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Neolithic grinding practices at Svinjarička Čuka, Serbia

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Abstract

Recent research on the neolithization process has highlighted Svinjarička Čuka as a key site in Southeastern Europe with some of the earliest well-preserved Early to Middle Neolithic (associated with the Starčevo horizon) architecture and a rich inventory of finds with analogies in Southwestern Asia. Among the latter, grinding and pounding tools are prominent due to their crucial role in plant food processing, which is one of the main components of the 'Neolithic Package'.

This paper presents a selection of 31 grinding tools comprising handstones, netherstones, pestles, mortars and abraders, which were subjected to a multivariate investigation comprising an analysis of shape and surfaces as well as use-wear and residue analysis with the aim of reconstructing foodways based on crushed foodstuffs at the site. Based on the shapes and use mode, four types of grinding kits and one type of abrader could be distinguished. Three kits were used to process low-fat grains, two of them most probably for cereals. The abraders were possibly involved in the production of pottery.

Key words: *Neolithic – grinding stones – use-wear – Serbia.*

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Grinding and pounding tools (GPT) and the neolithization process

Grinding and pounding tools (see table 1 for an overview of terms and definitions) are among the most frequent find categories in the archaeological record, as they are universal crushers for food stuff and other materials. Usually, they are part of the standard inventory in households, where they appear as pairs of active and passive tools.

Terms	Other known labels	Role	Use	Haptic	Possible motions
Handstone: flat active tools that are held horizontal.	Grinder, ball, sphere, rubbing stone, *Läufer*, *Molette*, hammerstone.	Active: it is moved on another surface	Grinding (crushing by applying pressure); pounding (crushing by hitting); dehusking.	One or two hands, depending on the size.	Horizontal: circular, oval, bidirectional flat, bidirectional pendular. Vertical: bidirectional.
Pestle: active tools that are held vertical.	Pounder for mortar, *pilons*, *Stößel*.	Active: it is moved on another surface	Grinding (crushing by applying pressure); pounding (crushing by hitting); dehusking.	One or two hands, depending on the size	Horizontal: bidirectional – rolling on the surface, circular-flat, bidirectional flat. Vertical: bidirectional. Oblique: circular-lateral.
Netherstones: passive tools standing on the ground, set into the ground, or on stone pavements and other installations.	Grinding stone, quern, slab, grinding dish, mortar, *mortiers*, *Reibsteine*, *Unterlieger*.	Passive: remains immobile during work.	Grinding (crushing by applying pressure); pounding (crushing by hitting); dehusking.	Lying horizontally or standing obliquely.	See above.

Table 1. *Overview of the terminology used in the paper.*

Generically, these tools are associated by archaeologists with the crushing of cereals and pulses, but there is an ample ethnographic record attesting the processing of all kinds of herbs, seeds, tubers, spices, drupes, nuts, fruits, legumes, berries, tobacco, meat and fish, and diverse types of minerals and pigments (e.g., Adams 2002; Dubreuil 2002; Dubreuil et al. 2015; Cappers et al. 2016; Nixon-Darcus & D'Andrea 2017; Shoemaker et al. 2017; Dietrich 2021a & b). In archaeological research, there was a tendency to neglect GPT, partly because their functions seemed to be clear, partly because no research agenda existed beyond provenance studies of raw materials. Another reason is the overall uniform appearance of these objects over longer periods of time. Consequently, they were considered less useful in defining chronological and regional differences – an assumption which is changing gradually (Dietrich 2022). Overall, the state of research for these tools is very inconsistent in time and space. However, in the last decades the interest in functional analyses has raised considerably (Adams 2002 & 2014; Adams et al. 2009; Dubreuil et al. 2015; Dietrich 2021a & b). Especially in periods and regions linked to the earliest large-scale integration of cereals into the diet and the onset of agricultural societies, like the period discussed here (Starčevo–Körös–Criș Culture, 6200–5500 BC), GPT have started to gain more attention, as their role as indicators for changes in subsistence, diet, innovations in cooking practices and in the development of local cuisines is a central one.

Regarding Serbia, there are two studies that include analyses of large numbers of Neolithic GPT: the comprehensive book on all macro-lithic tools done by D. Antonović (2003) comprising finds from Belovode, Čučuge, Divostin, Donja Branjevina, Lepenski Vir, Supska, Velesnica, and Vinča, and the more recent monograph by V. Vučković (2019) on macro-lithic tools from the Central Balkans, including the sites Motel Slatina, Turska Česma, Medjureč, At, Potporanj, Benska bara, Kremenilo, Vrajano, Čelina, Koraća Han, Pavlovac, Tumba Madžari, with a focus on the Late Neolithic layers from these sites. Both studies can help to integrate the finds from Svinjarička Čuka into a wider picture although the comparison to Early Neolithic finds is limited. A recent study on abrasive tools from Serbia is indicative for the reconstruction of grinding practices, too (Antonović & Dimić 2022).

In a wider picture, most of the grinding stones from Svinjarička Čuka belong in a time frame coinciding with the early stages of the neolithization process of the Central Balkans (Horejs et al. 2019 & 2022). Bulgarian, Romanian and Hungarian finds still await analysis and GPT from the Southern Balkans (esp. Greece) have been the subject of an ERC-Project but not yet fully published (Valamoti et al. 2020). Their analysis is all the more important from the perspective of innovation and traditions in foodways linked with the consumption of plants, especially with cereals, which is one of the main aspects of the 'neolithization' in its broader understanding as a complex process including the transmission and adoption of sedentism, domestication, of agriculture and livestock economies, and of new tools (including GPT) and technologies in order to support these changes; in other words, the adoption of a new way of life within a larger area (Sharl 2004; Schier 2009; Watkins 2008; Özdoğan 2010 & 2014; Guilaine 2019; Horejs 2019).

