Emergence of Social Complexity and Community building in the Late Neolithic (5400-4600 cal. BCE) of the Central Balkans

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Emergence of Social Complexity and Community building in the Late Neolithic (5400-4600 cal. BCE) of the Central Balkans

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This doctoral dissertation investigates the diachronic social changes that occurred in the Central Balkan's region of Šumadija (Gruža River valley), in present day Serbia, during the Late Neolithic period (5400-4600 BCE). At this time, communities known as the Vinča archaeological culture are characterized by many remarkable changes, such as the emergence of large scale settlements with defensive features, and also technological innovations in the form of pyrotechnic mastery in production of intricate pottery styles, shaft mining technology, and some of the earliest extractive metallurgy in the world. Dissertation field research was funded by a National Science Foundation Doctoral Dissertation Research Improvement Grant (# 1741667) titled: "Domesticated Plants, Animals and the Emergence of Social Complexity". Research included the development of methodological practices combining surface artifact collection over a regional area of 100 square kilometers combining non-invasive geophysical prospection surveys on selected sites. Analysis of the data collected showed extremely important regional scale shifts concerning population densities, socio-economic patterns, and settlement organization with population centralization already by the Early Neolithic (~5500 BCE). Subsequent population trends indicate a nearly total depopulation of the valley by the end of the Neolithic Period. Results also indicate the presence of community conflict as reflected in settlement patterning, large scale enclosure ditches, and proximity to and control over natural resources in the valley.

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PREFACE

One of the certainties for every student engaged in the study of the archaeology and prehistory of Europe is that there is no viable way of escaping an encounter with the Vinča culture. As an early cultural phenomenon, it is exceptionally striking with a substantial new form of social organization, settlement patterning, and material culture iconography that has puzzled archaeologists since its first discovery. In fact, a whole new category of "Danubian civilization" was created to place this development in the grander scheme of archaeological interpretations for prehistoric Europe and some of the earliest evidence of agricultural communities. Therefore, it was an incredible privilege for me, as a young student of archaeology, that my first field experience was at the eponymous site of Vinča Belo Brdo.

This first fieldwork experience shaped the entire focus of my subsequent graduate research. The opportunity to develop a dissertation project in the Šumadija region of Central Serbia was initiated by my mentor, Professor Bryan Hanks, when it was decided that we would jointly work together to re-establish a cooperation in that region that had started 50 years ago by Professor Alan McPherron (University of Pittsburgh) at the Vinča period settlements of Divostin and Grivac. This was a wonderful opportunity to return to a region that had been very important for the early archaeological study of the Vinča culture but where virtually no research had been done since the late 20th century.

This new research initiative, the Šumadija Regional Geoarchaeological Project (SRGAP), started with a phone call by a colleague and friend Dragan Jacanović, from the National Museum in Požarevac, to Marija Kaličanin-Krstić from the Heritage Protection Agency in Kragujevac.

Marija Kaličanin-Krstić then connected us to the National Museum in Kragujevac and Branka Zorbić as a primary contact person. Six months passed after that initial phone call until we met in March of 2016 with staff members at the National Museum and the Heritage Protection Agency in Kragujevac. After swift and decisive actions were taken by Slavica Đorđević from the Heritage Protection Agency, a meeting was arranged with Director Marko Grković and Deputy Director Marija Kaličanin-Krstić. Following this meeting, we were granted full institutional support from the Heritage Protection Agency, without which this whole endeavor would not have been impossible. After that instrumental first initiative, **SRGAP** was then supported by the Director of the Archaeological Institute from Belgrade, Dr. Slaviša Perić, who became one of the primary partners on the project.

These important institutional contacts, and their willingness to support SRGAP and my subsequent doctoral dissertation research, combined in an important way to focus and shape the nature of my dissertation program of research. This provided the important opportunity to conduct the first regional scale systematic pedestrian survey in this region of the Balkans. This has allowed me to approach many questions about Vinča social organization from an anthropological archaeology perspective and I was indeed fortunate that this work was supported by a National Science Foundation **Doctoral Dissertation Research Improvement Grant (# 1741667) titled: "Domesticated Plants, Animals and the Emergence of Social Complexity".**

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CHAPTER 1

1.1 EMERGENCE OF COMPLEXITY

Anthropological archaeology has been long influenced by a focus on the early emergence of sedentism and animal and plant domestication processes in different locations around the world. Research focused on demographic change has been one of the common threads linking much of this research with an emphasis on emerging scalar stress, or an "irritation coefficient" (Rappaport 1968: 116), due to population growth and resource exploitation (Johnson 1982). Some scholars have argued that this was a primary factor in driving social conflict and warfare ultimately leading to the rise of political centralization and new forms of social inequality in certain regions (Carneiro 1970; Flannery and Marcus 2000). The comparative study of settlement patterns around the world have attempted to better understand the "incipient" or "formative" stages of these processes in terms of identifying and explaining new forms of household organization, settlement growth and "fissioning", centralization, and regional site size ranking (Kuijt 2000:4; Feinman and Price 2001; Earle 1997).

Various studies of these phenomena have contributed importantly to understanding the different pathways that led to social and economic change in human societies and the creation of new forms of village lifeways. Much of this scholarship, however, has characterized these developments in terms of "stages" leading to the rise of political centralization (as discussed by Parkinson 2002:9; Yoffee 1993:60-68). Bandy and Fox (2010:1) also have highlighted that studies of early village societies have been dominated by a focus on "origins" rather than longer term historical trajectories of village growth and social change. As they suggest, broader comparative studies have much to contribute to acknowledging multiple pathways of early village formation and regional settlement patterning that have occurred around the world. As they suggest, such studies do not emphasize a single outcome of such processes (greater complexity and centralization) but rather observe human behavior and organization as case specific and acknowledge the multivariate nature of social organization and change (Bandy and Fox 2010:7). This broader comparative framework provides an important lens for considering regional developmental sequences during the European Neolithic that to date have not easily "fit" traditional models of social complexity and political centralization.

The Vinča culture development is one such case study within European prehistory. One of the goals of this dissertation research has been to produce a more detailed empirical foundation for examining settlement patterning, spatial organization, and demographic levels during the Neolithic period in the Balkan peninsula. The long sequence of development for the Vinča culture (5300-4600 BC) offers a valuable diachronic case study for examining these processes.

1.2 NEOLITHIC SOCIAL COMPLEXITY IN THE BALKANS

In a 1970 publication (p. 53), Colin Renfrew remarked that, *"The Vinča culture is unique to Yugoslavia (with southern Hungary and west Romania); it developed in these areas through the operation of factors local to them, and must be explained in terms of these factors. Their analysis presents one of the most challenging tasks in European prehistory".* Since Renfrew's important statement, nearly fifty years ago now, significant research has been undertaken on the Vinča development, however, many critical questions remain to be fully answered regarding settlement growth and development, demography, and related processes of social and economic change.

The Vinča development has been traditionally characterized by population nucleation at tells, "tell-like", and flat settlements, new forms of craft production in the form of dark burnished ceramics, a specific style of ceramic figurines (Bailey 2005) and early forms of extractive copper metal production and circulation (Radivojević et al. 2010; Roberts et al. 2009). The widespread diffusion of these new craft industries suggests the establishment of shared social networks and intra-regional trade routes among diverse agrarian communities across southeastern Europe. New research even suggests that the formation of the renowned Bronze Age Maritime centers of the Aegean, which stimulated powerful chiefdoms, kingdoms and republics, were rooted in the trade networks that had been established earlier during the Neolithic period.

Although the Vinča culture phenomenon has been known for somewhat longer than a century, and a significant amount of data has been collected through archaeological field research, the last major synthesis focusing on Vinča developments is John Chapman's book, "*The Vinča Culture of South-East Europe*" (1981). This publication set out several key problems associated with the lack of understanding of social and economic organization for Late Neolithic communities in the Balkans. To date, these problems remain as significant challenges for current and future scholarship.

1.3 VINČA SOCIAL ORGANIZATION

Early studies of Balkans prehistory were strongly conditioned by the predominance of a *kulturhistorische* model and causal explanations relating to the migration and diffusion of populations and technologies within the region (Childe 1925; Vasić 1932; Gimbutas 1977). Scholarship in the latter half of the 20th and early 21st centuries has focused more intently on the emergence of social complexity (Haas 2001; Price and Feinman 1995; Carballo et al. 2014) and especially processes of demographic growth and settlement fissioning related to early agricultural societies (Binford 1968; Flannery 1969; Chapman 1981; Tringham and Krstić 1990) and the trade and exchange of non-local "exotic" goods linked to social inequality (e.g. *spondylus* shells and obsidian blades).

Interpretations of these important regional developments have ranged widely from being rather simplistic to quite unique and innovative. For example, Neolithic societies in the Balkans have been viewed as "being stuck in the Danubian world" where a lack of "durable wealth" is equated with "poverty" and a "lack of innovation" (Bogucki 2011: 113). Other scholars have made very different claims wherein the region represents some of the earliest extractive copper metallurgy in the world, even predating sites in the Near East, and reflects a long trajectory of regional technological development (Radivojević et al. 2010). While these scholars' views are contradictory, they do reveal an important turn towards a greater focus on "regional variability" associated with the emergence, development and decline of Vinča communities in the 6^{th}-5^{th} millennia BC.

Even though such variability has been emphasized, research on the Vinča development has remained hyper-focused on settlements with virtually no "off-site" research being done within hinterland zones leading to a complete lack of systematic pedestrian survey being employed in the region. One final important issue relating to social organization and complexity is *the virtual absence of human burials* for the Vinča period. Notable exceptions are those human remains recovered from the settlements of Botoš (N=26-33; Chapman 1981) and Gomolava (N=24; Borić 1996). The lack of formal cemeteries has, therefore, placed exceptional emphasis on settlement excavation for the conceptualization of Vinča social organization during the Neolithic.

1.3.1 VINČA SUBSISTENCE PATTERNS

The emergence of Vinča culture communities has been traditionally viewed as an influx of a Neolithic "package" into southeastern Europe as seen through new forms of subsistence economy with domestic animal and plant husbandry and transhumant mobility (Tasić 2009; Orton 2012). Overall, this view has begun to change dramatically in recent years as the once assumed foundation of cereal agriculture, including emmer wheat (*Triticum dicoccum)*, einkorn (*Triticum monococcum)*, and in a smaller number of cases, barley (*Hordeum vulgare)*, pasta wheat (*Triticum durum/aestivum)* and proso millet (*Panicum miliaceum*), now appears to have been far less significant than once thought. Recent palaeobotanical work has revealed greater variability in wild plant taxa being used at Vinča settlements (e.g. wild pear, elderberry, acorn, sloe, cornelian cherry, bladder cherry, at the eponymous site of Vinča; see Filipović et al. 2014 and Filipović and Tasić 2012:9). In addition, palynology studies have indicated that land clearance immediately around Vinča settlements was limited, as recently shown at the sites of Gomolava (van Zeist 2002: 112) and in examples from Slovenia and broader zones of the Balkan Neolithic, where there seems to be a more complex model of hinterland landscape use than simple land clearance for agriculture (Gardner 1999). Furthermore, Orton (2012) has argued that livestock herding practices and wild animal hunting may have played a much more substantial role in the socio-economic organization of these early communities. This emphasis on use of mixed hinterland zones around the settlements, and upland zones between settlements, for the grazing of livestock, raises several important questions about the organization of labor for these tasks and the possibility of smaller settlements or herding camps being constructed for seasonal transhumance in "off-site" upland zones within the region.

Vinča craft production has been a focal point for many researchers, starting from, by all measurements, the incredible increase in pottery production noted for the Vinča period (Vuković 2011). Other scholars have highlighted the complicated networks of chert and obsidian exchange (Tripković and Milić 2008, Borić et al 2015) that can be documented and, as noted above, extractive copper processing and metallurgy may be among the earliest documented in the world (Radivojević et al 2012, Borić 2009). Developing a better understanding of these craft innovations and their organization at the regional and local scales requires a much better understanding of regional scale raw material resources and possible settlement patterning associated with them.

Much of the focus on trade has examined long distance and inter-regional exchange. For example, several important articles have been written on the trade of *spondyllus* marine shells and the role of long distance networks, or down the line trade connections, that facilitated the import of these non-local exotics (eg. Dimitrijević and Tripković 2006, Tripković and Milić 2008, Borić 2009). However, the study of copper metallurgy has been more regionally focused. This has been highlighted through the fact that near the well-known mine of Rudna Glava, which has produced Vinča culture material in preserved copper mine shafts, no nearby settlements have been identified (Jovanović 1982). It seems likely that the lack of regional pedestrian survey has impacted current understandings of copper craft production during the Vinča period due to a limited understanding of the spatial distribution and patterning of settlements and their proximity to raw material resources.

1.3.2 VINČA SETTLEMENT PATTERNING AND DEMOGRAPHY

The number of Vinča culture settlements that have been identified is continuously growing and densities of these are approaching the modern day rural populations of the central Balkans region. Combined with the almost "proto-urban" settlement organization suggested by some regional scholars (Perić 2016; Tasić 2012), questions surrounding the spatial organization and demographic nature of these communities are among the most important today for European prehistory. The characterization of Vinča social organization has ranged widely from "non-centralized" tribal communities (Chapman 1981) to "proto-urban" societies (Crnobrnja 2011).

One of the key reasons why such a varied set of interpretations exist is that no systematic regional scale survey has been completed and as a result any understanding of Vinča period demography, social organization, and settlement patterning is severely obstructed. As numerous comparative studies from around the world have indicated, settlement patterning and demography play a key role in addressing questions of socio-economic organization and the emergence of inequality and social stratification (Johnson 1982; Carneiro 1978; Feinman 2011).

Two major concerns have challenged demographic estimations for Vinča culture settlements: (i) the diachronic phasing of such settlements is often unclear, and (ii) sites that were examined through geophysical surveys are surrounded by other sites that have been noted but not examined either through surface or subsurface surveys. For example, other possible settlement sites have been identified near the eponymous site of Vinča Belo Brdo (Todorović 1977), however, these sites have had test pitting or excavation but the overall site sizes are unknown, no systematic pedestrian survey or surface collection has been done, and no geophysical surveys were completed. This pattern is repeated at several other known Vinča settlements. This includes the Gruža River valley, the region proposed for doctoral dissertation study, in which multi-year excavations in the

20th century were carried out at the Vinča settlements of Grivac, Divostin and Kusovac. Six other Neolithic period sites (yielding "Vinča" period pottery) have been identified within that region, however, no further investigations were done and virtually nothing is known of a more precise chronology of the sites or their sizes and relationships to the investigated settlements (*personal communication* with Marko Grković).

The problems outlined above, which have impacted the regional study of Vinča culture settlements and their hinterlands, have been effectively overcome in other regions of Europe for late prehistory. For example, systematic research in the Carpathian Basin, focusing on the Chalcolithic and Bronze Age, has employed highly successful and complementary methods utilizing regional pedestrian survey, detailed surface collection of artifacts across settlements, and geophysical and geochemical surveys (Parkinson et al 2010; Parkinson et al. 2012). These studies produced a detailed model for understanding diachronic changes in the Vésztö-Bikeri area, various patterns of settlement organization, and the emergence of fortified tells (Parkinson et al. 2010:180-182). These studies, and related field methods, hold great promise in terms of application for the study of Vinča communities in Serbia and have greatly informed the approach taken in this dissertation research.

Over the past decade, geophysical surveys have illuminated important diversity at Vinča settlements in terms of site size, spatial patterning in household organization, the presence of enclosures and, in some cases, complex fortifications (Uivar, see Schier 2006; Stubline, see Crnobrnja 2011; Oreškovica see Borić et al. 2018). These new findings allow for a productive step away from what has been a conventionally held grand narrative of Neolithic society and conceptualization of the "Vinča culture" to recognize that more nuanced and detailed understandings of these communities are needed.

These approaches, combined with pedestrian survey and surface collection, offer an important new way to explore settlement patterning and demography more effectively. For example, it has been recently argued that statistical analysis of artifact collections recovered from excavations of households at Vinča sites indicate an *absence* of social differentiation between houses (a sample of only 11 houses in total from 6 sites) (Porčić 2012). Some scholars have accepted that this interpretation may challenge the view that the accumulation of individual wealth was an important factor in Vinča social organization. However, because of the limited comparative sample provided through this study the issue of variability in artifact assemblages across households within Vinča settlements cannot be effectively addressed or definitively answered. Rather, a more representative sample should be produced and this may be done through surface collection and analysis across the entirety of Vinča settlements, as scholars have done in other regions, to examine variation in household artifact assemblages (Peterson and Drennan 2011: 80-87).

Such an approach may produce important datasets that illustrate variability in certain categories of artifacts (e.g. fineware vs. courseware ceramics, craft production debris, etc.) and yield a more representative cross-section of domestic activities across Vinča settlements and their connection to social organization, individual household units, and/or zones of "special intent". For example, such special zones have been interpreted during excavations carried out during the 1990s at the Vinča settlement site of Parta. Investigations at this site revealed the presence of architectural buildings that could not easily be interpreted as domestic households (Lazarovici 1989).

The section below outlines the specific research questions that structured my dissertation field research. This work focused on the collection and analysis of prehistoric multi-scalar datasets ranging from the household, settlement, and regional scales within the Gruža River valley of central Serbia.

1.4 RESEARCH FRAMEWORK OF THIS DISSERTATION

My program of research focused on testing two main conceptual models (and associated research questions) relating to proposed diachronic Vinča social organization and settlement patterning through associated research questions.

Model 1 (Centralization, inequality, and supra-local control of resources and craft production): *Vinča settlements in the Gruža River valley will exemplify distinct demographic growth and the emergence of incipient forms of social inequality between households. This will be characterized initially by the fissioning of settlements (Tringham et al. 1992; Flannery and Marcus 2014) and supra-local organization emerging with elements of political authority (Drennan et al. 2011) and control of craft specialization and production in "centralized" locations (Earle 1987; 1997).*

Model 2 (Autonomous settlement growth without clear hierarchical structure): *Vinča settlements in the Gruža River valley will exemplify distinct demographic growth as a product of the intensification of food production and sedentism but social organization will be structured in a more egalitarian manner (Kuijt 2000) with "peer-community" interaction between settlements (Renfrew and Chapman 1994; Fox 2010). Substantial household inequalities will not be visible and craft production (Shimada 2007) will be present but organized at the community/household level and not structured hierarchically with related signs of individual household wealth (White and Piggott 1996:151). Regional settlement organization will represent clusters of autochthonous villages with a strong communal ethos (Bandy 2010) and a rising competition and/or hostility toward other regional settlements (enclosure and/or fortification zones).*

The two models outlined above offer two widely dispersed conceptualizations of Vinča social organization that are comparable to trajectories of early agrarian villages that scholars have examined in other regions of the world. It was not expected that the field research would simply produce data that would fit neatly into one model or the other. Rather, the models offer a range of variability related to Neolithic transitions, demographic growth, emergence of scalar stress and social inequality, and regional center-hinterland dynamics that have been documented elsewhere for early village societies. The relatively long Vinča sequence (700 years) in the Gruža River valley offers an important opportunity to examine how these processes may have materialized and evolved relative to settlement growth and intra-site and inter-site organizational principles.

The two models, therefore, offer important points on a broad spectrum of variability that the Vinča sequence may fall within. In any case, by utilizing these models, and related research questions, multi-scalar datasets will be produced that will ensure that the Vinča sequence can be brought more effectively into a productive comparison with other early agrarian sequences from around the world.

1.4.1 RESEARCH QUESTION 1

(1) What is the distribution of identifiable settlement sites within the survey zone? How do these sites relate to each other chronologically and are different spatial patterns discernable through time?

The region of Šumadija, including the Gruža River valley, has been a major area of importance in the study of the Starčevo culture (6200-5200 BC) and later Vinča developments. Large scale excavations at the settlement sites of Grivac (Bogdanovic 2004) and Divostin (McPherron and Srejović 1988) remain, to date, some of the most comprehensive datasets and interpretations produced for the Serbian Neolithic. During previous excavations at two main zones at Grivac (campaigns 1953,1957,1965-1969, 1969-1971, 1989-1994) stratigraphy revealed that the cultural sequences at the site began during the Early Neolithic with Starčevo occupations (5500 cal. BC) and continued through the Early to Late Vinča phases (~5300-4600 cal. BC).

Data gained from excavations and radiocarbon dating at both Grivac and Divostin provided an important diachronic distribution of cultural sequences from the early to late Neolithic/Eneolithic (5500-4600 cal. BC). The Gruža River valley region, therefore, provides an important case study for examining human-environment relationships and potentially new forms of social, economic and political organization during the Neolithic. The valley itself is bordered by the Rudnik mountain range to the West and North and the Borač krš mountain range to the south. Lower elevation rolling hills occur towards the east and represent an important access route to the valley. The Rudnik mountain range is also significant, since there were discoveries of prehistoric mining shafts there by Dr. Antonović (2014), and those shafts are located approximately 30 km away from the settlements of Grivac and Divostin. The region also is geographically linked to the north-south Morava-Vardar-Aegean corridor route. Thus, the chosen area of research is one of the best zones currently available for systematic pedestrian survey and settlement spatial analysis for examining the emergence and development of early Neolithic communities in Central Serbia.

1.4.2 RESEARCH QUESTION 2

(2) What are the exact site area sizes of identified settlements and are they similar or is there a rank order pattern representing emergence of a "center-hinterland" dynamic?

Settlement site size, density of occupation, and chronological longevity are three of the most important factors associated with the influx of the Neolithic way of life in southeastern Europe and broader scale regional change in settlement patterning. This so-called "Neolithization" process has been widely accepted by scholars for the Vinča development yet there is very little understanding of how these communities formed and the nature and scale of interaction between them. Early Neolithic sites that have been previously identified are simply too far apart to make much sense in terms of understanding how they may relate to each other. A similar problem exists for the Middle to Late Neolithic, where neither site size or total number of sites situated within a single river valley is known. For example, Vinča settlements such as Belovode are known to approach nearly 100 hectares in total area.

Previously identified Neolithic settlements in the Šumadija region exceed 15 hectares in size. Such variation in settlement sizes, and the presence of fortifications at some sites, presents a contradictory view of Vinča societies in terms of possible hierarchy and social complexity found in other regions of the world where such patterning is evident (e.g. Sahlins 1960; Carneiro 1981) versus the seemingly egalitarian ethos that many regional scholars have accepted. The presence of enclosures and fortifications that have in recent years been identified at some Vinča settlements connects to a much broader phenomenon of Neolithic period enclosure and fortification in Europe (Whittle 1996). However, the factors that stimulated such developments in the Balkans remain largely unaddressed. While some scholars have tended to perceive the wider practice of enclosure of Neolithic settlements in Europe as mostly symbolic (e.g. Bailey 2000; Tilley 1996), emphasizing the substantial influence such constructions created in the landscapes and on social memory, others have stressed the organization of labor and communal effort needed for the construction and maintenance of these systems (Parkinson 2006; Parkinson et al. 2010; Yerkes et al. 2007).

This concern with social organization and labor is an important one in the context of Vinča settlements. For example, in the case of the site of Oreškovica (Fig. 5) it is possible to calculate that for an estimated population size of 200 ±45 it would take around six months to construct the ditches and palisade that have been identified as surrounding the site (Borić et al. 2018). Considering that this settlement is likely related to a single phase of occupation (5310-5060 cal. BC, after Borić et al. 2018), the emphasis on building “monumental” enclosure structures is striking, since this amount of mobilized labor could be perceived as de facto evidence of substantial labor organization and possible hierarchy, as discussed for many other regions of the world where such constructions are known (Flannery and Marcus 2003).

These important issues raise several questions concerning the role of conflict between communities, demographic growth and carrying capacities of local catchments (especially with newly emerging economies), and the nature of regional and supra-regional integration. Such issues have factored prominently in scholarship of central Europe and other regions of the world where trajectories of social and economic change are evident (Parkinson 2002; Tringham et al.1990; Tringham 1994; Drennan and Peterson 2010). This dissertation examines these important issues and frames the narrative in the broader discussion of early societal complexity and trajectories of socio-economic change in prehistory.

1.4.3 RESEARCH QUESTION 3

(3) Where are settlements located relative to topographical considerations and environmental resources and do these reflect a particular type of "catchment zone"? (e.g. soil types, access to water, relationship to herding and agricultural activities and production)?

As outlined above, the nature of socio-economic change and broader scale systems of interaction that appeared during the Balkans Neolithic remain largely unanswered at present. One model suggests that there was largely in situ localized development of Early Neolithic Starčevo communities that adopted domesticated caprine species and cereals (Orton 2012) and can be characterized by the construction of round semi-pit houses in small sized settlements (McPherron and Srejović 1988). These groups then, by the Late Neolithic, had developed into larger communities with larger settlements (sometimes enclosed and fortified) that became more specialized in cattle herding with complementary use of wild and domesticated plant foods. If this model is to be accepted, then what specific environmental, demographic, economic and social factors stimulated such change?

Many scholars have highlighted the importance of the Early Neolithic transitional phase of Starčevo – Vinča, which is mainly present for Eastern Serbia (Chapman 1981; Šljivar and Jacanović 1996). Yet, this poses a more serious question about related trajectories of social organization and related causal effects. For example, while societies in the southern Balkans seem to take completely different trajectories from the Neolithic onwards, leading to later Bronze Age chiefdoms and states, societies in the central Balkans appear to have taken a much different path without the development of subsequent hierarchical societies (Parkinson et al. 2010; Parkinson 2006). The most surprising thing about this is that Early Neolithic communities in the Balkans share many similar traits and appear to have similar forms of social organization and an early economic reliance on caprine species and domesticated cereals.

The social and economic change that occurs after this during the 6th millennia BC, especially within the central Balkans region, is represented by several important characteristics: (i) a sharp rise in the demography of the region and the emergence of "tell-like" mega settlements, (ii) increased ceramic production and refinement of pyrotechnology, (iii) emergence of copper metallurgy, (Borić 2009; Radivojević et al 2010), long distance trade and diffusion of "exotic" objects (Tripković and Milić 2008), fortifications (Crnobrnja 2012; Boric et al. 2018), and overall density of settlements within the region (Figs 5-7). All these important changes had to be accompanied by strategic choices regarding the placement of settlements, access to local resources, and the sustainability of agro-pastoralism within associated hinterlands. These important human-environment dynamics can only be better understood, and modeled using firmer empirical evidence, through detailed studies of regional settlement patterning and GIS analysis of local and regional resources.

1.4.4 RESEARCH QUESTION 4

4) Is there spatial patterning associated with artifact categories and their density across identified settlements? How do specific diagnostic artifacts (e.g. minerals and slag, vitrified ceramics, loom weights, and stone tools) relate to possible craft production zones within settlements?

The conventional perspective on Vinča developments in southeastern Europe and the Central Balkans holds that craft production was diffused across communities, and households within settlements, without clear evidence of specialization and hierarchical control over certain forms of production. Importantly, this rather standard view characterizes Vinča craft production for nearly a millennium (Chapman 1981). In fact, a common narrative among Balkan archaeologists is that based on artifact assemblages and typological differences every Vinča settlement appears the same as the next.

This rather anecdotal perspective springs from the fact that there has been so little detailed comparative study at the regional scale. This relates to the nature of research where, for example, at the settlement of Grivac, the excavation strategy was aimed primarily at only two very small zones of the settlement (Bogdanović 2004). The same holds true for the settlement of Belovode where all excavated trenches (except for one trench from 2015) were placed in one zone in the southern zone of the site (Šljivar and Jacanović 1996; Šljivar 2006; Borić 2009; *personal communication*). Undertaking systematic surface collection over these settlements, and subsequent processing and statistical and spatial analysis, is of critical importance for developing more empirically substantiated models of craft production at Vinča settlements. The efficacy of such methods is especially important when considering that it would be economically and logistically impossible to completely excavate any Vinča settlement site.

Recent scholarship on Vinča craft specialization, focused on ceramics (Vuković 2011), has indicated that there appears to be a uniform standardization within households, thus pointing to a single person (tradition) producing such wares within each household. Such conclusions are in line with previous studies, which have suggested such a model for individual household level production (Greenfield 1991:296). Recent statistical analyzes of household assemblages also showed little to no difference between households (Porčić 2012), however, since 50% of the samples in this study were obtained from only one settlement (Divostin), and one zone of the settlement, the validity of such a sample to broadly characterize Vinča craft specialization must be questioned.

This line of research is again lacking in terms of both inter-site and intra-site comparisons. The inference that every household (e.g. >500 houses identified at Drenovac; see Perić 2016), contained a highly skilled potter, metallurgist and lithic specialists is difficult to conceptualize. It may be argued that a new model of craft production is needed to reconcile these important discrepancies, and for such a model(s) to be substantiated through a strongly comparative set of regional data and the use of statistical methods drawing on more comprehensive intra-site and inter-site datasets.

1.5 DISSERTATION STRUCTURE

Chapter 1 has provided a brief overview of the Vinča development in the context of my program of doctoral research and the models and research questions driving my field studies. *Chapter 2* focuses on the wider theory on the emergence of complex societies and development of craft specialization, inequality and political complexity from an anthropological perspective. It provides an important overview of comparative studies and major directions of current research on early complex societies.

Chapter 3 focuses on the overview of the history and scholarly research of the Gruža River valley in Central Serbia. One of the important questions concerning the current state of affairs in the research of Central Balkan prehistory does come from the question of the epistemology of the discipline as well. This chapter also reviews the rich environmental and cultural history of the Vinča and the long duration and importance of the region.

Chapter 4 reviews the geomorphological traits of the region and includes a detailed discussion of geological and pedological processes that have been important for human settlement and land use in the region through time. This chapter also provides information from ethnographic sources and early historical accounts describing agro-pastoral production and social and cultural organization relating to this economic model.

Chapter 5 provides an outline of the dissertation field research design, methods, and the results that were recorded during the regional pedestrian survey. This information provides a crucial foundation for the demographic estimates presented in *Chapter 6*, which focuses on a predicted model of diachronic population change within the valley through time.

Chapter 7 provides an overview of environmental resource use in the Gruža River valley and possible models of social and economic interaction. The discussion in *Chapter 8* returns to the research questions to provide final conclusions and a model for social and economic development during the Neolithic and discusses this from a broader anthropological archaeology perspective. Finally, suggestions for future research in the region are presented.

CHAPTER 2 – EXAMINING THE EMERGENCE OF SOCIAL COMPLEXITY

In Chapter 1, a discussion of prehistoric social complexity in southeastern Europe was provided that connected with my program of doctoral dissertation research on Neolithic communities in the Balkans region and the research questions I pursued through field work. In this chapter, I will provide a discussion of some of the approaches to the study of social complexity in anthropological archaeology and emphasize key theoretical concepts that have been important for the study of the Neolithic for the Balkans region and the Vinča development.

During the late 19th century, classical cultural evolutionism emphasized a rather universal pattern of social progress that followed "unilineal" pathways of evolution (Figure 2.1) with associated classifications and typologies for human social, economic and political organization (Morgan 1851; Spencer 1896; Tylor 1871). By the mid to late 20th century, social and cultural developments were being re-examined through cultural neo-evolutionism (White 1960; Steward 1964; Steward and Shimkin 1961; Sahlins 1960; Service 1962) and a general dissatisfaction had emerged with earlier theoretical orientations (esp. Boasian approaches). As part of these developments, some scholars placed a greater emphasis on "multilinear" and "branching" forms of social and cultural evolution and the importance of examining local and regional cultural adaptations (Sahlins 1960; Service 1962).

In the latter half of the 20th century, with the emergence of processual archaeology (New Archaeology), scholarship in anthropological archaeology focused more intently on the emergence and development of early complex societies and the important natural and cultural variables that influence human social, economic and political organization. Cross-cultural comparison was an important part of such studies and in many cases scholars sought to address the fundamental question of why egalitarian social formations forfeit certain individual, or collective, liberties and agree to the ‘constraints’ of institutionalized leadership and social hierarchy (Kuijt 2000). Early comparative studies also focused intently on defining the nature of social ‘complexity’ and how it is possible to recognize such developments and to analyze them (Carneiro 1962).

2.1 CONCEPTUAL MODELS

In this dissertation, I will draw on various social theories and models that have been put forth by several researchers studying the Vinča development (e.g. Chapman 1981; Parkinson 1999; 2003; Borić 2009). These theoretical contributions have been especially productive in allowing for the analysis and interpretation of possible long durée trajectories that might have produced quite specific forms of social organization through the interplay of community specialization that stimulated regional scale forms of interaction and complexity (Figure 2.2).

An especially important social formation to consider in the context of Vinča development is that of the clan, which represents a long term extended kin bond that is less ambiguous then tribal political organization (Service 1962). Importantly, clans can continue to function event with slight changes to their core structure and can remain active even within larger tribal settings, chiefdoms, and states and empires. For example, the Roman gens, did not change the primary notion of clan structure or its social bonds from the earliest times of Roman society through to the later phases of the Roman empire (Smith 2006). Clans also are commonly connected with herding societies, as is the case with traditional herding societies in the Balkans (Boehm 1987) where large changes in social organization, social structure, and material culture do little to influence clan connections. Although, it has to be said, that in traditional scholarship the discussion of clans is not as clearly defined because of the emphasis on general kinship (Smith 2006, 2).

In looking at models that have been put forward for social organization during the Neolithic period in the Balkans, this shift in focus towards clans provides a useful heuristic device that allows one to step away from the more conventional and rigid unilinear perspectives that have been used in the past. This also provides an important perspective on diachronic changes in social integration and broader community interaction that are crucial to understanding the longer-term trajectories of social change within a region. This is especially useful for looking at Early Neolithic Starčevo communities in the continuum with Middle and Late Neolithic Vinča communities, since it was exactly such differentiation created through typological distinctions that placed the two in binary opposition.

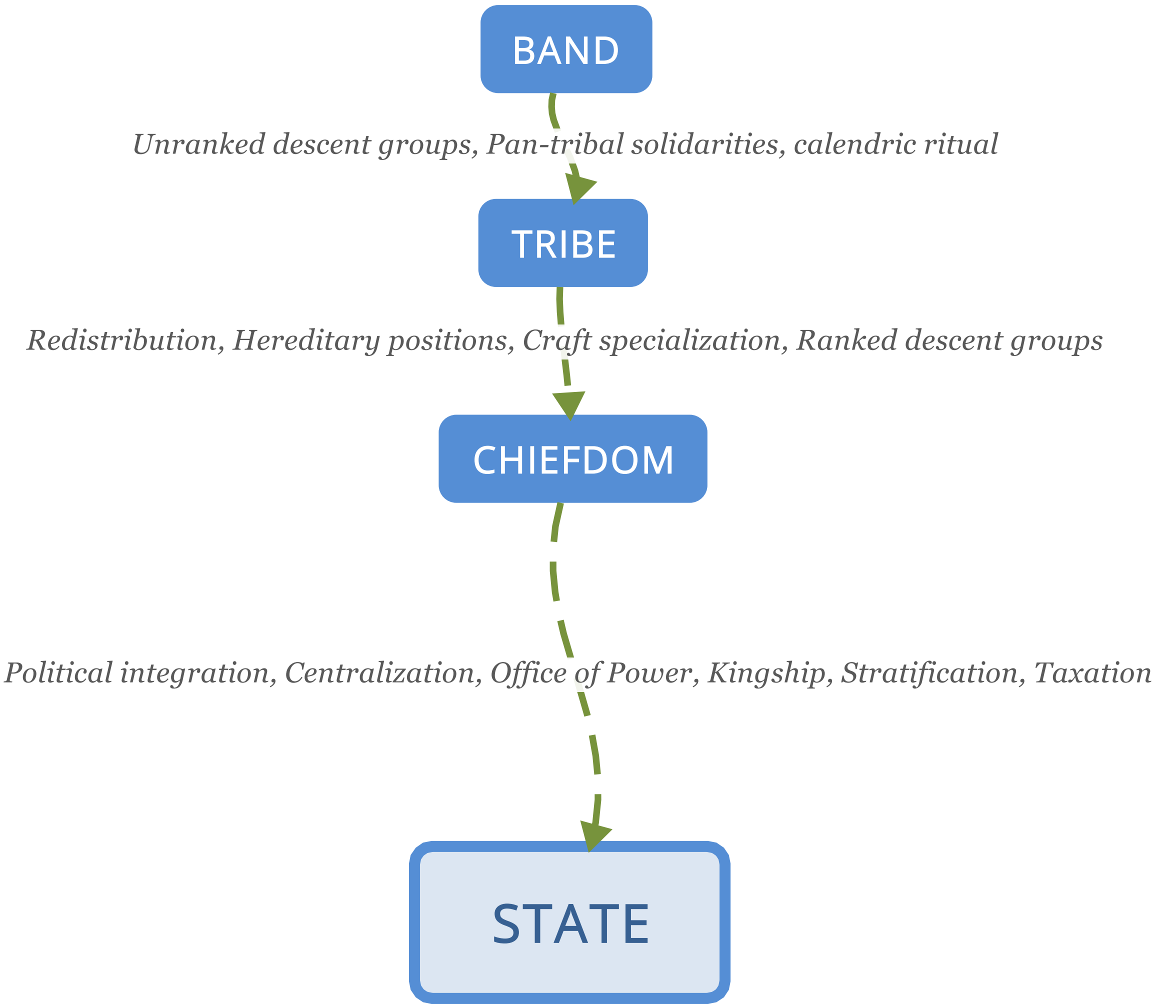

Figure 2.1 Unilinear model of social development after Service (1962) and important attributes that have been associated with different classifications of the model by various authors (e.g. Carneiro 1970; Earle 1993).

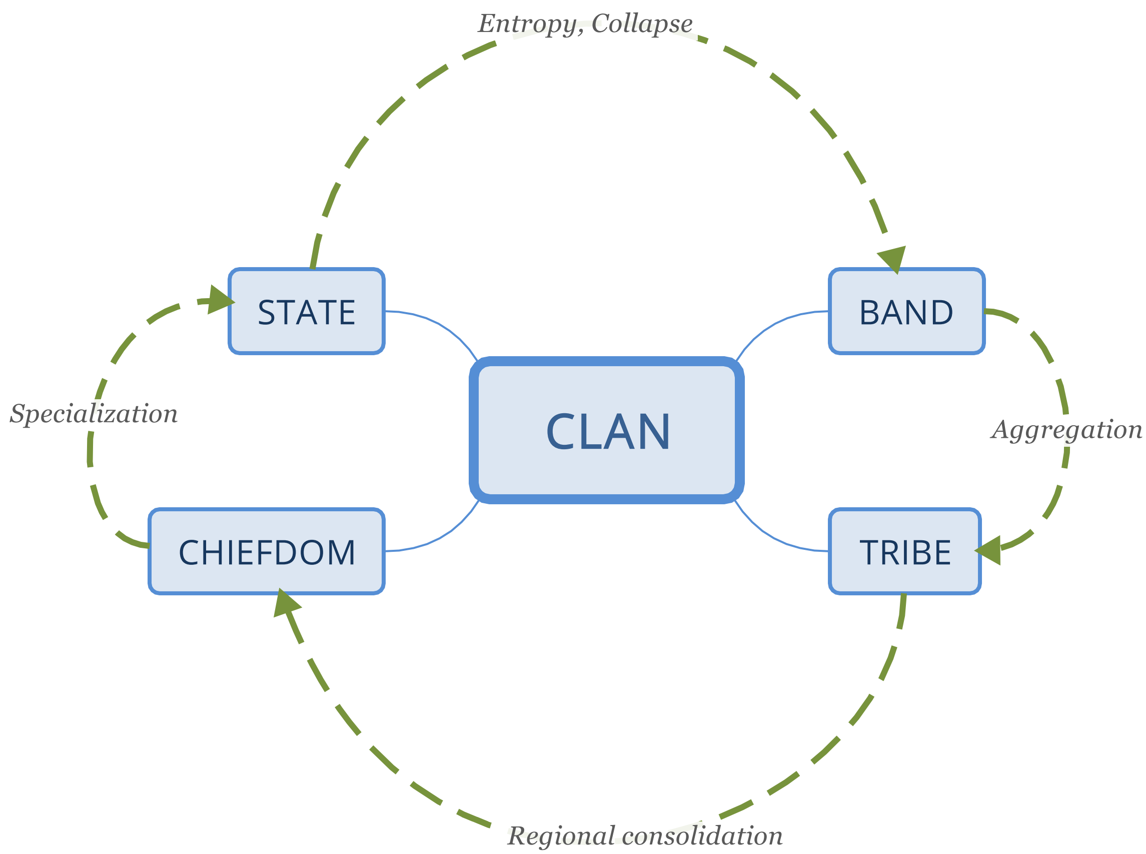

Figure 2.2 Model of cyclical organization with a focus on the clan, as a firm extended family unit with "blood" ties, permeating cultural or class division, combined with the principles of the model of tribal cycling (after Parkinson 1999).

More specifically, this dissertation focuses on questions connected with incipient village formation and the emergence of complexity in one of the regions of the earliest spread of agriculture out of the fertile crescent. Knowledge of these cultural complexes, which developed in the 7th millennia BC and covered vast areas of Southeastern Europe, has been developed over the past hundred years yet there is no consensus about what social and economic factors conditions these developments or what forms of social organization were actually present. This lack of an effective model is due partly to both theoretical and methodological challenges and geographical division.

One of the biggest conceptual obstacles that scholars have complained about is the choice of the level of analysis, as questions continue to arise over the very nature of the Starčevo-Koros-Kris and Vinča cultural complexes. Scholars have routinely questioned whether they represent bands, tribes, chiefdoms, states or some other form of social organizational pattern? Broader anthropological archaeology also had dwelled on questions of different types of complexity (e.g. Earle 1997; Drennan and Peterson 2012), in which Vinča does not seem to fit very well. Fundamental issues such as the nuclear unit of organization within these societies have proved controversial since household scale analysis have not provided answers to the many questions about social organization (e.g. Tripković 2007). One reason for this is that statistical analyses of recovered artifacts from excavated household contexts have indicated little material differentiation between households (Porčić 2012), which is at odds with the presence of new technologies and forms of production such as extractive metallurgy.

2.2 THE NEOLITHIZATION QUESTION

The Neolithization of the Balkans begins around the Seventh millennium BC with the first farmers entering the regions of the southern and eastern Balkans (territories of present day Greece and Bulgaria) with two general types of settlements. The first type occurs in the fertile flood alluvial plains such as the sites of Nea Nikomedia, Karanovo, and Sesklo (Borić 2008). The sites of Sesklo and Karanovo I and II follow patterns that were already present in the Near East that can be described as tell settlements. These sites have 2-3 m deep stratigraphy and reveal architectural similarities with their Eastern counterparts. They also contained tightly grouped, rectangular houses, that were constructed independently of the local surroundings and were made of wattle and daub frames with stone substructure or mudbrick construction (Boric 2008). These seem to follow the same seemingly “egalitarian” ethos in the Early Neolithic with the usual associated “package” of domesticated animal and plant production that utilized emmer and einkorn wheat and barley with cattle, sheep, goats, and pig husbandry (Whittle 1996).

These sites frequently have been used as supporting evidence for the “diffusion hypothesis” of the spread of farming from the Near East/Anatolia into Southeastern Europe. Today, there seems to be fairly little doubt that farming communities where, in fact, diffusing from the Near East given the similarities between such communities and, in recent years, both DNA and aDNA evidence (Whittle 1996; Mathieson et al 2018).

2.2.1 THE NEOLITHIZATION QUESTION – VARIETY IN BALKANS

Nevertheless, there are archaeological sites that do not follow this particular model fully. These are represented, for example, by Franchti Cave in Southern Greece, where there is continuous occupation for the last 20,000 years. At around 7000 BC at this site, there is the appearance of animal husbandry and use of emmer and einkorn, however, the technological complex reveals much closer ties to the earlier hunter-forager subsistence traditions. This suggests that early domestication practices in that region were partly indigenous. Such developments are also supported by evidence from the Northwestern Balkans in terms of the transition to Neolithic lifeways.

This leads us back to the geographical division between the Northwestern Balkans and Southeastern Balkans that was discussed above. In the northern area of the peninsula there is a very noticeable difference in the layout of Early Neolithic (~6300 BC) settlements. These are mostly flat and represent fairly small sites (~1-6 hectares) such as the eponymous site of the Starčevo culture (Starčevo-Koroš-Kriš complex) and Vinkovci, Nosa-Biserna Obala (Garašanin 1979), Divostin I (McPherron and Srejović 1988), and a number of other sites in the region. In addition to these sites being fairly small and interpreted as single occupations, there is also the problem that none of the architectural features have been found preserved. Typically, the only remnants of occupation are oval pit-house type features that have been interpreted as subterranean dwellings.

This is problematic since there are known clay models of houses that have been recovered in Macedonia, that depict rectangular dwelling structures (Borić 2008) and in rare cases actually are indicative of surface level dwellings, such as at Divostin I (McPherron and Srejović 1988) [1] .At the site of Grivac, which is located only 5 kilometers to the Northwest of Divostin I , such subterranean dwellings also were identified (Bogdanović 2004). This architectural pattern is something that was noted quite early in the study of the Starčevo. For example, Doctor Draga Garašanin notes such architecture in her doctoral dissertation on the Starčevo (1954). These studies have, unfortunately, led to rather conflicting opinions on the exact architectural pattern of Starčevo houses. However, it does seem that these populations in the Northern Balkans and Carpathian Basin were much smaller demographically and more mobile than those who occupied the Southern Balkans. This ambiguity of Early Neolithic sites also presents an additional problem in evaluating

[1] This is probably because of the local geology where the site of Divostin is located, which is in an upland zone of Central Serbia with very shallow sedimentation. This created a situation in which it was difficult to construct large subsurface pit house features.

the actual process of Balkan Neolithization whereby population estimates for the Northwestern Balkans are virtually non-existent and no clear understanding of settlement patterning has been achieved.

In contrast, in Southern Macedonia, we can see a fairly clear rise in regional demography with the formation of tell settlements. What has been well documented is that Mesolithic communities from the Danube Gorges region of the Danube River seem to follow a similar pattern to that present at Franchti Cave. At sites such as Lepenski Vir on the Danube, archaeological evidence has shown that some forms of incipient animal husbandry were already present (dog, pig) and there was definite contact between Neolithic agro-pastoralists and indigenous hunter-gatherer populations (Borić 2008; 2009; Whittle 1996). Whittle (1996) painted a very dramatic picture of the resistance of indigenous populations at the site of Lepenski Vir regarding transitions from hunting-fishing to the new agro-pastoralist packages associated with the Neolithic way of life. However, more recent archaeological evidence has not supported this. Instead, recent studies have indicated that there was dynamic interaction between Mesolithic and Neolithic populations in which female exchange was occurring (Boric and Price 2013). This strengthens the case for the possibility of local populations mixing (genetically through exogamous relationships) with farming communities and optimizing their subsistence practices. However, this did not appear to substantially modify the forms of social organization of the indigenous populations in the initial phases of contact and interaction.

One of the main questions that this evidence stimulates is how and why such a dynamic occurred during the Early Neolithic with the advent of new farming communities in the Danube River basin but more broadly across the Balkans region. Furthermore, the question of how local demographic patterns changed as a result has scarcely been examined. Unfortunately, in previous scholarship, this question has not been approached systematically and it is just accepted that the emergence of such Early Neolithic settlement patterns occurred (e.g. Starčevo-Koros-Kris complex).

Some scholars have tried to fit the development of the Neolithic Vinča culture into already existing models for the Middle East with demographic growth occurring because of agriculture. This has often followed the classical theories about the fissioning of communities with some groups being left to occupy less favorable areas (Tringham et al. 1992).

New radiocarbon dates suggest the opposite and indicate that small settlements in some cases even preceded larger settlements or were contemporaneous (Borić 2009). This suggests that a very different process took place whereby new settlements were constructed on top of old Starčevo settlements. The presence of long hiatuses between these occupations have been claimed, such as at Divostin (McPherron and Srejović 1988) where significant weathering of the Starčevo occupation occurred before Divostin was occupied during the Vinča period.

Also, in recent years, partly as a result of larger scale geophysical surveys, it has become apparent that evidence for enclosure and site fortification was widespread (Tripković 2013). Therefore, it seems that one of the reasons for the emergence of reduced regional mobility may be due to increasing levels of conflict. Although there is little unambiguous evidence for warfare the presence of human remains recovered from defensive ditches at Okolište (Mueller 2012) does seem to strengthen this possibility.

Innovation in pyrotechnic technology is one of the most prominent developments that occurs in the Balkans during the Neolithic. Mining also is well documented at Rudna Glava (Jovanović 1989) and Ai Bunar (Chernykh 1974) with almost all settlement sites indicating the presence of either malachite, cinnabarite, or copper objects, with some sites showing the likelihood of smelting activities, such as at Belovode (Borić 2009, Radivojević et al. 2010) and Vinča Belo Brdo (Vasić 1932). This evidence ranks among the earliest recorded extractive metallurgy in the world (Borić 2009). Such activities required specialized knowledge and craft specialization and has stimulated discussion among scholars about the possibility of related social stratification.

Another important characteristic of the Neolithic period in the Balkans is the emergence of transhumant herding of large cattle. It has been known for a long time that cattle were one of the main herd animals for Vinča communities (Orton 2012). However, because of such a hyper-focus of research on the model of cereal based farming (e.g. Bottema and Ottaway 1982) the significance of cattle herding often has been overlooked. Iconography recovered from Vinča culture sites also suggests that this was a focal point of the economy and ritual activity as bucrania (plastered bull skulls) have been found in household contexts as well as bovine figurines (Markotic 1984).

The study of Middle Neolithic sites of Bosut Culture (Bosnian Vinča variant) in Bosnia has indicated that they were placed in very constricted terrain with sharply delineated zones that were available for cultivation. Demographic estimates for these sites, and their local hinterlands, have shown that there was not enough available land for cereal agriculture as a primary subsistence focus and that transhumant herding in the vertical landscape of the Bosnian mountains was required (Müller-Scheeßel et al. 2010).

