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in the Neolithic of Southeast Europe

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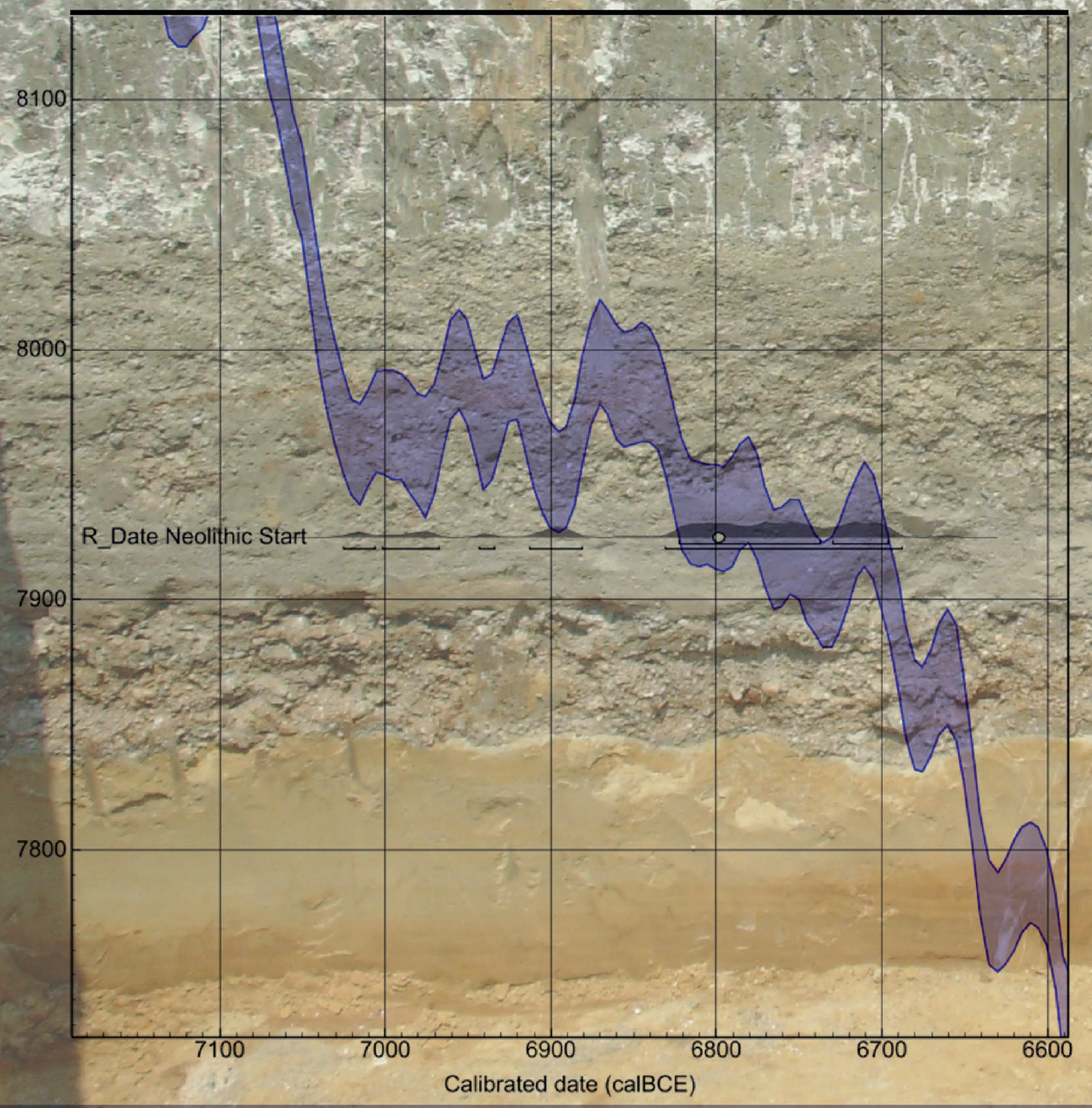

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Edited by Miroslav Marić, Jelena Bulatović and Nemanja Marković

Beograd
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SERBIAN ACADEMY OF SCIENCES AND ARTS

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Contents

Introduction

It is probably best assumed that the passage of time has been an important part of human reality for as long as humanity has existed. The notion of time, although likely not understood and measured by early hominids as it is today, was a self-evident fact of the cycles of life that each of us undertakes, from the moment of birth to the day of death. It became even more important to understand and measure when humans first attempted to understand their environment, to put it under their control. Perhaps at first, it was enough to realise when it was a period of cold or hot weather, a time of bounty and scarcity but as the complexity of human livelihood began to emerge with the onset of the Neolithic, the concept of time must have started to matter even more. Time, an intangible concept that cannot be rewound, renewed or traded, is an intricate part of daily lives governing our actions and cycles. The realisation that we can measure and organise it in the order of the occurrence of events to establish its flow was as important to the humans of the past as much as the concept of growing your own food resources and living in organised societies settled in specific environments. Certain authors (Aveni 1989) argue that the perception of time is inborn to living beings, evidenced through behaviours regulated by circadian cycles, but the measurement of time is surely a cultural product. Mankind, most likely even before the time of the Homo Sapiens, must have been aware of the biological time, evidenced in the individual phases of life that each living being goes through from birth to death. But the motion beyond that realisation, one that would cause the development of the concept of physical time; the time that exists as an external, measurable entity, must have demanded more than the inborn quality.

The measurement of time must have started very early in human prehistory, but the perishable character of material evidence from the human past partially prohibits us from discovering the point when it occurred. Additionally, even if material evidence is to be found, would we be able to, from our perspective, understand its character of timekeeping with certainty? If we were to argue the measurement of time came about in the Palaeolithic, then the material evidence is very limited due to, ironically, the sheer amount of time that has passed since. Perhaps then, it is possible to proxy search for other probable indicators of the existence of time as a concept among the current hunter-gatherer tribes that still occupy secluded parts of Earth today, avoiding contact with contemporary human societies of the 21st century? Certain studies (Sinha et al. 2011) have indicated that hunter-gatherer tribes in Amazon lack the linguistic structure that relates time and space or even lack words for time or terms associated with measuring time, like month or year. This, however, does not prevent them from talking about events and their sequence of occurrence, but it illustrates that, for them, the concept of time does not exist independently of events. Is it then prudent to assume that the Palaeolithic hunter-gatherers must have had the notion of seasonal cycles, possibly to keep track of which food sources to look for when, but surely not had them organised in calendars, rather as a series of interconnected and overlapping events related to certain natural phenomena (e.g. climatic cycles)? Would it be far-fetched to suspect that these Palaeolithic societies did not count the cycles of time but rather related them to events easily identifiable and transferable by the collective memory? This concept seems logical from the aspect of the short time scale that the hunter-gatherers were living on, based on recurring seasonal changes. It would also imply that their time was highly dependent on narratives passed down from generation to generation.

If no evidence of quantitative timekeeping can be found in the Paleolithic, can it then be identified in the Neolithic? Sedentary life and plant cultivation go hand in hand with the concept of longer annual or perennial cycles based on prolonged planning, food production, and harvesting management. While hunter-gatherers were influenced by individual seasons of climatic changes, Neolithic farmers would need to rely on at least annual cycles to know the adequate periods for sowing, cultivation and harvesting. It is safe to assume that these annual cycles would have already been known from the repetitive cyclical motions playing out above our heads – the astronomical cycles of constellations and the Sun and the Moon. The nature of these measurements is still unclear in the Neolithic period, as a key ingredient, writing, was still missing, depriving us of material evidence. Undoubtedly, the astronomical cycles have had an important role in the development of time measurement and the emergence of codified calendars, the basis for the earliest known systems of time measurement that would appear in the later periods.

Thus, moving to the earliest material evidence for timekeeping records may be pertinent, which originates in the Sumerian and Dynastic Egyptian periods (Greengus 1987; Polcaro 2013) from about 2200 BCE. However, it should be assumed that there would have been even older records since the writing system predates these earliest chronological records by almost a millennium. The Sumerian calendars were lunisolar, based on 12 lunar months, subdivided into seasons and organised around natural cycles like day (the regular rising and setting of the Sun), lunar month (the transition of the Moon through its cycle of phases) and solar cycle (the change rising and setting positions of the Sun throughout its annual cycle), while the Egyptian was solar based. The historical stage for chronology was thus set, driven by the need of emerging complex societies to record their time for posterity. Another side effect of the timekeeping was the creation of dynastic histories, the first relative chronological system known, albeit envisaged as a justification for the immense power vested in rulers rather than as a recording of the passage of time. Thus, a twofold split in chronology appeared, with shorter scaled civil time recording short-term astronomical cycles and regulating civil life, while historical time dealt solely with larger time scales that spanned periods from the current rulers back to the mythical, often divine, ancestors. The historical time was often referred to as sacred time, which must always be cyclical time as its existence made the present time (Eliade 1959). These cyclic events in which sacred times recreated the rituals originating from past sacred events from the long-gone periods often resulted in the creation of great years, truly long cycles which would often span multi millennia that were to repeat themselves over and over again.

The development of the concept of time did not end there. The cyclic time of the Bronze Age middle eastern societies began to be replaced by the notion of linear time, irreversible and not traced back to prior events in the Early Iron Age. This notion is deeply connected with the appearance of Judaism and monotheistic concepts of the Universe, which has its creation, lasting period and ending point (Goldberg 2000). Ancient Greek philosophers also tried to grasp the nature of time and the concept of chronology, introducing infinite time into the matter. The Sophist philosopher Antiphon claimed that time is not a reality, but a concept or a measure (Dunn 1996), while Parmenides saw it as an illusion because change is impossible and illusory (Hoy 1994). Somewhat later, Plato, in his Timaeus, stated that the time was created by the Creator and identified it with the period of motion of the heavenly bodies, of which he specially commented on the so-called Great Year, a complete cycle of the equinoxes around the ecliptic; effectively the return of the planets and the "fixed stars" to their original relative positions, a process that takes about 25,800 years (Plato 2001). This notion, derived from ancient astronomical observations of the movement of stars and constellations in the night sky, contributed further to the notion of linear time that early Christian authors will additionally advance in their attempts to synchronise and record the timeline of early Christianity.

In his Confessiones, St. Augustine noted that the world was neither timeless and eternal nor created at a certain point in the time series, but that the world and time were created together and also stated, "There are three times; a present of things past, a present of things present, and a present of things future" (Augustine 1992, XI:26). For Augustine, time is God's creature and God is the beginning and the end. This position reflects Neo-Platonism with an added splash of Aristotelian time as a linear stream, flowing from a beginning towards an end. This idea of linear time would not change much in the Early Medieval period. However, the theological view of time considers time to be of the material world only and that time ceases to exist in the immaterial after-world when they give way to eternity. Thus, time is an imperfect reflection of the heavenly life that awaits the worthy in this transitory world. Life on this Earth is time-bound and limited, while heavenly life is timeless and everlasting.

