

The Neolithic-Eneolithic sequence and pottery assemblages in the fifth millennium BC in north-eastern Slovenia

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ABSTRACT – *This paper discusses the settlements at Andrenci, Stoperce, Ptuj-Šolski center, Zgornje Radvanje and Hoče-Orglarska delavnica, all located in north-eastern Slovenia. The settlements are dated on the basis of the results of radiocarbon analyses. The characteristics of the material and cultural-chronological site structures were studied through analyses of pottery (pottery production, form, decoration) and comparative analyses.*

IZVLEČEK – *V prispevku obravnavamo naselbine Andrenci, Stoperce, Ptuj-Šolski center, Zgornje Radvanje in Hoče-Orglarska delavnica, ki se nahajajo v severovzhodni Sloveniji. Na podlagi rezultatov radiokarbonskih analiz ugotavljamo starost naselbin. Z analizami keramičnih najdb (način izdelave keramike, oblike, okras) in s primerjalnimi analizami pa smo raziskali značilnosti materialne kulture in kulturno-kronološko strukturiranost najdišč.*

KEY WORDS – *Neolithic; Eneolithic; settlement; NE Slovenia; 5th millennium BC; pottery analysis; ¹⁴C analysis; chronology*

Introduction

The study of the Neolithic and Eneolithic periods in north-eastern Slovenia (for an overview of the earlier part of the history of research, see *Budja 1983*) does not have a long tradition, in comparison with neighbouring countries, and this area consequently lacks knowledge and archaeological research of this era. Mainly due to archaeological research on the motorway network, only archaeological periods after the second half of the 5th millennium onwards in north-eastern Slovenia are relatively well-studied (*i.e.* the Lasinja Culture), while only individual pits, structures and finds from the end of the first half of the 5th millennium are known, and older settlement have not even been identified to date.¹

The present research has therefore been focused on analyses of pottery and an assessment of selected north-eastern Slovenian settlements dating to the first and the second half of the 5th millennium BC. The settlements are located relatively close to one another, in an area which is also important in the interpretation of archaeological records elsewhere (primarily in Austria, Hungary and Croatia) due to its transitional location between the Alps and the Panonian Plain. The settlement of Andrenci is located on a hill 335m high, called Andrenški vrh, in western Slovenske gorice. Stoperce is located in Haloze, along the Majšperk-Rogatec road, while Ptuj-Šolski center, Zgornje Radvanje and Hoče-Orglarska delavnica are

¹ Bukovnica (*Šavel 1992.59–60; 1994.47–48; 2006.90*), Andrenci (for both see also *Budja 1983.81; Guštin 2005.9–16; Tomaž 2010.164; Kavur 2010.71; Velušček 2006.32–35; 2011.211–216*), Ptuj-Šolski center, and partly, to a small extent, Ptujski grad (for both see *Guštin 2005.Fig. 1; Tomaž 2010.164; Kavur 2010.Fig. 1*), are sites that have been most often mentioned in literature as the only late Neolithic sites in north-eastern Slovenia. Most of the pottery from Ptuj-Šolski center has, until recently, not even been drawn or mended and, with the exception of Ptuj-Šolski center, no ¹⁴C dates were available for these sites.

situated on the edge of the Drava plain (Fig. 1).

Settlement contexts

Andrenci

Small-scale trenches dug in the 1950s at the settlement on Andrenški vrh partially explored two structures (*Pahič, Lorber 1954; Pahič 1973; 1976*).

Structure A was represented by a large pit containing two cultural layers, the bottom (A1) and top (A2). They both contained residue of charcoal, burnt clay, fragments of pottery vessels (A1: Pl. 1.1–9; see also *Pahič 1976.Pl. 2*; A2: Pl. 1.13–20; see also *Pahič 1976.Pl. 3 – Pl. 4.24*) and stone tools (A1: *Pahič 1976.Pl. 1.2, 8, 16–18*; A2: *Pahič 1976.Pl. 1.3, 11–12*),² but they were delimited by a thinner layer, A2a, which in addition to individual pottery fragments (*Pahič 1976.Pl. 4.25–27*) and stone tools (*Pahič 1976.Pl. 1.9*) also contained charcoal, ash,

rare bones and two spindle whorls (*Pahič 1976.Pl. 24.28–29*) (Fig. 2).³

Structure B also comprised a large pit with two cultural layers, bottom (B1) and top (B2). Both layers contained fragments of ceramic vessels (B1: Pl. 2.25–34, B2: Pl. 2.35–51; see also *Pahič 1976.Pl. 5.1–Pl. 22.6*) and stone tools (*Pahič 1976.Pl. 1.6–7, 13–15*), and were delimited by charcoal. In the bottom layer, and partly under it (*Pahič 1976.41*), two straight lines of pebbles with their intersection forming a right angle were discovered, which may be interpreted as part of a wall or building foundation (Fig. 3).

The ¹⁴C analysis of charred food residues obtained from the inner surface of a vessel base from the top layer (B2) in structure B showed a conventional age of 5730±40 BP, which means that it dates between 4689 and 4466 calBC (95.4% probability) or (between) 4652 and 4505 calBC (68.2% probability). Pottery assemblages from Andrenci are typologically homogeneous (Pls. 1–2), so it is possible to assume that both structures presented above were contemporaneous.⁴

Stoperce

Based on the results of ¹⁴C analyses, analyses of stratigraphic sequences and analyses of pottery, it is

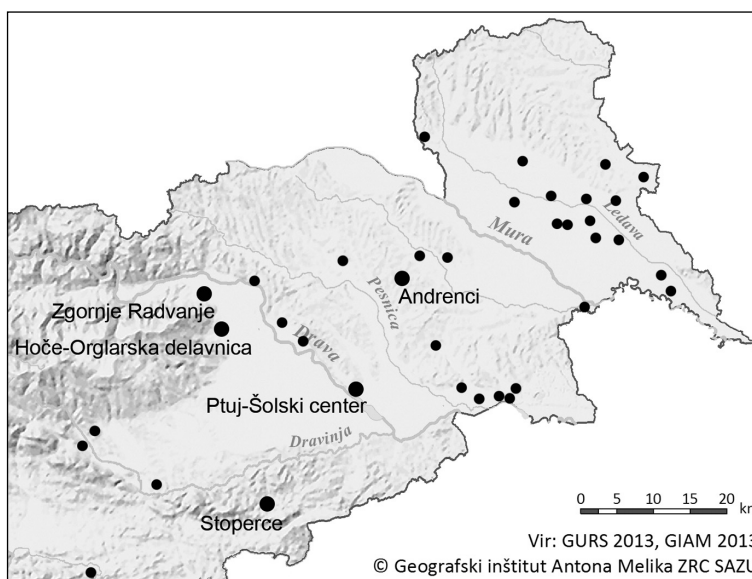


Fig. 1. Map of north-eastern Slovenian sites with settlement remains dating to the 5th millennium BC. Larger dots and inscriptions mark settlements, which are analysed in this paper.

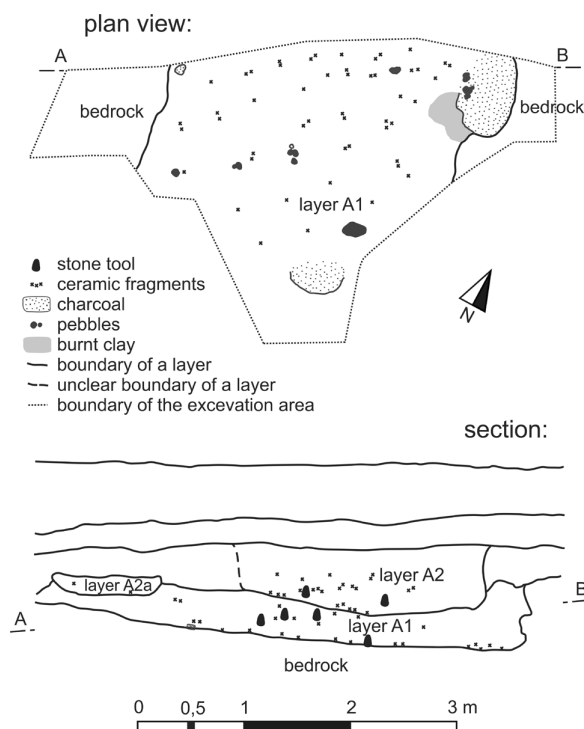


Fig. 2. Andrenci. Structure A. Plan and section.

² Layer A1 also yielded two large concentrations of charcoal and burnt clay (Fig. 2), which might represent the remains of a structure or a hearth (see also *Pahič 1976.35*).

³ Parts of individual vessels were found in both layers (Pl. 1.13–20), while Structure A also yielded individual finds (*Pahič, Lorber 1954.335–338*) with unknown location details (Pl. 1.21–24).

⁴ The conventional value of all the dates presented in this paper was calibrated using the program OxCal version v4.2.3 (*Bronk Ramsey, Lee 2013*), with a current calibration curve (*Reimer et al. 2013*).

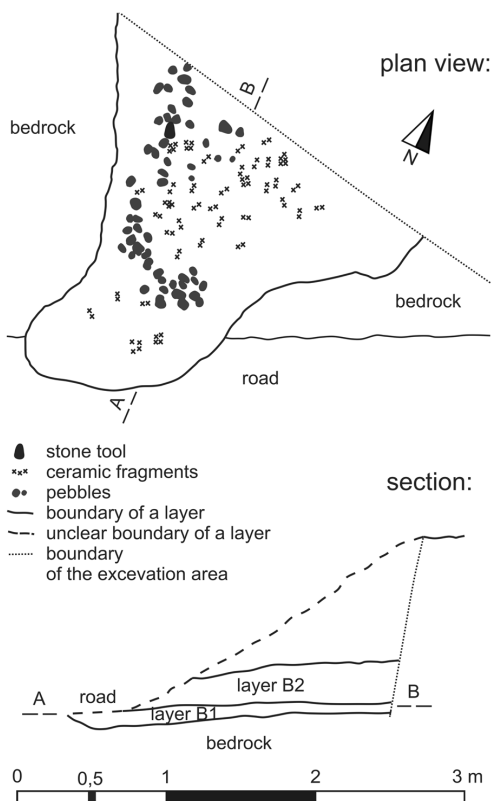


Fig. 3. Andrenci. Structure B. Plan and Section.

possible to conclude that the area researched in 2009 was settled twice (Fig. 6). The first (earlier) phase is represented by Structure I, and the second by Structure III – area 2. At least three (II, IV and V) other structures were discovered. They did not contain pits with pottery, and absolute dates were not obtained. However, it seems that they belong to the second settlement phase, because smaller pits (Pl. 4.75–77), ditches and post-holes were discovered in the vicinity which contained pottery comparable to pottery found in the pit from Structure III (compare with Pl. 4.70–74); fragments of such vessels were also found in a thin cultural layer, stratigraphic unit (SE) 003, which was examined in isolated areas on top of the structure remains.

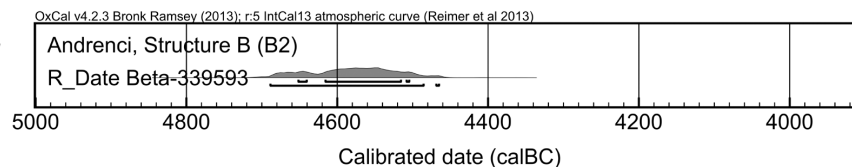
Structure I was single-spaced, partially deepened (pit SE 128) and, based on the distribution of post-holes, probably had a trapezoidal floor plan. The hollow/pit was filled with a single layer which contained charcoal, burnt clay, fragments of Late Neolithic pottery vessels (Pl. 3) and individual stone tools (Fig. 7). The ¹⁴C measurements of charcoal sample Beta-339594, gained from this layer showed a conventional age of 5690±30 BP, which means that it dates to the end of the first half or the turn of the first to the second half of the 5th millennium BC, and that Structure I was contemporary with Structure B from Andrenci (Figs. 9–10).

Structure III, which represents the second settlement phase, was perhaps two-spaced.⁵ Area 1 was not deepened, and rare pottery fragments were discovered only in a thin cultural layer above the post-holes. The central part of Area 2 was some 30cm deepened, with two cultural layers and a hearth detected in the pit itself (SE 150). The upper layer (layer 2) contained charcoal, burnt clay, a number of Early Eneolithic vessel fragments (Pl. 4.70–74) and stone tools. The bottom layer (layer 1) did not yield any finds.⁶ The hearth was discovered in the specially formed north-eastern part of the pit SE 150 which appeared as a layer of charcoal 2cm thick containing some burnt clay fragments (Fig. 8).

Two ¹⁴C dates are available from pit SE 150 (Structure III – Area 2), which significantly differ: the first date was calibrated to the end of the 5th and the beginning of the 4th millennium BC (Beta-362539) and the second to the end of the first half of the 4th millennium BC (Beta-339595). It is important to emphasise that the pottery from the pit is homogeneous, that comparable pottery occurs at sites within the region and beyond at the end of the 5th and the beginning of the 4th millennium BC, and that pottery, or any other proof of dating to the end of the first half of the 4th millennium BC, was absent

Site	Context	Lab Code	Material	Age (BP)	SD (±a)	CalBC (68.2%)	Cal BC (95.4%)	Reference
Andrenci	Structure B (B2)	Beta-339593	food crust	5730	40	4652–4505	4689–4466	first published here

Figs. 4 and 5. Andrenci. Structure B, layer B2. ¹⁴C AMS date.



⁵ There is a possibility that areas 1 and 2 were actually two separate structures, where one was older than the other, or perhaps they co-existed, but no stratigraphic data exist.

⁶ Cultural layers were separated based on the differences in the colour and fragments of pottery, stone objects and charcoal which concentrated on the boundary between them.

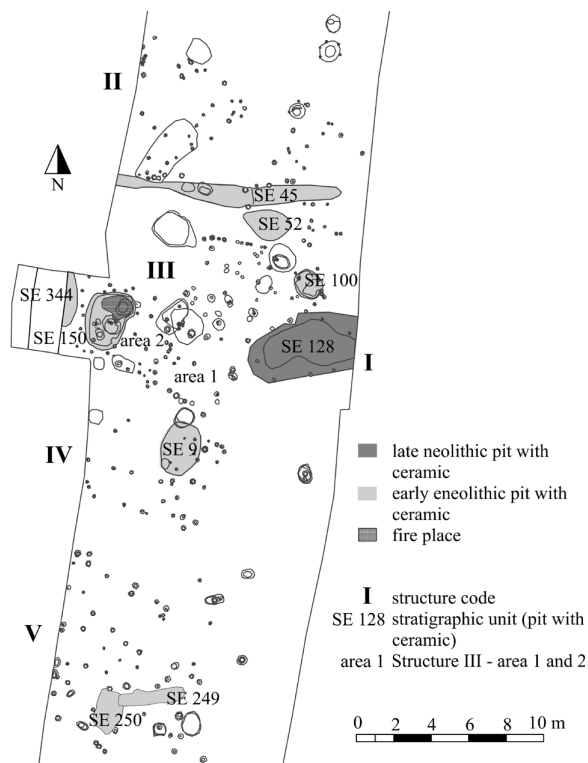


Fig. 6. Stoperce. General plan of the site.

from Stoperce.⁷ Therefore, it is possible to assume that the date of Beta-339595 is too late for the presented context (Figs. 9–10).

Ptuj-Šolski center

During 1980/1981 (Structure I), 2000 (Structures II and III) and finally 2010 (Structure IV), this multi-period site yielded four structures from the 5th millennium BC (*Strmčnik Gulič 1983; Lubšina Tušek 2004.74*). Structures II and IV have been radiocarbon dated and are presented in detail below.

Structure IV was deepened in the central part, where two cultural layers and a number of small pits were found (Fig. 11). Most of the pottery was found in layer SE 410, which was the top layer of a pit (Pl. 5.78–85), layer SE 430, which was located beneath (Pl. 5.89–91) and in a smaller pit SE 435, which was found at the deepest point of the structure. Parts of individual vessels were detected in all of the mentioned stratigraphic units (Pl. 5.86–88), so we can

assume that all layers were deposited within a short time span. This can be partially confirmed by ¹⁴C analyses of charcoal samples, which place Structure IV between the second half of the 45th and 43rd centuries BC (Figs. 13–14).

Structure II was probably rectangular. It was deepened along its entire length. The shallow deepening contained two cultural layers, a hearth and a greater concentration of burnt clay, probably the remains of a wall destroyed by fire. Two construction phases were documented, but they were more or less contemporary, as the northern and western sides of the building were only slightly modified during the second construction phase (Fig. 12).⁸ The bottom layer, which yielded a few stone artefacts and a large number of pottery fragments (Pl. 6), was deposited between the two construction phases. The upper, yellowish brown layer was deposited after the second construction phase and contained less pottery.

Two ¹⁴C dates are available to determine the age of Structure II; however, one of these is unreliable and

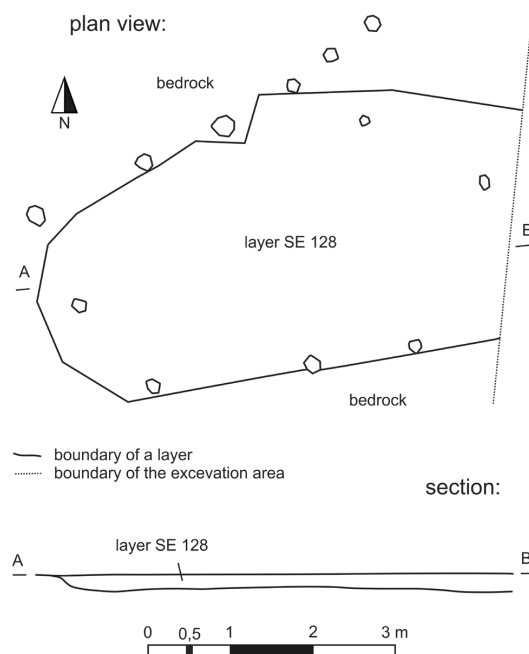


Fig. 7. Stoperce. Structure I. Plan and section.

⁷ In north-eastern Slovenia, pottery from the end of the first half of the 4th millennium was discovered at ¹⁴C dated settlements at Kalinovnjek near Turnišče (*Kerman 2013a.242–245*), Turnišče (*Tomaž 2012.277–280*), Gornje njive near Dolga vas (*Kerman 2013b.407*) and a ¹⁴C dated graveyard Pod Kotom – jug near Krog (*Šavel 2009.64, 94*). The absolute date from pit SE 11 at Ivanovci in Lendava is more or less simultaneous to dates, mentioned above. The pit yielded very fragmented (!) vessels from the Early Eneolithic period (*Kavur 2011.125–127*) together with fragments that are believed to be later, from the end of the first half of the 4th millennium BC (*Kavur 2011.find nos. 31 and 101*).

⁸ Construction phases were determined based on the heights of the post-holes. Individual post-holes were discovered at the base of the pit, while others were above the bottom layer.

therefore was not included in further analyses.⁹ The second available date places, with 68.2% probability, Structure II to the period between 4527–4366 calBC, which means that it may be slightly earlier than Structure IV. However, it has to be stressed that Structure II yielded one reliable ¹⁴C date, while Structure IV offers three (Figs. 13–14).

Zgornje Radvanje

The area of the site was intermittently inhabited from the Eneolithic to the Early Modern Period (*Kramberger 2010b.311; 2010a.7; Murko 2012.141–142; Arh 2012*). This paper presents 23 Eneolithic settlement structures, which were investigated in 2007 and 2008.¹⁰ The settlement was probably circular in form. Structure 22 was located in the central part in the first visible circumference, together with structures 31–36, which had not been deepened and yielded no finds.¹¹ The second circumference contained structures 5–21 and 26, with associated smaller pits; the third circumference was represented by structures 2–4, with associated smaller pits, while the partly researched fourth circumference might be represented by Structure 1 in the far north-eastern part of the excavation area and smaller pits SE 212, SE 245, SE 247 in the far western part (Fig. 15).

In addition to the structure studied already in complex 10 (*Kramberger 2010b*), labelled as Structure 5, ¹⁴C dates were also obtained from structures 22, 1, 4, 6, 7 and 10. The size and form of Structure 22 is comparable to Structure 5. Furthermore, it contained two phases; both were ¹⁴C dated (Fig. 16). Phase 1 was identified by several small pits containing

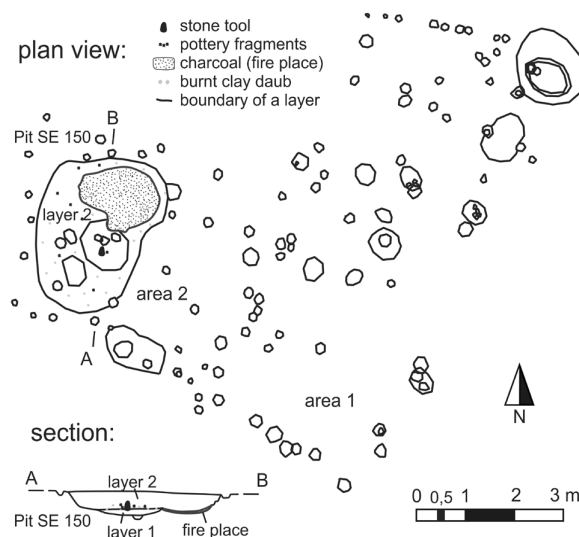


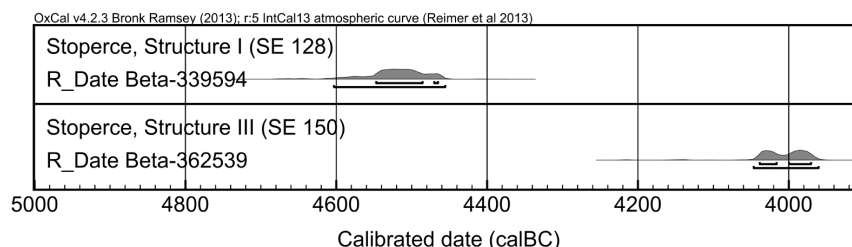
Fig. 8. Stoperce. Structure III with areas 1 and 2. Plan and section.

stone finds, pottery fragments (Pl. 7.109–118), fragments of burnt clay and wood, while Phase 2 was interpreted as the remains of a trapezoid house,¹² which was located above the Phase 1 pits. The daily activities of Phase 2 were documented by the remains of a hearth, with pottery (Pl. 7.119–122) and stone finds.

Based on the position of the post-holes, structure 6 was rectangular (Fig. 17). In contrast to structures 5 and 22, a uniform cultural layer (SE 250 = 252 = 226) has been detected in a shallow deepening, which was ¹⁴C dated. It contained fragments of charcoal and burnt clay, individual stone tools and pottery fragments (Pl. 8.123–133).

Site	Context	Lab Code	Material	Age (BP)	SD (±a)	CalBC (68.2%)	Cal BC (95.4%)	Reference
Stoperce	Structure I (SE 128)	Beta-339594	charcoal	5690	30	4548–4466	4604–4456	first published here
Stoperce	Structure III (SE 150)	Beta-362539	charcoal	5200	30	4039–3971	4047–3961	first published here
Stoperce	Structure III (SE 150)	Beta-339595	charcoal	4820	30	3650–3536	3656–3526	first published here

Figs. 9 and 10. Stoperce. First and second settlement phase. ¹⁴C AMS date. The ‘problematic’ date, excluded from further analyses, is shown with inclined letters.



9 This is the date of sample Z-3015, which was created by combining five different samples of charcoal, which, as is generally known, strongly influences the results of ¹⁴C analysis.

10 The rest of the settlement was studied by Monika Arh (2012).

11 Structures 31–36 have not yet been ¹⁴C dated, but based on their position in the first circumference, they seem to be from the Early Eneolithic period.

12 A greater quantity of burnt plaster and charcoal has been documented just above small pits, but direct evidence of the existence of a wooden structure similar to Structure 5 (burnt wooden post) has not been found here (*Kramberger 2010b.Fig. 4*).

Early Eneolithic Structure 4 was discovered under alluvial layer SE 983, which contained finds from the same period. Two layers were discovered in pit SE 1129. The pit base was filled with layer SE 1128. The ^{14}C dated layer SE 1102 was placed on top. Fragments of charcoal, burnt clay, stone tools and pottery (Pl. 9.142–146) were detected in both layers and were especially concentrated between the two layers (Fig. 18).

The construction of Structure 7 was documented only with a few post-holes that were discovered in the central part of the deepening. The deepening of the structure yielded one cultural layer (SE 16 = 18 = 25), which was ^{14}C dated, with some smaller pits (SE 37, SE 26 and SE 21) beneath. The cultural layer contained fragments of burnt clay, charcoal, Early Eneolithic stone tools and pottery (Pl. 8.134–141), as well as two concentrations of burnt clay (Fig. 19).