2.2.2 THE NEOLITHIZATION QUESTION – KEY CHANGES

It is important to stress that there were some similarities between the Balkans and other adjacent regions during the Neolithic. These include the initial emergence and spread of farming practices and the way that these communities first modified and organized their landscapes as small relatively egalitarian communities. What makes the Balkan Neolithic communities unique is that due to both environmental possibilities and constraints very specific forms of subsistence and raw material procurement emerged and that these were, in some ways, quite sharp differences when compared to the Neolithic in other regions of Europe. In the addition to the new technological practices, some additional noteworthy differences are the size of the settlements, population densities, and the volume of overall production of artifacts that is in most site, incomparable.

Neolithic communities and their associated social organization in the Balkans appear to have generally retained the egalitarian ethos of the previous Mesolithic period. However, when scrutinized further, it does seem clear that social organization was far more complex as Vinča culture communities persisted for 1,000 years and sustained one of the largest aggregations of farming communities up to the Classical period in Europe. Vinča communities also produced incredibly significant amounts of ritual paraphernalia when compared to other Neolithic communities in Europe (Chapman 1981).

John Chapman's seminal work on the Vinča culture (1981) synthesized almost 80 years of previous research and remains one of the most important and authoritative works on the subject. Chapman analyzed data from all available Vinča culture sites and materials at the time in his treatment of social organization during the Late Neolithic of the Western Balkans. In his analysis, according to the distribution of artifacts, house sizes and inventory, and settlement sizes, he concluded that the Vinča culture represented village societies with an egalitarian ethos and that craft production remained at the household level and that individual specialization did not emerge. While much praise has been given for Chapman's work, unfortunately, it suffered significantly from a lack of available data at the time that the research was undertaken.

First and foremost, settlement patterning data was sparse at the time of publication of his book and there was not a single systematic survey completed in the Balkans. Unfortunately, this situation has not improved over the past 35 years and regional scale data is simply unavailable. This has had a profound negative impact on current interpretations of the Vinča culture.

Additional problems have deeply impacted the theoretical framework that has been utilized to understand Vinča craft specialization. Although metallurgy has been identified as related to the Vinča culture since the early work of Professor Miloje Vasić of 1936, "Vinča – Industry of cinnabarite and makeup") (1936), it was declared impossible to distinguish whether this was a local development or the influx of ideas from the Middle East. This has significantly impacted the way in which craft specialization has been treated in the Balkans.

Following the excavations at the prehistoric mine of Rudna Glava (Jovanović 1982), and new excavations at the site of Belovode (Šljivar and Jacanović 1997; Radivojević et al. 2010), we know that dates for early metallurgy in the Balkans now precede those of the Near East (Borić 2009). This poses important questions about the knowledge and specialization that was needed for both mining and metal production and which members of society had access to specialized craft knowledge. This is not to say that the analysis of craft specialization has moved significantly forward since Chapmans work, as there seems to be a substantial lag of theoretical interpretation following the recovery of new empirical evidence and dating.

In recent years, one of the more significant studies devoted to the quantitative analysis of artifacts related to craft specialization and uniformity of production has been completed on Vinča pottery. This has suggested a wide variety of technological practice and little evidence of standardization of pottery production when viewed at the site level (Porčić 2012). One of the main problems is the levels of production of pottery in the Vinča culture, which were very high. The amount of pottery from a single excavation trench can be measured in metric tons. Therefore, there are sharply contrasting studies in which completely opposite conclusions have been formed about pottery recovered from the household level (Vuković 2011).

One more important aspect of Chapman's earlier study (1981), but one that has not been further developed, is the presence of transhumant herding of cattle. Recent studies have produced very interesting results and indicated that cattle herding was one of the most important subsistence factors (Orton 2012). Additionally, the majority of pollen that has been analyzed from local settlement contexts reflect wild taxa and this has questioned the actual extent of domestic cereal crop production.

As noted above, since the time of Chapman's 1981 publication, as well as today, there have been no complete or even large scale excavations of Vinča settlements. This has severely impacted our ability to understand the spatial arrangement of these sites. Over the past decade, however, large scale geophysical surveys have been completed and settlement enclosures and fortifications have been identified (e.g. Schier 2008). Additional survey has led to an increasing awareness of the large scale of these features and the substantial labor invested in constructing and maintaining them. These surveys also have provided a much clearer understanding of the spatial arrangements of Neolithic settlements and their possible diachronic phasing.

One of the most striking features, beside the presence of enclosure/defensive features, is the lack of open spaces for livestock keeping as settlement excavations have not indicated areas within houses that may have been used for this purpose (e.g. Divostin, Vinča Belo Brdo and Stubline). One possible answer for this question has come from excavations at the Bosnian site of Okolište, where GIS analysis was paired with an estimate of population density for the settlement. As noted above, this has shown a disparity between the estimated population and available land in which the only possible option was the use of transhumant pastoralism (Müller-Scheeßel et al. 2010). This specific problem is something that is addressed in Chapters 5, 6 and 7 of this dissertation.

This case study represents a situation where on one hand there was a need for animals to be grazed outside of the settlement but the presence of fortifications signals the likelihood of elevated conflict. Both livestock herding and metallurgy require long distance travel away from the protection of the settlement. If this was the situation, it is hard to imagine an individual, or even a small group of people, engaging in craft specialization as this would require movement within hostile landscapes. Specialization at the group level would have been a possible response to such dangers and may have limited the emergence of inequality and social aggrandizers. Through this type of approach to "crafting", the community increases its social resilience because even in the case of the loss of a single craftsperson the technological knowledge is widespread enough that such a loss would not impact the community greatly. This also reduces opportunities for aggrandizing, since there are not enough specialists or special products to contribute to a network and trade for wealth objects (Earle 1994). This is not to say that there was an egalitarian ethos at work it is just that the distribution of wealth and labor may have taken different pathways towards complexity.

Archaeological evidence from the necropolis at the Gomolava settlement may support these interpretations. At this site, 26 individuals were recovered and aDNA analysis of the skeletons indicated that they were all male, all from a single lineage, and all were buried with the same types of grave inventories including weapons and copper objects (Borić 1996; 2009). There also is evidence for the exchange of prestigious goods with obsidian moving from the Carpathian Basin (Chapman 1981; Tripković and Milić 2009) and spondylus shell traveling from long distances (Borić 2009). But, it does seem that, even with some of the settlements becoming more powerful and significantly larger, there is no widespread evidence of higher levels of social rank and power. This might be explained by forms of peer polity pressure (Renfrew 1996) where multiple competing polities were preventing any one polity, or community, from becoming an overarching regional power. However, clan membership and a strong community ethos may have prevented the establishment of any hierarchical order through the materialistic personification of social and economic power. In such a social arrangement, it pays to have communal identity and to develop a kinship system that encompasses the entire community into a single settlement and functions as a "house society" (Borić 2008). This would not only provide community members with a common identity and identification in opposition to other neighboring communities but actively reinforce social cohesion by keeping people within enclosed settlement complexes. This also would possibly support a system of labor tax for the construction and maintenance of enclosure systems and mining.

2.2.3 THE NEOLITIZATION QUESTION – SUMMARY

In summary of the theoretical discussions in this chapter on the Neolithization of the Balkans, there are three main conceptual areas that are problematic and remain to be addressed more fully. The first concerns the diachronic development of the Neolithic as a whole and whether it possible to see local developments, internal changes in social organization, and clear demographic shifts. The second concern relates to craft specialization and the way in which it is understood in terms of the scale of production and socio-economic organization and whether the nature of artifact collection (sampling) and recording have provided an true reflection of the craft industry. The third problematic area is tied to the second one noted above and relates to the overall scale of the research on Vinča sites and lack of evidence for vertical social stratification.

Previous scholarly research on the Vinča culture has used unilinear models of social evolution and as a result a clear understanding of Vinča social organization has not been achieved. This is discussed in more detail in Chapter 3 of this dissertation in terms of providing an overview of the historical development of the discipline and also the predominant theories. By shifting the theoretical focus to 'community', and a perception of community as not only political but related to other forms of kinship structure (i.e. clans) and a 'house society' model, may provide more insight. This dissertation uses this approach and examines the long-term development of tightly bound communities as the primary unit of social organization. Chapter 7 and Chapter 8 discuss in more detail the possible models of organization connected with these alternatives to a strictly hierarchical model of social organization. By using comparative ethnographic data and models, Neolithic communities are viewed through a different theoretical lens that emphasizes herding communities with strong mutually dependent ties that existed within hostile and competitive environments. This provides an important new perspective in which to address trends in subsistence production, regional demographic growth, and the emergence of inter-communal competition for access and control of vital resources during the Neolithic in Central Serbia.

CHAPTER 3

3.1 OVERVIEW OF THE HISTORY AND SCHOLARLY RESEARCH OF THE GRUŽA VALLEY

History is something that is abundantly present today in the region of Šumadija, Serbia and is a phenomenon that is lived and breathed by the local population. The nexus created between landscape, people and local history is a defining characteristic that cannot be escaped in any moment of daily life. From the brandy oak barrel that was built from the oak tree that a farmer cut in 1984 to the old withered pear tree next to it that bore witness to a flame of passion between the Prince of Serbia (Knjaz Miloš ca. 1815-1835) and the farmer's great grandmother.

A bit further down the road from that pear tree is an ancient church that was discovered during forest clearance by farmers who had come to this abandoned land as homesteaders and warriors, led by the leader of the first Serbian uprising Karađorđe Petrović (Black George) for the liberation from Ottoman occupation (ca. 1804).

The church, overgrown by the forest, was collapsed with only frescoes of saints, such as that of the church founder Radič Pustupović, still well preserved. This same founder was widely known from epic poetry as a great hero, warrior, leader and one of the richest lords in Europe who had acquired wealth through mining at the nearby Rudnik mountain. He had organized mining there through obtaining dependent peasant miners from Saxony who he brought to the Balkans. This was the same mineral rich mountain that was previously mined by populations during the Bronze and Iron Ages – groups that had made their homes in the clearings of the ancient forests originally made by Neolithic settlers into the region.

Although one cannot suggest realistically that there were direct connections between these ancient populations the perceived reality by local populations living there today is quite different. First, ethno-historic publications about the region of "Gruža", published by Professor Mihailo Dragić in 1912, contains many recorded folk stories in which all historic and prehistoric periods are mixed into one mythical place. The Neolithic period settlements of Kusovac and Grivac are fully recognized by the locals as previous settlements, not ambiguous myths, and there is a recorded legend that in the "olden days" a cat could have moved jumping from roof to roof, not setting foot on ground, all the way from Bare to Knić (Dragić 1912:188). This legend is the same one that I was told numerous times by local contacts during my field research. Such views indicate intimate relations towards the past, where it was not "others" living in this region, it was always "us". It is something that is not connected to the national identity, or any modern construct, but to an identity of the local people living in this valley today. They were, and always will be, *Gružanci*, the people of the Gruža River valley.

3.2 HISTORY OF RESEARCH

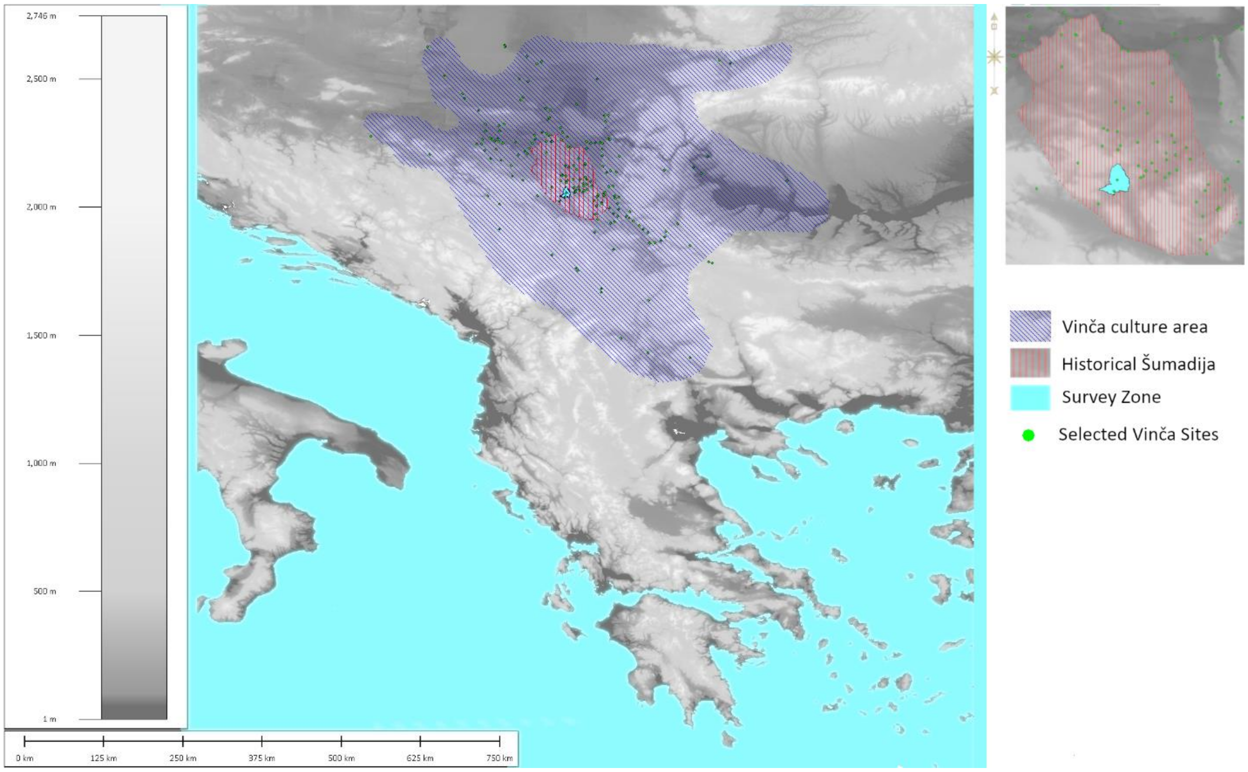

Figure 3.1 Map showing Vinča culture area, historical Šumadija and location of the survey zone over DEM model of Southeastern Europe (Kočić 2019).

Interest in the Gruža region only exploded in the XIX century when Šumadija and Gruža, for the first time, became the center of the Serbian state. A little-known fact, is that the first capitol of the modern state of Serbia was in fact not Kragujevac, which became the capital in 1818, but a village in the Upper Gruža, Gornja Crnuća, where the residence of Prince Miloš Obrenović (1780-1860) was situated from 1814-1818 (Borić 2018;26-28). Prince Miloš Obrenović was also the author of the executive order from 1844, which decreed that all antique objects should be gathered and reported to the state and this action supported the creation of the the National Museum in Belgrade.

In February of the same year, the Council of the newly formed state of Serbia passed the Prince's Act No.137, which forbid any unauthorized excavations of heritage and "treasure" recovery (Glasnik DSS 1847: 153-154; Bogdanović 1983: 10). Although, in this period, there was a slight tendency toward the acquisition of antiquities by the newly formed social elite, such as the Prince himself having a Roman milestone placed in his courtyard (Bogdanović 1983), the practices contrasted strongly with the higher scale use of antiquities in other parts of Europe.

The Austro-Hungarian Serbs were the only part of the Serbian corpus at that time that was engaged with antiquarian traditions (Novaković 2011: 386) and all endeavors south of the Danube River were only connected to state sponsored efforts. The first efforts in the exploration of the ancient past from a "scientific" point of view were undertaken on the northwest slopes of Rudnik mountain and the lower Gruža valley by the famous scholar, doctor, antiquarian, museologist, pan-Slavist and Slovak national Janko Šafarik (1814-1876) in collaboration with the local scientist Jovan Gavrilović (Đorđević et al 2005:13).

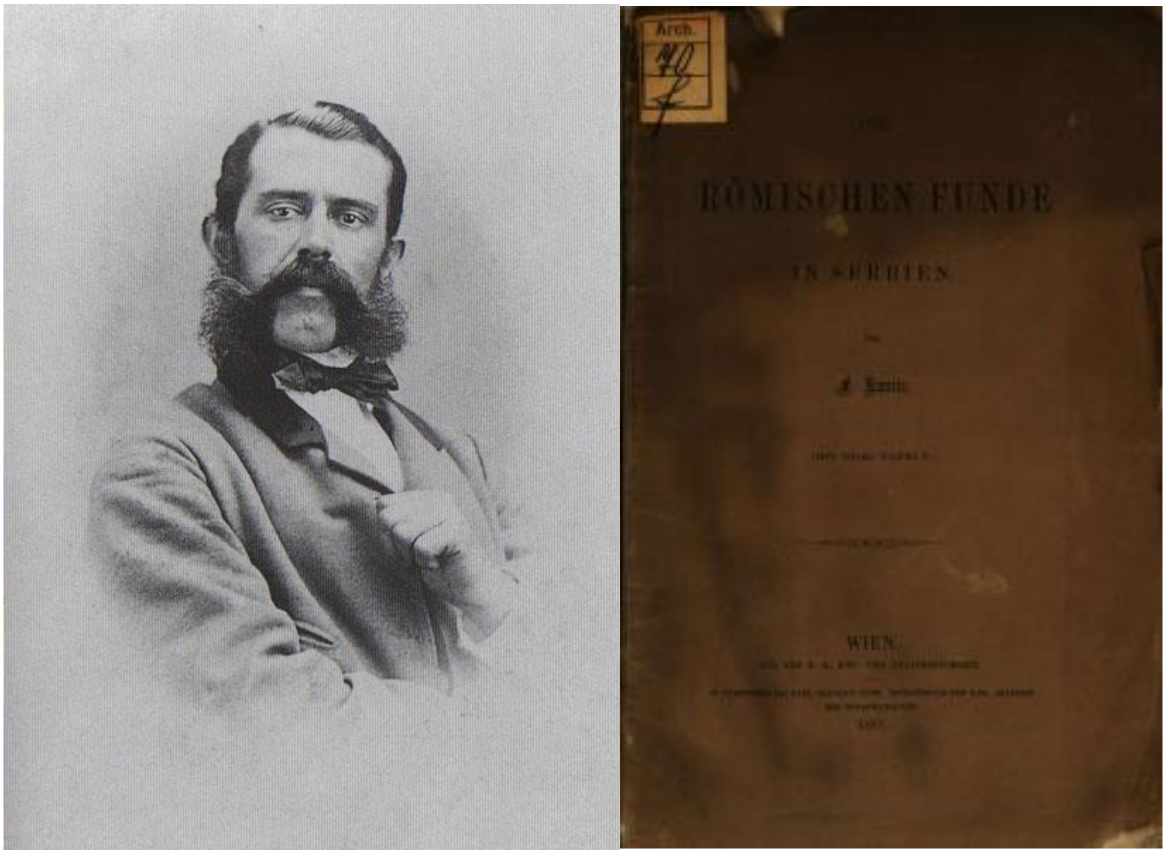

Figure 3.2 Left - Felix Kanitz, photo made by F.W. Rösler, Wien, around 1865 (public domain), Right - front page of the first edition of "Die römischen Funde in Serbien" published in 1861 (photo reproduced from http://mdz-nbn-resolving.de/urn:nbn:de:bvb:12-bsb10256972-4, after public domain license).

Corresponding to the collection of artifacts recovered during this time is an important collection of information characterizing this period. The young Serbian state, just liberated from the “clutches of the Oriental” and tentatively connected with the Occidental, was mesmerizing to the romanticist view that was predominant in Europe at this time among social elites. Numerous emissaries were sent to these “frontier” Balkan lands to form opinions about them (Ćirković 1981). For Serbia, the most important was that of the Austrian intelligence worker and geographer, Felix Kanitz, who in his magnum opus, “*Das Königreich Serbien und das Serbenvolk*” in two volumes, and even more important, “*Die Römischen Funde in Serbien*”, delivers an incredible amount of information that is invaluable to contemporary anthropological archaeology. One of the things that allowed for Kanitz’s immense contribution are his writings on the sparse population of Serbia lands at the time, in which the population levels still had not rebounded from the liberation wars with the Turks. This situation meant that the land had remained relatively empty and that vast deforestation had occurred as the result of timber procurement efforts by the elites to gain wealth and through efforts to create arable land for farming by local villagers.

These activities actually overturned the environmental situation where French politician, poet and writer, Alphonse de Lamartine, states in his book, "Voyage en Orient" (1833), that Serbian villages are placed within an “ocean of forests”. Austrian state reports from the first decades of the XIX century also noted that forest cover was approximately 80% in Serbia. This information stands in stark contrast to a dramatic speech given by Prince Miloš in the Soviet (council) where he advocates for halting the destruction of Serbian forests and states that the cutting of one tree equates to the killing of one Serb.

This grim ecological situation was, on the other hand, extremely beneficial to Kanitz as he was able to see the remains of historical architecture and monuments of archaeological importance all across Serbia. The main interests that he had, of course, were concerned with classical archaeology and, more specifically, Roman monuments and forts as well as Medieval ones. One similar account also was made famous by Arthur John Evans (1851-1941) who in 1881 worked as a journalist for the Manchester *Guardian.* Evans visited Bosnia, Serbia and Dalmatia collecting data about antiquities that later contributed to his publication *“Antiquarian Riches in Illyricum”* (1885) (Kuzmanović 2012:66). Although it must be said that Evan’s activities were not purely scientific as he was jailed for espionage by the authorities of the Austro-Hungarian empire (Kirigin 1988). Accounts of this nature became standard during this time and although they provide a great value as early sources they also convey biases as part of the romanticism of the past and the imperialist views of that time.

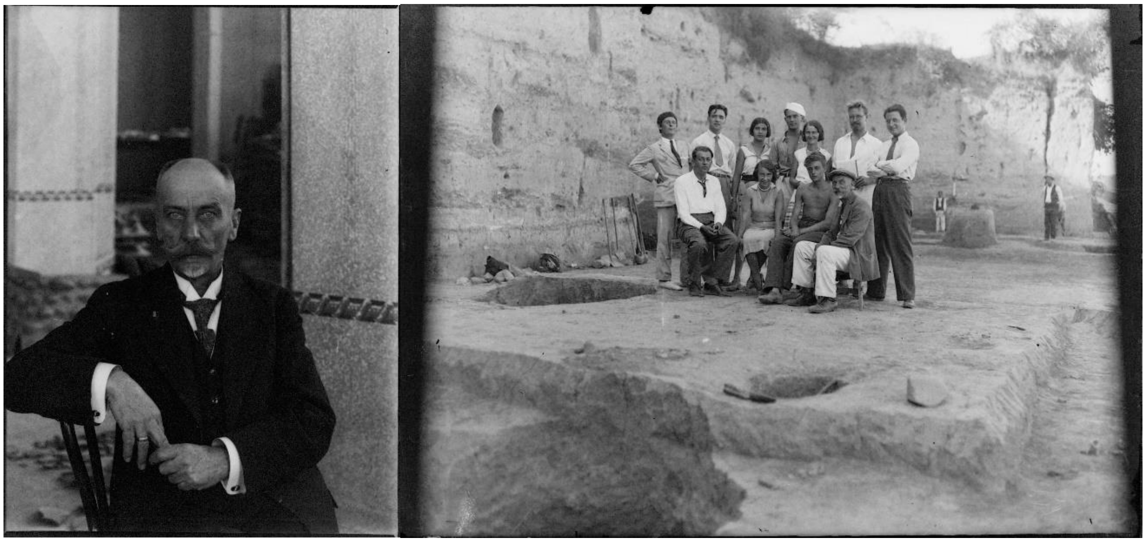

Figure 3.3 Professor Miloje Vasić and his expert team at the Vinča Belo Brdo excavation in the 1920's (photos from Arheološka zbirka Filozofskog fakulteta u Beogradu, public domain).

The founding of the "Great School" in Belgrade, Serbia, (later to become Belgrade University) initiated a new phase of exploration of archaeological sites. This incorporated a new scientific, not just antiquarian, dimension to research and led to the founding of the archaeology department in 1881 and the *Serbian Archaeological Society* in 1883. This led to numerous archaeological sites being identified and recorded in the region up to the eruption of the Balkan Wars. These included Neolithic sites around Aranđelovac, Bare and Dizaljka. The Balkan Wars (1908-1912) and The Great War (1914-1918) created a hiatus of any further archaeological explorations in the region. However, with the cessation of the hostilities a renewed surge of scientific activity, especially pronounced through international collaborations, began to highlight the rich prehistory of the region.

Professor Miloje Vasić's excavation at the Vinča Belo Brdo site established a completely new perspective for Danubian prehistory and indicated that there were large and complex prehistoric communities in the Balkans present before the emergence of the Aegean Bronze Age civilizations (Palavestra 2012). This led to a number of new collaborative projects including a somewhat haphazard survey of several archaeological sites by Vladimir Fewkes and subsequent exploration of Ljuljaci by Harvard University. The excavations at the site of Starčevo were first conducted by M. Grbić. Later, in collaboration with W. Fewkes in the campaigns from 1931-1932 at this site, he helped to identify the Starčevo archaeological culture development (Fewkes et al. 1933).

The Starčevo archaeological complex was recognized through these efforts as the Early Neolithic easily because of the stratigraphic relationship between identified Vinča and Starčevo layers. This connection was made even easier since the two eponymous sites are barely 7 km from each other. Unfortunately, the 'guns of war' were not silent for long and another long hiatus happened between 1941 and 1948, as the civil war between communists and royalists continued for three more years after the cease of the main hostilities in Europe. Conflict was especially intensive in Central and Western Serbia where the center of the royalist forces was positioned.

An explosion of archaeological research can be connected with the period following the war and the large scale reconstructions and new infrastructure that appeared during the 1950's. New generations of archaeologists, now funded by the state, which enforced both mandatory labor by local workmen and the very strict protection of heritage, brought about numerous new projects throughout the Socialist Federative Republic of Yugoslavia. These included excavations of the archaeological sites of Grivac, Ljuljaci and Divostin. First led by Professor Branko Gavela, it was exactly these sites that allowed the establishment of relative chronologies for the central Balkan transitional stages of the Early and Late Neolithic. These sites also opened the doors to large scale international projects and enhanced immensely the knowledge of the region (Bogdanović 1988).

The last decade of the XX century, unfortunately, witnessed another conflict in the Balkans and scientific archaeology, especially the one focused on prehistory, suffered gravely since the prehistoric past was seen as useless by the totalitarian regime that was engaged in newly rediscovered nationalist agendas (Babić 2009, Novaković 2011). This is why one can witness a sharp decline in all research activities at this time, especially outside of Belgrade, where local institutions were left without funding and salaries.

The first decades of the 2000s finally saw a renewal of scientific research and heritage protection activities. However, a chronic lack of funding associated with the transitional economy was still present. A resulting and interesting characteristic of Serbian archaeology is that it is known best by two things; early prehistoric archaeology and Roman provincial archaeology in which it has the longest traditions (Novaković 2011). It so happens, therefore, that both of these traditions have their roots in the center of Šumadija, especially around the Rudnik mountain and the Gruža River.

3.3 EARLIEST HUMAN OCCUPATION CA. 40,000 to 15,000 BCE

The Gruža region was first inhabited during the Pleistocene period. Evidence for this is found in the Jerinino Brdo Cave, which is also the first excavated Paleolithic site in Serbia. The cave was first excavated in the beginning of the XX century and yielded Mousterian tools and the remains of cave fauna together with two hearths. Unfortunately, the site itself was destroyed by excavation and subsequent road building, as the modern highway cuts through the hill where the cave is located (Gavela 1951, Garašanin 1973;9).

On the other side of the Rudnik mountain is Risovača Cave, which is near the entrance to the town of Aranđelovac. This cave also yielded Paleolithic Mousterian tools. The earliest absolute dates for the settling of this region fall into the WÜRM I/II interstadial, ca. 50000-20000 BP (Middle Paleolithic). For the Epipaleolithic and Mesolithic periods, there is no definite archaeological evidence since no sites of these periods were found. There are occasional surface finds of single artefacts that could be attributed to the Upper Paleolithic, including some recovered during the survey completed by the author, however, no definite sites have been identified.

The situation for the Mesolithic Period is even more tentative since no artifacts or sites were found between the Danube Gorges in Serbia and Crvena Stijena in Montenegro. This would indicate a very sparse human occupation of the region during the Mesolithic period in the Central Balkans, which is somewhat surprising. The Mesolithic, therefore, remains as one of the most elusive periods in the Central Balkans since it lacks any archaeological evidence. The only known Mesolithic settlement sites are situated in the Danube Gorge, where there is a definite overlap of Mesolithic and Neolithic populations, as identified through evidence from the sites of Lepenski Vir and Aria Babi (Borić 2006; 2007; 2009). Whether the challenges associated with the detection of Mesolithic sites are methodological, or there are simply no sites dating to this period, continues to present one of the biggest riddles for the archaeology of the central Balkans region.

3.4 EARLY NEOLITHIC (EN) CA. 6500-5500 BCE

The first period that indicates widespread habitation and elevated population levels in the Gruža valley is the Early Neolithic and this is characterized by the Starčevo cultural complex (6200-5300 BC). This complex is defined by its wide spread spatial nature, as identified across the Balkans and Central Europe, and lack of homogeneity in material culture patterning. This is why the cumulative nomenclature of Starčevo–Kőrös–Criș was introduced to describe the widespread spatial distribution of the complex. Even with the distinct separate complexes known in Southern and Central Greece, there are many cross-references and similarities between these different regional "cultures". This is why many individual periodizations and regionalizations have been put forward yet none are firmly established (Garašanin 1954; Bogdanović 2004; Stanković 1991). Some of the key characteristics of the Starčevo–Kőrös–Criș complex are dispersed households within smaller open settlements. Some of these sites are located in fertile flood alluvial plains such as at the sites of Nea Nikomedia, Karanovo and Sesklo (Borić 2008).

The sites of Sesklo and Karanovo I and II follow a pattern similar to Early Neolithic sites in the Near East and could be described as tell settlements with 2-3 m deep stratigraphy. They also have similarities in architectural features with Near Eastern sites wherein there have tightly grouped, rectangular houses. These are built in conjunction with local surroundings and resources that reflect houses constructed with wattle and daub frames, with stone substructure, or mudbrick construction (Boric 2008). In the case of the Stračevo culture in the Central Balkans, there is much more ambigity since the data is limited and often contested. Since the earliest research was conducted on these sites, debates have formed over the temporality of the houses since pithouses that had mixed material in them were discarded from the analysis and they were presumed to be later intrusions.

The main data for the Early Neolithic comes from sites such as Vinča Belo Brdo, Grivac, Divostin and Bubanj in Niš, Serbia (Garašanin 1954; McPherron and Srejović 1988; Bogdanović 2004). At these sites, Starčevo dwellings were mainly characterized as semi-subterranean dwellings (Bogdanović 1988:164). But, as early as the 1930's, Milojčić and Fewkes noted that there is a strong possibility that these dwellings might just be a subterranean "basement" for the above ground rectangular houses that were made from perishable material, such as only wattle, or wattle with dung (Garašanin 1954:24). These constructions seem to follow the same seemingly "egalitarian" ethos in the Early Neolithic, with the usual package of animal and plant husbandry, using emmer and einkorn wheat and barley, combined with cattle (Bos), sheep-goat (Ovi-caprines) and pig (Sus) husbandry (Whittle 1996).

Research on the Starčevo culture in Central Serbia started in full scale after WWII. Of particular note is the diligent work of the Garašanin couple, with Professor Draga Garašanin's important doctoral dissertation on the "Starčevo culture" in 1954, which became one of the best synthetic works on this subject. Professor Milutin Garašanin also contributed important research on Neolithic sites throughout the Balkans (Bogdanović 1983; Novaković 2011). Archaeological research in central Serbia continued with excavations in 1953 and 1954 (Gavela 1958). A new phase of international cooperation was carried out from 1968-1971 (McPherron and Srejović 1971) on the site of Grivac, where the earliest stage of the settlement was defined as pits with older Starčevo material, or "Proto Starčevo", according to the excavators (Bogdanović 2006).

These excavations were followed by the research on the sites of Divostin and Kusovac through the international project in the 1970's by Srejović and McPherron (McPherron and Srejović 1988). Site stratigraphy at Divostin indicated that the earliest occupation dated to the Early/Middle Neolithic and was characterized by Starčevo culture pottery and other portable artifacts characteristic of this period. Five above-ground domestic structures, pits of various dimensions and shape, some of which have been interpreted as “pit-dwellings”, open-air fire installations, and two burials also were identified (Divostin subphases Ia–c).

Several radiometric dates of charcoal established the early occupation at the site (McPherron et al. 1988). Overall, eleven dates from six different contexts associated with the Divostin I phase were achieved. Analysis of these dates, recently done by Borić (2009), indicates that this Early/Middle Neolithic occupation started sometime around 6000 cal BC and that the site might have been abandoned by around 5800 cal BC, was reoccupied somewhere around 4700 cal BC, and then abandoned around 4540 cal BC. Here a gap exists of almost one thousand years between the end of the Starčevo occupation and the Vinča culture occupation and no continuity in occupation of the site between these two phases has been identified.

This is an interesting fact when compared to comments by the original excavators in that they emphasize that some of the buildings of phase II were found exactly on top of earlier features (McPherron and Srejović 1988). They also note that the material of the previous Starčevo phase was heavily eroded and weathered, which poses an interesting set of questions regarding the visibility of these remains and decisions by later populations to resettle on earlier occupied areas.

The Divostin I phase does not provide much additional information, or almost any relevant information for that matter, because of the severe weathering of the archaeological deposits and the subsequent building sequences of the Divostin II phase. One thing that is visible are house floor areas and there are examples of studies that calculated population numbers based on these features. However, the conclusions of these studies seem quite insecure and this author is very doubtful about the projections of approximately 300 inhabitants that have been made for Divostin.

This is primarily because of the limitation of the sample available and the current lack of knowledge of the overall spatial extent of the Divostin I settlement (Porčić 2010).

During the 1980's, excavations to the south at the site of Blagotin, situated in the Morava River valley (Stanković 1993), produced new information about the Early Neolithic in the region. These excavations represent core data concerning the Early Neolithic in the Central Balkans. However, it must be said that except for Blagotin all of the sites are covered by later Vinča phases and only small partial excavations have been carried out. Thus, there is a definite problem in understanding the spatial organization of these sites. There also were large scale excavations at the sites of Paljevine and Grobnice in the now submerged area of the Gruža lake that were completed in 1980. Unfortunately, the site (450 square meters of excavated area) was never published and the documentation that should have been archived in the depot of the Kragujevac National Museum is missing (Bogdanović 1983). The most recent archaeological research in the Morava River valley is at the site of Drenovac (Perić 2016). Yet, this is a multi-period site with a very thick Vinča layer overlying the earlier phases/occupations at the site.

For the longest period of the XX century, the Starčevo complex remained little understood due to the lack of large scale regional synthetic studies of the Early Neolithic. Analogies and general conclusions were made by comparing sites that were often a few hundred kilometers apart and were situated in completely different ecological zones (see Bogdanović 1988).

3.5 MIDDLE AND LATE NEOLITHIC (MN AND LN) 5400-4600 BCE CAL

The Middle to Late Neolithic (MN and LN) is one of the best known periods in the Balkans as a result of the number of sites identified and researched. Nevertheless, it remains one of the most enigmatic in terms of understanding the social organization of these early communities. There are well over 900 sites known in Serbia proper (Marić 2012) and many more in neighboring countries connected to this period. Settlement patterns are much better known for the MN and LN since the preservation of the houses is better mostly due to the practice of the contemporaneous burning of the wattle and daub structures, which has been viewed as possibly connected to ritual practices (Thringham 1987, Borojević 2002).

The LN in the southeast Balkans seems to indicate a steady growth of settlements and population around 5400 BC. In the northwest Balkans, a very large number of settlements appear that are represented by two types: (i) *large tell sites* and (ii) *horizontally distributed settlements* lacking deep stratigraphy. The large tell sites (1-15 ha) appear within some alluvial floodplains and in the Pannonian basin. The higher elevation upland zone areas of the Balkans see the development of even spatially larger non-tell settlements (15-100 ha). These settlements see long-house type structures built within enclosed spaces that are often surrounded by fortification complexes (ditches and in some cases palisades). Examples include the sites of Belovode, which covers around 100ha (Šljivar and Jacanovic 1997), Okolište[2] (Muller-Schessel et al 2010), Obrovci (Tripković and Penezić 2017), and many others. These sites described by the term "Vinča culture" cover a huge area of the Central Balkans. They also have been identified in Northern

[2] Okolište is technically a site associated with the Butmir culture, but the Butmir culture and Vinča are completely contemporaneous sharing most of their characteristics with only small stylistic differences in portable artifacts present.

Greece and in the Carpathian Basin where they are linked to the rise of the Tisapolgar complex (Tasić 1979; 1995; Parkinson 2002; Boric 2009).

The beginning of research on the Vinča culture is tied to the efforts of Professor Miloje Vasić at the eponymous site of Vinča Belo Brdo near Belgrade (Vasić 1929) where excavations started in 1904 and continued under his direction into the 1930s. Excavations at this site are ongoing even today. The next major site connected to the Vinča culture is Dizaljka, which is located next to the town of Aranđelovac north of the Rudnik Mountain range. Dizaljka and Banja were surveyed in the 1930s by the joint team of the University of Belgrade and Harvard University (Bogdanović 1983:19).

The next stage of research in the region started after WWII, as mentioned above for the excavations at Grivac. Several campaigns of research were carried out from 1952-1994 in which 17 excavation trenches were opened. The stratigraphy at Grivac ranges from 1.4 m to 2.8 m in the locations of the house pit cuts. M. Bogdanović divided the site into 3 specific zones, although now it is clear that Grivac was one continuous site during the MN and LN. Chronologically the site covers periods from the Early Neolithic to the Iron Age. However, the Iron Age occupation is situated further to the west and across the earlier Neolithic occupation areas and the Iron Age features are mostly associated with burial and cemetary features.

The next significant phase of Vinča research is connected with the campaign between the University of Belgrade and University of Pittsburgh that started in 1967. During these campaigns, several sites were excavated (Divostin, Grivac, Kusovac, Rudnik, Resnik, and several others) but only a few were published. The best publication relating to this program of research is *Divostin* (McPherron and Srejović 1988). Excavations at this site took place between 1967 and 1970. The investigated area was around 2,480 m^2 of the total area of the site, which was estimated to be around 150,000 m^2 based on surface collection and early subsurface geomagnetic measurements (McPherron and Srejović 1988).

The area investigated was divided into sectors of 100m x 100m and eight of these were partially excavated within 5m x 5m spatial units. In some instances, these areas were subdivided into smaller 2.5m x 2.5m quadrants. In all areas, huts, houses, pits, and other features were found together with artifacts of the Early Neolithic (Starčevo culture or Divostin I) and the Late Neolithic (Vinča culture or Divostin II). The thickness of the cultural layer varied from 0.4m to 1.8 m. This thickness of the layer was interpreted by the authors as not relating only to cultural stratigraphy but also erosional processes at the site. Even though the excavators stated that they tried to follow the actual stratigraphy during the excavations, because of the local pedological situation in which the predominant soil type is *smonica* (with high levels of clay), the site was mostly excavated in arbitrary spits of 10cm. Excavation campaigns at Divostin were finished around 1974. After this period, additional work was carried out at the site of Grivac but no new sites were excavated.

3.6 ENEOLITHIC 4600-~3300BCE

In the archaeology of the Balkans there are few questions more important than the one connected with diachronic change following the Vinča culture. Uncertainty associated with the social organization and demography of the Vinča phase undermine most of the models and conclusions that have been advanced by previous scholars to interpret its decline and the succeeding Eneolithic Period (Chapman 1981, Tringham 1992, Tasic 1995). This problem directly effects questions surrounding pre-Vinča and post-Vinča regional population estimates, leaving scholarly interpretations without a beginning or an end and just a hazy middle phase.

Examples from the surrounding regions, such as the one defined by Parkinson, Yerkes and Gyucha (2004), describe important diachronic shifts that took place at the site of Veszto-Bikery. Research at this site has indicated a pattern of disaggregation of households and a trend towards greater interdependency of households that may have served as a social leveling factor. Sites from the Carpathian basin have produced much more data about the Early Copper Age (ECA) than sites from the Central Balkans. One of the problems with analyzing developments in the Šumadija region during the ECA is that there are few data for this period. Except for the Bubanj Hum settlements to the south in the valley of Morava, that are fairly large and continue with very similar patterns of organization as Vinča, there is little data for the ECA in the Central Balkans. Professors Draga and Milutin Garašanin have contributed immensely with their work on the site of Bubanj Hum, where they recognized that this cultural complex contained early stages representing the true Eneolithic phase and phase III was characterized as the Early Bronze Age (Garašanin 1973: 164-207).

One of the more prominent examples of other Eneolithic sites is the Šuplja Stena mine in the Avala Mountain, located just south of Belgrade, where Professor Vladimir Milojčić identified Baden culture artefacts in mining shafts and used these to develop a rough chronological system for the cultural sequence (Garašanin 1979). Previously, it was thought that this is because it had a short duration (Garasanin 1973) but now we know that the ECA lasts for much longer than that in the Central Balkans and possibly up to a millennium.

While there are more than 900 Vinča sites identified in total within the Balkans, the ECA sites are represented by less than 50 that are agreed upon by regional scholars (Tasić 1995). Not to mention, in opposition to the huge settlements of the Late Neolithic, most of the sites of the ECA in the Central Balkans are isolated farmsteads located on hilltops, such as the site of Bodnjik

(Palavestra et al. 1993), a few isolated burials such as the one at Lepenski Vir, and two hoards identified in the Danube Gorges (Garašanin 1979). Exceptions to this this are found in the eastern and southern zones of the Vinča territory. There are a number of small, isolated farmsteads, placed on hilltops in Eastern Serbia, in the region which was previously uninhabited by Vinča settlements, such as Zlotska Pećina near Majdanpek, Beligovo and Krivelj near the town of Zaječar (Tasić 1979, 1995), and Bubanj Hum, which is a relatively large settlement in southeast Serbia (Garašanin and Djurić 1983).

It does not seem completely incidental that the only region that retained more significant population levels is in the southeastern part of the LN coverage. After the dissolution of LN Vinča communities the Durankulak and Varna communities in Bulgaria emerge quite spectacularly with the clear presence of social inequality and personal wealth (Renfrew 1996; Chapman 2012). Whatever happened to the LN communities in the central Balkans was so severe that most of the Vinča settlements were burned approximately at the same time ~4600 BC (Boric 2009). In addition, however, it seems that the landscape was almost completely desolate of population.

One tentatively interesting pattern that is visible is that ECA sites are present in exactly the areas where LN sites were absent and vice versa (Milanović 2017:17). Šumadija is an example of this, since ECA habitational sites seem to be absent in most of the area that was previously densely populated by Vinča period settlements. In the area east of the city of Kragujevac there are some settlements dating to the Eneolithic period associated with the Kostolac culture (Bogdanović 1985:29), however, these are only characterized by the pottery and the characteristics of the settlements are not well known. The ECA is generally characterized by a change of the positioning of the settlements whereby settlements were built in easily defendable positions, such as Humska Čuka located next to the modern city of Niš (Garašanin 1978:175).

The most prominent evidence for the characterization of the Eneolithic period within the Gruža valley comes from a tumulus (kurgan) excavation near the village of Rogojevac in 1961. This tumulus was relatively small in size with a diameter of 13.5m and a height of 1.5m (Srejović 1976:117) and it contained two human skeletons in the center of the mound with pottery burial goods (around 50 sherds). Both the burial customs, and the material culture, are characteristic for the earliest stages of the Yamnaya culture, which is quite interesting, since this represents one of the southernmost sites connected with this culture and the beginning of the chronological spread of associated Yamnaya populations in the region.

Burial goods also were represented by carbonized horse, ox, dog, deer and wild boar bones and significant ocher within the grave pit context. In the subsequent excavations of other Yamnaya tumuli in the village of Bare, in which two more were excavated, these were slightly different in the nature of their construction and the materials used. In both cases, the dimensions were around 25 meters in diameter and the mounds were quite flat with the height difference between center and perimeter not exceeding 1.4 m. As a result, they were barely observable in the landscape.

The tumuli incorporated a stone ring delimiting the area of the mound that was then buried, as is very characteristic for Yamnaya tumuli (kurgans) in the Eurasian steppes. These mounds also contained skeletal material with very interesting features. One of the skeletons was decapitated and the skull was placed beneath the feet. This burial also was characterized by rich burial goods including golden jewelry found on the chest of the skeleton. One important side note was that during excavation the recovered pottery was found to have been made with a technique and firing that made it less resistant to weathering. As a result, the vessels disintegrated during their recovery (Srejović 1971:117-122). The other tumulus was completely different and contained evidence for a funerary pyre in the middle of the mound area. Burials associated with this feature were cremations with an indeterminate number of individuals represented.

The investigated Yamnaya tumuli can be chronologically tied with the later stages of the Eneolithic and the Kostolac culture (Bogdanović 1985: 30). However, they exhibit clear elements of Eurasian steppe cultural elements and have pottery characteristics that anticipate pottery associated with the subsequent Bronze Age cultures in the region.

3.7 BRONZE AGE 3000-1200 BCE

The Early Bronze Age in Central Serbia and the Šumadija region is characterized by four principal cultural complexes: (i) Bubanj Hum III, (ii) Belotić Bela Crkva, (iii) Vatin and (iv) the Paraćinska cultures. These cultural complexes were identified and delineated during the XX century (Jacanović 2012).

The Bronze Age has a fairly long and detailed history of research in the Gruža valley. The Ljuljaci site, which is located some 2 km north-west from Grivac, is placed on a hilltop position on the Milića brdo hill. The hill itself is situated outside the author's survey zone since it is already a part of the rising terrain of the Rudnik-Borač Krš complex. The hill itself is quite steep on all sides with a prominent outcrop on the middle where the mound is located. This site was discovered during the surveys in the 1930's organized by Harvard University. Actual research at the site only began after after WWII with first the revisionist excavations in 1956. This was done to confirm the existence of the site and then organized systematic excavations were initiated in 1965 (Bogdanović 1986).

Excavations at the site indicated that the settlement was occupied during the periods of the Early and Middle Bronze Age with Proto-Vatin and Vatin artifacts present. The settlement itself was situated on a hilltop and fortified with an earthwork enclosure. This settlement included several houses that were built of wattle and daub construction. Importantly, the settlement represents a clear difference in the form of settlement organization where there are no densely populated areas as identified for the Neolithic.

After WWII there were renewed programs of research in the valley. One of the most important projects was the excavation of tumulus burials by Draga and Milutin Garašanin. These studies also represented the first scientific excavation of Bronze Age burial mounds in Serbia in contrast to previous excavations that focused specifically on accessing central burial features. Investigation of the burial mounds in the Dobrača village, at the Umka site, which is situated on the border of the villages of Dobrača and Ramaća, provided important data for the categorization of the earliest phases of the Bronze Age in this region of the Balkans (Garašanin and Garašanin 1950:182, Garašanin 1973:378). Professor Dragoslav Srejović continued this line of research and excavated additional tumuli in the same area near the the villages of Bare, Rogojevac and Ljuljaci. Eneolithic mounds were discussed above, although all the smaller ones investigated in this region were identified as LBA mounds.

The Late Bronze Age is more characterized by the onset of the Urnfield culture elements. In Central Serbia, this period is mostly represented by the Paraćin cultural group (Garašanin 1973: 298-310), which covers areas around Kraljevo, Čačak and Kragujevac (Dmitrović and Ljuština 2013) and is punctuated by the disappearance of the Vatin group.

3.8 IRON AGE AND ROMAN PERIOD

The Iron Age represents a period of increased social complexity in the Central Balkans. M. Garašanin has suggested a periodization that divides the Iron Age into four main periods for Central Serbia: Iron Age I (1250-950 BC), Iron Age II (950-600 BC) Iron Age III (650-300 BC) and the Late Iron Age (300BC-0AD) (Jacanović 2012). This is a time when increased social complexity within the archaeological record is associated with increased mobility more broadly within the Balkans.

Numerous communities developed here that later became known in history as the Thracians, Dacians and Illyrians. Large scale population movements, such as the widely discussed Celtic invasions, left a distinct historical mark on the region. Sites from Iron Age I are sparse and small with a tendency to reflect possible mobile pastoral groups associated with the Basarabi culture. Large settlements that developed in the Iron Age are mostly hillforts located in the mountainous areas. Such sites are largely absent in Central Serbia but Iron Age materials are ubiquitous and there is little evidence of centralization.

One of the characteristic phenomena of the region is that there is almost no settlement of any other period that will not also contain Iron Age artifacts. However, evidence of dense occupation for this period is difficult to identify. Interestingly, after the Roman conquest of Serbia that was concluded by 44AD, when the region was fully integrated within the Roman province of Moesia Superior, the hillforts of the previous indigenous Iron Age groups were utilized by Romans. In this case, new strategic settlements and forts were built but the Gruža valley has little evidence of Roman occupation during this time. A Roman villa (Villa Rustica), with associated settlement, have been identified in the upland zone to the south of the Borač hillfort, where there are also Bronze and Iron Age artifacts present. But, it seems that the area of the upper Gruža valley was for whatever reason not suitable for settlement and occupation during this time. This is surprising, since the mineral richness associated with the Rudnik mountain was heavily exploited by the Romans on the Western side of the mountain. Here a number of Roman period temples and shafts were found including a votive tablet upon which was written, “TERRA MATER TEA” (Earth mother goddess). It was found near the entrance of one of the mine shafts that has been dated to the rule of Septimius Severus around the end of the 2nd century AD. After the fall of Rome and subsequent Barbarian invasions there are no finds in the region connected to that period.

