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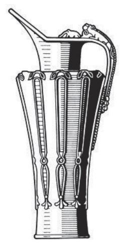

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Inhaltsverzeichnis / Contents

Jörg Weilhartner, Barbara Horejs
Editorial – 7

Artikel / Articles

Assunta Mercogliano
A Newly Discovered Middle Helladic Settlement in the Trapeza Area near Aigion (Achaea, Greece). The Materials from the Survey – 11

Filip Franković
Ashes to Kraters, Dust to Jugs. Use of Ceramic Vessels as Urns in the Middle and Late Bronze Age East Aegean–West Anatolian Region – 35

Nicole Mittermair
Take it to the Grave. Traces of Production, Post-Casting Treatment and Use of Metal Objects from Urnfield Cemeteries in Lower Austria – 65

Petr Dresler, Gabriela Dreslerová, Nela Doláková, Petr Kočár, Romana Kočárová
Beaver as Proof of the Change of Natural Environment and Economy of the First Half of the 10th Century AD – 117

Günther Kaufmann, Andreas Putzer
Neue Erkenntnisse zur Geschichte der Kirche St. Valentin in Schlaneid (Südtirol) – 137

Wolfgang Neubauer, Christoph Traxler, Alexander Bornik, Andreas Lenzhofer
Stratigraphy from Topography I. Theoretical and Practical Considerations for the Application of the Harris Matrix for the GIS-based Spatio-temporal Archaeological Interpretation of Topographical Data – 203

Michael Doneus, Wolfgang Neubauer, Roland Filzwieser, Christopher Sevara
Stratigraphy from Topography II. The Practical Application of the Harris Matrix for the GIS-based Spatio-temporal Archaeological Interpretation of Topographical Data – 223

Berichte / Reports

Barbara Horejs, Aleksandar Bulatović, Jelena Bulatović, Clare Burke, Michael Brandl, Laura Dietrich, Dragana Filipović, Bogdana Milić, Ognjen Mladenović, Nora Schinnerl, Tim M. Schroedter, Lyndelle Webster
New Multi-disciplinary Data from the Neolithic in Serbia. The 2019 and 2021 Excavations at Svinjarička Čuka – 255

Roderick B. Salisbury, Ian D. Bull, Susanna Cereda, Erich Draganits, Katharina Dulias, Kerstin Kowarik, Matthias Meyer, Elena I. Zavala, Katharina Rebay-Salisbury
Making the Most of Soils in Archaeology. A Review – 319

Rezensionen / Reviews

Andre Gingrich
David Graeber, David Wengrow, The Dawn of Everything: A New History of Humanity (Farrar, Strauss and Giroux, New York 2021) – 337

Nikola Vukosavljević
Robert Whallon (Hrsg.), Crvena Stijena in Cultural and Ecological Context: Multidisciplinary Archaeological Research in Montenegro. Montenegrin Academy of Sciences and Arts, Special Editions (Monographies and Studies) 138, Section of Humanities 18 (National Museum of Montenegro, Podgorica 2017) – 345

Reinhard Jung
Lázaros Kolónas, Βούντενη I: Ένα σημαντικό μυκηναϊκό κέντρο της Αχαΐας (Οργανισμός Διαχείρισης και Ανάπτυξης Πολιτιστικών Πόρων, Athen 2021) – 351

Peter C. Ramsl, Gabriela Russ-Popa
Károly Tankó, Kelta falu Győr határában: a ménfőcsanaki késő vaskori település / A Celtic Village in North-West Hungary. Archaeolingua. Studien zur Eisenzeit im Ostalpenraum 2 (Archaeolingua, Budapest 2020) – 365

Editorial

Der 106. Band der Archaeologia Austriaca beinhaltet sieben Artikel, zwei Berichte und vier Buchbesprechungen, die sich chronologisch vom Frühneolithikum bis in die frühe Neuzeit erstrecken und sich thematisch sowohl der materiellen Kultur von Fundstätten in Mitteleuropa, Serbien und der Ägäis widmen als auch mit neuesten methodischen Ansätzen und Fragestellungen einer interdisziplinär ausgerichteten Archäologie auseinandersetzen.

Am Beginn dieser Ausgabe stehen zwei Beiträge, die uns in die bronzezeitliche Ägäis führen. Assunta Mercogliano stellt eine repräsentative Auswahl an keramischem Material und Kleinfunden vor, die im Zuge von Oberflächenbegehungen bei Aigion in der Region Achaia auf der nördlichen Peloponnes aufgelesen wurden. Dieses Material vermittelt nicht nur einen ersten Eindruck von der neu entdeckten mittelhelladischen Siedlung unweit des Trapeza-Hügels, sondern erweitert auch die Evidenz des bislang nur unzureichend belegten Mittelhelladikums in dieser Region. Daran anschließend beschäftigt sich Filip Franković mit bronzezeitlichen Bestattungssitten in der Ostägäis bzw. in Westanatolien, wobei er eine Neubewertung der weithin akzeptierten Annahme vornimmt, die von einer Ausbreitung der Brandbestattungen von Anatolien aus in Richtung Westen ausgeht. Im Fokus seiner Überlegungen stehen unterschiedliche Keramikgefäße, die während der mittleren und späten Bronzezeit als Urnen Verwendung gefunden haben.

Im dritten Beitrag dieser Ausgabe untersucht Nicole Mittermair die Gebrauchsspuren an insgesamt 74 Messern, Nadeln und Rasierklingen aus zwei urnenfelderzeitlichen Gräberfeldern im unteren Traisental in Niederösterreich, Inzersdorf ob der Traisen (13.–11. Jh. v. Chr.) und Franzhausen-Kokoron (11.–8. Jh. v. Chr.). In ihrer Analyse der Herstellungs- und Gebrauchsspuren diskutiert die Autorin nicht nur die Abfolge von Arbeitsschritten eines spätbronzezeitlichen Produktionsablaufs (*chaine opératoire*), sondern schließt darüber hinaus auch eine Interpretation von Bestattungsritualen und Deponierungssitten in dieser Periode ein.

Petr Dresler, Gabriela Dreslerová, Nela Doláková, Petr Kočár und Romana Kočárová widmen sich den Auswirkungen des Zusammenbruchs des Großmährischen Reiches auf den Naturraum der bedeutenden frühmittelalterlichen befestigten Anlage von Pohansko (Tschechien) und die ökonomischen Strategien ihrer Einwohner. Im Zentrum dieser interdisziplinären Studie, die archäozoologische, archäobotanische, anthrakologische, palynologische, archäologische, kulturhistorische, ökologische und ethnologische Aspekte umfasst, steht die beispiellose Dominanz des Europäischen Bibers (*Castor fiber*) innerhalb der osteologischen Fundverbände, was auf spezialisierte Jagd oder sogar Zucht zurückzuführen sein könnte. Günther Kaufmann und Andreas Putzer stellen in ihrem Beitrag eine Neubewertung der Baugeschichte der Kirchenruine St. Valentin im Valteswald bei Schlaneid (Südtirol) vor, bei der es sich um den Vorgängerbau der 1770 im Ortszentrum errichteten Kirche handelt. Ausgehend von neuen Radiokarbondatierungen präsentieren die beiden Autoren eine chronologische Abfolge der mittelalterlichen und neuzeitlichen Baugeschichte, die mit einer Steinkirche aus der Karolingerzeit beginnt und mit dem Abbau der Kirche 1769/1770 endet. Die exakte Bestimmung eines spätantiken/frühmittelalterlichen Vorgängerbaus aus Holz muss hingegen offen bleiben.

In zwei zusammenhängenden Beiträgen werden neue Ansätze zur Anwendung der Harris-Matrix für die GIS-gestützte räumlich-zeitliche Interpretation topographischer Daten präsentiert. Wolfgang Neubauer, Christoph Traxler, Alexander Bornik und Andreas Lenzhofer bieten die theoretische Grundlage für die Anwendung der Prinzipien der archäologischen Stratigraphie auf die Analyse topographischer Daten, die aus Airborne Laser Scanning (ALS) oder anderen Prospektionsmethoden gewonnen werden. Bestehende Software zur Erstellung einer stratigraphischen Sequenz wurde durch ein intervallbasiertes Zeitmodell erweitert, sodass eine relativchronologische Gliederung der stratigraphischen Sequenz in Verbindung mit einer absolut chronologischen Zeitlinie möglich ist. Im Anschluss daran zeigen Michael Doneus, Wolfgang Neubauer, Roland Filzwieser und Christopher Sevara, wie sich die diachrone Interpretation von durch ALS generierten Geländemodellen in der Praxis gewinnbringend durchführen lässt, indem einzelne Befunde durch eine interaktive Verknüpfung zwischen Harris-Matrix und GIS in Perioden- und Phasenkarten dargestellt werden. Als Fallbeispiel dient die Gegend um St. Anna in der Wüste (Niederösterreich), deren komplexe Siedlungslandschaft mit mehr als 1450 archäologischen Reliefmerkmalen aus einem Zeitraum von mindestens 2500 Jahren klar in einzelne chronologische Phasen untergliedert werden kann.

Barbara Horejs, Aleksandar Bulatović, Jelena Bulatović, Clare Burke, Michael Brandl, Laura Dietrich, Dragana Filipović, Bogdana Milić, Ognjen Mladenović, Nora Schinnerl, Tim M. Schroedter und Lyndelle Webster stellen in Fortsetzung des in der Archaeologia Austriaca 103/2019 erschienenen ersten Grabungsberichts die neuesten Ergebnisse der 2019 und 2021 durchgeführten Ausgrabungen und naturwissenschaftlichen Untersuchungen an der neolithischen und metallzeitlichen Fundstelle Svinjarička Čuka im südlichen Moravatal (Serbien) vor. Neben der Präsentation von jungsteinzeitlichen Siedlungsbefunden, die anhand von Radiokarbondatierungen zwischen 5700/5600 und 5500 calBC datiert werden können, finden sich Detailanalysen zu Architektur, keramischem Material, Silexartefakten und deren Rohmaterialien, Kleinfunden, Reibsteinen sowie archäozoologischem und archäobotanischem Fundmaterial, die im Rahmen des Neolithisierungsprozesses kontextualisiert werden. Die späteren Besiedlungsphasen mit Befunden von der mittleren Bronzezeit bis zur frühen Eisenzeit werden in einem eigenen Abschnitt vorgelegt. Die Hervorhebung der Bedeutung von Böden und Sedimenten als Archiv menschlicher Aktivitäten und Umweltbedingungen stellt das zentrale Anliegen des letzten Beitrages dar. Roderick B. Salisbury, Ian D. Bull, Susanna Cereda, Erich Draganits, Katharina Dulias, Kerstin Kowarik, Matthias Meyer, Elena I. Zavala und Katharina Rebay-Salisbury bieten einen fundierten Überblick über die neuesten Ansätze und technologischen Entwicklungen der Boden- und Sedimentanalyse sowie deren Anwendungsbereiche für archäologische Fragestellungen in interdisziplinärem Forschungsrahmen.

Vier Buchbesprechungen – verfasst von Andre Gingrich, Nikola Vukosavljević, Reinhard Jung sowie Peter C. Ramsl und Gabriela Russ-Popa – beschließen diese Ausgabe und runden das inhaltliche Spektrum der Beiträge ab.

Zum besten Beitrag der Archaeologia Austriaca 105/2021 haben die Mitglieder des wissenschaftlichen Beirats den Beitrag „Ressourcen der Neandertaler im Burgenland (Österreich). Die Csaterberge bei Kohfidisch als Limnosilizit-Rohmaterialquelle vom Mittelpaläolithikum bis in die Kupferzeit“ von Oliver Schmitsberger, Michael Brandl und Viola C. Schmid gewählt, in dessen Zentrum der erste gesicherte Nachweis für ein Paläolithikum im Burgenland und verschiedene Aspekte aus der Zeitstufe des Neandertalers stehen. Im Namen des Herausgebergremiums und des gesamten Redaktionsteams gratulieren wir den Autor*innen sehr herzlich zum Best Paper Award und überreichen als Preis ein Bücherpaket!

Abschließend dürfen wir einige Änderungen aus der Organisation der Archaeologia Austriaca bekannt geben. Die redaktionelle Betreuung der Zeitschrift übernimmt mit dem kommenden Band wieder Sophie Zimmermann, Jörg Weilhartner sei für die Vertretung gedankt. Mit Beginn dieses Jahres hat Angela Schwab die graphische Gestaltung übernommen und Peter C. Ramsl hat die Nachfolge von Michaela Zavadil angetreten; er zeichnet nun gemeinsam mit Mario Gavranović für die Betreuung der Rezensionen verantwortlich. Wir danken an dieser Stelle nicht nur den beiden aktuellen Rezensionsbetreuern, sondern insbesondere auch Michaela Zavadil für die jahrelange sorgfältige redaktionelle Arbeit und ihr großes Engagement bei der Betreuung der Rezensionen!

Unser Dank für die Gestaltung dieses Bandes geht an Angela Schwab für das professionelle Layout sowie an Nicola Wood für das gründliche und stets rasche Sprachlektorat der englischen Beiträge und Zusammenfassungen. Die Koordination und Redaktion dieser Ausgabe verantworten Jörg Weilhartner, Ulrike Schuh und Barbara Horejs. Unser besonderer Dank gilt allen Autor*innen für ihr Vertrauen in die Zeitschrift und die unkomplizierte Zusammenarbeit sowie den zahlreichen Gutachter*innen, die mit ihren detail- und kenntnisreichen Gutachten entscheidend zur Qualitätssicherung der Archaeologia Austriaca beitragen.

Die aktuelle Ausgabe der Archaeologia Austriaca steht wie gewohnt nicht nur online, sondern auch zur Gänze Open Access zur Verfügung. Einzelne, bereits in der ersten Jahreshälfte fertig gestellte Beiträge wurden bereits vorab online publiziert, um den Zeitraum zwischen Einreichung und gedruckter Fassung zu verkürzen. Um einen Artikel einzureichen, kontaktieren Sie uns bitte unter archa@oeaw.ac.at. Wir freuen uns auf Ihre Beiträge!

Jörg Weilhartner, Barbara Horejs

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A Newly Discovered Middle Helladic Settlement in the Trapeza Area near Aigion (Achaea, Greece). The Materials from the Survey

Assunta Mercogliano

Abstract

A new Bronze Age site has been discovered near the Trapeza Hill, 7 km inland from Aigion (eastern Achaea, Greece). Ongoing research has thus far revealed a multi-phase settlement covering the Middle Helladic (MH) period and the transitional phase up until the Late Helladic (LH). Investigations since 2013 have included the collection of surface material, as well as the excavation of two trenches. This contribution presents the study conducted on the pottery and small finds recovered from the surface survey in order to outline an initial cultural and chronological framework of the settlement.

Keywords

Achaea, Middle Helladic, settlement, pottery

Zusammenfassung – *Eine neu entdeckte mittelhelladische Siedlung im Bereich des Trapeza-Hügels nahe Aigion (Achaia, Griechenland). Das Fundmaterial der Oberflächenbegehung*

In der Nähe des Trapeza-Hügels, 7 km landeinwärts von Aigion (östliches Achaia, Griechenland), wurde eine neue Stätte aus der Bronzezeit entdeckt. Die laufenden Forschungen haben bisher eine mehrphasige Besiedlung ergeben, die das Mittelhelladikum und die Übergangsphase bis zum Späthelladikum umfassen. Die im Jahr 2013 begonnenen Untersuchungen konzentrierten sich auf das Aufsammeln von Oberflächenmaterial sowie das Ausheben von zwei Grabungsflächen. Dieser Beitrag stellt Untersuchungen zu der Keramik und den Kleinfunden aus der Oberflächenbegehung vor, um einen ersten Eindruck vom kulturellen und chronologischen Rahmen der Besiedlung zu vermitteln.

Schlüsselbegriffe

Achaia, Mittelhelladikum, Siedlung, Keramik

1. Location and Description of the Site

Since 2010, evidence of prehistoric occupation in and around the Trapeza Hill – a 448 m-high plateau – has been the object of systematic fieldwork carried out by a team headed by Elisabetta Borgna from the University of Udine under the direction of Andreas Vordos for the Greek Ministry of Culture. Investigations proved the Trapeza area to be an extended archaeological landscape scattered with traces of occupation dating from the Neolithic period up until the Hellenistic age.[1] The MH site was discovered in 2013 on a flat saddle at the base of a high ground (409 m asl) immediately to the south of the Trapeza, located between the Meganitis River to the west and a narrow valley linking the hinterland with the coast to the east (Fig. 1). The area is surrounded by a verdant environment highly favourable to habitation and close to water sources, including a perennial small stream to the east of the site. The location is naturally protected, as it is inaccessible on three sides, whereas on the southwestern side, at mid-height, the slope gently declines, forming a protruding plateau. The very eastern edge of the slope offers a broad view of both the summit and the southwestern slope of the Trapeza, where in later times a Mycenaean chamber tomb necropolis (15th–11th centuries BC) was established.[2]

At the time of the discovery, an extensive quantity of pottery sherds was noted on the surface of the site – today covered by an olive grove to the north and a vineyard to the south. The area appeared to have been heavily damaged and disturbed by recent land terracing and drainage, as well as other obsolete modern installations including a tile factory.

During the first inspection in 2013, a number of pottery fragments were recovered from random locations allowing for a preliminary chronological evaluation. Investigations resumed in 2015 with a systematic and intensive surface

1 Borgna, Vordos 2016, 447–448.

2 Borgna 2013. – Borgna, Vordos 2016. – Borgna 2017. – Borgna 2018. – Borgna et al. 2019. – Borgna, De Angeli 2019. – Borgna, Vordos 2019. – Borgna, De Angeli 2020. – Borgna 2021. – Borgna, Licciardello 2021.

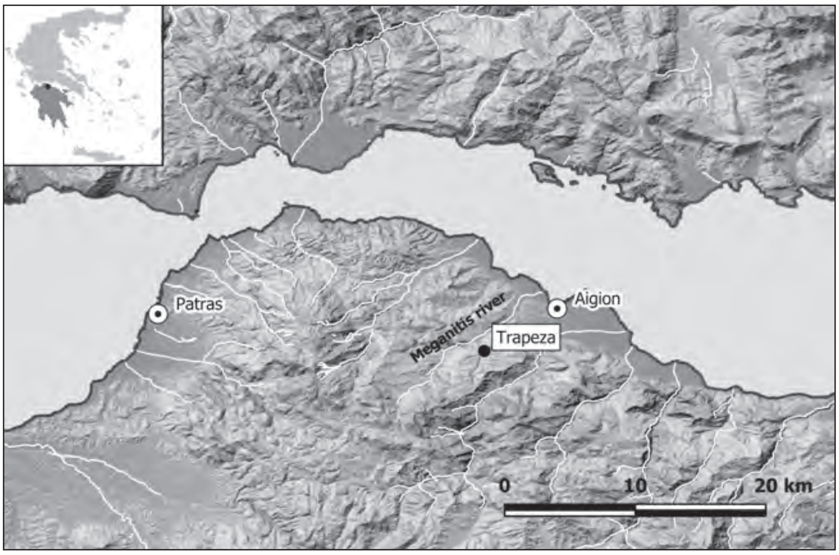

Fig. 1. Location of the Trapeza settlement (Map source: ©ASCSA Corinth excavations, offered under Creative Commons licensing, adapted by A. Mercogliano).

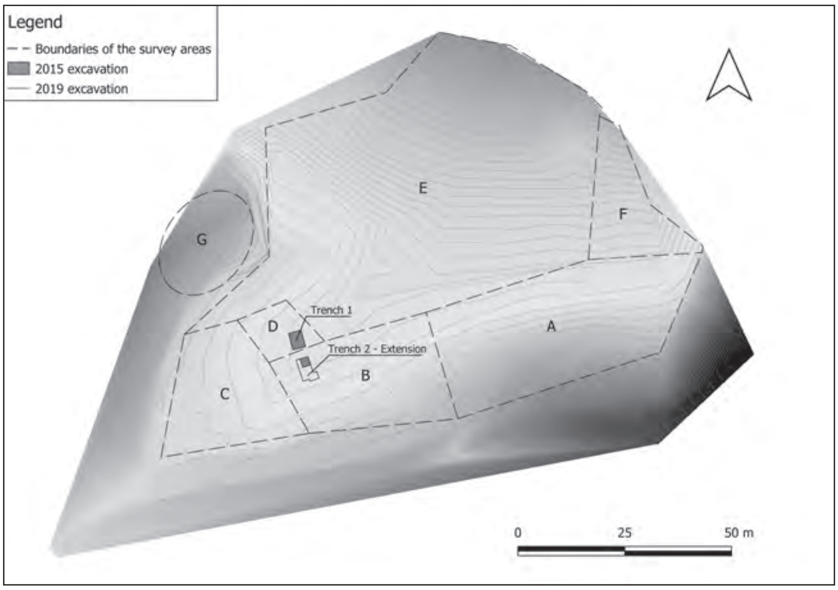

Fig. 2. Topographical plan of the settlement with survey areas and trenches 1 and 2-extension (Graphics: A. Mercogliano; topographical survey: Astrolabe Engineering).

survey. The area was divided into seven zones (from A to G), covering 0.8 ha, according to its geomorphological configuration (Fig. 2).[3] Materials were collected by walking within strips that were c. 2 m wide. As dense concentrations were observed, they were circumscribed and mapped as clusters. After the identification of the major cluster, two small test trenches were opened during the same year. In 2019 and 2021, new excavation campaigns were carried out in order to enlarge one of the trenches. The excavations brought to light a complex sequence of anthropic deposits packed with MH materials that resulted from successive actions of terracing, obliteration, filling, and levelling. On top of the sequence, a new cycle of use with architectural remains was distinguished and preliminarily dated to a transitional MH – LH or very early LH phase.[4] At least three infant burials belong to this upper cycle.[5]

3 The immediate surroundings have not been investigated; therefore, it is uncertain whether the site extended beyond the surveyed area.

4 Borgna et al. 2019, 330. – Mercogliano, Borgna, in press.

5 The presence of burials in the area of the settlement is common during all of the phases of the MH period, see Milka 2010. Starting from the late MH, spaces inside and among houses became exclusive for infant burials, especially when other formal extramural cemeteries were at the disposal of the community, see Pomadère 2010. At Mygadlia (western Achaea), infant burials were excavated

2. The Surface Materials

The results of the 2013 and 2015 surface collections included 2478 recovered items, of which 2338 are vessel fragments for a total weight of 45.786 kg.[6] My study encompassed the pottery and ceramic objects.[7] The general conclusive remarks presented here should be considered preliminary and will be integrated into the publication of the materials from stratified contexts, which are currently under study.

It is worth pointing out that the fragments collected in 2015 did not emerge on the surface as a result of continuous and uniform erosion. The concentration was due to circumscribed episodes which occurred between 2013 and 2015, specifically olive and vine planting. For this reason, the general state of preservation of the fabrics and surfaces is quite fair, while fragmentation has been recorded to an uneven degree, unfortunately in many cases preventing the reconstruction of the original shapes, especially when no exact parallels could be found.

Since we lack any information about the original archaeological context of these materials, the present research was primarily based upon the intrinsic physical aspects of every single sherd. Almost all of the assemblage could be assigned to wares of MH tradition, with only a small percentage belonging to Mycenaean wares, and a few sherds ascribable to minimal later disturbances.

A selection of 125 sherds bearing morphological and decorative diagnostic features was catalogued. Of these, only a representative fraction will be described in this text.

In presenting the materials, the following general criteria were applied: an initial distinction was made between Middle and Late Helladic pottery.[8] The former is further subdivided

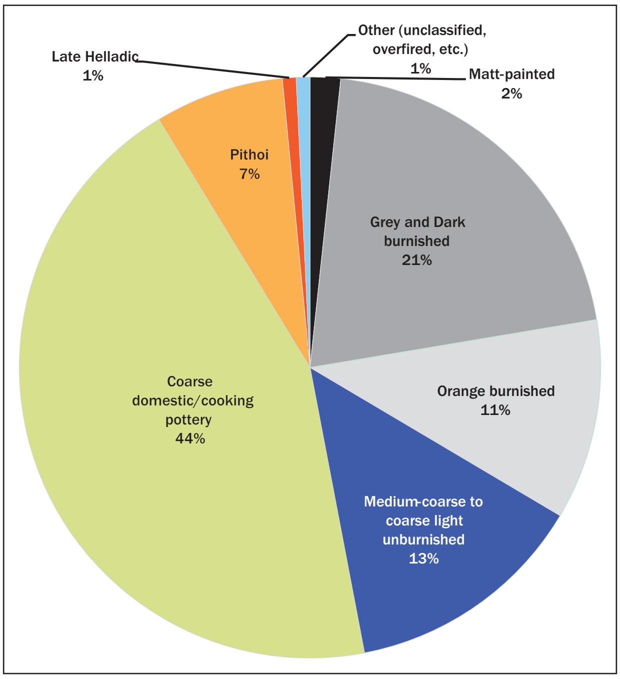

Fig. 3. Graph showing the percentages of each pottery group identified by sherd count (Graphics: A. Mercogliano).

into 'Matt-painted', 'Grey and Dark Burnished', 'Orange Burnished', 'Medium-coarse to Coarse Light Unburnished', 'Coarse Domestic/Cooking Pottery' and 'Pithoi' (Fig. 3).[9] The definition and description of each pottery group is clarified below. The small finds are treated separately.

2.1. Middle Helladic Pottery

2.1.1. Matt-Painted (Fig. 4)

A group of recovered fragments is indicative of the presence of MH Matt-painted wares at the site.[10] The decoration of these sherds was mostly obtained by applying dark or greyish-brown paint (5 YR 5/2–5/3–6/2–6/3) on smoothed or strongly burnished light-red surfaces (5 YR 7/6–6/6–6/8). The paint has a uniform matt appearance and is firmly bonded with the surface of the vessels so that no irregularities

within the settlement area and dated to LH I–IIA, see Papazoglou-Manioudaki, Paschalidis, Jones 2019.

6 The remaining items consist of clay objects (9 items), lithics (66 items) and a representative sample of modern tiles (65 items).

7 Master's thesis submitted to the University of Udine in 2018.

8 A few considerations on relative chronology are deemed necessary at this point. For the MH period, there is no real consensus on the division into the MH I – MH II – MH III periods, if not according to general pottery criteria, see the critique by Dickinson 1977, 17–31. R. Howell's phasing of MH pottery at Nichoria is one example of how the I–III division of MH has been solved at a single settlement, see Howell 1992. Stratigraphic investigations at several other sites led to the formation of different phasing systems, which fit the traditional partition to a greater or lesser extent, see Maran 1992a. – Gauss, Smetana 2007a. – Gauss, Smetana 2007b. – Zerner 2008. – Hale 2016. Nevertheless, 'MH I', 'MH II' and 'MH III' are standardly used labels which will be adopted in this text as well. When imprecisely dated *comparanda* are given, general indications such as 'early' or 'late' MH are used. Pottery in the MH tradition that possibly outlasts the MH period and is more suited to a transitional MH – LH chronology is also included in the MH pottery section. This choice is in line with recent reconsiderations of the chronological definition of the Middle – early Late Bronze Age periods, see Spencer 2010, 670. – Voutsaki 2010, 100. – Rutter 2017. – Wiersma, Voutsaki 2017, vii–viii. In terms of absolute dating, the high chronology has been followed, see Manning 2010. See also Voutsaki, Nijboer, Zerner 2009 for a proposition regarding the absolute dating of the traditional partition.

9 This is a re-elaboration of a personal subdivision that I adopted for my master's thesis. A more refined classification system is currently under construction.

10 Forty sherds in total, which represent c. 2 % of the total of the pottery collected.

could be spotted by running fingers over the surface. Generally, the fabrics are truly hard and fine, with barely visible sparkling inclusions or sparse limestone elements. Coarse fabrics in association with matt-painted decoration are rather rare. In only a few cases the paint was applied on a white slip coating, whereas in the northeastern Peloponnese this was a well-established technical feature from the early MH period.[11]

Most of the Matt-painted pottery analysed seems to be close in terms of surface colour and treatment to late MH Matt-painted 'Argive Light' wares (in the fine- and medium-tempered burnished varieties)[12] and central Greek 'Yellow and Red Minyan Matt-painted', as defined by Kalliope Sarri.[13] By the end of the MH period, the so-called 'Yellow Minyan Matt-painted' ware also reached the southern Peloponnese, according to the pottery sequence of Ayios Stephanos.[14] Similar matt-painted wares are well attested in Achaea during the MH III – LH I periods at Pagona, near Patra,[15] and at Aigion.[16]

Fragments from shoulder-handled bowls, nos. 1–4, vaguely recall MH III – LH I goblets or krateriskoi[17] found elsewhere in Achaea which typically bear solidly painted triangles on the shoulder.[18] They might indeed belong to bowls originally standing on a low foot. Unfortunately, most of the available parallels are only preliminarily published through pictures, preventing any accurate comparison.

Nos. 5 and 6 probably belonged to small globular jugs, but they are not sufficiently preserved for an attribution to specific types. Globular jugs are known from the early MH period[19] onwards and become particularly common during MH III and LH I, especially as grave goods in the northeastern Peloponnese.[20] Jugs with horizontal mouths seem to have been less popular than beaked ones until the MH IIIB phase, at least in the Argolid.[21] A few MH jugs are known in Achaea: a globular one with painted linear decoration from Aigion,[22] a beaked jug from Pagona[23] and a small globular jug with a horizontal mouth from an unknown context.[24]

The neck fragment no. 7, which once would have had a vertical handle attached, could belong to either an amphora or a hydria. While amphorae are only rarely found in MH contexts,[25] the hydria, together with various types of stamnoi, are regarded as a 'type fossil' shape of MH IIIB in the Argolid.[26] By the end of the MH period, the hydria-type jar was popular in Achaea as well, as demonstrated by the imposing matt-painted specimen from Drakotrypa near Katarraktis, now exhibited at the Archaeological Museum of Patra.[27] A thinned rim similar to that found on sherd no. 7 is

11 As can be seen, for example, in the case of Argos, see Philippa-Touchais 2002, 5, "classe à pâte semi-fine". This technique is also common at MH III – LH I Tsoungiza, see Rutter 1990, 420. – Rutter 2015, 210. – Rutter 2020, 487, 557–558.

12 Dietz 1991, 29.

13 Sarri 2007, 163. – Sarri 2010a, 77–79.

14 Zerner 2008, 193–199.

15 Dietz, Stavropoulou-Gatsi 2010, 123.

16 Papazoglou-Manioudaki 2010, 135.

17 To my knowledge, the term "krateriskos" is first used for MH – early LH low-stemmed goblets by L. Papazoglou-Manioudaki, see Papazoglou-Manioudaki 2010. It seems to be specifically indicative of a type of goblet with a carinated or biconical body and low conical base (not to be confused with the Mycenaean krateriskos, i.e., a smaller variant of the ring-base krater typical of western Greece and the Ionian Islands, see Mountjoy 1999, 29). Analogous vessels commonly appear in west-central Greece and the northwestern Peloponnese. They are referred to as "gobletartige Kratere" by P. Pavúk and B. Horejs (Pavúk, Horejs 2012, 54, 65–68) and as a more neutral "Fußgefäße" by J. Maran (Maran 1992a, 317 and n. 1016). S. Dietz prefers to use the conventional term "goblet" for large MH III – LH I low-footed vessels in the Argolid, even though he expresses some doubts about the aptness of the term, see Dietz 1991, 166.

18 Aigion: Papazoglou-Manioudaki 2010, Fig. 11 (LH I). Pagona: Dietz, Stavropoulou-Gatsi 2010, Fig. 1/19–20 (MH IIIB – LH IIA horizon). Mygdalia: Papazoglou-Manioudaki, Paschalidis 2021, Fig. 5/b (upper left); 8 (upper specimen) (Mygdalia I, transitional MH III – LH I/LH IIA). Teichos Dymaion (some published as Neolithic or Early Helladic but most likely MH): Mastrokostas 1967, Pl. 149/α, γ (lower left). For the shape, see also jars/kraters from a LH I–II deposit at Frantzi, in the Spercheios valley, see Karantzali 2016, Fig. 20/67–68.

19 Globular jugs with ornate painted decoration are typical of the EH III – MH I transition and MH I periods in the Argolid. Argos: Balitsari 2019, Fig. 30/98. Asine: Frödin, Persson 1938, Fig. 167/2. – Nordquist 1987, Fig. 34. Lerna: Zerner 1978, Pl. 12 BD155/5. See also at Kirrha: Dor et al. 1960, Pl. XLI. For further examples of globular jugs from the early MH Argos, see Philippa-Touchais 2002, Fig. 26/88 (late MH I–II); Philippa-Touchais, Touchais 2011, Fig. 12/6 (late MH I – early MH II).

20 Many examples are presented in Dietz 1991, Figs. 53–54. Comparisons can also be made with the MH III materials from Tsoungiza, see Rutter 1990, Figs. 14–15.

21 Dietz 1991, 177. – Philippa-Touchais 2002, 34.

22 Papazoglou-Manioudaki 2010, Figs. 3–4. This jug has a characteristic back-turned neck, reminiscent of a shape well attested in central and northern Greece, see Papazoglou-Manioudaki 2010, 133. For this type, see in general Maran 1992a, 151–156. – Maran 2007, 167–171. – Dakoronia 2010.

23 Dietz, Stavropoulou-Gatsi 2010, Fig. 1/18 (MH IIIB – LH IIA horizon).

24 Papadopoulos 1979, Fig. 50/d.

25 Siedentopf 1991, Pl. 49/220 (Kolonna, Stadt IX, MH II). – Dietz 1991, Fig. 59/AI-5 (Mycenae B-Circle, LH I B).

26 Dietz 1991, 192.

27 Papadopoulos 1979, Fig. 51/a. The excavations at Drakotrypa have not been thoroughly published. A first phase of the settlement is roughly dated to the late MH – early LH period and then the site was

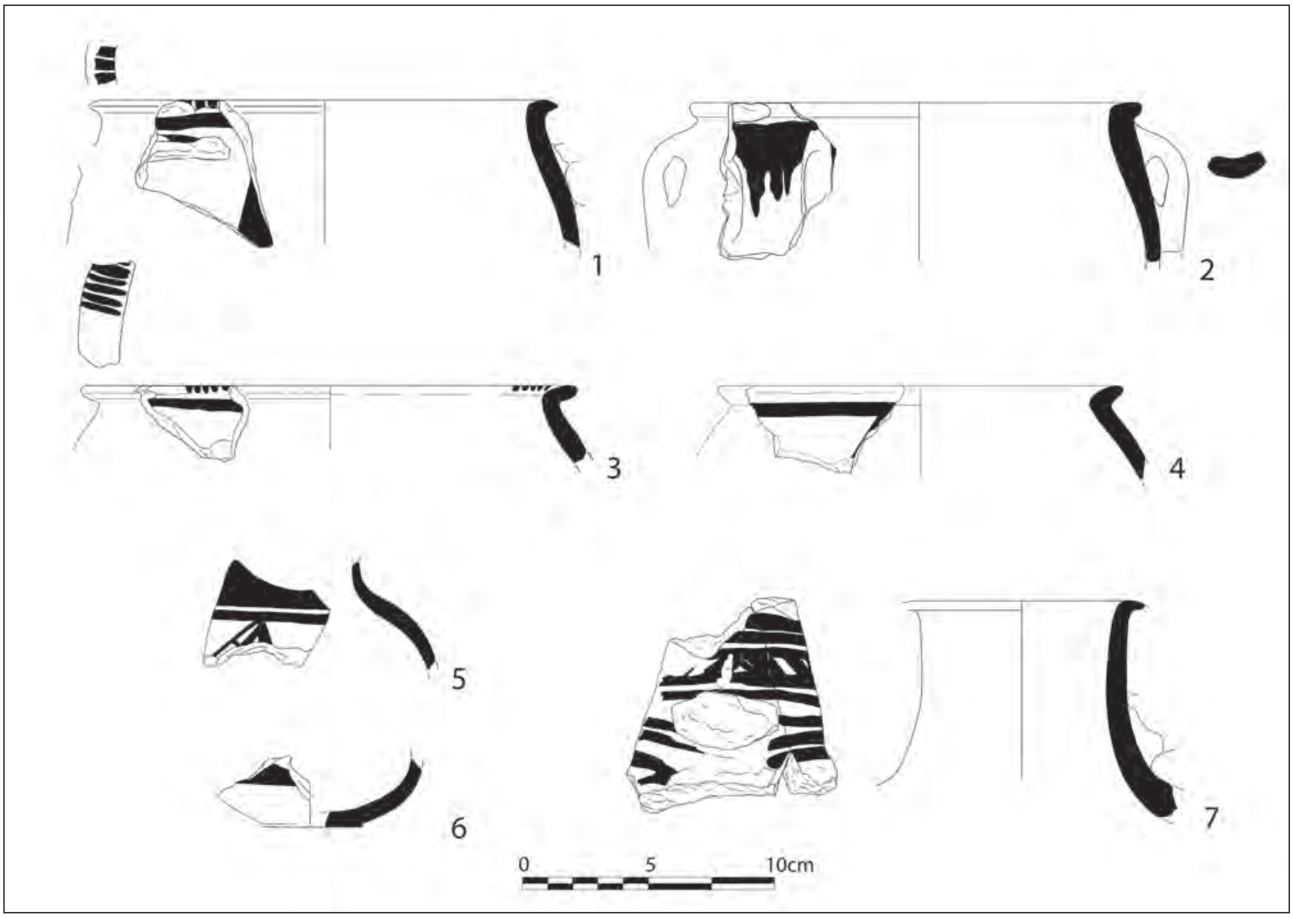

Fig. 4. Matt-painted pottery, scale 1:3 (Drawings: N. Petropoulos).

paralleled on a hydria fragment from Kafkania, although it has a vertical handle attached to the shoulder (like the hydria from Katarraktis) and not from the shoulder to the neck.[28]

2.1.2. Grey and Dark Burnished (Fig. 5)

The majority of the fragments included here show several similarities with the pottery traditionally called 'Grey Minyan': they feature hard-fired fabrics that are almost always fine and semi-fine, with a uniform selection of white limestone inclusions, completely reduced cores and burnished or polished surfaces (Gley 1 5/N, 5/10Y–6/10Y–7/10Y, 5 YR 4/1, 2.5 Y 4/1). Nonetheless, 'Minyanizing' would probably be a better definition as none of the fragments bear any obvious traces of wheel throwing.[29]

In some cases, imperfections in the colour were observed in pieces with not fully reduced cores or mottled surface colour, ranging from dark olive brown to black (10 YR 6/4–5/4–5/3–4/2–3/1). These characteristics, which result from different and less controlled conditions in the firing process, are typical of the pottery classified as 'Dark Burnished' at several sites.[30] Today the term 'Dark Burnished' is commonly preferred to the old-fashioned 'Argive' or 'Black Minyan', a ceramic ware characterized by a red clay core and black surfaces, as defined by Alan Wace and Carl Blegen in their dated classification of pre-Mycenaean pottery.[31] Of those presented here, only one fragment (no. 23) should be assigned to the

occupied again in the palatial period, see Zapheiropoulos 1965. – Papadopoulos 1979, 45–46. – Darcque 2005, plan 118.

28 Rambach 2002, Fig. 5/43.

29 For an overview of the history and definition of 'True Minyan' and 'Minyanizing' wares, see Sarri 2010b. – Pavúk, Horejs 2012, 15–18, 34–36. – Hale 2016, 246–250. – Balitsari 2019, 481. – Balitsari 2021.

30 Especially in the Argolid at Lerna (Zerner 1978, 142–143), Asine (Nordquist 1987, 49. – Dietz 1991, 31) and Argos (Philippa-Touchais, Touchais, 2011, 209. – Balitsari 2019), but also elsewhere in Greece at Mitrou (Hale 2016, 247) and Ayios Stephanos (Zerner 2008, 189–193).

31 Wace, Blegen 1918, 181.

Dark Burnished group. Diagnostic sherds for this ware appear to be under-represented, but account for a significant quantity among all the other fragments (although still less than the grey varieties).

The wide, offset, almost vertical rims, nos. 8 and 9, resemble the morphology of EH III and early MH I Bass 'Bowls' or cups.[32] This shape is also known in eastern Achaea where many examples were found in the EH III contexts of Helike.[33] Another close parallel comes from Aigeira.[34]

The bowl, no. 10, has a short, everted rim and a rather squat body that both push it slightly later into the Middle Bronze Age.[35] Large bowls or basins (no. 11) reaching 30 cm in diameter are common. They might have stood on large stems or low spreading bases (no. 20).[36]

Bowls and basins decorated with horizontal grooves (nos. 12–15) are also attested. The straight shoulder of fragments nos. 12–13 make a placement in the late MH I or early MH II more likely.[37] Bowls with horizontal grooves decorated with incised festoons (like no. 14) are typical shapes of the Dark Burnished wares (especially of the so-called 'Argive Minyan' variety) and can be dated to the MH II–III period.[38] Other specimens have been found in Achaea, at Aigion,[39] Pagona[40] and Teichos Dymaion.[41]

Fragments of goblets, including plain, incised or ringed stems, to the best of my knowledge represent the first known evidence of this shape in Achaea (nos. 16–19).[42] Due to the high degree of fragmentation, it is almost impossible to guess how the upper part of these vessels was originally moulded. Indeed, sherds bearing 'complex rims' typical of the 'Lianokladi' type goblet[43] have not been detected. Since the goblet fragments in question lack the technological features generally attributed to 'True Grey Minyan' vessels imported from central Greece, they were probably part of local 'goblet-like' vessels. As for their chronology, a general MH II–III range can be proposed.[44] Incised stems are documented at Pefkakia-Magoula phase 6 früh (MH II).[45] In the northeastern Peloponnese, goblets with ribbed stems usually predate those with plain or incised stems.[46]

The kantharos, no. 21, is likely consistent with a MH II–III date.[47] No. 22 probably belongs to a mature type of angular bowl or goblet, with many parallels in the Argolid from MH IIIA contexts.[48]

The curved profile of fragments nos. 23 and 24 suggests that they were part of semi-globular cups or kantharoi. Globular and semi-globular cups in Argive Light wares appear for the first time during MH IIIB according to Dietz's chronological scheme.[49] In the MH IIIB – LH IIA level at Pagona, there is evidence of globular and semi-globular cups produced in grey fabric.[50] According to Peter Pavúk, the incorporation of new shapes within the formerly narrow morphological corpus of Grey Minyan and Dark Burnished wares – as in the case of semi-globular cups – is indicative of a new phase which breaks the MH tradition, better suited to a LH I dating.[51] A very late MH or early LH date might also be assigned to the basin with an out-turned rim with a thickening on the inside, no. 25, given its similarity to the rim of a LH I–IIA bowl from Pagona.[52]

32 Zerner 1978, 138–140. – Rutter 1995, 355–376.

33 Katsarou-Tzeveleki 2011, Fig. 2/a.

34 Alram-Stern 2006, Pl. 19/230.

35 Zerner 1978, 139. – Zerner 2008, 191.

36 Compare with Sarri 2010a, Pl. 44.

37 Horizontal rounded ribs were very common in Lerna Va deposits, while sharp ridges are in general use later, see Zerner 1978, 139–140. Therefore, an early MH II chronology may fit well in this case. Lerna: Zerner 1978, Pl. 7/D BS GENERAL/5, 6, 10, 11 (MH I). Berbati-Mastòs: Säflund 1965, Fig. 125/1, 9–10 (EH III – MH I). The deposit dated to EH III by G. Säflund also includes early MH sherds, see Lindblom 2011, 89. Ayios Stephanos: Zerner 2008, Figs. 5.1/1009; 5.7/1099–1101 (MH I late).

38 Dietz 1991, 54, 69.

39 Papazoglou-Manioudaki 2010, Fig. 1 (MH II–III), comparable in particular with nos. 59–60.

40 Compare Dietz, Stavropoulou-Gatsi 2010, Fig. 1/13 (MH IIIA horizon) with no. 24.

41 Mastrokostas 1967, Pl. 160/β (upper centre and lower left).

42 There are none at Aigion (Papazoglou-Manioudaki 2010, 132) and no other goblet has been published from other sites in the region until now. However, the material that has been published thus far is too narrow to base overall statements on it.

43 The 'Lianokladi' ring-stemmed goblet has been acknowledged as the 'quintessential' shape of the MH 'True Grey Minyan' ware of central Greece, see Hale 2016, 250, 277. For a description and on the distribution of the shape, see Maran 1992a, 86–87. – Sarri 2010a, 110–124. – Pavúk, Horejs 2012, 35–36. – Balitsari, Papadopoulos 2018, 234–236. The term "complex rim bowls" was used by C. Zerner to describe open bowls bearing articulated profiles similar to those of the Lianokladi goblets, see Zerner 1986, 62. Only one sherd from a possibly imported late MH Lianokladi goblet was collected during the excavation, see Mercogliano, Borgna, in press.

44 Maran 1992a, 85–86. – Hale 2016. Although rarely, goblets are still found in LH I contexts, see, for instance, at Frantzi: Karantzali 2016, 45 and Fig. 16/39.

45 Maran 1992a, Pl. 70/11.

46 Rutter 1990, 430. – Dietz 1991, 170.

47 An almost exact parallel comes from a MH tumulus excavated in the Pyrgaki-Tsouka locality, near Pyrgos in Trifylia, see Rambach 2010, Fig. 1/α.

48 Asine: Nordquist 1987, Fig. 46/1. – Dietz 1991, Fig. 14/78.

49 Dietz 1991, 87–88.

50 Compare no. 21 in particular with Dietz, Stavropoulou-Gatsi 2010, Fig. 1/17 (MH IIIB – LH I/IIA).

51 Pavúk, Horejs 2012, 36.

52 Dietz, Stavropoulou-Gatsi 2010, Fig. 1/22.

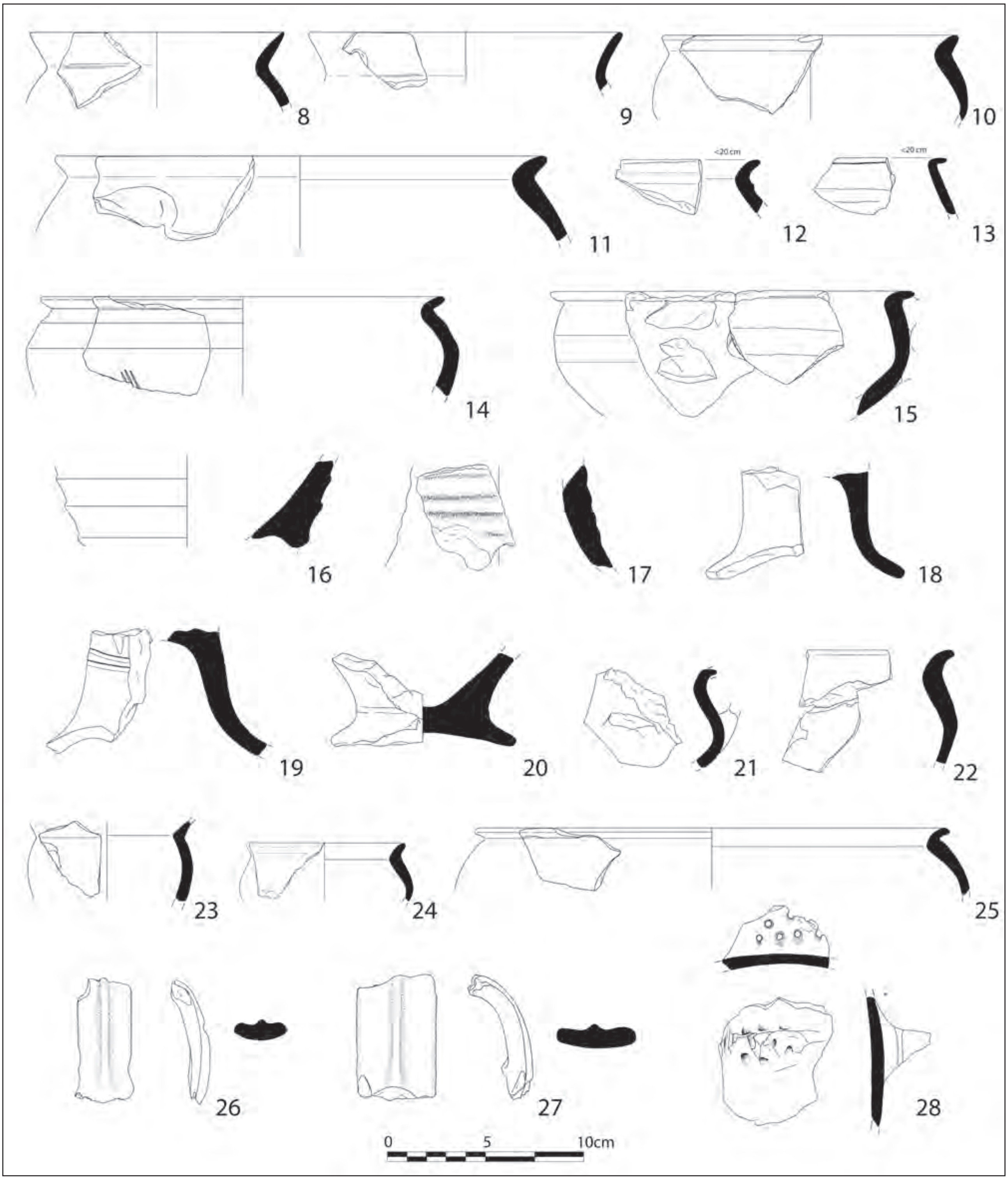

Fig. 5. Grey and Dark Burnished pottery, scale 1:3 (Drawings: N. Petropoulos).

Vertical strap handles with a mid-rib (nos. 26–27) are abundantly attested, but do not seem to be widely paralleled in southern Greece. Given the variability of their profile and dimension, they were likely features from different shapes, especially kantharoi and shoulder-handled bowls. Multiple-ribbed handles are typical of an early

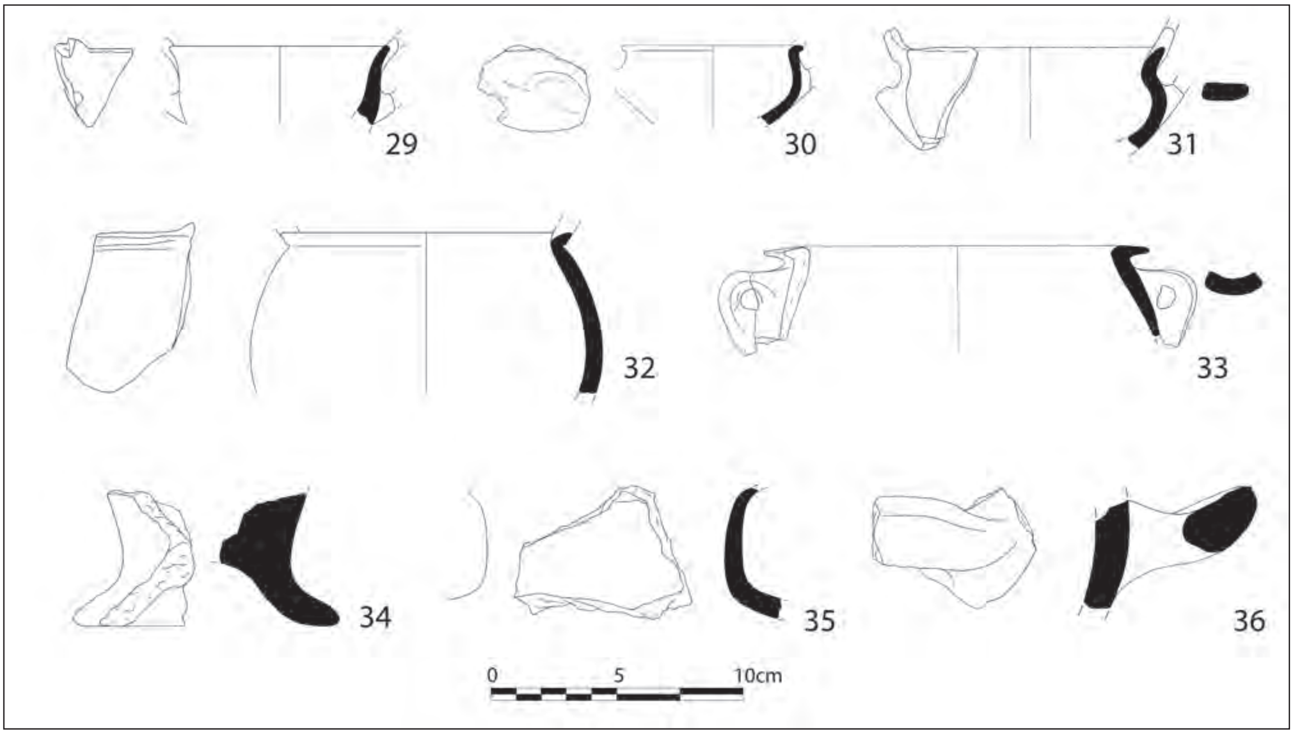

Fig. 6. Orange Burnished (29–34) and Medium-coarse to Coarse Light Unburnished (35–36) pottery, scale 1:3 (Drawings: N. Petropoulos).

MH phase.[53] The type with a central rib possibly betrays far-reaching northern connections,[54] but it has sometimes also been attested on coarse-incised 'Adriatic' vessels.[55] Overall, it seems more reasonable at present to consider it the result of local expression. A pierced lug made of medium-coarse grey fabric (no. 28), might belong to a closed shape. As a general tendency, dark-surfaced closed shapes are extremely rare in Greece, though they have been attested.[56]

53 At Mitrou, they are found during phases 1–4, corresponding to the EH III – MH I transition, MH I and MH I–II transition, see Hale 2016, 267 and Tab. 5.

54 Pefkakia-Magoula: Maran 1992a, Pls. 51/16 (phase 5); 71/11 (phase 6 früh); 115/20 (earlier or contemporary to phase 7); 120/16 (phase 7); 124/6 (earlier or contemporary to phase 7). Magoula Aidiniotiki (Thessaly): Maran 1992a, Pl. 42/8. Orchomenos: Sarri 2010a, Pl. 58/10. There are sparse occurrences of this feature in the southwestern Peloponnese (Nichoria): Howell 1992, fig. 3-33/P2417 ('Minyan' ware, MH II). See also Nezir caves (Albania): Andrea 1990, Pl. 15/1–2 (phase V, Middle Bronze Age). According to Z. Andrea, this morphological feature came to Albania as a result of the penetration of central Adriatic morphological elements in the Varvara cultures, see Andrea 1990, 32–33.

55 Lerna: Rutter 1995, Pl. 105/1260 (EH III). Kafkania: Rambach 2002, Pl. 7/58, 66. Malthi: Valmin 1938, Pl. XXI/D9.

56 Argos: Philippa-Touchais, Touchais 2011, Fig. 13/35–37 (late MH I). Filla-Kalogerovrysi: Sampson 1993, Fig. 48 (late MH). Eretria: Müller Celka et al. 2011, Fig. 8/36.

2.1.3. Orange Burnished (Fig. 6/29-34)

This category gathers all of the sherds from fine or semi-fine vessels with light-coloured surfaces, with shades ranging mainly from orange to red and – more rarely – from beige to yellow (5 YR 7/6–7/8–6/6–6/8, 7.5 YR 7/6–7/8–6/6–6/8, 10 YR 7/6). Fabrics are usually hard-fired and surfaces may be burnished or well smoothed. This category shows several macroscopic characteristics of the pottery traditionally known as 'Yellow Minyan',[57] also detected in the 'Yellow and Red Minyan' wares of central Greece[58] and in the long-lasting 'Hard Orange' wares of the southwestern Peloponnese.[59] The definition of this group also partially overlaps that of the 'Argive Light' wares described by Dietz.[60]

Nos. 29 and 30 belong to a category of small kantharoi commonly known as 'miniature kantharoi', which became popular in the MH III period in the northeastern

57 Wace, Blegen 1918, 181.

58 Sarri 2010b, 607.

59 Shelmerdine, Gulizio 2016, 160.

60 The burnished varieties, not including the painted examples, see Dietz 1991, 29–31.

Peloponnese,[61] also attested elsewhere in Achaea.[62] They both find precise parallels at MH III Tsoungiza.[63]

Kantharoi with an S-profile are represented as well (no. 31). S-profile kantharoi frequently appear in EH III – MH I contexts, although in contrast to no. 31, they usually present a deeper globular body and longer, wider, almost vertical rim.[64] While kantharoi tend to be angular or carinated in southern Greece from MH II onwards,[65] the S-profile kantharos is still found in central and northern Greece, where it gradually becomes smaller and shallower.[66] Thus, the kantharos represented by no. 31 can be generally dated to an advanced phase of the MH period.

The case of fragment no. 32 is both intriguing and uncertain. Its raised handle suggests that it is a kantharos, and its profile and short, thinned rim are reminiscent of a class of rounded kantharoi with sharpened vertical handles found in central Greece[67] and the Ionian Islands.[68] Unfortunately, the preserved fraction of the piece does not allow for a secure identification.

The shoulder-handled bowl fragment no. 33 might have been part of a goblet, as can be seen from the comparison with a similar fragment from Pisa, in Elis, showing traces of the joint of either a stem or a low foot.[69] Low feet do appear (no. 34), but the upper part of the vessel is missing in all cases. Low-footed goblets (or krateriskoi) are indicative of MH III – LH I phases and abundantly documented in the northeastern Peloponnese.[70]

2.1.4 Medium-coarse to Coarse Light Unburnished (Fig. 6/35–36)

Medium-coarse to Coarse Light-coloured fabrics ranging from reddish to pale orange (5 YR 6/8–7/6, 7.5 YR 7/8–6/6–7.5 YR 8/4) are employed for vessels with miscellaneous domestic functions, which are usually larger and closed, such as jars. Fabrics are not hard like the burnished categories described above and surfaces are almost invariably wiped.

The most frequent shape is the narrow-necked jar, a shape already common from the EH III period[71] and throughout the entire Middle Bronze Age. The short cylindrical neck with flaring rim, no. 35, seems to be more typical of hydriae or stamnoi of the late MH – early LH periods.[72] The concave-convex handle, no. 36, can be generally assigned to the MH period.[73]

2.1.5. Coarse Domestic/Cooking Pottery (Fig. 7)

Coarse Domestic/Cooking Pottery is abundantly attested in the recovered fragments. In this category, fabrics are coarse and mixed with small to rather large (up to 7–8 mm) red, grey, and white lithic inclusions. Surfaces are brown to red-coloured, occasionally mottled, and are either roughly or more carefully smoothed, while cores are greyish to black and grainy. The varied colour of the surfaces may have been caused by the use of the vessels for cooking but, given the fragmentary character of the material, it was very difficult to discriminate between the black surfaces created by cooking and those caused by uneven initial firing. As suggested by the evidence from other MH sites, such as Argos or Mitrou, there does not seem to be an exclusive, specialised local fabric type for cooking vessels at most settlements across the mainland during this period.[74] Similar observations have been made for the LH I cooking pottery from Tsoungiza.[75]

Ovoid jars with wide flaring rim (also known as 'wide-mouthed jars', nos. 37–39) are the most commonly recurring shapes. The wide-mouthed jar is commonly found from EH III to LH I all over Greece, without any substantial

61 Rutter 1990, 436. – Dietz 1991, 153. – Philippa-Touchais 2002, 16–17.
62 Papadopoulos 1979, Fig. 48/e (unknown provenance). See also the unpublished miniature kantharos displayed in a showcase of the Archaeological Museum of Aigion.
63 No. 31: Rutter 1990, Fig. 13/64. No. 32: Rutter 1990, Fig. 13/149.
64 Lerna: Rutter 1995, 44 (shape XI). – Zerner 1978, Pls. 5/D 594/4; 16/BE 435/3–BE 448/1 (MH I).
65 Zerner 1978, 140–141. – Dietz 1991, 48. – Philippa-Touchais 2002, 12.
66 Pefkakia-Magoula: Maran 1992a, Pl. 124/7 (phase 7, MH III). See also from Orchomenos: Sarri 2010a, Pl. 6/8.
67 At Pefkakia, this type of kantharos (type 2CIV) is known during phases 6 Mitte and spät (late MH II), see Maran 1992a, Pls. 93/9; 108/4.
68 Familiengrab 'S' near Skaros Hill, Leukas, see Kilian-Dirlmeier 2005, Pl. 47/2 (grave S8).
69 Rambach 2002, Fig. 12/P6 (MH II–III).
70 Dietz 1991, Fig. 51. Tsoungiza: Rutter 2015, Fig. 3/E 11 (LH I). Korakou: Davis 1979, Fig. 9/193, 195 (LH I).
71 Rutter 1995, 48–49 (shape XVII).
72 Dietz 1991, Fig. 58/AI-6 (MH IIIB), Fig. 59/AI-8 (LH IB). Korakou: Davis 1979, Fig. 10/222–229 (LH I).
73 Aigeira: Alram-Stern 2006, Pl. 22/263. Kafkania: Rambach 2002, Figs. 5/43; 8/81.
74 The local Coarse ware from Argos included shapes intended for both storage and cooking, see Touchais 2007, 84; see also Balitsari 2019. On Mitrou, see Lis 2017b, 197–198. The only exception seems to be Kolonna, where there was a specific fabric recipe used mainly for cooking pots, see Gauss – Kiriatzi 2011, 131, 199; Gauss et al. 2017, 51.
75 Lis 2020, 854.

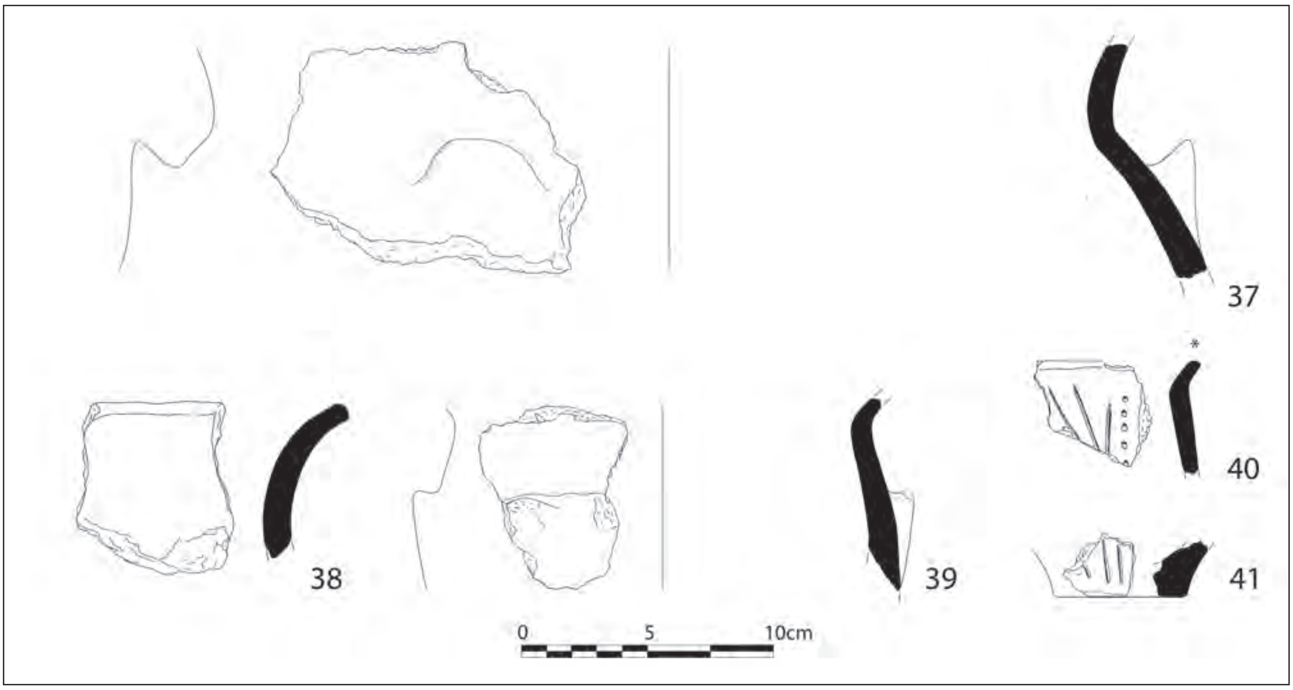

Fig. 7. Coarse Domestic/Cooking Pottery, scale 1:3 (Drawings: N. Petropoulos).

diachronic morphological variation.[76] Horn-shaped knobs, like the one found on the small jar no. 39, are a long-lasting feature from prehistoric times, also documented in MH contexts.[77]

Coarse incised decoration traditionally called 'Adriatic' is also present (nos. 40–41). The Adriatic ware definition identifies a group of coarse and semi-coarse vessels bearing incised decoration according to a rather simple syntax, usually composed of groups of vertical, horizontal and oblique lines in a herringbone pattern or rectangular panels variously arranged on the surface of small or medium-sized wide-mouthed jars or jugs.[78] As a result of the study carried out by Jeremy Rutter at Lerna IV, it is now generally acknowledged that this ware first appears in the EH III period, as a local innovation.[79] The case of fragment no. 40, with incised oblique lines and a row of dots, appears to be rather unusual. Rows of dots are rare but still present on MH coarse incised vessels.[80]

MH 'Adriatic' ceramics have been uncovered elsewhere in Achaea at Teichos Dymaion,[81] Pagona,[82] Aigion,[83] Aigeira[84] and in the Kastria Cave, near Kalavryta.[85] The coarse incised ware from this last context, which dates to a late phase of the MH, shows an especially high degree of variation in both shape and decoration.

2.1.6. Pithoi (Fig. 8)

Pithoi represent a problematic category in terms of chronology, as they are likely to remain in use for extended periods.[86] Prehistoric pithoi from mainland Greece lack a systematic

76 Lerna: Rutter 1995, 442–454 (EH III). Argos: Touchais 2007, 85–87 and Figs. 2–4 (MH). Tsoungiza: Rutter 1989, 12 and Fig. 7/18–19 (LH I). Mitrou: Lis 2017b, Fig. 3 (LH I–II). See also Lis 2017a, 39–40.

77 The type is common in all layers of the Aspis, see Touchais 2007, 88. Lerna: Zerner 1978, Pl. 2/D 563/16 (MH I). Argos: Philippa-Touchais, Touchais 2011, Fig. 13/40 (late MH I – early MH II). Nichoria: Howell 1992, Pl. 3-27/P2369–2371 (MH I). Kastria Caves: Sampson 1997, Pl. 82/340 (late MH). Frantzi: Karantzali 2016, Fig. 14/31 (mixed MH deposit). Pefkakia-Magoula: Maran 1992a, Pls. 43/8 (phase 4, MH I); 98/12 (phase 6 Mitte, late MH II).

78 The best and most numerous examples of coarse incised MH pottery are to be found in the western and southern Peloponnese, at Malthi (Valmin 1938) and Nichoria (Howell 1992). For a general description and overview of the so-called 'Adriatic' ware, see Rutter 1995, 632. – Touchais 2007, 88–89. – Sarri 2010a, 183–186.

79 Rutter 1995, 633–634.

80 Argos: Touchais 2007, 88. Nichoria: Howell 1992, Fig. 3.4/P2091 (MH I). Dimitra: Syriopoulos 1973, Pl. 48a/28–31.

81 Mastrokostas 1967, Pl. 160/α (lower left).

82 Dietz, Stavropoulou-Gatsi 2010, Fig. 1/11–12 (MH IIIA horizon).

83 Papazoglou-Manioudaki 2010, 131–132.

84 Alram-Stern 2006, Pl. 21 (EH III – MH I/II).

85 Sampson 1997, Figs. 81–82.

86 Rutter 2015, 210.

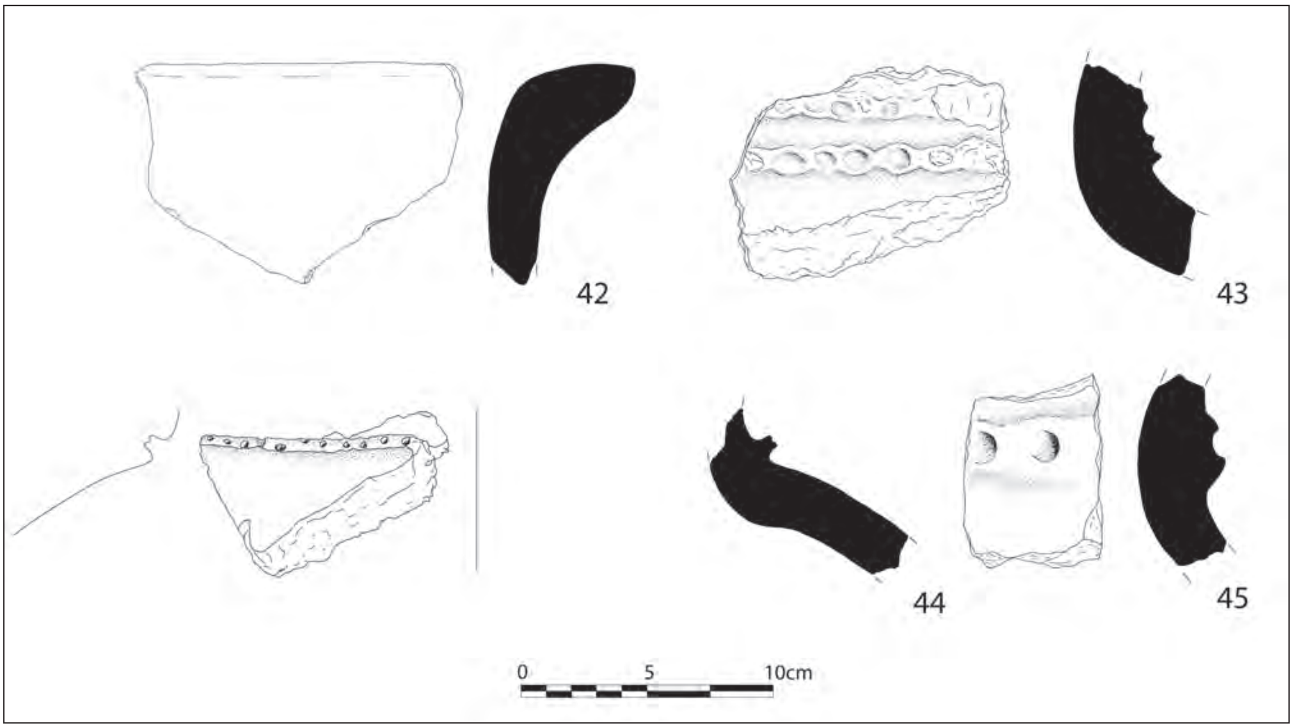

Fig. 8. Pithoi, scale 1:3 (Drawings: N. Petropoulos).

typological study,[87] and MH ones have been said to be "the most neglected ceramic types of the Aegean Bronze Age".[88] Due to these factors, the materials included in this category could only be framed into general long-term spans.

The pithoi fragments recovered at the Trapeza regularly show a rather uniform fabric recipe, which is likely to have been specifically designed for this shape. They are made of a pink to orange clay (5 YR 7/4–7/8, 7.5 YR 8/3–8/4, 7/3–7/6) mixed with selected inclusions of red flint. The pithoi retrieved at the EH III settlement of Helike (eastern Achaea) have similar technical characteristics to the pithoi from Trapeza.[89]

The fragment of a pithos with a horizontally everted and thickened rim (no. 42) has parallels at MH I Nichoria,[90] as well as MH III Asine,[91] and even in LH I–II contexts.[92] Narrow-necked pithoi bearing plastic bands with fingerprints or circular impressions at the junction between the neck and the shoulder (as in fragments nos. 43, 44 and 45) are part of a long-lasting tradition starting in EH III, covering the entire MH period and including the LH I.[93]

2.2. Late Helladic Pottery (Figs. 9–10)

Fragment no. 46 belongs to a kylix (FS 256) decorated with antithetic wavy stems.[94] It has close parallels from LH IIIA2 in Phocis.[95] The decorative scheme, consisting of a second exterior band below the rim and interior bands, is unusual on kylikes and more often found on stemmed bowls. It is noteworthy that this feature occurring on various types of

87 Lis, Rückl 2011, 154.

88 Rutter 2007, 35.

89 Katsonopoulou et al. 2016.

90 Howell 1992, Pl. 3-30.

91 Dietz 1980, Fig. 64/55. – Dietz 1991, Fig. 23/212 (MH IIIB).

92 Frantzi: Karantzali 2016, Fig. 22/81 (LH I–II deposit).

93 Tsoungiza: Pullen 2011, Fig. 6.68/734 (EH III). Helike: Katsonopoulou 2011, Fig. 11. – Katsarou-Tzeveleki 2011, Figs. 16–17 (EH III). Aigeira: Alram-Stern 2006, Pl. 22/260 (EH III – MH I/II). Deriziotis Aloni: Stocker 2003, Fig. 25/P154 (double row of rope pattern decoration, EH III). Koumoula: Touchais 1981, Fig. 44/2 (MH). Kafkania: Rambach 2002, Fig. 10/110 (MH II–III). Tsoungiza: Rutter 1990, Fig. 17/113 (MH III). – Rutter 2020, Fig. 9.18/D123, D125 (MH III – LH I); 9.37/D362 (MH III – LH I, compare in particular with no. 44 for the punctuate decoration); 9.44/E31 (LH I). Kiapha Thiti: Maran 1992b, Pl. 21/679 (LH I).

94 Borgna, Vordos 2019, Fig. 4. Mistakenly published with three bands below the rim in Borgna et al. 2019, Fig. 2/f.

95 Krisa: Mountjoy 1999, Fig. 294/64. Delphi: Mountjoy 1999, Fig. 294/66.

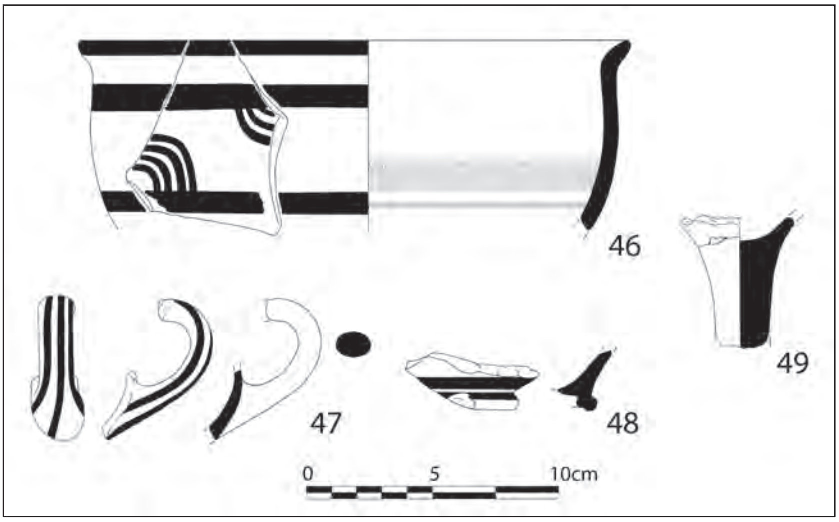

Fig. 9. Mycenaean pottery, scale 1:3 (Drawings: N. Petropoulos).

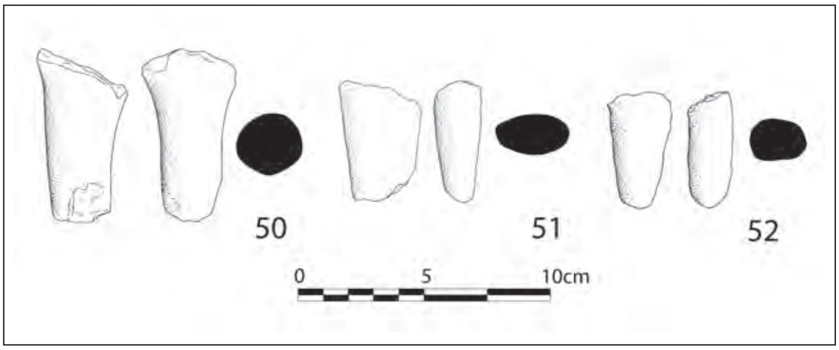

Fig. 10. Coarse tripod legs, scale 1:3 (Drawings: N. Petropoulos).

open shapes other than the stemmed bowl is a regional characteristic of Phocis.[96]

The handle, no. 47, painted with three vertical bands, is consistent with the same type of kylix. The base, no. 48, belongs to a ring-based shape, possibly a small piriform jar. For the kylix stem, no. 49, only a general LH III span can be proposed, most probably LH IIIA–B, when kylikes were widespread.

Three fragments of legs made of coarse clay are ascribable to tripod cooking pots. Their section varies from circular (no. 50) to elliptical (no. 51) and rounded irregular (no. 52). The tripod appears in Mainland Greece during the Early Mycenaean phase and becomes a standard shape only from LH IIB–IIIA1 onwards.[97] Some of the earliest evidence of this shape can be found in the LH IIA level at Mitrou, where a few occurrences of tripods have been found.[98] It is difficult to propose a more specific chronology for the leg fragments from the Trapeza, but, in any case, they almost certainly date to a phase following the Middle Bronze Age.

2.3. Small Finds (Fig. 11)

A few ceramic objects – all classifiable as textile tools – have been discovered at the site.

Nos. 53 and 54 belong to longitudinally pierced terracotta spools with concave ends. This type of spool appears early in the MH at Ayios Stephanos[99] and Lerna,[100] from

96 Especially on kantharoi and krateriskoi, see Mountjoy 1999, 744–745.

97 Lis 2017b, 196. Tripods are found at Kolonna in MH III and LH I, see Gauss et al. 2017, Figs. 6.5–6.6. Tripods found in MH III – LH I contexts of the mainland are imports either from Crete or Aegina: Tsoungiza: Rutter 1990, Fig. 18/171 (MH III). Asine: Dietz 1991, Fig. 16/108 (MH IIIA). Lerna: Lindblom 2007, 127 and Fig. 10 (lower right) (LH I). Korakou: Davis 1979, 252 (LH I).

98 Lis 2017b, Fig. 7.

99 Banks, Janko 2008, 427 and Fig. 9-23.

100 Caskey 1957, Fig. 3. – Banks 1967, 561–562 and Pl. 19/c1–c3.

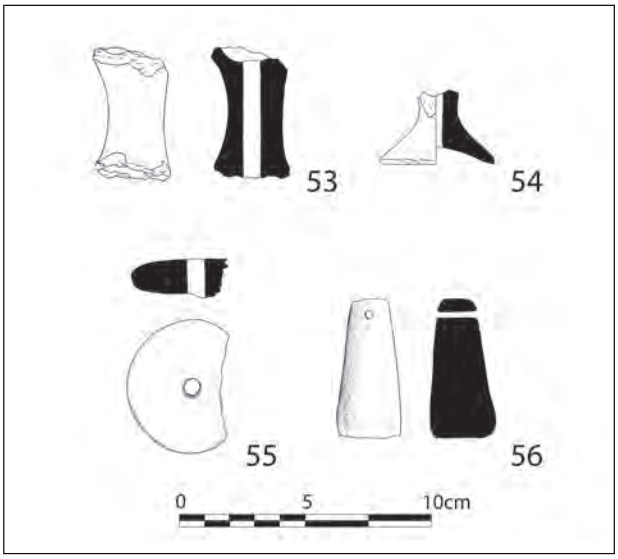

Fig. 11. Small finds, scale 1:3 (Drawings: N. Petropoulos).

phases 6 and 7 (MH II–III/LH I) at Pefkakia-Magoula[101] and – generally – is quite common all over Greece and as far as Chalkidiki and western Anatolia, during a span covering the MH II–III and LH I–II periods.[102] According to Jill Carington Smith's hypothesis, such spools might have been used in connection with horizontal looms.[103]

The flat clay disc with perforation, no. 55, may have been used as a spindle whorl. Flat discoid whorls are quite common in Neolithic times, but they make rare appearances during the Bronze Age.[104] A few parallels from MH contexts can be mentioned: one from MH I Nichoria,[105] the other from MH II–III Kafkania.[106]

The truncated-pyramidal loom weight (37 g) with a horizontal hole below the top (no. 56) is particularly interesting. Considering that weights of similar shape are in use until at least the early Roman period[107] and that the discovery of loom weights within MH contexts – especially in southern Greece – seems to be rare,[108] one could interpret the loom weight no. 56 as the result of a later occupation. Nevertheless, weights of pyramidal and truncated pyramidal shapes do occur starting in the Early Bronze Age period in northern Greece.[109] Two pyramidal loom weights have been found at Ayia Triada-Chalkis in Aitolia: one in a layer with mostly MH III materials,[110] the other was found in a LH IB deposit.[111] There is one example known at Kirrha with no precise indication of its archaeological context,[112] but it might well be Middle Helladic.[113] A pyramidal loom weight is also documented in a mixed prehistoric context at Ayios Stephanos.[114] Elizabeth Banks suggests that the appearance of this type at the site may have occurred at the end of the MH or the beginning of the LH period.[115] Therefore, there is a good chance that no. 56 dates to the late MH – early LH period as well.

3. General Remarks on Pottery

The abundance of pottery clearly proves the presence of a well-established settled site. As shown in the table (Fig. 12), a large part of the material was gathered in area D, the smallest of the surveyed areas, but the one located in close proximity to the largest flat area, where the ancient habitation may have been concentrated. The clustering of the remains may also be the result of exposition from harrowing and cultivation, but, in any case, an extensive anthropic sequence has been verified through excavation.

Almost all of the wares identified can be placed in the MH pottery tradition. Two major diagnostic categories characterize the sample: Matt-painted and fine unpainted (grey, dark or orange) burnished pottery. Matt-painted decoration is found across open and closed shapes, encompassing both tableware and storage functions. Motifs are mainly composed of geometric figures (notably solidly painted triangles) or groups of lines forming net patterns. Although not represented among the surface material, curvilinear patterns do appear, as testified by a few sherds coming from a transitional MH – LH horizon excavated in one of the test trenches.[116]

101 Maran 1992a, Pl. 155/3–4, 6–7.
102 Carington Smith 1975, 404–407. – Pavúk 2012, 123–126 with the entries collected on pages 129–130 and in Pl. XXXIV/a.
103 Carington Smith 1975, 218–239.
104 Carington Smith 1975, 398–399. – Carington Smith 1992, 682.
105 Carington Smith 1992, Fig. 11-2/2664 (type 12).
106 Rambach 2002, Fig. 11/S5 (MH II–III).
107 Carington Smith 2000, 236.
108 Carington Smith 1975, 400. – Carington Smith 1992, 689.
109 Refer to the sites mentioned in Carington Smith 2000, 236. At Pefkakia-Magoula, they occur in the *Übergangsphase* (EH III), and in phase 3, i.e., at the transition between EH III – MH, see Maran 1992a, Pl. 155/9–10, 12. They have been found in a securely dated closed context in Archontiko, western Macedonia, see Papadopoulou 2012, Pl. XXII/g–h (phase IV, 2135–2020 BC). A conical loom weight found in EH II Tiryns is unique in the Argolid, see Siennicka 2012, Pl. XXV/g.
110 Dietz, Moschos 2006, 104–105 and Fig. 60, but the context is disturbed by later Archaic activities.
111 Dietz, Moschos 2006, Fig. 40.
112 Dor et al. 1960, 144 and Pl. XII/6489.
113 An Early or Middle Bronze Age date had already been proposed, see Carington Smith 1992, 689.
114 Banks, Janko 2008, Fig. 9.4/6059.
115 Banks, Janko 2008, 427.
116 Borgna et al. 2019, Fig. 2.

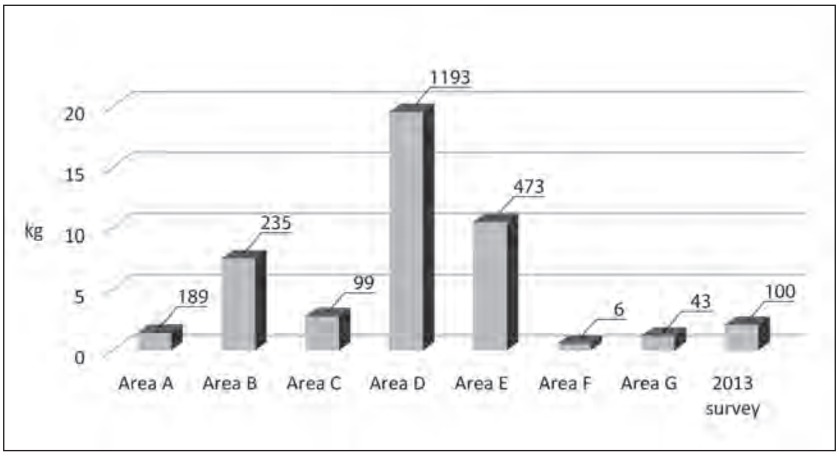

Fig. 12. Graph showing the amount of pottery recovered over different surveyed areas according to weight. The respective number of fragments is indicated above each bar (Graphics: A. Mercogliano).

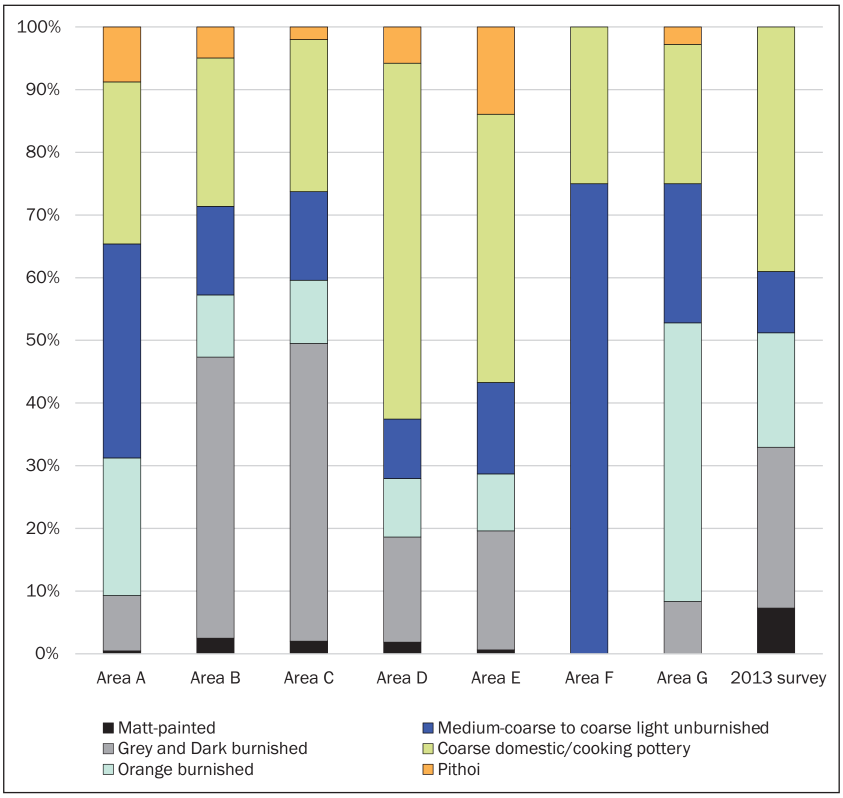

Fig. 13. Graph showing the ratio between different classes of pottery over different surveyed areas by sherd count (Graphics: A. Mercogliano).