There is increased evidence for plant food and the wide use of natural resources like wild grasses, tubers and roots, drupes and nuts prior to the neolithization of Southeastern Europe (Zupancich & Cristiani 2020), and even the culinary practice of crushing plants, which would become common in the Neolithic, is attested (Revedin et al. 2010). Obviously, a part of the vegetal diet was (systematically?) crushed prior to consumption beyond the simple removal of shells, which can be interpreted as a cooking practice. However, tools used in this process where ad hoc implements (Cristiani et al. 2021) and even the early 'pestle' from the Franchthi Cave used both for grinding and pounding of tubers, rhizomes or nuts (Revendin et al. 2010) is not a standardized tool.

This changed in the Neolithic. At the time when the Balkans were 'neolithizised', a broad spectrum of GPT, stone vessels, and culinary practices linked with the crushing of cereals and pulses was already in use in Southwestern Asia. Typical grinding and pounding kits from Upper Mesopotamia include netherstones used with one-or two-handed handstones and mortars and pestles (Dietrich 2021a & b). A part of these elements had already been transported along the coastline to Western Anatolia and Greece, including kits for the production of coarse flour to porridges and fine flours to breads as well as mortars and pestles. The latter are missing from Central Anatolia, which has a separate development (Dietrich 2022, with references therein).

Approximately in the mid-seventh millennium BC, surprisingly at the same time with the spread of the invention of pottery, grinding kits for the production of fine flour to bread became the supraregionally predominating tool (Dietrich 2022). Within the entirety of Southwestern Asia and in Southeastern Europe, and also at Svinjarička Čuka, the dominant type now is the netherstone with a two-handed handstone used with bidirectional motions. The handstone has the same width as the surface of the netherstone or is smaller, being used with two hands as a rule. This is a difference in comparison with Central Europe, where handstones are significantly heavier and larger than the netherstones as dominant type. However, the origin and development of the saddle querns are still under discussion (see Stroulia et al. 2017; Dietrich et al. in preparation, a). This difference as well as the absence of mortars and pestles in the latter region, the use of different rock types for the production of GPT, and the production of divergent meals mark the existence of two separate culinary provinces, one in Southwestern Asia and another one in Central Europe, with Southeastern Europe being a melting pot of convergent traditions (Dietrich 2022).

The site of Svinjarička Čuka

The neolithization process along the Vardar–Morava River Corridor forms a key for understanding the complexity of the substantial transformation from hunter-gatherers into sedentary farming communities in the Balkans starting around 6200–6000 BC. The site of Svinjarička Čuka is strategically situated within this river system on the small elevated Svinjarička River terrace northeast of Caričin Grad in the Lebane District of south Serbia (fig. 1). The site is a part of concentration of prehistoric sites in the Leskovac Basin (Bulatović & Jović 2009) which have been investigated since 2017 within the Pusta Reka Research Collaboration between the Austrian Academy of Sciences (Barbara Horejs), the Archaeological Institute in Belgrade (Aleksandar Bulatović) and the Archaeological Museum of Leskovac. This stratified site has been excavated since 2018; the main chronological phases belong to the Early and Middle Neolithic, the Chalcolithic, the Middle and Late Bronze Age, and the Early Iron Age.

The Neolithic domestic features consist of accumulations of stones, burnt clay and daub, pits and ovens, representing dwellings with stamped floor and outdoor areas; radiocarbon dates so far start from 5700 BC (Horejs et al. 2019 & 2022). Until now, an earlier and a later phase of Starčevo domestic occupation have been identified. The bedrock has not yet been reached, and even earlier structures are expected, as ^{14}C dates (ca. 6100–6000 BC) from drilling cores show (Horejs et al. 2022 & forthcoming). Most grinding stones have been found in use horizons nearby the dwellings, in pits and in outdoor areas (see chronology in table 3).

The geological setting is advantageous for the exploitation of several rock types for the production of grinding stones. The site is positioned in the Neogene Leskovac Basin at the border of the Carpatho-Balkanides to the east, and the Serbian-Macedonian Massif in the south and west (Marović et al. 2007). The complex geological setting of the

Figure 1. *Above: Map showing the location of Svinjarička Čuka. Image Credit: M. Börner & L. Dietrich. Below: Aerial view of the Svinjarička Čuka River terrace to the south and the excavation trenches N1 (front) and S1 (back). Image Credit: M. Börner.*

Carpatho-Balkanides is dominated by greenschists, flysch, sandstones, limestones, metamorphic rocks, volcanic-sedimentary rocks, ultramafic rocks and gabbros (Dimitrijević 1997). The principal lithological units within the Serbo-Macedonian Massif are crystalline schists, amphibolites, gneiss, micaschists, greenschists, marbles and quartzites (Pavlović et al. 2012, 349f).

During the Miocene, the Serbian Lake System (SLS) developed, which also included the Leskovac Basin. The latter is shaped by three extensive neostructural units, the Donja Toplica and Leskovac depressions, and the elevated Pečenjevac Block situated between the two (fig. 2). Linked to the Oligocene volcanic history of the area is the formation of the Lece Volcanic Complex (LVC), the second largest volcanic province in all of present-day Serbia. The volcanic sequence of the LVC essentially represents interlayering repeated lava flows and pyroclastic events with volcanoclastic rocks and andesites as the prevailing rock types (Kostić et al. 2017).

The two main lithologies determined for Svinjarička Čuka grinding stone assemblage are volcanic rocks (andesites) and (mica-rich) gneiss (table 3). The sources of those rock raw materials can be found in primary as well as secondary position close to the archaeological site, notably in the small river (Svinjarička) the settlement is located on. Primary sources of the volcanic rocks occur within the southeastern extension of the LVC less than 10 km west of the site. Deposits of micaschists and micaceous (biotitic) gneiss are found on every hill raising from the Leskovac Basin, including the hillock the Byzantine city of Justiniana Prima is located on.