3.9 MEDIEVAL 475-1500’s AD

The Medieval history of the region is mostly connected to the Serbian medieval state. There are some indications that the region was utilized during the Justinian revival, such as the Gradac fort outside of Kragujevac that has an early Byzantine church present. There also are references to the village of Divostin in Byzantine sources, such as Διβισισχον, where it is noted as a holy place with a monastery (Novaković 1908: 33-34). One of the reasons that there was almost no activity is that the Central Balkans was terribly depopulated. Byzantine sources cite that not a living thing remained in Tribalia after the conclusion of the bloody incursions by the Goths and especially by the arrival of the Avaric people in the period from the IV to VII centuries (Kovačević 1974). This is exactly why the emperor Heraclius (reign 610-641), after the civil war in the Avaric Khaghanate, allowed for the two victorious horse rider tribes, the Croats and Serbs, to settle in the decimated Balkan Peninsula (Ostrogorski 1969; Ćorović 1997: 60-80).

Historically, the first time that regions from Rudnik to Dalmatia are called Σερβλια, is during the consolidation of political power during king Časlavs reign in the X century (Ćorović 1997:79). During the next few centuries, the territory from the Sava River to Rudnik was in a constant state of flux between several kingdoms and represented an important border zone. The true revival of the region starts with intensive mining connected to the exploitation of the Rudnik mineral resources. In fact, the first Serbian coin was minted here during the rule of King Stevan Dragutin in the XIII century.

The majority of the population was placed closer to the Rudnik mountain and the important wealth of the mining operations there. One of the most important settlements in that period was Borač. This settlement appears even in the famous XV century Mapa Mundi from Venice and was the only settlement in the Central Balkans next to Belgrade and Niš that indicated the importance of the region during that period. The settlement itself had a significant merchant population of Latin merchants from Venice and Dubrovnik.

In the north, the most important settlement was Crnuća (Black village), which by folk and historical accounts was actually named Belića (White Village). Belića suffered such heavy losses during the initial Ottoman incursion into the Balkans that the name was changed to Crnuća, from piety. Crnuća was actually placed in a cluster of dispersed settlements forming a ring with the villages of Vraćešnica, Konjuša, Kamenica and Ramaća, with all of them connected by the rule of the grand duke of Radič Postupović, one of the richest people in Europe in the XV century. The source of that wealth was, of course, linked to the mining at Rudnik, and especially the colored metals and silver that were being obtained there.

In archaeological excavations during 2014, a large lead processing site was found within the Kamenica village, including three churches situated in a very small space, with one of them showing Northern European characteristics and almost certainly of the Western tradition (Kaličanin 2015). This church is connected to the non-local Saxon miners that were extensively imported between the XIV and XV centuries in Serbia from Saxony.

Unfortunately, not much is known about the Ottoman rule of the region except for the information that Evlii Chellebi, a famous Turkish writer, provides for the region as he travelled to Sarajevo and Montenegro through Gruža in the XVI century. He describes a Christian population of specific customs and significant wealth, and a well preserved, dense population. He also describes the region as one of extraordinary beauty of life and nature. This idyllic picture, unfortunately, was of short duration, since the Gruža region witnessed some of the heaviest fighting during the Austro-Turkish wars. Austrian authors recount that the fighting almost completely erased every living creature from the valley. This is visible in the chronicles of the liberation wars where only a handful of families remained living within the valley. Perhaps the most striking sentiment is that all the once famous churches were re-discovered by people living some 50 kilometers away. Populations who never dared venture into these desolate lands in earlier times.

CHAPTER 4. GRUŽA VALLEY

Few places can compete with the Gruža valley when it is in full bloom during the late spring and summer in terms of the lushness of the landscape. There is hardly anything that isn't green and growing during this part of the year. Water, which is the source of life, is found in abundance and there are numerous springs that never go dry. Yet, there is still some wildness, which jumps out every now and then, among the small groves of trees and in the large forests that can in places dominate the landscape. This is one of the reasons why this region was called Tribalia and was seen as the darkest part of the Balkans, a land known for mythical forests. Forests, which are believed to have concealed satyrs, and their leader Dionisius, fairies, and the place where only "brigands" lived for hundreds of years. The only beacon of light was the Rudnik mountain. An extinct volcano, rich at its core with a multitude of metals and other minerals, dominates the landscape as an important vantage point and economic resource. This made the mountain irresistible for many populations who dwelled within the region and a significant resource that every empire desired to control. During the last thousand years or so, it also became a beacon of Serbian identity and was known as the "Serbian Holy Mountain", because of the many monasteries scattered around the massif, and because it was both the starting point and the last stand of every major Serbian freedom struggle in the modern history of the region. This made Rudnik a beacon of epic struggle, a synonym for the "rock that you stand on", and, by association, the Gruža River valley became synonymous with "home".

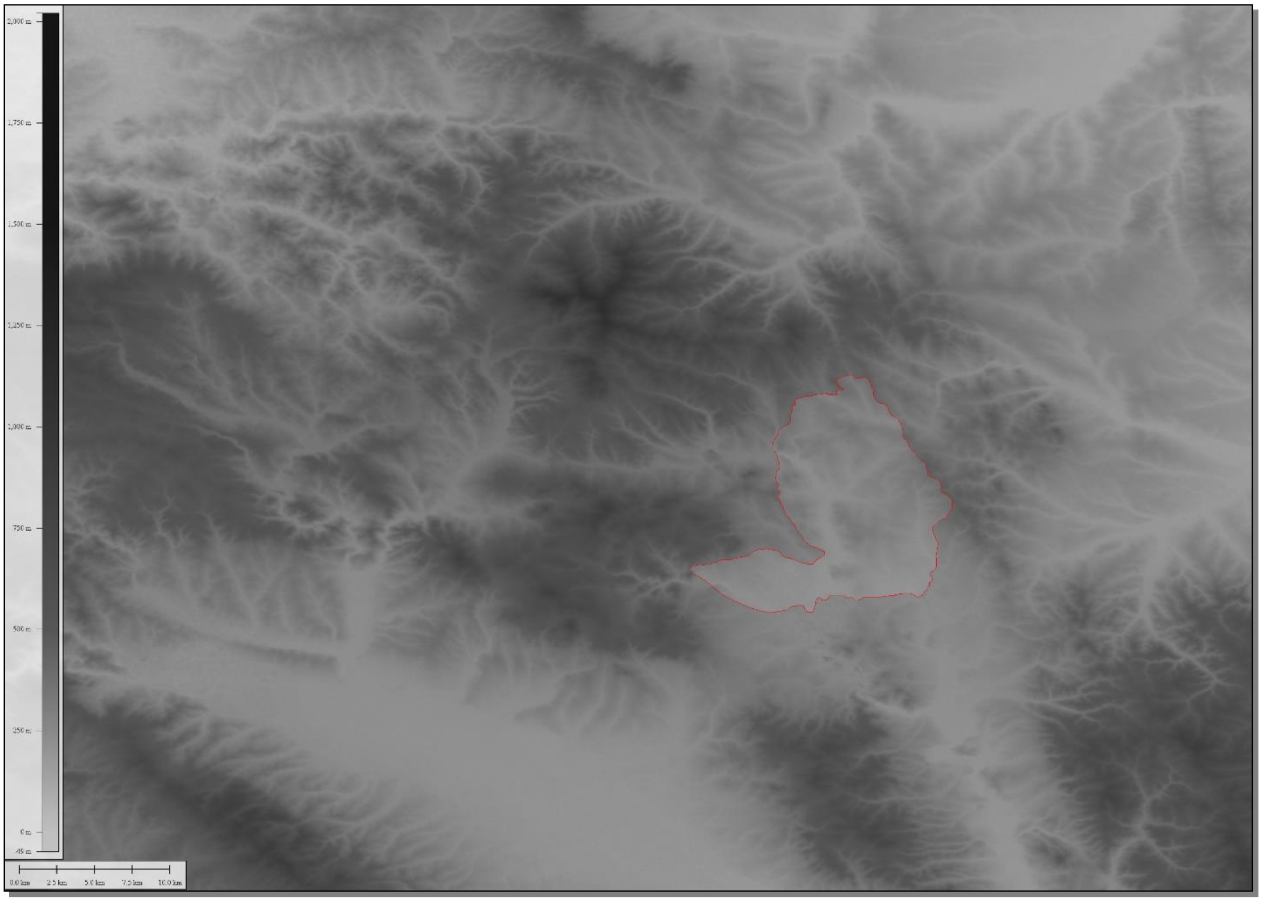

Figure 4.1 Topographic map of the wider Šumadija region with the survey zone outlined in red. In the northwest is the Rudnik massif. The Gruža River and its tributaries can be seen in the light gray areas of the survey zone.

4.1. GEOGRAPHY AND CLIMATE

The Gruža River valley is in the central zone of the Balkan Peninsula in the part of the present-day Republic of Serbia known as Šumadija (Land of the Forests) and in historical periods known as Tribalia.3 The valley itself lies 30km East of Kragujevac, the 4th largest city in present day Serbia, and a historical capital. The climate of the region is virtually on the boundary of the

[3] The Medieval Period name of the region is derived after the Iron Age Thracian tribe of *Triballi*, which covered large part of todays Serbia and Bulgaria.

Oceanic and Humid Subtropical Climate, as designated by the Köppen climate classification, with only 0.1℃ lower then the Humid Subtropical Climate. This means that four seasons are fully represented with very hot summers and mild to strong winters. The variation in annual temperatures can be quite extreme with average temperature differences between January and July being 31 degrees ℃, and the difference between the record low and record high being 70 degrees Celsius.

Precipitation is common throughout the year with May having the highest amount of rainfall and February being the driest month. There is a microclimate zone in the Gruža River valley, which is even personified in a folk saying that is common through the Balkans, "Circling like rain around Kragujevac" (meaning that someone is extremely indecisive). This is caused by mountains forming a cauldron shape around the Gruža and adjacent Lepenica valleys, causing a very specific form of airflow within the valley. Precipitation levels between 40mm and 90mm per month also mean that the general climate is never too humid and is somewhat sensitive to draught. It is not uncommon to have long summer periods without any precipitation, which usually indicates a very lean year in terms of agricultural production. This is somewhat countered by the number of permanent springs in the lower parts of the valley. Clay rich soil, which has poor drainage capabilities, has the potential for creating standing water and marshland. This is most prominently present in the areas where today the dam and artificial Gruža Lake is located. In the rest of the valley, historically marshy areas now have reduced water tables because of the overexploitation of irrigation water for agricultural needs.

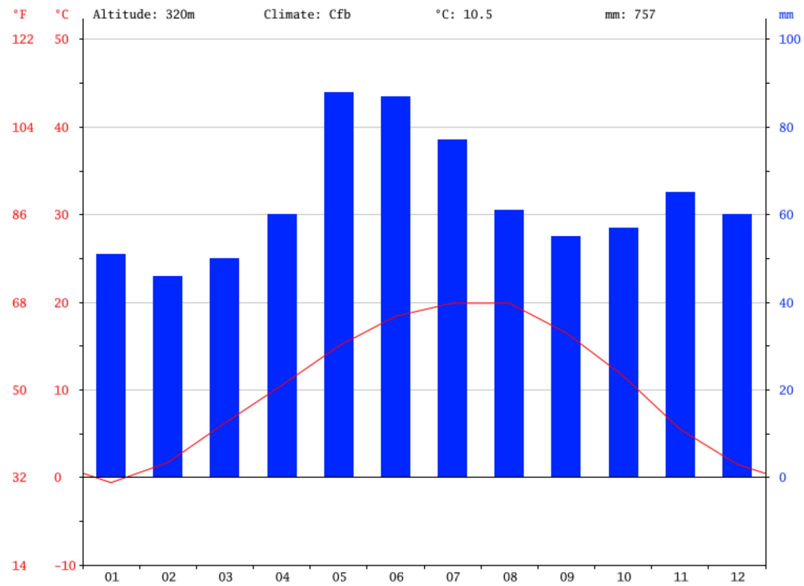

Figure 4. 2 Mean annual precipitation and temperature, data taken from Republic Hydro-meteorological Service of Serbia.

Climate data for Kragujevac municipality (1981–2010, extremes 1961–2010) Source: Republic Hydrometeorological Service of Serbia													
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Record high °C (°F)	20.6 (69.1)	24.2 (75.6)	29.4 (84.9)	31.4 (88.5)	35.4 (95.7)	39.4 (102.9)	43.9 (111)	40.4 (104.7)	37.4 (99.3)	32.6 (90.7)	27.6 (81.7)	21.0 (69.8)	43.9 (111)
Average high °C (°F)	5.2 (41.4)	7.3 (45.1)	12.5 (54.5)	17.8 (64)	23.0 (73.4)	26.1 (79)	28.7 (83.7)	28.8 (83.8)	24.0 (75.2)	18.5 (65.3)	11.6 (52.9)	6.2 (43.2)	17.5 (63.5)
Daily mean °C (°F)	0.9 (33.6)	2.3 (36.1)	6.6 (43.9)	11.7 (53.1)	16.7 (62.1)	20.0 (68)	21.9 (71.4)	21.5 (70.7)	16.9 (62.4)	11.9 (53.4)	6.4 (43.5)	2.1 (35.8)	11.6 (52.9)
Average low °C (°F)	−2.6 (27.3)	−1.9 (28.6)	1.8 (35.2)	5.9 (42.6)	10.6 (51.1)	13.8 (56.8)	15.3 (59.5)	15.1 (59.2)	11.3 (52.3)	7.1 (44.8)	2.5 (36.5)	−1.1 (30)	6.5 (43.7)
Record low °C (°F)	−27.6 (−17.7)	−23.8 (−10.8)	−18.3 (−0.9)	−5.8 (21.6)	−0.6 (30.9)	2.7 (36.9)	7.2 (45)	4.6 (40.3)	−2.2 (28)	−6.6 (20.1)	−16.4 (2.5)	−20.7 (−5.3)	−27.6 (−17.7)
Average precipitation mm	37.9	37.0	42.3	53.9	58.7	76.4	57.7	58.6	51.6	48.9	49.5	45.8	618.5
Average snowy days	8	7	4	1	0	0	0	0	0	0	3	7	29
Mean monthly sunshine hours	71.9	94.8	144.5	180.4	234.5	257.4	293.5	275.5	200.8	152.1	93.9	63.7	2,078.1

Figure 4.3 Climate data for Kragujevac municipality (1981–2010, extremes 1961–2010) Source: Republic Hydro-meteorological Service of Serbia.

The high piedmont area between the Lepenica and Gruža valleys was historically very sparsely settled and this pattern has remained today. This is because of the quite steep rise of the terrain between the two valleys that is heavily eroded and broken into difficult terrain. A recent rise in the present-day occupation of this zone has happened because of the urban sprawl of Kragujevac city.

Today, geographically delineating the Gruža River valley is somewhat difficult since historically it has been a specific social and economic unit with its own internal organization and hierarchy. This is true for the geology and other physical characteristics of the valley as well. The political and administrative boundaries are today divided between the municipalities of Knić, Gornji Milanovac, and Čačak. Gornji Milanovac covers the most Northwestern part of the valley and the Rudnik mountain massif forms the barrier to the North and West. Rudnik is also the place of the headwaters for the Gruža and Lepenica rivers.

The Rudnik mountain itself is volcanic in origin and its rich history and geology will be further disscused in 4.2 and 4.4 below. The mountain dominates the landscape of Šumadija and is visible as a landmark from as far away as Belgrade and Eastern Serbia. Although its overall elevation is not that significant (the highest peak is 1132 MASL/3714 feet), due to its volcanic pyroclastic origin it raises sharply from the surrounding landscape. To the Southwest it merges into the Borač mountain massif, which is another volcanic formation, forming a sharp border for the valley. The valley opens up under the Borač Krš point and medieval citadel into the wider plain, which later funnels into the Lower Gruža valley and the Bumbarevo hill and then extends into the Čačak municipality. To the East of this plain lies a depression that now forms the artificial Gružansko Lake, which covers an area of approximately10km^2 and was created in 1983 to provide municipal water for the cities of Kragujevac and Kraljevo.

Previously, this area was marshy, prone to flooding, and generally kept as pasture grass, since agriculture was problematic due to the high-water table. To the north of the lake the piedmont area begins and this is where the present-day municipality of Kragujevac starts. The extended valley system includes some 60 villages and 1 town. The majority of the valley lies around 400 MASL/ 1300 feet with two prominent plateaus with the first around the village of Bare and the second around the village of Kusovac.

The economy of the area today is focused on farming with individual farmsteads. This was not always the case since there is a long tradition of "zadrugarstvo," or co-op farming, which was a tradition in the Balkans since the Medieval period. The main crops grown are wheat, corn, barley and the expanding production of cabbage for international export. This is driving the socio-economic process of joining farms together with the local Spakić family from Kusovac being the leaders in this development. This is an important shift in what has been the tradition of agricultural production where the highest yielding product was livestock (most notably pigs and cattle) and fruit. The larger fields of cabbage, and required irrigation for this crop, is rapidly changing the look of the valley.

The location of the valley also is causing severe demographic issues. Located equidistant from three large urban centers, the valley has seen a significant demographic outflow of people. The current situation indicates that the average age of the population is 42 and that there is an overall steady demographic decline. The total population is around 14,000 people and 98.8% classify themselves as Serbian (Republic of Serbia Statistical Report 2003). The significant decline in population is well illustrated by the fact that during a recent survey campaign in 2017 three schools in the area declared that they did not have enough pupils to justify the functioning of the schools. As a result, children were redirected to the largest school located in the village of Toponica.

4.2. GEOLOGY AND GEOMORPHOLOGY

The Gruža River valley geologically falls into the Vardar Zone, which constitutes the most complex geological zone in the Balkans. This zone contains significant ultramafic and vulcanoids that are dramatically represented by the Rudnik mountain to the Northwest and the Borač Krš mountain to the Southwest of the survey zone (Pavlović et al. 2017: 57). These prominent topographic features are representations of once intensive volcanic activity that was present in the Central Vardar geological subzone.

The Rudnik volcano-intrusive complex is an elongated shape (North-Northwest to South-Southeast) created during the Oligocene and Miocene periods with the first igneous event being dated to 30 Mya and the second around 23 Mya (Cvetković et al. 2016: 96). This meant that metallogenetic deposits are commonplace within the zone and resulted in the Rudnik massif being exploited from prehistory to the present-day period. In particular, nickel and other colored metals have been heavily exploited at the Stragari mine. Flysch deposits also run through the zone. Marine deposits within the Gruža valley are characterized by marl stone, and sedimentary rocks rich in clay, stem from the deep marine sediments of the quaternary period. Chert is common throughout this zone and many well-known quarries are exploited even today4.

[4] Even a local soccer team is called “Kremenac“, which translates to Flint-stoners.

4.3. PEDOLOGY

The soils of Central Serbia are characterized by three primary types – alluvial, gajnjače (cambisols) and smonice (vertisols). Alluvials in the Gruža valley are characterized in a narrow zone of the river floodplain (Gruža with its tributaries) and while they are very fertile the character of the river itself is such that they also are very prone to flooding. This is why, historically, the zones adjacent to the river were not occupied through history since the spring flooding episodes can be very sudden and violent. The extensive watershed of the valley causes this with the majority of the flood waters stemming from spring snow melt on the Rudnik mountain.

The funnel shape of the valley further concentrates this, accelerating the flow and narrowing the valley into a “chokepoint” located exactly between the prehistoric Grivac and Kusovac settlement sites. In this area, there is a high propensity for flooding and usually from late November to February it is nearly impossible to pass through due to the marshy conditions.

The valley eventually opens out into the wide plain just south of the village of Kusovac. This topographical situation also means that the distribution of flood waters occurs in a wider and flatter landscape thus creating a marshy zone that, as noted above, has been dammed and converted into an artificial lake. Several accounts collected during my field research from older people within the villages of Oplanić and Grivac indicated that this area was primarily used for herding since the soil was too prone to flooding to be useable for agricultural.

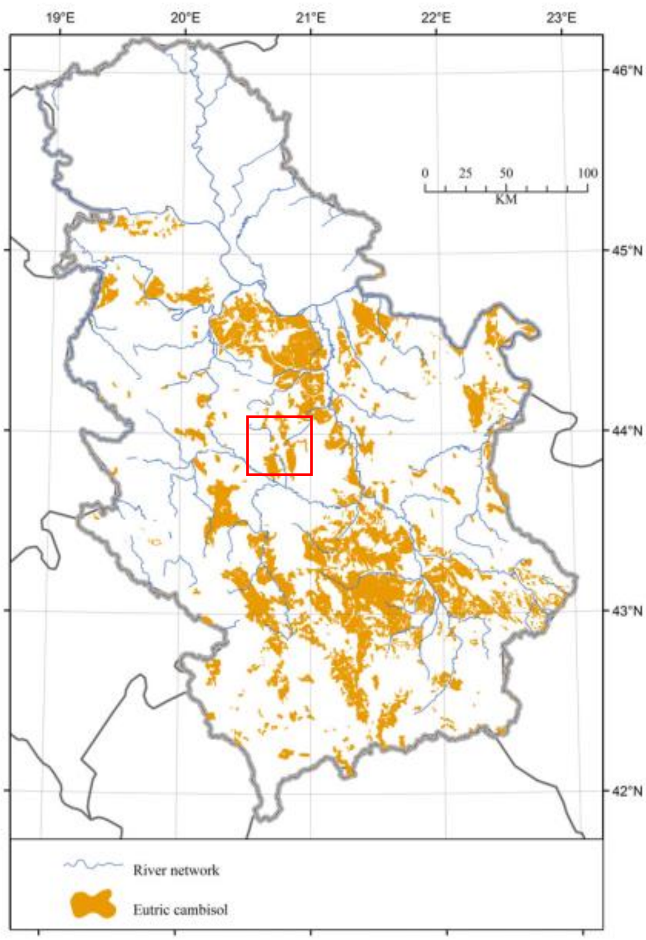

Figure 4.4 Distribution of Eutric Cambisols in Serbia (after Pavlović et al. 2017, fig 7.19, p. 129).

Unfortunately, there is no central registry of pedological maps available for Serbia and the maps that exist are sparse and typically produced for profit. The few maps that do exist are only available for certain zones and only in low resolution. Serbia has very heterogenous pedological maps with only a few soil types represented. This is the result of quite diverse conditions and the main parent material represented within distinct geological zones.

In the north of Serbia is the Pannonian basin with its characteristic highly fertile chernozems and loess deposits that developed in the shallow Miocene Pannonian Sea, which retreated during the Pleistocene epoch. As one progresses into Central Serbia and the Šumadija region the terrain changes dramatically with the rich loess deposits surrounding Belgrade giving way to the sedimentary and magmatic formations of Central Šumadija. Here, several main pedological types are present with the three most common ones being gajnjače (eutric cambisols), smonice (vertisols), and ranker lithosols.

Gajnjače soils are a local variant of the eutric cambisols and they are characterized by an extremely high clay content and are found in the areas that had chronologically long deciduous forest occupation (Pavlović et al. 2017:128). In the Gruža valley, they are characterized with colors ranging from brown to rusty-reddish brown, which are caused by hydrated iron oxides and clay minerals. These soils occur as primary soil formations in altitudes between 0-900 masl in Serbia and vegetation coverage is usually climatogenic Italian or Turkey oaks and the pubescent oaks in Šumadija (Pavlović et al. 2017:130). The soils are slightly acidic, to neutral, and in the doctoral dissertation research zone they are inclining towards acidic**.**

Smonitze are high fertile vertisols, very rich in clay, that range from 50%-70% of clay. Vertisols, as the name suggests, are a product of self-rotation or pedoturbation in the A horizon, with anthropogenic activity as the most likely driving force behind this process. This is likely related to early to modern historic anthropogenic effects during the past two thousand years (Pavlović et al. 2017:122). Pavlović describes smonitze soils as: *"The border between the A and C horizons is not usually a horizontal line, but is wavy or zigzag. During dry periods, the volume of the substrate with montmorillonite clay contracts and cracks, leading to the formation of wedge-shaped vertical cracks up to a depth of 1 m and more. In addition to these vertical cracks, narrow horizontal cracks also appear, and hence the prismatic aggregates leach out, which is a typical characteristic of the structure of vertisols. Crumbs of soil from the surface fall through vertical cracks wider than 1 cm to the bottom of the cracks, and hence the humus horizon becomes deeper* *in the form of wedges. During wet periods, clay swells and the cracks close, but the material which has fallen into the cracks also expands and puts lateral pressure on the aggregates. The infilling of the cracks with the surface layer of soil and processes of pedoturbation contribute to the formation of a deep humus horizon (50–100 cm) and its homogenization. The process of humus accumulation sometimes occurs under anaerobic conditions. In such conditions, plenty of bituminous material and low-molecular weight humic acids form, which together with montmorillonite clay form a stable argillo–humic complex, dark grey to pitch-black in colour." (Pavlović et al 2017: 122-123).*

These processes are significant in the context of archaeological research since one of the characteristic phenomena is that vertisols of dark color have been mostly recorded at locations where Neolithic sites have been identified. This is highly suggestive of significant phases of land clearing and utilization during the prehistoric occupation of the region.

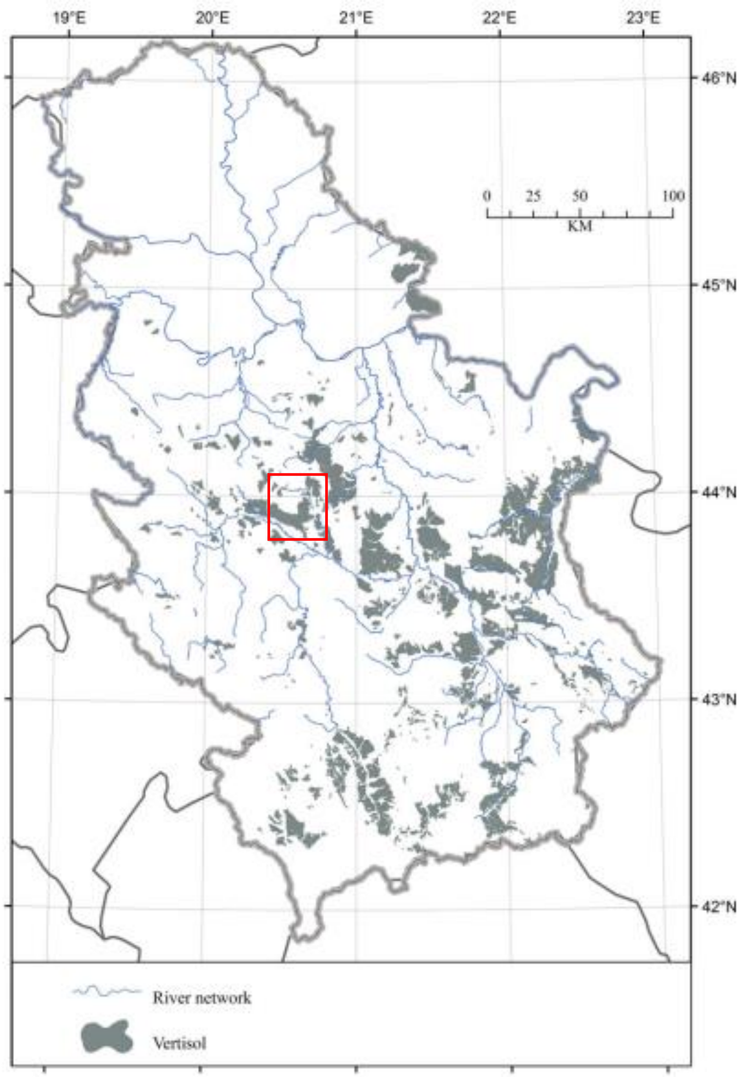

Figure 4.5 Distribution of Vertisols in Serbia (after Pavlović et al., 2017, fig 7.15, p. 124).

The physical properties of these soils mean that although they are organically enriched, thus having a high potential yield, they have poor physical properties and are very sensitive to drought. This is not only because of the poor drainage capabilities of the clay rich soils but also because of the propensity for the soils to develop deep cracks resulting in the splitting and damaging of the roots of agricultural crops. The only way of successfully utilizing such soils for agriculture is with additional irrigation that can assist with bridging the prolonged periods without rain. In the Šumadija region, these soils are most commonly used for cereal crops. Both gajnjače and smonitze have similar clay percentages due to the same parent lacustrian material, however, gajnjače soils generally produce smaller crop yields and are better suited for the growth of deciduous trees rather than row crops.

Ranker lithosols are characteristic of colluvial processes and are placed on steep hillsides. These represent young soils, of low fertility, and are generally located in areas that are unsuitable for human occupation in general. They are characterized by a high percentage of skeletal particles, low clay content, and the absence of textural differences (Pavlović et al. 2017:110). These soils are often toxic to plants, since they have a high mineral content from their parent material and also tend to be shallow. This is why the most common vegetation cover is pasture and evergreen species such as junipers.

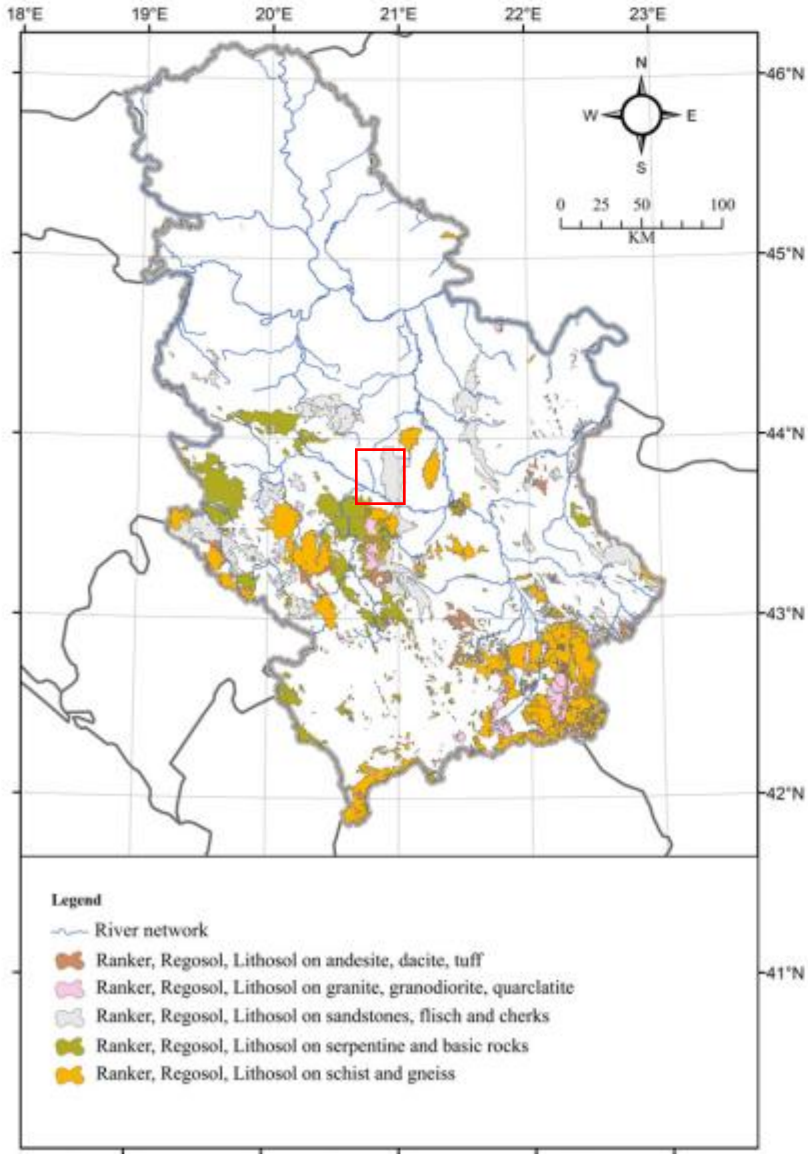

Figure 4.6 Distribution of Ranker, Regosol and Lithosol soils in Serbia (after Pavlović et al. 2017, fig 7.8, p. 110).

4.4 ETHNOGRAPHY

As noted above, the Gruža River valley held a special place in the ethno-mythology and folk art of people from Šumadija and the wider region. A popular saying is that no other river has more songs per kilometer of length than the Gruža. This is a phenomenon that is hard to describe until one visits the region and gains a personal experience of the beauty and rich surroundings. The current population of the valley settled there somewhere around the onset of the XIX century when first Serbian uprising liberated these areas. The leader of the uprising, Kara-Đorđe Petrović, called for colonists from the highland area of Pešter to settle in the Gruža River valley *"..since this land is completely devoid of people*" (Dragić 1912: 8-15).

Since the Gruža valley was decimated during the Austro-Turkish wars, the homesteaders that came there in the XIX century had the complete freedom to acquire land. The principle guiding this was that ownership of the land was gained purely through clearing it from the forests (Dragić 1912:170). This meant that the most suitable land was taken first and large tracts remained simply unclaimed. In order to put it to good use, cooperatives formed in the villages and they started using these lands communally and mostly for livestock herding needs. This allowed for the fast development of settlements in the valley.

These developments are particularly interesting if the economic customs of these settlers in the XIX century are looked at more closely. Since most of the settlers came from highland areas of what is today Montenegro, Hercegovina (in what is today the Federation of Bosnia and Hercegovina) and the Pešter highland of Western Serbia, the main economic subsistence pattern was herding. This meant that some of the first land clearances occurred on hilly terraces next to the main roads. The exceptionally fertile lands of the Gruža valley led to a dramatic increase in both the populations of humans and livestock. Initially, occupation and settlement occurred in the upland zones and only after two or more generations did people began to settle the most fertile lands next to the river and begin the process of intensive agriculture for cereal crops (Dragić 1912:175-180; Cvijić 1924).

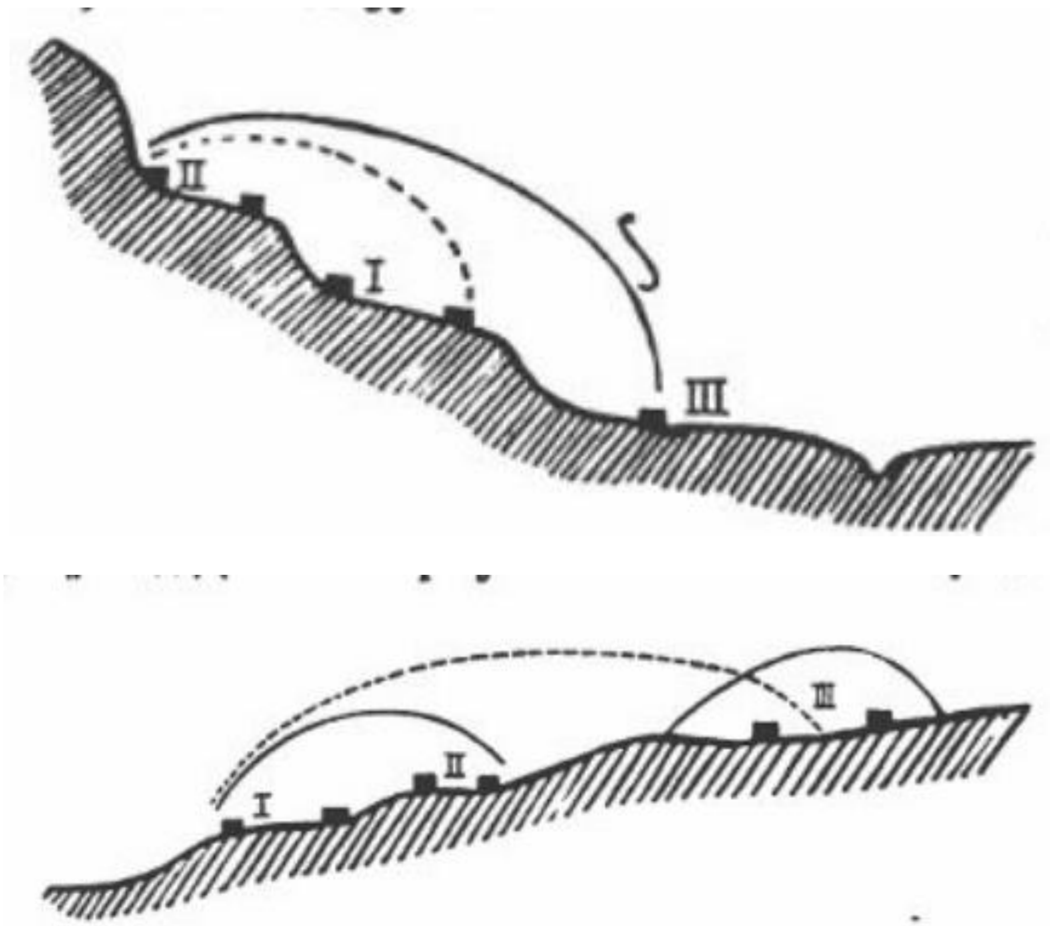

Figure 4.7 Ethnographic patterns of "off-shoot" household formation in the XIX century in the village of Gornja Crnuća. The top graphic portrays the higher elevation movement of the off-shoot first generation, where high altitude terrain is seen as favorable by herders. The bottom graphic portrays the lower elevation movements where in both the second and third off-shoot groups movement tends to be uphill (Dragić 1912, p180).

There are two important reasons for this seemingly unreasonable pattern of economic behavior and land use. One is the very pattern of movement associated with transhumant herding in which offshoot families (first born sons/daughters) were settling primarily in the summer pasture houses and thus followed a pattern of property inheritance. Second born children would inherit the poorer quality lands in the upland zones and would move there. However, since families in the region were still following a clan form of social organization, pasture would remain open to other members of the clan even though associated houses were owned by single nuclear households.

The second factor influencing economic behavior in the valley was that within the original Dinaric homelands of the migrant populations frequent wars occurred between clans due to conflict over pasture rights. This was largely stimulated because of overpopulation. It is important to note, however, that there were also cases of animal overpopulation during rich years, which led to massive culling of the herds or larger distance movement for trade. This often led to the destruction of a part, or less often, the whole clan (Cvijić 1924: 36).

When clans moved into a new territory, where there were much more fertile soils in the lowlands, they chose to first settle on the easily defensible hill tops. For them, the appropriation of a known space and ecozone was a more logical decision then what might appear as the more economically drivent choice of settling in the lower elevations of the valley where the soil was easier to work.

The division of land in such a manner was not so surprising since one of the main units of organization within South Slavic communities is the *zadruga*, or co-op of extended families or clans. These are co-ops that are mainly clan based that are comprised of people from extended families connected through blood relationships or through non-blood family ties (best man, godparents) and affiliates (Halpern 1958). The necessity of communal labor was one of the main driving forces behind these social formations and networks. Debts that were created could be paid for through labor and social connections were maintained by a series of communal clan rituals that involved communal feasting, gift giving/receiving, and larger scale celebrations. While the peak of labor requirements occurred annually during the late summer, which was connected to harvesting and processing activities, almost all clan celebrations occurred in the late autumn and winter. These were primarily associated with patron saint celebrations where clans that were connected through the same saint celebrated together. This also allowed for communication between clans since members of different clans could visit each other and create important and longer duration social networks.

In the XIX century, during the liberation period, which led to a severe lack of aristocratic order and a general increase in the liberal tendencies of the early Serbian state, the concept of communal land was formed within Serbia. What led to this change in the management of land was a rapid turn towards industrialization and the effect this had on increasing optimal production in agro-pastoralism. These changes are visible in formal censuses from the XIX century where the mainstay of production for the Šumadija region was livestock herding (Kanitz 1985). For example, census data taken in 1893 or the Kragujevac municipality (including the Gruža River valley) is 55,000 cattle, 173,240 sheep, and 63,000 pigs (Kanitz 1985).

Figure 4.8 Knić plum preserve manufacturing (after Kanic 1985, 605).

These livestock production numbers are far larger than the industrial pig and cattle farming that has occurred in the modern era. However, as Kanitz (1985:603) points out, this change came because of an increasing demand from central Europe for fruit preserves and the Gruža valley was known to be exceptional for fruit production. So much so that whole processing plants were placed on trains from Hungary and brought into the Knić area to process all the available fruit from the region (Kanitz 1985:606). Therefore, livestock herding began to decline and more and more households started investing in fruit tree orchards and this practice that has survived into modern times.

When we compare the data from the census of 1874, provided in Tables 4.1-4.7, this reflects detailed data for only two villages within the dissertation survey zone for which information was available. What makes these numbers significant is the cumulative number given for the Kragujevac region, where the total number of cattle herded was 98,000. This is indicative of a 25% decrease from the 120,000 cattle that were recorded in the 1835 census (Godišnjak 1874:141). What is particularly important about this census data is the remarkable potential for livestock herding in the region.

The census data from 1874 also documents the expansion of arable land compared to pasture and forests. This is the process that Kanitz also notes in 1893, regarding the dismal state of the forests, which led to a reduction in the number of pigs being herded. This is because pigs were becoming confined within individual household barnyards rather than in the forests, which previously had allowed for much larger herds to be maintained. This is also visible in the increase of sheep herding. The herding of sheep is more suitable for cereal agriculture and especially fruit production. The reason for this is that sheep can be used for weed control in the orchards and also contribute to soil fertilization by being herded there. These important changes in agro-pastoralism led to transitions in the social organization and placement of the local villages. This was reflected through a shift in use of upland zones to the more intensive use of the alluvial basins and the rich soils found there (Dragić 1912).

Table 4.1. Number of houses, humans and area of land in Gruža villages (left), Table 4.2 number of sheep (right) (after the 1874 census data).

1870 Census	HOUSES		HUMANS			LAND	
Municipality	Houses	Families	Men	Women	Total people	Arable	Pasture
Divostin	46	46	129	115	141	110	60
Bare	81	81	233	200	433	114.4	51.2
Ramaća	110	110	402	397	799	246.8	78.8
Ljuljaci	74	75	215	213	428	90.4	60
Toponica	60	60	178	146	324	84.4	77.2
Radmilović	66	67	131	161	292	104.8	102.4
Kusovac	27	27	77	82	159	46.4	56.8
Borač	106	106	316	354	670	158.4	282
Zabojnica	100	100	342	329	671	164.8	108
Grivac	74	74	261	232	493	91.6	58
Valley	698	700			4269	1212	934.4

1870 Census	SHEEP				
Municipality	Rams	Sheep	Yearlings	Lambs	Total Sheep
Divostin	24	432	224	76	756
Bare	39	680	171	305	1195
Ramaća	102	764	205	362	1433
Ljuljaci	40	828	244	211	1323
Toponica	133	1073	332	503	2041
Radmilović	10	245	48	81	384
Kusovac	10	165	41	71	287
Borač	52	786	134	381	1353
Zabojnica	15	284	235	360	894
Grivac	43	489	90	185	807
Valley					9717

Table 4.3 Number of beehives, buggies and carriages, plows (left) Table 4.4 number of goats (center), Table 4.5 number of pigs (right) in the Gruža villages (after 1874 census data).

1870 Census	BEES	TRANSPORT		PLOUGHS
Municipality	Hives	Horse buggies	Ox carriage	
Divostin	29	2	25	8
Bare	13	0	42	5
Ramaća	69	1	96	10
Ljuljaci	44	0	50	15
Toponica	69	1	96	10
Radmilović	25	11	0	3
Kusovac	8	0	17	5
Borač	20	1	52	5
Zabojnica	0	0	96	10
Grivac	1	1	39	2
Valley	249	15	488	65

1870 Census	GOATS				
Municipality	Billy goats	Goats	Half-years	Sucklings	Total goats
Divostin	0	20	0	0	20
Bare	0	0	0	0	0
Ramaća	0	20	0	0	20
Ljuljaci	2	21	5	0	28
Toponica	0	20	0	0	20
Radmilović	235	7	125	0	367
Kusovac	0	0	0	0	0
Borač	11	137	0	23	171
Zabojnica	0	5	0	0	5
Grivac	0	0	0	0	0
Valley					611

1870 Census	PIGS					
Municipality	Boars	Sows	Finisher	Yearling	Piglets	Total Pigs
Divostin	25	220	72	157	34	508
Bare	28	147	100	149	64	488
Ramaća	52	332	84	144	830	1442
Ljuljaci	23	200	160	242	109	734
Toponica	80	447	127	193	267	1114
Radmilović	18	187	48	22	17	292
Kusovac	17	114	23	31	26	211
Borač	24	526	113	160	152	975
Zabojnica	33	566	154	154	149	1056
Grivac	12	104	61	68	47	292
Valley						6604

Table 4.6 Number of horses (left) Table 4.7 Number of cattle (right) in Gruža villages (after the 1874 census data).

1870 Census	HORSES				
Municipality	Stallions	Mears	Work Horses	Youngs	Total Horses
Divostin	1	12	10	10	33
Bare	0	2	29	4	35
Ramaća	0	7	42	3	52
Ljuljaci	1	7	27	1	36
Toponica	0	14	55	7	76
Radmilović	0	7	12	3	22
Kusovac	0	9	8	8	25
Borač	0	19	45	6	70
Zabojnica	0	15	37	5	57
Grivac	0	10	25	9	44
Valley					417

1870 Census	CATTLE						
Municipality	Bulls	Oxen	Milk cows	Cows	Yearling	Calfs	Total bovines
Divostin	5	70	33	27	28	27	190
Bare	6	107	52	45	63	49	322
Ramaća	1	153	58	19	35	57	323
Ljuljaci	5	11	89	54	93	75	327
Toponica	3	222	111	40	68	107	551
Radmilović	2	73	84	26	42	62	289
Kusovac	0	35	50	11	64	49	209
Borač	3	125	99	139	101	97	564
Zabojnica	1	150	109	73	90	108	531
Grivac	0	102	65	26	43	65	301
Valley							3417

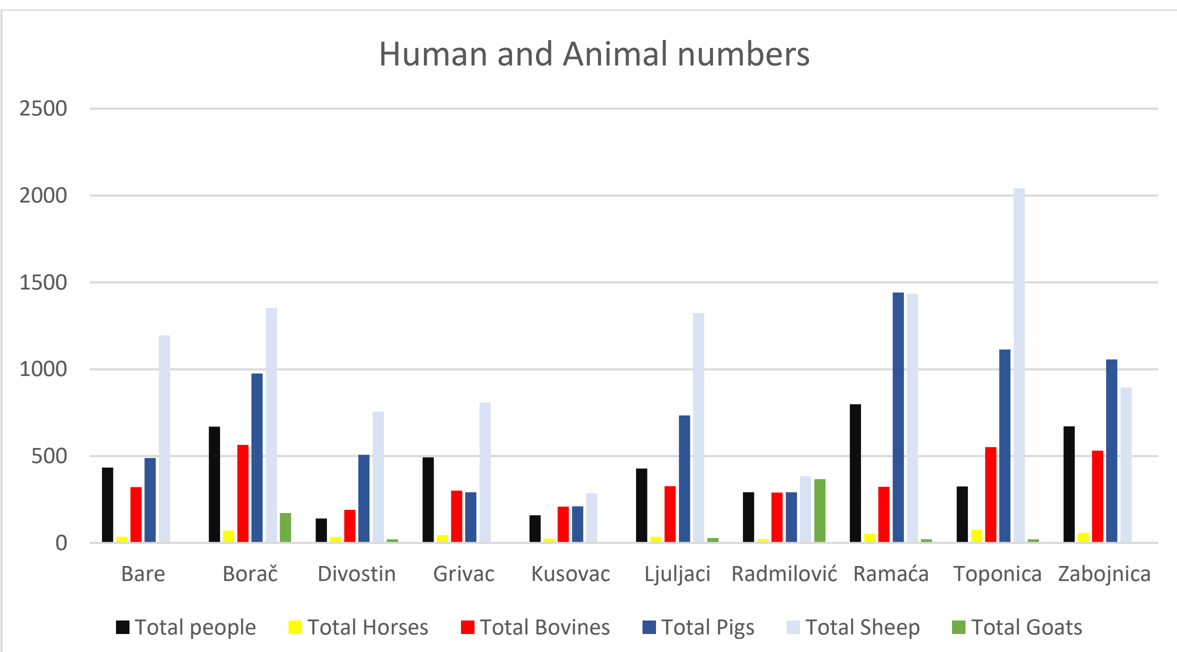

Figure 4.9 Comparison of human and animal populations in the Gruža villages (after the 1874 census data).

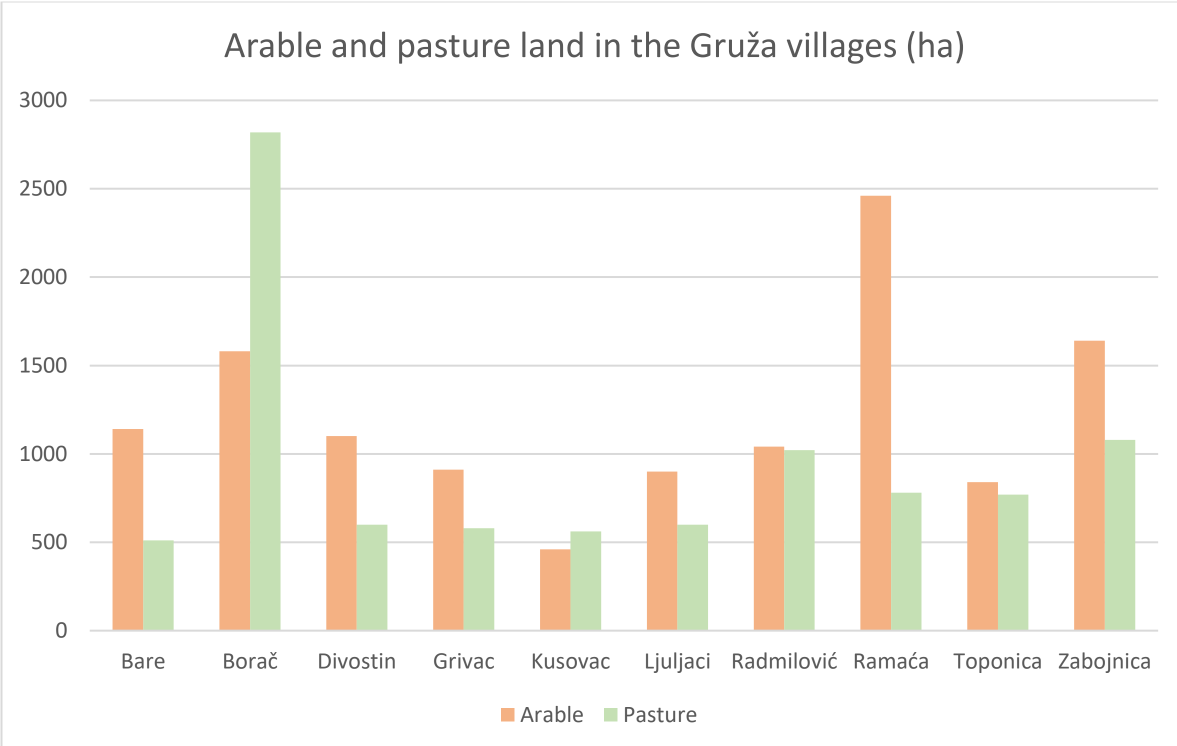

Figure 4.10 Comparison of human and animal populations in the Gruža villages (after the 1874 census data).