As for the plain burnished pottery, a primary distinction was made between the dark-surfaced and light-surfaced classes. Grey and Dark Burnished pottery is almost exclusively associated with open shapes, mainly medium- to large-sized (15–30 cm diameter) bowls (pedestalled or not) and basins. The decoration, horizontal grooves or incised lines, is quite uniform and canonical. Plain light fabrics, on the other hand, are used both for open and closed shapes. The Orange Burnished group mostly includes cups and kantharoi, which tend to be smaller (with an average diameter of 10–15 cm) than their dark counterparts. The standard plastic and/or incised decoration commonly found in dark unpainted wares is not found.

Some differences can be detected by looking at the ratio between different classes of pottery over different areas (Fig. 13). It is possible that the differences in the spatial distribution of pottery may indicate differences in the use of areas. Grey and Dark Burnished pottery appears to be underrepresented in areas A, C, G and F, primarily at the edges of the slope. The scarcity or absence of pottery belonging to this category in some areas of the site might also be of chronological significance. A general pattern has been identified in other sites showing that the relationship between Grey/Dark Burnished and burnished wares of light colour gradually reversed during the MH period: while Grey/Dark Burnished wares constituted a preponderant part of the fine pottery assemblage at the beginning of the Middle Bronze Age, burnished wares of lighter colours gradually became favoured for tableware starting in the late Middle Bronze Age.[117] Perhaps not by chance, most of the Mycenaean decorated sherds have been collected in one of the areas (area A) where Grey and Dark Burnished wares are overshadowed by light counterparts. Area A and marginal areas of the site (areas F and G) may have been the focus of later occupation or may simply hide more recent sequences of habitation that are better preserved.

The catalogued sherds can be gathered into four main chronological groups:

1. Late EH III – early MH group: this group is very poorly represented, exclusively by grey-surfaced sherds from bowls/cups with globular bodies (Fig. 5/8–9). The few parallels mainly point to the northeastern Peloponnese. There is no clear indication of Matt-painted pottery dating to the early MH thus far. Matt-painted pottery was absent from Aigeira, which was possibly occupied during the EH III – MH II period.[118] This may be indicative that painted wares were extremely rare in pottery contexts of the earliest MH period in Achaea.

2. Middle to late MH group: this is by far the richest group, attested by Matt-painted and fine unpainted wares in a wide variety of shapes, such as kantharoi (Figs. 5/21; 6/29–32), goblets (Figs. 5/15–19; 6/33), grooved and carinated bowls (Fig. 5/12–15, 22), basins (Fig. 5/11), jugs (Fig. 4/5–6) and jars (Figs. 4/7; 5/35). Similar shapes and wares are widely documented in a large geographical area, once again including Corinthia and the Argolid, but also the western Peloponnese and central Greece.

3. Transitional MH – LH: this group, which lacks a clear chronological definition (see below), collects all of the vases in the MH tradition which potentially fall into an early LH date, including globular and semi-globular cups and bowls (Fig. 5/23–25), low-stemmed goblets (Fig. 6/34) and krateriskoi with matt-painted triangles (Fig. 4/1–4). This pottery retains strong connections with the cultural sphere of the northeastern Peloponnese, but also shows some aspects that are only paralleled in Achaea and the neighbouring regions, emphasizing the presence of new local traditions in this area. An example of this phenomenon is the solidly painted triangles, which seem to be a signature of the decorative repertoire of late MH – early LH Achaean Matt-painted pottery, both eastern and western, with an influence reaching as far as the opposite side of the Corinthian Gulf, in Aitolia and Phocis.[119]

4. Mycenaean group: after an apparently long absence in remains, a small group of sherds, including a diagnostic LH IIIA2 decorated kylix (Fig. 9/46), provides evidence for Late Bronze Age occupation at the site.

The Medium-coarse to Coarse Light Unburnished, Coarse Domestic/Cooking Pottery and Pithoi should be mentioned separately, as they potentially fall within a wide range of time between the EH III – LH I periods, not allowing for a more precise dating.

The remaining group of ceramic objects (Fig. 11) can be placed in a late MH – early LH time span.

Several varieties of imported pottery, including wheelmade Grey Minyan ware, Aeginetan, Cycladic or Minoan vases, are completely lacking.[120] Not even one sherd could be conclusively assigned to the earliest Mycenaean 'Lustrous-decorated' wares. However, a LH date could be suggested for a few sherds manufactured in a MH tradition. Similar evidence has been observed on the pottery from the surface survey of the Mastos Hill in the Berbati Valley.[121] This absence leads to the issue of the identification of LH I, especially in peripheral contexts (compared to the northeastern and the southern Peloponnese), where the replacement of MH traditional wares was supposed to have been a slow process.[122] Indeed, there is increasing evidence for the

117 Rutter 2007, 5. – Pavúk, Horejs 2012, 37. G. Nakou interestingly linked this change to the increasing circulation of gold metal vessels in mainland Greece, see Nakou 2007, 236. See also Rutter 2012.

118 Alram-Stern 2010, 146–147.

119 Dor et al. 1960, Pl. XXX (upper left). – Dietz 2007, 87 and Fig. 2/4. – Dietz, Stavropoulou-Gatsi 2010, 125.

120 A few sherds from possibly imported vessels, including a Grey Minyan goblet, have been identified in the materials from the excavations, see above n. 43.

121 Lindblom 2011, 89–90.

122 Dietz 1991, 92–93. – Mountjoy 1999, 20. – Rutter 2012, 417. For recent general considerations on the LH I ceramic phase, see Dickinson 2014. – Lindblom, Gauss, Kiriatzi 2015. – Rutter 2015. – Dickinson 2021. The recently published detailed study on MH III – LH II ceramics from Tsoungiza shows that during the earliest LH I, Lustrous-decorated ceramics at the site are represented by

definition of a LH I "pre-early Mycenaean pottery stage" lacking Lustrous-decorated pottery,[123] further confirmed by the pottery sequence excavated at Mitrou, where LH I covers four subphases, the first two of which do not feature Mycenaean pottery.[124]

The earliest Mycenaean Lustrous-decorated pottery from Achaea constitutes a very small corpus and is so far attested at Aigion,[125] Mygdalia,[126] Pagona,[127] and Portes.[128]

4. A Diachronic Overview of the Site in the Framework of Middle Helladic Greece

The available information suggests that the site was founded at a very late stage of the Early Helladic or early in the Middle Helladic. Given the paucity of MH I diagnostic features, occupation may have been more intense late within this phase or early in MH II, possibly about the same time as the reoccupation of Aigion, on the coast.[129] Late EH III and early MH occupation is quite sparse in Achaea and has been uncovered at Teichos Dymaion,[130] Aigeira[131] and, recently, also at Lousika,[132] in the western part of the region.[133]

More substantial evidence has been recorded for the MH II and MH III periods, when Greece witnessed an increase in the number of settlements all over the mainland, including inland locations, according to a phenomenon that has been called 'colonization of the interior' by Jeremy Rutter.[134] As testified by the excavated sequence, the late MH might have been concurrent with massive terracing and levelling activities that are indicative of a change in the topography of the settlement. In the rest of Achaea, substantial social and economic growth has been recorded at the MH III – LH I transition, with the establishment of prominent sites, especially in the western part of the region, which started to experience a strong cultural connection with Aitolia, on the other side of the Corinthian Gulf.[135] There has been much discussion about a partition of Achaea into two cultural districts separated by the Panachaikon range, not only in the prehistoric period, but also during historical times.[136] Indeed, eastern Achaea seems to have always maintained closer relations with the northeastern Peloponnese, whereas the western part shared more cultural traits with Elis and Ionian Greece. This has also been claimed for the EH and early MH periods,[137] and seems to be confirmed by the 'early MH' and 'middle to late MH' groups at the Trapeza, which strongly resemble northeastern Peloponnese pottery production. According to the present state of knowledge, cultural differences between eastern and western Achaea appear to have been more strongly demarcated at the transition to the LH period, especially in the funerary sphere.[138] As already mentioned above, the MH – LH transitional pottery at the Trapeza shows many similarities to the northeastern ceramic sphere, although it should be emphasized again that, in some cases, the search for closely related materials revealed parallels only found in Achaea and in a few sites on the other side of the gulf. The evidence suggests that, despite strong influences from the northeastern Peloponnese, the pottery at the site featured certain local characteristics.[139]

At the moment, it is difficult to clearly demonstrate to what extent the Trapeza settlement survived into LH I, given the absence of many of the diagnostic LH I features and

Minoan or Minoanizing imports which account for 3.4 % of the inventoried pottery. Only from a developed subphase of LH I and, for sure, by the LH IIA, does most of the Mycenaean Lustrous-decorated pottery at Tsoungiza come from a ceramic industry inaugurated in the immediate environs of Mycenae, presumably based in the pottery workshop at Berbati, see Rutter 2015. – Rutter 2020, 559–562, 648.

123 Mathioudaki 2014, 15.

124 Van de Moortel et al. 2019, 288 and n. 37.

125 Papazoglou-Manioudaki 2010, 136 and Figs. 15–16 (LH I).

126 Papazoglou-Manioudaki, Paschalidis 2021, Fig. 9 (LH I/IIA).

127 Dietz, Stavropoulou-Gatsi 2010, 124–135 and Fig. 1/21–22 (LH I/IIA).

128 Moschos 2000, 17 and Fig. 9/1–2 (LH I).

129 Papazoglou-Manioudaki 2010.

130 Beyond the reports of the old excavations by E. Mastrokostas (Mastrokostas 1966a. – Mastrokostas 1966b. – Mastrokostas 1966c. – Mastrokostas 1967), see also the recent finds and reconsiderations by M. Gazis (Gazis 2017. – Gazis 2018).

131 Alram-Stern 2006. – Alram-Stern 2010. The recent finding of Pattern-painted pottery at the site provides an explicit hint that it was occupied at least from the late EH III (the fragments are illustrated in ÖAI 2013, 93–94).

132 Philis 2017.

133 EH III settlements are also known at Helike (Katsarou-Tzeveleki 2011. – Katsonopoulou 2011. – Katsonopoulou, Katsarou-Tzeveleki 2017) and Keryneia (Kolia, Spiroulias 2017. – Kolia, Spiroulias 2020), but both were abandoned before the end of the Early Bronze Age.

134 Rutter 2001, 131.

135 Dietz, Stavropoulou-Gatsi 2010, 125. Remains of megaron buildings dated to the late MH – early LH period have been uncovered in the area of Katarraktis, see above n. 25. A transitional MH III – LH I phase has been identified at Mygdalia, see Papazoglou-Manioudaki 2015. – Papazoglou-Manioudaki, Paschalidis 2017, 453. – Papazoglou-Manioudaki, Paschalidis, Jones 2019, 199–201. – Papazoglou-Manioudaki, Paschalidis 2021. The cemetery excavated at Portes records early LH examples of large built chamber tombs cut inside a tumulus, see Moschos 2000.

136 Petropoulos 2012. – Petropoulos 2016.

137 Alram-Stern 2010, 147.

138 Arena 2015, 12–13.

139 This issue attracted much more attention in relation to the Early Mycenaean period and to the establishment of a Mycenaean province in the Aigialeia, even though an independence model is now more widely accepted, see Arena 2015.

wares. One should nonetheless consider the position of the site, far from the coast and from significant long-distance connection routes or trading centres, such as Kolonna or Kastri on Kythera.[140] Moreover, if the surveyed area (about 1 ha) actually corresponds to the settlement size, then it would be considerably smaller than the estimated average area of late MH sites.[141] Herding must have been a substantial subsistence strategy at the site and, consequently, weaving and textile production would have been one of the main occupations, as demonstrated by the textile tools recovered. The identification of the site as a small-scale hamlet would further justify the absence of many imported wares and make it a perfect candidate as a 'type-site' of local pottery production.[142]

The Early Mycenaean period appears to be under-represented at the Trapeza, while many other sites were flourishing elsewhere in Achaea: in the western part of the region, coastal (or subcoastal) sites and inland locations became prominent, probably along a vertical axis of cultural connection linking Achaea with Ionian Greece.[143] In eastern Achaea, coastal sites like Aigion are distinctive, probably fostered by maritime trade routes that involved the future palatial poles of the Argolid together with several centres facing the Corinthian Gulf, such as Korakou or Kirrha.[144] Due to its defiladed geographical location, the Trapeza area may have lacked some of the crucial connections for the cultural and socio-economic growth of Early Mycenaean Achaea.

Scant evidence of occupation is recorded again in Palatial times, at least from the LH IIIA2 period, a phase that is, by contrast, well attested at the Mycenaean chamber tomb cemetery nearby.[145] Whether habitation was discontinuous, relocated or just obliterated by modern land use remains an open question to be solved by further systematic excavations.

The discovery of the MH site of the Trapeza therefore opens new interesting perspectives for research into a poorly known period in Achaea, which reveals evidence for widespread phenomena, but – at the same time – is distinguished by local characteristics that have yet to be systematically explored.

140 It is worth noting that no Aeginetan pottery is reported from the early LH horizon at Pagona, see Dietz, Stavropoulou-Gatsi 2010.

141 Wiersma 2014, 204, 214.

142 For further explanation on the characteristics of a 'type site', see Rutter 2007.

143 Tsonos 2016, 263–264.

144 Arena 2015, 28. The finds from the Early Mycenaean megaron at 8 Polychroniadou Street confirm the key role of Aigion within the trade network of the northeastern Peloponnese, see Papazoglou-Manioudaki 2015.

145 A possible connection between the cemetery and the settlement has been suggested in Borgna et al. 2019.

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Ashes to Kraters, Dust to Jugs. Use of Ceramic Vessels as Urns in the Middle and Late Bronze Age East Aegean–West Anatolian Region

Filip Franković

Abstract

The appearance of a large number of cremation burials towards the end of the Late Bronze Age in the west Aegean is usually explained as a result of the influence from the east Aegean–west Anatolian region, which is itself seen as influenced by the central Anatolian tradition. Although in some cases the cremated remains were deposited directly into graves, there are a number of cases in which they were first deposited in urns. This paper focuses on the use of urns in the east Aegean–west Anatolian region during the Middle and Late Bronze Age. It examines the use of different shapes of ceramic vessels as urns, as well as the similarities and differences between the attested traditions. The paper also compares the east Aegean–west Anatolian traditions to the picture emerging from the cemeteries in central Anatolia in order to re-examine the possible origin of the east Aegean–west Anatolian practices. Moreover, the east Aegean–west Anatolian traditions in the use of ceramic vessels as urns are compared to the newly emerged traditions at the end of the Late Bronze Age in the west Aegean. Finally, the results are used to re-evaluate the widely accepted and simplified narratives about the spread of the cremation burial rite from Anatolia to the west Aegean.

Keywords

Late Bronze Age, east Aegean–west Anatolian region, central Anatolia, Greek mainland, Crete, urns

Zusammenfassung – *Asche zu Krateren, Staub zu Krügen. Verwendung von Keramikgefäßen als Urnen in der mittleren und späten Bronzezeit in der Region Ostägäis-Westanatolien*

Das Auftreten einer großen Zahl von Brandbestattungen in der Westägäis am Ende der Spätbronzezeit wird in der Regel als Einfluss aus der Region Ostägäis-Westanatolien erklärt, der wiederum auf eine zentralanatolische Tradition zurückgeführt wird. Obwohl die verbrannten menschlichen Überreste in einigen Fällen direkt in Gräbern deponiert wurden, wurden die Überreste häufiger zuerst in Urnen deponiert. Dieser Artikel untersucht die Verwendung von Urnen in der Region Ostägäis-Westanatolien während der mittleren und späten Bronzezeit. Er beschäftigt sich außerdem mit der Verwendung unterschiedlicher Keramikgefäße als Urnen sowie mit den Gemeinsamkeiten und Unterschieden der durch die Forschung dokumentierten regionalen Traditionen. In diesem Artikel werden auch die ostägäischen-westanatolischen Traditionen den Gräberfeldern in Zentralanatolien gegenübergestellt, wodurch der mögliche Ursprung der ostägäischen-westanatolischen Praktiken überprüft wird. Darüber hinaus werden die ostägäischen-westanatolischen Traditionen der Verwendung von Keramikgefäßen als Urnen mit den neuen Traditionen verglichen, die in der westlichen Ägäis am Ende der Spätbronzezeit auftreten. Schließlich wird eine Neubewertung der weithin akzeptierten, jedoch vereinfachenden Annahme vorgenommen, die davon ausgeht, dass Brandbestattungen sich von Anatolien in die westliche Ägäis ausgebreitet haben.

Schlüsselbegriffe

Spätbronzezeit, Ostägäis-Westanatolien, Zentralanatolien, griechisches Festland, Kreta, Urnen

1. Introduction

Cremation burials began to appear in large quantities in the west Aegean towards the end of the Late Bronze Age (LBA), namely during the LH IIIC period according to the Aegean relative chronology or the 12th and early 11th centuries BC. Their appearance is often connected to cultural influences from the surrounding regions.[1] More precisely, the origins of cremation have been traced to Italy,[2] the Balkans[3] or most commonly Anatolia.[4] It is not surprising that the origin of the cremation burial rite in the Aegean is most commonly traced back to Anatolia, as this burial rite was widely employed in Anatolia during the 2nd millennium BC. In the periods preceding the 12th century BC, cremation has often

1 For an overview, see Jung 2007. – Ruppenstein 2013.
2 E.g. Dickinson 2006, 73. – Jung 2007, 229.
3 E.g. Ruppenstein 2013, 190.
4 E.g. Davaras 1973, 162, 167. – Mee 1978, 137. – Melas 1985, 169. – Georgiadis 2003, 83, 85. – Jung 2007, 220–221, 229.

been used to create a dichotomy between the Greek mainland and Anatolia due to its wide employment at 'Hittite' cemeteries in central Anatolia and uncommon occurrence at 'Mycenaean' cemeteries on the Greek mainland. However, the dichotomy is hard to maintain in the east Aegean–west Anatolian cemeteries.

Between the late 15th and the 13th century BC or the LH IIIA–IIIB period according to the Aegean relative chronology, the east Aegean–west Anatolian region witnessed a sudden and significant increase of imported and locally produced objects, as well as other material forms, often described as 'Mycenaean'.[5] One such form is 'Mycenaean-type' tombs (rock-cut chamber tombs[6] and tholoi), which appeared in the east Aegean–west Anatolian region for the first time in the late 15th century BC or the (LH IIB–) LH IIIA1 period and continued to be used until the early 11th century BC or the LH IIIC period.[7] As a result of the appearance of large quantities of 'Mycenaean' material forms, the east Aegean islands and west Anatolian coast were seen as a contact zone between central Anatolia and the Aegean, in which traits of two cultural circles mixed.[8] For example, the appearance of cremation, which is defined as an 'Anatolian burial rite', in some of the 'Mycenaean-type' graves in the east Aegean–west Anatolian region has been used to support the interpretation of the mixed (or hybrid) cultural character of the entire area.[9] The appearance of cremation burials in 'local' graves (e.g. large pithoi) has often been related to local traditions in the studies, rather than subjected to a separate study.

Earlier studies[10] mostly focused on the specific character of cremation, its relatively rare appearance in the west Aegean contexts, the practical and religious reasons for its appearance and the actual process of cremation. However, the fact that the use of the same burial rite might have had different meanings in different contexts and been used to signify different social identities among the deceased is often neglected.[11] Although the end result of cremation might have been the same, the funerary rituals connected to it might have been the differentiating factor.[12] Therefore, possible interpretations about the meaning of cremation in a certain society or even different groups within the same social environment can be based only on detailed contextual examinations. This suggests that there is a need for a detailed and diachronic re-examination of the cremation burials in the wider area, which would include the study of different data sets connected to cremation burials (e.g. a study of the age and sex of the cremated individuals, treatment of the cremated remains, tomb types in which the remains were deposited, types of ceramic vessels used as urns etc.).

This paper aims to examine a specific segment of cremation burials, more precisely the deposition of cremated remains in urns. Although this is not always the case, urns were widely used for the deposition of cremated remains in the east Aegean–west Anatolian region. This paper will examine the use of different shapes of ceramic vessels as urns, as well as their spatial and chronological distribution in the context of the east Aegean islands and west Anatolia. It will try to define patterns in the use of specific shapes and determine the possible development of different traditions. The paper mainly focuses on the cemeteries dating between the 14th and early 11th century BC in the east Aegean–west Anatolian region. However, the cemeteries dating between the 20th and 15th centuries BC (Middle Bronze Age (MBA) and early LBA) are also presented as they offer a good insight into the formative stages of the already established practices attested at the beginning of the 14th century BC. In order to examine the potential influences and spread of traditions, the east Aegean–west Anatolian urns are compared to those discovered in central Anatolia and the west Aegean, namely on Crete and the Greek mainland. At the end of this study, the results are used to re-evaluate the widely accepted and simplified narratives about the spread of the cremation burial rite from Anatolia to the west Aegean.

It is important to mention that the types of ceramic vessels used as urns for the deposition of cremated remains sometimes contained unburned skeletal remains. They often contained primary burials of infants and children, as well as secondary burials of adult individuals. In other cases, ceramic vessels were probably used for the deposition

5 E.g. Monaco 1941. – Furumark 1950. – Mee 1978. – Mee 1988a. – Benzi 1992. – Mee 1998. – Mountjoy 1998. – Niemeier 1998b. – Georgiadis 2003. – Eerbeek 2014. – Gorogianni, Pavúk, Girella 2016.

6 In this paper I use the term rock-cut chamber tomb as a typological term to define all subterranean chamber tombs which were cut into rock and soils of different types, hardness and compactness.

7 E.g. Mee 1978. – Mee 1988a. – Mee 1998. – Mountjoy 1998. – Georgiadis 2003. – Eerbeek 2014.

8 Mountjoy 1998.

9 Mountjoy 1998, 37.

10 E.g. Davaras 1973, 162, 167. – Mee 1978, 137. – Mee 1982, 90. – Melas 1985, 169. – Georgiadis 2003, 83, 85. – Jung 2007, 220–221, 229.

11 For example, cremation was one of the markers of the Hittite royal identity, e.g. Otten 1958. – Van den Hout 1994. – Kassian, Korolëv, Sidel'tsev 2002. – Van den Hout 2002.

12 E.g. Basedow 2000, 16.

of human skeletal remains, which were secondarily burned during fumigation and purification rituals. As these vessels appear in the same cemeteries as vessels containing cremations, they are also treated as urns and included in the study. However, it is important to note that the large pithoi which were widely used at the cemeteries all over west and central Anatolia as family graves for multiple burials, most of which were skeletal, are not considered as part of this group. Although the appearance of cremation burials in large pithoi is well attested in the east Aegean–west Anatolian region, they are usually deposited together with a higher number of skeletal burials.[13] Therefore, pithoi should not be regarded as urns, but rather as an integral part of grave architecture. In this paper, the cremations deposited directly into the large pithoi are discussed together with the cremations which were deposited directly into other grave and tomb types without the use of urns. The following overviews include all sites in the east Aegean–west Anatolian region where cremations in urns have been discovered.

2. Middle Bronze Age and Early Late Bronze Age Sites with Burials in Urns

The majority of the LBA cemeteries in the east Aegean–west Anatolian region discovered so far date between the 14th and the 12th century BC, which is also the period of the most intensive contacts between the 'Mycenaean' Greek mainland and the east Aegean–west Anatolian region. The number of MBA and early LBA cemeteries in the region is significantly lower. Nevertheless, the MBA and early LBA cemeteries in the east Aegean–west Anatolian region also need to be examined in order to fully understand the use of ceramic vessels as urns and the development of traditions in the later phases of the LBA.

Six sites dating to the MBA and early LBA have produced evidence of the use of ceramic vessels as urns. All of the sites are located in west Anatolia and none of them are on the islands (Fig. 1). Troy, Aphrodisias, Ulucak Höyük and Limantepe are located in the coastal area or its background, while the cemeteries at Demircihüyük-Sarıket and Dede Mezarı are located further inland, in the transitional zone to central Anatolia.

2.1. Troy (no. 1)

Two out of three child burials found below the floor of Room 601 (area FG/8–9) at Troy were deposited in ceramic vessels, namely globular jars.[14] However, none of them seem to have contained cremated remains, but rather inhumations. They probably date to the early Troy VI, possibly VIa, period.[15] An additional inhumation of a child in a jar was found dug into the Troy V layers (area A7) and probably dates to the early Troy VI.[16]

2.2. Demircihüyük-Sarıket (no. 2)

Five out of ten possible cremations at the MBA cemetery at Demircihüyük-Sarıket were found in urns. Three graves (Graves 182, 432, 566) were identified as urns with cremated remains.[17] The types of urns were not reported, but it is certain that in the case of Grave 182, a bowl was used as a lid. A small ribbed pithos (Grave 593) from the same cemetery also contained exclusively cremated remains[18] and might be considered as an urn rather than a pithos with additionally added cremated remains. Stone Grave 306 contained cremated remains placed in a bowl.[19] According to the results of the ^{14}C dating, the cemetery dates between the 19th and the 16th century BC.[20]

2.3. Ulucak Höyük (no. 3)

A small number of cremation burials have been reported from the MBA cemetery of Ulucak Höyük.[21] Smaller ceramic vessels were used as urns for the deposition of cremated remains of children and adults, as well as for inhumations of children.[22] The urn types remain unclear.

2.4. Dede Mezarı (no. 4)

At the cemetery of Dede Mezarı, one of the pithoi (F8) contained the remains of a cremated individual placed in a jar.[23] Another single jar (L5) was found, but it remains unclear what kind of burial it contained.[24] It could have also contained the remains of a cremated individual or a skeletal burial of a child.[25] According to the results of the ^{14}C dating,

13 E.g. Basedow 2000, 16. – Seeher 2000, 181. – Erkanal-Öktü 2018, 546.

14 Angel 1951, 12. – Blegen, Caskey, Rawson 1953, 128, 130 and Figs. 119–120, 325, 423, 457.

15 Angel 1951, 12. – Pavúk 2014, 112–114.

16 Angel 1951, 12–13. – Blegen, Caskey, Rawson 1953, 165 and Figs. 250–251. – Pavúk 2014, 154–157.

17 Seeher 2000, 182.

18 Seeher 2000, 182.

19 Seeher 2000, 182.

20 Seeher 2000, 224.

21 Çilingiroğlu et al. 2004, 57.

22 Çilingiroğlu et al. 2004, 58–59.

23 Koçak et al. 2007, 3. – Üyümez 2008, 137. – Üyümez, Koçak, Ilasli 2008, 406, 416 and Figs. 9, 11.

24 Üyümez, Koçak, Ilasli 2011, 121 and Fig. 6.

25 Another cemetery in the region is Yanarlar. Emre ruled out the possibility of cremation at the cemetery (Emre 1978, 134). One of her

Fig. 1. The map represents the spatial distribution of the cemeteries dating between the 20th and 15th centuries BC which have produced evidence of the use of ceramic vessels as urns. The numbers on the map follow the site numbers presented in the main text. – 1. Troy. – 2. Demircihüyük-Sarıket. – 3. Ulucak Höyük. – 4. Dede Mezarı. – 5. Aphrodisias. – 6. Limantepe (Map: P. Demján, adapted by F. Franković).

the cemetery dates between the middle of the 20th and the 16th century BC.[26]

2.5. Aphrodisias (no. 5)

During the excavations on the Acropolis hill at Aphrodisias, the remains of a prehistoric cemetery were discovered in one of the trenches.[27] In the area of 48 m² a large concentration of scattered human bones and a large quantity of ash has been found in association with broken and entirely preserved ceramic vessels.[28] Five burial vessels and multiple scattered bones suggest at least nine individual burials.[29] The individuals were found buried in jars, a tripod vessel and a collar-necked jar.[30] The layers containing the remains of the cemetery are widely dated to the Early Bronze Age (EBA), MBA, LBA and even the Carian period,[31] while the entirely preserved vessels are of Bronze Age date.

2.6. Limantepe (no. 6)

Intramural inhumations of children in ceramic vessels were discovered at Limantepe. They are dated to the Limantepe phases III.3 and III.1/2,[32] which would correspond to the MH III and LH I periods (the 18th and 17th centuries BC).[33] The types of vessels remain unclear.

main arguments was the size of the pithoi, which were, in her opinion, too large to contain only a single cremation burial. Consequently, Emre suggested that the traces of burning on some of the bones in Grave 33 could originate from a purification ritual (Emre 1978, 134). However, cremation burials were discovered in large pithoi at other cemeteries from the same period in west Anatolia.

26 Üyümez et al. 2007, 825–830. – Üyümez 2008, 138.

27 Joukowsky 1986, 119.

28 Joukowsky 1986, 119–120.

29 Joukowsky 1986, 119, 121, 176.

30 Joukowsky 1986, 120 and Figs. 346, 462.9.

31 Joukowsky 1986, 176–177.

32 Erkanal et al. 2016, 324–326.

33 See Aykurt 2009, 46. – Pavúk 2015, 85 and Fig. 1.

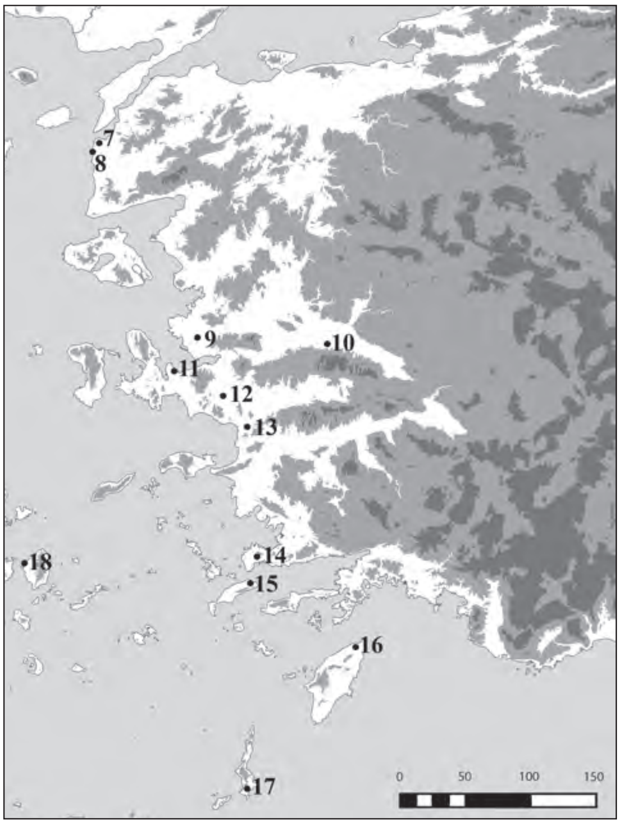

Fig. 2. The map represents the spatial distribution of the cemeteries dating between the 14th and 12th centuries BC, which have produced evidence of the use of ceramic vessels as urns. The numbers on the map follow the site numbers presented in the main text. – 7. Cemetery of Cinerary Urns at Troy. – 8. Beşik-Tepe. – 9. Panaztepe. – 10. Sardis. – 11. Limantepe. – 12. Bakla Tepe. – 13. Ayasoluk in Selçuk (Ephesos). – 14. Müskebi. – 15. Eleona-Langada on Kos. – 16. Ialysos on Rhodes. – 17. Tou Stavrou to Kephali on Karpathos. – 18. Aplomata on Naxos (Map: P. Demján, adapted by F. Franković).

3. Late Bronze Age Cemeteries with Burials in Urns Dating Between the 14th and 11th Centuries BC

The following overview includes 11 different cemeteries from the east Aegean islands and west Anatolian coast dating between the 14th and the early 11th century BC which have produced evidence of the use of ceramic vessels as urns (Fig. 2). Unlike in the earlier period, there are no sites in the inland of west Anatolia which are dated to this period and have produced urns. Since earlier research favoured Anatolia as the possible place of origin of cremation burials appearing in the west Aegean towards the end of the LBA, the evidence from the Cyclades, located in the middle of the Aegean, needs to be evaluated in order to examine the possible spread of traditions from one side of the Aegean to the other. Therefore, the Aplomata cemetery on Naxos is also included in this overview.

3.1. Troy – Cemetery of Cinerary Urns (no. 7)

One of the most famous cemeteries in west Anatolia is the Cemetery of Cinerary Urns at Troy. The cemetery was dated to LH IIIA2–IIIB according to the Aegean relative chronology (the second half of the 14th and 13th century BC).[34] At least 182 graves, mostly urns, have been reported at the site.[35] The number of urns was estimated on the basis of collected sherds and complete vessels. The complete vessels found at the site include only 19 urns and four large ribbed pithoi excavated by Carl Blegen, John Caskey and Marion Rawson,[36] as well as two additional urns discovered previously by Wilhelm Dörpfeld.[37] The urns were covered by lids of different types, namely the foot of a kylix, an additional ceramic vessel or a stone slab.[38]

Out of 25 vessels preserved in their entirety, four are burial pithoi (16.0 %). However, if compared to the number of fragmented vessels at the cemetery, this percentage would drop significantly, since very few fragments of pithoi were found among the fragmented vessels. The use of large ribbed pithoi as burial vessels at the cemetery has been questioned by some authors[39] and it does indeed seem that these pithoi do not entirely fit into the picture of other vessels used as urns at the cemetery. However, pithos graves are well attested at other west Anatolian cemeteries of the same period and some of them contained cremations in addition to skeletal burials. One small pithos (4.0 %) was identified with certainty as an urn.[40]

Krater-shaped vessels are the most numerous, which is also visible from the preserved, reconstructed and fragmented examples.[41] Among the 25 vessels preserved in their entirety there are ten kraters (40.0 %).[42] The other types of vessels include eight jars (32.0 %) (Fig. 3/1), a jug (4.0 %) and a flask (4.0 %).[43] It is important to note that four wide-mouthed jars resemble kraters.[44]

Despite the name of the cemetery and the fact that cremation was the predominant burial rite at the site, three

34 See Blegen, Caskey, Rawson 1953, 370–371, 377. – Mountjoy 1999.
35 Dörpfeld 1894, 124. – Blegen, Caskey, Rawson 1953, 374–375.
36 Blegen, Caskey, Rawson 1953, 371.
37 Dörpfeld 1894, 124.
38 Blegen, Caskey, Rawson 1953, 371.
39 Becks 2002, 299.
40 Blegen, Caskey, Rawson 1953, 374.
41 Blegen, Caskey, Rawson 1953, 375–376.
42 It is possible that an area probably containing additional burials in large kraters might have been located on the plateau to the north of the Cemetery of Cinerary Urns, see Blegen, Caskey, Rawson 1953, 375.
43 See Blegen, Caskey, Rawson 1953, 372–374.
44 Blegen, Caskey, Rawson 1953, 376.

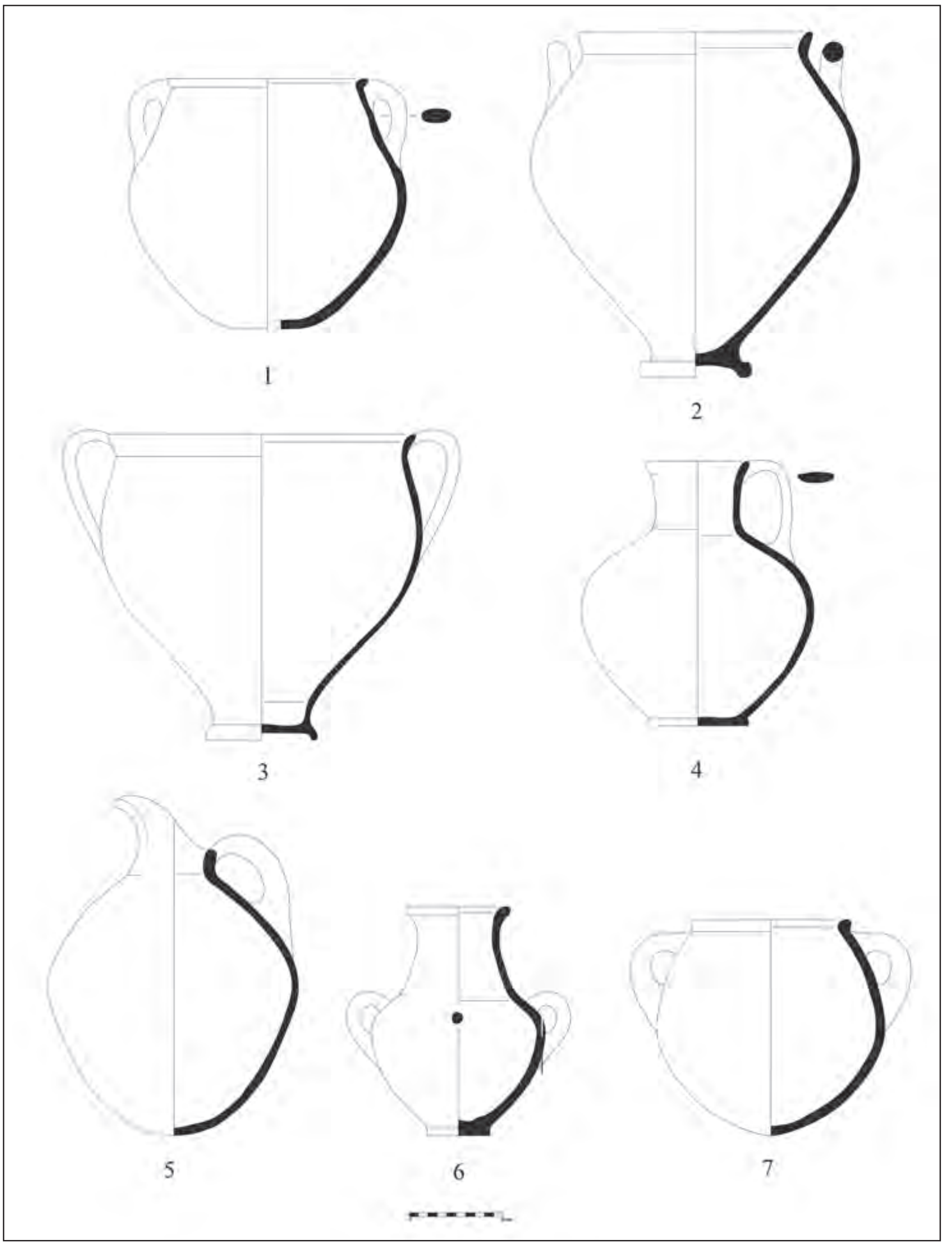

Fig. 3. Vessels from selected sites. – 1. Two-handled jar from Troy. – 2. Krater from Beşik-Tepe. – 3. Krater from the Ayasoluk hill in Selçuk (Ephesos). – 4. Jug from Eleona-Langada on Kos. – 5. Spouted jug from Ilica. – 6. Two-handled amphora from the later phase at Osmankayasi. – 7. Two-handled pot from the later phase at Osmankayasi (redrawn by Věra Doležálková after: 1. Rigter 2013, Pl. 50/3. – 2. Basedow 2000, Pl. LIX/80.3. – 3. Gültekin, Baran 1964. – Özgünel 1983. – 4. Allen 1990, Fig. 54/4. – 5. Orthmann 1967, Pl. 6/42. – 6. Bittel et al. 1958, Fig. 4/13. – 7. Bittel et al. 1958, Fig. 4/4) (Graphics: V. Doležálková).

urns contained skeletal remains which were not burned.[45] Graves 4 and 5 contained the bones of newborns, while Grave 2 contained the remains of an adult man.[46] Grave 2 is also particular because the unburned bones of the adult man

45 See Angel 1951, 12–14. – Blegen, Caskey, Rawson 1953, 372–374.

46 Blegen, Caskey, Rawson 1953, 372.

were collected and secondarily deposited in a jar. The burial jar was then deposited in a large krater together with the cremated remains of an adult woman.

3.2. Beşik-Tepe (no. 8)

The cemetery at Beşik-Tepe is dated to the LH IIIA2–IIIB period (the second half of the 14th and 13th century BC)[47] and is chronologically parallel to the Cemetery of Cinerary Urns at Troy. Cremation burials in ceramic vessels were found in different types of graves. Two stone-built chamber tombs probably contained exclusively cremated remains. Tomb 85 was found destroyed, but the cremated human remains might have been put in a necked jar.[48] Tomb 15-West was better preserved and it contained a krater with the cremated remains of two adult individuals.[49]

Large pithos graves contained 12 urns with cremation burials, always in the same graves as non-cremated burials.[50] Maureen Basedow noted that only four vessels were found in their original positions.[51] The remaining vessels had been removed from their original positions during the later manipulation of the grave contents and the cremated remains were found outside of the vessels. Consequently, the vessels were identified as urns on the basis of the typological similarity to the four examples identified with certainty. Therefore, the results of the research from Beşik-Tepe need to be considered with caution.[52] If these estimations are correct, jars were used in three burials (25.0 %), kraters in two (16.7 %) (Fig. 3/2),[53] a flask in one (8.3 %) and an amphora in one (8.3 %), while there are five burials (41.7 %) in which the shape of the vessel remains unclear.[54]

3.3. Panaztepe (no. 9)

The recently published cemetery at Panaztepe, dated to the 14th and 13th centuries BC (the LH IIIA–IIIB period according to the Aegean relative chronology),[55] produced a significant amount of evidence for the use of ceramic vessels as urns. Armağan Erkanal-Öktü suggested that pot graves were mostly used for cremation burials,[56] but this is far from true, since six pot graves (Graves Ü, AĞ, AM, BE, Bİ and BK) contained skeletal burials, while in one case (Grave AÇ) the burial rite remains unclear. Only two out of nine so-called pot graves (Graves F and K) from the West and North Cemeteries at Panaztepe contained cremated remains.[57] The pot graves contained burials of infants and children, while the remains of an adult female individual, in this case cremated, were found only in Grave K. Two burial vessels (Graves K and AĞ) can be described as handleless globular jars with an everted rim, one is a bowl (Grave AM), while one is a wide-mouthed jar (Grave Bİ).[58] One of the burial vessels (Grave AÇ) discovered at the North cemetery is a krater.[59] It is important to note that the wide-mouthed jar of Grave Bİ resembles a krater, as noted by Blegen, Caskey and Rawson for some of the examples at Troy.[60] A small pithos (not numbered in the catalogue) from the North cemetery[61] could also be added to this group of burials, as it contained only cremated remains.

Seven additional cremated individuals were deposited in stone-built chamber tombs at the West cemetery, but only two (28.6 %) of them (Graves A and İ) were deposited in urns. The types of urns, however, are not reported. Erkanal-Öktü suggests that necked jars were used as urns in looted Tomb B.[62] However, this conclusion is based on the information provided by the local inhabitants, who were themselves involved in the looting of the graves in the first place. Furthermore, it has been suggested that Tomb D contained between six and seven cremation urns.[63] Unfortunately, the vessels are now lost and not much is known about them.

3.4. Sardis (no. 10)

The cremated remains of an adult female individual were recovered from a jar grave at Sardis.[64] However, it seems that the grave was not a part of a larger cemetery. The grave

47 Basedow 2000, 3.
48 Basedow 2000, 46.
49 Basedow 2000, 46.
50 Basedow 2000, 16.
51 Basedow 2000, 16.
52 In some of the graves only ashy soil was reported, but no cremation. However, in some cases the types of vessels found in these graves correspond to those used as urns, see Basedow 2000, 16 and n. 51. This could point to the existence of additional urns in pithos graves at the cemetery.
53 Two separate pot graves at Beşik-Tepe were burials in kraters, see Basedow 2000, 39–40.
54 It is important to note that a piriform jar from Grave 94 was noted in the documentation as an urn, which was not confirmed during the later study, see Basedow 2000, 32–33 and n. 62.

55 See discussion in Erkanal-Öktü 2018, 159, 165.
56 Erkanal-Öktü 2018, 50.
57 See Erkanal-Öktü 2018, 62.
58 See Erkanal-Öktü 2018, Pls. 90–93.
59 Erkanal-Öktü 2018, 65.
60 Blegen, Caskey, Rawson 1953, 376.
61 See Erkanal-Öktü 2018, 62.
62 Erkanal-Öktü 2018, 11.
63 Erkanal-Öktü 2018, 2.
64 Hanfmann 1963, 7. – Spier 1983, 21.

might date to the LH IIIA–IIIB period (between the late 15th and 13th century BC), but could also date somewhat earlier.[65]

3.5. Limantepe (no. 11)

An intramural inhumation of a child in a ceramic vessel was discovered at Limantepe. It was dated to the Limantepe phase II.1,[66] which would correspond to the LH IIIC period (the 12th century BC) according to the Aegean relative chronology.[67] The type of vessel remains unclear.

3.6. Bakla Tepe (no. 12)

A stone-built chamber tomb was discovered at Bakla Tepe. The tomb most probably dates to the transition between the LH IIIB and LH IIIC periods (the 13th and 12th century BC).[68] The tomb contained the cremation burials of 11 adults and a child.[69] Although it has been suggested that all of the cremated remains were originally deposited in urns, it is not possible to connect specific individuals to specific ceramic vessels.[70] The urns themselves were crushed by the collapse of the tomb.[71] No clear information about the types of vessels used as urns was provided in the most recent and complete publication of the tomb.[72] Ayşegül Aykurt and Hayat Erkanal mention one globular jar and two kraters as urns,[73] but it remains unclear whether their conclusion is based on the excavation data or the analogy to the vessels from the Cemetery of Cinerary Urns at Troy.

3.7. Ayasoluk in Selçuk (Ephesos) (no. 13)

The grave discovered at Ayasoluk contained human skeletal remains in a stemmed krater (Fig. 3/3).[74] Although it remains unclear whether the skeletal remains could be associated with a secondary burial or a cremation burial, the latter seems more probable.[75] It is not specified whether the second krater discovered in the grave was used for the deposition of human remains.[76] The ceramic vessels retrieved from the tomb suggest that the tomb can be dated to the LH IIIA2 period (the second half of the 14th century BC).[77]

3.8. Müskebi (no. 14)

Rock-cut chamber tombs at Müskebi, excavated on multiple occasions since the 1960s, mostly contained inhumations.[78] However, cremation burials were also attested in some of the tombs dating to the LH IIIA2–IIIB period (the second half of the 14th and 13th century BC).[79] In one of the tombs (Tomb 3) the cremated remains were deposited in an urn.[80] The type of vessel used as the urn is not defined in the study, but some conclusions can be deduced from the available description and published tomb assemblages. The tomb contained a kylix, a small jug, a deep bowl and two stirrup jars. On the basis of a comparison to the examples from central Anatolia, Anne Marie Carstens[81] argued that a jug was used as an urn. However, Yusuf Boysal noted that the urn was a large ceramic vessel.[82] Therefore, the small jug and the kylix can be dismissed as possible urns due to their smaller size. Moreover, it is also unlikely that the two stirrup jars discovered in the tomb were used as urns, due to their narrow spouts. Although a locally produced stirrup jar was discovered among the reconstructed urns from the Cemetery of Cinerary Urns at Troy, Blegen, Caskey and Rawson note that the lower part of the vessel was missing and that it must have been deposited upside down and then used as urn.[83] Consequently, as the deep bowl is the only other vessel discovered in Tomb 3, it is most probable that it was the vessel used as the urn. It has to be noted that there is a certain formal similarity between deep bowls and kraters used as urns all over west Anatolia. Since kraters are completely absent from burial assemblages at Müskebi, the use of a similar type of vessel might be the local variation of the same practice.

An additional urn might have been reported by George Bass. During the original discovery of the cemetery, Bass retrieved a straight-sided alabastron filled with bones and ash.[84] The alabastron also contained a spindle whorl,

65 See Hanfmann 1963, 9.

66 Erkanal et al. 2016, 324–326.

67 See Aykurt 2009, 46. – Pavúk 2015, 85 and Fig. 1.

68 See Aykurt, Erkanal 2017, 123–128.

69 Aykurt, Erkanal 2017, 125, 264.

70 Erkanal 2008, 166. – Aykurt, Erkanal 2017, 90, 263.

71 Aykurt, Erkanal 2017, 90.

72 See Aykurt, Erkanal 2017, 262.

73 Aykurt, Erkanal 2017, 95, 126.

74 Gültekin, Baran 1964, 126.

75 Horejs, Kanz 2008, 120. – Franković 2018, 14–15.

76 It is possible that a similar example was discovered in Tomb 2 (D.33) at Değirmentepe (Miletus). In the published plan of the tomb (Niemeier 1998b, 36 and Figs. 10–11. – Niemeier 2005a, 13 and Fig. 34), the grave goods are marked by numbers, while bone clusters indicating possible burials seem to be marked by letters. Letter D seems to mark a layer consisting of small bone particles. It is represented close to a big amphoroid krater. It is possible that the bones were originally placed in the krater used as an urn.

77 Gültekin, Baran 1964, 127. – Mountjoy 1998, 36.

78 See Çiner 1964, 57. – Özkan, Mete Özler, Benli Bağci 2015, 115–117.

79 See Boysal 1964, 82–83. – Çiner 1964, 57. – Boysal 1965, 123. – Boysal 1967a, 37–38. – Boysal 1967b, 79.

80 Çiner 1964, 57. – Boysal 1967b, 79.

81 Carstens 2001, 91.

82 Boysal 1967b, 70.

83 Blegen, Caskey, Rawson 1953, 376.

84 Bass 1963, 355.

possibly added as a grave good. This could suggest that the skeletal remains did in fact belong to a human individual.

3.9. Eleona-Langada on Kos (no. 15)

Cremation burials have been discovered at the Eleona-Langada cemetery on Kos. Among these burials, the most important for this paper is the cremation burial found in the LH IIIC (the 12th and early 11th century BC) Langada Tomb 44.[85] The cremated remains were found inside a jug (FS 107) (Fig. 3/4).

3.10. Ialysos on Rhodes (no. 16)

Eight cremation burials in seven rock-cut chamber tombs were recorded at Ialysos on Rhodes.[86] These include six cremation burials in urns (Tombs 15, 17, 32, 33, 71, 87), which were deposited either on the floor or in the pits dug in it,[87] and two (Tombs 17, 38) cremation burials without urns, which were also deposited in pits.[88] Benzi believes that the cremated remains and ashes of the latter two burials might have been placed in urns made of perishable materials.[89] It is important to note that Tomb 17 contained cremations deposited both in an urn and directly into the tomb.

Jugs were used as urns for five burials, with the FS 107 jug appearing in three. The sixth urn was a coarse vessel.[90] All cremation burials date to the LH IIIC period (the 12th and early 11th century BC), while it is possible that one already appeared in the LH IIIA1–IIIA2 (the late 15th and 14th century BC) Tomb 19.[91] Furthermore, if Tomb 19 indeed contained cremated remains, they were found in connection with a jug.[92] This could indicate an early appearance of a tradition in which jugs were used as urns on Rhodes. An additional burial of an infant was found in the LH IIIC Early hydria (FS 129) in Tomb 20.[93] It is unclear whether the remains were cremated or not. Regardless of the burial rite, it should be noted that a pouring vessel was again used as an urn for the deposition of human skeletal remains.

3.11. Tou Stavrou to Kephali on Karpathos (no. 17)

Emmanouēl Melas argued that the LM IIIA (the late 15th and 14th century BC) amphoroid krater discovered at Tou Stavrou to Kephali contained human skeletal remains.[94] However, it remains unclear whether the remains were cremated or not.

3.12. Aplomata on Naxos (no. 18)

In addition to inhumations, Tomb Γ at the Aplomata cemetery contained human skeletal remains deposited inside a straight-sided alabastron.[95] The bones were not burned and they were probably deposited in the alabastron as part of a secondary ritual.

4. Ceramic Vessels Used for the Deposition of Human Skeletal Remains in the Middle and Early Late Bronze Age East Aegean–West Anatolian Region

The cemeteries in the east Aegean–west Anatolian region dating approximately between 2000 and 1400 BC or the MBA and early LBA are not numerous. All the available evidence for the use of ceramic vessels as urns comes from west Anatolia, while there is no evidence that cremation was even used on the east Aegean islands in this period. The absence of cremation on the east Aegean islands in this period is not as surprising since there is little evidence of burial practices in general. The only larger concentration of graves was noted at Trianda on Rhodes.[96]

Demircihüyük-Sarıket (no. 2),[97] Ulucak Höyük (no. 3), Dede Mezarı (no. 4), and possibly Aphrodisias (no. 5) in west Anatolia are the only extramural cemeteries of this period which produced evidence of the use of urns for the deposition of cremated human remains. Various types of vessels were used as urns. While most of the vessels at Demircihüyük-Sarıket (no. 2) remain unidentified, the use of a bowl is especially important to note. At Dede Mezarı (no. 4), the use of jars was confirmed, while at Aphrodisias (no. 5) the vessels include mostly jars and a tripod vessel (see Tab. 1). Aphrodisias (no. 5) itself is an interesting site as it shows that the cemetery might have been used continuously between the EBA and LBA. Another important characteristic of the cemetery is the fact that the only preserved burials are cremation burials in urns, although some skeletal remains might suggest the existence of disturbed inhumations. This was not the case with other MBA cemeteries in west Anatolia which contained cremation burials, such as Demircihüyük-Sarıket (no. 2), Dede Mezarı (no. 4), Ulucak Höyük

85 Morricone 1965–1966, 202 and Fig. 214, Inv. No. 161.
86 Benzi 1992, 230.
87 Benzi 1992, 230–231.
88 Benzi 1992, 230–231.
89 Benzi 1992, 230.
90 Benzi 1992, 231, 312.
91 Benzi 1992, 231.
92 Benzi 1992, 231.
93 Benzi 1992, 271.
94 Melas 1985, 169.
95 Kontoleon 1969, 139. – Orlandou 1969, 145 and Fig. 177. – Vlachopoulos 2006, 454–455.
96 E.g. Marketou 1998.
97 The numbers in the brackets correspond to those presented in the overviews of the sites.

(no. 3) or Çavlum.[98] All four cemeteries predominantly contained inhumations in different types of graves (pithoi, cists, pits), with an occasional appearance of cremations.

At two cemeteries, cremation burials were deposited directly into graves, without the use of an urn. At Demircihüyük-Sarıket (no. 2) the cremation burials were sometimes deposited in pithoi (Graves 196, 462, 471) and cists (Graves 501, 541) without an urn, together with skeletal burials.[99] Cremations have been discovered in graves excavated at Çavlum,[100] but it is unclear whether the remains were discovered in urns or simply deposited in graves. Based on the analogies in the material recovered from the graves, the Çavlum cemetery was dated to the first quarter of the 2nd millennium BC (until the second half of the 18th century BC).[101]

Intramural burials of children in ceramic vessels appear at Troy (no. 1) and Limantepe (no. 6). The burials at Limantepe (no. 6) suggest that such a practice must have continued from the MBA to the LBA. Interestingly, all burials were skeletal and so far no intramural cremation burials have been confirmed in this period. The types of vessels used are known only at Troy (no. 1) and they include jars (see Tab. 1), which corresponds to the practice attested at the extramural cemeteries in the region.

From the available evidence it is evident that various jars were the most common types of vessels to be used as urns for the deposition of cremated human remains and skeletal burials of children during the MBA and early LBA in west Anatolia. It is important to note that the two jars discovered at Dede Mezarı (no. 5) can be described as krateroid jars (Graves F8 and L5), while the early Troy VI jar found in area A7 shares some formal similarities with the later kraters from Troy. These examples could suggest the earlier formation of the tradition well attested at the later 14th- and 13th-century BC cemeteries in west Anatolia.

5. Ceramic Vessels Used for the Deposition of Human Skeletal Remains in the Later Stages of the Late Bronze Age in the East Aegean–West Anatolian Region

It is surprising that the cemeteries of the late 15th, 14th and 13th centuries BC or the LH IIIA–IIIB period are more numerous than those of the MBA and early LBA, despite the fact that the LH IIIA–IIIB period is almost three times shorter. A quick and significant rise in the number of cemeteries can be noted both on the east Aegean islands and in west Anatolia. However, the change is drastically more pronounced on the east Aegean islands than in west Anatolia. Considering the larger number of cemeteries and burials, the high number of cremation burials deposited in urns is not surprising. Still, most of the cemeteries relevant for this discussion are located in west Anatolia.

The Cemetery of Cinerary Urns at Troy (no. 7) should be differentiated from the rest of the 14th- and 13th-century BC cemeteries which produced burials in urns. While at other cemeteries in west Anatolia cremations in urns and inhumations in smaller pots make up only a minor portion of the burials, at the Cemetery of Cinerary Urns (no. 7) they are by far the predominant grave type. Even several large pithoi discovered at the site might not have been graves at all and the cemetery might have contained exclusively urns. Moreover, cremation seems to be the predominant burial rite at the cemetery, which is not the case anywhere in west Anatolia.[102] This excludes lone graves and tombs at Sardis (no. 10), Bakla Tepe (no. 12) and Ayasoluk (no. 13), as they were not part of a larger cemetery. An earlier appearance of a similar type of cemetery in the MBA could be indicated by the Aphrodisias (no. 5) graves, but it is not possible to draw a clear parallel due to the poor state of preservation of the stratigraphical relations at Aphrodisias (no. 5).

The dominant types of urns in west Anatolia during the 14th and 13th centuries BC are kraters (Fig. 3/2, 3) and various types of jars (Fig. 3/1). Kraters are widely distributed from the north to the south of west Anatolia (see Tab. 1). They appear at the Cemetery of Cinerary Urns at Troy (no. 7), Beşik-Tepe (no. 8) (Fig. 3/2), Panaztepe (no. 9), Bakla Tepe (no. 12) and Ayasoluk (no. 13) (Fig. 3/3). A similar practice might be attested at Müskebi (no. 14), where a deep bowl might have been used as an urn. It is important to note that kraters were used for the deposition of both cremated remains and the unburned skeletal remains of both children and adults (Cemetery of Cinerary Urns (no. 7) and Panaztepe (no. 9)).

Jars of different types are noted at the Cemetery of Cinerary Urns at Troy (no. 7) (Fig. 3/1), Beşik-Tepe (no. 8), Panaztepe (no. 9), Sardis (no. 10) and Bakla Tepe (no. 12). Other shapes such as flasks (Cemetery of Cinerary Urns (no. 7), Beşik-Tepe (no. 8)), jugs (Cemetery of Cinerary Urns

98 For the Çavlum cemetery see Bilgen 2005.

99 Seeher 2000, 181. The identification of the cremated remains in Grave 541 is not certain, see Seeher 2000, 182.

100 Bilgen 2005, 12, 57–58, 61, 63–64, 69–70, 75–76, 80–81, 84–85.

101 Bilgen 2005, 44–45.

102 The Cemetery of Cinerary Urns (no. 7) shows nicely that both cremated and unburned skeletal remains could have been placed inside the same vessel (Blegen, Caskey, Rawson 1953, 372). However, the cremated remains in Grave 2 were first collected in a separate urn and then deposited in another one, together with the unburned bones, which could point to a certain separation in this context.

Period	Region	Site	Kraters	Jars	Jugs	Hydriai	Flasks	Am-phorai	Am-phoriskoi/ Collar-necked jars	Small pithoi	Bowls, plates and cups	Tripods	Ala-bastra/ Pyxides	Uncer-tain
early Troy VI	west Anatolia	Troy		+										
MBA – early LBA	west Anatolia	Demircihüyük-Sarıket								+	+			+
MBA	west Anatolia	Ulucak Höyük												+
MBA – early LBA	west Anatolia	Dede Mezarı		+										
Bronze Age	west Anatolia	Aphrodisias		+					+			+		
MBA – early LBA	west Anatolia	Limantepe												+
late Assyrian Trade Colonies	central Anatolia	Arıbaş		+	+						+			
Old Hittite Kingdom	central Anatolia	Ilica			+									+
Old Hittite Kingdom	central Anatolia	Osmankayasi (earlier)		+			+	+			+			+
Old Hittite Kingdom	central Anatolia	Tarsus-Gözlükule		+										
LH IIIA2–LH IIIB	west Anatolia	Cemetery of Cinerary Urns	+	+	+		+			+				
LH IIIA2–LH IIIB	west Anatolia	Beşik-Tepe	+	+			+	+						+
LH IIIA–LH IIIB	west Anatolia	Panaztepe	+	+						+	+			
LH IIIA–LH IIIB (or earlier)	west Anatolia	Sardis		+										
LH IIIB–LH IIIC	west Anatolia	Bakla Tepe	+	+										
LH IIIA2	west Anatolia	Ayasoluk in Selçuk	+											
LH IIIA2–LH IIIB	west Anatolia	Müskebi									+		+	
LH IIIA	Dodecanese	Tou Stavrou to Kephali (Karpathos)	+											
Hittite Empire	central Anatolia	Mersin-Soloi												+
Hittite Empire	central Anatolia	Osmankayasi (later)		+			+	+			+			
LH IIIA–LH IIIB	Greek mainland	Brauron											+	
LH IIIA2–LH IIIB	Greek mainland	Prosymna						+						
LH IIIC	west Anatolia	Limantepe												+
LH IIIC	Dodecanese	Eleona-Langada (Kos)			+									
LH IIIC	Dodecanese	Ialysos (Rhodes)		+	+	+								
LH IIIC	Cyclades	Aplomata (Naxos)											+	
LH IIIC	Greek mainland	Argos			+	+		+	+					
LH IIIC	Greek mainland	Chania			+	+		+	+					
LH IIIC	Greek mainland	Perati			+			+	+					
LM IIIC	west Crete	Pezoulos Atsipadhes		+	+ (?)			+	+ (?)				+ (?)	
LM IIIC	east Crete	Tourloti							+					
LM IIIC	east Crete	Mouliana	+										+	
LM IIIC	east Crete	Fotoula in Praisos											+	
LM IIIC	east Crete	Kritsa											+	
LM IIIC	east Crete	Palaimylos											+	

Tab. 1. Overview of the types of urns appearing at specific sites in the Aegean and Anatolia.

(no. 7)), alabastra (Müskebi (no. 14)) and bowls (Panaztepe (no. 9)) appear only sporadically and in small quantities (see Tab. 1). The use of a bowl as an urn at Panaztepe (no. 9) is quite interesting, since an example of the same practice in the MBA was confirmed at Demircihüyük-Sarıket (no. 2). Nevertheless, even though the use of a bowl as an urn is an exception rather than a rule, it seems that the tradition continued well into the LBA. Interestingly, at Demircihüyük-Sarıket (no. 2),[103] the Cemetery of Cinerary Urns at Troy (no. 7)[104] and Beşik-Tepe (no. 8),[105] bowls were also used as lids for some of the urns.

At the Cemetery of Cinerary Urns at Troy (no. 7) and Panaztepe (no. 9), small pithoi used exclusively for the deposition of cremated remains were found (see Tab. 1). These examples should possibly be assigned to the category of urns. This practice dates to as early as the MBA, as confirmed by the small (ribbed) pithos at Demircihüyük-Sarıket (no. 2).

The predominant use of kraters, krateroid jars and other jars, as well as the sporadic use of bowls and small pithoi, all suggest that the same traditions continued in west Anatolia from the MBA onwards. However, the absence of 14th- and 13th-century intramural burials of children in ceramic vessels represents a possible distancing from the earlier tradition. It is possible that by this period the practice had been abandoned or at least was not as widely employed, while a possible reappearance in the LH IIIC period might be indicated by the example from Limantepe (no. 11).

It should be noted that the cemeteries which produced evidence of the use of ceramic vessels as urns also produced cremations which were deposited directly into the graves. Additional cremation burials deposited directly into other types of graves without the use of an urn were discovered at Beşik-Tepe. Two pithoi (Graves 49 and 52) contained cremated remains deposited directly into the grave, without an urn.[106] Cremated remains without a burial vessel were discovered in one cist grave (Grave 45).[107] Both the pithoi and the cist already contained skeletal burials of other individuals.[108] Cremated individuals deposited without the use of an urn were also discovered in large pithoi and stone-built chamber tombs at the West Cemetery at Panaztepe (no. 9).[109] At Müskebi (no. 14), cremations were simply laid on the floors of two rock-cut chamber tombs.[110]

The cemeteries on the east Aegean islands differ significantly from west Anatolian cemeteries. There is evidence that cremation was practised from the 14th and/or 13th century BC on some of the islands. The earliest possible example comes from the LH IIIA1–IIIA2 Ialysos on Rhodes (no. 16). According to the recent evaluation of the still preserved skeletal remains from Eleona-Langada cemetery on Kos, three cremation burials have been confirmed.[111] In all three cases, the cremated remains were deposited directly into the main chambers of the tombs. The examples include Eleona Tomb 20, used between LH IIIB and LH IIIC Early; Langada Tomb 15, used in LH IIIB and LH IIIC Middle; and Langada Tomb 34 dating to LH IIIC Middle.[112] Traces of burning have been documented in two other examples, namely the LH IIIA2–IIIB Langada Tomb 37 and the LH IIIB–IIIC Middle Langada Tomb 53. However, their identification as cremation burials is uncertain.[113] Moreover, burned human skeletal remains have been reported in the LH IIIA2–IIIB (the second half of the 14th and 13th century BC) rock-cut chamber tombs at Syngairos on Astypalaia and interpreted as possible cremation burials.[114] The skeletal remains have not been anthropologically examined and it is possible that the burning is the result of a purification ritual. If the burned remains were indeed the result of a cremation burial, they were most probably not deposited in an urn. Additional examples were recorded at Archontiki on Psara and Arkasa-Vonies on Karpathos and dated widely to LH IIIA–IIIB. A cremation burial was discovered in the stone-built Tomb 100 at Archontiki on Psara.[115] However, it remains unclear whether it was deposited in a ceramic vessel or not. As the cemetery remains largely unpublished, the possibility of other cremation burials cannot be dismissed. A possible cremation (or partial cremation) burial was discovered in a LH IIIA–IIIB (the 14th and 13th century BC) rock-cut chamber tomb at Arkasa-Vonies on Karpathos.[116] The remains were simply deposited in the tomb, without a burial urn.[117] It can be concluded that the examples from

103 Seeher 2000, 182.
104 Blegen, Caskey, Rawson 1953, 371.
105 Basedow 2000, 46.
106 Basedow 2000, 26–27.
107 Basedow 2000, 50.
108 Some of the urns were used for the deposition of the cremated remains of several individuals, see Basedow 2000, 22, 240.
109 Erkanal-Öktü 2018, 11, 546.
110 Boysal 1967a, 37–38.
111 Vitale et al. 2017, 250, 252–253.
112 Vitale et al. 2017, 250, 252–253.
113 Vitale et al. 2017, 250, 252–253.
114 Doumas 1983, 372. – Georgiadis 2003, 83. – Eerbeek 2014, 138–139.
115 Archontidou-Argyri 2006, 207.
116 Melas 1985, 39.
117 Melas suggested that the remains of burned human bones were also retrieved at Makeli on Karpathos (Melas 1985, 169).

Eleona-Langada on Kos and Syngairos on Astypalaia might suggest the appearance of cremation in LH IIIA2–IIIB, or slightly after the earliest appearance at Ialysos on Rhodes (no. 16). A similar date is possibly suggested by the evidence from Archontiki on Psara and Arkasa-Vonies on Karpathos.

Although the appearance of cremation is questionable in many of these cases, it seems unlikely that none of the reported burned human remains and ash were associated with a cremation burial. All of these examples have in common the fact that the cremated remains were not collected in a ceramic vessel. In other words, there is no proper evidence that urns were used on the east Aegean islands between the late 15th and the 13th century BC. This is not connected to the fact that all cremation burials on the east Aegean islands were found in Mycenaean-type rock-cut chamber tombs, as the use of ceramic vessels as urns was confirmed in tombs of the same type at Müskebi (no. 14). Therefore, the difference seems to be based on regional preferences. It should be noted that the presence of cremations without urns may also suggest a different tradition in which urns were not used as part of the funerary ritual.

A possible exception to this rule on the east Aegean islands is the unclear example of the LM IIIA amphoroid krater discovered at Tou Stavrou to Kephali on Karpathos (no. 17) (see Tab. 1). It is interesting that the use of a krater as an urn at this site could be the only proof of this tradition spreading outside of west Anatolia. Another possible exception is the jug possibly discovered in association with the cremated remains in the LH IIIA1–IIIA2 Tomb 19 at Ialysos on Rhodes (no. 16). However, in both cases the context of discovery is questionable.

A rather different picture emerges in the 12th and early 11th century BC or the LH IIIC period. In this period most of the available evidence for the use of urns comes from the east Aegean islands. Although some of the west Anatolian cemeteries, such as Panaztepe (no. 9) and Bakla Tepe (no. 12), most probably continued to be used in the early phases of the 12th century BC, the chronology of those cemeteries is far from being determined with certainty.

The most common shape on the east Aegean islands is jugs, with a clear preference for the FS 107 type (Fig. 3/4; also Tab. 1). Jugs are found at Eleona-Langada on Kos (no. 15) and Ialysos on Rhodes (no. 16). The only two other possible examples are the coarse vessel and hydria from Ialysos (no. 16). According to the current state of research, the use of jugs (and other pouring vessels such as hydria) as urns seems to have been a local trait, not connected to the practices in west Anatolia. The practice could have originated from the Dodecanese, as possibly suggested by the already discussed LH IIIA1–IIIA2 example from Tomb 19 at Ialysos (no. 16). Although it should be kept in mind that our poor knowledge of the 12th- and early 11th-century BC or LH IIIC urns in west Anatolia does not allow a proper comparison, some of the Bakla Tepe (no. 12) vessels might suggest that earlier traditions (i.e. the use of kraters and jars) continued into the early 12th century BC. Nevertheless, it should be kept in mind that jugs were rarely used as urns in west Anatolian cemeteries in any of these periods and were used sporadically only at the Cemetery of Cinerary Urns at Troy (no. 7).

The LH IIIC Middle alabastron from Aplomata (no. 18), which was used for the secondary deposition of unburned human skeletal remains, should be included in this discussion (see Tab. 1).[118] This is a rare example of an alabastron used for the deposition of human remains, with the only other possible example being the alabastron used as an urn at Müskebi (no. 14). However, the alabastron from Müskebi dates to LH IIIA2–IIIB,[119] which suggests a significant temporal hiatus between the two appearances. Therefore, it is impossible to argue that there is a direct connection between the two appearances of these similar practices.

6. Comparison to Central Anatolia

The first use of urns for the deposition of cremated remains in central Anatolia dates to the end of the EBA, although the appearance of cremation is documented even in the earlier periods. EBA urns were discovered at Çorum-Kuşsaray.[120] The earliest use of urns in west Anatolia also dates to the EBA. Cremation burials in urns have been discovered at Karaağaç[121] and Kaklik Mevkii.[122] Another possible west Anatolian site which might have produced evidence of the use of ceramic vessels as urns in the EBA is Aphrodisias (no. 5).[123] More precisely, the burial urn discovered at Kaklik Mevkii was a tripod cooking pot,[124] while a vessel of a similar

118 Aplomata and Kamini are the two most important LH IIIC Middle (the 12th and early 11th century BC) cemeteries on the Cycladic islands, located next to one another. Although neither of them produced any clear evidence of cremation, a burial on a pyre was discovered at Kamini. Although Desborough describes this burial as a cremation (Desborough 1964, 151), both preliminary reports and the later publication clearly state that it was an inhumation on a pyre, see Zapheiropoulos 1962, 250. – Zapheiropoulos 1966, 335, 337. – Vlachopoulos 2006, 90, 411. The connection of the buried individuals with fire, but not with the cremation ritual, is quite interesting in this case.

119 Bass 1963, 355.

120 Koşay 1968, 89. – Ekmen 2012, 28.

121 Alp 1965, 5.

122 Topbaş, Efe, İlasli 1998, 35, 77.

123 See Joukowsky 1986, 119–121.

124 Topbaş, Efe, İlasli 1998, 35, 77.

type was also used as an urn at Aphrodisias (no. 5). Tripod cooking pots used as urns are not attested in the later stages of the Bronze Age, neither in west nor in central Anatolia. Therefore, it is possible that the Aphrodisias example dates to the EBA as well. If this is true, the use of tripod vessels as urns could be specific for the EBA in west Anatolia.

The evidence of the use of ceramic vessels as urns in central Anatolia increases significantly in the 2nd millennium BC.[125] The cemeteries of the Assyrian Trade Colonies Period at Alisar[126] and Kültepe[127] did not yield any evidence of ceramic vessels used as urns, although possible cremated remains were reported in a cist grave at Kültepe.[128] However, a cemetery containing cremation burials in urns and dating to the late phase of the Assyrian Trade Colonies Period was discovered on the Arıbaş plot at Acemhöyük.[129] It is important to note that a single intramural inhumation in a pithos, more or less contemporary to the cemetery at the Arıbaş plot, was discovered at Acemhöyük.[130]

Unfortunately, the Arıbaş cemetery at Acemhöyük was published only in the form of preliminary reports and the published data does not allow a more detailed analysis.[131] Aliye Öztan associates the cemetery with the Assyrian Trade Colonies Period in central Anatolia, but dates it between the 18th and the middle of the 17th century BC.[132] Therefore, the absolute dating of the cemetery suggests that it should be associated with the transition from the Assyrian Trade Colonies Period to the Old Hittite Kingdom. Excavations at the site produced evidence of at least 139 cremation (83.2 %) and 28 inhumation burials (16.8 %).[133] Urns were used for the deposition of 112 cremations (67.1 % of the total number of burials).[134] The exact number of burial urns of each type is not known, but Öztan noted that the most common shapes are two- and four-handled jars with lids, while beak-spouted and trefoil-mouthed jugs, kantharoi, large cups, plates and bowls were also noted (see Tab. 1).[135]

Evidence of the use of urns in central Anatolia is best documented for the period of the Old Hittite Kingdom. Cemeteries with high quantities of cremations deposited in urns were discovered at Ilica[136] and Osmankayasi at Hattusa.[137] Both cemeteries contained inhumations in other grave types in addition to the dominant urns. The Old Kingdom phase (period B) of the cemetery at Ilica[138] contained 127 cremation burials (95.5 %), four inhumations (3.0 %) and two burials of unknown type (1.5 %). All of the 127 cremation burials were placed in ceramic vessels. In 124 examples (97.6 %), the vessel was a spouted jug (Fig. 3/5), while in the three remaining examples (2.4 %) it is impossible to deduce the shape from the published evidence.

The cemetery at Osmankayasi[139] provides evidence of both the Old Kingdom period (earlier phase) (c. 1700/1650–1400 BC) and the early period of the Hittite Empire (later phase) (c. 1400–1200 BC). The earlier or the Old Kingdom phase of the cemetery included 25 cremation burials (62.5 %) and 15 inhumations (37.5 %). Of the cremation burials, only four were not placed inside ceramic vessels. The remaining 21 examples (52.5 %) include nine two-handled amphorae (42.9 %), four bowls (19.1 %), three two-handled jars (14.3 %), three handleless jars (14.3 %), a flask (4.7 %) and a vessel of an unclear type (4.7 %).

A different practice was documented at Konya-Karahöyük, where intramural cremation burials were covered with ceramic sherds (and mudbrick fragments) instead of being deposited in urns.[140] Even in this case, the contemporary inhumations in pithoi were documented outside of the settlement.[141] Cremated remains of an infant were discovered in a small jar at Tarsus-Gözlükule.[142] The cemeteries of this period in which there is no confirmation of cremation were discovered at Ferzant-Büget,[143] Gordion,[144] Kazankaya[145] and the intramural cemetery at Ikiztepe.[146]

125 This overview excludes other examples of cremation found further east and southeast. For those, see Ekmen 2012, 29.
126 Von der Osten 1937.
127 Özgüç 1950.
128 Özgüç 1950, 163–164, 167–168. – Ekmen 2012, 27–28.
129 Öztan 1998. – Öztan 2006.
130 Emre 1966, 102–103. – Emre 1978, 123–124. – Özgüç 1966, 34–35.
131 Öztan 1998. – Öztan 2006.
132 Öztan 1998, 172.
133 Öztan 1998, 168–169. – Öztan 2006, 395–396. – Ekmen 2012, 29.
134 Öztan 1998, 168.
135 Öztan 1998, 168. It is important to note that Ekmen argued that one of peculiarities of the Arıbaş cemetery is the use of plates and bowls as urns (Ekmen 2012, 30). However, bowls are also used at the Osmankayasi cemetery dating to the Old Hittite Kingdom.
136 Orthmann 1967.
137 Bittel et al. 1958.
138 Orthmann 1967.
139 Bittel et al. 1958.
140 Alp 1956, 35. – Emre 1978, 126.
141 Ekmen suggested that house-shaped urns were used at Konya-Karahöyük (Ekmen 2012, 30). However, he wrongly refers to Alp's description of pithoi used for inhumations (Alp 1961, 524). No real urns were found in association with the cremation burials at Konya-Karahöyük.
142 Goldman 1956, 47, 64 and Fig. 167.
143 Özgüç 1978. – Özgüç 1986.
144 Mellink 1956.
145 Özgüç 1978, 69–88.
146 Alkim 1976, 718. – Emre 1978, 125.

The evidence of burial practices at the time of the Hittite Empire is rather scarce.[147] It includes a single inhumation of a skull from Polatlihöyük,[148] while intramural inhumations discovered at Hattusa date both to the Old Kingdom and the Empire periods.[149] The use of the Old Hittite Kingdom cemetery at Osmankayasi seems to continue into the 14th century BC and the period of the Hittite Empire, allowing comparison between the two periods.[150] The second cemetery of Hattusa at Bağlarbaşikayasi also dates to the period of the Hittite Empire. Both cemeteries at Hattusa confirm the use of ceramic vessels as urns in the later stages of the LBA in central Anatolia. Two additional cremation burials in urns dating to the period of the Hittite Empire were discovered at Mersin-Soloi.[151]

The later phase at Osmankayasi included 31 cremation burials (81.6 %) and 7 inhumations (18.4 %). The number of inhumation burials suggests a decrease in comparison to the earlier phase of the cemetery. Cremations were deposited in urns in 25 cases (65.8 %). The urns included: nine two-handled amphorae (36.0 %) (Fig. 3/6), three bowls (12.0 %), six two-handled jars (24.0 %) (Fig. 3/7), five flasks (20.0 %), one four-handled jar (4.0 %) and one tall amphora with V-shaped handles (4.0 %). Specific types of ceramic vessels used as urns suggest the continuation of the practices already attested in the earlier or Old Hittite Kingdom phase of the cemetery. More precisely, two-handled amphorae (Fig. 3/6) and jars (Fig. 3/7) are the most common types of vessels used both in the earlier (57.2 %) and later (60.0 %) phases of the cemetery, while the only significant difference seems to be the increase in the number of flasks in the later phase.

Bağlarbaşikayasi, the second cemetery at Hattusa, is contemporary to the later phase of the cemetery at Osmankayasi. It exhibits a similar pattern to Osmankayasi.[152] Most of the shapes present at Osmankayasi were encountered at Bağlarbaşikayasi as well.[153] Although some additional shapes were encountered at Bağlarbaşikayasi,[154] it remains uncertain which of the vessels presented by Bittel in 1937 actually originated from the cemetery.

A rather diverse picture arises from the overview of the 2nd-millennium BC cemeteries in central Anatolia. Urns appear rather rarely at cemeteries which contain predominantly inhumation burials in different grave types. Instead, they appear in larger clusters forming separate cemeteries, which are also used for inhumation burials to a small extent. Such cemeteries are rare in west Anatolia and can be found only at the Cemetery of Cinerary Urns at Troy (no. 7) (and possibly earlier at Aphrodisias (no. 5)). In west Anatolia, cremation burials in urns usually appear at larger cemeteries dominated by skeletal burials in different grave types and are often placed inside larger graves together with skeletal burials.

The evidence from several larger cemeteries in central Anatolia suggests that the use of specific ceramic vessels as urns in the period of the Old Hittite Kingdom varied between different sites and exhibited local preferences.[155] For example, it seems unlikely that the significant difference in the choice of ceramic vessels at Ilica (exclusively spouted jugs) and Osmankayasi (predominantly two-handled amphorae and jars) is related to chronology, as the continuous use of the cemetery at Osmankayasi from the period of the Old Hittite Kingdom until the period of the Hittite Empire suggests only minor changes in the local traditions during a long period of time. Moreover, the same shapes encountered at the cemetery of Osmankayasi were already well attested in similar ratios at the earlier Arıbaş cemetery at Acemhöyük. This suggests that in certain parts of central Anatolia, the same traditions lasted at least from the end of the Assyrian Trade Colonies Period until the period of the Hittite Empire. Unfortunately, from the available evidence it is not possible to present any clear conclusions about the spatial distribution of different traditions and their chronological development. For example, the cemeteries at Ilica and Arıbaş are located at approximately the same distance from the cemetery at Osmankayasi, the former to the northwest and the latter to the southwest. The cemeteries at Ilica and Osmankayasi are contemporary, but still exhibit completely different traditions, while the cemetery at Arıbaş predates the one at Osmankayasi, but exhibits almost the same tradition.

There are several main differences between the traditions in central and west Anatolia. Nevertheless, it should be kept in mind that most of the evidence from central Anatolia predates that from west Anatolia. Therefore, the comparison is not as straightforward as it might seem. Almost

147 Single inhumations dating widely to the Hittite period were also confirmed at Karaoğlan (Arik 1939, 58. – Emre 1978, 126) and Alaca Höyük (Koşay, Akok 1973, Pl. 3 and Fig. 2). Another single inhumation of approximately the same date was recorded at Maşat Höyük (Emre 1978, 128).

148 Lloyd, Gökçe 1951.

149 Bittel, Naumann 1952, 116–118, 155. – Schirmer 1969, 28–29. – Emre 1978, 124–125.

150 Bittel et al. 1958, 25–32.

151 Yağci 2003, 94. – Yağci 2007, 152. – Ekmen 2012, 30.

152 Bittel et al. 1958, 33–34.

153 See Bittel 1937, 35–56.

154 See Bittel 1937, 35–56. – Bittel et al. 1958, 33–34.

155 Ekmen 2012, 31.

the whole of west Anatolia exhibits a rather homogenous picture from the MBA until the end of the LBA, with a clear preference for the use of kraters, krateroid jars and other jars as urns. On the other hand, central Anatolia shows a rather diverse picture and more regionalized or even localized practices (e.g. Ilica, Osmankayasi and Konya-Karahöyük). Moreover, there is a clear difference in the use of preferred shapes between the two areas, although sporadic similarities do exist, such as the use of flasks and jugs at the Cemetery of Cinerary Urns at Troy (no. 7), Arıbaş, Ilica and Osmankayasi or the sporadic use of bowls at Demircihüyük-Sarıket (no. 2), Panaztepe (no. 9), Arıbaş and Osmankayasi. The most prominent formal similarity might be the use of two-handled jars at the Cemetery of Cinerary Urns (no. 7) (Fig. 3/1) and Osmankayasi (Fig. 3/7). Bittel already suggested a possible parallel between Trojan kraters and the two-handled jars (Fig. 3/7) from the cemeteries of Hattusa.[156] However, he was probably referring to two-handled jars rather than more elaborate kraters, as there is no clear formal similarity between the kraters from the Cemetery of Cinerary Urns (no. 7) and the two-handled jars from Osmankayasi (Fig. 3/7). Unfortunately, at the moment it is impossible to argue whether some of the shapes encountered in central Anatolia were used as kraters.

The use of jugs as urns in both areas is especially problematic. It was mentioned earlier that Carstens wrongly suggested that a jug was used as an urn at Müskebi (no. 14).[157] As noted, she based her argument on the comparison with the central Anatolian tradition. However, the cemetery at Ilica is the only one in central Anatolia where jugs were the predominant type of urn. Consequently, jugs cannot be considered as a type of urn typically used in central Anatolia. Furthermore, the cemetery at Ilica is several centuries earlier than the one at Müskebi (no. 14). Therefore, it is highly unlikely that the cemetery at Müskebi (no. 14) was influenced by the traditions attested at Ilica. Moreover, in west Anatolia, the use of jugs is attested only at the Cemetery of Cinerary Urns at Troy (no. 7), located on the opposite side of the west Anatolian coast from Müskebi (no. 14). Even at the Cemetery of Cinerary Urns at Troy (no. 7), the use of jugs is sporadic.

The rare use of jugs as urns in MBA and LBA west and central Anatolia directly relates to the question of the use of jugs as urns in the LH IIIC (12th and early 11th century BC) funerary contexts on Rhodes and Kos. As jugs are rarely used as urns in west Anatolia, their appearance on the east Aegean islands cannot be related to the developments on the coast. Furthermore, as no direct influence of central Anatolian practices could be determined even in the earlier periods, this possibility has to be dismissed in the LH IIIC period as well. Therefore, the use of jugs as urns on the Dodecanese should be regarded as a subregional tradition that developed separately. The possible LH IIIA1–IIIA2 appearance of cremation in association with a jug in Tomb 19 at Ialysos on Rhodes (no. 16)[158] could suggest that the development of the LH IIIC Dodecanese tradition was gradual and independent of any direct west or central Anatolian influence.