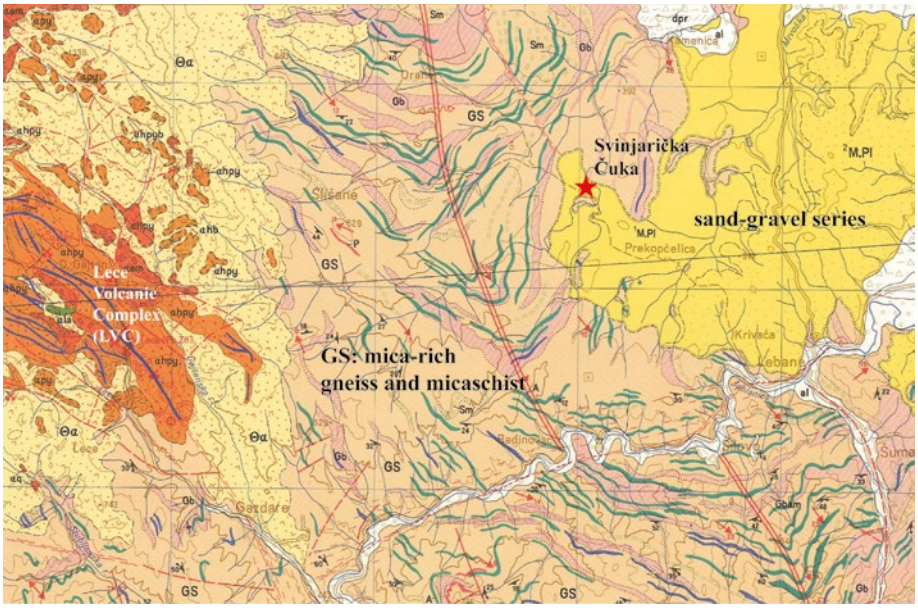

Figure 2. The geological setting around Svinjarička Čuka. Image Credit: adapted by M. Brandl from SGZB 1969.

The GPT from Svinjarička Čuka

Two main approaches used in the investigation of the GPT from Svinjarička Čuka are the functional analysis, including reconstruction of the crushed foodstuffs and meals, body positions and motions of the users, and processing techniques, and the formal analyses, including reconstruction of kits and types to reconstruct Neolithic grinding practices.

Several comprehensive studies on functional approaches of grinding and pounding tools have been published (Adams 2002 & 2014; Adams et al. 2009; Dubreuil 2002; Hamon 2008, Delgado-Raack & Risch 2008; Dubreuil et al. 2015; Hayes et al. 2018; Dietrich & Haibt 2020; Dietrich 2021a & b, all with references therein; particularly for Serbia: Antonović 2003 & Vučković 2019; Antonović & Dimić 2022). Despite of this fortunate development no common protocols on either terminology or recording procedures have been established yet. Thus, for the present study, following features and descriptive criteria have been established, with 'markers' being defined as combination of two or more attributes:

Attributes	Descriptive criteria
Flattening of the surface	Strong/medium/weak
Grains	Rounded/flattened/broken
Striations	Deep/fine; short/long
Polish (intensity)	High reflective/low reflective/dull
Polish (distribution)	Covering/concentrated
Erosion	Thinning down at sides and corners
Concaveness	Thinning down in a concave shape
Wear marker 1	Deep parallel gouges with rounded and flat spots in between
Wear marker 2	Flattened area with small fine striations
Wear marker 3	Loose rounded spots with fine striations
Wear marker 4	Field of scar negatives
Wear marker 5	Extended zone with flat plateaus on grains
Burning traces	Black- greyish traces
Pigments	Pigments of different colors
Breakage	Scar marks
Texture (tactile)	Very smooth/smooth/rough
Production marker 1	Flake negatives
Production marker 2	Peaking in steps
Production marker 3	Peaking
Curation marker 1	Peaking/Roughening
Curation marker 2	Both sides as active working faces

Table 2. *Descriptive criteria of the attributes.*

Both netherstones and handstones, as well as mortars and pestles have been recovered from the site (table 3).

No.	Code	Length cm	Width cm	Thickness cm	Weight g	Production/ Wear marker	Type	Rock	Chronology
1	CU21_0075 _07_0001	4.1	5.5	4.6	69	flatt.	hand-stone	vulca-nite	Neolithic
2	CU21_0085 _07_0001	5.4	4.3	4.4	108.9	flatt.	unde-fined	vulca-nite	Neolithic
3	CU21_0104 _07_0001 Fig. 9.4	5.6	6.5	3.7	172	WM1, flatt. burn.	nether-stone	vulca-nite	Neolithic
4	CU21_0123 _07_0001 Kit 1	14	8.2	3.2	218	WM1, flatt., burn	nether-stone	vulca-nite	Neolithic
5	CU21_0131 _07_0001 Type abrader	8.5	6.4	2.2	178	flatt., long striations	abrader	mi-ca-rich gneiss	Neolithic
6	CU21_0136 _07_0001	5.7	5.5	3.5	176	flatt., burn., long striations	hand-stone	vulca-nite	mixed
7	CU21_0155 _07_0001	5.4	5.2	4.7	158	Flatt.	unde-fined	vulca-nite	Neolithic
8	CU21_1050 _07_0001	9.3	6.4	2.7	211.6	flatt., striations, long, concave	nether-stone	sand-stone	mixed
9	CU21_1057 _07_0001 Kit 1 Fig. 8	15	12.4	5.5	2150	PM1; CM1; CM2 WM1	hand-stone	vulca-nite	Bronze Age
10	CU21_1057 _07_0002 Kit 3 Fig. 6.2	20.3	8.8	7.2	1950	PM3; WM4; break	pestle	vulca-nite	Bronze Age
11	CU21_1057 _07_0003 Kit 1, 2 Fig. 5	25.5	18.8	4.6	4350	PM1; CM1 WM 1, 2, 4, 5	nether-stone	vulca-nite	Bronze Age
12	CU21_1057 _07_0004 Kit 1 Fig. 7	18	10.4	5.7	2300	PM1; CM1, CM2 WM1	hand-stone	vulca-nite	Bronze Age
13	CU21_1061 _07_0001	11.3	6.4	4.8	288	flatt.	unde-fined	vulca-nite	Neolithic
14	CU21_1061 _07_0002 Kit 1, 3				40000	PM 2; WM1; WM 3	neth-erstone (mortar)	vulca-nite	Neolithic
15	CU21_1074 _07_0001 Kit 1	2.9	4.7	5.9	96	flatt.	unde-fined	vulca-nite	mixed
16	CU21_1089 _07_0001	4.6	2.6	3.9	62.5	flatt.	unde-fined	vulca-nite	Neolithic
17	CU21_1090 _07_0001	12.6	7.9	7.9	1006	WM1, flatt., scar marks	unde-fined, possible hand-stone	vulca-nite	Neolithic