On the opposite end of the spectrum, in the Mediaeval period, earthly time is still a flow of moments, measured in terms of cyclical movements of the celestial bodies and the rhythm of nature (Polcaro 2013, 5). Timekeeping became very important, especially when serving religious needs, like Epiphany, Christmas, Annunciation and others. These calculatory problems occupied early Christianity, and many computations were made in attempts to fix the dates of these major events until finally, a Benedictine monk Bede Venerabilis published his study De temporum ratione in 725 AD. With the advent of the developed and Late Medieval period and the resurrection of town life that sprang around fortified castles of nobility, a new concept of time started to appear, centred primarily on acquiring economic and social wealth and prestige. The prohibition of usury, which forbade Christians from making money out of money loans and credits with interest, started giving way to money lending, which required exact determination of the lending period dependent on the universal measurement of time. By the late 14th century, even time itself became viewed as a commodity that could be parcelled out and measured on an even scale. The invention of mechanical devices for time measurements – mechanical clocks enabled this organisation of daily life by the clock. In the Renaissance, the concept of time as a precious good became an everyday topic for intellectual elites like Michel de Montaigne or Giordano Bruno (Ashcroft 2018).

The rise of science in the Modern period, starting from the late 15th century, brought about changes in paradigms in many aspects of life, often breaking away from well-established traditions. The concept of time was not left unchanged either in this process. Examining the material or physical world led scientists like Galileo to state that an objective reality exists with its intrinsic properties, independent and distinct from the individual perceiving it (Galilei 2017). Galileo, one of the greatest minds of his period, considered time and motion to be two of these properties. However, another, perhaps the best-known scientist of the period, Isaac Newton, was credited with the introduction of absolute time alongside concepts like absolute space and absolute motion. In his Philosophiae Naturalis Principia Mathematica, Newton states: "Absolute, true, and mathematical time, of itself, and from its own nature, flows equably without relation to anything external, and by another name is called duration: relative, apparent, and common time, is some sensible and external (whether accurate or unequable) measure of duration by the means of motion, which is commonly used instead of true time; such as an hour, a day, a month, a year" (Newton 1687).

However, Newton's view of the time was not the only one in existence and was furthermore soundly opposed by another prominent intellectual figure of the period, Gottfried Leibniz, who considered that space and time are for him purely relative "an order of coexistence, as time is an order of successions. For space denotes, in terms of possibility, an order of things that exist at the same time, considered as existing together, without entering into their particular manners of existing" (Leibniz's third letter to Clarke – February 25, 1716).

These views on space and time gave birth to the absolute concept of time (Newton) and a relational one (Leibniz) based on different logical priorities of space and time concerning objects and material processes. The key question and difference lie in the dilemma of whether the existence of space and time allows the existence of objects or does the existence of objects creates space and time. Despite all advancement over the century, it is just these views that, to this day, govern, more or less, the Western concept of time, which also lies at the heart of the archaeological notion of time.

In its earliest periods, modern archaeology heavily relied on the concept of relative chronologies, particularly when dealing with recorded histories of human societies being studied. It is of no surprise because no way of establishing absolute age existed in that period. The interest in the ancient Middle East and Graeco-Roman periods heavily relied on epigraphic sources listing periods, rulers and important events. However, the oldest known archaeological chronology developed was the one of a Danish archaeologist C.J. Thomsen, curator of the National Museum of Denmark, who divided the prehistoric period into the Stone, Bronze, and Iron ages (the scheme was published in 1836 in his book Ledetraad til nordisk Oldkyndighed). By the end of the 19th century and the beginning of the 20th, relative chronologies were an everyday item in the archaeological kit (e.g., Petrie 1899; Reinecke 1899, 1902), helping establish the relative age of finds and sites throughout the world.

Relative chronology remained a principal archaeological tool for chronological placement of material cultures until the mid-20th century when Willard Libby proposed an innovative method applicable to organic materials which enabled absolute dating of finds based on the measure of decay of carbon-14, an unstable isotope of carbon. This method brought back the absolute time scale to archaeology in a revolutionary manner, making possible more precise historical and prehistoric chronologies across the periods. Libby, a professor of chemistry at the University of Chicago, realised that carbon-14, an isotope abundant in the atmosphere, is embedded into the organic living matter during its life cycle through respiration, food and liquid consumption and that its accumulation ceases with the death of the organic. He proposed that if one could establish the amount of carbon-14 in an object, one could estimate that object's age using the half-life of the unstable carbon-14 isotope, i.e., the rate of decay of the original isotope quantity to half of the starting value. For this method to work, Libby assumed that the concentration of carbon-14 has been constant for thousands of years and that the isotope moves readily through the atmosphere, biosphere, oceans and other bodies of water in a known process as the carbon cycle. The first factor was later proven to be generally true, but for the second, Libby had to calculate a ratio of carbon-14 atoms per every carbon atom on Earth, which appeared to be one carbon 14 atom per every 1012 carbon atoms. Following this, he calculated the mixing of carbons across different reservoirs resulting in a prediction of carbon-14 distribution across features of the carbon cycle. Further research by Libby and others established its half-life as 5,568 years (later revised to 5,730 ± 40 years), providing another essential factor in Libby's concept. In 1949 Libby and Arnold published their results (Libby and Arnold 1949), proving the success of the method and paving the way for its introduction into the world of archaeological chronologies.

Libby's discovery helped resolve multiple issues in the sphere of anthropology and archaeology, including the notion that civilisation originated in Europe and diffused outwards into the rest of the world. By dating man-made artefacts from Europe, the Americas, Asia, Africa and Oceania, archaeologists could establish that civilisations developed in multiple independent sites across the globe. Spending less time trying to determine artefact ages, archaeologists could now ask more searching questions about the evolution of human societies and behaviour in prehistory.

Radiocarbon dating in Southeast Europe made its maiden steps in the 1960s and continued in the early 1970s, with first data published from sites like Starčevo, Karanovo, Sesklo, Vinča and others (Kohl and Quitta 1966; Lawn 1973; Nandris 1968; Vogel and Waterbolk 1963) illustrating the importance of Southeast Europe as a prominent corridor for the introduction of the Neolithic way of life into Europe. Since then, the amount of radiocarbon measurements has increased immensely, creating new insight into the dynamics of the emergence and development of the Neolithization of Europe. Old schematics of parallel relative chronologies of material cultures in the region became infused with absolute dates from many sites in the region, creating a detailed narrative of events that would shape the identity of Europe's earliest farmers spanning over two thousand years.

To this great narrative of the Neolithic period and its chronology, we contribute and dedicate our volume in the hope that new generations of researchers will find it useful for research and the creation of new questions and topics that still exist out there and are waiting to be explored and placed in the ever-growing mosaic of knowledge that archaeologists build in an attempt to understand our past and origins better.

The Editors

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6.

Late Neolithic chronology in the contact zone between the south edge of the Carpathian Mountains and the Pannonian plain – the case study of the Vršac region

Miroslav Marić, Jelena Bulatović, Nemanja Marković, and Ivana Pantović

Abstract The Late Neolithic period in Southeast Serbian Banat is marked by a host of Vinča culture sites located between the Danube and the Vršac mountains, the south end of the Carpathian mountain range in this area. It is a predominantly flat landscape enclosed by extensive former marshes of Mali and Veliki Rit in the northwest, Vršac mountains in the northeast, and Deliblato sands and River Nera in the southwest and the southeast. Over 40 late Neolithic sites are known throughout the area, most from surveys, but some also excavated. Between 2020 and 2022, as part of the *Regional Absolute Chronologies of the Late Neolithic in Serbia* project, funded by the *Science Fund of the Republic of Serbia*, At and Potporanj sites were radiocarbon dated to produce detailed, Bayesian statistical model-based chronologies that could be used as a local chronological reference for future researchers of the Late Neolithic in the region. In this chapter, we present unified chronological data attributable to the beginning and ending phases of the Neolithic in this region.

Keywords: Serbian Banat, Late Neolithic, Vinča culture, Radiocarbon dating, Bayesian modelling, At, Potporanj

Introduction

The geographic region of Banat occupies the southeast edge of the Pannonian plain and the Southwest brinks of the Carpathian mountain range (Figure 1) and is divided today between three countries, Hungary, Serbia and Romania, the latter possessing almost two-thirds of the region in its western portion. Historically, the region was part of the Habsburg monarchy (1716–1867) and the Austro-Hungarian Empire (1867–1716) after being reclaimed from the Ottoman Empire (1552–1716) who conquered it in 1552 after a series of wars with the Hungarian Kingdom. In 1920, after the treaty of Trianon in 1920, it was divided between the three countries that enclose its territory today. In this chapter, we will focus on a smaller region of Banat, particularly the Southeast portion of the Serbian Banat area, roughly centred between the Danube east of Belgrade and the border between Serbia and Romania in the northeast.