The deepening of ^{14}C dated Structure 1 (SE 600) showed two major concentrations of charcoal with fragments of burnt clay (SE 623, SE 625), probably part of the structures' burnt construction, and a cultural layer SE 599. Stone tools and pottery fragments were found in SE 599 (Pl. 9.149–152) and in the concentrations of charcoal (Pl. 9.147–148, 153), where two ^{14}C samples were collected (Fig. 20).

The last ^{14}C dated structure, Structure 10, was identified as a pit (SE 1028) filled with layer SE 1027, which contained a large quantity of burnt clay, charcoal and fragments of pottery (Pl. 10.160–164). A hearth (SE 1029) was discovered next to the pit (both Phase 1). On top of layer SE 1027 and the hearth, another layer, SE 1004, was discovered which contained fragments of charcoal, burnt clay and various fragments of Early Eneolithic pottery (Pl. 10.154–157) (Phase 2). Post-hole SE 1040, also containing fragments of Early Eneolithic pottery (Pl. 10.158–159), was discovered under layer SE 1027. It was therefore assumed that it represented part of Structure 10 (Fig. 21).

Ten out of eleven dates from one part of the settlement at Zgornje Radvanje, which was investigated in 2007 and 2008, more or less overlap and date the settlement to the last third of the 5th millennium BC. Sample Beta-305862 from post-hole SE 1040 was dated somewhat later, to the end of the 5th and beginning of the 4th millennium BC (Figs. 22–23). The

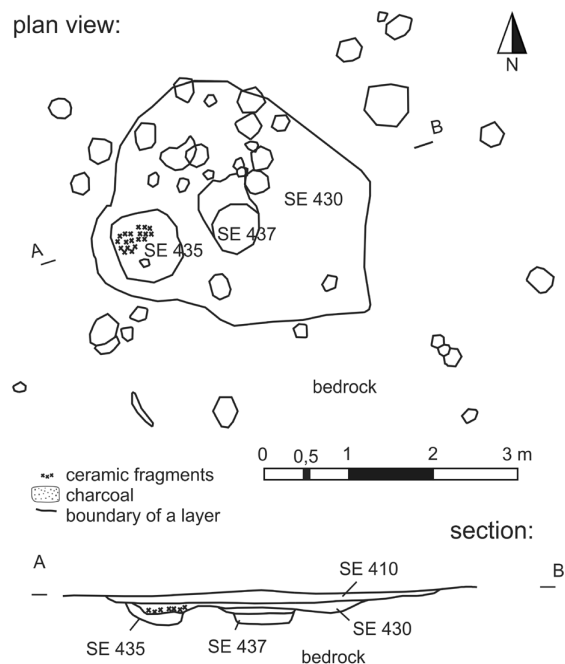


Fig. 11. Ptuj-Šolski center. Structure IV. Plan and section.

post-hole was, as already mentioned, discovered beneath layer SE 1027, so it was assumed that it was related to Structure 10 (Phase 1). However, charcoal sample Beta-305861 from SE 1027 yielded an earlier date, which is consistent with the rest of the settlement. So post-hole SE 1040 was perhaps dug into Structure 10 from the later layer SE 1004 (Phase 2), which is located above the layer SE 1027 and its cut into later layers was not detected (Fig. 21). This seems credible, but no ^{14}C dates are yet available from SE 1004, so we can not completely exclude the possibility that the ^{14}C dating of sample Beta-305862 from pit SE 1040 is incorrect in its context (Bronk Ramsey 2009b.1023–1024).¹³

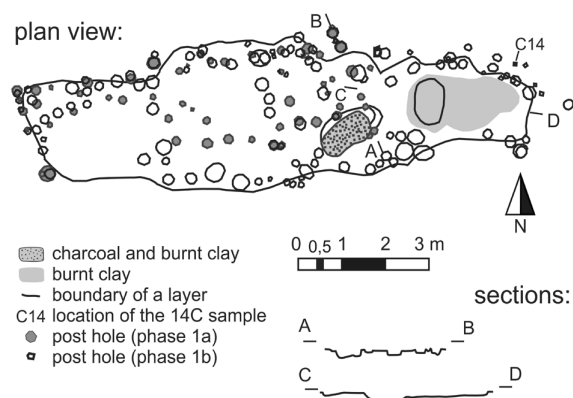
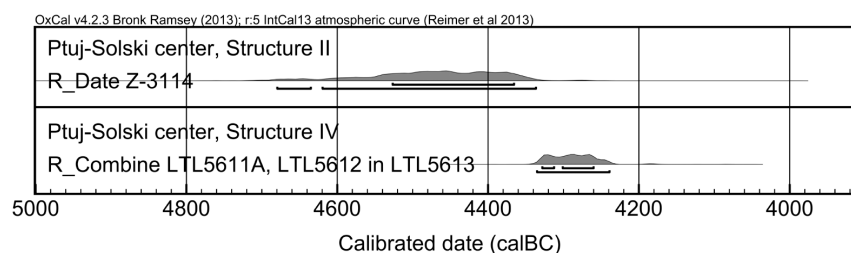


Fig. 12. Ptuj-Šolski center. Structure II. Plan and section.

¹³ Dates from the other part of the settlement at Zgornje Radvanje were presented by Monika Arh (2012. Figs. 10, 40, 61, 65).

Site	Context	Lab Code	Material	Age (BP)	SD ($\pm a$)	CalBC (68.2%)	Cal BC (95.4%)	Reference
Ptuj-Š.c.	Structure II (?)	Z-3015	charcoal	5873	132	4901–4556	5202–4449	Obelić et al. 2002.626
Ptuj-Š.c.	Structure II (SE 10)	Z-3114	charcoal	5626	80	4527–4366	4680–4337	Lubšina-Tušek 2004.75 (only mentioned)
Ptuj-Š.c.	Structure IV (SE 410)	LTL5611A	charcoal	5504	50	4445–4272	4455–4260	first published here
Ptuj-Š.c.	Structure IV (SE 430)	LTL5612A	charcoal	5387	45	4330–4176	4339–4059	first published here
Ptuj-Š.c.	Structure IV (SE 435)	LTL5613A	charcoal	5384	40	4328–4177	4336–4065	first published here

Figs. 13 and 14. Ptuj-Šolski center. ^{14}C AMS dates. Date, not included in further analyses, is shown with inclined letters.



Hoče-Orglarska delavnica

The latest site studied in this paper and the only one without ^{14}C dates is Hoče-Orglarska delavnica.¹⁴ In 1988 and 1989 Roman and Bronze Age settlements were discovered and partially studied, together with five hollows from the period studied in this paper (*Strmčnik Gulič 1989.224–226; 1990.173–175*).

Most of the pottery was found in three pits which were investigated in 1989 and interpreted as pit-houses (*Strmčnik Gulič 1990.174–175*).¹⁵ Pit-houses I and II contained a single cultural layer, which yielded burnt clay, charcoal, fragments of stone tools and pottery (Pl. 11 and Pl. 12.180–188), while pit-house III contained two cultural layers with pottery (Pl. 12.189–192) and a higher concentration of burnt clay mixed with charcoal. Layer 9 filled the deepening of the pit (Phase 1); a concentration of burnt clay and charcoal – probably the remains of a hearth – was situated on top of it, while layer 5 (Phase 2) represents the top layer (Fig. 24).

Neolithic-Eneolithic settlement in NE Slovenia

The settlements at Andrenči, Stoperce, Ptuj-Šolski center and Zgornje Radvanje yielded a total of 20 dated samples, while part of the site at Radvanje-Ha-

bakuk 2 (*Arh 2012*) offers another five dated samples. These provide a relatively good basis for explaining past events (Figs. 9–10, 13–14, 22–23 and their comments). Andrenči, two settlement phases at Stoperce and Ptuj-Šolski center offer only individual ^{14}C -dated structures,¹⁶ while the studied part of Zgornje Radvanje yielded a number of dates, so it is possible to analyse the life span of the settlement. The dates of the samples derived from the same structure were combined before calibration (function R. Combine), so that they were evenly represented during the activity period.¹⁷ In contrast, dates that refer to a variety of contexts were studied separately. The ‘Span’ function, which determines only the duration of directly dated events, was used, together with the ‘Interval’ function, which determines the whole range of activities between the beginning and the end of one phase (Fig. 25).¹⁸

Based on the presented ^{14}C dates, it is possible to conclude that the studied part of the settlement at Zgornje Radvanje, as well as the settlements at Andrenči, Stoperce and Ptuj-Šolski center document a time span of settlement activities in the period between the second half of the 47th and the first half of the 40th century BC, while the studied part of the Radvanje-Habakuk 2 settlement, partly dates back to

¹⁴ Early Eneolithic pits from Hoče-Orglarska delavnica were not radiocarbon dated because there were no suitable samples. The settlement is dated only indirectly by typological comparisons.

¹⁵ Post-holes were detected only at pit-house III, while the remaining pits were interpreted as pit-houses solely on the basis of the fragments of burnt clay and charcoal discovered in them.

¹⁶ As mentioned above, two structures were dated at Ptuj-Šolski center, but one reliable ^{14}C date comes from Structure II, with a large standard deviation.

¹⁷ The R_Combine function can, by definition, merge only ^{14}C dates relating to the same event, yielding a more precise date for this event, but it is also used to merge samples from the same pit (*Stadler, Ruttkay 2007*). The difference in the result is minimal in this case, as the merged dates relate to events which were more or less simultaneous.

¹⁸ Analyses were done with the OxCal program version v4.2.3 (*Bronk Ramsey, Lee 2013*) and the current calibration curve (*Reimer et al. 2013*).

the first and the second half of the 4th millennium BC (Arh 2012.Fig. 10; 2012. Fig. 40). According to the current chronology of the 'central and southern Slovenian Neolithic and Earlier Eneolithic' and ¹⁴C dates that are known so far, the settlements at Andrenci, Stoperce, Ptuj-Šolski center and Zgornje Radvanje can be placed in the period between the Younger or Late Neolithic and Early Eneolithic, while the settlement in the studied part of Radvanje-Habakuk 2 dates partly to the Middle Eneolithic period (Velušček 2011. 225–233).

The earliest settlement, dating to the end of the first half and the middle of the 5th millennium BC, was documented at Andrenci and Stoperce (Structure I – SE 128). Ptuj-Šolski center – Structure II, is younger and dates to the 4527–4366 calBC (68.2% probability), followed by a whole range of contexts with dates which more or less overlap: Structure IV at Ptuj-Šolski center, and Structures 7, 4, 5, 1, 22, 6 and 10 (Phase 1) at Zgornje Radvanje.¹⁹ With the Span function, the life span of the part of settlement at Zgornje Radvanje, determined by structures 7, 4, 5, 1, 22, 6 and 10 (Phase 1) has been estimated to not more than 95 years (95.4% probability), or not more than 43 years (68.2% probability), between 4355–4186 calBC and 4337–4226 calBC respectively; more-

over, the 'Interval' function yielded a maximum life span of 146 years in the period between 4355 and 4186 BC (95.4% probability) or a maximum of 60 years in the period between 4337 and 4226 calBC (68.2% probability).²⁰

Structures 7, 4, 5, 1, 22, 6 and 10 (Phase 1) at Zgornje Radvanje are earlier than Structure III (SE 150) at Stoperce, from post-hole SE 1040 at Zgornje Radvanje and individual contexts from part of the settlement at Radvanje-Habakuk 2, researched in 2010 (Arh 2012.Fig. 61). These latest contexts are dated to the end of the 5th and the beginning of the 4th millennium BC.

Pottery assemblages

The Neo-Eneolithic settlements at Andrenci, Stoperce, Ptuj-Šolski center, Hoče-Orglarska delavnica and the studied part of the settlement at Zgornje Radvanje yielded 38 398 pottery fragments (over 409.479kg). The pottery assemblages differ in quantity: the largest was discovered at Zgornje Radvanje (26 408 sherds (291.7kg)), followed by Ptuj-Šolski center (5908 sherds (65kg)), Hoče-Orglarska delavnica (1584 sherds (33.9kg)) and the second settlement phase at Stoperce (2522 sherds (14.6kg)). The pottery assemblages from Andrenci and the first settlement phase at Stoperce are the smallest and comparable in quantity (Andrenci, according to S. Pahič 1976.45 – 1050 fragments; Stoperce – 1186 fragments (4.3kg)) (Fig. 26).

Pottery production

2723 ceramic objects, which were mended from 16848 pottery fragments, were analysed according to the established method of macroscopic standards (Horvat 1999); 62 different fabrics were identified. Quartz (A), mica (C) and iron oxide (E) are present in all fabrics, only the size of grains and their frequency differ. In addition, some fabrics were characterised by whitish, somewhat softer grains, undefined in more detail. LM20, LM23 and LM59 were charac-

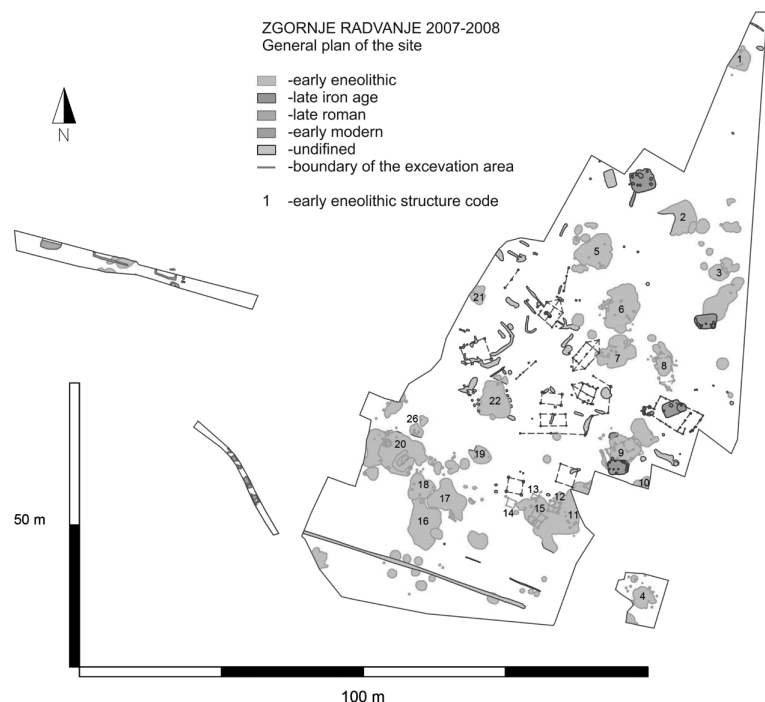


Fig. 15. Zgornje Radvanje 2007–2008. General plan of the site.

¹⁹ Structure 1 at Radvanje-Habakuk (Arh 2012.Fig. 10) is dated to the same period.

²⁰ Later ¹⁴C dates from Zgornje Radvanje are therefore largely a result of the characteristics of the calibration curve in the second half of the 5th millennium BC. This is quite curved and therefore more intersections of the value of the conventional dates with calibration curve occur, while dates have subsequently extended ranges (Wiener 2012.428–429).

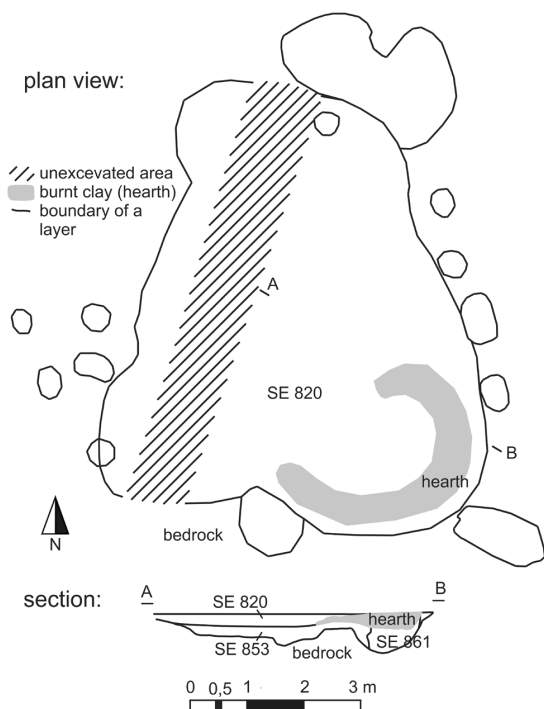


Fig. 16. Zgornje Radvanje. Structure 22. Plan and section.

terised by partially burnt organic material.²¹ The fabrics are macroscopically comparable, apart from the Andrenci pottery, which differs slightly in having a smaller amount of mica, which is probably due to different clays being used, as mica is naturally present in clay and its decomposition takes a place around 900–950°C (Guirao et al. 2014: 757–758; App. 1).

Most of the pottery was made of fabrics without quartz temper, and fabrics with a small amount of quartz temper. Andrenci (83%), Zgornje Radvanje (61%), Hoče-Orglarska delavnica (74%) and pits from the second phase of the settlement at Stoperce (66%) are dominated by pottery fragments made of very fine-grained fabrics. Fine-grained pottery was less frequent (most of it was found in pits from the second settlement phase at Stoperce – 21%); coarse-grained fabric was even less common. Only Structure I at Stoperce and Ptuj-Šolski center yielded slightly more pottery made of fine-grained fabrics (58% and 52%) (Fig. 27).

The pottery was hand-thrown and finished with treatment of the exterior and interior to remove irregularities from the surface of the objects. At An-

drenci, most of the pottery surface is uneven or rough, which means that their surface was smoothed before firing (98%). Structure I at Stoperce (91%), Ptuj-Šolski center (74%), Zgornje Radvanje (92%), Hoče-Orglarska delavnica (83%) and pits from the second phase of the settlement at Stoperce (88%) were dominated by pottery with smooth surfaces which were sponged before firing (Fig. 28).²²

In some cases, the surface was coated with a coloured clay slip, most frequently red. This type of pottery was discovered at Andrenci (3%), Structure I at Stoperce (32%), Ptuj-Šolski center (9%), Zgornje Radvanje (3%) and at Hoče-Oglarska delavnica (7%); it was coated with either a thicker layer of resistant slip (probably applied before firing, it now crumbles off the pottery surface), or thinner slips that can be removed from the pottery surface if touched with a wet finger (Fig. 29).

The decoration was made with fingers or various tools prior to firing. Three techniques of decoration can be seen – impressions, incisions and applied decoration – wherein the motif was made with a single technique or a combination of two or three techniques. Impressions of the tips of various tools, and

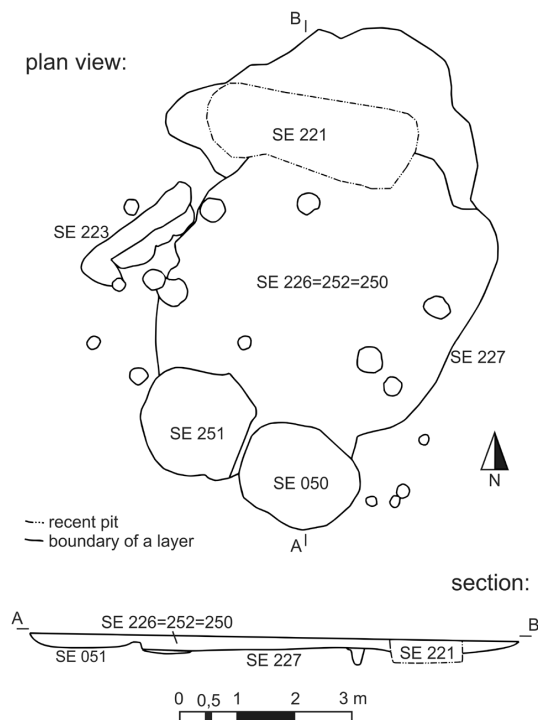


Fig. 17. Zgornje Radvanje. Structure 6. Plan and section.

²¹ Fabric LM18 is the only fabric containing grains of calcium carbonate. It was documented on the fracture of the base of a vessel from pit SE 52 at Stoperce. Its form resembles late prehistoric vessels, so it is assumed that it was not primary deposited in the pit.
²² Polished pottery is rare. It was found at Zgornje Radvanje (4%), Hoče-Orglarska delavnica (5%) and the Early Eneolithic pits at Stoperce (2%) (Fig. 27).

fingernail and fingertip impressions can be seen on the pottery surface. Incised decoration is a technique that includes dragging a tool tip/s across the surface, while applied decoration involves making an appliqué which is later applied to the surface.²³ The largest ratio of decorated pottery to undecorated vessels was discovered in Structure I at Stoperce (47%), Ptuj-Šolski center (39%) and in Hoče-Orglarska delavnica (37%). Less decorated pottery was found at Andrenci (28%), Zgornje Radvanje (25%) and in the pits of the second settlement phase at Stoperce (15%) (Fig. 30).²⁴

Individual sites are dominated by different decorating techniques. At Andrenci, most of the pottery was decorated with simple protrusions made with applied decoration (80%) and rarely with impressions (15%) or incisions (5%). Structure I at Stoperce is dominated by applied decoration and impressions (both 30%), with incisions (13%), combinations of incisions and impressions (13%), a combination of applied decoration and impressions (9%) and a combination of incisions and applied decoration (5%). The pottery at Ptuj-Šolski center more often has impressions (46%), while the quantities of applied decoration (28%), incisions (14%) and combinations of incisions and impressions (9%) are comparable to pit SE 128 at Stoperce. Most of the pottery from Zgornje Radvanje (49%) and Hoče-Orglarska delavnica (52%) was decorated with incisions, while a smaller proportion has applied decoration (Radvanje 25%, Hoče 14%), impressions (Radvanje 14%, Hoče 15%) or combinations of incisions and impressions (Radvanje 10%, Hoče 15%). Most of the ware from the second settlement phase at Stoperce is decorated with impressions (40%) or a combination of incisions and impressions (30%) (Fig. 31).

The firing atmosphere differs from vessel to vessel, wherein two firing conditions are most common. Vessels from all the sites were most often fired under oxidising conditions, wherein the firing temperature was too low and the oxygen was insufficient for the complete combustion of organic material.

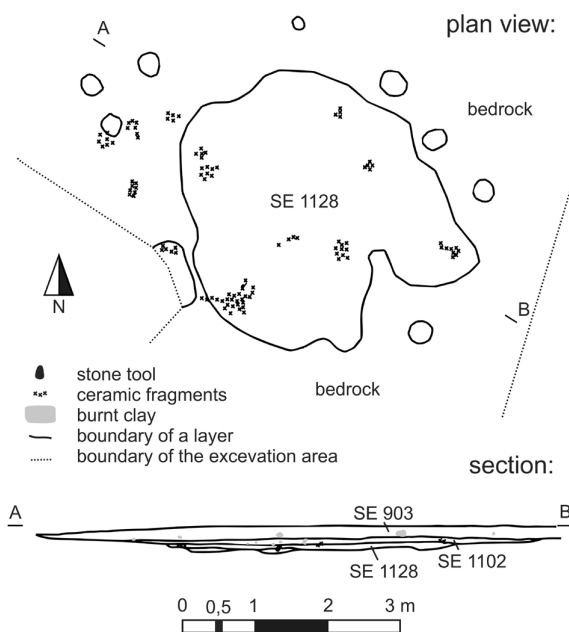


Fig. 18. Zgornje Radvanje. Structure 4. Plan and section.

Typically, the surfaces and fractures of pottery fired under these conditions have several bright hues (5 or more), with several grey areas that indicate partially burnt organic material.²⁵ Another common firing technique was with incomplete oxidation with a reducing phase at the end of the process. As the name suggests, vessels were constantly fired in oxidising conditions and the oxygen supply intentionally reduced during cooling. The pottery fractures are in bright colours, with darker grey tones on the surface. Such pottery was found in pit SE 128 at Stoperce. It is rare in comparison with pottery fired under incomplete oxidising conditions (13%), but occurs more often at Ptuj-Šolski center (29%), Zgornje Radvanje (30%), Hoče-Orglarska delavnica (24%) and the Early Eneolithic pits at Stoperce (40%). Some pottery fragments from Zgornje Radvanje (0.20%), Ptuj-Šolski center (1%) and from pits from the second phase of the settlement at Stoperce (3%) had fractures and surfaces with a uniform dark grey colour. These vessels were fired under reducing conditions, with constant temperature and reduced oxygen supply while firing as well as cooling (Fig. 32).²⁶

²³ Appliqués are discussed as parts of decoration, as some are very decorative (Kramberger 2014a, Fig. 149), although they probably also served as an aid in holding the object (like handles and lugs).

²⁴ The results need to be observed with caution. Namely, analyses included all rim fragments of vessels of closed forms, all fragments of vessel girths, all handle fragments, all fragments of the feet of footed vessels. Some of these were, within the studied pottery assemblage, never decorated or decorated rarely.

²⁵ All pottery from Andrenci was fired under these conditions, while SE 128 in Stoperce had 87%, Šolski center 70%, Zgornje Radvanje 63%, Orglarska delavnica 76% and the second phase of the settlement at Stoperce a total of 57% of pottery fired under these conditions.

