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Czech Academy of Sciences, Institute of Archaeology, Brno

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Content

Chapter 1

Introduction

'History is not the past, it is the present.
We carry our history with us. We are our history.'
James Baldwin

Change over time is an inherent feature of all entities, both past and present, including our understanding and knowledge of those past realities, particularly in archaeology. Knowledge in this field has evolved significantly, allowing us to deepen our insights into the past. The sheer volume of archaeological data available today, amassed by generations of professional archaeologists and engaged members of the public, is vast. This immense scale presents new challenges, particularly in terms of how to preserve the data and, more importantly, how to fully harness its potential (cf. Kuna et al. 2015; Richards et al. 2021). When combined, these sources of information on past societies offer a robust foundation for quantitative analysis using computational techniques, providing fresh perspectives on the development of the Germanic populations in the 'Marcomannic' settlement zone west of the Lesser Carpathians during the first four centuries AD (the Roman Period; Fig. 1.1).[1] In this context, a research project funded by the Czech Science Foundation (see Acknowledgements below) has been undertaken to explore new ways of exploiting archaeological data. The aim is to develop a series of general or specific proxies that could potentially reflect various developmental trajectories within the studied anthropogenic context and employ various computational techniques to explore and analyse available data and address the developments in demographic, economic, societal, and political domains.

The study region can be understood as a borderland defined by the boundaries of the Roman Empire. Within this liminal landscape, numerous interactions occurred between the Romans and the populations beyond the Middle Danube. It has become a particular scene of multifaceted Roman-Germanic interactions, most of the time peaceful ones. Although the conflict periods covered a considerably lesser proportion, some had far-reaching implications for the overall relations and geopolitical situation. In this regard, the turbulent epoch of the so-called Marcomannic Wars (e.g. Erdrich et al. 2020) has impacted significantly both the 'barbarian' and Roman environments of the Middle Danube region. The method and applied approaches in this book aim to broaden the current research agenda towards further understanding Germanic societies of interest and provide another perspective on their development through innovative methods and differentiating a relatively homogenous picture of the settlement structure and its development in the study region during the Roman Period.

Archaeological data are distinctively incomplete and inevitably biased, limiting available interpretation possibilities significantly in many aspects (e.g. Neustupný 2009). Nevertheless, they represent an exclusive source of information for most past human societies, whereas available narrative sources are burdened through other distortions (e.g. Todd 2005). As a science, archaeology can only develop further by exploiting and utilising all the available knowledge base and methodological tools to explore further the theoretical research avenues. By doing so, the aim is to develop a comprehensive framework that allows to enhance the potential of archaeological data to be explored from quantitative perspective.

1 If there is not stated otherwise, the author of all the figures is the author.

Fig. 1.1. *'Germania Magna'*. Reconstructed distribution of the main socio-political 'tribal' entities based on ancient narrative sources during the Early Roman Period.

There have been various initiatives integrating big-data approaches in archaeology. One of the early and relatively broadly conceived approaches based on the Iron Age archaeological data was conducted by L. Hedeager (1992), where the information from the burial context and other representative datasets were utilised through the temporal distributions of documented quantities in archaeologica record on various segments of archaeological data. Presently, the research activities, oriented to the exploitation of large quantities of radiocarbon data, generate substantiated proxies regarding demographic variables and other adjoined societal properties (e.g. Bird et al. 2020; Freeman et al. 2018). However, such datasets are not yet available in the amounts required for the Middle Danube Roman Period. Therefore, archaeological data and information are the only means for the establishment of broadly conceived proxies at present.

The main purpose of this research could be best described as a shift from singularities (individual artefacts) to more generalising structures. Despite obscuring some particular and specific aspects and properties, one of the aims lies in quantitatively oriented perspective. The research builds more broadly on big-data approaches, where quantitatively significant segments of data (e.g. habitation units, widespread everyday-use artefacts) are employed. The main focus lies in identifying the features and structures of development tendencies in available archaeological data and potentially shedding additional perspectives on the causes and character of the structural changes in various dimensions of the societal fabric, foremost demographic, economic, political and social. The project activities involved making a framework that allows for comprehensive collecting and structuring of either width (i.e. evidenced types of areas of past activities) and depth (justifiably formalising the typo-chronological determination elaborated through the more or less thorough antiquarian analysis and evaluation in the past) of the input archaeological information.