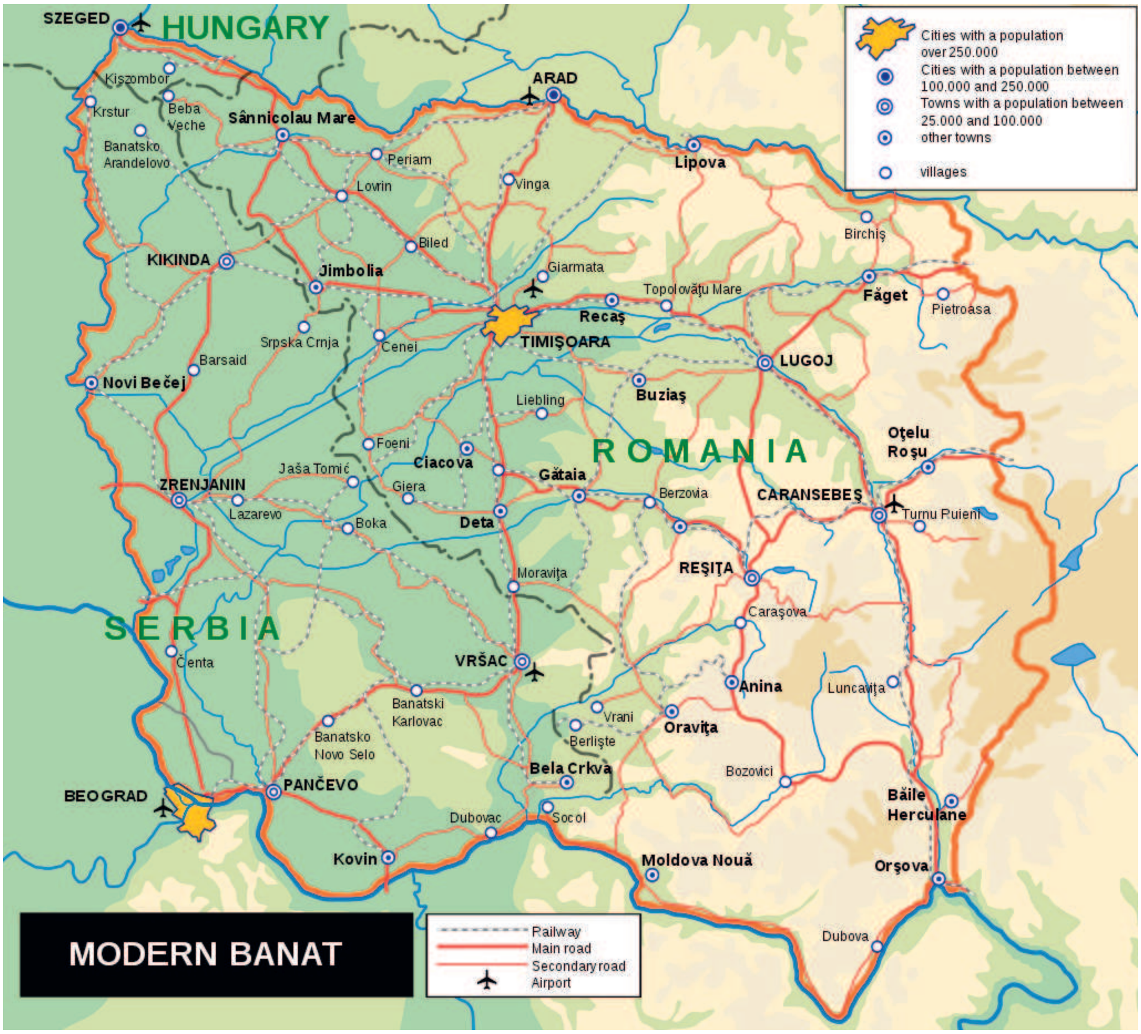

Figure 1. *Banat Geographic Region*

This region of predominantly flat landscape is nestled between several major geological formations. In the southwest, it borders the Deliblato Sands (Figure 2), once part of a vast desert that was formed during the recession phase of the Pannonian Sea (Butorac et al. 2002), while in the northeast, it abuts the south-west slopes of the Carpathian mountain range known as Vršac mountains. This formation, with its highest peak (Gudurički Vrh) at 641 meters above sea level, is composed predominantly of old rock formations like crystalline schists in the form of gneisses, while younger formations of mostly Pliocene sediments can be found in its lower northern and southern areas (Zeremski 1985). The number of water springs is relatively large, with the north side dominated mostly by stream valleys formed only between Gudurički Vrh and Donji Veršišor, opposed to larger branching streams of Mesić, Guzajna and Sočica on the southern, milder slopped side of the range. Underneath the northern slopes of Vršac mountains is one of the two major geomorphological features located in the immediate vicinity of each other; Mali Rit (Small marsh), approximately elliptical, 11 kilometres long and 2.2 kilometres at its widest (Figure 2), oriented southwest to northeast on its longer axis. The southeast side of Mali Rit is formed of mountainous rock of an older period intermixed with loess, whilst the opposing side consists of the loess plateau extending from At to the village of Vatin. The bottom of Mali Rit comprises older and younger marsh and lake sediments. Its formation started towards the end of the last Ice Age and was complete by about 8000 years BCE, after which the deposition of marsh-lake sediments started leading to the formation of the marsh/lake that finished by about 5500 BCE (Bugarski et al. 1995, p. 30).

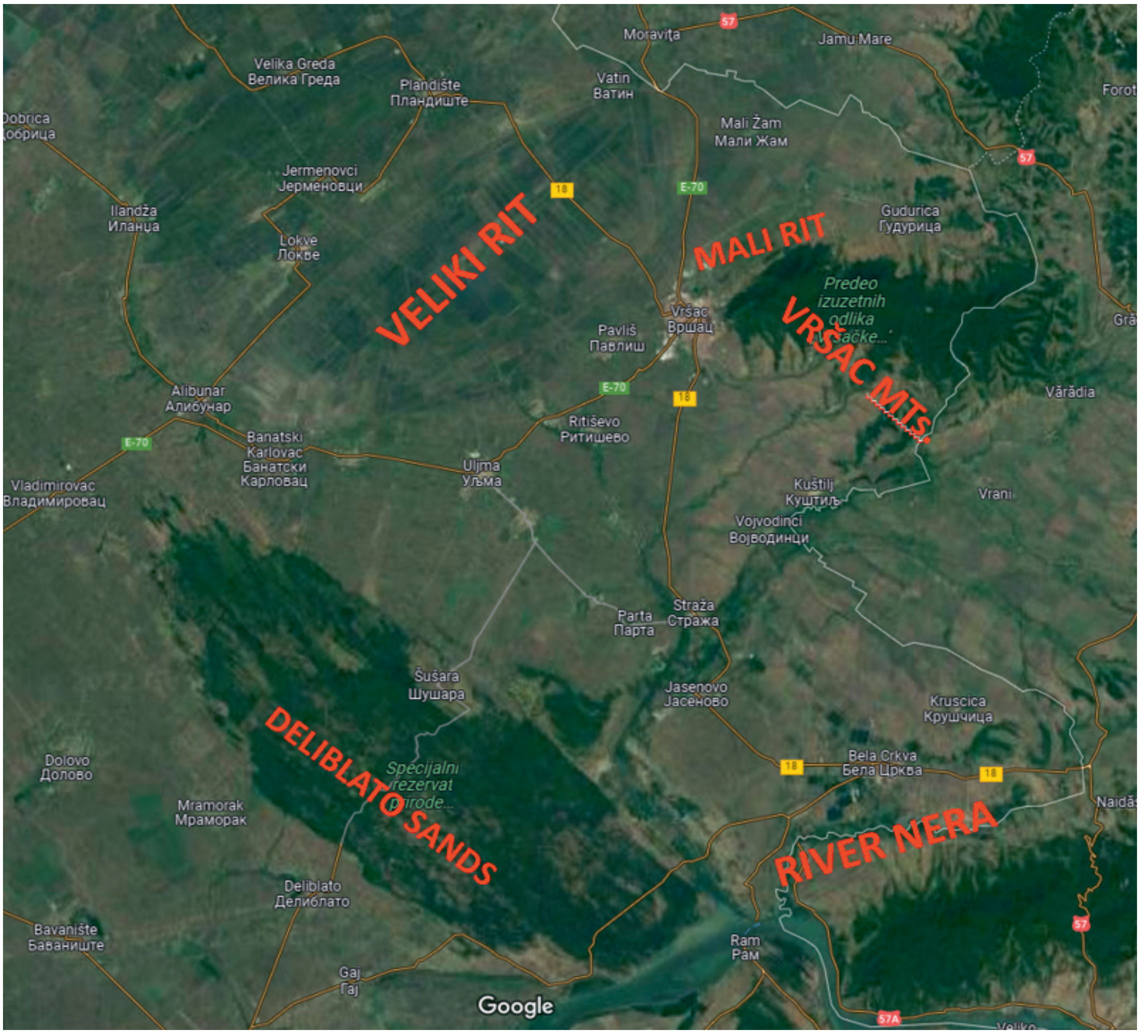

Figure 2. *Southeast Serbian Banat Region*

Next to Mali Rit, on the west side, is the At-Vatin loess plateau, a sort of division barrier beyond which is another, an even larger geomorphological feature of the area, the so-called Veliki Rit or the Alibunar depression (Figure 2). This feature, 30 kilometres long and close to 11 kilometres wide at its widest (between Pavliš and Barice villages), has most of its bottom at between 75 and 76 meters above sea level, with occasional spots at 78 meters. The depression results from the Epeirogenic movement, but its genesis is long and starts at the Würm II-III interglacial period lasting well into the Boreal (Zeremski 1967, pp. 150–151). The shaping of this feature was profoundly affected by the 8.2Kya event that resulted in the deposition of significant marsh/lake sediments at its bottom, a consequence of a moister climate that lasted for several hundred years, between 6300/6200 to 5800/5500 BCE (Burroughs 2005, p. 178). The endorheic character of the depression particularly assisted in the formation of a marshland/lake landscape that pertained until the vast reclamation works started in the late 18th century, which, over the last two centuries, were crowned by the finalisation of the Danube-Tisza-Danube canal system in 1977, which finally changed the direction of water accumulation and led to the draining of excess surface water towards the Karaš River valley.

Tucked between the Deliblato sands, Veliki Rit, and Vršac Mountains, the south Banat loess flat extends towards the southeast to the valley of the Nera River and encompasses the valley of the Karaš River (Figure 2). A geological survey of the area identified three loess horizons formed during the Würm I-III glaciation periods, with horizons of fossil soil in-between, formed during Würm I–II and II–III interstadials (Zeremski 1972).

Human occupation of the area presented in the chapter is evidenced already in the Palaeolithic period, primarily through chance finds of the Aurignacian period (Mihailović et al. 2011), but also through limited excavations on certain sites, like At (Chu et al. 2016; Radovanović 1986). However, large-scale systematic research on the Palaeolithic period is yet to be conducted. So far, there has been no evidence of Mesolithic occupation in the presented region, but it could be possible in the area, though without proper systematic research, the sites still elude detection.

In contrast to the previous periods, the Neolithic is better known, primarily due to a long-term archaeological survey of the region, started in the late 19th century by the first archaeologist in the area, Felix Milleker. In his carrier, spanning over five decades, Milleker identified some of the sites as early as 1883, one year after he started working in the Vršac city museum, which itself was founded one year before. Over the last 140 years, more than 70 Neolithic sites have been registered in the area presented here, over 30 of which belong to the period of Late Neolithic (Prikić and Joanovič 1978). However, out of the known sites, a handful of them, like At, Potok Mesić, Potporanj, and Pavliš, have ever been excavated, the latter three during archaeological rescue work mainly. Other sites are known solely from surface collections of finds. The problem is further accentuated by scarce publication of the research results, mostly just in the form of short reports (Joanovič 1977, 1976; Milleker 1938; Rašajski 1976, 1962) with only several larger volumes (e.g. Joanovič 2003; Pantović 2014; Prikić and Joanovič 1978).