7. Comparison to the Greek Mainland and Crete

Only a limited number of cremation burials were documented on the Greek mainland prior to the LH IIIC period (Postpalatial period). They mostly date to the LH IIIA–IIIB period (Palatial period),[159] but an earlier LH I appearance was also noted at Argos.[160] Cremations were almost never deposited in urns on the LH IIIA–IIIB Greek mainland. More precisely, there are only two known examples of cremated remains deposited in an urn. The first are the burned human remains found inside an amphora discovered at the entrance of a LH IIIA2–IIIB rock-cut chamber tomb at Prosymna.[161] The second example was discovered in a LH IIIA–IIIB rock-cut chamber tomb at Brauron in east Attica.[162] The alabastron discovered in the tomb contained burned human skeletal remains. It is important to note that the use of an alabastron for the deposition of cremated human skeletal remains is paralleled in the contemporary example from Müskebi (no. 14) in west Anatolia.[163] Apart from the mentioned examples, the use of urns is not attested on the Greek mainland until LH IIIC. Cremation burials in pithoi, jars and larnakes were discovered at Olous on Crete and dated to the LM IIIA–IIIB period.[164]

In the LH IIIC period, cremation burials appear in two different grave/tomb types on the Greek mainland. The first type are tumuli, in which cremations are predominant.[165] The second type are rock-cut chamber tombs, in which cremations were deposited together with predominant

156 Bittel 1937, 46.
157 Carstens 2001, 91.
158 Benzi 1992, 231.
159 See an overview in Cavanagh, Mee 1998, 71–72, 74.
160 E.g. Voutsaki 1993, 80.
161 Blegen 1937, 143.
162 Lazaridis 1968, 99. – Papadopoulos, Kontorli-Papadopoulou 2014, 121.
163 Bass 1963, 355.
164 Kanta 2001.
165 See Ruppenstein 2013, 187.

inhumations. Argos[166] and Chania near Mycenae[167] have produced cremation burials in tumuli on the Greek mainland, while an additional example is known from Pezoulos Atsipadhes in western Crete.[168] The tumulus discovered at Argos contained both skeletal (30.7 %) and cremation burials in urns (69.3 %).[169] The urns included 36 vessels of different types, namely 15 jugs of various types (44.4 %), ten amphoriskoi (27.8 %), six amphorae (16.6 %), two hydriae (5.6 %) and two collar-necked jars (5.6 %) (see Tab. 1).[170] Nine urns were discovered in association with the tumulus discovered at Chania near Mycenae.[171] The examples include five amphorae of different types (55.5 %), two jugs (22.2 %), an amphoriskos (11.1 %) and a hydria (11.1 %) (see Tab. 1).[172]

The most famous LH IIIC cemetery on the Greek mainland which produced evidence of cremations in rock-cut chamber tombs is Perati in east Attica. In total, 18 cremations were found in 10 tombs. The cremated remains were often simply deposited on the floor of the chamber or in a pit dug in the floor. In some cases, the remains were deposited in an urn, in four cases in jugs (FS 107), once in a collar-necked jar (FS 64) and once in an amphora (FS 69) (see Tab. 1).[173] The tradition of using jugs as urns continued in LH IIIC Late in Attica, as confirmed at Kerameikos in Athens.[174] Florian Ruppenstein suggests that the practice must have been abandoned by the beginning of the Early Iron Age.[175] However, two jugs discovered at the Elateia-Alonaki cemetery in Phthiotis date to the Early Protogeometric period.[176] The cemetery at Elateia-Alonaki also yielded an additional amphora used as an urn in the Early Protogeometric period.[177] Both shapes used as urns at Elateia-Alonaki suggest the continuation of the earlier tradition, which started already in the LH IIIC period.[178]

The evidence presented suggests that the most popular types of ceramic vessels used as urns on the Greek mainland during the LH IIIC period were jugs, amphoriskoi and amphorae.[179] The earliest use of an amphora as an urn was documented in the LH IIIA–IIIB context at Prosymna on the Greek mainland and it might suggest the early appearance of a local tradition, which started already in the Palatial period but did not fully develop until the LH IIIC or Postpalatial period. On the other hand, the earliest jug used as an urn was possibly noted in the LH IIIA context at Ialysos on Rhodes (no. 16) and it might represent the development of the local Dodecanese tradition independent of the traditions attested in Anatolia or the Greek mainland. Interestingly, similar to the amphorae on the Greek mainland, the tradition did not develop fully until the LH IIIC period.

Mee correctly noted the similarities in the deposition of cremated remains between Perati and Ialysos on Rhodes (no. 16), which encouraged him to believe that the LH IIIC inhabitants of the settlements associated with the Perati and Ialysos (no. 16) cemeteries must have originated from the same region.[180] Regardless of the possible migration or mobility hypothesis, the use of jugs (and hydriae) on the Greek mainland and the east Aegean islands in LH IIIC indeed displays similarities in the traditions, independent of the contemporary west Anatolian traditions. The connection is further strengthened by the fact that other parts of the Aegean, such as Crete, seem to have developed independently.

The most popular shapes used as urns during the LH IIIC period on the Greek mainland, namely jugs, amphoriskoi and amphorae, were deposited both in tumuli and rock-cut chamber tombs. It is evident that a larger number of amphorae, amphoriskoi and similar types existed in tumuli, while jugs might have been preferred in rock-cut chamber tombs. However, the evidence is far from conclusive and this might equally be a sign of local preferences, rather than connected with the grave type.

166 Piteros 2001.
167 Palaiologou 2013.
168 Agelarakis, Kanta, Moody 2001.
169 Piteros 2001.
170 Piteros 2001, 106–107 and n. 27; 111–113 and n. 53.
171 Palaiologou 2013, 254–267.
172 Various ceramic vessels were used as lids for urns at Argos and Chania. They are of three basic shapes: shallow bowls, deep bowls and cups. There seems to be no consistent correlation between the types of urns and types of vessels used as lids.
173 Iakovidis 1969, Pl. 174. – Iakovidis 1970, 422–424. – Mee 1982, 28.
174 Ruppenstein 2007, 24–25.
175 Ruppenstein 2013, 191.
176 Dakoronia, Deger-Jalkotzy, Fabrizii-Reuer 2002, 140, 143 and Fig. 4; 146. – Deger-Jalkotzy 2013, 222, 226–227.
177 Deger-Jalkotzy 2013, 227. The cemetery was used from the LH IIIA1 until the Early Protogeometric period. Cremations did not appear until the LH IIIC Late period, while urns were not used until the last phase of the cemetery in the Early Protogeometric period, see Deger-Jalkotzy 2013, 221–222.
178 It is important to note that the contextual evidence suggests that the amphora was used as an urn during the Early Protogeometric period, while its stylistic features suggest an earlier date. Therefore, it is probably an earlier vessel which was reused, see Deger-Jalkotzy 1999, 197. – Deger-Jalkotzy 2013, 227.
179 A four-handled amphora used as an urn was deposited in a rock-cut chamber tomb at Spaliareika-Lousikon, see Giannopoulos 2008, Pls. 21, 37 and Cat. No. 8–9.
180 Mee 1982, 28, 90.

In this respect, the tumulus at Pezoulos Atsipadhes in west Crete should be mentioned. The excavation of the tumulus produced one jar and two amphorae.[181] It should be mentioned that Eustathios Petroulakis identified 21 cremation burials in urns during his excavations at the site at the beginning of the 20th century.[182] Among the vessels he retrieved, he mentioned pyxides and collar-necked jars and published some of the examples (see Tab. 1).[183] Unfortunately, for most of the vessels published by Petroulakis it remains unclear whether they represent urns or burial gifts accompanying the urns.[184] The types of amphorae (e.g. the ovoid wide-mouthed type) resemble the types discovered in the tumuli on the Greek mainland. However, even with the example of Pezoulos Atsipadhes it is not possible to argue with certainty whether the similarity in the preferred type of urns used suggests a correlation of this type of vessel to the grave type, as it could equally suggest a similarity in tradition between the Argolid and west Crete. In any case, one option does not necessarily exclude the other.

The rest of Crete suggests that the traditions on the island developed in a different way in comparison to west Crete and the Greek mainland.[185] An especially interesting example is a pictorial krater from the Tholos Tomb A at Mouliana on Crete, which was used as an urn (see Tab. 1).[186] This is one of only two examples of kraters being used as urns outside of west Anatolia in any of the MBA and LBA phases, with the dubious LM IIIA example from Tou Stavrou to Kephali on Karpathos (no. 17) being the second one. However, there is insufficient evidence to argue that there was a direct connection between the appearances or propose that this tradition spread from Anatolia to Crete via Karpathos. More precisely, there is no definite evidence to prove the use of kraters as urns on Karpathos after the LM IIIA period, on Crete before the LM IIIC period or in west Anatolia after the LH IIIB period, although some of the Bakla Tepe (no. 12) kraters might date to the early stages of the LH IIIC period. Therefore, there are no definite contemporary appearances in all three areas which would prove the possible connection.

The types of vessels popular on the Greek mainland were seldom used on Crete. Ruppenstein argued that there is not a single Cretan example of a jug used as an urn in the LM IIIC period.[187] Although there are no clear examples of such practice, it has to be noted that jugs were among the vessels retrieved by Petroulakis from Pezoulos Atsipadhes (see Tab. 1).[188] However, in this case it remains unclear whether they were used as grave goods or urns. Although the appearance of jugs at Pezoulos Atsipadhes would not be surprising, the only definite parallel between the traditions on Crete and the Greek mainland is the use of amphorae and amphoriskoi as urns at Pezoulos Atsipadhes[189] and Tourloti (see Tab. 1).[190]

Furthermore, other examples from Crete suggest a tradition different from the contemporary cemeteries on the Greek mainland and the east Aegean islands. Cylindrical pyxides/alabastra were documented in east Crete at Mouliana, Fotoula in Praisos, Kritsa and Palaimylos (see Tab. 1).[191] Although alabastra were used at Müskebi (no. 14) in west Anatolia and Brauron on the Greek mainland during the LH IIIA–IIIB period, as well as at Aplomata on Naxos (no. 18) during the LH IIIC period, the connection between these appearances remains unclear. Moreover, none of these cemeteries have produced more than one example of an alabastron used as an urn, while in east Crete the appearance of alabastra was documented at several sites. Therefore, it seems that the tradition was stronger on Crete than anywhere else and there is no need to look for possible influences from elsewhere. Rather, it should be regarded as a local occurrence.

8. Interregional Interaction and the Spread of Traditions – Some Theoretical Considerations

At the beginning of this brief theoretical discussion, I would like to point out that it is not my intention to address in detail the question of interregional interaction

181 Agelarakis, Kanta, Moody 2001, 71–73.
182 Petroulakis 1915.
183 Petroulakis 1915. – Agelarakis, Kanta, Moody 2001, 70.
184 Agelarakis, Kanta, Moody 2001, 70.
185 Davaras presented an overview of cremation burials discovered on Crete until 1973 (Davaras 1973).
186 See Davaras 1973, 163. – D'Agata 2007, 113. – Papadopoulos 2009, 74. Moreover, bronze vessels were used as urns at Spaliareika in Achaea (Giannopoulos 2008, 116, 168, 224 and Pls. 23/19; 39/19) and Tylissos on Crete (Marinatos 1931, 112–113). A hemispherical bowl was used at Tylissos, while the vessel discovered at Spaliareika was a lekani. Although Davaras argued that the burial from Tylissos should date to the Protogeometric period (Davaras 1973, 166), it seems more probable that it dates to the advanced stage of LM IIIC, see Ruppenstein 2013, 191 and n. 59.
187 Ruppenstein 2013, 191.
188 Petroulakis 1915, 49 and Fig. 2.
189 Petroulakis 1915, 49 and Fig. 1. – Agelarakis, Kanta, Moody 2001, 72 and Fig. 8; 73 and Fig. 10.
190 Paschalidis 2009, 15–17.
191 Xanthoudidis 1904, 35–36 and Pl. 3. – Platon 1966, 305 and Pls. 243/b, 244/a. – Davaras 1973, 158–160, 162 and Pl. 28/1–6. – Tsipopoulou, Little 2001, 85–86 and Figs. 2–4; 91–92. – Paschalidis 2009, 16 and n. 101.

between Anatolia and the Aegean or provide a comprehensive overview of the history of research. Rather, my aim is to point out specific problematic points in the earlier interpretations which influenced our perception of burial practices. In my opinion, these problematic points hindered a better understanding of the influence of interregional interaction on the development of various funerary forms. The problematic points are mostly related to the use of various explanatory models developed within the framework of the culture-historical discourse and employed from the beginning of the 20th century until fairly recently.[192] Such explanatory models interpreted the cultural change, including that attested in the funerary record, as a result of cultural diffusion and/or migration from one side of the Aegean to the other.

Although there are important differences between the approaches of various authors whose explanatory models were developed within the framework of the culture-historical discourse, most of them rely on the idea that the changes in funerary data can be related to migration and population changes. For example, this is well attested in the case of rock-cut chamber tombs, which were used in the east Aegean–west Anatolian region between the late 15th and the early 11th century BC. The initial appearance, as well as the later changes in the number and distribution of rock-cut chamber tombs in the east Aegean–west Anatolian region, were interpreted as a sign of immigrants coming from the Greek mainland. More precisely, the first appearance of rock-cut chamber tombs in the LH IIB–IIIA1,[193] their spatial spread and increase in numbers during LH IIIA2,[194] and the repeated rise in LH IIIC after the LH IIIB decrease in numbers[195] were all interpreted as the result of the influx of new immigrants from the Greek mainland.[196] Similar explanations were sometimes used to explain the appearance of cremations and the use of urns on the Greek mainland in the LH IIIC period. For example, as noted earlier in the text, Mee proposed that the cremated individuals buried at Perati in east Attica and Ialysos on Rhodes (no. 16) must have originated from the same region.[197] Therefore, specific elements of burial practices were used to argue for the origin of the individuals associated with those practices. Unusual and newly emerged funerary forms, including the burial rite, were commonly interpreted as a sign of immigrants, especially when similar forms already existed in the nearby regions. Although it is highly likely that small scale migrations and mobility were continuously reshaping the social environments,[198] it has to be noted that migrations and mobility have not yet been successfully traced in the funerary record, although the potential for such an analysis might exist if anthropological, isotope and DNA analyses were included.[199] Therefore, I remain unconvinced that specific objects, employed burial rites or documented funerary practices can simply be used to determine the presence of immigrants, as visible in the following two examples.

One of the cist graves at Beşik-Tepe contained an adult male individual buried in the extended position on his back. According to Basedow, he must have come from Macedonia, as the extended position of the deceased on the back does not correspond to the Anatolian tradition.[200] Interestingly, two cremation burials deposited in the same grave were interpreted as the burials of an Anatolian wife and a child of the buried Macedonian man,[201] as the cremation burial rite has always been regarded as something typically Anatolian. Although Basedow is correct that the extended position on the back is not commonly used at the 2nd-millennium BC cemeteries in west Anatolia, the evidence from other cemeteries in different parts of the east Aegean–west Anatolian region (e.g. Demircihüyük-Sarıket, Trianda on Rhodes) suggests a connection between the extended position and cist graves at least since the first half of the 2nd millennium BC.[202] Therefore, the extended position of the male individual discovered in the cist grave at Beşik-Tepe could equally represent the introduction of a foreign practice or continuation of the east Aegean–west Anatolian tradition.

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192 E.g. Furumark 1950, 150, 202. – Mee 1978. – Mee 1988a. – Mee 1988b. – Benzi 1992. – Benzi 1996, 973. – Mee 1998. – Niemeier 1998a. – Niemeier 2005a. – Niemeier 2005b.

193 E.g. Furumark 1950, 180–181, 262–263. – Mee 1982, 82. – Driessen, Macdonald 1984, 67. – Benzi 1988, 62. – Mee 1988a, 301. – Benzi 1992, 212. – Benzi 1996, 948. – Niemeier 1999, 149. – Karantzali 2001, 78.

194 E.g. Macdonald 1985, 192. – Benzi 1988, 62. – Mee 1988a, 304. – Niemeier 2002, 295.

195 Deger-Jalkotzy connects the destructions in the transition between LH IIIC Early and LH IIIC Middle on the Aegean islands to migration from the Greek mainland (Deger-Jalkotzy 1998, 113).

196 E.g. Mee 1982, 2, 88. – Mee 1988b, 57. The idea about the migration of Mycenaeans from the Greek mainland after the destruction of the palatial system dates back to the work of Tsountas and Manatt (Tsountas, Manatt 1897, 364–365).

197 Mee 1982, 28, 90.

198 See the overview of the topic in Mokrišová 2016.

199 Franković 2018, 18–19.

200 Basedow 2000, 155.

201 Basedow 2000, 155.

202 Marketou 1998, 76 and Pl. IV. – Seeher 2000, 194–207. – Georgiadis 2003, 35.

Another example is the Mycenaean-style krater from Ayasoluk in Selçuk (Ephesos) (no. 13), which was used as an urn for the deposition of human skeletal remains.[203] As shown earlier in the text, west Anatolian-type kraters were the most common type of urn used for the deposition of the human skeletal remains all over west Anatolia from the beginning of the 2nd millennium BC. However, the use of kraters as urns is almost completely unknown outside of west Anatolia, with the possible exception of the LM IIIA example from Tou Stavrou to Kephali on Karpathos (no. 17) and the rather late LM IIIC example from Mouliana on Crete.[204] Therefore, the use of a Mycenaean-style instead of an Anatolian-type krater at Ayasoluk (no. 13) represents a novelty in the west Anatolian burial practices. However, as I argued elsewhere, the krater could equally represent a foreign object appropriated into local practices by west Anatolian inhabitants or the appropriation of west Anatolian burial practices by the immigrants from the west Aegean.[205] Both cases would leave the same trace in the archaeological context.

To overcome the obvious inability to differentiate between locals and foreign immigrants in the archaeological record, Penelope Mountjoy introduced the concept of the east Aegean–west Anatolian hybrid interface.[206] She interpreted the area as a mixture of Mycenaean and local/Anatolian cultural traits, also attested in the funerary practices. However, the concept of the hybrid interface only creates an additional artificial taxonomic category, while it completely neglects the dynamic and creative processes which led to the creation of such a hybrid.[207] If we accept that the hybrid is nothing more than a mere mixture, then almost every cultural form can be described as a hybrid of local traditions and foreign influences. However, if everything is defined as a hybrid, then the concept loses its explanatory value.[208] An additional problem with the concept of the hybrid interface is that it still envisages the east Aegean–west Anatolian region as a mixture of Anatolian and Mycenaean cultural traits, which can then be individually determined in specific archaeological contexts. For example, within Mountjoy's concept, cremations in an urn would still be regarded as an Anatolian feature of the hybrid interface. Consequently, by determining the origin of certain cultural forms within the hybrid interface, Mountjoy's concept simply prolongs the use of the culture-historical discourse.[209]

Approaches developed within the framework of culture-historical discourse commonly suppose that certain material forms and cultural practices must have had the same meanings in the region of their origin and in the region where they were subsequently introduced. More precisely, such approaches focus almost exclusively on the meanings that specific cultural traits had in their region of origin rather than focusing on the way they were appropriated, translated and attributed with new meanings in the context of their consumption. In order to trace the origin of specific material forms and cultural practices, the theoretical approaches to interregional contacts working within the framework of the culture-historical discourse mostly focus on the examination of the similarities which exist between different regions, only occasionally mentioning the differences.[210] Such an approach hinders a better understanding of local meanings of individual practices and leads to generalized conclusions about the origin and level of foreign influence on local cultural change. For example, the focus on the similarities between Anatolia and the Aegean led to the simplified conclusion that the introduction of the cremation burial rite and the accompanying urns took place due to the influence of the central Anatolian (Hittite) funerary traditions on the Aegean through the mediation of the east Aegean–west Anatolian region. However, there are two basic problems with such an approach. First, it completely neglects the fact that there is no such thing as a central Anatolian (or Hittite) funerary tradition and that there is almost no influence of the central Anatolian burial practices on the appearance of cremation burials in urns in the east Aegean–west Anatolian region. More precisely, the focus on similarities completely neglects the fact that the west Anatolian tradition of the use of ceramic vessels as urns developed independently from central Anatolia at the beginning of the 2nd millennium BC. In west Anatolia, cremations make up only the minority of burials at the cemeteries and are predominantly deposited in kraters or jars in all parts of the region. Cremations make up the majority of burials at individual cemeteries in central Anatolia, while the choice of urns depends on distinct local practices.

203 This particular example was recently discussed in Franković 2018.

204 See Davaras 1973, 163. – D'Agata 2007, 113. – Papadopoulos 2009, 74.

205 Franković 2018, 18.

206 Mountjoy 1998.

207 Stockhammer 2013, 14. – Franković 2018, 11.

208 Kraidy 2002. – Maran 2012, 59, 64. – Michaels 2019, 9.

209 Franković 2018, 11.

210 See the discussion in Stockhammer, Athanassov 2018, 105–106.

Second, there is only a limited number of similarities between the urn types used in the east Aegean–west Anatolian region and the west Aegean, while there is no clear connection to any of the central Anatolian traditions. Although there are certain similarities between the Dodecanese (i.e. Kos and Rhodes) and west Aegean traditions in the deposition of cremated remains in jugs, the similarities to west Anatolian traditions and the use of kraters and jars are almost non-existent.

The oversimplified interpretations arise from the lack of detailed contextual examinations of the data. For example, knowledge about the relationship between the age, gender, status and other social categories of the deceased and the specific burial rites, let alone the choice of the specific urns, is rather scarce if not completely lacking for both Anatolia and the Aegean. Moreover, the interpretations about the Anatolian influence on the appearance of cremation burials in the west Aegean tend to be ahistorical. For example, the use of ceramic vessels as urns for the deposition of cremated remains in the west Aegean appears more frequently in the period when the use of urns is almost unattested in west or central Anatolia, while the types of vessels used in the west Aegean completely differ from those used in west or central Anatolia. Furthermore, the proposed spread of the practice of cremation from Anatolia to the west Aegean appears in a period of decline in the interaction between the two regions.

In my opinion, as our understanding of the social connotation of the cremation burial rite either in the east Aegean–west Anatolian region or the west Aegean is almost non-existent, it is highly questionable whether its origin is indeed a relevant research question from the methodological and theoretical point of view. The focus should be placed on the practices and their social connotations in specific contexts, and the examination should not simply stop when the existence of formal similarities is determined. Even in the current state of research, there is enough evidence to suggest that cremation burials and urns in which cremated remains were deposited had a variety of different social connotations in different parts of the Aegean and Anatolia. For example, it is highly unlikely that the exclusive use of cremation burials in high-elite stone-built chamber tombs at Beşik-Tepe (no. 8) and Bakla Tepe (no. 12) had the same social connotation as the cremations of children and sometimes adults which were deposited in different grave types at larger west Anatolian cemeteries during the MBA and LBA. Similarly, while cremation burials make up the majority of burials in stone tumuli on the LH IIIC Greek mainland, they constitute only a minority of burials in the contemporary rock-cut chamber tombs.

In my opinion, the question is not whether the influences of one region on the other existed, but how such influences were received and incorporated into the already existing local practices. As correctly noted by Rik Vaessen for the east Aegean–west Anatolian sites, different combinations of influences appear at each site and a variety of different reactions to these influences can be expected due to the different positions of sites and associated communities in various communication networks.[211] Therefore, one cannot expect a simple transfer of cultural practices from one region to the other which would act as a homogenizing factor. Any homogenizing process inevitably leads to simultaneous heterogenization.[212] Homogenization and heterogenization are two complementary and inseparable processes which work simultaneously and are not contradictory.[213] Therefore, there is no passive reception of cultural influences, such as the use of cremation burial rite and urns for the deposition of cremated remains, but rather a variety of local appropriations. Cultures and cultural traditions are not bounded, isolated, enclosed and homogenous entities which occasionally and unidirectionally influence each other. Rather, they are constantly reshaped and transformed through the exchange of material forms, practices, ideas and knowledge, at the same time erasing the borders between them. More precisely, cultural traditions are continuously recreated, transformed, negotiated and performed.[214] Consequently, the material forms, practices, ideas and knowledge are not simply transferred from one region to another through migration or cultural diffusion, but transformed through interaction.[215] However, although the employment of new theoretical approaches can prove fruitful for our understanding of the spread of foreign cultural traits in different parts of the Aegean, a significant amount of empirical work still needs to be done.[216]

The lack of clear boundaries between cultural traditions is visible in the patterns emerging from the study of ceramic vessels used as urns. The evaluation of the distribution of different types of urns at different sites in the Aegean does not suggest that the transitions between different traditions are clear, but rather that they are gradual and fluid. For example, in the 12th and early 11th century BC, jugs are the dominant type of urn on the Dodecanese,

211 Vaessen 2016, 54, 58.

212 Robertson 1995, 38.

213 Robertson 1995, 27–28, 36, 40. – Bauman 1998, 44–45.

214 E.g. Friedman 1997. – Juneja 2011. – Hahn 2013, 25, 34–35. – Juneja, Falser 2013. – Maran 2017, 21–22. – Maran 2019, 52, 60–61.

215 Latour 1986, 268. – Maran 2017, 22–25.

216 Knappett 2016, 205.

the only exceptions being a hydria and a coarse jar used as urns. In Attica, jugs are the most commonly used type of vessel, but amphorae and similar types can also be found. Further to the west, in the Argolid, the number of amphorae, amphoriskoi and collar-necked jars increases, while jugs are still important but not dominant. The practice changes further south. In west Crete, we encounter a similar tradition as in the Argolid, but the local influence is possibly visible in the use of pyxides. In east Crete, pyxides are the main type of vessel used as an urn, while other shapes are rarely used.

9. Concluding Remarks

The main aim of this paper was a detailed examination of the use of ceramic vessels as urns in the 2nd millennium BC east Aegean–west Anatolian region. I examined the emergence and development of different traditions, as well as the influence of central Anatolian traditions on their formation. As Anatolia is often taken as the place of origin of the cremation burial rite and the use of urns in the west Aegean, I also examined the similarities and differences between the west Aegean and Anatolian traditions.

The data presented in this paper suggests that urns were used in west Anatolia from the early years of the 2nd millennium BC on. The use of krateroid jars and other jars as urns for the deposition of cremated remains and burials of children in the first half of the 2nd millennium BC in west Anatolia suggests the early formation of the traditions attested in the later 14th- and 13th-century BC cemeteries. Unfortunately, there is a lack of MBA and early LBA evidence that the cremation burial rite was employed or that urns were used on the east Aegean islands. However, this does not come as a surprise, as our knowledge of the funerary data on the east Aegean islands in this period is almost non-existent.

At the same time, a separate tradition developed in central Anatolia. The types of ceramic vessels used as urns in west Anatolia were not used in the contemporary cemeteries in central Anatolia. Moreover, central Anatolian cemeteries in this period exhibit a localized character and there was no tradition of using specific ceramic vessels as urns which was common to the whole area. Therefore, the traditions in west and central Anatolia developed independently after the beginning of the 2nd millennium BC.

Although the evidence of a wider spatial distribution of krateroid jars and other jars in the MBA and early LBA cemeteries in west Anatolia is quite scarce, the 14th- and 13th-century BC data suggest that the use of kraters and jars was widespread in most parts of west Anatolia by this period. This clearly contrasts with the picture attested in the earlier cemeteries in central Anatolia, where local practices prevailed. Although there is insufficient data to define with certainty the development of funerary practices in the 14th and 13th centuries BC in central Anatolia, the data from the 14th-century BC cemetery at Osmankayasi might suggest that the earlier local traditions continued into the later period as well. The only possible prominent similarity in this period is the use of two-handled jars at the Cemetery of Cinerary Urns (Fig. 3/1) and Osmankayasi (Fig. 3/7), despite other sporadic similarities in the choice of vessels used as urns in west and central Anatolia.

The east Aegean islands developed their own, independent burial tradition. While no cremation burials are attested in the MBA and early LBA funerary contexts, they seem to appear for the first time in the 14th and 13th centuries BC. However, in most of the cases they were not deposited in urns, but directly in the tomb. Two possible but dubious examples from Tou Stavrou to Kephali on Karpathos (no. 17) and Ialysos on Rhodes (no. 16) might be exceptions to this rule. The former points to the use of kraters as urns even outside of west Anatolia, while the latter supports the early development of the later independent LH IIIC tradition in which jugs were the dominant shape used as urns. Unfortunately, the evidence is far from conclusive.

Although there is some evidence of the use of urns for the deposition of cremated remains on the Greek mainland during the 14th and 13th century BC, there are only two examples of such practices in this two-hundred-year period. Therefore, it is impossible to discuss any Anatolian influences on the development of this segment of burial practices on the Greek mainland during the Palatial period. However, it should be kept in mind that Mycenaean-style pottery was occasionally used in local burial practices in west Anatolia, as confirmed by the Mycenaean-style krater used as an urn at Ayasoluk in Selçuk (Ephesos) (no. 13).[217] Therefore, if there was any influence in this respect, it was that of the west Aegean on west Anatolia.

It is important to note that urns were more commonly used in cemeteries on the east Aegean islands and in the west Aegean from the beginning of the LH IIIC period (12th century BC), or more precisely, after the collapse of the palatial system on the Greek mainland. If the appearance of cremation and the deposition of cremated remains in urns were indeed connected to the influence of Anatolian traditions, it remains unclear why there is not more evidence of these practices in the period of the most intense contacts, more precisely in the LH IIIA–IIIB periods (between the late 15th and the 13th century BC). Moreover, the use of jugs as urns

217 See Franković 2018.

on the east Aegean islands suggests the development of a tradition independent from the earlier 14th- and 13th-century BC cemeteries in west Anatolia. Unfortunately, the only evidence of the use of urns in 12th-century west Anatolia (from Bakla Tepe (no. 12) and possibly Panaztepe (no. 9)) is dubious, due to the unclear contextual data and dating of the vessels, but it could point to a continuation of the earlier west Anatolian traditions. Therefore, there is no direct evidence that the tradition attested on the east Aegean islands was influenced by the previous or contemporary west Anatolian traditions. However, there is a clear similarity between the 12th- and early-11th-century BC practices attested on the east Aegean islands and those documented on the Greek mainland, mostly the Peloponnese and Attica. More precisely, jugs were quite popular types of vessels used as urns both on the east Aegean islands and the Greek mainland. Certain local traditions developed independently on the Greek mainland. For example, shapes such as amphorae and amphoriskoi were rather popular urn types of the 12th and early 11th centuries BC on the Greek mainland. The use of urns is also attested on contemporary Crete, which developed its own tradition, partially independent of the traditions attested on the Greek mainland and the east Aegean islands. However, certain similarities between traditions did exist, such as the appearance of amphorae and amphoriskoi at some of the Cretan cemeteries.

The available evidence suggests that the choice of urn types in the Aegean and Anatolia was highly regionalized and, in some cases, even localized. Therefore, the choice of urn does not support the idea of a direct spread of influences from one region to another. Thus, in order to fully understand the meaning behind these seemingly similar practices, they need to be studied in their specific local contexts. In other words, rather than focusing on the similarities which can be used to create weak links between the material records of different regions and support possible interpretations about direct cultural influences, the focus should be on the differences and local characters of these practices. Only in that way can we hope to understand fully the entire complexity of the interregional interaction and its influence on the change in cultural practices, such as the appearance of cremation in the regions where it had not been attested before. Moreover, if such an approach was applied to other sets of data, it might shed a different light on the identity of the east Aegean–west Anatolian region as an independent and autonomous region,[218] rather than as a region dependent on cultural contacts with larger cultural circles such as those of Mycenaean Greece or Hittite Anatolia. As suggested by the results presented in this paper, the urns used for the deposition of cremated human remains reflect the development of an independent common tradition in the east Aegean–west Anatolian region which lasted from the beginning of the 2nd millennium BC until at least the 12th century BC. Such a picture directly contrasts with the more localized traditions attested in central Anatolia and the west Aegean. Therefore, it is no longer possible to sustain the idea that the 2nd-millennium BC east Aegean–west Anatolian region should be regarded simply as a passive recipient of foreign cultural influences or as a contact zone between larger centres of high culture on the Greek mainland and in central Anatolia. Even a small-scale study, such as the one presented in this paper, suggests that the east Aegean–west Anatolian region emerges as an independent entity with its own complex cultural development.

218 E.g. Mac Sweeney 2009. – Pavúk 2015.

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Take it to the Grave. Traces of Production, Post-Casting Treatment and Use of Metal Objects from Urnfield Cemeteries in Lower Austria

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Abstract

Within the scope of a master's thesis, investigations of traces of use on selected knives, pins and razors from two Urnfield Culture cemeteries were conducted to gain insight into the Late Bronze Age *chaîne opératoire* concerning the production and processing of deposited artefacts. Selected finds from two sites, 3 km apart from each other in the Lower Traisen Valley, Lower Austria, were sampled for the study. Inzersdorf ob der Traisen is the slightly older site dating mainly to Ha A with activity in both preceding and subsequent periods (late 13th–11th century BC). The cemetery of Franzhausen-Kokoron is attributed to Ha A2 – Ha B3 (early 11th–8th century BC). Copper-based knives, pins and razors are some of the commonly deposited metal objects in the graves of both cemeteries. Taking into account the object biographies and the Late Bronze Age depositional customs, the production steps, traces of further processing and modes of use of the objects and their development in the course of the Late Bronze Age will be examined in more detail.

Keywords

Urnfield period, Lower Austria, bronze objects, metalwork wear analysis, Lower Traisen Valley

Zusammenfassung – *In das Grab gebracht. Herstellungs-, Bearbeitungs- und Gebrauchsspuren an Metallobjekten urnenfelderzeitlicher Gräberfelder in Niederösterreich*

Im Rahmen einer Masterarbeit wurden Untersuchungen zu Gebrauchsspuren an ausgewählten Messern, Nadeln und Rasiermessern aus zwei urnenfelderzeitlichen Gräberfeldern durchgeführt, um Einblicke in die spätbronzezeitliche *chaîne opératoire* deponierter Metallfunde zu gewinnen. Für die Untersuchungen wurden ausgewählte Artefakte aus zwei 3 km voneinander entfernt liegenden Fundstellen im unteren Traisental, Niederösterreich, herangezogen. Die Fundstelle Inzersdorf ob der Traisen, die etwas älter ist und hauptsächlich in Ha A datiert, zeigt Aktivitäten in vorangehenden und nachfolgenden Perioden (spätes 13.–11. Jahrhundert v. Chr.). Das Gräberfeld in Franzhausen-Kokoron wird in Ha A2 – Ha B3 (frühes 11.–8. Jahrhundert v. Chr.) eingeordnet. Messer, Nadeln und Rasiermesser gehören zu den am häufigsten deponierten Metallobjekten in den Grabbefunden beider Friedhöfe. Unter Berücksichtigung der Objektbiographien und der spätbronzezeitlichen Deponierungssitten werden in diesem Beitrag Herstellungsschritte, Bearbeitungsspuren und Nachweise des Gebrauchs der Objekte sowie die Entwicklung der Arbeitsabläufe gesamtheitlich im Laufe der Spätbronzezeit betrachtet.

Schlüsselbegriffe

Urnenfelderzeit, Niederösterreich, Bronzeobjekte, Gebrauchsspurenanalyse, Herstellungsspuren, Unteres Traisental

1. Introduction

This paper discusses the processes connected to the manufacture, working, manipulation and deposition of Late Bronze Age knives, pins and razors from the cemeteries of Inzersdorf ob der Traisen and Franzhausen-Kokoron in Lower Austria. The results of metalwork wear analysis presented here derive from a master's thesis. The goal of this paper is to extend metalwork wear analysis to knives, pins and razors found in funerary contexts in order to shed light on applied production and processing techniques. The aim of the analysis of knives, pins and razors was to ensure a range of detectable traces as well as identification of differences in the working steps applied. The choice of burial contexts was made because the burial rites in the Urnfield period cemeteries of the region follow a comparable pattern of deposition concerning metal artefacts. Furthermore, only minor chronological or individual deviations can be observed in the features.[1] This results in a sufficient number of artefacts as a data basis, which will improve detection of varying standardised working processes at different sites.

However, the preservation of objects varies significantly within each cemetery site due to the presence of certain

1 Lochner 2021, 233–234 and Tab. 09_01.

objects during the pyre-burning process. Knives, pins and razors were selected as they are found in high numbers in both cemetery sites in order to answer questions about the potential of metalwork wear analysis on objects with traces of heat exposure. Moreover, all three find groups are sufficiently well embedded in the typological framework to also observe subtle chronological developments and changes in production and post-casting treatments. Ultimately, the question of their use prior to the deposition in the grave is of fundamental interest. Traces of use on artefacts result from regular application and thus depend not only on the function of the artefact but also on the individual object's biography. Such marks may also correlate with prehistoric burial practices, depending on their placement in the burial pit as grave goods or personal belongings, for example, and as such might be tied to the location within the burial pit as well.

The methodology of metalwork wear investigations of artefacts applied originally derives from use-wear analyses of lithic tools.[2] By now, this is a widely acknowledged field of research in archaeometallurgy, even if the potential is far from being fully utilised. Previous works clearly demonstrated that corrosion, use and subsequent manipulations of objects do not diminish the significance of such analyses.[3] Through constant development of new methods and approaches, more and more causes of observed traces and reasons behind their formation on metal objects can be identified. So far, concerning research on the Bronze Age period, the focus has been directed mainly towards weapons and pieces of armour, especially in the context of their potential use in combat.[4] Additionally, a significant body of work is on specific prehistoric tools and/or weapons like axes.[5] During the development of metalwork wear analyses as a research discipline and also in subsequent years, copper-based objects classified as tools or jewellery received significantly less attention. Traces of production, processing and use are investigated on knives from different archaeological contexts in Poland and Switzerland,[6] most of them found in wetland settlement features. By contrast, pins and razors remained mostly disregarded.[7]

2 This term was chosen based on suggestions in a paper by Andrea Dolfini and Rachel Crellin as it includes traces of production, (re-) working and use, see Dolfini, Crellin 2016, 79.

3 Semenov 1964. – Roberts, Ottaway 2003, 120.

4 Brandherm 2011. – Dolfini 2011. – Li et al. 2011. – Mödlinger 2011. – Molloy 2011. – Horn 2013. – Hermann et al. 2019.

5 Kienlin, Ottaway 1998. – Roberts, Ottaway 2003. – Krištuf, Boháč 2017. – Horn, Karck 2019. – Baron et al. 2020.

6 Schäppi 2014. – Jennings 2014. – Sych 2015.

7 A study by Michael Meier focused on one razor find and its production and use, see Meier 1992.

2. Methodology

In total, 74 artefacts, including 26 knives, 40 pins and 8 razors, were selected for the master's thesis since these object groups vary in their function and location within the graves. In addition, they are represented in sufficient numbers in both cemeteries, allowing changes in chronological or typological respects to be monitored. The procedure of selection for more detailed investigations was based on a preliminary optical assessment, the quality of the find context of each object, as well as typo-chronological classifications. In a subsequent step, the selected finds were examined under a Wild Heerbrugg M400 macroscope, beginning with the smallest magnification, 5.8×, during which areas of interest on each object were established. Subsequently, magnification up to 35× was used to ensure identification of smaller marks. A detailed analysis with a Zeiss Axio binocular and a linked Canon EOS 750D camera application was followed directly by documentation of evidence of production, processing, alteration and use. In addition, any heat impact observed on the objects' surfaces was recorded in consistent photographic, written and tabular form.

2.1. Definition

Traces of production include marks connected to the casting, which consist of:

- casting seams
- cavities and pores
- casting flaws

Traces of processing present as marks from a subsequent work step. Their function was to increase the utility and performance of the artefact. These include:

- removal of the casting jet
- traces of cold working
- evidence of repairs or reworking

In most cases these marks are intended to cover up traces of production with the ideal goal of removing them completely. However, the two categories, traces of production and further processing, are not addressed separately in comparable studies.[8] A differentiation of those marks nevertheless seems inevitable here, as their absence or presence is a strong indicator for human intentions to optimise the object in question. They directly affect future handling of the objects and connected processes, be this use, recycling or deposition. Moreover, certain work steps such as the whetting of an edge of a blade were applied repeatedly if weapons or tools had been used intensively. Post-casting addition of decorations as a way to individualise an object or adapt it to

8 Sych 2015, 116–118.

aesthetic conceptions is a step that follows the production. Such practices do not improve the material properties of objects. Instead, the decoration and its placement on objects are closely intertwined with prehistoric individual and/or collective identity formation, mentality and inter-/intracultural communication through symbols and the need to be regarded as a distinct category.[9]

Traces of wear are evidence of the object's use and identifiable through:

- notches on the surface or edges
- loss of material due to intensive (re-)sharpening
- abrasion of decoration
- blunt tips or edges

Damage on copper-based objects like chipping at the edges of a blade or fissures, as well as observed bends, were not integrated into any of the mentioned categories, since they might be caused by placement on the pyre during the cremation and amplified by heat exposure. Furthermore, post-depositional processes can be responsible in such cases. Thus, those marks, as well as surface corrosion, were noted and documented separately.

2.2. Heat Impact, Corrosion and Conservation

Initial macroscopic observations and subsequent stereomicroscopic investigations showed areas affected by heat exposure, corrosion processes and conservation procedures, which all affect the conducted analyses of underlying traces.[10] Nevertheless, the state of the surface was documented in such cases as well. Considering the object's biography, the degree of heat impact visible on the surface is of interest for comparisons to other grave goods within the burial and provides additional information about the pre-depositional funerary practices. Depending on the copper and tin composition, the melting range between solidus and liquidus of bronze artefacts varies. A copper-based artefact with up to 20 wt. % Sn has liquid phases according to the copper-tin phase diagram starting with temperatures around 799°C and more. The analysis of cremated bones and archaeological experiments shows that such temperatures are commonly reached during the cremation and remain constant enough to affect the surface of metal objects.[11] Thus, the observation of deformations and impacts of heat exposure enables an identification of patterns in pre-depositional funerary practices with regard to the deceased and the artefacts involved.

Their absence, however, might not necessarily mean that they were not incorporated in the pyre-burning process, since the location the object was placed in might not have reached the necessary temperature or it might have fallen off before impacts of heat could manifest on its surface.

Corrosion processes depend on the chemical composition of each artefact and surrounding soil as well as post-depositional conditions (moisture, pH values, presence of organisms).[12] Additionally, object areas influenced by stress, e.g. due to intensive cold working or ornamentation, but also heat exposure, may exhibit an even greater degree of corrosion. In cases of overlapping, higher magnification might help with observations of faint traces when investigations are conducted by macroscopic or stereomicroscopic means.

While modern conservation procedures mostly leave corrosion layers intact, former practices often included the removal of corroded surfaces. The application of (electro-)chemical and mechanical procedures removed most, if not all, corrosion. The investigated artefacts from Franzhausen-Kokoron and Inzersdorf underwent first conservation work in the early 1980s.[13] In some instances this left marks on the objects (Fig. 1), most likely resulting from the corrosion removal process. Moreover, the artefacts were coated with a

Fig. 1. Traces of conservation. – a–b. Modern abrasions superimposing on blade and handle surface. – c. Acrylic resin residue in fluted pinhead encased in red. – d. Modern abrasions superimposing on pinhead surface (Photos: N. Mittermair).

9 Wobst 1977, 127, 320–321. – Sørensen 1997, 93. – Sørensen 2004, 167.

10 A thorough discussion of the impact of conservation on the object's surface is found in Sych et al. 2020.

11 Wahl 1981. – Fülöp 2018, 288–289. – Fritzl et al. 2019.

12 Scott 2002. – Oudbashi 2015. – Oudbashi 2018.

13 Neugebauer, Gattringer 1984, 52.

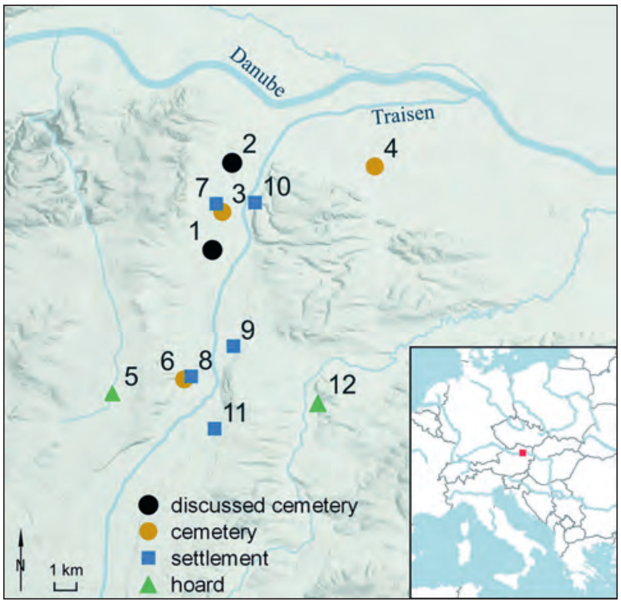


Fig. 2. Urnfield Culture sites in the Lower Traisen Valley. – 1. Inzersdorf ob der Traisen. – 2. Franzhausen-Kokoron. – 3, 7. Getzersdorf. – 4. Gemeinlebarn. – 5. Hafnerbach. – 6, 8. Unterradlberg – 9. Ossarn. – 10. Oberndorf. – 11. Pottenbrunn. – 12. Rassing bei Kappeln (Credits: I. M. Petschko; digital elevation model: geoland.at; water: Land Niederösterreich and Natural Earth; administrative boundaries: EuroGeographics).

transparent resin-based liquid in order to prevent further chemical reactions. The coating was applied with a brush, as attested by visible traces on the surface of the artefacts and inclusions within the protective layer. This not only leads to an increased reflection of light on the artefacts' surface, it also further complicates identification and documentation of traces lying underneath.

3. Archaeological Landscape: The Lower Traisen Valley

The Lower Traisen Valley, stretching from north to south, is situated in the centre of the Austrian province of Lower Austria. The variety of preserved archaeological records and the intensive research conducted there makes the area one of the most important archaeological landscapes in Austria.[14] During construction work for the S33 road, the Federal Monuments Authority Austria under Univ.-Prof. Dr. Johannes-Wolfgang Neugebauer conducted extensive archaeological investigations. In the early 1980s, numerous sites dating from the Neolithic to the Middle Ages were uncovered. Along the 20 km-long course of the Lower Traisen, glacial terraces are located up to the confluence with the Danube. A number of Late Bronze Age settlements, cemeteries and hoards were found on both riverbanks, more concentrated along the low and high terraces (Fig. 2). Prominent sites in the vicinity with attested activity during the course of Late Bronze Age include Getzersdorf, Gemeinlebarn, Hafnerbach, Unterradlberg, Ossarn, Oberndorf and Pottenbrunn.[15] The dense distribution of sites from prehistoric periods onwards underlines the importance of the region for communication between the foothills of the Eastern Alpine region in the south, the Bohemian Massif in the north and the east-west course of the Danube.[16] Both of the cemeteries discussed are assigned to the Middle Danubian Urnfield Culture (1300–800/750 BC) and lie three km apart from each other.[17]

3.1. Inzersdorf ob der Traisen

The site encompasses 273 cremation burials and urn graves (Plan 1). They are generally attributed to the so-called *Baierdorf-Velatiće* group dating to the older Urnfield Period (Bz D – Ha A1). Based on the burial practices and deposited grave goods, a continuity up to the transition to Ha B1 can be assumed for a number of them. Within the site excavated in 1981–1983 and 1987, predominantly individual burials occur (250 features), but 21 group burials were also detected. The original spatial distribution of the cemetery cannot be reconstructed due to disturbances by modern gravel operations and intensive agricultural activities. Archaeological features consist of a few rectangular burial pits (1.5–2.4 m) considered the oldest burials within the site. The applied funerary practices are customary for the earlier activity span within the site. The features of this phase comprise cremated human remains arranged resembling physical bodies, while placements of grave goods roughly follow observable patterns in predating inhumation burial pits.[18] Numerous, shallow oval to round pits with deposited urns ranging between 0.4 and 1.0 m in diameter are the most common grave form. The pottery finds of the cemetery represent the characteristic repertoire of the older Urnfield period containing vessels with a cylinder-shaped neck, biconical vessels and cups with an s-shaped profile. They often occur in concentrations around a central urn or cremated remains.[19] Selected parts of animal bones, especially sheep/goat, were found within

14 Neugebauer, Gattringer 1981, 157–190.

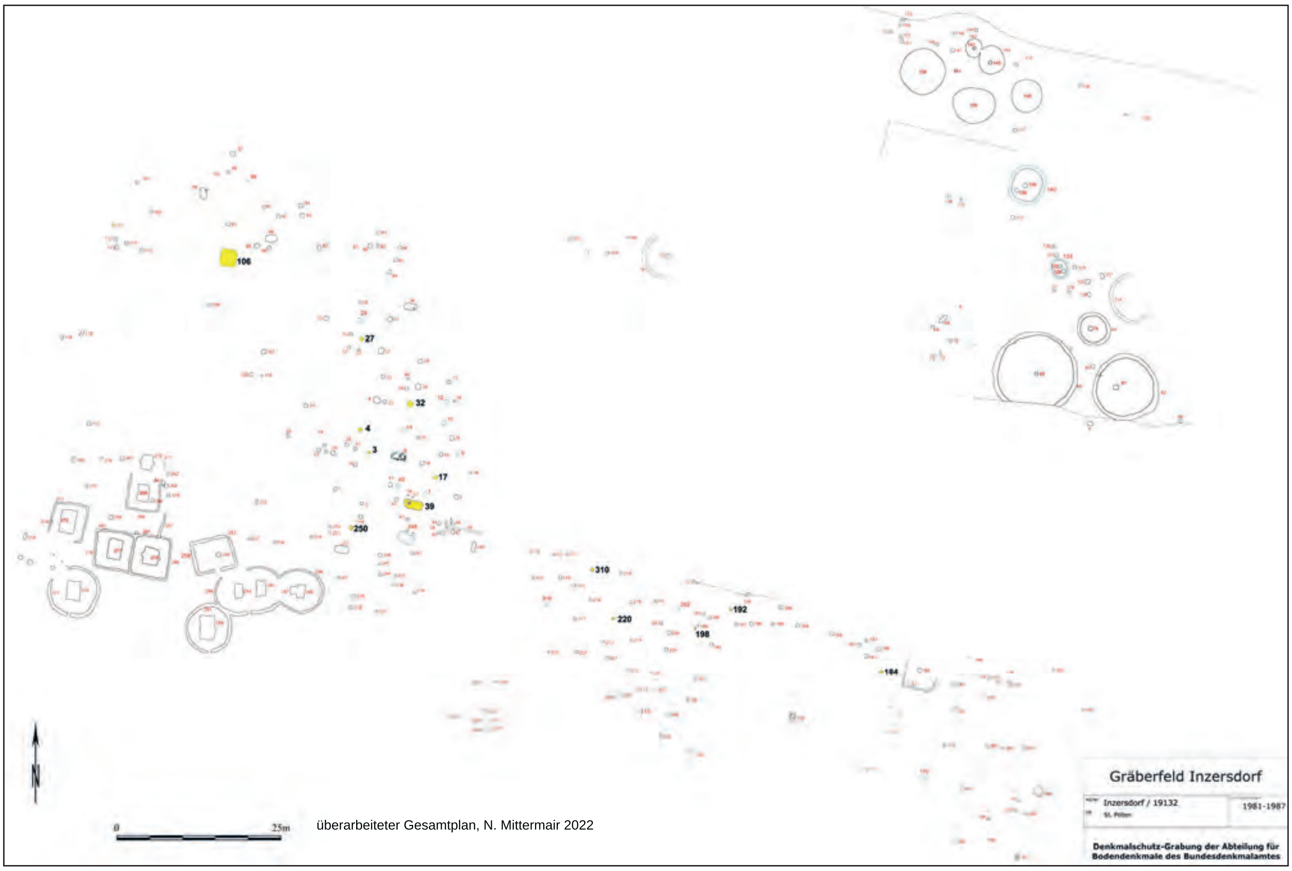
15 For an overview of Lower Austria and the Traisen Valley during the Urnfield periods with most of the mentioned sites, see Lochner 2021.

16 Blesl 2012, 6–9.

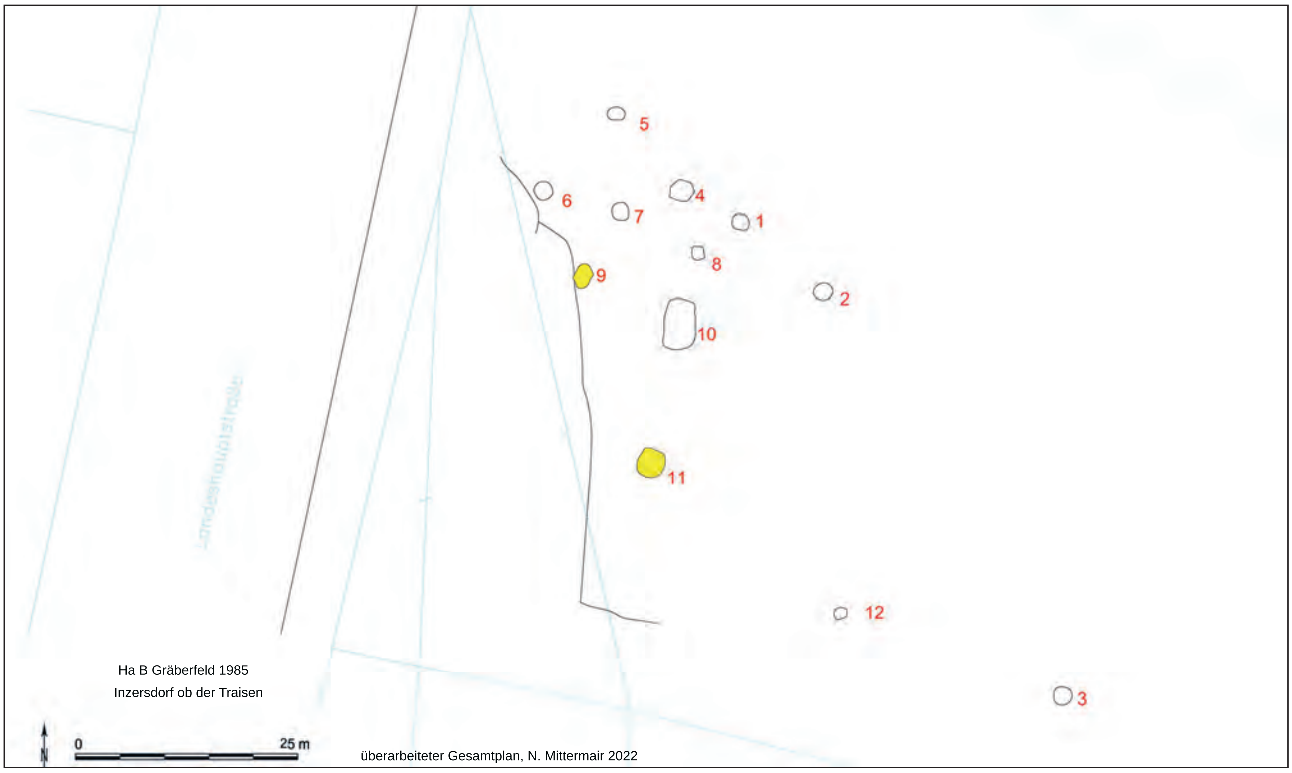
17 Pittioni 1954, 403–444. – Lochner 2021, 24.

18 Sørensen, Rebay 2007, 120–121.

19 Lochner 2013, 18.



Plan 1. Excavation plan of the cemetery at Inzersdorf ob der Traisen (Bz D – Ha B1) (Credits: Federal Monuments Authority Austria, adapted by N. Mittermair).



Plan 2. Excavation plan of the cemetery at Inzersdorf ob der Traisen (Ha B) (Credits: M. Lochner, adapted by N. Mittermair).

the burials.[20] In terms of metal finds, the quantity of 332 recovered copper-based objects and the absence of artefacts clearly categorised as weapons are remarkable. A bronze cup of type *Friedrichsruhe* from grave 39 shows clear breaks and marks of repair that demonstrate its use over an extended period.[21] Other metal grave goods include mostly dress items such as pins, fibulae, bracelets, necklaces and various clothing ornaments made of sheet metal. Average features included two to three metal objects each, significantly exceeding this in the case of burials of multiple individuals.

In 1985, further construction works approx. 500 m towards the south uncovered an urn cemetery (Plan 2) with 13 disturbed burials dated to the Ha B period.[22]

3.2. Franzhausen-Kokoron

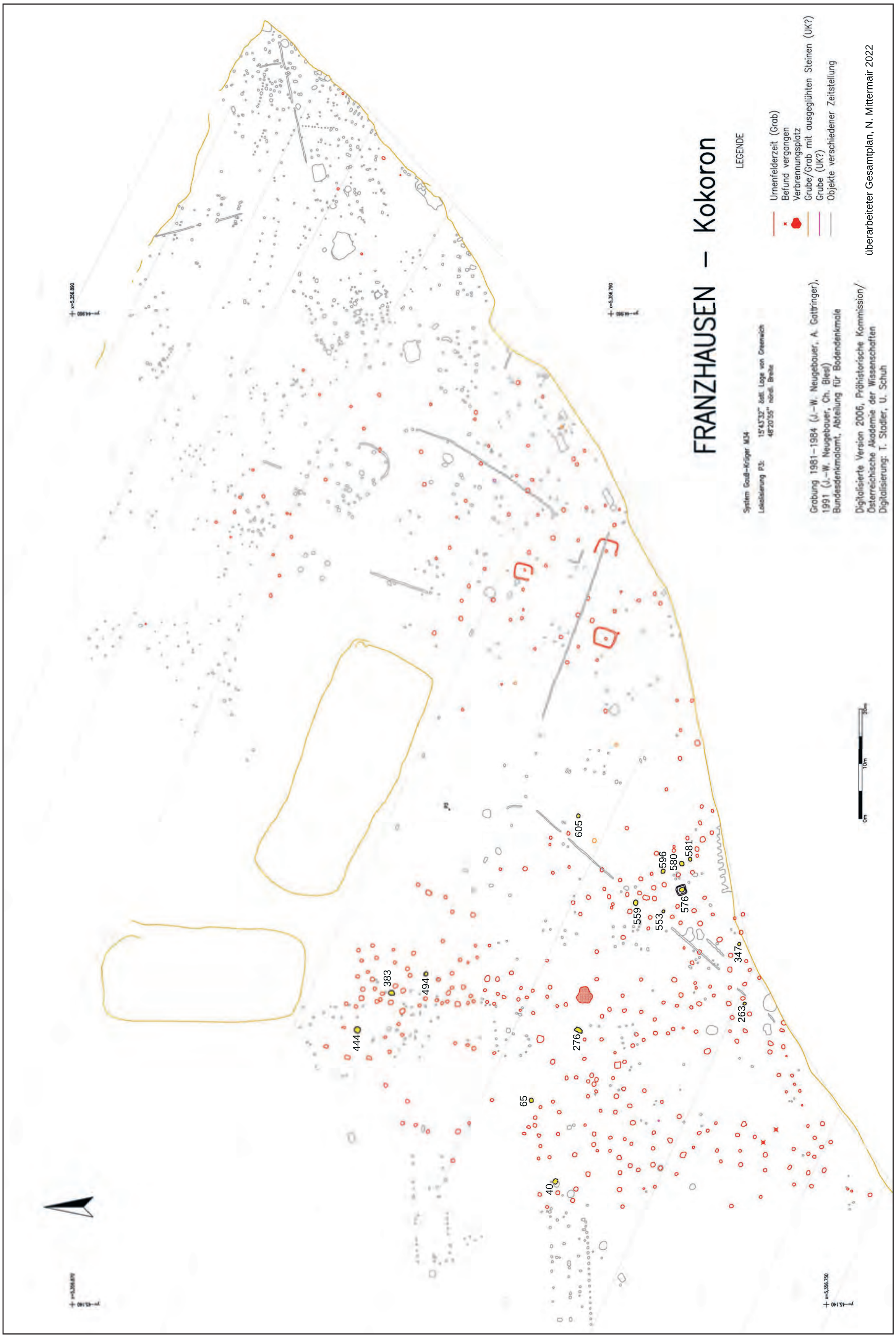
With an investigated area of 12,000 m² in 1981–1984, 1988 and 1991, in total 403 graves were excavated (Plan 3), of which 111 features were completely preserved. This cemetery dates to the younger Urnfield period (Ha A2 – Ha B3).[23] Spatial and chronological correlations can be observed in the form of a rather scattered, older group in the east and a younger, more densely organised concentration of graves in the west. Moreover, a cremation site situated in the centre of the western grave concentration was uncovered.[24] Since no prehistoric overlap of graves was recorded in either of the cemeteries, the existence of grave markers on the surface is assumed, although no archaeological evidence could be detected. 268 graves from Franzhausen-Kokoron were classified as urn burials. A significant number of burial pits show similarities with the features observed in the cemetery of Inzersdorf ob der Traisen, with round or oval shape and diameters between 0.4 and 1.0 m. In a few cases, pits displayed a rectangular shape with comparable dimensions. In contrast to Inzersdorf, at 24 features the number of co-buried individuals is significantly lower, with a variety in funerary practice ranging from all individuals within one urn, individuals placed in separate vessels and partly deposited individuals on the bottom of a pit outside an urn. Correlations between urn size and the age of deceased were argued.[25] The deposited pottery includes vessels with a conical or funnel-shaped neck and a flaring rim, beakers, cups with an s-shaped profile and bowls with an inverted rim. In over 40 graves, bones from the shoulder parts of goats/sheep or pigs were excavated still in anatomical position, often in connection with shallow bowls and/or knives. The find composition in burial contexts is mainly interpreted as grave good food offerings for the deceased.[26] An alternative perspective may be a habit of sharing the food with the deceased. Sherds with and without traces of secondary heat exposure and scattered animal bones are regularly found in the burial contexts, suggesting the activity of participating members in close vicinity to the burials. In total, 529 copper-based objects were found, mainly pins, bracelets, fibulae, buttons and ringlets, on average one to two metal finds per grave. Graves with more than one individual contained significantly lower numbers of metal finds compared to Inzersdorf ob der Traisen.

4. Archaeological Context of the Analysed Finds

In total, in this paper objects from 31 graves are discussed. From Inzersdorf 14 graves dating to the older Urnfield periods (Bz D/Ha A1 – Ha A2) and two from the smaller Ha B cemetery, located slightly more to the south, were chosen. In addition, 15 graves from Franzhausen-Kokoron are addressed. The site of Inzersdorf is the subject of an ongoing dissertation by Michaela Fritzl.[27] The following short description of the archaeological records and results of anthropological investigations provides the context of the analysed metal objects. Lukas Waltenberger systematically revised the original anthropological analyses in Inzersdorf by Silvia Renhart, who conducted investigations of the material from both sites. Due to the large discrepancy between the two studies, the original results concerning the sex and age of individuals will only be taken into account with reservation. Nevertheless, determination of temperature ranges for the exposure to heat of human remains is significant with regard to the observation of traces of heat impact for the metal objects discussed.

Both Urnfield cemeteries, Inzersdorf and Franzhausen-Kokoron, provide a good overview of Urnfield burial practices adopted and adapted over the course of the Late Bronze Age.[28] Nevertheless, clear differences can be pointed out regarding the number and position of the metal objects within the graves. While approximately half of the discussed burials (8 out of 14 graves) from Inzersdorf contain more than two copper-based finds, the same is true only for a third

20 Lochner 2021, 232. Herbert Böhm investigated the animal bones.
21 Lochner 2013, 16.
22 Neugebauer, Gattringer 1988, 74–75.
23 Lochner 2013, 24.
24 Lochner, Hellerschmid 2016.
25 Lochner, Hellerschmid 2009.
26 Lochner 2021, 248.
27 Burials with multiple individuals were investigated for a master's thesis at the University of Vienna in Fritzl 2017.
28 Lochner, Hellerschmid 2016. – Fritzl 2017. – Lochner 2021, 247. – Cavazzuti et al. 2022, 64–65.



Plan 3. Excavation plan of the cemetery at Franzhausen-Kokoron (Ha A2 – Ha B3) (after LOCHNER, HELLERSCHMID 2016, modified by N. Mittermair).

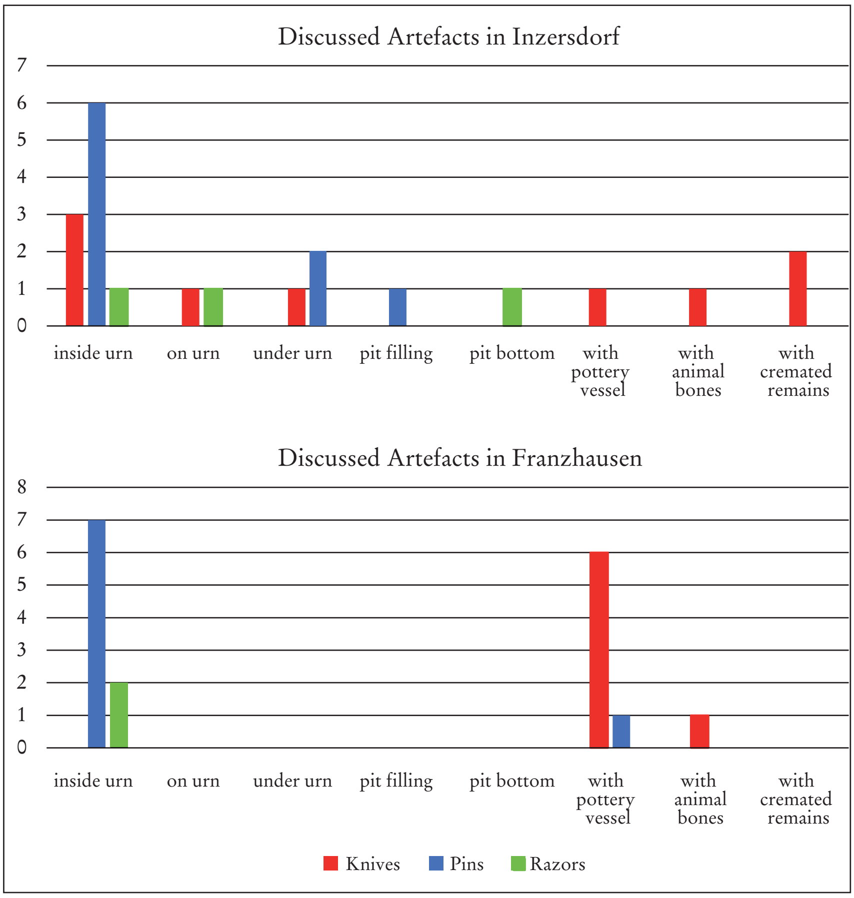


Fig. 3. Context of discussed knives, pins and razors within the burials of Inzersdorf ob der Traisen (n = 19) and Franzhausen-Kokoron (n = 17) (Graphics: N. Mittermair).

of those from Franzhausen-Kokoron (5 out of 15). Furthermore, the burials in Inzersdorf are not only richer in metal grave goods but they also display more depositional variety. In Inzersdorf, the investigated pins (9 in total) were mostly found inside an urn, below an urn or within the pit. The three analysed razors were excavated within the urn, on the urn shoulder and in the pit filling. Lastly, the knives under study (9 in total) are found in comparable frequency mixed with cremated human remains, inside an urn or together with vessels and/or animal bones. Less often, they are found deposited under an urn or on the pit bottom (Fig. 3).

Analysed pins from Franzhausen-Kokoron (8 in total) mostly derive from inside an urn; one was found inside an additional pottery vessel. Two razors were excavated inside an urn; the third's original location inside the burial pit unfortunately cannot be reconstructed. Notably, except for Grave 11 from Inzersdorf, anthropological analyses of burials with a razor inside suggest the cremated remains are attributable to adult male individuals. In Inzersdorf, the biological age was narrowed down to 40–69 and over 50 years. All of the investigated knives (7 in total) were found accompanied by a shallow pottery vessel, mostly bowls, together with animal bones. In some cases, either pottery vessels or animal bones were accompanied by a knife. The shift in metal find deposition in the context of Late Bronze Age burial practices might very well accord with a change in metalwork wear traces on the investigated objects.

4.1. Knives

Changes in the morphology of knives are especially common due to practical reasons like increasing durability and the optimisation of shafts for a comfortable and simple handling of the artefact. The function of knives is still the subject of discussions based on their size, shape, decoration and occasional investigations of metalwork wear or metallography in recent years.[29] Late Bronze Age knives

29 Říhovský 1972, 3. – Schäppi 2014, 102. – Sych 2015. – Hohlbein 2016, 11–22. – Mödlinger, Trebsche 2021.

served as multifunctional tools, which gain influence in the burial context from the older Urnfield period onward, while the number of daggers simultaneously decreases.[30] Elaborate decoration on the back of the blade and upper parts of blades indicate that even if the objects were primarily of practical function, the wish to express and convey individual and/or collective aesthetic perceptions was frequently present and often fulfilled. This regularly leads to considerations of knives either being deposited as personal belongings of individual importance[31] or within frameworks of cultural burial practices as part of food offerings and connected to the social role of the deceased individuals or conceptions about the afterlife.[32]

4.2. Pins

Metal pins show a great morphological variety during the Late Bronze Age. The object category does not merely fulfil a functional role, but simultaneously – and maybe more importantly – transmits prehistoric ideas of aesthetics. Considering the widespread dispersal of certain types or regional similarities in ornamentation styles, pins also serve as a medium to communicate socio-cultural conceptions of form and decoration strongly connected to the self-identification of individuals and groups.

4.3. Razors

Evidence concerning Late Bronze Age hair and beard styles within central Europe is difficult to obtain, since depictions of human faces and archaeological evidence are scarce. Deposition in graves together with awls and tweezers from the Middle Bronze Age onwards lead to the attribution of razors to 'toilet sets' belonging to the deceased. As the artefacts often appear in burials of anthropologically classified male burials, various interpretations discuss razors with regard to male identity.[33] Transitions of individuals as regards age or family and social status also influence Late Bronze Age burials in terms of grave goods and the attire of prehistoric individuals. Moreover, the burial context of razors might well be linked to preparation of the body in funerary contexts or connected to mourning practices.[34]

5. Production

The analysed finds, 16 knives, 17 pins and 6 razors are presented in Appendix B in their typological and chronological context, while the traces of metalwork wear are documented.[35]

The observation of metalwork wear traces from the production steps of the three discussed object groups show significant differences.

5.1. Knives

As knives constitute a rather functional group of artefacts and are partly covered by a handle, the high number of documented production traces was not unexpected. The analysis of production traces on knives shows a clear variety in production techniques. Casting seams were found on hidden-tang knives INZ 9/6, FHK 40/5 and FHK 444/4, where the handle, made of organic material, would cover such marks (Fig. 4/a–d). Together with a noticeable mismatch in the area of the handle and tang in the latter two

Fig. 4. Evidence of production in two-part casting mould of knives. – a. Casting seam remains on INZ 9/6. – b. Casting seam remains and detail of mismatch in tang section in FHK 40/5. – c. Casting seam remains on tang tip of FHK 444/4. – d. Mismatch in intermediate section of FHK 444/4 (Photos: N. Mittermair).

30 Hansen 1994, 226.
31 Sych 2015, 123.
32 Lochner 2021, 247–248.
33 Treherne 1995. – Kristiansen, Larsson 2005, 228. – Harding 2008. – Kaul 2013. – Kincade 2014.
34 Frieman et al. 2017, 42.
35 The finds were typologically classified by Michaela Lochner. Graphics for artefacts from Inzersdorf were drawn by Maria Imam, graphics for artefacts from Franzhausen-Kokoron were made by Franz Siegmeth. The objects are depicted in the figures in the order they are dealt with in the discussion.

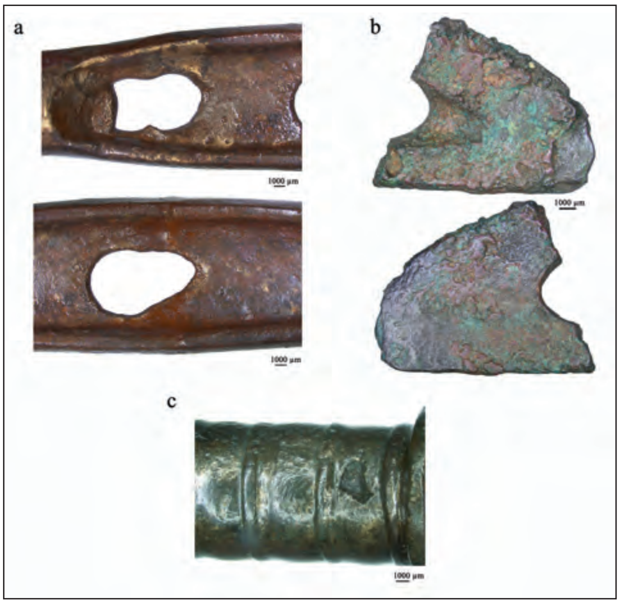


Fig. 5. Traces of production on knives. – a. Casting flaws close to rivet holes of INZ 39/7 prove a preparation in the casting model/mould. – b. One-sided rivet hole indentation in INZ 3/4 prepared in a casting model/mould. – c. The cavity in the intermediate section of FHK 383/6 originated in the casting process (Photos: N. Mittermair).

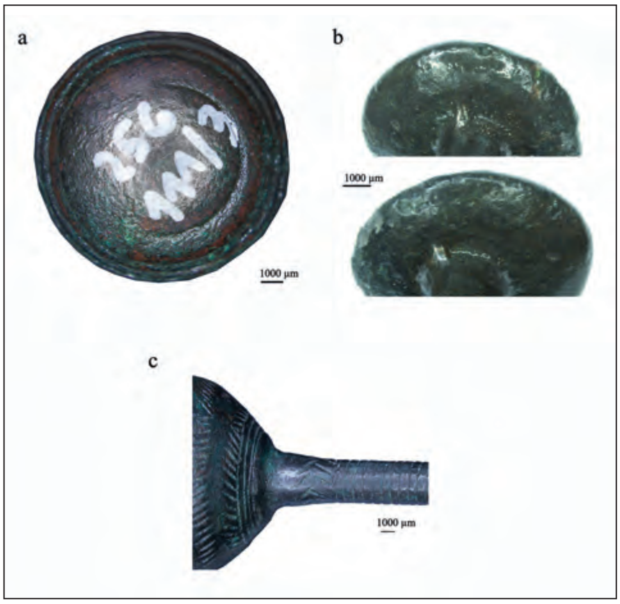


Fig. 6. Traces of production on pins. – a. Mismatch of cast decoration on pinhead INZ 111/3. – b. Casting seams on bottom of pinhead FHK 553/2. – c. The neck of pin INZ 310/5 (left) shows clear evidence for a 'cast-on' procedure (*Überfangguss*) (Photos: N. Mittermair).

objects, clear evidence for casting in a two-part mould is displayed. Comparable types of hidden-tang knives show no traces from a two-part mould, resulting from either a thorough removal of production traces or a lost-wax casting process. In the case of INZ 3/4 both a single-part mould or lost-wax casting are feasible. The position of the casting jet, if observable in the investigated object range, was located on the tip of the tang. Examples for casting jets located at the tip of the blade are known in Urnfield Culture finds from pile dwellings in Switzerland.[36] However, evidence for such a production technique was not detected in the analysed material.

Rivet holes on artefacts were mostly already prepared in the casting mould/model (Fig. 5/a–b). The potential problems of preparation in moulds/models are displayed in occasional casting flaws (INZ 39/7).

Casting flaws like cavities and shrinkage defects are mostly noted in areas of the intermediate section between the blade and the tang or the tang itself. The lack of removal in latter instances is likely linked to the organic shaft that also covered the tang. Attestable flaws on the intermediate section relate only to the surface of objects and therefore do not influence the functionality in the investigated cases (Fig. 5/c).

5.2. Pins

Since the aesthetic function of pins is at least as important as that of fastening draped textiles and clothing, the general lack of production traces compared to knives is not surprising. Nevertheless, the analysis displayed remains of production traces on six of the pins discussed from Inzersdorf ob der Traisen and on four from Franzhausen-Kokoron attesting varying production processes.

Conclusions about the production technique of one pin (INZ 111/3) are drawn based on the casting flaw visible on the pinhead (Fig. 6/a). Due to its general asymmetric form and the first groove being interrupted exactly at the midpoint, production in a two-part mould is very likely. Remains of casting seams on the junction of the pinhead and pin neck in the case of two pins with vase-shaped heads (FHK 581/4, FHK 553/2) also suggest production in a two-part mould (Fig. 6/b).[37] The casting of pinheads in a 'cast-on' technique (*Überfangguss*) was identified on two pins with onion-shaped heads (INZ 192/9, INZ 310/5). The characteristic constriction followed by a distinct carination towards another segment of the object is a strong indicator for a two-phase production (Fig. 6/c). The lost-wax casting technique, if applied for production of the whole knife,

36 Schäppi 2014, 102.

37 Drescher 1958, 5–15.

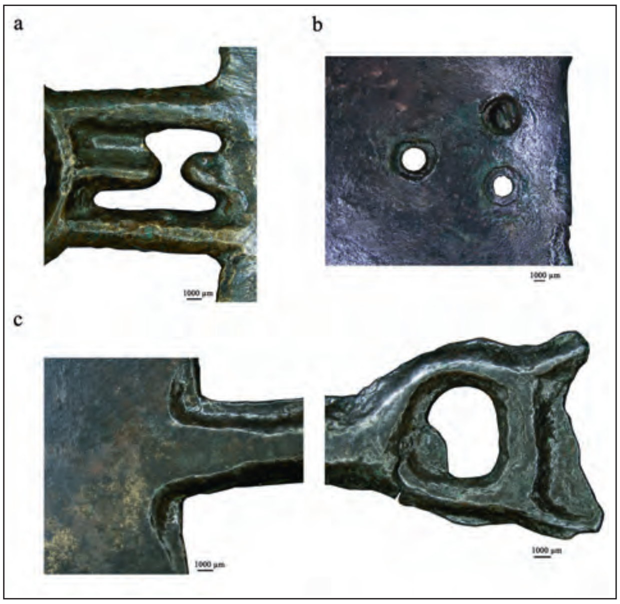


Fig. 7. Traces of production on razors. – a. Detailed view of a misrun in the handle area of FHK 605/7. – b. Rivet holes in INZ 192/8 prepared in the casting model/mould. – c. Details of the mismatch and resulting cold shut effect in the ring knob of FHK 494/8 (Photos: N. Mittermair).

razor or pin, is not easily determined by observations of the metal surface alone. The fluting of the *Mostkovice*-type pin (INZ 106/2), however, was likely formed in a wax model resulting in an irregular course.

In the case of pin INZ 192/9, an oval-shaped cavity inside the surface of the break resulted in a weak point as soon as it was exposed to stress like heat exposure (Fig. 37). The most common traces of production attestable on pins concern the surface of the objects. Shrinkage defects are the result of uneven solidification of the metal during the casting process and are visible on four objects (INZ 32/3, INZ 111/3, INZ 198/3, FHK 596/8). Such casting effects form cavities on the surface of an object and are characterised by an amorphous shape. Since the observed casting defect is located on the surface, usually no negative consequence follows.

5.3. Razors

The analysis of production procedures on razors showed most results in the areas of the handles, which is comparable to the general observations on knives. Unremoved casting seams or remains of the same were found on razors FHK 276/1, FHK 494/8 and FHK 605/7 inside the ring knobs or between the spiked handle ends. The position of the casting jet is not always determinable. In the case of INZ 184/3 and FHK 494/8 they were most likely located at the end of the handle.

Casting flaws of different sorts were also found in the area of the handles, resulting from either cold shuts (FHK 494/8) or misruns (FHK 605/7) that were not further worked on (Fig. 7/a, c). However, the cold-shut effect visible in razor FHK 494/8 may have been influenced by the observable mismatch in the area of the handle. The rivet holes observable on INZ 192/8 partly demonstrate preparation in the casting mould or model (Fig. 7/b).

6. Metalwork

Even though only a relatively small percentage of Late Bronze Age finds in general constitute metalworking tools, a large bandwidth of procedures connected to the working the cast products is attestable within the investigated finds. Recently a comprehensive study of Bronze Age tools and techniques involved in metalworking practices was published.[38] In general, the most commonly identified traces are linked to the removal of casting jets and seams as well as the polishing of surfaces and re-sharpening of blade edges.

6.1. Knives

An inevitable work step before an intended use of the objects is the removal of the casting jet. Traces of one of the first work steps can be found on four objects (INZ 184/6, FHK 40/5, FHK 65/10, FHK 383/6), either showing sharp-edged breaks or negative tool imprints (Fig. 8/a).

Cold working, annealing, quenching and hammering after treatment of the casting surface results in harder material properties. The resultant increasing crystalline irregularities in the microstructure lead to a more brittle copper alloy.[39] When the crystalline structure exceeds a certain level of deformation, fissures on the surface occur. These increase with repeated applied cold working, intense use or other manipulation of the object like the application of decoration or a high degree of heat exposure. Such fissures are visible on three knives (INZ 3/4, INZ 27/16, FHK 276/2). Another fissure was discovered below the handle of INZ 192/10, but cannot be attributed to this work step alone with certainty. Easily identifiable traces of cold working on one side together with a slight bend in the blade in some cases provides evidence for the last cold-worked side of an object.

Evidence for lack of quenching is provided in the form of dendritic surfaces. In two cases, FHK 65/10 and FHK 444/4, no traces of such intense metalworking steps can be attested in certain areas.

38 Nessel 2019.

39 Born, Hansen 2001, 241–244.

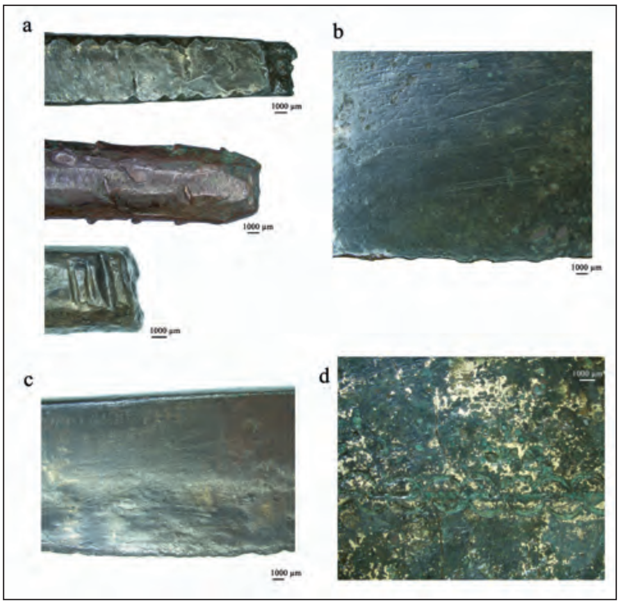


Fig. 8. Traces of metalworking on knives. – a. Negative tool marks on tangs deriving from removal of casting jets and forming the tang into the desired shape by hammering on FHK 65/10, INZ 184/6 and FHK 383/6. – b. Horizontal striation marks on FHK 65/10. – c. Horizontal striation marks and hammering marks along the edge on FHK 383/6. – d. Vertical fissures on the blade's surface attest to the work step of hammering in order to harden the blade on INZ 276/2 (Photos: N. Mittermair).

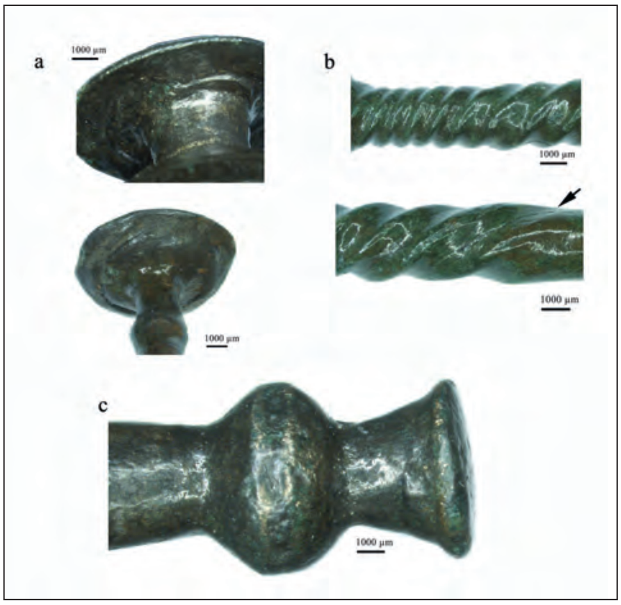


Fig. 9. Traces of metalwork on pins. – a. Bottom of pinheads processed post-casting on FHK 605/5. – b. Torsion in varying degrees led to a fissure in the pin shaft on FHK 576/6. – c. Excess material along the top of the pinhead due to hammering on FHK 559/3 (Photos: N. Mittermair).

Horizontal striations are visible on a high number of artefacts, proof that the surface was regularly subjected to further treatment (Fig. 8/b). These traces may also be connected to reworking steps conducted sometime after the production of the knives. Such marks may be difficult to trace if an object was the subject of subsequent hammering, another annealing procedure or heat exposure in a later phase.

Hammering traces are attestable on a variety of objects (Fig. 8/c), especially close to the edge of a blade. Within the handle of INZ 4/14 evidence of hammering marks is also detectable. Occasionally linear grooves along the back of the blade attest that the whole blade was subjected to hammering (Fig. 8/d). The tangs of knives were frequently worked into desired shapes, observable by the round beginning of the tang and tool marks. In most cases, notches were punched into the tangs in a subsequent step in order to ensure better support of the shaft (Fig. 8/a). Attaching an organic handle with more than one rivet was achieved by punching through from the same side (INZ 27/16, INZ 39/7, INZ 106/29).

6.2. Pins

Metalwork wear investigations proved that the majority of pins show unequivocal evidence of surface treatment, often including signs of surface polishing. The pin INZ 32/3 lacks traces of polishing on the bottom surface of the pinhead, providing indications of time-efficient work procedures.

Much clearer traces of metalwork processes are visible on pins with a vase-shaped head (FHK 553/2, FHK 581/4, FHK 596/8, FHK 605/5). The pin shaft of FHK 576/6 was partially hammered into a rectangular shape, which resulted in linear grooves running through the middle of the sides parallel to the pin's course (Fig. 9/b). The subsequent torsion might have increased the effect slightly.

Negatives of the work process are visible at the transition from the node to the pin shaft. The bottom of the pinhead occasionally displays a gradual thinning towards the outer end of the pinhead plate, which was originally cast slightly thicker in shape (Fig. 9/a). This procedure was supported by hammering the surface on the outer edge, provided the work angle and the size of the pinhead allowed it (FHK 605/5). In the case of smaller pinhead plates (FHK 576/6, FHK 581/4, FHK 584/16, FHK 596/8), the treatment of such areas was probably rather carried out by grinding and polishing the surface. The pin with a small vase-shaped head (FHK 559/3) shows evidence of hammering at the top of its head, resulting in compression of excess material at the edge of the pinhead (Fig. 9/c). Also, in Franzhausen-Kokoron, the incomplete removal of

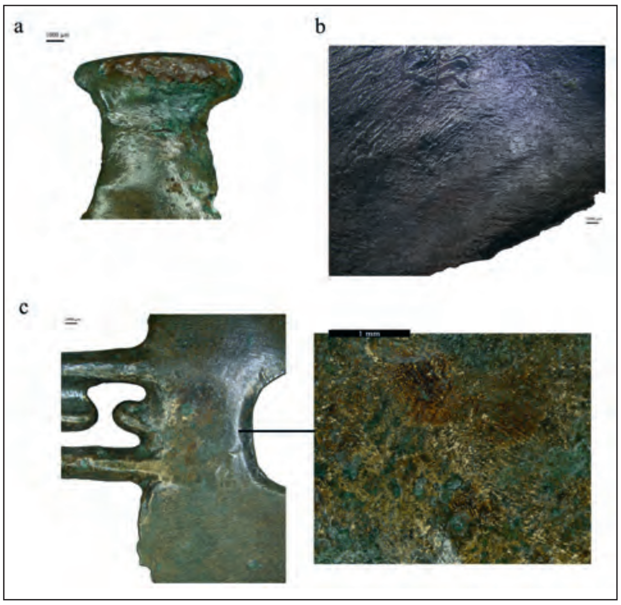


Fig. 10. Traces of metalwork on razors. – a. Horizontal fissure under the reworked casting jet of INZ 11/8. – b. Parallel-oriented peening marks along the edge on INZ 192/8. – c. Less worked area between the blades of FHK 605/7 with the dendritic surface in detail (Photos: N. Mittermair).