No.	Code	Length cm	Width cm	Thickness cm	Weight g	Production/ Wear marker	Type	Rock	Chronology
18	CU21_1099 _07_0001 Kit 1 Fig. 6.1	14.6	13.3	5.2	1300	PM1; CM1; curated from a netherstone; WM1	hand-stone	vulca-nite	Neolithic
19	CU21_1110 _07_0001	8.4	6.2	3.2	294	flatt.	unde-fined	amphi-bolite	Neolithic
20	CU21_1110 _07_0002 Kit 3	33.5	22.8	16.8		PM1; PM2; WM3	neth-erstone (mortar)	vulca-nite	Neolithic
21	CU21_1111_ 07_0001	8.4	4.8	5.4	243	undefined	possibly hand-stone	vulca-nite	Neolithic
22	CU21_1125_ 07_0001	8.7	3.2	4.55	97	flatt.	hand-stone	vulca-nite	Neolithic
23	CU21_1125_ 07_0002	7.8	4.6	1.7	89.33		unde-fined	mi-ca-rich gneiss	Neolithic
24	CU21_1127_ 07_0001 Type abrader Fig. 9.1	19.6	10.6	4.9	453	WM6	abrader	mi-ca-rich gneiss	Neolithic
25	CU21_1127 _07_0003 Type abrader Fig. 9.3	14.9	10.8	3.6	258	WM6	abrader	mi-ca-rich gneiss	Neolithic
26	CU21_1127 _07_0004 Type abrader Fig. 9.2	13.3	11.1	3.2	573	WM6	abrader	mi-ca-rich gneiss	Neolithic
27	CU19_1054_ 07_0001 Kit 2	15.3	10.7	4.2	1093	WM1	hand-stone	mi-ca-rich gneiss	mixed
28	CU19_0067_ 07_0001	10.1	7.8	4.9	488	flatt.	unde-fined	vulca-nite	mixed
29	CU19_1051_ 07_0001	14.4	13.5	4.9	1276	flatt., concave, fine striations	nether-stone	mi-ca-rich gneiss	Iron Age
30	CU22_1137 _7_3 Kit 4 Fig. 10.1	47.8	35.5	18.5	4000	WM1	nether-stone	vulca-nite	Neolithic
31	CU22_113 7_ 7_5 Kit 4 Fig. 10.2	18.5	11.8	6.3	1700	WM1	hand-stone	vulca-nite	Neolithic

Table 3. *Selection of GPT from the 2019 and 2021 excavations seasons.*

Based on their shapes and deformation, they can be classified into four kits. This kind of classification is more convenient than individual classifications as it allows the

description and analyses of motion and grinding techniques in addition to shapes and deformations in a comprehensive system.

Kit 1. Flat netherstones and two-handed equally wide handstones (similar to Form 2 in Zimmermann 1988; figs. 2/1 and 5–8). For now, it seems that this is the most widespread type in the Neolithic of the Central Balkans (cf. Antonović 2003; Vučković 2019), but additional research is necessary, especially for the Early Neolithic. Grinding with this kit would be possible longitudinally or transversally on the netherstone. Experiments made with comparable replicas (Dietrich 2021a & b) allow a valid reconstruction of the processing techniques. These were based on bidirectional grinding with back- and forth motion and very hard pressure, especially due to the use of heavy handstones with both hands. During grinding, hands can be positioned either at both ends or in the middle of the handstones. Experiments show that both positions are equally effective and comfortable (Dietrich 2021b) so that the operation *modi* are most probably culturally conditioned.

Kit 1 is the most widespread at the site, as far as it can be reconstructed on fragments. All pieces (Table 3, Nos. 4, 9, 11, 12, 15, and 18) are heavily used and most of them are broken. Originally, similar netherstones may have been up to 46 cm long and up to 32 cm wide (Vučković 2019); one completely preserved piece at the site has a length of almost 27 cm and a width of almost 20 cm (Dietrich et al. in preparation, a). Most probably appropriately large natural boulders from the immediate vicinity (see above geological description) were chosen and used as grinding stones, minimizing, or avoiding the necessity of modification; flaking has been observed only on one piece (table 3, No. 11). No handstone belonging to kit 1 is completely preserved, and use-wear indicates that their length was almost consistent with the width of the netherstone. Handstones Nos.