Families that took ownership of the land that was best suited for agriculture rapidly gained wealth and a new class of village economic leaders emerged between WWI and WWII but was completely overturned with the revolution following WWII when land became nationalized. Interestingly, in the Gruza region, this did not disrupt the social fabric significantly since the principle of communal land and village co-ops had already been well established previously. The clan structure of the original highland families had been organized around livestock herding and this was preserved and the management of the new fruit orchard production was absorbed by the social organization of the clans as well. In this case, locally in the Gruza valley, certain patriarchs gained more monetary wealth and power in soci-economic decision making.

Today, most of the population of the valley remains oriented toward agriculture, however, the severe decline of the population has stimulated an equal drop in the overall agro-production value of the region. Recent initiatives by the Serbian government has led to the industrial production of cellulose products as well as large scale production of secondary stage agricultural products and these are beginning to benefit the region economically.

The Gruža River valley, as seen from both climate, geomorphology, and ethno-historic records, represents a historically unique and highly productive region for agro-pastoralism within the Central Balkans. The rich variety of natural resources provided a crucial foundation for a multitude of socio-economic decision making by the many human communities that have dwelled there since the beginning of the early Holocene. Although some regional resources are more optimal then others, there is no question that the region provided an important foundation for over 2,000 years of social and economic development by the earliest agro-pastoralist communities that appeared there in the Neolithic.

CHAPTER 5 – GRUŽA VALLEY SURVEY

5.1 METHODOLOGY

The diverse nature of the Gruža River valley (as discussed in chapter 3) necessitated several requirements in regards to the methodological choices for regional scale pedestrian survey. The total area that was surveyed encompassed 102.47 km². The consistent splitting of local land parcels, due to the property inheritance practices of the region, meant that there were no large, open tracts of land to survey. Usually, the parcels encountered were about 1 ha or less, with few being larger and many being smaller. This meant that conducting long linear survey transects would be next to impossible since most of the parcels are split by bocage (hedgerows), usually comprised of thorny acacia woods. As a result, a different methodology was utilized, one that was more dependent on the mobility of the survey team, use of handheld global positioning system receivers, and pre-determined and printed maps.

The survey team tried to maintain a target of around 50 ha of coverage per day but this varied significantly depending on the number of "sites" encountered and density of associated surface artifacts5. Following the methodology proposed by Drennan and Peterson (2011: 54), and building on several other studies developed in various parts of the world (MacNeish et al. 1975, Hirth 1980, Feinman et al. 1990), the research utilized systematic pedestrian survey to examine the distribution of surface artifacts, organization of 'sites', and population estimates.

[5] One extreme example of this is the site of Kusovac, where a single day of work would cover not more than 8ha, utilizing a 7 person team, wherein 5 people on the team would collect artifacts, and two team members would be focused specifically on the task of collecting and transporting bags of finds.

The original plan for pedestrian survey was to employ a mixed strategy of surface collection and shovel test probes depending on the relative surface visibility of artifacts. Fortunately, the autumn season in 2017 was not as warm and dry as in previous years and this allowed for an earlier start to the plowing of the agricultural fields as rain is needed to help loosen the clay after the late summer heat. This situation meant that all the areas within the defined regional survey zone were freshly plowed in the early fall season and this reduced the need to incorporate shovel probes There were, of course, fields that were left fallow and not plowed but even in these the surface visibility was very good and never fell beneath 45%.

The main collection unit that was utilized in the surface survey was comprised of 1 hectare “supra-cells”, which were further divided into primary collection units of 20m x 20m. These units were sampled using a 1.81meter radius “dog-leash” collection circle (Figure 5.1; 5.2) (Drennan and Peterson 2011:56). These provided a 10 square meter collection sample, and also limited the overall collection lot, since one of the biggest problems the author faced was to rein in overly eager survey participants that had not had such contact with so many artifacts during survey.

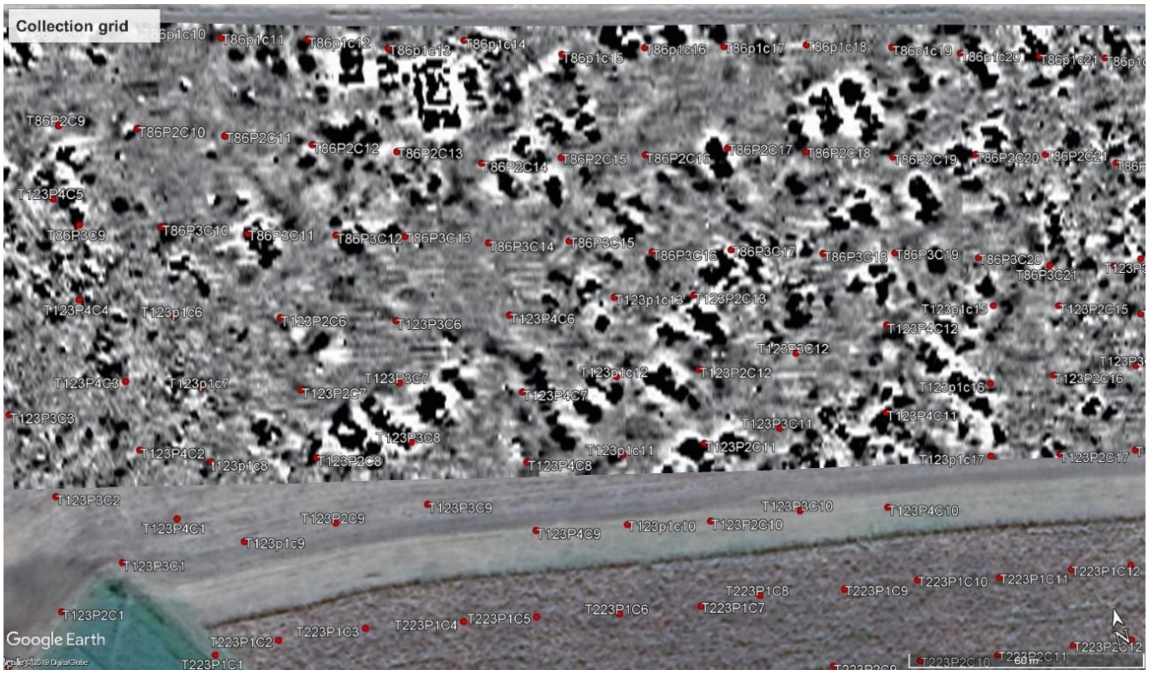

Figure 5.1 Greyscale plot of Fluxate gradiometery survey from Kusovac showing overlaid collection circles in red (Kočić 2019).

Figure 5.2 Example of a dog-leash sample from the Oreškovica settlement survey in 2012 (photo M. Kočić).

The pedestrian survey methods followed a proposed methodology whereby a five-person team used 20 m spacing between individuals in order to maintain cell structure. Instead of each member having a handheld compass, handheld GPS unit, or smartphone device to mark, record, and maintain tracks for the collection cells, two members of the team recorded the start and the end of the line with a highly sensitive handheld GPS device (Garmin Glo antennas). This was done because experience had previously indicated that in hilly terrain there was significant loss of time while each survey participant waited for their handheld unit to fall into an acceptable error range for accuracy. In many of these transects, it was impossible to drop to below a 20 m error. This problem was mitigated somewhat by the use of preplanned polygons and lots and consistent checking of the spatial dispersion of the team through using a laser range finder.

Survey team members were all required to have high visibility vests due to local legal codes as all archaeological work in the Republic of Serbia is classified as outdoor construction. This had an additional advantage, since the reflective surfaces of the vests worked perfectly with the range finder and produced an error of under 1m in terms of team deployment. Every survey team member had a wooden staff with a 1.81 m long rope in which the staff was placed in the center of a "dog-leash" circle and collection was done in only one systematic pass (Figure 5.2). Multiple passes were avoided since the sediment (mostly clay vertisol and cambisols) is easily disturbed by shoes and new artifacts were then disturbed from the immediate subsurface.

The author's previous experience in surface collection over Neolithic settlements in Serbia indicated that the time required per dog-leash circle was around 5-10 minutes. Although somewhat slower than utilizing a timed collection or limited amount collection method (which were all tried during pilot surveys), the "dog-leash" circle method produced the best results, especially because of lithic material, which was extremely under-represented when utilizing the timed or number limited survey method. This is simply because large fragments of pottery are far more visible to team members than flakes of flint.

The author's initial plan was to utilize the 'minimum of 20 artifacts method' (Drennan 2011: 2009), which can be used because of the statistical post-processing to assure a minimum required sample. However, previous pilot surveys by the author over Vinča settlements indicated that there are rarely less than 20 artifacts encountered, which was a situation also encountered during the dissertation research survey. This pattern was clearly visible from the surface collection undertaken at the settlement of Oreškovica where in the process of higher resolution surface collection (3 as opposed to 1 "dog-leash" circle per 20 x 20 m cell) a total of 7,600 artifacts were recovered from 3 ha of the settlement. This represented an average of 290 artifacts per collection sample. This also was one of the reasons why a single pass method of collection had been adopted for this dissertation research.

One of the main components in evaluating the surface collection data produced during the doctoral dissertation research was the utilization of previously obtained subsurface geophysical prospection data. Most of this prospection was undertaken on these sites as a part of the joint SRGAP project (Šumadija Regional Geoarchaeological Project), which was conducted by the University of Pittsburgh, the Kragujevac Regional Heritage Protection Agency, and the Serbian Institute of Archeology (Hanks at al. forthcoming). This data has been made available for this dissertation as a result of my contribution to this project. The geophysical surveys utilized a Bartington 601-2 high resolution single axis fluxgate gradiometer with twin probes. Grid units were set using a magnetic compass to establish baselines and metric tapes to triangulate additional grid points. The gradiometer survey utilized 20m x 20m units and data was collected every 12.5 cm along survey traverses and traverses were surveyed at either 1m or 0.5 meter intervals.

Satellite imagery used for this dissertation comes from Google Earth imagery, since that it has the highest resolution available from non-commercial services. Layering of survey data was completed in Google Earth Pro and images were exported with georeferenced vector layers for density distribution of statistics. The density distributions plots were completed in Surfer spatial statistical software. Gradiometer data was plotted using Terrasurveyor software to produce the greyscale plots of subsurface magnetic anomalies.

Figure 5.3 The central area of the Grivac settlement showing greyscale plots of fluxgate gradiometery surveys placed on Google Earth Satellite imagery.

Figure 5.4 Fluxgate gradiometery surveys showing enclosure ditches and other magnetic anomalies at the Grivac settlement.

Figure 5.5 Fluxgate gradiometery surveys showing composite of all recorded magnetic anomalies at the Grivac settlement.

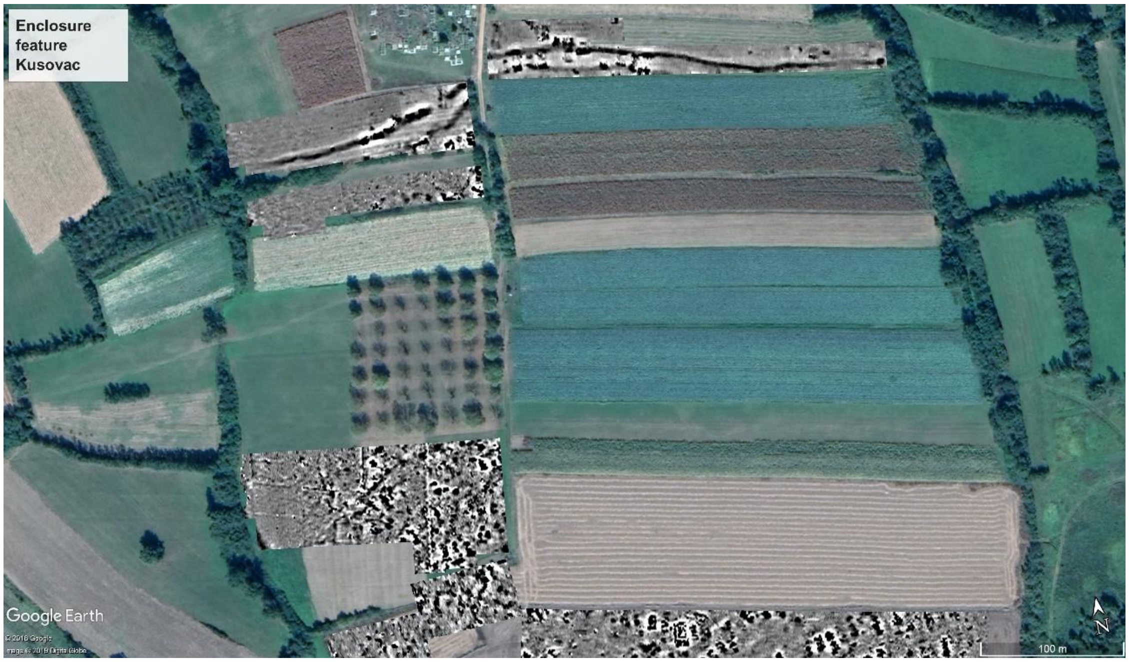

Figure 5.6 Fluxgate gradiometer surveys at the Kusovac settlement revealing enclosure ditches and other magnetic features .

Figure 5.7 Fluxgate gradiometer surveys in the central zone of the Kusovac settlement showing one structure with different orientation and a significantly larger area (in red circle).

5.2 DISTRIBUTION OF PALEOLITHIC SITES (~40000-15000 BCE)

Figure 5.8 Google Earth satellite imagery showing location of possible paleolithic scraper, location noted in green (Kočić 2019).

The Gruža River valley is well known for revealing occupation sequences for more than 8,000 continuous years, however, one of the surprises of the author's pedestrian survey was the discovery of a possible Paleolithic notched scraper (Figure 5.9). This artifact was found in Transect 85, on the top of the hill directly above the salt spring known as Slana Bara. The spring itself routinely attracts herbivores because of the natural high nitrate levels. It is possible that the salt spring was not active during the Pleistocene, although the position is in a perfect vantage point over the three adjacent valleys.

Figure 5.9 Notched scraper from Transect 85, above Slana Bara location (Kočić 2019).

Unfortunately, there were no other finds in this vicinity except for a few flakes of different material recovered some 80 m away from that position. These were much more likely connected to the ubiquitous Early Neolithic occupation of this area. The tool is not made from chert of a color that was observed to be common among lithic artifacts on the Neolithic or Later Prehistoric sites surveyed in the region. The scraper also has a steep retouch on the notch that is characteristic for the Upper Paleolithic. Although there are no known Paleolithic sites in the Gruža valley there are well known Paleolithic sites both to the North (Risovača Cave near Aranđelovac) and to the East (Gradac cave in Kragujevac). One of the exciting possibilities is the presence of an open air Paleolithic site, however, this is a question that will require further work at this location since there are no caves in the survey zone where cave sediments would be preserved.

5.3 DISTRIBUTION AND ORGANIZATION OF EARLY NEOLITHIC SITES (~6400-5400 CAL BC)

Early Neolithic occupation in the valley is characterized by the Starčevo culture. Absolute dating of Starčevo horizons from the site of Grivac was done through thermoluminescence methods (Bogdanović 2004: 491), which is somewhat problematic, since samples are very sensitive to a number of post-depositional disturbances (Richter 2007: 672). One C14 uncalibrated date from charred wood remains also gave a date that is somewhat consistent with the typological determination of the Starčevo phasing at Grivac.

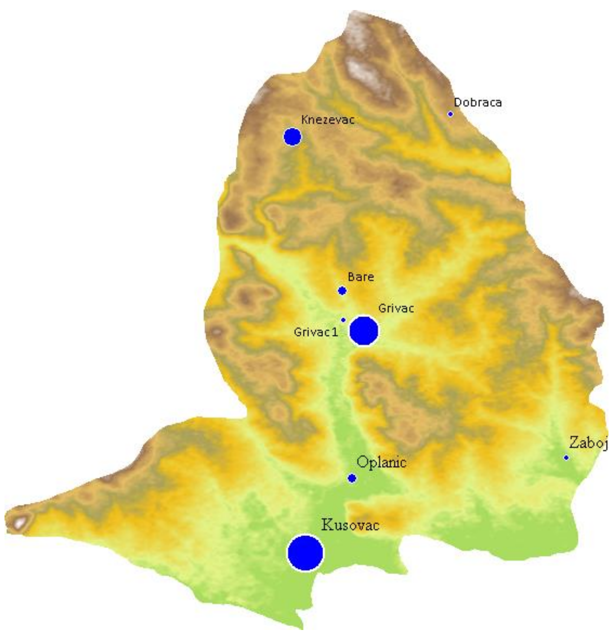

Figure 5.10 DEM model of the survey zone with Early Neolithic Starčevo sites noted, generated in Grass GIS. (Kočić 2019).

The Grivac material has been described as belonging to the Proto-Starčevo phase (Bogdanović 2004:489). Calibration of the date note above was done by the author using OxCal 13 and indicated an early date consistent with the Early Starčevo phase. However, the calibration had a large error range placing the phase between 6368-5945 cal BC with 95.4% probability (Figure 5.11). This places Early Neolithic phases present at Grivac within the same time period as the Mesolithic-Neolithic transition in the Lepenski Vir and Iron Gates series (Borić et al. 2018:8).

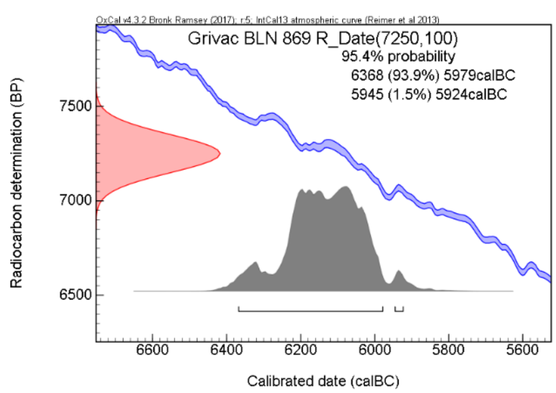

Figure 5.11 Grivac BLN 869 (after Bogdanović 2003:496) calibrated with OxCal 13.

This poses some interesting questions concerning the earliest occupation of the Gruža River valley relative to the well known and dated Iron Gates Mesolithic and Early Neolithic sequences. The lack of earlier occupation evidence in the Gruža River valley stimulates additional questions about the early colonization of this territory and transformation of local landscapes.

During the regional pedestrian survey, a total of 1,329 sherds were collected that could be diagnostically determined as Starčevo pottery. Although a small percentage of these were decorated most were identified by the presence of wheat chaff in the pottery fabric and a specific slip-trailing technique of treating the surface with dense pasty slip that forms an irregular surface. This is known as barbotine. Three sites were identified within the survey zone as permanent habitation sites with surface areas greater then 1ha (Figure 5.10). The sites identified were Grivac, Kneževac and Kusovac.

The spatial distributions of artifacts were plotted in all cases done using an 'inverse distance to a power; method (with a power of 1). During interpolation in Surfer software, the data were weighted so that the influence of one point relative to another declines with distance from the grid node. This method was chosen, because, as described in the Golden Software Surfer Help Manual, when power of one is used, IDTP behaves as an exact interpolator, without adding values during interpolation. This is why in the case of the analysis of surface distribution, very limited smoothing was used, in order to reduce the possibility of linear correlation problems. Although, in the case of some artifact densities, there was the inevitability of some linear distortions, because of the nature of transects being linear, so in cases of generally low densities, areas that have higher densities produced some linear distortions. This can be seen in the plot of flint finds for Kusovac (Figure 5.22).

5.3.1 KNEŽEVAC

Kneževac is the smallest of the 3 sites and it was largely unknown in the scientific literature except that it was reported to be located somewhere near the village of Kneževac. What makes Kneževac a very important archaeological site in the valley is that it is a significant size for the period (~6ha) and it contains no evidence of subsequent Vinča occupation. Reports noted that Neolithic potsherds were being found in the fields by the local villagers (Bogdanović 1983) although no survey or excavation was undertaken. This site is located on the northernmost part of the Kneževac village (central point Lat 44.062846°, Long 20.673181°), and on the municipal borders of the villages of Kamenica and Ramaća.

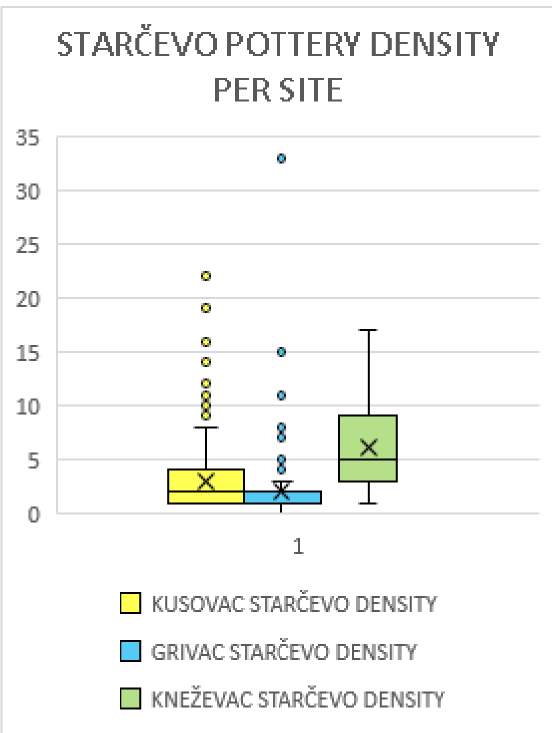

Figure 5.12 Box and Dot plot of pottery densities between three sites of the Starčevo culture in the Gruža valley. X axis is number of sherds per 10 m². In both cases graphs show values with median, arithmetic mean, whiskers showing 1.5 upper and lower quartile, and bubbles showing outliers that are outside of inter-quartile range. High number of outliers are noticeable in Kusovac and Grivac, which is connected with later Vinča coverage, which is skewing the sample (Kočić 2019).

The location of the site is largely towards the northeast and along a gentle slope and the top of the hill. This location represents the beginning of the slope of the first outcrops of the Rudnik mountain. There is one active spring within the site, one in the immediate vicinity, and two creeks running on both sides of the site. Soil on the site itself is representative of vertisol smonitza, which is restricted to the immediate vicinity of the site, the site itself, and adjacent creek area. The surrounding higher flatlands are comprised of the cambisol gajnjača soil type that has a relatively low carrying capacity. This was evident with the modern crops in that area being much more dispersed than in the lower parts of the valley. Also, in those areas surrounding the site, there was a striking absence of artifacts of any period, except for a part called Zbegovište (tr. Refugium) to the northeast where two green glazed Ottoman period pottery sherds were recovered. This area is described in several literary sources as possible roadside campsites for Ottoman troops on their way from Novi Pazar to Belgrade (Dragić 1912).

The density of artifacts on the site was surprisingly high for a Starčevo period site. More discussion about these densities will be given in Chapter 6 but it is important to note here that although densities on Kneževac seem higher than the ones at the much larger sites of Kusovac and Grivac the centers of these sites were covered by later Vinča occupations. The estimated area of the entire activity zone of the site is around ~6 ha. This is corroborated by both the wider zone of artifact scatters and geophysical prospection (Figure 5.13).

Figure 5.13 Gradiometry survey of Kneževac. The red outer line denotes the perimeter of the widest extent of surface artifacts. The red polygons magnetic subsurface features that are most likely pit-house dwellings.

The central zone of the site is showing a pattern that could be tentatively interpreted as a circular organization of pit anomalies (Figure 5.13) and it is possible that these represent Starčevo architectural elements known as pit houses. Although a number of researchers have postulated that such 'pit house structures' may have been part of more complex above earth structure (e.g. Garašanin 1954).

The circular organization could be indicative of a more communal site type organization, as has been stipulated for the Levant (Kuijt 2000), but this needs further consideration and is discussed more in Chapters 7 and 8. Coring with a 10 cm diameter bucket auger indicated that the stratigraphy was less than 1 m thick in between the subsurface magnetic anomalies. Augering was not undertaken within the magnetic anomalies at that time. Artifact densities from the site indicate possible internal organization with the greatest density of ceramic sherds found adjacent to and between the circular anomalies (Figure 5.14). Another apparent pattern was the location of flint working and other possible lithic industries.

Figure 5.14 Inverse distance to a power weighted density distribution of pottery densities layered over fluxgate gradiometer grey scale plot at Kneževac. Darker red zones delineate higher densities of recovered surface artifacts (Kočić 2019).

Figure 5.15 Inverse distance to a power weighted density distribution of lithic material layered over fluxgate gradiometer grey scale plot at Kneževac. Darker zones delineate areas that have higher density of surface artifacts (Kočić 2019).

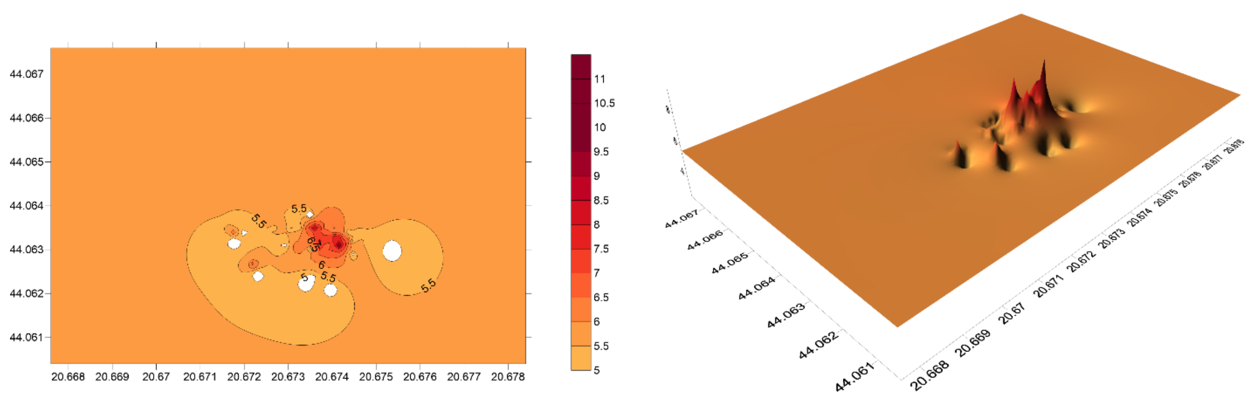

Figure 5.16. Left - Inverse distance to a power weighted distribution of pottery densities at Kneževac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. (Kočić 2019).

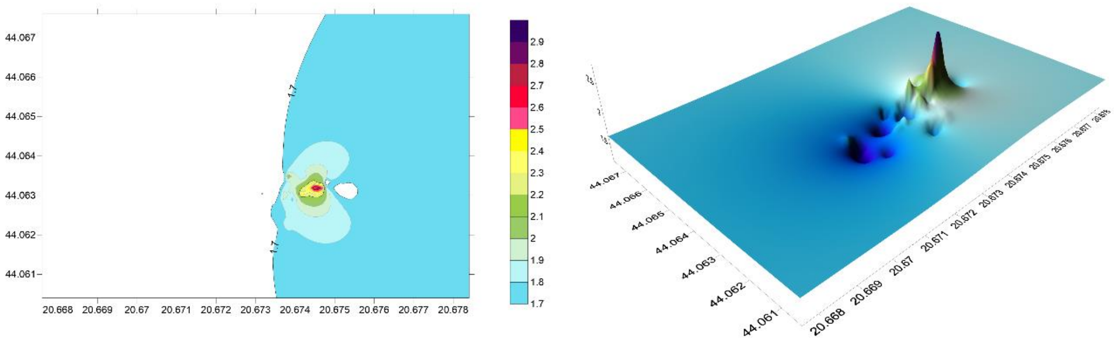

Figure 5.17. Left - Inverse distance to a power weighted density distribution of flint densities at Kneževac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. (Kočić 2019).

The presence of two large clusters of activities and separated activity zones could be interpreted as related to communal activities by the inhabitants of this settlement. Material from the site shows a great variability of flint source material, including some that are absent from the rest of the valley, including the schist adze. Results from this site, both surface collection and archaeological geophysics, suggest that it would be an excellent site for extended study as it may be one of the earliest villages of its type in this region of Europe.

5.3.2 GRIVAC

Grivac is located exactly 5.7 km Southeast from Kneževac (central point Lat 44.013628°, 20.690753°). The position of the site and its surroundings are very well described in the publication "Grivac – Naselje Protostarčevačke i Vinčanske kulture" (Bogdanović 2004), although it is important to further elaborate on some of this information here. Similar to Kneževac, the immediate area around Grivac is located on rich, dark vertisol smonitza type soils. These cover around 120 hectares in the wider zone of the site with a gradual transition to cambisol gajnjače in all areas except to the East, where at the base of the Čiker hill the soils transition to the skeletal ranker soils. Exploration of the site has been ongoing since 1952. One important issue that causes some confusion is the spatial distribution of the site across multiple locations and these have been treated as separate "sites" in previous publications. Both surface collection and archaeological geophysics show a somewhat different spatial organization but support the fact that this is one continuous settlement.

Excavations have indicated that the stratigraphy is relatively shallow for a multilayer type site and includes both Starčevo and Vinča period layers, averaging 1.6 meters with up to 2.8 meters in the 'pit-house' features (Bogdanović 2004:13). A clear understanding of the stratigraphic separation of these layers was not defined in previous publications and this remains one of the key questions regarding the site and is one that will require further excavations to resolve. Surface collection on the site of Grivac recovered a total of 255 diagnostic Starčevo period artifacts. As it was expected, Starčevo artifacts were located where Vinča layers were thinner. An unexpected finding was that the Starčevo occupation is significantly larger spatially then the Vinča occupation and revealed much less density suggesting a more dispersed pattern of population (or perhaps, palimpsest of occupations).

The Starčevo zone covers more than 30 hectares and we know from previous excavations that Starčevo artifacts are generally present in all areas covered by subsequent Vinča occupation. One of the biggest challenges on multilayered sites with Vinča and Starčevo occupations is the inability to separate the lithic material by period, with any degree of certainty, during surface collection. The reason for this is that both populations used the same source materials and the knapping techniques for stone tool production were very similar. Only through the analysis of excavated material may significant statistical differences be established and lithic materials more carefully re-examined.

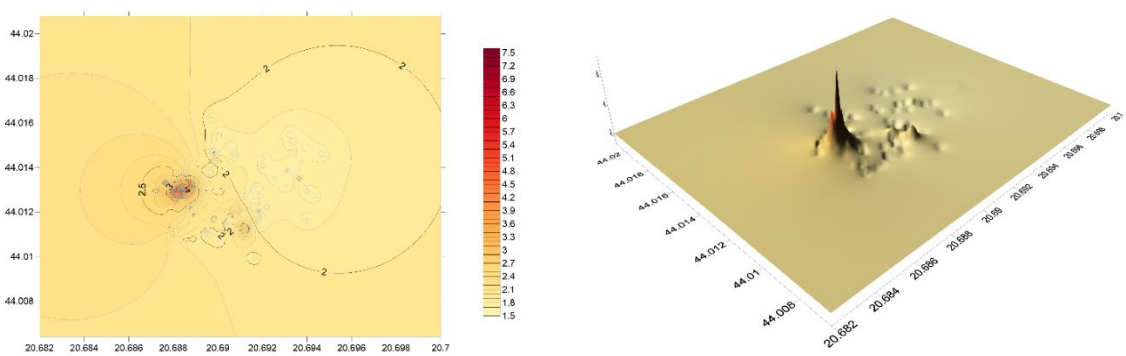

Figure 5.18. Left - Inverse distance to a power weighted density distribution of Starčevo pottery densities at Grivac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. (Kočić 2019)

Figure 5.19. Inverse distance to a power weighted density distribution of Starčevo pottery in Grivac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones delineate areas that have higher densities. The transparent yellow shaded wider zone contained extremely sparse artifacts, with a maximum of one artifact per lot (Kočić 2019).

Excavators divided Starčevo layers of the Grivac site into 3 phases: Grivac I, II, and III, according to the typological predominance of certain pottery styles in different locations (Bogdanović 2004:29-31). However, without the availability of absolute dating the stratigraphic and diachronic relationships of the identified phasing remain questionable. For example, Bogdanović (2004:25) notes the same stratigraphic sequences for Grivac VI and Grivac IIIc and that layer Grivac V was underlying Grivac III (Figure 5.20). Such stratigraphic relationships do not seem plausible and what is crucially needed is a more systematic approach to excavation, sampling and AMS dating that would help to further substantiate the phasing sequences suggested through these earlier excavations.

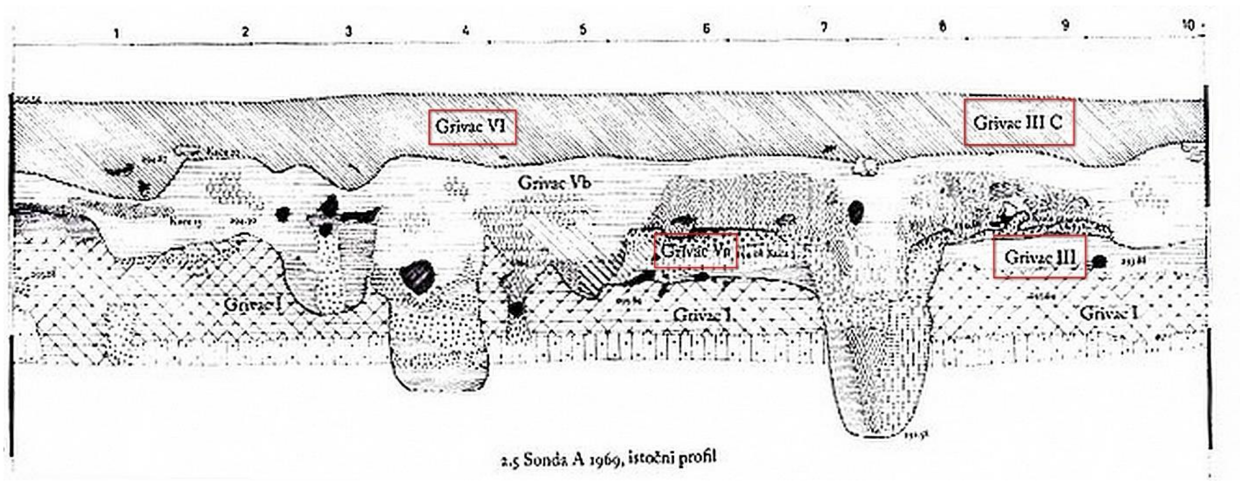

Figure 5.20 Grivac Trench A 1969, west facing section, after Bogdanović 2004: 25. Red squares show problematic layers that show completely impossible superposition of older layer III C over layer Va and Vb.

5.3.3 KUSOVAC

Kusovac is located 6.4 kilometers South of Grivac on a small ridge between the village of Gruža and a small creek located behind the graveyard of the Kusovac village (central point Lat 43.955832°, Long 20.676283°). This position now overlooks a historically created artificial lake to the South, which previously was a swampy flood valley associated with the Gruža River. Soil on the site and in the immediate area is again vertisol smonitza, which seems to corroborate a theory discussed in Chapter 3 that this is the result of anthropogenic-induced pedology. The site of Kusovac was excavated between 1969 and 1971 by a joint team from the National Museum in Kragujevac and the University of Pittsburgh. Between July 22, 1970 and August, 9, 1970 an excavation covered an area of 48 square meters and revealed a stratigraphy ranging between 80 and 120 centimeters.

In one report that was published, researchers noted that the deepest cultural layers are similar to those encountered at Grivac, with early/proto Starčevo layers. They also note that artifacts were encountered that indicate unusual transitional forms between Starčevo and Vinča periods, which is best visible in pottery styles, but the author does not provide any further detail. The upper stratigraphic layers were classified as associated with the Early Vinča phase (Letica 1971:15).

Unfortunately, the detailed documentation for this excavation is no longer stored in the Kragujevac museum and the small published article does not provide any pictures or illustrations. Thus, many questions surround the data and the interpretations from the previous work at this site. Efforts are now being made to retrieve the original site documentation. Information concerning the location of the trenches was recovered from local villagers at Kusovac who took part in the excavation and they have located the trenches in an area that is geographically at the center of the settlement zone. This is also an area that produced some of the less dense distributions of artifacts during the surface collection.

What is certain is that the Kusovac settlement reflects some of the most interesting village spatial organization during the Early Neolithic in this region. The pattern is similar to Grivac, with Starčevo artifacts recovered from across the site and within its immediate vicinity. In order to clearly show these spatial patterns (Figures 5.20 and 5.21) the lower end of the density was cut off at 2 sherds per 10 square meters. This was done because chance finds were obscuring important and clear patterns present in the South Eastern sector of the site.

As at Grivac, Vinča layers were obscuring the Starčevo occupation in the central part of the site. Starčevo artifacts were present in the border areas but in contrast with Grivac, the Starčevo occupation is seen in a second prominent location, to the South East, expanding to the area at the border of what would have been a marshy floodplain that is now inundated by the historically created lake. This area has a very dense Starčevo occupation and is even more interesting when the distribution of lithic debitage across the site is considered (Figures 5.21, 5.21).

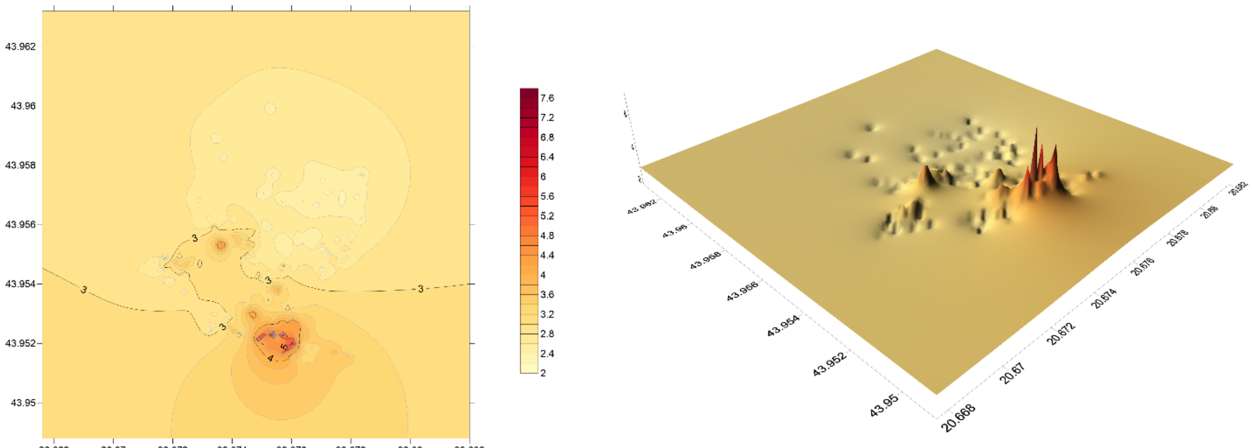

Figure 5.21 Left - Inverse distance to a power weighted density distribution of Starčevo pottery densities at Kusovac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot (Kočić 2019).

Figure 5.22 Inverse distance to a power weighted density distribution of Starčevo pottery in Kusovac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones delineate areas that are higher in recovered artifact density. The transparent wider yellow zone indicates an area with extremely sparse artifacts, with a minimum of two artifacts per lot (Kočić 2019).

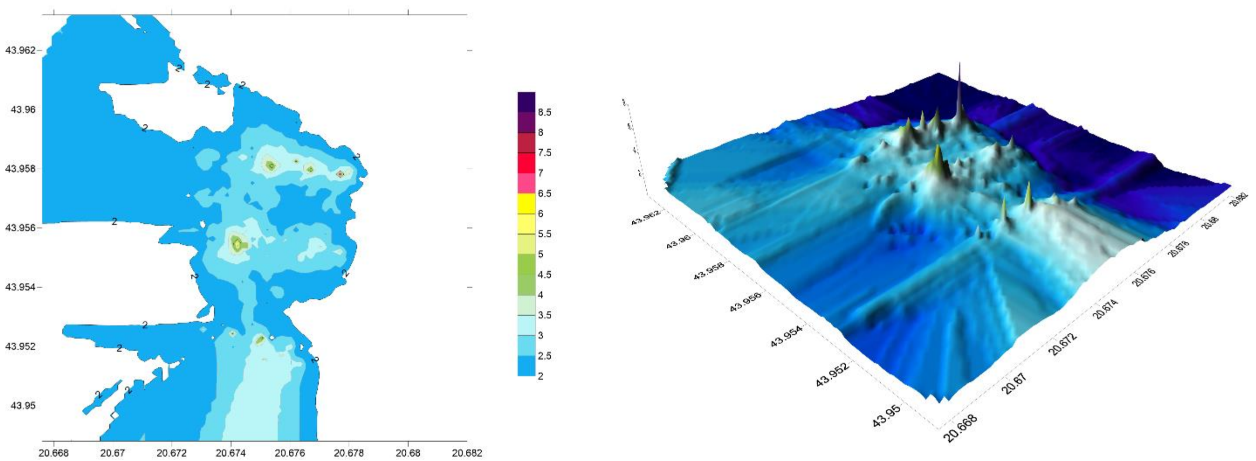

Figure 5.23 Left - Inverse distance to a power weighted density distribution of flint debitage densities at Kusovac; Right – 3D data presentation of the same density distribution. The scale represents density per collection lot. There is a noticeable overlap of the southern density zone of the flint debitage and Starčevo pottery from Figure 5.21. Also, linear correlation here is very problematic, so slight smoothing, with a value of 1.5, was performed when plotting the data (Kočić 2019).

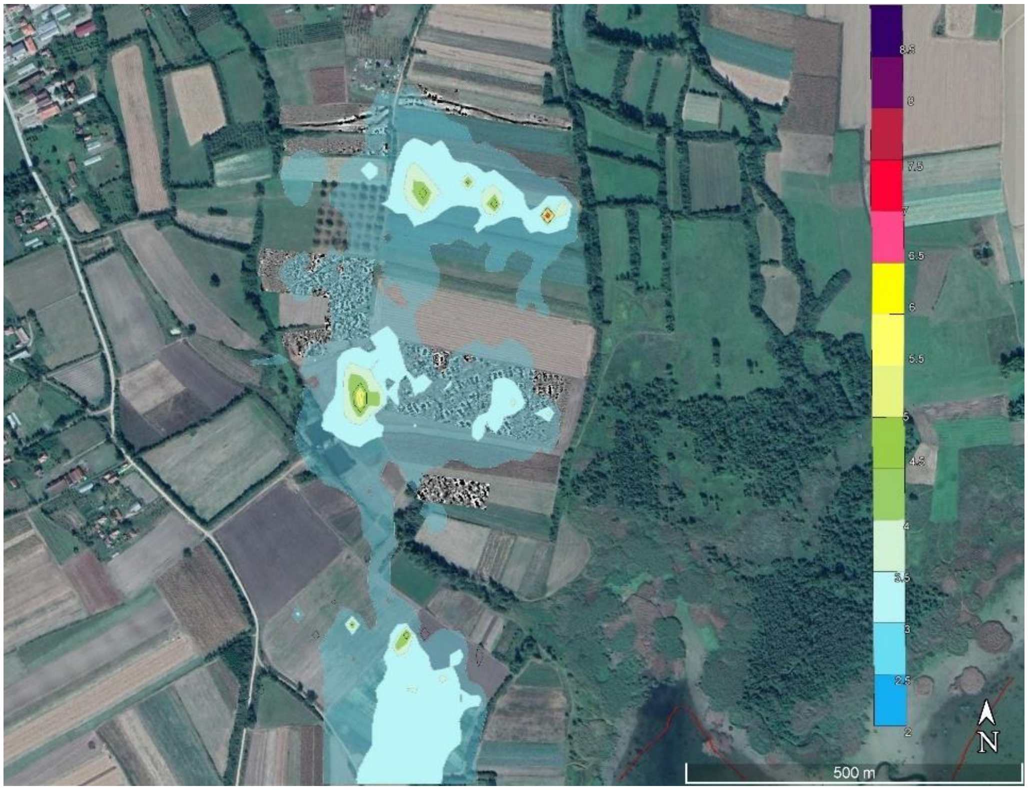

Figure 5.24 Inverse distance to a power weighted density distribution of Starčevo pottery in Kusovac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones delineate areas that are have higher artifact densities. The outward extending linear spatial correlation features were removed in order to show clearer patterning (Kočić 2019).

The distribution of lithic debitage at Kusovac indicates that there are 3 main clusters of activity connected with flint knapping. The first one is at the Northernmost part of the Vinča occupation, the second one is associated with the subsurface cluster of house features (based on fluxgate gradiometer data) in the Southern zone of the Vinča occupation, and the third is in the zone of the high Starčevo densities in the southernmost area of the site that is lacking any evidence of Vinča pottery. This allows us to connect this specialized zone with Starčevo occupation(s) and to posit that there is a large area, covering approximately ~6 hectares, that already formed during Starčevo phases and is likely connected with specialization in flint production.

As shown before, densities of pottery material are somewhat lower in Kusovac then encountered at the site of Kneževac, but again, the majority of the site is covered by subsequent Vinča occupation. However, if this is indicative of Starčevo occupation(s) that covered more than 45 ha this would be an extraordinary occurrence for the Early Neolithic. The cutoff point for artifact densities was when artifact collection fell to under 2 in non-adjacent collection lots. This was especially important for evidence of the Early Neolithic, since scatters of individual sherds that are substantially separated from each other are common in the Early Neolithic, as a result of the pattern of movement and activity being different then during the Middle and Late Neolithic phases. Also, historical agricultural patterns of fertilizing with manure could contribute to these patterns (Bintliff and Snodgrass 1988). While important to note for the patterns of use of arable land connected with cereal agriculture, especially for contrasting to later stages of the Vinča culture, these isolated artifacts cannot represent something we could easily describe as a habitational site. At Kusovac there are also several pottery sherds that indicate exactly what Letica noted in 1971 – that there are transitional stages between Starčevo and Vinča attributes where there is evidence of the characteristic barbotine slip decoration but the pottery fabric had changed. In this case, wheat chaff was no longer used as an organic component and was replaced by fabric characteristic for Vinča pottery that utilized finely grounded cellulose most likely taken from animal dung.

5.3.4 OTHER NON-HABITATION SITES IN THE VALLEY

Starčevo type pottery sherds were discovered in multiple other locations within the Gruža valley but do not appear to represent habitational sites (Figure 5.10). Collection units for these sherds represent extremely low-density artifact scatters where two artifacts, as in the case of

Zabojnica, are separated by more then 100m. One problematic site is Oplanić–Grobljište, since the low-density area lies on the very edge of a river terrace. In this case there is a possibility that underlying heavy alluvial deposits represent buried sediments containing a much greater density of artifacts and possibly even a habitational site. Since the size of the alluvial flood area is significant in this location and represents an area of heavy sediment discharge from the Gruža River as it exits the narrow part of its flow and enters the wider valley.

However, one may decide to classify these sites, as processing camps, small temporal sites, etc. they all definitely represent activity zones and indicate that in the Early Neolithic there was much more mobility than in the succeeding period. Sites such as Oplanić-Grobljište and Bare are also conceptually important since they lie on important "chokepoints" in the landscape and could represent meeting points between villages that may have been located within border zones between territorial units.

5.4 DISTRIBUTION OF MIDDLE TO LATE NEOLITHIC SITES (5400-4600 cal BC)

Gruža valley settlement organization changes dramatically in the Middle to Late Neolithic period. In stark difference to what was visible in the Early Neolithic with Starčevo sites and the dispersal of smaller sites and material around the valley there are only two Vinča sites present in the valley, namely Kusovac and Grivac. It is striking that no Vinča type artifacts were found anywhere outside these site areas. The total calculated site inhabitation area of the two settlements during the Vinča period is comparable . In this case, Grivac covers around 28 ha, and Kusovac 30 ha (Figure 5.25).

They are also comparable when the number of collection lots is taken into account where at Grivac there were 556 collection lots and at Kusovac 599. Surprisingly, these areas correspond perfectly with the extent of subsurface enclosure features at both sites, which have been identified through archaeological geophysics and limited augering to confirm depth. It has to be noted that the Northeastern border of Kusovac is most likely artificial since there is a possibility that the site could have extended for up to 10 ha further into the adjacent marshy flatland. Unfortunately, this area, which was used for pasture by farmers in Kusovac (by testimonies of Spakić family that owns the land), was never suitable for cereal agriculture or orchards since the water table is just below the surface. Today this area is a full marsh due to the lake formation. In the summer periods, when there is an increased use of water in the lake for irrigation and water levels drop 2 to 3 meters, this area can be walked on. However, in the winter during higher accumulations of precipitation it is not possible to enter the area. The lack of archaeological finds during the pedestrian survey on the far northern side of the small valley does not suggest that the site could have been much larger but in the future more research could be undertaken along the river bed and the marshy area and occupation evidence may be found there.