These represent indispensable sources of information, once correctly identified, described and

Chapter 6

Spatiotemporal aspects of the Germanic settlement structures

This chapter explores selected spatiotemporal aspects of the archaeological information contained in the MARCOMANNIA dataset (above all residential areas/settlements as well as other quantitatively well-represented entities of the dataset – components, objects, artefacts) and environmental data regarding their temporal dimension given by the consensually established time blocks (see Chapter 3.3). From the perspective of representativeness, the landscape's physical properties (foremost the geomorphology) provide (almost) complete knowledge due to its general stability.

6.1 Boundaries and internal structuring of the settlement territory

From the perspective of any spatially oriented analysis and modelling of the region of interest, it is essential to outline its boundaries formally. Such an attempt has many pitfalls regarding the actual meaning of such boundaries, as well as multifaceted perception, understanding, and reflection of the spatial dimension in the past reality. It is intended to leave the details on these aspects simple. In this place, it plans to generate essential delimitation of the region based on the archaeological data regarding the residential areas (see Chapter 5.1). Therefore, this constructed spatial entity would result from the spatial distribution of the more or less stable presence of the Germanic communities, even though a wide range of activities naturally occurred within the 'off-site' space. A significantly lesser amount of information is available for such activities, which could have left only minimal traces in the archaeological record.

In order to establish the spatial delimitation itself, the principles of affordance (cf. Zipf 1949) were acquired through the least-cost calculation, which is central in many theoretical approaches (e.g. Herzog 2014; Surface-Evans, White 2012). A layer was created for each time block of the represented residential areas with spatial and temporal information, and it was eventually summed up. As a result, locations or regions with more enduring or stable habitation are more significantly represented. This approach also suppresses the effect of unevenness in the primary data on residential areas. During each calculation, the least-cost distance layer resulted from the spatial distribution of points (sources of anisotropic movement), regardless of whether only one or a cluster of large numbers are present in particular regions. Therefore, the only situation leading to an artificial underrepresentation within this analysis is the complete absence of residential activity from specific regions or areas. Despite many well-developed procedures and techniques available (Herzog 2014; 2022; Verhagen et al. 2013; Verhagen, Polla, Frommer 2014), the calculations used standard unmodified tools (*cost distance*). Primarily, no additional specific assumptions were present for this analysis, as the actual paths or corridors are not the objective but rather a buffer zone. Subsequently, this spatial entity was internally differentiated using the reclassification (*natural breaks/jenks* method) of the cost distance values into five classes (Fig. 6.1). The maximum boundary was set to the values corresponding with the residential areas, which are the most outlying regarding their position and proximity to the core parts of the region along the main rivers.

