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New Insights into the Later Stage of the Neolithisation Process of the Central Balkans. First Excavations at Svinjarička Čuka 2018

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Abstract
This article discusses recent findings from the newly identified archaeological site of Svinjarička Čuka, situated next to the Southern Morava River in southern Serbia. We will present the latest results from the excavation, material studies, bioarchaeological analyses and contextualised radiocarbon data, focusing on the Starčevo Neolithic horizon within the context of the new NEOTECH project. The interdisciplinary approach aims to shed light on the Neolithisation process of the region along one of the main communication routes between the Aegean and the Danube by the Axios-Vardar-Morava river system. The work so far has uncovered remains of Early to Middle Neolithic features dating around 5600 calBC, with analyses of faunal remains, ceramics and lithics contributing new insights into animal exploitation, raw materials and technological practices during this important time of socio-economic transition.

Keywords
Neolithisation, Starčevo, Bronze Age, Serbia, Balkan archaeology, South Morava River, Material studies.

Zusammenfassung – *Neue Einblicke in die entwickelte Phase der Neolithisierung auf dem Zentralbalkan. Erste Ausgrabungen in Svinjarička Čuka 2018*

Der neu entdeckte Fundort Svinjarička Čuka an der südlichen Morava in Südserbien wird in diesem Beitrag mit ersten Ergebnissen zu ausgegrabenen Befunden, Materialstudien, bioarchäologischen Analysen und kontextualisierten Radiokarbondaten präsentiert. Der Fokus liegt dabei auf ersten Erkenntnissen zum neolithischen Starčevo-Horizont in dieser Region, die auch im Zentrum des neuen NEOTECH-Projekts stehen. Die interdisziplinären Forschungen konzentrieren sich auf die Neolithisierungsprozesse entlang der Flüsse Axios, Vardar und Morava, die eine der zentralen Kommunikationsrouten zwischen der Ägäis und der Donau darstellen. Die Befunde des frühen bis mittleren Neolithikums datieren um 5600 calBC und werden gemeinsam mit den technologischen Ergebnissen zur Keramik und Lithik im größeren Zusammenhang der Neolithisierung diskutiert.

Schlüsselbegriffe
Neolithisierung, Starčevo, Bronzezeit, Serbien, Balkanarchäologie, Südliche Morava, Materialstudien.

1. Introduction

Understanding the Neolithisation process of the Balkans has long been a focus in prehistoric archaeology, with investigation providing large amounts of primary data and related foundational studies.[1] Research has already examined many aspects of the transformation of hunter-gatherer societies into permanent settled farming communities on the central Balkans, broadly discussing themes such as pottery decoration and typologies, symbolism, and chronologies, providing a good framework for a broad range of archaeological questions. A key outcome of these studies

1 Milojčić 1950. – Childe 1957. – Srejović 1969. – Gimbutas 1974. – Garašanin 1979. – Chapman 1981. – Kozłowski, Kozłowski 1982. – McPherron, Srejović 1988. – Pavúk 1993. – Perić 2001. – Whittle et al. 2002. – Manson 2008. – Krauss 2010. – Borić et al. 2018.

Fig. 1. Map of Neolithic sites in the central Balkans discussed in the text (Map: M. Börner, OREA).

has been the definition of particular 'cultural groups' (e.g. Karanovo, Starčevo, Gălăbnik) alongside synchronised sequences of pottery-based chronologies of various Balkan sub-regions, more recently supported by radiocarbon data.[2] The Starčevo horizon marks the beginnings of the Neolithic on the central Balkans, starting slightly before or around 6000 BC[3] and mainly relates to the modern territories of Serbia and southeast Hungary.

Whilst eastern Balkan early farming communities show strong correlations to northwest Anatolia in terms of the impact of early house-based societies,[4] the picture from the central Balkans remains unclear. The phases of so-called Proto-Starčevo or Starčevo I (also Gălăbnik or Anzabegovo-Vršnik I) represent the beginning of the Neolithic in the areas of North Macedonia and Serbia,[5] with around 20 sites dating to this initial phase (final centuries of the 7th millennium BC) known in the region (Fig. 1). Discussion of these sites includes the chronology, material culture, subsistence systems, site and social-economical organisation (mobility, nomadic/semi-nomadic, sedentism etc.), the results of which indicate that the initial Neolithic in the Serbian and wider

2 Whittle et al. 2002. – Borić et al. 2018. – Shennan 2018.

3 Recently published broad results for the Carpathian Basin and Hungary in particular by Bánffy 2019.

4 Bailey 2000. – Özdoğan 2013.

5 Manson 2008. – Pavúk 2016.

Balkan regions was a period of complex socio-economic change, with communities displaying varied developmental trajectories. Whilst on-going research in central and northern Serbia (esp. Vojvodina) is providing new insights into both the anthropological and chronological aspects of the Starčevo societies (EUROFARM, BIRTH),[6] the patterns and the characterisation of Early Starčevo in southern Serbia and beyond is still lacking. Moreover, whilst pioneering, early excavated and published data do not allow us to coherently trace the main elements of the so-called 'Neolithic package' and the timing of its appearance in Serbia and the wider Balkans. Instead, evidence of house-based societies, with early farming, animal husbandry, pottery production etc. in this region are mainly known from Late Neolithic times (esp. from the Vinča horizon).[7] Further, the relations of farming communities, and the meaning behind elements of shared material culture concepts between the Aegean and the Danube during the onset of the Neolithic are still nebulous.

2. Technologies and the Built Environment of Central Balkans Early Farmers

The NEOTECH project aims to shed new light on the character of the Neolithisation process in the Balkans by analysing the built environment in combination with the potential impact of new social and cultural technologies. Both will be broadly analysed in later stages of the project based on new data, but will constitute the starting point as the main framework of the four year project.

The adoption of two aspects in the region is crucial – living in house-based communities, and integrating new technologies for the production of material culture. NEOTECH aims to examine the impact of human-material relations with a special focus on house-societies, and lithic and ceramic technologies. It will place new data from Svinjarička Čuka (and comparative sites in the Republic of North Macedonia, Anatolia and Greece) within the wider context of the Neolithisation process in the Balkans to investigate how the trends identified fit within wider discussions of the nature and spread of the key elements associated with the introduction of the Neolithic way of life.

The introduction and widespread adoption of house-based societies, pottery making, developments in lithic technology and raw materials in the Early Neolithic, offer an exciting and important opportunity to explore shared cultural concepts, innovation, technological transfer, raw material procurement strategies and spheres of contact/influence during this time of societal transition. Significantly, although work in Serbia and the wider Balkans has discussed the appearance and distribution of particular pottery styles and chipped stone technologies during the Neolithic, much of the research is embedded within traditional concepts of diffusion based on typology and decoration, with very few analytical investigations of the potential locations of production and technological practices.[8] Further, there is currently a lack of research to characterise and explain elements of continuity, innovation and discontinuity during this time of significant societal development beyond ideas of cultural diffusion and migration. As such, although we have a solid understanding of the location and distribution of particular ceramic types, and broad changes in lithic raw materials and technology, the absence of analysis to test ideas of provenance and distribution means we are unable to explain the trends observed. Importantly, we are not able to fully address why and how different developments took place, particularly in relation to the broader changes seen as part of the Neolithisation process. Therefore, it is currently unclear how technological innovations came about or their different trajectories in Early Neolithic communities, associated with new emergent identities and lifeways.

Most striking is the lack of evidence for the built environment in the Early Starčevo zones (esp. central and northern Serbia), which is considered a key element in the Neolithisation process in areas further south. The development of the Neolithic village system, centred on house-based societies, is considered as a trigger in the process of sedentism, leading to the establishment of permanent settlements.[9] This socio-cultural decision of linking a community's activity zone to a permanent location (village) is a multifaceted, rather than a linear, process related to many things, such as moving from mobile hunting and gathering towards farming and herding.[10] However, there is currently a lack of consistent evidence for cultivated crops (in contrast to the evidence of domesticated animals) at Early Starčevo sites, which may, in large part, be the result of the current state of research[11] and requires a state-of-the-art scientific approach to clarify.

6 EUROFARM project: https://cordis.europa.eu/result/rcn/219270_en.html (last access 27.5.2019). – BIRTH project: https://new.ercbirth.com/ (last access 27.5.2019). – As results see for example Orton, Gaastra, Vander Linden 2016. – Porčić, Blagojević, Stefanović 2016.

7 Chapman 1981. – Marinova et al. 2013. – Bogaard, Halstead 2015.

8 For notable exceptions see Yiouni 1996. – Logar et al. 2004. – Vučković, Svilar 2016. – Spataro et al. 2019.

9 Bailey 2000.

10 A good overview of the discussion is presented in Sommer, Astaloş 2015. – For subsistence strategies see Scheu 2012. – Bogaard et al. 2013. – Orton, Gaastra, Vander Linden 2016.

11 Filipović, Obradović 2013. – Marinova et al. 2013.

With this in mind, the well-known 'pit structures' seen as the primary 'built remains' at almost every Early Starčevo site are of particular interest. These subterranean structures are interpreted as pit-huts, subterranean dwellings, pit complexes or even pit-houses,[12] although debates surround their purpose, for example Vassil Nikolov has suggested Bulgarian examples are 'pit sanctuaries'.[13] In the context of long-term debates, Starčevo pits in Serbia have been examined in terms of their length of usage and their primary function,[14] for example, in Blagotin the spatially organised pits are seen as indicators for a short-term occupation by a relatively mobile society.[15] However, the pit structures also show a functional diversity, like in Zadubravlje,[16] but seldom an individual domestic character,[17] and have been linked with northeast Mesolithic traditions[18] or regions north of the Körös-Starčevo complex.[19] As such, it is still unclear if these pits were temporarily used as camps and/or were part of distinct social units, and later house societies as forerunners of the Late Neolithic village system.[20] Finally, consideration of activities undertaken outside of the pits[21] may also offer some insights such as the presence of surface-level buildings alongside the pit-structures, as suggested by Eszter Bánffy.[22]

A significant difficulty is the current understanding of the spatial distribution of Early Starčevo sites which are primarily known from central and northern Serbia,[23] with an absence of systematic data from the south (except Drenovac excavated by Slaviša Perić).[24] This is particularly problematic as the area along the South Morava River has the potential to shed new light onto the nature of this cultural horizon and ongoing debates, being situated close to the northern Aegean zone, where Paliambela as one of the 'Neolithic pioneers' is located, showing comparable pit structures in its oldest occupation phase.[25] Additionally, the Morava-Vardar-Axios river system is well known as an important communication route between the Aegean and the central Balkans throughout history,[26] and therefore, most likely played a key role during the Neolithic.[27] As such, our archaeological and environmental investigations in the area, and particularly the discovery of the new site at Svinjarička Čuka, are providing crucial primary data to address questions related to the built environment and material culture of the Early to Middle Neolithic communities in this area.

These new field investigations are embedded in the broader *Pusta Reka Research Collaboration* initiated in 2017 as a collaboration between the OREA Institute of the Austrian Academy of Sciences (Barbara Horejs), the Archaeological Institute in Belgrade (Aleksandar Bulatović) and the Archaeological Museum of Leskovac. The regional focus of this collaboration lies in the Leskovac Basin with an area of c. 1,600 km², which was the location of the first permanent settling of the area in Neolithic times. The investigation focuses on landscape and environmental development and usage through prehistory, including changes from the Early Neolithic until the end of the Bronze Ages. An interdisciplinary survey in the area was conducted in 2017 including geophysics, core drilling, radiocarbon dating, GIS analyses and surface collections using intensive and extensive methods. The survey detected 20 prehistoric sites, with at least five having evidence for use in the Early to Middle Neolithic period (Fig. 1),[28] from which the highly promising site of Svinjarička Čuka was selected for the first systematic excavations, where remains of the Starčevo Neolithic horizon were expected. The aim of the first field season in 2018 was to test the nature of the archaeological remains and the potential for analyses within the aims of the NEOTECH project, with an additional study season in spring 2019 providing the opportunity to examine and record the excavated materials in detail in the Museum of Leskovac. The focus of this article is the newly identified site of Svinjarička Čuka, which is located in the Lebane district next to Caričin Grad, on a small-elevated river terrace. The first results of our work are presented below.

3. Excavations at Svinjarička Čuka in 2018

The first excavations at the newly detected site Svinjarička Čuka were conducted by an Austrian-Serbian team between 20.8. and 21.9.2018. The following presentation aims to provide an initial overview of the site's potential, which will be followed by more detailed studies (including

12 E.g. Flannery 1972. – Makkay 1982. – Bánffy 2013. – Sommer, Astaloş 2015.

13 Nikolov 2011.

14 Bailey 2000.

15 Greenfield, Jongsma 2006. – The idea of short-term occupation additionally suggested through the results of archaeozoological analysis, see Greenfield, Jongsma Greenfield, Jezik 2014.

16 Minichreiter 2001.

17 Hunter-Anderson 1977. – Bailey 2000.

18 Bogdanović 1988.

19 Makkay 1982.

20 Greenfield, Jongsma 2006. – Greenfield, Jongsma 2008.

21 Bailey 2000.

22 Bánffy 2013.

23 E.g. Karmanski 2005. – Bogdanović 2008.

24 Perić 2008.

25 Katsanis et al. 2008. – Recent excavations by Kostas Kotsakis recovered a complex system of pits which he kindly presented on-site to the authors and as a lecture at the OREA Institute on 21.11.2018.

26 E.g. Hänsel 1982. – Müller, Rassmann, Hofmann 2013. – Pavúk 2016.

27 Gurova, Bonsall 2014. – Krauss, Floss 2016.

28 Horejs et al. 2018.

quantifying methods and statistical analyses) in a later and more advanced phase of the project. Based on the results of the survey work conducted in 2017, two trenches were opened in the first excavation campaign of 2018 (Fig. 2) located at the foot of a hill-spur, nowadays visible as a flat terrace west of the Svinjarička River, where geophysical survey and core drilling indicated promising cultural layers.[29] Trench North 1 (N1) measured 15 m × 20 m and trench South 1 (S1) measured 10 m × 15 m. Both trenches were organised in grids of 5 m by 5 m, two of which were investigated intensively in each trench – grids R27–R28 in trench N1 (50 m²) and grids S22–T22 in trench S1 (50 m²). The surface was removed by a mechanical excavator, with subsequent archaeological excavation by teams of archaeologists and local workmen.

The stratigraphical outcome of both excavated trenches supports the geoarchaeological results by Steffen Schneider and Marlen Schlöffel, who suggested an increasing ground terrain of the fluvial sediments engulfing the hill-spur from south/southeast towards north/northwest.[30] The close vicinity of the excavation trenches to corings nos. 8–10 provides additional data about the thickness and extension of cultural deposits, as well as the potential erosion process in this area (Fig. 2). Cores taken in the area of the southern trench indicate the presence of anthropogenic layers to a depth of 2.30 m, of which 1.30–1.40 m has been excavated in grid S22. The rising ground towards the north indicates shallower cultural deposits, which were evident immediately underneath the modern surface, and have been excavated to a depth of c. 0.50 m in the grids R27–R28.

The excavated anthropogenic layers in both trenches provide a first insight into the potential of Svinjarička Čuka for the study of the Early to Middle Neolithic and the Late Bronze Age to Early Iron Age periods, as already suggested by the radiocarbon dates from cores nos. 7 and 10.[31] Deposits in good contexts of the Eneolithic period, evident from one ^{14}C date in core no. 7, have not been recovered in the excavated trenches so far. In addition to well-defined in-situ archaeological remains, there are stratigraphical units that appear to have been redeposited through anthropogenic and/or natural processes, such as erosion of material from higher up the sloping topography, that contain pottery, burnt remains etc.

The excavations were conducted stratigraphically based on a stratigraphical unit system after Harris.[32] Each single stratigraphical unit (SU) and interface (IF) is described, documented and positioned in relation to the other units. The stratigraphical relations are illustrated with a Harris matrix, which forms the backbone of all further analyses. The unique SU number is, moreover, the basis for all related finds, samples etc. defined in the project.[33] The excavated soils were dry sieved with selected SUs additionally wet sieved (flotated) in a flotation installation built by the projects' archaeobotanist, Dragana Filipović (methodology detailed in section 8.1).

The trench, and SU position and extent were recorded using the Leica Flexline TS06+ total station (WGS84/UTM zone 34N coordinate system). The precise location of each small find, sample, flotation soils etc. was also recorded using the total station. The units and trench profiles were documented with 3D photogrammetry (structure from motion), with selected phases (combined from several units) illustrated as digitalised plans. The trenches are related stratigraphically only via the surface (SU 1) and the topsoil layer (SU 1000 in trench N1 and SU 2 in trench S1) and, as such, will be presented separately. An overview of the methodology and stratigraphy are summarised below, for absolute dating please refer to section 3.3.

3.1. Stratigraphy of Trench N1

The first prehistoric features appeared immediately after removing the topsoil layer (SU 1000), indicating human activity across the whole extent of trench N1, a total of 300 m² (SUs 1001, 1002, 1004, 1010, 1026–1029) (Figs. 3, 4). Finds from different prehistoric periods were recorded, dating from the Neolithic, the Late Eneolithic, the Bronze Age and the Iron Age. Detailed excavations continued in grids R27–28, where several features were identified below the topsoil with mixed materials. Pit IF 1021 included deposits (SU 1007, 1015, 1023) with burnt daub, small to medium-sized stones (max. 8 cm) and ceramic fragments dating the feature to the Early Iron Age, although finds from earlier periods such as the Middle Bronze Age and Neolithic were also noted.

To the north of the pit lies a horizontally deposited thick layer with various Middle/Late Bronze Age features, including two possible post holes comprising of IF 1022 filled by SU 1008 and SU 1011, and IF 1031 filled by SU 1013 and SU 1014, and the Late Bronze Age contexts SUs 1003,

29 For detailed results of the surveys 2017 see Horejs et al. 2018.

30 Horejs et al. 2018, 41–44.

31 Horejs et al. 2018, 45 and Fig. 12.

32 Harris 1989.

33 The numerical system of the project is established as follows: The finds related to SU 12 are defined according to their category as CU18-12-1-1 ff. (1: pottery, 2: bones, 3: small finds, 4: lithics, 5: metals, 6: slag, 7: grinding stones, 8: burned clay, 9: others, 10: flotation samples, 11: ^{14}C samples, 12–25: various material samples); each SU number exists only once at the site.

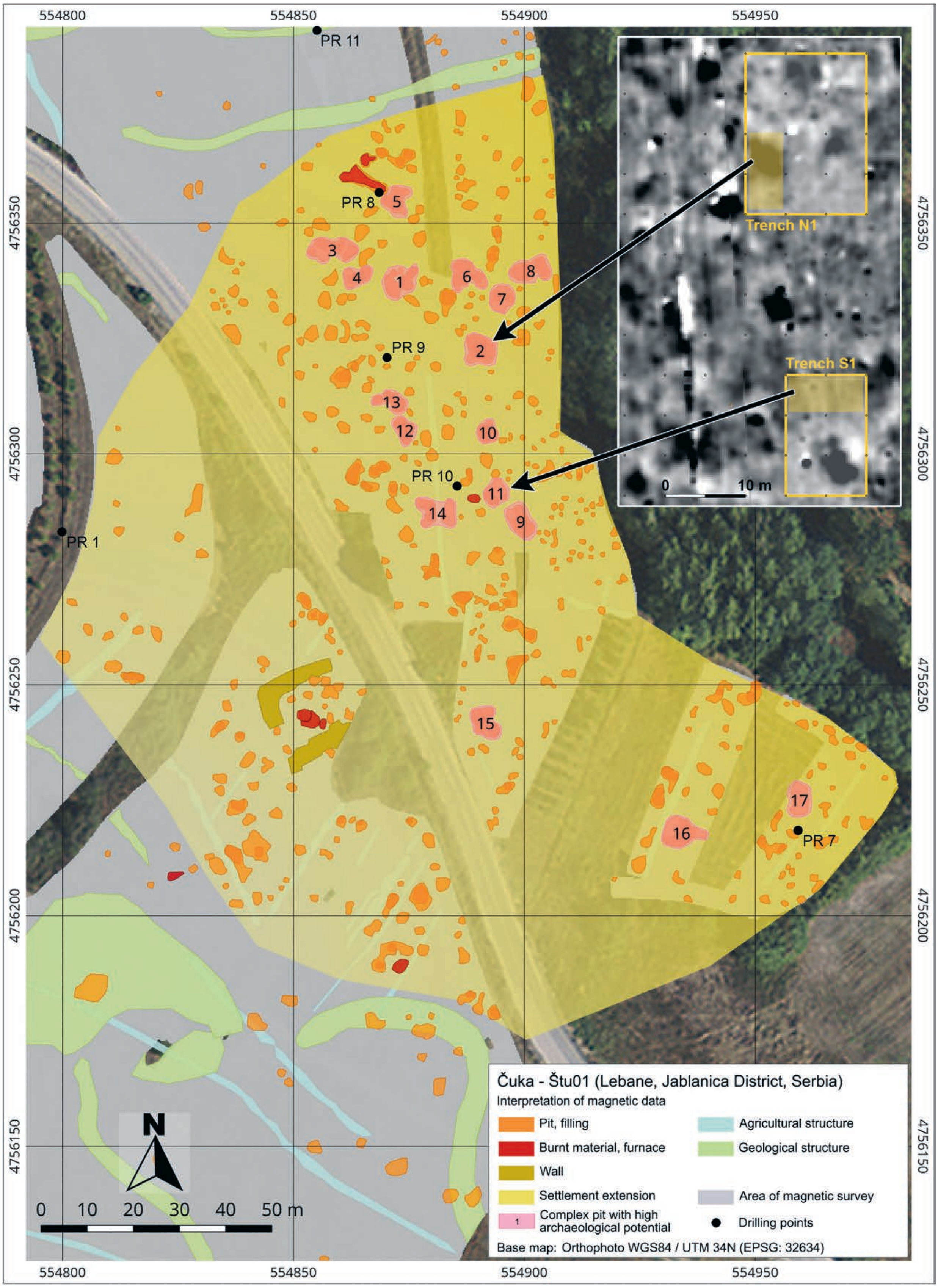

Fig. 2. Interpretation of geophysical survey results at Svinjarička Čuka (after Horejs et al. 2018, 38 and Fig. 8) and location of the excavation trenches N1 and S1 linked with the geomagnetic anomalies (Map: M. Börner, OREA).