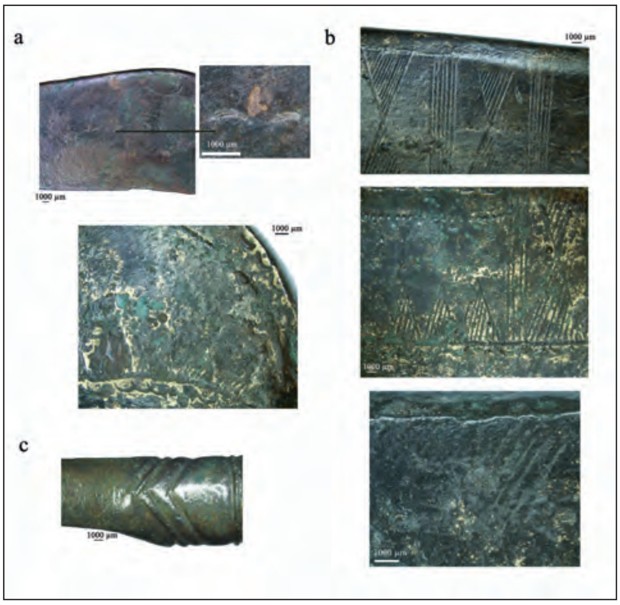


Fig. 11. Decorations on knives. – a. Arched indentations on INZ 184/6 and FHK 276/2 with partial overlap. – b. Various incised triangular designs on hidden-tang knives FHK 444/4 and FHK 276/2, and also on the reworked knife fragment FHK 494/1. – c. Decoration towards the back of blade FHK 65/10 cast with an error deriving from modelling (Photos: N. Mittermair).

traces of production and processing suggest an inclination towards time-saving work procedures.

6.3. Razors

Post-casting procedures are visible on all discussed razors attesting a similar workflow. While no negative tool marks resulting from the removal of the casting jet are ascertainable, other procedures are comparable to the ones observed in knives. One object, INZ 11/8, even shows a fissure on the surface resulting from extensive cold working (Fig. 10/a). In this case, the casting jet was reworked into a node with roughly rhombic shape in cross-section, which additionally stressed the crystalline structure in the area. Evidence of hammering is detectable on all objects through either negative tool marks, material dispersion visible along the back and edges or one or more peening tracks parallel to the edges (Fig. 10/b). Dendritic surface was visible on razors FHK 276/1 and FHK 605/7 in the area between the two blades and the handle or at the base of the blade (Fig. 10/c).

7. Decoration

Variations in application techniques for decoration on the objects discussed were observed during the metalwork wear analysis, these being either cast with the object or applied after surface treatment.

7.1. Knives

The investigation of knife decorations revealed a strong preference for post-processing application of indentations and incisions. Only two discussed objects (FHK 65/10, FHK 383/6) show an intermediate piece between blade and tang adorned with decorations, both of which were prepared in the casting mould or model.[40] Additionally, an error in the adornment of the model was cast together with the object (Fig. 11/c). Six other artefacts, the majority belonging to hidden-tang knives, display decorations of mostly geometrical nature. In general, only a few instances with overlapping decorative motifs were identified, like the herringbone pattern on the back of the blade of INZ 220/6.

Two objects have a flat, rectangular tang and show incised triangular decorations. Neither decoration is well-preserved, since the artefacts were reworked. However, similarities can be detected in the design of triangles compared to other objects with hidden tangs (Fig. 11/b). The decoration of FHK 494/1 has an incised line running

40 Experiments regarding the application of decoration with the lost-wax technique have been conducted since the late 19th century, see Müller 1878, 38. Other studies on ornamentation practices include, e.g., Foltz 1980 and Lobisser 2009.

through their middle filled with mirror-inverted hatchings. The difference can be found in FHK 580/3, which shows differently decorated triangles.

The concentric circle decorations of INZ 184/6 are not preserved well enough to determine whether they were incised or punched into the surface. For the row of arches, the latter application method can, however, be identified (Fig. 11/a). The same is true for the arches of FHK 276/2, while the rows of round indentations were chiselled into the surface. A slightly larger diameter was chosen for the solitary punctures on top of and between the incised triangle motifs. The hatchings of triangles and x-shaped decorations were created at a later stage. A comparable composition of decorative elements was used for FHK 444/4.

7.2. Pins

Regarding the previously mentioned shrinkage cavities on the surface, which would have been removed with further post-casting processing, these were on occasion apparently rather covered by superimposing decorations over them. Seven pins from the Inzersdorf cemetery show clear signs of decoration being applied after surface treatment (INZ 17/18, INZ 111/3, INZ 192/9, INZ 220/8, INZ 310/5, INZ 198/3, INZ 250/4). As for Franzhausen-Kokoron, this is the case for six objects (FHK 347/6, FHK 263/6, FHK 553/2, FHK 559/3, FHK 576/6, FHK 605/5).

In case of the *Kugelkopfnadel* with horizontal ribs (INZ 111/3), evidence for the casting of the ribs is provided by the shrinkage defect seen in the last rib on the pinhead bottom (Fig. 12/a). Moreover, a casting flaw on the first rib on the top of the pinhead can be detected. In a subsequent step, shallow indentations were applied on specific ribs, cast slightly broader.

Incised decorations in particular allowed observation of application techniques and their order of creation. First of all, due to slight overlaps in the decorative motifs in some cases, a sequence of application was determined. The indentation decoration on the pin with a biconical head, INZ 17/18, filling the segments of the pin shaft, was applied after the linear incisions were formed, while in the case of *Zwiebelkopfnadel* INZ 192/9, the incision line running through the middle of the pin head is drawn over the circular motif. The diagonal indentations on the carination of the *Spindelkopf* of INZ 220/8 were applied after the lines were incised. *Kolbenkopfnadel* INZ 250/4 shows that the irregular course of the herringbone motif was intersected by the linear incisions, which is also the case for *Zwiebelkopfnadel* INZ 310/5 and *Vasenkopfnadeln* FHK 263/6 and FHK 584/16.

Also remarkable are the attestable starting or end points during post-processing work steps (Fig. 12/b), when incised

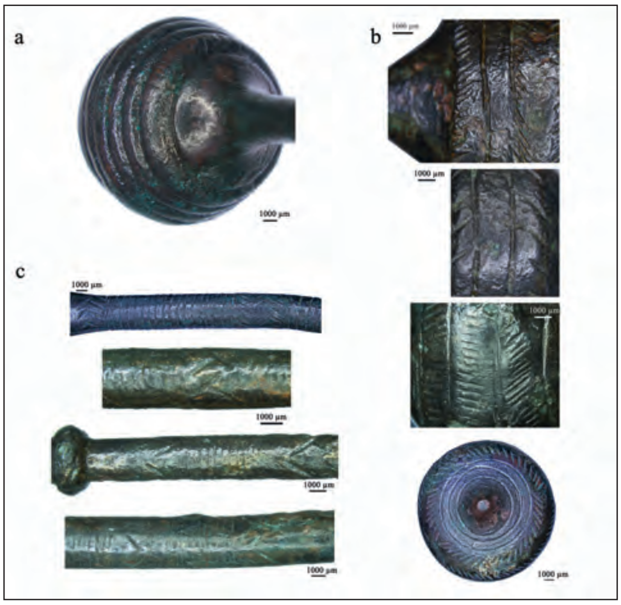


Fig. 12. Decorations on pins. – a. Detailed view of cast ribs of pinhead INZ 111/3. – b. Various imprecise applications of decorations on INZ 220/8, INZ 198/3, FHK 596/8 and FHK 310/5 (downwards). – c. Decorated pin shafts of FHK 310/8, FHK 605/5 with overlapping decor, FHK 584/16 and FHK 263/6 (downwards) (Photos: N. Mittermair).

circumferential lines do not fully merge (INZ 198/3) or overlap (INZ 220/8, INZ 310/5, FHK 596/8). In addition, errors and corrections are regularly attestable. On the top of the preserved pinhead INZ 192/9, within the motif of three concentric circles, the middle incision overlaps with the inner incision at one point. Significant overlap is also visible in INZ 250/4, while the groove along the node of FHK 559/3 runs in a highly irregular course. Decorations on pin shafts also show irregularities in some instances (FHK 605/5).

Overall, the applied motifs mostly fit into the general repertoire of the Late Bronze Age (Fig. 12/c). One exception is INZ 17/18, as no parallels for such a decoration style were found, although the application techniques are comparable and the particular motifs are attestable during the period. A possible explanation may be that the composition of pin INZ 17/18 reflects more of an individual taste. The deliberate choice of covering casting flaws with decorative elements and the irregular or even flawed application of such elements seems to fit the general impression of time-efficient work strategies being applied in both cemeteries.

7.3. Razors

Only one of the discussed razors shows decorative features that were incised after most of the processing steps (INZ 11/8). Downward-facing triangles on the blades are filled with diagonal hatching. Repeated grinding procedures

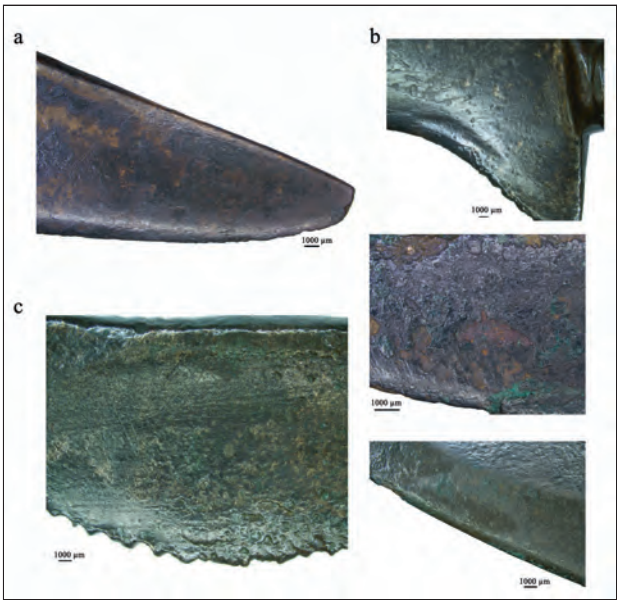


Fig. 13. Use of knives. – a. Notches and sharpened edge of blade tip INZ 27/16. – b. Transition of blunt base to sharpened edge of FHK 65/10, and sharpened edges of INZ 184/6 and INZ 4/14 (downwards). – c. Evidence of reuse on FHK 580/3: transition of blade edge to notches for handle (Photos: N. Mittermair).

and traces linked to conservation work led to the progressive fading of the patterns. The motif is comparable to observed decorative features on knife blades in terms of the application technique, placement on the object and size.

8. Use

For the discussed objects, differing conclusions concerning their use were obtained, as suspected beforehand.

8.1. Knives

The conducted analysis proves that the majority of knives were indeed used before their deposition within the burials. Characteristic traces include the sharpening of the edge, notches along the edge and varying degrees of blade wear. Investigations revealed differing patterns of use. The knife of *Binningen* type (INZ 4/14) shows signs of wear, especially from the middle of the blade towards the tip. *Dašice*-type knives (INZ 27/16, INZ 39/7), the riveted knife (INZ 3/4) and the flange-hilted knife (INZ 106/29) display more intense wear in the middle and rear edge of the blade. However, the reason for or cause of such diverging traces of use remains unclear for now. It might be linked to practical efficiency, to typological or morphological features or to a more individual preference in terms of use. Systematic investigations of knives together with an experimental approach may prove useful in order to gain more insights.

In hidden-tang knives, the degree of use is equally heterogeneous. Some objects (INZ 184/6, FHK 65/10) show slender blades and diverging courses of the edges compared to the orientation of the backs of the blades in addition to a pronounced recess close to the blade base. Together with scratches and notches, these are strong indicators of constant resharpening and an intense pre-depositional use (Fig. 13/a–b). Two other artefacts (INZ 9/6, FHK 40/5) are striking due to the broad blades and blunt edges, which suggest a distinctly lower degree of use.

Identifiable reuse of blade fragments is visible in Franzhausen-Kokoron (FHK 494/1, FHK 580/3). The rear end is worked into a flat, rectangular tang in order to ensure a secondary phase of use (Fig. 13/c). In the case of FHK 580/3, notches were punched into the upper and bottom side of the tang. An organic handle would have mostly covered the original decoration. The comparable placement within the burial pit indicates no diverging function compared to other knife types.

8.2. Pins

Clear evidence for the use of pins based on metalwork wear analysis was not detected during the course of the analysis, which was to be expected. Slight, regular bends along the total length of pin shafts as observed in some cases (INZ 106/2, FHK 347/6, FHK 553/2, FHK 576/6) might suggest an additional work step for a more practical use, especially if heat exposure as one causal factor can be excluded. Nevertheless, such indications are not conclusive, since such bends may be connected to the deposition itself and/or disturbances of burial features. In some cases, hammering traces show that a manipulation of the shaft axis is linked to the processing. Bends of over 90° possibly hint towards deliberate manipulations before depositing the artefact in the burial, although combined with evidence of heat impact, movement during the pyre-burning process may have an impact as well.

8.3. Razors

The results of use-wear analysis on razors proved to be slightly problematic, since in nearly every case the original surface of the edge was badly or hardly preserved. Due to the circumstances, the work steps for intended use could not be observed in detail. Occasionally, some objects (FHK 494/8) show some traces of edge preparation on the base of the blade. In consequence, the only definite indicator for intensive use is attestable blade wear, best visible in INZ 11/8, attesting to the highest degree of use in the discussed objects in the middle of the blade.

9. Heat Impact

Although traces of heat impact hinder the determination of metalwork wear on artefacts, interesting insights may be gained about funerary processes and the biography of individual objects by correlating observations with available data on the heat exposure of cremated bones.

9.1. Knives

Investigations of the surfaces of knives show distinct traces of heat impact on five of the knives discussed, all deriving from the Inzersdorf site (INZ 3/4, INZ 4/14, INZ 39/7, INZ 106/29, INZ 192/10). Analysis of the cremated bones show that they were exposed to temperatures of at least 500°C, mostly between 650°C and 700°C. The objects were usually discovered either with cremated human remains or inside the urn in the case of features with an earlier dating (Fig. 14). By contrast, knives found accompanied by pottery vessels or bones show no signs of heat exposure at all. The lack of attestable heat impact in knives from Franzhausen-Kokoron is connected to a shift in the find location within the burials, resulting from the change in burial practices.

9.2. Pins

Eight of the discussed pins show clear marks connected to heat exposure (INZ 17/18, INZ 111/3, INZ 192/9, INZ 220/8, INZ 310/5, FHK 347/6, FHK 553/2, FHK 559/3). The varying degree of heat exposure traces is notable. The evidence ranges from small heat-affected areas (INZ 111/3) to a vesicular surface on the entire object (INZ 192/9). Objects with clear indicators of heat exposure, provided data on temperatures is available (4 burials), were predominantly found within urns. Only in the case of *Spindelkopfnadel* INZ 220/8 was the pin found below the urn. The human remains found in the graves prove heat exposure in the ranges of 550–700°C, 650/700°C being the most common (Fig. 14). The similarities in visible heat impacts attest to the consistent role pins assume in the funerary practices of the Late Bronze Age in the Lower Traisen Valley.

9.3. Razors

The artefacts, although occasionally found within the urn, did not show significant heat impact. In the case of INZ 192/8, deformations and heat exposure indicate the presence and involvement of the object during the pyre-burning process. Interestingly, the razor was discovered placed on the shoulder of the urn rather than within the vessel, suggesting a deliberate selection of material after the heat impact. The cremated remains of the burials suggest exposure to maximum values of 650°C and 700°C within the pyres. Taking the particularly thin razor blades into account, as well as other analysed objects, such temperatures would have left detectable traces of heat exposure on the metal surface.

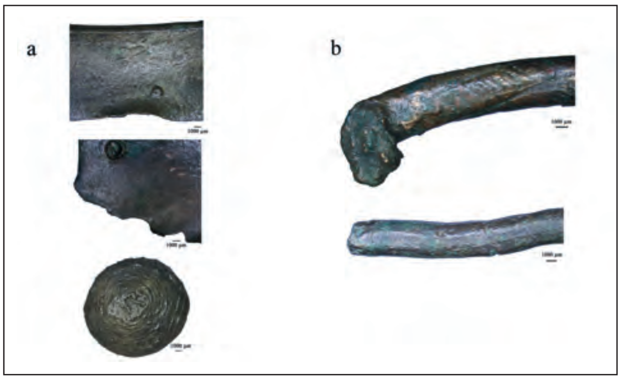


Fig. 14. Varying degrees of heat impact. – a. The discussed metal finds from Inzersdorf burial 192 show a similar vesicular surface (from top to bottom: INZ 192/10, INZ 192/8, INZ 192/9). – b. Pin shafts show partial heat impact concentrated on specific locations (INZ 17/18, FHK 310/5) (Photos: N. Mittermair).

10. Discussion

Investigations of metalwork wear conducted on the discussed finds show a variety of production techniques ranging from casting in one- or two-part moulds to lost-wax casting. As far as it was possible to reconstruct the positions of casting jets, these were located at the end of knife tangs or at the tip of razor blades towards the handle or its end. Late Bronze Age knives from Switzerland showed casting jets positioned at the tip of the blades.[41] No equivalent to this was found in the analysed material, and it could suggest variations in production processes connected to different regional workshop clusters. The processing of knives from both cemeteries followed a comparable work sequence, ranging from casting jet removal to surface treatment, annealing and cold working. Interestingly, a few artefacts show differences in the orientation of the blades and the handles, which must have been already designed prior to processing in either the casting mould or model. The modifications and diverging determinable wear of some knife blades attest to varying use patterns that might be tied to the object's form, individual preferences or differing functions.

Tangs were frequently hammered into desired shapes and notches added to optimise their support of organic

41 Schäppi 2014, 102.

handles. Compared to studies of Late Bronze Age knives from southwestern Poland, the number of identifiable manufacturing marks is significantly higher.[42] Possibly, the differences in detectable traces are linked to regional variations in applied work procedures. Moreover, marks of wear are visible to a much higher degree and in greater variation than in the case of contemporaneous knives from the hoards of Karmin, Poland.[43] It is not clear, however, whether production for an intended depositional context could have influenced the patterns of object use and thus be responsible for diverging observations on wear. Otherwise, regional preferences in metalcraft processes could also be responsible in this case. Since metalwork wear analyses of copper-based artefacts in Austria are not yet common practice, customary practices, parallels and particularities in production, cold working and use are not yet established on a regional level. It may prove sensible to investigate more sites of different archaeological contexts first. Nevertheless, such large-scale observations are interesting and tempting, as numerous Late Bronze Age artefact types show a widespread distribution.

Razors show comparable traces of production and processing to knives. Use of two-part moulds is attested. The area of the handle in particular was often only slightly worked on and this seems to have saved time and effort. The same is true for the often only roughly worked knife tangs, which would have been covered by the handles. Parallels like horizontal striation patterns, sharpening of edges and cold-working procedures attest to a similar preparation of the objects prior to their use. However, the bad preservation of razor blade edges does not provide conclusive results from use-wear analysis of the investigated objects. Only the decorated razor from Inzersdorf shows intensive wear in the central area of the blade. What remains unknown is whether such evidence reflects a more individual use pattern. Another possibility would be a longer period of use, for example due to the individual's age or the object being passed on as gift or inheritance.

In the case of pins, the comprehensive investigation shows comparable production quality within both cemeteries. Here too, different casting techniques are attestable, lost-wax as well as two-part mould casting, through characteristic casting seams or constrictions under the pinhead. However, the frequency of attestable production procedures is significantly lower than in knives. The surfaces are in almost all cases carefully polished, so that hints of casting seams, or cast surface or tool imprints from cold working are only detectable in a few instances. If identifiable, such marks are detectable under the pinhead, where visibility is limited. In my opinion, the predominantly aesthetic function of the object favours the lack of identifiable traces of production, although the practical choice of improving utility, too, had an influence on the application of work processes. In any case, an increased work effort is visible, when compared to post-casting treatment of knives and razors.

Nevertheless, a considerable number of pins allow conclusions to be drawn about production and processing. In general, the observable production processes seem to follow practical considerations and correlate to morphological traits of the objects rather than being based on the chronological sequence of the two sites or the abilities of the producers. The high number of visible traces deriving from production and processing might be linked to time-efficient work procedures, which coincides with the sometimes imprecise decoration patterns. This is also supported by errors in application, easily identifiable under closer inspection. It remains unclear if the act of timesaving during production, processing and decoration of the pins was consciously perceived to be of greater value than the effort invested in the aesthetic quality of objects. Reasons for such a perspective may be found in a production solely for deposition within the burial. Considering most other investigated artefacts seem to at least suggest an intended use by the attestable cold working, this seems unlikely in my opinion. Another reason for different qualities in processing might be the varying levels of experience of the different craftspeople making them, since the investigated pins vary significantly in identifiable metalwork traces. The number of identified imprecisions created during the application of decoration to knives was significantly lower than in the case of pins.

In general, the application techniques of incised geometrical shapes and lines as well as chased or chiselled motifs is of similar fashion in both cemeteries on knives, razors and pins alike. Overall, the style fits well into the embellishment repertoire of the Late Bronze Age. The geometric decorations on the broadside of blades and blade backs were mostly applied in a post-processing step by incisions. Intensive use and resharpening results in partially faded embellishments. Also, in the case of pins, decorations were mostly applied after processing the objects and only occasionally cast together with the artefacts. A closer inspection of tool imprints in combination with experimental studies might shed more light on the tools used and whether motifs on knives, razors and pins were indeed produced with identical or similar means and equipment. Most common errors in application include irregular or broken lines and overlapping of the ornamentation.

42 Sych 2015, 120.
43 Baron et al. 2019, 69–70.

Although no definite evidence for the use of pins was provided through the metalwork wear analysis, studies of traces of heat exposure, combined with the archaeological information, proved useful. The regular context of pins within the cremation burials together with clear evidence of heat exposure, show a firm cultural integration of the object category in the burial practices attestable in Inzersdorf ob der Traisen and Franzhausen-Kokoron, either in the form of the deceased individual's attire or in the form of additional textile funerary goods. With regard to knives, burial practices during the younger and late Urnfield periods change to a common deposition on top of additional pottery vessels, mostly bowls, together with animal bones. This circumstance apparently led to an exclusion of knives from cremation processes. Since animal bones found within the highly probable context of food offerings were obviously portioned, the discussed knives may very well have been used during such food preparation steps prior to deposition as well. Blade wear, traces of resharpening the edges and notches along the edge were observed in varying stages and intensities on every knife analysed, which attests to functionality and use prior to their deposition, regardless of the exact location within a grave. Such observations make a production solely for deposition in a funerary context in Inzersdorf and Franzhausen-Kokoron rather unlikely. Reworking of blade fragments to rectangular-tanged knives, suggests a mainly practically motivated, deliberate choice instead of producing a new object attested by the covering of typical decoration with organic handles for further use. Such a practice was not encountered in metalwork wear investigations of Late Bronze Age knives from settlement contexts of Switzerland nor in analysed finds from hoards in Poland. Moreover, their deposition within burials at Franzhausen-Kokoron attests that the role of knives within the burial context was not directly linked to a certain type or shape. However, the beginning of rather standardised food offering compositions in Franzhausen-Kokoron might be linked to the hidden-tang knives, so called *Griffdornmesser*.

11. Conclusion

Metalwork wear analyses prove useful even if objects were found in the context of cremation burials. An attestable vesicular surface often does not affect the whole copper-based object, which for such effects to occur must have been exposed to stable temperatures of at least 500–650°C or higher. Frequently, however, objects found within the urns show few to no traces of heat exposure. Even though knives, pins and razors were evidently further worked on post casting, conclusions regarding production techniques and work steps are still possible. Use of one- and two-part casting moulds as well as the application of the lost-wax casting method are attestable. Occasionally, the 'cast-on' technique was identified for the application of pinheads. Grinding and polishing of surfaces has been identified on most objects, however the degree of effort invested and thoroughness varies, especially depending on the visibility and utility of certain areas. Evidence of use was hardly detected on pins. Knives and razors, on the other hand, have yielded traces of varying degrees of use, provided that objects were sufficiently well preserved. Sharpened blade edges on knives and striation traces on razors also suggest a clear intention for use. Due to the preserved state of edges, observations of notches were not possible for razors, but were attested in considerable number on the analysed knives. In such cases, either intensive use or usage over longer periods seems more likely. Decorations were applied post-processing in most cases, generally more often on pins than on knives and only on one razor.

The analysis of investigated knives, pins and razors from Inzersdorf ob der Traisen and Franzhausen-Kokoron revealed occasional cases of imprecise execution in production, processing and decoration. Nevertheless, the amount of observed metalwork and use patterns on knives and razors seems to suggest, that production of the frequently decorated pins, knives and razors exclusively for deposition in the burial features as grave goods or funerary attire is unlikely.

Acknowledgements

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Appendix A

Grave Features

1. Inzersdorf ob der Traisen (Bz D – Ha B1)

Grave 3
Location: east within western area
Burial type: urn burial
Pit shape: burial pit of square shape (0.5 × 0.42 m)
Preservation: disturbed in modern times
Pottery: vessel fragments
Metal finds: riveted tanged knife (INZ 3/4), pin, bracelet, two *Noppenringe*[44]
Position of discussed finds: inside the urn
Individuals: 2
Anthropology: 19–40-year-old possibly female adult (individual I), 0–6-year-old child (individual II)
Heat exposure: approx. 500°C

Grave 4
Location: east within western area
Burial type: urn burial with pottery cover
Pit shape: irregularly round burial pit (0.5 m)
Preservation: disturbed
Pottery: bowls, cups and vessels with cylindrical neck east and south of the urn
Metal finds: knife with a shell handle (INZ 4/14), pendant, fibula fragments, four bracelets, *Noppenringe*, sheet fragments, melted objects[45]
Position of discussed find: inside the urn
Individuals: 2
Anthropology: female adult (individual I), 1–3-year-old child (individual II), both inside urn
Heat exposure: approx. 650–700°C

Grave 17
Location: east within western area
Burial type: urn burial with stone cover
Pit shape: almost oval burial pit (0.75 m)
Preservation: undisturbed
Pottery: cups, bowls and vessel with cylindrical neck surrounding urn[46]
Metal finds: a pin with biconical head (INZ 17/18), four bracelets, *Noppenringe*, fibula fragments, buckled sheet metal pieces, metal fragments
Position of discussed find: inside the urn
Individuals: 2
Anthropology: 35–50-year-old female adult (individual I), 3–9-month-old child (individual II)
Heat exposure: approx. 650–700°C

Grave 27
Location: northeast within western area
Burial type: urn burial with stone cover
Pit shape: almost round burial pit (0.7 m)
Preservation: undisturbed
Pottery: bowls, cups and vessel with cylindrical neck on top of urn south/southwest[47]
Metal finds: knife with shell handle and rivets (INZ 27/16), bracelet
Position of discussed find: inside the urn
Individuals: 2
Anthropology: 1–3-year-old child (individual I), adult of unknown sex (individual II)
Animal bones: burnt bones of sheep/goat inside the urn
Heat exposure: individual I approx. 500°C, individual II approx. 300°C

Grave 32
Location: east within western area
Burial type: urn burial, cremation burial
Pit shape: round burial pit (1.01 m)
Preservation: undisturbed
Pottery: various concentrations within the pit, mostly bowls, cups and biconical vessels[48]
Metal finds: pin (INZ 32/3), bracelet fragments, tubular bronze spirals, bow fibula, fibula fragments, bronze spiral fragments, melted fragments
Position of discussed find: inside the urn
Individuals: 2
Anthropology: 30–50-year-old male adult (individual I) mixed with approx. 24-week-old foetal remains, 20–50-year-old possibly female adult (individual II)
Heat exposure: approx. 500°C

Grave 39
Location: east within western area
Burial type: cremation burial possibly with wooden panelling
Pit shape: rectangular burial pit (2.7 × 1.4 m)
Orientation: east-west axis
Preservation: undisturbed
Pottery: cups characteristic for the older Urnfield period aligned in east-west orientation, vessel with cylindrical neck, knobs and channelling in the west with smaller cups[49]
Metal finds: fragments of a shell handle knife with rivets (INZ 39/7), pin, bronze vessel of type *Friedrichsruhe*
Position of discussed find: in the southwestern corner mingled with cremated remains together with burnt pottery fragments
Individuals: 1
Anthropology: young adult of unknown sex, cremated remains deposited centrally in oval-shaped area

Grave 106
Location: north within western area
Burial type: cremation burials with wooden panelling
Pit shape: burial pit of square shape (2.7 × 2.6 m)
Orientation: east-west axis
Preservation: disturbed in ancient times
Pottery: two pottery concentrations in the east and in the west in burial of individual I including a *Baierdorf-Velatiće* cup and other

44 Fritzl 2017, 288–291.
45 Fritzl 2017, 292–302.
46 Fritzl 2017, 312–364.
47 Fritzl 2017, 364–372.
48 Fritzl 2017, 380–395.
49 Lochner 2021, 243.

cups, a vessel with cylindrical neck, a supposed drum,[50] fragmented pottery concentration in the south with bowls
Metal finds: pin (INZ 106/2), flange-hilted knife (INZ 106/29), hooked belt plate, belt hook, chisel fragment, sickle fragment, decorated metal sheet casing, wire rings, metal rings
Position of discussed find: mingled with cremated remains in the north (INZ 106/29), in the pit filling (INZ 106/2)
Individuals: 3
Anthropology: 16–19-year-old possibly female adult in the north (individual I), 1–6-year-old child in pit filling and mixed with individual I (individual III), 7–12-year-old child (individual II)
Heat exposure: approx. 650–700°C[51]
Animal bones: burnt bones of sheep/goat in the centre of southern burial

Grave 111
Location: northwest within western area
Burial type: urn burial
Pit shape: roughly round burial pit (approx. 0.45 m)
Preservation: disturbed
Metal finds: pin with round, ribbed head (INZ 111/3)
Position of discussed find: inside the urn
Individuals: 1
Anthropology: adult of unknown sex

Grave 184
Location: north within the southern area
Burial type: urn burial
Pit shape: round burial pit (0.55 m)
Preservation: disturbed
Pottery: pottery fragments and a cup in the west
Metal finds: hidden-tang knife (INZ 184/6), single-edged razor (INZ 184/3)
Position of discussed find: inside the urn (INZ 184/3), together with animal bones in the east (INZ 184/6)
Individuals: 1
Anthropology: < 50-year-old male mature
Animal bones: left front leg of sheep/goat in anatomical position in the east

Grave 192
Location: north within the southern area
Burial type: urn burial
Pit shape: round burial pit (0.5 m)
Preservation: slightly disturbed
Pottery: vessel fragments in the north, bowl on top of urn, cup inside urn and fragments in the pit filling
Metal finds: riveted razor (INZ 192/8), pin fragment (INZ 192/9), riveted tanged knife (INZ 192/10)
Position of discussed find: on the urn's shoulder (INZ 192/8, INZ 192/10), inside the urn (INZ 192/9)
Individuals: 1
Anthropology: 40–69-year-old mature male

Grave 198
Location: northwest within the southern area
Burial type: urn burial
Pit shape: round burial pit (0.45 m)
Preservation: disturbed in modern times
Pottery: dislocated fragments in burial pit, vessel with cylindrical neck inside the urn
Metal finds: pin (INZ 198/3), copper-based metal ringlets
Position of discussed find: inside the urn
Individuals: 1
Anthropology: adult of unknown sex

Grave 220
Location: east within the southern area
Burial type: urn burial
Pit shape: round burial pit (0.45 m)
Preservation: disturbed in modern times
Pottery: dislocated pottery fragments partly burnt, a bowl inside the urn
Other finds: bone beads inside the urn
Metal finds: belt hook, a knife blade (INZ 220/6), pin (INZ 220/8, INZ 220/9), melted metal droplet
Position of discussed find: below the urn
Individuals: 1
Anthropology: possibly female adult

Grave 250
Location: east within western area
Burial type: urn burial
Pit shape: roughly round burial pit (0.5 m)
Preservation: disturbed in modern times
Pottery: bowl, small pot and cup within pit filling, cup with horizontal channelling inside urn
Other finds: bone beads inside the urn
Metal finds: pin (INZ 250/4)
Position of discussed finds: inside the urn
Individuals: 1
Anthropology: possibly female adult

Grave 310
Location: northeast within the southern area
Burial type: urn burial
Pit shape: round burial pit (0.5 m)
Preservation: undisturbed
Pottery: vessel fragments in pit filling, bowl inside the urn
Metal finds: pin (INZ 310/5)
Position of discussed find: below the urn
Individuals: 1
Anthropology: 30–50-year-old possibly male adult

2. Inzersdorf ob der Traisen (Ha B)

Grave 9
Location: southwest within the grave concentration
Burial type: urn burial
Pit shape: oval burial pit (0.8 m in diameter)
Preservation: disturbed in modern times
Pottery: various bowls in the south
Metal finds: hidden-tang knife (INZ 9/6)
Position of discussed find: with the pottery concentration in the south
Individuals: unknown

50 Pomberger 2011, 34. – Lochner 2015, 346.
51 Fritzl 2017, 402.

Grave 11
Location: south of the grave concentration
Burial type: urn burial (possibly with cover)
Pit shape: round burial pit (approx. 0.7 m)
Preservation: disturbed in modern times
Pottery: base fragments of a bowl on top of urn, cup and two bowls northwest of the urn
Metal finds: single-edged razor (INZ 11/8)
Position of discussed find: in the north of the pit
Individuals: unknown

3. Franzhausen-Kokoron (Ha A2/B1 – Ha B3)

Grave 40
Location: northwest within the western grave concentration
Burial type: urn burial
Pit shape: roughly oval pit (approx. 0.89 m)
Preservation: undisturbed
Remarks: intersecting another pit dated to the Early Bronze Age[52]
Pottery: assemblage of pottery vessels, including pots, bowls and cups in the south, conical bowl in the east
Metal finds: hidden-tang knife (FHK 40/5), melted pin shaft
Position of discussed finds: together with the biconical bowl in the east
Individuals: 1
Anthropology: probably male adult
Heat exposure: approx. 550°C

Grave 65
Location: northwest within the western grave concentration
Burial type: urn burial
Pit shape: roughly oval burial pit (0.75 m)
Preservation: undisturbed
Pottery: mainly cups, bowls and vessels with cylindrical neck placed from east to west at the bottom of the pit surrounding urn, two graphited bowls, one of which has a funnel-shaped neck[53]
Metal finds: hidden-tang knife (FHK 65/10), pin fragments
Position of discussed find: on top of bowl
Individuals: 1
Anthropology: male adult (89 g human remains outside of urn)
Heat exposure: approx. 650–700ºC
Animal bones: pig and sheep/goat were found scattered within the bowl, other vessels and on the bottom of the burial pit

Grab 263
Location: south within the western grave concentration
Burial type: urn burial
Pit shape: oval burial pit (0.55 m)
Preservation: undisturbed
Pottery: bowl and beaker with funnel-shaped neck south of urn
Metal finds: pin with a small vase-shaped head (FHK 263/6), decorated pin fragment (FHK 263/9)
Position of discussed find: inside the urn
Individuals: 1
Anthropology: female adult
Heat exposure: approx. 550°C
Animal bones: possibly belonging to sheep/goat mixed with human remains, finding of a shell of a common central European river mussel (*Unio crassus*) below one of the bowls

Grave 276
Location: west of the centrally situated cremation place
Burial type: urn burial
Pit shape: amorphous burial pit (1.45 × 0.87 m)
Preservation: slightly disturbed in modern times
Pottery: concentration east and southeast of the urn[54]
Metal finds: crescent-shaped razor with ring handle (FHK 276/1), hidden-tang knife (FHK 276/2)
Position of discussed find: together with bowl and animal bones (FHK 276/2), unknown (FHK 276/1)
Individuals: 1
Anthropology: uncertainly classified as male adult
Heat exposure: approx. 650–700°C
Animal bones: left foreleg of sheep/goat in the southwest of the burial pit (green discolouration)

Grave 347
Location: south within the western grave concentration
Burial type: urn burial
Pit shape: burial pit of roughly round shape (0.6 m)
Preservation: slightly disturbed in modern times
Pottery: decorated vessel with cone-shaped neck, a bowl with inverted rim, and fragments of a pot visibly impacted by heat situated in the south of the pit[55]
Metal finds: pin with small vase-shaped head (FHK 347/6), iron knife, bracelet, perforated pin, fishing hook, belt buckle, ring, copper-based metal buttons
Position of discussed find: inside the urn
Individuals: 2
Anthropology: possibly female adult (individual I), 1–6-year-old child (individual II)
Heat exposure: approx. 650–700ºC
Animal bones: undetermined animal bones in the filling of the pit mixed with cremated human remains

Grave 383
Location: north within the western grave concentration
Burial type: urn burial
Pit shape: roughly rectangular in shape (0.86 × 0.82 m)
Preservation: slightly disturbed in modern times
Pottery: several cups, beakers and bowls east and south of urn[56]
Metal finds: hidden-tang knife (FHK 383/6), single-edged razor, belt buckle
Position of discussed find: on top of a bowl in the south (FHK 383/6)
Individuals: 1
Anthropology: possibly female adult

52 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_40.xml.
53 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_65.xml.
54 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_276.xml.
55 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_347.xml.
56 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_383.xml.

Heat exposure: approx. 300–550°C

Grave 444
Location: north within the western grave concentration
Burial type: urn burial
Pit shape: round burial pit (0.97 m)
Preservation: poorly preserved
Pottery: pottery fragments, bowl with inverted rim and a decorated beaker with cone-shaped neck in the east[57]
Metal finds: decorated hidden-tang knife (FHK 444/4)
Position of discussed find: together with animal bones on pit bottom
Individuals: 1?
Anthropology: undetermined
Heat exposure: approx. 650–700ºC
Animal bones: right foreleg, left hind leg as well as rib parts of a sheep (green discolouration), single rib of a pig

Grave 494
Location: northeast within the western grave concentration
Burial type: urn burial
Pit shape: round burial pit (0.7 m)
Preservation: slight disturbance in modern times
Pottery: bowl with inverted rim, a cup with cone-shaped neck[58]
Metal finds: knife with partial rectangular tang (FHK 494/1), crescent-shaped razor (FHK 494/8)
Position of discussed find: inside a cup (FHK 494/1), inside urn (FHK 494/8)
Individuals: 1
Anthropology: male adult
Heat exposure: approx. 650–700ºC

Grave 553
Location: southeast within the western grave concentration
Burial type: urn burial
Pit shape: round burial pit (0.55 m)
Preservation: disturbed in modern times
Pottery: miniature vessels including a bowl, beaker and perforated lid[59]
Metal finds: pin with a big vase-shaped head (FHK 553/2), ring
Position of discussed find: inside the urn
Individuals: 1
Anthropology: 25–35-year-old possibly male adult
Heat exposure: approx. 550°C

Grave 559
Location: southeast within the western grave concentration
Burial type: urn burial
Pit shape: roughly rectangular burial pit (0.55 × 0.49 m)
Preservation: disturbed in modern times
Pottery: graphited, conical bowl and vessel with cone-shaped neck in the northwest[60]
Metal finds: pin with small vase-shaped head (FHK 559/3)
Position of discussed find: inside the urn
Individuals: 1
Anthropology: female adult
Heat exposure: approx. 650–700°C

Grave 576
Location: southeast within the western grave concentration
Burial type: urn burial, cremation burial
Pit shape: rectangular trench surrounding the oval burial pit (0.9 m)
Preservation: disturbed in modern times
Pottery: bowls and cups concentrated in the southwest[61]
Metal finds: pin with small vase-shaped head (FHK 576/6)
Position of discussed find: inside the urn
Individuals: 2
Anthropology: possibly male adult in the urn (individual I), uncertainly classified as female adult spatially concentrated in pit filling (individual II)
Heat exposure: approx. 550°C

Grave 580
Location: south within the western grave concentration
Burial type: urn burial
Pit shape: oval burial pit (0.9 m)
Preservation: slightly disturbed in modern times
Pottery: graphited cup in the north, a bowl with inverted rim and a vessel with cone-shaped neck in the southwest[62]
Metal finds: small knife with partial, rectangular tang (FHK 580/3), pin fragment
Position of discussed find: in a bowl
Individuals: 1
Anthropology: undetermined
Heat exposure: approx. 650–700°C

Grave 581
Location: south within the western grave concentration
Burial type: urn burial
Pit shape: oval shape (0.6 m)
Preservation: disturbed in modern times
Pottery: a bowl with inverted rim and a graphited cup in the south with a graphited bowl inside[63]
Metal finds: pin with small vase-shaped head (FHK 581/4)
Position of discussed find: inside the urn
Individuals: 1
Anthropology: female adult
Heat exposure: approx. 650–700°C

57 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_444.xml.
58 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_494.xml.
59 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_553.xml.
60 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_559.xml.
61 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_576.xml.
62 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_580.xml.
63 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_581.xml.

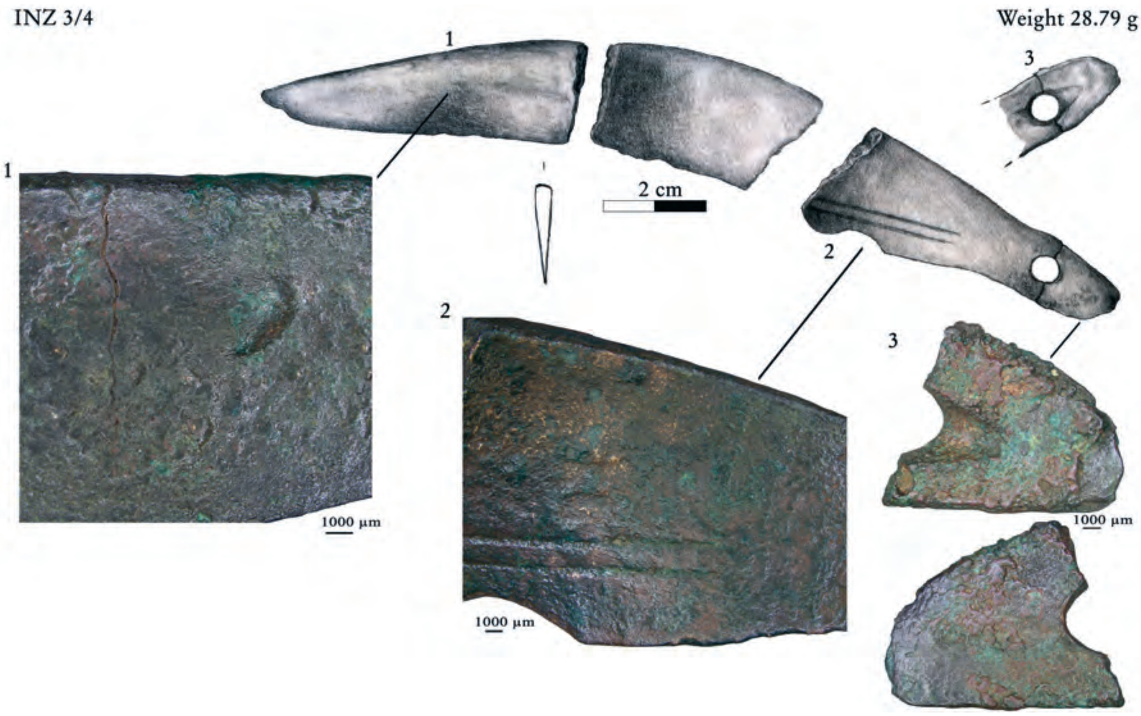

Fig. 15. Riveted knife INZ 3/4. – 1. Fissure from cold working and surface affected by heat exposure. – 2. Parallel incisions and hammered edge with small-sized notches towards the hilt. – 3. The rivet prepared in the casting mould/model suggests a single-part mould or lost-wax casting (Drawing: M. Imam. – Photos: N. Mittermair).

Grave 596
Location: southeast within the western grave concentration
Burial type: urn burial
Pit shape: oval burial pit (0.65 m)
Preservation: undisturbed
Pottery: two vessels in the east, a bowl from inside the urn[64]
Metal finds: pin with small vase-shaped head (FHK 596/8), pin fragments (FHK 596/12, FHK 596/13), bracelet, ring
Position of discussed finds: from a vessel in the east (FHK 596/8, FHK 596/12), inside the urn (FHK 596/13)
Individuals: 1
Anthropology: female adult
Heat exposure: approx. 650–700°C

Grave 605
Location: east within the western grave concentration
Burial type: urn burial, cremation burial
Pit shape: round burial pit (0.75 m)
Preservation: undisturbed
Pottery: bowl with inverted rim, a cup with cylindrical neck and a bowl with cylindrical neck with another cup inside in the southeast, a bowl with cylindrical neck on top, bottom of a vessel in the pit filling[65]
Metal finds: pin with small vase-shaped head (FHK 605/5), an awl and a double-crescent-shaped razor (FHK 605/7)
Position of discussed finds: inside the urn
Individuals: 2
Anthropology: 25–35-year-old male adult (individual I) in the urn, female adult (individual II) in pit filling
Heat exposure: approx. 550°C

Appendix B

Object Descriptions

1. Knives

INZ 3/4 (Fig. 15)
Typology: *Riegsee* type
Dating: beginning of older Urnfield period (Bz D – early Ha A1)
Distribution: southeastern Germany, eastern Alpine region, northeastern Austria, Moravia
Length: 12.7 cm
Width: 0.3 cm
Height: 1.9 cm
Preservation: fragmented; 99 %; modern damage on edge at tip and towards hilt
Production: due to even reverse, production in single-part mould likely; rivet hole already prepared in casting mould
Processing: vertical fissures in surface starting from the back of blade prove hardening procedure even though possibly increased due to heat exposure; blade close to edge shows marks of hammering

64 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_596.xml.
65 Lochner, Hellerschmid 2016, http://hw.oeaw.ac.at/franzhausen-kokoron2/output/Grab_605.xml.

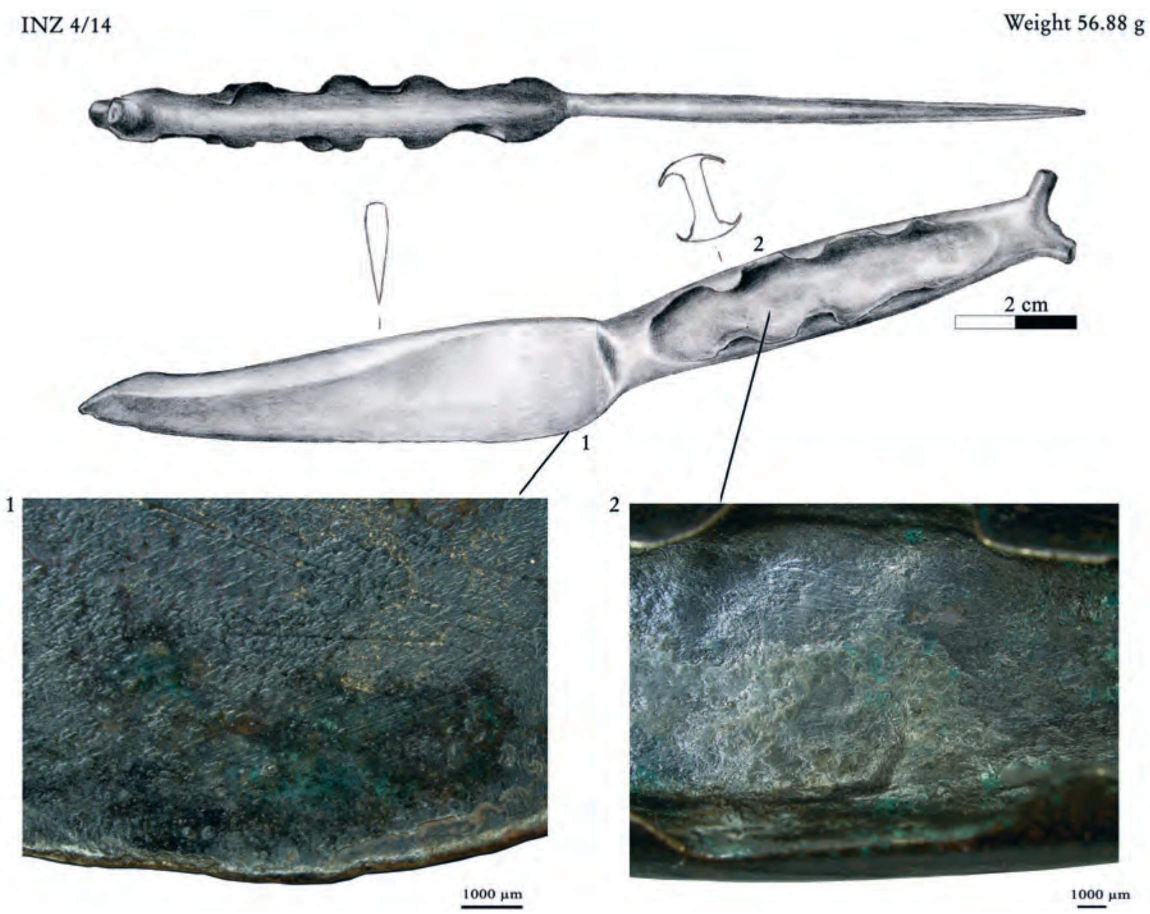

Fig. 16. Knife with shell handle INZ 4/14. – 1. Rather blunt edge at the end towards the hilt. Visible irregular striations along the blade derive from use rather than polishing or sharpening. – 2. Negative hammer marks within the shell handle (Drawing: M. Imam. – Photos: N. Mittermair).

Decoration: post-processing application of 2 parallel incisions
Use: small-sized notches in blade edge; blade wear visible in unpronounced blade base running from tang
Deformation: nearly 180° bend in object; surfaces of break show fewer signs of heat exposure; post-funerary manipulation of object possible
Heat exposure: vesicular surface on most of the fragments; side not depicted in drawing more exposed to heat
Corrosion: high rate of surface corrosion

INZ 4/14 (Fig. 16)
Typology: *Binningen/Courtavant* type B
Dating: beginning of older Urnfield period (Bz D – Ha A1)[66]
Distribution: Switzerland, western Alpine region[67]
Length: 16.3 cm
Width: 1.1 cm
Height: 2.0 cm
Remarks: blade facetted and blade back showing protrusion close to tip rather typical for *Baierdorf* knives
Preservation: 97 %; modern damage on tip of blade and edges
Production: seam on inside of incomplete ring knob; asymmetrically worked transition from blade to handle and end of handle shell; averted axis of blade to horizontal axis of handle prepared in mould/model; 6 arched fixings for handle inlay already prepared in casting mould
Processing: casting surface removed; post-casting treatment of surface including polishing except in handle shell; hammering marks within handle shell; facetted blade part and blade close to edge show marks of hammering; post-casting revision of 6 arched fixings for inserted handle inlay; drawing of object shows last processed side of object
Use: sharpened edge from tip to half of blade; low number of notches; abrasions on blade edge visible, especially towards the tip
Heat exposure: a few areas with a vesicular surface beginning to form on knife blade
Corrosion: slight surface corrosion within handle shell
Conservation: corrosion removal traces on back of blade

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66 Willvonseder 1939, 271.
67 Říhovský 1972, 37. Southwest Germany was mentioned as the main distribution area; however, equivalent objects were not found in Hohlbein 2016. Unless stated otherwise, information about the dating and distribution of knives derives from Říhovský 1972.

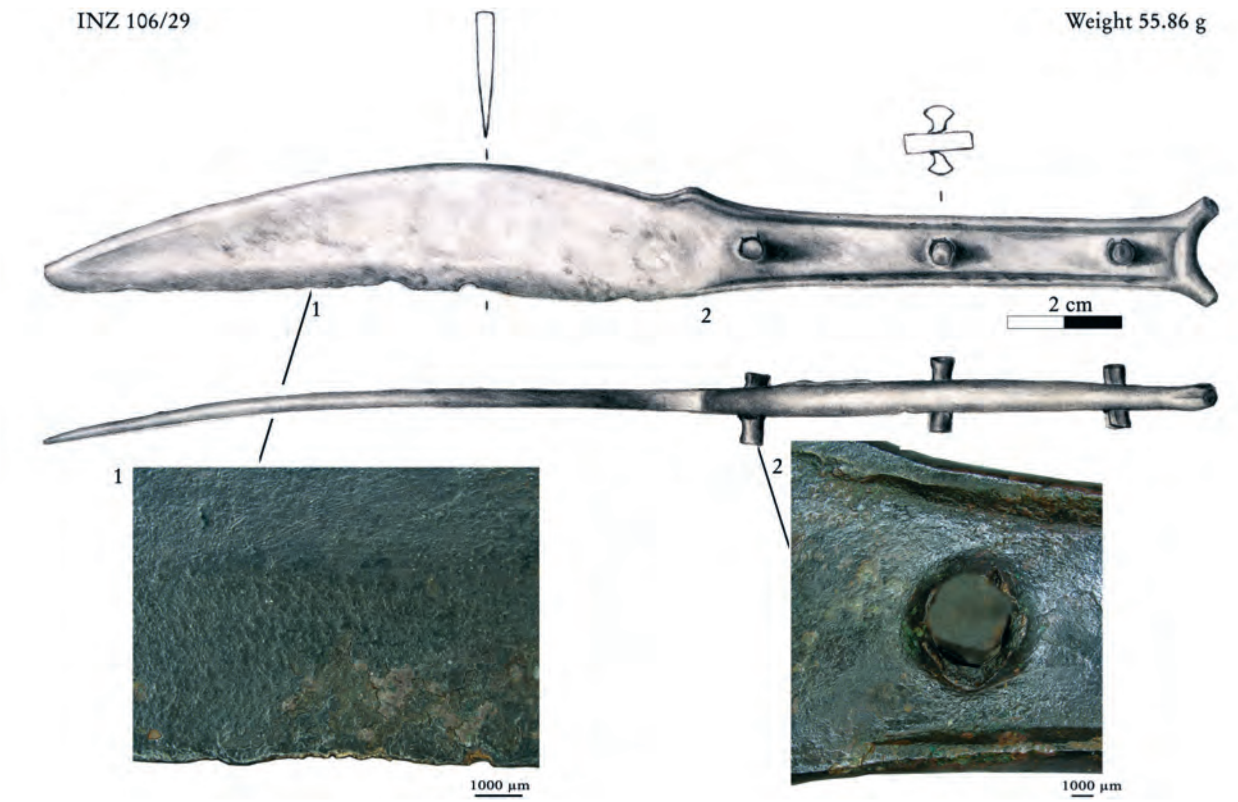

Fig. 17. Flange-hilted knife INZ 106/29. – 1. Notches along the edge and irregular striations along the blade suggest use. – 2. Three rivet holes punched through the same side, while rivets are made of similar-looking multi-edged fragments. Ends of flanges hammered flat towards the blade (Drawing: M. Imam. – Photos: N. Mittermair).

INZ 106/29 (Fig. 17)
Typology: *Baierdorf* type
Variant: A
Dating: beginning of older Urnfield period (Bz D – Ha A1)
Distribution: Alpine region, southwest Germany, southern Bohemia, northern Austria
Length: 20.4 cm
Width: 1.2 cm (with rivets)
Height: 2.3 cm
Preservation: 97 %; modern damage along edge
Processing: post-casting treatment of surface including polishing; flat hammered flanges at beginning of blade; 3 rivets pierced through the handle from the same side; hammering of lower blade part; facetted blade tip
Use: sharpened edge; medium- and small-sized notches in the edge; blade wear visible in midsection and unpronounced blade base; occasional scratches on blade surface
Deformation: slight bend in the blade area
Heat exposure: visible heat exposure on surface at blade tip on drawn side
Corrosion: visible surface corrosion in some areas
Conservation: traces of corrosion removal visible at the end of the flange on the reverse

INZ 27/16 (Fig. 18)
Typology: *Dašice* type
Dating: older Urnfield period (Ha A1)
Distribution: eastern central Europe
Length: 18.4 cm
Width: 1.4 cm (with rivets)
Height: 1.9 cm
Preservation: 100 %; slight modern damage along edge
Production: excess material of casting process inside the ring knob; visible casting features at transition from knob to handle; averted blade axis to horizontal axis of handle prepared in mould/model; 3 rivet holes prepared in mould/model
Processing: post-casting treatment of surface including polishing except in handle shell; hammering marks at handle; rivets pierced through the shell from the same side; hammering traces on lower part of blade; blade facet
Use: sharpened edge; small-sized notches close to blade base and tip; blade wear in midsection; scratches with various orientations (parallel, diagonal to edge) and lengths (approx. 1–3 cm)
Corrosion: slight surface corrosion within handle shell
Conservation: corrosion removal traces on blade part

INZ 39/7 (Fig. 19)
Typology: *Dašice* type
Dating: older Urnfield period (Ha A1)[68]
Distribution: eastern central Europe
Length: 18.5 cm

68 Lochner 2013, 16.

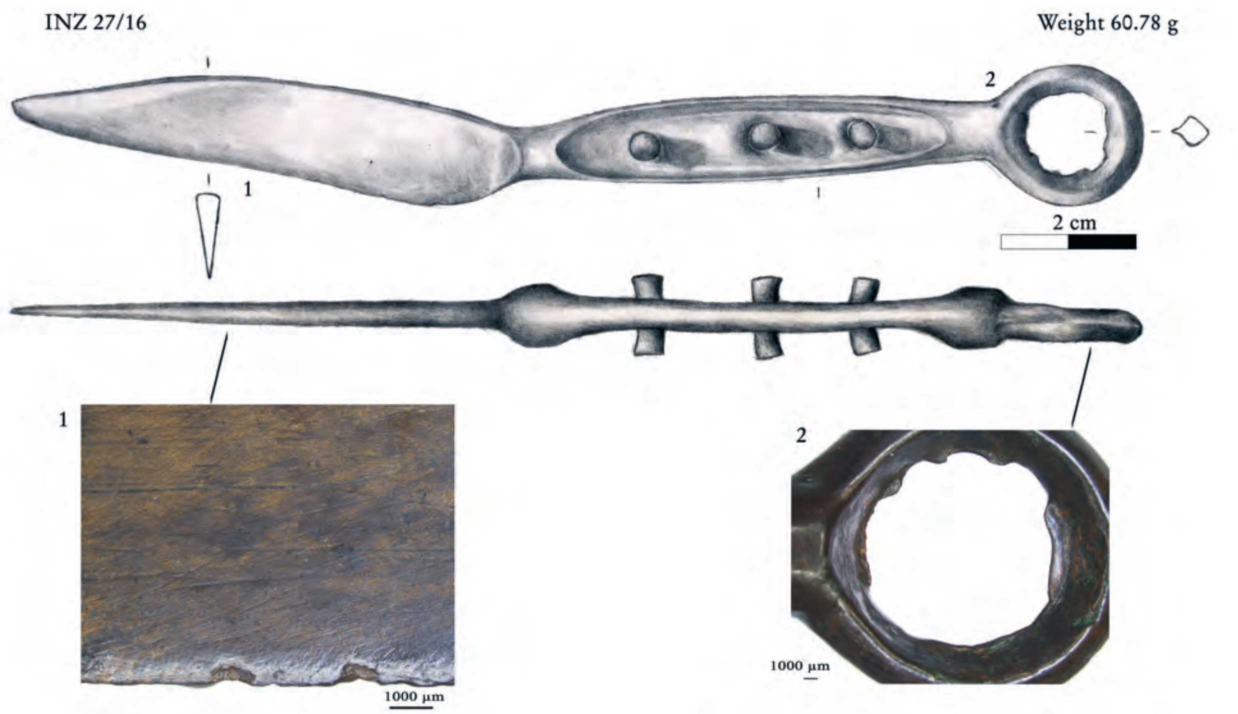

Fig. 18. Knife with riveted shell handle INZ 27/16. – 1. Fine, diagonal striations along the edge are proof of (re-)sharpening of the blade. Irregular striations likely derive from use. Similar notches in close proximity may suggest patterns in use or derive from post-casting treatment like hardening. – 2. Roughly removed excess material from casting inside the ring (Drawing: M. Imam. – Photos: N. Mittermair).

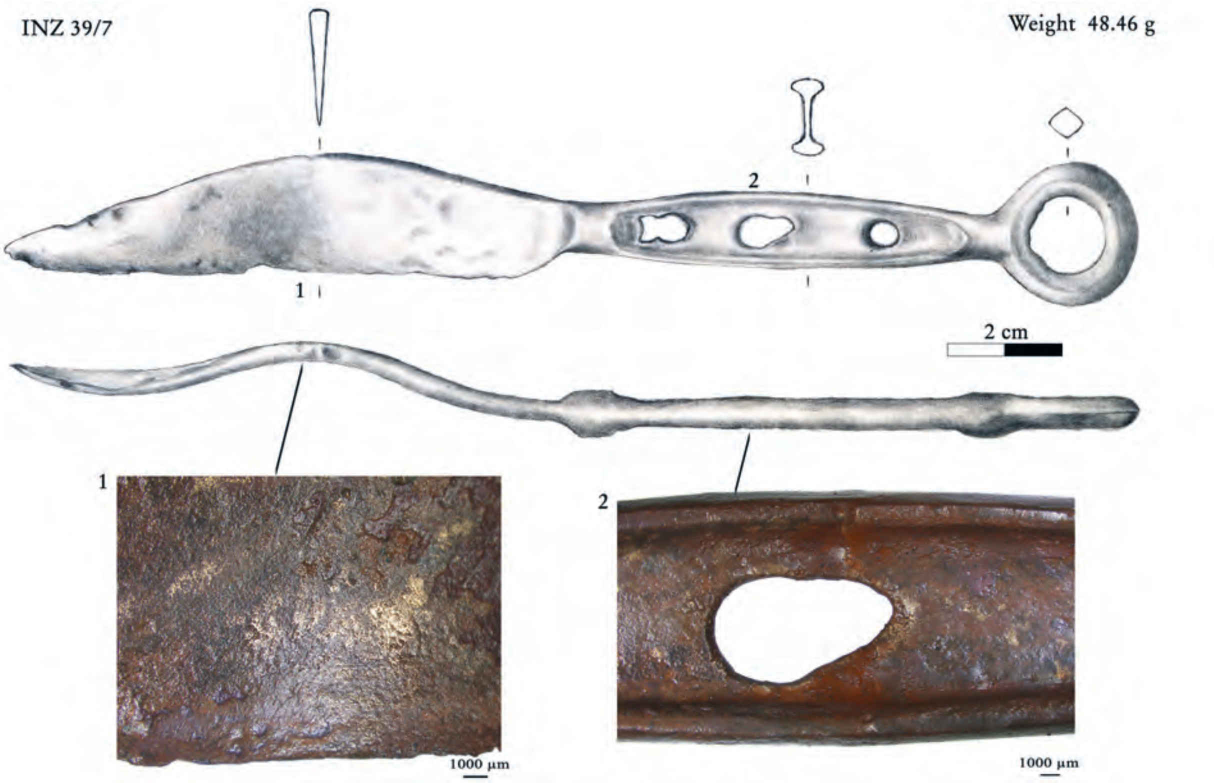

Fig. 19. Knife with riveted shell handle INZ 39/7. – 1. Vesicular surface on blade superimposes the barely visible horizontal striations either deriving from (re-)sharpening the blade or use. – 2. The casting defect visible at the second rivet resulted in a wider rivet hole than planned (Drawing: M. Imam. – Photos: N. Mittermair).

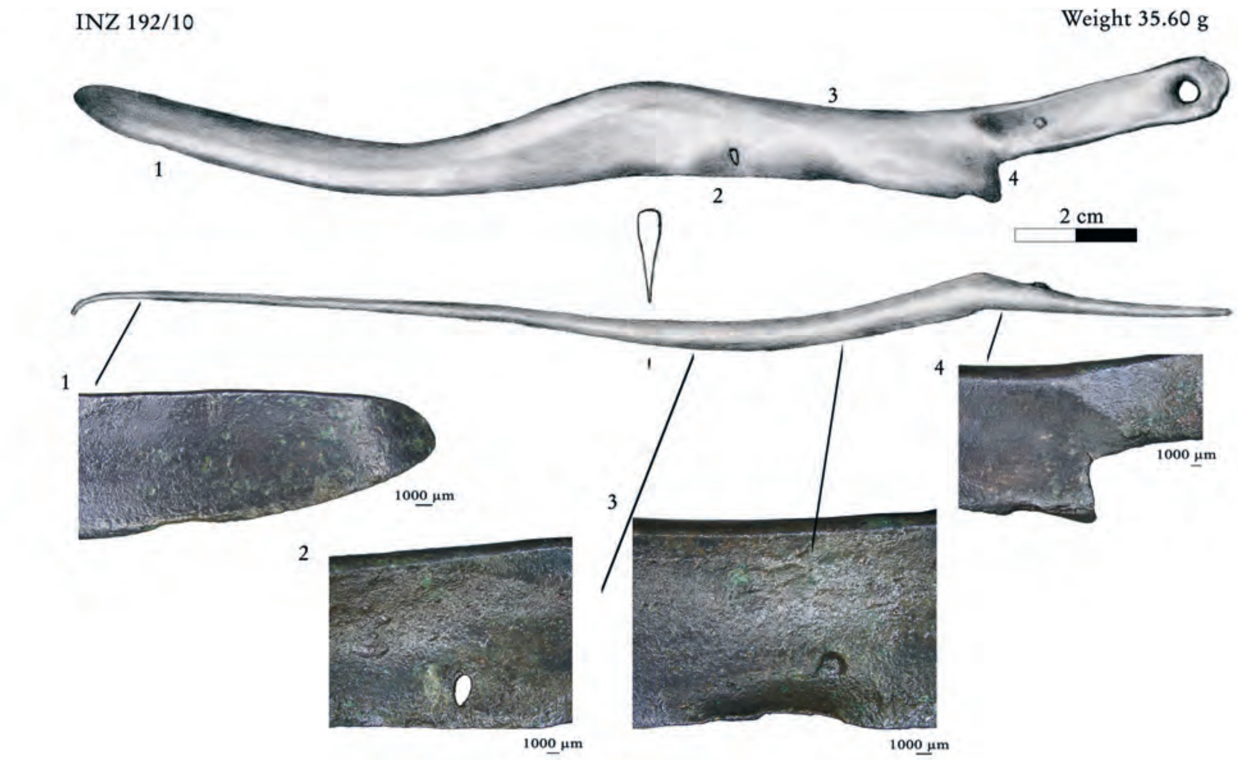

Fig. 20. Knife with riveted tang INZ 192/10. – 1. The bent blade tip may derive from the pyre-burning process. – 2. The cavity in the blade is a result of a cold-shut casting defect, the size may have increased during the pyre-burning process. – 3. The bent edges, as in 4, are a result of the heat impact affecting the microstructure in thinner sections. – 4. Blade area exposed to hammering visible. The fissure between the handle and the hilt is a result of the cold-working process, possibly increased by the impact of heat (Drawing: M. Imam. – Photos: N. Mittermair).

Width: 0.7 cm
Height: 1.7 cm
Preservation: 100 %
Production: excess material of casting process inside the ring knob; 3 rivet holes prepared in mould/model; casting flaws at 2 rivet holes
Processing: inner and outer rivet pierced through handle from same side; evidence of hammering at blade base
Use: sharpened edge; small-sized notches in areas with less heat impact; low degree of blade wear
Deformation: bend in blade
Heat exposure: vesicular surface and high degree of heat exposure
Corrosion: high degree of surface corrosion
Conservation: corrosion removal traces on whole object

INZ 192/10 (Fig. 20)
Typology: *Dašice* type
Dating: older Urnfield period (Ha A)
Distribution: eastern central Europe, equivalent find from Rýdeč[69]
Length: 18.9 cm
Width: 0.6 cm
Height: 1.5 cm
Preservation: 100 %
Production: rivet hole in tang prepared in mould/model; curved course of blade in part prepared in mould/model
Processing: post-casting surface treatment including polishing of blade; high number of hammering marks on tang; traces of hammering on whole blade including facetted blade, especially intense on lower part of blade; curved course of blade further expanded during hardening of blade; fissure at junction of handle and blade due to hardening procedures possibly expanded by use and/or heat impact
Use: blade sharpened close to tip; low number of small-sized notches; blade wear visible towards the tip
Deformation: slight bend in object
Heat exposure: vesicular surface on tang and blade on both sides; hole within blade
Corrosion: surface corrosion visible in some areas around the tang
Conservation: corrosion removal traces on whole object; acrylic resin residue

INZ 184/6 (Fig. 21)
Typology: *Hadersdorf* type
Dating: beginning of younger Urnfield period (Ha A2/B1)[70]
Distribution: Alpine region, Silesia, Bohemia, Moravia, Hungary, Slovakia
Length: 15.7 cm

69 Jiraň 2002, 35.

70 According to Říhovský 1972, 63–64, decorated *Hadersdorf*-type knives date to later phases in general (Ha B1 – Ha B3). However, the number of uncovered finds of this type within the discussed region in general is quite low.

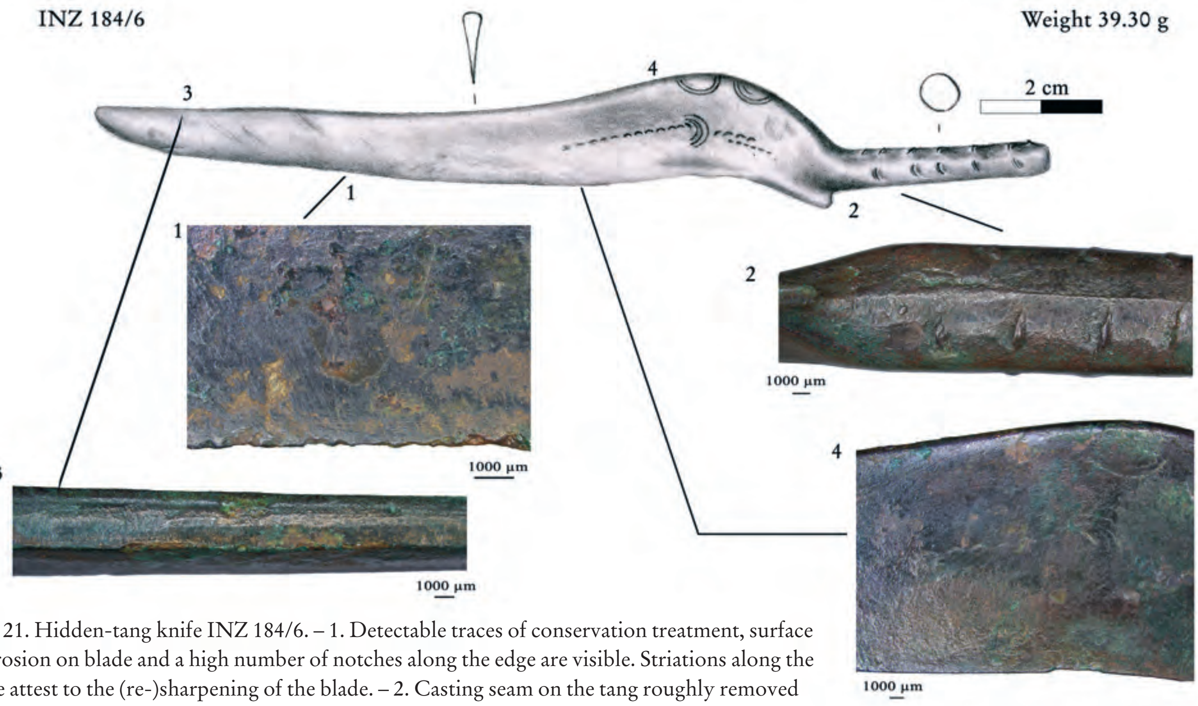

Fig. 21. Hidden-tang knife INZ 184/6. – 1. Detectable traces of conservation treatment, surface corrosion on blade and a high number of notches along the edge are visible. Striations along the edge attest to the (re-)sharpening of the blade. – 2. Casting seam on the tang roughly removed towards the blade, possibly by hammering. – 3. The channel-like indentation on the back of the blade derives from repeated hammering along the upper parts of the blade. – 4. Decoration lines and concentric circle motifs punched into the back of the blade (Drawing: M. Imam. – Photos: N. Mittermair).

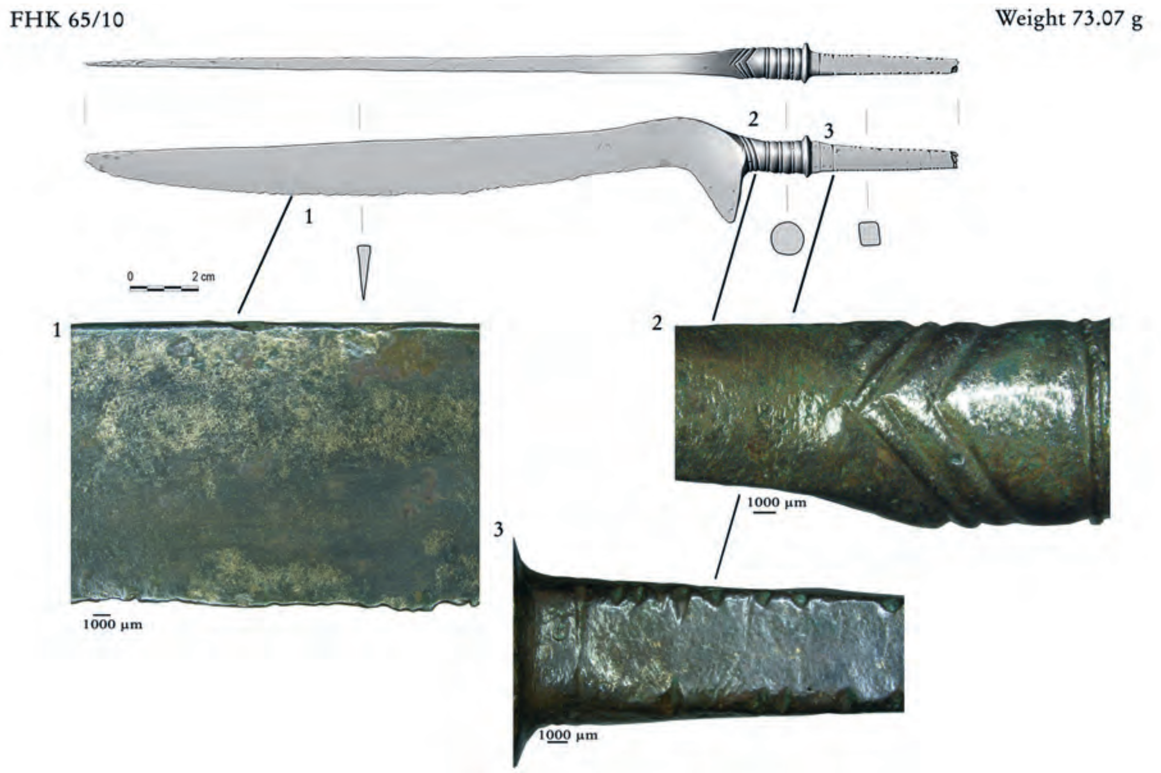

Fig. 22. Hidden-tang knife FHK 65/10. – 1. Damage includes small-sized notches along the edge and on the transition to the back of the blade, possibly from cold working and use. – 2. The irregularity in decoration of the transition to the hilt is one example of the inaccurate application of decoration on either the casting model or the artefact. – 3. Rectangular tang hammered into shape, indentations along the corners to improve the grip on the handle (Drawing: F. Siegmeth. – Photos: N. Mittermair).

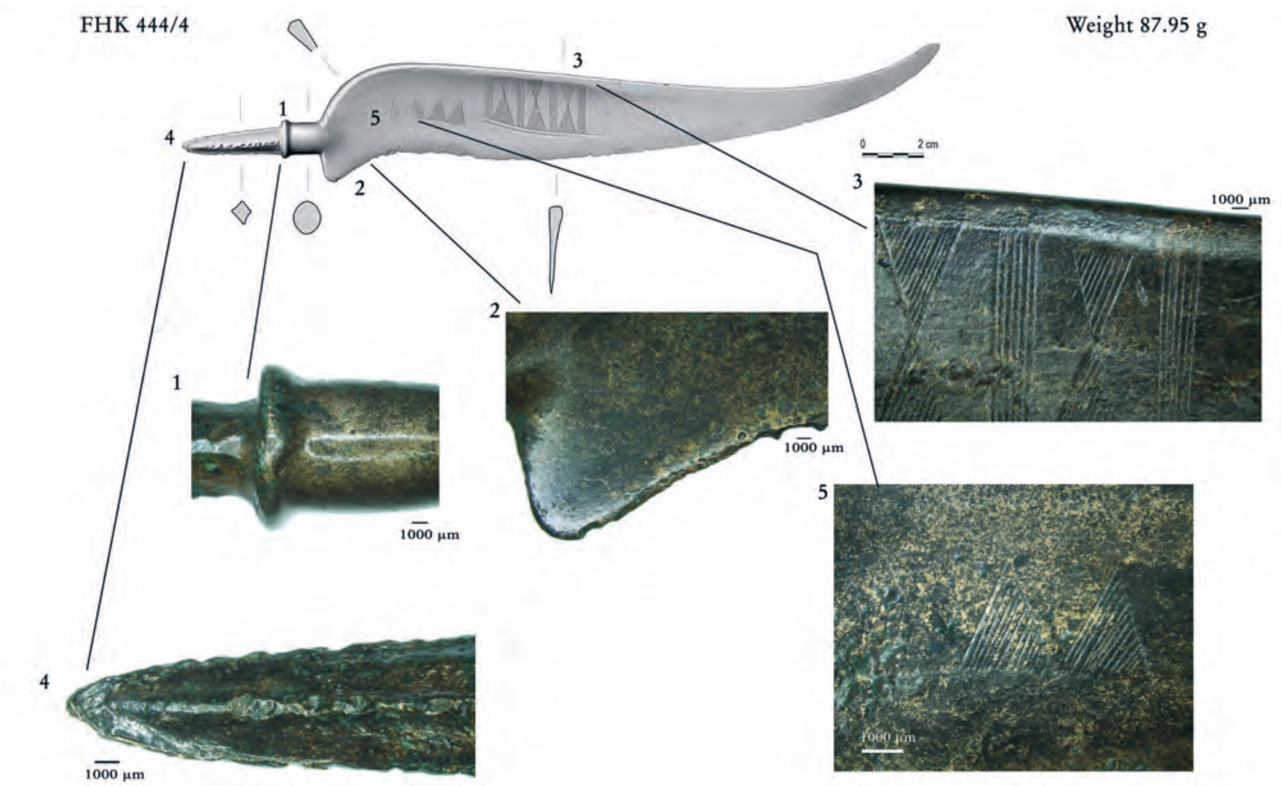

Fig. 23. Hidden-tang knife FHK 444/4. – 1. Asymmetry at the hilt results from not fully aligned casting mould parts. – 2. Clearly visible transition from striations at sharpened edge to the blunt end of the blade. – 3. Carefully incised decorations superimposed by horizontal striations, possibly from (re-)sharpening the blade or use. Transition to the back of the blade in the area hammered flat in a subsequent step. – 4. The casting seam of the tang was left in order to punch in notches to improve the grip on the handle. – 5. The varying degrees of accuracy between 3 and the hatchings in the standing triangle motif may indicate application by different craftspeople (Drawing: F. Siegmeth. – Photos: N. Mittermair).

Width: 0.7 cm
Height: 1.7 cm
Preservation: 100 %
Production: casting jet originally at end of round tang; shrinkage defects at surface of tang
Processing: removal of casting jet and hammering of tang end; post-casting treatment of surface including polishing; rows of indentations for ideal support of shaft; evidence of hammering of blade part towards tip; hammering marks along lower part of blade; drawn side is last worked edge side; reorientation of blade tip course through hammering
Use: sharpened edge; diagonal scratches at tip of blade; blade wear visible at end of blade and towards tip
Decoration: post-processing application of incised decoration; decoration identical on both sides; concentric half circles close to back of blade; concentric half circle and row of small arched incisions running parallel to back of blade[71]
Corrosion: visible surface corrosion
Conservation: corrosion removal traces visible on back of blade

FHK 65/10 (Fig. 22)
Typology: *Wien-Leopoldsberg* type
Dating: younger Urnfield period (Ha B1 – Ha B2)
Distribution: central Europe
Length: 25.4 cm
Width: 0.7 cm
Height: 2.5 cm
Preservation: 100 %
Production: casting jet originally located at end of tang; possibly produced in lost-wax casting; small round cavities around decoration and below handle
Processing: removal of casting jet; post-casting treatment of surface including polishing; horizontal resharpening striations; originally round tang hammered into rectangular shape (vertical fissures in surface); indentations punched into corners to support shaft; last hammering of edge on side not drawn
Use: nearly no original edge left; high number of medium- and small-sized notches attestable along edge; intensive blade wear visible at back of blade near base
Decoration: decoration of intermediate piece between blade and handle cast; error attestable
Heat exposure: initial stages of vesicular surface on blade base
Corrosion: surface corrosion visible on tip
Conservation: corrosion removal traces visible on back of blade

71 Parallels in decoration choice are interestingly found in a *Hadersdorf*-type knife from Kostelec nad Orilicí, see Jiraň 2002, 53 and Pl. 16/176.

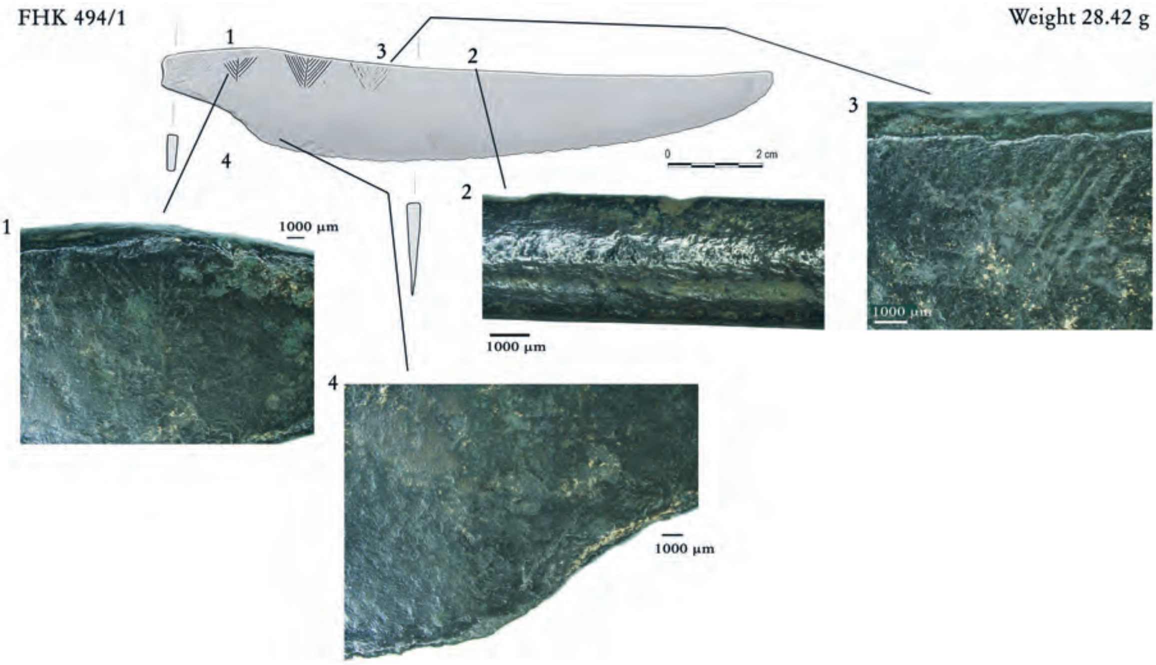

Fig. 24. Knife with rectangular tang FHK 494/1. – 1. Transition to rehammered angle of back of blade. Abraded hatched triangle motifs may be an indication of repeated cold working and sharpening. – 2. Evidence of hammering during cold-working procedure on the upper blade parts. – 3. Detail of abraded decorations. – 4. Evidence of hammering at the transition towards the blade during reworking of the blade fragment into the tang section (Drawing: F. Siegmeth. – Photos: N. Mittermair).

FHK 444/4 (Fig. 23)
Typology: *Wien-Leopoldsberg* type
Dating: younger Urnfield period (Ha B1 – Ha B2)
Distribution: central Europe
Length: 25.3 cm
Width: 0.9 cm
Height: 2.8 cm
Preservation: 100 %
Production: not completely overlapping two-part casting mould resulted in mismatch of end of intermediate piece; casting seam remains visible at beginning of tang
Processing: post-casting treatment of surface including polishing; indentation punched into casting seam remains and carination at tang to support shaft better; course of blade amplified by hammering; traces of hammering on blade especially along lower part of blade; last worked edge on drawn side
Use: sharpened edge; high number of medium- and small-sized notches
Decoration: post-processing application of incised decoration; 5 standing triangles with hatchings parallel to blade edge; alternating 5 parallel lines and x-shaped decoration with diagonal hatching; both motifs are positioned above 1 or 2 parallel arched grooves
Deformation: slight bend in blade tip corrected
Corrosion: surface corrosion

FHK 494/1 (Fig. 24)
Typology: knife with partial rectangular tang
Dating: younger Urnfield period (Ha A2/B1 – Ha B3)
Distribution: central Europe
Remark: originally likely a *Stillfried*-type knife
Length: 13.0 cm
Width: 0.4 cm
Height: 1.9 cm
Preservation: 100 %
Processing: post-casting treatment of surface including polishing; parallel running groove due to hammering visible on back of blade; reworking of blade fragment; hammering marks on tang and back of tang show; last processed side lies plane on even surface (side not drawn); hammering of lower part of blade
Use: high number of medium- and small-sized notches; blade wear visible towards the tip
Decoration: post-processing 3 incised triangular motifs starting from the back of blade with line running through the middle and mirrored hatching; decorations run beneath the shaft handle (derive from original object)
Corrosion: slight surface corrosion
Conservation: patina removed from a few areas

FHK 580/3 (Fig. 25)
Typology: small knife with partial rectangular tang
Dating: younger Urnfield period (Ha A2/B1 – Ha B3)
Length: 7.1 cm
Width: 0.2 cm
Height: 1.3 cm
Preservation: 100 %
Processing: post-casting treatment of surface including polishing; reworking of blade fragment; hammering marks on tip of blade, end of blade, tang; indentations punched into tang for ideal support of handle
Use: high number of small-sized notches in blade; intense blade wear visible towards the tip; a few scratches oriented parallel or diagonally to blade course (approx. 0.5–1.5 cm)

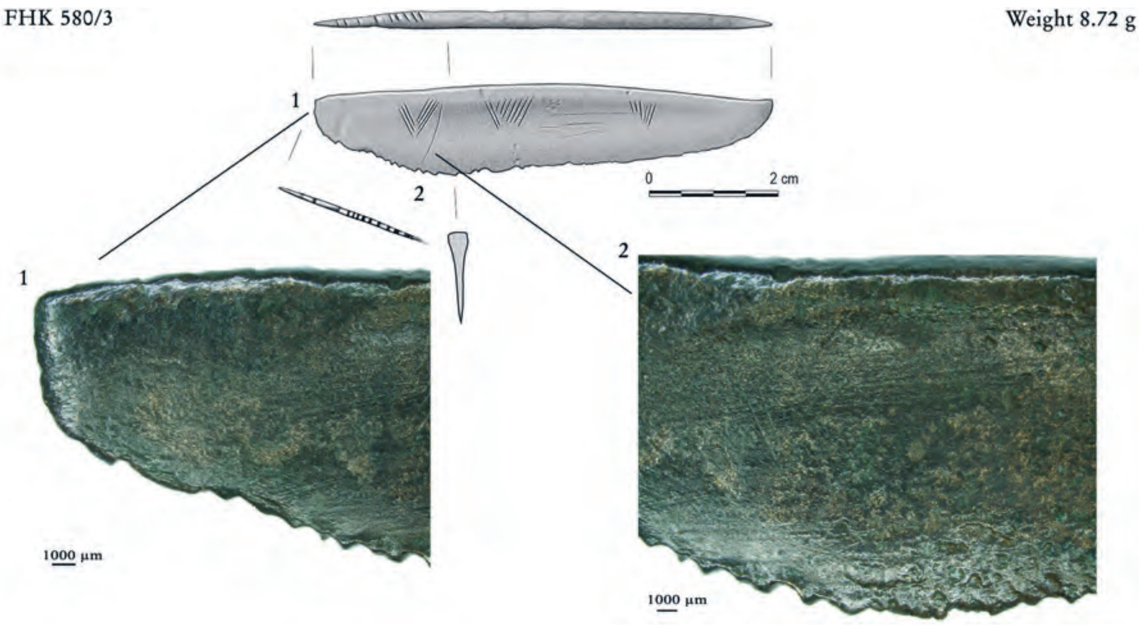

Fig. 25. Knife with rectangular tang FHK 580/3. – 1. Reworked blade fragment into tang through hammering indirectly visible through lack of striations. – 2. Intense wear of blade visible due to intense horizontal striations and abraded decorations deriving from repeated sharpening. Indented notches for the organic hilt (Drawing: F. Siegmeth. – Photos: N. Mittermair).