Figure 3. *Position of the presented region with respect to the important known sites of the Late Neolithic period*

The importance of the region presented in our chapter for the Late Neolithic period of the southern edge of the Pannonian plain is almost immediately apparent if we take into account its position with respect to the large complexes and centres of the Neolithic in the region (Figure 3). Located between some of the larger and best-known sites of the so-called Vinča culture, like the type site of Belo Brdo in the southwest, Újvár and Parţa in Romania to the north and Turdaş in the northeast and Belovode and Rudna Glava in the southeast, the region appears to be in the middle of a more extensive network that connects the core area of the Vinča culture to the south with the northern expansions in modern-day Romania. Unsurprisingly, the two excavated sites, At and Potporanj especially, are probably best known for the most considerable quantity of obsidian finds, followed by Belo Brdo itself (Chapman 1981, pp. 80–81). Obsidian, an easily traceable material, is a perfect medium to illustrate the existence of well-established, long-running networks that span vast distances and connect different societies of the same period (Tripković 2004). Limited modelling using GIS based on the characteristics of the landscape in the area and the positions of known sites with obsidian finds (Marić 2015: Figure 10) illustrate that the immediate vicinity of the modern town of Vršac may have been a natural funnel of trade routes from various directions, possibly indicating why a large quantity of Vinča period sites (over 25 in 20 km range around Vršac) are patterned in such manner. In such a network of closely positioned late Neolithic settlements, the site of At is of particular interest to us, being at the very heart of it, on a dominant loess plateau between the eastern edge of Veliki and the western edge of Mali Rit. Establishing a strict chronological framework for this region in the Late Neolithic period based on sets of radiocarbon dates is of great importance for future research.

Methodology

In 2020, a project titled *"Regional Absolute Chronologies of the Late Neolithic in Serbia"*, funded by the Science Fund of the Republic of Serbia, set about examining various regions of Serbia for adequate collections and sites of the Vinča culture that could be used to produce detailed chronological sequences combining newly produced radiocarbon dates coupled with the knowledge of relative chronologies within a Bayesian statistical framework. The project was inspired by earlier work on the Belo Brdo site in Vinča, which produced several new chronological strands of the excavations on the type site of the Vinča culture (e.g. Tasić et al. 2016a, 2016b; Whittle et al. 2016). Over the next two years of the project duration, multiple sites from several regions of Vinča culture distribution were analysed (Figure 4) with over 200 new radiocarbon dates made in the process, most out of secure contexts with well-known stratigraphic positions.

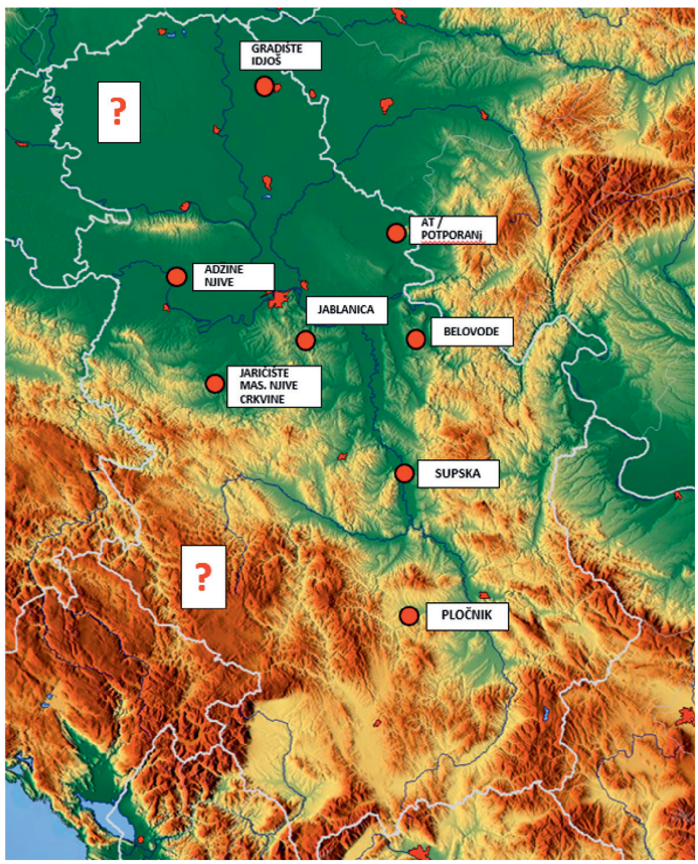

Figure 4. *Archaeological sites researched during the "Regional Absolute Chronologies of the Late Neolithic in Serbia" project*

These newly acquired dates were to be used within a Bayesian statistical framework to produce a strict chronological model of the analysed site. The field of Bayesian statistics provides archaeologists with an explicit probabilistic method that can be used to estimate absolute dates of individual events from the past. The method strength is the possibility to quantify uncertainties linked with these statistical estimates of radiocarbon measurements. It is not a novel statistical concept (Lindley 1991) and has been used in modern archaeology (Bayliss et al. 2007; Buck et al. 1996). Bayes' theorem in archaeological applications means that archaeologists analyse new data collected about a research problem (in this case, data is the standardised likelihoods of radiocarbon samples) in the context of existing archaeological experience and knowledge of the research problem (denoted as prior beliefs in Bayesian statistics). This concept then enables the creation of a new understanding of the research problem by incorporating existing knowledge and new data (to create posterior beliefs). These posterior beliefs then become future prior beliefs and inform the collection of new data and its interpretation in cyclic repeats of the procedure (Figure 5). In simplified terms, calibrated radiocarbon dates form the standardised likelihoods part of the model and are then reinterpreted regarding the prior archaeological beliefs (the knowledge), which can be informative and uninformative. The first represent specific and definite information on a problem that substantially affects the output of the model. In our example, the informative beliefs are usually evidence from stratigraphic sequences between two or more radiocarbon samples of an archaeological site being analysed. Without this, information sequences from artefact typologies or seriation can also be used. A key issue is that age proximity between the radiocarbon sample and the context which they date must exist; thus, short-lived samples such as charred grain or articulated bones are sought after. On the other hand, uninformative prior beliefs occur where there is little definite information about the research problem. However, these need also be included in the Bayesian model to avoid biasing it. This approach accounts for the fact that the radiocarbon dates being analysed in a model are related (Bayliss et al. 2007; Bronk Ramsey 2000). Uninformative prior beliefs may stem from the period of site use or the circulation period of a certain pot type indicative of a phase. This allows the model to assess how much calibrated radiocarbon dates reflect the real chronological time span of an archaeological activity dated and if they are, and to what degree, a product of statistical scatter.

$$\frac{P\ (\text{data} \mid \text{parameters})}{P\ (\text{data})} \quad \text{x} \quad P\ (\text{parameters}) \quad = \quad P\ (\text{data} \mid \text{parameters})$$

⇓		⇓		⇓
Standardized likelihoods	x	Prior beliefs	=	Posterior belief
⇓		⇓		⇓
C14 dates	x	Arch. knowledge	=	A Solution

Figure 5. *Bayes' theorem in archaeological application*

To complement the radiocarbon analyses and available chronological sequences with another strand of data needed for a more precise Bayesian model, statistical analyses of pottery typology were undertaken on most chosen sites using a revised universal typology proposed by Garašanin and Stanković (1985) in order to enable direct cross-comparison of site assemblages chosen for the analyses. Multiple typologies of Vinča pottery were developed over several decades of research (e.g., Garašanin 1951; Jovanović 1994; Nikolić 2004; Vukmanović and Radojčić 1990), most strictly associated with specific sites they were designed for. The typology used during the project was created drawing from both the older ones but mostly from research done on a more recent project (Mirković-Marić et al. 2021a, 2021b). Ten principal categories of vessels were defined according to their assumed or proposed function, with further subdivisions within each category based on vessel morphology. The statistical analysis of vessels was then performed using Correspondence analysis (CA), as this method already showed good results on Vinča style pottery (Diaconescu et al. 2020; Schier 1996). The popularity of CA is increasing with the availability of personal computing in archaeological research and is most appropriately used in analysing tables that contain counted data, which number or frequency of pot types per archaeological context or site certainly is. The ability to represent both rows (contexts) and columns (pot types) of a data matrix as points in a single plot (Baxter

1994, p. 100). Superimposing the row and column data identifies possible clustering to reveal pattering of values (if there is one) that stand out from the calculated average data profile. Most commonly, CA is used to seriate data, i.e., to test if specific finds can identify the relative chronology of archaeological contexts or entire sites (Baxter 1994, p. 118) based on the presumption that row orders reflect the relative chronology of contexts and column data chronological evolution of material type on examination. When successful, CA will produce a *horseshoe* pattern in the plot, the so-called *Guttman effect* (Schier 1996, Figure 2). The data represented at the end of the horseshoe will have nothing in common, and the data in between will share a certain amount of similarities, indicating progressive development over time. The CA analysis was performed in the Factoshiny statistical package of the R code, a freeware statistical environment.

The AMS radiocarbon dates were made predominantly on animal bones, as in most archival assemblages used in the project no macrobotanical samples were available primarily as none were collected at the time of excavation, mainly because some of the chosen sites were excavated long before the collection of macrobotanical samples was introduced. Samples of animal bone, usually no more than 20 g in size, were then analysed in two separate laboratories, the BRAMS facility of the University of Bristol, UK and the HEKAL AMS laboratory in Debrecen, Hungary, where they were prepared in concordance with the procedures explained in Knowles et al. (2019) and Molnar et al. (2013). The direct comparison of measurements was made possible using replicate measurement data if shown to be statistically consistent (Ward and Wilson 1978). The Bayesian modelling was undertaken in the OxCal v4.4 program (Bronk Ramsey 2010, 1995), and the models described are defined by OxCal CQL2 keywords and the brackets seen on the left edge of model figures. Calibrated radiocarbon dates are given in grey outlines, with posterior density estimates created by Bayesian modelling in solid dark grey. Intrusive or residual samples are kept in the model and given in red colour.

Results and discussion

One major obstacle was detected early in the Southeast Serbian Banat region; the lack of excavated Late Neolithic sites with a complete chronological sequence of the Vinča culture. Although they must exist, the small number of excavated sites prevented us from identifying them in the landscape. To alleviate this issue, the team decided to use data from two sites, the early phase Kremenjak, found on the outskirts of the village of Potporanj, and the late phase At, located on the northern outskirts of Vršac.

Figure 6.
Location of the site of Potporanj

The site of Kremenjak near Potporanj was discovered by accident in 1882 when reclamation works began in the area. It was first surveyed by Felix Milleker, who undertook his single research campaign on the site in 1899. The site is located in the southeast part of the village of Potporanj (Figure 6), partially under the modern settlement. It was located on an elevated section of a flat diluvial terrace with no marking geomorphological features. On the eastern periphery of the village was a shallow valley of one of the source streams for the Boruga stream, later marked as a swamp on the maps. A similar valley of the Boruga tributary also existed in the past on the northern edge of Potporanj village. These streams were beneficial for the Vinča settlement, providing additional water sources in its immediate vicinity. In 1947, a scheduled construction of a large drainage channel led to the start of rescue archaeological excavations on the site, which were resumed in 1957 and 1958 (Brukner 1960). The excavations confirmed the existence of an early phase Vinča-Tordoš settlement with stratigraphy ranging between 2.5 and 3.4 meters. After the construction of the Dunav-Tisa-Dunav drainage canal system that destroyed significant parts of the settlement, further research was halted until 2011, when a new campaign, led by Ivana Pantović of the Vršac City Museum, started, aiming at establishing remaining site boundaries, habitation layers and procuring absolute dates. After an initial geophysical survey that indicated the existence of multiple archaeological features, including wattle and daub structures, pits, and even possible enclosure ditches, several trenches were opened to test the results on both sides of the drainage channel. The stratigraphy of the trenches was documented using single context recording, producing a detailed relative stratigraphic sequence for Bayesian modelling. However, even from the Milleker record, it was evident that the site was abandoned by the end of the early phase of the Vinča culture (Plates 1–2), a fact further confirmed in the analysis of the ceramic assemblage as well (Plates 1–3); another site was needed to produce data for the ending part of Vinča culture in the region.