²⁶ According to the pottery fractures, complete oxidation, oxidation with reduced atmosphere in the final stage and reduced firing with the oxidising atmosphere in the final stage were determined. Fragments were mostly very small, so it is possible that the evaluation would be different if sherds were larger.

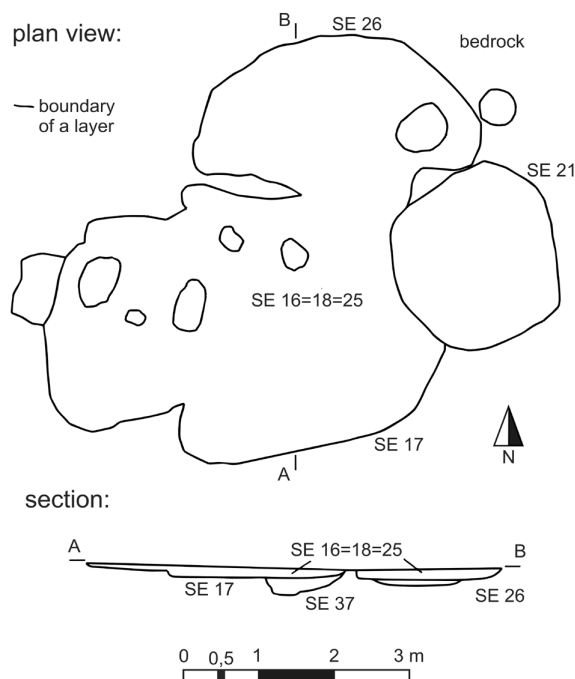


Fig. 19. Zgornje Radvanje. Structure 7. Plan and section.

The hardness of the pottery was determined by macroscopic analysis. A statistical comparison of the results of a Mohs test showed that the pottery from Structure I at Stoperce, Ptuj-Šolski center, Zgornje Radvanje, Hoče-Orlarska delavnica and the Early Eneolithic pits at Stoperce was on average harder (dominated by a value of 3–6 on the Mohs' scale of hardness) than the pottery from Andrenči (values 1–4 on the Mohs' scale of hardness) (Fig. 33). The hardness of pottery depends on many factors, the most important of which are the composition and microstructural properties of clay, the surface treatment of vessels prior to firing, firing temperature and atmosphere (Rice 1987. 354).²⁷

Forms of pottery, decoration and typological comparisons

The pottery found at the settlements from the 5th millennium BC differs in form and decoration, with some notable differences from site to site which can be seen between contexts, which according to the results of ¹⁴C analyses, date to different periods, as well as between contexts that were contemporaneous. Good comparisons are available in different

geographic areas and the studied sites can be connected to different cultural groups.

As mentioned above, according to the current chronology of the 'central and southern Slovenian Neolithic and Earlier Eneolithic and ¹⁴C dates known so far, the settlements at Andrenči, Stoperce, Ptuj-Šolski center and the studied part of the settlement at Zgornje Radvanje date to the Younger or Late Neolithic and Early Eneolithic (Velušček 2011.225–233). According to the above chronology, the earliest settlement in central and south-eastern Slovenia is culturally defined as pertaining to the Sava group of the Lengyel Culture, followed by the Lasinja Culture, dated to the Early Eneolithic period, and later by the horizon of pottery with furrowed incisions, which is dated to the Middle Eneolithic (Velušček 2011.209).

The chronological scheme of the 'central and south Slovenian Neolithic and Earlier Eneolithic' is comparable to the Austrian chronological scheme, with the only difference being the terminology used.²⁸ However, a very different chronological scheme exists in neighbouring Croatia (Marković 1994.27–29) and Hungary. The transition from the Neolithic to the Copper Age is better defined in Hungary, where the Sé horizon, early and middle phases of the Lengyel Culture (West Hungary) and the Tisza Culture (East Hungary) define the Late Neolithic period. Phase Lengyel III (West Hungary), which according to Anton Velušček is correlated with the Sava group of the Lengyel Culture (Velušček 2011.210–222), and the Proto-Tiszapolgár and Tiszapolgár horizons (East Hungary) date to the Early Eneolithic period, while the Balaton-Lasinja Culture and the horizon of pottery with furrowed incisions ('Furhenstich') date to the Middle Eneolithic period (Raczky 1974; Makray 1976; Zalai-Gaál 1982; Kalicz 1973; also Bánffy 1995c.192; 1997.61). The transition from the Neolithic to Eneolithic has been explained by changes in society and lifestyle, supposedly related to the spread of new technologies from the area of the central Balkans to Central Europe (Bánffy 1995c.183–187). Contacts with the central Balkans are also supposed to be seen in a number of new forms of pottery that first appear during the Late Lengyel Culture and which are a specific feature of the subsequent Balaton-Lasinja Culture (Bánffy 2002).

²⁷ The results of the analysis need to be treated with caution, since the analysis was carried out with a magnifying glass, not a microscope. Moreover, the Mohs hardness test is not entirely relevant for gritty pottery (Rice 1987.357).

²⁸ In Austria, the Lengyel Culture and related cultural groups (e.g., Moravia – East-Austrian group of painted ceramics, Stichbandkeramik, the Münschöfen Culture) define the Middle Neolithic, while the Kánzianiberg-Lasinja and related cultures define the earlier phase of the late Neolithic period, which equates to the Copper Age in Austria (Krenn-Leeb 2006.Fig. 2).

The second half of the 47th to the beginning of the 45th century BC

Differences in pottery forms and pottery decoration can be seen at Andrenči (Pls. 1–2) and Structure I at Stoperce (Pl. 3), although they were absolutely dated to approximately the same era, *i.e.* between the 47th and mid 45th century BC (95.4% probability) or between the second half of the 47th and the beginning of the 45th century BC (68.2% probability). Differences can be noticed mainly in the forms of pots and decorative motifs, while, for example, footed dishes, dishes and jugs are almost identical.

To begin with, we focus on finds with no significant differences, because such finds have been found over a wide geographical area. The pottery assemblages from Structure I at Stoperce (Pl. 3.52, 54, 56) as well as from both structures at Andrenči (Pl. 1.1.2, 16, 23; Pl. 2. 26, 38) often include dishes with a convex body and an everted rim (*cf.* Kramberger 2014.285–287), which stood either on a base or low cylindrical foot (*cf.* Kramberger 2014.288–289).²⁹ Furthermore, all contexts contain dishes with a convex body and a straight rim (Pl. 1.3, 18; Pl. 2.37, 40; Pl. 5.3, 58; see also Kramberger 2014.290)³⁰ and jugs with a low-convex body, shoulders and a long or medium sloping neck (Pl. 1.10; Pl. 2.44; Pl. 3.59; see also App. 2.V11–V13).³¹ The so-called beak-spouted rims (Pl. 1.21–22),³² the ‘buta’ type of vessel with horizontal handles of a triangular form (Pl. 24.1; Pl. 2.49; see also Kramberger 2014.159–161, 299), ladles with a punctured handle attachment and a semi-spherical receptacle (Pl. 2.47–48) and a ladle with a punctured handle attachment and a semi-ellipsoidal receptacle (Pl. 19.1; *cf.* Kramberger 2014.298) only appear at Andrenči; these are generally known types of pottery from the 5th millennium BC in Central and South-eastern Europe.

Differences in pot forms are more significant. Apart from differences, defined as versions, it was discovered that structures A and B at Andrenči yielded only pots with rounded body (Pl. 1.11–12, 20) and an everted neck (Pl. 1.6, 11–12; Pl. 2.28, 31, 33–

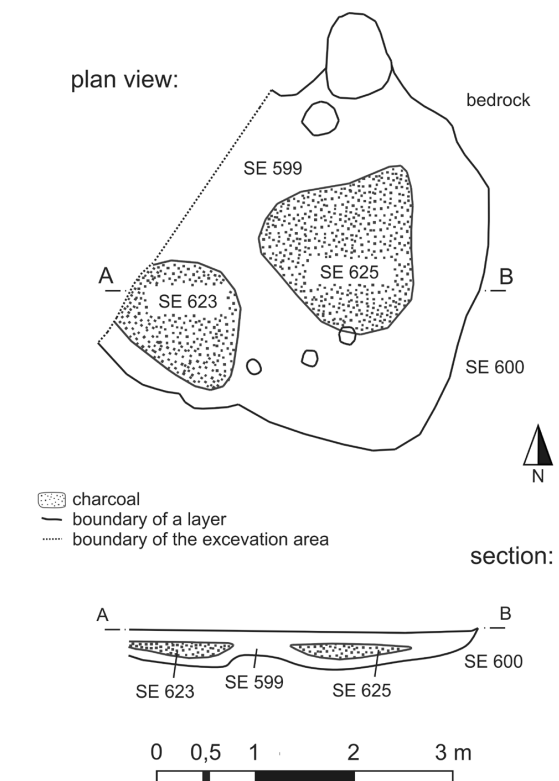


Fig. 20. Zgornje Radvanje. Structure 1. Plan and section.

34),³³ while better preserved pots from Structure I at Stoperce have concave bodies (Pl. 3.66–69) and strongly everted (Pl. 3.63, 69), slightly everted (Pl. 3.60) as well as ellipsoidal necks (Pl. 3.62, 64) (see also App. 3. L24.1–L15.1–2). The upper parts of pots have vertical strap handles, a characteristic of pots from the end of the first half of the 5th millennium BC onwards in Austria (MOG IIa and IIb; Stadler, Ruttkay 2007.142–143) and Hungary (end of the Phase II and Phase III of the Lengyel Culture; Bánffy 1995b.87; Zalai-Gaál 2003.294–295).

A common feature of pottery decoration at Andrenči and SE 128 from Stoperce are plastic motifs on girths (Pl. 1.1–2, 7, 9, 10, 12, 17, 20; Pl. 2.29–30, 32, 37, 42–44, 46; Pl. 3.58–60, 63, 65, 68), while there is a great difference in the frequency of occurrence of such motifs in comparison with other types of decoration. Applied motifs are the most common tech-

²⁹ Simple dishes with feet tapering at the end appear individually at Andrenči (Pl. 13.1).

³⁰ SE 128 at Stoperce yielded a similarly formed dish with a concave body (Pl. 3.57).

³¹ Good comparisons are available at, for example, the Late Lengyel sites of Nagykanizsa-Inkey-Kápolna, Zalaszentbalázs-Szólóhegyi mező and Čatež-Sredno polje (*cf.* Horváth, Kalicz 2006.58; Velušček 2011c.214–242; Kramberger 2014.Fig. 186).

³² Comparisons can be found at, for example, the sites of Lengyel Culture, the Sopot Culture and at Čatež-Sredno polje (Kramberger 2014.291).

³³ Although only three such pots are typologically identified, based on fragments of the lower parts of the vessels, it is possible to assume that the majority were of this form. All fragments of closed vessels from structures A and B have rounded bodies, while the necks of all closed vessels from structures A and B were everted. We can assume that most of these fragments are fragments of pots, while some could be from jugs or the ‘buta’ type of vessels.

nique of decoration at Andrenci,³⁴ while the decoration of pottery from Structure I at Stoperce is diverse. Apart from applied decoration, one can notice impressions (Pl. 3.64, 66–67), a combination of impressions and applied decoration (Pl. 3.63, 68), a combination of impressions and incisions (Pl. 3.62, 69), incisions and a combination of incisions and applied decoration (Pl. 3.65). A feature of the ware from Andrenci has to be stressed, *i.e.* decoration with a large bulge on the rim of a vessel (Pl. 2.45) and horizontally perforated appliqué (Pl. 1.5), while only pottery from SE 128 at Stoperce has two small plastic bulges (Pl. 3.58) and horizontal elongated appliqués (Pl. 3.52, 54).

Pottery which disparates Andrenci from Structure I at Stoperce can be found in different geographic areas. The Andrenci pottery mainly resembles pottery assemblages dating to the end of Phase II and from Phase III of the Lengyel Culture in West Hungary, in Styria (for a review, see *Obereder 1989; Tiefengraber 2006*) and Bukovnica (*Šavel 1992.59–60*), and is thus the extreme southwest site where such pottery occurs. The West Hungarian sites are the most researched among the sites mentioned. Firstly, the site at Zalaszentbalázs-Szőlőhegyi mező has to be mentioned (for an analysis of decoration, see *Bánffy 1995b. 78–80*), followed by, for example, sites at Nagykanizsa-Inkey-Kápolna (*Kalicz 2003; Horváth, Kalicz 2006*), Tekenyé (*Katalin 1987*), Veszprém (*Regenye 2007*), Szentgál-Füzi-Kút (*Regenye 1994*) and Kaposvár-Gyertyános (*Regenye 2006*). These sites yielded pots with rounded bodies, everted necks and vertical strap handles (*cf.* Pl. 12.1 with *Bánffy 1995b.Pl. 71.179*, with *Regenye 2007.Fig. 2.1*), which are almost identical to the pots described above. Moreover, the pottery is decorated with similarly formed appliqués (*cf.* Pl. 1.5: *Bánffy 1995b.Pl. 53.16; Pl. 63.109; Pl. 71.199; Pl. 92.126–127, Kalicz 2003.Pl. 4.12–14, Pl. 5.4, Regenye 1994.Fig. 8.19, Fig. 11.7, Regenye 2006, with Šavel 1992.Pl. 5.16; cf. Pl. 2.45: Bánffy 1995b.*

Pl. 71.179, Katalin 1987.Fig. 26.12). Similar forms and decoration also appear at sites dated to the late phase of the Moravia – East Austrian group of painted pottery (MOG) in Austria (*Stadler, Ruttkay 2007. 140, 142–143; cf. Pl. 1.11 with Ruttkay 1976.Pl. 3.3*), while similar forms, but decorated with painted ornament, occur at sites dated to the middle phase of the MOG (*e.g., Stadler, Ruttkay 2007.138–139, 142; cf. Pl. 1.12 with Neugebauer, Neugebauer-Maresch 2006.Fig. 3.8; Pl. 2.45 with Carneiro 2006. Fig. 5. 1–2*). Good comparisons can, moreover, be found in late phases of the Brodzany-Nitra Group in Slovakia (*cf. Pl. 2.45 with Rakovský 1986.Fig. 1.1, Fig. 2.1, 4, with Kuča et al. 2011.Fig. 5.10 and Košťurik 1979.Pl. 1.8, Pl. 4.4, Pl. 7.5, 7*).

The form and decoration of pottery from Structure I (SE 128) at Stoperce, on the other hand, mainly resembles sites in central and south-eastern Slovenia. Good comparisons can be found at settlement phase 2 at Moverná vas (*Budja 1995.Fig. 4; Tomaž 1999*), at Resnikov prekop (*Harej 1975; Korošec 1964*) and at Gradišče pri Stiški vasi (*Velušček 2005*). Individual comparisons also occur at, for example, Čatež-Sredno polje (*Tomaž 2010; Tomaž, Kavur 2006*) and Dragomelj (*Turk, Svetličič 2005*), where it seems

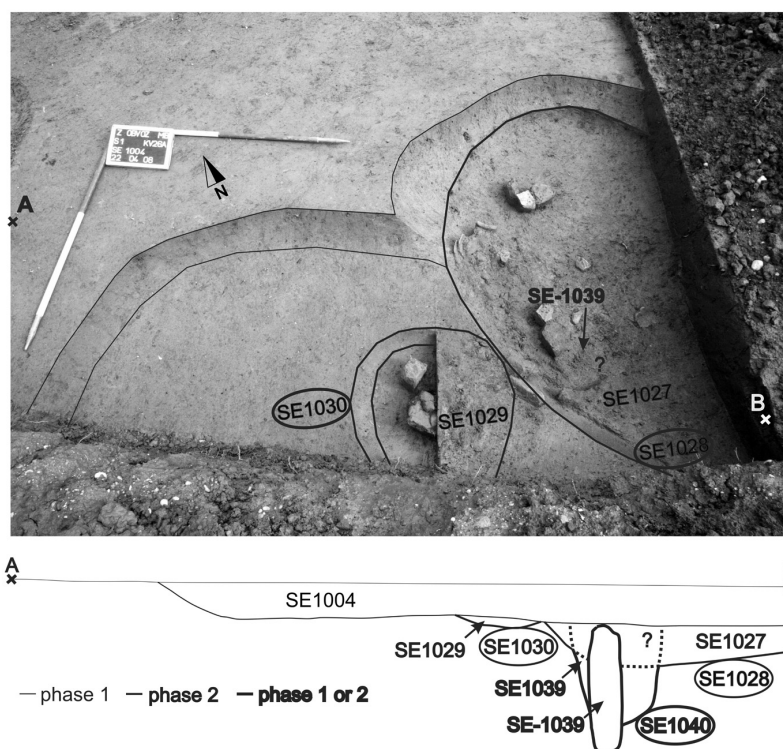
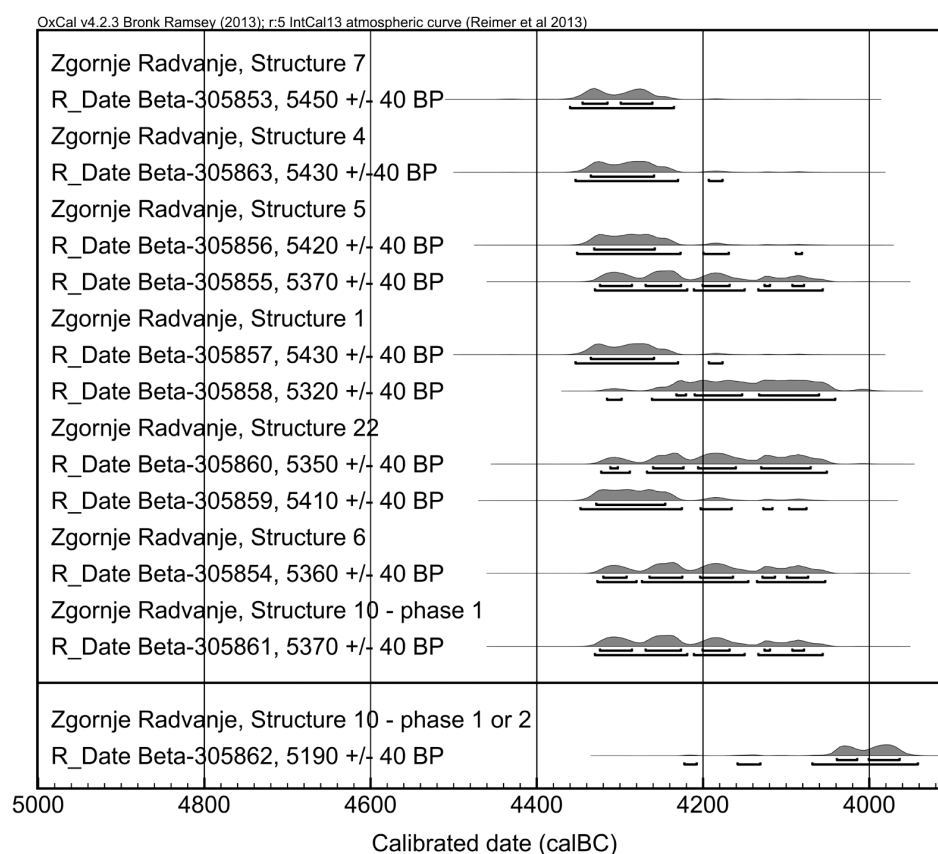


Fig. 21. Zgornje Radvanje. Structure 10. Photo and segment of partially researched structure.

³⁴ Structure A yielded 19 vessels decorated with plastic motifs, while Structure B yielded 9 vessels with this type of decoration. According to the statistics, as already stated, this means that 80% of pottery was decorated with plastic motifs, 15% of motifs were impressed (Pl. 28.2, 34, 50) and only 5% were incised (Pl. 1.8).

Site	Context	Lab Code	Material	Age (BP)	SD ($\pm a$)	CalBC (68.2%)	Cal BC (95.4%)	Reference
Zg. Radvanje	Structure 7 (SE 20)	Beta-305853	charcoal	5450	40	4346–4262	4361–4236	first published here
Zg. Radvanje	Structure 4 (SE 1102)	Beta-305863	charcoal	5430	40	4336–4260	4354–4177	first published here
Zg. Radvanje	Structure 5 (SE 324)	Beta-305855	charcoal	5370	40	4325–4079	4331–4057	first published here
Zg. Radvanje	Structure 5 (SE 330)	Beta-305856	charcoal	5420	40	4332–4259	4352–4082	first published here
Zg. Radvanje	Structure 1 (SE 623)	Beta-305857	charcoal	5430	40	4336–4260	4354–4177	first published here
Zg. Radvanje	Structure 1 (SE 625)	Beta-305858	charcoal	5320	40	4233–4061	4316–4042	first published here
Zg. Radvanje	Structure 22 (SE 853)	Beta-305860	charcoal	5350	40	4312–4071	4323–4052	first published here
Zg. Radvanje	Structure 22 (SE 820)	Beta-305859	charcoal	5410	40	4329–4246	4348–4076	first published here
Zg. Radvanje	Structure 6 (SE 250)	Beta-305854	charcoal	5360	40	4321–4074	4328–4054	first published here
Zg. Radvanje	Structure 10 (SE 1027)	Beta-305861	charcoal	5370	40	4325–4079	4331–4057	first published here
Zg. Radvanje	Structure 10 (SE 1040)	Beta-305862	charcoal	5190	40	4040–3964	4223–3824	first published here



Figs. 22 and 23. Zgornje Radvanje. ^{14}C AMS dates from part of the settlement, which was investigated during 2007 and 2008.

that more pottery is decorated with impressions.³⁵ These sites yielded identical or similar decorated pots, with concave bodies, strongly everted (*cf.* Pl. 3.63 with *Tomaž 1999. Pl. 14.1*, with *Harej 1975. Pl. 1.6*; *cf.* Pl. 3.69 with *Tomaž 1999. Pl. 12.1–2*),³⁶ slightly everted (*cf.* Pl. 3.60 with *Tomaž 2010. find no. 668*) and ellipsoidal necks (*cf.* Pl. 3.62 with *Velušček 2005. find no. 8*; see also the pot from settlement phase 2 in *Budja 1995. Fig. 4*). Dragomelj, Resnikov prekop, Čatež-Sredno polje and Gradišče pri

Stiški vasi, all of these with artefacts that are comparable to the studied pottery, have been dated to the so-called Sava Group of the Lengyel Culture. According to Mitja Guštin, Moverná vas in Bela Krajina is not attributed to this group (*Guštin 2005. Fig. 1*). However, Velušček considers that the distribution of this cultural group is wider and includes sites in Bela Krajina, around Karlovac, Kočevsko and Slovenian Styria (*Velušček 2011. 206*), which is confirmed by the pottery from the deepening of Structure I at Stoperce.

³⁵ According to the analysis, which was presented by Alenka Tomaž, this is reliable, especially for Čatež-Sredno polje (*Tomaž 2010*), while a study of the whole Dragomelj site has to be published first in order to confirm or disprove this.

³⁶ The second settlement phase of Moverná vas offers the best comparisons with footed dishes decorated with a horizontally elongated appliqué (*cf.* Pl. 3.52, 54 with *Tomaž 1999. Pl. 5.2*).

End of the 46th to 43rd century BC

Based on individual ¹⁴C date from Structure II and dates from Structure III, the site at Ptuj-Šolski center can be dated to between the end of the 46th and 43rd century BC (Fig. 25). The date partly overlaps with dates from both, *i.e.* Structure I at Andrenci and Zgornje Radvanje. This indicates that Ptuj-Šolski center may have been contemporary with Structure I at Stoperce and with Andrenci, as well as with the structures at Zgornje Radvanje. However, the pottery assemblages found in the structures differ from site to site.

Based on pottery assemblages, Ptuj-Šolski center is culturally dated to the Late Lengyel Culture (*Kavur 2010.71*) or the 'wider Lengyel Culture' (*Guštin 2005.9, Fig. 1; Tomaž 2010.164*). The comparisons presented in this paper are only partly consistent with this definition. In addition to finds that are comparable to material from Andrenci and Structure I at Stoperce, Structures I–IV also yielded finds comparable to the Lasinja Culture in the region. The most important feature of the Late Lengyel Culture (*Carneiro 2004.267–271*) and the 'wider area of the Lengyel Culture' (*Guštin 2005.12–13*) are vessels with a coloured clay slip.³⁷ It can be seen on dishes of identical or similar forms as those from Andrenci and SE 128 at Stoperce: on dishes with a convex body and an everted rim (Pl. 5.82; Pl. 6.100), simple hemispherical dishes (Pl. 5.78 ; Pl. 6.92), dishes with a convex body, of simple form with a tapered upper part, where the base is not preserved (Pl. 5.90; Pl. 6.94, 102), on high hollow cylindrical feet (Pl. 6.96) and on numerous foot fragments.³⁸

In addition to the presented dishes with clay slip, which were probably footed, Ptuj-Šolski center yielded many footed dishes with a convex body and straight rim decorated with four tongued appliqués (Pl. 5.79, 81, 89; Pl. 6.93, 95) which have been identified as a typical find of the Slovenian Lasinja Culture (*Guštin et al. 2005.47; Velušček 2011.222*). These were usually fired under incom-

plete oxidising conditions, with reducing conditions used at the end of the firing process. The same firing process was used for high hollowed sloping feet (Pl. 6.99), high hollowed sloping feet, convex in the middle (Pl. 5.83), high hollowed sloping feet, convex on top, and differently formed low feet (Pl. 6.97–98). Some footless dishes and bowls were similar in form (Pl. 6.101, 103) occur together with dishes with a simple semi-circular form (Pl. 5.91). Handles or spouts, semi-circular spouts with a partition (Pl. 5.91), or thrown spouts (Pl. 5.84) could be attached to all types of dishes and bowls as well as footed dishes.