Decoration: post-processing application of incised triangular motifs starting from back of blade; varying decoration within triangles (chevrons, hatching)

INZ 9/6 (Fig. 26)
Typology: *Baumgarten* type
Dating: younger and late Urnfield period (Ha B1 – Ha B3)
Distribution: central Europe
Length: 21.9 cm
Width: 1.0 cm
Height: 2.9 cm
Preservation: 100 %
Production: casting seams at beginning of tang suggest two-part casting mould; end of both halves casting mould not symmetrical; casting feature at blade base; open cavity on tang
Processing: post-processing treatment of surface including polishing; horizontal striation pattern at upper blade part; traces of hammering on blade; negative marks of tool traces on bottom and top side of junction of intermediate part and tang to remove excess casting material; hammering traces on tang; indentations punched on corners of rhombic tang
Use: blunt edge; distinctly low number of small-sized notches
Corrosion: some areas with visible surface corrosion
Conservation: traces of corrosion removal

FHK 40/5 (Fig. 27)
Typology: *Baumgarten* type
Dating: younger and late Urnfield period (Ha B1 – Ha B3)
Distribution: central Europe
Length: 30.3 cm
Width: 1.4 cm
Height: 3.8 cm
Preservation: fragmented; modern break; 99 %
Production: cast in two-part mould due to visible remains of casting seams at beginning of tang; casting moulds lacking overlap visible in cross-section of tang; shrinkage defects visible on blade; intermediate piece between blade and tang and tang itself
Processing: negative marks of tool traces on bottom side of junction of intermediate part and tang to remove excess casting material; notches punched into corners of rhombic tang; post-casting treatment of surface including polishing; horizontal resharpening striations along blade; hammering of tang resulted in deformation of shrinkage defects; evidence of hammering on blade
Use: slightly sharpened edge towards blade tip; high number of medium- and small-sized notches
Deformation: slight bend in blade tip close to break
Corrosion: slight surface corrosion visible
Conservation: a few areas with visible corrosion removal on back of blade; acrylic resin residue

FHK 276/2 (Fig. 28)
Typology: *Baumgarten* type
Dating: younger and late Urnfield period (Ha B1 – Ha B3)
Distribution: central Europe
Length: 28.4 cm
Width: 1.2 cm
Height: 3.2 cm
Preservation: 100 %
Production: traces of casting jet removal on tang end; cavity in tang
Processing: post-casting surface treatment including polishing; tang hammered into rhombic form; notches punched into corners; high number of fissures from high degree of hardening of the blade
Use: high number of large and medium-sized notches along edge

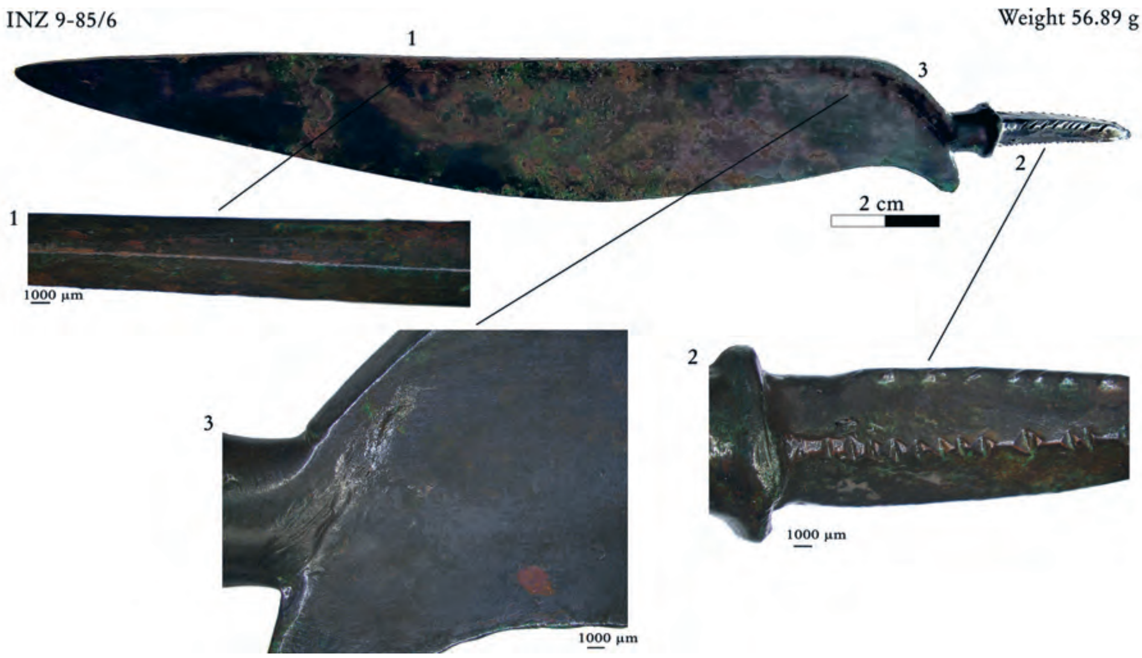

Fig. 26. Hidden-tang knife INZ 9/6 from the Ha B cemetery of Inzersdorf. – 1. Faceted back of blade likely prepared in casting model/mould. – 2. Casting seams used for application of notches for the hilt. – 3. Negative tool marks of hammer from cold working. Along the blade, regular horizontal striations from polishing the surface (Photos: N. Mittermair).

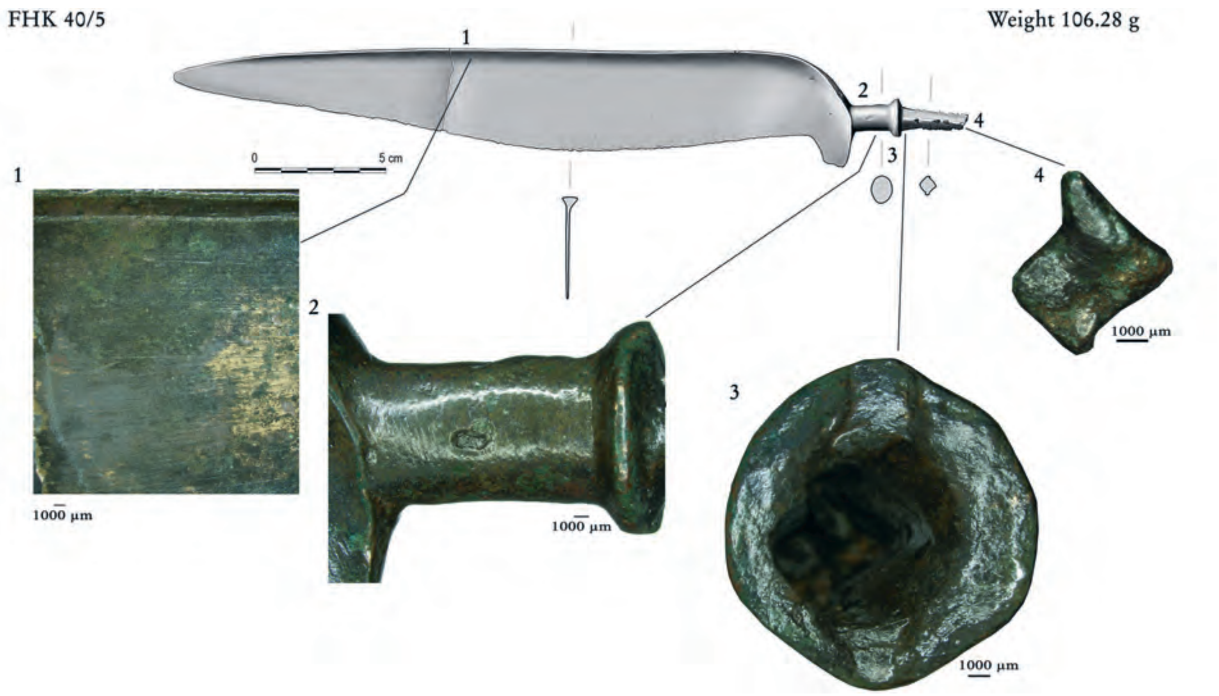

Fig. 27. Hidden-tang knife FHK 40/5. – 1. Regular horizontal striations attest to polishing of the surface. Irregular, deeper striations are likely linked to object use. – 2. The visible cavity between the tang and the blade is a result of the casting process and was not fully removed. – 3. Roughly removed casting seams are visible at the end of the tang and attest to casting in a two-part mould. – 4. The asymmetric tang end also indicates production in a two-part mould (Drawing: F. Siegmeth. – Photos: N. Mittermair).

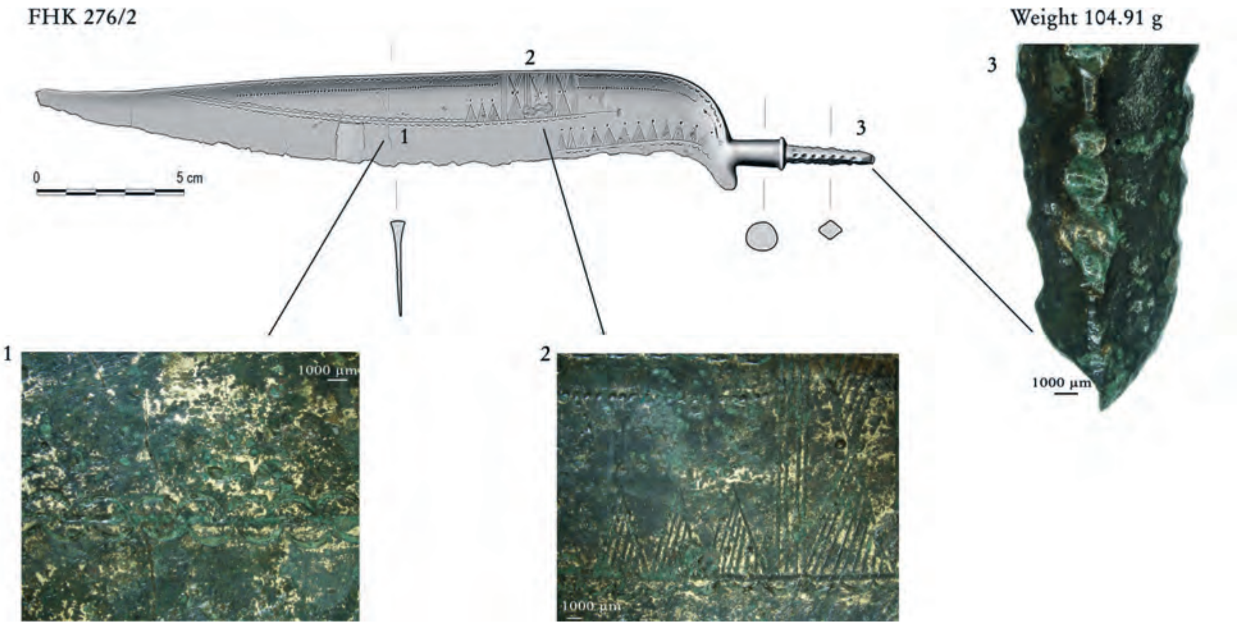

Fig. 28. Hidden-tang knife FHK 276/2. – 1. The high number of vertical fissures is evidence for intensive cold working. – 2. Detail of incised and indented geometrical decorations. Slight overlaps in the right part of the picture within the incised line shows the production sequence: first the horizontal line was incised, then the half-circles were indented in a row. Afterwards the hatchings of the triangles followed (Drawing: F. Siegmeth. – Photos: N. Mittermair).

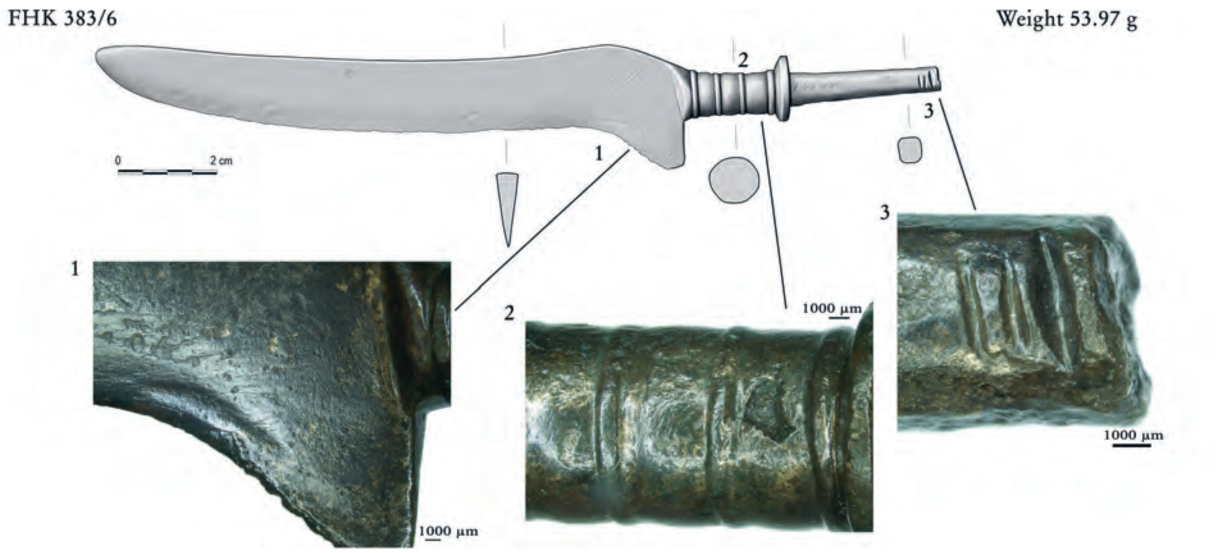

Fig. 29. Hidden-tang knife FHK 383/6. – 1. Characteristic indentation above the edge. Irregular striations suggest object use. – 2. Cavities between the hilt and the blade result from the casting process. Due to the shape of the hilt, the lost-wax technique is likely. – 3. Negative tool marks at the end of the tang from the removal of the casting jet. Visible traces of hammering below (Drawing: F. Siegmeth. – Photos: N. Mittermair).

Decoration: post-casting application of incised decoration on both blade sides; arched line incised following the course of the edge; incised triangles with hatching; x-shaped incisions with hatching and 4 vertical lines on upper side, alternating; fine dotted lines pierced into blade side; slightly larger dots above or next to triangle tips; arched rows of bows punched into surface with same tool
Corrosion: high degree of surface corrosion
Conservation: visible corrosion removal traces; patina partly removed; acrylic resin residue

FHK 383/6 (Fig. 29)
Typology: *Baumgarten* type
Dating: younger and late Urnfield period (Ha B1 – Ha B3)
Distribution: central Europe

Fig. 30. Decorated blade fragment INZ 220/6. – 1. Detail of incised parallel lines. – 2. Hammering evident on blade. – 3. The large notch in the edge shows signs of treatment, a continued object use is likely. Horizontal striations attest to (re-)sharpening. – 4. Detailed view of incised zig-zag lines (Drawing: F. Siegmeth. – Photos: N. Mittermair).

Length: 17.3 cm
Width: 1.8 cm
Height: 2.2 cm
Preservation: 100 %
Production: original position of casting jet located at end of tang; cavities on intermediate section and tang
Processing: negative tool marks from removal of casting jet; post-casting surface treatment including polishing of blade and intermediate section; hammering marks on blade especially lower part; horizontal resharpening striations visible on surface; tang hammered into rectangular shape
Use: sharpened blade; small and medium-sized notches along edge; diagonal scratches on blade surface
Decoration: segments of intermediate section prepared in mould/model

INZ 220/6 (Fig. 30)
Typology: fragment of a hidden-tang knife
Dating: younger and late Urnfield period (Ha B)
Distribution: central Europe
Length: 9.9 cm
Width: 0.4 cm
Height: 2.3 cm
Preservation: approx. 40 %
Processing: post-casting treatment of surface; horizontal resharpening striations; traces of hammering along facetted blade; especially in lower part
Use: large notch in edge; small-sized notches along edge
Decoration: post-casting application of incisions on back of blade; alternating motifs of transversely running parallel lines; x-shaped decorations and herringbone patterns
Deformation: bent blade c. 100°
Corrosion: visible surface corrosion

2. Pins

INZ 106/2 (Fig. 31)
Typology: *Mostkovice* type
Dating: Baierdorf phase (Bz D)[72]
Distribution: Silesia, Bohemia, Moravia
Length: 13.2 cm
Ø Head: 1.0 cm
Ø Shaft: 0.35 cm
Preservation: 100 %
Production: flutes run irregularly due to casting-mould or casting-model production
Processing: casting surface and other production traces removed
Deformation: slightly bent pin shaft
Corrosion: a few areas with visible surface corrosion
Conservation: corrosion removal traces; acrylic resin residue

72 Říhovský 1979, 156–157. Unless stated otherwise, information about the typology, dating and distribution of the discussed pins was acquired from Říhovský 1979.

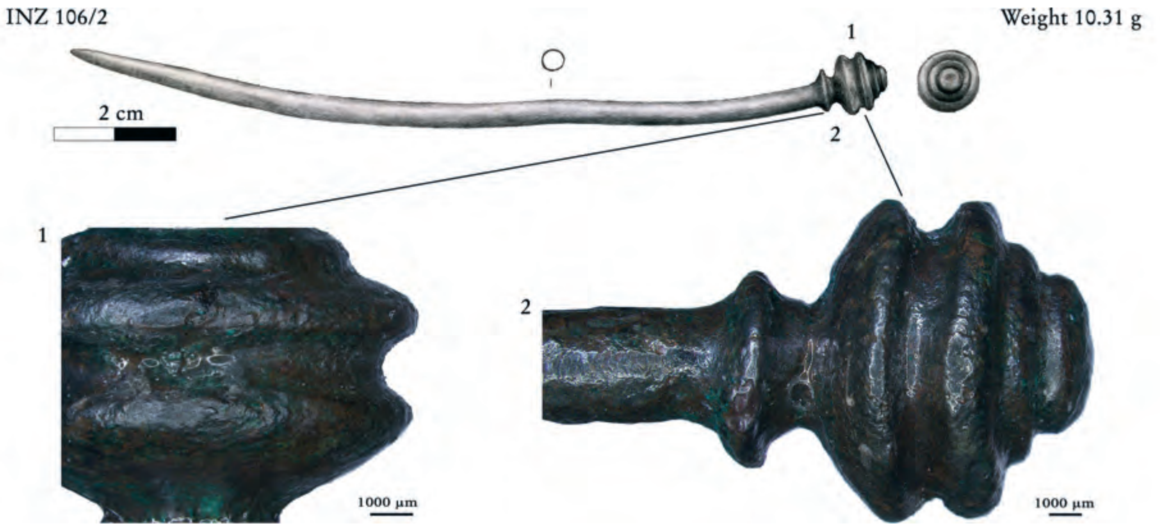

Fig. 31. Pin with *böhmischer Profilierung*. – 1. Detail of the incision shows no tool mark, making a preparation in a casting model likely. – 2. The irregular course of the incised line on the pinhead and no trace of the 'cast-on' technique affirm suspicions of production by the lost-wax technique. Dried remains of the resin-based liquid which was applied to the metal surface in the course of conservation work (Drawing: M. Imam. – Photos: N. Mittermair).

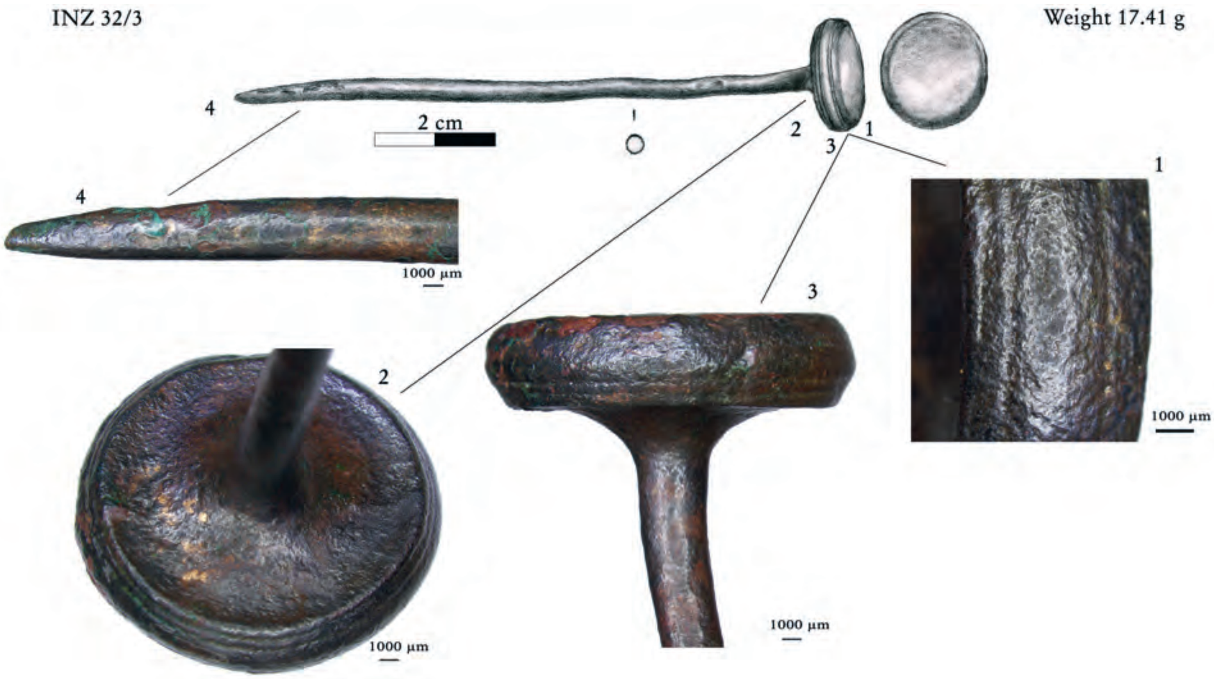

Fig. 32. Pin with seal-shaped head INZ 32/3. – 1. Detail of incised parallel lines on pinhead side. – 2. The surface on the bottom of the pinhead shows a less treated surface. – 3. Small-sized cavity in the side of the pinhead not fully removed by surface treatment. – 4. Detail of increased surface corrosion at the tip (Drawing: M. Imam. – Photos: N. Mittermair).

INZ 32/3 (Fig. 32)
Typology: *Petschaftkopfnadel*
Variant: with biconical head
Dating: older Urnfield period (Bz D – Ha A2)
Distribution: south Germany, Bohemia, Austria
Length: 10.8 cm
Ø Head: 1.9 cm
Ø Shaft: 0.35 cm
Preservation: 100 %
Production: shrinkage effects visible on the side of the head
Processing: post-casting treatment of surface; the surface on the slightly retracting bottom surface shows no traces of fine polishing

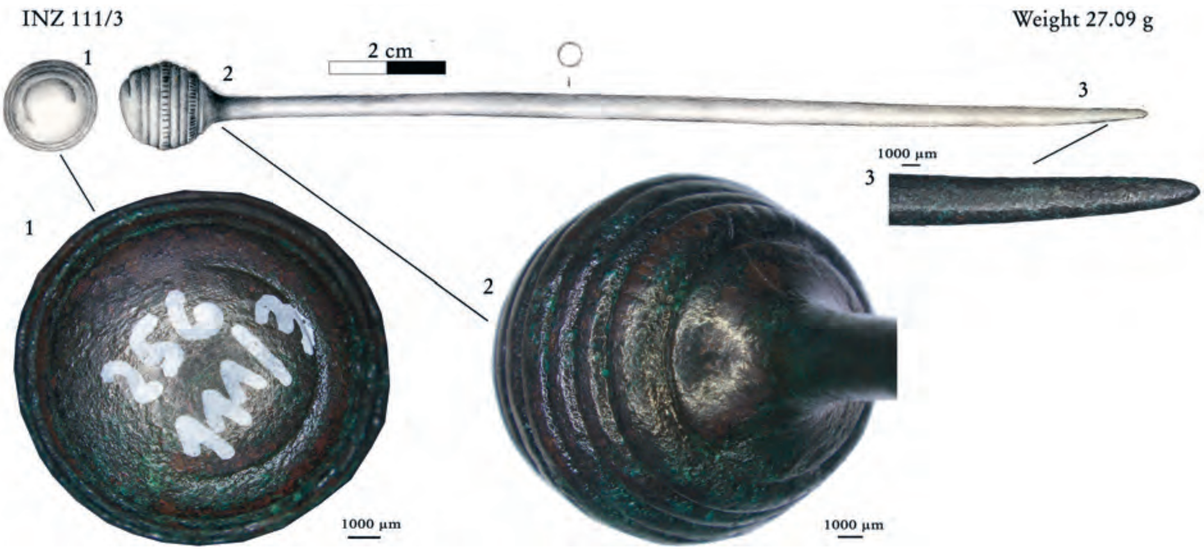

Fig. 33. Pin with globular head INZ 111/3. – 1. Asymmetry in the top view suggests production of the pinhead or possibly of the entire object in a two-part mould. – 2. Detail of pinhead from a bottom view. Original casting surface visible in the rib indentations. – 3. Detail of unworked tip (Drawing: M. Imam. – Photos: N. Mittermair).

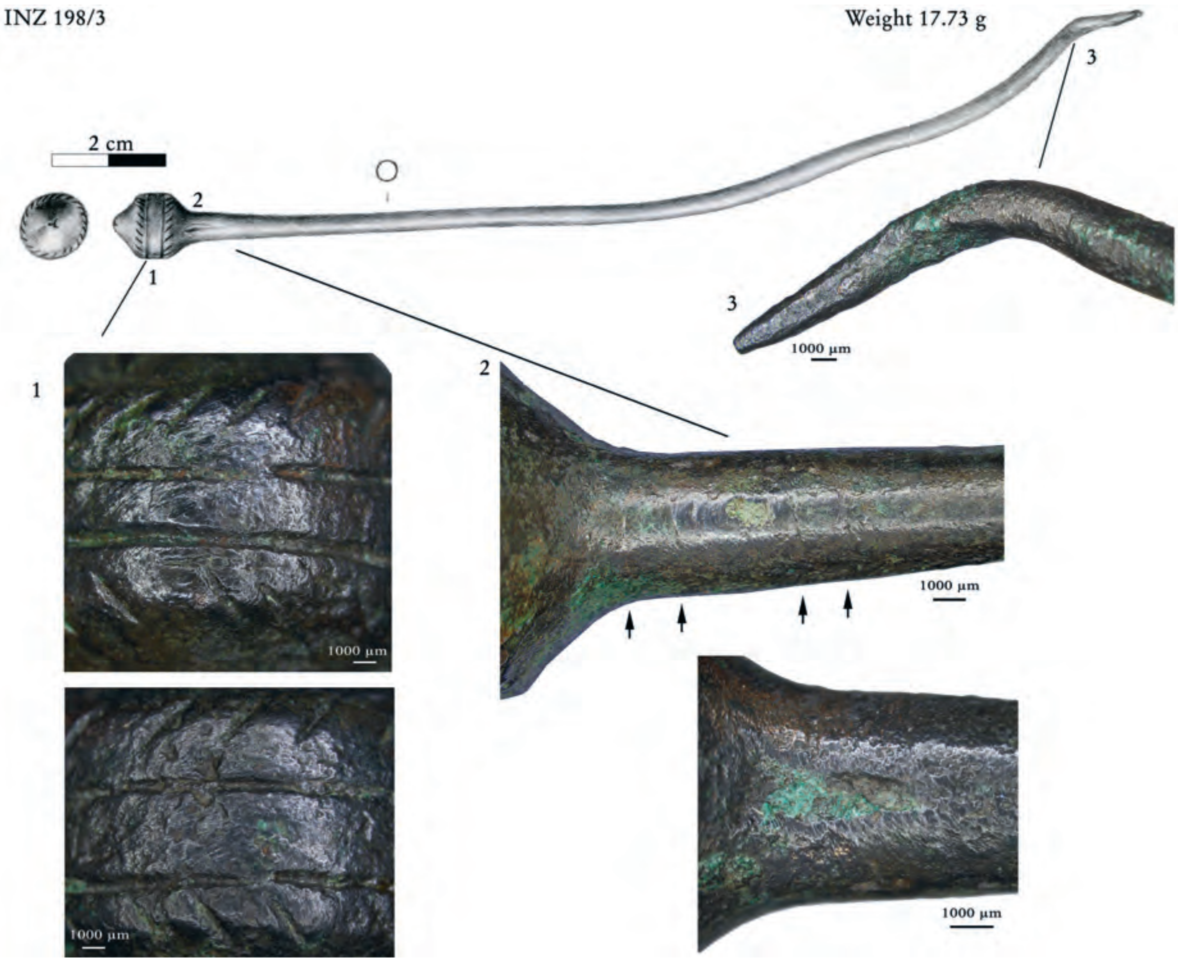

Fig. 34. Pin of type *Klentnice* INZ 198/3. – 1. Detail of unfinished incision line, starting point on the right. – 2. Abraded incisions on the pin shaft in a spiral motif. – 3. The bent tip may be a result of the pyre-burning process or sustained damage. – 4. Detail of diagonal indentations and lower unfinished incision line, starting point on the right. – 5. The irregular indentation below the pinhead is a result of the casting process (Drawing: M. Imam. – Photos: N. Mittermair).

Decoration: 4 shallow, linear, parallel incisions along the side of the head; irregular course indicates post-casting application
Deformation: slightly bent pin shaft
Corrosion: several areas with visible surface corrosion on pin shaft and head

INZ 111/3 (Fig. 33)
Typology: *Kugelkopfnadel* with horizontal ribs[73]
Dating: older Urnfield period (Bz D – Ha A2)
Distribution: middle Danube region
Length: 16.7 cm
Ø Head: 1.6 cm
Ø Shaft: 0.3 cm
Preservation: 100 %
Production: shrinkage defect visible on bottom and side of head at transitions to ribs
Processing: post-casting treatment of surface
Decoration: seven cast ribs; post-casting application of small, parallel, vertical indentations on slightly broader ribs 1, 4 and 7
Deformation: slight bend in pin shaft
Heat exposure: vesicular surface on side of the pinhead
Conservation: removal of patina visible in some areas
Further remarks: asymmetric form of head; interruption in the course of the top rib and area of shallow depth in first indentation correlate

INZ 198/3 (Fig. 34)
Typology: *Spindelkopfnadel*
Variant: *Klentnice*
Dating: transitional period to younger Urnfield period (Ha A2/B1)
Distribution: middle Danube region
Length: 17.2 cm
Ø Head: 1.2 cm
Ø Shaft: 0.35 cm
Preservation: 100 %

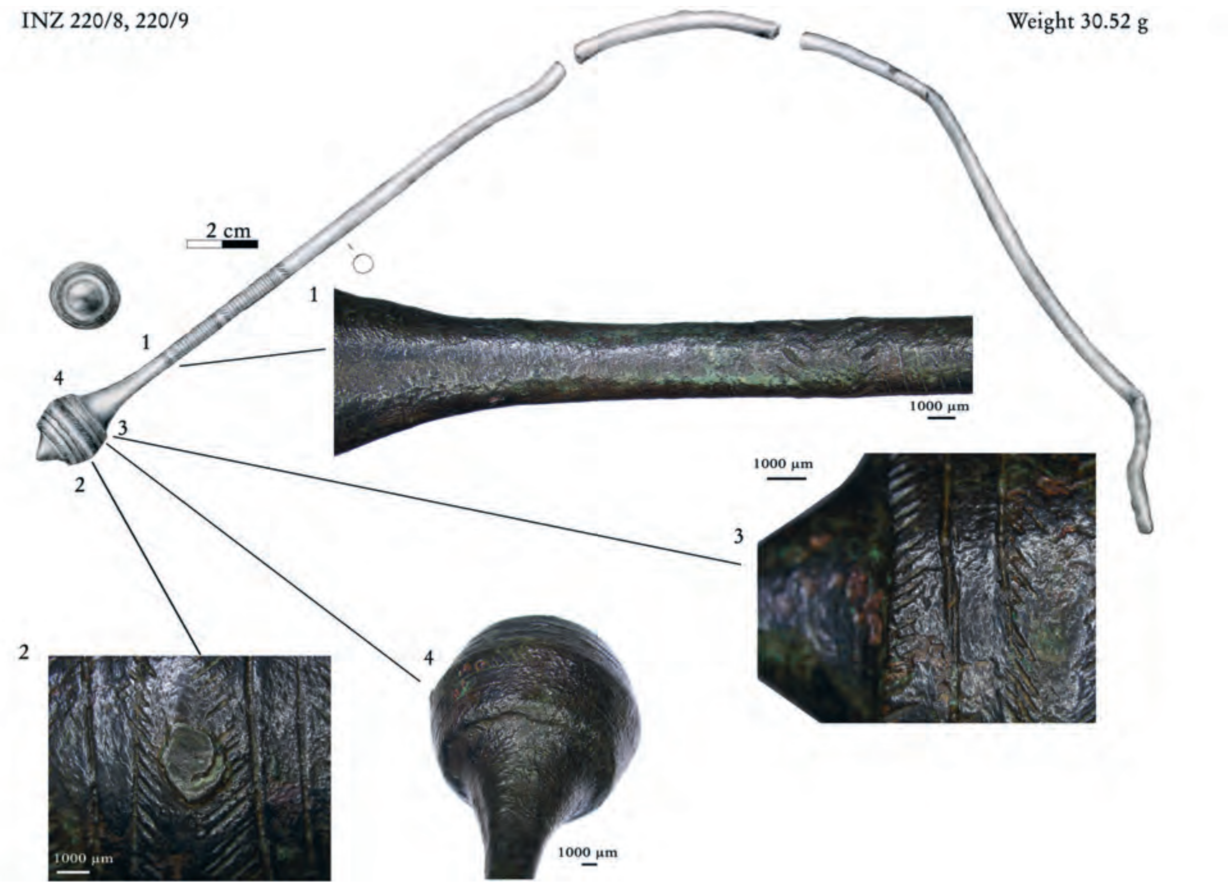

Fig. 35. Pin of type *Klentnice* INZ 220/8, 220/9. – 1. Pin shaft with first stages of decoration. – 2. The fragment melted onto and superimposing on the decorations of the pinhead likely derives from the pyre-burning process. – 3. Detail of diagonal indentations superimposed by the incision line (right) and overlapping the start and end of the incision line (left). – 4. Pinhead viewed from below showing vesicular surface (Drawing: M. Imam. – Photos: N. Mittermair).

73 An object that closely resembled this was found in Grave 270 of the cemetery at Gemeinlebarn, see Szombaty 1929. – Říhovský 1972, Pl. 31/C.

Production: shrinkage defect on top of pinhead; triangular indentation at neck formed during casting
Processing: post-casting treatment of surface including polishing
Decoration: post-processing application of pinhead and shaft; 2 linear, parallel circumferential incisions on head with visible starting/end points; a less distinct incision in orientation of the linear incisions is visible; diagonal, parallel indentations running in mirror-inverted orientation on both carinations of pinhead; post-casting application of incised spiral decoration along neck
Deformation: bottom third of pin shaft bent
Corrosion: surface corrosion visible on one side of the pinhead

INZ 220/8, 220/9 (Fig. 35)
Typology: *Spindelkopfnadel*
Variant: *Klentnice*
Dating: transitional period to younger Urnfield period (Ha A2/B1)
Distribution: middle Danube region
Length: 13.7 cm
Ø Head: 1.95 cm
Ø Shaft: 0.3 cm
Preservation: fragmented; c. 60 %
Processing: post-casting treatment of surface including polishing
Decoration: post-processing decoration on middle part of pinhead and on shaft; 4 lines in total; linear, parallel, circumferential incisions with visible starting/end points on each half; errors attestable; superimposing diagonally oriented, mirror-inverted parallel indentations on each carination with irregularities in exact orientation and distance from each other; circumferential spiral and herringbone pattern on pin neck and shaft
Deformation: visible deformations on pin fragments INZ 220/8 due to heat exposure
Heat exposure: prominent heat exposure on pinhead and end of pin shaft of INZ 220/9; bends in all fragments in varying degrees
Corrosion: intense corrosion on pin fragments INZ 220/8 as a result of heat exposure

INZ 250/4 (Fig. 36)
Typology: *Keulenkopfnadel*
Dating: older to younger Urnfield period (Bz D – Ha B2)
Distribution: middle Danube region
Length: 11.9 cm
Ø Head: 0.75 cm
Ø Shaft: 0.35 cm
Preservation: 95 %
Processing: post-casting treatment of surface including polishing
Decoration: post-processing application of decoration on head; irregular circumferential herringbone pattern and partially superimposing diagonal row of indentations orientated in the opposite direction below; 1 linear circumferential incision at the top and 2 parallel lines mark the end of the decoration and occasionally encroach on the row of indentations
Deformation: bent tip
Corrosion: visible surface corrosion at the tip
Conservation: traces of corrosion removal visible on the neck

INZ 192/9 (Fig. 37)
Typology: *Zwiebelkopfnadel*
Dating: younger Urnfield periods (Ha A2/B1 – Ha B3)
Distribution: central Europe
Length: 2.9 cm
Ø Head: 1.7 cm
Ø Shaft: 0.4 cm
Preservation: c. 15 %
Production: cavity visible on surface of break; pinhead possibly cast on the pin shaft in a 'cast-on' technique (*Überfangguss*)
Decoration: post-processing decoration of pinhead; 2 concentric arched incisions around middle of pinhead; motif closed by 3 parallel, circumferential incisions; errors attestable; superimposing circumferential linear incision in middle of pinhead running through the concentric circular decoration
Heat exposure: vesicular surface proves heat exposure; breaks at tip of pinhead and pin neck

INZ 310/5 (Fig. 38)
Typology: *Zwiebelkopfnadel*
Dating: younger Urnfield periods (Ha A2/B1 – Ha B3)
Distribution: central Europe
Length: 5.9 cm
Ø Head: 1.95 cm
Ø Shaft: 0.35 cm
Preservation: fragmented; c. 90 %
Production: segmented transition from pinhead to pin shaft suggests casting of head in 'cast-on' technique (*Überfangguss*)
Processing: post-casting treatment of surface including polishing
Decoration: post-processing decoration on all fragments attestable; 4 circumferential diagonal, irregular rows of indentations running semicircularly and then inverting orientation while 3 or 4 linear incisions with identifiable starting/end points encase pinhead motif; errors attestable; decoration on pin shaft regularly alternating between incised superimposing herringbone or double-herringbone patterns to incised spirals
Deformation: recent break fits well with pinhead fragment; lower part of pinhead bent
Heat exposure: shortest pin fragment shows evident traces of heat exposure; pinhead fragment shows traces of heat exposure on surface
Corrosion: longer pin fragment with slight traces of surface corrosion
Conservation: slight traces of corrosion removal on longer pin fragment

INZ 17/18 (Fig. 39)
Typology: pin with biconical head
Dating: older to late Urnfield period (Bz D – Ha B3)
Distribution: middle Danube region
Length: 4.2 cm
Ø Head: 1.0 cm
Ø Shaft: 0.4 cm
Preservation: c. 30 %
Processing: post-casting treatment of surface including polishing
Decoration: post-processing decoration on entire preserved pin; 4 circular incisions on top of pinhead; errors attestable; atop and below circumferential linear incision along carination of pinhead, parallel, diagonal indentations in mirror-inverted orientation; incised spiral decor on pin shaft; below, circumferential vertical incisions structuring pin shaft in 4 segments, filled with occasionally superimposing orthogonally oriented indentations
Deformation: a c. 90° bend is attestable in the pin shaft directly before the break
Heat exposure: vesicular surface due to heat exposure on bottom of pinhead and shaft; molten surface on surface of break
Corrosion: visible surface corrosion on the pin shaft

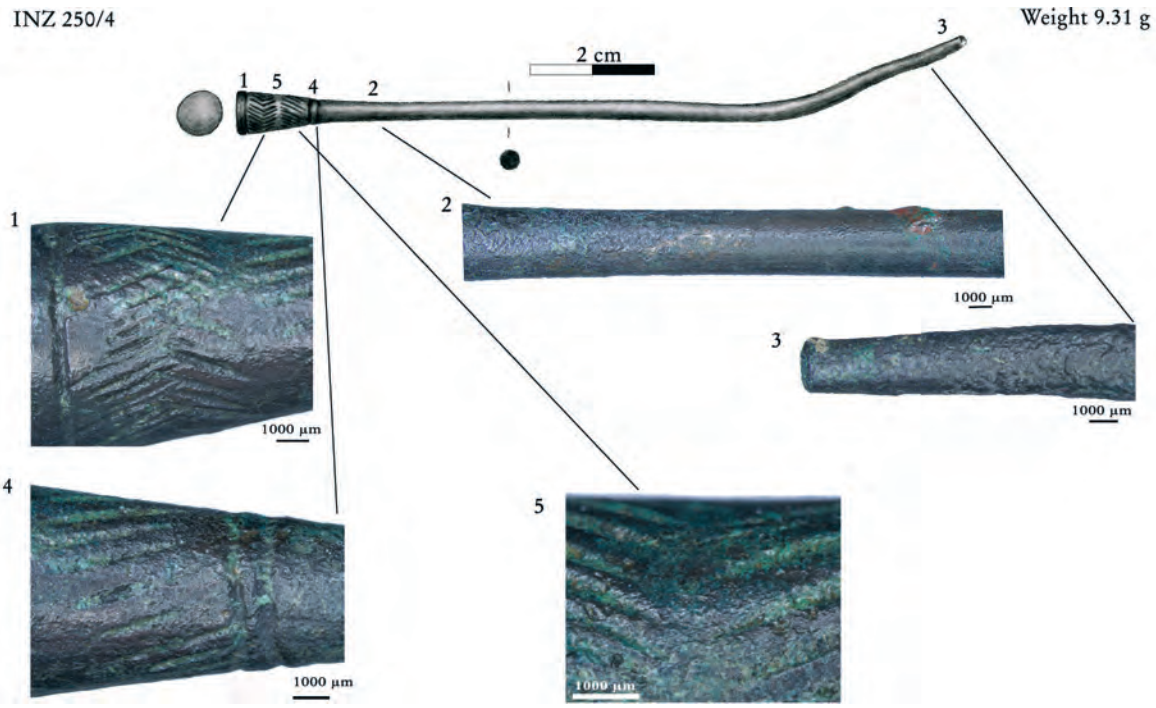

Fig. 36. Pin with *Keulenkopf* INZ 250/4. – 1. Imprecisions and irregularities in decoration application. – 2. Different degrees of heat exposure on the surface along the pin shaft. – 3. Vesicular surface and damage to the tip most likely deriving from the pyre-burning process. – 4. Bottom incision lines superimpose diagonal indentations due to irregular orientation of line. – 5. Detailed view of the decorations prove irregular use of an identical tool (Drawing: M. Imam. – Photos: N. Mittermair).

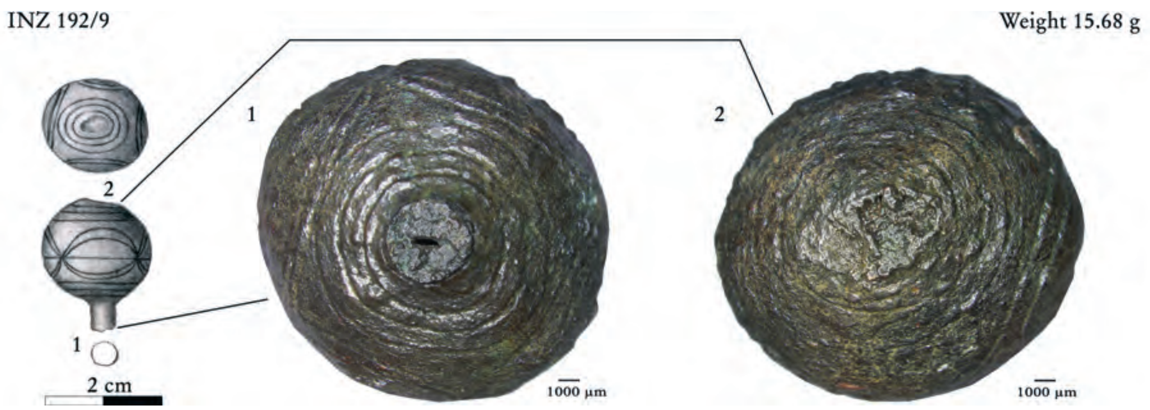

Fig. 37. Pin with onion-shaped head INZ 192/9. – 1. The oval cavity in the pin shaft fracture shows inaccuracies in the casting process. The irregular course of the incised lines is visible from the bottom view. – 2. Damage on top of pinhead and the vesicular surface make heat exposure evident (Drawing: M. Imam. – Photos: N. Mittermair).

FHK 347/6 (Fig. 40)
Typology: *Vasenkopfnadel*
Variant: with small head
Dating: younger Urnfield period (Ha A2/B1 – Ha B3)[74]
Distribution: central Europe
Length: 12.1 cm
Ø Head: 0.6 cm
Ø Shaft: 0.25 cm
Preservation: 95 %
Production: possible remains of casting seams on bottom of pinhead opposite each other suggest production in a two-piece casting mould
Processing: post-casting treatment of surface including polishing
Decoration: approx. 2 cm of post-processing decoration preserved on pin shaft; alternating between circumferential indented single or double chevrons and incised fine spiral decor

74 Maraszek 1998, 43.

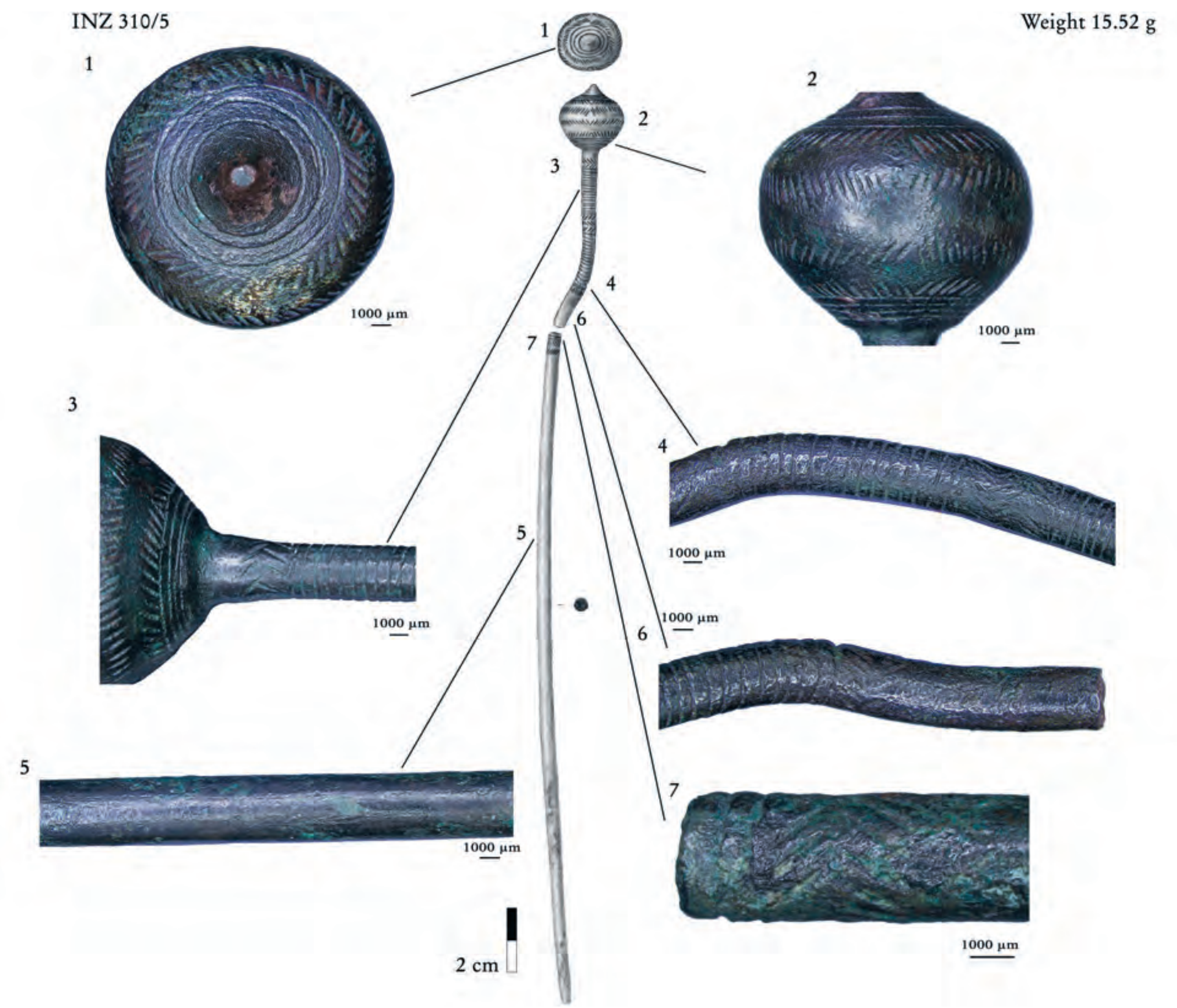

Fig. 38. Pin with onion-shaped head INZ 310/5. – 1. Top view of accurately decorated pinhead. – 2. The irregular course of the indentation lines is evident, the switch in orientations relatively uniform. Incised lines superimpose indentations. – 3. The retracting pin shaft suggests casting of the pinhead using the 'cast-on' technique. – 4. Detail of incised decorations on pin shaft. – 5. Striations on the pin shaft are likely a result of surface polishing. – 6. Bend in the pin shaft and a change in course without any trace of heat impact detectable. – 7. The tip of a fractured pin shaft with varying degrees of corrosion and continuing decoration may likely belong to a second pin (Drawing: M. Imam. – Photos: N. Mittermair).

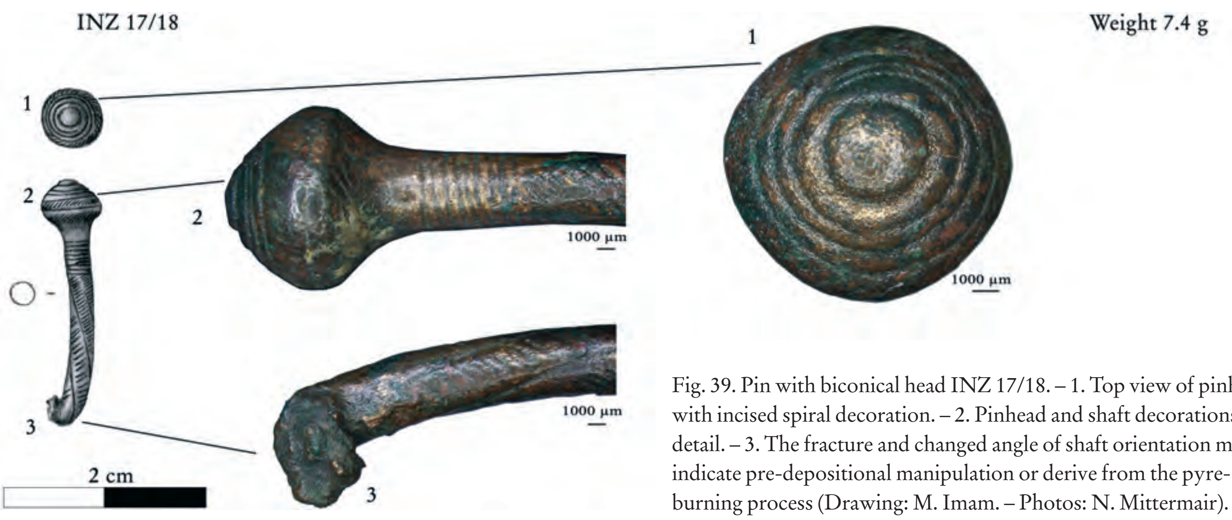

Fig. 39. Pin with biconical head INZ 17/18. – 1. Top view of pinhead with incised spiral decoration. – 2. Pinhead and shaft decorations in detail. – 3. The fracture and changed angle of shaft orientation may indicate pre-depositional manipulation or derive from the pyre-burning process (Drawing: M. Imam. – Photos: N. Mittermair).

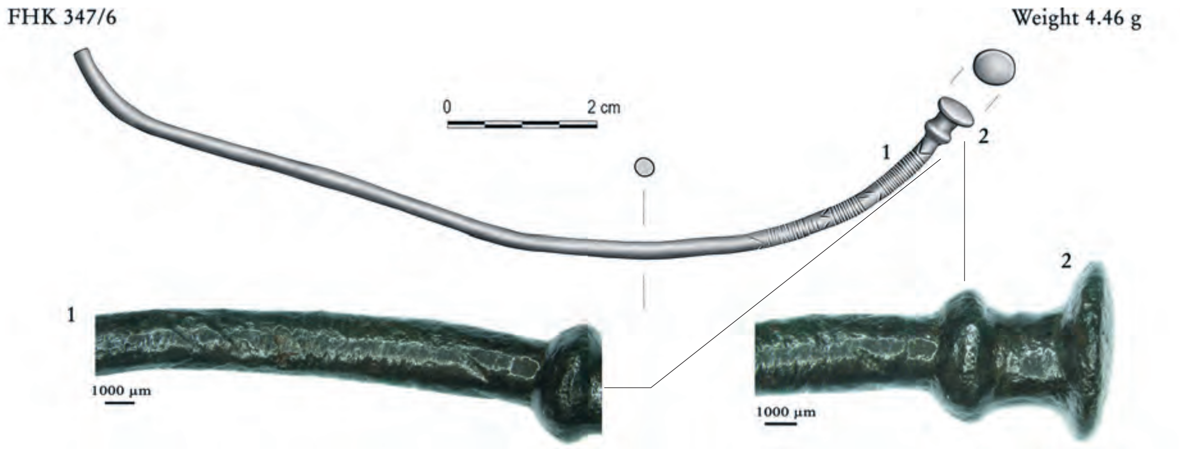

Fig. 40. Pin with small vase-shaped head FHK 347/6. – 1. Incised decorations on pin shaft. – 2. Detailed view of pinhead (Drawing: F. Siegmeth. – Photos: N. Mittermair).

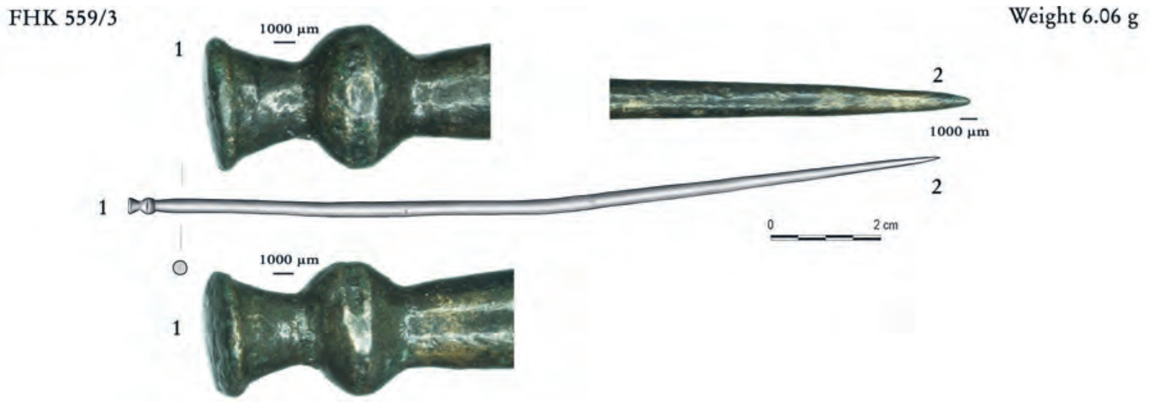

Fig. 41. Pin with small vase-shaped head FHK 559/3. – 1. Incisions on pinhead vary, possibly applied post-casting. Evidence of hammering in excess material accumulating along the transition of pinhead top and side. – 2. Detailed view of the regular course of the tip (Drawing: F. Siegmeth. – Photos: N. Mittermair).

Deformation: bent pin shaft
Heat exposure: vesicular surface on top of the pinhead; surface showing traces of heat exposure on pin shaft and surface of break
Conservation: traces of corrosion removal visible on the top of the pinhead and along the pin shaft

FHK 559/3 (Fig. 41)
Typology: *Vasenkopfnadel*
Variant: with small head
Dating: younger Urnfield period (Ha A2/B1 – Ha B3)
Distribution: central Europe
Length: 14.7 cm
Ø Head: 0.3 cm
Ø Shaft: 0.3 cm
Preservation: 100 %
Processing: post-casting treatment of surface including polishing
Decoration: fluting along carination in varying depths and widths, possibly originally running circumferentially
Deformation: slight bend in lower half
Heat exposure: distinct surface areas of pin shaft possibly exposed to heat
Corrosion: occasionally areas with visible surface corrosion

FHK 576/6 (Fig. 42)
Typology: *Vasenkopfnadel*
Variant: with small head
Dating: younger Urnfield period (Ha A2/B1 – Ha B3)
Distribution: central Europe
Length: 16.4 cm
Ø Head: 0.6 cm
Ø Shaft: 0.25 cm
Preservation: 100 %
Processing: post-casting treatment of surface including polishing; linear indentations visible within the middle of the twisted sides which are evidence of hammering the upper pin shaft into a rectangular form; negative of tool visible on bottom of pinhead node
Decoration: starting from pinhead, tightly twisted pin shaft loosening towards the unworked pin shaft
Deformation: lower half of pin shaft bent
Corrosion: a few areas with slight surface corrosion

FHK 581/4 (Fig. 43)
Typology: *Vasenkopfnadel*
Variant: with small head
Dating: younger Urnfield period (Ha A2/B1 – Ha B3)

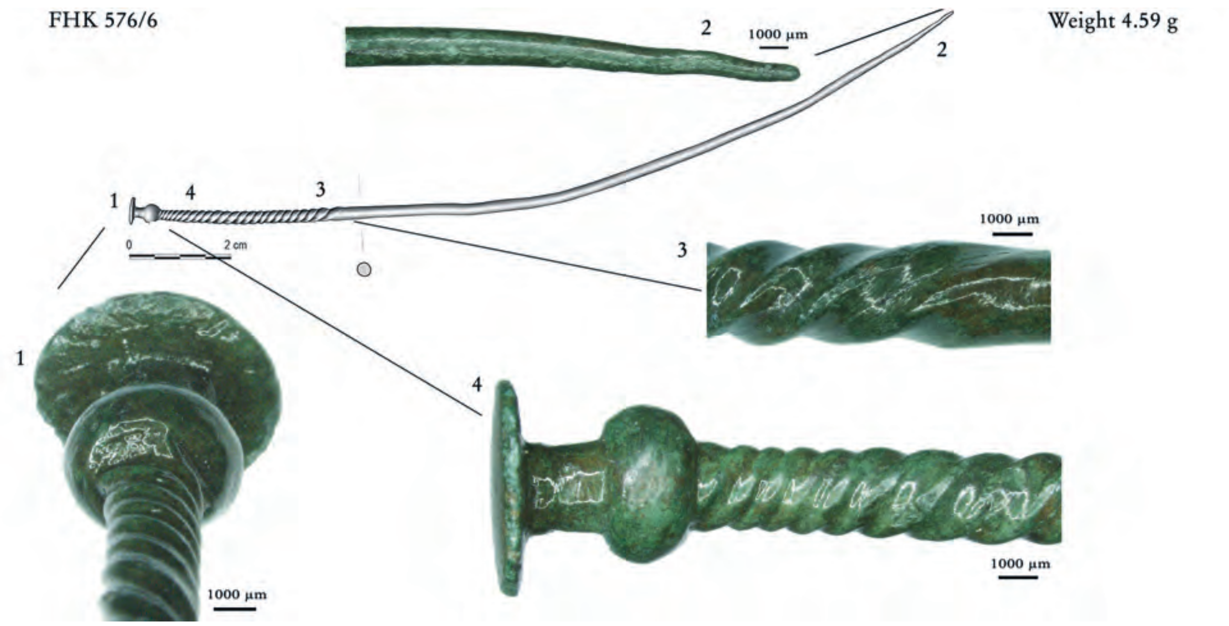

Fig. 42. Pin with small vase-shaped head FHK 576/6. – 1. Bottom view of pinhead showing striations on pinhead plate. – 2. The bent tip sustained damage. – 3. The fissure in the surface in the middle of the lowest torsion spiral is evidence of a stressed microstructure. – 4. Loosening course of torsion towards the pin shaft (Drawing: F. Siegmeth. – Photos: N. Mittermair).

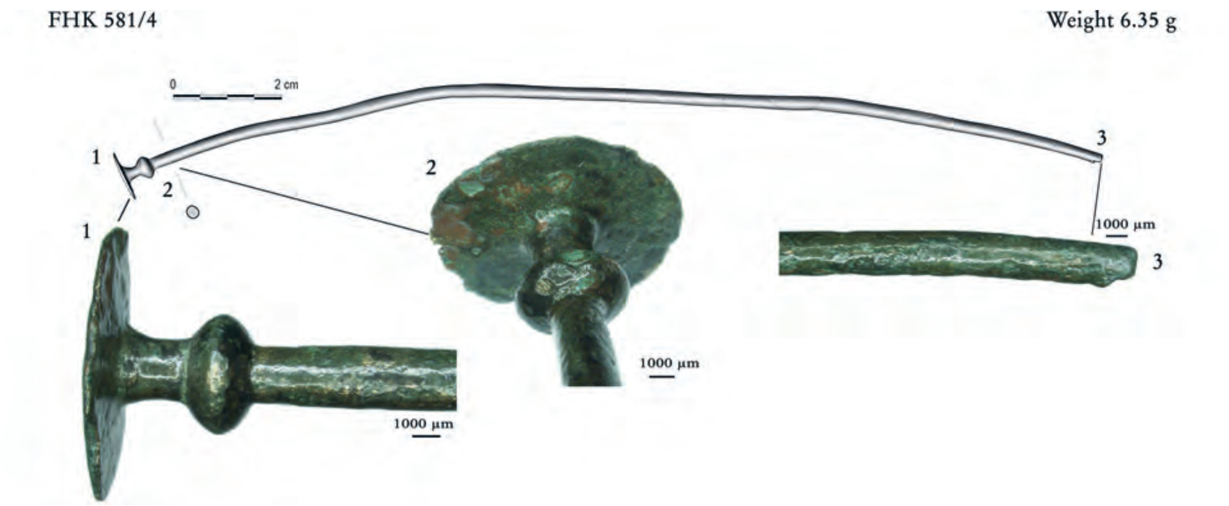

Fig. 43. Pin with small vase-shaped head FHK 581/4. – 1. Detailed view of pinhead. – 2. Bottom view of pinhead shows no signs of surface irregularities. – 3. Abraded fracture of pin shaft (Drawing: F. Siegmeth. – Photos: N. Mittermair).

Distribution: central Europe
Length: 18.2 cm
Ø Head: 1.0 cm
Ø Shaft: 0.25 cm
Preservation: 99 %
Processing: post-casting treatment of surface including polishing; traces of hammering on bottom of pinhead attestable
Deformation: bent pin shaft
Corrosion: some areas with surface corrosion
Conservation: acrylic resin residues

FHK 605/5 (Fig. 44)
Typology: *Vasenkopfnadel*
Variant: with small head
Dating: younger Urnfield period (Ha A2/B1 – Ha B3)
Distribution: central Europe
Length: 10.4 cm
Ø Head: 0.8 cm
Ø Shaft: 0.25 cm
Preservation: c. 85 %
Production: pinhead plate originally cast slightly thicker (2 mm) in shape, identifiable close to carination

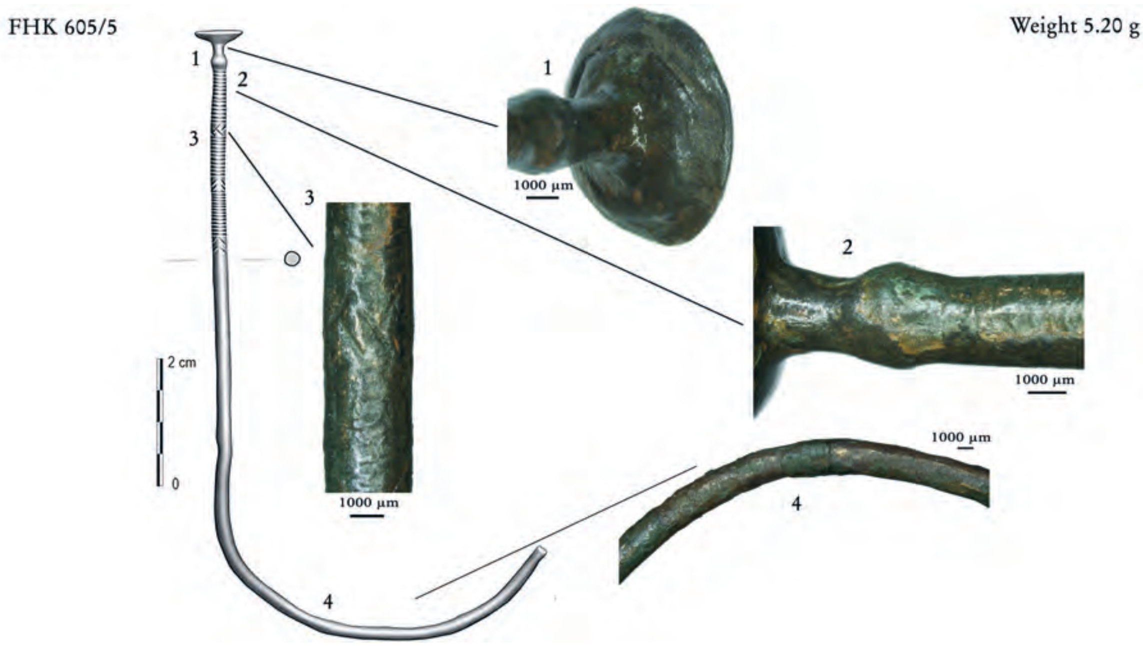

Fig. 44. Pin with small vase-shaped head FHK 605/5. – 1. Bottom view of pinhead with noticeable tool marks. – 2. Detail of pinhead node and starting spiral decorations. – 3. Overlap of herringbone decoration. – 4. Bend in pin shaft over 90° (Drawing: F. Siegmeth. – Photos: N. Mittermair).

Processing: post-casting treatment of surface likely; removal of uneven surface on bottom of pinhead less attestable
Decoration: remains of post-processing pin shaft decoration visible; alternating fine spirals and chevron decoration
Deformation: a c. 180° bend in pin shaft
Corrosion: high degree of surface corrosion partially due to impact of heat
Conservation: removal of patina visible in some areas

FHK 263/6 (one decorated shaft fragment from another pin) (Fig. 45)
Typology: *Vasenkopfnadel*
Variant: with large head
Dating: younger Urnfield period (Ha A2/B1 – Ha B3)
Distribution: central Europe
Length: 30.9 cm
Ø Head: 1.6 cm
Ø Shaft: 0.35 cm
Preservation: fragmented; 100 %
Processing: post-casting treatment of surface including polishing
Decoration: post-processing application of circumferential row of round indentations on head of pin; 2 parallel circumferential linear incisions segmenting pin node; 3 rows filled with irregular diagonal indentations alternating in orientation; pin shaft decorated with alternating fine spirals and single or double chevron decoration with different orientations
Deformation: 90° bend in pin shaft; at modern breaking point (rectangular cross-section) another bend identifiable
Heat exposure: vesicular surface on part of pinhead and pin shaft fragment; shifted axis in pinhead and node resulting from partial fissure due to heat impact
Corrosion: high degree of surface corrosion visible, mainly resulting from impact of heat
Conservation: traces of corrosion removal attestable

FHK 553/2 (Fig. 46)
Typology: *Vasenkopfnadel*
Variant: with large head
Dating: younger Urnfield period (Ha A2/B1 – Ha B3)
Distribution: central Europe
Length: 17.5 cm
Ø Head: 0.9 cm
Ø Shaft: 0.3 cm
Preservation: fragmented; 100 %
Production: remains of casting seams at bottom of pinhead attesting production in a two-part casting mould and on one side even on carination from pin neck to node
Processing: post-casting treatment of surface including polishing; though only outer bottom part of pinhead
Decoration: post-processing decoration of pin node; 3 circumferential, linear incisions structuring the node in 4 segments filled with irregular rows of diagonal indentations in alternating orientation
Deformation: slight bend in pin shaft
Heat exposure: vesicular surface on side and top of pinhead
Corrosion: surface corrosion on pin shaft fragment
Conservation: removal of patina in several areas

FHK 596/8 (Fig. 47)
Typology: *Vasenkopfnadel*
Variant: with large head
Dating: younger Urnfield period (Ha A2/B1 – Ha B3)
Distribution: central Europe
Length: 26.1 cm
Ø Head: 1.9 cm
Ø Shaft: 0.35 cm
Preservation: fragmented; 100 %
Production: shrinkage defect on lower side of pin node

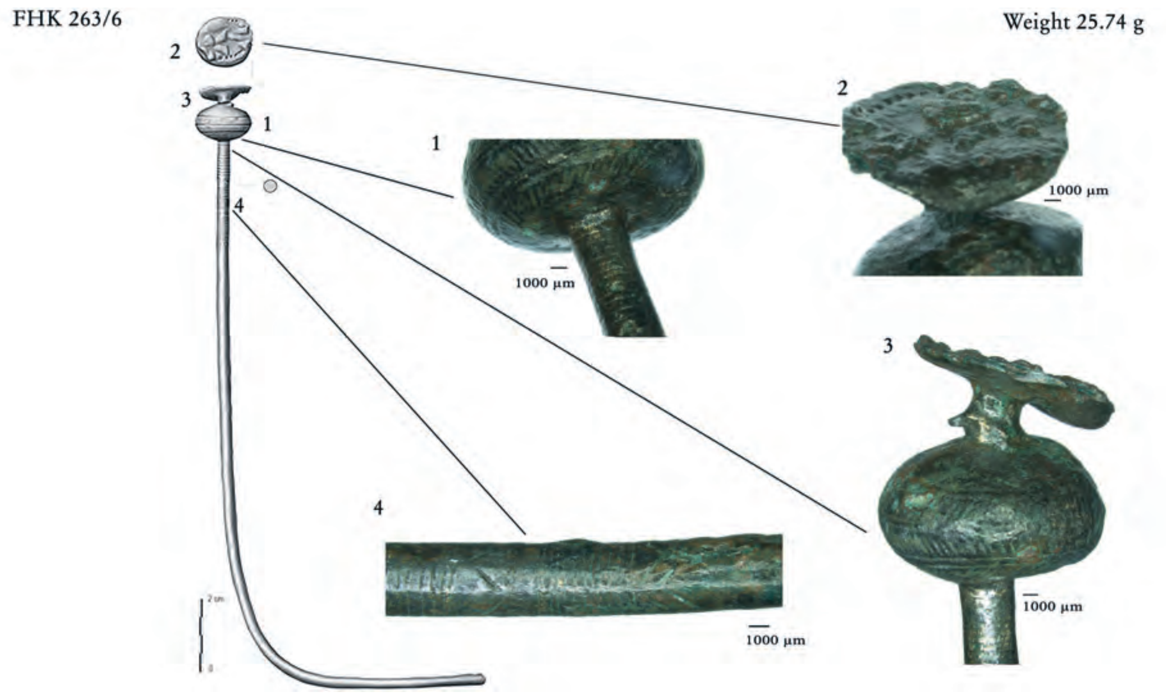

Fig. 45. Pin with big vase-shaped head FHK 263/6. – 1. Bottom view of decorated pinhead. – 2. Round indentation line along the top of the pinhead superimposed by vesicular surface. – 3. Clearly visible heat impact in the upper half of the pinhead. – 4. Detailed view of incised pin shaft (Drawing: F. Siegmeth. – Photos: N. Mittermair).

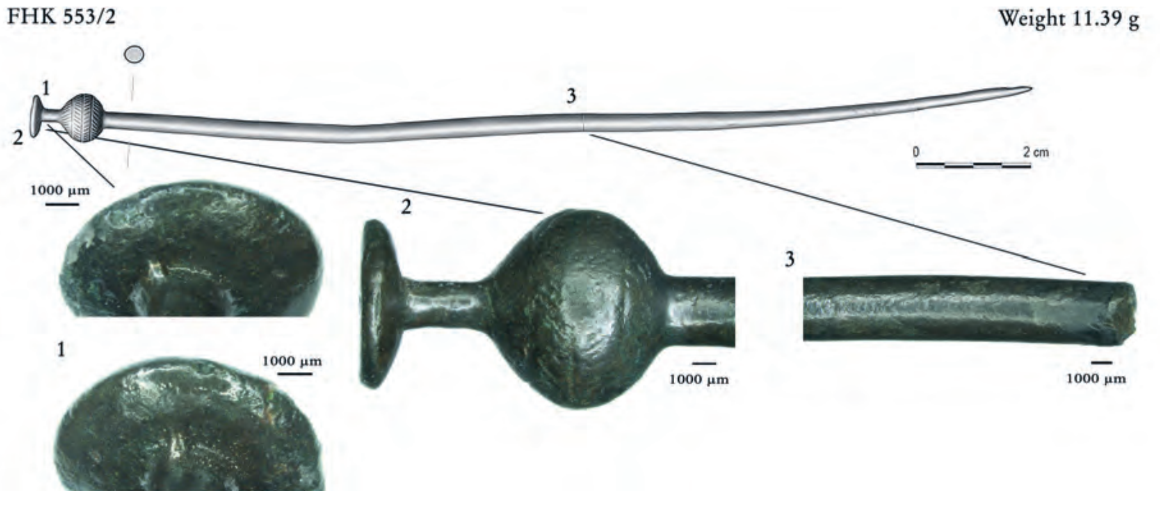

Fig. 46. Pin with big vase-shaped head FHK 553/2. – 1. Remains of casting seams exactly opposite each other is proof of the production of the pin within a two-part casting mould. – 2. Incised decorations on the pinhead node. – 3. The uncorroded fracture suggests post-depositional damage (Drawing: F. Siegmeth. – Photos: N. Mittermair).

Processing: post-casting treatment of surface including partial polishing (surface of pinhead bottom and top of node partly not fine polished)
Decoration: post-processing application of decoration; 3 irregular rows of diagonal indentations alternating in orientation; starting/end points partially attestable; 4 linear circumferential incisions with partially attestable superimposing starting/end points; errors attestable
Deformation: especially in lower half of pin bend of c. 90°
Corrosion: high degree of surface corrosion in some areas of the pin shaft
Conservation: removal of patina along pin shaft; acrylic resin residues

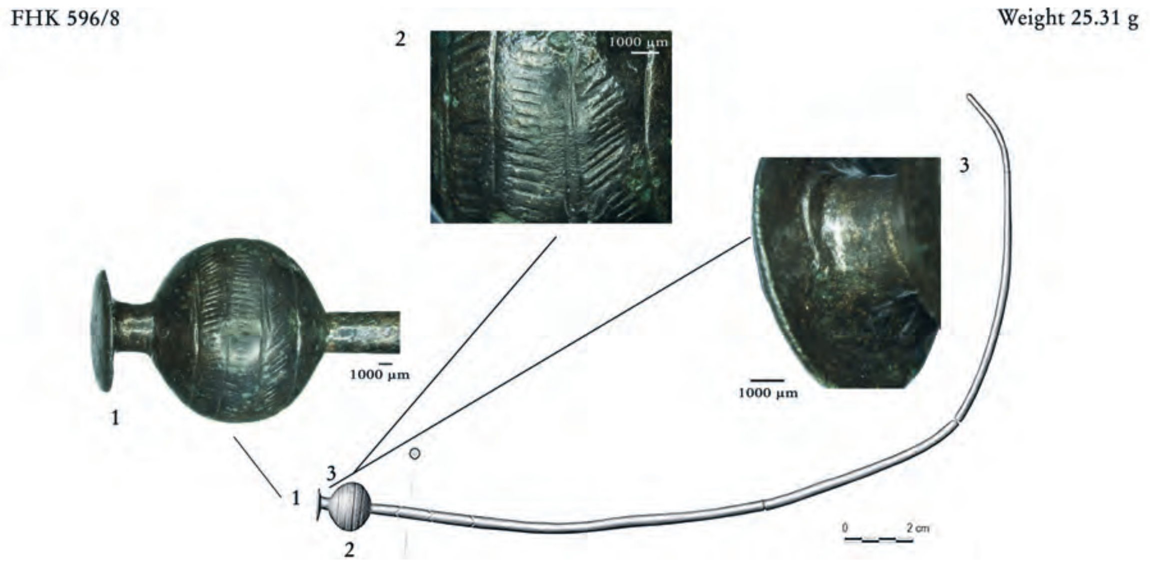

Fig. 47. Pin with big vase-shaped head FHK 596/8. – 1. Inaccuracies in overlapping incision lines. – 2. Detailed view of irregularly applied incision and superimposed indentations. – 3. The irregular course of the pinhead surface in bottom view derives from the casting mould or model (Drawing: F. Siegmeth. – Photos: N. Mittermair).

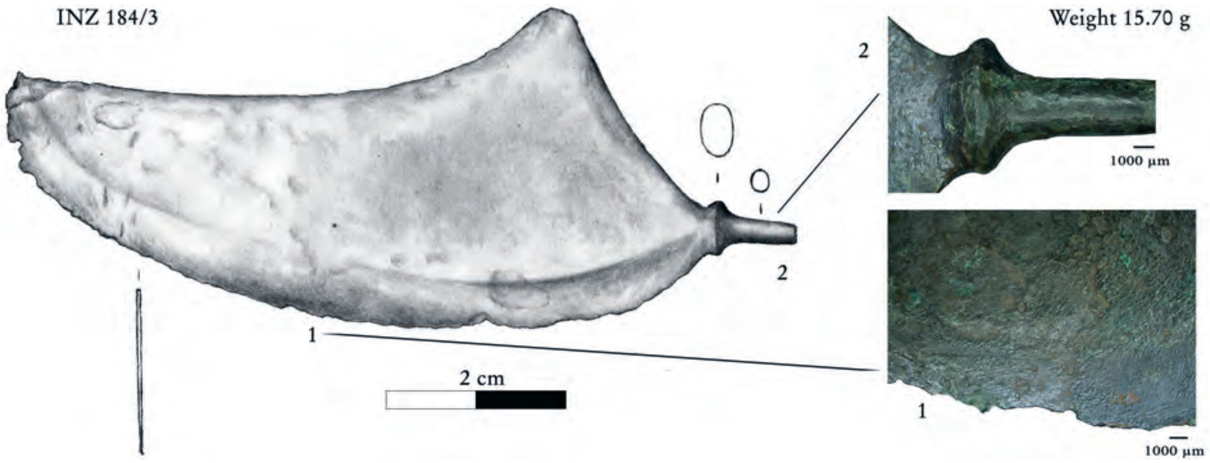

Fig. 48. Single-edged razor INZ 184/3. – 1. The state of preservation of the edge allows only for observation of a few diagonal striations, possibly deriving from the sharpening of the blade (right). – 2. Detail of the biconical node separating the tang from the blade part (Drawing: M. Imam. – Photos: N. Mittermair).

3. Razors

INZ 184/3 (Fig. 48)
Typology: *Herrnbaumgarten* type
Dating: younger Urnfield period (Ha A2/B1 – Ha B2)[75]
Distribution: eastern Bavaria, Silesia, Moravia, middle Danube region
Length: 13.1 cm
Width: 0.5 cm
Height: 5.4 cm
Preservation: 100 %; high degree of medium- and small-sized breaks along edge
Processing: casting jet likely originally located at handle; post-casting treatment of surface including polishing; resharpening striations; 2 courses of hammering marks along edge
Use: traces of sharpened edge attestable at blade base
Deformation: slight bend in blade
Corrosion: high degree of surface corrosion
Conservation: attestable traces of corrosion removal

75 Jockenhövel 1971, 210–211. Information relating to the chronological and regional distribution of razors derives from Jockenhövel 1971, if not stated otherwise.

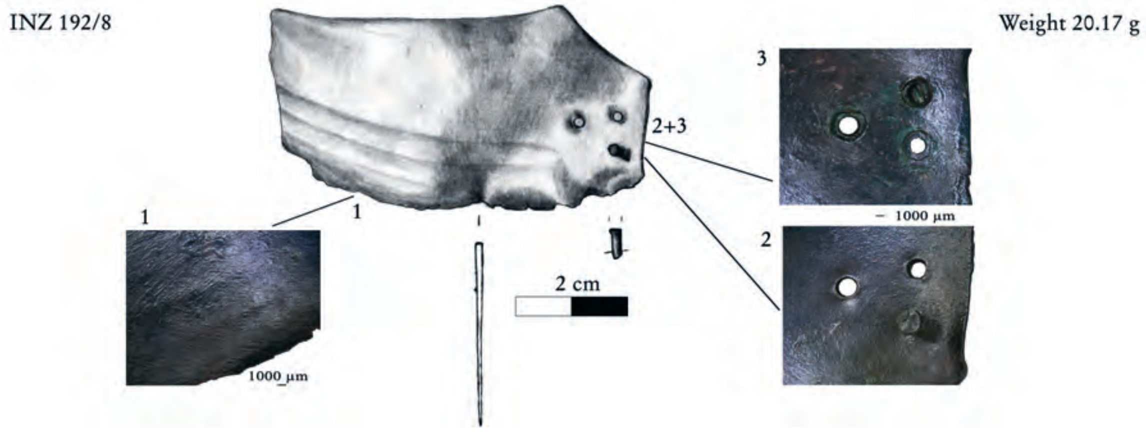

Fig. 49. Riveted razor INZ 192/8. – 1. Parallel oriented course of cold-working process along edge. – 2. Detectable bend in the object deriving from heat impact. Missing indentations along the rivets suggests a preparation during casting in the mould or model to ensure the correct size of the rivets. – 3. The minimal amount of excess material shows the identical orientation of the artefact during application of the organic hilt (Drawing: M. Imam. – Photos: N. Mittermair).

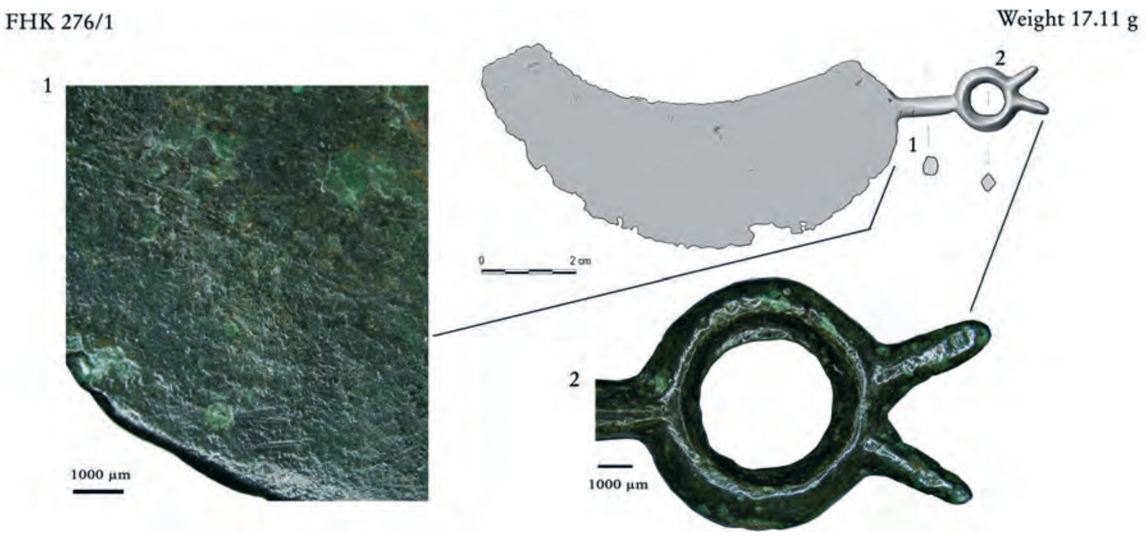

Fig. 50. Razor with ring handle FHK 276/1. – 1. Preservation state of edge in detailed view with a few horizontal striations possibly deriving from post-casting surface treatment. – 2. No signs of treatment inside the ring handle (Drawing: F. Siegmeth. – Photos: N. Mittermair).