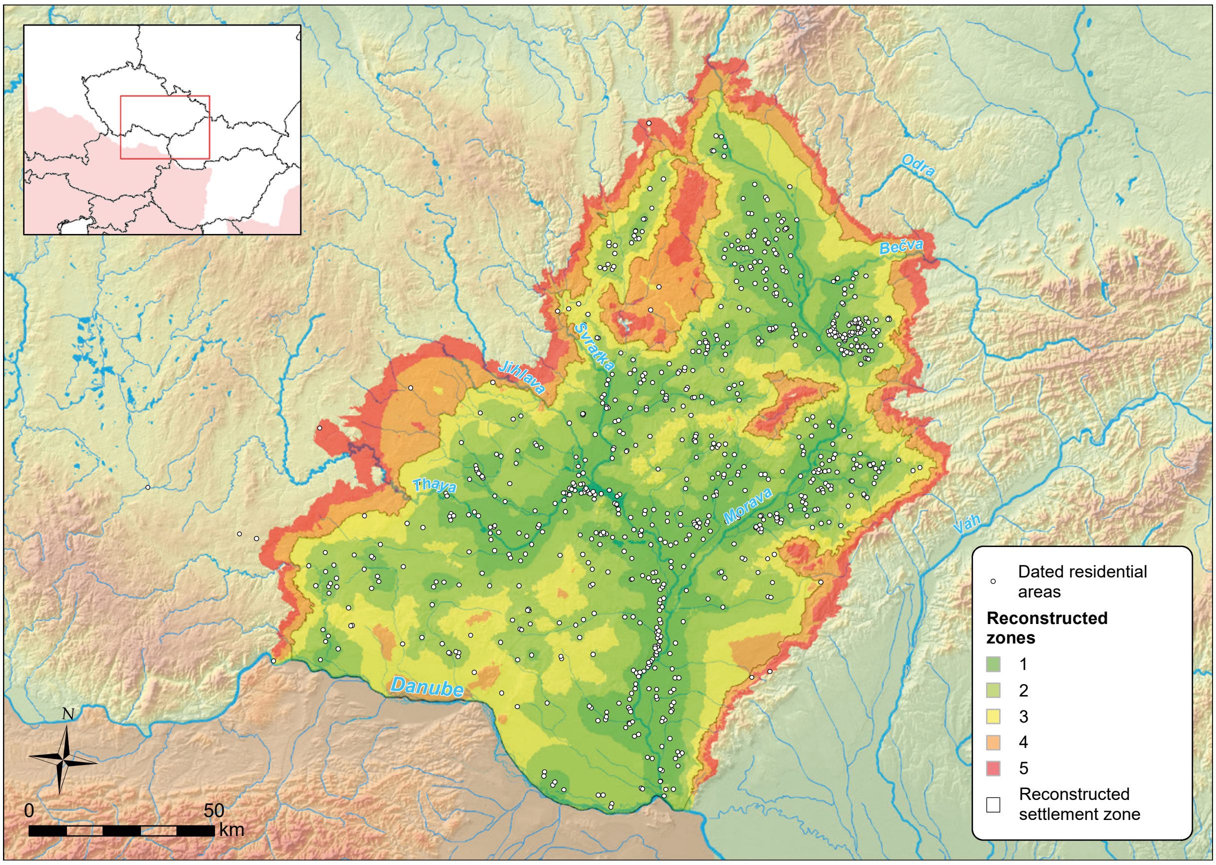

Fig. 6.1. Settlement region. The summed least cost-based layers are based on the residential areas' spatial and temporal distribution and density (see Chapter 6.2, 7.3.1).

The resulting area covers 16,000 km^2 and overlaps for most of the parts with the manually created boundaries of the 'Marcomannic' settlement zone (e.g. Komoróczy et al. 2020, 176; Rajtár 2014, 111), and it naturally contains the low-lying areas of the regions, especially along the axial rivers. As geomorphology is the calculations' primary driver and constraining parameter, the settlement region is outlined by more significant mountain ranges. Notably, the elevation along the boundary line has an average of 362 m ASL (with a standard deviation of 109.7 m). Naturally, this property has its spatial aspects, and it develops in individual regions, especially from the south (the most low-lying area in the Vienna basin) to the north, where the settlement area is clearly outlined through significant mountain ranges. Nevertheless, its variability is given foremost by the spatial distribution of the evidenced residential areas, and the reconstructed boundary reflects various geomorphological contexts. In the Upper Moravian Ravine, the northeast part of the boundary reaches relatively low elevations.

As a result of the summarisation of the temporally differentiated subset of the residential areas, the internal space of the settlement territory can be structured and evaluated in general terms of representation of archaeological sources (Tab. 6.1). Some significant correlations are apparent there, especially regarding the representation of the residential areas and their properties (size, geomorphological aspects). It could be well-anticipated that zone 1 (5,200 km^2) would contain the most considerable amount of all the point evidence within the MARCOMANNIA dataset (66.1%), foremost in the case of the residential area (81.8%). This zone is also characterised by the lowest mean elevation and slope gradient values. The consequent zones contain an exponentially decreasing amount of archaeological evidence, whereas the first and the second zones contain practically all the relevant evidence (96.7% of residential areas and 88.4% of all types of evidence). In mean elevation, each gradual zone is elevated by 50 m ASL. Apparently, the outlying zones 4 and 5, with a mean slope gradient above 6 degrees and an elevation of 400 m ASL, provide only limited conditions for implementing the subsistence strategies and foundation of settlements (Fig. 6.2).

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