Even more differences can be seen between jugs and pots from Ptuj-Šolski center and those from Andrenci and Structure I at Stoperce. In contrast with the jugs from SE 128 at Stoperce and Andrenci, the typologically determined jugs from Ptuj-Šolski center have a low concave body (Pl. 6.104–106), shoulders and either short and slightly sloping (Pl. 6.106) or long cylindrical necks (see also App. 2). Pots usually have a high concave body, shoulders and a medium (Pl. 5.86; Pl. 6.107) or short cylindrical neck or a long sloping neck (Pl. 6.108). Pots of different forms are rare (Pl. 6.88; see also App. 3).

The ceramic finds are most often decorated with impressed, applied, incised and impressed-incised motifs; some are comparable to those from Structure I at Stoperce (*cf.* Pl. 3.52, 54 with Pl. 6.92; *cf.* Pl. 3.63, 68 with Pl. 6.106). Different motifs also occur (Pl. 6.103); they are more comparable to those at Zgor-

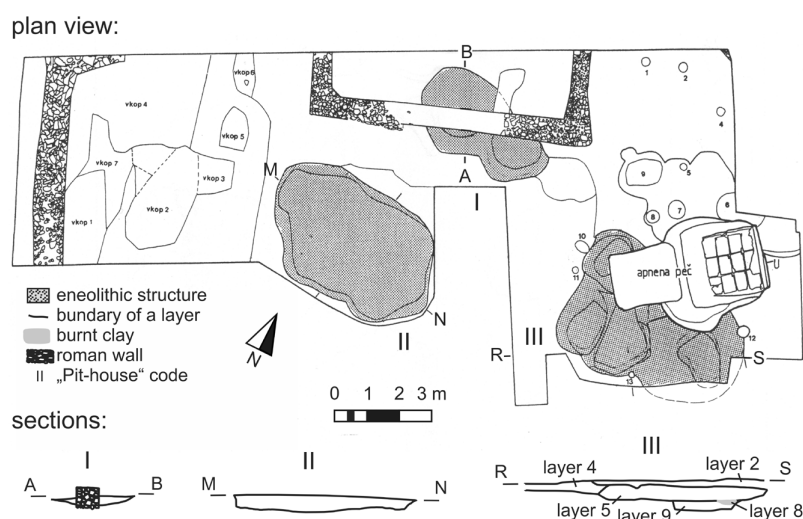


Fig. 24. Hoče-Orglarska delavnica. Plan of the part of the settlement that was excavated in 1989 and sections of Early Eneolithic 'pit-houses' (drawn according to Strmčnik-Gulič 1990.App. 2).

³⁷ Ptuj-Šolski center, as already stated, yielded more slip-coated pottery than Andrenci, but less than SE 128 at Stoperce (Fig. 28).

³⁸ No base fragments covered with slip were found at the site, so we can assume that most of the presented variations were footed.

nje Radvanje and Hoče-Orglarska delavnica (cf. with Pl. 8.128 and Pl. 12.182, 186, 188).

Typological comparisons reveal great similarities in the pottery from the nearby site of Rabenstein near Lawamünd, which, according to the chronology of E. Ruttkey, dates to the Early Lasinja Culture (*Tiefengraber 2004; Carneiro 2004; see also Krenn-Leeb 2006.195, Fig. 2*). The pottery from this site is relatively fragmented; however, several forms can be identified: dishes with a convex body and everted rim (cf. Pl. 5.82 with *Tiefengraber 2004.Pl. 5.45*) and dishes with a simple semi-circular form with a conical top (cf. Pl. 6.102 with *Tiefengraber 2004.Pl. 2.15–16, Pl. 4.33, Pl. 14.152–153*) coated with red

slip and probably footed; simple spherical dishes with spouts, with partition of semi-circular form (cf. Pl. 5.91 with *Tiefengraber 2004.Pl. 5.49, Pl. 9.95*); jugs with a low concave body (cf. Pl. 6.105 with *Tiefengraber 2004.Pl. 2.20–21, Pl. 8.79, Pl. 11.114–115*) and almost identical decoration (cf. Pl. 5.87 with *Tiefengraber 2004.Pl. 10.101*; Pl. 6.103 with *Tiefengraber 2004.Pl. 3.29*; Pl. 6.101 with *Tiefengraber 2004.Pl. 14.150*). Comparisons of some forms of pottery which from Ptuj-Šolski center which differs from that found at Andrenci and Structure I at Stoperce are known from some sites in central and south-eastern Slovenia, the most important being: the ¹⁴C dated settlement phases Moverna vas 4, 5 and partly 6 (cf. dish with a thrown spout – Pl. 5.84

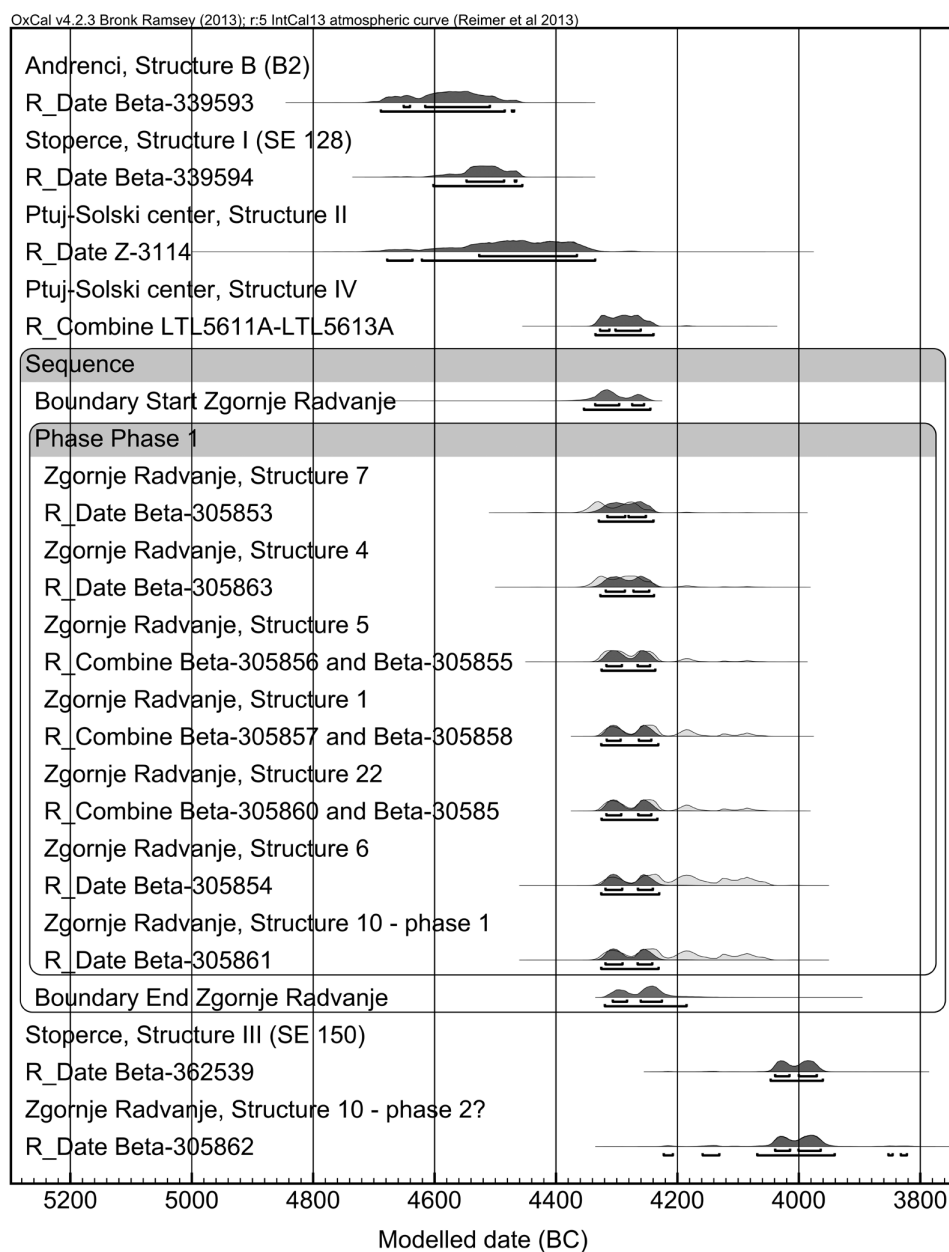


Fig. 25. Settlement chronology at Andrenci, Stoperce, Ptuj-Šolski center and part of Zgornje Radvanje.

Settlement	Amount of fragments before mending	Amount of fragments after mending	Total weight of pottery fragments (kg)
Andrenci	1050	/	/
Stoperce – settlement phase 1	1186	850	4,28kg
Stoperce – settlement phase 2	2522	1714	14,58kg
Ptuj-Šolski center	5908	4465	64,995kg
Zgornje Radvanje	26408	18086	291,677kg
Hoče-Orglarska delavnica	1584	895	33,947kg
All settlements together	38398	26010 + Andrenci	409,479 kg + Andrenci

Fig. 26. Size of studied pottery assemblages. The only data available from Andrenci is the quantity of pottery fragments that were found in the settlement.

with *Tomaž 1999.Pl. 17.4*; a pot with a concave body and cylindrical neck – Pl. 5.86 with *Tomaž 1999.Pl. 24.1, Pl. 25.1, Pl. 32.6*; a jug with a concave body decorated with incisions – Pl. 6.105 with *Tomaž 1999.Pl. 31.2–3*) and a ¹⁴C-dated site at Ponikve pri Trebnjem which is dated to the same era as Structure II at Ptuj-Šolski center (*Ravnik, Tica in press*)³⁹ and settlement phases Moverna vas 4 and 5.

In addition to the similarity between pottery from Ptuj-Šolski center and pottery from the sites mentioned above, noticeable differences also exist. The former has frequent imprinted decoration more frequently, while the pot with a low convex body and a sharp transition between a medium cylindrical neck and shoulders, as well as footed dishes with a straight rim and hanging appliqué, which were identified in the region as typical of the Lasinja Culture, are not known at the above-mentioned sites. Is this merely a result of archaeological research, or do we have to look for an answer elsewhere?

Ptuj-Šolski center is located near the so-called ‘west-ern route’ defined by Eszter Bánffy and based on many elements of southern origin seen on pottery. Sites further away from this route have fewer of these elements (*Bánffy 1994.294; 2002.42*). As already noted, these links are important, as they help to determine the transition from the Hungarian Late Neolithic to the Copper Age, as they link with changes that should have resulted from spread of new technologies (primarily copper) from the area of the central Balkans to Central Europe. Further research is needed to answer the above question, but, at this point, it is necessary to stress that there are noticeable similarities to pottery from several Copper Age cultural groups in the central Balkans, primarily with the early phases of the Salcuta Culture. Several correlations can be found (*Kramberger 2014.292, 308–*

309, 310–311). However, the comparison with a uniquely formed pot with a low convex body and sharp transition between medium cylindrical neck and shoulders (Pl. 5.88; Fig. 34.1) has to be stressed here. No similar form has been found at other Slovenian sites (*cf.* Fig. 34.2).

The end of the 44th and 43rd century BC

As mentioned above, ¹⁴C dates and settlement model date structures 7, 4, 5, 1, 22, 6 and 10 (Phase 1) at Zgornje Radvanje to the late 44th and 43rd century BC (68.2% probability) or, more specifically, between the second half of the 44th and the early 42nd century BC (95.4% probability) (Fig. 25). Pottery from these structures is typologically well comparable with pottery from Hoče-Orglarska delavnica (*cf.* Pl. 7–10 with Pl. 11–12), but slightly different from that found at Ptuj-Šolski center, mainly in elements where similarities with Ptuj-Šolski center, Structure I at Stoperce and Andrenci were found.

Namely, Zgornje Radvanje and Hoče-Orglarska delavnica yielded only footed dishes with a straight rim decorated with hanging tongue-like appliqué (Pl. 7.109, 112; Pl. 8.124; Pl. 9.142, 147, Pl. 10.159; Pl. 11.165). Different forms of feet are present (Pl. 8.137; Pl. 11.172; Pl. 12.180, 184; see also *Kramberger 2010.Pl. 1.1; Pl. 6.33*), the most common being high hollow feet, convex on top (Pl. 7.110; Pl. 8.123; Pl. 10.155; Pl. 12.183). Dishes and bowls were formed similarly to footed dishes.⁴⁰ They have applied handles (Pl. 8.126; Pl. 11.166; Pl. 12.186), lugs (Pl. 12.192), appliqué (Pl. 7.113; Pl. 11.168) or spouts. Semi-circular spouts with a partition (Pl. 9.145) and thrown spouts (Pl. 9.143; Pl. 10.154) appear with a protrusion/protrusions on the inside, and circular spouts with partition (Pl. 7.111; Pl. 11.170) and ex-tracted spouts (Pl. 7.115; Pl. 12.181) are also present.

³⁹ I am grateful to Mateja Ravnik that enabled me to get an insight to the dating and pottery and allowed me to mention the yet unpublished data at this stage.

⁴⁰ Only bowls with a concave body, shoulders and rim differ (Pl. 11.168, see also *Kramberger 2010b.Pl. 1.6–7*).

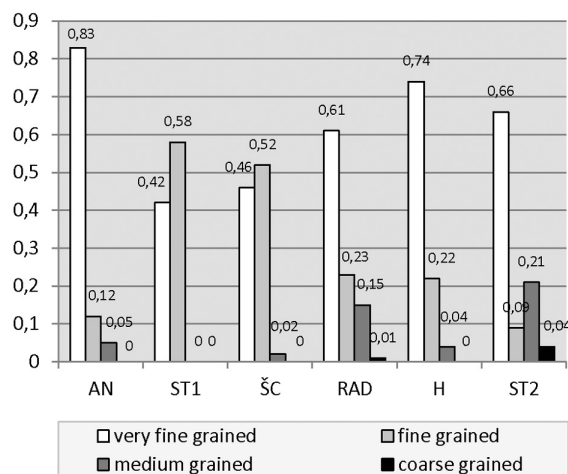


Fig. 27. Andrenči (AN), Stoperce – settlement phase 1 (ST1), Ptuj-Šolski center (ŠC), Zgornje Radvanje (RAD), Hoče-Orglarska delavnica and Stoperce – settlement phase 2 (ST2). Percentage of different granularity groups of fabrics.

Jugs with a low concave body, low shoulders and a long, cylindrical (Pl. 7.116; Pl. 11.174; Pl. 12.182) or slightly sloping neck (Pl. 10.162) are similar in form to jugs found at Ptuj-Šolski center, but the shoulders are often extremely thickened (see also Pl. 8.128, *Kramberger 2010.Pl. 7.41, 45*). Jugs with identically formed upper parts, but a high concave body (Pl. 7.121; Pl. 8.136; Pl. 11.171; Pl. 12.185, probably also Pl. 9.144), and jugs with a high concave body and long strongly sloping necks (Pl. 8.127, 135; Pl. 9.149) (see also App. 2) are also present.

The most common pot forms are, similarly to Ptuj-Šolski center, pots with a high concave body, shoulders and a sharp transition to a short cylindrical neck (Pl. 8.131; Pl. 11.177–178; 12.187–188; see also *Kramberger 2010.Pl. 2.12; Pl. 3.13–15, 18; Pl. 7.48–49; Pl. 9.52; Pl. 10.58*), and pots with a high concave body, low shoulders and a long, sloping neck (Pl. 9.152; Pl. 11.176, 179; see also *Kramberger 2010.Pl. 7.46–47*). Pots with a high concave body, with no shoulders and a long, strongly sloping neck (Pl. 7.122; Pl. 9.146, 153; see also *Kramberger 2010.Pl. 8.50*) are also frequent, together with individual finds of pots with a low concave body (*Kramberger 2010.Pl. 2.11; Pl. 20.4*), a pot with a high concave body, shoulders and medium strongly sloping neck (Pl. 10.164), a pot with a concave body and an indi-

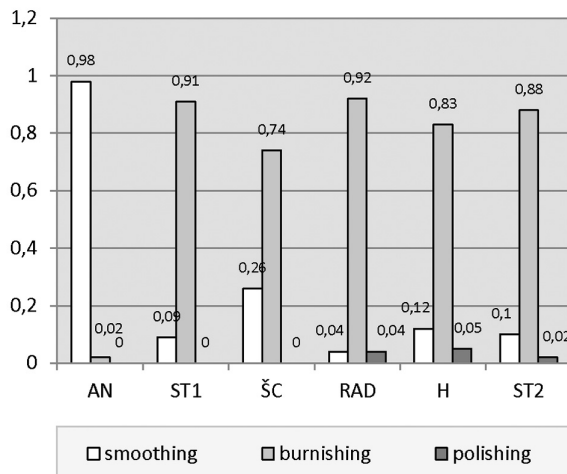


Fig. 28. Andrenči (AN), Stoperce – settlement phase 1 (ST1), Ptuj-Šolski center (ŠC), Zgornje Radvanje (RAD), Hoče-Orglarska delavnica and Stoperce – settlement phase 2 (ST2). Percentage of finishing (surface treatment) techniques.

stinct transition to a short slightly sloping neck (Pl. 7.114) and pots with a convex body and a long, slightly sloping neck (Pl. 12.189–190; see also App. 3).

Apart from pots, ¹⁴C-dated structures at Zgornje Radvanje also yielded bottle-like vessels (Pl. 7.118, *Kramberger 2010b.Pl. 3.17, 9.55*). They are similar to the so-called Lasinja bottles – a characteristic of this period, which are also present at Zgornje Radvanje (Pl. 7.119) and Hoče-Orglarska delavnica (Pl. 12.191) – but incomparably larger (*Kramberger 2014.343–344, 346–348*). They were categorised as pots in the first publication (*Kramberger 2010.313, 314*), but compared to pots they are more closed and have appliqués instead of handles.

The pottery ladles were made in one piece, with a full (Pl. 8.132) or punctured attachment (Pl. 9.151; Pl. 10.160; Pl. 11. 175) for a handle. The latter is more common, often with one (Pl. 7.117; Pl. 8.141; see also *Kramberger 2010b.Pl. 9.53*) and sometimes more protrusions, which is characteristic of a period after the Lengyel Culture (*Ruttkay 1994. 223*).

Pottery similar to that found at Hoče-Orglarska delavnica and Zgornje Radvanje can primarily be found⁴¹ at sites dated later as pertaining to the Lengyel Cul-

⁴¹ Some forms and ornaments have comparisons on sites that are dated to the 45th and 44th century BC (Phase 4 and 5 of Moverna vas – see *Kramberger 2010b.317–322*) and even sites that are dated to the middle of the 5th millennium BC (*cf. Pl. 9.150* with Pl. 3.66). The datings of some sites which are based on comparisons of a few small pottery fragments do not seem completely convincing (see *Tomanič-Jevremov et al. 2006.find no. 2–15* and compare find no. 3 with Pl. 8.133). However, we also have to mention that there are indeed some fragments at Ptujski grad which are characteristic of the pottery of the middle of 5th and first half of 5th millennium BC (*Tomanič-Jevremov et al. 2006.find no. 2; Korošec 1951.Fig. 55; 1965.Pl. 11.4*)

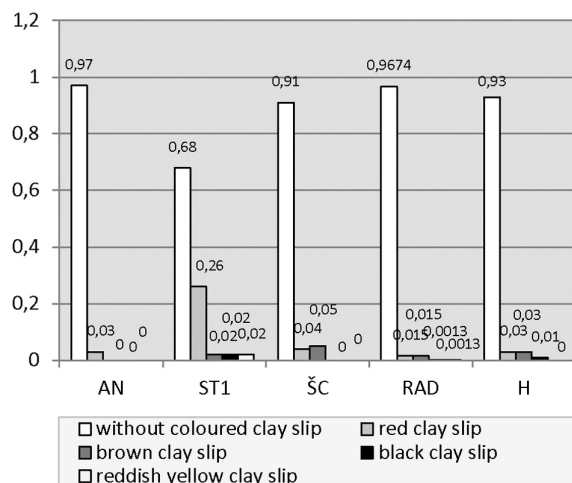


Fig. 29. Andrenči (AN), Stoperice – settlement phase 1 (ST1), Ptuj-Šolski center (ŠC), Zgornje Radvanje (RAD), Hoče-Orglarska delavnica and Stoperice – settlement phase 2 (ST2). Percentage of different coloured clay slips.

ture. Most comparisons are from Lasinja sites in the region, in south-eastern Slovenia and in the Gorenjska region in Northern Slovenia; Zbelovo (cf. Pl. 19. 189–190 with *Pahič V. 1983.Pl. 5.1*; cf. Pl. 7.119 and Pl. 12.119 with *Pahič V. 1983. Pl. 15.10–11*) and Brezje pri Zrečah (cf. Pl. 7.119 with *Pahič 1956. Pl. 1.2*), located at Dravinjske gorice. The Drava plain offers good comparisons at, for example, Hardek (cf. Pl. 12.189–19 with *Žižek 2006a.find no. 31*; Pl. 7.115 with *Žižek 2006a.find no. 20*; Pl. 7.114 with *Žižek 2006a.find no. 23*), part of the pottery from Ptujski grad (*Tomanič Jevremov et al. 2006b.178–182*) and some of the finds from Ormož-Škoršičev

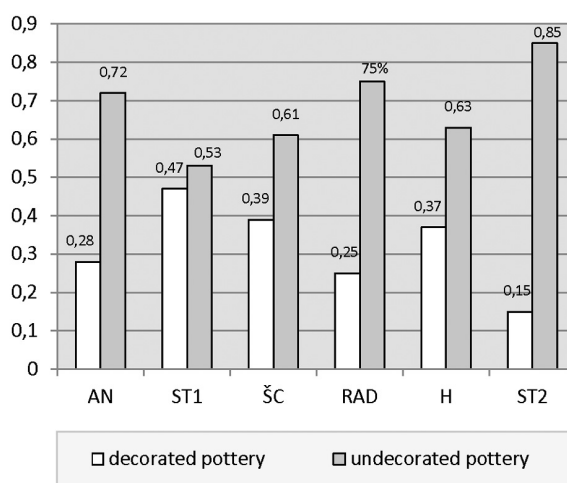


Fig. 30. Andrenči (AN), Stoperice – settlement phase 1 (ST1), Ptuj-Šolski center (ŠC), Zgornje Radvanje (RAD), Hoče-Orglarska delavnica and Stoperice – settlement phase 2 (ST2). Percentage of decorated/undecorated pottery.

vrt (cf. Pl. 12.189 with *Tomanič Jevremov et al. 2006a.find no. 21*). South-eastern and northern Slovenia offer well comparable pottery finds primarily from burials in Ajdovska jama (cf. Pl. 7.121 with *Horvat Mi. 1989.Pl. 6.435*; Pl. 11.179 with *Korošec Pa. 1975.Pl. 8.1*; Pl. 11.176 with *Horvat Ma. 1986. Pl. 3.2*; cf. *Kramberger 2010b.Pl. 3.17* with *Horvat Mi. 2009.Fig. 5.10*; cf. Pl. 7.119 with *Horvat Mi., Horvat Ma. 1987. Fig. 3*), finds from the 6th and 7th settlement phase of Moverna vas (*Budja 1995. Fig. 4*), pit PO 004 at Čatež-Sredno polje (cf. Pl. 7.121 with *Tiefengraber 2006b. find no. 5*), and partly finds from Spaha (*Velušček 2011.222–223*) and Dru-

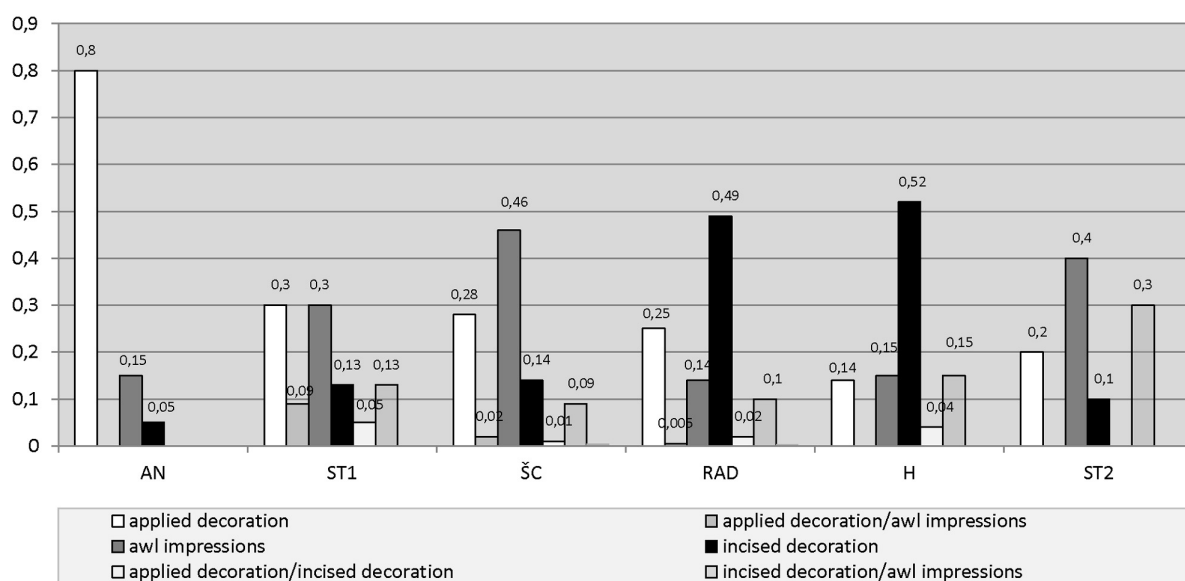


Fig. 31. Andrenči (AN), Stoperice – settlement phase 1 (ST1), Ptuj-Šolski center (ŠC), Zgornje Radvanje (RAD), Hoče-Orglarska delavnica and Stoperice – settlement phase 2 (ST2). Percentage of pottery decoration techniques.