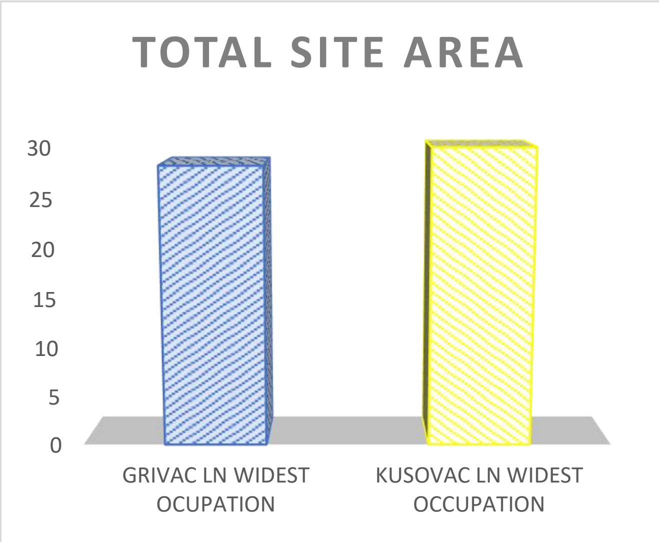

Figure 5.25 Size comparison between Vinča period Grivac and Kusovac.

Table 5. 1 Left - Descriptive statistics of collected pottery at Grivac. Left - Descriptive statistics of pottery collected at Kusovac

GRIVAC POTTERY	
N of Cases	556
Minimum	0
Maximum	132
Median	6.000
Arithmetic Mean	10.424
Standard Deviation	13.550
Sum	5,796

KUSOVAC POTTERY	
N of Cases	599
Minimum	1
Maximum	234
Median	13
Arithmetic Mean	24.671
Standard Deviation	31.515
Sum	14,778

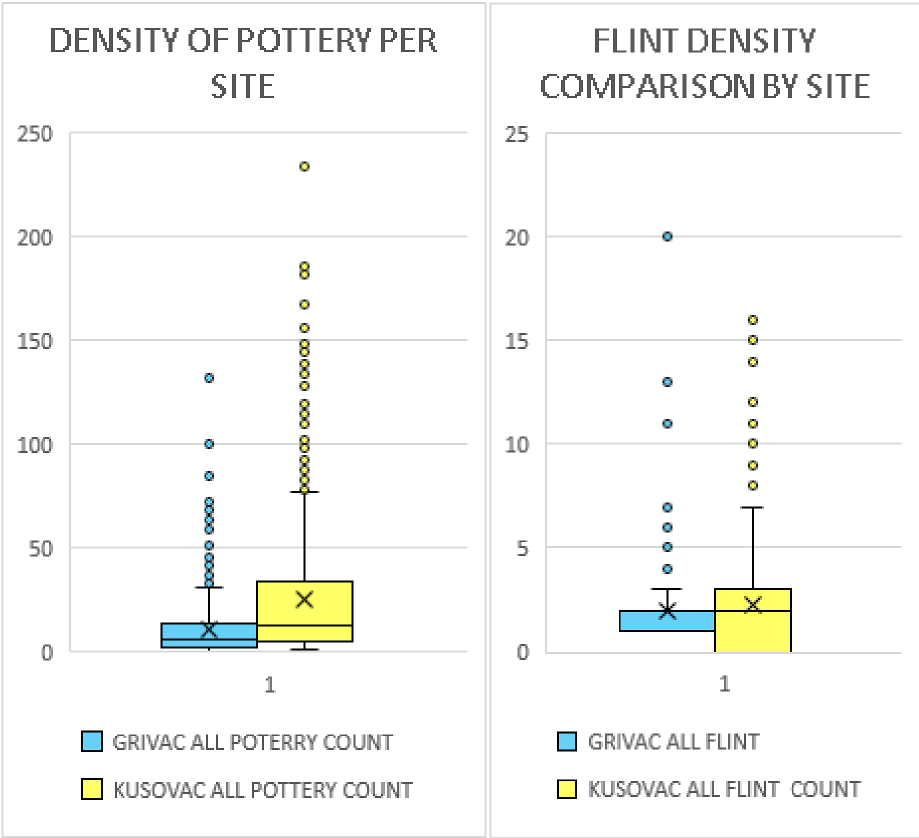

Figure 5.26 Left - Density of pottery per site; Right - Density of flint (total) per site. In both cases graphs show values with median, arithmetic mean, whiskers showing 1.5 upper and lower quartile, and bubbles showing outliers that are outside of inter-quartile range. Both sites show upward straggle due to high outliers, which are caused by presence of areas of intense densities.

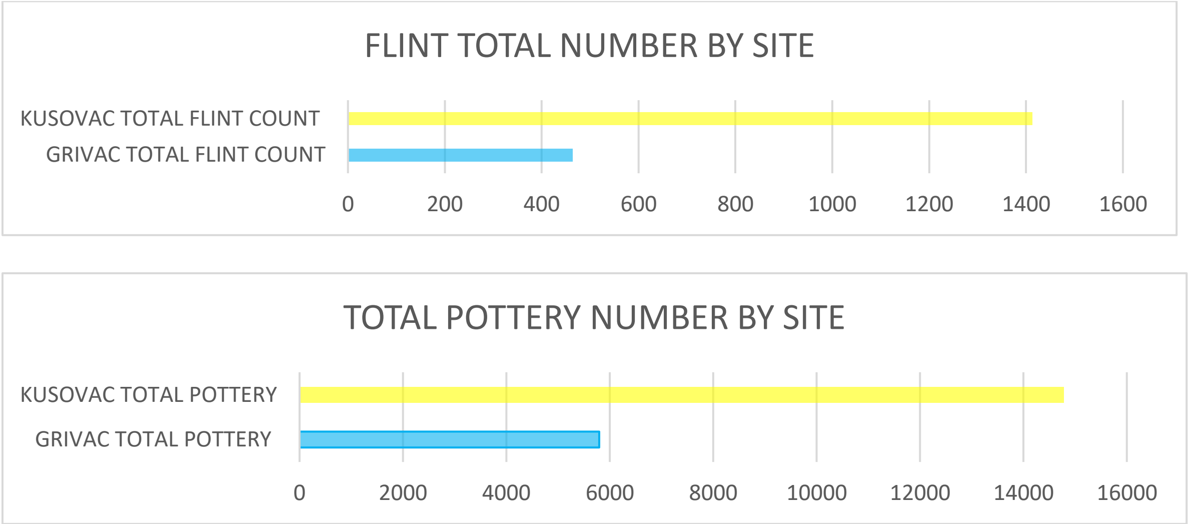

Figure 5.27 Upper- Comparison of the total number of flint artifacts per site; Lower–Comparison of total pottery number by site

Between the two sites of Grivac and Kusovac there is a stark difference in this period in the total number of artifacts recovered (Figure 5.27). Part of this difference could be attributed to preservation issues since there is evidence that Kusovac is being exploited agriculturally more intensively in present time. However, when densities of material are compared to the total number of artifacts recovered it is clear that densities are twice higher in Kusovac then in Grivac in the case of pottery, and only slightly higher in the case of flint (Figure 5.26).

This suggests that a difference between the sites is real and may represent different population and material production levels. Fluxgate gradiometry surveys at both sites indicate interesting and clear patterns of spatial organization of burned house features that will be discussed in the comparative analysis section (Chapter 5.4.3). In both cases, houses are arranged in tight rows and there are peripheral ditch enclosure features present at both sites. Surface collection of artifacts, however, also has indicated some interesting spatial patterns that shed additional light on the organization at both of these settlements.

5.4.1 GRIVAC

Middle to Late Neolithic occupation at Grivac has been well researched through extensive excavations that have been carried out at the site over a 45-year period in which 24 houses were excavated (Bogdanović 2004). All these features indicated a close association with the Vinča culture and were similar to the domestic house features identified at the contemporaneous

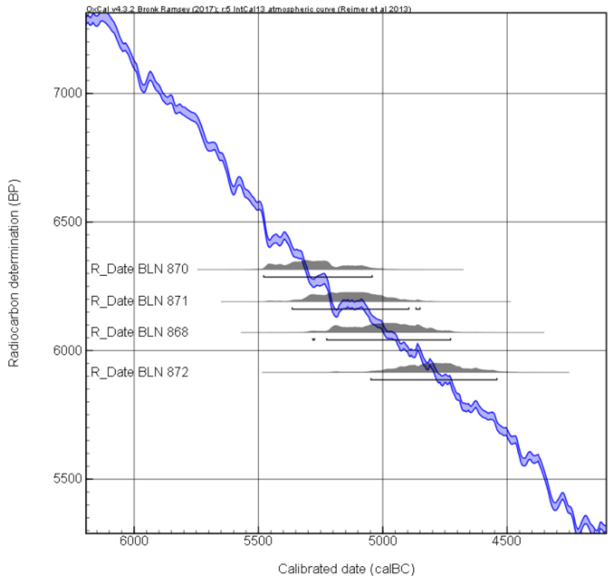

Figure 5.28 Calibrated dates for Grivac Vinča occupation, using OxCal 13, after Bogdanović 2004, Kočić 2019.

settlement of Divostin located 11 kilometers to the northeast. Absolute C14 dates from Grivac show tentatively that the settlement spans the entire duration of the Vinča culture sequence. Unfortunately, only 4 dates are available and therefore the error ranges are quite significant. In future research, which would include a larger sample of materials taken from specific feature contexts, the dating would likely produce a much tighter chronological sequence. What is clear from comparing the fluxgate gradiometry surveys from the sites (Hanks et al. forthcoming) and the surface collection produced through the doctoral dissertation research is that there is both diachronic and synchronic differences in the site areas and their overall organization.

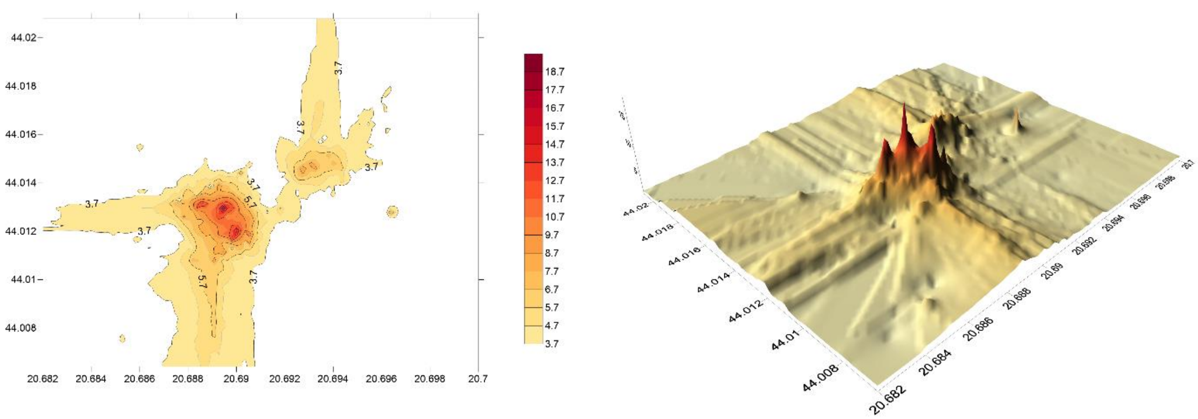

Figure 5.29 Left - Inverse distance to a power weighted density distribution of thin pottery (wall thickness under 60mm) densities at Grivac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. Kočić 2019.

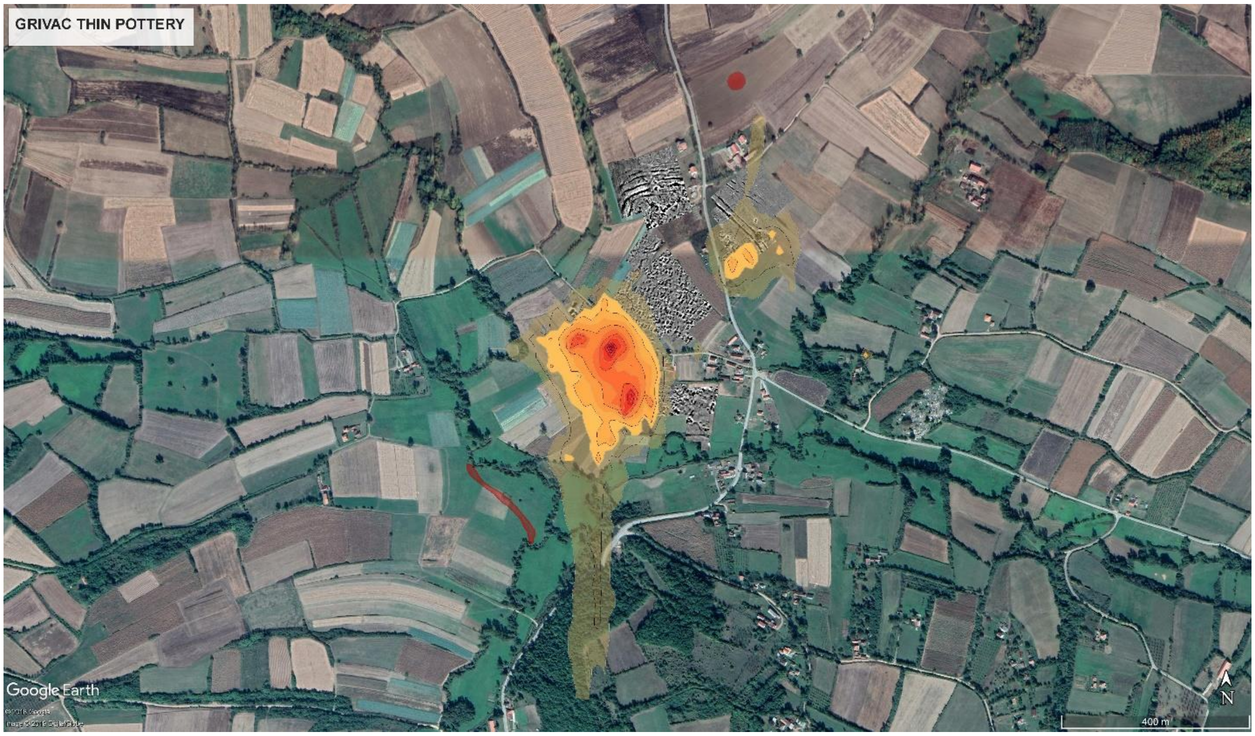

Figure 5.30 Inverse distance to a power weighted density distribution of thin pottery (wall thickness less then 60mm) in Grivac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones delineate areas that are higher in artifact densities (Kočić 2019).

Distribution of thin walled pottery (wall thickness less then 60mm) shows concentration around the most prominent house anomalies in the Southern part of the settlement at Grivac (Figure 5.30). Separation of pottery classes was done on the basis of wall thickness because typology analysis would be next to impossible to operationalize because of the state of preservation of many of the artifacts recovered through surface collection. Instead, an approach that would produce the most robust dataset was used in which wall thickness was taken as an indicator of the function of the pottery (Rice 1996).

Thin walled pottery was considered to be pottery thinner than 60mm in the cross section of the vessel wall, which would indicate that it was too thin to be utilized for cooking and therefore was used as a serving vessel. Medium walled pottery (60mm to 200mm wall thickness) was taken to be indicative of cooking as well as the extreme thick-walled pottery (200mm and larger) of large storage vessels. The area of Grivac that is most connected with the recovery of serving vessel sherds is also connected with the most prominent anomalies recorded through the fluxgate gradiometry surveys.

The central area of the settlement, which fluxgate gradiometry has indicated clear anomalies of burned rectangular houses in rows, shows statistically an almost complete absence of any type of material. This is most likely indicative of those anomalies representing an earlier phase of the settlement that was no longer functioning in the final phase when the primary occupation area may have been only in the Southern part of the site.

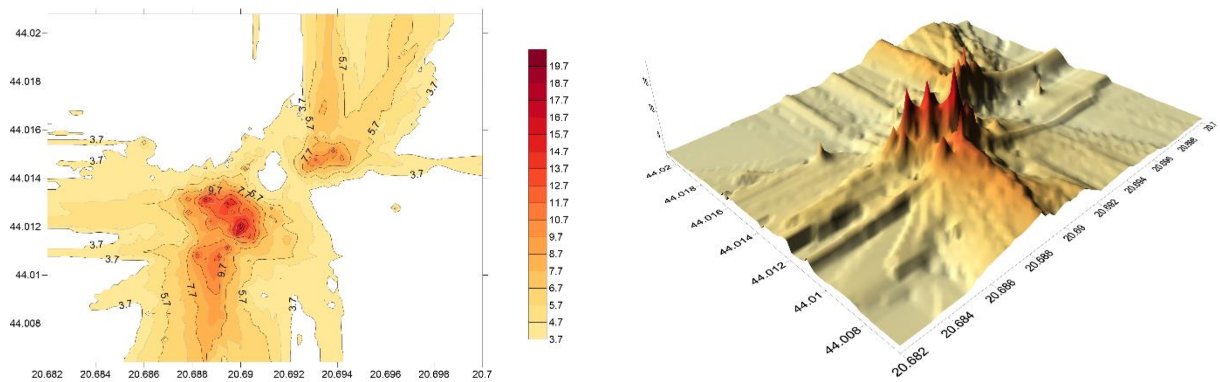

Figure 5.31 Left - Inverse distance to a power weighted density distribution of medium pottery (wall thickness 60mm-200mm) densities at Grivac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. Kočić 2019.

Figure 5.32 Inverse distance to a power weighted density distribution of medium pottery (wall thickness between 60mm and 200mm) in Grivac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones delineate areas that are higher. Kočić 2019.

A similar pattern is perceptible in the analysis of the medium pottery, which is the pottery with thickness between 60mm and 200 mm. This class is over-represented since many storage vessels will fall into this category as well and not just those associated with cooking. The variety of shapes associated with this class of pottery is somewhat problematic without the benefit of a typological analysis that would be possible with better preserved sherds.

Despite this problem, the distribution of the medium pottery sherds recovered through surface collection follows closely the distribution of thin pottery and also conforms to the highest density being identified in the same zone of houses in the central area of the settlement. The densest area is associated with houses located in the Northwestern area that I have named “House Area 1” for comparative purposes further below.

One additional pattern that emerged is the rather linear distribution of sherd scatters along a ‘corridor’ leading into the narrower part of the Gruža valley towards the site of Kusovac.

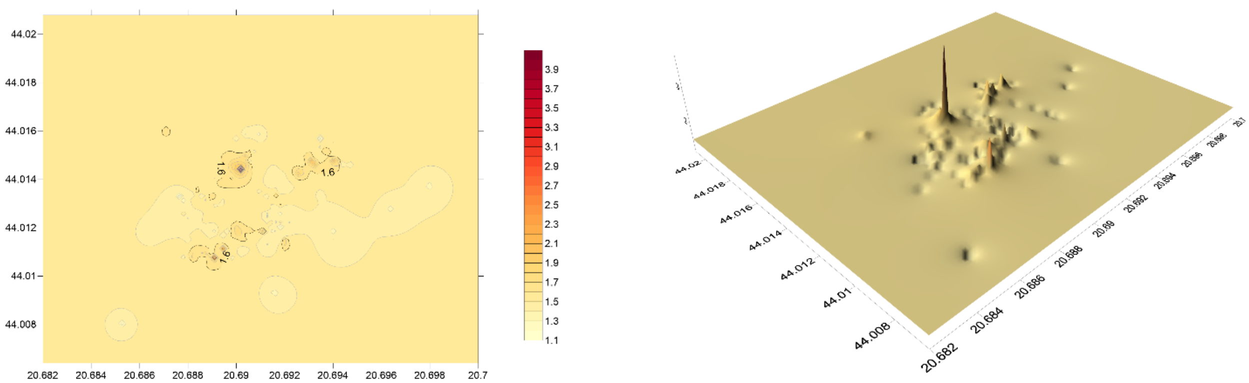

Figure 5.33 Left - Inverse distance to a power weighted density distribution of thick pottery (wall thickness greater then 200mm) densities at Grivac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot (Kočić 2019).

Figure 5.34 Inverse distance to a power weighted density distribution of thick pottery (wall thickness greater then 200mm) in Grivac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones delineate areas that are higher in recovered artifact densities (Kočić 2019).

Distribution of the thick-walled pottery represents a starkly different spatial organization where it seems that the storage vessels are used in a very different pattern than cooking and serving vessels. Here we see the highest concentration in the Northwestern zone of the settlement (Figure 5.34), which is indicative of variation in domestic activities that are not just related to specialization in different households but more broadly at what may be considered the community level. This will be discussed in more detail further below in the comparative analysis section.

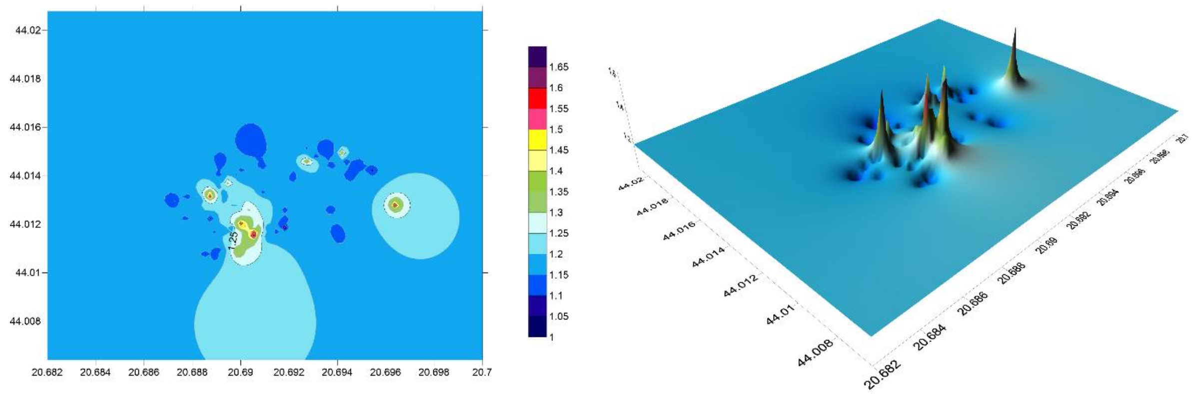

Figure 5.35 Left - Inverse distance to a power weighted density distribution of flint tool densities at Grivac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot (Kočić 2019).

Figure 5.36 Inverse distance to a power weighted density distribution of flint tools in Grivac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Except for the clustering around the habitation area, the other high density zones are adjacent to ditch enclosure features, suggesting use of tools in those zones. Darker zones delineate areas that are higher in recovered artifact densities (Kočić 2019).

The spatial distribution of flint tools (Figure 5.36) indicates that the main zone of activity is connected with house area 1 in the Southern zone of the site. A similar pattern is visible with flint debitage and this may place lithic production activities in the small area around houses and in some areas on the periphery of the settlement.

One of the limitations concerning the zone outside of the enclosed area of the settlement is that there is, as previously noted above, a difficulty in discerning between debitage of the Starčevo and Vinča periods. This inability to separate the lithics associated with these two different chronological phases challenges a straightforward interpretation of the internal distribution of lithic artifacts and its connection to socio-economic organization.

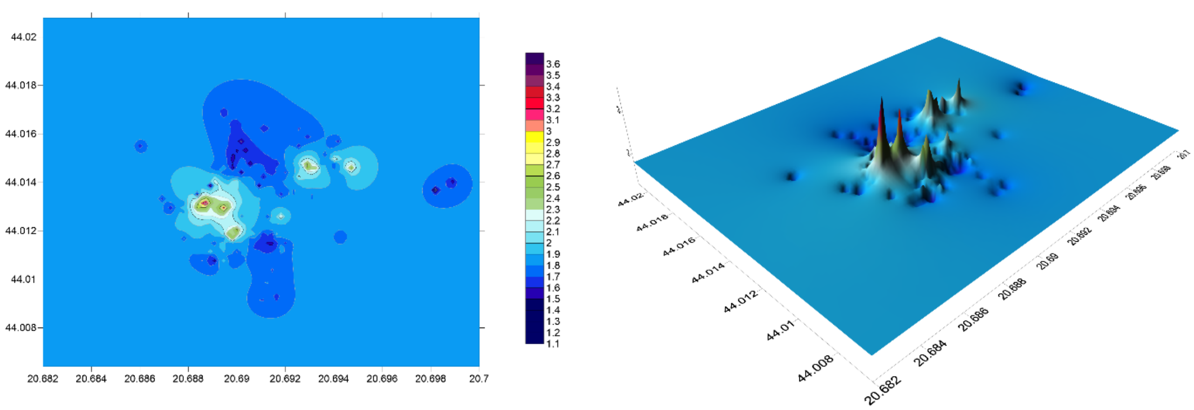

Figure 5.37 Left - Inverse distance to a power weighted density distribution of flint debitage densities at Grivac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. Kočić 2019

Figure 5.38 Inverse distance to a power weighted density distribution of flint debitage in Grivac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Debitage shows highest occurrence in the habitation zone. Darker zones delineate areas that are higher in recovered artifact densities (Kočić 2019).

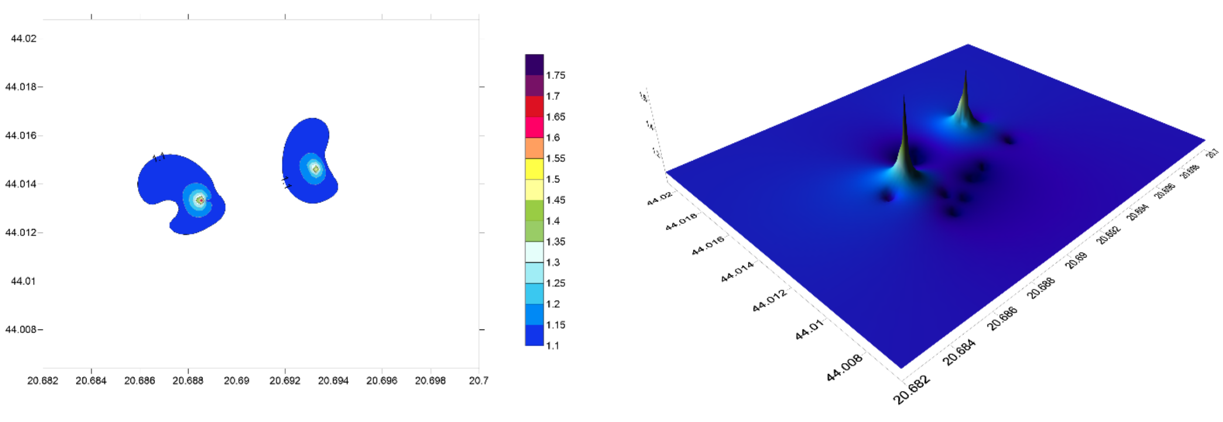

Figure 5.39 Left - Inverse distance to a power weighted density distribution of ground stone tools densities at Grivac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. Kočić 2019

Figure 5.40 Inverse distance to a power weighted density distribution of ground stone tools in Grivac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones represent higher values of recovered artifact densities (Kočić 2019).

With regard to the ground stone and flint tool artifacts recovered during the pedestrian sruvey, and the addition of the obvious zone of high activity in and around House Area 1, the Northeastern zone of the settlement indicates an area of significant human activity. Here, in addition to the peaks of the collected material, is a large oval distribution pattern on the border of the enclosure ditches. This peak is actually noticeable in a number of other artifact categories, however, the distribution is clearly definable from the surface collection of lithic artifacts. This distribution of surface finds might be connected to later prehistoric modification, such as burial mound building, since this is a zone of the settlement area where two later prehistoric burial mounds have been identified. This possibility would suggest that the underlying stratigraphic layers are disturbed through the mound construction and that this explains the higher amounts of all artifact classes.

Another possibility is that this area was a communication route in and out of the settlement and that accumulation of artifacts there was made by everyday actions of the community. Unfortunately, these are questions that can only be examined through some method of ground testing.

Surface collection on the site of Grivac indicates several different possibilities in terms of socio-economic organization and chronological phasing. First, that during the final phase of the settlement the core area of the site is reduced in the Southern zone although it is clear that the entirety of the site is being used. Settlement area zones that once were clearly occupied, and where burned subsurface domestic house units have been identified through fluxgate gradiometry surveys, were repurposed. These areas of the site where then used in a different capacity.

If this is the case, then these secondary activities did not leave any non-perishable archaeological material and might have been related to the use of the area for animal management (corrals, stalls, etc.), storage areas, or possibly for the formal disposal of human remains. Again, this is a question that will require further testing and excavation to resolve. The use of targeted test trenching, chemical analysis of soils, additional geophysical techniques, and AMS dating would likely provide a clearer understanding.

What is clear at this time, based on the data presented above, is that there is no support for a model of fissioning of the settlements due to population pressure (Tringham et al 1992). Instead, the pattern that is visible is one of population decline, which would account for the fall off of the production frequency of pottery in the Late Vinča phase (Chapman 1982). This pattern of decline in production might then be correlated with the area covered by the dwellings in the Late Vinča period at both Grivac and Kusovac. There is a reduction of village space after the Starčevo period, as a result of the formation of the settlement enclosures and spatial delimitation of the internal and external areas of the settlement. It is, however, probable that the Starčevo areas of occupation(s) actually conform to the later enclosed areas and reflect the spatial characterization of the village 'area' that was already formed in the Early Neolithic. Thus, it appears that the peak of settled space occurs in the Early Vinča phase with an overall decline taking placed in the Late Vinča phase.

5.4.2 KUSOVAC

The Middle to Late Neolithic phases of occupation of Kusovac, unfortunately, do not have accompanying absolute dates as the initial excavation efforts discussed above were never continued. Site stratigraphy seems to be very similar to that encountered at Grivac where the test trenches from the 1970s revealed an average depth between 80 and 120 cm (Letica 1971). There were no descriptions of subsurface pit houses so it may be assumed that these would be significantly deeper than 120 cm.

The Vinča phase of occupation at Kusovac covers ~30 ha with the settlement following the natural contour of the higher elevation ridge and an enclosure ditch that has been discovered through fluxgate gradiometry along the Northeastern periphery of the settlement area. The site has one active fresh water spring on the Northeastern side of it but is surrounded by running water on all sides.

Similar to the pattern at Grivac, surface collection and spatial analysis indicates that at Kusovac there also was a reduction in overall site size from the previous period. The earlier phase relating to Starčevo culture occupation extends well beyond what has been identified for the final phase of Vinča culture occupation. This is most likely due to the centralization of the population, not reduction in population between Starčevo and Early Vinča periods. Also, similarly to Grivac, what would be the geometric center of the settlement was found to have very low densities of artifacts. This suggests that a similar process in terms of site diachronic occupation was going on at both the Grivac and Kusovac settlements. The key difference is that the proposed core area of Kusovac was still in use and is approximately ~8 ha in size as compared to approximately 3 ha in Grivac.

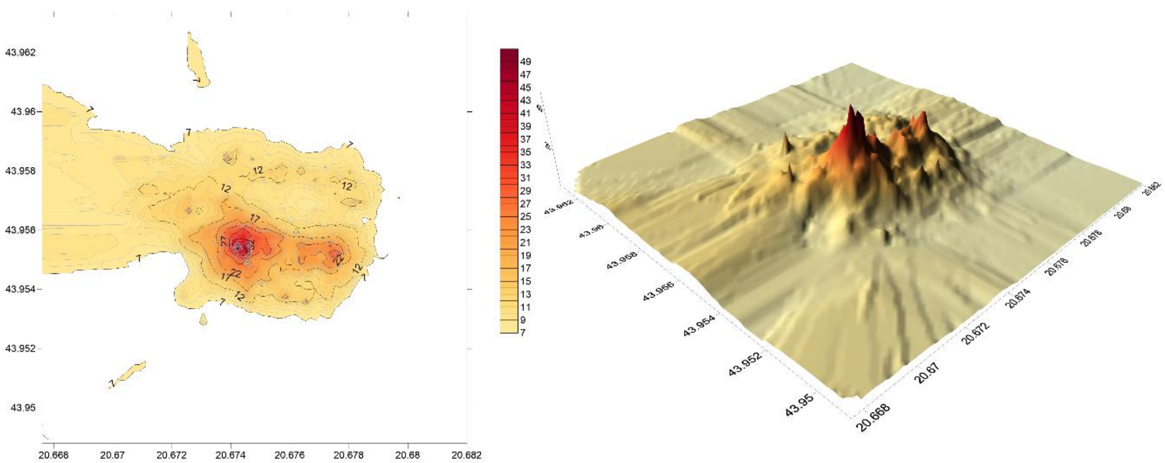

Figure 5.41 Left - Inverse distance to a power weighted density distribution of thin pottery (2mm to 60mm) densities at Kusovac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. Kočić 2019.

Figure 5.42 Inverse distance to a power weighted density distribution of thin pottery (2mm to 60mm) at Kusovac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones represent higher values. Kočić 2019.

Thin pottery distribution at Kusovac is primarily focused around the Southern zone of the site with the densest area located on the break of the slope of the hill on both sides (Figure 5.42). This is either because of depositional-erosional processes or because the settlement middens were located on the slopes that were harder to utilize for building houses and other domestic structures. Which ever is the case, the sherd densities are highest around this area and this data has been used for comparative analysis (i.e. Kusovac House Area).

The distribution of medium pottery sherds at Kusovac, which is similar to Grivac, show a similar distribution pattern to the thin pottery and is mostly concentrated around the core area of the site and is likely related to the final phase of occupation in the Neolithic (Figure 5.44, 5.45). The central area of the site has very low densities of material artifacts overall and this raises an important question about the nature of human activities in this area of the site. In contrast to Grivac, the distribution of thick pottery finds (Figures 5.46, 5.47) has a much more centralized pattern then that seen at Grivac with two high density areas once again being associated with the slopes of the hill. However, one zone is particularly interesting as it is associated with the possible entrance area of one large burned domestic feature identified through the fluxgate gradiometer survey (Figure 5.6). In this area, a cluster of three burned dipolar anomalies stand out first and foremost by their orientation since their long axes are oriented North-South unlike other Vinča structures that are oriented Southeast-Northwest. Also, the distinct rectangular feature is significantly larger than any other feature in this zone of the settlement area, as it covers 134 square meters (Figure 5.43).

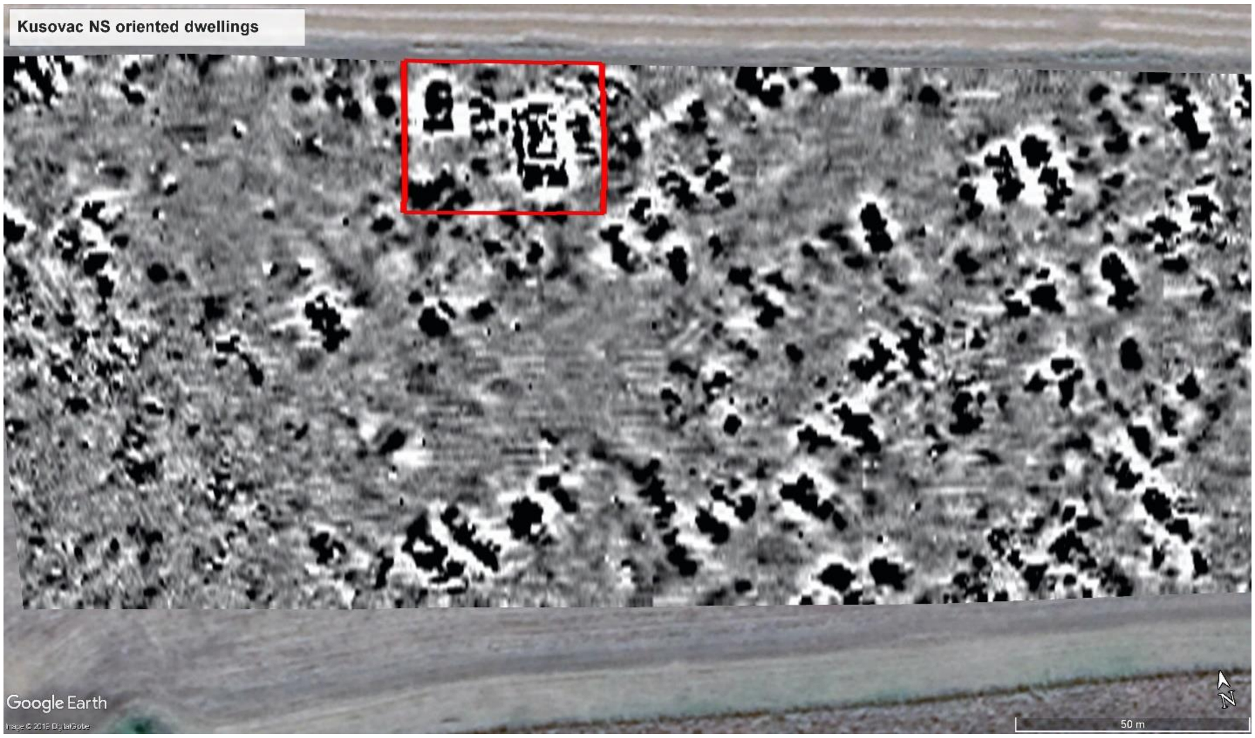

Figure 5.43 Enlarged zone of abnormally oriented, and significantly larger, anomalies recorded with fluxgate gradiometry at Kusovac. The red square denotes the anomalies in question.

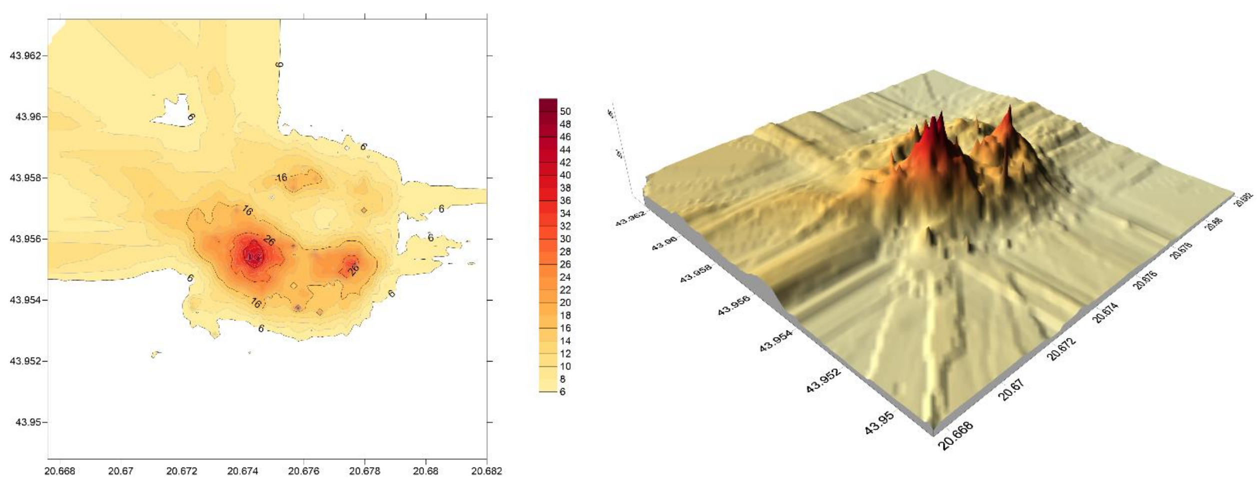

Figure 5.44 Left - Inverse distance to a power weighted density distribution of medium pottery (wall thickness 60mm-200mm) densities at Kusovac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. Kočić 2019.

Figure 5.45 Inverse distance to a power weighted density distribution of medium pottery (wall thickness 60mm-200mm) in Kusovac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones represent higher densities of recovered artifacts (Kočić 2019).

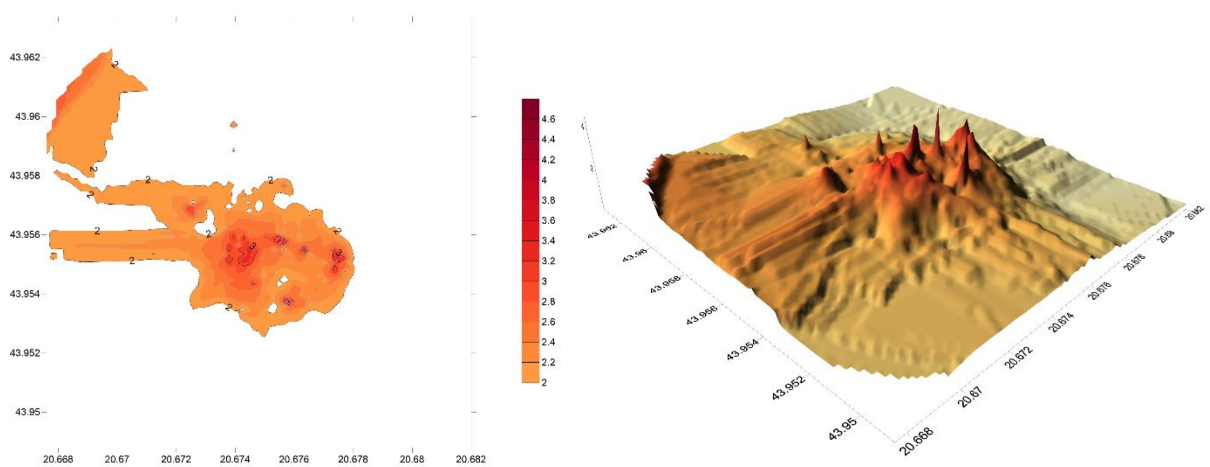

Figure 5.46 Left - Inverse distance to a power weighted density distribution of thick pottery (wall thickness above 200mm) densities at Kusovac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot (Kočić 2019).

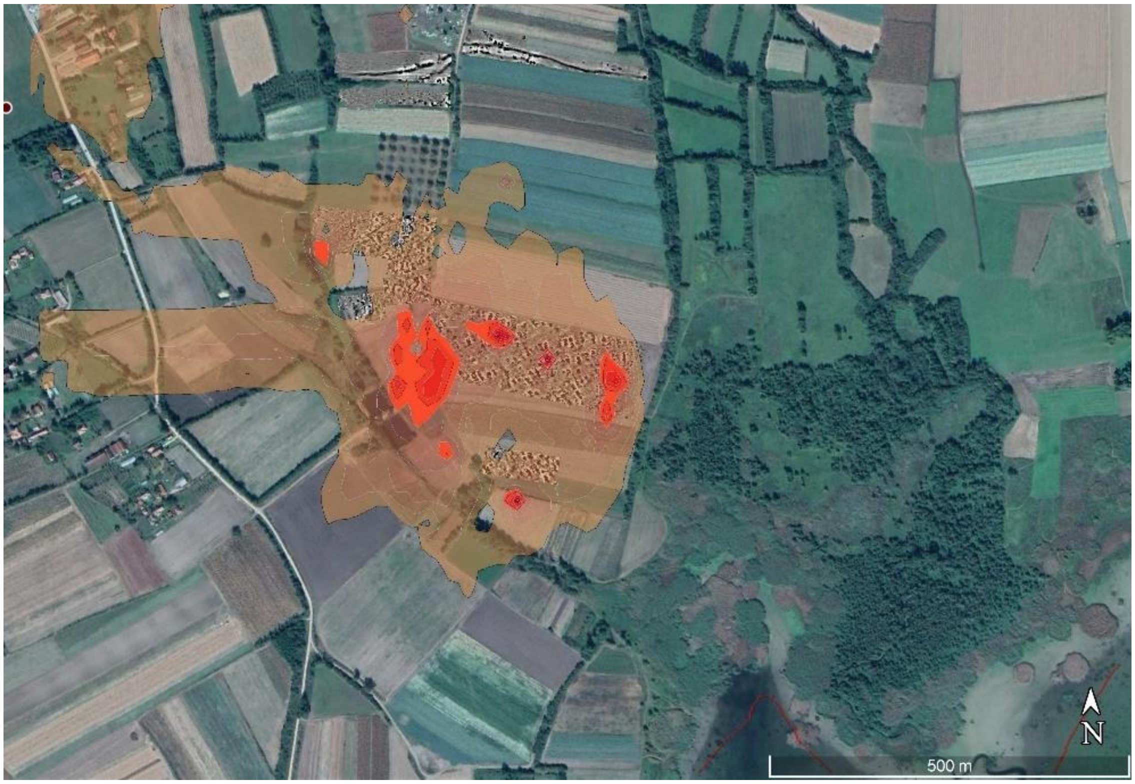

Figure 5.47 Inverse distance to a power weighted density distribution of thick pottery (wall thickness above 200mm) in Kusovac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones represent higher values of recovered artifact densities (Kočić 2019).

The spatial distribution of lithic artifacts recovered at Kusovac is markedly different. In complete contrast to the pottery distribution, the highest density of lithic artifacts is located in the Northwestern sector of the site and in immediate proximity to the enclosure features at the perimeter of the site. The size of this high-density area, which covers 2.4 hectares, is too large to represent an isolated tool cache and likely represents prolonged repetitive activity in the same area suggesting a spatial separation of stone tool manufacture by the Kusovac inhabitants. This is reminiscent of the settlement organization that was visible at the site of Kneževac during the Starčevo phase, as discussed above, where there was a similar separation of activities connected with flint working. Also, the earlier Starčevo phase organization that was discussed for Kusovac above, indicated a specific area associated with flint manufacturing industry. This also was of significant spatial size and covered 6 hectares. This is all augmented by the significant percentage of the debitage with cortex recovered and the recovery of prehistoric bones that were used as tools (Figures 5.48; 5.49). Statistical comparison of percentages, and not total numbers, indicates that there is a significantly larger amount of debitage with cortex that was worked on Kusovac (17:83%), then on Grivac (8:92%), indicating the presence of chert from a specific regional geological matrix. Specialized mining/quarrying for flint by this population, or a related component of the larger community, remains a strong possibility that could have created a significantly different dynamic between the two settlements, especially in trade networks, since Kusovac appears to have had a significant advantage.

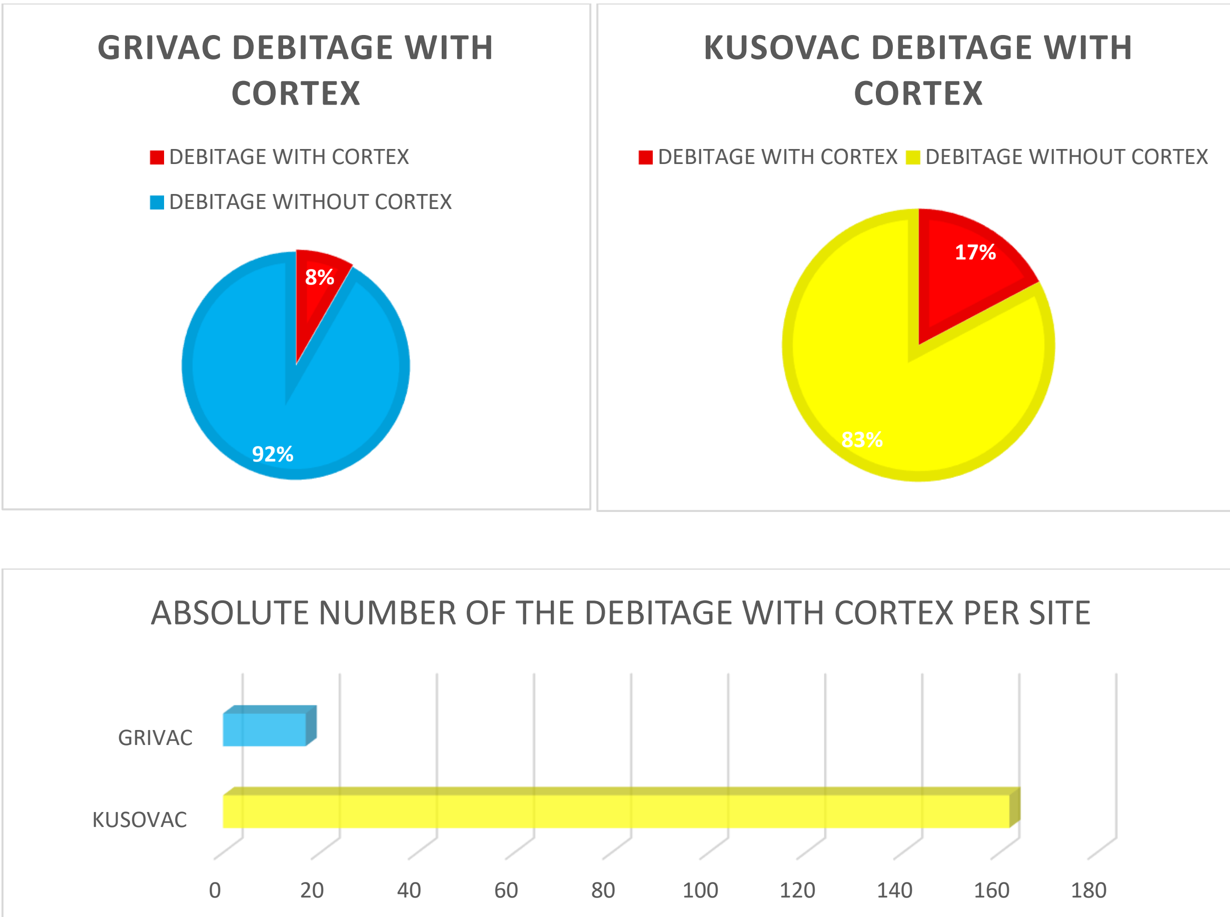

Figure 5.48 Upper Left – Comparation of percentages of flint debitage with and without cortex from Grivac assemblage; Upper Right - Comparation of percentages of flint debitage with and without cortex from Kusovac assemblage; Lower – Comparison of total number of debitage with cortex artifacts between the sites.

The debitage spatial distribution also indicates that there was some form of intramural site organization as well during the Vinča period occupation in addition to what may have been an earlier Starčevo pattern that was discussed above. Figure 5.51 shows that within the Kusovac settlement there are two zones with high density of flint debitage. The first and smaller one is located in the same area on the break of the slope directly west of the Kusovac 'House Area Zone'. The second high density zone is located next to the peripheral ditch enclosure area to the North. This specialized activity zone is even more accented when considering the spatial analysis of the ground stone tools where there is an even more pronounced clustering of artifacts in the Northern zone next to the enclosure ditches.