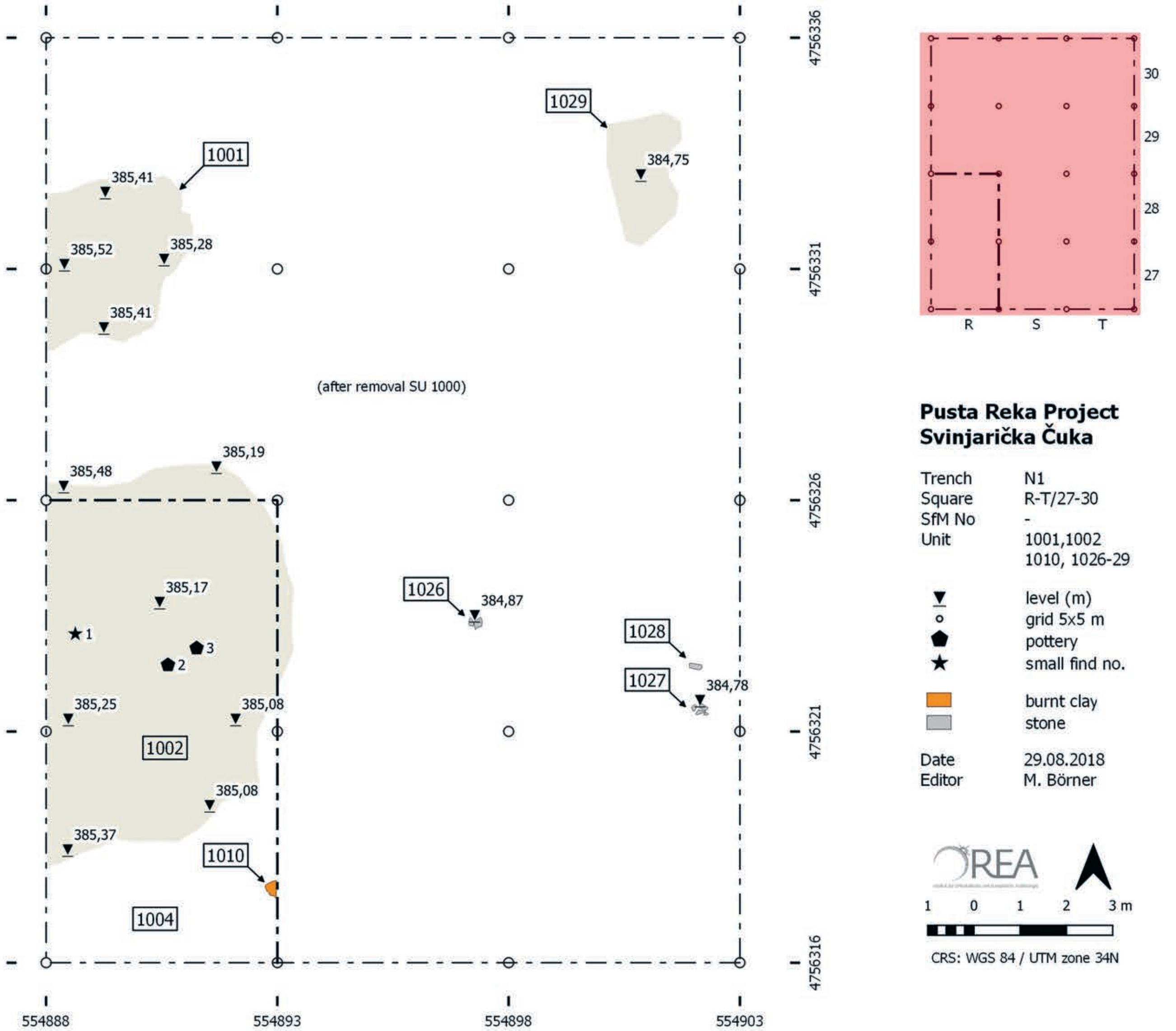

Fig. 3. Uppermost archaeological features in trench N1 at Svinjarička Čuka after removing the humus (Plan: M. Börner, OREA).

1016, IF 1030, 1017, IF 1020 (Fig. 4). These Middle/Late Bronze Age remains indicate a structure, most probably the elements of a house, lying upon a dark brown clayish layer (SU 1004) which includes lumps of daub and small to medium-sized stones (max. 10 cm). Below the structural feature, SUs 1012, 1018, 1019 were artificially defined due to the lack of a clearly visible stratigraphic differentiation. These dark brown clayish layers did not include any structural remains, but did contain fragments of burnt clay and lumps of daub with architectural impressions, with a total of 18 small finds and artefacts (also including older Neolithic ones). The mixed dating of the finds and difficulty in defining a consistent archaeological deposit indicates that these layers may have been redeposited. The location of the layers below the Bronze Age structural features indicates that their deposition took place in post-Neolithic times but before the potential Middle/Late Bronze Age house was installed. The last excavated feature SU 1024 is located in the northeast corner of the grid R28. This forms a 1.6 m × 1.9 m irregular deposit of brown sandy silt, containing huge amounts of burnt daub and clay, as well as fragments of animal bones, ceramics, pebble stones and small finds consistent with the Starčevo Neolithic period. The deposit appears to continue north and west but its full extent, as well as its relation to the horizontally extending brown clayish layer SU 1032, will be clarified in future excavation seasons.

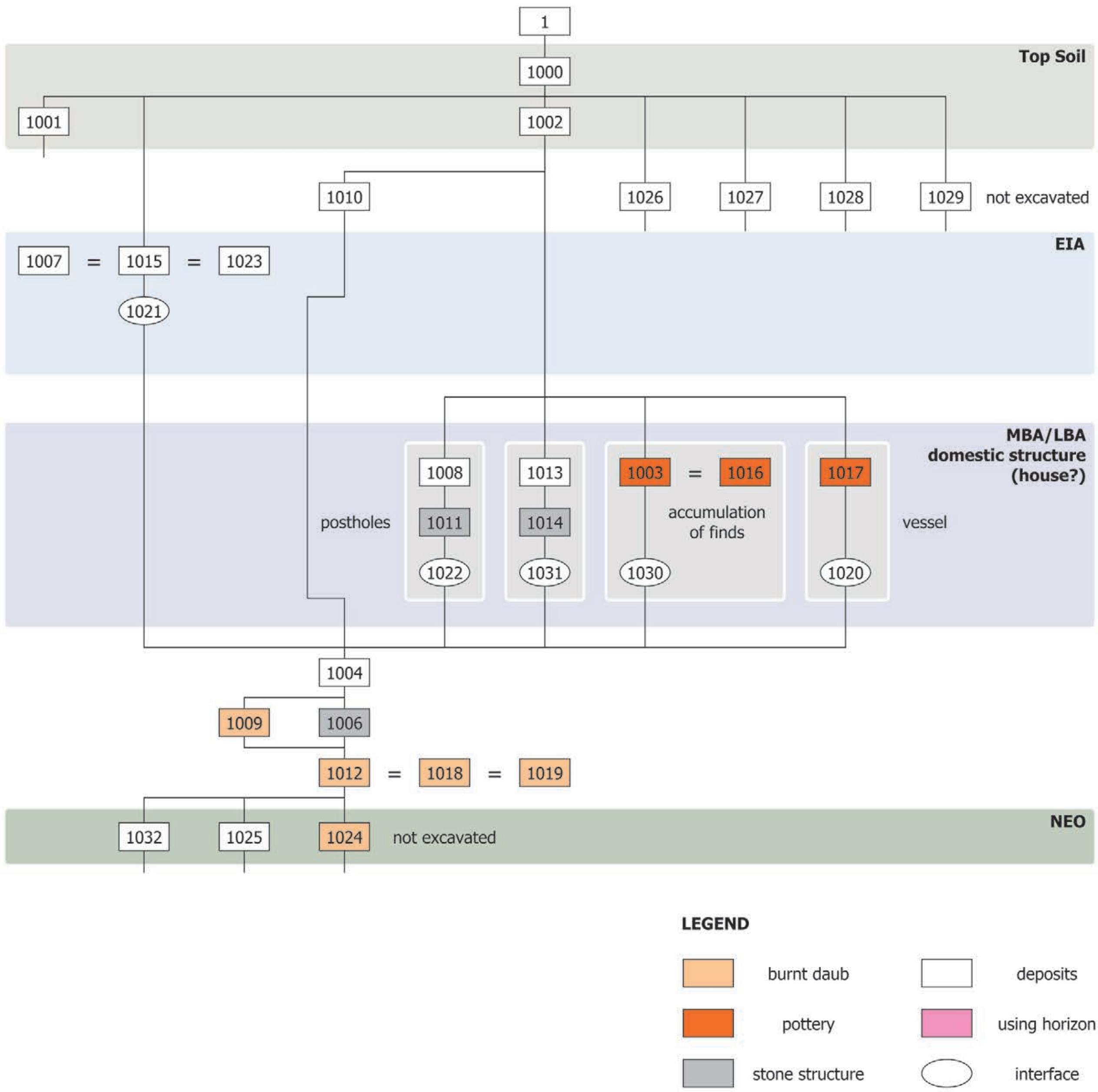

Fig. 4. Stratigraphical matrix of trench N1 at Svinjarička Čuka 2018 excavations (B. Horejs, D. Bochatz, M. Börner, OREA).

3.2. Stratigraphy of Trench S1

The uppermost and youngest layers in trench S1 (SUs 3, 4, 5, 7, 8 and 13) represent different kinds of clayish-humus-mixed soils within a sloping position from north/northwest towards south/southeast. The dark brown homogeneous sediments of SU 3 and 4 contains few artefacts, pebbles and roots. SU 5 lay at a depth of 0.25–0.45 m and is characterised as a dark grey to brown clayish deposit containing an abundance of small artefacts (e.g. ceramics and burnt daub), and small pebbles consistent with anthropogenic activities (Fig. 5), however, this layer seems to be redeposited, possibly from archaeological structures situated higher up, located further west or northwest.

Below these lay SU 7, the borders of which were not easily discernible and therefore artificially divided. The layer is defined as a dark grey to dark brown clayish layer with inclusions of ceramics and burnt daub fragments. A pit (IF 16) with unclear edges was first recognised in this level, situated at the western trench border in square S 22 (Fig. 5). The pit's filling of two levels (SUs 9 and 14) contains Early Iron

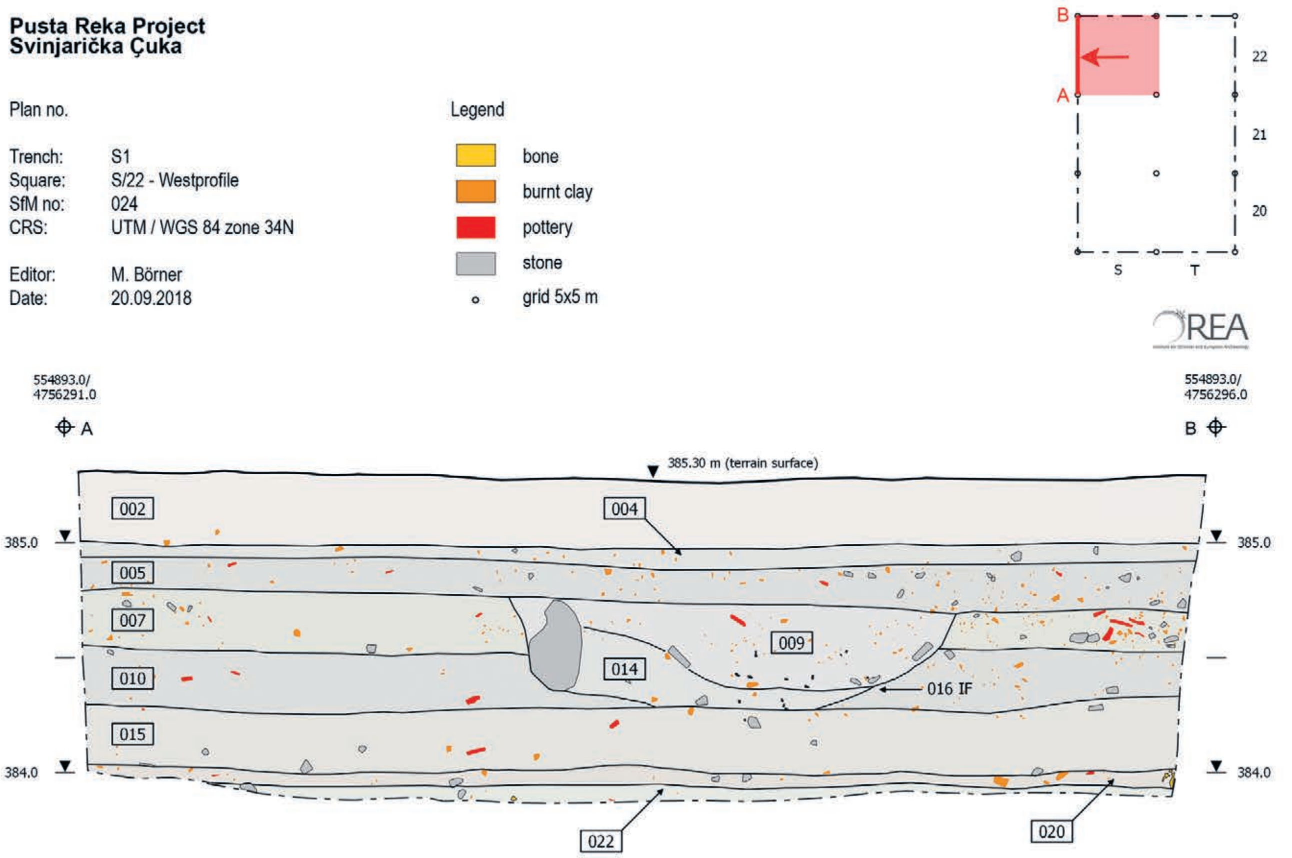

Fig. 5. Western profile of trench S1, grid S22 at Svinjarička Čuka after 2018 excavations illustrating the stratigraphy. – SUs 3, 4, 5, 7: Clayish-humus-mixed soils. – SUs 9, 14, IF 16: Early Iron Age pit. – SU 10: Potentially relocated dark clayish layer with mixed intrusions. – SU 15: Dark clayish horizontal filling layer. – SU 20: Neolithic filling with mixed intrusions. – SU 22: Filling horizon of Classical Starčevo phase. – SU 26: Clayish feature of Classical Starčevo phase (Drawing: M. Börner, OREA).

Age pottery. The pit cuts into SU 7, SU 10 and SU 15, and its excavated extent measures 1.86 m (north–south) to 1 m (east–west) with a depth of 0.65 m (Fig. 6). However, due to its continuance westwards beyond the area of excavation, the full shape and size of the pit remain unclear. This Iron Age pit and the layer SU 7 into which it is cut, represent the youngest activity at the site.

The following layers of horizontally deposited small stones and pebbles (SUs 12, 19) were detected only as small accumulations in square S22 (SU 12 lying upon SU 10) and in wider concentrations in grid square T22 (SU 19) (Fig. 7). The stone layer was mixed with fragments of pottery and small finds from various periods of the Neolithic, Late Bronze Age and Early Iron Age. Due to the absence of any structures related to this deposit and the later intrusions, it remains unclear if this horizon represents an in-situ deposit. These layers are related to SU 10 in grid S22, defined as a horizontal deposit of dark grey to dark brown clayish sediment sloping south and southwest, containing burnt daub and a few ceramic fragments. It was very difficult to separate SU 10 from SU 7 and the finds recovered from SU 10 are mixed in date, with artefacts from the Neolithic, Eneolithic, Late Bronze Age and Early Iron Age periods. This mixed dating of material and the unclear nature of the deposit indicates that it may have been redeposited. Future excavations in the neighbouring grids (S–T21) are expected to clarify the details of the deposition processes in this area, which generally show mixed deposits until c. 0.8–1.0 m underneath the modern-day surface (Figs. 5, 7).

The sloping deposition of sediments in the trench stops at about 0.85 m underneath the surface with SU 15 in grid S22, which appears as a horizontal layer (Fig. 5). The younger pit intrusion (IF 16) ends in this horizon, although its bottom was hardly recognisable. The massive dark grey to dark brown clayish layer, SU 15, includes small fragments of burnt daub and a large amount of ceramics and artefacts. The mass of 7,709 pottery fragments primarily date to the Starčevo Neolithic period, although a small quantity of

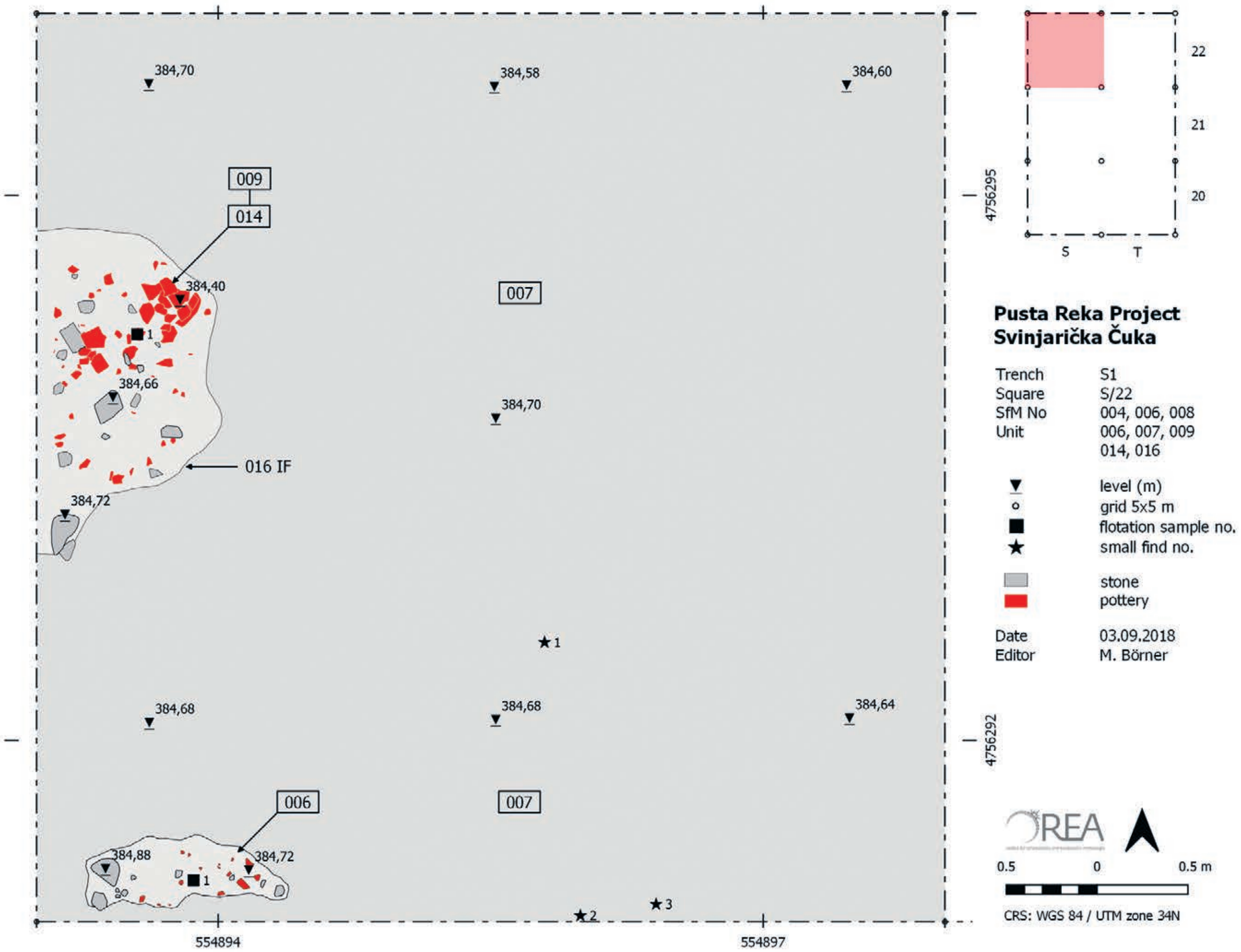

Fig. 6. Digitised archaeological features of an Early Iron Age pit (IF 16) and associated horizon of the dark clayish layer SU 7 excavated in trench S1, grid S22 (Plan: M. Börner, OREA).

distinctly post-Neolithic (Eneolithic, Late Bronze Age and Iron Age) vessel fragments were also recovered. In addition to the dominance of Neolithic pottery, the presence of 27 objects that include fragments of figurines, so-called 'cult tables', a ceramic spoon and discs, stone axes and spindle whorls, add support to a primarily Neolithic date for SU 15, and it represents a redeposited fill of Neolithic sediments in later times.

The increasing slope of the terrain towards the neighbouring eastern grid T22 probably explains the stratigraphically contemporaneous contents of the grey brown layer SU 29, which again indicates the deposition of soil and mixed materials from various periods. Like SU 15, the mixed deposit of SU 29 includes a large amount of ceramics, the majority of which can be dated to the Bronze Age. Neolithic, Eneolithic and Early Iron Age finds appear in smaller quantities. SU 34 contained pebble stones and not very significant ceramics dating mainly to post-Neolithic times, probably to the Bronze Age period.

SU 20 in grid S22 (c. 1.10–1.25 m below the surface) (Fig. 8) is a dark brown clayish layer rich in large fragments of well-preserved Neolithic pottery, and probably represents a filling horizon. It is stratigraphically related to SU 32 in grid T22, which has not yet been fully excavated. Below SU 20 are layers SU 22 (c. 1.25–1.40 m) and SU 30, which overwhelmingly contain Starčevo Neolithic finds and features discussed below. The increased abundance of Neolithic objects and decrease in material of mixed dating indicates that the excavations have reached good Neolithic deposits. The excavations in trench S1 stopped at the level of SU 30 and the related SUs 24–27, 33 and IF 35 in grid S22 (Fig. 5), but will be continued in future seasons. The

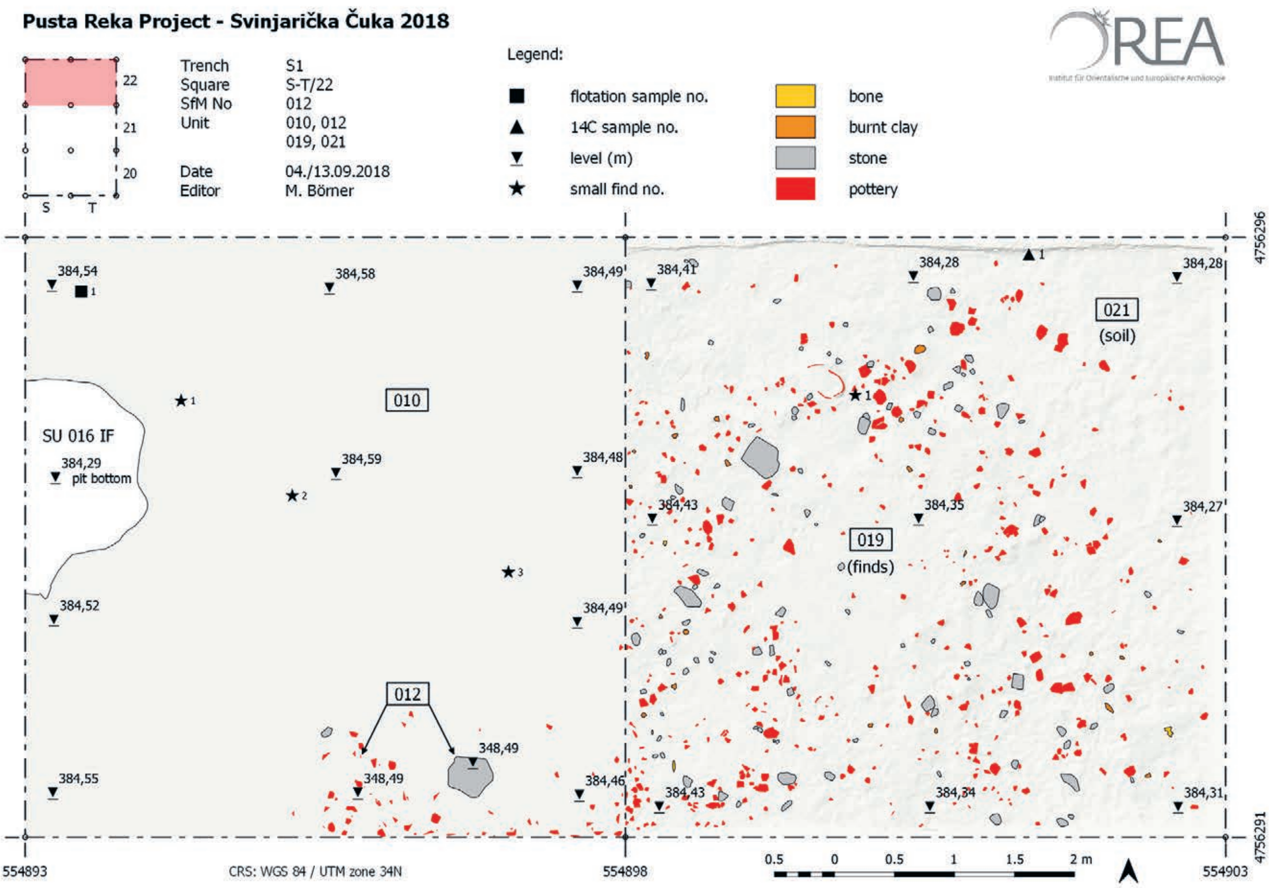

Fig. 7. Digitised archaeological relocated remains (SUs 10, 12, 19, 21) with mixed materials dating to Neolithic, Eneolithic, Late Bronze Age and Early Iron Age recovered in trench S1, grids S–T22 around 0.8–1 m underneath the modern-day surface (Plan: M. Börner, OREA).

overall stratigraphy of trench S1 is also presented in the matrix (Fig. 9).