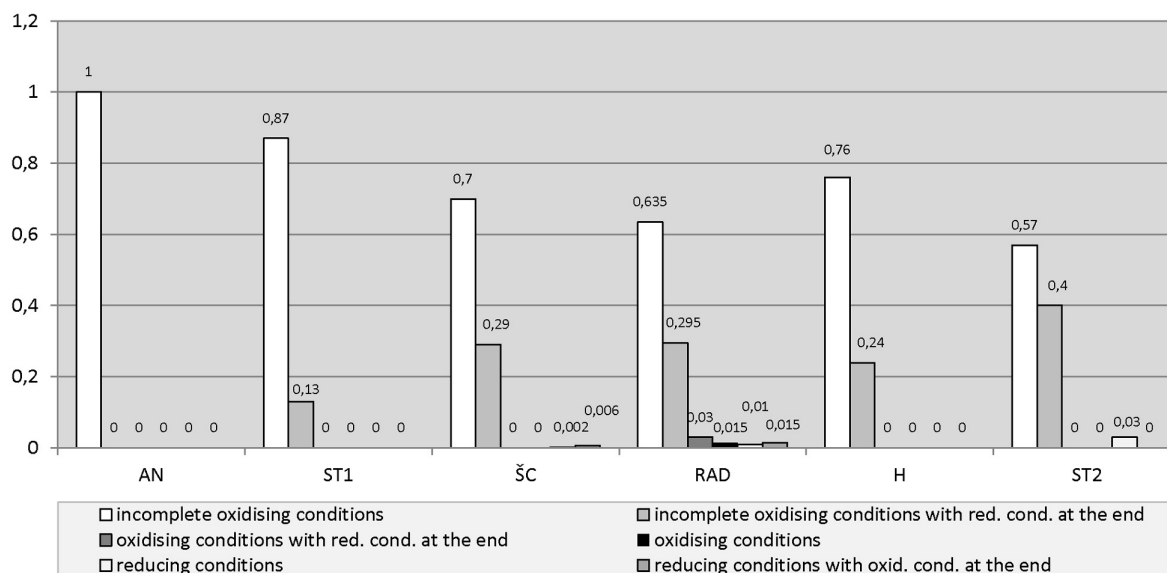


Fig. 32. Andrenci (AN), Stoperce – settlement phase 1 (ST1), Ptuj-Šolski center (ŠC), Zgornje Radvanje (RAD), Hoče-Orglarska delavnica and Stoperce – settlement phase 2 (ST2). Percentage of types of firing of pottery (firing conditions).

lovka near Kranj (Guštin et al. 2005.47–50; cf. also Pl. 7.119 with Guštin et al. 2005.find no. 32).⁴²

The best Austrian comparisons are from Raababerg near Graz (cf. Pl. 7.115 with Obereder 1989.Pl. 15. 155–156; cf. Pl. 9.143 with Obereder 1989.Pl. 18. 183–184, Pl. 20.201–204; cf. Pl. 9.145 with Obereder 1989.Pl. 18.188, Pl. 20.205; cf. Pl. 12.192 with Obereder 1989.Pl. 9.97 and 149), and also from Stillfried (cf. Pl. 7.113 with Hahnel 1991.Pl. 1.2) and Kanzel bei Graz (cf. Pl. 12.189–190 with Artner et al. 2012.Pl. 1.R30–R42, R69).

The other side of Slovenske gorice yielded comparable sites at Sodolek (cf. Pl. 7.114 with Kavur et al. 2006.find no. 5; Pl. 9.143 with Kavur et al. 2006. find no. 2) and Šafarsko (cf. Pl. 7.116 with Šavel 2006.find no. 27; cf. Pl. 12.189–190 with Šavel 1984.Pl. 4.1), which are located on the right bank of the Mura River. Slightly fewer comparisons can be found at sites from the Prekmurje region in eastern Slovenia and Hungary. In Prekmurje, for example, pottery comparisons can be found at Popava 1 near Lipovci (cf. Pl. 12.189–190 with Šavel, Karo 2012. find no. 481; Pl. 7.119 and Pl. 12.119 with Šavel, Karo 2012. finds nos. 49, 239–240, 507, 717, 729), Turnišče (cf. Pl. 12.189–190 with Tomaž 2012.finds nos. 7–8, 10, 14, 15, 22, 139; Pl. 12.192 with Tomaž 2012.find nos. 435, 485, 487–488), Bukovnica (cf.

Pl. 11.176 with Šavel 1994.Pl. 21.2; cf. Pl. 12.189 with Šavel 1994.Pl. 21.13), Kalinovnjek near Turnišče (cf. Pl. 12.189–190 with Kerman 2013a.find no. 408; Pl. 12.192 with Kerman 2013a.find no. 267) and Gorice near Turnišče (cf. Pl. 9.152 with Plestenjak 2010.find no. 15). It is also necessary to mention some of the Hungarian sites, particularly Szombathely metro (cf. Pl. 7.121 with Gábor 2004. Pl. 86), Dobri-Alsó-mesö (cf. Pl. 12.189–190 with Horváth, Katalin 2004.Fig. 25.3; Pl. 12.192 with

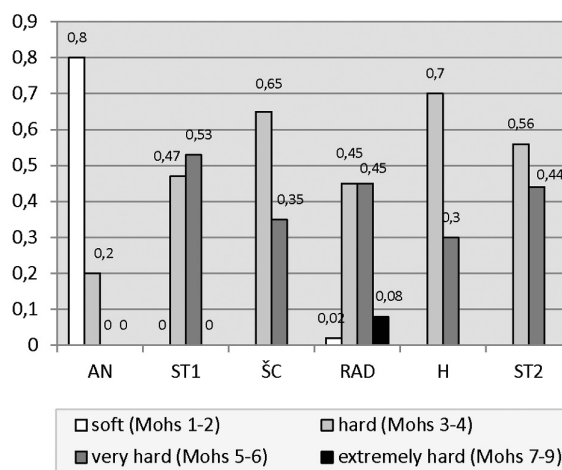


Fig. 33. Andrenci (AN), Stoperce – settlement phase 1 (ST1), Ptuj-Šolski center (ŠC), Zgornje Radvanje (RAD), Hoče-Orglarska delavnica and Stoperce – settlement phase 2 (ST2). Percentage of hardness groups of pottery.

⁴² The miniature bottle from Drulovka has been explained as a representative find of the Sava Group of the Lengyel Culture, but it is not clear on what basis. Resnikov prekop, Čatež-Sredno polje, Dragomelj and other comparable Slovenian sites have not yielded miniature bottles; they are present only at sites of the Lasinja Culture.

Horváth, Katalin 2004.Fig. 6.5), Sormás (cf. Pl. 12.189–190 with Straub 2006.Fig. 4.6; Pl. 12.192 with Straub 2006.Figs. 5.3, 8.2, 8.1, 3), Nagykanizsa (cf. Pl. 12.189–190 with Kalicz 1975. Pl. 9.4), Zalaszentbalázs-Pustatető (cf. Pl. 12.189–190 with Bánffy 1995a.Pl. 32.129), Gellénháza-Városrét (cf. Pl. 12.191 with Horváth, Katalin 2003. Figs. 22.7, 23.8; Pl. 9.143 with Horváth, Katalin 2003.Fig. 24.7; Pl. 12.192 with Horváth, Katalin 2003.Fig. 24.2), Úpérint-Kavicsbánya (cf. Pl. 7.116 with Károlyi 1992. Pl. 34.4), Mosonszentmiklós-Pálmajor (cf. Pl. 7.113 with Virág, Figler 2007.Fig. 8.1), Kaposvár (cf. Pl. 7.113 with Samogyi 2000.Fig. 13.3), Zalavár-Basasziget (cf. Pl. 12.189–190 with Virág 2003b.Fig. 3.5, Fig. 6.4; Pl. 12.192 with Virág 2003a.Fig. 4.1), Letenye-Szentkerszdomb (cf. Pl. 12.189–190 with Kalicz 1973. Fig. 19.6), Tornyszentmiklós (cf. Pl. 12.189–190 with Barna 2003.Fig. 6.10) and Nagykanizsa-Sanc (cf. Pl. 12.189–190 with Kalicz 1991. Fig. 8.1).

In Croatia, the best correlations come from Bukovje (cf. Pl. 7.119 with Homen 1985.Fig. 1), Beketinec (cf. Kramberger 2010.Pl. 3.17 with Homen 1990. Fig. 5.8; Pl. 7.118 with Homen 1990.Fig. 2.1; Pl. 7.119 with Homen 1985.Figs. 2–3), Cerje Tužno-Krč (cf. Pl. 7.119 with Marković 1994.Pl. 24.9) and Jakšić (cf. Pl. 12.189–190 with Marković 1985.Fig. 3).

The second half of the 41st and the first half of the 40th century BC

Pottery from the Early Eneolithic pits at Stoperce, which, based on an absolute date from the hearth in Structure III, can be dated to the period between the second half of the 41st and the first half of the 40th century BC, are typologically homogeneous. The finds that connect Early Neolithic pits at Stoperce, structures 7, 4, 5, 1, 22, 6, 10 (Phase 1) from Zgornje Radvanje, Hoče-Orglarska delavnica and Ptuj-Šolski center are dishes with a straight rim (Pl. 4.70) on high hollow feet that are convex on top (Pl. 4.71), and decorated with tongue-like appliqué, together with dishes and bowls similar to them. On the other hand, differences can be seen in jug and pot forms and decorative motifs.

The pots and jugs most frequently have an S-shaped profile. These jugs (Pl. 4.74, 77) and pots (Pl. 4.72) differ from one another only in dimensions and the number of handles. Another form of pot has a high concave body, an indistinct transition to the upper part and a long, slightly sloping neck (Pl. 4.75). A jug from the same site is similar in form, but

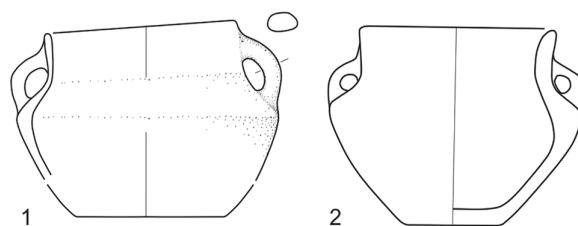


Fig. 34. Comparison to a pot with a low convex body. 1 Ptuj-Šolski center, Structure IV; 2 Salcuta (after Radu 2002.357 – CANA 2B).

has a distinct transition to the upper part (Pl. 4.76) (see also App. 2–3). As mentioned above, the decoration is noticeably different. The most common form consist of individual bunches of incisions that end with awl impressions (Pl. 4.73, 77). Another decoration that has to be mentioned consists of two lines of impressions on the shoulders of a closed vessel (Pl. 4.76) and the upper parts of the feet of footed dishes (Pl. 4.71). A foot of this type was also found in layer SE 1004 in Zgornje Radvanje (cf. Pl. 10.155), which may be linked to post-hole SE 1040 and its absolute date (see Fig. 25 and comments on dates from Zgornje Radvanje).

Again, comparable finds in terms of form and decoration can be found mainly at Lasinja Culture sites and related cultures in neighbouring countries. The best correlations are from Keutschacher See in Austria (cf. Pl. 4.71 and Pl. 10.155 with Samonig 2003. Pl. 40.435; Pl. 4.75 with Samonig 2003.Pl. 13.133; Pl. 4.74, 77 with Samonig 2003. Pl. 13.138 and Fig. 25: Type B2), Pri Muri near Lendava (cf. Pl. 4.72 with Šavel, Sankovič 2011. find nos. 92, 131–132) and Brezje near Turnišče (cf. Pl. 4.71 and Pl. 10.155 with Novšak et al. 2013.find no. 97), and finally in some of the finds from Hardek (cf. Pl. 4.75 with Tušek 1999.Pl. 2.8; Pl. 4.74, 77 with Žižek, 2006.find no. 22).

Chronologically concurrent sites and cultural groups

To summarise, the best comparisons with the pottery from Andrenici can be found in pottery from the later Lengyel Culture (phases Lengyel IIb and III) in western Hungary, Austrian Styria and Bukovnica and from later phases of the MOG Culture in Austria (phases IIa and IIb), while pottery from chronologically contemporary Structure I at Stoperce correlates with sites in central and south-eastern Slovenia. Pottery from slightly later structures at Ptuj-Šolski center is comparable to pottery from Rabenstein near Lawamünd and some sites in central and south-eastern

Slovenia, while pottery from Zgornje Radvanje, Hoče-Orglarska delavnica and settlement Phase 2 at Stoperce correlates with Lasinja Culture sites.

^{14}C dates from Structure B in Andrenči and Structure I at Stoperce are comparable with dates from the Late Lengyel site at Zalaszentbalázs-Szólóhegyi mező in western Hungary, from Dragomelj, settlement Phase 3 of Moverna vas and some of the dates from Resnikov Prekop (see also *Mlekuž et al. 2013. Pl. 1*) and Čatež-Sredno polje. This indicates that these sites were partly contemporary. The unpaint-

ed phase of the Lengyel Culture (Lengyel Phase III) was, by definition, concurrent with the 'Phase of unpainted pottery' MOG IIB in Austria, while Phase MOG IIa, which is characterised by multiple colour painting, was probably earlier (*Bánffy 1997.61*). However, scholars note that this does not correlate with the AMS ^{14}C dating (*Velušček 2011.236*). This was furthermore confirmed with dates from Andrenči and Structure I at Stoperce, which are earlier than dates from MOG IIB and comparable to MOG IIa (Michelstetten, Oberbergern, Antonshöhe in Reichersdorf) (Fig. 35).

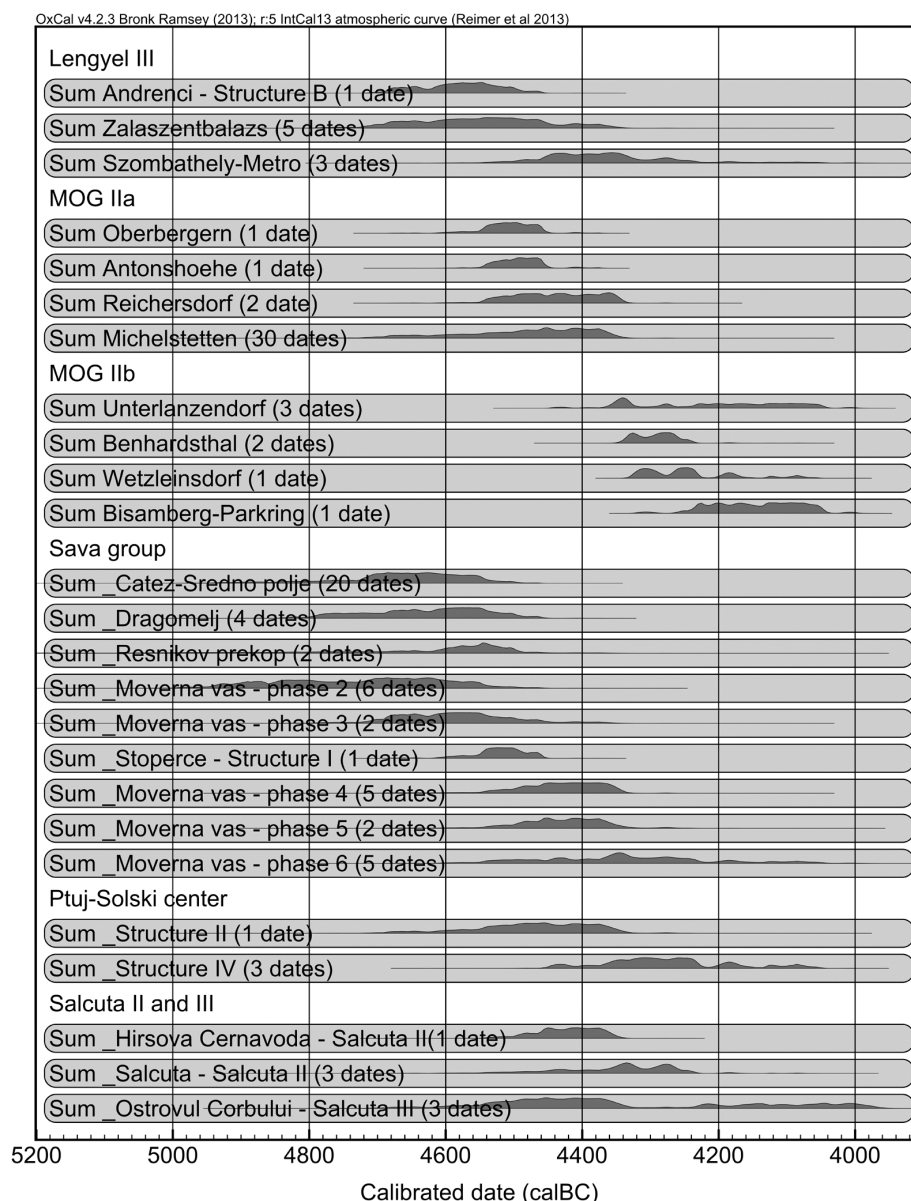


Fig. 35. Sum probability of dates from the sites of Lengyel Phase III (according to Hertelendi 1995.105 and Gábor 2004.Fig. 26), phases MOG IIa and IIB (according to Stadler, Ruttkay 2007.Pl. 1–4), the Sava Group and comparable sites in central and south-eastern Slovenia (according to Guštin 2005.Fig. 2; Turk 2010.43; Turk, Svetličič 2005.69; Budja 1994.Fig. 5; Čufar, Korenčič 2006.Pl. 2; Sraka 2012.375), earlier phases of the Salcuta Culture (after Lazarovici, Lazarovici 2013.Fig. 5 and Rădoescu 2009.42) and dates from Ptuj-Šolski center.

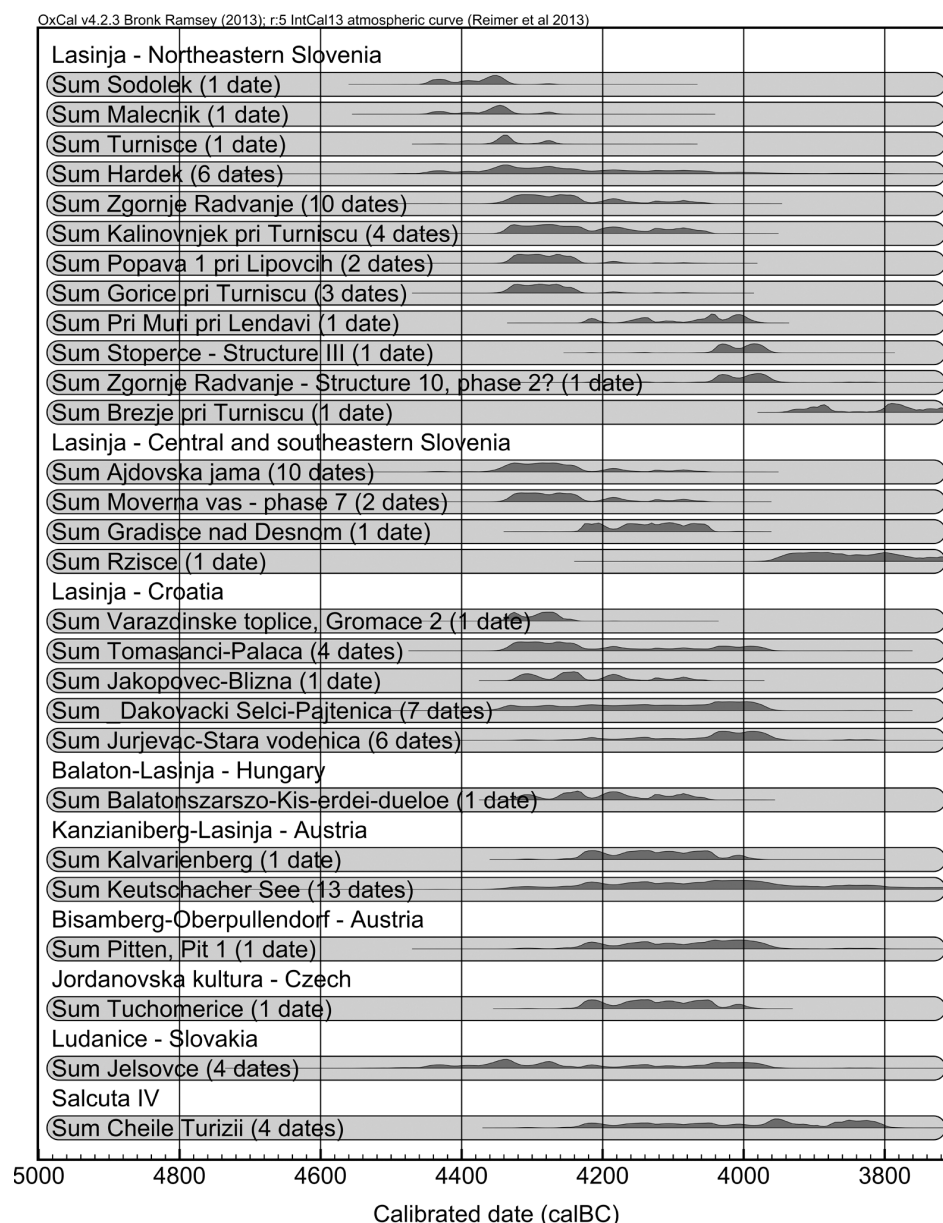


Fig. 36. Sum probability of dates from the Lasinja Culture sites in north-eastern Slovenia (according to Guštin 2005.Fig. 3; Tomaž 2012.Fig. 59; Žižek 2006.Figs. 2 and 3; Kerman 2013.Fig. 46; Šavel, Karo 2012.Figs. 48 and 49; Plestenjak 2010.Figs. 86, 93-94; Šavel, Sanković 2011.Fig. 52; Meiert Grootes, Josée Nadeau 2013.126), in central and south-eastern Slovenia (Bonsall et al. 2007.Tab. 1; Mason, Andrič 2009.Tab. 1; Sraka 2013.375) and in Croatia (Bekić 2006.95; 2006a.27; Balen 2008.Fig. 3); a single date of the Balaton-Lasinja Group in Hungary (Oross et al. 2010.Fig. 12); dates of the Kanzianiberg-Lasinja Group (Fuchs 2002.117; Cichočki 2003.Tab. 1), Bisamberg-Oberpullendorf Group in Austria (Stadler, Ruttkay 2007.Tab. 4); date of the Jordanovska Culture in the Czech Republic (Sankrot, Zápotocký 2011.114); dates of the Ludanice Group in Slovakia (Görsdorf 1995.205-206) and sum probability of dates from Salcuta Phase IV (according to Lazarovici, Lazarovici 2013.Fig. 5).