INZ 192/8 (Fig. 49)
Typology: *Herrnbaumgarten* type
Dating: younger Urnfield period (Ha A2/B1 – Ha B2)
Distribution: eastern Bavaria, Silesia, Moravia, middle Danube region
Length: 8.3 cm
Width: 0.2 cm
Height: 4.6 cm
Preservation: 80 %; large and middle-sized breaks along edge
Production: pre-casting preparation of rivet holes
Processing: post-casting treatment of surface including polishing; striation pattern along blade; hammer marks on whole object; 3 courses of hammering marks along edge up to blade base; 3 rivets pierced through material from same side; organic handle was likely not aligned with orientation of blade
Use: traces of sharpened edge attestable
Deformation: bent blade
Heat exposure: slight traces of heat exposure
Corrosion: high degree of surface corrosion
Conservation: acrylic resin residues

FHK 276/1 (Fig. 50)
Typology: *Herrnbaumgarten* type
Dating: younger Urnfield period (Ha A2/B1 – Ha B2)
Distribution: eastern Bavaria, Silesia, Moravia, middle Danube region
Length: 12.1 cm
Width: 0.4 cm

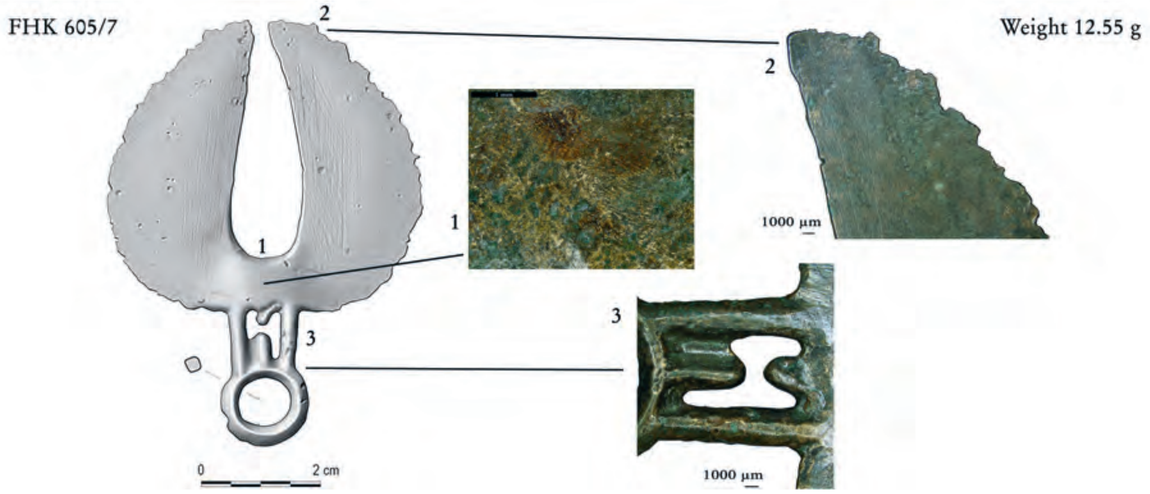

Fig. 51. Double-edged razor FHK 605/7. – 1. The detailed view of the dendritic surface is evidence of gradual post-casting cooling of the metal artefact as well as a lack of work steps influencing the microstructure of the area. – 2. Striations oriented horizontally to the blade attest to the surface treatment it underwent. Along the edges, cold-working procedures removed the striations. – 3. Casting defect visible at the hilt of the razor (Drawing: F. Siegmeth. – Photos: N. Mittermair).

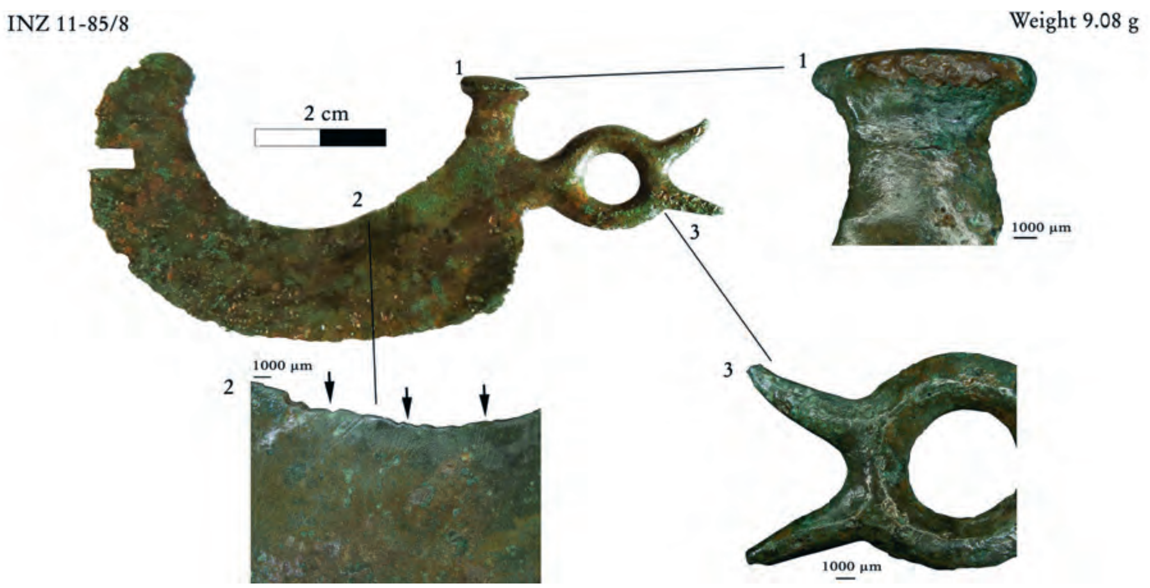

Fig. 52. Single-edged razor INZ 11/8 from Ha B-dating cemetery. – 1. Horizontal fissure are the result of intense hammering. – 2. Abraded geometric decorations account for the intensive artefact wear. – 3. Detail of the ring handle (Photos: N. Mittermair).

Height: 3.1 cm
Preservation: 95 %; no original edge preserved
Production: remains of casting seams inside ring knob and between spiked extensions
Processing: post-casting treatment of surface including polishing; hammer marks attestable throughout whole object; especially along edge
Corrosion: high degree of surface corrosion
Conservation: traces of corrosion removal

FHK 605/7 (Fig. 51)
Typology: *Nynice* type
Dating: younger and late Urnfield period (Ha B1 – Ha B3)
Distribution: southern and eastern Germany, Bohemia
Length: 7.3 cm
Width: 0.3 cm
Height: 5.2 cm
Preservation: 100 %; original edge barely preserved
Production: casting flaw visible in central part of handle; originally cast thickness of blade attestable in middle part of blade; handle mostly unworked; dendritic surface visible on blade surface above handle attesting long cooling phase and low degree of further working steps in this area

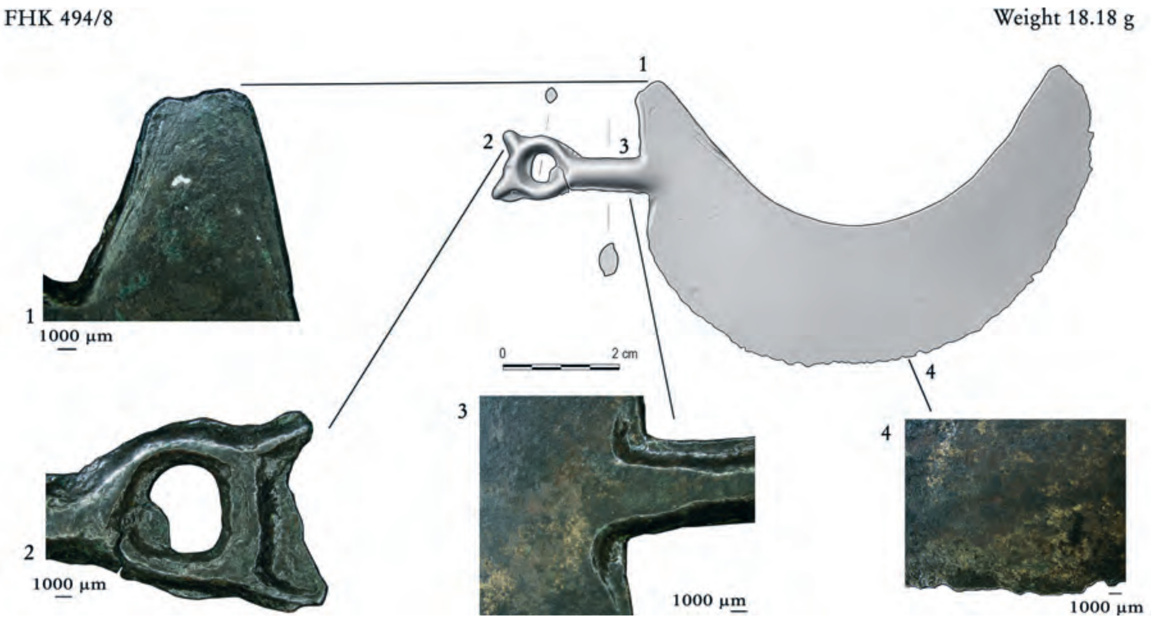

Fig. 53. Razor with ring handle FHK 494/8. – 1. Negatives of tool marks along the blade tip towards the hilt. – 2. Cold-shut casting defect visible at the ring handle. – 3. Asymmetry in the area of the hilt speaks for production in a two-part casting mould. – 4. Low preservation of the edge, horizontal striations suggest sharpening of the blade (Drawing: F. Siegmeth. – Photos: N. Mittermair).

Processing: post-casting treatment of surface including polishing; ring knob on one side shows traces of polishing on outer surface; striations running in orientation of blade; superimposed by hammer marks from tip to blade base along edge; last cold-worked side is drawn; fissures from hardening the blade visible on the surface
Use: due to preservation of edge, no traces of sharpening detectable; shape of objects suggests blade wear along tips
Corrosion: slight traces of surface corrosion visible
Conservation: parallel lines on tips attest corrosion removal process nearly orthogonally oriented to striations
Sample: for metallographic investigations taken from blade; oriented 90° to blade part axis

INZ 11/8 (Fig. 52)
Typology: *Určice* type
Dating: later Urnfield periods (Ha B1/B2 – Ha B3)
Distribution: Silesia, eastern Bohemia, Moravia, eastern Austria, northern Slovenia
Length: 5.8 cm
Width: 0.4 cm
Height: 3.6 cm
Preservation: 100 %; original edge barely preserved
Production: casting jet at back tip of crescent-shaped blade
Processing: casting jet hammered into node; post-casting treatment of surface including polishing; superimposed by hammer marks from tip to blade base along edge; fissures from hardening the blade visible under node
Use: traces of sharpened edge visible at tip; blade wear in central part of blade; end of decoration superimposed by reworking of blade
Decoration: post-processing application of incised decoration; downwards-oriented triangles from back of blade with hatching
Corrosion: slight traces of surface corrosion
Conservation: visible traces of corrosion removal processes in decorated area; acrylic resin residues

FHK 494/8 (Fig. 53)
Typology: *Určice* type
Dating: later Urnfield periods (Ha B1/B2 – Ha B3)
Distribution: Silesia, eastern Bohemia, Moravia, eastern Austria, northern Slovenia
Length: 10.5 cm
Width: 0.3 cm
Height: 2.5 cm
Preservation: 100 %; original edge barely preserved
Production: production in two-part mould likely; moulds not perfectly aligned; break on ring knob of handle result of casting flaw; casting seams on handle unremoved
Processing: visible tool mark negatives from casting seam removal on blade tips close to back of blade; post-casting treatment of surface including polishing; striation pattern along blade superimposed by traces of hammering on blade, especially along edge
Use: possible blade wear along front tip of blade
Conservation: visible traces of corrosion removal processes

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Beaver as Proof of the Change of Natural Environment and Economy of the First Half of the 10th Century AD

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Abstract

The collapse of the Great Moravian early medieval fortified centre at Pohansko near Břeclav triggered some changes. These changes became evident in the development of the alluvial plain environment, as well as in the settlement, subsistence, and economic strategies of the population. One particularly prominent phenomenon was an unprecedented increase in the proportion of hunted animals appearing in osteological assemblages from the 10th century AD. They were found among the features and the cultural layers of the former northeastern suburbium of the Great Moravian centre at Pohansko and a new settlement known as Břeclav-Na Včelách. Remains of the European beaver (*Castor fiber*) predominate or are strongly represented among the wild species, which might be the result of specialised hunting or even breeding. The joint analysis by palynologists, archaeobotanists and archaeozoologists seeks to explain the significant presence of a specific species in terms of the evolution of the natural environment and the economy.

Keywords

Beaver (*Castor fiber*), hunting, natural environment, Pohansko, early Middle Ages, Great Moravia

Zusammenfassung – *Biber als Beweis für den Wandel der natürlichen Umwelt und der Wirtschaft in der ersten Hälfte des 10. Jahrhunderts n. Chr.*

Der Zusammenbruch des großmährischen frühmittelalterlichen befestigten Zentrums in Pohansko bei Břeclav brachte einige Veränderungen mit sich. Diese Veränderungen sind in der Entwicklung des Naturraums der Schwemmlandebene sowie in der Siedlungsweise, dem Lebensunterhalt und in ökonomischen Strategien der hiesigen Bevölkerung zu beobachten. Zu den deutlichsten Phänomenen gehört eine beispiellose Erhöhung des Anteils an Jagdtieren in osteologischen Fundverbänden aus dem 10. Jahrhundert n. Chr. Diese fanden sich zwischen einzelnen Objekten und Kulturschichten der ehemaligen nordöstlichen Vorburg des großmährischen Zentrums in Pohansko und in einer neuen Siedlung, die als Břeclav-Na Včelách bekannt ist. Die völlige Dominanz bzw. der zumindest starke Anteil des Europäischen Bibers (*Castor fiber*) unter den Wildtieren könnte auf spezialisierte Jagd oder sogar Zucht zurückzuführen sein. Eine gemeinsame palynologische, archäobotanische und archäozoologische Analyse bemüht sich, die bedeutende Präsenz einer konkreten Tierart in Hinsicht auf die Entwicklung des Naturraumes und der Ökonomie zu erklären.

Schlüsselbegriffe

Bieber (*Castor fiber*), Jagd, Naturraum, Pohansko, frühes Mittelalter, Großmähren

1. Introduction

Pohansko near the town of Břeclav was an early medieval hillfort and an economic centre lying above the confluence of the Morava and the Dyje rivers in the Czech Republic. The site has been systematically investigated since 1959. This long-term research has yielded a wealth of material, much of which has been analysed over the years. Unfortunately, complete and high-quality analysis of certain aspects of material culture is still missing. For example, animal bones are included in this category and they have been processed only in terms of taxonomy, without regard to the dating and origin of the fragments.[1]

Newly analysed archaeozoological assemblages from part of Pohansko and two other chronologically and spatially related settlements, Břeclav-Na Včelách (BNV) and Kostice-Zadní hrúd (KZH) (see Fig. 1), show that at a certain stage, a radical change occurred in the composition of the fauna.[2] In the 10th century AD, wild animals were hunted, exploited, and consumed to a considerably higher degree than in the 9th century AD. The presence of beaver bones in the 10th century AD is particularly significant compared to the 9th century AD, where such assemblages are not

1 Kratochvíl 1968. – Kratochvíl 1969. – Kratochvíl 1980.
2 Dreslerová, Hajnalová, Macháček 2013.

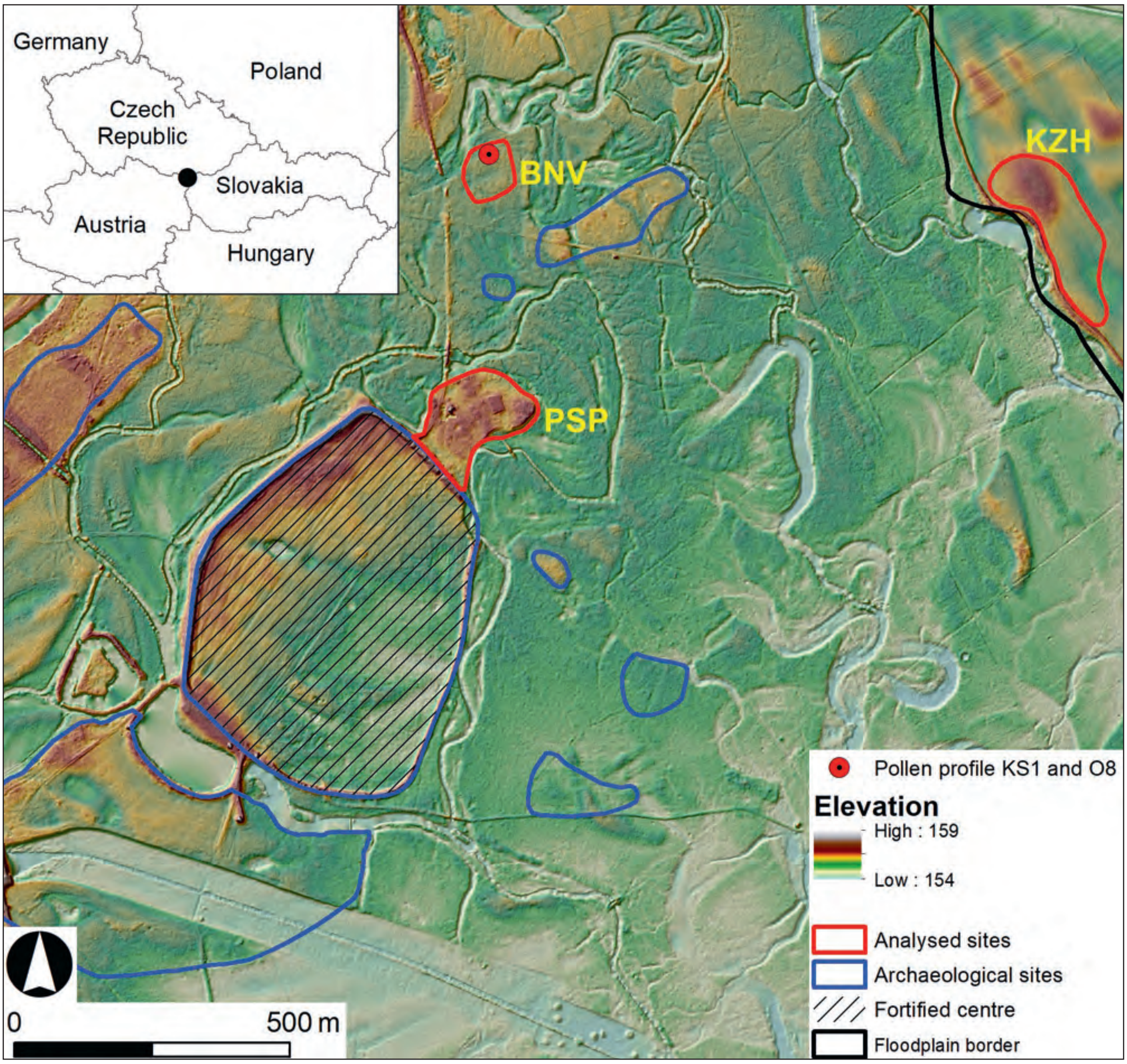

Fig. 1. Location of analysed sites. PSP – Pohansko northeastern suburbium; BNV – Břeclav-Na Včelách; KZH – Kostice-Zadní hrúd (Map: P. Dresler).

featured. This interdisciplinary contribution seeks to investigate possible reasons for the occurrence of beaver bones in the osteological assemblages and to elucidate why beavers were hunted on such a massive scale.

The newly discovered housing estate and the significant changes in osteological assemblages gives rise to the following questions that we will try to solve in the text that follows. How does the natural environment change when Pohansko is abandoned? Was the natural environment suitable for the return of wild animals and their subsequent hunting? Who could profit from fur hunting?

1.1. Archaeological Background

Starting in the Early Slavic period – RS1[3] (later 6th century – early 7th century AD) – the local settlement was connected to the alluvial plain of the River Dyje. The settlement, including a burial site, was located on sandy elevations within the floodplain and at its edge. A link with the alluvial plains of major rivers is typical of the early Slavs in the

3 Abbreviations are explained in Tab. 1.

Abbreviation	Archaeological culture	Date
RS1	Early Slavs / Prague-type C	550–700
RS2	Early Hillfort period	700–800
RS3	Middle Hillfort period	800–950
RS4	Late Hillfort period	950–1200

Tab. 1. Explanation of abbreviations of archaeological phases and their absolute time span.

whole of central and eastern Europe.[4] This link continued into the Early Hillfort period – RS2 (later 7th century – end of the 8th century AD) – but the settlement expanded into the surrounding area. The clearest link to the alluvial plain, in terms of fortified centres, may be observed in the Middle Hillfort period – RS3 (9th century – early 10th century AD) – which also encompassed Great Moravia and when fortified settlement at Pohansko emerged. The floodplain still contained settlements, yet the settlement structure in the terraced areas and along small, more distant watercourses grew markedly denser. After the end of Great Moravia (early 10th century AD), the alluvial plain in the Pohansko area and its surroundings was settled only sporadically, and during the 10th century AD, it became abandoned. Since the 11th century AD (RS4), settlements and villages in the floodplain have been the exception; nonetheless, local administration centres such as Břeclav, Podivín and Hodonín were located directly in the middle of the floodplain and are still there today. Economic exploitation of the floodplain in the river basin was intense from the 6th century until the late 10th century AD, when the settlement in the observed area moved to the floodplain's borders or beyond.[5]

Pohansko near Břeclav is situated on a sandy elevation in the middle of the floodplain of the River Dyje basin (Fig. 1). Although the elevation was settled as early as the Neolithic, archaeological finds pre-dating the Early Slavic period (6th and 7th centuries AD) have only been sporadic. In the 6th century AD, the elevated area was settled by one farming community, possibly two, which were absorbed by an extensive, densely settled, fortified, 55 ha-large centre in the later 9th century AD. Pohansko was settled rapidly, in three main areas: the centre, the southern suburbium and the northeastern suburbium. It probably had as many as 2400 inhabitants in its heyday.[6] The centre, covering 28 ha, was fortified with a wood-earth rampart with a shell frame and a stone outer wall.[7] Inside was the magnate's court (Pohansko velmožský dvorec – PVD) bounded by a palisade, with residential and communal buildings and outbuildings, as well as a stone church and an adjacent burial site.[8] The northeastern suburbium (Pohansko severovýchodní předhradí – PSP) was not fortified and contained sunken and above-ground features organised into homesteads. Since a stone church was constructed there, it may be presumed that it also contained the court of a magnate, the owner of the church.[9] Southern suburbium inhabitants mostly lived in sunken dwellings and were buried in the space between them. Existing analyses of the centre, including the court and the southern suburbium (Pohansko jižní předhradí – PJP), indicate that it was occupied mainly in the later 9th century AD. The settlement was abandoned in the late 9th century or early 10th century AD; however, the burial site associated with the first church was still in use, and in the late 10th century and the beginning of the 11th century AD, the church site was briefly inhabited by a small group of people, perhaps a family. The settlement in the northeastern suburbium probably lasted until the mid-10th century AD, while burials continued around the second church until the same time.[10]

The Břeclav-Na Včelách settlement (BNV) is located 300 m north of the northeastern suburbium of Pohansko, in the inundation zone of the Dyje. Spatially limited excavations have revealed a cultural layer, very small sunken features and possibly the remains of a house built on the original surface. Based on archaeological and radiocarbon data, the site was inhabited in the mid-10th century. The cultural layer and house debris were buried under sterile flood sediments at some unspecified later date.[11]

The Kostice-Zadní hrúd (KZH) settlement is located outside of the floodplain. The site was inhabited from the 6th to the 12th century AD, with a brief interruption at the time of the most developed settlement period of Pohansko in the last quarter of the 9th century AD.[12]

2. Materials and Methods

Explaining the high presence of beaver necessitated cooperation from the natural sciences, which primarily tried to reconstruct the natural environment of the monitored

4 Kuna, Profantová 2004.
5 Dresler, Macháček 2013.
6 Dresler 2016, 52.
7 Dresler 2011.
8 Dostál 1975.
9 Macháček et al. 2016.
10 Čáp et al. 2012. – Macháček et al. 2016.
11 Dresler 2016.
12 Balcárková 2017.

localities in relation to the management of the animal component of the diet. The archaeozoological analysis was carried out by Gabriela Dreslerová, the palynological analysis by Nela Doláková, the anthracological analysis by Romana Kočárová, and the palaeobotanical analysis by Petr Kočár.

2.1. Palynology

Two profiles from the Břeclav-Na Včelách settlement were processed: test pit KS1 and the fill of archaeological feature O8, both of which are in sector G51-43. Profile KS1 contained the cultural layer representing the same period as the main fill of the feature O8. Comparison of these profiles with different deposition processes enabled better specification of the vegetation environment.[13]

For palynological purposes, samples were processed in the laboratory by means of the maceration method (HCl, HF, KOH) and acetolysis (H_2SO_4 +$(CH_3CO)_2O$). To enhance the detection of palynomorphs from the sediments of lower organic content, heavy liquid $ZnCl_2$ was employed to concentrate the organic component. Determination of the palynomorphs was conducted with a Nikon Alphaphot 2 optical microscope (200×, 400× and 1000× magnification), largely following the work of Hans-Jürgen Beug[14] and Maurice Reille.[15] Both profiles were relatively rich in terms of palynology (all samples contained over 100 identified grains), which enabled the creation of pollen diagrams. The pollen diagram (Fig. 4) was processed using the POLPAL programme.[16]

2.2. Archaeobotany and Anthracology

The sampling strategy at Břeclav-Na Včelách is based on the excavation grid system. There is one 15-litre sample per 4 m² and one sample of the same size for feature O8. The researchers had twelve anthracological samples from the Břeclav-Na Včelách site at their disposal, from which 41 charred seeds and fruits were identified, as well as 401 charcoals. The samples were floated through a system of sieves with the smallest hole perforation at 0.25 mm and dried at room temperature. The plant remains (seeds and fruits and the fragments of charcoals) were removed and sorted out under a stereoscopic microscope.

The archaeobotanical material (plant seeds and fruits) was identified by means of a reference collection of plant diaspores. The charcoals came from samples obtained from the sediments with a fraction over 2 mm. After making fresh fractures (transversal, radial and tangential), the charcoals were observed under an optical microscope adjusted for observation in overhead light magnified by 50×, 100× and 200×. The numbers of charcoal fragments in the processed samples were recorded and standard literature on the determination of wood and charcoals was employed.[17]

2.3. Archaeozoology

Preliminary research into the extensive fortified settlement complex and its vicinity divided the acquired osteological material into eight groups, which have been analysed (Tab. 2). Combining material from all the assemblages studied, over 66,000 bone fragments were recorded in full, including over 21,000 identified to species. The osteological assemblage was derived from the Pohansko excavations since 1959, therefore some specimens are hand-collected and some of them are sieved. The osteological assemblages were analysed by means of standard procedures consisting of the determination of anatomy, species[18] and age,[19] as well as side determination and sex, together with taphonomy, pathological manifestations[20] and metrics.[21] For determination, the comparative collections of the Moravian Museum and the University of Veterinary and Pharmaceutical Sciences in Brno were used. Due to the absence of a comparative fish collection, we did not make a detailed species identification of the findings in this category. All identified bones and their attributes, as well as the number and weight of unidentified bone fragments, have been collected in the database. Fragment weight monitoring is a quantification method that measures relative abundance based on weight rather than counts. It relies on raw weight itself or estimations of the potential edible output represented by faunal remains. Bone weight quantifications aim to interpret the relative importance of food animals based on their potential meat output rather than numerical frequency.[22] The osteological assemblage analysed in text is based on material from the Pohansko northeastern suburbium from 150 pits; from Břeclav-Na Včelách from eight pits and the excavated cultural layer, representing a total area of 116 m²; and from Kostice-Zadní hrúd from 150 pits.[23]

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13 Primary data published in Doláková et al. 2020, Tab. 1.
14 Beug 2004.
15 Reille 1995.
16 Walanus, Nalepka 1999.
17 Schweingruber 1978. – Primary data published in Doláková et al. 2020, Tab. 1.
18 Schmidt 1972.
19 Habermehl 1975. – Fandén 2005.
20 Baker, Brothwell 1980.
21 Driesch 1976.
22 Reitz, Wing 2008, 171.
23 For additional information, see Dreslerová 2018.

Site	Pohansko-Lesní hrúd / homestead	Pohansko rampart R18 / base of fortification	Pohansko north-eastern suburbium	Pohansko magnate's court / seat of elite	Břeclav-Lány / rural settlement	Břeclav-Na Včelách / rural settlement	Kostice-Zadní hrúd / rural settlement	Pohansko north-eastern suburbium / rural settlement
Taxon	**PLH**	**PR18**	**PSP**	**PVD**	**BL**	**BNV**	**KZH**	**PSP**
	RS3	RS3	RS3–4	RS3	RS1–2	RS3–4	RS1–RS4III	RS2
Sus scrofa f. *domestica*	1906	866	2427	1756	92	166	543	25
Bos primigenius f. *taurus*	1715	308	2188	685	84	552	421	25
Capra aegagrus f. *hircus*	74	12	23	10	1	4	9	
Ovis ammon f. *aries*	157	105	78	135	1	4	12	
Ovis/Capra	545	379	524	891	33	45	277	7
Equus ferus f. *caballus*	56	5	83	6	4	3	34	3
Equus caballus x *asinus*	2						0	
Equus sp.	1		1				0	
Canis lupus f. *familiaris*	150* (29)	3	19	83*	4	5	577* (19)	
Felis silvestris f. *domestica*	3	1	4	3			65* (4)	
Gallus gallus f. *domestica*	54	46	96	3	7	21	259	1
Anser anser f. (?)	21	15	10	3	1		149	
Domestic animals	**4713* (4563)**	**1740**	**5453**	**3575* (3492)**	**227**	**800**	**2363* (1727)**	**61**
Bos primigenius			1	3		1		
Cervus elaphus	26	1	52	21	2	9	56	
Capreolus capreolus	7		37	2		1	11	
Sus scrofa	4		824	20		49	27	2
Ursus arctos			6	1		3	2	
Vulpes vulpes	1						18* (1)	
Mustela putorius							1	
Meles meles	3						1	
Castor fiber			387			142	1	
Lepus europaeus	4	1	9	1	1	4	35	
Accipiter gentilis	1		2					2
Anas platyrhynchos			36	12				
Aquilla sp.					1			
Columba livia/oenas			2			1		
Garrulus glandarius							1	
Emys orbicularis							9	
Esox lucius			2					
Piscis			246		1	18	83	2
Anodonta sp.							1	
Wild animals	**46**	**2**	**1604**	**60**	**4**	**228**	**246* (229)**	**6**
Bos sp.			1			1	1	
Sus sp.	4		30	3		4	1	
Aves	14	3	44	3	4	17	161	3
Domestic/wild animals	**18**	**3**	**75**	**6**	**4**	**22**	**163**	**3**
Cricetus cricetus	9		3				10	3
Microtus sp.	1		2		1		11	1
Talpa talpa							12	
Arvicolinae	2							
Recent	**12**	**0**	**5**	**0**	**1**	**0**	**33**	**4**
Homo sapiens sapiens	10		61			1	9	17
NISP-total	**4799**	**1745**	**7196**	**3641**	**236**	**1051**	**2761**	**91**

Tab. 2. Analysed osteological assemblages from recent excavations.

3. Results

3.1. Environment and Agriculture

The current archaeobotanical research was carried out both in the form of pollen analyses and the study of plant macroremains and charcoals. The interpretation of the vegetation cover and farming activities at the site and in its proximity follows on from previous research.[24] The vegetation of the wider surroundings of the floodplain close to the confluence area of the Morava and the Dyje rivers was made up of a mosaic of both forested and open areas. Forest growth consisted of mesophile hornbeam woods with linden trees and alluvial woods in the form of hardwoods (mainly alder and elm) and softwood species near watercourses and their overgrown branches (willow, ash, poplar). Forest edges and glades consisted of mixed shrub complexes (*Cornus*, *Euonymus*, *Corylus*, *Rubus* and *Pomoideae*). Open meadow areas consisted of sections ranging from very to slightly wet, with various proportions of grasses (Fig. 4). Marsh vegetation around the watercourses was plentiful (*Cyperaceae*, *Typha*, *Potamogeton*, *Caltha*, *Valeriana*). Human activity was observed in all the sample areas studied (earliest 8200 BP), in the form of deforestation, grazing, cultivation of crops and the presence of weeds.[25] According to Emanuel Opravil,[26] the vegetation in the surroundings of early medieval hillforts was, in contrast to the present, more diversified and of different quantitative proportions resulting from the higher morphological diversity of the sites. According to Vojen Ložek[27] and Emanuel Opravil,[28] the increase in precipitation in the lower Atlantic led to increased erosion and the first levelling of low-lying niches in the floodplain area. The landscape started to adopt its modern characteristics in this period. Spatial and temporal distributions of vegetation have recently been studied in the work of Nela Doláková and colleagues.[29] The current archaeobotanical research was carried out both in the study of plant macroremains (seeds and charcoals) and in the form of pollen analyses.

The small assemblage of charred plant seeds/fruits (Fig. 2) largely contained caryopses of crops with a preponderance of millet (*Panicum miliaceum*) (49 % of plant macroremains analysed) and wheat (*Triticum aestivum*) (34 %), while barley (*Hordeum vulgare*) was present in the form of a single caryopsis (2 %).

Weed species included the *Chenopodium hybridum*, a typical weed of the ploughed soils of spring cereals, gardens and ruin sites.

For Pohansko, only the results of the analyses of manually selected charcoals have been published to date.[30] However, these assemblages are now considered less reliable, with possible selection bias during archaeological excavation in favour of tree species with more resistant, less disintegrable charcoals (especially oak). Consequently, an extensive assemblage of charcoals obtained by flotation was newly acquired for the anthracological comparison from the Břeclav-Na Včelách site as well as for the locations in the Pohansko hillfort region.

Oak (*Quercus*) predominated in the anthracological spectrum from the Břeclav-Na Včelách site (Fig. 3) (52.6 % of analysed charcoals), which also showed an unusually high proportion of elm (*Ulmus*) (17.9 % of charcoals) and maple (*Acer*) (9.6 %). Further species present were poplar (*Populus*) and willow (*Salix*) (4.9 %), hornbeam (*Carpinus*) (3.9 %), plum (*Prunus*) (3.9 %), alder (*Alnus*) (3.4 %) and the subfamily *Pomoideae* (2.8 %). Taxons of fir (*Abies*), dogwood/cornel (*Cornus*), hazel (*Corylus*) and spruce (*Picea*) featured only sporadically.

Hydrophilic elm woodland was thus the main source of firewood: hardwood (oak, elm), oak-hornbeam woodland (oak, maple, hornbeam) and softwood (alder, poplar, willow). Some of the firewood was also obtained from glades and forest edges (hazel, plum trees, *Pomoideae*).

Two profiles were processed from the Břeclav-Na Včelách site to investigate its palynology. The first came from archaeological feature O8 (ten samples, 10 cm each). The deepest sample (test pit 99 cm below the surface) came from the underlayer of the feature, while samples from the upper section of the profile (29 and 19 cm) represented its backfill and from 9 cm, the topsoil layer. The fill of the feature was found between 39 and 89 cm. Test pit KS1 (six samples from a depth of 75 cm) was made *c.* 3 m from the feature, in natural sediments. A cultural layer was detected at a depth of 32–57 cm (mapping by Jan Petřík, 2018). Overlying and underlying beds consisted of flood loams.

The composition of pollen complexes from the two profiles was relatively unified. The palynological analysis shows that the vegetation in the area was typical of a floodplain close to a watercourse (with old channels). The pollen spectra are marked by a high proportion of hard (*Alnus,*

24 Svobodová 1990. – Opravil 1998. – Opravil 2000. – Doláková, Roszková, Přichystal 2010. – Dreslerová, Hajnalová, Macháček 2013.

25 Doláková, Roszková 2006.

26 Opravil 1978. – Opravil 1983. – Opravil 1999.

27 Ložek 2007.

28 Opravil 1999.

29 Doláková et al. 2020.

30 Opravil 1966.

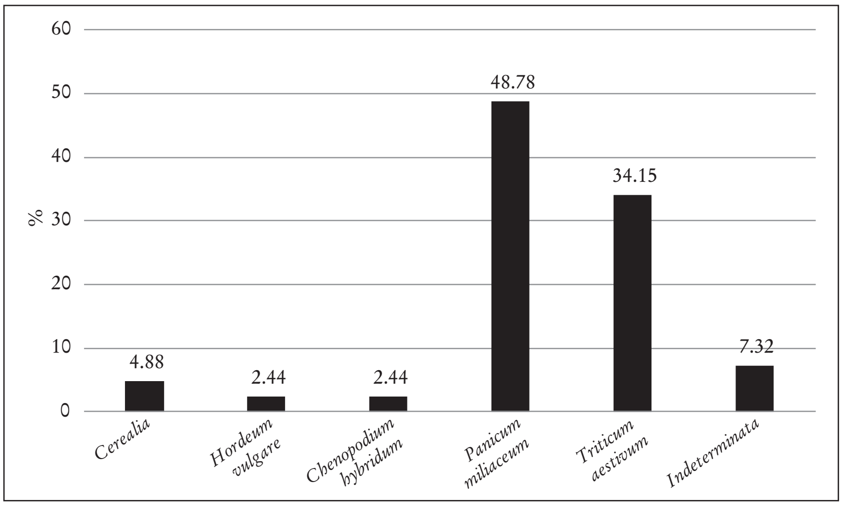

Fig. 2. Břeclav-Na Včelách. Results of archaeobotanical macroremains analysis. Percentage of identified assemblage (N=49) (Graphics: P. Kočár).

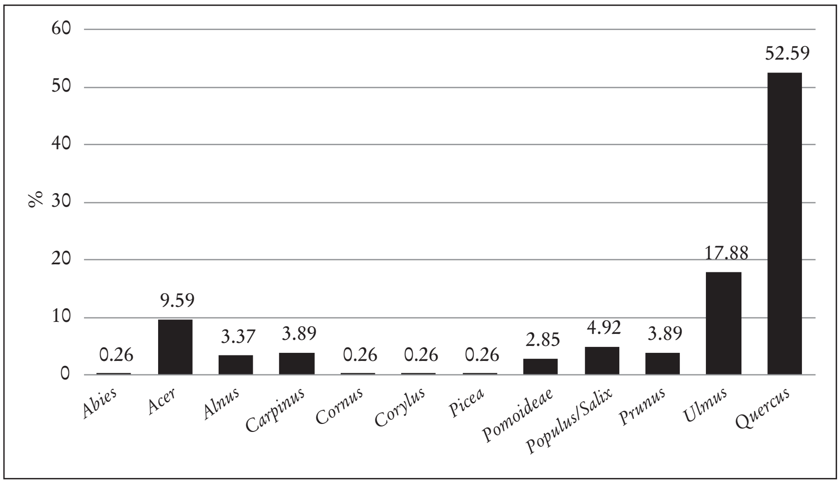

Fig. 3. Břeclav-Na Včelách. Results of anthracological analysis. Percentage of identified assemblage (N=286) (Graphics: R. Kočárová).

Ulmus) and soft timber (*Salix, Populus, Fraxinus*), as well as marsh plants (*Cyperaceae*, *Typha*, *Potamogeton*). There was a variety of mesophytic growth and a high proportion of ferns. The Břeclav-Na Včelách site was relatively forested – about 50 % – in the earliest segments, below the cultural layer and in the underlayer of the features (Fig. 4). The same held true of the sediments from the topsoil of the feature and test pit KS1, which originated after the decline of the settlement. A decrease in trees was observed in the feature fill and the upper section of the cultural layer. The composition of the tree and herb elements varies, with no clear increase in nitrophilic components traceable in other parts of Pohansko (*Chenopodiaceae*, *Artemisia*, *Asteraceae/Liguliflorae*). These indicators of a high proportion of nitrogen are more concentrated in the fill of feature O8, in contrast to the overlying and underlying sediments and the cultural layer in test pit KS1. Feature O8 also shows a slightly higher percentage of cereals. Several pollen grains of *Vitis* (grapevine) appeared. The occurrence of walnut (*Juglans* pollen grains, from 49 cm, 10 % of all grains identified) was notably high. They were at their richest (including previous profiles from Pohansko) on the Břeclav-Na Včelách site.[31] Such high

31 Svobodová 1991. – Macháček et al. 2007. – Doláková, Roszková, Přichystal 2010.

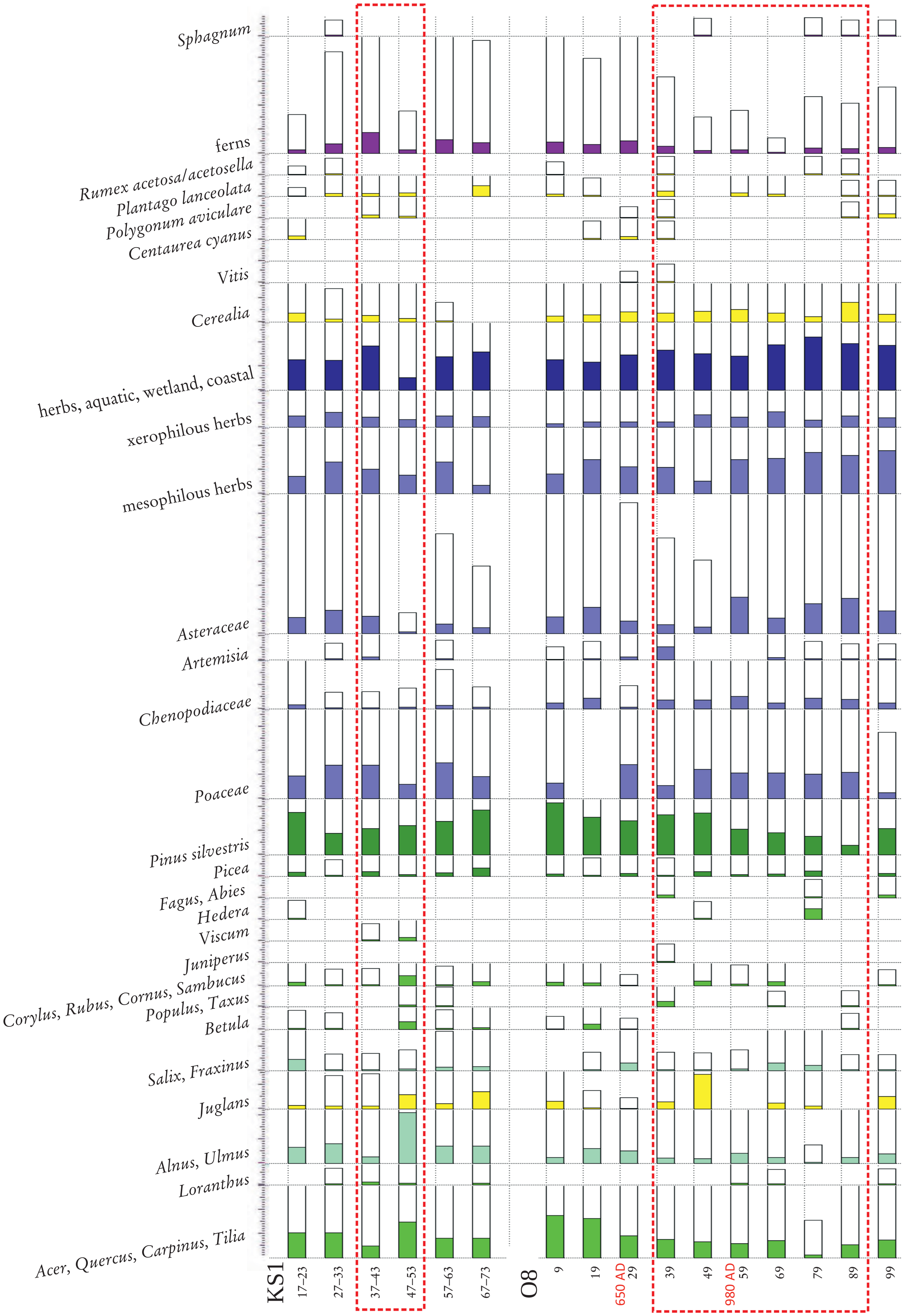

Fig. 4. Břeclav-Na Včelách. Palaeobotanic combined pollen diagram: Test pit KS1 and feature O8 (Graphics: N. Doláková).

occurrence might indicate cultivation in the surrounding area. However, the presence of the *Juglans* on the site has not been confirmed by finds of the matching plant macroremains. Nearby in Mikulčice, macroremains of walnut from the early Middle Ages were documented by Opravil.[32] The presence of several notably large pollen grains from the family *Chenopodiaceae* in feature O8 is also interesting. These are presumably *Chenopodium bonus-henricus*, mentioned as a cultivated plant (spinach substitute) as early as the Bronze Age from Roztoky nad Vltavou.[33] In Pohansko, the occurrence of these pollen grains was documented regularly in the fill of the Great Moravian features of the northeastern suburbium (PSP).

Grains of spruce (*Picea*) were fewer but occurred regularly. Spruce is traditionally considered an import from higher altitudes. In central Europe spruce forests cover wide areas of the montane (mostly planted) and the sub-alpine zones, in lowlands it is more mixed with other species.[34] In the Subatlantic *Picea abies* occurred occasionally in locally suitable habitats, including in the lowlands.[35] Slavomil Hejný and Bohumil Slavík[36] mentioned exceptional local occurrences of *Picea* in the field of thermophytics and the Pladias database[37] mentions its possible occurrence in alluvial forests and oak-hornbeam groves. The issue of the occurrence of *Picea* in the lowlands and its higher representation in pollen diagrams than in charcoals was discussed by Jan Novák and colleagues.[38]

Information from the cultural layer of the test pit KS1 is based on two samples from the upper and bottom sections of the layer. In the bottom section, a marked increase in the concentration of elm (*Ulmus*) pollen grains was observed, accompanied by a decrease in the diversity of plants. The upper section was characterised by a decrease in tree species, no longer discernible in the overlying sample. It was only in this layer that a few pollen grains of mistletoe (*Viscum*) were detected.

In comparison to the Great Moravian cultural layer uncovered inside Pohansko,[39] the Břeclav-Na Včelách layer shows a higher proportion of mesophile trees (especially oak), a lower representation of nitrophile plants and generally a more varied composition.

3.2. Animals

The archaeozoological data enabled a spatial and chronological comparison of animals at the site. The comparison showed differences, and not only in the composition of species. There was little evidence of wild animals hunted at Pohansko and its surroundings since the 6th century AD, except for the northeastern suburbium (PSP) and Břeclav-Na Včelách (BNV) sites (Tab. 3). At these sites, the high proportion of identified bones of wild animals is related to the hunting of beavers and wild boars (Fig. 5).

Beaver bones and teeth occurred in the observed assemblages in two forms. The first form may be termed "random occurrence" and is illustrated by the situation from horizon KZH RS4III at Kostice-Zadní hrúd with the find of 1 beaver fragment in a total of 359 identified fragments in the horizon, i.e. 5.55 % of the fauna hunted (except fish bones), and at Mikulčice-Valy (MIV) with 151 fragments of beaver in a total of 239,386 identified fragments, i.e. 0.06 % of total and 1.8 % of the fauna hunted.[40] The second form reflects the situation at the two discussed sites which is markedly different in terms of quantity. In the Pohansko northeastern suburbium (PSP), the number of beaver bones from 45 features amounted to 387 (3802 g) out of a total of 7196 identified fragments, which makes up 28.5 % of the fauna hunted (1358, except fish bones). In Břeclav-Na Včelách (BNV), beaver fragments amounted to 142 (1011 g) out of 1152 identified fragments, which approximates to 67.6 % of the fauna hunted (210, except fish bones). Some 529 fragments of finds of this animal come from dated archaeological contexts in the Pohansko northeastern suburbium (PSP) and in Břeclav-Na Včelách (BNV), which exceeds the total of all 319 finds of the bones of this rodent reported from 230 archaeological sites across prehistory in the entire Czech territory.[41] The occurrence of beaver bones was accompanied by an increase in the bones of wild pigs, parallel at both sites, while the proportion of traditionally hunted species such as red deer, roe deer and hare were negligible (Tab. 2).

The sheer number of beaver bones and teeth enabled analysis in terms of anatomical parts. The parallel occurrence of beaver at the two sites (PSP, BNV) enabled comparison and the description of possible differences in frequency. The first comparison is based on the number of finds (Fig. 6).

32 Opravil 1998.
33 Tempír 2007.
34 Caudullo, Tinner, de Rigo 2016.
35 Pokorný 2002. – Chytrý 2012.
36 Hejný, Slavík 1988, 557.
37 Pladias 2014–2022.
38 Novák et al. 2017.
39 Doláková, Roszková 2006. – Macháček et al. 2007. – Doláková et al. 2020.
40 Kratochvíl 1978.
41 Kyselý 2005, Tab. 9.

Site	Period	Date	Domestic animals	Wild animals	*Castor fiber*
Břeclav-Lány (BLN)	RS1	6th cent.	72	1	
Břeclav-Lány (BLN)	RS2	7th–8th cent.	79	2	
Kostice-Zadní hrúd (KZH)	RS1/2	6th/7th cent.	10		
Břeclav-Líbivá (BLI)	RS2	7th–8th cent.	169	2	
Pohansko northeastern suburbium (PSP)	RS2	7th–8th cent.	61	4	
Břeclav-Lány (BLN)	RS3	8th/9th cent.	57		
Kostice-Zadní hrúd (KZH)	RS3	8th/9th cent.	406	1	
Břeclav-Líbivá (BLI)	RS3	9th cent.	1010	27	2
Mikulčice-Valy (MIV)	RS3	9th cent.	231,686	7549	151
Pohansko southern suburbium (PJP)	RS3	9th cent.	409	4	
Pohansko-Lesní hrúd (PLH)	RS3	9th cent.	4563	46	
Pohansko rampart R18 (PR18)	RS3	9th cent.	1740	2	
Pohansko magnate's court (PVD)	RS3	9th cent.	3492	60	
Pohansko northeastern suburbium (PSP)	RS3/4	9th–10th cent.	5453	1356	387
Břeclav-Na Včelách (PNV)	RS3/4	10th cent.	800	210	142
Kostice-Zadní hrúd (KZH)	RS4	11th–13th cent.	472	31	
Kostice-Zadní hrúd (KZH)	RS4I	11th–13th cent.	203	41	
Kostice-Zadní hrúd (KZH)	RS4II	12th cent.	296	54	
Kostice-Zadní hrúd (KZH)	RS4III	13th cent.	340	18	1

Tab. 3. Bones of domestic and wild animals (except fish bones) including beavers and beaver bones alone from the early medieval sites from Břeclav-Pohansko and close hinterland.

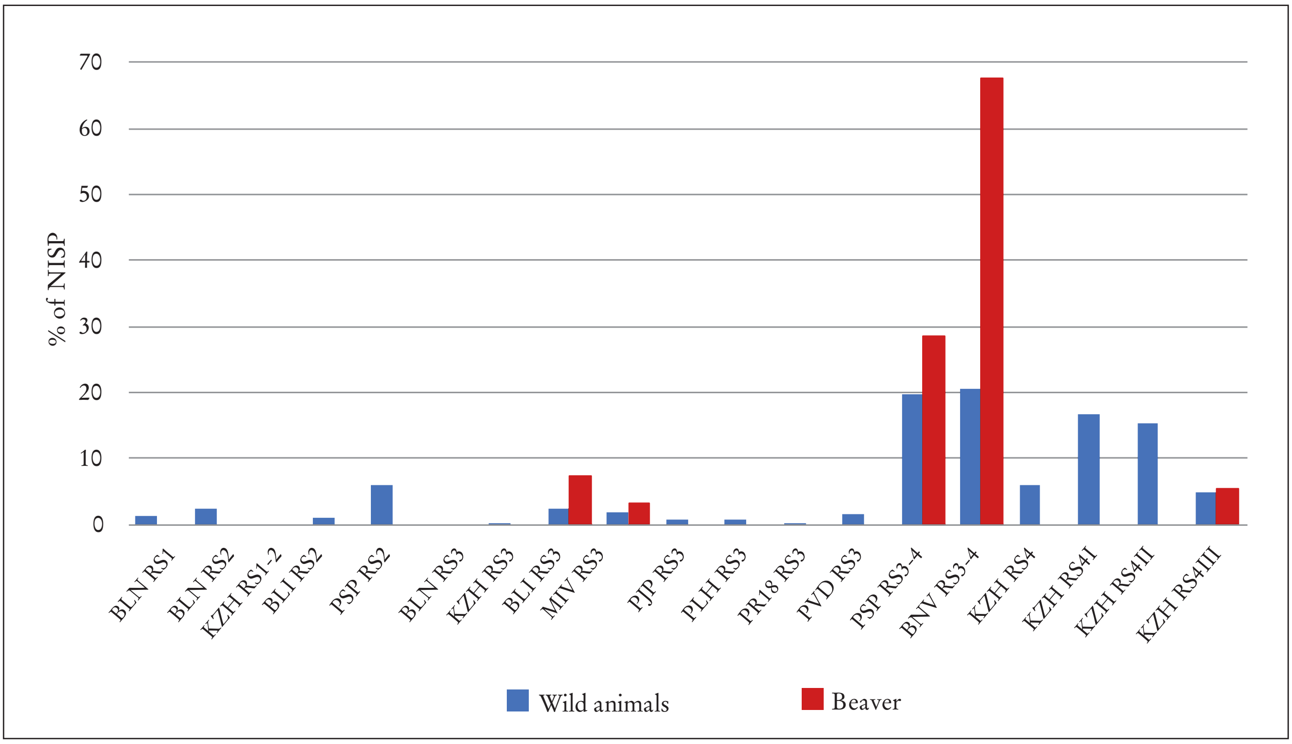

Fig. 5. Proportion as a percentage of the wild animals (except fish) from all identified fragments (NISP) and the proportion as a percentage of beaver fragments within the total of wild animals (except fish bones) – after dating. For data used in this graph see Tab. 3 (Graphics: G. Dreslerová).

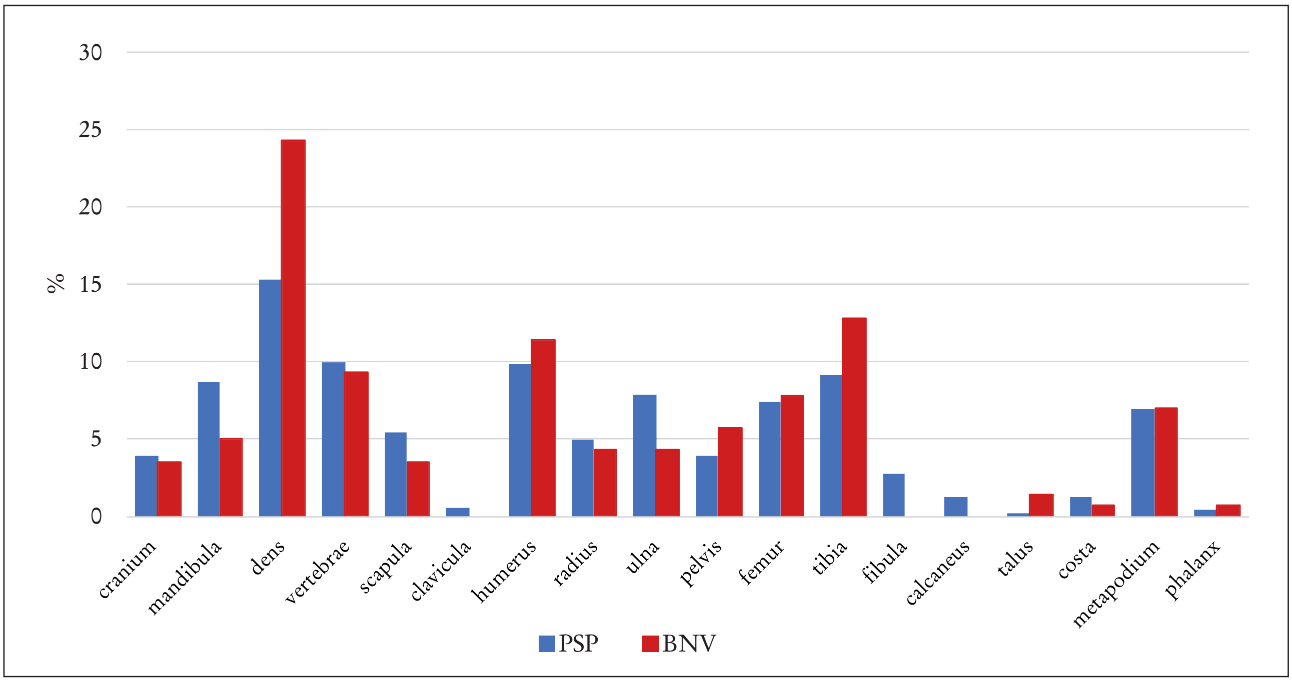

Fig. 6. Occurrence of anatomical parts of beaver skeletons (dens = loose teeth) from Pohansko northeastern suburbium (PSP) and Břeclav-Na Včelách (BNV). Number of fragments expressed as percentages (Graphics: G. Dreslerová).

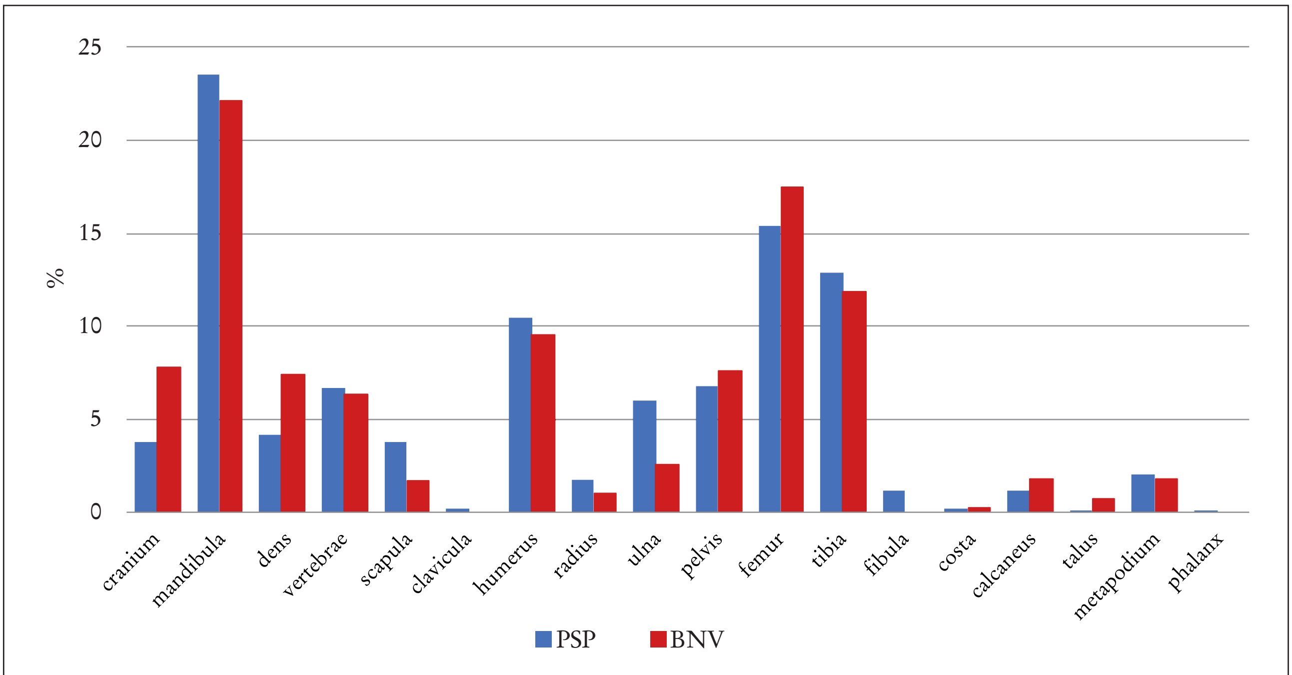

Fig. 7. Occurrence of specific parts of beaver skeletons, by the weight of fragments, expressed as percentages from Pohansko northeastern suburbium (PSP) and Břeclav-Na Včelách (BNV) (Graphics: G. Dreslerová).

The diagram illustrates differences in the number of teeth. Teeth occur in Břeclav-Na Včelách (BNV) in a proportion higher than that in the Pohansko northeastern suburbium (PSP), but the share of individual bone elements between PSP and BNV is similar throughout the whole skeleton.

The situation was also observed in terms of the weight of the fragments (Fig. 7), which partially eliminates the influence

Bone element	dist_o	prox_c	prox_o-dist_o	prox_o-dist_c	dist_c	prox_j	prox_j-dist_o	prox_j-dist_j	prox_c	prox_c-dist_o	prox_c-dist_c	**Total**
scapula					1							**1**
humerus	1			1	14	1					4	**21**
radius					1				3	1	1	**6**
ulna		3	1			1			6	2	1	**14**
femur	1	3	1		1		1	2	3		1	**13**
tibia	3	4		1	7							**15**
fibula		1										**1**
calcaneus		4										**4**
metapodium	5				4							**9**
vertebra			4					1			3	**8**
Total	**10**	**15**	**6**	**2**	**28**	**2**	**1**	**3**	**12**	**3**	**10**	**92**

Tab. 4. European beaver. Pohansko northeastern suburbium (PSP): developmental states of postcranial skeletons. Abbreviations: dist – distal epiphysis, prox – proximal epiphysis, o – open, j – joining, c – closed. Values represent NISP.

Fig. 8. Pohansko northeastern suburbium (PSP), feature O206. Beaver, mandibula of a juvenile individual (Photo: G. Dreslerová).

Fig. 9. Pohansko northeastern suburbium (PSP), feature O217. Beaver, mandibula of an adult individual (Photo: G. Dreslerová).

of fragmented bones. Also, the distribution of the values of each bone element among sites is similar. The authors believe that there is only one possible reason for this: the presence of complete skeletons at the sites, as only skeletons offer a firm, stable proportion of representation for individual bones and teeth. This supports a presumption that the whole carcases of the animals hunted were taken to the settlement.

The age at which the beavers died was derived from the state of the junction of the epiphysis and diaphysis of the long bones, a joining process that may take as long as twelve years in the beaver's body.[42] The table above (Tab. 4) provides an overview of the state of development of the long bones and vertebrae. The values disclose many long bones with unfinished development, clearly related to the long ontogenetic development of the beaver. No bones were found in the age category from birth until 1.5 years; 21 finds are linked with the following sub-adult age (1.5–3 years); 26 with the young adult age (3–6 years); 31 fall into mid-adulthood (6–9 years); and the bones of animals older than this are represented by 1 find of bones of an animal older than 9 years and 4 finds of animals older than 12 years. Thus, mid-adult bones are the most common, followed by finds in the young adult category.

The age of beavers derived from the timing of the teeth eruption[43] in preserved jaw bones revealed the presence of one six-month-old kit (Fig. 8) with an erupting molar. Lack of abrasion of the lower jawbone and teeth also indicates a juvenile individual (Fig. 9).

42 Fandén 2005, Tab. 9.

43 Ognev 1963.

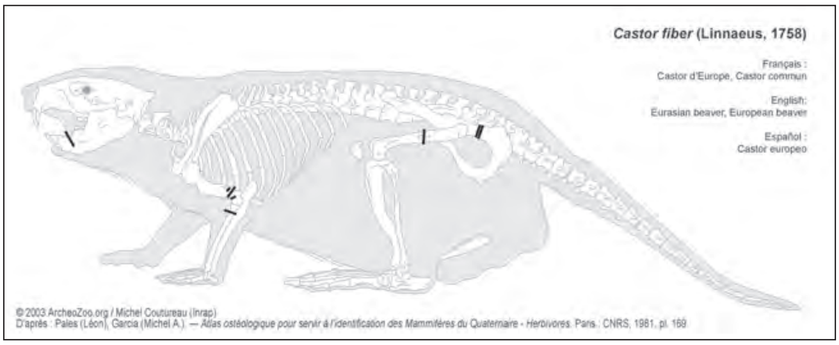

Fig. 10. Summary representation of taphonomic phenomena on beaver skeleton (Source: ArcheoZoo.org, adapted by G. Dreslerová). For absolute numbers see Tab. 5.

	BNV	PSP	Total
Gnawing marks	1	5	**6**
Cut marks	2	5	**7**
Burnt	10	3	**13**
Total	**13**	**13**	**26**

Tab. 5. Taphonomic phenomena on beaver skeleton parts divided into groups. Number of cases: BNV – Břeclav-Na Včelách; PSP – Pohansko northeastern suburbium.

Determination of age based on basal enamel layers of the teeth was not employed,[44] since no tooth found exhibited clear wear.

These age structure findings confirm that beaver hunting at Pohansko did not concentrate upon specific groups but involved animals of all age categories.

Taphonomic Phenomena

The processing of the beaver carcases was, as might be expected, accompanied by post-mortem changes to the bones. An identical number of phenomena were recorded at both sites; however, charred bones prevailed at the Břeclav-Na Včelách (BNV) site, probably burned as fuel, while bones with teeth marks made by carnivores and cutting marks were more common on the Pohansko northeastern suburbium (PSP) site (Tab. 5). Teeth marks were probably made by dogs, whose bones and skeletons are known from Pohansko. We associate the cutting mark on the jaw with skinning,[45] while the frequent findings of cutting marks on nutritionally valuable bones are probably more related to meat consumption (Fig. 10).

4. Discussion

The Great Moravian phase of Pohansko is characterised by a dense network of sunken archaeological features, both in the fortified central area of the complex and in the unfortified suburbiums. Palynological analyses indicate that this period was marked by distinct deforestation, attributed to intense construction of the centre, together with the use and cultivation of the land in the vicinity as well as that farther away.[46] Osteological assemblages from this period are dominated by domestic animals, especially pigs, cattle, sheep, and goats. The proportion of bones of wild animals never exceeds 10 %, while all the fragments of beaver skeletons total only a hundredth of a percent.[47] The same representation of domestic and wild animals in relation to the beaver may be observed in the chronologically identical contexts of neighbouring Mikulčice-Valy[48] and in unfortified rural settlements from the Early Slavic and Early Hillfort periods – and naturally the Great Moravian period as well, investigated both within and beyond the floodplain of the Dyje, the Morava and their tributaries: Břeclav-Pohansko,[49] Břeclav-Líbivá,[50] Břeclav-Lány,[51] Kostice-Zadní hrúd,[52] and Mutěnice-Zbrod.[53] Beaver hunting does not appear to have played a major part in the economies of the cultural centres and rural settlements at these times, either for subsistence or for fur trading. The situation changed completely after the

44 Mayhew 1978. – Mayhew 1979.
45 Reitz, Wing 2008, 128.

46 Macháček et al. 2007. – Dresler, Beran 2019.
47 Dostál 1975. – Dostál 1985. – Vignatiová 1992. – Dreslerová 2018.
48 Kratochvíl 1978. – Chrzanowska, Januszkiewicz-Zalecka 2003. – Chrzanowska, Krupska 2003a. – Chrzanowska, Krupska 2003b.
49 Kratochvíl 1968. – Kratochvíl 1980.
50 Roblíčková 2000.
51 Dreslerová 2018.
52 Dreslerová, Hajnalová, Macháček 2013.
53 Klanica 2008.

depopulation of the centre in the late 9th century or the early 10th century AD. In archaeological contexts, sharp increases in the number of beaver bones in the former Pohansko northeastern suburbium and the new settlement at Břeclav-Na Včelách are observed. What led to this change? Defining the habitat specific to the beaver constitutes a sound first step towards resolving this issue.

4.1. The European Beaver Today

The beaver, Europe's largest indigenous rodent, is exclusively herbivorous, feeding on trees, aquatic plants and herbs growing on the banks of bodies of freshwater.[54] The consumption of these types of vegetation varies with the seasons. In winter, beavers are limited to the tree component of their diet, i.e. outer bark, inner bark (cambium) and twigs from the woody growth on riverbanks. In spring and in the vegetation period, submerged plants and underground tubers are crucial for beavers (knotweed, etc.). A variety of woody plants grows in the immediate surroundings of watercourses in the summer months. Beavers tend to consume largely members of the family Salicaceae *Salix* spp. (willows), *Populus* spp. (poplars/aspens), as well as other hard and soft species. At present, 86 species of trees and 149 species of other plants have been described as parts of the beaver's diet. The choice of food depends on several factors, such as the season, state of the water surface, quality and quantity of edible growth, and the availability and regeneration of plants.[55] The amount and quality of the food correspond to the quantitative characteristics of the population. For example, the extent of family territory is in direct proportion to the extent of growth of preferred trees;[56] where the situation is stable, this reaches a minimum of 1.8 km from the home lodge. In addition, the species mix of trees also appears to influence the number of beavers in a territory. In areas rich in poplar there are, on average, more beavers than in places with willow.[57] Any increase in beaver population increases feeding pressure on growth, perhaps leading to a reduction in preferred plants, acceleration of their decrease at the expense of regeneration, and therefore long-term fluctuations in settlement. However, beavers as such are not, at present, primarily responsible for the disappearance of their food base. Anthropogenic factors play far more damaging roles, such as neglect of riverbank growth, forestry activities, and general interference on the part of local inhabitants.[58]

An increase in the beaver population may be observed at present, since the protection of these animals is anchored in the legislation of the Czech Republic and neighbouring countries, and the study of beaver populations is a subject for state ecological institutions.[59] The adult beaver has only a few natural enemies, such as the wolf (*Canis lupus*), the bear (*Ursus arctos*) and the lynx (*Lynx lynx*), all of them very rare today.[60] In environments where beavers are protected and not subject to predation, the growth of the beaver population depends on the availability of potential habitats. Until appropriate space becomes limited, beaver populations grow rapidly and almost exponentially. When the capacity is exhausted, population densities cease to rise.[61]

To what extent do recent observations, and the ecological requirements of the beaver reflect the past situation in Pohansko and its surroundings? Do the results of the anthracological, archaeobotanical and palynological analyses correspond to an environment appropriate to the occurrence of beavers?

4.2. Surroundings of Pohansko in the Early Medieval Period

The character of the floodplain vegetation in the early Middle Ages is very similar to the vegetation found at the location today. Intensively deforested areas and a mosaic-like structure of forests and meadows, places suitable for growing crops and areas left to natural vegetation preferring a humid and waterlogged environment have been observed. All analysed plant spectra show a heavy human influence.[62]

The palynological analysis shows that the vegetation in the area was typical of a floodplain close to a watercourse (with old channels). Comparing features studied within Pohansko from the pre-Great Moravian period with the Great Moravian period, the landscape appears more forested in the former, with a high proportion of pine. Human impact was higher in the Great Moravian period and was associated with a distinctly lower representation of nitrophile plants (*Chenopodiaceae*, *Artemisia*, *Asteraceae/Liguliflorae*, *Galium*).[63] The regular occurrence of spruce is interesting; its natural occurrence at the confluence of the Dyje and the Morava rivers is detailed on the Pladias database[64] and by studies of the development of forest growths in central Moravia.[65]

54 Heidecke 1989.
55 Heidecke 1989.
56 Fustec et al. 2001.
57 Campbell et al. 2005.
58 Vorel et al. 2013, 22.
59 Vorel et al. 2013.
60 Baker, Hill 2003.
61 Vorel et al. 2013, Fig. 2.
62 Doláková et al. 2020.
63 Doláková, Roszková, Přichystal 2010. – Novák et al. 2017. – Doláková et al. 2020.
64 Pladias 2014–2022.
65 Novák et al. 2017.

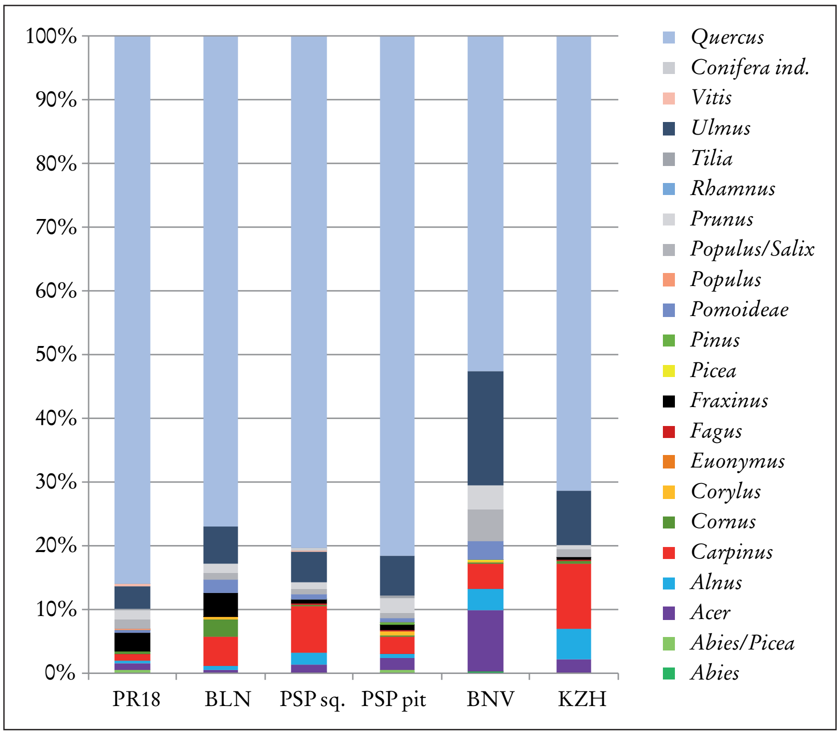

Fig. 11. Pohansko and its surroundings. Comparison of the anthracological spectrum. BNV – Břeclav-Na Včelách; BLN – Břeclav-Lány; KZH – Kostice-Zadní hrúd; PSP sq. – Pohansko northeastern suburbium, settlement layer/square grid; PSP pit – Pohansko northeastern suburbium, pits; PR18 – Pohansko, cross-section through rampart 18 (N=6484) (Graphics: P. Kočár).

A high percentage of walnut pollen is also evident, possibly grown or spread by self-seeding, especially in bright, open, and wet places with a high content of humus, in the vicinity of old river branches.

The small assemblage of charred plant seeds/fruits with a preponderance of millet (*Panicum miliaceum*) and wheat (*Triticum aestivum*) (34 %), while barley (*Hordeum vulgare*) was present in the form of a single caryopsis (2 %), most likely comes from elevated positions within 1 km from where they were transported to the site.

The anthracological spectrum from Břeclav-Na Včelách (BNV) differs from other sites investigated in the region,[66] chiefly in its relatively low proportion of oak and high proportion of other trees (Fig. 3). A relatively distinct proportion of maple and hornbeam indicates the existence of coppices in mesophile forests (oak-hornbeam woodland). The relatively high proportion of poplar/willow group and alder charcoals indicates the exploitation of softwoods and the possible existence of alder coppices. A high proportion of elm charcoals would appear to indicate quite concentrated acquisition of hardwoods for fuel.

It thus appears that inhabitants of the Břeclav-Na Včelách (BNV) settlement acquired most of their firewood from hydrophilic forests not suitable for farming. The specific natural conditions and the situation near a river meant that they probably had at their disposal insufficient areas of mesophilic forests for any intensive management of oak-hornbeam woodland. This, for example, might have arisen out of the fact that a major part of the mesophilic forest area had been felled and the land used for farming.

At the other anthracologically investigated sites in the region (Fig. 11)[67] we either observe a balanced proportion of the indicators of mesophile oak-hornbeam woodland and hydrophile alluvial forests (PSP, BLN), or the dominance of the indicators of mesophile oak-hornbeam woodland (KZH). The sample from cross-section PR18 of rampart construction and destruction at Pohansko is heavily affected by the presence of burnt timber. There is an obvious

66 Doláková et al. 2020.

67 Doláková et al. 2020.

dominance of quality hard wood suitable for the building of wood-earth ramparts (oak, elm admixture).

4.3. European Beaver in Early Medieval Economics and Trade

Apparently, the landscape was relatively favourable for the burgeoning beaver population. Palynological and anthracological analysis shows enough trees, especially softwoods, and a wide range of plants on the riverbanks. It also included poplars, the most sought-after source of food. However, their real volume is usually underestimated in pollen spectrums (sediments do not preserve pollen grains well). Among the anthracological finds, these trees are represented by as much as 5 %.

Existing osteological analyses that map the occurrence of beaver bones in settlement contexts of prehistory and the Middle Ages of central Europe reflect beaver hunting as a more or less random activity.[68] The situation at Pohansko and Břeclav-Na Včelách testifies to the inhabitants' completely different approach to hunting. The range of the beaver bone fragments excavated shows that beavers of all age categories were hunted, with sub-adult individuals prevailing. This age composition does not correspond to the age structure of beaver families, which consist of parents and two or three generations of kits, i.e. juvenile animals expelled from the immediate lodge after reaching adulthood.[69] It seems that Pohansko hunters selected adult and bigger animals rather than hunting whole beaver families. This may have been associated with demand for fur, the size of which is proportionate to the animal's age and reaches its maximum by the third year,[70] and thus its maximum market value. Historical sources from the western, northern and eastern early medieval Europe convey the use of beaver fur as a commodity and exchange article. For example, in Pułtusk (Poland) beaver furs were used to pay levies and rent, the rate being 10 for the prince to 50 for sale.[71] Beaver fur was considered a luxurious and expensive commodity in early medieval Europe. Because we lack information about the value of beaver fur in our area, we had to find information about their real monetary value in other areas of Europe. Detailed records come from Wales from the year 940, with listed prices for furs of different species. Beaver was valued at 120 pence/dinars, which was five times more than weasel and ten times more than otter.[72] High prices led to intensive beaver hunting, and the rarer the beaver became, the more the price rose; beavers became rare in England in the late 10th century AD.[73]

Demand for high-quality beaver fur, especially in black, is known from Polish written sources from the 11th–14th centuries AD. Specialised breeders (*bobrovniks*) emerged, originally known as "the guardians of the beavers" (*cum castoribus et eorum custodibus*). Their role was to breed beavers and manage the subsequent production of fur. *Bobrovniks* feature regularly in lists of providers supplying the monasteries in Lubiąż, Mogilno and Ląd, as well as major churches – Gnezdno, Trzebnica and Włocławek (all Poland). As late as 1229 AD, a beaver breeding station with 251 beavers existed not far from Pułtusk (Poland), administered by Jaszko de Maków. He complained that the beavers needed a vast amount of maple.[74] When addressing *bobrovniks* and specialised breeding, Polish researchers refer to archaeozoological analyses from the northwest of Russia, where beaver bones feature in large quantities at various sites in 11th–12th-century AD layers, making up as much as 40 % of the hunted fauna, e.g. Psków (48.6 %), Voiščina (46.6 %: 90 fragments of beaver bones out of 193 fragments of the hunted fauna), Kamno (37.1 %), Staraja Ladoga (37.7 %); in other areas the proportion of beaver bones varies between 14 % and 25 %.[75] Recent research at the Minino site (Russia) identified wild fauna in osteology assemblages from the 11th to 13th centuries AD at 58–73 %. Wild fauna is mostly represented by beaver, squirrel, marten, and other fur species. Beaver is represented at 38–67 % of the wild animal bone fragments (1583 fragments) or 22–42 % of the total number of 2451 identified bone fragments.[76] A similar situation was recently observed in Estonia and Latvia, where beaver bones were observed at 26–46 % among wild animal bones, and from the Russian settlement Krutik in the Vepsa region, near Beloye Lake, where beaver bones represent almost 97 % of the wild animal bones.[77] These proportions of beaver bones come close to the data from Břeclav/Pohansko northeastern suburbium and Břeclav-Na Včelách. As a result, specialised management of beavers cannot be ruled out. Unfortunately for us, Polish and Russian assemblages of beaver bones from archaeological contexts have not been analysed by age. It is therefore not possible to decide whether they are the remains of hunting or breeding.

68 Kyselý 2005.
69 Vorel et al. 2013, 20.
70 Larson, van Nostrand 1968, Fig. 1.
71 Zwolińska 1969, 30–31.
72 Wade-Evans 1909, 98.
73 Conroy, Kitchener 1996, 10.
74 Zwolińska 1969, 31.
75 Sedov 1960, 77. – Hensel 1965.
76 Maltby 2012.
77 Luik 2010, 447.

Who were the target customers for this specific economic activity, and how was it financially underwritten? In the first half of the 10th century AD, the central Danubian region was under the political and military influence of Hungarian nomads. Contacts between inhabitants of the Břeclav-Na Včelách settlement and this ethnic group are confirmed by the find of a semicircular pendant and a bag fitting.[78] The chronological classification of the Břeclav-Na Včelách settlement points towards the period when the Hungarians suffered a serious defeat in the Battle of Lechfeld in 955 AD. After this event, and later after the baptism of Grand Duke Gejza in 973 AD, the central Danubian region was again open to trade, having been (previously?) closed for over fifty years.[79] The absence of dinars and their imitations in the former northeastern suburbium of Pohansko and Břeclav-Na Včelách confirms the older dating of both settlements, and that settlement there did not last until the last quarter of the 10th century AD. It cannot be ruled out that beaver fur production was intended for trade, in which case it was possibly based on non-monetary exchange. Judging by later analogies, payment of levies through special kinds of natural products can be presumed; see Pułtusk. But to whom? To local elites, the Hungarians or to the Přemyslids who, according to Martin Wihoda, might have become the new rulers of south Moravia soon after the Battle of Lechfeld in 955 AD?[80] Archaeological finds from Great Moravian graves from Staré Město-Na Valách[81] and from the late 10th century AD in Starigard/Oldenburg[82] bear witness to the use of beaver furs as items of clothing. Nonetheless, beaver hunting and possible breeding in Pohansko and Břeclav-Na Včelách did not continue and features from the beginning of the last quarter of the 10th century and from the 11th century AD from the not too distant settlement in Kostice-Zadní hrúd contained no beaver bones, although the proportion of fauna hunted was considerably higher there than at other sites from the same period.[83] Again, the occurrence of beavers is only evidenced by a single bone from the last phase of the existence of the Kostice settlement, i.e. from the 12th century AD (Tab. 3).

5. Conclusion

During the first half of the 10th century AD, the former northeastern suburbium of Pohansko near Břeclav, a Great Moravian fortified settlement, and in the second half of the 10th century AD, the newly established settlement of Břeclav-Na Včelách, saw the development of a highly specific economic system based on hunting, and perhaps also breeding, beavers. This was probably facilitated by a change in the use of the surrounding landscape and the natural environment of the former Great Moravian centre, resulting from a nearly complete depopulation of the large complex, covering 55 ha with more than 2000 inhabitants. The surroundings of the centre, until then intensively exploited and deforested to acquire firewood, food and pasture, became forested again with self-seeding species highly appropriate to beaver life: poplar, alder, willow, maple, etc. At the Břeclav-Na Včelách settlement, natural conditions were completely unsuitable for farming, but the composition of trees was ideal for beavers and hunting, rather than breeding, of the same. Cereals and crops yielded by the cultural layer of the site were probably not grown nearby but in more distant locations, and were transported to the site not completely cleaned, as can be deduced from finds of some field weeds.

The Pohansko northeastern suburbium and Břeclav-Na Včelách settlements were radiocarbon dated to a period marked by distinct political turbulence, when even the neighbouring lands were under the influence of the Hungarians. Although after the defeat in the Battle of Lechfeld in 955 AD, south Moravia is believed to have fallen under the influence and rule of Přemyslid princes, it is not clear for whom the furs were intended. Earlier and more recent archaeological sources related to the observed area show no direct evidence of them being worn, nor are links with trade proven. The occurrence of beavers might thus have been associated with changes in the landscape, in the economy or in the geopolitical situation.

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Neue Erkenntnisse zur Geschichte der Kirche St. Valentin in Schlaneid (Südtirol)

Günther Kaufmann
Andreas Putzer

Zusammenfassung
Unterhalb des Dorfes Schlaneid liegt im Valteswald die Ruine der St.-Valentin-Kirche, die bereits 2015 von den Verfassern publiziert wurde. Neue ^{14}C-Datierungen geben Anlass zu einer Neubearbeitung. Die Kirchenruine baut auf einer Brandschicht aus der späten Kaiserzeit/Spätantike auf. Zeitlich folgt eine Bestattung aus dem Frühmittelalter. Die bisher angenommenen Holzkirchen konnten nicht bestätigt werden, ein (spätantiker-)frühmittelalterlicher Holzbau ist aber nach wie vor anzunehmen. Der älteste gesicherte Kirchenbau (Phase A) ist eine Steinkirche aus der Karolingerzeit, am ehesten aus dem Zeitraum 775–890. Im Hochmittelalter wurde die Kirche neu errichtet. Die romanische Bauphase B datiert in die ersten Jahrzehnte des 12. Jahrhunderts, vielleicht um 1120. Im Spätmittelalter und in der frühen Neuzeit wurden nur mehr Umbauarbeiten (Phase C) vorgenommen. Die Freskomalerei (Phase C1) ist vor/um 1330/40 zu datieren. Der Bau des glockenturmartigen Aufsatzes (Phase C2) sollte in etwa 1397–1469 geschehen sein. Die spätgotische Erneuerung der romanischen Süd-, West- und teilweise Nordmauer mit Guss eines neuen Estrichs (Phase C3) wurde wahrscheinlich im ersten Viertel des 16. Jahrhunderts vollzogen. Nach 1557 sollten der Estrich erneuert und ein neuer Seitenaltar (Phase C4) eingebaut worden sein. Der Abbau der Kirche (Phase D) erfolgte 1769/70, seitdem verfiel sie zur Ruine.

Schlüsselbegriffe
Kirche, Frühmittelalter, Karolinger, Hochmittelalter, Romanik, Spätmittelalter, Gotik, Neuzeit

Abstract – *New Findings on the History of the Church of St. Valentine in Schlaneid (South Tyrol)*

Close to the village of Schlaneid in the 'Valtes Forest' lies the ruin of St. Valentin's church, already published in 2015 by the authors. New radiocarbon dating gave reason to review the interpretation of the different archaeological phases. The ruin of the church lies above a charcoal layer of the Late Roman Age/Late Antiquity, followed chronologically by a burial from the Middle Ages. The previously postulated wooden churches can no longer be confirmed, although a timber building from Late Antiquity or the Early Middle Ages is presumed. The oldest assured church building (Phase A) is a Carolingian stone church, most likely from 775–890 AD. In the High Middle Ages the church was re-edified. The Romanesque Phase B dates to the first decades of the 12th century AD, probably around 1120. During the Late Middle Ages and the Early Modern Age (Phase C) only remodelling occurred. The fresco painting (Phase C1) happened around 1330/40 AD. The erection of a bell tower (Phase C2) occurred around 1397–1469 AD. The Late Gothic renewal of the Romanic South, West and parts of the North wall with the casting of a new floor screed (Phase C3) was undertaken in the first quarter of the 16th century AD. After 1557 a new side altar and a new floor screed (Phase C4) were incorporated. The dismantling of the church (Phase D) took place in 1769/70, since when the church has decayed to a ruin.