3.3. Radiocarbon Dating

The new radiocarbon dates of the short-lived emmer and barley grains derive from the excavated and wet-sieved archaeological contexts discussed above and were measured in the CEZA Mannheim lab. They mainly support the ^{14}C data of the charcoal samples from the drilling cores from the former surveys, as well as the first relative chronology of the site based on the material studies.[34] All data and results together offer a first insight into the dating of Svinjarička Čuka (Fig. 10, Tab. 1). The earliest Neolithic levels at a coring depth of c. 2.20 m are dated to 6207–6017 calBC (MAMS-34883) and have not been reached in the excavation trenches yet. This initial phase of the Neolithic might be linked with the so-called Proto-Starčevo[35] or Starčevo I-phase[36] as defined in the last decades based on pottery sequences. The next radiocarbon-dated evidence at Svinjarička Čuka represents the so-called Classical Starčevo phases, related to the Early and Middle Neolithic periods. The older classical phase is dated to 5706–5620 calBC (MAMS-40136) and derives from a barley grain from the remains of a potential oven structure SU 26 which lies below SU 22 (Figs. 5, 9), also supported by the date 5748–5644 calBC from coring (MAMS-34882). The potential second Classical Starčevo phase is indicated by the two dates of emmer and barley grains from SU 22 (Figs. 5, 9, 14) of 5616–5494 calBC (MAMS-40137) and 5613–5486 calBC (MAMS-40138). This is additionally supported by the core dating of 5611–5481 calBC (MAMS-34884).

The Eneolithic period of the 4[th] millennium BC is evidenced by pottery fragments in mixed deposits recognised

34 Horejs et al. 2018, 45 and Fig. 12.

35 Srejović 1972. – Pavúk 2016, 234 and Tab. 1.

36 Manson 2008, 98 and Tab. 4.

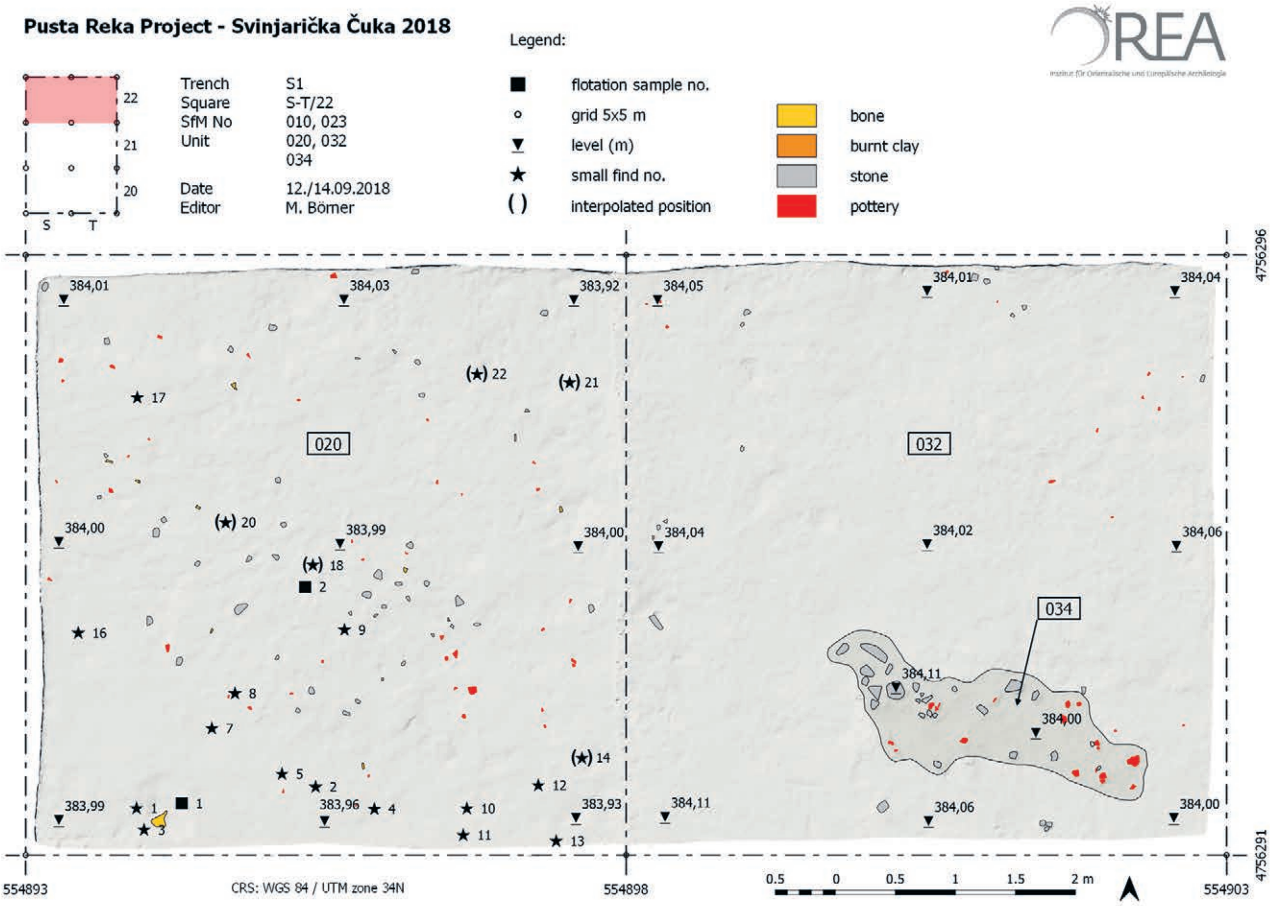

Fig. 8. Digitised archaeological features (SUs 20, 32, 34) in trench S1, of which the dark brown horizontal filling layer SU 20 contains large amounts of Starčevo ceramics and artefacts marked by stars (Map: M. Börner, OREA).

in both trenches, but archaeological features of this date have not yet been recovered. The seeds dated to 3653–3532 calBC (MAMS-40135) from SU 26, and to 3648–3530 calBC (MAMS-40141) from SU 1016, are most likely not found in situ, but relocated (for example through bioturbation). While the scattered ceramics from various mixed units are pointing to the Coțofeni-Kostolac group, the ^{14}C data can be associated with the late phase of Bubanj-Hum I in this area[37] (i.e. Černavoda I/Salkuta IV-Galatin in today's south Romania, eastern Serbia and northwest Bulgaria). Anthropogenic activities in the 3rd millennium BC at Svinjarička Čuka are also indicated by scattered pottery in mixed deposits with relations to the Bubanj-Hum III group. One most likely relocated seed from SU 20 is dated to 2458–2212 calBC (MAMS-40139), which fits perfectly with the recently analysed data of the Bubanj-Hum III horizon.[38] Built remains or good contexts for this horizon have not been recovered yet.

The Middle and Late Bronze Age periods are so far evident in pottery, excavated features and two radiocarbon dates. One emmer grain from SU 1016 is dated to 1756–1643 calBC (MAMS-40140), whilst charcoal from the drilling core is dated to 1494–1309 calBC (MAMS-34886). Both periods can be linked with the recovered pottery types and confirm the presence of archaeological features of Middle and Late Bronze Age date at the site (Fig. 4).

37 Bulatović et al. 2018, 25–26.

38 Bulatović, Milanović in press.

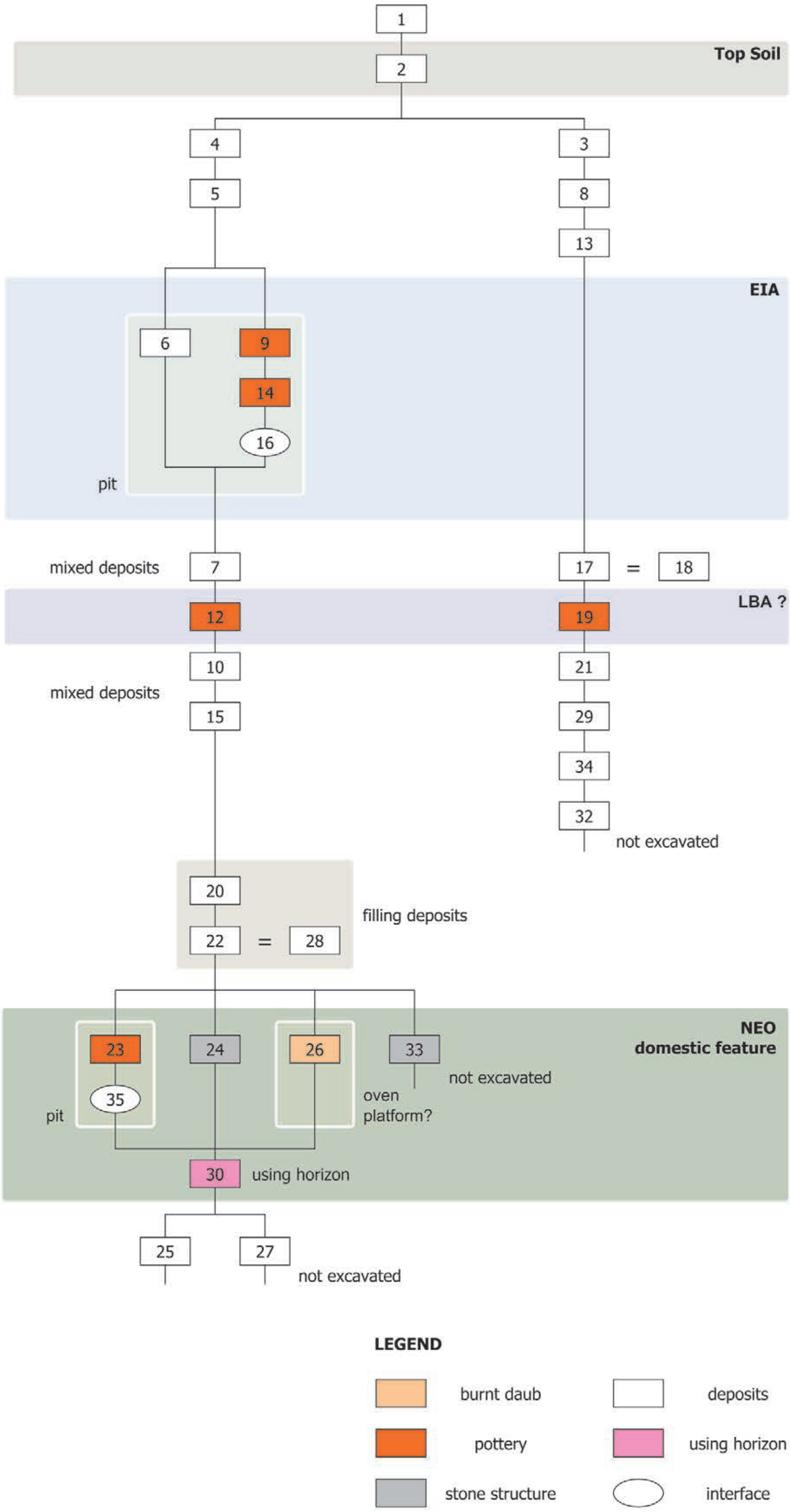

Fig. 9. Stratigraphical matrix of trench S1 at Svinjarička Čuka 2018 excavations (B. Horejs, D. Bochatz, M. Börner, OREA).

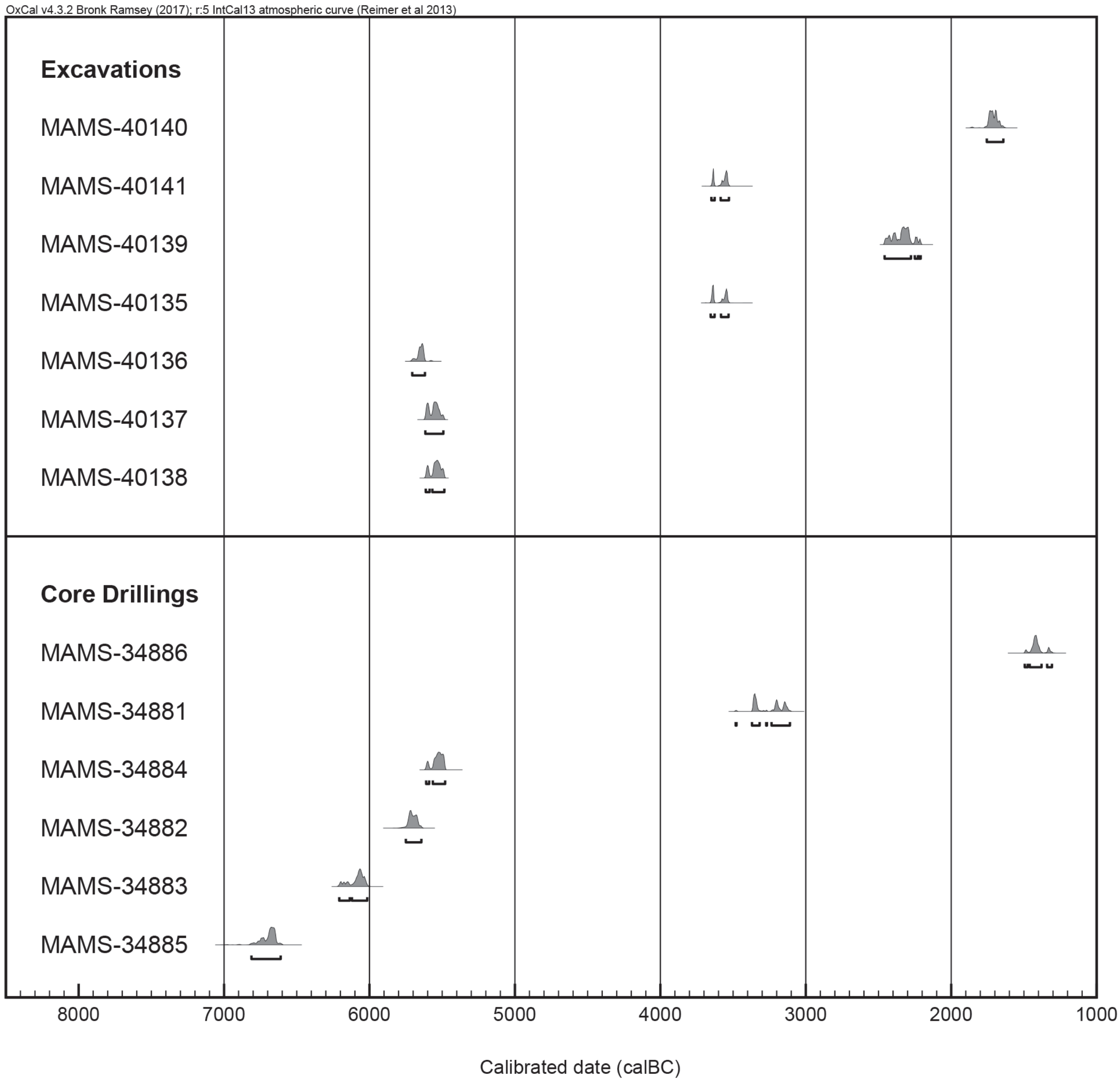

Fig. 10. Radiocarbon dates deriving from the excavations 2018 and drilling cores 2017, both measured in the CEZA Mannheim lab (Graph: C. Schwall).

4. Discussion of Selected Contexts

4.1. Remains of a Bronze Age Structure

SUs 1003, 1016, IF 1030, 1017, IF 1020, 1008, 1011, IF 1022, 1013, 1014, and IF 1031 belong to one contemporaneous structure, most likely a Late/Middle Bronze Age house or hut (Figs. 4, 11, 12). Due to its location directly underneath the top soil and the disturbance from ploughing and other farming activities, the structure has suffered disturbance with potential recent intrusions. Nevertheless, within an area of 2.5 to 4 m the horizontally layered accumulation of medium- to large-sized stones marks the probable interior part of a building. This surface was covered with a large quantity of pottery fragments, including well-preserved vessel fragments, among them many joining pieces, small finds, various artefacts and animal bones. The installation of a large storage vessel (SU 1017) deposited in the pit IF 1020 also belongs to the interior horizon of the architectural remains. More detailed analyses in the future are expected to shed light on the complex deposition process, the spatial distribution of the assemblage, and to offer good data for the functional interpretation of the complete context. As one can see in Figure 4, IF 1011 and 1022 might have functioned as postholes, whilst fragments of burnt daub indicate

Sample and core ID	Laboratory no.	Height of sample/ depth in core [m]	^{14}C date [yr BP]	±	δ^{13}C AMS [‰]	Cal 1-sigma	Cal 2-sigma	C [%]	Material
CU18_26_11_1	MAMS-40135	383,95	4822	24	-23,6	3647-3539 cal BC	3653-3532 cal BC	27,1	emmer grain
CU18_26_11_2	MAMS-40136	383,95	6734	25	-23,0	5661-5629 cal BC	5706-5620 cal BC	30,6	barley grain
CU18_22_11_1	MAMS-40137	383,88	6611	24	-22,0	5610-5525 cal BC	5616-5494 cal BC	59,6	emmer grain
CU18_22_11_2	MAMS-40138	383,88	6597	24	-23,2	5606-5511 cal BC	5613-5486 cal BC	56,5	barley grain
CU18_20_11_1	MAMS-40139	383,96	3857	21	-20,5	2434-2236 cal BC	2458-2212 cal BC	42,2	emmer grain
CU18_1016_11_1	MAMS-40140	384,85	3412	20	-25,5	1743-1688 cal BC	1756-1643 cal BC	57,1	emmer grain
CU18_1016_11_2	MAMS-40141	384,85	4811	22	-23,5	3642-3537 cal BC	3648-3530 cal BC	47,0	emmer grain
Štu23_0000_13_1	MAMS-34881	0,90	4558	26	-26	3364-3136 cal BC	3482-3110 cal BC	53	charcoal
Štu23_0000_13_1	MAMS-34882	1,85	6824	31	-26,2	5729-5674 cal BC	5748-5644 cal BC	0,8	charcoal
Štu23_0000_13_1	MAMS-34883	2,20	7221	31	-32,9	6101-6024 cal BC	6207-6017 cal BC	0,5	charcoal
Štu01_0000_13_08	MAMS-34886	0,87	3140	25	-27,2	1444-1331 cal BC	1494-1309 cal BC	44,5	charcoal
Štu01_0000_13_08	MAMS-34884	1,78	6581	29	-26,8	5547-5488 cal BC	5611-5481 cal BC	43,9	charcoal
Štu01_0000_13_08	MAMS-34885	2,33	7857	32	-27,2	6743-6644 cal BC	6811-6612 cal BC	49,4	charcoal

Tab. 1. Radiocarbon data from the excavations and core drilling at Svinjarička Čuka used for the graph in Fig. 10 (D. Blattner, B. Horejs).

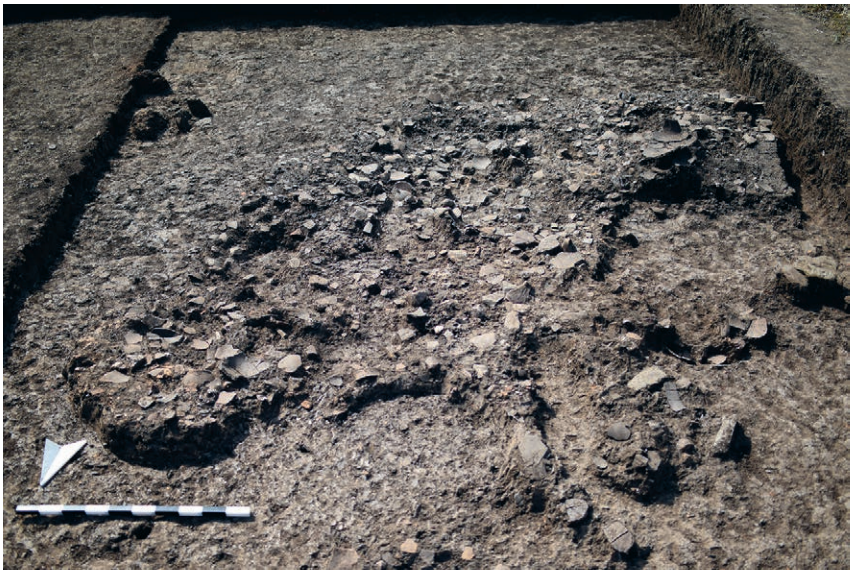

Fig. 11. Overview of the excavated Bronze Age structure in trench N1, grids R27–28 (Photo: F. Ostmann, OREA).