This site proved to be At-Crvenka, located on the northern outskirts of Vršac (Figure 8). It is located on an elevated loess plateau that divides the Mali and Veliki Rit but is also near the conflux of Mesić stream into the Veliki Rit. The site was first known as Westrand (or West side) after a regulatory canal was dug from Središte towards Vršac, discovering archaeological layers. After 1910, Milleker started referring to it as At (a local toponym for the area) when similar finds were discovered further along the plateau. Certain areas of the site were excavated on multiple occasions by Rasto Rašajski and Šarolta Joanović from 1961 onwards as part of rescue archaeological work due to sand extraction in the area of the site. In 1984, an archaeological excavation was made in a successful attempt to identify Palaeolithic layers located underneath the Late Neolithic settlement (Radovanović 1986). Similar attempts were repeated in 2014 and 2015 (Chu et al. 2016), leading to the discovery of a Starčevo period multi-roomed pit dwelling. Finally, in 2021, the first geophysical survey was done in order to establish the boundaries of the site, and the condition of features, for the first time revealing a complex settlement with wattle and daub rectangular structures grouped in several areas, numerous pits and multiple enclosure ditches that separate the settlement into smaller segments. The material from the site is abundant and well-preserved (Plates 3–4).

Based on the results of excavations in Potporanj, although still not processed in full, the construction of a Bayesian chronological model relying on relative stratigraphic relationships between features recorded during the excavation in trenches 2 and 2a was undertaken. In total, 4 horizons were detected during the excavations. However, only horizons II to IV could be associated with the early Vinča period settlement. Sporadic finds of Starčevo/Körös pottery in the deeper layers suggest an earlier occupation of the site, together with a single radiocarbon sample POZ-70082 (7180,50), found out of context, which can be dated to 6218–6138 cal BC or 6097–5978 cal BC or 5946–5922 cal BC (95.4% prob.), or possibly 6073-5999 cal BC (68.3% prob.). For the construction of the model, there were 27 radiocarbon samples available. However, due to poor preservation of animal bones from the site, most likely associated with waterlogged terrain associated with the proximity of a former stream bed, a certain percentage of radiocarbon samples were made on charcoal or burned sediment (Table 1), which on several occasion proved to be intrusive or residual (5 samples in total). This left us with 22 radiocarbon samples that were identified as being usable for the construction of the model (Figure 7), which exhibited a good overall agreement (Amodel: 81).

The model indicates that the Vinča period habitation (horizon IV) on the site began about 5331–5207 cal BC or 5188–5122 cal BC (95.4% prob.), possibly 5289–5211 cal BC (68.3% prob.). The duration of this early phase on the site is also very interesting, as it may have lasted anywhere from 0–215 years (95.4% prob.) or 0–164 years (68.3% prob.). A similar effect was noted earlier for the Vinča A phase (Whittle et al. 2016, p. 28), indicating a long development of the ceramic typology typical for this period.

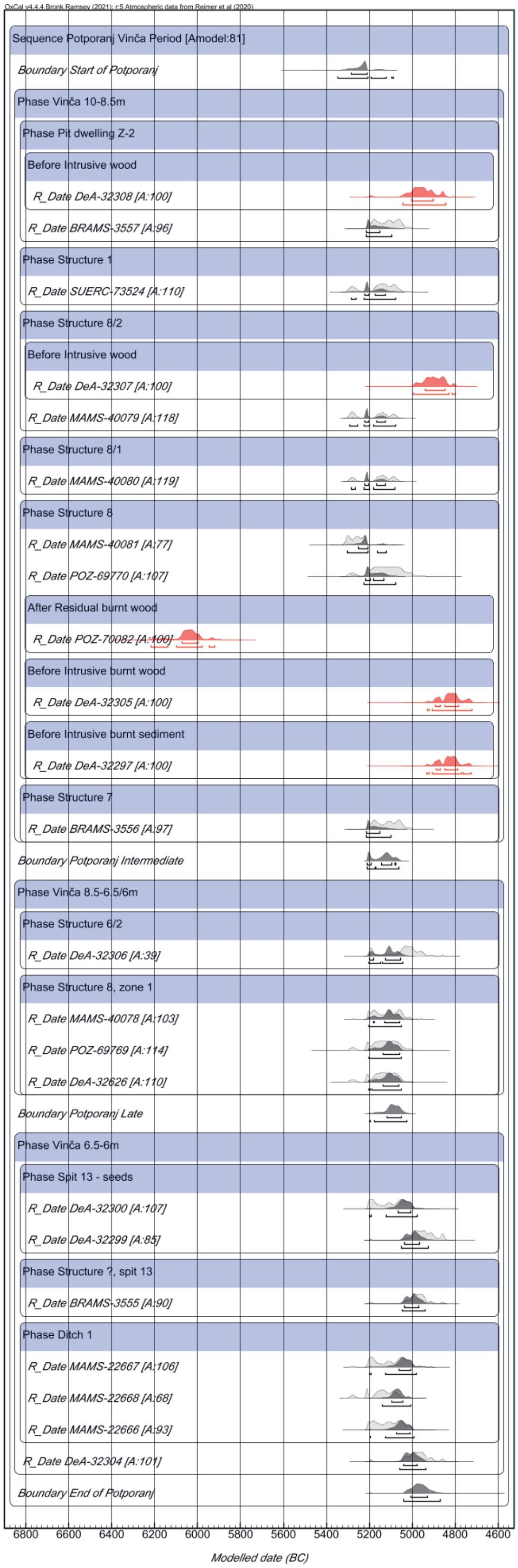

Figure 7.
Bayesian chronological model devised in Oxcal 4.4 for the site of Potporanj

Figure 8.
Location of the site of At

The middle phase of Potporanj in the Vinča period (horizon III) appears to start at 5211–5176 cal BC or 5170–5062 cal BC (95.4% prob.), possibly 5149–5094 cal BC or 5209–5192 cal BC (68.3% prob.). This horizon also appears to have lasted shorter than the previous, for 0–117 years (95.4% probability), possibly 0–57 years (68.3% prob.). Finally, the late phase of Potporanj (horizon II) starts about 5176–5025 cal BC (95.4% prob.), possibly 5115–5050 cal BC (68.3% prob.), and is again a longer phase, lasting anywhere from 0–246 years (95.4% prob.), possibly 53–184 years (68% prob.).

The end of the Late Neolithic occupation on Potporanj, at least in the trenches used for this analysis, can be modelled at 5198–5188 cal BC or 5040–4871 cal BC (95.4% prob.), possibly 5008–4927 cal BC (68.3% prob.). However, this may be somewhat different in other parts of the settlement, currently unexcavated. The Late Neolithic settlement on the site thus may have lasted close to 300 years in continuity, being abandoned at an exciting moment in the chronology of the Vinča period.

If we are to examine the relative chronological phasing of the site, it appears that the Late Neolithic settlement in Potporanj appeared towards the middle of the Vinča A phase, or the period corresponding to the 9-8.8 meters relative depths on the settlement of Belo Brdo (Tasić et al. 2016a). This horizon then proceeded well into the early Vinča B1 period (Whittle et al. 2016, Figure 2). However, since the site assemblage, including pottery finds, has not yet been fully analysed, it is impossible to distinguish this change without an in-depth statistical analysis. The start of horizon III, marked as the intermediary phase of Late Neolithic life in Potporanj (Figure 7: *Boundary Potporanj Intermediate*), coincides with the second half of the Vinča B1 period, and it also extends into the Vinča B2 phase. In Belo Brdo, the beginning of this horizon would fall between 7.5 and 7 meters of relative depth. The late phase of Potporanj, horizon II (Figure 7: *Boundary Potporanj Late*), starts near the end of the Vinča B2 phase and extends towards the transformative, Gradac phase, the beginning of the metallic period Vinča. These layers correspond to relative depths between 7 and 6.5 meters on the Belo Brdo site (Tasić et al. 2016a). Finally, the end of the Late Neolithic settlement on Potporanj could be modelled to the beginning stage of the Gradac phase, the period corresponding to layers between 6.5- and 6-meters relative depth in Belo Brdo, a phase in which the central Balkans Vinča becomes infused with copper metallurgy that, over the following centuries will gradually change its nature, best reflected in the material culture of the late phases.

It must be stated here that due to the lack of excavated sites in the region, in this chapter, we have no available dates for the so-called Vinča C phase, a period which most likely already starts with the Gradac phase and is one of the most prominent periods in the span of the Late Neolithic Vinča culture. This period is the time of expansion of Pannonian plain linear pottery traditions towards the core area of Vinča, already somewhat present towards the beginning of the Gradac phase in the site assemblages in the area (Plate 3: 10–14). This suggests that existing networks brought about changes in the material culture in the northern parts of the Vinča territories, likely due to influences shifting towards the north, away from the core area of the culture. We cannot, without a doubt, also exclude the possibility that Vinča C material exists on At. However, out of multiple excavated trenches, adequate sampling material (i.e., animal bones) was preserved only from trenches 4 and 5, thus preventing us from dating other excavated areas of the site using existing archival records in the City Museum of Vršac. Perhaps new research started in 2021 will produce new strands of data for future dating of different parts of the Late Neolithic settlement there.

If we turn our attention to the late period of Vinča culture in the southeast Serbian Banat, a more detailed paper about the methodology of work for the late phase modelling, based on the site of At is presented elsewhere (Marić et al., in preparation). In this chapter, we will discuss only the modelling results in relation to the chronology of the Late Neolithic in the presented area. The approach for the site of At was somewhat different. Using the most chronologically sensitive category of pottery assemblage, the bowls, it was possible to establish the existence of three specific pottery phases that encompassed several excavation layers, each through the application of Correspondence Analysis. Combining the results of the CA with 25 successful radiocarbon samples (Table 2) into a Bayesian chronological framework using OxCal (Figure 9), it was possible to construct a model that had a very strong agreement (Amodel: 275), which suggests that the Late Neolithic occupation in this area of the site of At started around 4737–4700 cal BC (95% probability; Start AT1; Figure 9), probably 4723–4710 cal BC (68.3% probability). The premiere phase of occupation did not last long, up to 24 years (95.4% probability), but likely just 8 (68.3% probability), which can be seen using the *Interval* command in OxCal.