Structure II at Ptuj-Šolski center yielded a date that overlaps with the later MOG IIa, with earlier MOG IIb, with dates of the Late Lengyel Culture site at Szombathely metro in Hungary and dates of settlement phases 4 and 5 at Moverna vas (south-eastern Slovenia), which can probably be attributed to the Sava Group (Velušček 2011.226-227). Dates from phases II and III of the Salcuta Culture, where, for

example, a comparison of a pot with a rounded lower part was found, are also comparable (Fig. 35).

According to the results of the ^{14}C AMS analyses, structure II at Ptuj-Šolski center is earlier than structures 7, 4, 5, 1, 22, 6 and 10 (Phase 1) at Zgornje Radvanje, and perhaps also Structure IV at Ptuj-Šolski center, although typologically well comparable

pottery has been discovered in both structures. These structures are earlier than Structure III at Stoperce, part of the site at Radvanje-Habakuk 2 (Arh 2012) and the date from the post-hole SE 1040 at Zgornje Radvanje. Dates from the mentioned structures at Zgornje Radvanje, as well as from Structure IV at Ptuj-Šolski center, are consistent with the earlier dates of the Lasinja Culture and its related cultures in neighbouring countries, while the dates from Structure III at Stoperce (SE 150), part of the site at Radvanje-Habakuk 2 and from post-hole SE 1040 in Zgornje Radvanje, correlate with later dates of the Lasinja Culture and its related cultures. It is important to note that sites with comparable pottery material have been shown to be chronologically concurrent (Keutschacher See, Pri Muri near Lendava and Brezje near Turnišče) (Fig. 36).

Conclusion

Comparative analyses of pottery found at the studied settlements and beyond, as well as comparisons of radiocarbon dates show that, based on the presented settlements of the 5th millennium BC in north-eastern Slovenia, it is possible to identify three cultural groups, *i.e.* the Sava, the (Late) Lengyel and the Lasinja Culture. According to the current chronology of the 'the central and southern Slovenian Neolithic and Early Eneolithic' and ¹⁴C dates known so far, these settlements date to between the Younger/Late Neolithic and the Early Eneolithic (Velušček 2011.225–23).

Andrenci in western Slovenske gorice represents the extreme south-western site of the Lengyel Culture, while the more or less concurrent Structure I from Stoperce at Haloze belongs to the Sava Group. They are dated to between the end of the 47th century and the first half of the 45th century BC, which is consistent with the earlier dates of the Late Lengyel Culture in western Hungary (Zalaszentbalázs-Szóló-hegyi mező) and dates of MOG IIa in Austria.

The settlement at Ptuj-Šolski center dates to between the end of the 46th and 43rd century BC.⁴³ The comparative analyses of the pottery are not completely consistent with the relative chronological incorporation of Ptuj-Šolski center into the wider Lengyel Culture (Guštin 2005.13, Fig. 1) or Late Lengyel Culture (Kavur 2010.71). The pottery found in structures (I, II and IV) shows elements of the Sava Group in central and south-eastern Slovenia, as well as elements

already attributed to the Early Eneolithic Lasinja Culture. Comparable pottery assemblages are deemed to have been produced in the early phase (Phase I) of the Lasinja Culture in Austria (Tiefengraber 2004.219).

These phases were followed by the 'Classical' Lasinja Culture. The studied sites passed through two phases: structures 7, 5, 1, 22, 6 and 10 (Phase 1) at Zgornje Radvanje, part of the settlement at Radvanje-Habakuk 2 (Arh 2012.Fig. 10) and the settlement at Hoče-Orglarska delavnica represent the older phase, namely the end of the 44th and 43rd century BC (68.2% probability), with dates corresponding to earlier (!) dates of the Lasinjska Culture and related cultures in neighbouring areas. Structure IV at Ptuj-Šolski center was more or less contemporaneous, although pottery from this structure is well comparable with material from Structure II on the same site, while its decoration and forms differ slightly from the material found at Zgornje Radvanje and Hoče-Orglarska delavnica. Differences in decorative techniques, motifs and forms could therefore be regional or chronological, but the latter can be confirmed or disproved only with new ¹⁴C dates and new pottery assemblages.

The Late Lasinja Culture is presented by pits from the second settlement phase at Stoperce, individual pits in part of the site Radvanje-Habakuk 2 and, according to the ¹⁴C date, post-hole SE 1040 at Zgornje Radvanje. This settlement dates to the end of the 5th and the beginning of the 4th millennium BC, where the dates correlate with the later (!) dates of the Lasinja Culture and related cultures in neighbouring countries.

Translation: dr. Nives Kokeza

⁴³ One of the two dates from Structure II was, as already stated, not included in further analyses, as five different samples were mixed in one sample prior to dating.

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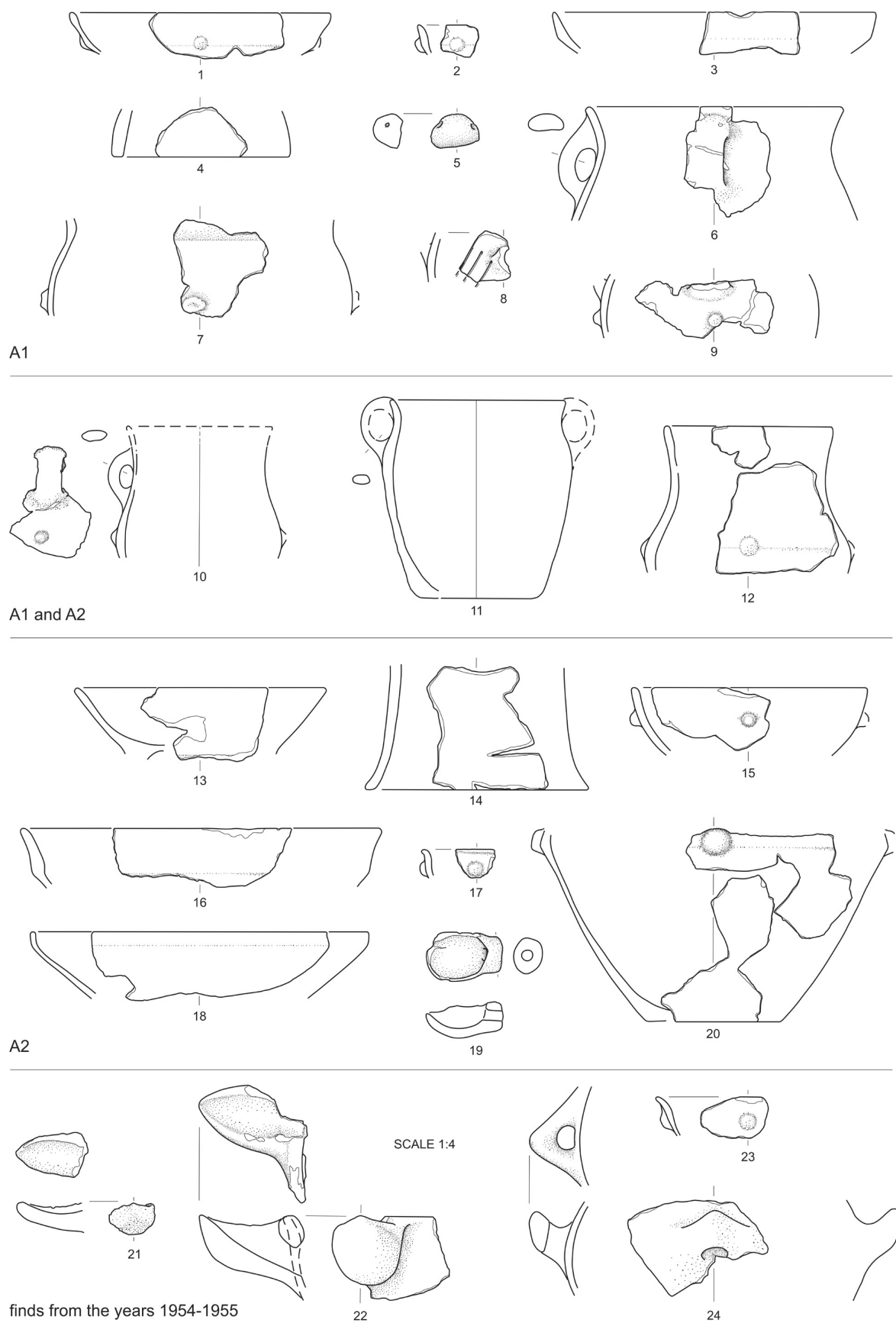
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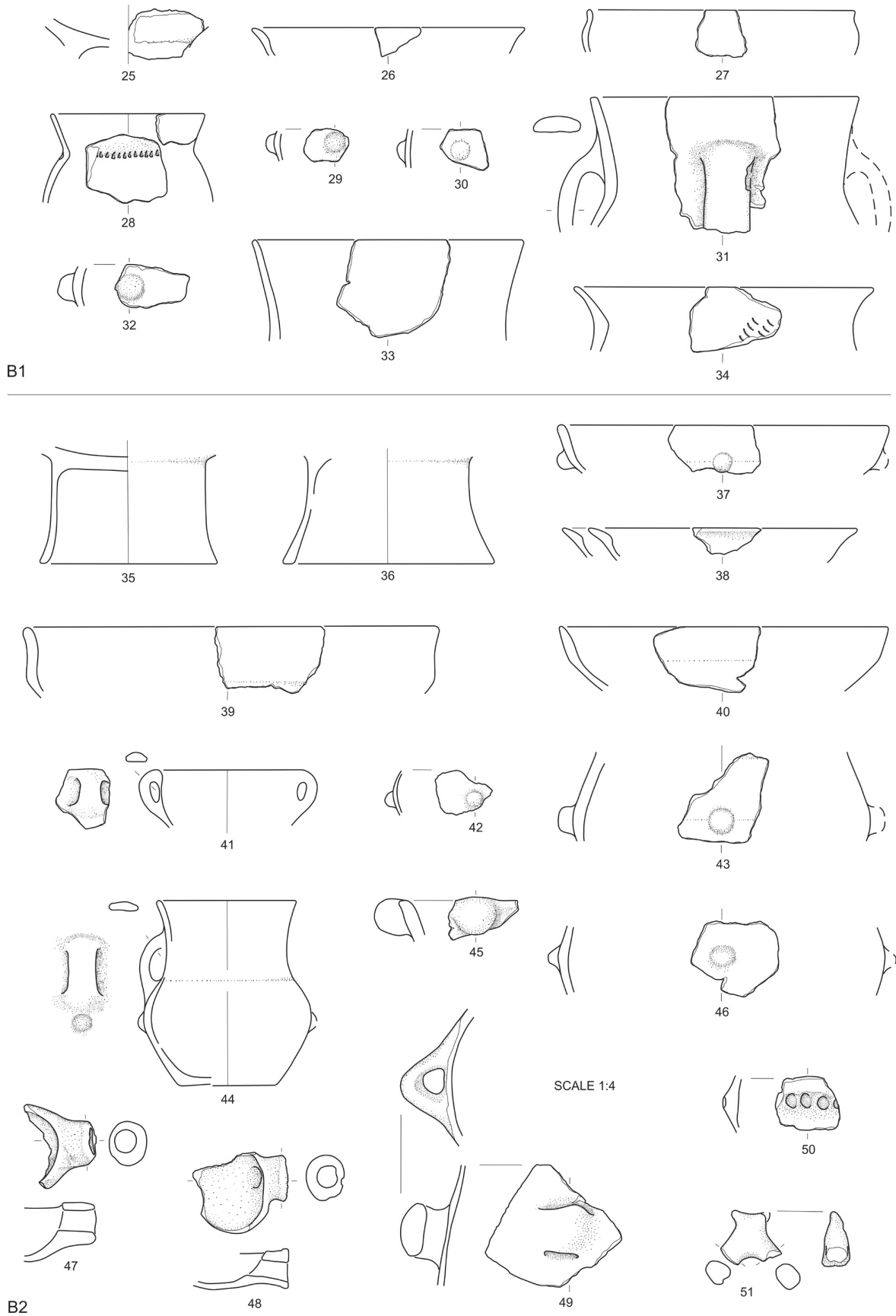
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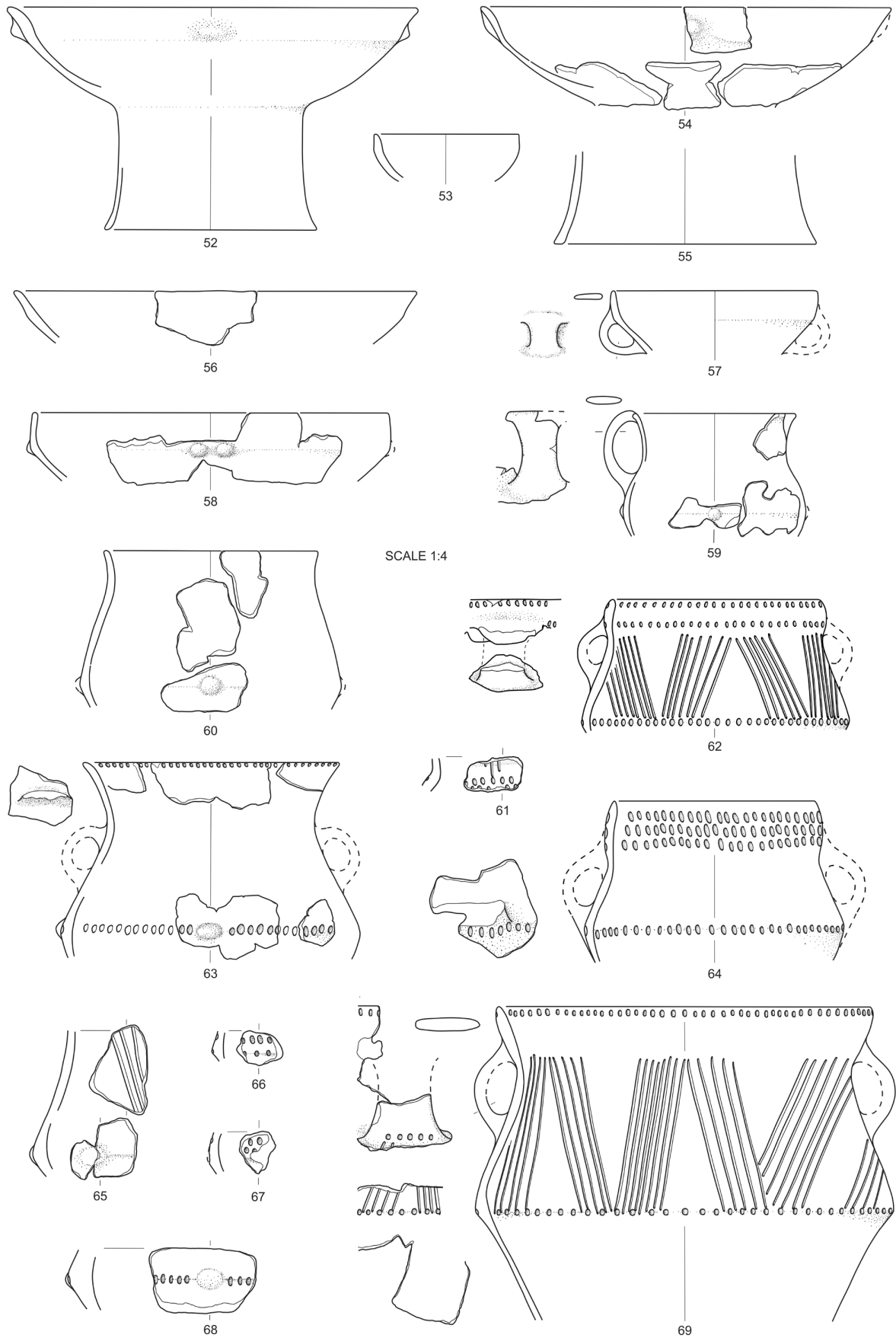
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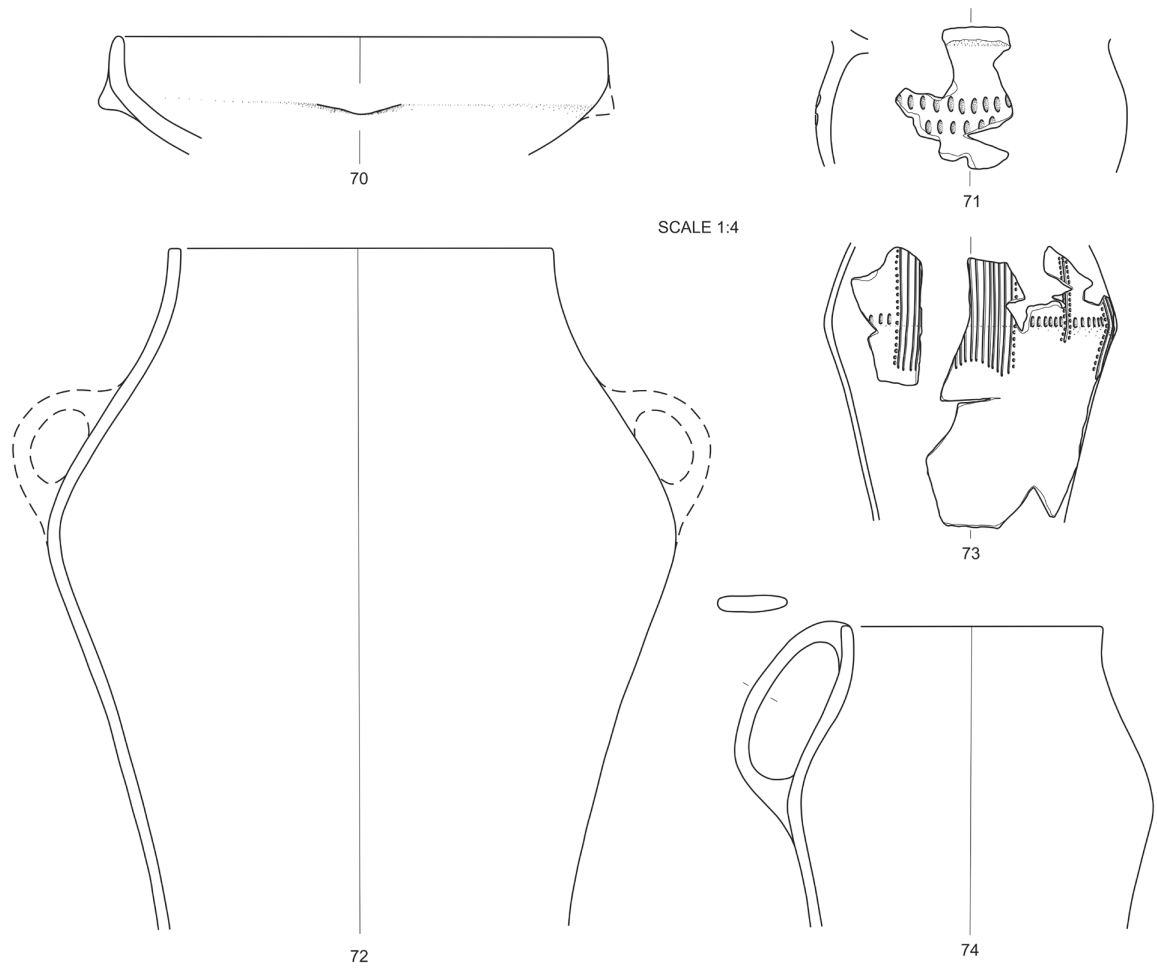
Pl. 1. Andrenči. Structure A – layer A1, layer A2 and finds from 1954–1955. Pottery.



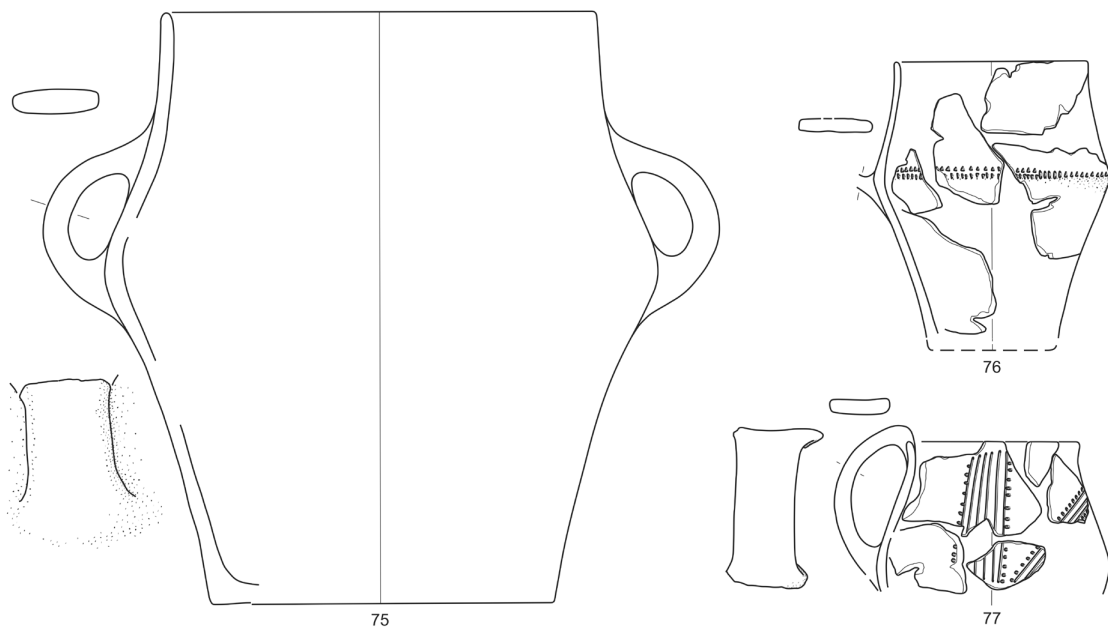
Pl. 2. Andrenici. Structure B - layer B1 and layer B2. Pottery.



Pl. 3. Stoperce. Structure I - layer SE 128. Pottery.

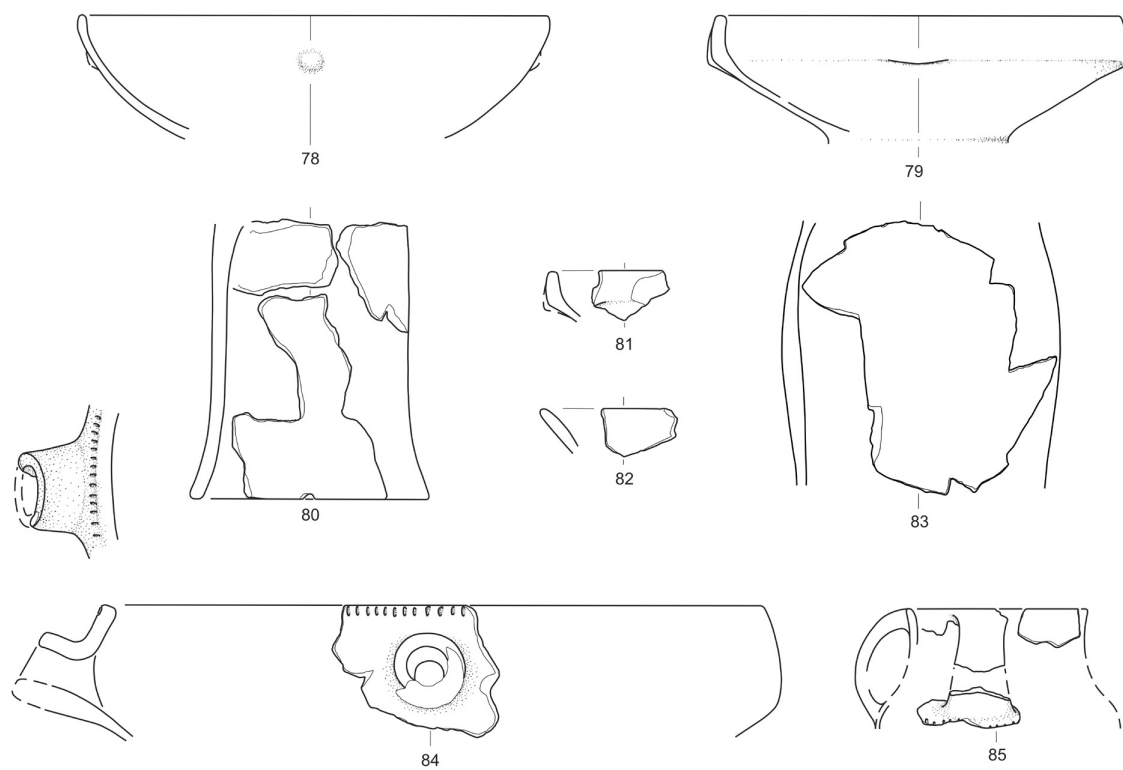


Structure III - SE 150

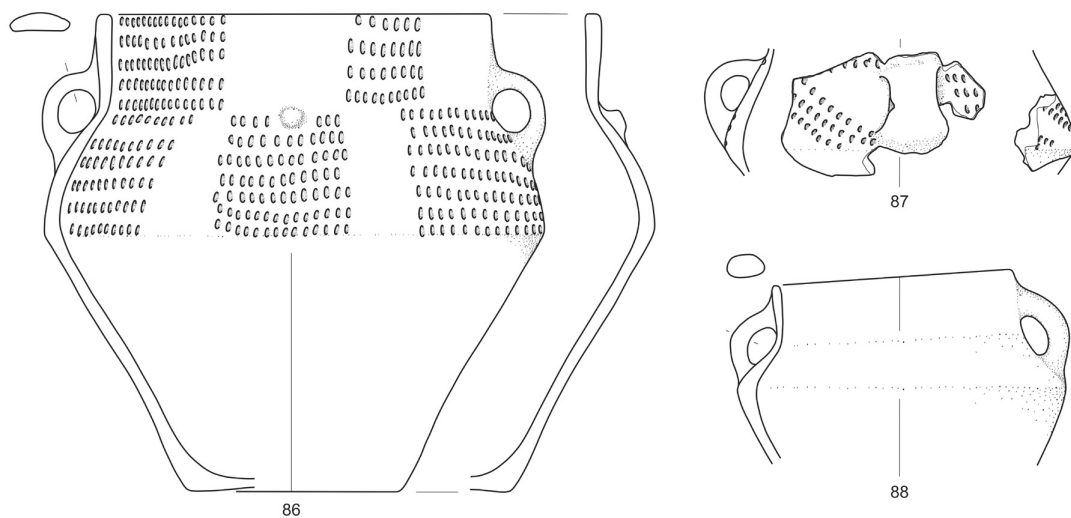


SE 52

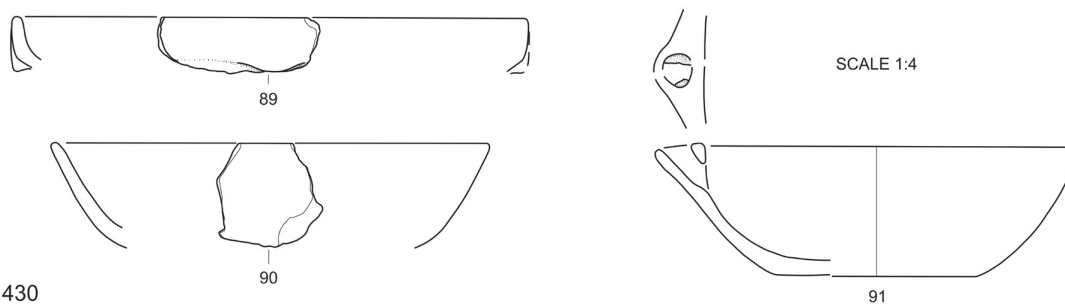
Pl. 4. Stoperce. Structure III – layer SE 150. Pit SE 52. Pottery.