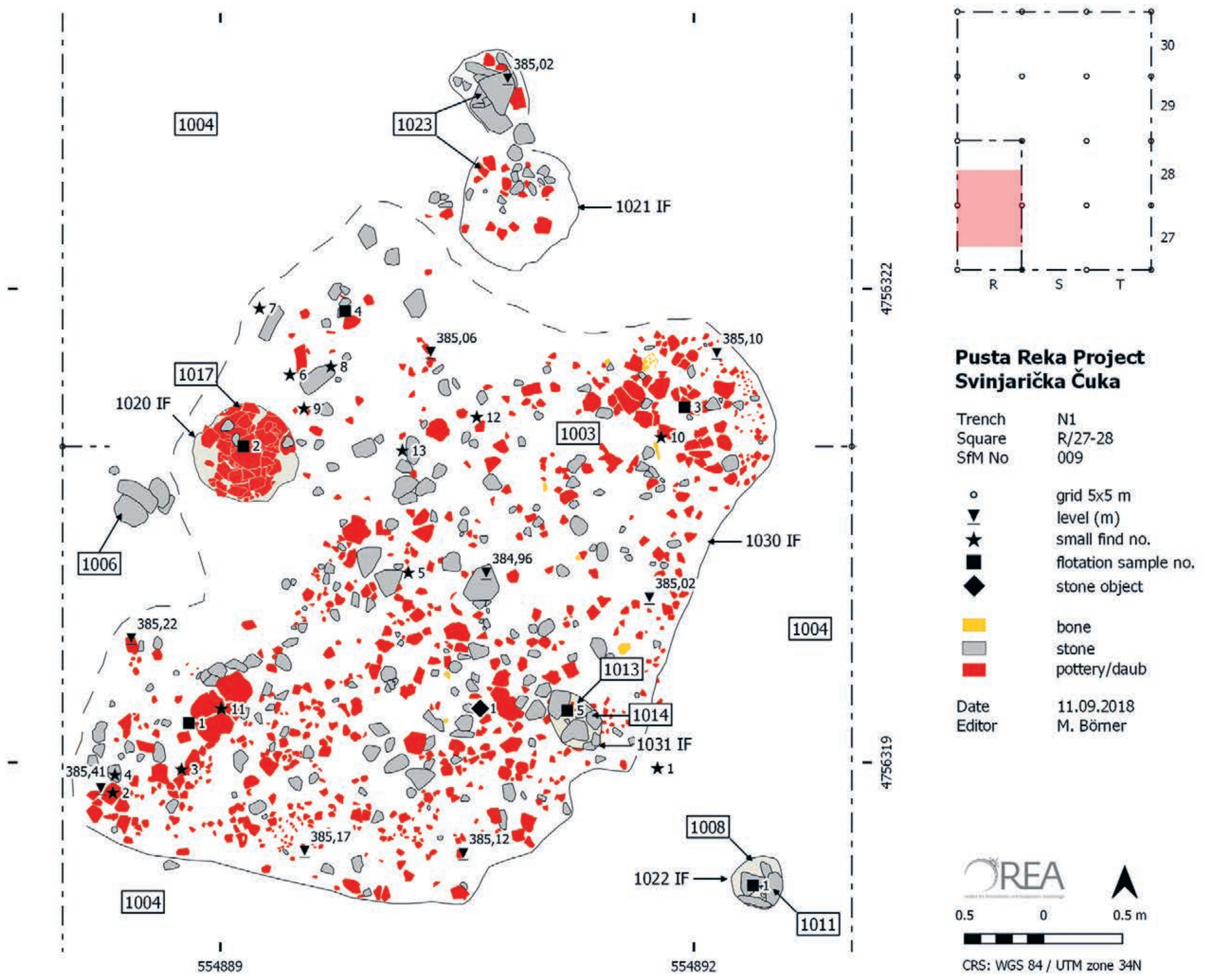

Fig. 12. Digitised excavated remains of a Middle to Late Bronze Age structure in trench N1, grids R27–28 (Plan: M. Börner, OREA).

walls erected in the wattle and daub technique. The structure contains pottery of stylistic and typological elements belonging to the Middle and the Late Bronze Ages. It is not clear whether the structure belongs to the Late Bronze Age, which would suggest earlier elements lasted much longer than previously thought, or if the structure belongs to the Middle Bronze Age, as the absolute date (MAMS 40140) and some of the potsherds indicate, and in that case the presence of the Late Bronze Age pottery could be explained by ploughing or other recent human activities. The Late Bronze Age finds from the remains of the possible house include S-profiled bowls (Fig. 13), two handled beakers with handles which surpass rim, wide horizontal or everted rims with plastic rib on the inner side of rim (the so-called Brnjica rim) and especially potsherds ornamented with series of impressed triangles, oval imprints and incised triangles, while deep semi-globular bowls, jars ornamented with series of impressed fingerprints as well as wide strip handles could be interpreted as the Middle Bronze Age pottery.[39]

4.2. Neolithic Domestic Features

Within an area of 25 m², remains of Starčevo layers have been recovered in trench S1, grid S22, and interpreted as domestic features (Figs. 9, 14, 15). The accumulation of five large and flat stones, laid horizontally (SUs 24, 33), appears to be in-situ deposition, next to fragments of burnt clay and burnt daub. The contemporaneous small pit IF 35 is located in the grid's southeast corner, and filled by SU 23 containing pebble stones and a few pottery fragments (see below). A clayish feature (SU 26) with small pebbles and animal bones is located at the northwest corner of trench S1 and radiocarbon dated to the older Classical Starčevo phase (see 3.3). This feature (SU 26) included a large amount of burnt and broken

39 Bulatović, Milanović in press.

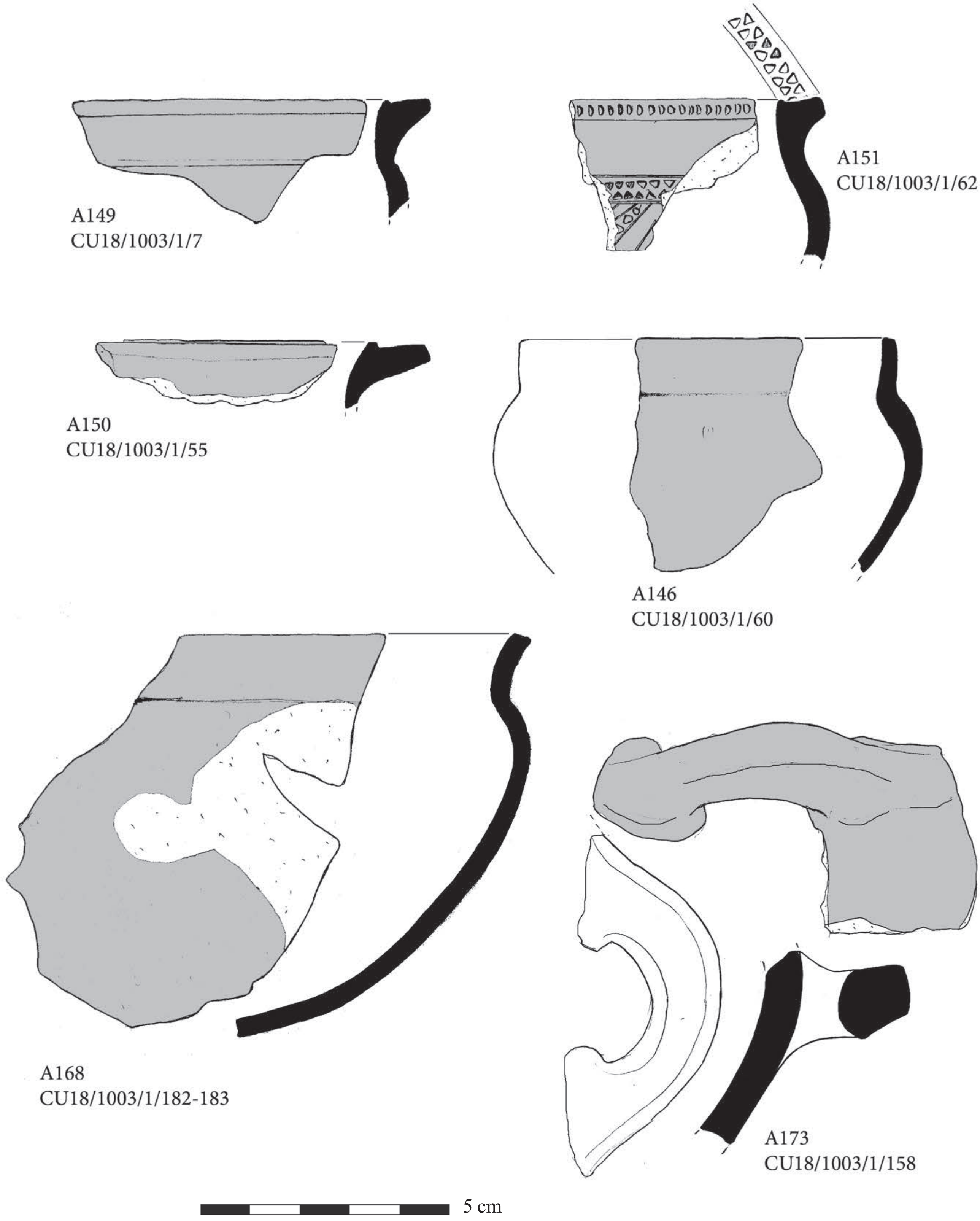

Fig. 13. Middle and Late Bronze Age pottery deriving from SU 1003 (Drawings and plate: A. Bulatović).

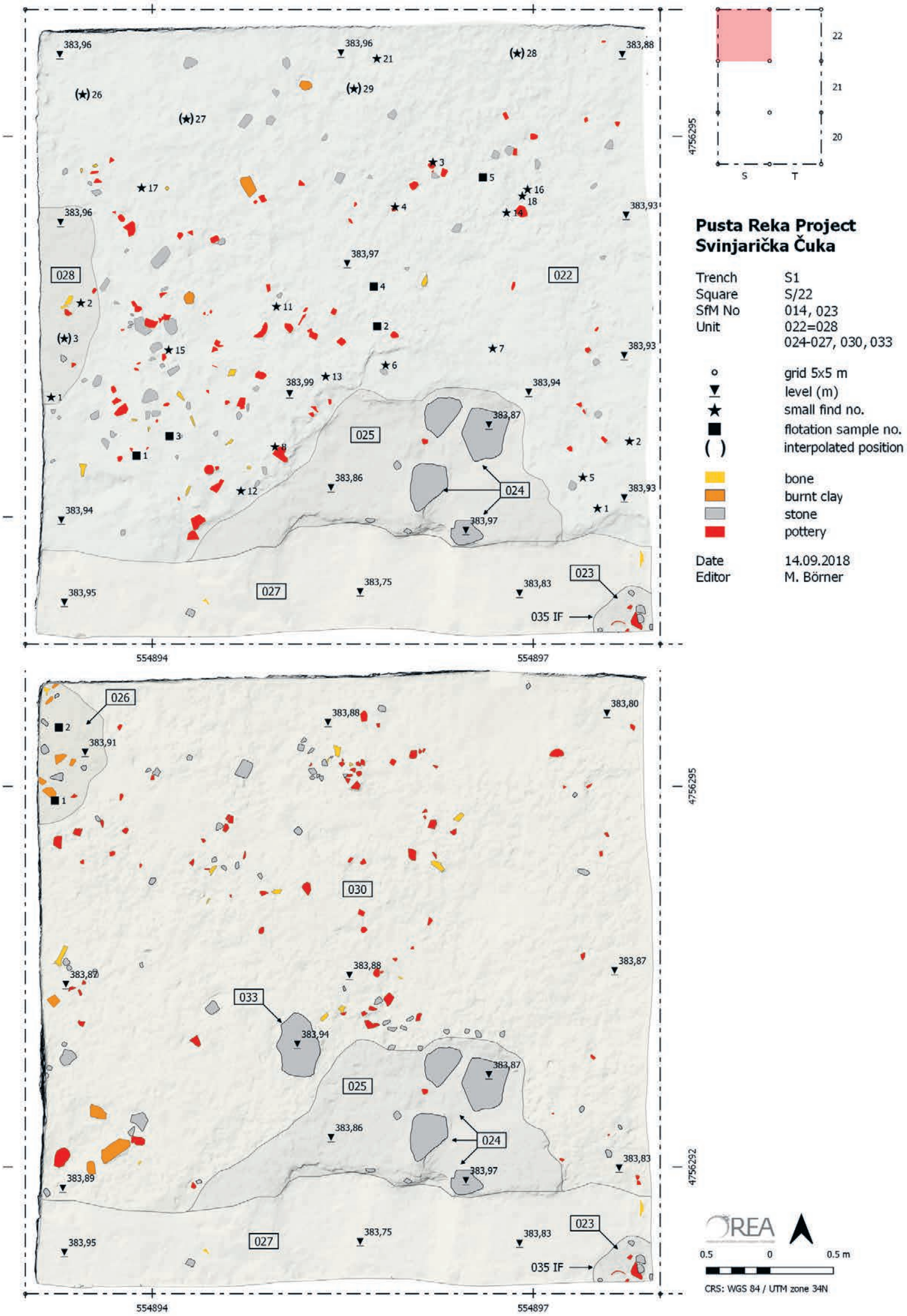

Fig. 14. Digitised excavated remains in trench S1, grid S22 dating to the Classical Starčevo phase (Plan: M. Börner, OREA).

Fig. 15. Overview of excavated Starčevo features in trench S1, grid S22 (Photo: F. Ostmann, OREA).

architectural daub fragments with a smooth and flattened upper surface, most probably belonging to a former oven platform or at least a pyrotechnical installation. All these features are related to the horizontal deposits SU 22 (lying above) and SU 30 (lying below). The grey brown clayish deposit SU 22, contains an astonishing amount of artefacts totalling 1675 ceramics (dominantly Starčevo types, with 260 diagnostic sherds), 29 small finds and 87 chipped stones (Fig. 14), and is radiocarbon dated to the Classical Starčevo period (see 3.3).

The remarkable concentration of small finds within SU 22 around the stone feature (SUs 24–25), was already apparent in SU 20 above (Fig. 8), but this concentration does not appear to continue into SU 30 (Fig. 14). Both clayish layers SU 22 and SU 30 contain many ceramics, fragments of animal bones, burnt clay, small fragments of burnt daub, a few charcoal fragments and small pebble stones, however, they do not display an organised spatial arrangement, but instead appear to have been randomly deposited. Whilst the layers SU 20 and SU 22 can be defined as fill deposits above and/or within a Neolithic structure/feature, the earlier level, SU 30, needs to be further excavated to fully understand its extent and relationship.

The highly promising preservation of the archaeological remains and their characteristics permit us to expect a potential larger built (subterranean?) structure, such as a pit-like feature, continuing to the north, west and east. The excavated flat stones in a horizontal position (SUs 24–25, Figs. 14–15) are reminiscent of the stone installations associated with Late Mesolithic and Neolithic huts in the wider region. Examples are known from e.g. Vlasac Ia[40], Lepenski Vir,[41] Padina,[42] Divostin[43] or Grivac I–II,[44] where their function is interpreted as stabilizing the entrance area, wooden post-footings or beddings. The interpreted anomalies from the geomagnetic surveys fit with the excavation results and indicate about a dozen comparable remains at the Svinjarička Čuka river terrace (Fig. 2).[45] Although early in our work, the excavated and radiocarbon-dated remains recovered to date are consistent with domestic features of the Classical Starčevo period and offer a good opportunity for the following analyses of pottery, small finds, lithics and raw materials as well as for a first insight into the subsistence related to faunal and floral remains. First results of the mentioned technological approach will be discussed as well.

5. Neolithic Pottery

This section will provide an overview of the early results from typological and technological analysis of the Neolithic pottery recovered so far from the Svinjarička excavations (ceramics from later periods will be presented elsewhere). Diagnostic sherds (rims, bases and decorated wall sherds) of

40 Srejović 1979, Fig. 2.

41 Borić 2007.

42 Jovanović 2008.

43 Bogdanović 1988. – Bailey 1999.

44 Bogdanović 2008, 31–43.

45 Horejs et al. 2018, 34–41. – The re-evaluation of the excavated results with the geophysical expert Cornelius Meyer supports the already published interpretation of many of the anomalies as potential pits.

pottery from the 2018 excavation season have been washed, sorted, counted, labelled, photographed and entered into the project database. In addition to typological details, work is also being undertaken to sort and record technological information relating to raw materials, forming, finishing and firing. In line with this, macroscopic 'ware groups' have been established, primarily based upon macroscopic fabric details in terms of visible inclusions, and their abundance and sorting, but also where possible, in relation to diagnostic ware relationships, for example between particular macro fabrics and surface finishes. The aim is to form a macroscopic typo-technological reference collection of the pottery that will inform sampling for other analyses (primarily petrography and scanning electron microscopy – SEM) to identify the raw materials and examine potting technology at a higher resolution. The diagnostic pottery has been recorded in terms of shape, preservation, size (rim/base diameter, and wall thickness), ware group/macroscopic fabric, decorative features and visible details relating to forming, finishing and firing. In addition, key pieces have also been drawn to provide a visual record of the typological variability at the site. The typo-technological work has thus far focused on the most coherent Neolithic stratigraphic units of 22, 28, and 26, from which 297 diagnostic sherds have been fully recorded, and are typologically consistent with Starčevo-type pottery from other sites in Serbia. In addition, a small number of sherds from bowls of likely Vinča date were also recorded, but will not be presented in detail here.

5.1. Ware Groups/Fabrics

From pottery of all dates thirty three ware groups thirty-three ware groups have been identified with a broad division between those with macroscopic fabrics that contain rock and mineral inclusions, and those that contain mineral/rock inclusions and organic temper. Within the 33 ware groups, approximately ten different macroscopic fabrics are visible dating from the Neolithic and metal age periods, primarily differentiated by the types and sorting of visible inclusions and the nature of the clay matrix (refer to Fig. 16 for examples). Inclusions have been described at the macroscopic level in terms of colour, shape and hardness, rather than identification of their geological nature, which requires petrographic analysis that will be conducted at a later stage in the project.

The ware group macro fabrics range from fine and well sorted, to coarse and moderately well or poorly sorted; however, the material is predominantly medium coarse and moderately well sorted, irrespective of vessel type or wall thickness. The majority of the pottery belongs to a brown to orange firing, sandy or gritty micaceous (gold and/or silver mica) fabric with hard white and semi-translucent rock inclusions and few rounded voids. The exception is thin-walled slipped and painted vessels such as red slipped deep bowls, which are dominantly associated with a fine orange firing, mica-rich macroscopic fabric with very rare visible voids. Other inclusions such as hard pink/red rock fragments and rounded orange or brown soft inclusions have been identified in the majority of the Neolithic pottery, alongside the rarer presence of shiny black rock inclusions, that are more often associated with pottery from the metal ages. Whilst we must be cautious at this early stage and until petrographic analysis has been undertaken, the very similar inclusion types across multiple macroscopic fabrics may be an early indication of the use of similar or the same raw material types to make a range of vessel types and wares. It is also notable that some of the mineral/rock-based Neolithic macroscopic fabric groups are also found in the later Bronze Age material, perhaps indicating a long-lived potting tradition in terms of raw material choices. These macro trends will be tested more fully using petrographic analysis at a later stage in the work.

The second main class of macroscopic fabric within the ware groups is that containing fine organic temper (its presence indicated by linear voids at the surface and/or linear blackened voids in the breaks). Like the mineral/rock-based macroscopic fabrics, the organic-tempered fabrics are also commonly micaceous but include rounded soft orange or brown inclusions, as well as rarer hard white and semi-translucent inclusions. They are notably finer and softer than the mineral/rock-based macroscopic fabrics, moderately well sorted, and consistently associated with jars in particular. The presence of two clay preparation technologies (mineral/rock inclusions vs. organic and mineral/rock inclusions) fits well with the observations of macro fabrics at other Neolithic sites within Serbia (for example, Blagotin[46]).

In addition to the main macroscopic fabrics, it has been possible to identify the use of multiple clay types in a single vessel, with a fine, mica-rich clay being coated or slipped with a thicker much coarser clay, forming the exterior and interior surfaces. This is particularly interesting as it appears that both the fine, mica-rich clay and the clay for the coating have also been successfully used alone without combination in other vessels and clay objects such as loom weights. The reason for the combined use is unclear at present but may relate to both cultural and/or functional aspects of production, for example the desired fired colour or texture of surfaces. This will be more fully investigated through petrography and SEM analysis (Fig. 17).

46 Vučković 2004.

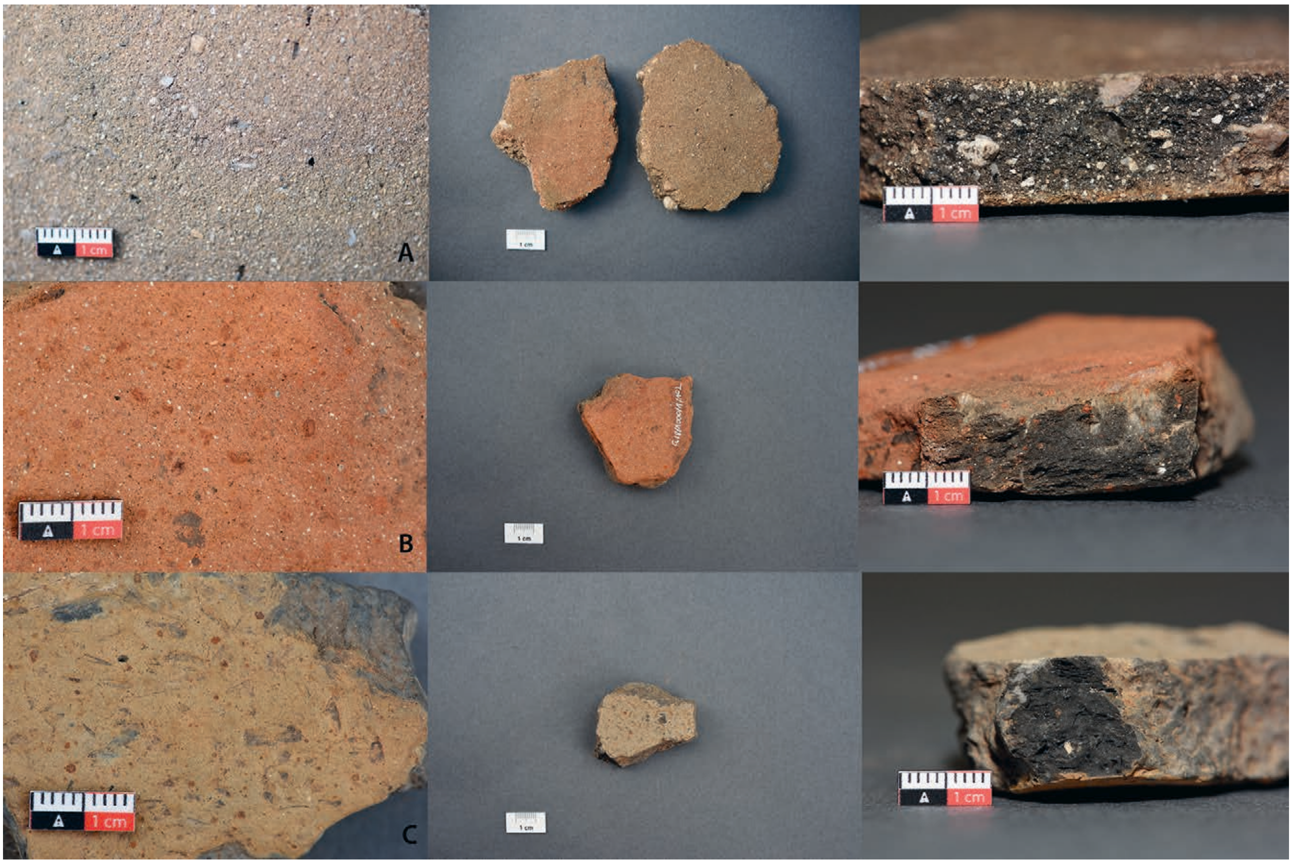

Fig. 16. Examples of ware groups (WG), surfaces and break with macroscopic fabric. – A: WG1. – B: WG3. – C: WG5 (Photos: F. Ostmann, figure design: C. Burke).

