imaginary) Roman complex, but the gentle slopes falling towards the southwest and the coastline (the terrain on the north rises gently to the hill Dorine) suggest that this would be the perfect area for cultivation. Another argument which could speak in favour of the existence of a Roman complex located next to the border of the estate is a crossroad near the church which has, until very recently, been visible only on the historical cartographic sources. Its northern section (marked 'A') could continue to follow one of the *cardo* lines to the north, and go directly towards the church named *S. Selvasio* on the 19th century topographical map. The continuation of its eastern section ('B') can be followed towards the settlement of Bale. Approximately 260 meters north of this lost path section (*decumano*?) lies a perfectly parallel line ('C'), which should be attributed to another line of Roman division. Another medieval church, St Mary the Little (Sv. Marija Mala, or Mala Gospa) is located along this line, with its rectangular layout closely following its orientation. The line C, visible either as a field path or a parcel division, stretches almost to the settlement. This western zone of the settlement hides yet another medieval church - St Elijah (Sv. Ilija) - with the easily recognizable façade bell tower. Its position also speaks in favour of the importance of the western entrance to the settlement, and the historical route towards Rovinj.

Without a proper archaeological excavation, all of these assumptions can not be confirmed. However, it is obvious that the search for the remaining traces of the system of the land division could benefit greatly from an approach presented here, even before the implementation of the latest technological marvels.

Conclusion

The outcomes of the work presented in this paper could be summed into two sets of results. The first one is related to the assessment of the relevance and reliability of the used material, primarily of the historical cartographic sources. The analysis and the results were predominantly of quantitative nature and have demonstrated their potential in the archaeological research. A high number of documented features together with the established mathematical basis offers an insight into the state of the landscape before the transformations took place in the second half of the 20th century. This is the most important characteristic of these sources, since they are the earliest, and still compatible with contemporary methodologies because of their precision. The still-existing subjectivity of the maps of the 2nd survey (after all, they were completely hand drawn and painted; see Slukan Altić 2003: 146) in some way offers new elements of personal interpretation of spatial features, whether it is the state of built objects, or the need to document a name of some site. On the other hand, contemporary methods of landscape documentation offer much more precise and completely objective, almost 'cold' results without the historical context. Therefore, the only valid strategy is to use both approaches, because they complement each other. And since the material presented here has finally become publicly available through various digitised media, we can expect more and more research projects similar to this (very limited) endeavour.

The other set of results refers to the interpretative study of the spatial organization of the area around Bale. Only after all the data and the materials have been integrated and mapped, it was possible to reach certain conclusions which have only scratched the surface of many of the problems. Unfortunately, the area in question has experienced a significant transformation, and the patterns which have shaped our perception of a typical Mediterranean landscape are slowly disappearing. That is why it is essential to continue with this work, and to apply the same research principles to other neighbouring areas.[3]

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