This pattern indicates that not only was flint production undertaken in this area but also activities related to the time intensive and laborious production of heavy stone tools such as axes, pounders and adzes. Also, the presence of completed artifacts indicates not only production of stone tools but also the use of them as well. This suggests activities concerned with heavy tools use, such as woodworking, and masonry. Adzes, which make up the largest component of the ground tool industry, are especially indicative of wood working since, unlike axes and pounders, this is the primary function for this tool.

Grinding stones are ubiquitous in Vinča culture settlements and arguably, next to pottery, represent one area where there is an issue of correlating scale of production with the actual needs of the community. The grinding stones are not just used for their primary function of processing domestic cereals but have been frequently found as structural elements associated with kilns and houses. The evidence from Kusovac indicates that ground stone was extremely important and stands out considerably when comparted to other evidence that has been previously published from other Vinča settlements, especially in the size of individual grinding stones. One of the largest grinding stones identified at Kusovac had to be removed with a JCB tractor-loader. It measures 120cm across and is 60cm thick and is estimated to weigh in excess of over 500 kilograms (Appendix Table 6). The object was removed from the agricultural field and placed near the state weather station, which is located in the Kusovac site area.

In addition to this example, other ground stone objects were recovered during the survey for analysis and were often over 20 kilograms in weight. One of the problems with such large technological objects is that none of them were identified in their primary position since they have been moved by local farmers for perhaps centuries due to the obstruction of farming and use of farm equipment. Many of the objects were then moved to field boundaries or were reused as stone markers or other purposes for which stone may be needed.

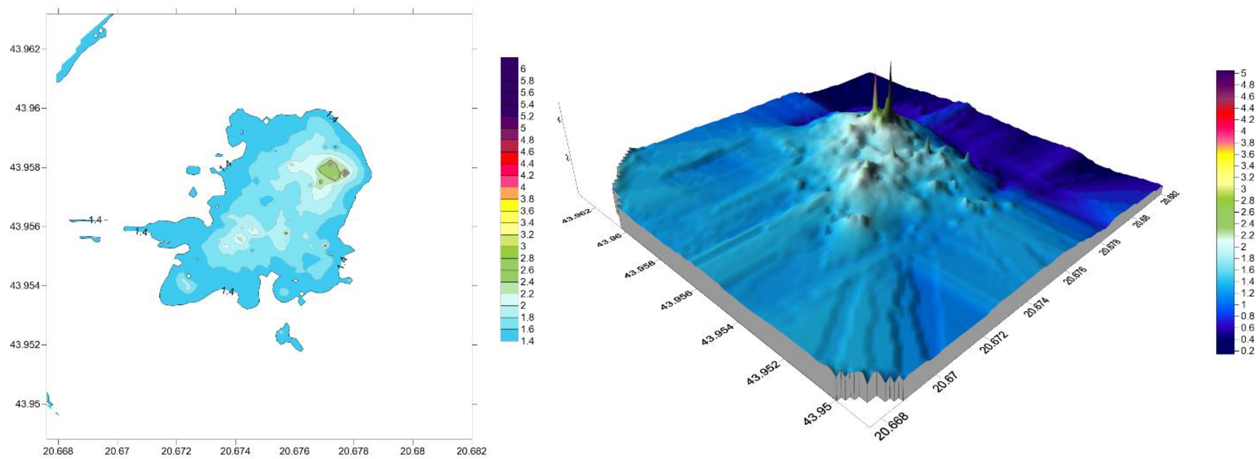

Figure 5.49 Left - Inverse distance to a power weighted density distribution of flint tools densities at Kusovac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot (Kočić 2019).

Figure 5.50 Inverse distance to a power weighted density distribution of flint tools in Kusovac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones represent higher values of recovered artifact densities (Kočić 2019).

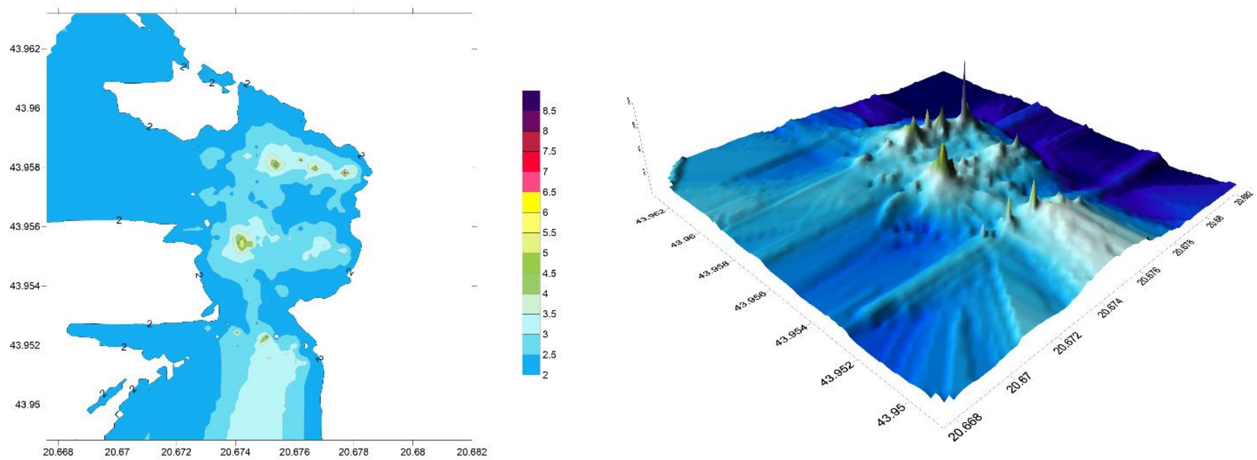

Figure 5.51 Left - Inverse distance to a power weighted density distribution of flint debitage densities at Kusovac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. Linear correlation here is very problematic, so slight smoothing with a value of 1.5 was performed (Kočić 2019).

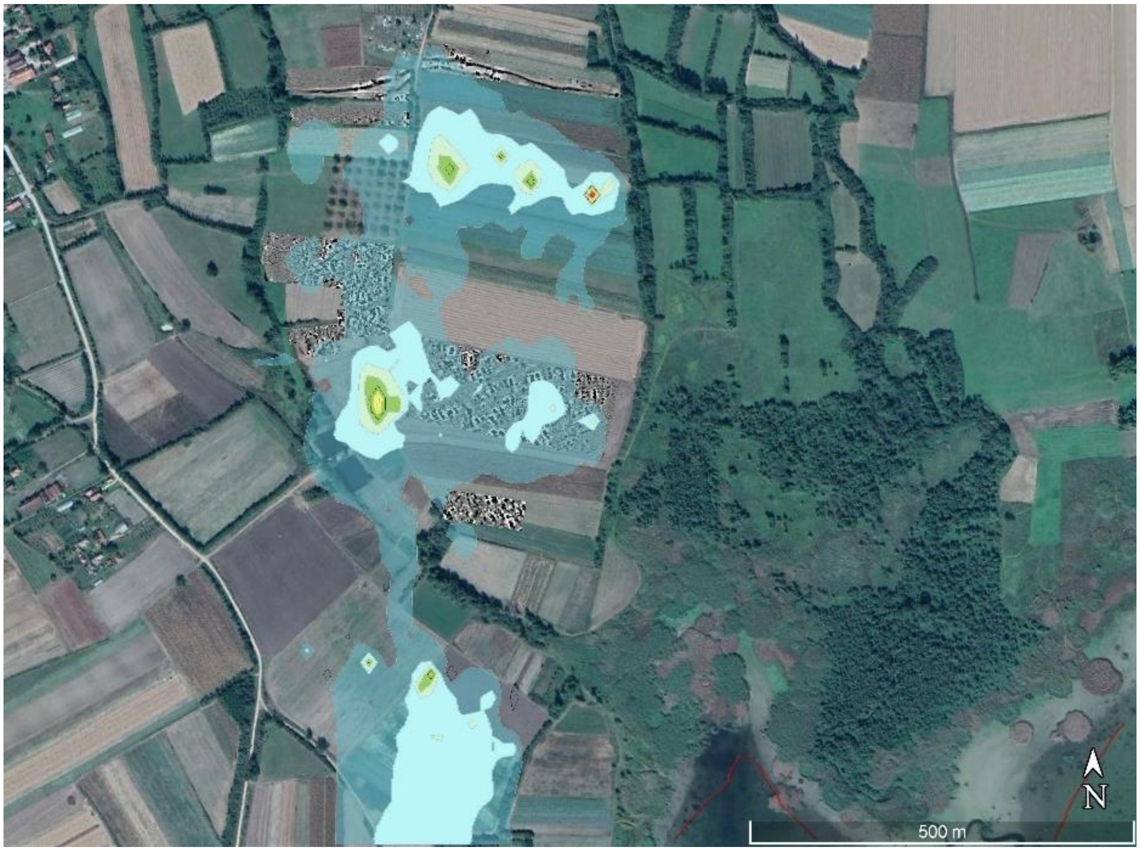

Figure 5.52 Inverse distance to a power weighted density distribution of flint debitage in Kusovac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones represent higher values of recovered artifact densities (Kočić 2019).

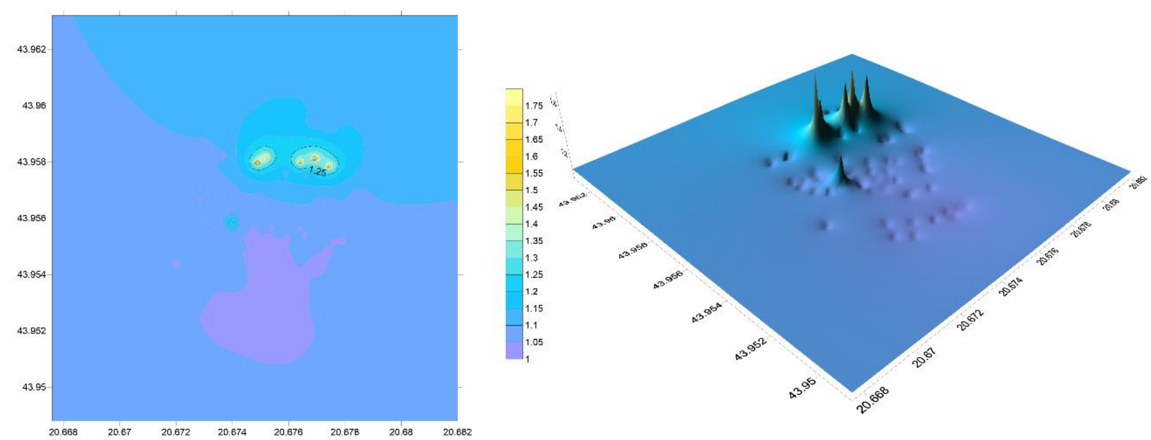

Figure 5.53 Left - Inverse distance to a power weighted density distribution of ground stone tools densities at Kusovac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. Kočić 2019.

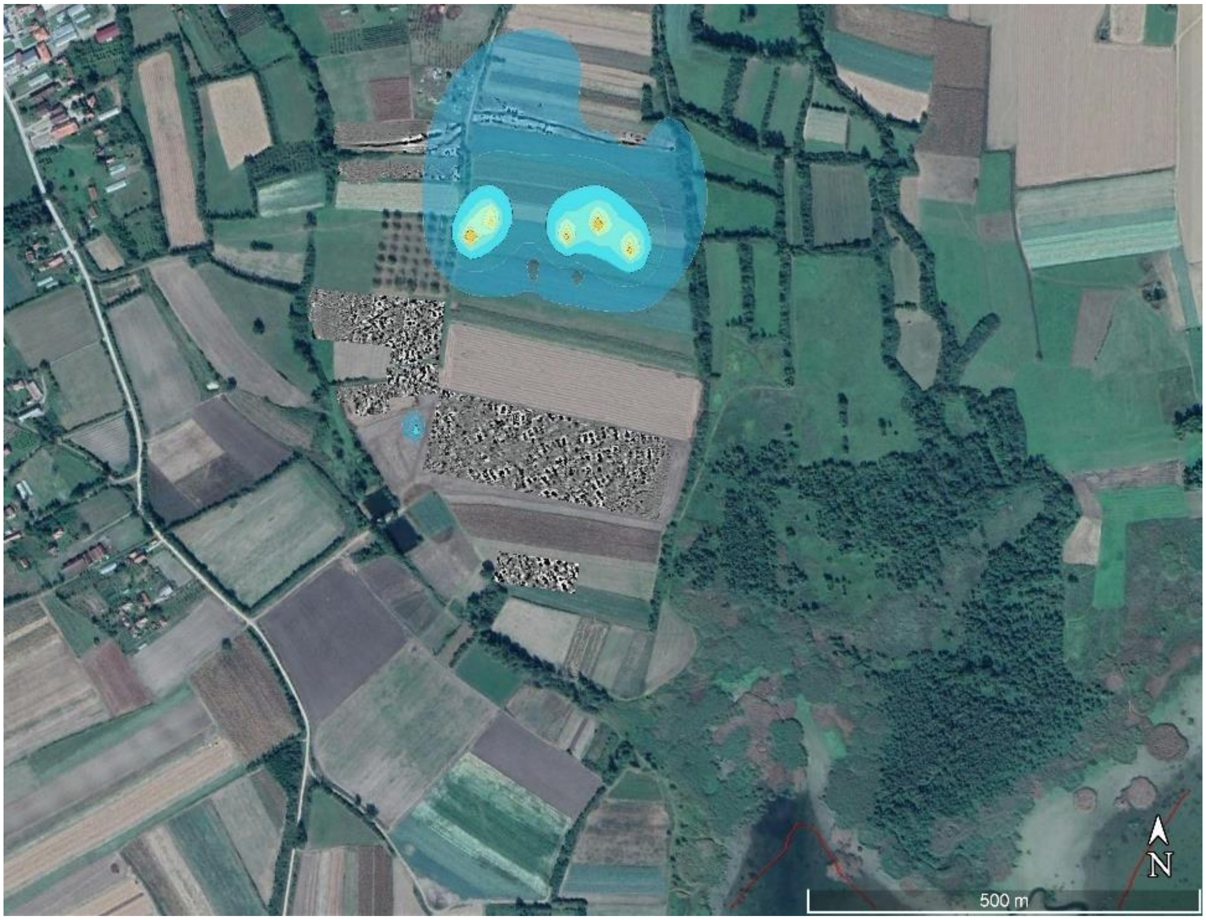

Figure 5.54 Inverse distance to a power weighted density distribution of ground stone tools in Kusovac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Darker zones represent higher values of recovered artifact densities (Kočić 2019).

5.5 STATISTICAL COMPARISON

Comparison of the two Vinca Period Middle to Late Neolithic settlements of Grivac and Kusovac have produced important results at the site level but in order to take the ambiguity out of data, and to perform more controlled comparisons, 3 areas were selected for comparison. The 3 areas selected all had to conform to the following conditions:

1. Geophysical prospection had been completed
2. Identifiable subsurface habitation features could be identified (geophysical analysis)
3. Surface collection was completed over the areas
4. 100% ground visibility was possible during surface collection

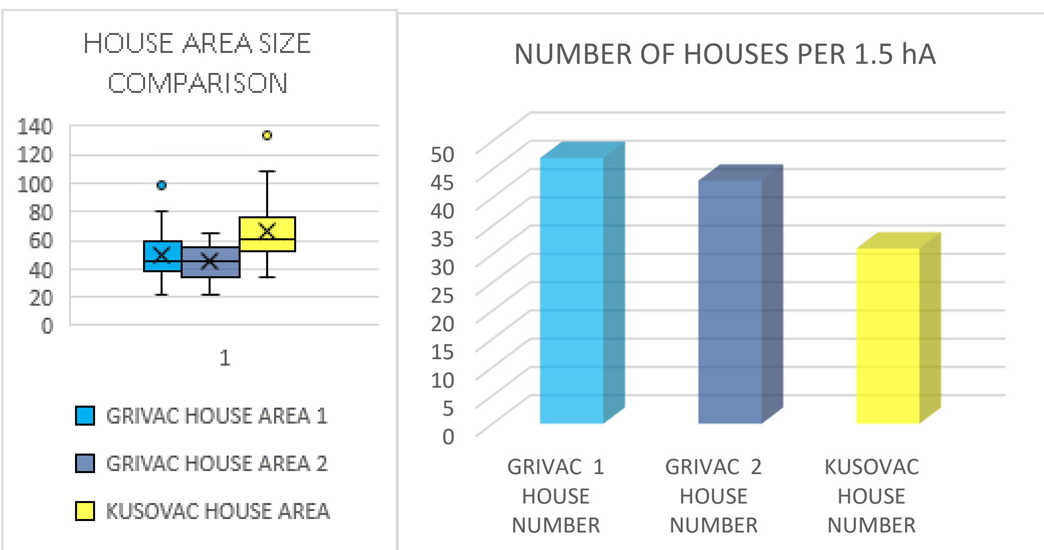

Figure 5.55 Left -House floor size area comparison. X axis is square meters. In both cases graphs show values with median, arithmetic mean, whiskers showing 1.5 upper and lower quartile, and bubbles showing outliers that are outside of inter-quartile range. In both cases there is a single outlier house, but in the case of Kusovac it is significantly larger; Right – Number of houses per area (Kočić 2019).

The areas selected for these characteristics were analyzed by comparing the associated artifact densities, estimated floor area sizes, and number of burned house features. This was done to evaluate where it would be possible to compare two active zones of the settlements and one that was likely used in earlier phases but then declined over time (Grivac).

When the numbers of houses are compared at the two sites, it is clear that the two zones at Grivac are very similar in organization both in terms of house numbers and the floor areas of the houses. Although, when the total house floor area is compared for all three areas, it is evident that there is a significantly larger total floor area associated with the Grivac 'House Area 1' zone. Nevertheless, one could state that at the Kusovac settlement, which indicated a higher square footage estimate per house, that social status may have played a role in larger house floor size.

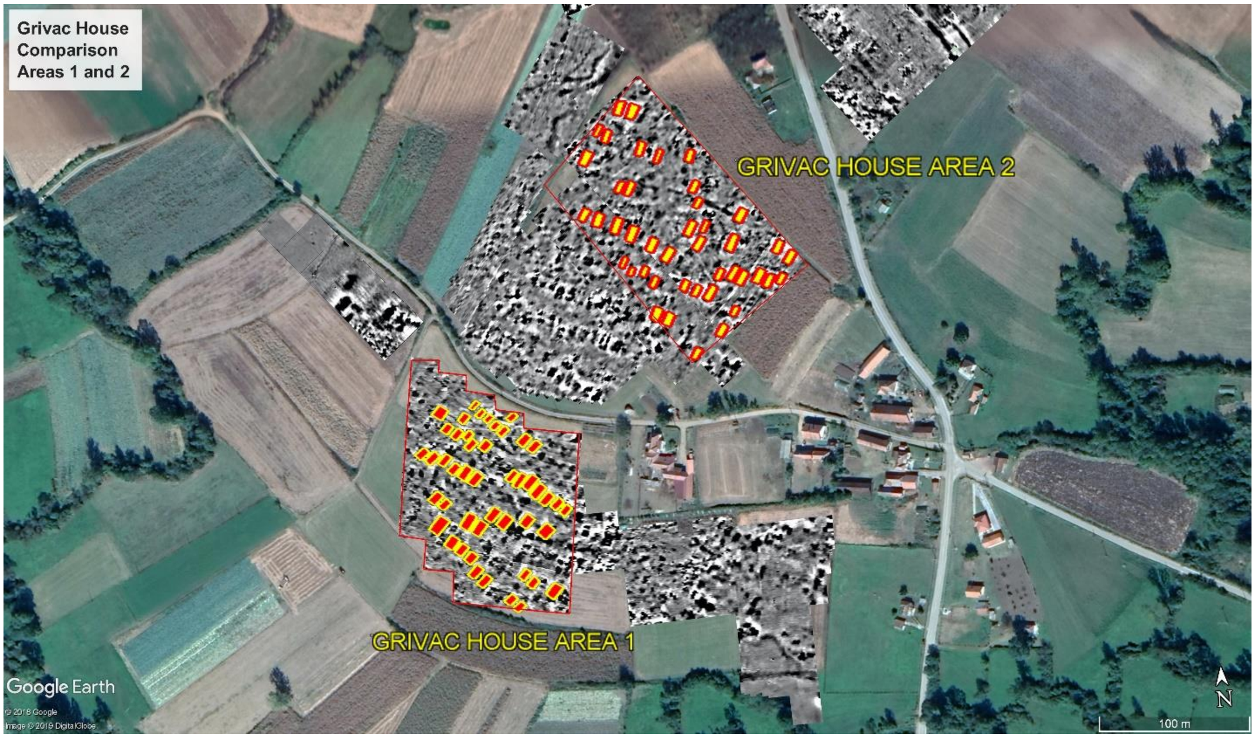

Figure 5.56 Grivac House Area 1 and House Area 2. Squares noted in red and yellow signify features interpreted as houses and used in comparison. Red lines demarcate 1.5 hectare areas (Kočić 2019).

Figure 5.57 Kusovac House Area. Squares noted in red and yellow signify features interpreted as houses and used in comparison. Red lines demarcate 1.5 hectare areas. Kočić 2019.

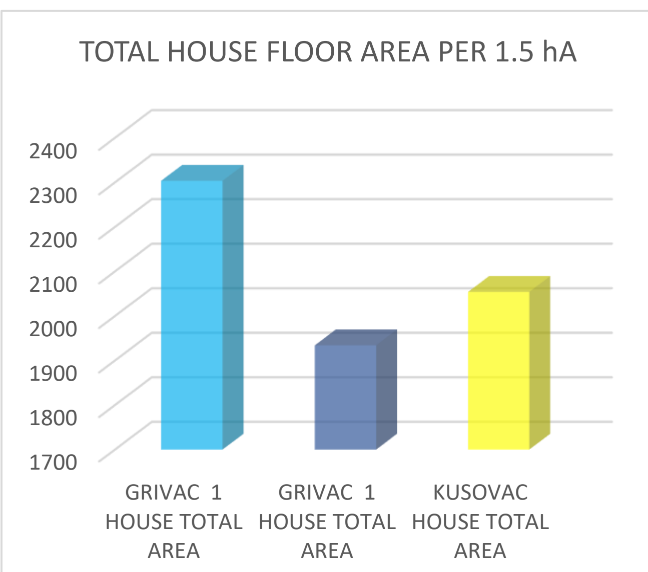

Figure 5.58 Comparison of the total floor area per 1.5 ha. Kočić 2019.

While house floor area estimates indicate that Kusovac was less densely occupied in terms of space between houses, when combined with overall floor area size the artifact analysis reveals a significant difference between the two settlements. Both pottery and flint densities are much higher in the Kusovac 'House Area' and almost down to zero in the Grivac 'House Area 2'. So, even though the area of the floor and number of houses is greater in Grivac ‘House Area 1’, the number of recovered artifacts is significantly larger from the Kusovac ‘House Area’.

If one assumes that density per area is an indication of population size and density then one could argue that the population of Kusovac was at least double that of Grivac. Alternatively, one could suggest that Kusovac had an occupation twice as long, which is somewhat unlikely, since both material styles and associated relative dates indicate that occupation at Grivac covered all phases of the Vinca culture, from early to late. Unfortunately, the excavation documentation from Kusovac, which would normally provide some important answers, has not been published and is currently reported as missing. However, this stimulates an important question about the spatial organization of the house structures and the nature of those houses in the context of the occupation of the settlement and related Vinca social organization more generally. Except for the one special house feature noted above for Kusovac, it is not possible to claim that there is a clear material differentiation between the houses (i.e. variability of artifacts between house structures). There is a definite difference in the size of the houses at Kusovac and also the amount of space between them. Whether this space was used for storage or specialized and/or ritual activities is something that can be examined only through excavation.

Chapter 8 will provide additional disscusion about the patterns recorded in this chapter and possible models of the organization of the comunities in these sites. Some of the most important patterns that were identified at Kusovac and Grivac are:

- Strong centralization during the Early Vinča period, and complete lack of artifacts outside the enclosed area of the settlements, showing strong patterns of population agreggation.

- A difference between surface artifact densities and geophysical prospection (subsurface architectual features) suggesting very different occupation characteristics at the with the tendency towards a reduction of pottery production in the later sequences.
- Specialized activity zones, where tool use is limited to zones external to the houses and close to the enclosure ditch features suggesting quite distinct organizational principles related to lithic production and use.
- Specialized production of flint at the Kusovac site and the presence of larger dwellings. Also the presence of some extraordinary buildings, which appear different in orientation and size, combined with 'emptier' zones betweeen the houses and related richer assemblages of artifacts.

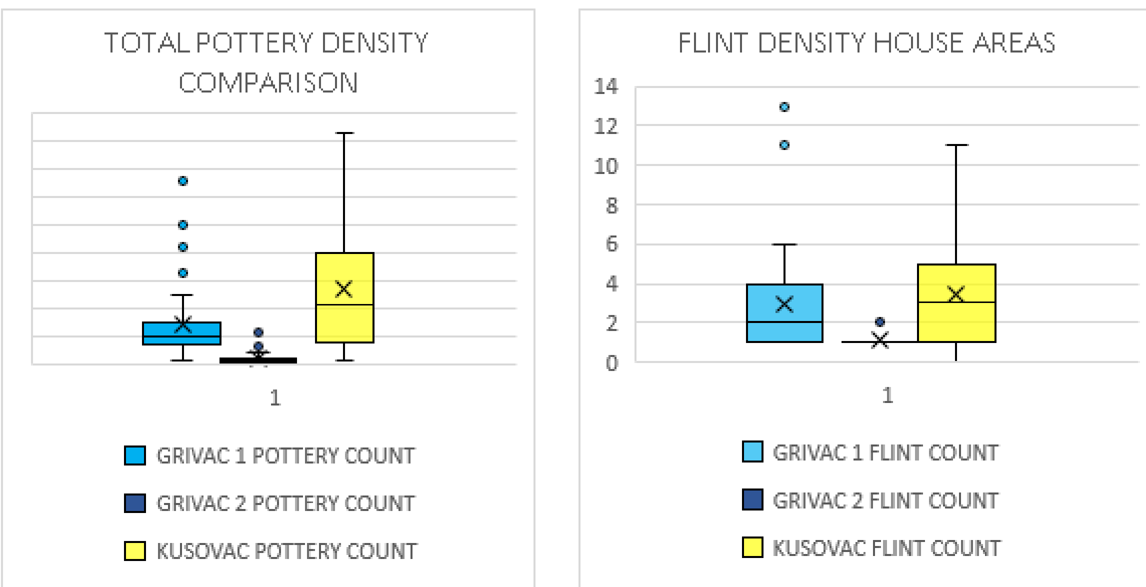

Figure 5.59 Left - Comparison of the total pottery densities per 1.5 hectares, in the 'House Areas' of both sites. X axis delineates number of artifacts; Right – comparison of flint densities in the 1.5 hectare 'House Areas'. In both cases, graphs show values with median, arithmetic mean, whiskers showing 1.5 upper and lower quartile, and bubbles indicate outliers that are outside of the inter-quartile range. It is visible that 'House Area 2' in Grivac should be excluded from this analysis, since the number of artifacts there is completely hidden by the subsequent deposition in that area of the site. Comparison of the 'House Area 1' from Grivac and Kusovac 'House Areas' show that density of pottery is at least doubled. Flint distribution is much closer for both areas, suggesting that flint is not heavily utilized within house features (Kočić 2019).

5.6 ENEOLITHIC SITES ORGANIZATION

One of the most challenging questions that the regional survey produced was the nature and organization of the Eneolithic period. Artifacts that could be connected to the Eneolithic period were recovered from only two sites – the Grivac and Kusovac settlements. During the survey a specific kind of pottery was recovered by the survey team members that was described as pottery with “graphite” inclusions. The pottery fabric was very different and was dark reddish brown with inclusions of subangular gravel. This is likely a result of the clay used in the production of the pots being sourced from colluvial deposits.

This important technological characteristic is starkly different from any of the inclusions present within the Vinča or Starčevo period pottery in which the sand/gravel used was well rounded suggesting an alluvial origin. These inclusions most likely come from shale deposits, which are not found in the immediate vicinity and for which the closest deposits are all over 50km away. One of the sherds of this type was a rim, showing an atypical narrow lip, which could be attributed to the Kostolac culture (Garašanin 1983). The only confirmed Eneolithic period settlement is approximately 15 kilometers to the east at the village of Korićane (Tasić 1979) and has been attributed to the Kostolac culture.

As this archaeological culture has been described as a possible transition and pattern of more sedentary occupation for the Baden culture (mobile pastoralist communities) (Tasić 1995:64-67) the presence of this pottery at sites that were heavily occupied in the late Neolithic could be indicative of those sites still being utilized. There could be a number of possible speculations about why this would be the case but without a clearer chronological timeline it is difficult to substantiate one possibility over another. What is certain is that the pottery was found within the areas that the earlier settlement phases were identified and the tumuli are located well outside the earlier settlement zone, thus appearing to recognize the intramural and extramural spaces. This is confirmed also by the positioning of the tumuli, both those that have been excavated (Srejović 1976) and those identified throughout the dissertation pedestrian survey, as they all are positioned to the north of the Grivac settlement (Figure 5.61).

The same form of organization is also true for Kusovac, where the pottery that can be attributed to Kostolac is found only within the perimeters of the earlier settlement area. The problem that is present in both cases is that the Vinča stratigraphic layers are identifiable in the plow zone. This means that the later Eneolithic occupation layers are on the very surface and as a result have been influenced by the agricultural practices in the region. This creates the problem of establishing a clear relative chronology and clear stratigraphic relationship between the identified archaeological cultures without the identification of pit features that may have been cut into the deeper strata. These issues, however, should not influence the surface collection all of the artifacts should be clearly visible on surface.

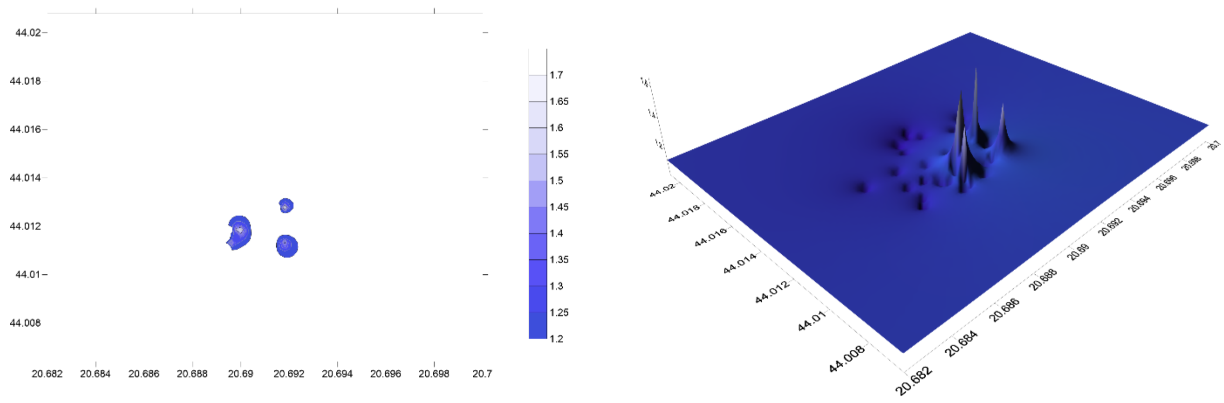

Figure 5.60 Left - Inverse distance to a power weighted density distribution of Eneolithic pottery at Grivac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. Kočić 2019.

Figure 5.61 Inverse distance to a power weighted density distribution of Eneolithic pottery at Grivac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Lighter zones represent higher values of recovered artifact densities. The red circle in the Northern part above the enclosure ditch is the possible Eneolithic burial mound (Kočić 2019).

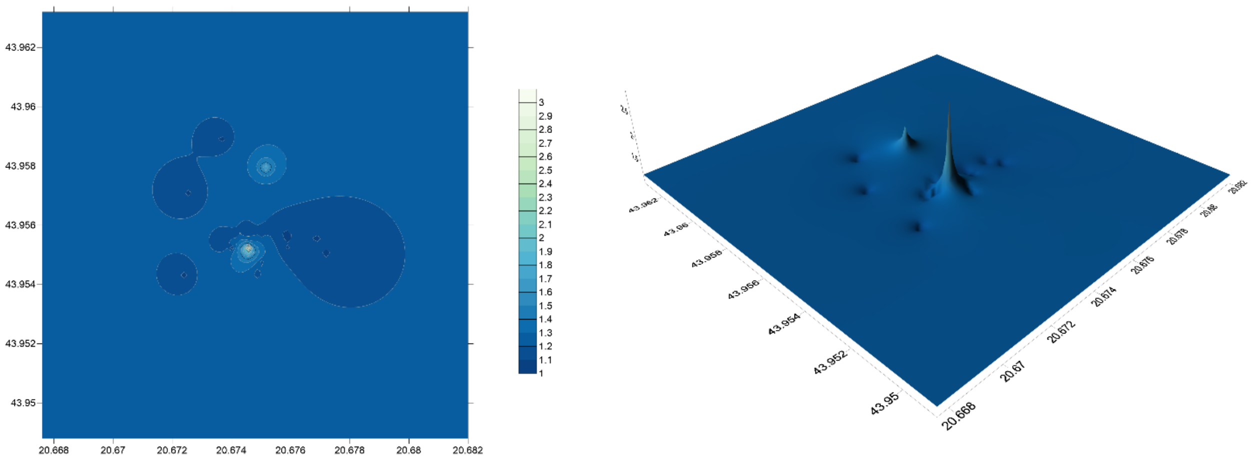

Figure 5.62 Left - Inverse distance to a power weighted density distribution of Eneolithic pottery at Kusovac; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot. Kočić 2019.

Figure 5.63 Inverse distance to a power weighted density distribution of Eneolithic pottery at Kusovac layered over fluxgate gradiometer grey scale plot and Google Earth Satellite imagery. Lighter zones represent higher values of recovered artifact densities (Kočić 2019).

While these practical issues can be blamed for the lack of a clear Eneolithic occupation in the excavation record, there is a strong possibility of some form of dramatic depopulation occurring near the end of the Neolithic period. This possibility is strengthened by the formation processes discussed previously, where Eneolithic sherds should have been over-represented by agricultural practices, and yet, their numbers were found to be minute. This has been discussed for well dated sites to the south and what is perceived as an overall lack of evidence for the Neolithic to Eneolithic transition over a large area of the Central Balkans (Bulatović and Vander Linden 2017:1055-1056). Persistence of this problem is caused, as noted above, by the lack of settlement sites for the Central Balkans in this period. This also is possible due to unclear stratigraphic sequences at sites and the possibility of highly mobile populations that used the earlier Neolithic sites as camps. One of the ways to counter this would be the employment of a detailed and rigorous dating program on sites at Kusovac and Grivac, especially for dating the enclosure features and houses. This would help to clarify the processes that occurred after Vinča occupation and their possible chronological overlap with other important developments outside of the Central Balkans connected with the megasites of the Tripolye culture and the wealthy burials of Durankulak and Varna (Renfrew et al. 1986).

5.7 LATER PREHISTORY SITE ORGANIZATION

Material artifacts that date from the Early Bronze Age (~2300 BC earliest phases) to the Iron Age (~1200 BC to the time of Roman Conquest in 75 BC) define the later prehistory for the surveyed region. Dating of these chronological phases is extremely problematic since most of the dating was based on relative dates, which are proving to be unreliable for this period in the region (Kapuran 2016). One of the problems with this period is the lack of clearly defined settlement sites and good diagnostic pottery. What is undoubtedly clear, however, is that a complete shift occurred in the way that the Gruža valley was settled and used in the late prehistoric period. Instead of centralized settlements there is more widespread occupation along a continuous zone following the river valley and the south facing slopes. The whole zone appears to be consistent with a distribution of dispersed households.

The highest count of late prehistoric artifacts recovered during survey did not exceed 16 sherds for the entire survey zone. One of the problems of understanding chronological phases is that the Bronze Age in the Central Balkans, in contrast to the Aegean, has virtually no representative C14 dates (with the exception of a few specific sites). This has generated a lot of problems for developing an understanding of the spatial and chronological characteristics for the Bronze Age. The relative chronologies have been set for the Central Balkans based on the assumption that they are later than the Aegean Bronze Age (Garašanin 1975). These periodizations were done during the 1950's and were relative to the Aegean Bronze Age, but also to the Vinča culture, where the end phase of Vinča D was thought to end around 3,300 BC. This opinion was caused in part by the lack of Eneolithic period sites in the central Balkans. As a result, at many sites Bronze Age layers are directly superimposed on to earlier Vinča settlements. Fortunately, the Bronze Age site of Ljuljaci, which is located just adjacent to the edge of the region surveyed for the dissertation research, has been radiocarbon dated. Also, the site of Pusto Polje, which is also adjacent to the region surveyed, was excavated and Late Bronze Age and Early Iron Age stratigraphic levels were confirmed in addition to several burial mounds (Bogdanović 1986:12). All of these sites, however, are located in higher elevations than the surveyed Gruža River valley and are associated with the piedmont area of the Rudnik mountains.

The C14 dates produced from these sites indicate dates of around 2,000 cal BC for the older phase of the Ljuljaci settlement and 1,650 cal BC for the subsequent phase (Bogdanović 1986:70). Typologically, this site has been associated with the Proto-Vatin culture in the older phases and the subsequent Vatin phase. The Vatin culture is characterized by smaller hilltop forts and generally smaller sites that have been interpreted as settlements (Bogdanović 1981; Garašanin 1973). Very different pattern of dispersed households is clearly visible on Figure 5.64.

Most of the artifacts recovered from the Ljuljaci Grivac habitation zone are likely associated with the Bronze Age occupation of the region. Pottery of this period is made with clay sources that are very different than those used during the Neolithic period. Both temperatures of the firing and choice of inclusions contributed to a very frail pottery, as was discovered when washing the sherds collected during survey.

Flint sources used during the Bronze Age also are quite different from that of the Neolithic and the lithic artifacts look more haphazard and improvised with most flint being very small in size with strong evidence for significant retouching until the artifacts were no longer usable. The pottery sherds collected had few perceivable decorations and were primarily associated with Vatin type decorations, such as pinching on the lip of the vessel. Pieces of handles, which would otherwise be useful for diagnostic analysis, were badly eroded to such an extent that only the differentiation of the color, due to reduction baking of the core and outside, allowed them to be described as handles. All of the sherds were highly fragmented and this was an effect of the fabric of the pottery. A few sherds that may possibly date to the Bronze Age were recovered during survey at the Grivac settlement but absolute determination was not possible. It is possible that they were simply more poorly fired Neolithic sherds.

Pot sherds associated with Iron Age occupation were somewhat easier to recognize with two sharp profilated sherds from the Bare site and the Ljuljaci Grivac habitation zone recovered. These finds are likely representative of Early Iron Age occupation and date broadly from 1,200 BC to 850 BC. Quite surprisingly, no Roman artifacts were recovered during the survey and Medieval period architectural remains were all noted in areas of higher elevation just adjacent to the survey zone.

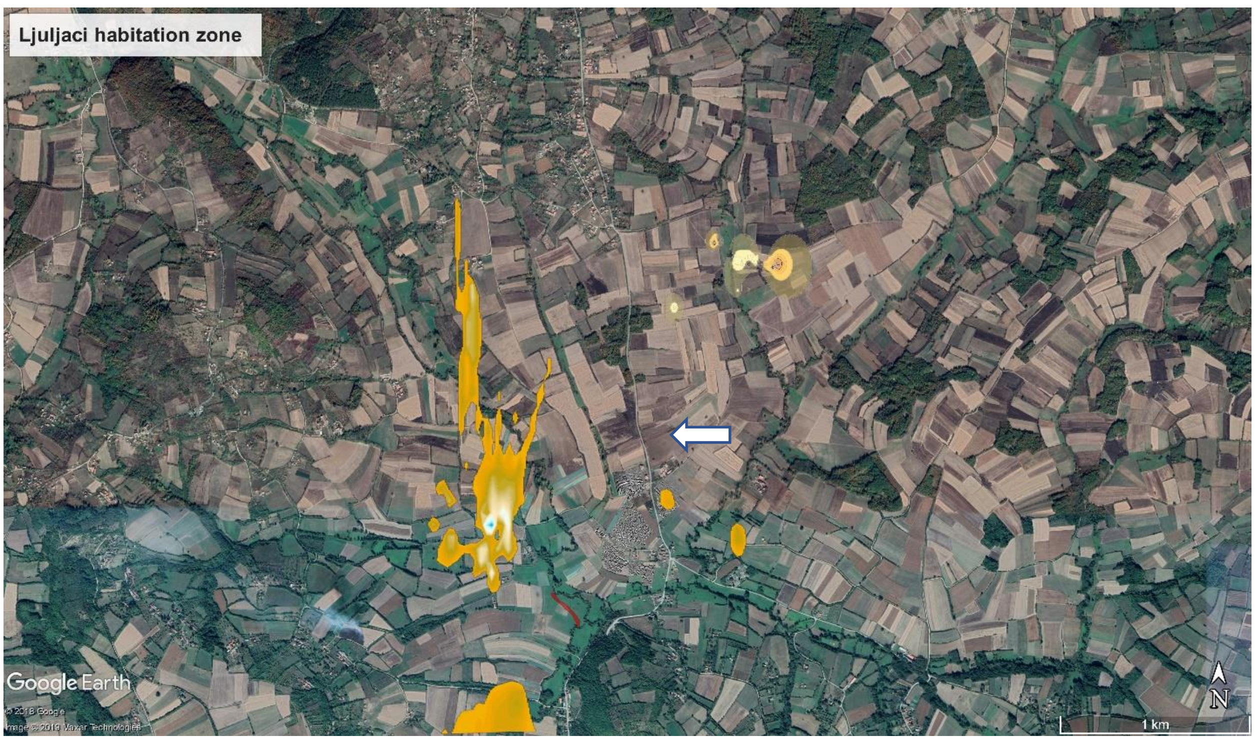

Figure 5.64. Inverse distance to a power weighted density distribution of pottery at the late prehistoric Ljuljaci Grivac habitation zone, overlaid over Google Earth satellite imagery. The white arrow points to the location of the largest recorded tumulus and on the upper left the Iron Age site of Bare is visible (Kočić 2019).

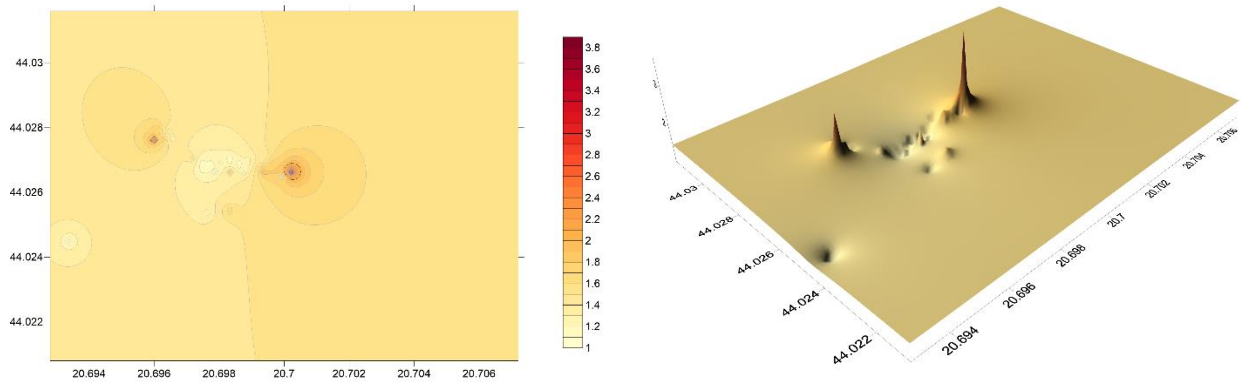

Figure 5.65. Left - Inverse distance to a power weighted density distribution of pottery at Iron Age site of Bare; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot (Kočić 2019).

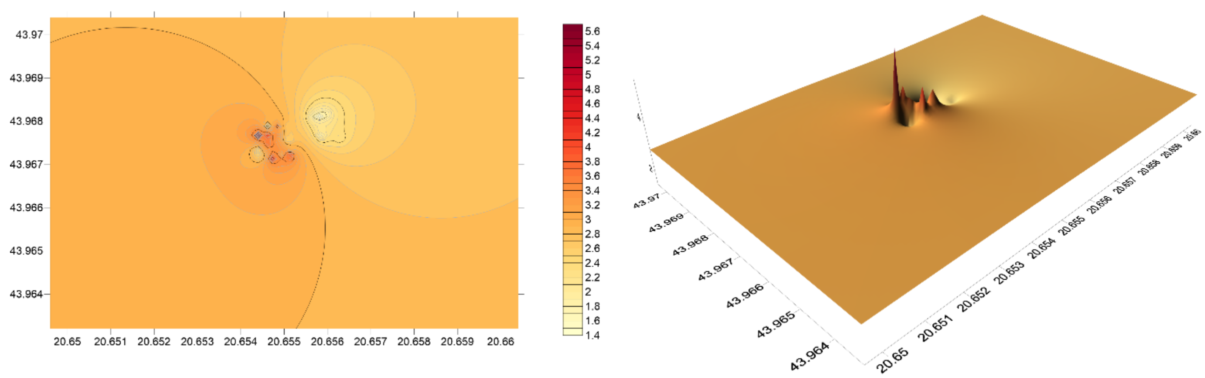

Figure 5.66. Left - Inverse distance to a power weighted density distribution of pottery at the Iron Age site of Borač; Right – 3D data presentation of the same density distribution. Scale represents density per collection lot (Kočić 2019).

Figure 5.67. Inverse distance to a power weighted density distribution of the pottery at the Iron Age Borač site, overlaid over Google Earth satellite imagery (Kočić 2019).

CHAPTER 6 – REGIONAL SETTLEMENT PATTERNING AND DEMOGRAPHIC ESTIMATES

6.1 INTRODUCTION

Population estimates are one the biggest questions for the Neolithic of Southeastern Europe and are especially a conundrum for the Vinča culture (eg. Chapman 1981; Parkinson 2003; Porčić 2012). Even though a focus on demographic estimates have been at the core of anthropological archaeology for a number of decades, especially in the context of comparative studies at the regional scale in many parts of the world (eg. Willey 1952; Billman and Feinman 1999 Kowalewski 2008), such approaches have not been a common element of European archaeology[6] until relatively recently (Parkinson 2003; Chapman 1995). One of the reasons for this was the simple lack of a regional perspective in research and instead a reliance on targeted excavations of single archaeological sites that produced a relatively narrow point of view of prehistoric social developments and associated settlement patterning. This is especially true when dealing with a period where there is virtually no above ground preservation of archaeological features, such as the case for the Vinča culture.

This poses an interesting question concerning the best approach to estimating populations in specific regions for Vinča settlements. Certainly, one confirmed method would be to use a proxy of area density index, and to evaluate relative changes of population of artifacts through time where they may be seen as representative of patterned human activities (Drennan et al. 2015:12-36). One thing that has been absent in the tradition of Vinča culture research is that there has been no systematic regional scale survey as part of the archaeological tradition in the Balkans. This was an

[6] Except for archaeological practice in the United Kingdom where Processual archaeology made a significant impact since the publication of David Clarke's *Analytical Archaeology* in 1968.

important factor in the development of my own approach to the implementation of pedestrian survey in this region for my dissertation research.

It was crucial to establish a dense surface coverage while surveying to provide a robust data set that would allow for more empirically substantiated demographic estimates and an important baseline of data for future research in the region. The only areas of the selected regional survey zone where surface collection was not possible was in the dense unpassable patches of young acacia forest that is planted on hill slopes with heavy erosion. This did not present a substantial problem, since these forests were planted exactly in the region where the skeletal soils are predominant (as discussed in a previous chapter). Prehistoric human occupation of these zones was practically nonexistent.

Small patches of oak forests in the lowland area of the region were intensively surveyed and almost 100% of these zones contained no artifacts. These areas are not well suited for agriculture because they are too arid, the clay soils are too dense, or there is simply too much shade due to forest growth.

In other comparative studies of settlement patterning, demographic estimates have been correlated with the total amount of human produced refuse (artifacts and ecofacts) and this has been found to be proportional to the number of people that would have produced the refuse (Drenann and Rivas 2003:69; Hassan 1981:63-93; Paine 1997). Unfortunately, from the artifact distributions detailed in Chapter 5 for the Neolithic sites in the Gruža River valley, it is clearly visible that there are areas within these sites that have very low densities of surface material. In contrast to the surface archaeology, archaeological geophysics surveys over these areas have indicated subsurface rectangular burned house features, often arranged in rows, which are certainly houses associated with the Neolithic period. The existence of two definite Vinča stratigraphic layers has been confirmed from excavations at the site of Grivac as well (Bogdanović 2004:12-20).

The same problem exists for the previous stages of the Early Neolithic relating to Starčevo occupation layers. Starčevo evidence exists in areas on the periphery of the larger Vinča period occupations. In the case of the Kusovac settlement, it was noted in Chapter 5 that a separate zone was identified to the south of the site. It is a reasonable assumption that Starčevo may have been present across most of the site area and this has been supported by excavation at both sites.

Before evaluating population densities for these settlements, one must consider what depositional processes may have contributed to these sites relative to their location in the landscape and position in areas of higher elevation.