5.2. Vessel Types

The dominant vessel types recovered so far can be broadly divided between two overarching types – jars and bowls (Fig. 18). As a first defining category, bowls have been separated into 'shallow' and 'deep' types following the German differentiation between *Schale* and *Schüssel*. Shallow bowls commonly have a rounded rim, or less commonly a flaring rim, with a diameter between 12 and 35 cm, averaging 35 cm and a wall thickness averaging 1.5 cm, and appear slightly conical in their profile. In terms of surface finish (discussed more fully below), they are dominantly plain or roughened, although some examples display evidence of a light burnish or polish. Deep bowls have a diameter between 10 and 26 cm, averaging 18 cm, and a wall thickness average of 1 cm, but with much thinner examples of approximately 0.5 cm also recorded. They display more variation than shallow types in terms of surface finish with burnished, painted, and incised decoration. They also display variation within their rim profiles having rounded, slightly flaring, and flaring types, also commonly having a conical, slightly conical, or a biconical body profile.

Fig. 17. Example of pedestal base with fine, mica-rich, grey-fired clay core coated with yellow-brown firing coarse clay (Photo: F. Ostmann).

The second dominant vessel type, jars, have two broad classes: large storage jars, which are not common, and smaller jars, which dominate the jar class. The best-preserved storage jar fragments come from SU 22 and most likely

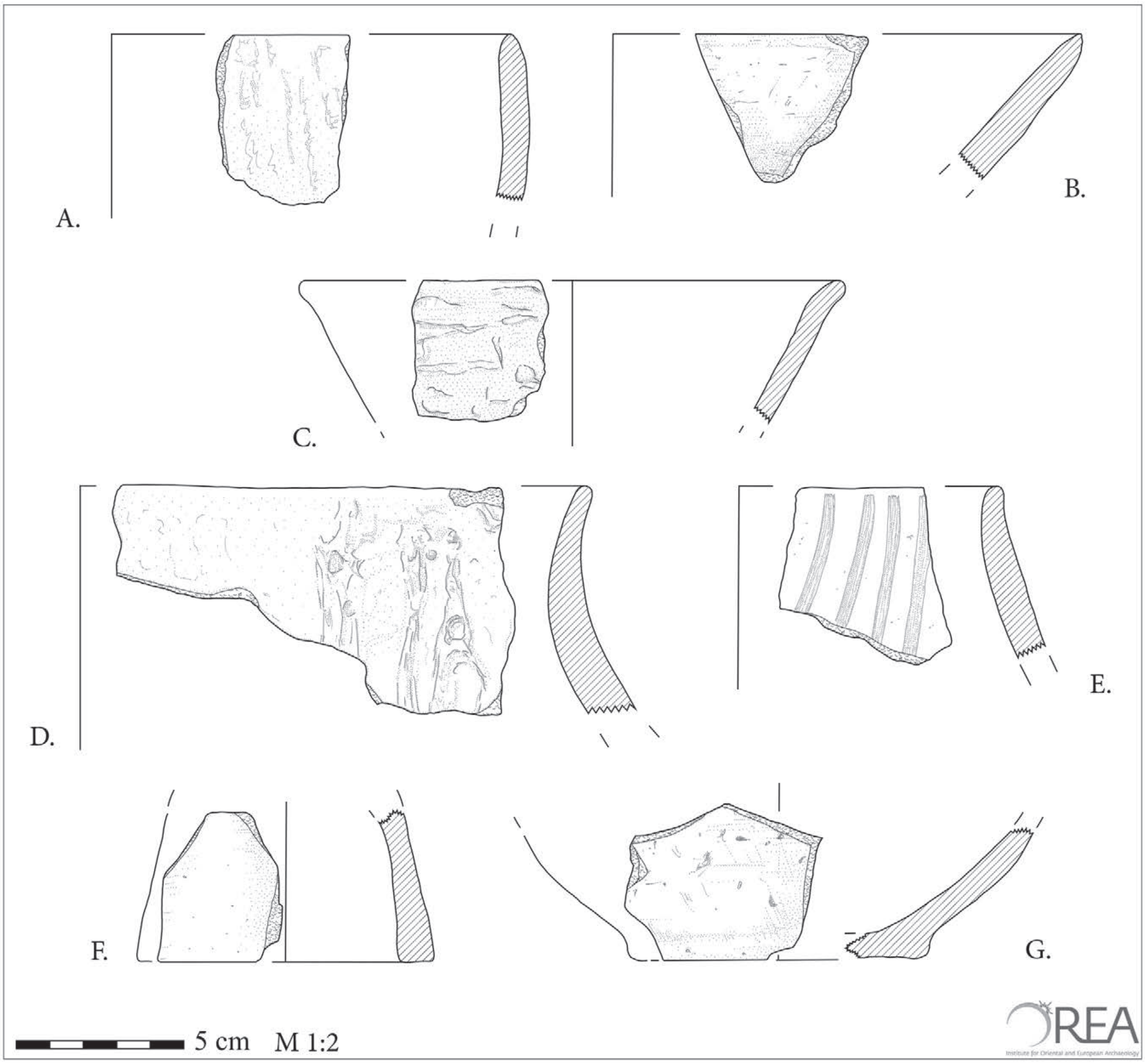

Fig. 18. Examples of rim and base profiles. – A. Deep bowl with rounded rim. – B. Shallow conical bowl with thinned rim. – C. Deep bowl with flaring rim. – D. Storage jar with flaring rim. – E. Conical neck jar with slightly flaring rim. – F. Pedestal base. – G. A stepped base (Illustrations: D. Blattner, figure design: C. Burke).

relate to a single vessel with a slightly flaring, rounded rim, burnished interior, barbotine exterior, and a flat base. The rim diameter is 35 cm with a wall thickness between 1.4 and 2.2 cm, making the vessel very heavy and cumbersome so unlikely to have been regularly lifted and moved, as, for example, would be expected in food preparation. In contrast, the small jar shapes have a wall thickness averaging 0.8 cm and rim diameter of between 12 and 28 cm, making them much easier to move and more likely to relate to usage for activities such as daily food processing, preparation and small-scale storage. Their rim profiles show very little variation being predominantly flaring, narrow mouthed or having a short collar with a rounded or slightly flaring rim.

Bases are divided into three types: flat base, stepped base (also known as a 'disk base') and pedestal base. The first two types form the majority of the bases found, being common at all comparable sites such as Blagotin,[47] Grivac,[48] and

47 Vučković 2004.

48 Bogdanović 2008.

Drenovac.[49] The pedestal bases are often finer, sometimes displaying the remains of a red or orange slip and most likely belong to pedestal deep bowls.

Handles are predominantly loop handles and pierced knobs. Lugs are uncommon, with the exception of a possible small double lug noted in SU 20. In addition to these true handles, there are also applied flat 'button' knobs/discs and double 'button' knobs/discs with comparable examples published from Drenovac.[50] The small size of these applied discs suggests they would have had a decorative rather than wholly functional purpose, whilst the position and orientation of the small pierced knobs suggests these were used to thread twine through for hanging vessels.

5.3. Surface Modification/Finishing

It should be noted at this point that many vessel surfaces show some slight degree of abrasion, particularly those within the grittier ware groups. Despite this, it has been possible to define a range of vessel surface finishes. The main surface finishes are consistent with Starčevo types (refer to Fig. 19 for examples):

1. Burnished
2. Polished
3. Incised
4. Barbotine
5. 'Pseudo barbotine' or 'roughened'
6. Painted
7. Slipped

Within these broad classes there are a range of combinations, for example vessels with burnished interiors and barbotine exteriors, and burnished or polished pottery with painted decoration. The burnished interior of some vessels may have had a functional as well as a decorative component, acting as a seal on the interior surface and, to a certain extent, providing a 'non-stick' surface that prevented contents being absorbed into the ceramic. Interestingly, the large storage vessel from SU 22 has a well-burnished interior with distinctive pitting towards the lower portion of the body and base, an abrasion pattern also noted on other larger jar/storage jar shapes. This pitting may relate to their use and offer another important avenue for future work to examine vessel function,[51] alongside residue analysis which is currently not widely applied in Neolithic ceramic studies.

A common surface finish recorded in the material so far is barbotine in two styles, 'structured' and 'unstructured'. The former displays a vertical direction of raised bands and striations in the clay from base to rim, forming deep roughened troughs on vessel exteriors and strongly associated with mineral-based macroscopic fabrics. The second is 'unstructured' which displays no organisation or directionality and is associated with both organic tempered and mineral/rock-based macroscopic fabrics. Alongside this, there are also many examples of what may be termed 'pseudo barbotine' or roughened external surfaces found on both organic-tempered and mineral-based macro fabrics but commonly the former. Both barbotine and roughened surfaces are strongly associated with large and small jar shapes, although some deep bowl fragments also appear to have been roughened on the exterior in the lower portion of the body. In addition to barbotine fully covering external surfaces, we have also recovered a small number of Barbotine 'rosettes' which were applied to vessels with barbotine surfaces, potentially as some form of grip or additional decoration.

Slips and paints are also present, although in small amounts and commonly abraded. Slips are dominantly red or orange, although a very small number of cream-white examples are also noted. The red to orange slips are usually found on thin-walled predominantly open-shaped vessels, such as deep bowls with a slightly conical profile, and are predominantly associated with fine micaceous macroscopic fabrics, although there are a small number which also appear to have organic temper. The rarer cream-white slips appear thickly applied and associated with grey-fired, thick-walled vessels with a laminated micaceous macro fabric. Less commonly, thin cream-white slips are also found on orange-fired wall fragments which appear to have additionally been polished. Pattern painted pottery is also present in the material but is uncommon. It predominantly consists of black/black-brown painted motifs on a red/orange slipped or fired background. Patterns are usually linear, such as short lines below the rim, sometimes with a cross-hatch pattern, also with black paint on the rim itself. Spiral decoration is also recorded but is very rare. These motifs have been widely noted, for example, similar spiral decoration is published from Donja Branjevina[52] and cross-hatch pattern from Starčevo.[53]

Like barbotine, incised surface modification is a common decorative type within the recorded material consisting of two primary types. The first and more common, is linear incised diagonal lines, either as a cross-hatch pattern or as triangular chevrons (Fig. 20). Both appear to be made using some form of tool, as indicated by the grooved texture noted within the incised lines. The chevron pattern is

49 Perić 2008.

50 Perić 2008, 49.

51 Vučković 2009.

52 Karmanski 2005, Pl. XXVII.

53 Fewkes, Goldman, Ehrich 1933, 51.

Fig. 19. Examples of surface finishes. – A–B. Slipped and painted. – C. Diagonal and chevron incised decoration. – D. Cross-hatch incised decoration. – E. Barbotine. – F. Roughened/Pseudo barbotine decoration (Photos: F. Ostmann and C. Burke, figure design: C. Burke).

widely noted at other comparable sites, for example within the Grivac II and III material[54] and at Blagotin.[55] Incised linear decoration is common on conical and biconical bowls with several examples of biconical types displaying incised chevron decoration on the upper part of the carination and being smoothed or roughed on the lower part.

The second incised decorative type is Impresso, which is rare, consisting of crescent shaped incised lines, that in the cases examined appears to have been done using fingernail incisions.

5.4. Forming

Examination of surface marks, fresh breaks and variation in wall thickness can provide important insights into the forming and finishing of vessels.[56] Such macroscopic investigation of the Svinjarička material has shown that

54 Bogdanović 2008, 102.

55 Vučković 2004, 148.

56 Rye 1981.

Fig. 20. Biconical deep bowl from SU 22 with incised chevron-style decoration. The rough edges at the carination show the join between the two halves of the bowl (Photo: F. Ostmann).

Fig. 21. Example of finger impressions on interior of vessel base (Photo: F. Ostmann).

forming primarily comprised of slab, and/or pinch/drawing techniques, with some bases preserving the fingerprint impressions of the potter from pushing and moulding the clay with their hands (Fig. 21).

In addition, it has been possible to ascertain that rims and bases were added as separate components, or, in the case of biconical bowls, that the vessel was made in two halves that were joined at the point of the carination. This evidence suggests that the *chaîne opératoire* of pottery forming consisted of multiple stages and/or of multiple components in the majority of the pottery examined so far – primarily with a pinch-formed base onto which the walls were built up using slab and drawing techniques, followed by the addition of the rim.

5.5. Vessel Firing

As noted, the bodies of vessels are predominantly fired orange-brown or brown in colour, and commonly display a dark firing core, for the most part with sharp borders. The exterior surfaces of vessels usually have an even colour, although some mottled examples have been noted. The orange to brown colours of the pottery indicate that it was fired in a predominantly oxygen-rich atmosphere,[57] whilst the presence of a sharp grey core, including for thin-walled vessels, suggests that the soaking time/oxygenation of the pottery was short. Those with organic temper often also display a thick grey or black core related to the combustion of the organic remains.[58]

In summary, the pottery recovered so far from the Svinjarička excavations finds comparisons with Starčevo-type pottery from a number of other Serbian sites and forms a coherent assemblage consistent with domestic activities. Technologically, it has already been possible to identify a range of macroscopically different and shared inclusion types used in the clay pastes from the Neolithic through to the Bronze Ages. It has also been possible to establish a range of forming and finishing techniques, including the multi-stage construction of vessels. Macroscopic recording will continue alongside the more detailed examination of raw materials and production technology of selected sherds through thin section petrography and SEM to characterise paste recipes, identify potential sources of the raw materials used, the microstructural and chemical nature of different surface treatments and paints, and the potential firing conditions of the pottery.

6. Tools, Ornaments and Ritual Objects

The potential Classical Starčevo structural feature discussed above also revealed an impressive amount of approximately 60 tools, artefacts, ornaments and ritual objects. Most of them were recovered in SU 20 and SU 22. The implements show signs of use and many are still intact, such as perforated ceramic discs, polishing stones, hammer-stones, a pounder and a polished stone adze (Fig. 22/1–2) as well as a few bone tools (see 6.1, Fig. 23). The same good state of preservation is also observed for the very few personal ornaments deposited in the Neolithic layers, such as clay beads and a ceramic labret (Fig. 22/3). Both the complete preservation of ornaments and the intact appearance of the tools suggest they were not deposited in the context of waste disposal but may relate to loss. These objects were found in the same deposits as distinctly ritual objects – three anthropomorphic

57 Kilikoglou 1994. – Day, Kilikoglou 2001.

58 Orton, Tyres, Vince 1993, 133–135. – Rice 2005, 343–345.

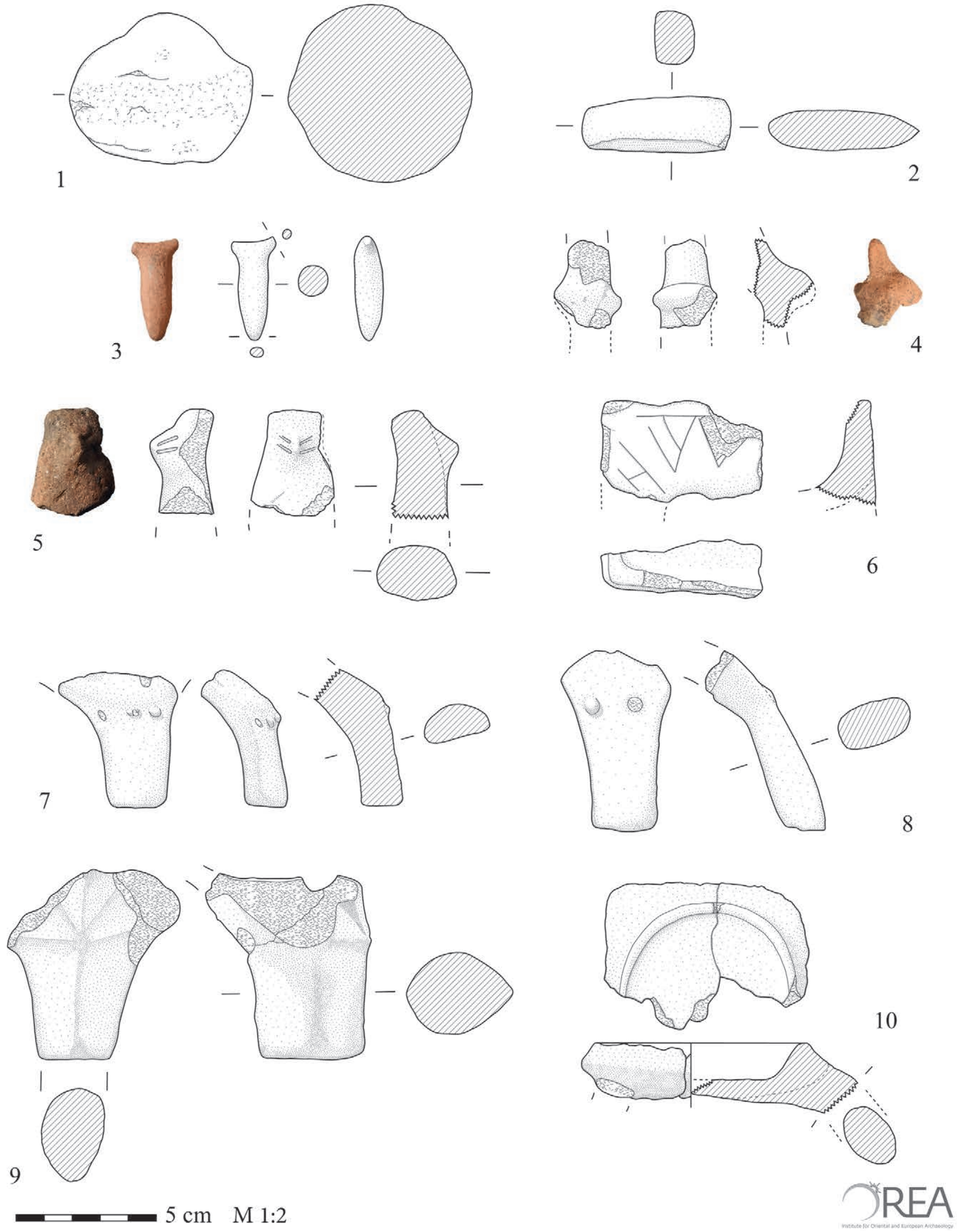

Fig. 22. Tools, ornaments and ritual objects from the Starčevo filling layers SUs 20 and 22 in trench S1, grid S22. – 1. Quartz pounder (CU18-22-3-1). – 2. Stone adze (CU18-22-3-14). – 3. Clay labret (CU18-22-3-21). – 4. Anthropomorphic figurine fragment (CU18-20-3-18). – 5. Anthropomorphic figurine fragment (CU18-20-3-3) – 6. Fragment of a decorated 'cult table' (CU18-22-3-26). – 7–10. Fragments of 'cult tables' (CU18-20-3-20, CU18-20-3-21, CU18-20-3-5, CU18-20-3-14) (Drawings 1–3: D. Blattner, 4–5: B. Horejs, 6–10: F. Ostmann; photos 3–5: F. Ostmann).

figurines and nine so-called 'cult tables' or altars – which were all incomplete and fragmented, suggesting breakage (not modern but old, e.g. through use) (Fig. 22/4–10). All these artefacts were distributed in both SU 20 and SU 22 around the flat stone installation SUs 24–25 (Figs. 8 and 14 with detailed mapping[59]), rather than displaying functionally different deposition practices. Whilst at this initial stage of work the spatial deposition and preservation do not aid our interpretation of the probable structural feature, their combined presence in deposits is consistent with a domestic pattern. The combined deposition of artefacts, ornaments and pottery is common in the fills of Starčevo-related features, for example, comparable patterns are recorded at Drenovac,[60] Grivac I–II,[61] Jaričište 1,[62] Donja Branjevina,[63] Divostin I[64] and Blagotin.[65] Ritual objects are sometimes also evident in the structures of these sites but not necessarily associated with later fills (but instead with 'floor horizons'). Future analyses and further excavations are expected to shed more light on the spatial-functional interpretation of deposition processes at Svinjarička Čuka.

From a stylistic-typological and technological perspective, the spectrum of objects is well embedded in the known repertoire of the Classical Starčevo or Early to Middle Neolithic central Balkans. The cylindrical labret, for example, is known from various other sites, where they are also designated as 'amulets'. Their interpretation as 'horned pendants' related to a new symbolic manifestation of cattle in the Starčevo-Körös horizon was pointed out recently by Bánffy.[66] Catherine Perlès also discussed similar objects (not necessarily horned) as earstuds, potentially used as personal ornaments or pins for clothes. She additionally highlighted their restricted geographical distribution within the Greek mainland to Thessaly and Macedonia.[67] Lately discussed in their wider distribution within the Starčevo-Körös-Criş horizon by Raiko Krauß,[68] they are frequently evident along the Morava River, such as in Grivac,[69] Divostin,[70] Međureč[71] and Drenovac.[72] Their intended function can be manifold, including their use as pins and studs as suggested by Perlès. Their potential (additional) use as personal ornaments for lip-pins or ear-plugs is not only indicated by the (slightly later) Vinča figurines displaying corresponding body modification but also in the well-known practices from various indigenous peoples as discussed by Sergej Karmanski.[73] Labrets[74] are also known from the Pre-Pottery-Neolithic and Neolithic to Chalcolithic Near East, such as in Chogha Mish (Iran),[75] where depictions, as well as in-situ contexts of these objects in clay or stone, demonstrate their functional interpretation as body-piercings in our view. Anyhow, further analyses of the horned clay objects in the Starčevo horizon appear worthwhile and should include use-wear studies as well as their role in the 'Neolithic package' in the future.[76]

The illustrated fragments of the anthropomorphic figurines (Fig. 22/4–5) represent two common types defined as steatopygous and 'bird-faced' cylindrical figurines, known from many Starčevo-dated sites in the central Balkans.[77] Finally, the fragments of nine different so-called 'cult tables' display high quality production (e.g. burnished surfaces). They also occur with incised decoration (Fig. 22/6) or decorative knobs on the legs (Fig. 22/7–8), also interpreted as 'zoomorphic' at other contemporaneous sites.[78]

The spectrum of polished tools, ornaments and ritual objects from the excavated Starčevo feature in trench S1 points to a range of domestic and ritual activities undertaken by the community during the Early to Middle Neolithic periods. The deposition of a range of object types with varying states of preservation and their spatial distribution will need to be explored through further excavation and analyses; however, the combination and typological-stylistic

59 The numbers of small finds in the digitised excavation plans Figs. 8 and 14 correspond to the individual object numbers illustrated in Fig. 22 and listed in the captions (CU18-22-3-14).

60 Perić 2008.

61 Bogdanović 2008, 31–33.

62 Marić 2013, 18–24.

63 Based on Karmanski 2005, 24, 27, 36–44, 102 and Tab. 7; 106 and Tab. 8; 124 and Tab. 10; 150 and Tab. 11; 204 and Tab. 17; 255 and Tab. 19; 260 and Tab. 20.