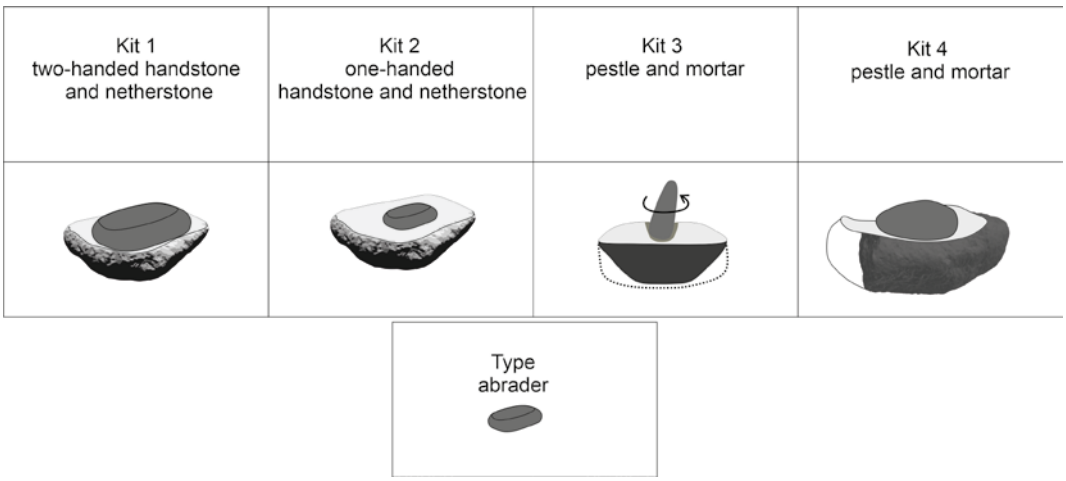

Figure 3. *Schematic reconstruction of the grinding kits at Svinjarička Čuka. Image Credit: L. Dietrich.*

9, 12, and 18 of ovoid or irregular contour can be attributed to this kit. Most probably, as also in the case of kit 4 (see below) handstones were recycled from broken netherstones, as indicated by some pieces with double-used faces and divergent oriented wear (fig. 8).

The typical wear marker on their surfaces is a combination of deep parallel striations and small flat and rounded spots between these lines (table 3, No. 1; figs. 4 and 5–8; Horejs et al. 2022; Dietrich et al. in preparation, b). Similar markers are attested in other Neolithic sites in Serbia (Vučkovic 2019, fig. 6.1.a; 6.2.20; Antonović & Dimić 2022, fig. 7) and they are consistent with the processing of hard grains to fine flour (Dietrich 2021a & b). Archaeobotanical analyses by D. Filipović revealed the presence of emmer and einkorn as main cereals at the site (Horejs et al. 2022). Thus, based on this multivariate approach, we interpret the archaeological evidence as suggesting the processing of emmer and einkorn to fine flour for bread-like products as main practice for the consuming of cereal food, and one of the most important foodways at the site.

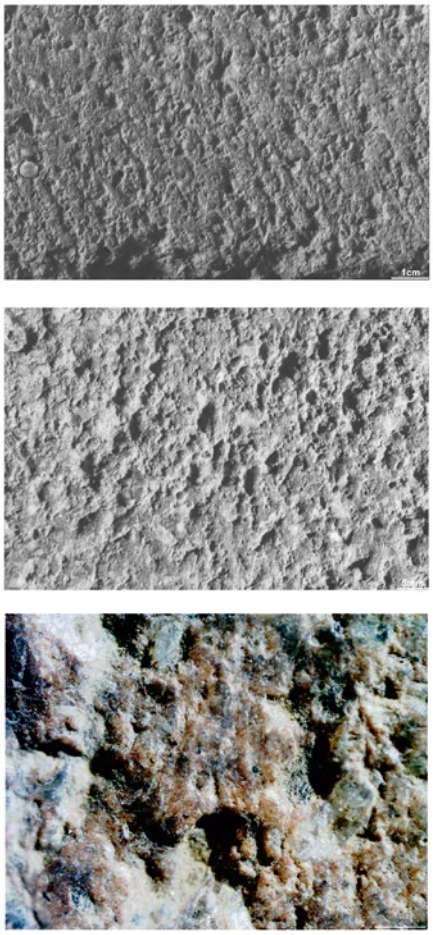

Figure 4. *Wear marker 1. Image Credit: L. Dietrich.*

Kit 2. Flat to concave netherstones and one-handed handstones, probably belonging to the Bronze Age. Only one complete preserved handstone (Table 3, No. 27) indicates the existence of this kit, which will not be discussed in the present paper since it is focused on Neolithic grinding kits.

Kit 3. Kits of mortars and pestles are intriguing tools which, based on ethnographic evidence from the American Southwest, have always been interpreted as pounding implements (Adams 2002). In Southwestern Asia (Dietrich 2021a & b) and Southeastern Europe (Horejs et al. in preparation) wear traces indicates that they are not used for pounding though, but for rotary grinding. The pieces from Svinjarička Čuka (table 3, Nos. 10, 14, and 20; fig. 6), which will be discussed in detail in a separate study in their specific context, represent the northern frontier of the spread of these implements; they are very similar in shape and function to their Asian counterparts (Dietrich 2021a; Horejs et al. in preparation). Objects with a depression labelled as 'mortars' have been found at other (Late Neolithic) sites in the Balkans (Vučkovic 2019) as well as in Early Neolithic Greece (Bekiaris et al. 2020). Although not numerous, some objects from the latter region