Keywords
Church, Early Middle Ages, Carolingian, High Middle Ages, Romanesque period, Late Middle Ages, Gothic period, Modern Age

1. Topographische Vorbemerkungen

Das mittlere Etschtal zwischen Bozen und Meran ist ein breites U-förmiges Tal mit steilen Hängen und darüber liegenden weiten Mittelgebirgslandschaften an beiden Seiten. An der östlichen Seite befindet sich der sogenannte Tschögglberg; auf diesem Mittelgebirge wiederum die Gemeinde Mölten. Das kleine Dorf Schlaneid ist ein Ortsteil von Mölten und liegt auf 1160 m Seehöhe.

Etwas unterhalb des heutigen Dorfkerns von Schlaneid, einen halben Kilometer Luftlinie nordwestlich, erstreckt sich eine kleine Terrasse. Diese ist zum Abbruch gegen das Etschtal hin bewaldet, der Wald heißt heute noch Valteswald (Grundparzellen 1515, 1516). Die Wiesenflächen im Sattelgelände scheinen im Maria-Theresianischen Kataster von 1777 als Valentins-Acker auf (Grundparzellen 1518, 1519) oder heißen heute noch Valteswiese (Grundparzelle 1517).[1] Das Waldgelände ist vom anstehenden Porphyrfels geprägt,

1 Südtiroler Landesarchiv: Rustikalsteuer-Kataster (1777), Gericht Mölten, Kat.-Nr. 290.

Abb. 1. Lage der alten St.-Valentin-Kirche auf dem Tschögglberg bei Schlaneid, Gemeinde Mölten (mit freundlicher Genehmigung von Karl Gruber).

der nach Westen hin steil abfällt. Dort, an der Abbruchkante zum Etschtal, liegt die Valteskirche, die Ruine der ehemaligen St.-Valentin-Kirche (Grundparzellen 1515, 1516) auf 1110 m Seehöhe (Abb. 1). Sie liegt auf einer leichten Erhebung, der geologische Untergrund besteht aus Bozner Quarzporphyr, das felsige Gelände trägt nur eine dünne Humusdecke. Vom Vorplatz der Kirche hat man einen hervorragenden Ausblick über das mittlere Etschtal und auf die gegenüber liegende Mittelgebirgsterrasse von Prissian und Tisens.

Bis 1964 gehörte das Etschtal südlich von Meran zur Diözese Trient, wurde dann aber der Diözese Bozen-Brixen zugewiesen.[2] Schlaneid war früher also Trienter Bistumsgebiet.

2. Forschungsgeschichte

In der Landesbeschreibung Südtirols, verfasst um 1600 von Marx Sittich von Wolkenstein, finden die beiden Kirchen St. Ulrich und St. Valentin in Schlaneid zwar Erwähnung, sind darin aber nicht näher beschrieben.[3]

Bei der Kirchenruine im Valteswald handelt es sich um den Vorgängerbau der heutigen St.-Valentin-Kirche im Dorfzentrum von Schlaneid. Letztere ist ein Neubau von 1770 und wurde 1771 geweiht.[4] Die Ruine der alten St.-Valentin-Kirche besteht aus einem rechteckigen Saal mit ostseitiger Rundbogenapsis, sie wurde aus kunsthistorischer Sicht wegen des Grundrisses als romanischer Bau aus dem 12./13. Jahrhundert interpretiert.

2 Dörrer 1953. – Dörrer 1967. – Dörrer 1971. – Dörrer 1972. – Kaufmann 2009, 31–35.

3 von Wolkenstein 1936, 238: „Mer hat es ein perg oder torf, haist auf Schleineyt, hat auch 2 capellen zue, die ain bey San Ullricht, ligt ob den dorf, die ander bey San Valthin.“

4 Pfarrarchiv Mölten: Position 213, 1768–1771, Errichtung der Kirche zu den Hll. Laurentius und Valentin in Schlaneid 1770 XII 12; enthält unter anderem Abbruch- und Baugenehmigung, Weihe 1771 II 14. Unser Dank gilt dem Pfarrverantwortlichen Alfons Stanger für die Ablichtung der Dokumente. – Schwarz 1990, 121.

Als erster Kunsthistoriker beschrieb Karl Atz 1862 die „in Trümmer liegend[e]“ Kirche als „der romanischen Bauperiode“ angehörend.[5]

Nach der Jahrhundertwende äußerte er sich zusammen mit Adelgott Schatz wieder über die Ruine: „Man sieht nur mehr die Grundmauern, welche ein fast quadratisches Schiff mit einer halbkreisförmigen Apsis deutlich erkennen lassen. Der Bau kann wenigstens ins 13. Jahrhundert versetzt werden.“[6]

Auch Josef Weingartner hat 1929 die Ruine kurz behandelt: „Von der alten Kirche auf einem nördlich gelegenen Waldhügel nur noch die Grundmauern mit abgesetzter Rundapsis sichtbar. XII. oder XIII. Jahrhundert.“ Sowohl in dieser ersten Auflage von 1929 als auch noch in der von Magdalena Hörmann-Weingartner 1991 herausgegebenen siebten Auflage wird die heutige Kirche im Dorfzentrum von Schlaneid fälschlicherweise als Bau aus der Zeit um 1500 mit Erweiterung des 17. Jahrhunderts angegeben.[7]

Diesen Fehler hat Josef Schwarz bereits 1973 berichtigt und auch gleich die Erklärung für den Fehlschluss mitgeliefert: „In Schlaneid finden wir ganz unten am Rande des steilen Felsabhanges gegen das Etschtal die Überreste einer Wallburg. Gegen Westen hin findet sich eine Kirchenruine von der alten Valentinskirche. Patron ist der Bischof und Glaubensbote St. Valentin von Rätien, dem in Südtirol 19 Kirchen und Kapellen geweiht sind. Die übriggebliebenen Mauern deuten auf einen romanischen Bau hin. Zu dieser ‚Valteskirche‘ wurden Bittprozessionen gemacht gegen die Fallsucht. Im 15. Jahrhundert wurde die Kirche erneuert und ein gotisches steingerahmtes Spitzbogenportal eingesetzt. Weil die Bauernhöfe weiter oben gelegen sind, das Kirchlein aber ganz unten am Rand des abschüssigen Berges, bat man das Ordinariat, die Kirche abreißen und oben mitten im Dorf neu bauen zu dürfen. Es wurde bewilligt. Die Schlaneider haben es gründlich gemacht. Teile der Kirche, wie das Portal, verwendeten sie für die neue Kirche. Im Herbst 1770 meldeten sie, der Bau sei fertig und am 14. Februar 1771 war Kirchweihe.“[8] Dies ist auch in seiner von Richard Furggler und Anton Oberkofler bearbeiteten und 1990 – also zehn Jahre nach seinem Tod – herausgegebenen Chronik von Mölten nochmals wiederholt. Darin orakelt er auch: „Wenn man die Ruine bloßlegen könnte, dürfte noch manches Interessante gefunden werden.“[9]

Leo Andergassen hat sich im Rahmen eines Kirchenführers von Mölten 1993 kurz mit St. Valentin befasst und vor allem eine Umbauphase des 14. Jahrhunderts herausgestellt: „Die Apsis der kleinen Valentinskirche wurde wohl im 14. Jahrhundert mit einem weiteren Mauerring verstärkt; niedere Strebemauern bildeten ein Widerlager zum Konchenschub. Die gesamte Apsiskonche wurde mit Wandmalereien versehen. Die wenigen Spuren erlauben jedoch die Rekonstruktion des Programms. Über einer Sockelzone, geziert von dreipassförmigen Kleeblättern, standen die zwölf Apostel. In der Konche ist gewohnheitsmäßig Christus als Weltenrichter in der Mandorla anzusiedeln, flankiert von den Evangelistensymbolen. An der südlichen Apsidenseite war eine Nische zum Ablegen des Altargeräts ausgespart.“[10]

Im Jahr 1990 – nach über einem Jahrhundert Befassung durch die Kunstgeschichte – hat die Archäologie begonnen, sich mit der Ruine auseinanderzusetzen. Das Amt für Bodendenkmäler der Autonomen Provinz Bozen führte nämlich unter der Leitung von Hans Nothdurfter und Alois Stuppner in den Jahren 1990 und 1991 archäologische Untersuchungen an der Kirchenruine durch (Abb. 2). Die Initiative dazu ging von dem damaligen Kulturassessor der Gemeinde Mölten, Franz Josef Karnutsch, aus.[11] Die erste Grabungskampagne im Oktober 1990 war dem Wegräumen des Bauschutts und der Ausgrabung im Kircheninneren sowie außen im Südosten der Apsis gewidmet.[12] Die zweite Grabungskampagne von Ende August bis September 1991 konzentrierte sich auf die Bereiche außen an der Süd- und Nordmauer sowie im Nordosten der Apsis.[13] Hans Nothdurfter hat darüber im Tätigkeitsbericht der Abteilung

5 Atz 1862, 41: „Die Kirchlein zum hl. Valentin in Schlaneid, nun in Trümmer liegend, zum hl. Ulrich über dem Pfarrdorfe und zum hl. Georg in Versein gehören der romanischen Bauperiode an.“

6 Atz, Schatz 1903, 323: „St. Valentin in Schlaneid, auf einem aussichtsreichen Punkte, Slaneit im Urbar Meinhards II. um 1286, eine halbe Stunde westlich vom Pfarrdorfe mit 34 Häusern und einer leichten Schwefelquelle, die von der Umgegend benützt wird. Das Kirchlein des Weilers ist unansehnlich, stammt aus neuerer Zeit, die alte nördlich auf einem freien Hügel, jetzt im Walde gelegene, ist verlassen worden. Man sieht nur mehr die Grundmauern, welche ein fast quadratisches Schiff mit einer halbkreisförmigen Apsis deutlich erkennen lassen. Der Bau kann wenigstens ins 13. Jahrhundert versetzt werden; sind ja fast alle St. Valentinskirchen im Lande sehr alt. Während der Sommermonate werden hier sechs Wetterämter abgehalten; eine förmliche Stiftung hiezu besteht aber nicht.“

7 Weingartner 1929, 81–82. – Weingartner 1991, 186: „Von der ursprünglichen romanischen Kirche haben sich auf einem nahen Waldhügel die Grundmauern mit abgesetzter Rundapsis erhalten.“

8 Schwarz 1973, 369.

9 Schwarz 1990, 108–110.

10 Andergassen 1993, 22–25, bes. 23 (Zitat).

11 Nothdurfter, Stuppner o. J., 1.

12 Laut Grabungsprotokoll 1990 dauerten die Ausgrabungen vom 1. bis zum 24. Oktober 1990, daran teilgenommen haben: Hans Nothdurfter, Alois Stuppner, Albert Brunner, Alois Winkler, Alois Erlacher, Alexander Erlacher, Karl Höller, Hermann Schötzer und Anke Stampfer.

13 Nothdurfter, Stuppner o. J., 1.

Abb. 2. Die Ruine von St. Valentin bei Schlaneid, erhaltene Bausubstanz im Jahr 1990 (mit freundlicher Genehmigung von Hans Nothdurfter und Alois Stuppner).

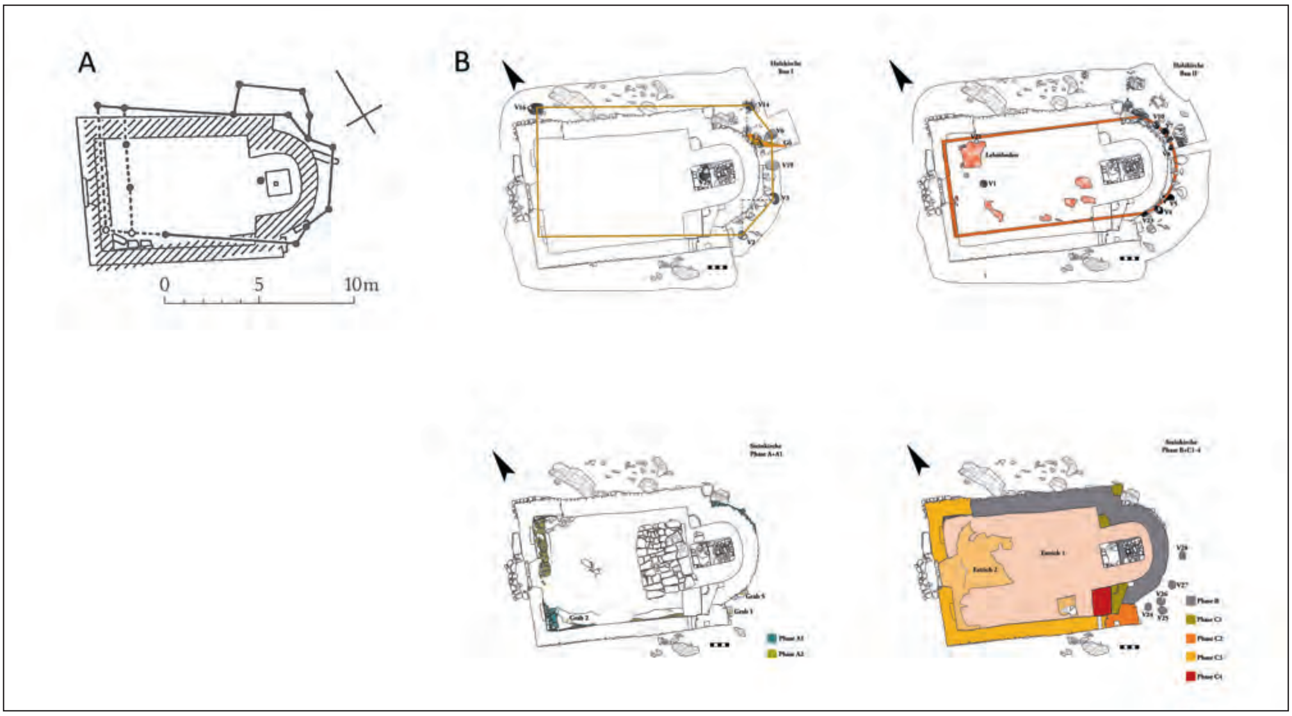

Abb. 3. St. Valentin, Interpretation nach Nothdurfter 2003 (A) und nach Putzer/Kaufmann 2015 (B). Maßstab 1 : 400 (Grafik: G. Kaufmann).

Denkmalpflege kurz bekanntgegeben: „Im sogenannten ‚Valteswald' (Valentinswald) in Schlaneid wurde unter einem baumbestandenen Steintrümmerhaufen eine Kirche aus dem 12. Jh. mit gotischen Erweiterungen nach Westen freigelegt. Diesem Bau gingen mindestens zwei schwer in Phasen zu gliedernde Holzbauten voraus, die wohl in frühbairische Zeit zurückreichen."[14]

Im Jahr 2003 hat sich Nothdurfter nochmals eingehender mit der Grabung befasst. In seinem Beitrag über die Kirchenbauten Südtirols im Katalog der frühen Kirchen im östlichen Alpengebiet stellt er St. Valentin in Schlaneid anhand einer Karteikarte vor (Abb. 3A). Er unterscheidet zwei Bauphasen: Bau I: Holzkirche mit trapezförmigem Chor, Vorhalle und Nebenraum; Bau II: Saalkirche mit eingezogener hufeisenförmiger Apsis. Die Rekonstruktion von Bau I gibt er als hypothetisch an, vermutet einen Stabwandbau mit Pfosten und Schwellriegel und datiert ihn aufgrund der Größe in das 8./9. Jahrhundert. Bau II hingegen mit Flächenputz außen und innen an der Apsis, Malerei und Lehmfußboden im Schiff sowie Gräbern an der Südmauer innen und an der Apsis außen datiert er aufgrund der hufeisenförmigen Apsis und der nicht im Winkel errichteten Mauern in das 10. Jahrhundert. Neben diesen beiden frühen Bauphasen beschreibt er noch spätere Umbauten: „Die Romanik errichtet denn auch die S- und W-Mauer sowie den Triumphbogen neu und bringt mehrfach Korrekturen an Apsis und Choreinzug sowie an der N-Mauer des Schiffes an. Eingriffe der späten Gotik, im Zusammenhang mit Einbau des Portals sind an der NW- und SW-Ecke des Schiffes fassbar."[15] Die bereits 2003 vorgestellte Rekonstruktion wurde nochmals 2017 in neu gezeichneter Form in einem Bildband von Karl Gruber und Hans Nothdurfter abgedruckt und dabei wurde der erste Steinbau mit den Langobarden in Verbindung gebracht.[16]

In der Festschrift zum 75. Geburtstag von Hans Nothdurfter haben wir uns 2015 erstmals mit der Grabung von St. Valentin befasst (Abb. 3B). Wir unterschieden zwei frühmittelalterliche Holzkirchenbauten. Die Holzkirche Bau I mit trapezförmigem Chor datierten wir in die zweite Hälfte des 7. Jahrhunderts bzw. spätestens in die erste Hälfte des 8. Jahrhunderts, historisch aber ordneten wir sie als bairische Eigenkirche in die 660er-Jahre ein. Die Holzkirche Bau II mit nicht eingezogener Rundbogenapsis datierten wir in das 8. Jahrhundert und verbanden sie mit der Eigenkirche eines bairischen Adeligen aus der Mitte der 760er-Jahre. Des Weiteren unterschieden wir drei Hauptphasen mit Unterphasen von Steinkirchen (A, B, C). Die Steinkirche A1 mit Rechtecksaal und eingezogener, innen gestelzter Rundbogenapsis, Steinplattenboden, Freskoausmalung und Bestattungen innen an der Südmauer und außen an der Apsis datierten wir in das 8./9. Jahrhundert und verbanden sie mit einem karolingischen Amtsträger aus den letzten 780er-Jahren. Die Steinkirche A2 erfassten wir lediglich als Erneuerung der West- und Südmauer und datierten sie noch in karolingische(-ottonische) Zeit, also in das 9.(/10.) Jahrhundert. Die Steinkirche B, den romanischen Bau mit Blockaltar, datierten wir aufgrund des Grundrisses und der Mauertechnik in das frühe 12. Jahrhundert. Die Steinkirche C mit den vier Umbauphasen (C1–C4) interpretierten wir als gotische bis frühbarocke Adaptierungen des romanischen Baus. Die Phase C1 mit dem Einzug von Strebeecken bzw. des Triumphbogens und der Nordostecke außen wurde von uns in die erste Hälfte des 14. Jahrhunderts datiert. Die Phase C2 mit der Errichtung des glockenturmartigen Aufsatzes wiesen wir der zweiten Hälfte des 15. Jahrhunderts zu. Die Phase C3 mit Neuerrichtung der Süd- und Westmauer sowie mit Estrich 2 datierten wir um 1500 bzw. in die erste Hälfte des 16. Jahrhunderts. Die Phase C4 mit Errichtung des Seitenaltars und Erneuerung des Bodens (Estrich 1) ordneten wir noch in das späte 16. Jahrhundert ein.[17]

Nach diesem Aufsatz wurden allerdings vom Südtiroler Archäologiemuseum neue Radiokohlenstoff-Datierungen in Auftrag gegeben, die eine Neubewertung der verschiedenen Phasen erfordern. Hier soll deshalb unter Berücksichtigung der gesamten Grabungsdokumentation nochmals ausführlich darauf eingegangen werden, auch um einige Richtigstellungen vorzunehmen.

3. Vorkirchenzeitliche Nutzungsphasen

Auf derselben Terrasse wie St. Valentin liegt gut 120 m Luftlinie südlich bis südöstlich der Kirche auf 1100 m Seehöhe eine Hügelkuppe mit verstürztem steinernem Ringwall (Abb. 4). Es handelt sich hierbei um eine urgeschichtliche befestigte Höhensiedlung. Bereits Josef Saxl, Georg Innerebner, Josef Schwarz und Eckehart Schubert haben auf diese Wallburg aufmerksam gemacht. Der Lehrer von Perdonig, Josef Saxl, hat zudem anlässlich eines Sommerurlaubs 1923 eine erfolgreiche Schürfung vorgenommen: „Nach mehreren nur oberflächlichen Grabungen fielen mir aber doch einige prähistorische Topfscherben in die Hände."[18] Die wenigen Funde hat Saxl im November 1930

14 Nothdurfter 1997.

15 Nothdurfter 2003b, 332–333.

16 Gruber, Nothdurfter 2017, 152–153. – Vgl. dazu die Rezension Kaufmann 2018a, 76–77.

17 Putzer, Kaufmann 2015.

18 Saxl 1923.

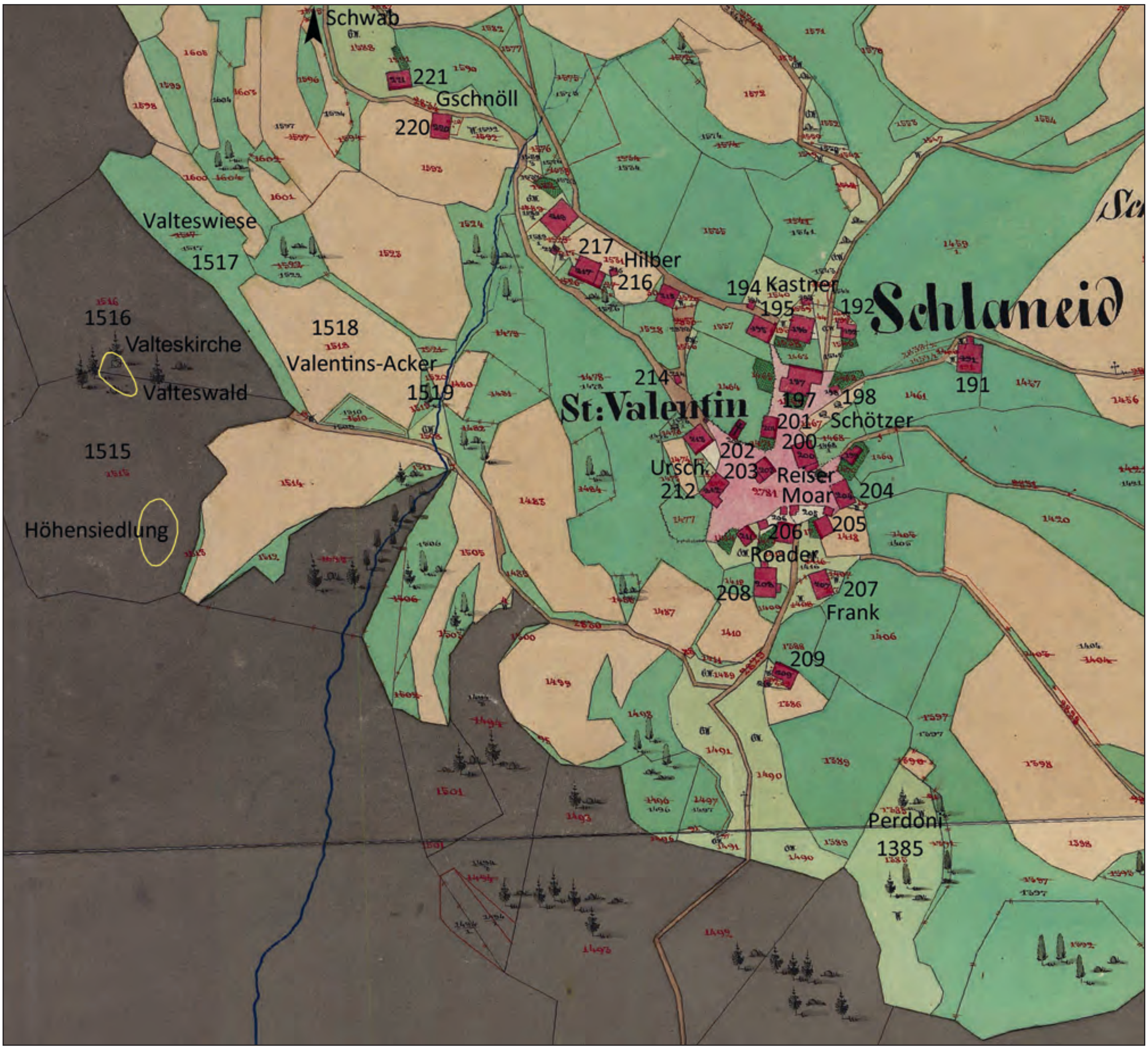

Abb. 4. Schlaneid, das Dorf mit der heutigen St.-Valentin-Kirche (Bauparzelle 202) und der Flur Perdoni (Grundparzelle 1385), der Valteswald mit der St.-Valentin-Ruine (Grundparzelle 1516) und der befestigten Hügelsiedlung (Grundparzelle 1515), Katastermappe von 1858. Maßstab 1 : 5000 (Grundlagenkarte mit freundlicher Genehmigung Autonome Provinz Bozen – 41.2. Inspektorat für den Kataster).

dem Bozner Stadtmuseum übergeben, wo sie nach wie vor aufbewahrt werden.[19] Außerdem hat Georg Innerebner die Wallburg Valtlwald in seinen Katalog aufgenommen.[20] Und auch er hat wohl Grabungen vorgenommen, denn im Bozner Museum liegt ein stark korrodiertes Bronzestück auf.[21] Auch Josef Schwarz und Eckehart Schubert erwähnen die Wallburg Valteswald/Valtlwald.[22] Außer den oben genannten Funden und einer kleinen Feuersteinklinge (Abb. 5), die Helmut Moser im Oktober 1990 auf der Höhensied-

19 Stadtmuseum Bozen, Inventar Nr. 767, Mölten, St. Valentin: Scherben, 1 Bronzering, MVB Nov. 1930 übergeben von Lehrer Saxl. Heute werden in der Kiste 1 Burggrafenamt-Mölten, Schachtel 20 das Randfragment RA ML 3 (767) und unter RA ML 4 vier weitere atypische Scherben aufbewahrt.
20 Innerebner 1957, 467, Nr. 110.

21 Stadtmuseum Bozen, Kiste 1 Burggrafenamt-Mölten, Schachtel 20, RA ML 5 (I 1643). Das Bronzestück trägt noch die alte Inventarnummer der Sammlung Innerebner I 1643.
22 Schwarz 1973, 369. – Schwarz 1990, 108. – Schubert 1991, 495, Nr. 29.

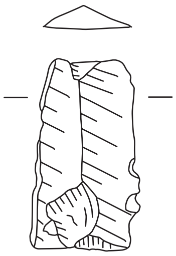

Abb. 5. Schlaneid, Höhensiedlung/Wallburg Valteswald. Silexklinge. Maßstab 1 : 1 (Zeichnung: G. Kaufmann).

lung fand, sind bisher keine weiteren Funde bekannt. Der Datierungsrahmen muss daher mit der Angabe Bronzezeit bis Eisenzeit äußerst weit bleiben. Die Terrasse war jedenfalls in den vorchristlichen Jahrhunderten/Jahrtausenden besiedelt.

Der Name Schlaneid, 1288 erstmals als *Slaneik* in einem Urbar Meinhards II. schriftlich erwähnt,[23] weist ebenfalls auf eine lange Kontinuität. Schon Karl Finsterwalder dachte an einen römischen Prädialnamen, den er von *Aesculanus oder *Osculanus ableitete und als „Grundbesitz des Aesculanus" deutete.[24] Doch leider gibt es in den erhaltenen römischen Schriftquellen weder den einen noch den anderen Personennamen.[25] Es ist zwar sehr wahrscheinlich, dass Toponyme mit Endung auf *-īcum/-īca* lateinischen/römischen Ursprungs sind, sie müssen es aber nicht zwangsläufig sein. Sie könnten auch aus einer anderen indogermanischen Sprache stammen und erst in einem zweiten Moment in das regionale Lateinische entlehnt worden sein. Der Name Schlaneid könnte damit auch latènezeitlich, aber nicht rätisch sein; oder aber – wohl doch eher – frühkaiserzeitlich. Dieser frühe Ursprung des Namens und vor allem seine Überlieferung bis heute weisen auf eine lange Kontinuität vor Ort hin. Die Terrassen von Schlaneid müssen also ohne längere Unterbrechungen von Menschen benutzt und besiedelt worden sein.

Die archäologische Ausgrabung auf dem Areal der St.-Valentin-Ruine hat weitere Hinweise auf vorkirchenzeitliche Phasen ergeben, obwohl die Kirchenmauern bzw. deren Fundamente mehr oder weniger direkt auf dem anstehenden Porphyrfels oder dessen Verwitterungserde aufgesetzt sind und damit ältere Befunde getilgt haben sollten. Die Grabung lieferte unmittelbar auf diesem Fels einen Hinweis auf eine vorkirchenzeitliche Phase. In Planum 5 (Taf. 5) im Kircheninneren, 70 cm östlich des nördlichen Türgewändes in +137 cm Höhe, wurde ein 20 × 20 cm großer rundlicher Fleck Branderde „als braune Erde mit sehr viel Holzkohle" dokumentiert, der auf der Verwitterungserde bzw. auf dem anstehenden Fels aufliegt (Abb. 6). Auf der Planzeichnung (Planum 5) ist er als Probe Nr. 2 eingetragen, im Grabungstagebuch auch als Fundnummer (= FN) 29. Dieser Brandfleck wurde von uns 2015 noch fälschlicherweise als Brandschicht des zweiten Holzkirchenbaus interpretiert.[26] Eine Radiokohlenstoff-Datierung der Holzkohle (LTL16660A) im Labor CEDAD der Universität von Lecce hat nun das Alter 235–425 calAD (95,4 %) ergeben (Tab. 1). Damit ist der älteste, direkt auf der Verwitterungserde und dem Fels liegende Horizont in die späte Kaiserzeit/Spätantike zu datieren.

Auf demselben Planum 5 liegt 1,50 m weiter nördlich noch ein kleiner länglich-ovaler Brandfleck (15 × 7 cm) auf der hellbraunen lehmigen Verwitterungserde. Fast 80 cm südöstlich von Probe Nr. 2 gibt es direkt auf dem Porphyrfels, in +161 cm Höhe, den als Verfärbung V1 (Planum 4, Taf. 4) dokumentierten rundlichen Brandfleck (42 × 38 cm) von 4 cm Dicke. In Profil P2 (Taf. 6) ist 90 cm südlich der Südmauer direkt auf dem Fels über eine Länge von 20 cm eine 1 cm dünne Schicht „grau-schwarzer Erde vermischt mit Holzkohle" (2) dokumentiert. In der Südwestecke des Kirchensaals (Planum 2, Taf. 2) sind drei Brandflecken auf dem hellbraunen Grundlehm, unmittelbar über dem Fels, eingetragen. In der Südostecke des Kirchensaals (Planum 2) hat man auf dem Fels bzw. auf der lehmigen, mit Porphyrderivaten versetzten Erde drei kleine Flecken Holzkohle angetroffen. Auch im Profil P4 (Taf. 7) ist auf dem anstehenden Fels und der hellbraunen, sandig-lehmigen und stark mit Porphyr vermischten Erde (4) eine 5 cm dünne „braune, stark mit Holzkohle vermischte Erde" (3) zu sehen; diese Brandschicht ist auf einer Länge von 70 cm eingezeichnet. Es ist sehr gut möglich, dass dieser über das gesamte Grabungsareal als Flickenteppich von kleinen Brandnestern dokumentierte Befund (Abb. 6) den Rest einer einst größeren Brandschicht widerspiegelt.

Weder der ^{14}C-datierte Brandfleck noch die anderen sind mit Baubefunden in Verbindung zu bringen. Die eher dünnen Reste der Brandschicht können daher auch von einem Wiesen- und Buschbrand stammen, sie müssen nicht zwingend eine anthropogene Schicht im Umfeld einer spätrömischen/spätantiken Siedlung oder gar die Reste eines abgebrannten Baus darstellen. Auszuschließen ist aber auch das nicht.

23 von Zingerle 1890, 139: *Der hof Chvnratz von Slaneik*.

24 Finsterwalder 1973, 382–383.

25 Vgl. die Epigraphik-Datenbank Clauss, Slaby, http://www.manfredclauss.de/ (letzter Zugriff 30.05.2020). Nur Ascul(ana) / Asculanorum / Asc(u)lanis / Asculaneis scheinen auf.

26 Putzer, Kaufmann 2015, Abb. 4.

Abb. 6. St. Valentin, Grabungsareal mit Lage des spätrömischen/spätantiken Brandflecks Probe Nr. 2/FN 29 (Planum 5); weitere Brandflecken auf dem gesamten Grabungsareal und das frühmittelalterliche Grab 6 im Bereich des felsigen Geländes sowie der späteren Kirchenruine. Maßstab 1 : 80 (Zeichnung: G. Kaufmann).

Probe	Labornummer	^{14}C-Alter (BP)	δ^{13}C (‰)	Kalibriertes Alter (2σ)*
St. Valentin, Grab 1, FN 35	LTL16655A	497 ± 45	–17.1 ± 0.3	1315–1356 (12,3 %) 1388–1469 (83,1 %)
St. Valentin, Grab 2, FN 39	LTL12278A	1212 ± 30	–20.6 ± 0.5	695–702 (1,1 %) 708–746 (12,2 %) 764–890 (82,1 %)
St. Valentin, Grab 3, FN 40	LTL16656A	1040 ± 45	–18.9 ± 0.5	891–1047 (90,0 %) 1091–1122 (4,4 %) 1140–1148 (1,0 %)
St. Valentin, Grab 4, FN 41	LTL16657A	1221 ± 45	–18.6 ± 0.3	677–895 (94,1 %) 929–940 (1,3 %)
St. Valentin, Grab 5, FN 25	LTL16658A	458 ± 45	–18.2 ± 0.4	1330–1340 (0,8 %) 1397–1519 (90,2 %) 1593–1619 (4,4 %)
St. Valentin, Grab 6, FN 65	LTL12277A	1328 ± 30	–21.4 ± 0.5	649–720 (77,3 %) 741–767 (18,1 %)
St. Valentin, PL 3, Grab (?), FN 42, westlicher Südteil unter Planum 3	LTL16659A	280 ± 45	–26.6 ± 0.7	1471–1670 (89,0 %) 1779–1799 (5,1 %) 1943–heute (1,3 %)
St. Valentin, PL 5, Probe 2, FN 29, Kirche innen westlicher Nordteil	LTL16660A	1700 ± 45	–23.9 ± 0.2	235–425 (95,4 %)
St. Valentin, PL 2, Probe 3, FN 30, Kirche innen Süd, aus Baugrube	LTL16661A	1129 ± 45	–17.0 ± 0.3	775–994 (95,4 %)
St. Valentin, PL 2, Probe 1, FN 31, unter Estrich von Planum 2, Wurzel	LTL16662A	1179 ± 45	–28.0 ± 0.5	712–745 (5,4 %) 765–975 (90,0 %)

*Programm OxCal 4.3. Kurve IntCal 13

Tab. 1. Übersicht über die Radiokohlenstoff-Daten von St. Valentin in Schlaneid.

Eine weitere Phase vorkirchlicher Zeit ist mit der Nutzung des Areals zu Bestattungszwecken in Verbindung zu bringen. Außen an der nördlichen Apsis der Kirchenruine kam Grab 6 zum Vorschein (Abb. 6). Es handelt sich um die beigabenlose (Nord)West-(Süd)Ost-ausgerichtete Körperbestattung eines erwachsenen Mannes in gestreckter Rückenlage mit über dem Becken gekreuzten bzw. gefalteten Händen.[27] Das rechte Bein ist ab dem Knie gestört, der Unterschenkel liegt verschoben über dem linken Unterschenkel, von dem rechten Fuß sind keine Reste erhalten. Alle anderen Knochen lagen noch im Verbund und waren nicht gestört. Die Ursache der Störung des rechten unteren Beins konnte nicht geklärt werden. Beigaben waren keine im Grab, auch keine Reste davon. Es gibt also keine Hinweise auf möglichen Grabraub. Eine andere Erklärungsmöglichkeit für die Störung wäre ein Tierbau, doch auch der ist nicht dokumentiert. Der Tote lag in einer Felsrinne auf brauner lehmiger Verwitterungserde in +97 cm Höhe,[28] der nach vorn geneigte Schädel kam auf +79 cm Höhe zu liegen.[29] Die Tiefe des Felsens bzw. der Felsrinne kann durch die nahe gelegenen Profile V7 (+112 cm) und V10 (+114–98 cm) (Taf. 11) kontrolliert werden. Eine Grabgrube bzw. das Niveau, von dem aus der Tote von Grab 6 bestattet worden war, konnte nicht beobachtet werden. Über dem Toten lagen einige Bruchsteine, die im Planum (vgl. Planum 3, Taf. 3) und im Profil V7 eingezeichnet sind. Das Profil V10 belegt das stratigraphische Verhältnis zu der Apsis: Der tiefste Punkt der Felsrinne (3) liegt auf +98 cm Höhe, darüber folgen eine 46 cm mächtige Schicht hellbrauner, mit Felsstücken vermischter Erde (2) und im Anschluss eine 8 cm mächtige Schicht dunkelbrauner Erde mit Holzkohlestückchen (4), worauf bei +152 cm Höhe die Unterkante des Apsisfundaments liegt (5). Der Tote lag demnach gut ½ m tiefer als die Apsis und mit dem Schädel zudem vertikal darunter.[30] Seine Orientierung nimmt keinen Bezug auf den Verlauf der Apsis. Stratigraphisch sollte er auch deshalb älter als die Steinkirche sein, weil auf dem Niveau bei etwa +145 cm Höhe, von dem aus die Apsis (nach Norden) aufgesetzt bzw. (nach Süden) eingetieft worden sein sollte, keine längliche Grabgrube, dafür aber runde Verfärbungen

27 Es handelt sich hierbei um eine bei frühmittelalterlichen Bestattungen sehr häufig angetroffene Körperhaltung, siehe Kromer 1980, 7–8 und Abb. 5.

28 In der Planum-Zeichnung sind +207 cm eingemessen.

29 In der Planum-Zeichnung sind +189 cm eingemessen.

30 Nothdurfter, Stuppner o. J., 10: „Kopf […] unter die älteste Apsismauer hineinreichend, […].“

Verf.	OK	UK	Unterlage	Tiefe	Länge	Breite	Verfüllung	Dokumentation	Pfostenloch?	Gruppe
1	161	157	auf Fels	4	42	38	Holzkohle, Steine	Planum 4/Profil	fraglich, Schicht	–
2	163	143	auf Fels	20	52	40	Verkeilsteine	Planum 2/Profil	ja	2(–3–4)
3	174	145	in lehmiger hellbrauner Erde	29	50	40	(Verkeil-)Stein	Planum 1+2/Profil	ja	2
4	151	127	auf Fels, in lehmiger brauner Erde	24	46	34	Verkeilsteine, Holzkohle, Grabgrube 5	Planum 2/Profil	ja	(2–)3
5	155	141	in lehmiger brauner Erde	14	60	30	Holzkohle	Planum 2/Profil	ja	(2–)3
6	140			?	58	46	(Verkeil-)Steine	Planum 2	möglich	2
7	159	109	in hellbrauner Erde über Grab 6	50	30	30	Holzkohle	Planum 1+2/Profil	ja	(2–)3(–5)
8	148	146		2	32	22	(Verkeil-)Stein	Planum 2	fraglich	(2–)3
9	142	140	Erde über Grab 6	2	30	30	Verkeilsteine	Planum 2	fraglich	(2–)3
10	159	112	in hellbrauner Erde, 5 cm über Fels	47	35	35	Verkeilsteine, Holzkohle, Eisennagel	Planum 1+2/Profil	ja	(2–)3(–5)
11	130	110	in hellbrauner Erde	20	50	38	Verkeilsteine, Holzkohle, Mörtel, Bauschutt, Eisennagel, Knochen	Planum 1+2/Profil	ja	4
12	141	103	in verwittertem Fels	38	36	36	Verkeilsteine, Holzkohle, Eisennagel, glasierte Scherbe	Planum 1/Profil	ja	4
13	155	131	in brauner sandiger Erde, auf Fels	24	36	30	Verkeilsteine, Holzkohle, Mörtel	Planum 1+2/Profil	ja	4
14	155	115	in hellbrauner Erde	40	34	34	Verkeilsteine, Holzkohle	Planum 1+2/Profil	ja	2(–3)
15	129		auf Fels	?	50	40	Steine	Planum 2	nein, Schicht	–
16	151	133	in brauner Erde	18	74	60	Mörtel und weißgrauer Sand, Steine, Unterlagsplatte	Planum 1/Profil	fraglich, Grube	4
17	169	160	auf Fels	9	100	60	Mörtel mit Kies, Randsteine	Plaum 2/Sauer	fraglich, Grube	4
18	119		in brauner Erde	?	24	20		Planum 1	fraglich	4
19	156	130	in brauner humoser Erde	26	78	50	Holzkohle	Planum 2/Profil	ja	2
20				?	40	40		Planum 1/Sauer	nein	–
21	165	145	auf Fels	20	50	30	(Unterlags-?)Stein	Planum 3+4(+5)	fraglich, Felsmulde	–
22	159		in hellbrauner Erde	?	25	16	Steine	Planum 2	fraglich	4
23	153	145	auf Fels	8	36	24	Holzkohle, Grabgrube 5	Planum 2	möglich	(2–)3
24	175	170	in brauner Erde	5	40	40	Steine	Planum 1	möglich	5
25	170	165	in brauner Erde	5	40	40		Planum 1	möglich	5
26	180	175	in brauner Erde	5	40	40	Eisennägel	Planum 1	möglich	5
27	169	159	in brauner Erde	10	44	40		Planum 1	möglich	5
28	170	160	in brauner Erde	10	44	30	Mörtel	Planum 1	möglich	5
29	173	148	auf Fels	25	60	45	Steine	Planum 1	möglich, Grube?	1

Tab. 2. Übersicht über die dokumentierten nummerierten Verfärbungen (Verf.) , deren Ober- und Unterkante (OK/UK) in cm, deren Unterlage, Tiefe, Länge und Breite in cm, deren Verfüllungsmaterial, Dokumentationsqualität in Hinsicht auf die Interpretation als Pfostenloch und deren Zuweisung zu einem Kirchenbau.

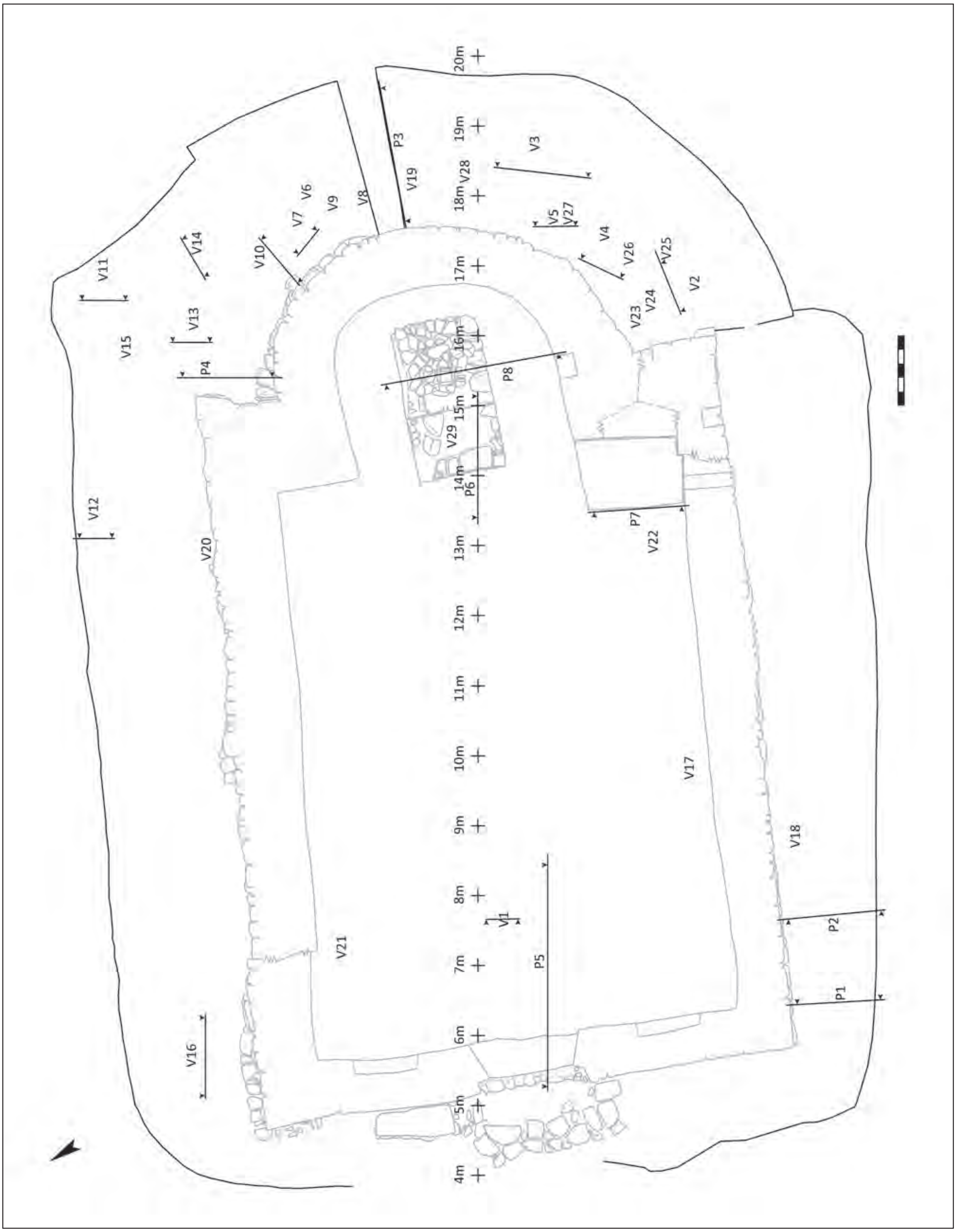

Abb. 7. St. Valentin, Grabungsareal mit Lage der 29 Verfärbungen und der gezeichneten Profile (P1–P8 sowie V1–V5, V7 und V10–V14) im Bereich der späteren Kirchenruine mit Vermessungsmittelachse. Maßstab 1 : 80 (Zeichnung: G. Kaufmann).

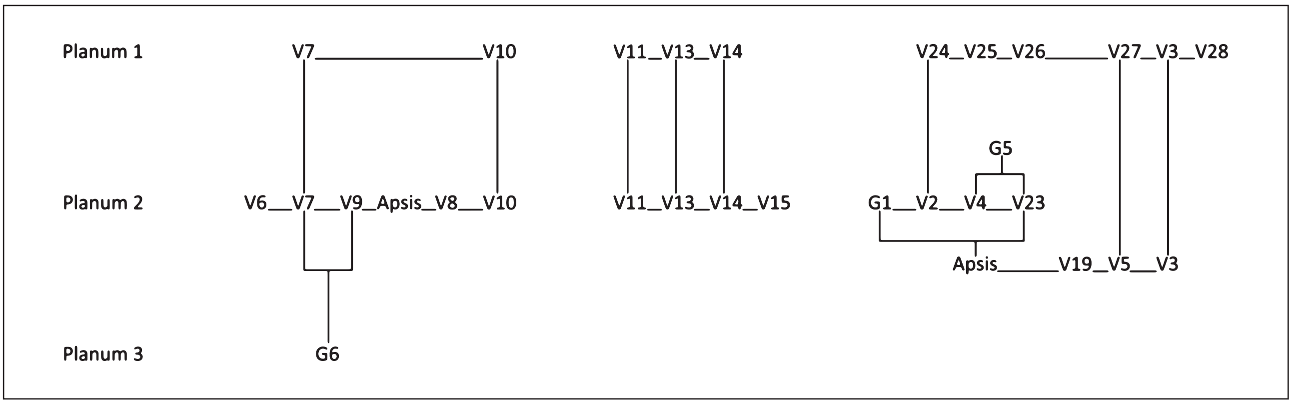

Abb. 8. St. Valentin, Abfolge laut Plan-Zeichnungen der Verfärbungen und Gräber im Bereich östlich außerhalb der Kirche von Norden nach Süden (Grafik: G. Kaufmann).

(Pfostenlöcher V7, V8, V9) in sonst intakten Schichten dokumentiert wurden.

Grab 6 (LTL12277A) wurde einer Radiokohlenstoff-Datierung unterzogen. Diese hat das Alter 649–767 calAD (95,4 %) bzw. 649–720 (77,3 %) und 741–767 (18,1 %) ergeben (Tab. 1). Die Kalibrierung des Messdatums 1328 ± 30 BP mit der Kurve IntCal 13 der neuen Programmversion OxCal 4.3 hat leicht – von den 2015 von uns veröffentlichten – abweichende Jahreszahlen ergeben.[31] Es handelt sich hier also um eine frühmittelalterliche Grablegung mit der für romanische Beisetzungen typischen Beigabenlosigkeit. Das Grab ist mit keinen weiteren Befunden direkt in Verbindung zu bringen, weder mit anderen Bestattungen noch mit anderen Bauten. Die Fundamente der Apsis sowie die Verfärbungen V7 und V9 liegen darüber und sind jünger.

Es stellt sich hier nun die Frage nach einem frühmittelalterlichen Gräberfeld. Die kleine Fläche der Kirchengrabung erlaubt aber keine Antwort auf diese Frage. Denn die wenigen anderen angetroffenen Gräber (siehe unten) sind stratigraphisch und absolutchronologisch verschiedenen jüngeren Phasen zuzuweisen und bereits mit dem Kirchenbau in Verbindung zu bringen. Es gibt allerdings unter den Funden eine Kiste mit Streufunden, in der sich etliche Menschenknochen befinden, die im Zuge der beiden Grabungskampagnen an mehreren nicht näher bestimmbaren Stellen geborgen wurden.

Die ^{14}C-Daten aus der späten Kaiserzeit/Spätantike und aus dem Frühmittelalter unterstützen damit den sprachwissenschaftlichen Hinweis auf eine kontinuierliche Benutzung und Besiedelung der Terrassen von Schlaneid.

4. Pfostenlöcher als Hinweise auf Holzkirchen?

Im Zuge der Ausgrabung haben Nothdurfter und Stuppner innerhalb und vor allem außerhalb der Kirchenruine zahlreiche Verfärbungen freigelegt. Insgesamt sind 29 Verfärbungen benannt und mehr oder weniger gut dokumentiert (Abb. 7 und Tab. 2). Sie sind zu einem guten Teil als Pfostenlöcher anzusprechen. Einige sind allerdings zweifelhafter Natur. Drei Verfärbungen (V17, V20 und V21) konnten überhaupt nur durch den späteren Plan von W. Sauer identifiziert werden. V17 ist zwar in Planum 2 (Taf. 2) eingezeichnet, anlehnend an die Südmauer als große Grube, verfüllt mit weißem und graubraunem Mörtel und Kies, aber von den Ausgräbern nicht als Verfärbung nummeriert. In keiner Planum-Zeichnung auszumachen ist V20. Sie sollte in Planum 1 (Taf. 1) an der Nordmauer liegen, an dieser Stelle wurde aber keine Verfärbung angetroffen. V20 ist daher zu streichen. Verfärbung V21 bleibt zweifelhaft, weil es sich laut Planum 3–5 (Taf. 3–5) um eine natürliche Felsmulde mit einem flachen horizontalen Stein handelt und in den Plänen keine Nummer eingetragen ist. Auch eine kleine Verfärbung vor dem Seitenaltar ist auf der Originalzeichnung nicht nummeriert, wir haben ihr die Nummern V22 gegeben. Letztendlich ist nur für einen Teil der Verfärbungen eine Interpretation als Pfostenloch gesichert, bei anderen handelt es sich um größere Gruben und Reste von Schichtbefunden.

Bei elf Verfärbungen (V1, V4, V5, V7, V10, V11, V12, V13, V14, V19, V23) ist in der Verfüllung Holzkohle beobachtet worden. Allerdings sind keine Holzkohlestücke mehr erhalten, die man einer Radiokohlenstoff-Untersuchung unterziehen hätte können, um somit das absolute Alter der Verfüllungen zu bestimmen. Im Fundprotokoll ist nur eine Probe verzeichnet – unter FN 26 von der Verfärbung V5 –, diese Probe ist aber nicht mehr vorhanden.

31 Putzer, Kaufmann 2015, 130: „640–730 n. Chr."

Hans Nothdurfter hat im Jahr 2003 und nochmals im Jahr 2017 insgesamt 16 Pfostenlöcher von 29 Verfärbungen hypothetisch zu einer Holzkirche rekonstruiert. Bei diesen 16 Pfostenlöchern handelt es sich um V16, V?, V20, V12, V11, V14, V13, V10, V6, V5, V4, V2, V17, V1, V21 und V29.[32]

Diesem Interpretationsmodell haben wir uns im Jahr 2015 angeschlossen. Wir unterschieden drei Pfostengruppen aufgrund der stratigraphischen Lage der Verfärbungen, deren unterschiedlicher Typologie und des Vorkommens von Mörtel in der Verfüllung einiger Verfärbungen. So ordneten wir 21 Pfostenlöcher von 29 Verfärbungen hypothetisch drei Bauten zu. Die zwei älteren, weil stratigraphisch tiefer gelegen als die dritte Pfostengruppe, wiesen wir als Pfostenlöcher zwei Vorgängerkirchen in Holzbauweise zu. Horizontalstratigraphisch trennten wir Holzkirche I (V2, V3, V6, V14, V19 sowie vielleicht V16 und V29) von Holzkirche II (V4, V5, V7, V8, V9, V10, V23 und mit Vorbehalt V1 und V21). Die höher gelegene dritte Gruppe (V24, V25, V26, V27 und V28) hingegen schrieben wir als Gerüstpfostenlöcher der romanischen Kirche (Phase B) zu.[33]

Dieses Interpretationsmodell muss hier nochmals kritisch durchleuchtet werden. Stratigraphie und Datierung gilt es zu prüfen. Die Verfärbungen liegen auf unterschiedlichen Niveaus und sind daher verschiedenen Phasen zuzuweisen (Abb. 8).

Im Norden der Apsis wurde die Gruppe der Verfärbungen V11 und V13 bis V15 dokumentiert. Bereits in Planum 1 (Taf. 1) tauchen die Pfosten V11, V13 und V14 auf, sie sind auch noch in Planum 2 zu fassen. Die tiefere Schicht V15 hingegen war nur in Planum 2 sichtbar, sie ist älter. Mithilfe eines Profilschnitts, der nur beschrieben, aber nicht gezeichnet wurde, konnte V15 geklärt werden: Es handelt sich hierbei weder um ein Pfostenloch noch um eine Grube, sondern um eine hier höher an die Oberfläche tretende Schicht; im Profilschnitt wurde sie nach unten hin immer breiter. Die Verfärbung V11 liegt laut Planum 1 in der hellbraunen, sandigen und mit sehr vielen kleinen Steinchen vermischten Erde, V13 und V14 befinden sich hingegen in einer weißgrauen, mit Mörtel und Bauschutt vermischten Erde. In den Verfüllungen V11 und V13 liegen auch Mörtelstückchen, was sie als kirchenzeitlich ausweisen sollte; in V11 wurden zudem ein Eisennagel und ein Knochen gefunden (FN 59). In diesem Bereich liegt der Apsisansatz direkt auf dem anstehenden Fels bei etwa +160 bis +165 cm Höhe bzw. auf einer hellbraunen sandigen Erde bei +147 bis +152 cm Höhe auf; Baugrube hat es keine gebraucht. Ein stratigraphischer Bezug von Verfärbungen und Apsis ist nicht direkt herzustellen, jedenfalls wurden die Verfärbungen nicht von der in Profil P4 (Taf. 7) dokumentierten obersten braunen sandigen Erde (1) (+161 bis +181 cm Höhe) aus eingetieft, die an die Apsis anschlägt, sondern von den tiefer gelegenen Schichten (V13 und V14: +155 cm; V11: +130 cm) aus, deren stratigraphisches Verhältnis zur Apsis nicht zu bestimmen ist. Der Mörtel in der umliegenden Schicht und in der Verfüllung deutet aber darauf hin, dass die Pfostenlöcher V11, V13 und V14 kirchenzeitlich sein sollten.

Im Nordosten der Apsis liegt die Gruppe V6 bis V10. Während man die Pfosten V7 und V10 sowohl in Planum 1 als auch noch in Planum 2 dokumentiert hat, wurden die Verfärbungen V6, V8 und V9 erst in letzterem sichtbar, sie sollten also älter sein. V8 und V9 sind jeweils nur 2 cm tief, sie sind daher auch nicht als Pfostenlöcher eines Ständerbaus, sondern eventuell als Pfostenlöcher eines zeitweiligen Gerüstes oder überhaupt nur als Schichtreste anzusprechen. In diesem Abschnitt streichen die Schichten, in welche die Verfärbungen eingetieft waren, entweder unter der Apsis hindurch oder direkt an die Apsis ohne erkennbare Baugrube. In Profil V10 (Taf. 11) streicht die braune Erdschicht (4) unter die Apsis (5), die bei +152 cm Höhe darüber liegt. Währenddessen war die Verfärbung V10 laut Planum 1 bereits bei +159 cm Höhe erkennbar, sie lag in der 5 cm mächtigen, graubraunen, mit Eisennägeln und sehr viel Holzkohle vermischten Erde. Auch an der Oberkante des Pfostenlochs V10 lag ein Eisennagel (FN 56). Die soeben genannte Brandschicht ist mit der Zerstörung des Pfostens V10 (und einer Holzkonstruktion) in Zusammenhang zu bringen. Die Brandschicht stößt an die Apsis an und ist deshalb jünger. In der Profilzeichnung V10 ist diese Brandschicht bereits abgetragen, sodass es den trügerischen Anschein hat, das Pfostenloch sei älter als die Apsis. Hier wurde das Pfostenloch von der braunen Erdschicht (4) aus eingetieft, auf der auch die Apsis ruht. Die Verfüllungserde (1) des Pfostenlochs ist erst von +147 cm Höhe abwärts dokumentiert, als „dunkelbraune Erde mit kleinen verbrannten Holzkohlestückchen“ (1). Sie ging nach oben in die abgetragene, bis +159 cm (Planum 1) dokumentierte, graubraune, mit sehr viel Holzkohle vermischte Erde über. Die Zerstörung des Pfostens und der Holzkonstruktion ist kirchenzeitlich, auch seine Errichtung. Die Verfärbung V7 ist ebenfalls bereits in +159 cm Höhe dokumentiert (Planum 1), sie lag zumindest zur Hälfte in der braunen, mit Mörtel und kleinen Steinchen vermischten Erde, ebenfalls ein Indiz für die Kirchenzeit. Tiefer befanden sich die

32 Nothdurfter 2003b, 332 und Abb. 1. – Gruber, Nothdurfter 2017, 153. – Eines der als gesichert angegebenen Pfostenlöcher ist in der Grabungsdokumentation nicht vorhanden (V?), und zwar im Norden zwischen V16 und V20.

33 Putzer, Kaufmann 2015, 129–130 und Abb. 3; 138–139 und Abb. 4; 146 und Abb. 6.

anderen drei Verfärbungen V6, V8 und V9. Diese wurden in Planum 2 in +140 cm (V6), in +142 cm (V9) und in +148 cm Höhe (V8) eingezeichnet. Da alle drei sehr seicht waren, hat man keine Profilschnitte angefertigt. Die Verfärbungen V8 und V9 lagen mit ihrer westlichen Hälfte in einer umgelagerten braunen lehmigen Erdschicht (Planum 2 und Profil V7), während die östliche Hälfte von hellbrauner Erde umgeben war. In etwa bei +145 cm Höhe liegt hier die erste Steinreihe der Apsis. Weil die Unterkante der Apsis weiter nördlich (Profil V10) bei +152 cm und weiter südlich (Profil P3) bei +136 cm Höhe lag, sollte sie sich hier in etwa dazwischen (ca. +144 cm) befinden. Die umgelagerte Erdschicht, in welche die Verfärbungen zur Hälfte eingetieft waren, ist also nicht wirklich als Baugrube der Apsis anzusehen, eher als Vorbereitungsschicht, auf welche bzw. in welche die erste Steinreihe auf- bzw. eingesetzt wurde. Dies sollte darauf hindeuten, dass die Verfärbungen V8 und V9 in etwa zeitgleich mit dem Kirchenbau sind. Die Verfärbungen V7 und V9 liegen direkt über dem älteren Grab 6 (649–767 calAD). Nur die ausschließlich in der helleren Erde liegende Verfärbung V6 könnte effektiv auch älter sein, letztendlich ist ihr stratigraphisches Verhältnis zur Apsis aber nicht wirklich zu klären.

Im Südosten der Apsis liegt die Gruppe V2 bis V5, V19 und V23 bis V28. In Planum 1 sind die Verfärbungen V24 bis V28 eingetragen und auch der Stein von V3 ist schon zu erkennen. In diesem Planum (bei etwa +160 bis +175 cm Höhe) sind etliche Schichten mit Mörtel und vielen Eisennägeln (FN 14) verzeichnet. Eindeutig in einer Mörtelschicht liegt V27, V28 hat Mörtel in der Verfüllung. In Planum 2 (bei etwa +150 bis +160 cm Höhe) sieht man die Pfostenlöcher V2 bis V5 und V19 sowie die Verfärbung V23 und die Kindergräber 1 und 5. Grab 1 ist ^{14}C-datiert (Tab. 1): 1315–1469 calAD (95,4 %) bzw. 1315–1356 (12,3 %) und 1388–1469 (83,1 %). Die Grabgrube von Grab 5 hingegen stört die Verfärbungen V4 und V23, laut Planum liegt das linke Bein des Kindes über dem Boden von Verfärbung V4. Das Kindergrab 5 sollte daher jünger sein als die beiden Verfärbungen, alle liegen jedoch auf derselben Ebene. Auch Grab 5 ist ^{14}C-datiert (Tab. 1): 1330–1619 calAD (95,4 %) bzw. 1330–1340 (0,8 %), 1397–1519 (90,2 %) und 1593–1619 (4,4 %). Im südlichen Bereich streicht der braune umgelagerte Waldboden, in welchen die Verfärbungen und Gräber eingetieft sind, in +153 cm Höhe direkt an die Apsis/Kirche oder deren Unterkante wurde dort hineingesetzt. In beiden Fällen ist von einem ursächlichen Zusammenhang von umgelagerter Erdschicht und Steinbau auszugehen. Eine Baugrube für die Kirche/Apsis ist hier nicht vorhanden. Die Unterkante der Apsis steigt von +136 cm Höhe im Profil P3 (Taf. 7) wieder an, denn der rippenartige Fels ist in den Profilen V5 (Taf. 11) (bei +132 bis +149 cm), V4 (bei +127 bis +146 cm), V2 (Taf. 10) (bei +143 bis +163 cm) und in dem Planum des Kindergrabes 5 (bei +145 cm) höher eingemessen als in Profil P3. Die Unterkante Apsis/Kirche setzt also hier direkt auf den anstehenden Fels und/oder auf den umgelagerten Waldboden auf. Ein beweiskräftiges Profil hierzu gibt es nicht. Die Grabgruben von Grab 1 und Grab 5 sowie die Verfärbungen V4 und V23 sind direkt an die Kirche bzw. Apsis angelehnt. Die etwas weiter nördlich gelegenen Verfärbungen liegen zum Teil in anderen Schichten. Die Pfostenlöcher V3 und V5 sind umschlossen von einer hellbraunen mit Mörtel und Steinchen vermischten Erdschicht (Profil V3 und Planum 2), auch hier ist also ein Zusammenhang mit dem Steinbau zu sehen. Der Stein von V3 war bereits in Planum 1, ebenfalls in einer Mörtelschicht, zu sehen: Sehr wahrscheinlich handelt es sich um einen Keilstein zur Stabilisierung eines Holzpfostens. V5 stößt auch an die Baugrube der Apsis an. Das Verhältnis des Pfostens V19 zur Apsis ist gut in Profil P3 (Taf. 7) dokumentiert. Die Baugrube der Apsis (9) und das Pfostenloch V19 (8) wurden von demselben Niveau (4) (+156 cm Höhe) aus eingetieft. Was uns 2015 noch dazu bewogen hatte, die Holzpfosten älter als die Steinkirche anzusehen, kann auch dahingehend interpretiert werden, dass die Pfosten zeitgleich mit (oder bald nach) der Steinkirche eingetieft wurden.

Insbesondere auf diese Vielzahl an Verfärbungen um die Apsis herum hat sich das Interpretationsmodell der Holzkirchen gestützt. Die wenigen restlichen Verfärbungen innerhalb der Kirche und außerhalb nördlich wie südlich davon waren immer schon zweifelhaft.

Im Kircheninneren liegen die Verfärbungen V1, V17, V21, V22 und V29. Die Verfärbung V1 in Planum 4 (Taf. 4) in der hellbraunen lehmigen Verwitterungserde ist mit nur 4 cm Tiefe als Pfostenloch eines Ständerbaus auszuschließen, selbst wenn darunter Fels liegt. Eventuell ist in V1 der Rest einer Brandschicht zu sehen, so wie der nahegelegene spätrömische/spätantike Brandfleck. Die Verfärbung V21 befindet sich ebenfalls im westlichen Kirchensaal, und zwar in Planum 3–5 (Taf. 3–5) in einer natürlichen Felsmulde, in welcher ein flacher Stein auf der hellbraunen lehmigen Verwitterungserde liegt. Keilsteine und organische Verfüllung wurden nicht angetroffen bzw. dokumentiert. Die Interpretation als Pfostenloch eines Ständerbaus ist daher sehr unwahrscheinlich. Die Verfärbung V17 ist innen an der Südmauer in Planum 2 (Taf. 2) zu lokalisieren. Es handelt sich um eine unregelmäßige, recht große, aber seichte Vertiefung, die mit weißgrauem Mörtel und Kies verfüllt war. V17 ist wohl eher als Grube anzusprechen und nicht als Pfostenloch. Die Verfärbung V22 wurde innen vor dem Seitenaltar dokumentiert, und zwar in Planum 2 als rundliche dunkelbraune Verfärbung, die zur Hälfte in der Baugrube der Kirche und zur Hälfte in der lehmigen Grundschicht lag, in welche die Baugrube eingetieft war. Sollte V22 wirklich ein Pfostenloch (18 × 24 cm) darstellen, kann es nur zu einem Gerüst oder zu einer Chorschranke gehören, welche(s) nach Verfüllung der Südmauer-Baugrube aufgestellt worden ist. Die Verfärbung V29 wiederum liegt innen vor bzw. direkt unter dem Altar in Planum 1 (Taf. 1) auf dem Fels. Dieses große (60 × 45 cm) Pfostenloch V29 ist zeitlich vor der Errichtung des Altars einzuordnen. Es ist zwar nicht genauer datierbar, aber dennoch mit einem Lehmboden in Verbindung zu bringen (siehe unten).

Nördlich außerhalb der Kirche befinden sich in Planum 1 die beiden Verfärbungen V12 und V16 sowie (wohl kaum) V20. Pfostenloch V12 liegt in einer weißgrauen, mit Mörtel vermischten Erdschicht; in der Verfüllung kamen ein Eisennagel und eine glasierte, derzeit nicht auffindbare Scherbe (FN 60) zum Vorschein. Demnach kommt nur eine (spätmittelalterliche-)neuzeitliche Datierung in Frage. Die größere (74 × 60 cm) Verfärbung V16 ist neben Felsen in die braune Erde eingetieft, auf der die Nordmauer liegt. In der Verfüllung von V16 befindet sich Mörtel. Wenn es sich also nicht um eine nachträgliche Störung handelt, kann Pfostenloch/Grube V16 nur mit oder nach der Errichtung der Steinkirche entstanden sein. Dasselbe würde auch für V20 gelten: Dieses mehr als fragliche Pfostenloch ist aber nur auf dem nachträglichen Plan von Sauer eingetragen, aber nicht in der Planum-Zeichnung. Es soll direkt an der Kirchennordmauer eingetieft sein, wo die oberste braune sandige Erdschicht (Planum 1 und Profil P4) eingezeichnet ist.

Südlich außerhalb der Kirche liegt nur die kleine Verfärbung V18, und zwar in Planum 1, eingetieft in eine braune Erde; V18 und die braune Erde lehnen an die Kirchensüdmauer an (Profile P1 und P2). Da den Ausgräbern nicht klar war, ob es sich um ein Pfostenloch handelte, bleibt die Interpretation der Verfärbung zweifelhaft. Profilschnitt gibt es keinen. Auch V18 ist nur im Zusammenhang mit der Kirche erklärbar.

Fasst man alle diese Beobachtungen zusammen, bleibt fast nichts mehr übrig, was zwingend auf einen Holzkirchenbau hinweisen würde. Bei sieben Verfärbungen (V1, V15, V16, V17, V18, V20, V21) handelt es sich mit großer Wahrscheinlichkeit gar nicht um Pfostenlöcher. Elf Verfärbungen (V3, V5, V7, V11, V12, V13, V14, V16, V17, V27, V28) liegen entweder in einer Mörtelschicht oder haben Mörtel in der Verfüllung. Mörtel ist aber nur in Zusammenhang mit den erhaltenen Steinkirchenbauten belegt (siehe unten), für ältere Steinmörtelbauten gibt es keine Hinweise, ebenso wenig für Holzbauten mit Mörtelputz. Weitere drei Verfärbungen (V24, V25, V26) liegen in höheren, eindeutig jungen Schichten. Letztendlich können überhaupt nur die Pfostenlöcher V6 und V29 sowie die zweifelhaften Verfärbungen V1 und V21 älter als die Steinkirche sein. V19 wurde von demselben Niveau aus eingetieft wie die Kirche.

Während V21 nur eine Felsmulde und V1 wahrscheinlich Teil der spätrömischen/spätantiken Brandschicht ist, sind die Pfostenlöcher V6 und V29 mit dieser Brandschicht nicht in Verbindung zu bringen, also nicht zu einem spätrömischen/spätantiken Bau zu rekonstruieren. Nur V29 kann mit einem Baubefund, einem Lehmboden, in Verbindung gebracht werden.

So wie die Brandreste direkt auf dem Porphyrfels oder auf den unmittelbar darauf liegenden lehmigen Verwitterungsschichten anzutreffen sind, liegt darüber auch ein planierter roter Lehm, der bereits als Fußboden bzw. Gehhorizont interpretiert wurde (Abb. 9). Dieser rote Lehmfußboden wurde von den Ausgräbern noch der ersten Bauphase des Steinkirchenbaus und von uns einem vermuteten Holzkirchenbau II zugeschrieben.[34] Der rote Lehm ist nur im Inneren der Kirchenruine in allen unterirdischen Profilen (P5–P7) und in verschiedenen Planum-Zeichnungen (Planum 2 bis Planum 5) dokumentiert. Auch dieser rote Lehm ist leider nicht durchgehend, sondern nur als Flickenteppich erhalten, ähnlich wie die vorhin beschriebenen Brandreste. Das Verhältnis von dem roten Lehm zu den Brandresten im Kircheninneren ist nur an drei Stellen zu bestimmen. Eindeutig ist die Situation vor dem Seitenaltar, dort ist in Profil P7 (Taf. 9) der rote Lehmboden (4) über eine Länge von 72 cm in +164 bis +170 cm Höhe dokumentiert. Im Planum 2 (Taf. 2) sind die Brandflecke in +159 cm Höhe auf der lehmigen mit Porphyrderivaten durchmischten Schicht eingetragen, ein Brandfleck liegt unmittelbar vor P7 und damit unter dem roten Lehm. In der Südwestecke in Planum 2 liegen Brandflecke und roter Lehm auf dem hellbraunen Grundlehm und sind nebeneinander gezeichnet, sie stoßen auf einer Länge von 35 cm aneinander, wobei nicht dokumentiert und erkennbar ist, ob eine und falls ja, welche Schicht älter ist. In der Nordwestecke in Planum 5 (Taf. 5) befindet sich ein Brandfleck nördlich einer herausragenden Felskante auf der hellbraunen Verwitterungserde, südwestlich der Felskante liegt der rote Lehm auf der Verwitterungserde. Auch in diesem Fall ist nicht klar, ob der Brandhorizont älter als der rote Lehmhorizont ist, wie dies vor dem Seitenaltar der Fall ist. Wenn nun die beiden Flickenteppiche – die Brandreste und der rote Lehm – jeweils zusammenhingen, sollte der (spätrömische/spätantike) Brand älter als der rote Lehmfußboden sein. Letzterer

34 Nothdurfter 2003b, 332 und Abb. 1. – Putzer, Kaufmann 2015, 138 und Abb. 4.

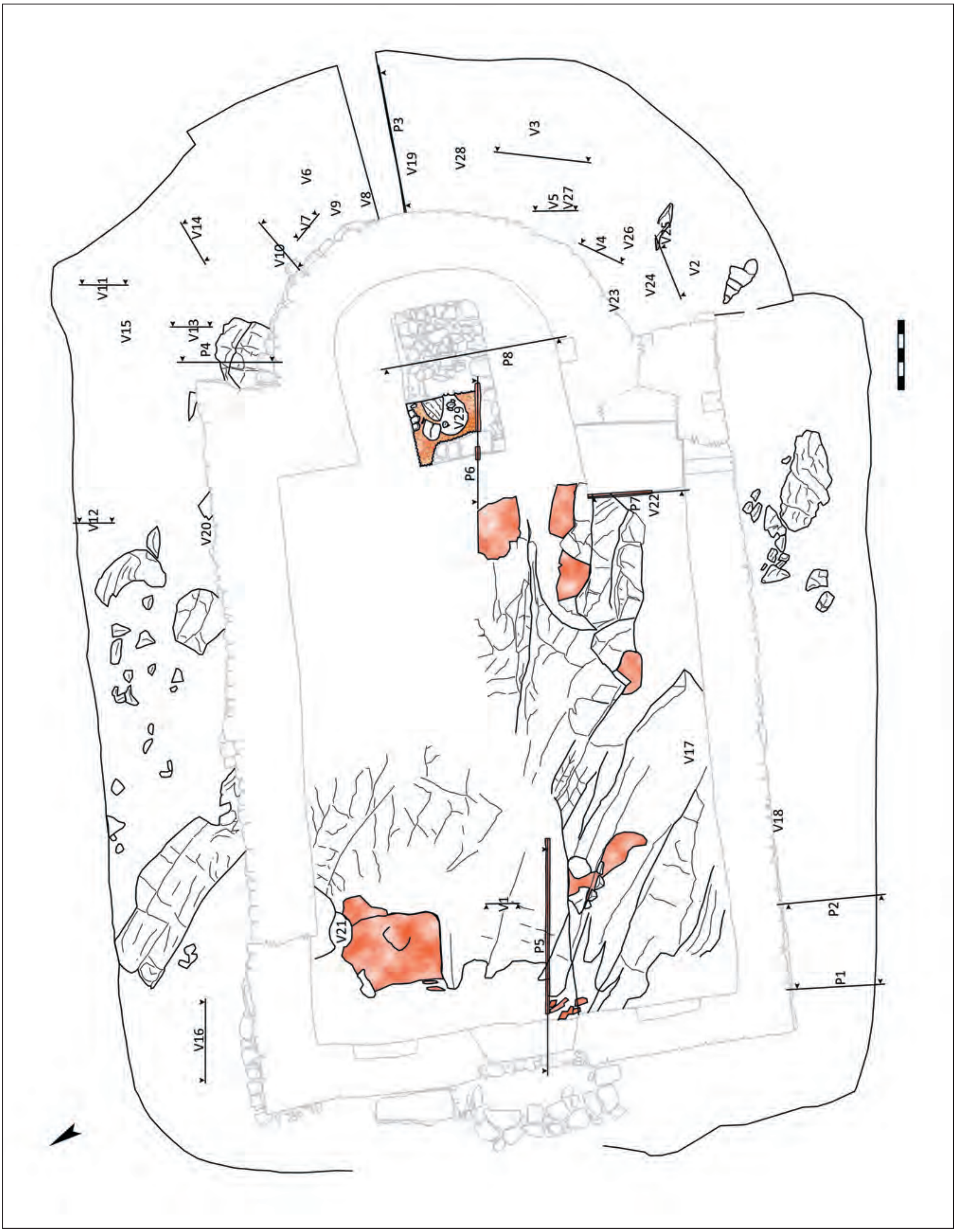

Abb. 9. St. Valentin, spätantiker-frühmittelalterlicher Holzbau mit rotem Lehmboden. Maßstab 1 : 80 (Zeichnung: G. Kaufmann).

ist aber mangels weiterer Hinweise nur nach dem Brand und vor dem Bau der ersten Steinkirche einzuordnen, also zwischen später Kaiserzeit/Spätantike und Frühmittelalter/Karolingerzeit.

Da der Lehmboden außerhalb der Kirchenruine nicht vorhanden ist, kann sein (zeitliches) Verhältnis zur frühmittelalterlichen Bestattung Grab 6 nicht eruiert werden.

Der rote Lehm sieht in den Profilen P6 (Taf. 8) und P7 (Taf. 9) effektiv wie ein planierter horizontaler Lehmboden aus. In Profil P5 (Taf. 8) hingegen ist dem nicht so, dort zeigt er ein welliges unregelmäßiges Aussehen. Dieser Widerspruch ist nicht zu lösen. Auch fällt es schwer, den roten Lehmhorizont (2) mit weiteren Baubefunden zu verbinden. Lediglich die Verfärbung V29 könnte als Pfostenloch eines Holzbaus dazugehören. In Planum 1 (Taf. 1) ist um V29 eine rot-grün-gelbe Schicht in +173 cm Höhe eingetragen, ebenso der Fels und ein Stein mit +173 cm und +174 cm sowie der Steinplattenboden mit +184 cm (+182/186 cm). In Profil P6 ist der rote Lehm (4) mit +168 bis +172 cm Oberkante eingezeichnet, derselbe Plattenboden mit +180 cm. Es gibt also einen Messunterschied von 4 cm zwischen Planum 1 und Profil P6. Die rot-grün-gelbe Schicht von Planum 1 liegt 11 cm unter den Platten. Auch der rote Lehmboden von P6 liegt 8–12 cm unter dem Plattenboden. Damit handelt es sich um ein und dieselbe Schicht und der Lehmboden gehört zum Pfostenloch V29. Der Lehm umgibt zu mehr als drei Viertel des Umfangs den Pfosten, der somit zentral im Raum und nicht entlang einer Wand gestanden hat. Dies ist er einzige Baubefund, der dem Boden zuzuweisen ist.

Die Rekonstruktion eines Holzbaus ist damit leider nicht möglich. Es bleibt der Flickenteppich eines langrechteckigen Lehmbodens mit einer mächtigen Firstsäule auf der Ost-West-Längsachse. In der Verlängerung dieser Längsachse nach Osten liegt das Pfostenloch V19, das aber weder älter als die Kirche noch mit dem Lehmboden in Verbindung zu bringen ist. Nicht zu beantworten ist die Frage, ob es sich um Reste eines Profan- oder eines Sakralbaus handelt. Platzkontinuität muss nicht Kultkontinuität bedeuten. Auch bei St. Prokulus in Naturns konnte eine Abfolge von spätantikem Friedhof, kurzlebigem frühmittelalterlichem Haus, frühmittelalterlichem Friedhof (ohne Kirche) und (spätfrühmittelalterlicher-)hochmittelalterlicher Kirche mit Friedhof belegt werden.[35] Für die Annahme eines frühmittelalterlichen Holzkirchenbaus bleibt in Schlaneid also nur sehr wenig übrig. Es könnte genauso gut ein spätantiker-frühmittelalterlicher Profanbau gewesen sein.

35 Kaufmann 2019.

5. Die Steinkirche

Der älteste erwiesene Kirchenbau ist also ein Steinbau. Dieser wurde an einer schon länger genutzten Stelle errichtet, wo bereits ein nur schwach dokumentierter Vorgängerbau unbekannter Funktion aus Holz gestanden hatte.

In groben Zügen ist es der Bau, der – nach mehreren Umbauten – heute noch als Ruine erhalten ist. Es gilt also, aus der Grabungsdokumentation und der erhaltenen Bausubstanz mehrere Bauphasen zu unterscheiden. Wir halten uns dabei weitgehend an die bereits 2015 vorgelegte Abfolge.[36]

5.1. Die frühmittelalterliche Steinkirche (Phase A)

Von diesem ersten Steinbau sind nur mehr Reste im Fundamentbereich erhalten. Im Aufgehenden sind alle Mauern durch neuere ersetzt. An vier verschiedenen Stellen sind im Fundamentbereich ältere Mauerreste dokumentiert.

Hans Nothdurfter hat daraus eine Saalkirche mit eingezogener hufeisenförmiger Apsis rekonstruiert und sie zuerst in das 10. Jahrhundert, später in das 8. Jahrhundert datiert.[37] Auch wir haben 2015 die vier Mauerstücke zu einem Bau mit Trapezsaal und eingezogener gestelzter Apsis rekonstruiert, allerdings zwei Phasen unterschieden und diese in das 8./9. bzw. in das 9./(10.) Jahrhundert datiert.[38]

5.1.1. Phase A – Grabungsbefund

Wie schon oben festgehalten sind nur mehr in vier Fundamentbereichen die ältesten Mauerreste erhalten bzw. dokumentiert: die nördliche Außenapsis, die südwestliche Mauerecke, die nördliche Westmauer und die östliche Südmauer (Abb. 10).

Der teilweise unterschiedliche Umriss im Vergleich zum Aufgehenden der Phase B (siehe unten) lässt für die Apsisfundamente eine vorhergehende Phase A vermuten. Die Fundamente der nördlichen Außenapsis sind außen in drei Planum-Zeichnungen sowie in den Profilen P3, P4 und V10 dokumentiert. Die nördliche Apsishälfte ist in zwei Grabungsschnitten (Nordwest, Nordost) mit jeweils zwei Planum-Zeichnungen (Planum 1 und Planum 2, Taf. 1–2) erfasst. Im nordwestlichen Schnitt zeigen alle beide, Planum 1

36 Die Unterteilung in die Phasen A, B und C wird beibehalten, angefügt wird hier die Phase D (Abbruch und Verfall). Von einer Gliederung der Phase A in A1 und A2 wird hier wieder abgesehen. Beibehalten wird die Unterteilung der Phase C in C1, C2, C3 und C4, allerdings werden der Triumphbogen und die äußere Nordostecke hier nicht mehr der Phase C1 zugewiesen, sondern der Phase B.

37 Nothdurfter 2003b, 333 und Abb. 1. – Gruber, Nothdurfter 2017, 152–153.

38 Putzer, Kaufmann 2015, 142, 145 und Abb. 5.

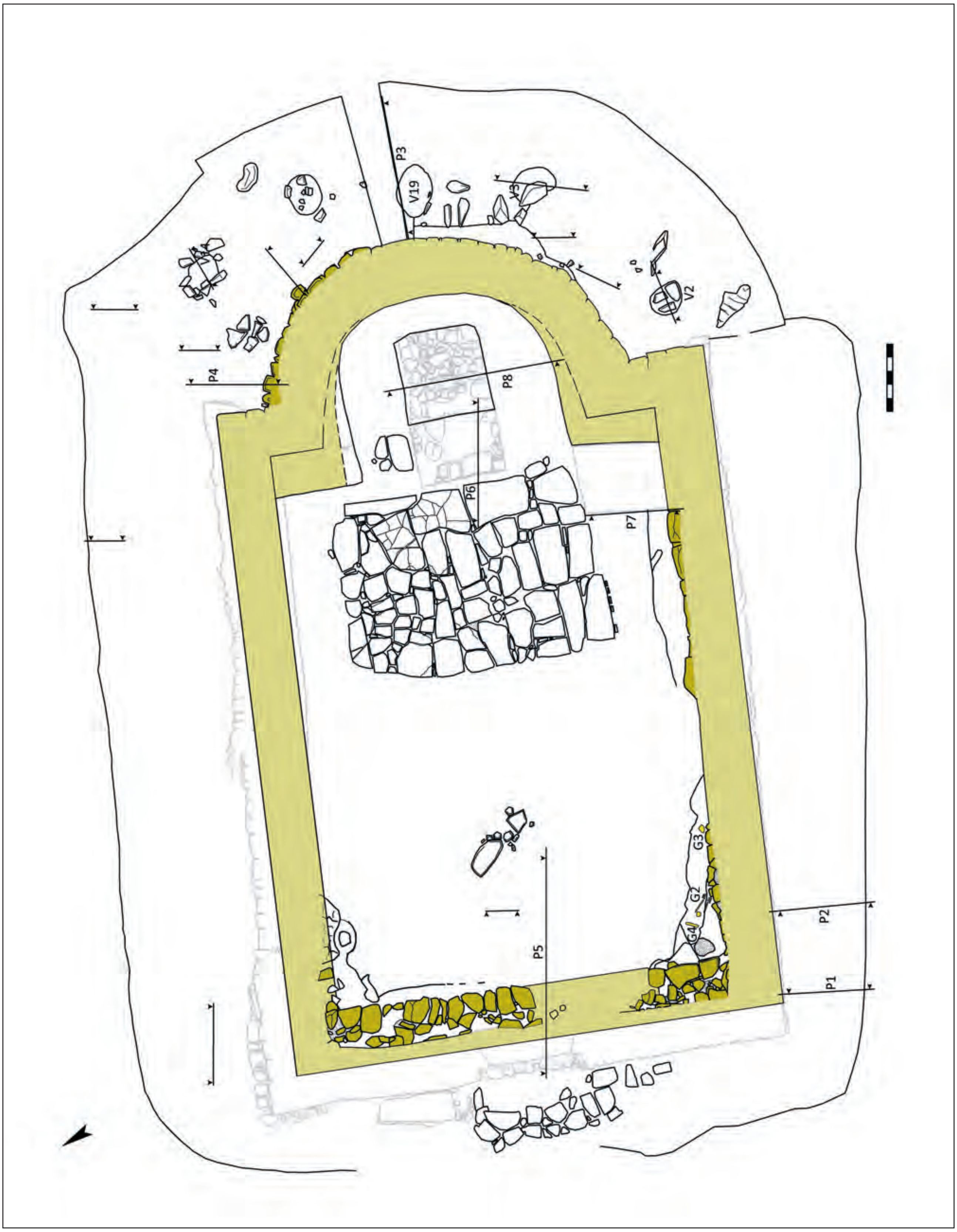

Abb. 10. St. Valentin, frühmittelalterliche Kirche in Steinbau, Rekonstruktionsversuch zu Phase A. Maßstab 1 : 80 (Zeichnung: G. Kaufmann).

und Planum 2, die unterste Steinreihe. Diese kragt ziemlich weit (bis zu 24 cm) unter der aufgehenden Apsismauer hervor und ruht im Westen in +158 bis +160 cm Höhe auf dem Fels. Dies ist auch in Profil P4 gut dokumentiert (Taf. 7) (+165 cm Höhe). Anschließend in Richtung Osten liegen die Fundamente in +143 bis +147 cm Höhe auf der hellbraunen bis braunen sandigen Erde mit wenig Steinchen, wie auch Profil V10 (Taf. 11) belegt (+152 cm Höhe). Auch im nordöstlichen Grabungsschnitt sind in Planum 2 die drei untersten Steinreihen dokumentiert, wobei nur die erste und zweite Reihe 8–16 cm hervorkragen und in +145 cm Höhe auf/in einer umgelagerten braunen lehmigen Erdschicht liegen. Der Scheitel der Apsis ist in Profil P3 (Taf. 7) gut erfasst. Hier sind alle Steinlagen im Lot. Die untersten Steinlagen (2) ragen nicht vor, sie sind ausgehend von einem Gehhorizont (4) in +156 cm Höhe in eine Baugrube (9) auf +136 cm gesetzt worden. Insgesamt verläuft der nördliche Umriss der Apsisfundamente nicht kreisförmig, sondern ab dem Scheitel zuerst bogenförmig und dann schräg geradlinig zur Ostwand hin. Die Fundamente der südlichen Apsishälfte sind nicht mehr durch Profile dokumentiert; die Planum-Zeichnungen zeigen keine vorkragenden Steinreihen, doch zeichnet sich auch hier ein vom Scheitel zum Schenkelansatz hin immer weniger bogenförmiger und immer mehr geradliniger Verlauf des Apsisumrisses ab, also symmetrisch zur nördlichen Hälfte. Der äußere Apsisumriss setzt sich also aus einem gedrückten Rundbogen und geradlinig schräg auslaufenden Schenkeln zusammen. Im Innenbereich der Apsis ist nicht gegraben worden, nur Planum 1 mit Estrich 1 ist dokumentiert. Der innere Umrissverlauf der Fundamente kann also nicht angegeben werden. Dass die Fundamente denselben gestelzten Verlauf – mit gedrücktem Rundbogen und geraden parallelen Schenkeln – des aufgehenden Mauerwerks haben, ist durchaus möglich. Nothdurfter hat für den nördlichen Innenschenkel einen zum südlichen nicht parallelen, sondern schrägen Verlauf rekonstruiert. Bei dieser Rekonstruktion würde die Dicke der Apsis in etwa im Bogenbereich 85–88 cm und im Schenkelbereich 105–120 cm betragen, also zum Schenkelansatz hin zunehmen. Da der innere Umriss nicht ergraben ist, kann er auch parallel zum äußeren rekonstruiert werden, mit gleichmäßiger und den anderen Mauern (siehe unten) entsprechender Dicke von 75–95 cm.