SE 410

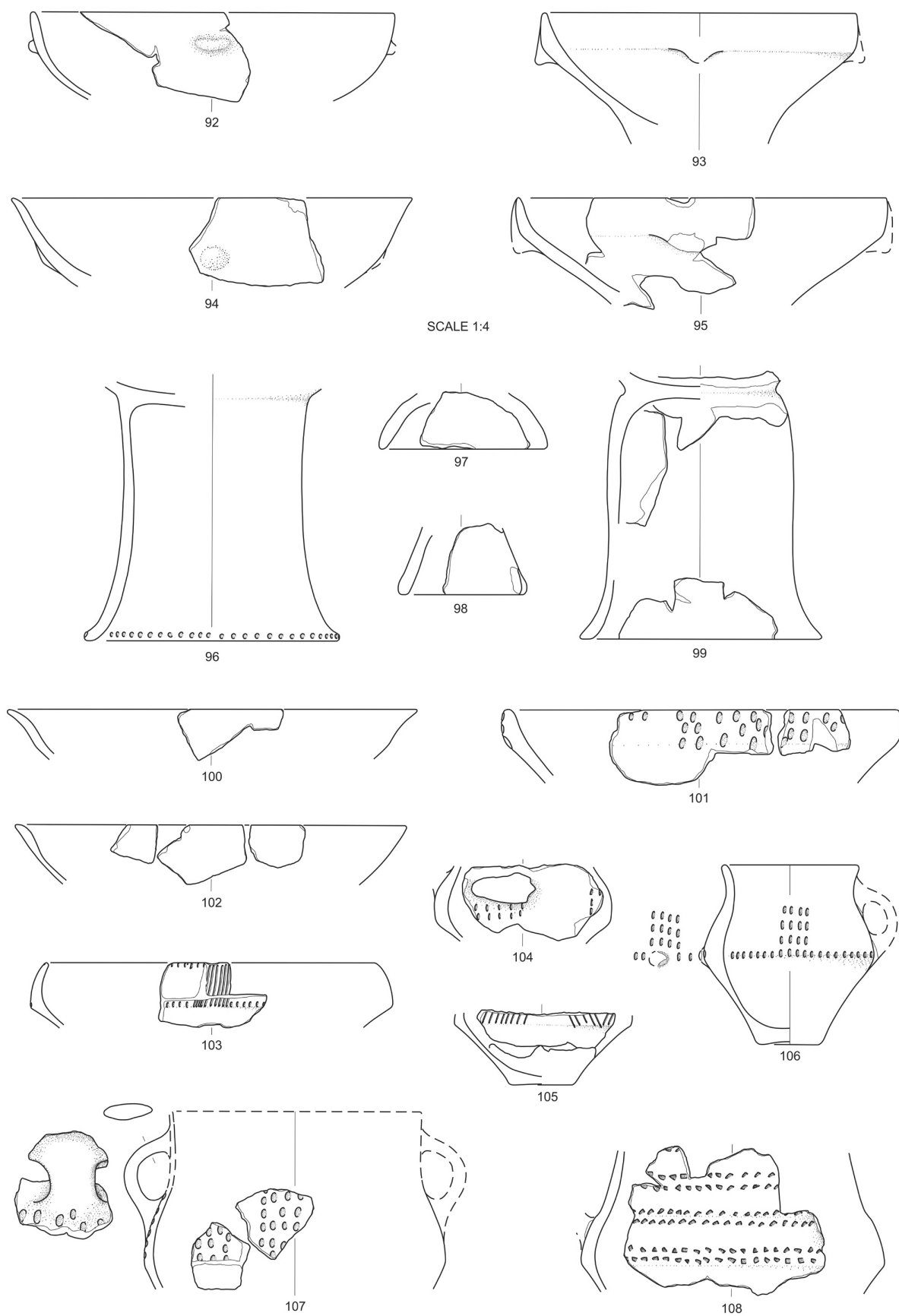


SE 410, SE 430 and SE 435

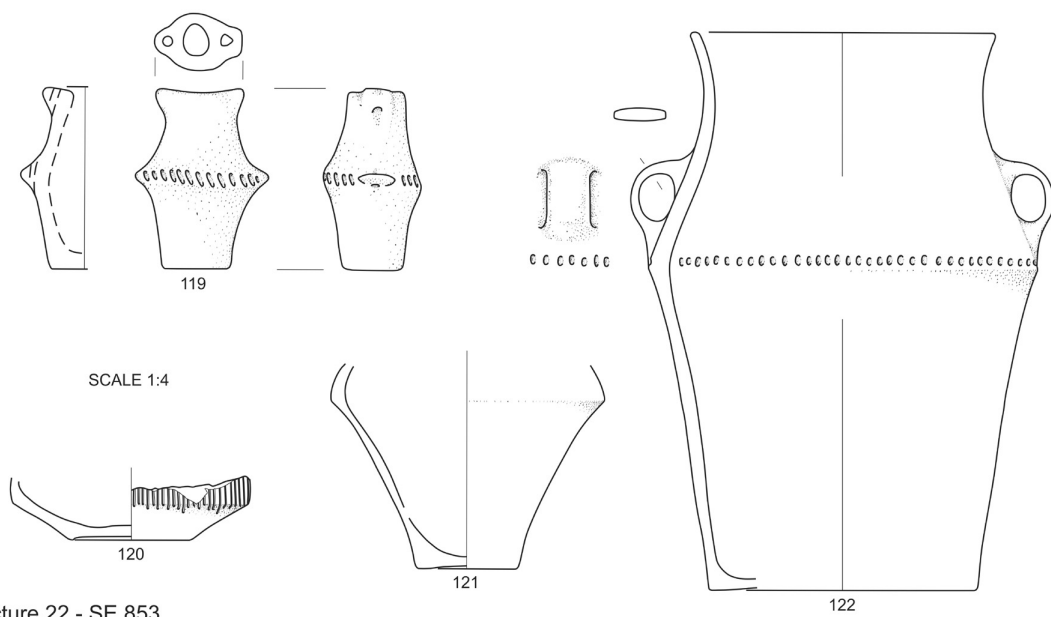
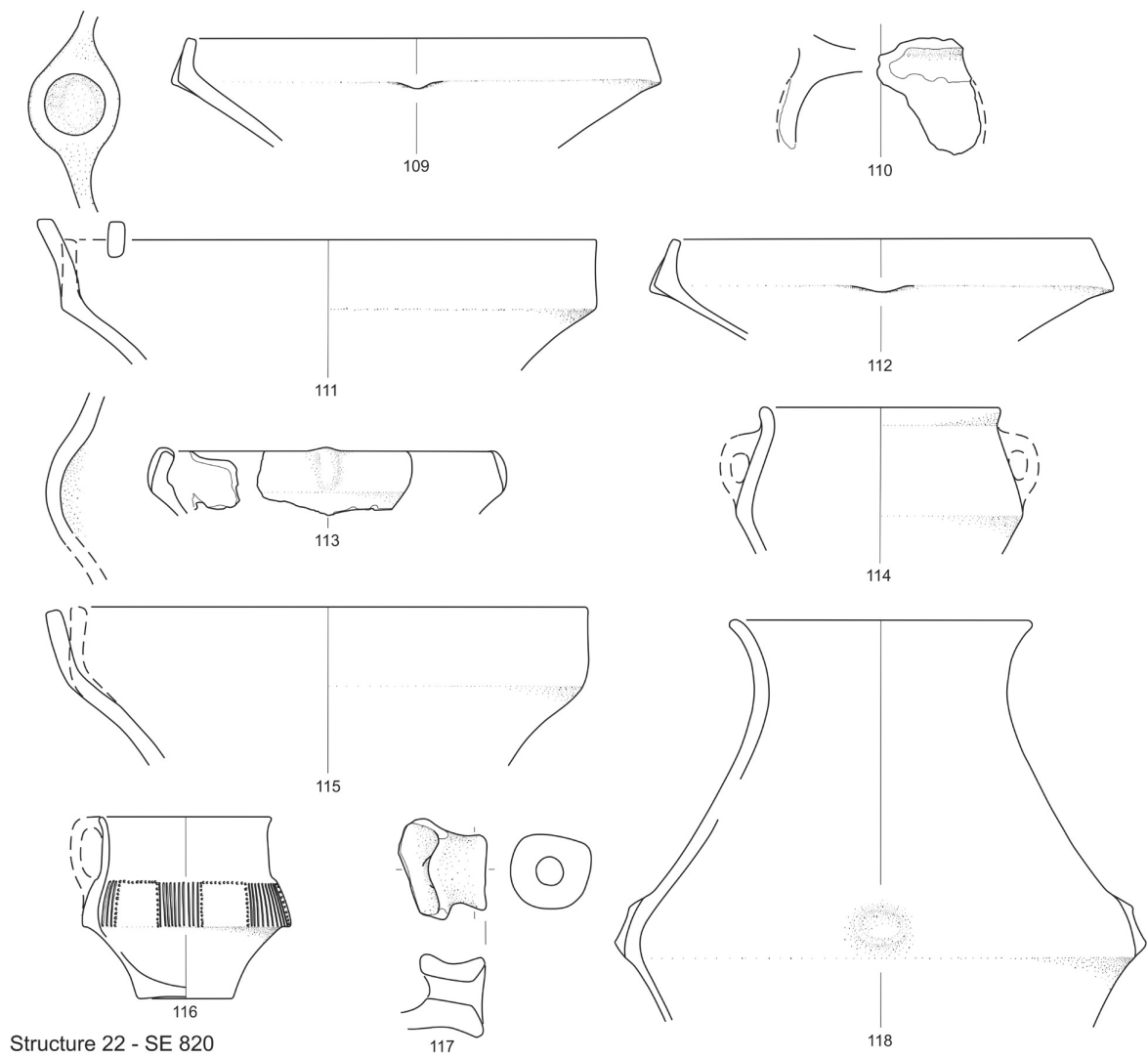


SE 430

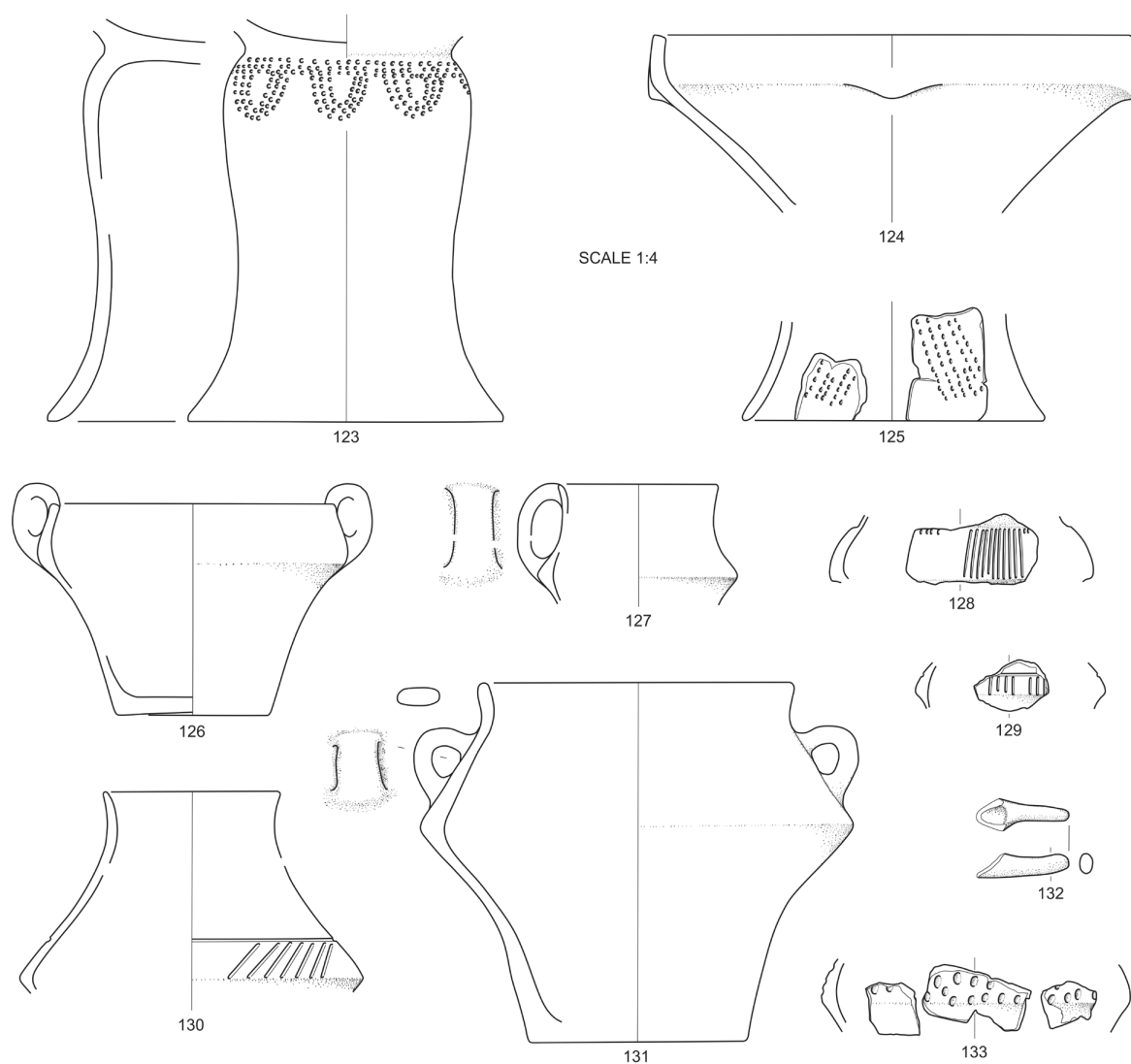
Pl. 5. Ptuj-Šolski center. Structure IV – layers SE 410, 430 and 435. Pottery.



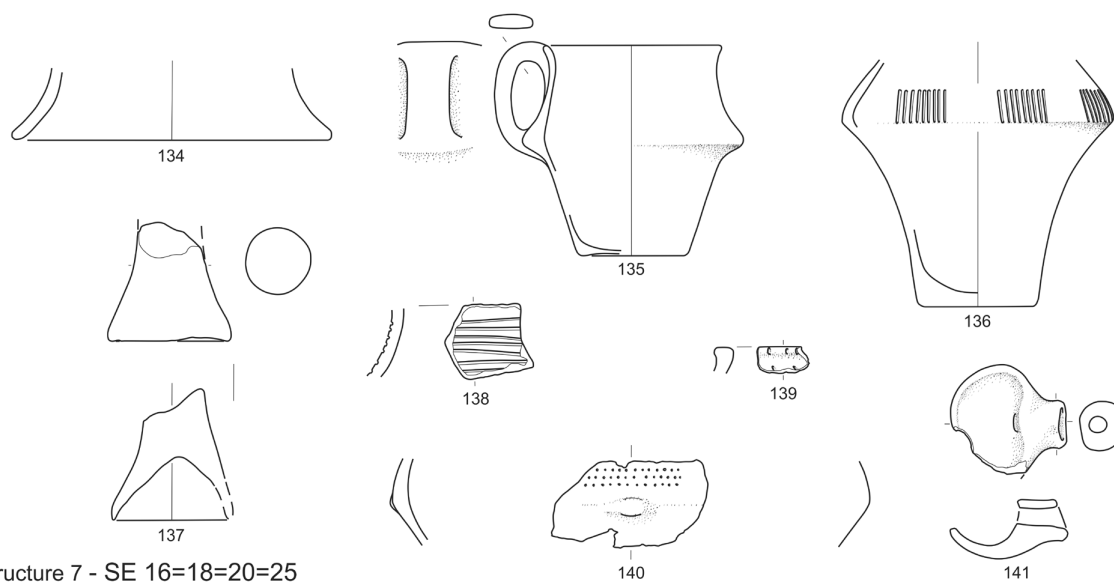
Pl. 6. Ptuj-Šolski center. Structure II – gray-yellowish brown layer. Pottery.



Pl. 7. Zgornje Radvanje. Structure 22 – SE 820 and SE 853. Pottery.

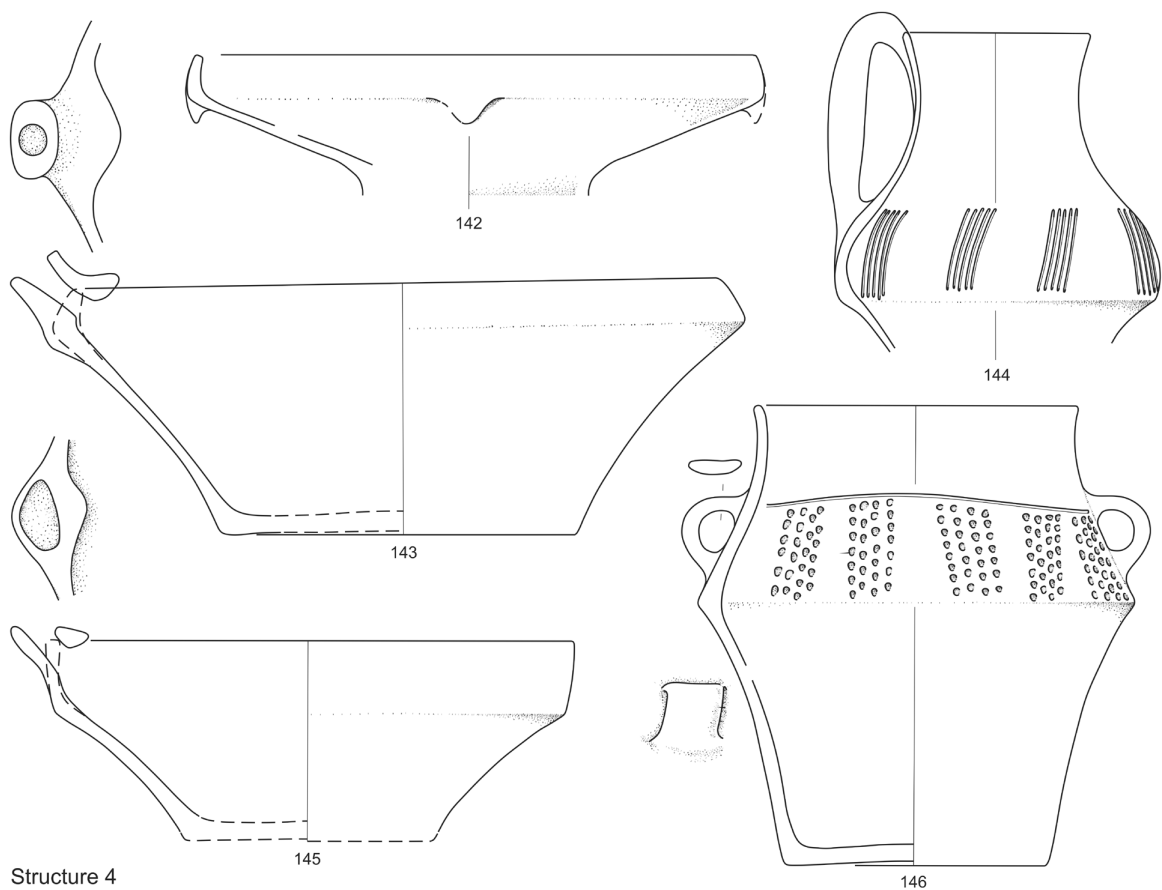


Structure 6 - SE 250=252=226

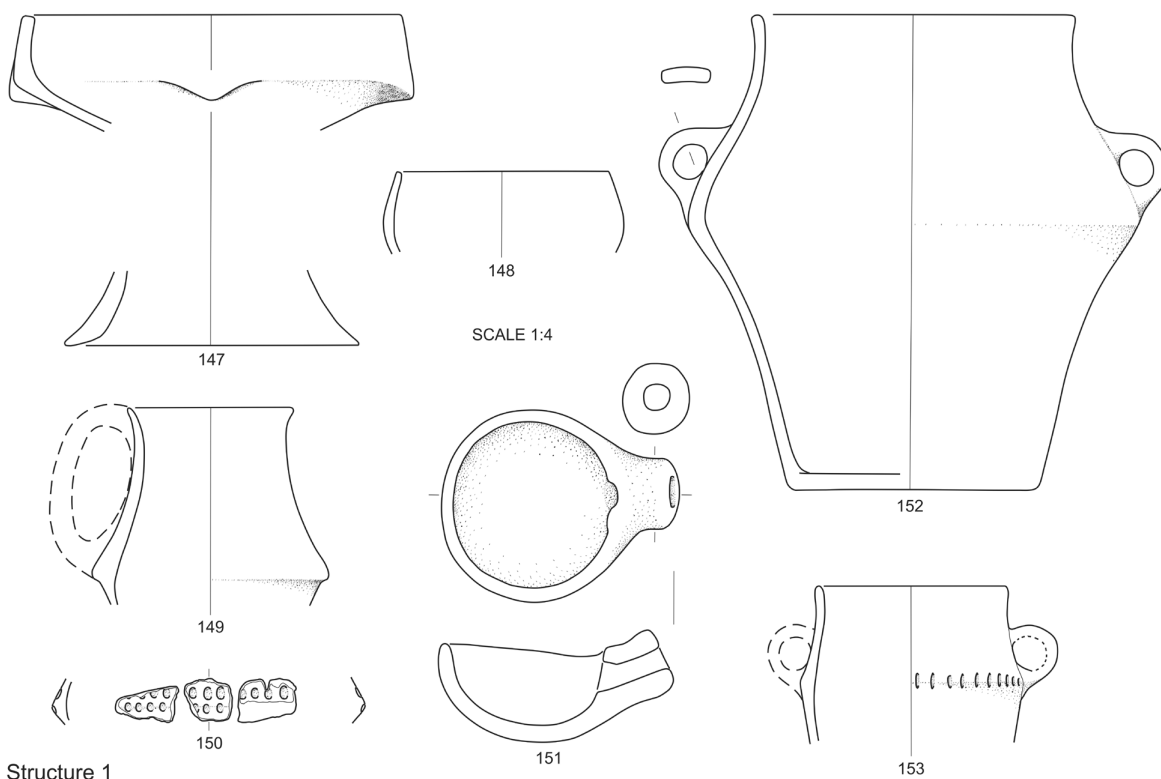


Structure 7 - SE 16=18=20=25

Pl. 8. Zgornje Radvanje. Structures 6 (SE 250 = 252 = 226) and 7 (SE 16 = 18 = 20 = 25). Pottery.