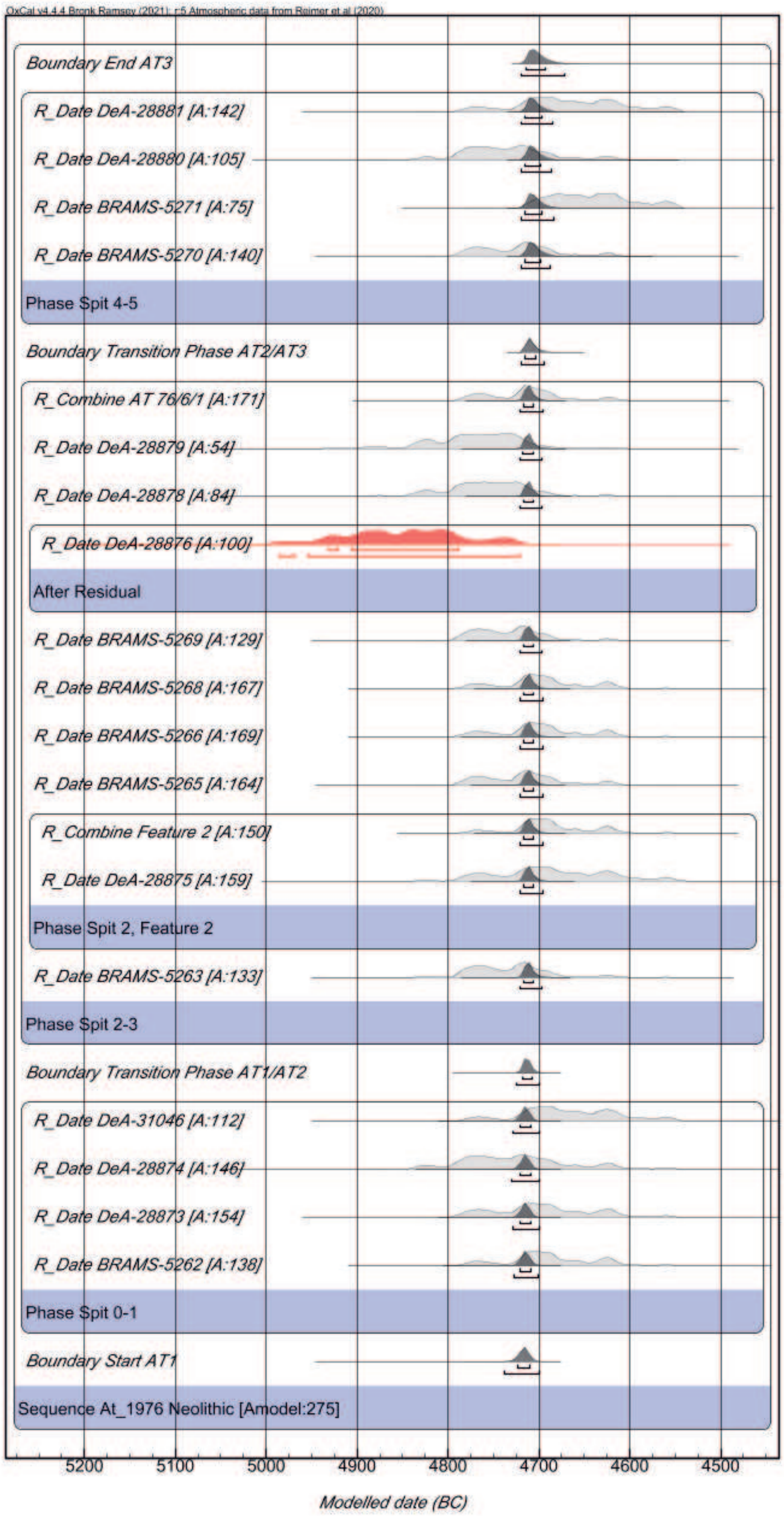

Figure 9.
Bayesian chronological model devised in Oxcal 4.4 for the site of At

The second phase of At occupation (*Transition phase AT1/AT2*; Figure 9) started at 4724–4701 cal BC (95.4% probability), possibly 4719–4708 cal BC (68.3%), and again lasted a relatively short period – at most 17 years (95.4% probability), possibly just 7 (68.3% probability). This puts it well within one generation's lifespan. The final phase of Late Neolithic occupation of At in trenches 4 and 5 (*Transition phase AT2/AT3*) began at around 4720–4695 cal BC (95.4% probability; Figure 9), possibly 4716–4704 cal BC (68.3% prob.), lasted up to 37 years (95.4% prob.), possibly just 11 (68.3% prob. Figure 9). According to the model, the end of late Neolithic occupation in the area of the site where trenches 4 and 5 were located is modelled at 4720–4673 cal BC (95.4% prob.; Figure 7), possibly 4715–4694 cal BC (68.3% prob.).

Comparing the absolute chronology of this part of the site from the aspect of relative chronological schemes, the Late Neolithic Vinča period use of space in trenches 4 and 5 at the Late Neolithic settlement on At coincides with the early Vinča D phase (Whittle et al. 2016, p. 31), a fact corroborated by finds of some specific late phase bowls, like the biconical bowls with inverted rims, a very typical form of the late Vinča period phases. These bowls, although existent in the assemblage, are not as dominant as they appear towards the end of the Vinča D phase on other sites when they become almost the only bowl type (Garašanin 1979, tbl. I/1, III/3, IV/4, VI/2; Mirković-Marić et al. 2021b). This occupation on At would correspond to layers between 4.0 and 3.5 meters relative depth on the Belo Brdo site in Vinča.

Conclusions

The Bayesian chronological modelling illustrated here is a powerful tool for deciphering and understanding chronological relations in prehistoric periods. Using a combination of techniques available to an archaeologist of today, it can create a robust chronological scale, with specific fixed points in absolute time, that can be a basis for detailed archaeological research in any area. However, the ending results can only be as good as the data they rely on, i.e., the excavated material, its recording at the time of the excavation and keen scrutiny of the processes that created the deposits excavated. Through this chapter, we hope that we have been able to demonstrate the potential of archival records, often created several decades ago, to produce new information using methods unavailable at the time of their creation. We must also stress that keeping larger volumes of raw data, i.e. the finds is by all means necessary, no matter how much it complicates the everyday activities of Institutions that store it. For example, when our project started in the autumn of 2020, we were unsure whether the state of preservation of the At archives was sufficient to achieve any results from it. Luckily, it has proven that our doubts were unfounded in the end, enabling us to present a meaningful chronological sequence for a significant period in the region. We were able to produce formally modelled estimates for almost the whole of the duration and timing of Late Neolithic in Serbian southeast Banat, a region linking the core area of the Vinča culture south of the Danube and its expanse into the Carpathian Mountains.

Having examined the newly created chronology of the site of Potporanj, we can argue that the expansion of the Vinča style material culture into the northeast regions started early, perhaps within just a generation or two after the forming of the Belo Brdo site, 70 kilometres to the south. Off course, this proposition should be taken *cum grano salis*, as Potporanj could be even earlier, but limited excavations done so far have prevented us from being entirely sure. We can see that the settlement evolution is a stable, steady growth that extends over multiple generations, further corroborated by the sheer thickness of the culture layers created by the prolonged life of the Late Neolithic settlement. The model also supports the notion of continuity of material culture as the phases extend for longer periods, a fact that will possibly be further examined in detail when the statistical and typological analysis of the finds is completed in the near future. Perhaps then, we will be able to distinguish further subphases that will illustrate better a gradual, subtle evolution of material culture, which could then enable us to construct even more precise, generational, or two-three generational chronological models with shorter subphasing spans and life cycles. The cessation of Late Neolithic life on Potporanj remains yet another exciting episode to investigate further, now especially in the light of its chronological position, towards the

Gradac transitional phase and the onset of the Vinča C phase, a period profoundly infused with transformative processes that include the invention of copper metallurgy, copper implements emergence, spread and consumption, but also the emergence of a host of new settlements throughout the region (Lazarovici et al. 2009; Ristić-Opačić 2005) and a distinct change in material culture.

The ending of the Vinča period in Serbian southeast Banat can be examined on the site of At. There, so far at least, the latest material of the Vinča period was discovered over several excavation seasons, especially during the 1970s. Examining the finds from two trenches with adequate dating material available closely, it was possible to establish three different ceramic phases. These, however, appear to date to a relatively short period, indicative of the beginning of the Vinča D phase rather than its ending period. A rather dynamic episode of events over a relatively short period occurred and marked the end of the Vinča occupation of the site. From the Bayesian modelling, it can be suggested that the ending phase of the Vinča settlement at At did not unfold to the full extent 70 kilometres further to the south, on the type site of Belo Brdo. Perhaps in the case of At, the ending of the typical Vinča style ceramics settlement is not the end of the occupation. Some authors (Draşovean 2015, 2014, 1997) suggested that the Foeni pottery-style communities dominated the Vinča D period in the Banat area. Indeed several fragments of what appear to be Foeni red painted ware with geometric decorations are known from the site of At (Plate 3: 15–16), but no secure context containing Foeni pottery has ever been excavated on the site, and we cannot thus corroborate the existence of a Foeni type pottery settlement here. The contemporaneity of late Vinča C and Foeni I, as suggested by Draşovean (2014, Figure 7b) using Bayesian chronological modelling, could indicate the origin of these pieces rather than establish the existence of a Foeni settlement on At, but further research may prove different. The extinction of the Vinča pottery style settlement on Uivar, another late Vinča period site in the relative vicinity (Draşovean 2014, pp. 146–147), clearly suggests a possibility that Vinča period settlements in Serbian Banat met a fiery end somewhat sooner than the Danubian settlements further south, possibly due to destructive force of incomers (Draşovean 2015, p. 133). However, more research is needed in the area to understand better the processes that occurred at the end of the Late Neolithic and the beginning of the Eneolithic in the Serbian southeast Banat. We hope that our work presented here will provide that necessary incentive to restart systematic research of the site of At, possibly the largest of all late period Vinča sites in the region of the town of Vršac in Serbian Southeast Banat.