64 McPherron, Srejović 1988, 42– 44, esp. Tab. 5/2.

65 Greenfield, Jongsma Greenfield, Jezik 2014, 7–10.

66 Bánffy 2019, 78–81.

67 Perlès 2001, 288–289.

68 Krauss et al. 2014. – Krauss et al. 2017, Fig. 2.

69 Bogdanović 2008, 134 and Pl. 6/8.

70 McPherron, Srejović 1988, 332.

71 Exhibited in the Museum of Jagodina.

72 Perić 2008, Pl. 6/5–8.

73 Karmanski 2005, 42–43.

74 Classification as labrets after Hole, Flannery, Neely 1969, 235–237, introducing the term for the first time.

75 Hole, Flannery, Neely 1969, 47. – Delougaz, Kantor 1996, 254–256 and Pl. 66B.

76 E.g. like Çilingiroğlu 2005 discussing ear-plugs for the 'Neolithic Package' in western Anatolia.

77 E.g. Grivac: Bogdanović 2008, 127. – Divostin: McPherron, Srejović 1988, 173–177, 188 and Fig. 7/1. – Donja Branjevina: Karmanski 2005, 36–39, 85–94 and Pls. 3–12. – Bailey 2005. – Hansen 2007. – Naumov 2015.

78 E.g. Grivac: Bogdanović 2008, 128–130. – Zoomorphic interpretation by Karmanski 2005, 132–136 and Pls. 45–48.

Fig. 23. Burnishing bone tool (scraper) from the Starčevo filling layer SU 22 (CU18-22-3-17) made of a large mammal's rib segment (Photo: F. Ostmann, OREA).

character of the assemblage appears well embedded in the central Balkan repertoire.

6.1. Neolithic Bone Tools

In total, eight bone artefacts were recovered from the Neolithic SUs in the trench S1 at the site of Svinjarička Čuka. With the exception of one red deer antler, all the objects were made from the long bone or rib fragments of large and medium-sized mammals. The artefacts were classified into three groups according to the overall shape and mode of use on the working edge – pointed objects, burnishing tools and incomplete objects.[79] The group of incomplete artefacts (type VIII[80]) is the most numerous (four specimens); they (three bone and one antler piece) were too fragmented for more detailed typological classification, however, it was notable that all of them have traces of polishing or cutting. The group of pointed objects consists of three fragmented bone awls (type I1A[81]). Two of them were made from long bones of medium-sized mammals (probably sheep/goat), while the third one was made from a sheep/goat metapodial. The awls were made by longitudinal splitting of the bones with the final shape being obtained through cutting and polishing. In the case of the awl made from a sheep/goat metapodial (type I1A1[82]), it is noted that half of the distal epiphysis was preserved at the basal part as a handle, while the tip was missing. One almost completely preserved burnishing tool, a scraper, was made of the rib segment of a large-sized mammal (Fig. 23). The rib segment appears to have first been cut, with the basal end (handle) flattened, while the other, working edge is slightly curved and intensively used. It was notable that the whole scraper surface had a high polish.

7. Lithics

The first stage of analysis of lithics from the 2018 excavations of Svinjarička Čuka aimed to document finds from good contexts in order to provide first insights into technological, typological and raw material aspects of lithic production in the settlement. The assemblages selected for these investigations are related to Neolithic contexts in SUs 20 and 22 recovered from trench S1, and comprise 132 chipped stone artefacts. Additionally, the assemblage from the Bronze Age SU 1003 was studied with the aim of examining the diachronic picture regarding the production and use of chipped stone tools at this multi-phased settlement.

Techno-typological analyses

The study of lithic technology and typology related to material from the site concerns the identification of primary and secondary modification of blanks. Technological analysis, which is the focus of the current study, is based on the definition of five main categories regarding core reduction strategy, i.e. production of blanks – cores, core preparation and rejuvenation elements, blades, flakes and debris. Additionally, tested and unmodified pieces were documented from the excavated contexts. Detachment stigmata on cores and blanks (flakes and blades) were used for further assessments of knapping techniques. Secondary modification of blanks is addressed through the patterns of retouch (position, type) and traces of use studied both macro- and microscopically. Use traces were examined macro- and stereo-microscopically; however, no assessments concerning the functionality were attempted except in the case of sickle implements, which were determined based on the characteristic 'sickle gloss'.

Lithic Raw Materials

In order to gain insights into the lithic raw material economy involved in chipped stone tool production, the Neolithic assemblage was additionally subjected to raw material investigations. The goal of the analyses was to determine the raw material type and to establish consistent groups forming the basis for future provenance studies. The resulting groups were used to explore Neolithic raw material procurement and use, which are the foundations of resource management strategies. In combination with technological aspects, this allows for a preliminary view of the economic behaviour of the prehistoric inhabitants of this settlement.

79 Following defined typology and classification in Vitezović 2011.
80 According to Vitezović 2011.
81 According to Vitezović 2011.
82 According to Vitezović 2011.

Raw material	Variety	Macroscopic characteristics	Microscopic characteristics
vein quartz	1	semi translucent	flawless
	2	milky non translucent	some inclusions and micro cracks
jasper	1	yellow, red, non translucent	no fossil inclusions, typical growth structure
Neogene Lacustrine Silicite (NLS)	1	brown dominated, semi translucent – non translucent	characteristic lacustrine fauna communities corresponding to a Miocene lake environment (i.e. freshwater snails, algae remains, e.g. *charophyta*)
	1a	brown dominated, with macro-plant remains	
	2	blue dominated, non translucent	
	3	blue dominated, translucent	
	3a	pinkish purple, semi translucent – translucent	
	4	white dominated with brown/reddish Fe-oxide veins, non translucent	
	5	dark brown/greenish dominated, non translucent	
	6	dark brown dominated, semi translucent – translucent	
	7	black, non translucent – semi translucent on the edges	

Tab. 2. Characterisation of raw material varieties detected in the lithic assemblage from Svinjarička Čuka (M. Brandl).

Method of Raw Material Analysis

Lithic raw materials in the chipped stone tool assemblage of Svinjarička Čuka were determined in a two-stage process. The first step was forming macroscopic groups, defined according to visual criteria, i.e. colour, translucency, texture, and macroscopically detectable inclusions. The second step was microscopically examining the macroscopic groups for their internal consistency, aiming to identify characteristic inclusions in the raw materials. In silicites (i.e. organically formed SiO_2 modifications), the detection of microfossil remains is particularly helpful in identifying or narrowing down a raw material cluster; however, non-fossil inclusions can also be used for a classification. As a result of this analytical strategy, distinct raw material groups were defined (Tab. 2). Hereafter, the first results of detailed raw material analyses from Neolithic as well as Bronze Age contexts are presented (Tab. 3).

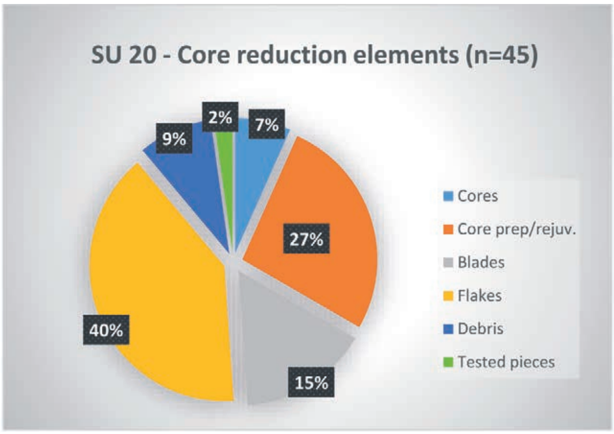

Fig. 24. Core reduction elements from the Neolithic SU 20 at Svinjarička Čuka (B. Milić).

7.1. Lithics from Neolithic Contexts

SU 20

This unit is composed of 45 pieces, with the presence of all core reduction elements (Fig. 24). Three cores from this layer, attesting to production of flakes and blade(let)s, imply different reduction systems – unidirectional, multidirectional, and bipolar. In terms of size, it seems that cores, preserved to maximum lengths of up to 30 mm, are quite extensively reduced and occasionally made on previous flakes, which testifies to a strong exploitation of raw materials. Core preparation and rejuvenation elements mainly comprise rejuvenation flakes related to preparation and/or rejuvenation of a knapping surface, decortification flakes and blades (i.e. lateral blades with cortex), and a single plunging blade. The assemblage of flakes is comprised of hinged, thin cortical and thin non-cortical specimens, with 15 mm being chosen as the boundary between thin and thick flakes for the site's assemblages. The maximum length of flakes in SU 20 is 45 mm, and the maximum width is 55 mm, which, besides regular and elongated flakes, also implies the production of short flakes. The majority of flakes display a unidirectional dorsal pattern, with half being complete examples. Both blank types – flakes and blades – show minimal dorsal reduction. Blades are rather fragmented, and

SU	Raw material	Variety	Artefact category												
			A	B	C	D	E	F	G	H	I	J	K	L	M
20	vein quartz	1													1
	NLS	1	1						3			1			
	NLS	2					1		2		2	4		2	1
	NLS	4							1		1	1			
	NLS	5							1	1					
	NLS	6			1					1	1	1			
	NLS	7									1				
	NLS	burnt				1			3		5	1	2	3	2
22	chert	'Balkan Flint (?)'								1					
	chert	indet.										1			
	vein quartz	1									1				
	vein quartz	2													1
	jasper	1												2	
	jasper	burnt													1
	NLS	1		1				1	3	2	4	5		3	4
	NLS	2			1				3		2	4	1	1	
	NLS	3			1						1	2		1	1
	NLS	4						1	5		5	2			
	NLS	5							2	1	1			1	
	NLS	burnt			1				4		7	4			5
1003=1016	vein quartz	1			2						1				
	vein quartz	2			2	1					1				
	jasper	burnt			1							1			
	NLS	1	1		4			1	9		6	6			2
	NLS	1a									2				
	NLS	2			6	1			1		3	1	1		
	NLS	3									1	1		1	
	NLS	3a									1	2			
	NLS	4				1			1		4	1			1
	NLS	5									1				
	NLS	7		1											
	NLS	burnt							3		2	1			6
	NLS	patinated										1			

Tab. 3. Raw materials and artefact categories from selected Neolithic and Bronze Age contexts. – A: Tested piece. – B: Blade core. – C: Flake core. – D: Blade and flake core. – E: Bipolar core. – F: Burin. – G: Unmodified preparation elements. – H: Preparation elements modified/used. – I: Flake. – J: Flake modified/used. – K: Blade. – L: Blade modified/used. – M: Debris (M. Brandl).

preserved to maximum lengths of 40 mm. It is unusual that almost all the blades from this layer come from an extensively burnt assemblage (visible through cracks, colour change, and potlid scars), which might be related to burning activity involved in the layer formation. Finally, a single tested nodule and a small amount of debris, related to pieces with unclear knapping properties and those resulting from burning activities, have also been recorded.

Based on the cores and blanks from SU 20, different detachment techniques can be recognised. Hard (stone) direct percussion is evident for at least one core and flakes with typical features on ventral sides with wide butts, cone-like bulbs and the presence of the bulb scar. A single bipolar core speaks in favour of the reduction of small flakes, triangular bladelets, and micro-blades using an anvil. The only evidence of possible pressure blade making is a single blade fragment from the burnt assemblage with parallel edges and a regular dorsal pattern, however, a larger collection is needed to confirm the presence of the pressure technique in the Starčevo horizon on the site. Finally, the presence of many incomplete and fragmented blanks without preserved proximal parts limits the identification of other techniques, such as soft direct and indirect percussion, i.e. the punch technique.

Within the assemblage of SU 20, 33.3 % is made up of retouched and used tools and 66.7 % unused pieces. Retouched tools comprise truncated and laterally retouched flakes and blades. In addition to the retouched tools, there are also unmodified flakes with use traces, which are macroscopically visible on the edges or on the distal and proximal ends. Two sickle blades are documented from the burnt assemblage, and display gloss on the edge opposite the retouched edge, which was probably modified for hafting purposes. Finally, based on the patina and different retouch types, two of the used and retouched flakes from this layer most likely relate to recycling and use of old artefacts of pre-Neolithic date.

Raw materials

Only two raw material types are present in SU 20, vein quartz and lacustrine chert, which can be defined as Neogene Lacustrine Silicite, from here on referred to as NLS (for a more detailed description see Brandl, Hauzenberger 2018).[83] Whilst vein quartz is only represented by one piece, NLS clearly dominates the assemblage with 44 specimens. Within the NLS component of the assemblage, sub-varieties 1 and 2 prevail, whereas the other varieties are underrepresented (Tab. 3). Raw material surveys undertaken in the 2018 season revealed that NLS sub-varieties 1 and 2 are the most common types in local deposits in the immediate surroundings of the site. Vein quartz is also available from sources in the immediate vicinity. All elements of the *chaîne opératoire*, including preparation flakes, were frequently used and modified, regardless of raw material varieties, which attests for their highly opportunistic ad hoc use. The present picture does not point to deliberate acquisition of specific raw materials for certain tasks (i.e. modified or formal tools). Additionally, 17 pieces are burnt.

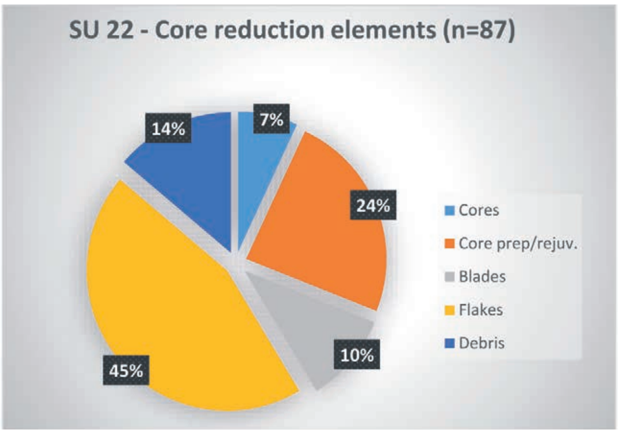

Fig. 25. Core reduction elements from the Neolithic SU 22 at Svinjarička Čuka (B. Milić).

SU 22

In total, 87 lithics from this unit demonstrate a similar pattern of distribution of core reduction elements related to the primary production of blanks (Fig. 25), as in SU 20. However, there is a smaller number of blades and greater amount of debris in SU 22 compared to the previously addressed layer. Cores are more numerous as well, which might have to do with the somewhat larger assemblage from this unit in general. Amongst the core collection there are unidirectional flake cores, a single turned blade core, and two burins (as cores). Almost all cores are made on previous flakes and show well exploited surfaces, as they are preserved in their final stage in lengths from 20–40 mm. Core preparation and rejuvenation elements are classified as knapping surface rejuvenation flakes, decortification flakes and lateral blades with cortex or preserved crested remains. The dorsal pattern of these pieces mainly shows uni- and multidirectional negatives with occasional cortex remains. The flake assemblage is quite large, which has to do with flakes being targeted products in the primary modification of blanks. Cortical and non-cortical flakes are equally distributed, followed by a few small flakes related to mini debitage (smaller

83 Brandl, Hauzenberger 2018.

than 11 mm) and a single hinged flake. Thick flakes (over 15 mm) are present as well, and often bear traces of cortex, resulting in the reduction of larger nodules. Some of them show additional removals of smaller flakes, however, these do not represent real cores with systematic reduction patterns. A large proportion of the flakes are preserved as complete, while the rest are preserved as proximal and distal fragments, with some flakes showing minimal lateral breakages, possibly due to their use. There are a couple of large flakes in this unit, with maximal lengths and widths of 70 mm and 60 mm respectively. Blades from SU 22 are mainly unidirectional, generally well preserved (half of the number is complete), often with traces of dorsal reduction and removal of overhangs, therefore attesting to a more regular reduction pattern than in the case of flakes, which involves the platform preparation. Debris corresponds to unclearly knapped pieces and pieces resulting from burning influence, with very little remains of knapping waste.

As in the material from SU 20, hard direct percussion is well documented in the assemblage of flakes, core preparation and rejuvenation elements, based on the presence of typical features associated with this technique on the ventral side of blanks. Additionally, minor or no platform preparation was observed. Two of the flakes show traces of hammering on the dorsal side, and imply that those were produced from nodules (or cores), which were previously used as hammer stones. This implies a recycling of the raw material involved in the chipped stone production. Aside from the dominance of hard direct percussion, the blade assemblage also has features that testify to the involvement of other techniques; nevertheless, it is unclear to what extent soft direct percussion or punching contributed to blade making in this Neolithic layer.

Retouched and used pieces (Fig. 26) make up approximately 43 % of the lithic assemblage of SU 22. It is interesting to note that practically all categories were used, including cores, debris, and, unexpectedly, flakes dating to before the Neolithic, which were likely to have been collected in the vicinity of the site. This shows that there are no preferred blanks for further modification, nor is there a clear selection between cortical and non-cortical (clean), thick or thin specimens for further use. Many suitable forms of blanks were used without any retouch. Retouched pieces are distributed through several tool types, laterally and end-retouched flakes, truncations, retouched and backed blades. While true formal tools are lacking in the Starčevo horizon analysed from two larger units, in SU 22 there appear to be single drills (micro-drill), semi-circular scrapers, and polishing tools.

One flake showed more than one retouch type, attesting to its use as a multifunctional tool including truncation and *pièce esquillée* use. Sickle inserts, also with retouched edges, are recorded on both blanks, i.e. blades and flakes, and differ in the position of the gloss, being oblique to the edge on a flake, and parallel to the edge on blade blanks. Unmodified used blanks are mainly represented by laterally used flakes. Based on the core typology and number of flakes, as well as determination of blank use, it is clear that this Starčevo assemblage is flake-based, with a rather small component of blades in the material, these were most likely all produced on site from local raw materials.

Raw materials

Chert, vein quartz, jasper and NLS were detected within the assemblage of SU 22 (Tab. 3). Of the two chert artefacts identified, one shows characteristics indicative of Cretaceous material commonly referred to as 'Balkan Flint'. Vein quartz and jasper are only represented by five pieces altogether and are therefore, only of minor significance. Due to their volcanogenic origin, jasper can sometimes co-occur with NLS in local deposits.[84] The presence of a preparation flake from possible 'Balkan Flint' also displaying use-wear is worth closer consideration, since some researchers see this kind of raw material as a potential marker for networks associated with the spread of the Neolithic in the Balkan region.[85] It will be of interest to examine the role of 'Balkan Flint' at Svinjarička Čuka once the excavations are further advanced and a larger sample of lithics is available.

Similar to SU 20, NLS dominates the assemblage with 80 pieces, whereby sub-varieties 1, 2 and 4 prevail. Sub-variety NLS 4 may be of interest, since it has not been recorded from deposits in the immediate vicinity of the site as commonly as varieties 1 and 2, and could therefore indicate the use of selected materials from specific NLS deposits. This however needs to be substantiated through sound provenance studies planned in the future. Although the number of blades increases slightly, they are made from a wide array of raw material varieties (jasper and different NLS types) showing a diffuse and opportunistic rather that targeted pattern of raw material use.

7.2. The Neolithic Lithics in a Broader Context – Preliminary Assessments

Although the number of lithics from good Neolithic contexts at Svinjarička Čuka is limited, we attempt a comparison with published data in order to place the material in a broader perspective of the Starčevo phenomenon. According to ^{14}C results from the analysed contexts, the lithic assemblage from Svinjarička Čuka can best be compared with

84 Brandl, Hauzenberger 2018.

85 Gurova 2012. – Gurova 2016.

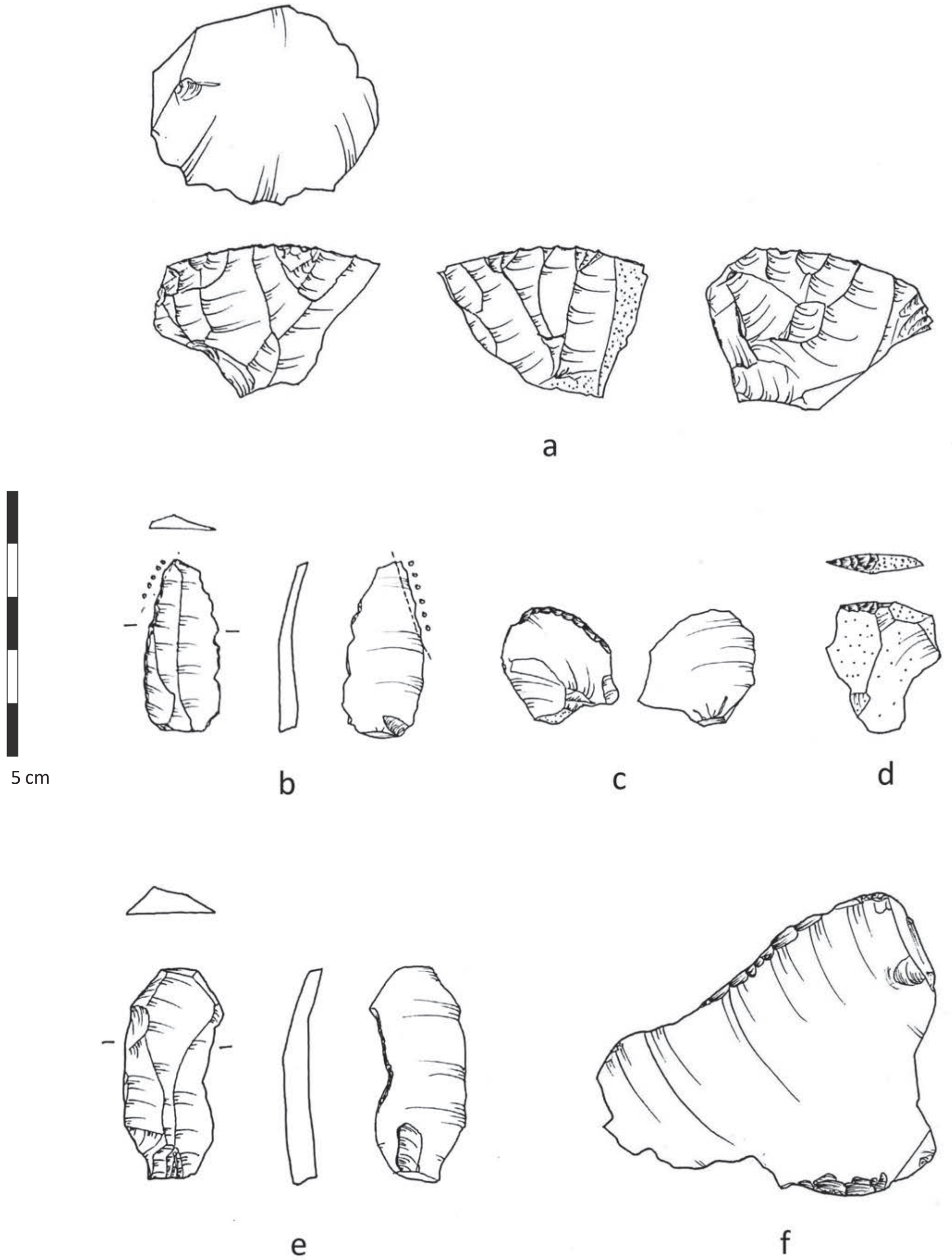

Fig. 26. Retouched tools (b–f) and a core (a) from the Neolithic SU 22 (B. Milić).

sites dating to advanced phases of the Starčevo horizon, such as Blagotin, Šalitrena pećina and Donja Branjevina dating to Starčevo II, and Ušće Kameničkog potoka and Knjepište dating to Starčevo III.[86] Lithic studies reveal a general trend that becomes visible through a diachronic view of the Starčevo horizon from the early (i.e. Proto-) to the latest phases, which is expressed by an overall decrease in unretouched flakes and, at the same time, an increase in all other retouched tool types. While the quality of tool technology seems to generally increase over time, the basic production of debitage does not show significant variation between different stages of the Starčevo horizon.