Although there are a number of possible depositional processes that could create the difference between the two zones, and there are definite questions about equifinality which can only be answered by further excavation and analysis, one certainty is that a large part of the site falls out of use in the last stage of the settlement life, and there is a definite contraction of the settlement in the final phase of use. One of the indicative, although tentative, threads is a lack of artifacts in the central part of the settlement. This is something that is not easily explainable by natural sedimentation processes, since it is located at the highest point of elevation, so the process of erosion is always more prevalent then the process of accumulation (Holliday 2004: 41-45). Therefore, the question remains why are artefacts so sparsely represented there, since from the excavations, we know that Early Vinča phases generally produced more artifacts and greater density of material (Bogdanović 2004)? This process is most likely anthropogenic or anthropogenically induced bioturbation caused by the changed nature of land use in that zone. The depth of Starčevo layers at Kneževac and Kusovac are indicative of such increased accumulation, since Early Starčevo layers at both sites are already nearly 40 cm in areas without subsequent Vinča accumulation. Potentially, these areas could have been used for storage, garden plots or animal keeping

A similar situation is present in the area of the high intensive flint working area on Kusovac, so natural deposition processes do not seem to conform to the processes present in the central part of the settlement. Of course, this will require excavation to confirm or disprove, but for the needs of this chapter, this is taken as the most likely scenario concerning a definite discrepancy between the presence of rectangular anomalies, and absence of surface collection material in conditions of high visibility.

Also, because of the herding of large ungulates, this may have contributed to significant bioturbation of the stratigraphic layers, so there would not be a clear layered deposition from horizons of house construction and occupation. This scenario appears to correlate with the situation present in the surface collection of artifacts and the subsurface features identified through geophysical prospection. In consideration of this, both the Grivac and Kusovac settlements were divided in the last phase of the settlement for analysis with the area density index. This division includes a defined area of *high density* and an area of *low density* (Figures 6.7 and 6.8). Such division is a necessity, since there are clear patterns, both through surface collection and analysis of artifacts and subsurface geophysical prospection, showing that most settlement patterning and related activities were spatially bound and organized. Habitational zones that were used in the final stages of the settlements in the Late Neolithic are clearly visible in the distribution of surface finds and especially pottery (Chapter 5). However, other classes of material, such as chipped and ground stone, indicate that the entirety of the settlement area was used for the deposit of these artifacts.

To evaluate this ‘refuse’ in the context of an area density index then the entirety of the site areas must be used.

The surface collection strategy, as described in Chapter 5, employed 1 hectare unit supracells. This strategy was utilized especially for the possible presence of numerous dispersed households, small sites, and/or processing sites in between, and to approach measuring a population of artifacts within that 1 hectare. With the results showing the existence of large habitational sites it was possible to use every collection lot. These all had individually recorded positions and it was therefore possible to calculate density indexes according to the densities of artefacts, which showed clear spatial patterning.

Even more important, the exact positions of collected lots allowed for the evaluation of densities in areas where they showed much lower values. However, subsurface prospection indicated that the actual density of the dwellings was much larger then in later periods. Hence, calculations used the trimmed means of densities of artifacts over certain areas, delineated chronologically by the same period and multiplied by the area. The house floor area that was determined from geophysical prospection was then used as the factor for correction of the population of artifacts for determining the estimations of human demography.

As an example, if the population of artifacts in one 5 hectare area had a trimmed mean of 10 artifacts per square meter, with the chronological span of 5 centuries, and following the methods of evaluating a relative population of artifacts (Drennan et al. 2015:35-38), the formula for estimating demography would be as follows:

$$\frac{trM * A}{H}$$

Here, trM represents the trimmed mean, A is area, and H is time. After calculating this proxy for the density of population of artifacts, the calculations for the average number of people would be used to calculate the maximum number of population for the area in question. Thus, if the average floor area per person would be estimated at 5 square meters per person, then floor area would be calculated from the subsurface prospection at the site.

If the recorded floor area of all objects per one hectare was 1,000 square meters then the maximum number of estimated persons in those houses would be 1,000/5=250. This would mean that our maximum population of artifacts in one hectare of 10 artifacts per square meter per century would correspond to the peak maximum population of 250 people. Although, this does not influence the calculation in the area where there is both subsurface geophysical prospection and surface collection, it can be used as a proxy in areas where there is no geophysical prospection. This is especially important for the areas of the Kusovac settlement that were not recorded with geophysical prospection, but rather show high densities of surface artifacts. This is the case for the Starčevo area of the sites as well.

The section below provides the data for the calculation of the area estimates. Since the collection circles are 10 m^2, it was quite easy to come to the required density per 1 square meter by adjusting by one decimal place. The distribution of collection lots within the areas where densities were evaluated is provided for histograms for each site (below), which show the number of collection lots and frequencies of density per collection lot.

6.2 POPULATION LEVELS ESTIMATES

The number of sites in the Gruža River valley with Early Neolithic material is quite high (N=9). All locations had the presence of Early Neolithic pottery, and 4 additional sites had only flint present, but without any clear typological provenience. However, in reality, only three of these can be described as clear occupation sites since all of the other sites had surface areas of less than one tenth of a hectare (>100m²) with artifacts present. These sites show human activity, and hence, are included in the overall representation of the presence in the valley but they do not represent large enough occupation areas to be considered permanent sites. They were likely short duration camps that were seasonally or sporadically used in the Early Neolithic by Starčevo groups.

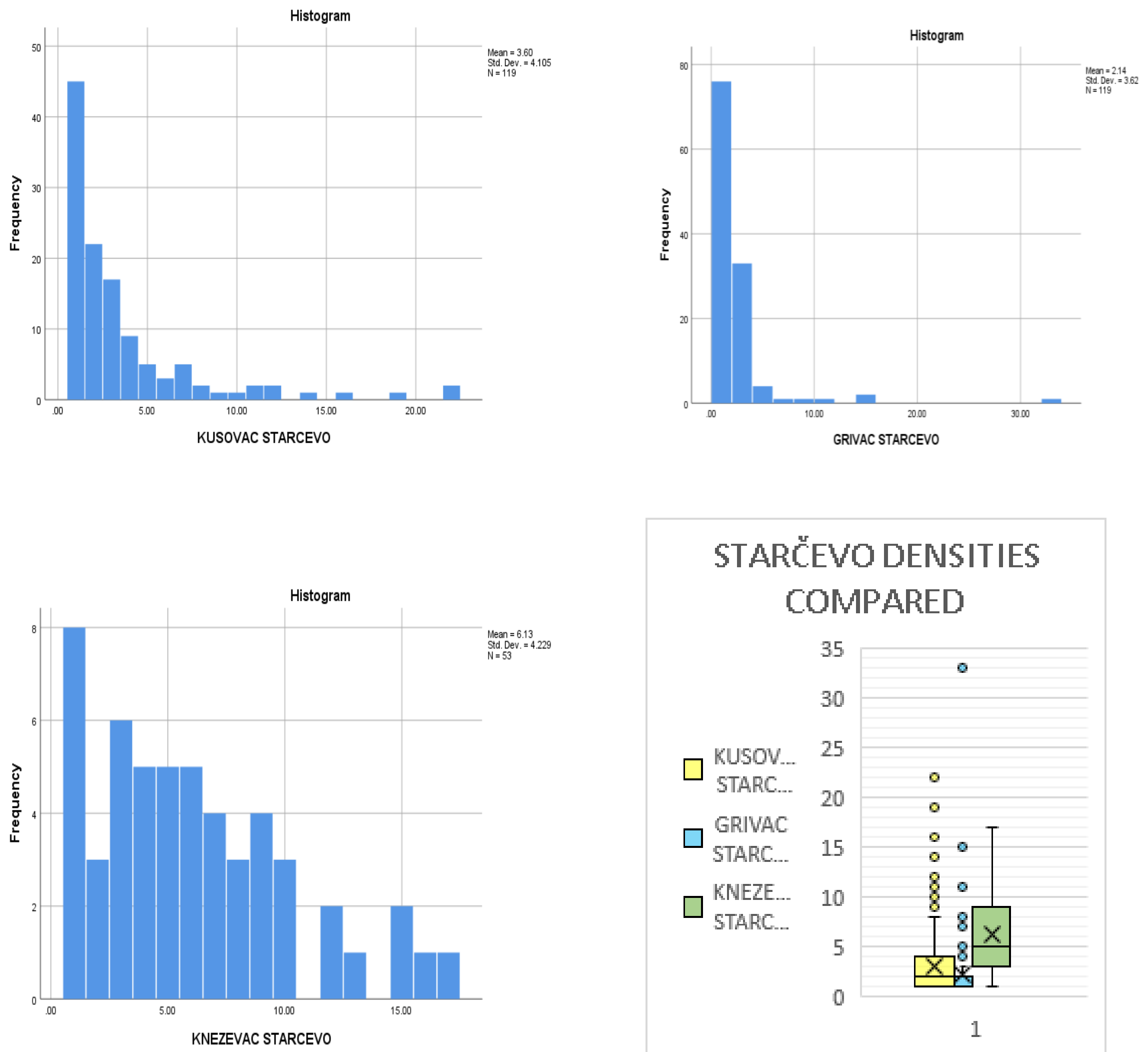

Figure 6.1 Upper left – Histogram showing the densities of Starčevo sherds per collection lots at Kusovac; Upper right – Histogram showing the densities of Starčevo sherds per collection lots at Grivac; Lower left - Histogram showing the densities of Starčevo sherds per collection lots at Kneževac; Lower right – Box and Whisker plot showing comparison of the densities between habitation sites. All histograms indicate number of lots on the X axis and sherd density on the Y axis. Box and whisker plots indicated a trimmed mean and median and whiskers represent upper and lower interquartiles. It is notable that the sample from Kneževac has the most normal distribution, because both Grivac and Kusovac are suffering from large numbers of high outliers. This is because the majority of the sample comes from the area that is on the edge of the habitation zone.

Comparisons of population estimates during the Starčevo period must be accepted with some caution, since the time span of the period is somewhat problematic due to the lack of radiocarbon dates for this particular region, as is the question of the habitation of specific sites in terms of duration of use.

While pit houses are well known and established for this period a significant question remains as to their temporal permanence and if they were all utilized as habitations. Therefore, for the Starčevo sites, the whole activity zone (spatial distribution of surface finds) is treated as one continuous area and thus used to calculate area density proxies.

Figure 6.2 Starčevo occupations at Kneževac. Area cover is 8.44 hectares. Kočić 2019

Figure 6.3 Starčevo occupation at Grivac. Area cover is 50.8 hectares. Kočić 2019.

Figure 6.4 Starčevo occupation at Kusovac. Area covers 47.8 hectares.

Table 6.1 Table showing the calculation for the area density index for the population of artifacts, with high and low estimations. High estimates are calculated by using the trimmed mean estimates from the site of Kneževac, where there is no subsequent occupation of the site. Low estimates are calculated from the densities actually noted on Kusovac and Grivac. Note the higher density at Kusovac because of the specialized flint production zone (Kočić 2019).

SITES	STARČEVO ~6300-5400*[7]			
	AREA	DENSITY (per m²)	INDEX	INDEX ÷ CENTURIES
GRIVAC High *estimated*	50.8	6.13	311.404	34.60
GRIVAC Low *estimated*	50.8	1.81	91.948	10.22
KUSOVAC High *estimated*	47.4	6.13	290.562	32.28
KUSOVAC Low *estimated*	47.4	4.79	227.046	25.23
KNEŽEVAC	8.44	6.13	51.7372	5.75
BARE SS	0.1	1	0.1	0.01
SLANA BARA	0.1	1	0.1	0.01
OPLANIĆ GROBLJIŠTE	0.1	1	0.1	0.01
TOPONICA SEVER	0.1	1	0.1	0.01
TOTAL			LOW EST	**41.24**
			HIGH ESTIMATED	**72.68**
			MEDIAN ESTIMATED	56.95

Starčevo occupation densities were calculated with two possible values for the two largest sites (Grivac and Kusovac), which is done because Vinča layers are obscuring Starčevo occupation over large areas of the site, making it hard to evaluate the pattern of Starčevo occupation. The pattern may be produced through palimpsest occupations (Bailey 2007) of groups coming to the site seasonally, thus covering the large area of 50 hectares, or it may be a case of an initial Starčevo occupation becoming sedentary and then expanding but with much smaller densities then those associated with Vinča period (covering more area with fewer people).

In both of these cases, there would be a decision at some stage to enclose the settlement with ditches, thus constricting movement of humans and animals. Currently, it is impossible to say

[7] Date range taken after the conventional spread for Starčevo culture after Bayesian modeling of available dates (Borić 2009), but quite possibly, dates might be even earlier, since Grivac is showing proto-Starčevo phasing.

whether this occurs in the late Starčevo, or Early Vinča, since it likely happens during the transitional phase when pit houses are no longer used and more permanent rectangular surface houses are constructed. This is why the density of sherds was used to represent these possibilities with both high and low estimates, which were then combined with the data from the number of pit houses from Kneževac.

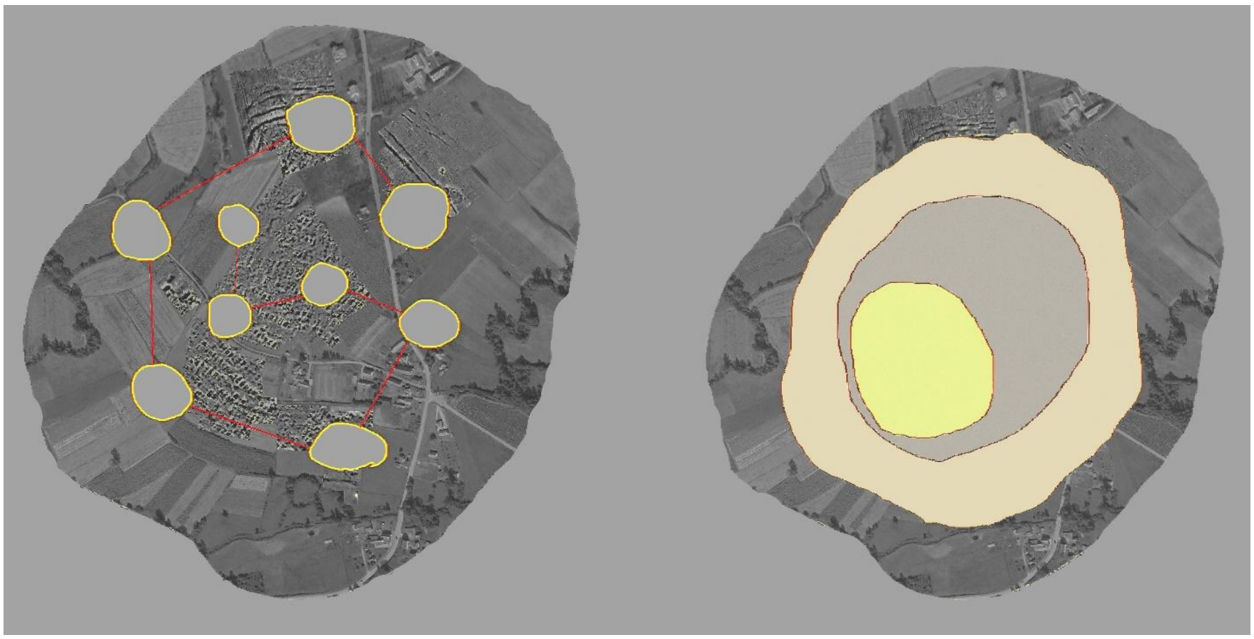

Figure 6.5 Possible models for Starčevo occupation at Grivac. Left - palimpsest model where mobile populations are resettling different zones of the same cleared area, which will with the growth of population delineate the area of the future enclosed zone; Right – permanent settlement with linear growth until the maximum of the artifact spatial distribution is reached, and then the actual living zone of the settlement is enclosed with ditches during the Early Vinča phase.

The density per m^2 that was used was taken from the site of Kneževac where there was no evidence for subsequent Vinča occupation levels. This was therefore used as an approximate density index for the 'high estimates' for Early Neolithic occupation of both Grivac and Kusovac where there was subsequent intense occupation during the Vinča phase. It is important to note, however, that the higher densities encountered at Kusovac for the Starčevo phase (mean 9.6 per

m^2) are actually higher than those encountered at Kneževac (mean 6.13 per m^2) and used for the 'high estimates' at Grivac and Kusovac. This was done because, in any case, the areas for Grivac and Kusovac with Starčevo occupation evidence are spatially large. Furthermore, due to the later Vinča occupation, it is difficult to evaluate how densely they were settled during the Starčevo phase. Geophysical prospection allowed for the evaluation of this model according to the presence of possible pit house features. Unlike the features from the Vinča period that have clear rectangular shapes, the pit houses of the Starčevo period are irregular. Previous excavations at Grivac have shown that the majority have diameters around 5m, making their average area around 25 square meters (Bogdanović 2004:30-34). The subsurface anomalies that are present at Kneževac fall very close to these dimensions and a median area of 25 m^2 was taken to represent these houses. It should be noted that exact dimensions are difficulty to provide because of the ephemeral nature of the features and because gradiometer data reflects variation in the earth's magnetic field and not precise feature limits.

Also, since these pit houses have a much smaller area size, with no developed pyrotechnological features (e.g. ovens, kilns, etc.) recorded, it is possible to conservatively estimate that one nuclear family of 4 people (2 parents, 2 child) occupied one pit house. In this case, the number of ~6 m^2 is taken to be the area estimate per person. This actually corresponds well with comparative data that has been published for agricultural villages (Caselberry 1974; Kolb et al. 1985).

These estimates are then used in the evaluation of two possible models, one of occupation being palimpsests of seasonal occupations, and the other being year round occupation (Figure 6.5). Although the density patterns do suggest that activities are located in only one area of the site at Kneževec, suggesting continuity during the Starčevo phase, there is still the possibility that this could be seasonal use, since the nature of the pit-houses is such that the depressions remain in the same location. In order to evaluate the figures for the low estimate of the palimpsest model, the area of the two larger sites (Kusovac and Grivac) was reduced five fold (Kusovac 47.4 ha ÷ 5 =9.48 ha; Grivac 50.8 ha ÷ 5 = 10.16 ha) bringing them very close to the range at Kneževac. In the following step, the total house area for the site of Kneževac (475 m^2) was then recalculated in area per hectare (56.28 m^2), which was used to calculate the possible house areas for Kusovac and Grivac. The results of these estimations are presented in Table 6.2. This resulted in an estimate of 1,000.28 people for the whole valley in the case of the 'high density' calculation, and 263.39 people in the 'low density' calculation, with an arithmetic mean of 632.10. This actually corresponds well to the estimates produced when data from the area density index (Table 6.1) was adjusted to the values calculated from the Vinča site dwelling estimates, which will be discussed further below.

Figure 6.6 Kneževac site geophysics with marked anomalies (in yellow) that were used for calculation of possible population. Fluxgate magnetometry overlaid on Google Earth satellite imagery (Kočić 2019).

Table 6.2 Calculations for the population estimates during the Starčevo period using house and site areas (Kočić 2019).

	Kneževac	Grivac	Kusovac	Gruža river valley
Area of Houses per site (max)	475	2859.00	2667.65	All year-round occupation
Area of Houses per site (min)	475	571.80	533.53	Palimpsest
Area of Houses per 1 hectare	56.28	56.28	56.28	
People max	79.17	476.50	444.61	1000.28
People min	79.17	95.30	88.92	263.39

The other significant question that had to be resolved concerning demographic estimates was the overall site phasing diachronically. Radiocarbon dates for Starčevo and Vinča in the broader Balkans region are somewhat more reliable now due to the application of Bayesian modeling of previously published dates (Borić 2009; Whittle et al. 2016). Nevertheless, there is still the question of how reliable they are at the local level where in many cases few if any dates are available. This is the reason that I used a somewhat wider date range for the Starčevo phase (6300-5400 cal BC), as this fits best with the date that is available for Grivac. One of the reasons for using a whole span of Starčevo culture in the Central Balkans, besides the unreliable dates from Grivac, which show very early dates, is that the typology indicates the presence of what Bogdanović calls Proto-Starčevo and this usually correlates to the earliest phases of Starčevo culture.

Bogdanović divides the Vinča culture occupation of Grivac into three periods., Following the recent modeling of the dates and pottery sequences (Whittle et al. 2016), which have indicated that there are two clear major phases, I have used an Early Vinča (5400-4700 cal BC) phase and a Late Vinča (4700-4400 cal BC) phase for interpreting the results of the regional pedestrian survey in the Gruža River valley. The choice of using the Late Vinča phasing of 4700 BC is an arbitrary one, since until a more detailed dating sequence can be produced, the exact date of that second distinct phase remains inconclusive. Recent studies (Whittle et al. 2016) indicate that the most common date for the second phase of Vinča sites falls around that period and this is why the date has been chosen. Future plans for research in the region include doing an AMS dating sequence, which will give more precise data on the phasing of the sites.

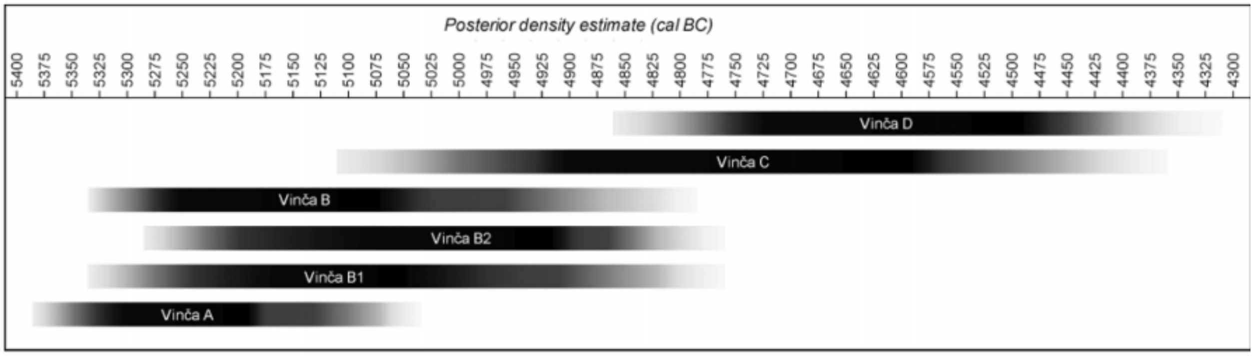

Figure 6.7 Vinča phasing modeled with Bayesian statistic of C14 dates (after Whittle et al. 2016:40).

These phases correspond well to the stratigraphy from both the Grivac and Kusovac settlements where, as discussed above in Chapters 3 and 5, there are two distinct Vinča phases present within the settlements.

Figure 6.8 Grivac High (red) and Low (blue) zones of artifacts. Red denotes the area of the high densities of artifacts, while blue denotes the zone of low densities of artifacts (Kočić 2019).

Figure 6.9 Kusovac High (red) and Low (blue) zones of artifacts. Red denotes the area of the high densities of artifacts, while blue marks the zone of low densities of artifacts (Kočić 2019).

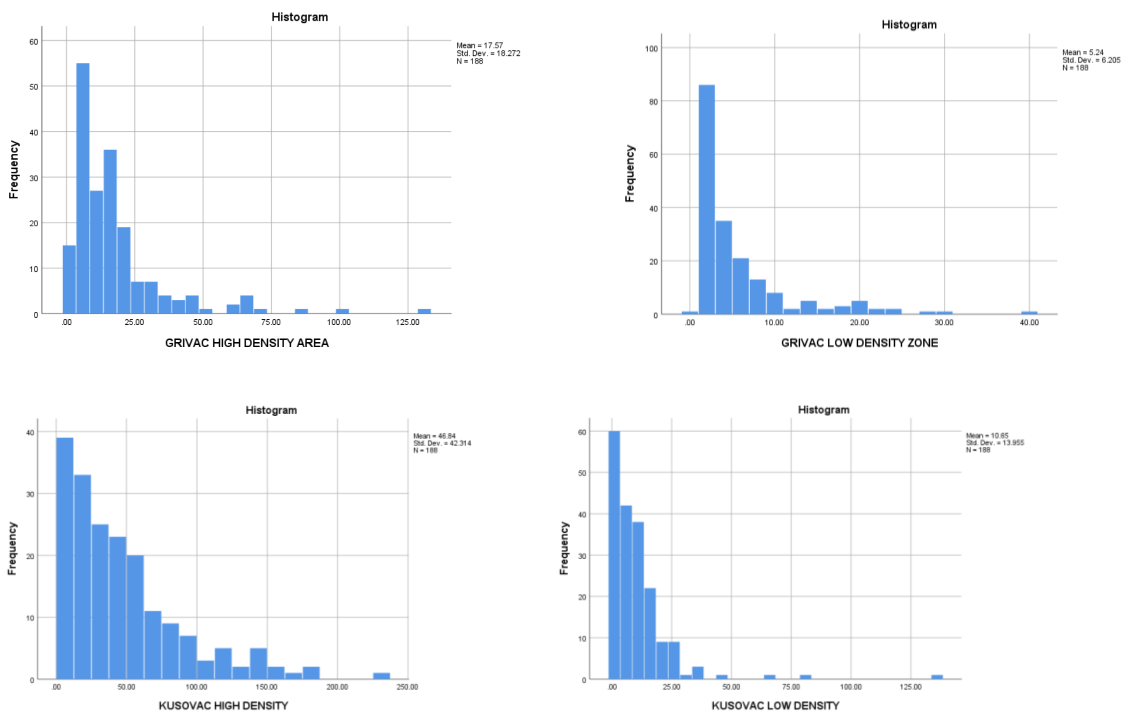

Figure 6.10 Upper left – Histogram showing the densities of Vinča sherds per collection lots within the Grivac High density zone; Upper right – Histogram showing the densities of Vinča sherds per collection lots within the Grivac High density zone; Lower left - Histogram showing the densities of Vinča sherds per collection lots within the Kusovac High density zone; Lower right – Histogram showing the densities of Vinča sherds per collection lots within Kusovac Low density zone. All histograms are showing the number of lots on the X axis, and sherd density on the Y axis. At both Kusovac and Grivac, there is a more normal distribution of artifacts in the High density zones, which is likely caused by the disturbed distribution in the Low density zones (Kočić 2019).

Regarding the Starčevo and Late Vinča phases, population estimates were calculated using both a combination of an artifact density index from the surface collection study and the floor space estimates based on the archaeological geophysics surveys and the use of cross-cultural studies relating to dwelling floor area per person calculations (Table 6.2).

Although there are a number of ways to approach the subject of population estimates according to dwelling floor size (Casselberry 1974; Kolb et al. 1985; Porčić 2010; 2012), for the purpose of estimates used in this dissertation, Narroll's study (1962) was used with average values of $10m^2$ per person. The choice of this estimation was made for several reasons. Although Porčić (2012: 80-86) has used the lower estimate of $6m^2$ per person for Vinča dwellings, there is a case to be made for using the larger $10m^2$ per person area. One important reason is the number of technical installations (kilns, oven, etc.) that have been recovered during the excavation of Vinča dwellings.

Excavations at the Divostin settlement, as shown in the plan of House 14 (Figure 6.10), have indicated that almost a quarter of the dwellings could be occupied by large pyro-technical features. This is not an isolated case, since most of the houses excavated at Divostin show similar arrangements (McPherron and Srejović 1988). A similar situation is present at the excavated houses within the Grivac settlement, where in House 5 a kiln with associated work platform was identified, and these features effectively divided the dwelling into two parts and occupied a substantial area of the floor space (Bogdanović 2004:173). Because of the common incorporation of such technical installations within the dwellings, combined with storage needs within the houses, the higher area estimate of $10m^2$ per person seems very logical.

One of the problems not addressed within this discussion is the question of whether there was a multi-level organization (two or more stories) of Vinča dwellings since there is now compelling evidence for such structures from excavations in the adjacent region of the Morava Valley (Perić 2016). However, published reports of earlier excavations at Grivac and Divostin did not mention archaeological evidence of this type of organization for the dwellings. Such a question is of tantamount importance, as multi-level dwellings could easily double the possible population of Vinča period settlements. This should be considered in settlement population estimates, especially for the Kusovac settlement, where geophysical surveys have indicated that the overall floor of the houses is significantly larger than at Grivac.

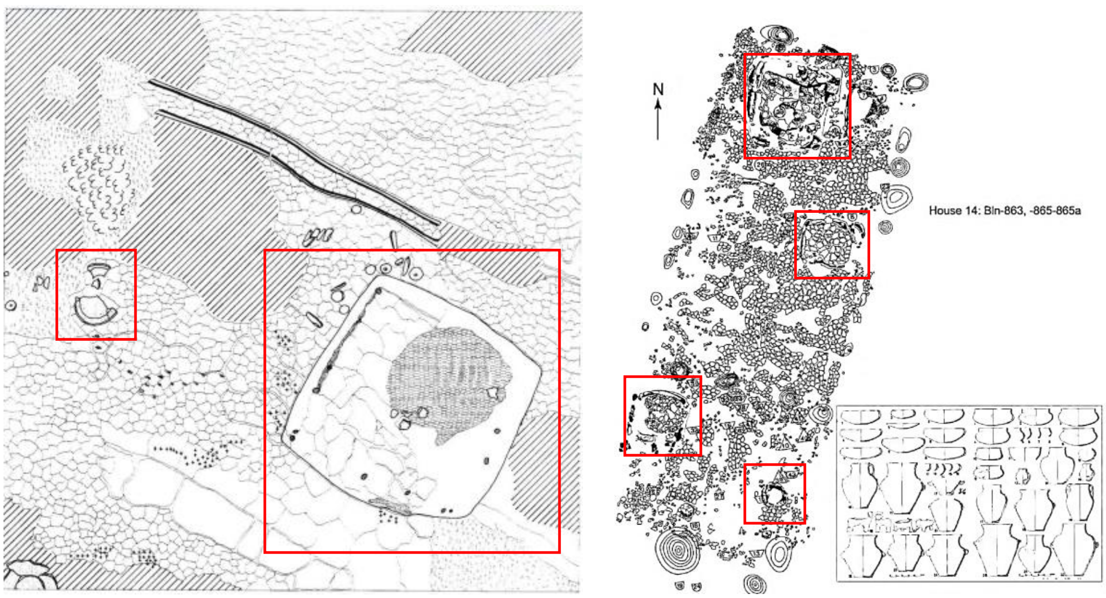

Figure 6.11. Left - House 5 from Grivac (after Bogdaović 2004:173); Right - House 14 from Divostin, (after McPherron and Srejovic 1988:80). Technological features are denoted by the red squares.

Another important question is the possible contemporaneous nature of the dwellings that have been identified through geophysical survey as large rectangular burned house floor features. Were all the house features occupied at relatively the same time or were they abandoned, burned, and another dwelling structure built next to them? Unfortunately, there is no easy answer to this question and further excavation and detailed radiocarbon dating would be needed to resolve the issue. A similar problem has been discussed for Linearbandkeramik settlements in Central Europe and excavation and high-resolution dating schemes, with use of C14 dates also for population estimates, have been employed in these cases with some success (*Müller 2013:206).*

Excavations at the Vinča Belo Brdo site have indicated that dwellings were very often rebuilt over earlier constructions with little to no relocation of the spatial placement of the structure (Whittle et al. 2016; Tasić 2010). However, Vinča Belo Brdo is a tell site where lateral spatial movement for construction was very limited and diachronic settlement phasing is indexed through vertical stratigraphic relationships. This situation contrasts strongly with the Grivac and Kusovac settlements, which have large open spaces where the succession of houses were distributed laterally thus making the differentiation of house phasing more challenging.

Therefore, I have made the choice in this dissertation to use a maximum estimation for the settlement populations in the Gruža River valley, where the maximum number of houses can be used as a baseline for any future study on settlement phasing and demographic estimations at these settlements.

Table 6.3Left – Calculations for area density index for the Late Vinča phase for which there is unambiguous evidence. Right – calculation of the floor area and the subsequent estimation of population of people. House floor areas were calculated according to the estimation of the House Areas from Chapter 5, where the average house floor area was recalculated per 1 hectare and then multiplied by the area within the enclosures. For the Early Period the maximum extent of the enclosed area, minus a 20 meter buffer zone, was used. For the Late Period, only the area of the high density of material, attributed to Late Vinča, was used (Kočić 2019).

SITES	LATE VINČA PHASE (4700-4400) cal BC			
	AREA	DENSITY (per m²)	INDEX	INDEX ÷ CENTURIES
GRIVAC HIGH	10	17.57	175.7	58.57
GRIVAC LOW	23.4	5.24	122.616	40.87
KUSOVAC HIGH	15.3	46.84	716.652	238.88
KUSOVAC LOW	14.7	10.64	156.408	52.14
TOTAL				390.46

SITES	EARLY VINČA PHASE (5400-4700) cal BC	
	AREA	Population
GRIVAC	26095	2609.5
KUSOVAC	30118	3011.8
TOTAL		5621.3

SITES	LATE VINČA PHASE (4700-4400) cal BC	
	AREA	Population
GRIVAC	15350	1535
KUSOVAC	20535	2053.5
TOTAL		3588.5

An estimation was produced by using the Late Vinča stage sample, which allowed me to compare the population of artifacts and estimated population of the houses. The mean for the house area for the late stage was taken as a representative for the valley population, which was perceived as a 100% of the sample. This was then compared with 100% of the area density index maximum population for a one century period. This was used to calculate an overall estimate of possible population by considering the maximum spread of dwelling use at the settlements of Grivac and Kusovac, since there were no other Vinča settlements identified in my regional pedestrian survey.

Table 6.4 Theoretical and practical approaches to house area/population relationship (after Porčić 2010, 88).

Analysis	Level of area analysis	Level of population analysis	Conclusions	Parameters
Naroll 1962	Total area under roof in settlement	Total number of humans in settlement	Population and area relationship is allometric . Average area per person is $10m^2$	Settlement type, social relationship
Casselberry 1974	Individual households	Number of people per household	Linear relationship between people and area. Average area per person $6m^2$	Settlement type, social relationship
Kolb 1985	Individual households	Number of people per household	Average area for Mesoamerican cultures is $6.12m^2$ per person	Settlement type, social relationship

These estimates (Tables 6.3) were used to calculate an annual rate of change. The annual rate of population change was calculated using two standard rates of change equations, both of which are for linear growth. One formula was log based, and the other used was a more simplified model of percentiles, which does produce a higher error range but still can be useful as an exploratory method. Although the log-based estimations for Middle to Late Neolithic population growth are quite high for this period of European prehistory, relatively speaking, the second equation may be better suited for estimating lower population levels, since the log equation is used mostly in modeling modern population levels of cities and states.

In principle, the formulas produce an annual rate of change – **r**, using a calculation that requires an end population input – **Pn,** and start population input **– Pt,** and number of years in which to estimate demographic change **-n**.

$$r = \left(\frac{\log\left(\frac{Pn}{Pt}\right)}{n * log0} * 100 \right) \qquad r = \left(\frac{2(Pn-Pt)}{n(Pn+Pt)} \right) * 100$$

In the first case, the population estimates for Starčevo were calculated by using a combination of the population evaluated for the Late Vinča phase, divided with the area density index, in order to get the multiplier number for the Starčevo area density index. This produced an evaluated value of 662 people for the valley. This was used to calculate the population change, and the annual rate of change for population starting from the Early Neolithic (6300-5500 BC) to the Early Vinča (5400-4700 BC). This change is calculated to be 0.04% per year using the 'Low Population' estimate and 0.17% per year for the 'High Population' estimate.

When the Starčevo 'palimpsest model' estimations were calculated the rate of change was found to be 0.19%. For the 'sedentary growth model' occupation in the Starčevo period the the rate of change was calculated at 0.14% annually. Even if we consider that only half of the houses were occupied during the Early Vinča period at any given moment, and if we thus reduce the population by 50%, the percentiles change only by 0.02-0.04% because of the Early Neolithic duration of 900 years. This range falls within some recent models that have been proposed for both early agriculturalist and hunter-gatherer societies (Bettinger 2016:812-814).

Even when compared to the large demographic data available for the period between the 8th to 4th millennia for the Middle East, where the annual population estimate growth is around 0.1%-0.4% (Carneiro and Hilse 1966), the high density estimation for the Gruža valley seems to be quite comparable for the Middle Eastern agriculturalist communities.

If one uses the lowest estimation for Starčevo demography, the growth rate changes by 0.03%-0.08% per year. This result is not surprising, since it indicates a positive linear progression and not a rapid population expansion. What is surprising is the annual rate of change between the Early and Late Vinča phases, where the result indicates a decline at a percentage of 1.28%. This does not change the case of the 'Low Estimate' since the population is 50% of the High Estimates' in both cases and the ratio of change between them do not change. This points to a sharp and perhaps 'catastrophic' demographic process, which may have been irreversible, ultimately resulting in the complete collapse of the viable population in the Neolithic in the region.

When we compare such a pattern to the modern Balkans, where one extreme population negative growth rate has been noted for Bulgaria with a -0.61% decline (2017 estimates, source CIA Factbook), it becomes clearer how drastic a -1.28% decline may have been in the Neolithic.

Population levels in the Gruža River valley do not seem to rebound until the Bronze Age. Even then, when area density indexes are calculated, the demographic estimates are not close to the population present in the region during the Neolithic period. It is clear that the valley was no longer used in the same way or as intensively. There is a significant gap in population as well between the Roman conquest and the XIX century, since there were virtually no material finds recovered during pedestrian survey for these periods. The first visible shift in the valley in terms of settlement patterns and demography is with the onset of the modern age of Serbia.

Similar demographic trends seem to be occurring across Europe during the initial stages of the Neolithic where after an initial population growth there appears to be a sudden fall off of regional populations (Müller 2013:206; Shennan et al 2013; Palmisano et al. 2017). Although this is very noticeable in Southeastern Europe as an aggregate, and somewhat less severe in Central Europe and Scandinavia (Figure 6.13), the depopulation that appears to be present in the Gruža valley might be even more severe than these other regions of Europe noted above. Although, it must be noted that the data for these evaluations came almost exclusively form C14 dates as population proxies so this produces a question of how accurate the chronologies are regionally.

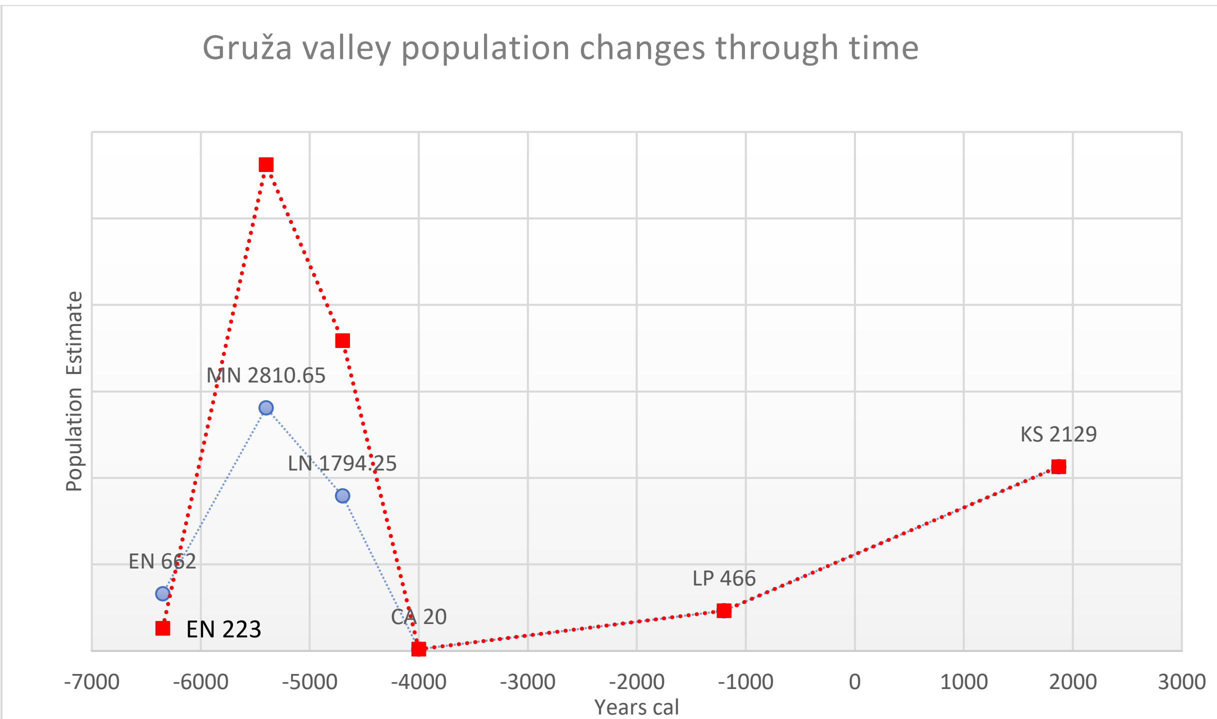

Figure 6.12. Population changes in the Gruža River valley from the Early Neolithic up to the late 19th century: EN – Starčevo, MN – Early Vinča Period, LN – Late Vinča Period, CA – Eneolithic, LP – Bronze and Iron Ages, KS – Kingdom of Serbia 1887. Red trend line represents lower estimate and blue trend line represents higher estimates.

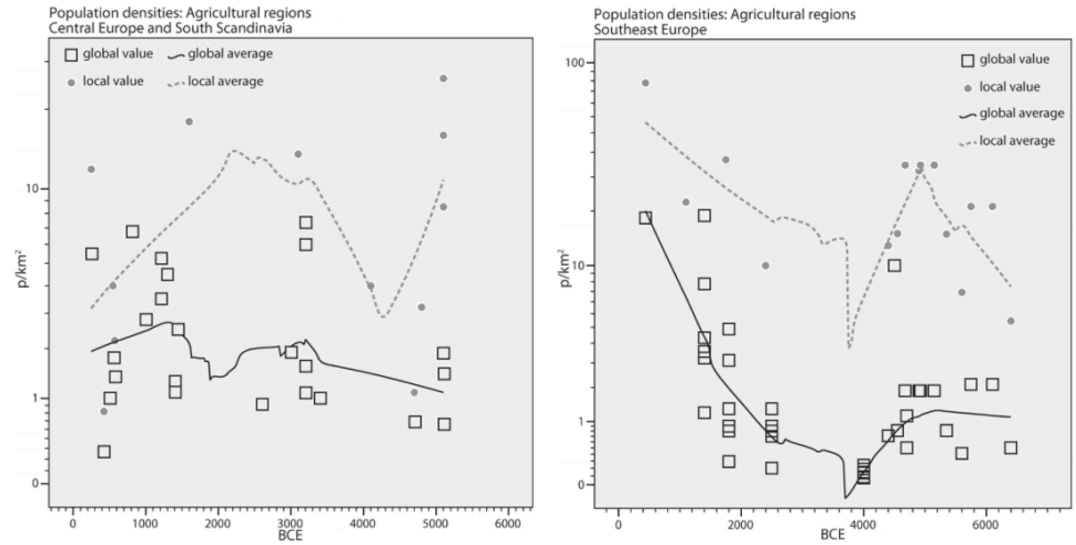

Figure 6.13. Left – population estimates for Central Europe and Scandinavia; Right -population estimates for Southeast Europe. In both graphics axis runs right to left with BCE being on the right and AD on the left (after Müller 2013:206).

The dramatic demographic change during the Vinča period is not easily explainable, based on current archaeological evidence. One cannot dismiss the possibility of spiraling warfare and violence as possible driving mechanisms, as a number of authors have noted such effects on social complexity (Carneiro 1970) and also demographic patterns (Chagnon 1988; Blick 1988; Arkush et al. 2005). Other explanations could include health epidemics and/or chronic and reoccurring contagion events that have been identified when humans and animals live in close proximity to each other (Mira et al. 2006; Rassmusen et al 2015). One might event expect that with a widespread epidemic event an even sharper decline in population could be expected (Shennan et al. 2013). A seemingly perplexing pattern visible for the later prehistory of the region is discussed in Chapter 7. In this case, the role of the Rudnik mountain and its mineral exploitation was the most likely culprit for demographic shift and use of the valley.

Conceptual, and more important factual, issues concerning these changes is the complete lack of precise dates for the *Gruža River valley* especially for the Starčevo and Early Neolithic periods. One of the things that is visible is that predictors of annual population change do not fluctuate, whether the starting population estimate is 200 or 1000, and this is simply because the time span is enormous and covers almost a thousand years for the Early Neolithic. If we compare this to any other period we can see whole empires rise, depopulate and then rise again, as in the case of the IV century AD plague, and loss of, by some estimates, more then 40% of the population of the Roman Empire (Harper 2017). Followed by the rebound, fall of Rome, subsequent succession of nomadic khaganates, the early Frankish Empires, and finally rise of Medieval states.

Nevertheless, the population 'catastrophe' that has been estimated for the Late Neolithic is not easily explainable with current archaeological evidence. One of the big conceptual problems in explaining such a development is that it does not seem to be a a local occurrence. A similar pattern is visible from the Balkans to the British Isles. However, what makes this hard to explain is the diachronic nature of it, since it appears in all regions after the adoption of the Neolithic but adoption dates are very different from region to region (Shennan et al 2013:4). Also, there is a difference in the overall severity of the declines. While it seems devastating in Southeastern Europe, it seems much milder as the spread of Neolithic moves into northern Europe (Müller 2013). As discussed above, there are different possibilities, but most of them point to an increasing risk of pathogens with humans and animals living in proximity and other variable that may have stimulated inter-community conflict.

The question remains as to whether there was a clear and steady progression of population or a steady decline. There is the possibility of much different patterns or cycles of slow gradual increase with a sudden change in social organization. For example, as discussed above, this may correspond to the formation of the early non-enclosed Starčevo settlements and then a phase where these ceased to exist and the new form of bounded, enclosed settlements emerged representing a completely new way of life and a new social order for regional communities. This represented a new phase where small sites ceased to exist and the only community that mattered was the large enclosed villages themselves. The same may be true for the pattern of warfare and instability, where cycles of these behaviors (Hanks 2008, Robb 2002, 1997) can cause extreme events that rapidly and fundamentally change the regional social fabric. These outstanding issues and related questions are perhaps some of the most important in terms of the direction for future field research and refinement of our understanding of related population changes. In effect, utilizing a fine point brush to enhance greater detail on what are now broad brush strokes of understanding for Neolithic trends in the Gruža River valley.

CHAPTER 7: RESOURCE EXPLOITATION IN THE VALLEY

7.1 INTRODUCTION

The resource requirements for any human community remain one of the most important and consistent variables in modeling social change within early human societies. However, debates exist over what represents the minimal, maximal and optimal levels for such resources. When considering the Neolithic period in Serbia, there is little data available for understanding resource use among Vinča communities and the actual pattern of subsistence. For example, widespread variation exists in the data for wild taxa representation within faunal records, ranging from 75% of the total remains recovered at Biserna Obala to less than 3% at Anzabegovo (Orton 2012). Of course, one of the important questions in this case is whether these percentages reflect an actual pattern of subsistence or are a record of groups that have similar life ways but very different environmental constraints and associated subsistence patterns.

There is clear evidence for the use of domesticated plant agriculture within the Vinča region since macrofaunal remains of various cereals have been recovered at most of the excavated Neolithic sites. The bigger question is the overall scale of production and its contribution to the subsistence needs of these early communities. Such questions are of fundamental importance to the density of occupation of Neolithic settlements and the growth and maintenance of settlement patterning and their populations.

While there is some difference in the proposed average catchment zone for Vinča sites, mostly due to a chronic lack of means to perform population estimates, most authors agree that the wider catchment zone is around 5 km and the smaller more intensively used catchment zone around 2 km. The smaller inner zone is generally recognized as being capable of supporting around 1,500-2,000 people (Chapman 1981; Bankhoff and Greenfield 1984). The evaluation of the availability and patterns of use of these possible catchment resources will be discussed below where they are used to evaluate models of social organization proposed for the Vinča development.

7.2 SUBSISTENCE RESOURCES

For the purposes of this evaluation, both animals and edible plants will be considered here as one group while timber and minerals will be considered on their own since these two groups represent very different conceptual items in terms of food (subsistence) and technology (raw material resources). Faunal records from the site of Divostin I show that in early stages of occupation connected with the Starčevo layers (Early Neolithic ~6300-5400 BC) domestic pig (40.9%) and cattle (46.5%) represent two of the main subsistence species for the region with somewhat high levels of additional wild species (8%) (*Bokonyi* 1988; Orton 2012:15).

An interesting alternative view has been proposed through lipid analysis of pottery vessel walls. Samples were collected for the Early Neolithic from the sites of Divostin I, Grivac and Blagotin). At Grivac, evidence indicated that 50% of the sherds analyzed indicated the use of ruminant dairy fats and 50% from ruminant adipose fats (Ethier et al. 2017:8).

Zooarchaeological studies of faunal remains recovered from Vinča settlements have been important in establishing subsistence patterns. Recovery of small taxa has likely been influenced by the lack of systematic use of soil sieving during excavation. Middle and Late Neolithic phases (5400-4600 BC) at Divostin see an increase in the percentage of cattle (Table 7.1; Figure 7.1) whereby it becomes the predominant species (62.7%), representation of domestic pig declines (10.1%), with some increase in sheep (11.4%), and also wild taxa (15%) (Orton 2012:12).

Table 7.1 Comparative table of representation of animal species; Upper part of the table shows the percentages and NISP for Starčevo sites (sites noted with star are in Northern Serbia, since there is lack of Starčevo sites in Central Serbia with zooarchaeological analysis); Lower part of the table shows Vinča period sites from Central Serbia and percentages and NISP of animal species represented (Data taken from Orton 2012: Table 1, pages 10-12).