Acknowledgements

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Laboratory Nr.	Sample Ref.	Material	Stratigraphy	14C age (BP)	C:N
DeA-32303	POT 01/2013	Charred wood	Trench 2, spit 10	6028 ±39	
DeA-32304	POT 03/2013	Charred wood	Trench 2, spit 12, structure remains	6070 ±30	
DeA-32297	POT 06/2014	Sediment (macro charcoal not found)	Trench 2, spit 17, floor level	5952 ±28	
DeA-32298				6218 ±31	
DeA-32305	POT 07/2014	Charred wood	Trench 2, spit 17, floor level	5947 ±31	
DeA-32626	POT 01/2018	*Bos taurus,* maxilla	Trench 2a, spit 14, structure 8	6195 ±34	4.7
DeA-32306	POT 04/2018	Charred wood	Trench 2a, spit 16 under structure 6/2 (oven)	6106 ±30	
DeA-32307	POT 15/2018	Charred wood	Trench 2a, spit 17, structure 8/2	6010 ±30	
DeA-32299	POT 18/2018	*Cornus* mas stone	Trench 2a, spit 13	6042 ±29	-
DeA-32300	POT 18/2018			6139 ±31	
DeA-32308	POT 02/2019	Charred wood	Trench 2, structure 2/1	6057 ±33	
DeA-32309	POT 04/2019	Charred wood	Trench 2A, spit 19, post hole, bottom	6035 ±31	
MAMS-22666	POT 01/2012	Charred wood	Ditch 1 – crossection	6156 ±30	
MAMS 22668	POT 03/2012	Animal bone	Ditch 1	6211 ±25	
MAMS 22667	POT 02/2012	Charred wood	Ditch 1	6139 ±29	
BRAMS-3555	POT 03/2015	Charcoal	Trench 12, spit 13, Structure floor	6069 ±19	
MAMS-40078	POT 01/2018	Charcoal	Trench 2, spit 14, beneath house floor	6158 ±19	
Poz-69769			Trench 2, spit 14, beneath oven	6190 ±40	
BRAMS-3556	POT 03/2018	Charcoal	Trench 2a, Spit 17, Structure 7	6161 ±19	
MAMS-40081	POT 04/2018	Charcoal	Trench 2a, spit 17, structure 8, floor	6290 ±22	
Poz-70082			Trench 2a, spit 17, structure 8, floor	7180 ±50	
Poz-69770			Trench 2a, spit 17, structure 8, floor	6180 ±50	
MAMS-40080	POT 03/2018	Charcoal	Trench 2a, spit 17-1, structure 8, oven	6221 ±19	
MAMS-40079	POT 02/2018	Charcoal	Trench 2a, spit 17-4, structure 8, bottom	6227 ±20	
SUERC-73524		*Bos taurus*, bone	Trench 2, Structure 1, oven bottom, west area	6217 ±31	3.2
BRAMS-3557	POT 03/2019	Charcoal	Structure Z, 2/1	6163 ±19	

Table 1. *List of 14C samples used to create Bayesian chronology of Potporanj.*

Laboratory Nr.	Sample Ref.	Material	Stratigraphy	14C age (BP)	C:N
BRAMS-5261*	AT 76/2/1	*Cervus elaphus*, phalanx 1	Trench 4, spit 1	5828 (±27)	2.71
BRAMS-5262	AT76/9/2	*Bos taurus*, radius	Trench 4, spit 1	5829 (±27)	2.71
BRAMS-5263	AT 76/4/2	*Cervus elaphus*, metacarpal	Trench 4, spit 2	5857 (±27)	2.72
BRAMS-5264**	AT 76/11/2	*Bos taurus*, metatarsal	Trench 4, spit 2, Feat. 2	5836 (±27)	2.73
BRAMS-5265	AT 76/6/2	*Bos taurus*, metatarsal	Trench 4, spit 3	5847 (±27)	2.71
BRAMS-5266	AT 76/5/2	*Cervus elaphus*, metatarsal	Trench 4, spit 3	5834 (±27)	2.73
BRAMS-5267***	AT 76/6/1	*Cervus elaphus*, metatarsal	Trench 4, spit 3	5836 (±27)	2.73
BRAMS-5268	AT 76/8/3	*Bos taurus*, metacarpal	Trench 5, spit 3	5833 (±27)	2.72
BRAMS-5269	AT 76/8/4	*Bos primigenius*, metacarpal	Trench 5, spit 3	5858 (±27)	2.71
BRAMS-5270	AT 76/7/3	*Cervus elaphus*, metatarsal	Trench 5, spit 4	5849 (±27)	2.70
BRAMS-5271	AT 76/7/4	*Bos taurus*, metacarpal	Trench 5, spit 4	5792 (±26)	2.71
DeA-28873	AT 76/9/1	*Cervus elaphus*, radi+ulna	Trench 4, spit 1	5835 (±37)	3.5
DeA-28874	AT 76/3/1	*Cervus elaphus*, metatarsal	Trench 4, spit 1	5859 (±46)	3.7
DeA-28875	AT 76/11/1	*Bos taurus*, tibia	Trench 4, spit 2, Feat. 2	5830 (±41)	3.5
DeA-28876	AT 76/5/1	*Bos taurus*, metatarsal	Trench 4, spit 3	5965 (±49)	3.5
DeA-29963	AT 76/1/1	*Bos primigenius*, metacarpal	Trench 4	5814 (±64)	
DeA-28877	AT 76/1/3	*Bos taurus*, radius	Trench 4	5893 (±48)	3.4
DeA-28878	AT 76/8/1	*Cervus elaphus*, metacarpal	Trench 5, spit 3	5882 (±41)	3.2
DeA-28879	AT 76/8/2	*Bos taurus*, humerus	Trench 5, spit 3	5896 (±39)	3.0
DeA-28880	AT 76/7/1	*Cervus elaphus*, tibia	Trench 5, spit 4	5864 (±39)	3.3
DeA-28881	AT 76/7/2	*Bos primigenius*, metatarsal	Trench 5, spit 4	5815 (±41)	
DeA-31045*	AT 76/2/1	*Cervus elaphus*, phalanx 1	Trench 4, spit 1	5947 (±38)	3.2
DeA-31046	AT 76/10/1	*Bos taurus*, metatarsal	Trench 4, spit 1 (or 3)	5816 (±37)	3.3
DeA-31047**	AT 76/11/2	*Bos taurus*, metatarsal	Trench 4, spit 2, Feat. 2	5813 (±34)	3.3
DeA-31048***	AT 76/6/1	*Cervus elaphus*, metatarsal	Trench 4, spit 3	5857 (±37)	3.2

Table 2. *List of 14C samples taken for At site. Samples marked with *, ** and *** are replicate 14C samples.*