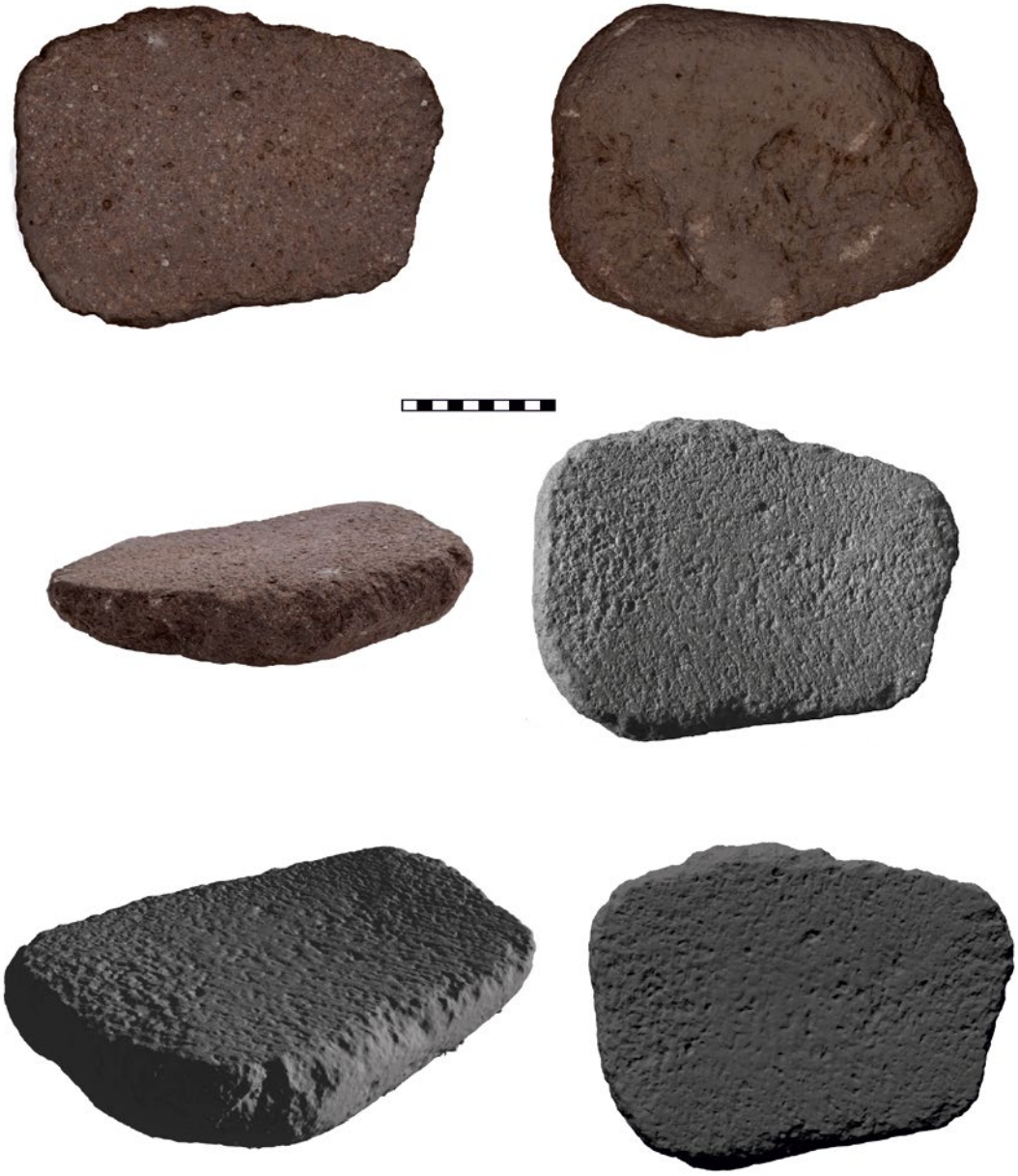

Figure 5. *Grinding stone, table 3, No. 11. Image Credit: L. Dietrich.*

Figure 6. *Grinding stones, table 3, Nos. 10 (2) and 18 (1). Image Credit: L. Dietrich.*

Figure 7. *Grinding stone, table 3, No. 12. Image Credit: L. Dietrich.*

Figure 8. Grinding stone, table 3, No. 9. Image Credit: L. Dietrich.