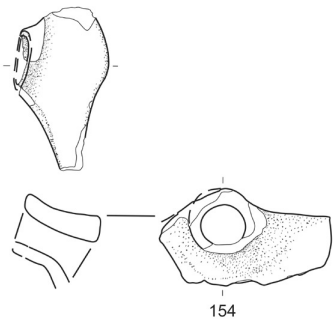


Structure 4

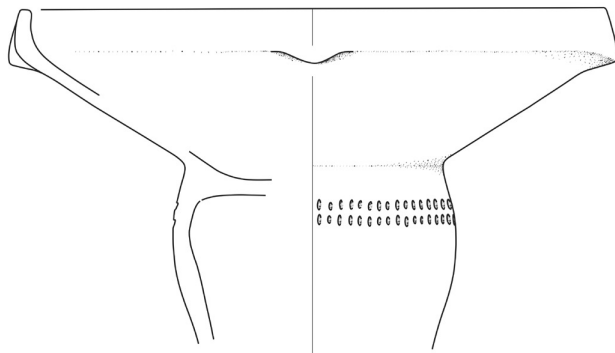


Structure 1

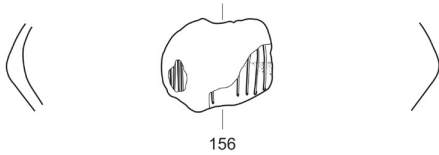
Pl. 9. Zgornje Radvanje. Structure 4 – SE 1128 (142–143, 145–146), SE 1102 (144). Structure 1 – SE 623 (147, 153), SE 625 (148), SE 599 (149–152). Pottery.



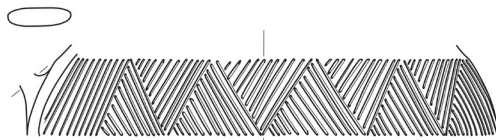
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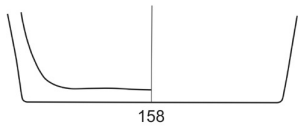


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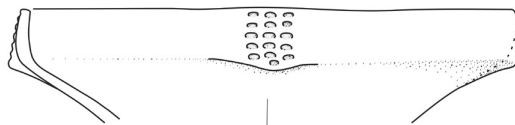


157

SE 1004



158



159

SE 1040

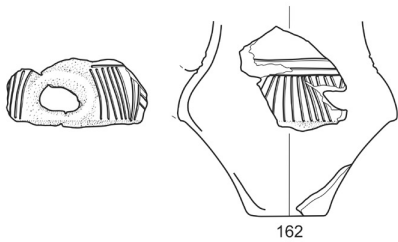


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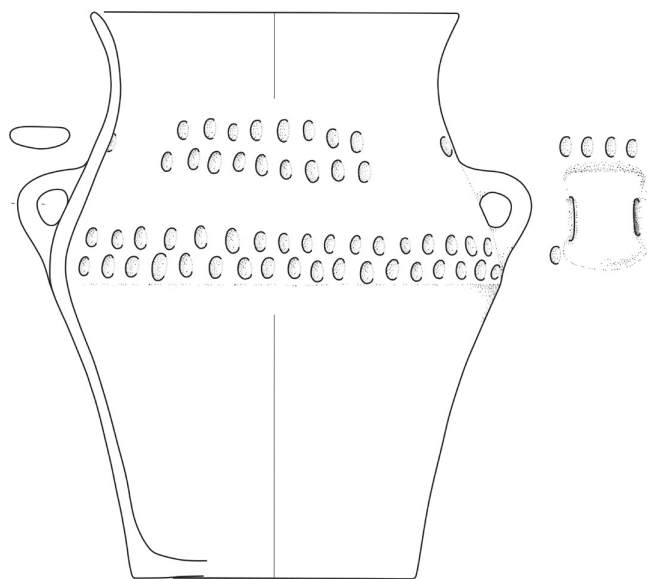
SCALE 1:4



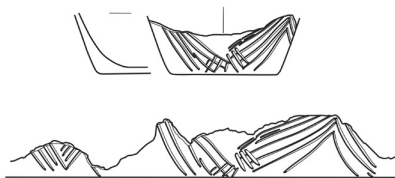
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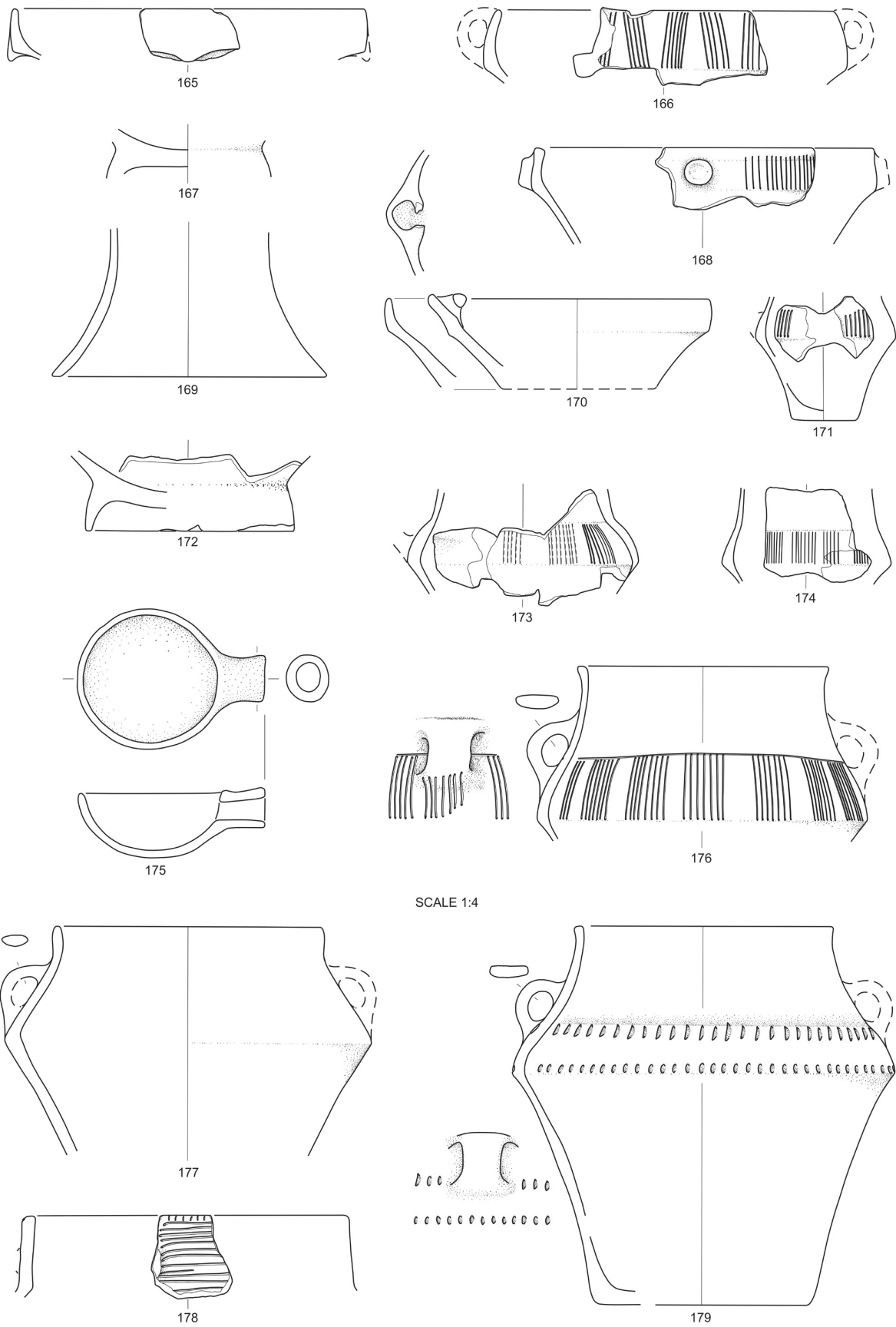
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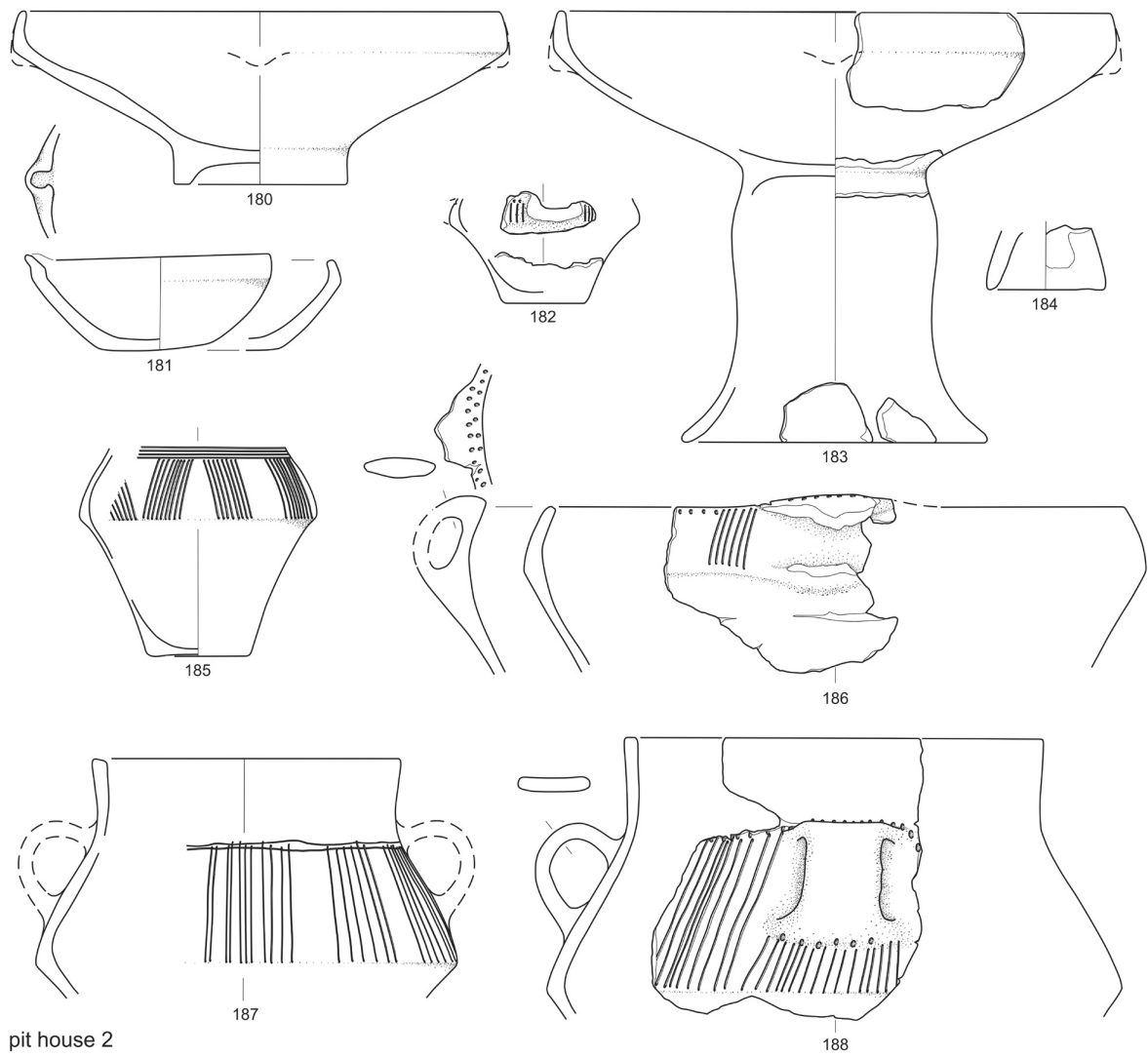
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SE 1027

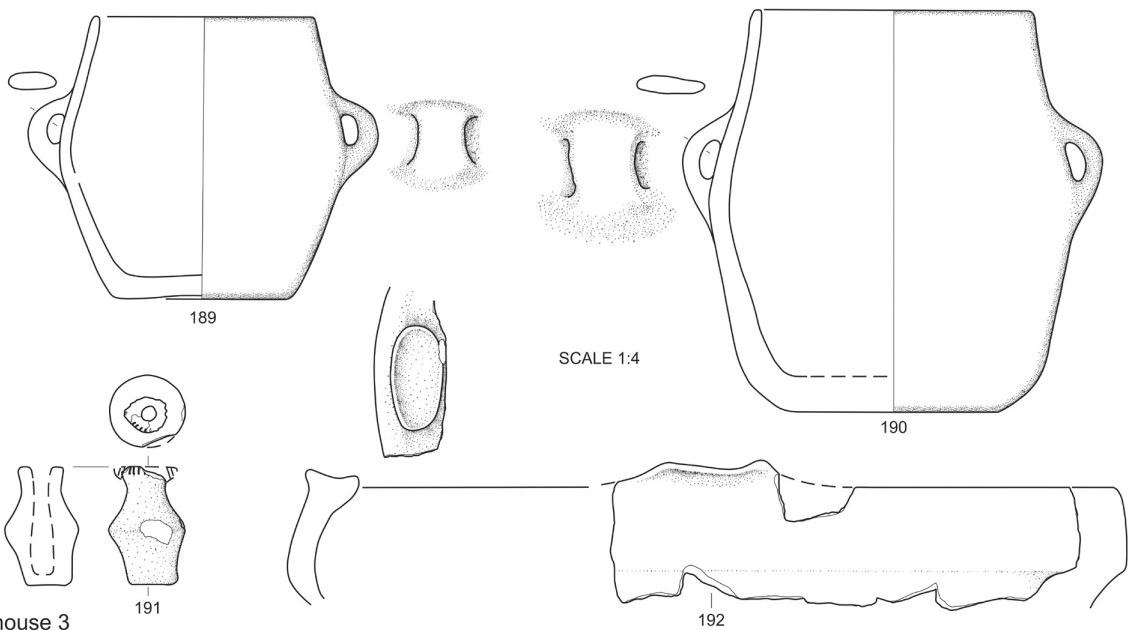
Pl. 10. Zgornje Radvanje. Structure 10 – SE 1004 (154–157), SE 1040 (158–159) and SE 1027 (160–164). Pottery.



Pl. 11. Hoče-Orglarska delavnica. Pit-house I. Pottery.



pit house 2



pit house 3

Pl. 12. Hoče-Orglarska delavnica. Pit-houses II and III. Pottery.

Appendix

Fabric	Macroscopic description	Granularity	Quantities of different fabrics					
			AN	ST1	ŠC	RAD	H	ST2
LMo1	A13;C21;E31;E21	1	1	/	/	/	/	/
LMo2	A13;C23;E31;E21	1	1	3	133	628	54	23
LMo3	A13;C23;E31;E23	1	/	/	5	29	4	2
LMo4	A21;A13;C21;E31;E21	1	31	/	/	/	/	/
LMo5	A21;A13;C23;E31;E21	1	/	2	/	39	5	6
LMo6	A21;A13;C31;C23;E31;E22	1	/	/	/	13	3	/
LMo7	A21;A13;C32;C23;E31	1	/	1	/	24	54	2
LMo8	A21;A13;C31;C22;E41;E31;E22	1	/	/	/	1	/	/
LMo9	A31;A21;A13;C21;E31;E21	1	88	/	/	/	/	/
LM10	A31;A21;A13;C31;C22;E31;E21	1	/	12	112	177	20	22
LM11	A31;A21;A13;C31;C22;E31;J31	1	/	/	/	23	1	/
LM12	A31;A21;A13;C31;C22;E32;E22;J31	1	/	/	/	40	/	/
LM13	A31;A21;A13;C31;C22;E41;E32;E23	1	/	/	/	5	/	/
LM14	A31;A21;A13;C32;C23;E31	1	/	/	/	6	16	/
LM15	A41;A31;A13;C31;C22;E31;E21	1	/	1	/	6	2	7
LM16	A41;A31;A13;C21;E31;E21	1	1	/	/	/	/	/
LM17	A51;A31;A13;C31;C22;E31	2	/	/	/	1	/	/
LM18	A31;A21;B13;A13;C21;E31	2	/	/	/	/	/	1
LM19	A22;A13;C31;C22;E31;E21	2	/	7	132	55	6	/
LM20	A22;A13;C31;C22;D31;E31;E21	2	/	/	/	1	/	/
LM21	A22;A13;C31;C22;E31;E22	2	/	/	58	/	/	/
LM22	A22;A13;C31;C22;E32;E22	2	/	/	/	4	/	/
LM23	A31;A22;A13;C21;D33;E31	2	7	/	/	/	/	/
LM24	A31;A22;A13;C21;E32;E22	2	1	/	/	/	/	/
LM25	A31;A22;A13;C22;E31	2	10	/	/	/	/	/
LM26	A31;A22;A13;C31;C22;E31	2	/	/	43	50	7	5
LM27	A31;A22;A13;C31;C22;E31;E21;J31	2	/	/	/	36	/	/
LM28	A31;A22;A13;C31;C22;E31;E22;J31;J23	2	/	/	/	6	/	/
LM29	A31;A22;A13;C31;C22;E32;E22	2	/	11	/	/	/	1
LM30	A31;A22;A13;C31;C22;E32;E22;J31	2	/	5	/	29	/	/
LM31	A31;A22;A13;C32;C23;E31	2	/	1	/	71	19	1
LM32	A31;A22;A13;C32;C23;E31;J31	2	/	/	/	6	/	/
LM33	A23;A13;C22;E41;E31;E22	2	/	/	/	2	/	/
LM34	A23;A13;C31;C22;E31;E21	2	/	1	/	17	8	/
LM35	A23;A13;C32;C23;E31;E21	2	/	1	/	4	5	/
LM36	A23;A13;C31;C22;E32;E21	2	/	/	48	/	/	/
LM37	A23;A13;C31;C22;E32;E23;J21	2	/	/	/	3	/	/
LM38	A23;A13;C32;C23;E31;E21	2	/	/	/	12	1	/
LM39	A31;A23;A13;C22;E31;E22;J21	2	/	/	/	19	/	1
LM40	A31;A23;A13;C22;E41;E31;E21;J31;J21	2	/	/	/	15	/	/
LM41	A31;A23;A13;C31;C22;E21	2	/	/	1	40	/	/
LM42	A31;A23;A13;C32;C22;E31;E22;J21	2	/	/	/	/	/	1
LM43	A31;A23;C31;C22;D31;E41;E31;E23	2	/	/	/	1	/	/
LM44	A32;A21;A13;C31;C22;E21	3	/	/	/	26	/	/
LM45	A32;A21;A13;C31;C22;E31;J31;J21	3	/	/	/	15	/	/
LM46	A32;A21;A13;C32;C22;E21	3	/	/	/	11	/	/
LM47	A32;A22;A13;C21;E31	3	7	/	/	/	/	/
LM48	A32;A22;A13;C31;C22;E31	3	/	/	1	61	3	12
LM49	A32;A22;A13;C31;C22;E31;J31	3	/	/	/	6	/	/
LM50	A32;A22;A13;C31;C22;E32;E21;J31	3	/	/	/	44	/	/
LM51	A32;A22;A13;C31;C22;E33	3	/	/	/	/	/	4

Fabric	Macroscopic description	Granularity	Quantities of different fabrics					
			AN	ST1	ŠC	RAD	H	ST2
LM52	A32;A22;A13;C32;C23;E31	3	/	/	/	27	4	/
LM53	A32;A23;C22;E32;E21	3	/	/	10	17	1	/
LM54	A32;A23;C41;C31;C22;E32;E21	3	/	/	/	2	/	/
LM55	A32;A23;C22;E32;E21;j31;j22	3	/	/	/	2	/	3
LM56	A33;A22;C31;C22;E31	3	/	/	/	6	/	/
LM57	A33;A23;C22;E31	3	/	/	/	3	/	/
LM58	A33;A23;C22;E31;E21;j31	3	/	/	/	12	/	/
LM59	A41;A32;A22;A13;C31;C22;D31;E32	3	/	/	/	5	/	/
LM60	A42;A31;A21;A13;C31;C22;E31;E21;j31	4	/	/	/	15	/	/
LM61	A42;A31;A21;A13;C22;E31	4	/	/	/	/	/	2
LM62	A42;A31;A21;A13;C32;C22;E31	4	/	/	/	/	/	2

App. 1. Pottery fabrics and their representation in the Late Neolithic pottery assemblages at Andrenci (AN) and Stoperce 1 (ST1) and Early Eneolithic pottery assemblages at Ptuj-Šolski center (ŠC), Zgornje Radvanje (RAD), Hoče-Orglarska delavnica (H) and Stoperce (ST2). Fabric codes, firstly define type of a particular grain (A – quartz, B – calcium carbonate, C – mica, D – charred organic substance, E – iron oxides, J – undefined white grains), followed by its size (1 – <0.25mm, 2 – 0.26 to 0.50mm, 3 – 0.51 to 2.0mm, 4 – 2.01 to 3mm and 5 – >3mm), and finally their frequency (1 – <5 grains per mm², 2 – 5 to 10 grains per mm² and 3 – >10 particles per mm²).

	jug form											context	Radiocarbon dates (cal BC)		
V11	V12	V13	V10	V9	V6	V8	V7	V3	V4	V1	V2	V5			
X	X	X	X	X	X X	X X	X X X X	X X X X X X X X X X	X X X X X X X X	X X X X X X X X X X	X X X X X X X X X X	X X X X X X X X X X	X X X X X X X X X X	ANDRENCI, Structure B ANDRENCI, Structure A STOPERCE, Structure I ŠOLSKE CENTER, Structure II ŠOLSKE CENTER, Structure I ZGORNJE RADVANJE, Structure 10 (phase 1) ZGORNJE RADVANJE, Structure 22 ZGORNJE RADVANJE, Structure 4 ZGORNJE RADVANJE, Structure 9 ZGORNJE RADVANJE, Structure 17 ORGLARSKA DELAVNICA, „Pit-house II“ ORGLARSKA DELAVNICA, „Pit-house I“ ZGORNJE RADVANJE, Structure 7 ZGORNJE RADVANJE, Structure 5 ZGORNJE RADVANJE, Structures 11-15 (SE 786) ZGORNJE RADVANJE, Pit SE 986 ZGORNJE RADVANJE, Pit SE 213 ZGORNJE RADVANJE, Pit SE 245 ZGORNJE RADVANJE, Structure 20 ZGORNJE RADVANJE, Structure 3 ZGORNJE RADVANJE, Structure 1 ZGORNJE RADVANJE, Structure 6 ZGORNJE RADVANJE, Pit SE 1407=SE 1419 STOPERCE, Pit SE 52 STOPERCE, Structure III STOPERCE, Pit SE 45	

App. 2. Combination table of jugs in the studied Late Neolithic and Early Eneolithic settlement contexts. Bold letters highlight ¹⁴C AMS dated contexts.

L24/1		L23/1	L13/3	L7/1	L14/2	L15/1,2	L20/1	L25/1	L10/5	L12/1	L12/2	L12/3	L12/4	L12/5	L5	L4	L13/1,2	L1/1	L22	L11/4	L11/2	L2/1	pot form / context		Radiocarbon dates (cal BC)	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ANDRENCI, Structure A		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	STOPERCE, Structure I		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	SOLSKI CENTER, Structure I		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	SOLSKI CENTER, Structure II		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	SOLSKI CENTER, Structure IV		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	RADVANJE-HABAKUK 2, Structure 1 (SE 214)		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	RADVANJE-HABAKUK 2, Structure 5		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZGORNJE RADVANJE, Structure 20		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZGORNJE RADVANJE, Structure 2		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZGORNJE RADVANJE, Structure 4		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZGORNJE RADVANJE, Structure 11-15 (SE 786)		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ORGLARSKA DELAVNICA, "Pit-house I"		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZGORNJE RADVANJE, Structure 3		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZGORNJE RADVANJE, Structure 6		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	RADVANJE-HABAKUK 2, Pit 10 (SE 221)		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	RADVANJE-HABAKUK 2, Pit 13 (SE 219)		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZGORNJE RADVANJE, Structure 22		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZGORNJE RADVANJE, Structure 17		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZGORNJE RADVANJE, Structure 9		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZGORNJE RADVANJE, Structure 1		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ORGLARSKA DELAVNICA, "Pit house III"		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZGORNJE RADVANJE, Structure 19		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	STOPERCE, Structure III		4500
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	STOPERCE, Pit SE 52		4500

App. 3. Combination table of pots in the studied Late Neolithic and Early Eneolithic settlement contexts. Bold letters highlight ¹⁴C AMS dated contexts.