86 Šarić 2005. – Šarić 2006. – Šarić 2014.

According to Josip Šarić,[87] blades and retouched blades, as well as geometric microliths, potential elements of long-standing local traditions, characterise the 'typical' Starčevo chipped stone tool assemblage. Additionally, scrapers, side-scrapers, perforators, and burin-like tools are frequent tool types at Starčevo sites.

Specifically, the appearance of long regular (predominantly pressure) blades is a distinctive element in Starčevo lithic assemblages, and interpreted as indicating advanced developments in agricultural techniques, namely the increased need for standardised sickle blades.[88] Starčevo assemblages in which blades do not prevail are also known, e.g. from Ušće Kameničkog potoka and Knjepište, dating to a late phase of this horizon. Such local variations from the general pattern are interpreted following the idea that at certain sites agriculture may not have played an equally important role as at others (e.g. at Blagotin), possibly due to specialisation in specific food production or an unfavourable settlement location.[89]

From a 'global' raw material perspective, obsidian and specifically 'Balkan Flint' are perceived as potential markers for networks associated with the spread of the Neolithic in the Balkan region.[90] In combination with local resource use, this pattern is also described as an integral element of the Starčevo lithic raw material spectrum.[91]

Whilst still very preliminary, the results of our initial study of the lithic assemblage recovered from the Neolithic Starčevo layers at Svinjarička Čuka can be contrasted against this background. The analysis of core reduction processes at Svinjarička Čuka reveals a flake-based technology, substantiated by the large numbers of flakes, which constitute the blanks for the majority of modified tools in the investigated assemblage. Direct percussion using hard hammer stones seems to be the primary knapping technique used for production of blanks, whilst it is likely that others, in particular soft direct and indirect, i.e. the punch technique, were used in parallel. The presence of the pressure technique is lacking for now apart from one single fragment, which could also be an outlier from a different context. On-site production concerning all stages of the *chaîne opératoire* is documented, regarding the use of locally available raw materials, roughing out and decortification of the nodules, primary and secondary modification of blanks, and tool use, recycling and discard. Core reduction strategies and recycling of initial nodules can only be addressed in a preliminary manner for the Neolithic studied contexts, while larger assemblages are expected to shed more light on the local management of core reduction methods and use of blade blanks with the involvement of different production techniques in particular. The general tool set is still quite undefined, as the variety of formal tools remains poor. However, it seems that during the Starčevo horizon a large amount of artefacts were modified with a retouch or used in an opportunistic manner. Interestingly, there is a peculiar re-use of older artefacts, most likely dated earlier than the Neolithic.

The raw material economy relies heavily on locally available resources. The most popular raw materials used for the production of chipped stone tools in the investigated Neolithic units are Neogene Lacustrine Silicite (NLS) varieties, which clearly dominate the assemblage. Potential imports of specific NLS varieties can so far not be identified and require in-depth provenance analyses of distinct deposits in the vicinity of the site as well as from further away in the Leskovac and Niš-Dobrič Basin complexes. Systematic surveys have already been undertaken, and results based on the Multi Layered Chert Sourcing Approach (MLA)[92] can be expected in the near future. Vein quartz is far behind in numbers and makes up only a minor component of the assemblage. Jasper is also only present in insignificantly low numbers and does not allow for further interpretations. It is more likely that this raw material was obtained in the course of NLS procurement than assuming specific procurement from sources further away, since both raw materials can occur in the same deposits. This is especially true for secondary river sources where material from different source locations is accumulated. Only two chert outliers were recovered from Neolithic contexts so far. Amongst those, a preparation flake of possible 'Balkan Flint' displaying use-wear in SU 22 is worth closer consideration regarding the role assigned to this kind of raw material by previous studies.

As a preliminary conclusion, it becomes apparent that from both a techno-typological as well as a raw material perspective, we recognise a strongly localised pattern of lithic production and economic behaviour. With regard to the technology and typology, it is noteworthy that over one third of all lithic products (flakes, blades and preparation elements) are modified, which complies with the general assessment for later stage Starčevo assemblages. The group of blades, although representing a minor component in the

87 Šarić 2014, 191–192.

88 E.g. Šošić-Klindžić 2011, 353–354. – Šarić 2014, 186.

89 Šarić 2006, 18. – Šarić 2014, 186.

90 E.g. Gurova 2012. – Gurova 2016.

91 Šošić-Klindžić 2011, 353–354. – Bogosavljević Petrović, Starović 2013. – Gurova 2014. – Bogosavljević Petrović, Starović 2016, 34.

92 Brandl 2016.

investigated lithic assemblage, is maintained in both studied units. The role of blades in comparison to the clear dominance of flakes seems to contradict the general idea of advanced agricultural production at sites situated in advantageous locations such as Svinjarička Čuka; however, this pattern might change with the intensification of data when excavations have proceeded further.

Altogether, the analysed Neolithic assemblage predominantly relies on local lithic resources. Raw materials were procured in a highly opportunistic manner predominantly aiming at high quality NLS varieties most likely derived from the immediate vicinity of the site. Cores of the best quality were extensively exploited, and all products of the lithic reduction sequence were modified or used regardless of the raw material type. The presence of one specimen of 'Balkan Flint' indicates the embedding of Svinjarička Čuka into networks active in the Neolithic central Balkans. In this regard, it will be of interest to examine the role of 'Balkan Flint' at Svinjarička Čuka once the excavations are further advanced and a larger sample of lithics is available.

7.3. A Brief Diachronic Perspective

A single unit from trench N1, related to the Bronze Age layer was chosen for comparative analysis regarding lithic technology and typology. This SU 1003 (=1016) also contained the most representative assemblage with the highest number of chipped stone artefacts, which can be used to address the production and use in the later phase of the site's occupation. As in the Neolithic units, the Bronze Age unit 1003 (with 1016) confirms the presence of all stages of the *chaîne opératoire* in this layer, attested through studied categories related to core reduction and primary modification of blanks (Fig. 27). The core typology and dominant components of flake products testify to a strong flake-based assemblage in the Bronze Age, with a minor element related to blade production on-site. The most abundant core type is the irregular multidirectional flake core, which constitutes half of the core assemblage. Other significant types are the production of flakes and mixed flakes and blades using a single or double platform, and are followed by turned cores and burins. Additionally, there are a couple of cores on large flakes. Cores in general display a broad range of sizes and shapes, reaching the maximal weight of 800 gr and length/width of 130 mm. Some of the cores were subsequently turned into hammer stones after the exploitation of the knapping surface, which additionally confirms the idea of extensive exploitation of the raw materials. On some occasions, the final stage of core reduction displayed evidence for the production of bladelets and small flakes, and in these cases they have prepared platforms. Such tiny blades and flakes were documented from the flotation samples, which provided new information about the presence of mini debitage in the Bronze Age as well. Numerous core preparation and rejuvenation elements give a good overview of on-site decortification of cores, and further preparation and correction of knapping surfaces. Additionally, the presence of platform rejuvenation flakes and tablets speak in favour of a rather systematic reduction of unidirectional flake-blade cores in this layer. A large number of flakes show good preservation, with half of the number being complete (up to 50 mm in length). A few flakes also show additional removal of smaller pieces, which supports the interpretation relating to the opportunistic manner of production. Thin (non-cortical and cortical) flakes are most numerous amongst the flake assemblage, followed by a small number of thick cortical and hinged specimens and tiny flakes attesting to a mini debitage.

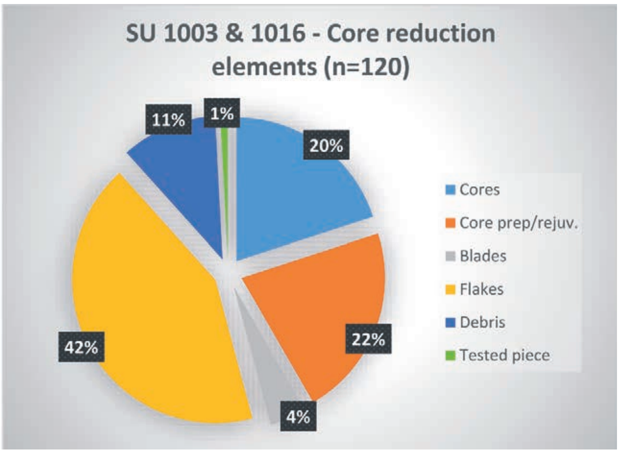

Fig. 27. Core reduction elements from the Bronze Age SUs 1003 and 1016 at Svinjarička Čuka (B. Milić).

Only five blades have been recovered from this unit, with dorsal patterns following the unidirectional and single bidirectional knapping system. Blades and blade fragments are preserved with a maximal length of 50 mm but do not provide enough information about the knapping technique due to fragmentation and the absence of proximal parts. Debris is mainly related to unclearly knapped artefacts and occasional residue from burning and not to waste products from knapping. Many flakes and preparation/rejuvenation elements suggest the use of hard (stone) direct percussion for the main blank modification. The presence of hammer stones, and cores turned into hammer stones, confirms the on-site production and recycling of artefacts.

The tool sets from these two major Bronze Age contexts are still quite undefined as the variety of formal tools remains poor; however, it is possible to contrast the Bronze Age and the Neolithic. A large amount of artefacts from the Starčevo horizon were modified with a retouch or used in an opportunistic manner; however, in the Bronze Age similar methods of tool production and use are found on a significantly lower number of retouched tools in general, making up 26 % of the assemblage. The modification of blanks through retouch suggests the use of several tool types during the Bronze Age – laterally and end-retouched flakes are most numerous, followed by notches, end-scrapers on flakes, truncations, pointed tools (possibly including drills), laterally retouched blades and a single *pièce esquillée*. Tools do not seem to have been particularly selected in terms of clean and regular blanks, as cortical and rejuvenation flakes often seem to be used alongside other clean and rather regular blanks. In both contexts, there is an unusual re-use of older artefacts, most likely dated earlier than the Neolithic.

In terms of raw materials, vein quartz, jasper and NLS are present in the Bronze Age context. The two jasper artefacts, a flake core and a flake, are burnt. Vein quartz presents a more interesting case with seven artefacts produced from this raw material in the lithic assemblage, of which five are cores and two are flakes, indicating a small-scale quartz industry. All other lithic finds correspond to different NLS varieties, with types 1, 2 and 4 by far outnumbering the rest. In addition to the NLS types already seen in the Neolithic assemblage, a few other varieties appear (i.e. NLS 1a and 3a, see Tab. 3); however, they are in very low numbers and only used for the production of typologically insignificant flakes. Hence, speculations concerning the targeted procurement of those materials are more than doubtful.

Finally, taken together, the overall raw material distribution pattern and production of chipped stones in the investigated Bronze Age assemblage appears to rely heavily on a local, opportunistic supply strategy, which seems to be generally comparable to assemblages from the Neolithic, and should be investigated in more detail when more material is available.

8. Archaeobotanical Remains

Despite its rich and, for this part of Europe, highly significant archaeological heritage, southeastern Serbia has received very little archaeobotanical attention. The geographical location of the region – at the junction of the cultural influences coming from the east (via Bulgaria) and the south (via North Macedonia) – must have, in the past, made this region a corridor for the transfer of goods and technologies and a transversal route for people. The first domesticated plants likely travelled this route on their way to central Europe from southwest Asia. It is known that they first reached the central Balkans in the Early Neolithic, but it remains unclear when exactly this happened and whether the appearance of domesticates happened simultaneously over a broader region or if they, for example, emerged first in the south (e.g. in southeast Serbia). Also not fully resolved is the repertoire of plants used in the prehistory of the region and their economic importance. The archaeobotanical datasets available to date from southeastern Serbia are few and small, with more data urgently needed to address long-standing questions about prehistoric plant use in this part of the Balkans, its social and environmental context, and impact. The archaeobotanical work at the site of Svinjarička Čuka offers an ideal opportunity to start filling in this knowledge gap with analysis looking to address the following:

- How are plants preserved at the site and, roughly, in what quantity? How was the botanical assemblage formed?
- In what kind of archaeological contexts were plant remains found (i.e. distribution of plant materials across the site as a proxy for the reconstruction of plant-related activity areas)?
- Which plants (domesticated and wild) are represented at the site and what was their potential role (e.g. crops grown for food/fodder, gathered wild plants, etc.)? What was their importance to the inhabitants of the site?
- Were domesticated plants grown and processed at the site? What were the crop growing conditions?
- What do gathered wild plants reveal about the environment of the site?
- How does the assemblage from this site compare to the datasets from other contemporary sites in the wider region?

8.1. Sampling, Recovery and Analysis

During the first excavation season at Svinjarička Čuka, 10-litre samples were taken from selected stratigraphical units; the sampling was not systematic, and layers and contexts were targeted that appeared unmixed and/or relatively higher-yielding in archaeological materials, with the aim of increasing the likelihood of finding and retrieving plant remains. For this reason, more than one sample was also sometimes taken from a single SU. In total, 38 soil samples were taken from 21 SUs in the two excavation trenches. The samples, amounting to 446 litres of soil, were processed with the help of a flotation set-up constructed to be used on-site. The system consisted of an adapted 180-litre oil drum and a 500-litre plastic water tank from which water was directed into the barrel through a garden hose. Flotation was essentially done manually since, instead of a power source (e.g. water pump), advantage was taken of the natural slope of the terrain to drive water from the reservoir (cistern), placed on top of the steep slope (m≈2), to the flotation tank, installed at the foot of the slope, by the bed of the dried-up Svinjarička stream. This is similar to the principle used for the 'Ankara machine'[93] where water pressure from an elevated reservoir was also used to break up the sediment. In building the flotation tank for Svinjarička Čuka (Fig. 28), drawings illustrating the system used at the site of Kaman-Kalehöyük[94] were consulted and the machines used at the site of Çatalhöyük served as a model. A large shower head was fixed inside the oil drum, at mid-height, and connected with the water inlet; it served to apply water pressure from below flotation samples. A metal grid was installed above the shower head to hold the 2-mm plastic net (standard window screen), used to collect the heavy residue. For each flotation sample, a clean piece of net was placed inside the tank above the metal grid and clipped to the rim of the drum. A metal spout (sluice) was attached to the rim on the outside to channel the overflow into a piece of fine, c. 300-micron cloth that collected the light residue. The cloth was fastened to the rim of a bottomless bucket, which was then hung on the hooks projecting from the sluice. The use of cloth was preferred to the use of sieves, as this solution ensures that the floating plant remains are retained without being pressed against a metal screen of (nested) geological sieves. Water inflow into the tank was controlled by a tap installed on the outside of the barrel and a handheld hose extended from the tap to apply water pressure from above the sample.

The light and heavy fractions of the samples were left to dry within the pieces of cloth and net. After drying, they were transferred into paper and plastic bags. All were sorted in their entirety – heavy fractions with the naked eye,[95] and light fractions with the aid of a low-magnification (x8–x40) stereo-microscope. The suitable charred plant remains from several of the samples were submitted for radiocarbon dating (discussed above). Non-wood macro-plant remains (e.g. seeds, fruits) were identified to the level of family, genus or species, whereby some of the remains were too poorly preserved or fragmented and they remained unidentified. They were all counted or their volume measured (the latter was done for wood charcoal and amorphous pieces of vegetal matter). The counts of different taxa per sample are combined in cases where more than one sample was taken from the same SU; thus, in this report, SUs also represent the units of archaeobotanical analysis.

Fig. 28. Stages in the construction of a flotation tank for Svinjarička Čuka (Photos: D. Filipović).

8.2. Results of the Analysis for 2018

The heavy fractions contained small amounts of materials such as chipped stone debitage, potsherds, small (fragments of) bones, a few beads, pieces of daub and stone, and charred plant remains (mostly wood). The light fractions were sorted for charred non-wood and wood remains; charring was the only plant preservation mode observed. Table 4 lists the identified taxa and the number of remains per analysed SU, whilst the discussion covers the remains of all SUs/periods together.

93 French 1971, 60.

94 Nesbitt 1995.

95 This work was done by Dragana Perovanović, archaeologist from Belgrade.

		Trench	S1	S1	S1	S1	S1	S1	S1	S1
		SU	5	6	10	12	14	15	18	19
		Category	arbitrary layer	stone accumulation	arbitrary layer	stone accumulation	pit	arbitrary layer	arbitrary layer	stone accumulation
		Sample volume (L)	12	12	12	12	12	36	12	12
		Botanical density	0.0	0.6	0.6	1.3	0.1	0.3	1.1	0.3
	Wood charcoal	(volume in ml)	0.2	6	0.5	6	3.5	1.7	9.5	2.5
Plant taxon	**Common name**	**Plant part / total remains**	0	7	7	15	1	12	13	3
CEREALS										
Triticum monococcum	einkorn	grain							1	
Triticum dicoccum	emmer	grain			3			5	1	
Triticum monococcum/ dicoccum	einkorn/ emmer	grain			3					
Triticum sp., 'new type'	'new type' glume wheat	glume base								
Triticum sp., hulled	glume wheat	grain						1		
Triticum sp.	wheat	grain				1		3		
Hordeum vulgare, hulled	hulled barley	grain								
Hordeum vulgare	barley	grain		3						
Panicum miliaceum	broomcorn millet	grain				11	1		10	1
Cerealia indeterminata (non-*Panicum*)	indeterminate cereal	grain		3				2		1
LEGUMES										
Lathyrus sativus/cicera	grass pea	seed								
Lens culinaris	lentil	seed								
Pisum sativum	pea	seed								
Vicia ervilia	bitter vetch	seed				1				
Leguminosae sativae indeterminatae	indeterminate legume	seed								
OIL/FIBRE PLANTS										
Linum usitatissimum	flax/linseed	seed								
WILD-GATHERED PLANTS										
Cornus mas	cornelian cherry	fruitstone fragment						4		
Corylus avellana	hazelnut	fragment of nutshell								
Fragaria vesca	wild strawberry	seed								
Phragmites communis	common reed	culm node fragment								
Physalis alkekengi	Chinese lantern	seed								
Prunus insititia	damson plum	fruitstone fragment								
Rubus idaeus	raspberry	seed								1
Sambucus nigra	black elder	seed								
Sambucus sp.	elder	seed								

Tab. 4. The list of plant taxa identified at Svinjarička Čuka and their quantities (D. Filipović).

S1	S1	S1	S1	N1	N1	N1	N1	N1	N1	N1	N1	N1
20	21	22	26	1003	1016	1009	1010	1008	1013	1017	1015	1023
arbitrary layer	arbitrary layer	arbitrary layer	stone structure	Bronze Age feature	Bronze Age feature	daub accumulation	daub accumulation	posthole 1022	posthole 1031	vessel	same as 1023	same as 1015
24	24	60	24	60	24	12	12	12	18	24	12	20
0.4	1.0	0.6	0.5	0.3	0.6	0.2	1.3	0.1	0.1	0.3	0.2	1.4
1.1	4	3.4	1	16.7	11.5	1.8	1.7	1.5	2.2	1.9	3	15
10	23	37	13	19	15	2	15	1	2	6	2	28
		2		3	3							4
2	5	1	2		4							2
		1	1	1	1				1			
			2									
1												4
		2		1			1	1		1	1	1
	2	4	1				1					5
1	1	4	1	1			1			2		1
	8			1			1					
4	1	9	1	4	4	1			1	1	1	1
												1
				2								2
	2											
		1										1
	2	2	1									
					1							
		2			1							
2												1
		1	1									
		1										
		1	1									1
		1										
							1					
		1										
					1							

		Trench	S1	S1	S1	S1	S1	S1	S1	S1
		SU	5	6	10	12	14	15	18	19
		Category	arbitrary layer	stone accumulation	arbitrary layer	stone accumulation	pit	arbitrary layer	arbitrary layer	stone accumulation
ARABLE/RUDERAL PLANTS										
Alchemilla type	lady's mantle (type)	seed			1					
Cerastium sp.	chickweed	seed								
Chenopodium album	fat-hen	seed								
Chenopodium polyspermum	manyseed goosefoot	seed								
Chenopodium sp.	goosefoot	seed								
Echinochloa crus-galli	barnyard millet	fruit		1						
Fallopia convolvulus	black bindweed	nutlet							1	
Galium aparine	cleaver	seed						1		
Galium cf. *spurium*	false cleaver	seed								
Galium sp.	bedstraw	seed								
Hordeum sp.	(weedy) barley	fruit								
cf. *Lolium*, small-seeded	ryegrass	fruit								
Matricaria chamomilla	chamomile	seed								
Mentha sp.	mint	seed								
ARABLE/RUDERAL PLANTS										
Poa trivialis type	rough bluegrass (type)	fruit								
Poa sp.	bluegrass	fruit								
cf. *Potentilla* sp.	cinquefoil	seed								
Rumex, sp. (keeled, *conglomeratus* type)	dock	nutlet								
Setaria viridis/ verticillata	green/bristly foxtail	fruit								
Setaria/Echinochloa	foxtail/bar-nyard millet	fruit								
Solanum dulcamara	bittersweet	seed								
Tecurium chamaedrys	wall germander	seed				1				
Teucrium sp.	germander	seed								
Trifolium pratense type	red clover	seed								
Trifolium repens type	white clover	seed								
BROADLY IDENTIFIED										
Chenopodiaceae		endosperm (core)								
Crucifereae, small-seeded		seed								
Poaceae		fruit								
Solanaceae		seed				1				
indeterminate		seed								

Tab. 4. Continued.

S1	S1	S1	S1	N1	N1	N1	N1	N1	N1	N1	N1	N1
20	21	22	26	1003	1016	1009	1010	1008	1013	1017	1015	1023
arbitrary layer	arbitrary layer	arbitrary layer	stone structure	Bronze Age feature	Bronze Age feature	daub accumulation	daub accumulation	posthole 1022	posthole 1031	vessel	same as 1023	same as 1015
				1								
			1									
	1											
							2					
		1		1								1
							1					
1												
						1						
		1										
				1								
							1					
												1
		1										
							1					
		1										
							2					
	1											
										1		
			1									
		1										
										1		
							1					
							1					
		1		1			1					
		1										2
				1								
				1								

		Trench	S1	S1	S1	S1	S1	S1	S1	S1
		SU	5	6	10	12	14	15	18	19
		Category	arbitrary layer	stone accumulation	arbitrary layer	stone accumulation	pit	arbitrary layer	arbitrary layer	stone accumulation
BROADLY IDENTIFIED										
indeterminate nutshell/ fruit stone		fragment								
cf. nutshell/fruit stone		fragment								
nut meat (volume in ml)		amorphous fragments								
cf. fruit flesh or skin (volume in ml)		amorphous fragments		1	0.01			0.1		
'food' (volume in ml)		amorphous fragments								
mouse pellet										

Tab. 4. Continued.