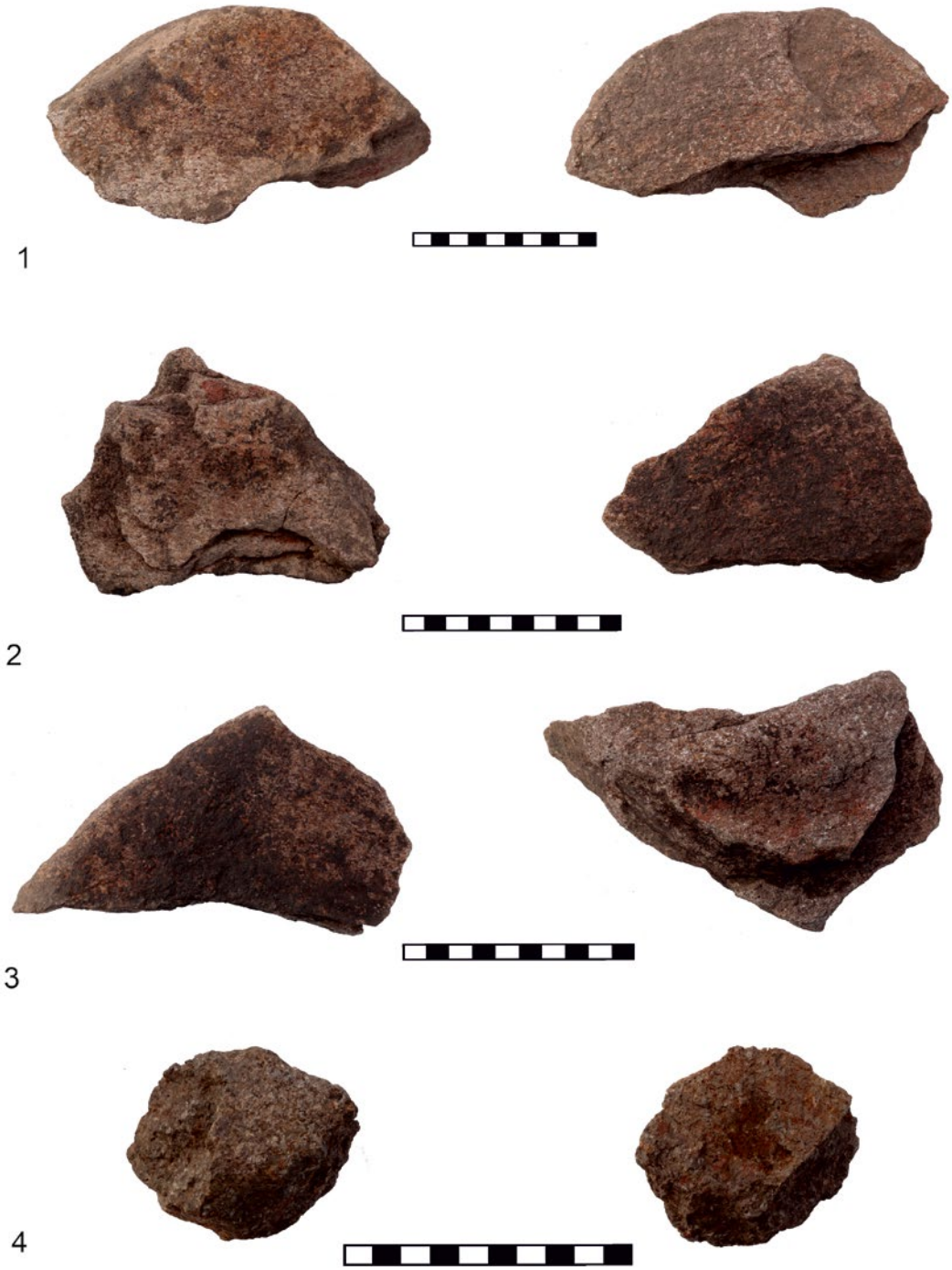

Figure 9. *Grinding stones, table 3, Nos. 15 (1), 26 (2), 25 (3) and 3 (4). Image Credit: L. Dietrich.*

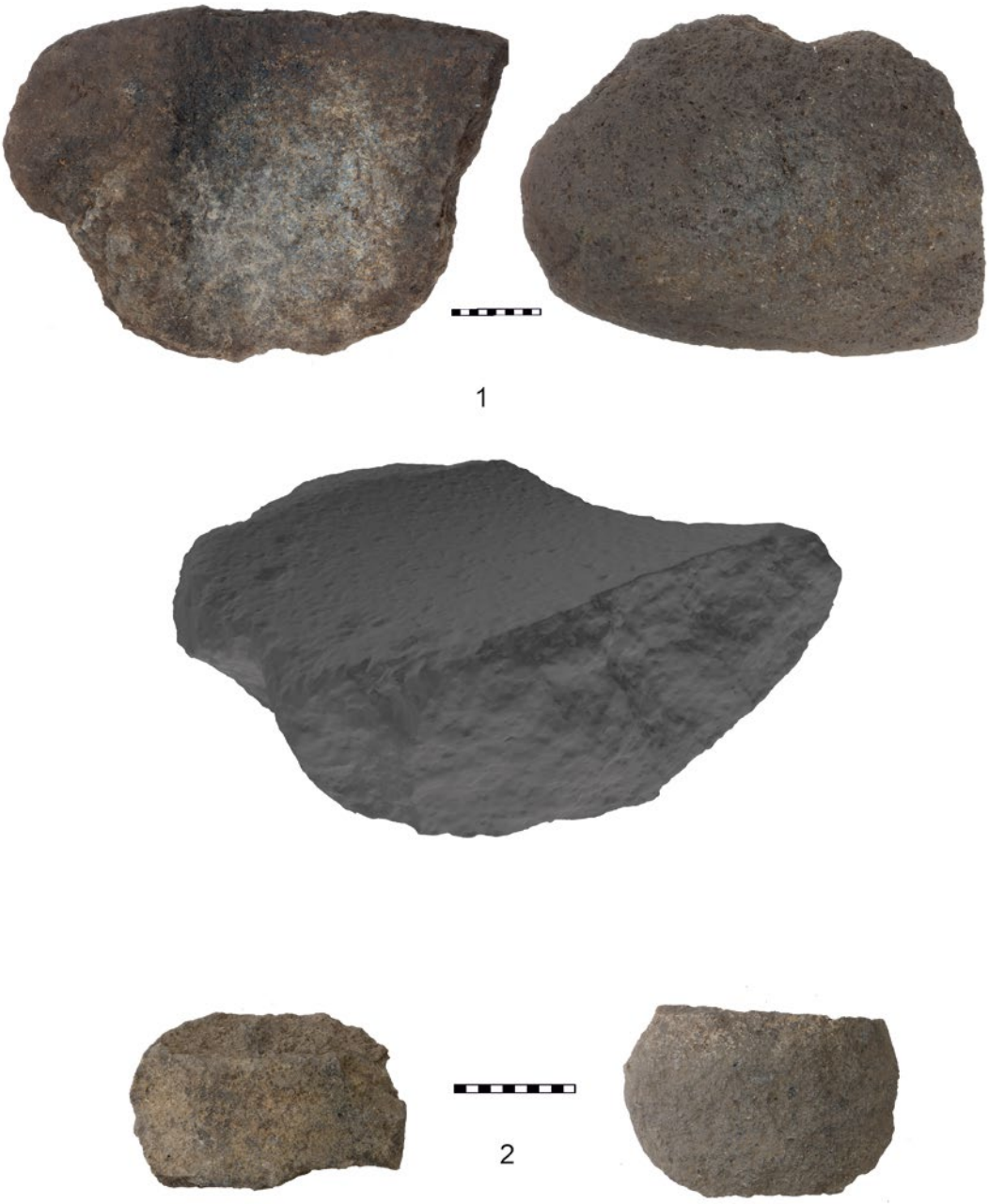

Figure 10. *Grinding stones, table 3, Nos. 30 (1) and 31 (2). I mage Credit: L. Dietrich.*