PLATE 1

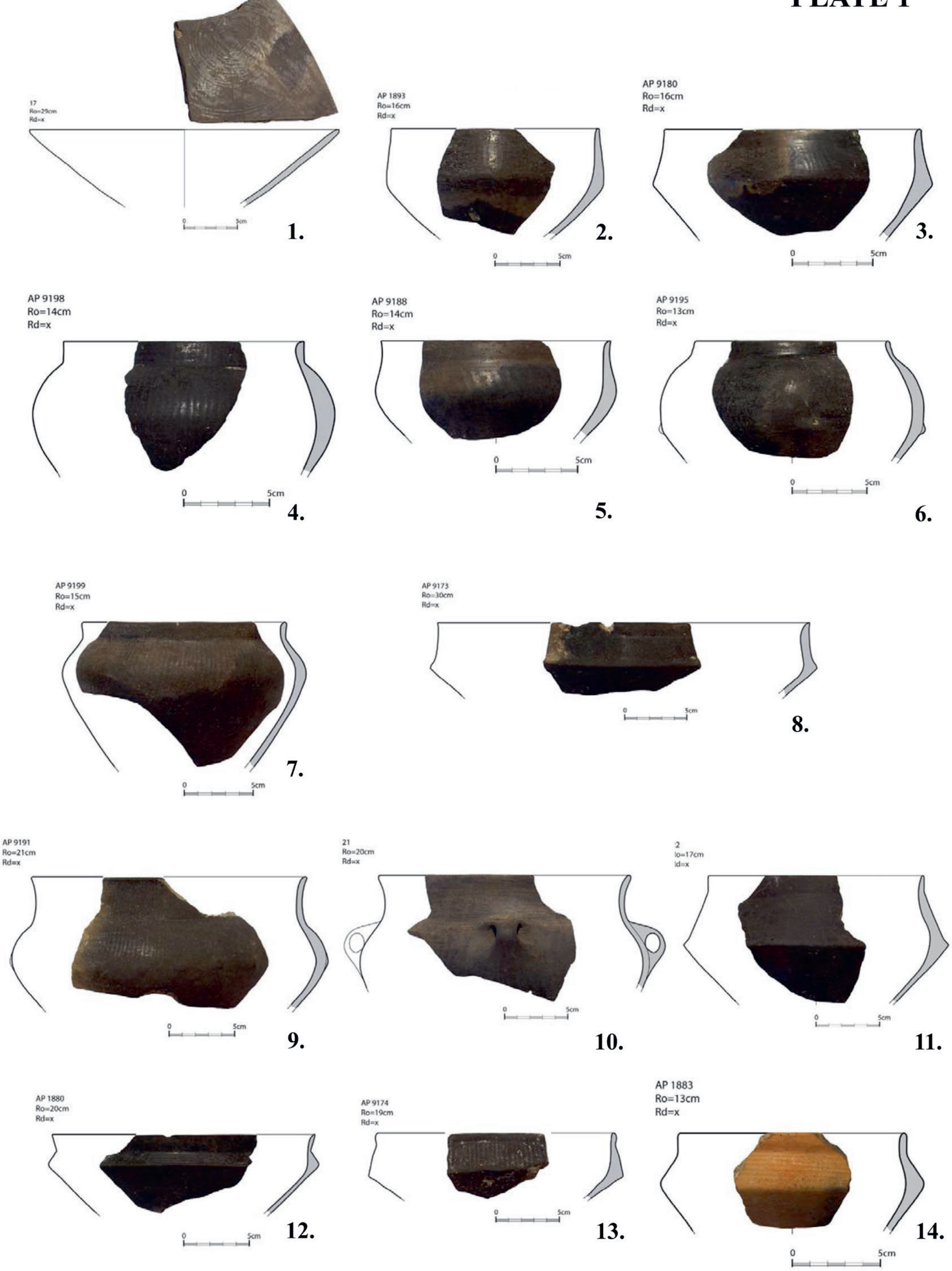

Plate 1. *Early period Vinča style pottery from the site of Potoranj*

PLATE 2

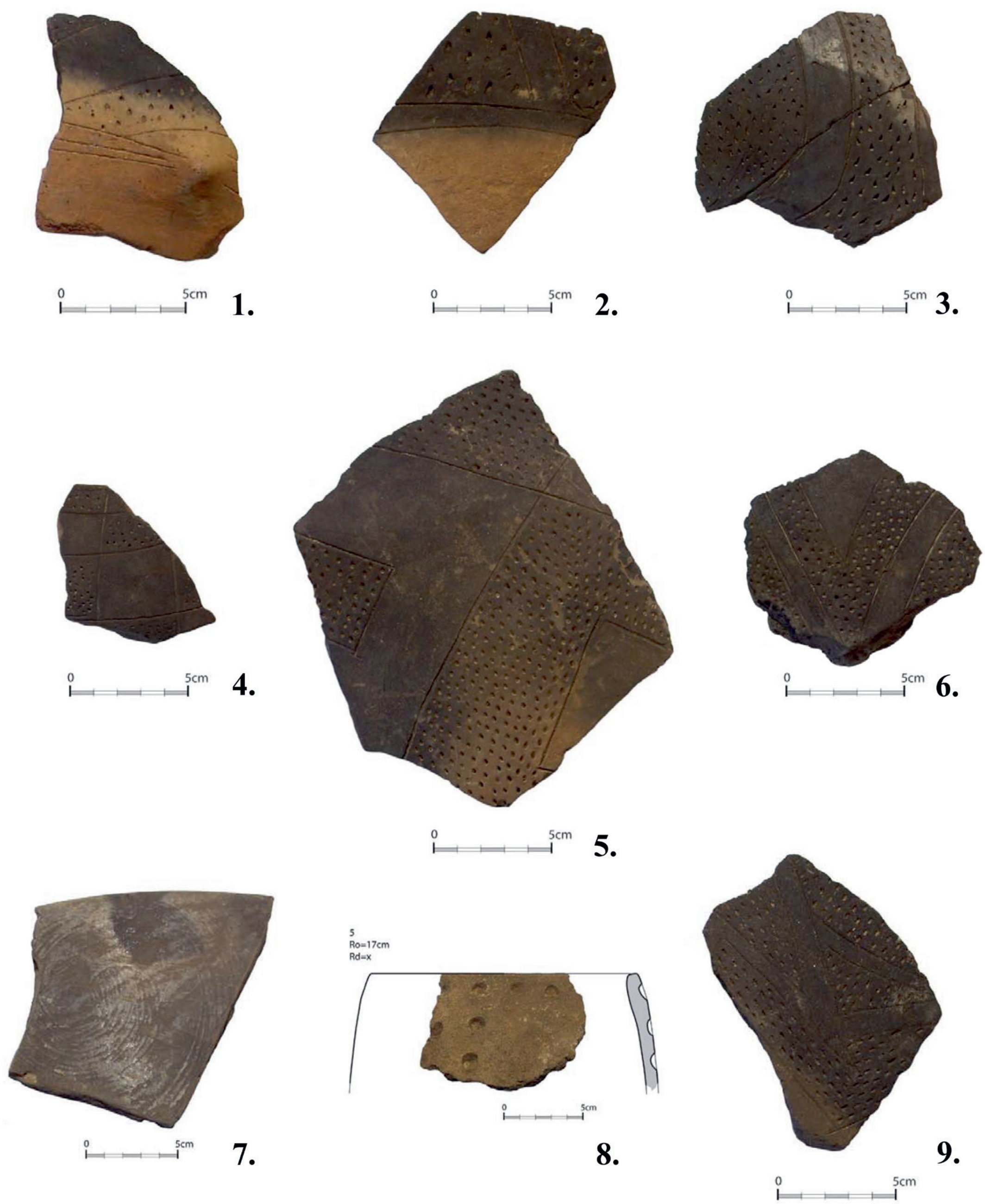

Plate 2. *Selection of typical early period Vinča style pottery decoration from Potporanj*

PLATE 3

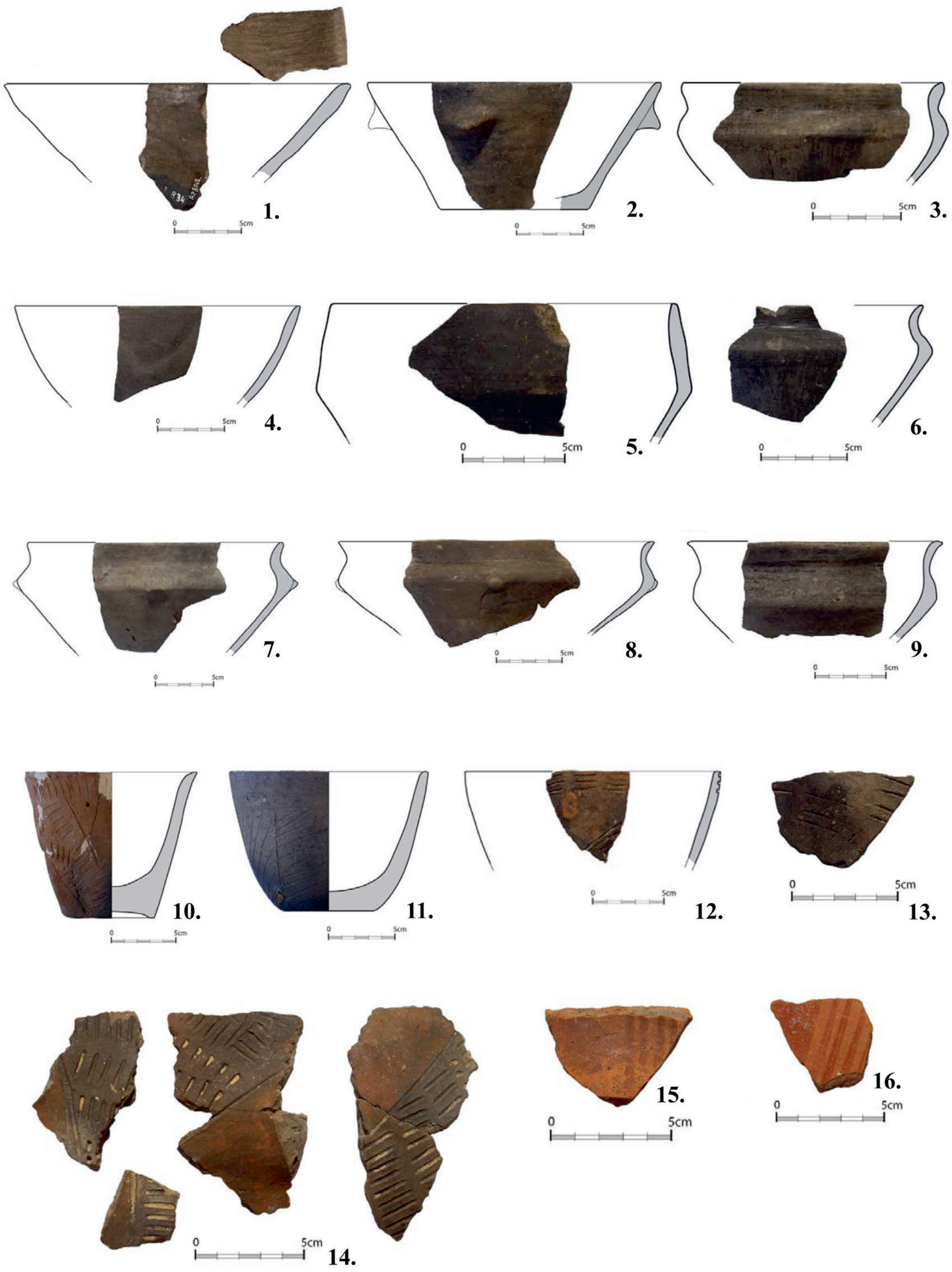

Plate 3. *Late period Vinča style pottery and non-local pottery from the site of At*

PLATE 4

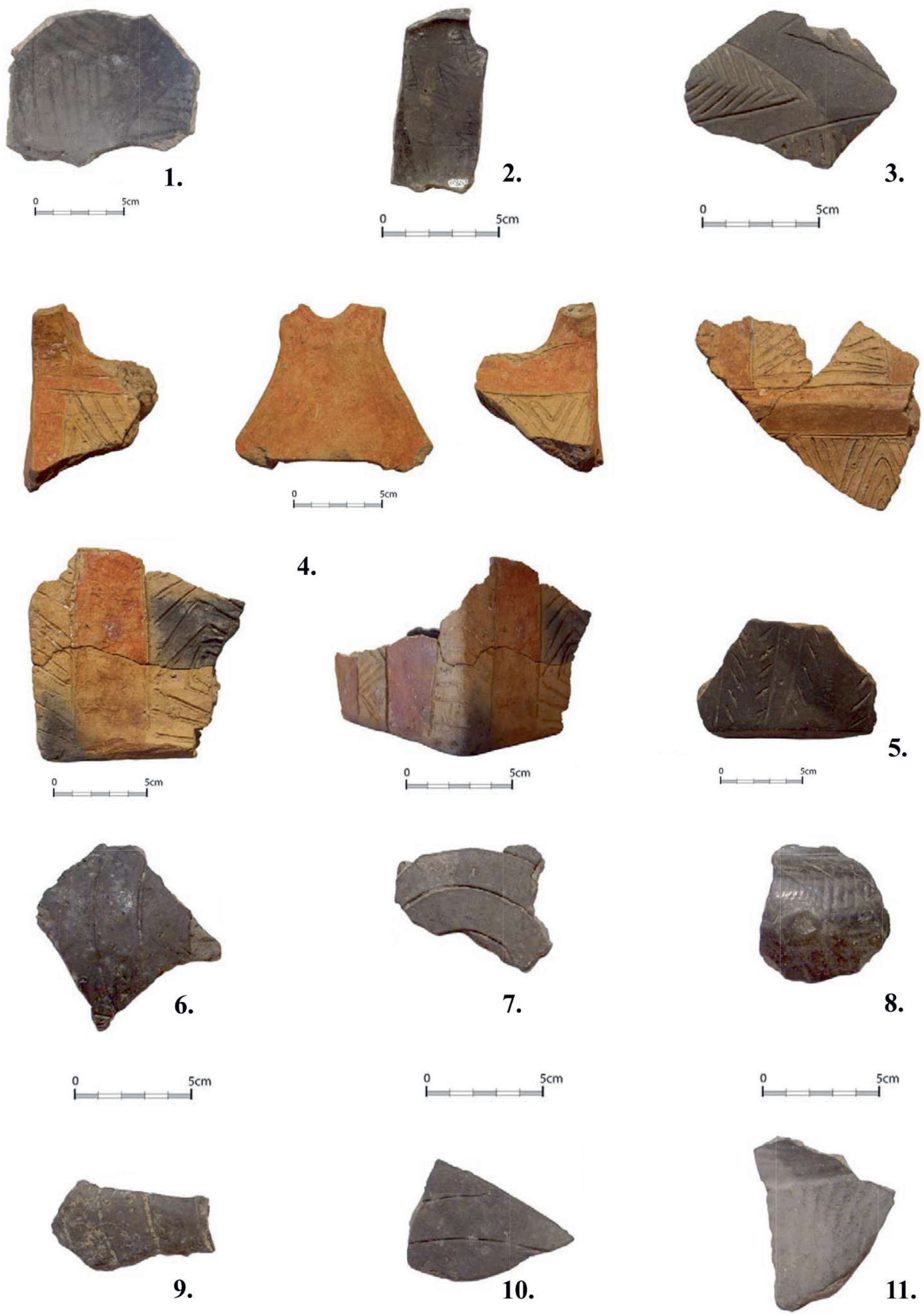

Plate 4. *Selection of typical Late Neolithic decorations of Vinča style and Linear pottery style from At*

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