Overall, the SUs yielded little plant material and the density was extremely low, rarely exceeding one seed/fruit item per litre of soil. The presence of charcoal is also minor. This is unsurprising given that, on the one hand, the chance of becoming charred determined the potential of plants and plant parts to be preserved and on the other, no fire-related features have been encountered in the excavated portion of the site (hearths, ovens etc.) which could be a source of charred plant remains. In addition to the charred material, burning was documented by the presence of lumps of burnt daub. The relationship between quantified remains of wood charcoal and seed/fruit/chaff remains (illustrated in Fig. 29) shows the general co-occurrence of relatively higher amounts of charcoal and seeds/fruits in the SUs. This indicates that, in most cases, both types of material come from the same source and were deposited at the same time. The sources could be fire-installations, where the plant material served as fuel, or other areas of burning, which may have been on a larger scale, given the finds of burnt (house) daub. From this perspective, it is possible that at least some of the charcoal comes from burnt construction wood (e.g. timber, wattle) and also that some of the non-wood remains represented inclusions (as temper) in daub or a building material in their own right (e.g. reed stems).

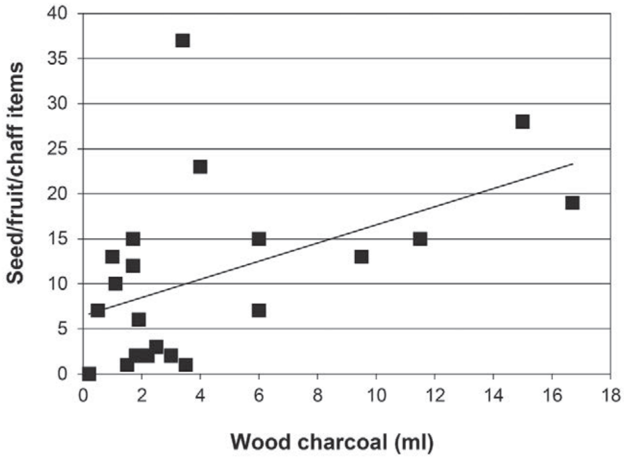

Fig. 29. The relationship between wood charcoal and charred seed/fruit/chaff remains at Svinjarička Čuka (D. Filipović).

Despite the modest number of the remains, a range of crops and wild plants were identified in the assemblage retrieved in 2018. They include cereals, legumes and an oil/fibre plant that were grown in fields or gardens, wild plants with edible fruit or other parts that supplemented the plant diet reliant on produced food, and wild plants that likely grew in cultivation plots (as arable weeds) around them, or near the areas used or affected by humans (e.g. trampled areas, waste places). These plants are known from other analysed prehistoric sites in the wider region and they point to a combination of agriculture and wild plant gathering in food acquisition strategies. The diverse taxonomy reflects different activities, from processing of plants prior to use (e.g. removal of weed/wild seeds, wheat chaff and nutshell) to disposal of inedible parts (e.g. fruit stone). The presence of crop by-products (though minimal – a single spikelet fork and seeds of potential weeds) indicates that processing of crop harvests could have taken place within or near the site and that crops were perhaps grown locally. The surroundings of the site would have been suitable for food production and maybe this attracted the use of the area in

S1	S1	S1	S1	N1	N1	N1	N1	N1	N1	N1	N1	N1
20	21	22	26	1003	1016	1009	1010	1008	1013	1017	1015	1023
arbitrary layer	arbitrary layer	arbitrary layer	stone structure	Bronze Age feature	Bronze Age feature	daub accumulation	daub accumulation	posthole 1022	posthole 1031	vessel	same as 1023	same as 1015
					1							1
						1						
												0.3
	0.01	0.2								0.01		
	2											

different prehistoric periods, as demonstrated by the presence of artefactual evidence from the Neolithic through to the Iron Age.

The plant remains also derive from different phases of occupation of this locale and reflect its long-term use. Einkorn, emmer and 'new type' glume wheat were present in the central Balkans from the Neolithic onwards. Barley was frequently present in the Neolithic in the region, but has almost always been found in very small quantities; much more barley has been found in later deposits, those from the Late Bronze and Iron Ages.[96] Broomcorn millet is also visible here from the Late Bronze Age onwards. Svinjarička Čuka thus has the potential to document long-term changes in the crop spectrum and possibly also in the agricultural practices associated with different crops in this regional context. On the other hand, the fact that the same area was used in different periods of prehistory requires caution when attributing plant remains to the specific temporal phases, since the remains from later cultural layers could have ended up in the earlier deposits, i.e. could be intrusive. This is where absolute dating of the deposits is essential and will enable the investigation into diachronic changes/continuity in plant production and use strategies at this site.

9. Animal Bones

Animal remains recovered from the ongoing excavations at the site of Svinjarička Čuka provide a unique opportunity to examine the nature and development of the animal economy during the Early Neolithic, the Late Bronze Age and the Early Iron Age. The broad goals of archaeozoological research at the site are to reconstruct the animal economy and strategies of animal exploitation and their changes over time. In general, archaeozoological data from southern Serbia are very scarce with up-to-date archaeozoological data available from only four sites – the Late Neolithic Pločnik,[97] the Eneolithic/Early Bronze Age Bubanj,[98] the Late Bronze Age Hisar,[99] and the Early Iron Age Ranutovac.[100] With a lack of detailed information on animal use in this region during the Early Neolithic, the new archaeozoological research at Svinjarička Čuka will provide a valuable glimpse into the animal economy of the first herders in southern Serbia. Also, the research will broaden the existing very modest knowledge of animal exploitation during later prehistoric periods. Considering that archaeological investigations at the site have just started, and that a relatively small amount of animal remains have been collected during the first excavation season in 2018, the preliminary results of this initial archaeozoological research are limited and insufficient for detailed reconstruction of the animal economy and its diachronic change. However, these results provide first evidence of domestic and wild animals present and used during the Early Neolithic and the Late Bronze Age at Svinjarička Čuka, as well as data on the taphonomic histories of the analysed faunal samples which are presented and discussed here. Detailed analysis of biometrics, survivorship, and

96 Filipović 2014. – Filipović 2015.

97 Bulatović 2018. – Bulatović, Orton in press.

98 Bökönyi 1991. – Bulatović 2018.

99 Bulatović, Stankovski 2012.

100 Bulatović, Marković, Bulatović 2014.

skeletal part data will be carried out in the future when the sample size allows it.

9.1. Recording Protocol

All animal remains recovered during the 2018 field season at the site of Svinjarička Čuka have been recorded. Specimens identified to the lowest possible taxonomic category – usually to a genus or species level – considered 'diagnostic'[101] were analysed in detail and (beside taxon) the following data were recorded where appropriate: element, symmetry, element part, diagnostic zones,[102] epiphyseal fusion, tooth eruption/wear,[103] sex, surface condition, burning, gnawing, and metrics.[104] Specimens with butchery and modification marks, or pathological changes were automatically treated as 'diagnostic' even if they did not meet the other criteria, with the location and description of these features being recorded. 'Un-diagnostic' specimens were only counted by body size category (large [cattle-sized], medium [sheep-sized] or small [hare-sized]) and element type; weathering, gnawing and burning marks were just counted. Taxonomic identification was carried out using the reference collection of the Laboratory for Bioarchaeology of the Faculty of Philosophy in Belgrade, helped by published morphological criteria.[105] The number of identified specimens (NISP) was used as a quantification measure.

The vast majority of animal remains were systematically collected by hand in combination with dry sieving, while a very small quantity (2 % of the total) was retained from wet-sieved soil samples (i.e. heavy residue samples); however, they have been analysed together, no matter the method of their recovery. All specimens belong to mammals and remains of other animal classes were not identified. Out of 1820 animal remains from the site of Svinjarička Čuka, 565 (31 %) were collected from the SUs excavated in the trench N1, while the remaining, larger portion of 1255 specimens (69 %) were retrieved from those in the trench S1.

9.2. Animal Remains from the Trench N1

Out of the total number of excavated SUs in the trench N1, animal remains were found in the following 14 SUs: 1000, 1001, 1002, 1003, 1004, 1005, 1012, 1015, 1016, 1018, 1019, 1023, 1024 and 1029. As the majority of these SUs are topsoil or artificial layers with relocated and mixed archaeological material from different periods, animal remains found in them (although recorded) have not been analysed. Only a smaller amount of animal remains (167 or 29.6 % out of the 565 recovered and recorded specimens) deriving from five undisturbed SUs dated to the Early Neolithic (SU 1024), the Late Bronze Age (SUs 1003, 1016) and the Early Iron Age (SUs 1015, 1023) have been analysed and the results presented (Tab. 5).

Faunal samples from the Early Neolithic and Early Iron Age SUs in the trench N1 are extremely small, and consist of only 11 and 12 specimens respectively, with slightly more remains dating to the Late Bronze Age. The Late Bronze Age sample consists of 144 animal remains, out of which 44 (30.6 %) were identified to the species level. Animal remains from this sample are mostly fragmented, and only six (4 % of the total) short bones (phalanges and astragali) are complete. Gnawing marks made by carnivores (most likely by dogs) were noticed on 12 specimens (long bone [e.g. humerus, radius, tibia] and scapula ends, and phalanges). Evidence of butchery in the form of a few short cut marks is observed on only one long bone shaft fragment of a large (cattle-sized) mammal. A red deer antler fragment was cut by the cut-and-break technique, however, the specimen was too fragmented for detailed typological classification. One unidentified specimen was carbonised due its exposure to fire. Data obtained through the analysis of this Late Bronze Age faunal sample are limited because of its size, but still, they provide the first, preliminary evidence for the animals present and used at Svinjarička Čuka during this period. Remains of domestic cattle and caprines (sheep and goat taken together) are evenly represented and the most frequent in the sample, followed by domestic pig and red deer. Wild pig, roe deer and dog remains are also present (Tab. 4).

9.3. Animal Remains from the Trench S1

Animal remains were recovered from 19 SUs (6, 7, 8, 10, 11, 14, 15, 18, 19, 20, 21, 22, 23, 25, 26, 28, 29, 30, 31) excavated or detected (but not fully excavated) in the trench S1 at the site of Svinjarička Čuka. Out of the total animal remains (1255) from the trench, 810 specimens (64.5 %) were collected in seven undisturbed Early Neolithic SUs (20, 22, 23, 25, 26, 28, 30), whilst the rest recovered from the other SUs with mixed deposits and later intrusions have not been analysed. The distribution of different animal taxa based on

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101 The following criteria described by Russell, Martin 2005 for diagnostic specimens were considered: skull fragments identified to the skull region they came from, atlas, axis, sacrum, pelvis and scapula articular surfaces, mandible fragments assigned a side, long bone shaft fragments with at least half the circumference of the shaft and with the portion of articular or metaphyseal surface preserved, tooth fragment assigned to a jaw and tooth class.

102 Dobney, Reilly 1988.

103 Payne 1973. – Grant 1982.

104 Measures were taken following Driesch 1976.

105 E.g. Boessneck, Müller, Teichert 1964. – Schmid 1972. – Prummel 1988. – Halstead, Collins, Isaakidou 2002. – Zeder, Lapham 2010. – Zeder, Pilaar 2010.

		Early Neolithic	**Late Bronze Age**				**Early Iron Age**		
		SU 1024	**SU 1003**	**SU 1016**	**TOTAL**		**SU 1015**	**SU 1023**	**TOTAL**
Common name	Latin name	NISP	NISP	NISP	**NISP**	**% NISP**	NISP	NISP	NISP
domestic cattle	*Bos taurus*	1	14		**14**	**31.8**			
domestic pig	*Sus domesticus*		4	2	**6**	**13.6**			
wild pig	*Sus scrofa*		2		**2**	**4.5**			
sheep	*Ovis aries*		1		**1**	**2.3**			
sheep or goat	*Ovis/Capra*	1	12	1	**13**	**29.5**		1	1
dog	*Canis familiaris*		1		**1**	**2.3**			
red deer	*Cervus elaphus*	1	6		**6**	**13.6**			
roe deer	*Capreolus capreolus*		1		**1**	**2.3**			
brown bear	*Ursus arctos*	1							
Identified		**4**	**41**	**3**	**44**	**100**		**1**	**1**
large mammals		6	61	3	**64**		1		1
medium mammals		1	27	8	**35**		3	1	4
mammals (indet.)			1		**1**			6	6
Unidentified		**7**	**89**	**11**	**100**		**4**	**7**	**11**
TOTAL		**11**	**130**	**14**	**144**		**4**	**8**	**12**

Tab. 5. Distribution of various animal taxa at Svinjarička Čuka by SU (period) in the trench N1 as NISP (Graph: J. Bulatović).

NISP by SU from the trench S1 during the Early Neolithic is given in Table 6.

The number of animal remains varies by SUs in the trench S1. SU 20 and SU 22 yielded far more animal remains compared to all the others (e.g. SU 28; however, the remaining Early Neolithic SUs have not been excavated yet, and specimens from them were accidently picked up). Out of the total 810 animal remains from the Early Neolithic SUs in the trench S1 at the site of Svinjarička Čuka, 120 (14.8 %) were identified to the genus or species level. This low percentage of specimens identified to the lowest taxonomic level is the consequence of their fragmentation. In general, animal remains from the Early Neolithic SUs are very highly fragmented. Complete specimens constitute only 0.9 % of the sample, and all of them are dense and firm short bones – carpals, tarsals or phalanges. Approximatelly 2 % of specimens had visible traces of burning; their colour ranged from black in carbonised to white in calcined specimens. Gnawing marks, most likely made by dogs, were noticed on around 4 % of specimens in the sample, indicating that the animal remains had been on the surface available to dogs for a period of time before they were buried. Human modifications in the specimens were made during animal butchery, bone manufacturing and their usage as a tool. Short and long cuts or chop marks produced during the proccessing of animal carcasses are observed on 16 specimens; their location implies that different stages of animal butchery such as skinning, dismembering, disarticulation and filleting were practised in the settlement. Butchery marks were observed on the caprines (humerus, tibia, calcaneus), domestic cattle (radius, pelvis), badger (femur) and ibex (first phalanx) remains. They were also noticed on rib and long bone fragments of unidentified large (cattle-sized) mammals, as well as on long bone fragments of sheep-sized mammals.

Remains of 11 different species – five domestic and six wild – were identified in the Early Neolithic sample from the trench S1 at the site of Svinjarička Čuka (Tab. 6). Domestic cattle is the most abundant species (41.7 %) followed by caprines (sheep and goat taken together) which are also well represented (32.5 %). The third most common species is domestic pig, whose remains comprise around 11 %, while there is only one specimen belonging to dog. Red deer is the most frequent wild species followed by wild pig, while all the other identified wild species – roe deer, ibex, badger and fox – are represented with only one specimen.

10. Summary and Outlook

The first results of the geoarchaeological surveys in 2017, excavations in 2018 and a study campaign in 2019 revealed some essential new data for understanding the Neolithisation

		Early Neolithic								
		SU 20	SU 22	SU 23	SU 25	SU 26	SU 28	SU 30	TOTAL	
Common name	Latin name	NISP	NISP	NISP	NISP	NISP	NISP	NISP	**NISP**	**% NISP**
domestic cattle	*Bos taurus*	21	21		1	1	3	3	**50**	**41.7**
domestic/wild cattle	*Bos* sp.							2	**2**	**1.7**
domestic pig	*Sus domesticus*	1	9				1	2	**13**	**10.8**
wild pig	*Sus scrofa*	1	2				1		**4**	**3.3**
domestic/wild pig	*Sus* sp.		1						**1**	**0.8**
sheep	*Ovis aries*	2	2						**4**	**3.3**
goat	*Capra hircus*	1							**1**	**0.8**
sheep or goat	*Ovis/Capra*	14	15				2	3	**34**	**28.3**
dog	*Canis familiaris*		1						**1**	**0.8**
red deer	*Cervus elaphus*	3	3						**6**	**5.0**
roe deer	*Capreolus capreolus*		1						**1**	**0.8**
ibex	*Capra ibex*	1							**1**	**0.8**
badger	*Castor fiber*		1						**1**	**0.8**
fox	*Vulpes vulpes*	1							**1**	**0.8**
Identified		**45**	**56**		**1**	**1**	**7**	**10**	**120**	**100**
large mammals		201	240	1		17	11	38	499	
medium mammals		56	99				7	7	159	
mammals (indet.)		3	10						10	
Unidentified		**260**	**349**	**1**		**17**	**18**	**45**	**690**	
TOTAL		**305**	**405**	**1**	**1**	**18**	**25**	**55**	**810**	

Tab. 6. Distribution of various animal taxa at Svinjarička Čuka by Early Neolithic SUs in the trench S1 as NISP (Graph: J. Bulatović).

process along the Southern Morava Valley in southern Serbia. The Leskovac Basin forms the geographical framework of the new NEOTECH project, where, so far, five new sites of the Neolithic period have been detected. Our first field investigations (core drilling and excavations) at Svinjarička Čuka revealed substantial anthropogenic layers dating to the Early and Middle Neolithic, Eneolithic, Middle and Late Bronze, as well as Early Iron Age periods. The radiocarbon dates of both, drilled cores and excavated layers, allow us to conclude human activity at the site within the timespans of c. 6200–6000 calBC, c. 5700–5500 calBC, c. 3700–3500 calBC, c. 3400–3100 calBC, c. 2500–2200 calBC, c. 1800–1600 calBC and c. 1500–1300 calBC.

The excavations investigated the two trenches N1 and S1 covering a total of 100 m² and have provided a first insight into the deposition process and accumulation of layers on the river terrace, discussed in relation to the environmental reconstruction of the geophysical and core drilling results.[106] One probable domestic feature dating to the Classical Starčevo (or Starčevo II) period appears well preserved without massive intrusions from later periods. A potential (subterranean?) structure (SU 30) accompanied by flat stones, a potential oven and pits was covered with several fillings, of which the layers SU 20 and SU 22 have been analysed in detail. The latter contained an astonishing amount of Starčevo materials, including 1675 ceramics, 29 small finds and 87 chipped stones.

The technological and typological analyses of the related ceramics offer a first insight into the pottery repertoire in Classical Starčevo times. The technological approach has highlighted evidence for a range of forming techniques, including the multi-stage construction of some vessels, with surfaces being finished in a variety of ways (using single and combined methods such as slipped and burnished). Macroscopically different fabrics have been identified, which will be analysed through thin section petrography to characterise paste recipes and identify potential sources of the raw materials used. The comparison of the recorded fragments

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of the different pottery forms (shallow and deep bowls, jars and storage jars), are consistent with the domestic ceramics of the Starčevo horizon seen through comparison with published data from several sites in the wider region. Their deposition in fills at the site in combination with other artefact types is common. The c. 60 tools, artefacts, ornaments and ritual objects of contexts in the Starčevo structure indicate various activities and practices undertaken at the site in Early to Middle Neolithic times. These include complete and fragmented, perforated ceramic discs, polishing stones, hammer-stones, a pounder, a polished stone adze, bone tools and personal ornaments (beads, labret) that were recovered within the fills, in addition to three fragmented anthropomorphic figurines (of steatopygous and 'bird-faced' cylindrical types) and nine so-called fragmented 'cult tables'. Whilst their combination and typological-stylistic character appears well embedded in the central Balkan repertoire, their spatial and functional interpretation requires further excavations and analyses in the future.

The lithic analyses offer a preliminary overview of technological and typological features as well as the raw materials used in the likely Starčevo SUs at Svinjarička Čuka with comparative reference to other sites. The first results show a flake-based technology evidenced by large numbers of flakes as targeted products. The primary knapping technique for the production of blanks was direct percussion with hard hammer stones, accompanied by limited evidence for soft direct and indirect percussion. With the exception of a single example, the pressure technique appears lacking so far. On-site production is suggested by the use (and dominance) of locally available raw materials and the presence of remains relating to all stages of the *chaîne opératoire*, with roughing out and decortification of the nodules, primary and secondary modification of blanks, and tool use, recycling and discard. Additionally, a large number of artefacts were modified with a retouch or used in an opportunistic manner, with over one third of all the lithic products being modified, corresponding to the general assessment for later stage Starčevo assemblages. Of particular interest is the re-use of older artefacts, most likely dated to pre-Neolithic times.

The most popular raw materials used for the production of chipped stone tools in the investigated Neolithic units are Neogene Lacustrine Silicite (NLS) varieties. Vein quartz and jasper were also used, but make up only a minor component of the assemblage. Only two chert outliers were recovered from Neolithic contexts so far, amongst those, a preparation flake from possible 'Balkan Flint' derives from the Starčevo filling SU 22, which may give an early indication of the site's involvement in networks active in the Neolithic central Balkans but which will have to be explored further as excavation and analysis continue. Altogether, the lithic analyses conducted so far suggest a strongly localised pattern of production and economic behaviour. The role of blades in comparison to the clear dominance of flakes seems to contradict the general idea of advanced agricultural production at sites situated in advantageous locations such as Svinjarička Čuka. However, this might be solely based on the small available dataset and needs further investigation.

The first evidence of Starčevo-dated plant remains indicates agricultural activities. Although only recorded in small quantities so far, grains of einkorn, emmer, 'new type' glume wheat, wheat, barley and hulled barley are attested, in addition to legumes, wild-gathered and ruderal plants. Further excavations, and larger lithic and faunal assemblages, are expected to shed more light on the questions of farming processing on-site, including quantity and intensity, and the potentially related toolkits. The agricultural activities on site also appear to have included herding and hunting as attested in the archaeozoological remains of five domestic and six wild species deriving from the Starčevo-dated layers. Most dominant are domestic cattle followed by caprines and domestic pig. Hunting of red deer was most popular, followed by wild pig, which appears less frequent. Roe deer, ibex, badger and fox are represented with only one specimen so far. Different stages of animal butchery such as skinning, dismembering, disarticulation and filleting were practised on-site and could have been identified on caprines, cattle, badger and ibex so far.

Finally, structural remains dated to the Middle to Late Bronze Age recovered in the northern trench (N1) likely relate to the interior of a potential house or hut. Although the structure was damaged by agricultural activities, the horizontal accumulation of finds as well as related pits and postholes have been preserved within an area of about 2.5 by 4 m. The feature included not only the installation of a large storage vessel, but was also covered by many ceramics, small finds, and animal bones. The destruction potentially led to the mixture of materials showing characteristic Late as well as Middle Bronze Age features, whilst the radiocarbon date of 1756–1643 calBC supports a Middle Bronze Age date. The complex deposition and formation processes of the structure and surrounding area requires further analyses and more ^{14}C dates in the future to offer a more detailed picture.

To conclude, the first investigations within the NEOTECH project embedded in the *Pusta Reka Research Collaboration* of the Austrian-Serbian expedition revealed several new prehistoric sites in the Leskovac Basin. The stratigraphic excavations at Svinjarička Čuka contribute new additional data relating to Starčevo period activities along the important Southern Morava Valley, as one of the main corridors in the Neolithisation of the Balkans. The results suggest the presence of a community involved in a range of domestic, ritual, agricultural and hunting activities, with characteristic Early to Middle Neolithic materials dating to c. 5700–5500 calBC. In future excavations we aim to explore the structural remains and associated deposits in more detail as well as to investigate deeper stratigraphy lying below the Neolithic deposits revealed to date. In addition, the continued work on both Neolithic and Bronze Age remains will provide an important diachronic perspective for understanding the micro-region, including developments in raw material procurement strategies and environmental changes.

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Michael Brandl: raw material analyses, writing
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Dragana Filipović: installation of flotation set-up, botanical analysis, writing
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