present striking similarities with the Serbian objects, especially through their contexts – as fixed components of households' inventories (Karamitrou-Mentessidi et al. 2015). Although earlier objects labelled as 'mortars' have been mentioned from Mesolithic contexts (Radovanović & Voytek 1997), they represent a different category of finds with deviant shapes and contexts, and most probably were used with different processing techniques, like pounding, as it has been already suggested (Srejović 1969).

Up to now, the objects in Svinjarička Čuka are earlier than the previously published pieces from the Balkan Neolithic, but this most probably represents only a research gap. Hopefully, the present paper will bring this category of finds into the spotlight of Balkan research. The only preserved pestle (table 3, No. 7; fig. 6) has been shaped by pecking into a pear-like shape. Its base is heavy and rounded. Typical wear on the mortars' working faces is rounding of the grains, which is consistent with the wear produced through rotary grinding during experiments with similar pieces of soaked pulses (Dietrich 2021a), thus possibly indicating an Anatolian influence in the Central Balkans, as a preliminary consideration for further research (see also Dietrich 2022). However, the functional reconstruction of the objects from Svinjarička Čuka is still in progress. Chronologically later pieces belonging to the Late Neolithic in the Central Balkans (Vučkovic 2019) show deviant wear markers and other uses, possibly representing later (local) developments.

Kit 4. Massive netherstones and heavy two-handed handstones. The existence of this kit is indicated by two pieces discovered in the 2022 excavation season, belonging to a larger complex of five GPT associated with a use horizon of the Starčevo settlement (table 3, Nos. 30 and 31; fig. 11). The working face of the thick, massive netherstone (Nr. 30) is well preserved. The netherstone has a length of almost 48 cm and a width of 35.5 cm while its weight overpasses 40 kg. This impressive size clearly indicates its (original) purpose and/or use as fix component in a household inventory, probably in the outdoor area. Wear marker 1 dominates both on the working faces of the netherstone and of the complementary handstone. The latter is broken at two sides, possibly intentionally, but its length of 18.9 cm is preserved entirely, fitting perfectly on the working face of the netherstone. The deformations of the working faces, the orientation of wear marker 1 on both handstone and netherstone, the shape of the netherstone's base as well as the shape and weight of the handstones are indicative for the way of using and the processing techniques. We can reconstruct a bidirectional back-and-forth motion based on the moving of the handstone with both hands, repeatedly on the same trace and on a distance equal to an arm-length. Experiments (Dietrich 2021b) point at this processing as a more ergonomic way than moving the handstone on the entire face of the lighter netherstone, like with kit 1. Most probably, as indicated by its base with two sloping facets, the massive netherstone belonging to kit 4 was either sunk into the ground or fixed with stones on both sides, in a horizontal position, while the much lighter netherstone of kit 1 was only standing directly on the ground, thus being less

stable than the netherstone belonging to kit 4. Also, the body positions were possibly consequently different, as the lighter netherstone could have been placed in different heights, positions and/or on other objects.

Type 'Abraders' (table 3, Nos. 24–26; fig. 10). This term describes several hand-held tools made of schist with a uniform flat surface and deep thin parallel striations (table 2: wear marker 6) and occasional some grayish pigments, whose function is not clear yet. Blackish and reddish pigments could indicate functions for the processing of pottery, but this hypothesis needs to be verified through further analyses.

Undefined. The largest number of objects cannot be attributed to one of the four kits.

Results

Combined functional and contextual analyses show the use of Early Neolithic GPT as crushers, for (a) the processing of cereals, possibly of pulses, and (b) hypothetically, for the production of pottery. The processing of cereals and pulses was done through three main techniques, using different kits, motions and body positions for each of these techniques, as described above. Main differences between the kits (Kit 1 versus 4) regard both the processing techniques for the same, dominant meal at the site (fine flour made of cereals for bread-like products) as also the intended products (Kits 1 and 4 versus 3 for cereals or pulses).

Most finds at the site can be linked to the production of fine particles (fine flour) through bidirectional motions using two hands with very hard pressure. All finds belonging to kits of these types (1 and 4), either representing the upper or the lower part of the kit, are in fragmented condition, and have been heavily worn. Some of the GPT were clearly intended as fixed inventories of households, while most of them were discarded after use in pits or left in the outdoor areas.

Thus, excavations and related material and scientific analyses at Svinjarička Čuka offer new data for the neolithization process of the Central Balkans from insights of foodways related to processing and consuming of founder crops. A total area of 225 m^2 at the small elevated river terrace has been investigated so far and revealed Starčevo Neolithic domestic features of an earlier and later phase dating to the 57th and 56th centuries cal. BC with fixed installation of grinding and pounding tools. This contribution offers the first reconstruction of the grinding practices of this Starčevo-associated site, which let us assume not only various grinding and pounding techniques, but also a further insight into the neolithization process of the region. Various other domestic activities can be related with the house contexts, such as textile production, polished stone tool production or food preparation.

The domestic features of this important site have been presented recently in more details (Horejs et al. 2022). In addition, the rich pottery repertoire, including several sizes and shapes of small to very large vessels with and without decoration (Burke in Horejs et

al. 2022) indicate the probable existence of other, complementary foodways, which will be analyzed in the near future.

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