	NISP	% Cattle	% Pig	% Caprines	% Dog	% Red deer	% Roe deer	% Auroch	% Wild pig	% Other	% Wild
	EARLY NEOLITHIC										
Divostin I	2400	46.5	40.9	3.5	0.7	1.9	0.5	4.2	1.3	0.5	8.417
Nosa-Biserna Obala*	911	10.4	2	12.6	0.1	10.4	12.6	14.3	8.2	29.3	74.9
Starcevo*	1448	49.5	3.5	20.2	0.5	9.7	0.7	3.7	11.2	1	26.24
	VINČA PERIOD										
Belovode	1046	42	25.9	25	5.9	NA	1.2				1.2
Divostin II	10,785	62.7	10.1	11.4	0.9	3.9	0.4	5.8	4.6	0.3	15
Crkvine-Mali Borak	1871	86.9	3.2	2.3	N/A	6	0.1	0.7	0.8	0.1	7.7
Drenovac	123	30.1	10	27.6	N/A	18.7	4.9	4.1	1.6	N/A	29.3
Selevac	7442	38	26.5	20.7	N/A	11.1	3.8	N/A	N/A	N/A	N/A
Žarkovo	249	41.8	18.1	3.2	0.8	30.1	4.4	0.4	0	1.2	36.1

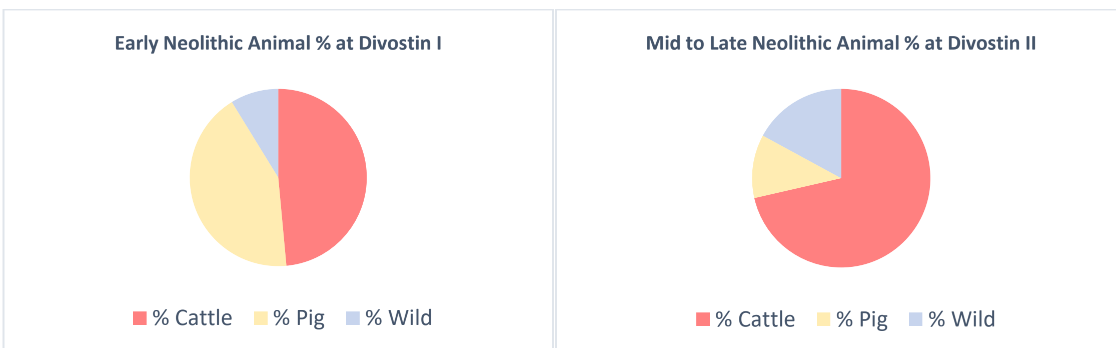

Figure 7.1 Left – representation of the percentages of cattle, pig and wild taxa represented and Divostin I Starčevo period layers; Right – representation of the percentages of cattle, pig and wild taxa represented and Divostin II Vinča period layers (Kočić 2019).

Combining the evidence from the broader region, the Vinča development makes a clear shift toward cattle herding (Orton 2010; 2012). However, in contrast to the Greek Neolithic, where hunting completely disappears from practice (Perles 1991), it remains a significant part of the Neolithic subsistence pattern in the Central Balkans. Alasdair Whittle has proposed that large scale cattle herding created a shift from "moving on to moving around" (Whittle 1997), where instead of the relocation of settlements part of the population of both humans and animals remained mobile. When palynological records from the region are considered they appear to support this model of an increase in cattle pastoralism.

Palynological research at the Gomolava settlement has indicated that land clearance around the settlement was very limited (van Zeist 2002:112). This raises an interesting question about the role and scale of domesticated cereal production among Starčevo and the later more specialized cattle herding populations of Vinča communities.

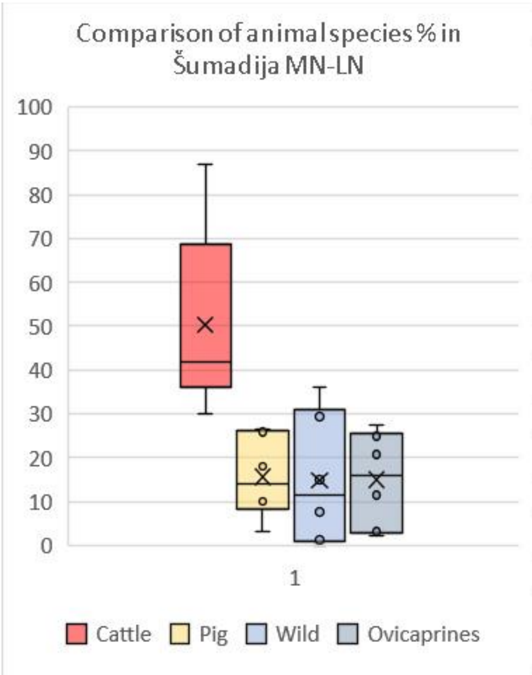

Figure 7.2. Box and whisker plot of the animal species comparison from Vinča period sites from Central Serbia. X axis represent percentages (0-100%). Boxes represent median and means for percentages from these sites, while whiskers show uppermost and lowermost interquartile values. Data from Table 7.1.

The site catchment and carrying capacity calculations noted above were done by considering the role of cereal agriculture as the primary subsistence strategy. One of the problems is that there have been a number of suggestions that the heavy soils of the region, such as *chernozem* and *smonitza*, are simply impossible to work without an ard or a plow (Barker 1975; Chapman 1981). However, others have argued that if cereal agriculture was smaller in scale, and comprised of horticulture and a system of small plots adjacent to the settlement, then simple hoes or digging sticks could suffice (Filipović et al. 2017; Kreuz and Schafer 2011).

But this is posing the question of what is a sufficient carrying capacity for herders and, unfortunately, that is almost impossible to answer until the nature of such herding, and data for size of the herds, is better studied.

One of the proposed strategies is transhumance and there seems to be evidence for such strategies of cattle herding with both evidence for long distance (Benac 1971) and short distance transhumance (Chapman 1981; Orton 2009). The additional importance of cattle herding, and especially transhumance, is that it requires specialized skills for animal tending and also an intimate knowledge of the landscape. Transhumant mobility could offer a possible explanation for the intrinsically valuable items, especially some that don't have local sources, such as obsidian and *spondylus* shell, and that appear at Vinča sites with the patterns observed being similar to point to point direct trade (Chapman 1981). In this way, luxury items could be obtained and moved by the part of the population that is stewarding the cattle herds. If this is model is considered then cattle herding may not have utilized a simple circular catchment zone around the settlements. Instead, it may have moved along the riparian river zones and also from lowland to upland areas through transhumant regional scale migration. Such mobility patterns related to cattle herding should be reconsidered in future research for the region.

7.3 MINERAL RESOURCES

In models of social change for Vinča communities it has been speculated that one such important area to consider is specialization in the production of mineral based, non-subsistence materials, such as lithics and pottery (Kaiser and Voytek 1983:342-345). This has been seen as one such response to population growth and sedentism. This idea has been further developed by Tringham who argues that this specialization promoted a further increase in craft production at the household level resulting in the overall fragmentation and fissioning of Neolithic settlements and their communities. In support of these ideas, Tringham has drawn on the evidence recovered from the Opovo settlement (Tringham et al. 1985:427; Tringham and Krstić 1990; Thringham 1991).

In the case of the Gruža valley, or the piedmont area of Eastern Serbia (Borić et al. 2018), there seems to be a complete reversal of this socio-economic pattern. There is no fissioning of settlements and there are only processes of centralization present where both greater numbers of settlements are present in the earlier period. As was discussed in Chapter 5, specialized production of a knapped stone industry was already present during the Starčevo period on the site of Kusovac and at the settlements of Kusovac and Grivac. In these cases, the only process that is visible in the valley is a reduction in settlement size and possibly in the utilization of the valley.

The amount of flint tools recovered during the pedestrian survey, with cortexes that revealed they were quarried/mined and not collected from erosional environments, indicates a labor intensive process connected with the acquisition of flint. There are two locations in the immediate vicinity of the site of Kusovac that both have similar sedimentary layers with chert lenses present (Figure 7.3). One is the hill of Dragušica, which is named after the village that it is located on. The other is a smaller hill to the South-East, which is named Kamenjak (Stony hill) and is a common toponym for ancient/active quarries. Unfortunately, this hill is an island now within the artificial lake created for a regional drinking water reservoir and special permits are needed to visit it.

Figure 7.3 Google Earth Satellite imagery showing polygons (in yellow) with noted zones with flint deposits. Polygon to the North marks Dragušica hill, and polygon to the south marks Kamenjak hill, now an island in the artificial lake. Site of Kusovac marked with red square. Kočić 2019.

Pottery, on the other hand, is in definite abundance at the Neolithic sites. One could argue that there was an almost hyper-production of pottery during the Middle to Late Neolithic in comparison with other periods. However, one factor has to be taken into account and that is the pedology of the site areas themselves. As discussed in Chapter 3, most of the gentle slopes and hilltops in the Gruža River valley are comprised of cambisols (*gajnjače),* and the sites themselves of vertisols (*smonice).* These are extremely high in clay content reaching near 70%.

In a number of casual experiments performed with just few plates of top soil collected from both sites, and utilizing a wood furnace, in six instances it was possible to produce black reduction baked pottery and there were no issues in achieving a high polish. Inorganic inclusions that were present in the clays looked very similar, if not the same, as those present in the Neolithic pot sherds recovered from the site. Unfortunately, there were no conditions for a controlled experiment, selection of organic tempers, and proper macroscopic and microscopic analysis of the plates, so it is planned that these initial experiments will be repeated with a more controlled environment in the very near future. Nevertheless, these limited experiments indicated that the local soil itself completely reduces without generating any limitation on pottery production.

Another testament to this came from interviews with locals I spoke with from Grivac. Most of the older houses in the village of Grivac are made of brick that was produced *in situ* from just using the top soil and baking it in piles. Effectively, with soil taken almost from directly 'under foot', and dung taken from herded livestock, there is very little need to obtain clay from other sources and the only real limitations for pottery production are fuel and labor.

The technological advancement connected to Vinča culture that has attracted the most attention in recent years is extractive copper metallurgy (Vasić 1936; Jovanović 1982; Šljivar and Jacanović 1996; Šljivar 2002; Borić 2009; Radivojević et al 2010; Radivojević 2012). While there is no doubt that the Vinča period has produced some of the earliest evidence for extractive metallurgy in Europe, and that it perhaps even rivals early dates for the Near East, there is a definite outstanding question regarding the scale and organization of such production.

Important copper objects associated with the Vinca period are the copper bracelets recovered during excavations at Divostin and Gomolava, (McPherron and Srejović 1988; Borić 1996). The largest hoard of metal objects found to date, represented by 18 large copper tools, was found at the site of Pločnik. This assemblage represents the most significant percentage of objects found believed to be connected to the Vinča period. However, based on the context of the finds, there have been debates as to whether these are in fact connected with the Vinča period or are from a subsequent period (Pernicka et al. 1993). In any case, what is becoming more obvious is that while present metallurgy may have played a very limited and highly symbolic component of the Vinča culture.

Some authors (Šljivar 2002; Radivojević et al 2010; Heyd and Walker 2015: 674-678) have correctly emphasized that such production would have required specialized knowledge. However, the outstanding question is if there was a need for full time specialists or whether this can be connected with individual household production. A considerable literature has been produced relating to such questions and the role of metallurgy within early societies (Shimada 2007; White and Piggot 1996:151).

With regard to Vinča metallurgy, the doctoral dissertation pedestrian survey did not identify any malachite, copper, ore, or any other intrinsically valuable metal objects attributed to the Vinča period. Considering the fact that there has been a definite confirmed presence of copper objects at the site of Divostin, and that the Rudnik massif is metallogenetic including copper deposits, it seems logical that if there was widespread regional metal production that it would be reasonable to find more artifacts relating to metal production.

For this question, the speed of adoption of new technologies has to be taken into account. Equifinality is of importance since there are a number of ways that the adoption of a new technological practice can begin (Robb and Miracle 2007: 109). Innovation does not always guarantee acceptance and optimization. There is widespread evidence for exactly the contrary being true in which there is a certain buffer period where a new technology passes through a very selective and reductive stage where the formalization of practices takes place and creates a postponed effect of technology adoption (Roberts et al 2015). In no way is a new technology guaranteed success, since just as easily as it becomes accepted and practice it can go into decline and be forgotten (Hollenback and Schiffer 2010:7).

Figure 7.4 Illustration from De Re Metallica Book 2, Georgius Agricola, Erzsucher - The Prospectors. The image shows various techniques used for mining and prospection during the XVI century, such as test pitting, recognition of areas of flora impacted with metals, and dowsing (Reproduced from Agricola 1556, Book II, page 1).

Technological development and use in the Gruža valley is a testament to this. Medieval entrepreneur Georg Bauer, better known under the name Georgious Agricola, is considered the father of mineralogy. In his seminal work, *De Re Metallica*, published in 1556, he describes metallurgical choices in the pre-industrial period. Here he describes the ways in which German medieval miners would identify and approach mining and search for prominent points where metallogenetic layers could be located. However, just as important in this process was the shape of the valley and the availability of wood and water. He argues that if a valley is deep and flat with mountain rivers and strong flooding activities this should be avoided. The ideal valleys for mineral exploitation are ones having gentle slopes and enough timber and strong rivers with a year-round water supply.

This is nearly a perfect description of the Gruža River valley. Yet, when metals are exploited extensively there a complexity shift in how the valley is utilized begins to occur. During later prehistory, there is still occupation of the valley but it is reflected through much smaller population numbers and dispersed settlement that followed the bottom of the river valley. As soon as a large scale mining industry occurred, the overall social and economic system of the valley changed. This is most likely due to the simple reason that once ore is being mined in large quantities the cost of transportation of the additional 15 km from Rudnik outweighed the benefits of the Gruža River valley and the population simply migrated to the Rudnik mountain area. This process is seen through the archaeology of Roman settlements in the region and the continuous settlement ocupation there through the Early and Late Medieval period, during Ottoman rule, and up to the modern age. What changed in the modern age of Serbia was that mining at Rudnik was reduced, since new and richer mines were discovered, and the centralization of both people and human populations once again shifted into these new mineral rich zones.

7.4 TIMBER RESOURCES

The damp Atlantic phase of the 6th and 5th millennia during the Holocene Climatic Optimum (Davies et al 2003:1711-1713), meant that the predominant timber stands present in the Balkans were most probably Beech trees (*Fagus* family), with *F. moesiaca* and *F. sylvatica* being the two most prominent species (Stojanović 2005). Archaeological evidence from Vinča Belo Brdo and the Danube River Iron Gates region show a predominance of Oak (*Quercus*) and Ash (*Fraxinus*) (Filipović et al 2017; Srejović et al 1968). However, both Lepenski Vir and Vinča Belo Brdo are situated along the Danube River, where Ash and Oak would have had a more suitable environment and the Fagus species was better suited to the higher altitudes of the Šumadija plateau.

Beech provides an excellent source of firewood, with a high caloric value of 2,800 KWh per $1m^3$ (Glavonjić 2011). Also, beech has excellent splitting properties, which makes it a perfect choice for building material. In the experimental work that I directed in the recreation of a Lepenski Vir culture house, I found that beech was an ideal timber for plank production since it was possible to split it with the use of one stone adze and wooden pins (Kočić 2010). Interestingly, it is exactly such rectangular planks that are used for both the sub-structure of the houses at Grivac (Bogdanović 2004:197) and in the daub pieces recovered from the pedestrian survey at Kusovac, which revealed only rectangular imprints.

Beech and Oak are, of course, excellent wood for furniture, known for strength and durability, and also for tool handles. It is no small wonder that in all Indo-European religions Oak and Beech have magical properties and that the heads of pantheons, such as Odin, Zeus and Dažbog, all have exactly Oak and Beech as their sacred/votive tree. This was a custom kept among the South Slavs up to modern times where churches were often replaced by oak and beech (Čajkanović and Đurić 1985).[8]

The Vinča ground stone industry is most represented by the recovery of stone adzes, both from the dissertation pedestrian survey and from previous excavations (Antonović 2004: 453-455). This suggests that this tool was very widespread and very well developed for woodworking. This important fact, combined with the spatial distribution of the ground stone industry densities at Grivac being associated with the enclosure ditches (Chapter 5), suggests that these may have been important locations for storage and work zones for timber processing. While beech is very easy to work while wet and lush in the spring once it dries out it becomes much more labor intensive (Kočić 2010). This suggests that the optimal seasonality of activities concerned with labor and movement in the forests may have been in the spring.

An additional benefit in the spring is that young beech leaves are edible. Also, at both the Vinča Belo Brdo, and Gomolava settlements, the presence of berries and wild fruit has been recorded from excavations. One of the theories that has been advanced is that in close proximity to the large settlement sites the forest had been thinned out in order to stimulate the growth of lower fruit bearing plants (Filipović et al 2017).

When all of these patterns are observed as a model there are some discrepancies visible. In terms of economic activities, it appears that there were requirements that nurtured long distance movement (herding and raw material exploitation) and those that were focused more on the

[8] It is worth noting that the Germanic words for *book/buch/bÓk* and the Slavic word for the letter *буква* all mean beech tree.

localized hinterlands around the settlements themselves. This pattern would have played a significant role in the social and economic organization of Vinča communities.

One more interesting and noteworthy question is that relating to the use of projectiles. The evidence of flint arrowheads is very slim for almost the entire region occupied by the Vinča culture. The exception a few stone points recovered from Selevac (Voytek 1990) that oddly showed no use wear as would be expected for projectiles (Chapman 1999:112). What is present, though, are large numbers of fired clay balls that have been interpreted as slingshot munitions. These have been found in large caches up to 300 pieces in interpreted as being stored for village defense (Vasić 1902; Chapman 1981:65-66). During my survey and surface collection, our teams found few fragments that could be related to these artifacts, however, since they are fragmentary it is very difficult to say with any degree of certainty (they could as easily be parts of loom weights) . This would make the cleared zones around the enclosed settlements perfect in terms of providing a high visibility space. This also would imply that, in addition to enclosed spaces, there was a constant fear present that required the presence of defensive caches for protection against raiding. One activity that seems to be at odds with the lack of projectiles is hunting, which one would assume would have been an important activity at all the settlements during this time period, as was discussed previously above. There might be several reasons for this. One, considering that garden plot hunting may have been the most probable and productive this likely included the use of nets and snares and not projectiles. The other option, which actually supports the possibility of constricted movement within the valley, is the possibility that the whole region was heavily saturated with traps, both for animals and for protection of the settlements and their primary trackways. This would have promoted the establishment of specific patterns (and symbolism) for the movement of humans and livestock, reduced the possibility of off trackway contact, and decreased the need for projectiles. In this case, adzes and stone axes may have remained the tool of choice and could have been used to deliver the final blow to an entrapped animal. This might also explain the significance that stone axes appear to have had within the Vinča culture, as they have been recovered both in the graves at Gomolava (Brukner 1972) and are a common motif on figurines that have been found at many of the settlements.

7.5 MODELS OF RESOURCE EXPLOITATION, COMPETITION AND/OR COOPERATION

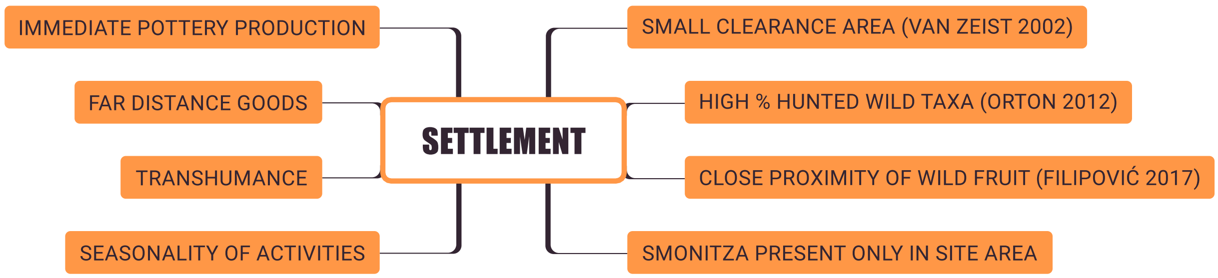

Figure 7.5 Model of the Vinča period settlement and constraining factors (Kočić 2019).

Resources will always play the most crucial role in any human organization, be it social, practical or conceptual. Without denying any level of agency to human actors, there are definite constraints in some aspects of practice. While one can argue that if the enclosure ditches are defensive, symbolic, or both, there is no denying that there is a certain amount of soil that must be removed and that an equal amount of human labor will be needed to accomplish this (Borić et al. 2018). By following the same threads of evidence, when we compare the utilization of the Gruža river valley, we can see that there are two possible trajectories that remained constant from the Early to Late Neolithic. These are connected with cattle herding, hunting and quarrying and/or mining. These are the only three material aspects that do not undergo significant changes between these chronological phases. In contrast, transitions including house forms (round pit house to surface level rectangular long house types) and overall settlement organization change substantially. Funerary customs also seem to change in the sense that during the Early Neolithic there are an abundance of burials but by the emergence of the Vinča period there is little evidence for formal burial.

One of the few driving forces that can stimulate such profound changes is social conflict and competition. The most obvious change that happens with the Vinča period is the appearance of centralization and aggregation of population, which is cross culturally seen as a measurement of reducing risk (Allen 2008; Earle 1997; LeBlanc 2006). The construction of multiple lines of ditches, and possibly skirmish lines, and the building of houses very close to each other, all can be looked at through the lens of warfare and its effect on social organization (Roscoe 2008).

Combining the presence of a system of enclosure ditches with the disappearance of small hinterland camp/exchange sites suggests the formation of buffer zones between the two large settlements, which may be another indicator of warfare (Allen 1994; Marcus and Flannery 1996). In a similar fashion to the trend that emerged during the chaos of the Archaic period of ancient Greece, areas of interaction became areas of limitations and borders (Snodgrass 1986). Equidistant separation has been noted previously for Vinča settlements, usually representing around 5 kilometers (Milanović 2017), but there have been questions as to whether there were smaller camps or processing sites located between these settlements. The regional scale pedestrian survey completed through this dissertation research has confirmed that no smaller scale sites or camps existed between the two large settlements.

Nevertheless, without more detailed chronological sequences through absolute dating it is difficult to fully understand these processes, however, following a proposed model for the cyclical nature of warfare and violence (Robb 1997), one might suggest that there was some traumatic event, or series of events, that happened near the end of the Starčevo culture (~5500 cal BC) sequence. This in turn prompted the building of enclosures and a completely new way of formalized communication and tolerable behaviors between communities. At the same time, it does appear that some groups were able to move long distance (e.g. livestock herding) while at the same time large villages were well prepared for a defensive posture against raiding through elaborate systems of enclosure. This seems to suggest that there was a strong potential for raiding and violence but that formalized behavior that included peer polity competition was embedded within the social and political organization of the region.

Transhumant mobility is one of these important components of such a system. While the presence of high levels of violence would potentially constrain movement beyond the safety of the enclosed settlements the presence of long-distance trade objects stands in contrast to this. One of the ways of explaining this is transhumant herding. By keeping the safety in numbers in gathering and joining both herds and people, risk is reduced, and the groups can follow optimal transhumant patterns. Herding cattle can provide some level of protection as herds provide a mobile source of food. This may have stimulated the long-distance travel associated with transhumance and minimized the potential of raiding by other groups. Some tentative evidence for this was found both in Kusovac and Grivac, with some non-local forms of mountain crystal that are very common on the high outcrops associated with the Rudnik mountain.

Small clearings around the villages, and the lack of long distance projectile artifacts, suggest a specific form of taskscape for these Neolithic communities (Ingold 2017). Large ungulate species such as Red Deer (*Cervus elaphus*) and Roe Deer (*Capreolus capreolus*), known to be garden raiding species, may have been hunted in the small clearances around the settlement through a pattern known as *garden hunting* (Linares 1976). In addition, the hunting of other wild taxa may have provided an important subsistence resource in lean years caused by epidemics, starvation and/or warfare (Orton 2010:110-112).

Hunting practices also may have supported the social identity of “elites” in which hunting could be seen as an activity separated from everyday domestic life in which the “wild” was conceptualized as “the other” (Hamilakis 2004:244). Unfortunately, the exact pattern of hunting has yet to be determined for groups from the Gruža valley since detailed faunal analysis is lacking.

There are other important considerations with regard to modification of the landscape immediately adjacent to the enclosed settlements. For example, the use of enclosures by competing polities may have signaled the “othering” of populations settled outside the enclosed boundary of the settlements. The modification of the landscape with traps and other impediments to movement is something that has been recorded for populations involved in endemic and long-term warfare. For example, the North Indian Naga headhunters utilized entrenched roads in order to control communication (Woodthorpe 1882). In this case study, areas of thick forests that represented buffer zones near settlements have been described as being completely covered by *punjie* and various other traps while paths utilized for human and livestock were followed very closely (Woodthorpe 1882:83).

The lack of precise projectiles and large scale hunting could indicate that traps and snares were used as primary techniques for hunting and relate to a very specific modification of the landscape around the enclosed settlements. This type of ‘funneling’ movement within the landscape may have encouraged the construction of enclosures and skirmish lines precisely at chokepoints in the topography where it was necessary to pass. This would have led to the further formalization of resource exploitation and the nature of interaction between communities. The ‘funneling’ of movement through these localized landscapes would have led to a behavioral pattern that was inflexible with a high probability of collapse (Ullah 2013). In short, by overspecializing all aspects of movement within the system, the system became too specialized. This meant that any deviation from it could have greatly impacted the system as a whole.

CHAPTER 8: CONCLUSION

From the discussed data and general interpretations above, it is now possible to return to the original research questions that structured the dissertation field research. This provides a set of final conclusions for the dissertation fieldwork and sets out thoughts for future research in the region.

(1) What is the distribution of identifiable settlement sites within the survey zone? How do these sites relate to each other chronologically and are different spatial patterns discernable through time?

Research has shown a pattern connected with the first occupations in the Early Neolithic and the autochthonous development of settlement within the valley. Population estimates, produced from both surface collection and statistical analysis and subsurface geophysical survey, indicate steady growth in the Early and Middle Neolithic phases (Starčevo and Early Vinča). This leads to a reduction of contact zones that were present during the Early Neolithic. This is most likely explained by an increased competitiveness that developed between the now larger, enclosed communities due to cattle herding, and the possible appearance of internecine warfare or raiding, which would be in line with pastoralism being the primary economic staple strategy (Salzman 2004).

(2) What are the exact site area sizes of identified settlements and are they similar or is there a rank order pattern representing emergence of a "center-hinterland" dynamic?

There is no rank order pattern present in the valley itself. Instead, there seems to be a pattern of peer polity formation and interaction. During the Vinča period the two large settlements were very comparable in overall size. The largest possible extent during the Early Vinča for both sites was approximately ~30 hectares. During the Late Vinča stage it was approximately 10ha at Grivac and 15 ha at Kusovac. The question of organization of rank order and size during the Starčevo period remains very problematic. The subsequent Vinča occupation of the sites does appear to conform to the spread of the earlier Starčevo artifacts (Kusovac 47.4 ha and Grivac 50.8 ha) with the one smaller site of Kneževac (8.44 ha) revealing evidence of Starčevo occupation but no evidence for subsequent Vinča occupation.

Although there are still many questions left to answer for the Early Neolithic it is clear that these sites are much larger then has been previously accepted for the Starčevo period. The question arising from the site sizes is also one concerning the possibility that the Vinča and Starčevo regional arrangements were larger, although this does not conform to other comparative examples from other regions where one single social entity emerges within a valley (eg. Sahlins 1960; Carneiro 1981). The equidistant distribution of the sites during this period in the Gruža River valley does show that there was development of buffer zones between the sites and that this is suggestive of conflict and competition. However, this may also have stimulated much larger supra local entities in the region and this has not been discussed in previous scholarship.

(3) Where are settlements located relative to topographical considerations and environmental resources and do these reflect a particular type of "catchment zone" (e.g. soil types, access to water, relationship to herding and agricultural activities and production)?

The landscape locations of the three Early Neolithic and two Middle to Late Neolithic sites are very similar. They are all situated on gentle hill slopes and plateaus with easy access to permanently available water resources. All three sites also share very interesting and important pedological characteristics in which vertisols are the only ones that developed on the locations of the sites themselves. This suggests a very limited scale of landscape clearance and the creation of a settlement organization that may be characterized as ‘islands in a sea of forest’.

(4) Is there spatial patterning associated with artifact categories and their density across identified settlements? How do specific diagnostic artifacts (e.g. minerals and slag, vitrified ceramics, loom weights, and stone tools) relate to possible craft production zones within settlements?

While there does not seem to be specialization at the household level the identified patterns of artifact distributions are substantial and clear. As discussed in Chapter 5, at all three sites there is strong clustering of two types of artifacts and possible related activities. At all three sites, there are strong separations between living areas and zones that have higher concentrations of flint and polished stone tools. The most interesting feature is that this pattern is established already in the Starčevo phase and is continuous during the Vinča period where such activities shape how the internal spaces of the enclosed settlements are used. This pattern also likely divided the population along lines of specific economic/craft activities, since all tasks that utilized heavier tools seem to be arranged close to the enclosure ditches. There is a definite question that has emerged concerning pottery production since it was most probably undertaken either in the dwellings or just adjacent to them.

The *Centralization Model* that was proposed by Ruth Tringham regarding the formation of inequality between households and related processes of settlement fissioning (Tringham et al. 1992; Flannery and Marcus 2014) does not fit with the data that was recovered during this dissertation research. Rather, the data indicates that while there is centralization and aggregation of populations there is no evidence for settlement fissioning. In contrast, it seems that the populations were quite contained within the settlements that, as other researchers noted, dwarf in size even the Mycenean palaces and towns of the Aegean Bronze Age (Chapman 1981:45).

While there is evidence for communal building as a cohesive element (enclosure features, etc.), there is no evidence of supra-local organization per-se as seen in other places such as Oaxaca and Monte Alban in Central America, or the European and Aegean Bronze Age (Drennan et al. 2011; Kristiansen and Larson 2005; Dickinson 2007). There also is no clear evidence of centralized production (Earle 1987; 1997) but of communal action and production that occurred in centralized zones of the settlement, such as flint production and possible woodworking that seem to happen on the edges of the settlement and near the enclosure ditches.

Peer polity interaction of the settlements (Renfrew and Chapman 1994; Fox 2010) is an issue that requires further attention and new data from contextualized features, since the ceramic assemblages from surface collection were too fragmented to reconstruct the functional nature of vessels and better comparison between the settlements. The one area where there seems to be strong proof of structured interaction is in the working of flint (Chapter 5). In this case, surface artifacts recovered from the settlement of Kusovac indicate a specific zone for the primary production and acquisition of flint. This raises the question about the possibility of direct trade between the settlements and if this is the reason why richer artifact assemblages and larger houses were identified at Kusovac. While there is no apparent inequality within the settlements there does appear to be an emergent inequality that developed between the settlements.

A possible population decline during the Middle Neolithic likely changed the dynamic between the villages and halted the formation of more complex political institutions. If these communities were especially reliant on herding as a major component of their subsistence economies then events such as raids or epidemics might have shifted the whole system into complete chaos. Unlike cereal agriculture, animal herds require more time to rebound and thus can lead to prolonged periods of insecurity, which can be a major variable in stimulating conflict and violence (Keeley 1996). While there are definite signs for centralization, which is especially visible in the enclosed forms of settlement organization, there seems to be some factor that limits aggrandizing as a social strategy (Hayden 2011). The answer to the question of why this pattern developed most likely lies in late Starčevo/Early Vinča social organization and the question of extended kin group connections.

The proposed model (Figure 8.1) for the organization and development of the Neolithic communities in Central Balkans, based on previous regional research and the results of this dissertation research, is not a vague heterarchical model of loosely based egalitarian villagers. Rather, it is one of rigid autochthonous villages (Bandy 2010) that achieve remarkable levels of technological and social complexity but with over-specialization and constant competition develop into overspecialized, highly complex societies with ever reducing resilience and adaptability to internal and external social and natural forces. Such a cycle would have been exacerbated by the overly complex everyday practices that are visible in the patterns of movement and in the patterns of everyday usage of the sites and their overall decline over time. This was visible both in the research that has produced this dissertation and, in fact, is discernable in almost every other Vinča case study. This places Vinča development in the range of social organization discussed in Chapter 1 in which choices for optimal economic behavior through adaptation to regional resources also meant the loss of social flexibility.

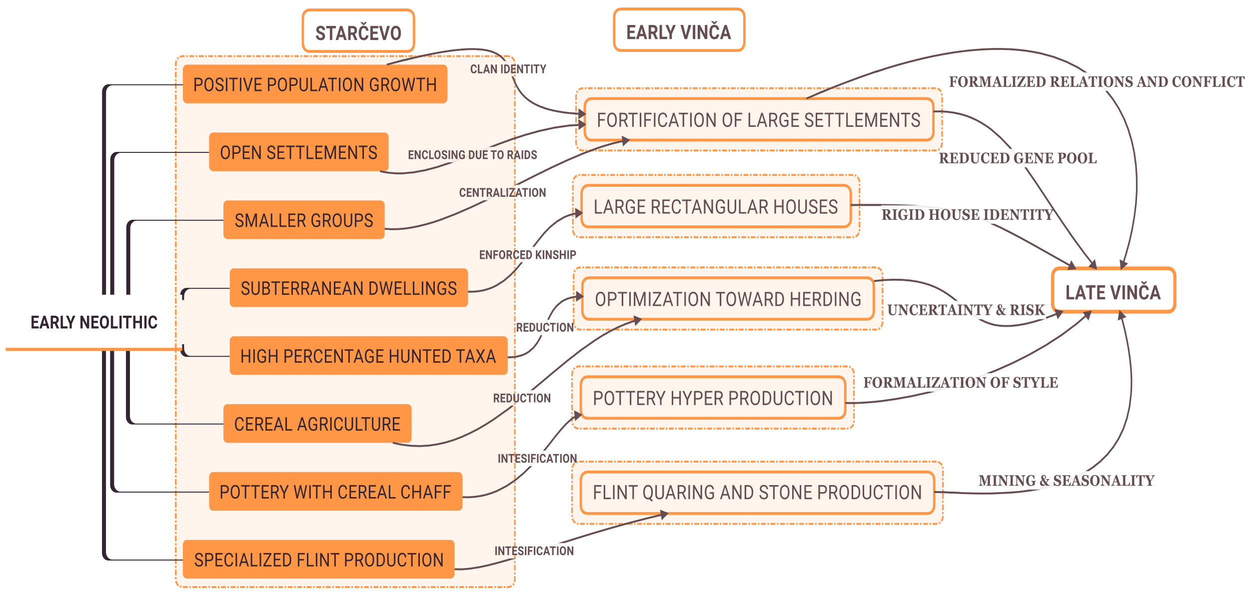

Figure 8.1 Conceptual model of Neolithic social complexity and emergence of Vinča society as a consequence of livestock herding choices.

8. 1 DISCUSSION OF RESEARCH RESULTS

The validity of pedestrian survey and surface collection methods as an interpretative tool is something that has been questioned in Balkan archaeology for a long time. This has resulted in a widespread lack of regional datasets and, more generally, regional scale approaches to archaeology. There have been a few notable exceptions to this in the wider context of the Balkans (e.g. Parkinson 1999; Chapman et al. 1996; Bintliff et al 2006).

Although this represents an extreme position, produced through the particularistic nature of the Central European archaeological tradition, there is definite merit in evaluating the problems and possibilities created through such approaches. Valid concerns need to be addressed concerning the use of pedestrian survey and surface collection for different periods when important contextual information is not available from excavations (Chapman 2010:1-4). This factor, in the Balkans region, presents problems especially for periods with elusive settlement patterns that appear to be the result of high mobility patterns of populations, such as in the Bronze and Iron Ages. In such cases, the nature of the archaeological record will require an adaptation of the survey methods.

Nevertheless, the high densities of surface artifacts encountered on Neolithic period sites, combined with sub-surface non-invasive geophysical prospection surveys, allows for the opening of new avenues into the study of settlement patterning and household archaeology. Importantly, it allows one to circumvent the problem of 'looking at a bear through a microscope' that is common when using only small-scale exploratory excavation trenches on large settlement sites. While such excavations, especially of household units, produce incredibly nuanced data, it is hard to contextualize and interpret without a larger spatial understanding of settlement patterning. This is especially true for evaluating larger scale processes, such as population changes, conflict, and resource management.

8. 1. 1 SITE DISTRIBUTION AND ORGANIZATION IN THE GRUŽA VALLEY

The completed dissertation field research has produced several interesting patterns as discussed in Chapter 5. One of the most important identified shifts was between the Starčevo (EN 6350-5500 cal BC) and Vinča (MN and LN 5400-4600 cal BC) phases. Although a number of scholars have stressed the presence of a hiatus existing at this time (Chapman 1981: 32-46; Bogdanović 2004), there is little contextual evidence of this in the Gruža River valley. This becomes especially clear with the placement of the settlements in specific topographical zones, where Starčevo material corresponds to the exact area that was enclosed with ditch features during the subsequent Vinča phases of occupation.

This cannot be a coincidence or a pattern that could appear after one century of separation between occupations. If Starčevo dwellings do represent subterranean pit-house features, these would have eroded soon after abandonment. There is also the effect of reforestation, which can be very rapid in the Šumadija region. In fact, it is hard to think of a scenario where there would be enough visible remains to serve as a land mark of previous occupation. Such a situation is documented by XIX century colonists into Central Serbia. These migrants discovered stone built monastic complexes completely over grown by vegetation and forest. In addition, both in the dissertation research survey and in the 1970's excavations, there were pottery forms recovered that can only be described as transitional forms between the Vinča and Starčevo types where vessels have a barbotine slip and Vinča fabric type.

This all suggests direct continuation and social organization changes rather then any clear abandonment, hiatus, and reoccupation phase by an entirely new population during the Early to Middle Neolithic transition. Settlement patterns seem to suggest that Early Neolithic farmers were in fact colonizing the region. When these groups began to settle more permanently, they did so in a sparsely settled pattern connected with the process of terraforming for agriculture. As a result, they changed their own traditions through localized adaptation and a more efficient optimization of energy input to energy returns in terms of subsistence practices.

It is possible to recognize such a conceptual model through comparing the Starčevo communities in the Southern Balkans. The pattern here indicates that the primary substance was agriculture and sheep-goat herding, while in the Central Balkans the primary substance was a shift to cattle herding and the exploitation of large wild herbivores such as red deer (*Cervus elaphus*). The pilot studies that have been completed using lipid analyzes of pottery have supported these shifts (Ethier et al. 2017).

This is quite a different pattern and one that is hard to conceptualize in an environment that would be highly modified for cereal agriculture since all of the most prominent animal species present at Divostin and Grivac (pig, cattle, red deer) are highly destructive to cereal crops. In traditional societies, such species are not usually paired with intensive cereal agriculture (Orton 2010; 2012).

Returning to questions concerning social agency and self-organizing principles, while it seems quite clear that Starčevo farmers were colonizing and settling the region with their own set of values and performative practices, such choices are not infinite but are limited by the specific adaptation needs for localized environments. This is not claiming that there is a direct ecological determination (Butzer 1964), but rather that the amount of choices is finite (Ullah 2013). The social bonds of these Early Neolithic communities appear to reflect organizational principles that then resonated throughout the next 1,000 years of occupation in the region.

Settlement patterns in the valley suggest that there were in situ developments of economic and social practices since the Early Neolithic. This means that subsequent Vinča developments must be perceived as connected to the earlier Starčevo world. The circular arrangement of early pit houses associated with the Vinča culture is comparable to the pit house features that have been identified in the geophysical prospection of the Starčevo sites (Chapter 5). It could be argued that the increasing reliance on cattle herding encouraged a particular form of social organization. Symbiotic relations with cattle herding also meant that certain social patterns were more optimal then others.

It may be argued that the new settlement types and the enclosure of the immediate landscape with multiple households were not foreign practices that were introduced by Vinča culture colonists but were in fact a further specialization of an already present social and economic practice that began with Starčevo groups. The presence of settlement enclosures is recorded in exactly those areas where the local topography did not provide a form of natural defense (e.g. bends in the river, embankments, etc.). Rather, Vinča period occupation routinely followed earlier occupations associated with the Starčevo period.

Subsequent periods associated with later prehistory show drastically different patterns of settlement organization and are nowhere near as centralized as those of the Neolithic period. This fact makes the Neolithic period the most active in the overall history of occupation of the Gruža River valley.

Some of the general patterns associated with the broader Vinča culture development, and that are also represented in the Gruža River valley, include the following:

(i) Overall frequency of settlements (Opačić-Ristić 2005).

(ii) Large numbers of artifacts present, which is most significant for the Early Vinča phase (Vinča B).

(iii) Settlements that are generally larger during the Early Vinča phase (Vinča B) (Chapman 1981:273).

(iv) A general decline in the number of settlements across the Vinča culture area (Chapman 1981, Opačić-Ristić 2005).

Also, in consideration of the data from the Gruža River valley survey, as described in Chapter 6, a significant population decline is a very visible trend. This will be discussed in more detail below.

8. 1. 2 SITE AREA SIZES AND PRESENCE OF CENTER HINTERLAND DYNAMIC

One of the biggest problems for the analysis of the regional systemic organization of the Balkan Neolithic was the evaluation of site sizes in order to establish site rank size and possible existence of centers (Berry 1961). This dissertation research has found that there was no regional center formation but there was a high centralization of the population within the valley in two large settlements.

John Chapman, in a previous publication, divided the Vinča culture area into 36 different regions and then did a rank size analysis that concluded that there were no center-periphery relations (Chapman 1981:44-46). One of the problems with this earlier study is that in 1981 the reported settlement site sizes varied substantially with what has been confirmed in more recent years (Ristić-Opačić 2005) and that the number of sites, such as Kusovac, had almost no detailed published data at the time.

Evaluations for catchment zones associated with Vinča sites were completed by using data from the Classical Greek period with the ratio for calculation being 1:40 in comparison with the settlement area to land use area (Theocharis 1973). This was adjusted for the Balkan Neolithic by adding a pastoral variant, in which the ratios were increased to 1:40:100. These calculations were used to suggest that a radius of 5km would provide the resources needed by these communities (Chapman 1981:46). Of course, this model used an optimal resource distribution. Considering the rich landscape and natural resources of the Gruža River valley, however, this model seems appropriate.

During the Starčevo phase there is less constriction of movement and general economic activities in the valley. However, there were only three major sites, Kneževac, Grivac and Kusovac, which followed a spatial distribution characteristic that indicates a lack of hierarchy with two sites of similar spatial size and a smaller site that either becomes abandoned or is assimilated by one of the other two larger sites in the valley.

During the Vinča period, the two large settlements were of a similar size and may have reflected peer polity interaction (Renfrew 1986). Being so similar in overall spatial area and estimated demography for the initial phase (similar to the earlier Starčevo phase), these sites could have easily followed a path of mutual competition but one in which neither site emerged as a regional leader (Linduff et al. 2004; Drennan and Peterson 2005; Drenann et al 2010).

This mutual competition, combined with the presence of intrinsically valued, mobile resources such as cattle, may have caused a spiraling circle of internecine violence and warfare during the period of the highest density of population, when livestock herds would be at their largest as well. While there is a growing literature on early pastoralist groups, stressing flexibility in policy making and social organization within these groups (e.g. Honeychurch 2014; Anthony 2010), transhumant pastoralists present somewhat of a problematic group. There is no clear consensus on when transhumant pastoralism appears in the Balkans although a number of authors consider, and passionately support, the notion that this occurred in the Balkan's Early Chalcolithic period (Arnold and Greenfield 2006; Greenfield 1988; 1989; 1991; 2005; Sherratt 1981).

Transhumance pastoralism is a socio-economic model that was proposed for the Vinča culture nearly fifty years ago (Garašanin 1971). Lipid analyses of pottery show that, as with Vinča and especially the Starčevo, that pottery from most sites does show dairy lipids next to ruminant fats. Although there is some variability, as in the case of the Iron Gates region on the Danube River, where microregions can cause specific local adaptations. As previously discussed, Zooarchaeological data from the Southern Balkans region indicates a predominance of sheep and goat herding while the subsistence economy of the Central Balkans is represented by cattle and wild deer (Ethier et al. 2017).

At the same time, however, Starčevo pottery from the Iron Gates indicates that the main source of lipids was freshwater fish (Cramp et al. 2019). Although there is diversity in the ways early agricultural populations adapted to the new environments, and how local populations were changing and creating new forms of subsistence practices, the exploitation of domestic livestock was a nearly common pattern across a large region.

In the vast majority of cases, the secondary product revolution of using dairy products (Sherrat 1981) had already happened. In pottery sherds from the Šumadija region dairy product preparation and consumption has been identified from the Early Starčevo (Ethier et al. 2017). A number of researchers have made assumptions that with the shift toward secondary products domesticated animal herd size would grow in order to increase dairy and fat production and still retain protein from meat (Sherrat 1981; 1983; Hesse 1982). Settlement patterns from the Early to Middle Neolithic seem to confirm this, as there is a definite increase in the size of the population. This also included the usual hallmarks indicating increased and intensified agricultural production, such as specialized storage areas, or household based production (Binford 1962). There was a definite increase in the total volume of vessels at such sites and this is also apparent in both the excavations (Bogdanović 2004) and data that were obtained from the surface collection in the *Gruža River valley* as part of this dissertation research.

Transhumant pastoralism, as a staple strategy, creates enormous pressures on social organization and further constricts the choices that are available to individual actors. Intra-communal organization also requires close cooperation since animals require specific forms of livestock management. Consumption patterns linked to pastoralism also promote social cohesion since food sharing solves the problem of storing significant amounts of meat that come from the butchering of a single cow (Halstead 2007: 26-27).

This pattern of communal effort is reflected also with the creation of settlement enclosures as this represents a labor requirement that is supported at the village level and, in the case of smaller sites such as Oreškovica, we can see that almost the entire community had to be included in the creation and maintenance of these features (Borić et al. 2018). Furthermore, cross-cultural studies show that there is a higher probability of violent interaction with herders because tribal pastoralists tend to "institutionalize solidarity and common defense" (Salzman 2004) wherein the whole community's survival is dependent on the group's reputation for aggressiveness (Moritz 2008:103). This further strengthens the ethos of a community and contributes to defining it in a way that could potentially be devastating in the long term if one considers that multiple regional scale communities may have been involved in such "honor maintenance".

Comparative anthropological archaeology studies of early social complexity have focused frequently on evidence of elites and the emergence of hierarchy, specialized craft production (Costin 1995; Eerkens 2005), vertical status differentiation (Price and Feinman 2010; Yoffee 2005), and agricultural intensification (Sahlins 1971; Earle 2005). For the Balkan's Neolithic, there has been little evidence of such social transformations. While some studies have examined the metrics of Neolithic pottery production they have indicated that there is a statistically significant uniformity with the production of these vessels at the household scale (Vuković 2011). This does not contrast other lines of evidence and rather could be seen as further entrenching it. Based on available evidence, it can be argued that most Neolithic households were included in pottery making and that this was just another communal activity and one not controlled by elites as has been found in other regions of the world in prehistory (Brumfield and Earle 1997).

From the results of the pedestrian survey and surface collection in the Gruža River valley, it seems that there were enormous activity zones for specialized activities in which communal roles were further entrenched and reinforced. Large lithic production zones and polished stone tools patterns that were recorded in the survey show that the everyday practices were very spatially structured and organized, with specific places that are attributed to a specific activity over the lifespan of the settlement. Also, the distinctive lack of the differentiation between ratios of "fine" pottery between the households, or any other intrinsically valuable material class, suggests the likelihood of a very strict enforcement of the communal, or clan, ethos. While cosmology and worldview were likely shared in the vast area that the Vinča culture covers, it is not monumental, as is the pattern of settlements. Overly complex, but rigid ritual, was probably further complicated by every region developing its own local variations of patterns of decoration and ritual practice, which is visible in both pottery and figurine variation (Chapman 1981; Markotić 1984)

In the future, more research is needed to address a number of questions related to the 'trigger mechanisms' that allowed Starčevo and Vinča to make remarkable social and technological developments. This included remarkable technological innovations such as extractive metallurgy and immensely complex social networks that occurred at both the local and long distance scales. It also will be possible to evaluate more fully the factors that led to a significant decline of the regional population of the Neoltihic and towards an ultimate social and demographic 'collapse'.

A priority in future research should be to establish regional specific sequences of high-resolution dates and to date not only the 'secured' features of Vinča or Starčevo occupation but exactly those features that would fall into the "transitional" stage. Furthermore, although this dissertation research has produced an important systematic survey and surface collection that can be used as a proxy for the valley, it is important to extend further survey within the broader region. This should be done initially by focusing on a reasonable estimate of a full day's walk of ~25km radius from the two major settlements of Grivac and Kusovac. This would then incorporate survey of other important identified Neolithic sites, such as Divostin, Rajac, Dizaljka, Banja, and Gradac, and ensure that systematic surface collection and geophysical prospection surveys are completed. This will allow the establishment and evaluation of possible larger scale supra local organization and further test the pattern of Neolithic site formation in terms of size and layout[9].

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[9] Known sites from Gruža valley continue to be equidistant to known sites in the Lepenica River valley to the East, at around 5 kilometers. Sites to the North have a gap because of the Rudnik mountain, which is located there.

Excavations that would be necessary for the radiocarbon dating effort also should have an experimental and outreach component to them as well, since local communities are eager to engage in the preservation and presentation of these sites. Such opportunities, unfortunately, have been rare in the past. An open-air museum component with experimental workshops would be a way to both give back to the local communities (Gružanci) and include them in the efforts to understand more fully the important questions that remain about the history of their valley. This also would provide valuable experimental samples of pottery, flint, and other materials for geochemical, physical and biochemical comparative analysis with the artifacts recovered from the pedestrian survey and previous archaeological excavations.

The careful recovery of skeletal material is needed for both animal and possibly human remains to examine for possible pathologies but also bone chemistry to establish dietary choices and longer term trends. It may be possible to follow the example of research undertaken at the settlement of Okolište, where several human remains were recovered from the enclosure ditches. The human remains revealed a high incidence rate of trauma (Mueler-Shuessel et al 2009). Such excavations would represent a good strategy for the possible recovery of human material at the Kusovac and Grivac settlements that has up until the present been rarely recovered from Middle to Late Neolithic sites. The recovery and detailed study of human remains would be instrumental for understanding complex and long term processes that conditioned the lifeways of the populations inhabiting these extraordinary settlements and the resource rich Gruža River region.

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