Die südwestliche Mauerecke eines Vorgängerbaus ist innen in Planum 3–5 (Taf. 3–5) erfasst. Die Fundamente der älteren Südwestecke liegen parallel leicht nach Nordosten verschoben im Kircheninneren, d. h. die ehemalige Westmauer befindet sich nur mit Ihrer Außenseite unter der heutigen Westmauer, die ehemalige Südmauer hingegen liegt unter der heutigen und ist nur leicht nach Norden vorkragend. Die Südmauer ist in die Westmauer eingebunden, die Eckmauern sind also gleichzeitig errichtet worden. Die Mauern bestehen aus in Kalkmörtel gebundenen kleinen Lesesteinen aus Porphyr und Sandstein – den in unmittelbarer Nähe vorzufindenden Gesteinsarten. Die erhaltene Länge der Südmauer beträgt in etwa 2,60 m, jene der Westmauer 1,40 m. Die Breite der Mauern ist nicht genau bestimmbar, weil diese teilweise unter dem aufgehenden Mauerwerk liegen. Die Breite der Südmauer entspricht mit ca. 75–80 cm in etwa der heutigen. In Profil P1 (Taf. 6) ist ein 6–8 cm vorkragendes Fundament (eine Steinreihe) (2) dokumentiert, in P2 jedoch nicht mehr. Dort sind alle Steinreihen bis zur tiefsten im Lot (4). Auch die Westmauer dürfte in etwa diese Breite gehabt haben. Die Fundamente ruhen in dunklem Material in +138 cm Höhe auf hellbrauner lehmiger Erde und auf Fels. Innen im Zwickel der beiden Mauern liegt in der Baugrube auf der hellbraunen lehmigen Erde ein gelbbrauner Mörtelfleck (27 × 31 cm).

Die nördliche Westmauer eines Vorgängerbaus ist innen in Planum 3–5 (Taf. 3–5) nachgewiesen. Die Fundamente der älteren Westmauer liegen parallel zur heutigen Westmauer leicht nach Osten verschoben im Kircheninneren, eine eingebundene Nordwestecke konnte nicht dokumentiert werden. Die Mauer besteht aus regelmäßigen, in Kalkmörtel gebundenen Bruchsteinen. Die erhaltene Länge der Mauer beträgt etwas mehr als 3 m. Die Breite ist nicht bestimmbar, weil die Westaußenseite unter dem aufgehenden Mauerwerk liegt. Die Westmauer dürfte aber in etwa 80 cm breit gewesen sein. Die Fundamente ruhen in einer Baugrube in dunklem Material in +135 bis +148 cm Höhe auf der hellbraunen lehmigen Erde und auf Fels. Die Baugrube hat den östlich gelegenen roten Lehmboden gestört. In der Baugrube befinden sich Reste des Lehmbodens, aber laut Grabungsprotokoll auch Freskoreste (!), Mörtelbrocken und Holzkohle.[39] Sollten wirklich Verputzreste mit Freskomalerei in der Baugrube gefunden worden sein, müsste ein älterer freskobemalter Steinbau vorausgesetzt werden.

Die östliche Südmauer ist innen in Planum 2 (Taf. 2) und in Profil P7 (Taf. 9) dokumentiert. Die Fundamente der ehemaligen Südmauer (11) sind gegenüber der heutigen

39 Grabungsprotokoll vom 22.10.1990: „Beim Entfernen des Erdmaterials im Bereich der Mauer kam die Baugrube zum Vorschein, die mit Fresken, Mörtelbrocken und Holzkohle gefüllt war. An der Basis der Baugrube lagen Teile des rotbraunen, anplanierten Lehms (wie Baugrube vor dem südlichen ‚Seitenaltar'." Die im Grabungsprotokoll genannte Mauer ist zwar nicht genauer beschrieben bzw. ist nicht festgehalten, ob es sich um den nördlichen oder südlichen Teil der „älteren Mauer" (Westmauer) handelt, aber der rote Lehm ist nur in der Baugrube der nördlichen Westmauer in Planum 5 eingetragen und zwar an zwei Stellen unmittelbar südlich und östlich des Mauerrestes.

Südmauer (12) parallel leicht nach Norden verschoben. Es ist nur die 4–20 cm vorkragende Innenseite auf einer Länge von 2,80 m erfasst, die Außenseite ist nicht nachgewiesen. Die Mauer besteht aus regelmäßigen, in Kalkmörtel gebundenen Bruchsteinen. Die Breite der Mauer ist nicht bestimmbar, sie könnte aber ebenfalls ca. 80–95 cm betragen haben. Die Fundamente ruhen in einer 20 cm tiefen Baugrube (2) in +155 cm Höhe auf gelbem Sand und Fels (1). Profil P7 belegt, dass die Baugrube den älteren roten Lehmboden (4) geschnitten und zerstört hat. Die Baugrube ist gefüllt mit gelbem Sand mit Mörtelkörnern (2), aber auch mit losem Mörtel, einem roten Lehmbrocken, vielen Holzkohleflittern und zwei grünen, derzeit nicht auffindbaren Freskoteilen (!), die in +157 cm Höhe bei einem Fundamentstein mit +169 cm Oberkante eingemessen wurden (Planum 2). Das größere Freskostück ist 6 × 8 cm groß. Die Präsenz von Freskoresten in der Baugrube würde eigentlich einen älteren bemalten Steinbau voraussetzen.

Es stellt sich nun die Frage, ob diese vier Mauerteile zusammengehören bzw. ob sie gleichzeitig errichtet wurden. Von dem Verlauf der Mauerfluchten her könnten sie alle problemlos zu einem Bau mit (Trapez-/)Rechtecksaal und eingezogener Apsis gehören. Stratigraphisch ist dies nicht zu belegen.

Die bereits behandelten Verfärbungen gehören größtenteils den verschiedenen Bauphasen der Kirche an. Für den ersten Kirchenbau kommen am ehesten die Pfostenlöcher V3, V6 und V19 in Frage, nur aufgrund der Lage eventuell auch V2 und V14 (Abb. 10). Ein stratigraphischer Zusammenhang ist aber nur für das Pfostenloch V19 durch das Profil P3 wahrscheinlich zu machen. Es könnte sich um Pfostenlöcher eines Gerüsts für den Aufbau der Apsis handeln.

Nun zu den Gehhorizonten der ersten Phase (Abb. 10). Im Kircheninneren liegen direkt auf dem roten Lehmboden ein Steinplattenboden (Profil P6), ein graubrauner Estrich (Profil P5) und ein gelbbrauner Estrich (Profile P5 und P7). Dieser farblich unterschiedliche Estrich 2 stößt an den Plattenboden an (Planum 1). Der Boden aus unregelmäßig verlegten, 10–15 cm starken Steinplatten aus Porphyr und Sandstein ist in Planum 1 dokumentiert, erhalten ist nur eine 2,71 m breite und 3,75 m lange, rechteckige Fläche im östlichen Kirchensaal. Der Boden bindet an keine Mauer an, im Gegensatz dazu aber die beiden jüngeren Estriche (1 und 2) an die Steinplatten. Als ältester erhaltener Boden über dem Lehmboden sollte also der Plattenboden zu Phase A gehören.

Außen bei der nördlichen Apsis liegt unmittelbar anschließend an den Fels auf der hellbraunen bis braunen sandigen Erde mit wenig Steinchen auch der Rest eines Bodens mit fünf Platten mit +151 cm Höhe Oberkante. Dieser äußere Plattenboden ist nur als kleiner Rest erhalten, er flankierte ursprünglich wohl den gesamten äußeren Mauerverlauf. Keine der fünf Platten stößt allerdings an die Apsis an. Dass der Plattenboden bereits zu Phase A gehörte, ist daher nur anzunehmen, aber nicht gesichert. Ebenfalls außen, vor der Westeingangstür der letzten Umbauphase, liegen etliche Steinplatten als Eingangsboden. Diese Platten könnten von einem älteren Boden stammen und wiederverwendet worden sein. Außen an der Südseite sind in Profil P2 (Taf. 6) kein Plattenboden, dafür aber drei Gehniveaus eingezeichnet. Das erste und älteste liegt über der braunen, körnigen, mit verwittertem Fels vermischten Erde (3). Nur das dritte und höchste Gehniveau ist jünger als die heutige rezente Südmauer.

Einen Altar hat es natürlich schon in Phase A gegeben (Abb. 10). Der Apsis-/Altarbereich ist aber nicht weiter ausgegraben worden bzw. nur in Planum 1 (Taf. 1) erfasst. Die Profile P6 (Taf. 8) und P8 (Taf. 9) belegen den heutigen Altar(rest) auf dem roten Lehmboden. Es ist wohl davon auszugehen, dass hier ein quadratischer Blockaltar anstelle des jetzigen gestanden hat.

Mehrere Bestattungen sind mit Phase A in Verbindung zu bringen, genau genommen mit der südwestlichen Mauerecke (Abb. 10). Es handelt sich um die Reste der sogenannten Gräber 2 (FN 39), 3 (FN 40) und 4 (FN 41) sowie um mindestens einen von drei weiteren Knochen (FN 42). Dokumentiert sind sie in Planum 3 (Taf. 3).

Nur Grab 2 kann effektiv als zumindest teilweise noch erhaltenes Grab angesprochen werden, bei allen anderen handelt es sich um lose Knochen(gruppen). Grab 2 (FN 39) besteht aus zwei Röhrenknochen (Unterschenkel) und wenigen Fußknochen eines Kleinkindes, eventuell – nach der Zeichnung und der Einschätzung der Ausgräber[40] – noch *in situ*, mit Ausrichtung Nord(West)-Süd(Ost). Eingezeichnet sind aber nur zwei Röhrenknochen, nach den erhaltenen Resten wohl zwei Wadenknochen. Wo aber sind die beiden Schienbeinknochen? Zwischen diesen beiden Röhrenknochen befand sich in sekundärer Lage die fragmentierte Schädeldecke eines Kindes, die aber ebenfalls diesem Grab zugewiesen worden ist. Die Knochen lagen auf/in einer hellbraunen sonst fundleeren Schicht, die an die Südmauer und die Westmauer sowie im Norden an den Fels anstieß. Wahrscheinlich wurde diese Schicht im Nordwesten durch eine rötlichbraune mit Holzkohle und Mörtel vermischte Schicht gestört (siehe unten, Phase C3).

Als Grab 3 (FN 40) scheint der Fund einer fragmentierten Schädeldecke eines Kindes auf, die östlich von dem vorherigen Grab nahe der Südmauer auf/in der hellbraunen

40 Nothdurfter, Stuppner o. J., 10.

sonst fundleeren Schicht lag. Diese Schädeldecke befand sich sicher nicht mehr in ihrer ursprünglichen Lage. Sehr wahrscheinlich gehörten die beiden fragmentierten Schädeldecken aus Grab 2 und 3 zu demselben Kind.

Als Grab 4 (FN 41) wird der Fund eines Röhrenknochens eines weiteren Kindes behandelt, der unmittelbar nordwestlich der Schädeldecke und der Röhrenknochen von Grab 2 auf/in der hellbraunen sonst fundleeren Schicht lag. Auch er befand sich sicher nicht mehr in seiner ursprünglichen Position.

Alle drei sogenannten Kindergräber (Grab 2–4) müssen als gestört angesehen werden, nur Grab 2 lag (vielleicht) teilweise noch *in situ*. Die hellbraune Schicht, auf/in der die Knochen lagen, ist als Planier-/Nivellierungsschicht anzusehen, die eine Vertiefung zwischen Südwestecke und Fels auffüllen und einen horizontalen Boden vorbereiten sollte. Im darunter liegenden Planum 4 (Taf. 4) sieht man noch einen 600 cm² großen gelbbraunen Mörtelfleck neben der Westmauer, der die darüber liegende hellbraune Schicht von Planum 3 (Taf. 3) als Füllschicht ausweist. Sie ist demnach als gleichzeitig mit der Südwestecke der Kirche anzusehen. Die Knochen könnten rein hypothetisch auch älter als die Schicht sein, dann würde es sich um gestörte Gräber eines vorkirchenzeitlichen Gräberfeldes (siehe oben, 3.) und miteingefüllte Knochen handeln. Sie sollten aber eigentlich gleichzeitig mit der Schicht sein. Trifft diese Überlegung zu, dann wurde zumindest eine Bestattung (Grab 2) mit der Füllschicht eingebracht, aber im Zuge weiterer Bestattungen und späterer Störungen stark beeinträchtigt, wodurch sie nur mehr teilweise *in situ* angetroffen wurde.

Drei weitere Knochen (FN 42) lagen in der Südwestecke zwischen Planum 3 und Planum 4, sie sind daher nirgends eingezeichnet und demnach schwieriger zu beurteilen. Es handelt sich um die dünne fragmentierte Schädeldecke eines Kindes, einen Röhrenknochen und den unteren Teil (Ellbogen) des Oberarmknochens (*Humerus*) eines Jugendlichen/Erwachsenen. Die Schädeldecke ist wohl wieder mit den beiden vorher genannten Fragmenten (siehe oben, Grab 2 und Grab 3) zu einem Kinderkopf zu rekonstruieren. Der Röhrenknochen ist nicht weiter zuzuweisen. Der Oberarmknochen hat sich durch die ^{14}C-Datierung als bedeutend jünger, in etwa frühneuzeitlich, erwiesen (siehe unten, Phase C3) und verkompliziert die Interpretation seiner tiefen Lage: Entweder befand er sich in der schon genannten, rötlichbraunen mit Holzkohle und Mörtel vermischten Störschicht bzw. kam durch sie tiefer zu liegen oder das gesamte Südwesteck ist in der frühen Neuzeit neu verfüllt worden. In diesem Fall muss aber auch Grab 2 als nicht *in situ* angesehen werden. Leider kann dies nicht mehr eindeutig geklärt werden, wahrscheinlicher erscheint uns aber die erste Variante.

Die von uns noch 2015 der ersten Phase zugeordneten Gräber 1 und 5 hingegen haben sich als jünger erwiesen (siehe unten, Phase C2), sie gehören nicht hierher.[41]

5.1.2. Phase A – Datierung

Die Datierung stützt sich auf ^{14}C-Daten und auf die Bautypologie. Betrachtungen zum Patrozinium sind ebenfalls möglich.

Für eine Datierung der Apsisfundamente, der nördlichen Außenapsis, gibt es keine absolutchronologischen Anhaltspunkte. Relativchronologisch sollten sie jünger sein als Grab 6 (649–767 calAD) und älter als das aufgehende lagige Mauerwerk der romanischen Phase B.

Die südwestliche Mauerecke kann durch die sogenannten Kindergräber 2–4 datiert werden. Dazu gibt es ^{14}C-Datierungen (Tab. 1). Von den Resten von Grab 2 (FN 39) wurde ein Wadenbein (LTL12278A) einer Radiokohlenstoff-Datierung unterzogen; sie hat das Alter 695–890 calAD (95,4 %) bzw. 695–702 (1,1 %), 708–746 (12,2 %) und 764–890 (82,1 %) ergeben. Von dem sogenannten Grab 4 (FN 41) wurde der Röhrenknochen (LTL16657A) datiert: 677–940 calAD (95,4 %) bzw. 677–895 (94,1 %) und 929–940 (1,3 %). Von dem sogenannten Grab 3 (FN 40) wurde die Schädeldecke (LTL16656A) datiert. Das ^{14}C-Datum lautet: 891–1148 calAD (95,4 %) bzw. 891–1047 (90,0 %), 1091–1122 (4,4 %) und 1140–1148 (1,0 %). Von den unter der FN 42 subsumierten Knochen hat der Oberarm (LTL16659A) das Alter 1471 calAD – heute (95,4 %) bzw. 1471–1670 (89,0 %), 1779–1799 (5,1 %) und 1943–heute (1,3 %) ergeben. Weil die oben geschilderten stratigraphischen Ungewissheiten in Bezug auf die Lagerung des letzten Knochens nicht ausgeräumt werden können, ergeben sich zwei Interpretationsmöglichkeiten: Entweder der gesamte Bereich der Südwestecke wurde in der frühen Neuzeit gestört und neu eingefüllt. In diesem Fall sind alle Knochen nur Verfüllung aus dem Zeitraum zwischen 1471–heute und geben keinen Anhaltspunkt für die Datierung der Südwestecke. Oder die frühneuzeitliche Störung betraf nur einen (kleineren) Bereich, während Grab 2 zumindest teilweise noch *in situ* blieb. In diesem Fall wäre Grab 2 für die Südwestecke datierend, die somit vor/um 695–890 errichtet worden wäre. Die wenigen Reste von Grab 3 und Grab 4 sind sicher gestört und bieten somit keinen Anhaltspunkt für die Datierung der Südwestecke. Sie sind in etwa gleich alt bzw. jünger als Grab 2, mit dem sie in derselben Schicht liegen. Diese Schicht ist also größtenteils

41 Putzer, Kaufmann 2015, 141 (Phase A1) und Abb. 5.

gestört worden, belegt aber zwei Bestattungsphasen mit zwei Gräbern (Grab 2 und Grab 4) bzw. mit einem Grab (Grab 3). Unter bestimmten Bedingungen kann also die Südwestecke vor/um 695–890 datiert werden.

Aus der Südwestecke gibt es noch ein weiteres ^{14}C-Datum, das nicht minder problematisch ist: es stammt von einer verkohlten Wurzel (Probe Nr. 1, FN 31) (LTL16662A), die unter dem in Planum 2 eingezeichneten Estrich (Estrich 2) geborgen wurde. Weil die Stelle aber weder in Planum 2 noch in Planum 3 eingezeichnet ist, kann die Wurzel über der abgebrochenen Westmauer oder aber auch unmittelbar nördlich der Südmauer bzw. deren Fundamentbereich gelegen haben. Das kalibrierte Alter beträgt 712–975 calAD (95,4 %) bzw. 712–745 (5,4 %) und 765–975 (90,0 %). Höchstwahrscheinlich lag die Wurzel unmittelbar nördlich der westlichen Südmauerfundamente, weil ein ähnliches Datum aus der Baugrube der östlichen Südmauer vorliegt (siehe unten). Bedingt ist das Datum nach/um 712–975 also auch für die Errichtung der Südwestecke verwendbar.

Für eine Datierung der nördlichen Westmauer gibt es keine absolutchronologischen Anhaltspunkte. Relativchronologisch liegt sie vor der Nordmauer/Nordwestecke der romanischen Phase B.

Die östliche Südmauer wiederum kann durch eine Holzkohle (Probe Nr. 3, FN 30) (LTL16661A) aus der Baugrube, eingezeichnet in Planum 2 (Taf. 2), datiert werden. Das ^{14}C-Alter ist 775–994 calAD (95,4 %).

Es gibt also für die Errichtung der Südwestecke (695–890 und 712–975) und der Südmauer (775–994) annähernd übereinstimmende Daten, auf jeden Fall für den Zeitraum 775–890.

Die Bautypologie ist hier nur bedingt für die Datierung nutzbar, ist doch die Zusammengehörigkeit der vier ältesten Bauteile nicht gesichert, vor allem nicht die des Kirchensaals mit der Apsis. Zudem ist der Innenverlauf der Apsis unbekannt, somit muss der Bauvergleich ungenau bleiben. Saalkirchen mit um Mauerbreite eingezogener Apsis (Abb. 11) sind über das gesamte Früh- und Hochmittelalter gebaut worden. Als Beispiele seien hier angeführt: St. Georg in Rhäzüns (6./7. Jh.),[42] St. Georg in Pfäfers (8./9. Jh.),[43] St. Laurent in Saillon (8./9. Jh.),[44] Sant'Antonino in Sant'Antonino (9./10. Jh.),[45] St. Karpophorus in Latsch/Tarsch (10. Jh.),[46] Mariä Geburt in Mieders (10. Jh.),[47] St. Sebastian in Zuoz (10./11. Jh.)[48] und S. Giuliana in Vigo di Fassa (11./12. Jh.).[49] Der Schwerpunkt liegt eindeutig zwischen dem 8./9. und 10./11. Jahrhundert. Die Kirche Johannes Evangelist (heute Andreas) in Muraz (10./11. Jh.) hat eine um doppelte Mauerbreite eingezogene Apsis.[50]

Plattenböden in Kirchen treten bereits in vorkarolingischer Zeit in St. Cassian in Lantsch[51] auf, dann in S. Martino in Drena (8./9. Jh.),[52] S. Stefano in Fornace (9. Jh.),[53] S. Martino in Tenno (9. Jh.)[54] und auch noch im frühen 13. Jahrhundert in St. Medardus in Latsch/Tarsch.[55] Auch hier liegt der Schwerpunkt im 8./9. Jahrhundert.

Überlegungen zum Patrozinium sind meistens nicht mehr als Hinweise, selten nur Beweise für eine Datierung. Im Jahr 2015 gingen wir noch davon aus, dass die Kirche von Anbeginn dem heiligen Valentin geweiht war, und wir konstruierten umständlich, dass für den Bau einer Holzkirche in Schlaneid in den 660er-Jahren eventuell Reliquien von der fränkischen Burg Mais unter Chlotar III. (657–673) und dessen Bruder Childerich II. (662–675) den Baiern übergeben worden seien.[56] Der Bau einer Holzkirche hat sich aber als sehr unwahrscheinlich erwiesen. Der Leichnam Valentins wurde von der Burg Mais zuerst durch die Langobarden nach Trient (729/736) und dann durch Tassilo III. nach Passau (757/764) überführt.[57] Für die Errichtung der Steinkirche, die am wahrscheinlichsten in den Zeitraum 775–890 fällt, wird eine Reliquienüberführung aus Passau nun aber zumindest problematisch. Deshalb könnten an einem ursprünglichen Valentinspatrozinium auch Zweifel angebracht werden; außer es hätte doch noch eine ältere Kirche gegeben.

Das Dilemma des archäologischen Befunds haben wir 2015 mit der Unterteilung in Phase A1 und Phase A2 zu lösen versucht.[58] In den Baugruben der nördlichen Westmauer und der östlichen Südmauer wurden nämlich Freskoreste gefunden, welche eigentlich einen bemalten Vorgängerbau voraussetzen. Wir haben damals die Südwestecke der Phase A1 sowie die nördliche Westmauer und die

42 Sennhauser 2003, 149–150 (A81).
43 Sennhauser 2003, 143 (A77).
44 Jacobsen, Schaefer, Sennhauser 1991, 357–358, Bau II.
45 Sennhauser 2003, 160–161 (A88).
46 Nothdurfter 2003b, 321–322 (C14).
47 Sydow 2003, 248–249 (B19).
48 Sennhauser 2003, 206–207 (A122).
49 Bersani et al. 2003, 397–398 (D17), Bau II.
50 Jacobsen, Schaefer, Sennhauser 1991, 297–298, Bau III.
51 Sennhauser 2003, 108–109 (A52).
52 Bersani et al. 2003, 375–376 (D6).
53 Bersani et al. 2003, 377–378 (D7).
54 Bersani et al. 2003, 389–390 (D15).
55 Nothdurfter 2001.
56 Putzer, Kaufmann 2015, 136.
57 Kaufmann 2018b, 106, 108–109.
58 Putzer, Kaufmann 2015, 145.

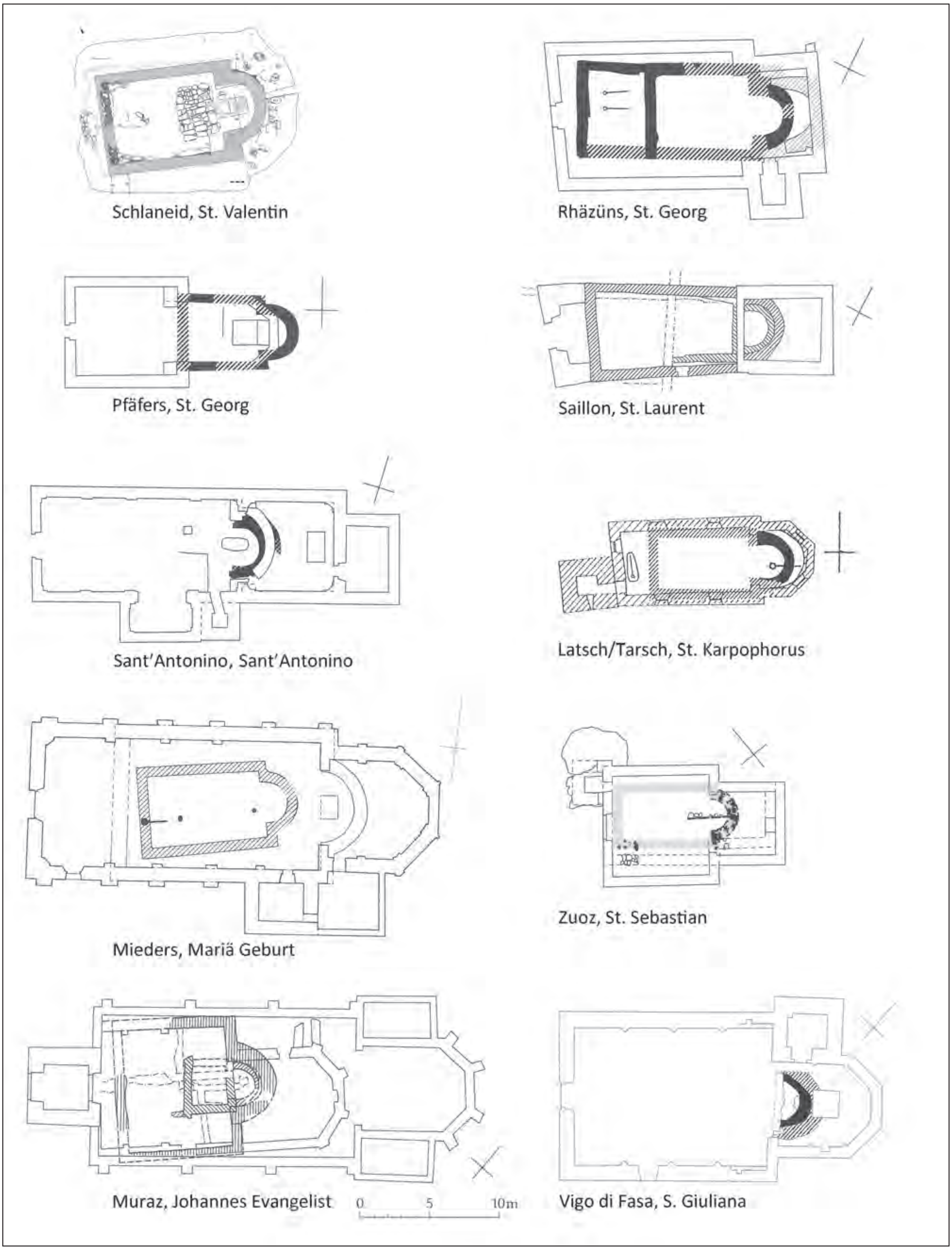

Abb. 11. St. Valentin, Phase A und vergleichbare frühmittelalterliche Kirchen im Alpenraum (Abbildungsgrundlagen nach Anm. 42 bis 50). Maßstab 1 : 400 (Grafik: G. Kaufmann).

östliche Südmauer bzw. die gesamte Süd- und Westmauer im Aufgehenden der Phase A2 zugewiesen. Da nun die ^{14}C-Daten aus den Baugruben der Südwestecke und der östlichen Südmauer parallel für das 8./9. Jahrhundert und damit für eine Gleichzeitigkeit sprechen, müsste entweder für den Bau der Phase A ein bemalter Vorgängerbau postuliert werden, von dem aber keine Reste erhalten sind, oder aber, die Originallage der Freskoreste ist anzuzweifeln (siehe unten, Phase C3). Dann bezeichnet Phase A den Erstbau.

Somit bleibt vieles im Ungewissen. Als erster fassbarer Kirchenbau kann der hier beschriebene Steinbau einer Saalkirche mit eventuell um Mauerbreite eingezogener Apsis angesehen werden. Er datiert in das 8./9. Jahrhundert, am ehesten in den Zeitraum 775–890.

5.1.3. Phase A – Historische Einordnung

Unter Karl dem Großen (768–814) fand eine stärkere fränkische Einflussnahme auf den Alpenraum statt: In Churrätien erfolgte zuerst um 773 die Unterstreichung des Schutzverhältnisses, dann wurde um 806 die Grafschaftsordnung eingeführt. Das südlich angrenzende Langobardenreich wurde 774 erobert. Letztendlich in Baiern wurde 788 Tassilo III. entmachtet.[59] In der Folge kam es zu einer gründlichen Reorganisation jener Gebiete. So kamen drei Viertel der karolingischen (Mark-)Grafen Norditaliens von nördlich der Alpen. Die adelige Führungsschicht Norditaliens bestand in diesen Jahrzehnten aus etwa 360 Franken, 160 Alemannen und nur 15 Baiern.[60] Im Alpeninneren kam es zu einer Beschränkung bzw. Beseitigung der lokalen Machtinhaber. Im Inntal wurde nach dem Sturz des Herzogs Tassilo III. die Scharnitzer Gründersippe der Huosi abgelöst. Als Nachfolger des bairisch ausgerichteten Adels wird der sagenhafte Haymo vom Rhein (oder/und aus Italien) angesehen.[61]

Auch in Schlaneid wurde wahrscheinlich ein karolingischer Amtsträger eingesetzt. Der Tschögglberg war Teil der Grafschaft Nurichtal, die sich über das Eisack- und Inntal erstreckte; wie eine noch zu besprechende Urkunde von 923 für Mölten und Terlan beweist. Bozen wurde also politisch nicht dem Herzogtum Trient zugewiesen, sondern behielt seine Nordausrichtung.[62]

Der neue karolingische Amtsträger in Schlaneid dürfte zu seinem Herrschaftsantritt ein Machtzeichen gesetzt haben, indem er einen Herrenhof und eine neue steinerne Eigenkirche mit Bestattungsrecht errichten ließ. Insofern könnte man die Kirche noch in die letzten 780er-Jahre datieren, was wir bereits 2015 vorgeschlagen haben.[63]

Auf die karolingische Organisation des Territoriums von Schlaneid weist auch ein Flurname. Im Maria-Theresianischen Kataster ist zum (Hof) Frank gehörig eine Wiese Perdoni (Grundparzelle 1385) eingetragen.[64] Diese liegt auf der Terrasse unterhalb des heutigen Ortskerns, 650 m südöstlich der St.-Valentin-Kirche (Abb. 4). Der Name Perdoni ist – gleich wie jener des auf der gegenüber liegenden Etschtalseite befindlichen Ortes Perdonig – aus dem Lateinischen *pratum dominicum* hervorgegangen und bedeutet „Herrenwiese“. Seit den Studien von Otto Clavadetscher ist bekannt, dass dieser Name für karolingisches Königsgut steht.[65]

In Mölten ist weiteres karolingisches Königsgut belegt: Der die karolingische Herrschaftspraxis fortführende letzte ostfränkische König Konrad I. (911–918) schenkte 916 dem Chorbischof von Kärnten Güter zu Mölten und Terlan in der Grafschaft Nurichtal. Chorbischof Gotabert wiederum übergab diese 923 der Kirche von Salzburg. Die umfangreichen Güter auf dem Tschögglberg und im Etschtal mit Höfen und Häusern, Leibeigenen, Weingärten und Äckern, Wiesen und Weiden, Fisch- und Jagdrechten lassen sich leider nicht mehr lokalisieren.[66] Sie sind aber sicher nicht nur im Ortskern von Mölten selbst zu suchen.[67]

5.2. Die hochmittelalterliche Steinkirche (Phase B)

In Phase B erfuhr die Kirche von Grund auf eine Erneuerung (Abb. 12). Von diesem Neubau ist beachtlich mehr Substanz erhalten geblieben als von dem vorhergehenden Bau. Im Aufgehenden sind von Phase B die eingezogene Apsis und ein Großteil der Nordmauer noch gut sichtbar. Der Grundriss war bereits den ersten Bearbeitern aufgefallen.

59 Meyer-Marthaler, Perret 1955, Nr. 19, 46. – Kaiser 1998, 39, 50–51, 53. – Heitmeier 2005, 345–352.

60 Hlawitschka 1960, 23–52, bes. 40–41.

61 Heitmeier 2005, 345–346, 348–350.

62 Riedmann 1990, 296. – Kaufmann 2009, 29. – Kaufmann 2018b, 110, 111 und Abb. 10.

63 Putzer, Kaufmann 2015, 144.

64 Südtiroler Landesarchiv: Rustikalsteuer-Kataster (1777), Gericht Mölten, Kat.-Nr. 275.

65 Clavadetscher 1965. – Nachdruck in Clavadetscher 1994, 241–269.

66 Hauthaler 1910, 66–68, Nr. 1: *proprietatem, quam in locis Mellita et Torilan dictis in comitatu Nurihtale donante Chonrado rege acquisivit, cum curtilibus aedificiis vineis agris pratis pascuis piscationibus venationibus mancipiis utriusque sexus* […]. – Huter 1937, 17, Nr. 24.

67 Es könnte sein, dass die Möltner Güter von dem Salzburger auf den Brixner Bischof und später teilweise auf Meinhard II. übergegangen sind, siehe von Zingerle 1890, 139: *von vier hoeven, die der pischof von Brixen minen herren gab: 12 phunt. […] Ein wise von Brihsen giltet: 6 phunt; wart geloest vmb 25 phunt.* Es handelt sich auch hier um ansehnlichen Grundbesitz, der leider nicht zu lokalisieren ist.

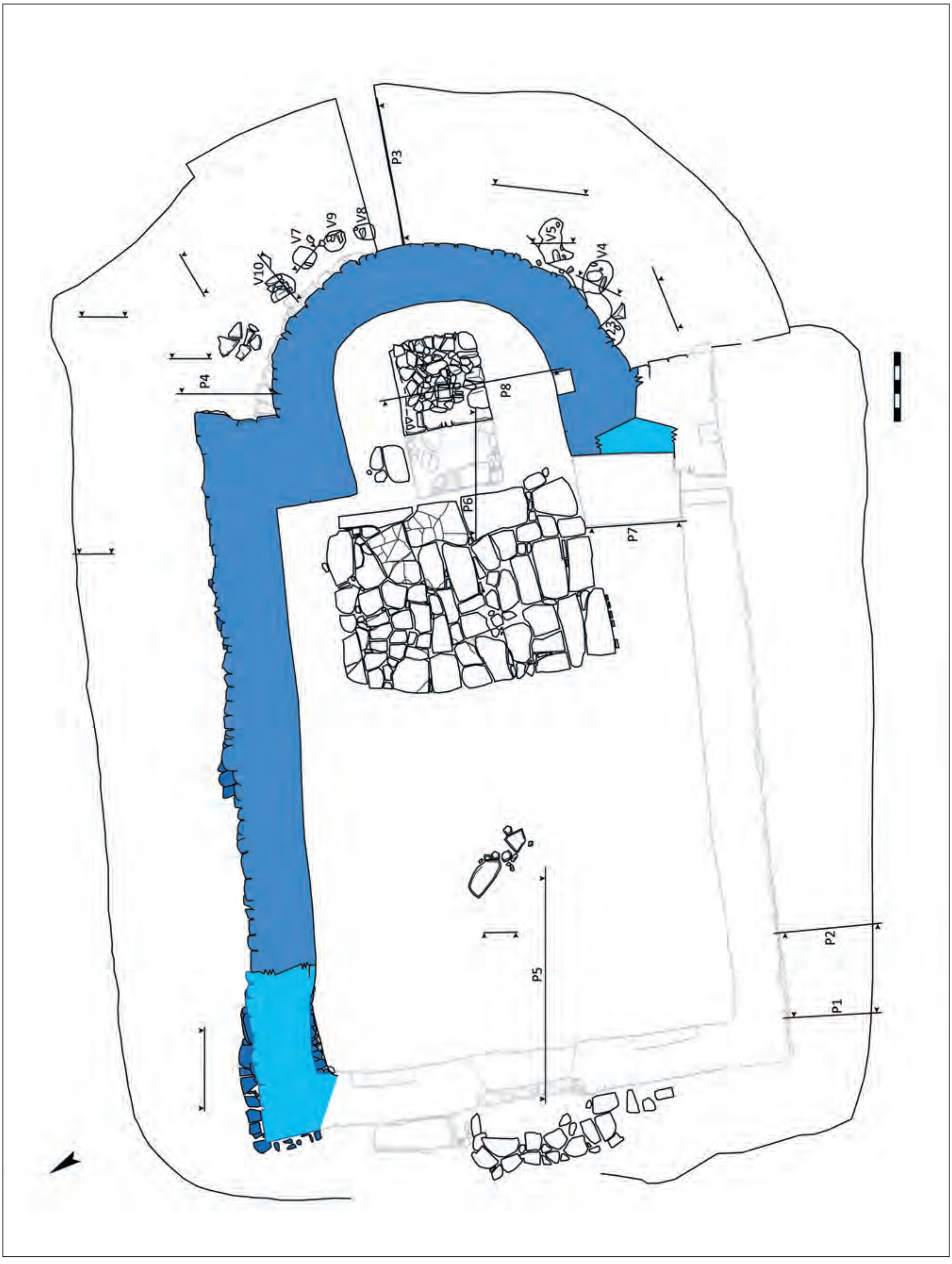

Abb. 12. St. Valentin, hochmittelalterliche Kirche, Rekonstruktionsversuch zu Phase B. Maßstab 1 : 80 (Zeichnung: G. Kaufmann).

Abb. 13. St. Valentin, Apsis, hochmittelalterliches Mauerwerk, Phase B (Foto: G. Kaufmann).

5.2.1. Phase B – Grabungsbefund

Mauern sind noch im Aufgehenden erhalten, teilweise sogar 1 ½ m hoch. Im Gegensatz dazu ist im archäologischen unterirdischen Befund nur wenig erhalten. In Planum 4 (Taf. 4) und Planum 5 (Taf. 5) sind die Fundamente der Nordwestecke dokumentiert. In den Profilen P1, P2 (Taf. 6) und P3 (Taf. 7) sind Gehhorizonte und Schichten mit dieser Phase in Verbindung zu bringen.

In Phase B wurde der Vorgängerbau der Phase A bis auf die Fundamente abgerissen. Im Nordprofil P3 (Taf. 7) sieht man auf dem Bau- und Gehhorizont der Phase A (4) eine bis zu 16 cm dicke Schicht aus reinem Mörtelsand und zerfallenen Putzen (5) parallel zur Kirchenmauer. Diese Mörtel-Putz-Schicht bedeckt noch zum Teil die dritte Lage der Apsis und läuft nach Osten hin nach 64 cm Länge aus. Diese Schicht kennzeichnet also Abriss und Neuaufbau der Apsis: Es handelt sich um Mörtel- und Putzreste der abgerissenen Kirche sowie um Kalkspritzer des Neubaus. Das alte Steinmaterial der abgerissenen Kirche ist zusammen mit neuen Quadern von quadratischem Umriss für den Neubau (wieder)verwendet worden und daher im archäologischen Befund nicht anzutreffen. Demzufolge blieben im östlichen Apsisbereich (Profil P3) drei Lagen der karolingischen Vorgängerapsis erhalten. Im nördlichen Apsisbereich hingegen liegt das neue Mauerwerk auf der vorkragenden ersten Lage des Vorgängerbaus auf, wohl auch im südlichen Apsisbereich.

Die Apsis wird also auf den untersten Lagen der karolingischen Vorgängerkirche (Phase A) neu errichtet (Abb. 13). Das neue Mauerwerk ist außen gut sichtbar. Regelmäßiges Bruchsteinmauerwerk ist noch fünf Lagen hoch erhalten. Die verwendeten Bausteine sind würfelförmig zugehauene Porphyrsteine. Der Grundriss der Apsis ist nun nicht nur außen, sondern auch innen klar zu umreißen. Es handelt sich um eine innen gestelzte Rundapsis. Die Mauerstärke der Apsis beträgt 87/88 cm im Bogenbereich und 105 cm im Ansatz. In der inneren südlichen Apsismauer befindet sich in +294 bis +324 cm Höhe, also 114–144 cm über dem Boden, eine 30 × 30 × 30 cm große Nische, die wohl zur Aufnahme der liturgischen Messgeräte gedient hat. Die von den Ausgräbern dort beobachtete Bauwerksfuge ist nicht zu erkennen.[68]

Die Apsisecken zur Ostmauer wurden mit 15 cm hohen Sandsteinquadern als Ecksteinen gemauert. Die Reste des

68 Nothdurfter, Stuppner o. J., 6: „Eine weitere vertikale Baufuge innen in der südlichen Apsismauer ist einen Meter von der Südostecke entfernt und fällt mit einer 0,25 bis 0,30 m tiefen, 0,30 m hohen und 0,30 m breiten Nische zusammen. Die Nische befindet sich in 1,15 m über dem Estrich und 0,90 m von der Südostecke entfernt.“

Abb. 14. St. Valentin, Nordmauer, hochmittelalterliches Mauerwerk, Phase B (Foto: G. Kaufmann).

Triumphbogens hat man im Schutt der Kirche angetroffen.[69] Sandsteinquader bildeten die Schenkel eines gedrückten Rundbogens.[70]

Im Aufgehenden erhalten ist auch der Großteil der Nordmauer (Abb. 14) bis zur Nordwestecke, wo sie nur mehr im Fundament nachzuweisen ist. Die Nordmauer und die um eineinhalb Mauerstärken eingezogene Apsis sind verbunden und bilden demnach ein zusammengehörendes Mauerwerk. Sieben Lagen hoch ist die Nordmauer noch erhalten. Das Mauerwerk besteht aus gerundeten Bruchsteinen, die meist waagrecht verlegt wurden, dazwischen finden sich immer wieder aufgestellte Steinplatten. Die Lagen sind 20–25 cm hoch. Die Mörtelbindung besteht aus porösem Feinsand und Kies. Innen wird der Verputz von einem jüngeren Putz mit gotischer Wandmalerei bedeckt. Die Mauerstärke der Nordmauer beträgt ca. 90–100 cm.

Das Nordwesteck der Phase B ist nur mehr im Fundament (Planum 4 und 5, Taf. 4–5) erhalten. Das Aufgehende ist jünger und durch eine Bauwerksfuge von der Nordmauer der Phase B abgesetzt. Das angesprochene Fundament der Phase B besteht aus in Mörtel gebundenen Steinlagen, die an der heutigen jüngeren westlichen Nordmauer innen ca. 16 cm vorstehen. Dieses Nordmauerfundament setzt sich unterhalb der heutigen jüngeren Westmauer fort, wo es an die vorhergehenden karolingischen Westmauerfundamente anstößt. Die unterste Steinlage der Nordmauer der Phase B streicht also an der nördlichen Abbruchkante der karolingischen Westmauer vorbei; sie ist nicht eingebunden.

Die Südmauer und die Westmauer der Phase B sind nicht mehr erhalten. Die Südmauer ist in spätgotischer Zeit ersetzt worden. Die heutige jüngere Südmauer ist in der Südostecke durch eine Bauwerksfuge abgesetzt. Der frühgotische Verputz mit Freskomalerei, der in der Apsis, am Choreinzug und (teilweise) auf der Nordmauer noch erhalten ist, fehlt auf der heutigen Südmauer und war auch im Grabungsbefund kaum/nicht auszumachen.[71] Die Südmauer der Phase B, die sicherlich ebenfalls diese Ausmalung getragen hat, ist nicht mehr vorhanden und sogar im Fundamentbereich nicht zu erkennen. Sie muss ohne Baugrube direkt auf den älteren Fundamenten der karolingischen Phase A errichtet worden sein.

Auch von der Westmauer gibt es kaum eine Spur. Sie baute jedenfalls nicht direkt auf den Fundamenten der karolingischen Westmauer auf, sondern wurde etwas nach Westen versetzt. An der heutigen jüngeren Nordwestecke außen

69 Grabungsprotokoll vom 8.10.1990: „Im Innern kam der Versturz des Triumphbogens zum Vorschein.“. – Nothdurfter, Stuppner o. J., 6: „Einige Sandsteinquader dieses Bogens wurden auch im Versturz im Inne[r]n der Kirche gefunden.“

70 Im Gegensatz zu Putzer, Kaufmann 2015, 150 wird der Triumphbogen aus Sandsteinquadern hier der Phase B zugewiesen, denn es sind – vor allem an der nördlichen Wand – keine Bauwerksfugen erkennbar, die einen späteren Einbau rechtfertigen würden.

71 Grabungsprotokoll vom 4.10.1990: „Auffallend ist, dass an der Nordmauer sehr viele Freskoreste zum Vorschein kommen im Gegensatz zur Südmauer.“

gibt es als tiefste Lage vorstehende Steine. Diese könnten von den Fundamenten der Nordwestecke der Phase B stammen. Demzufolge dürfte die Westmauer der Phase B bis auf diese unterste Fundamentlage von der heutigen Westmauer ersetzt worden sein.

Insgesamt behielt der Bau B allerdings größtenteils den Grundriss der vorhergehenden Kirche bei. Der Kirchensaal wurde nur minimal breiter und etwas länger, vielleicht insgesamt auch höher.

Für die Errichtung der Kirche der Phase B dürften Holzgerüste zum Einsatz gekommen sein. Einige Pfostenlöcher sollten demnach zu dieser Phase gehören. Die von uns bereits dieser Phase zugewiesenen Verfärbungen V24, V25, V26, V27 und V28 haben sich aber als noch jünger erwiesen (siehe unten, Phase D).[72] Stratigraphisch lassen sich dieser Bauphase keine Verfärbungen zwingend zuweisen. Das Pfostenloch V4 und die Verfärbung V23 sollten dieser Bauphase zuzuweisen sein, weil sie älter sind als das noch zu behandelnde Grab 5 (siehe unten, Phase C2). Auch das Pfostenloch V5 könnte hier eingeordnet werden. Hypothetisch sollten auch die (möglichen) Pfostenlöcher V7, V8, V9 und V10 dieser Bauphase angefügt werden. Diese Pfostenlöcher könnten zu einem Gerüst gehört haben, das man für die Errichtung des Baus B aufgestellt hat.

Zu den Gehhorizonten der Bauphase B: Als Fußboden im Kircheninneren dürfte weiterhin der Plattenboden gedient haben. Nur zentral im Kirchensaal sollte der ursprüngliche karolingische Boden größtenteils unberührt über dem roten Lehmboden liegen geblieben sein. An den Rändern zu den neuen Mauern hin müssen die Platten neu verlegt worden sein. Sie sind aber nicht mehr erhalten.

Was die außerhalb der Kirche befindlichen Gehhorizonte angeht, konnten nur im Profil P2 (Taf. 6) an der Südmauer drei übereinander liegende Gehhorizonte dokumentiert werden. Das zweite, mittlere Gehniveau auf der dunkelbraunen körnigen Erde mit vereinzelten Holzkohlestückchen (5) stößt an einen Stein an und könnte zur Bauphase B gehören.

Mit der Neuerrichtung der Apsis muss auch der Altar erneuert worden sein, er dürfte bei der Demolierung der Vorgängerkirche Schaden genommen haben. Aufbauend auf dem vorhergehenden wurde der Blockaltar aus Bruchsteinen aus Porphyr, gebunden in rötlichbraunem Lehm, mit einem Reliquienloculus in der Mitte, neu errichtet.[73] Der Altar ist 1,31 m lang und 1,26 m breit sowie noch 0,66 m hoch erhalten. Es konnten zwei Verputzschichten beobachtet werden; die erste Verputzschicht an der Nord-, Ost- und teilweise an der Südseite ist wohl noch der Phase B zuzuweisen.[74] Die Reliquiennische ist mit Sandsteinplatten ausgekleidet und innen 18 × 18 × 18 cm groß, wie in Planum 1 (Taf. 1) und Profil P8 (Taf. 9) gut zu sehen ist.

Bestattungen können der Bauphase B keine zugewiesen werden. Alle datierten Knochen sind entweder älter oder jünger als der romanische Bau.

5.2.2. Phase B – Datierung

Zur Bauphase B gibt es keine ^{14}C-Daten. Relativchronologisch liegt sie zwischen den ^{14}C-datierten Phasen A und C2.

Ausschlaggebend ist die Bautypologie. Seit Karl Atz wird die Kirche als romanischer Bau angesehen.[75] Der Baubestand bzw. das Mauerwerk ist teilweise noch 1 ½ m hoch erhalten. Gut einsehbar ist vor allem die Nordmauer innen und die Apsis außen.

Die horizontale Schichtung der Bausteine in der Nordmauer mit immer wieder auftretenden kleinen Steinen bzw. Steinplatten, die zur Verfüllung bzw. zum Ausgleich eingebracht wurden, um die horizontale Lagigkeit des Mauerwerks zu garantieren, ist ein sicheres Indiz für die romanische Bautechnik.[76] Auch das im Fundament erhaltene Mauerwerk der Nordwestecke, das in reichlich Mörtel gebunden ist, entspricht der in der Romanik üblichen Fundamentierung von Mauern.[77] Das aufgehende Mauerwerk der noch erhaltenen Nordmauer hat eine frühe Parallele in der Außenseite der Südwand der Stiftskirche von St. Lorenzen, bei der mit der Bauphase III um 1090 ebenfalls ein horizontallagiges Schichtmauerwerk vorliegt.[78]

Die im aufgehenden Mauerwerk der Apsis verwendeten würfelförmig zugehauenen Porphyrsteine und deren horizontale Verlegung lassen sich mit den untersten Lagen des Turms von Gars am Kamp vergleichen, der um 1100 (± 20 Jahre) bzw. dendrochronologisch nach 1090 datiert wird.[79] Vergleichbare Quader von quadratischem Umriss und Rundbögen mit Sandsteinquadern finden sich im romanischen Kernbau der Kirche Maria Trost in Untermais, der aufgrund dendrochronologischer Untersuchungen um 1108/10 datiert.[80] Auch an der Südwand des Bergfrieds von Hocheppan aus der ersten Hälfte des 12. Jahrhunderts sind lagig verlegte Quader von quadratischem Umriss zu sehen. Hocheppan ist die Stammburg der 1116 erstmals erwähnten

72 Putzer, Kaufmann 2015, 146.

73 Nothdurfter 2003a, 285.

74 Nothdurfter, Stuppner o. J., 8.

75 Atz 1862, 41.

76 Mittermair, Bitschnau 2003.

77 Nothdurfter 2003a, 286.

78 Mittermair, Bitschnau 2003, 668 und Abb. 2.

79 Demetz 2015, 164 und Abb. 6. – Bitschnau 2015, 189.

80 Mittermair 2006, 46–55.

Grafen von Eppan.[81] Damit ergibt sich für die Phase B eine Datierung in das frühe 12. Jahrhundert.

Ein erneuter Blick auf das Patrozinium kann weitere Hinweise liefern. Der Kult des heiligen Valentin erfuhr im Hochmittelalter von Passau aus einen neuen Schub.[82] Die von einem Anonymus Passaviensis niedergeschriebene Lebensgeschichte des heiligen Valentin wurde längst als Fälschung erkannt. Sie stützte sich angeblich auf eine bei der Erhebung des heiligen Leibes um 1120 im Sarg aufgefundene Bleitafel und beschrieb Valentin als einen vor den Arianern aus Passau geflüchteten Bischof,[83] in Wirklichkeit aber verwendete sie Motive aus der Vita Corbiniani und der Vita Severini und ist voll historischer Fehler. Diese Vitenfälschung diente zur Kultförderung und bildete somit die im 12./13. Jahrhundert verbreitete Passauer Valentinslegende.[84]

Die romanische Phase B gehört in die ersten Jahrzehnte des 12. Jahrhunderts, vielleicht um 1120.

5.2.3. Phase B – Historische Einordnung

Schriftliche Quellen zu dem romanischen Bau bzw. dessen Weihedatum gibt es nicht, auch nicht zu Schlaneid im Hochmittelalter.

Im Jahr 1027 übergab Kaiser Konrad II. dem Bischof Udalrich II. von Trient die Grafschaften Bozen und Vinschgau. Die Grafschaft Bozen wurde damals begründet und erstmals vergeben, sie wurde aus den Territorien der Grafschaften Nurichtal und Vinschgau herausgegliedert.[85] Nach den Grafen von Bozen hatten in der ersten Hälfte des 12. Jahrhunderts die sogenannten Grafen von Morit-Greifenstein – beide Geschlechter sind Verwandte der Grafen von Eppan – die Grafschaft Bozen inne; nach dem Aussterben der Greifensteiner 1166 behielt der Trienter Bischof Adelpret die Hälfte der Grafschaft Bozen in eigener Verwaltung und die andere Hälfte übertrug er Graf Berthold von Tirol.[86] Die Gerichtsherrschaft Greifenstein (bzw. das Gericht Mölten) entstand in diesem Kontext. Sie verantwortete neben der Rechtspflege auch die politische Verwaltung.[87]

Im Verlauf des Hochmittelalters entwickelte sich Schlaneid von einem frühmittelalterlichen Königsgut zu einem spätmittelalterlichen Kleindorf; 1330 ist Schlaneid nämlich als *villa* erwähnt.[88] Die karolingische Villikation und die Nachfolgehöfe wurden mehrfach geteilt und kamen in die Hände verschiedener Grundherren. Im frühen 12. Jahrhundert wurde die St.-Valentin-Kirche auf der unteren Terrasse im romanischen Stil erneuert, als Teil eines dazugehörenden Herrenhofes (Mayrs). Auf dem darüber liegenden Hang liegen zwei weitere Höfe mit Funktion eines Mayrs (Abb. 4). Sie gehen sicher auf das Hochmittelalter zurück und stehen am Beginn eines neuen Siedlungszyklus. Wenn die von Josef Tarneller vorgenommene Gleichsetzung des Moar (Bauparzellen 204–205) mit dem 1450 genannten *der ober Mair* stimmt,[89] woran nicht zu zweifeln ist, dann muss – zumindest bei der Gründung desselben im Hochmittelalter – auf der unteren Terrasse noch ein weiterer Mayr bestanden haben, also der *Unter-Moar als Nachfolger der Villikation. Es gibt aber noch einen weiteren Hof mit Mayrfunktion am Hangrücken, den höher liegenden Kastner (Bauparzellen 192, 194–195), der 1330 als *castenarius de Schelaneichk* aufscheint,[90] wohl die dritte Etappe im Reigen der Abspaltungen.

Zu den Grundherrschaften: Der Moar (Mayrhof Kat.-Nr. 278) ist im Maria-Theresianischen Kataster von 1777 (Tab. 3) bereits abgelöst. *Der ober Mair* scheint zusammen mit Ursch und Roader in einer Hofliste auf. Weil der Roader 1777 zu der Gerichtsherrschaft gehörte,[91] ist es sehr wahrscheinlich, dass auch *der ober Mair*, also der zentral im

81 Bitschnau 2015, 178 und Abb. 2; 179 und Abb. 3–4; 188.

82 Kaufmann 2011, 32–33, 47.

83 Anonymus Passaviensis: *Populi autem videntes eum instanter praedicantem, unacum Arianis restiterunt ei, et ejecerunt eum non sine laesione de finibus suis. Ille vero, ut erat homo patiens, excusso pulvere pedum in eos, regressus ab Urbe declinavit ad montana* [...] und Laurentius Surius (1522–1558) nach Anonymus: *Beatus vir Athleta fortissimus [...] delegit vitam solitariam, [...] fecerat sibi jam pridem Oratoriolum seorsim ab hominum tumultu [...] Vocatis fratribus et commilitonibus suis indicavit eis, prope adesse suum e vita decessum [...] Corpus autem ejus in Alpibus in Ecclesia, quam ipse condiderat, humatum est.* – Zitiert nach Stampfer, Kretz 1861, 49. Unter anderem wird Grimoald als König der Langobarden dargestellt: *Cum beatae memoriae S. Corbinianus Episcopus Frisingensis Romam aliquando profisceretur, captus est a ministris Grimoaldi Langobardorum* [!] *Principis - - - perductasque est in Magiense castrum. Ubi cum maneret sanctissimus vir, accessit ad monumentum S. Valentini Pataviensis quondam episcopi quod in eodem castro in Alpibus sito idem beatus antistes Valentinus extruxerat: in quo postquam gentibus praedicaverat et multos ab ethnicismo ad Christi religionem traduxerat post obitum suum humatus requievit in pace.* – Zitiert nach Mazegger 1890, 32. Zur Problematik der Datierung in das 12. Jahrhundert und zu den einzigen Hinweisen *ante quem* 1289 bzw. 1244 vgl. Berg 1989, 72 mit Anm. 102. – Vom Datum 1120 sprechen Stampfer, Kretz 1861, 49 und Kröss 1910, 90 mit Anm. 1 sowie Morin 1924, 73.

84 Seider 1907. – Oswald 1971, 13.

85 Huter 1937, Nr. 52. – Vonficht 1980. – Riedmann 1990, 329 (Karte). – Landi 2002. – Kaufmann 2009, 29–30.

86 Riedmann 1990, 353, 356–357.

87 Schwarz 1990, 46–61, bes. 47.

88 Tarneller 1909, [204] 328 mit Anm. 1: *villa Schelaneichk*.

89 Tarneller 1909, [206] 330, Nr. 1809.

90 Tarneller 1909, Nr. 1806, 1809. Als *castenarius* bezeichnete man einen Urbarverwalter oder Mayr.

91 Tarneller 1909, Nr. 1808, 1809, 1811.

Kat.-Nr.	Hofname	Bauparzelle	zugehörige Fluren	Erstnennung	Grundzins 1777
278	Mayrhof	204–205		1450	abgelöst
323	Knottenpaur	189–190		1777	Luteigen
272	Raiderhof	206, 208		1450	Gerichtsherrschaft
305	Schwabenhäusl oder Lägä-Gütl	222		1777	Gerichtsherrschaft
304	Händl	304		1777	Gerichtsherrschaft
290	Hilberhof	216–217	Valentins-Acker Grundparzellen 1518–1519	1493	Graf Trapp Erben Franz Karl Graf Trapp
301	Gschnöllen-Hof	220–221		1493	Graf Trapp Erben, Kloster Gries
285	Schözerhof	191, 197–198, 200–201		1613	Graf Trappisches Amt in Bozen, Herrenkloster in Gries
292	Reiser	203		1777	Kellenamt Meran
275	Frankenhof	207, 209	Perdoni Grundparzelle 1385	1545	Pfarrwidum auf Tirol
281	Urschengut	212, 214		1450	Peter von Zahlinger
297	Kastnerhof	192, 194–195		1330	von Giovanelli in Bozen

Tab. 3. Übersicht über die Grundherrschaften der Höfe von Schlaneid im Rustikalsteuer-Kataster von 1777.

Dorf liegende Moar, ursprünglich zu der Gerichtsherrschaft gehörte – in direkter Nachfolge der hochmittelalterlichen Grafschaft Bozen und des frühmittelalterlichen Königsgutes. Dasselbe gilt für den Ursch (Urschengut Kat.-Nr. 297), der 1777 Peter von Zallinger gehörte; die Familie von Zallinger gelangte erst im 17. Jahrhundert zu ihren Besitzungen im Raum Bozen. Der Kastner (Kastnerhof Kat.-Nr. 297) hingegen gehörte 1777 den von Giovanelli in Bozen, die dort erst im 18. Jahrhundert zu ihren Besitzungen gekommen waren. Bei vielen anderen wiederum lässt sich die grundherrschaftliche Entwicklung von dem karolingischen Königsgut zu den neuzeitlichen Grundherren gut nachverfolgen: Der bereits genannte Roader (Raiderhof Kat.-Nr. 272), der Schwab (Schwabenhäusl Kat.-Nr. 305) und die neuzeitliche Behausung Händl (Kat.-Nr. 304) gehörten 1777 zu der Gerichtsherrschaft. Der Schötzer (Schözerhof Kat.-Nr. 285) und der Gschnöll (Gschnöllen-Hof Kat.-Nr. 301) hatten beide 1777 jeweils zur Hälfte das Kloster Muri-Gries und die Erben von Graf Trapp zum Grundherrn. Die Grundherrschaft des Klosters Muri-Gries geht auf dessen Gründer, Graf Arnold III. von Morit-Greifenstein und somit letztendlich wieder auf die Grafschaft Bozen zurück.[92] Auch für den Hilber (Hilberhof Kat.-Nr. 290), dessen Grundherren 1777 die Erben von Franz Karl Graf Trapp waren, kann man wohl denselben Weg vermuten, wie für den Schötzer und den Gschnöll. Selbst wenn im Detail noch nicht geklärt ist, auf welche Art und Weise die Grafen Trapp, die erst unter Herzog Sigmund dem Münzreichen um 1500 von der Steiermark nach Tirol kamen und im Vinschgau die Vögte von Matsch beerbten, zu ihrem Besitz in Bozen und Mölten gelangten. Auch beim Reiser (Kat.-Nr. 292) und beim Frank (Frankenhof Kat.-Nr. 275), die 1777 dem Kellenamt Meran und dem Pfarrwidum Tirol Grundzins zahlten, wird man den Weg über die Grafen von Tirol, die 1166 mit Graf Berthold von Tirol das halbe Erbe der Greifensteiner übernahmen, nicht abstreiten können. Bleibt nur mehr der luteigene Knottenpaur (Kat.-Nr. 323). Von den hier aufgezählten Höfen/Häusern liegen der Knottenpaur, der Schwab und die Behausung Händl außerhalb des Ortskerns und haben somit mit der Entwicklung von dem frühmittelalterlichen Königsgut zu dem spätmittelalterlichen Kleindorf nichts zu tun. Diese erfolgte zunächst durch Teilung und Neuansiedlung am oberen Hang, dann durch weitere Grundteilungen bei gleichzeitigem Verbleib der neuen Hofstellen im so entstehenden Ortskern.

Von den Altfluren gehörte der Valentins-Acker (Grundparzellen 1518, 1519) 1777 zum Hilber (Franz Karl Graf Trapps Erben) und die Wiese Perdoni (Grundparzelle 1385) zum Frank (Pfarrwidum Tirol).

Selbst wenn die Hälfte der Höfe erst im Spätmittelalter ab 1330 (Kastner), 1450 (Moar, Roader, Ursch) bzw. 1493 (Hilber, Gschnöll) sowie der Rest überhaupt erst in der Neuzeit urkundlich genannt sind, so kann man dennoch eine Entwicklung des Dorfes am Hang ab dem Hochmittelalter

92 Schwarz 1990, 44–46, bes. 46.

Abb. 15. St. Valentin, Ost- und Nordmauer mit frühgotischer Wandmalerei (Phase C1), mit dem horizontalen, in der Nordostecke ansteigenden Trennband zwischen unterem Bildprogramm mit dreipassförmigen Kleeblättern und oberem, nicht mehr erhaltenen Bildprogramm, sowie mit Verstärkung der Apsisecke für den Triumphbogen (Foto: G. Kaufmann).

nachzeichnen und alle Grundherrschaften letztendlich auf die hochmittelalterliche Grafschaft Bozen und noch weiter auf das karolingische Königsgut zurückverfolgen.

Auf das Hochmittelalter könnte auch der Kult Heinrichs II. in Schlaneid zurückgehen. Dort war sein Todestag, der 13. Juli, ein großer Feiertag, an dem ein Gottesdienst abgehalten wurde und nicht gearbeitet werden durfte.[93] In der neuen St.-Valentin-Kirche im Dorfkern befindet sich, zum Seitenaufbau des Barockaltars gehörend, eine Statue des heiligen Kaisers Heinrich II. in Kriegstracht, dargestellt in der Ikonographie des Wetterherrn.[94]

Kaiser Heinrich II. (1002–1024), der bereits 1004 die Grafschaft Trient dem Bischof von Trient verliehen hatte, hat sich durch zahlreiche Schenkungen als besonderer Wohltäter des Bistums Säben/Brixen hervorgetan.[95] Heinrich wurde schon zu Lebzeiten als der Fromme gepriesen, nach seinem Tod wurde in Bamberg das Bild des heiligen Kaisers begründet, heiliggesprochen wurde er jedoch erst 1146. Von da an verbreitete sich sein Kult schnell in dem von ihm gegründeten Bistum Bamberg, auch in Bayern, im Bodenseegebiet und im Elsass. Erst 1348 wurde der Heinrichstag, der 13. Juli, auch im ferneren Bistum Basel zum hohen Feiertag erkoren.[96]

In Tirol gründet die Memoria Kaiser Heinrichs II. auf dem Heiligen selbst. Seine Kanonisierung erfolgte 1146 zur Zeit Graf Bertholds von Tirol (1141–1184), der wiederum ab 1166 zur Hälfte das Greifensteiner Erbe antrat. Erst ab dem Spätmittelalter wurde Heinrich zum Wetterpatron. In Schlaneid hielt man während der Sommermonate sechs Wetterämter ab. Eine Stiftung – und damit Datierung – der Wetterämter hat sich aber nicht erhalten.[97]

5.3. Die spätmittelalterlichen und neuzeitlichen Umbauten (Phase C)

Die Phase C bezeichnet nicht eine Umbauphase, sondern mehrere im Verlauf der Jahrhunderte erfolgte Renovierungen, Erweiterungen und Umbauten an der bestehenden Kirche ohne radikale Erneuerung. Der Grundriss blieb

93 Schwarz 1990, 110.

94 Schwarz 1973, 369. – Andergassen 1993, 25.

95 Riedmann 1990, 306–307.

96 Pfaff 1963. – Hess 2002.

97 Atz, Schatz 1903, 323: „In diesem Kirchlein [St. Ulrich in Gschleir] wurden früher nach herkömmlicher Weise drei Wetterämter gehalten, nun aber wegen geringer Betheiligung der Bevölkerung nach Schlaneid übertragen."

Abb. 16. St. Valentin, Süd- und Ostmauer mit Triumphbogenansatz und frühgotische Wandmalerei in der Apsis (Foto: G. Kaufmann).

derselbe. Im Folgenden werden vier Ausbesserungen als Phase C1, C2, C3 und C4 beschrieben.

5.3.1. Phase C1

5.3.1.1. Phase C1 – Befund

Hierbei handelt es sich um keine Bauphase. Mauern wurden nicht verändert. Der romanische Saal blieb, er wurde aber neu ausgemalt. Auf der älteren romanischen Putzschicht hat man einen Verputz mit Freskomalerei angebracht. Der gesamte Innenraum wurde mit Fresken versehen. In der Apsis ist die Malerei bis auf eine Höhe von 1,10 m noch gut erhalten, ein horizontales rotes Band in einer Höhe von etwa 65 cm trennt die Freskomalerei in zwei Felder. Den unteren Bereich zieren dreipassförmige, rote und runde Kleeblätter mit gebogenem Stil (Abb. 15). Im oberen Feld hat sich nur die Darstellung von Füßen erhalten, die von einem Heiligen stammen. Während der Grabungen konnten von dem oberen Bildprogramm noch 13 Bildzonen beobachtet werden. Die mittlere Bildzone ist 1 m breit, die zwölf seitlichen sind jeweils 50 cm breit. Sie sind heute nur mehr zum Teil erkennbar, vermutlich waren die zwölf Apostel und im Zentrum Christus als Weltenrichter dargestellt.[98] Die Freskomalerei ist teilweise auch an der nördlichen Ostmauer erhalten, wo das rote Band in der Nordostecke ca. 33 cm vertikal ansteigt und sich dann an der romanischen Nordmauer horizontal fortsetzt. Unterhalb des Bandes befinden sich auch an der Nordmauer die dreipassförmigen roten Blätter. Sie sind von der Nordostecke in Richtung Westen bis zu 2,25 m erhalten; das über dem trennenden Band gemalte obere Bildprogramm ist zerstört. An der Nordmauer überdeckt der Verputz der Wandmalerei einen älteren (romanischen). An der südlichen Ostmauer verschwindet das horizontale rote Freskoband mit den darunter liegenden dreipassförmigen Blättern hinter dem später errichteten Seitenaltar (Planum 1). Auch oberhalb des Seitenaltares soll in der Südostecke ein Freskorest erhalten geblieben sein (Planum 1), aber weder auf alten Aufnahmen (Abb. 2) noch heute (Abb. 16) sind dort Verputz oder Wandmalereien zu sehen.[99]

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98 Andergassen 1993, 23. – Nothdurfter, Stuppner o. J., 6.

99 Nothdurfter, Stuppner o. J., 5: „Die Freskomalereien der Apsis setzen sich an der Innenseite der Ostmauer fort, wie aus einem festgestellten Freskomalereirest in der Südostecke über der Seitenaltaroberkante hervorgeht." Steht im Widerspruch zu ebd., 4: „Hinter dem Seitenaltar sind in der Südostecke Freskomalereien festgestellt worden, die nicht zu dem Zeitpunkt wie die Apsis angebracht wurden. Sie stammen aus der Zeit, als eine neue Südmauer zusammen mit der südlichen Ecke der Apsis neu aufgezogen wurde." Für eine Zuordnung der Malerei in der oberen Südostecke – sei es zur Ausmalung der Apsis (Phase C1), sei es zur Errichtung des glockenturmartigen Aufsatzes (siehe unten, Phase C2) oder der Südmauer (siehe unten, Phase C3) – gibt es keine Hinweise mehr.

Unmittelbar mit der Phase C1 sind keine Pfostenlöcher in Verbindung zu bringen. Allerdings könnten allgemein mit der Phase C, also mit den spätmittelalterlichen bis frühneuzeitlichen Veränderungen, die Pfostenlöcher V11, V12 und V13 (Abb. 17) an der Nordseite der Kirche zusammenhängen. Eventuell handelt es sich um die Reste von Fahnenstangen.

Mit der Phase C1 ist weder ein neuer Boden noch ein neuer Altar in Verbindung zu bringen. Die zweite Verputzschicht an der Südseite des Blockaltars könnte aber mit der Kirchenausmalung dieser Phase entstanden sein.[100]

Es gibt keine Bestattungen, die in diese Phase zu datieren wären.

5.3.1.2. Phase C1 – Datierung

Als Datierungsgrundlage dienen stilistische Argumente zur Malerei. Das Fresko mit regelmäßig angebrachten dreipassförmigen roten Kleeblättern findet eine überzeugende Parallele in der Gewölbemalerei der Krypta der Stiftskirche zu den heiligen Candidus und Korbinian in Innichen, die in die erste Hälfte des 14. Jahrhunderts datiert wird.[101] Nach wie vor nicht überzeugend ist der Vergleich mit den dreipassförmigen, teilweise zackigen oder elliptisch bis lanzettförmigen Blättern der Ostwand in der Unterkapelle von Schloss Tirol, an der Datierung ändert sich aber nichts.[102] Die Phase C1 ist weiterhin in die erste Hälfte des 14. Jahrhunderts zu datieren, eventuell um 1330/40.

5.3.1.3. Phase C1 – Historische Einordnung

Für die Neugestaltung des romanischen Kircheninneren mit kompletter frühgotischer Ausmalung sind keine archivalischen Quellen beizubringen.

Im 14. Jahrhundert war Schlaneid einer von vielen Ortsteilen von Mölten und die St.-Valentin-Kirche eine von fünf Filialkirchen der Pfarre Mölten.

Wohl in Zeiten des Meinhardiners Heinrich II. (1310–1335) oder der Gräfin Margarethe Maultasch von Tirol (1335–1363)[103] erfolgte die Innenneugestaltung der St.-Valentin-Kirche.

Im frühen 14. Jahrhundert hat die Kirche St. Blasius und Silvester in Verschneid Fresken einer Kreuzigung und einer Heiligenreihe erhalten.[104] Im späten 14. Jahrhundert wurde auch die Pfarrkirche Maria Himmelfahrt in Mölten mit Fresken eines Katharinenmartyriums geschmückt.[105] Auch an der Kirche Maria Himmelfahrt in Terlan wurden im 14. Jahrhundert mehrfach Arbeiten vorgenommen. Der Turm ist um ca. 1330 in noch romanischen Formen errichtet worden, der gotische Chor könnte um 1370 gebaut und bemalt worden sein.[106]

In der Leitung der Pfarre von Mölten gab es im 14. Jahrhundert mehrere Wechsel. Von diesen Amtsträgern könnte jeder ein Zeichen seines Amtsantritts gesetzt haben: Guarnardus/Bernhard (1318, 1323 und 1336 *Rector de Milten*), Walter (1319 *Vicar von Melten*), Wernhard/Bernhard (1330 *plebanus super monte Maleti*), Heinrich (1343 Pfarrer von *Malet*) und Nikolaus (1344 Pfarrherr *zu Melten*).[107]

Eine Erklärung für die qualitative Aufwertung der St.-Valentin-Kirche im Stil der Frühgotik könnte auch das Aufkommen einer lokalen Wallfahrt sein, was wir schon 2015 begründet hatten.[108]

5.3.2. Phase C2

5.3.2.1. Phase C2 – Befund

Die Umbauten dieser Phase betreffen die Südostecke der Kirche. Dort wurde ein rechteckiger glockenturmartiger Aufsatz von etwa 1,00 × 1,50 m (maximal 1,20 × 2,00 m) von Grund auf errichtet (Abb. 17). Er besteht aus unregelmäßigem Bruchsteinmauerwerk und großen behauenen Ecksteinquadern. Der Turmstumpf ist heute an der Außenseite noch 4 m hoch erhalten (Abb. 18). Die in der Südostecke verwendeten Quader haben eine Höhe von bis zu 40 cm und sind aus Porphyr. Das Mauerwerk, das an die romanische Apsis und an die heute nicht mehr vorhandene romanische Südmauer (Phase B) anbindet, ist von älteren Bruchsteinen und kleinen Füllsteinen geprägt. An der Innen- und Außenseite der heutigen Südmauer ist eine vertikale Bauwerksfuge erkennbar. Innen verläuft die Baunaht über dem Seitenaltar fast vertikal, 30–35 cm von der Südostecke, außen verläuft sie ziemlich schräg, 130–164 cm (am Boden) von der Südostecke. Der zum Turmaufsatz gehörende Mauerstumpf der Südostecke bildet zur heutigen Südmauer innen einen 6 cm breiten Absatz, ist also um 6 cm breiter. Dies

100 Nothdurfter, Stuppner o. J., 8.

101 Gruber, Nothdurfter 2017, 72–77. – Kofler-Engl 1995, 200.

102 Putzer, Kaufmann 2015, 150–151. – Vgl. das Rankenwerk bei Kofler-Engl 1995, Abb. 32 und Andergassen 2017, Abb. 5.

103 Die Landesfürstin stiftete 1351 für die Pfarrkirche von Terlan *50 solidos* Öl, 3 Yhren Wein und angeblich ihre mit Silber bestickte Haube, siehe Atz, Schatz 1903, 291.

104 Schwarz 1990, 110: „aus dem frühen 14. Jahrhundert." – Andergassen 1993, 16–17: „Beginn des 14. Jahrhunderts […] Linearstil, um 1300."

105 Schwarz 1990, 105: „Bozner Schule um 1350–1370.". – Andergassen 1993, 4: „spätes 14. Jahrhundert."

106 Mitterer, Nicolussi 2020, 35. – Stampfer 2020, 81.

107 Atz, Schatz 1903, 290. – Schwarz 1990, 117.

108 Putzer, Kaufmann 2015, 152–153.

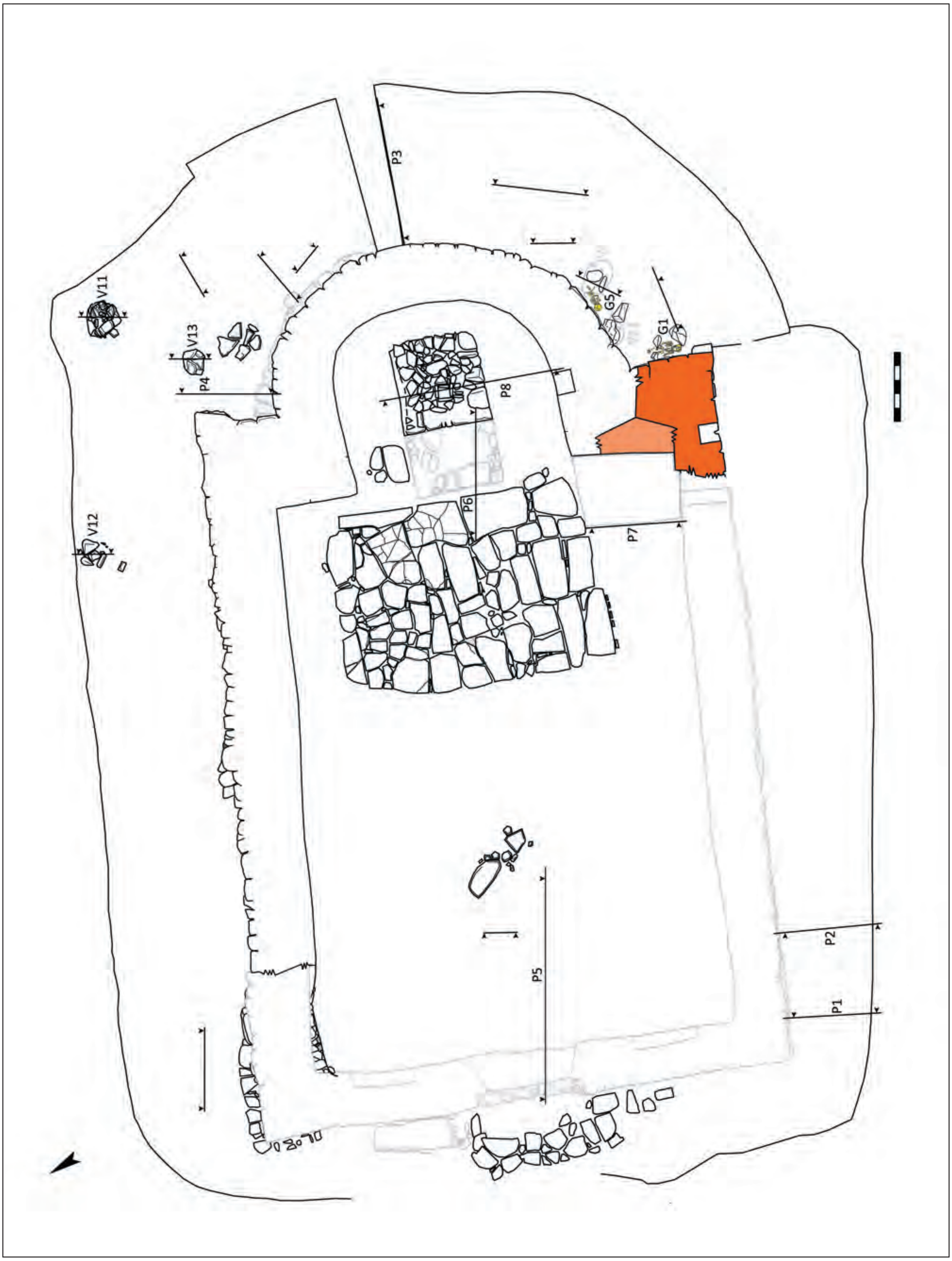


Abb. 17. St. Valentin, spätmittelalterliche Kirche, Rekonstruktionsversuch zu Phase C2. Maßstab 1 : 80 (Zeichnung: G. Kaufmann).

Abb. 18. St. Valentin, Stumpf des gotischen glockenturmartigen Aufsatzes (Foto: G. Kaufmann).

bezeugt wohl, dass die Turmecke ursprünglich an ein älteres, dickeres Mauerwerk angebaut war. Dabei muss es sich um die romanische Südmauer gehandelt haben. Die Breite der romanischen Nordmauer beträgt wie oben beschrieben 90–100 cm, die Dicke des zur Turmecke gehörenden Mauerstumpfes – und damit wohl auch der romanischen Südmauer – beträgt hingegen nur 80 cm. Wir setzen hier zwei zeitlich unterschiedliche Bauwerksfugen mit mehr oder weniger demselben Verlauf voraus: zuerst eine Baunaht zwischen der romanischen Südmauer (Phase B) und der angebauten Turmecke (Phase C2); dann die heutige Bautrennfuge zwischen der Turmecke (Phase C2) und der angebauten rezenten Südmauer (Phase C3). Auf diese Weise erklärt sich auch das Fehlen der Wandmalerei auf der heutigen Südmauer innen. Im südlichen Mauerwerk des glockenturmartigen Aufsatzes war (vor der jüngsten Restaurierung 2018) außen auf einer Höhe von 1,50 m (vom Boden) eine Nische (33 × 25 cm, tief ca. 25 cm) sichtbar, die innen mit Mörtel zugekleistert war. Die einzig sinnvolle Erklärung für diese Nische scheint eine Verwendung als Gerüstloch, da für die Errichtung des Turms ein Gerüst notwendig war. Die Anbaunaht des Turms an der Außenseite des Apsisschenkels ist ebenso gut erkennbar und gewinnt mit steigender Höhe eine Breite von 1,20 m von der Südostecke.

Der Turmzubau an das bestehende romanische Mauerwerk hat im Bereich des Triumphbogens auch bei der südlichen Ostmauer seine Spuren hinterlassen, welche (teilweise) neu eingemauert an den zum Turm gehörenden Stumpf der Südmauer und an die Triumphbogensteine stößt ohne eingebunden zu sein. Durch diesen Eingriff in der oberen Südostecke muss auch der Verputz mit Freskomalerei zerstört worden sein. Die neue südliche Ostmauer aus älteren romanischen Bausteinen ist mit porösem Mörtel gebunden, Wandverputz ist oberhalb des Seitenaltars keiner erhalten, der ursprünglich vorhandene Rest einer Malerei ist nicht zuordenbar.[109]

Außen an der Nordostecke der Kirche hat man 15 cm hohe Sandsteinquader im Bauschutt gefunden, welche laut den Ausgräbern auf eine Erneuerung der Nordostecke

109 Vgl. auch Anm. 99.

verweisen.[110] Im erhaltenen Baubefund kann dies leider nicht mehr beobachtet werden. Die Quader sind nicht mehr vorhanden.

Obwohl für den Aufbau des Turms sicher ein Gerüst aufgestellt worden ist, können diesbezüglich keine Pfostenlöcher namhaft gemacht werden. Auch können keine neuen Böden oder Gehhorizonte dieser Umbauphase zugeordnet werden.

Der Blockaltar blieb seit seiner Errichtung während der Romanik unverändert.

Es gibt aber zwei Bestattungen, die mit dieser Phase in Verbindung gebracht werden können. Grab 1 an der Ostseite des neuen glockenturmartigen Aufsatzes und Grab 5 an der Südseite der Apsis (Abb. 17 und Taf. 2–3).

Grab 1 (FN 35) lehnt an die Ostseite des neuen glockenturmartigen Aufsatzes bzw. an dessen Fundamente an. Die Grabgrube (50 × 20 cm) war mit dunkelbrauner Erde gefüllt.[111] Es handelt sich um eine Süd-Nord-ausgerichtete Körperbestattung eines Kleinkindes in Rückenlage mit an den Körper angelegten ausgestreckten Armen. Arme, Beine, Hände, Füße, Rumpf und Kopf sind gut erhalten. Im Jahr 2015 waren wir noch davon ausgegangen, dass der glockenturmartige Aufsatz nur im Aufgehenden neu wäre, während die Fundamente der karolingischen Kirche zuzuordnen wären.[112] Diese Annahme wurde deshalb geäußert, weil der rechteckige Umriss des Grabes 1 erst in Planum 2 (Taf. 2) mit den tieferen Verfärbungen (Pfostenlöchern) dokumentiert worden ist.[113] Nun ergibt sich aber aus der Neudatierung der Verfärbungen und aus der Radiokohlenstoff-Datierung eine Zugehörigkeit des Grabes 1 zu Bauphase C2.

Grab 5 (FN 25) lehnt an die Südseite der Apsis an. Die Grabgrube (50 × 15 cm) war mit dunkelbrauner Erde und Holzkohlestückchen gefüllt.[114] Es handelt sich um eine West-Ost-ausgerichtete Körperbestattung eines Kleinkindes in Rückenlage mit über dem Becken gekreuzten bzw. gefalteten Händen. Grab 5 stört die Verfärbungen V4 und V23 (siehe oben, 4.). Doch auch Grab 5 scheint zweimal gestört worden zu sein: Das linke Bein ist noch im Verbund nach rechts gebogen, was wohl nicht zum Bestattungsmodus gehört; der rechte Unterschenkel wiederum liegt neben dem rechten Oberschenkel, was auf eine Störung des Skelettes hinweist, eventuell auch durch Kleintiere. Beide Füße sind nicht dokumentiert.

5.3.2.2. Phase C2 – Datierung

Die Datierung der Erweiterungsphase C2 stützt sich auf ^{14}C-Daten und auf die Bautypologie.

Die Errichtung des glockenturmartigen Aufsatzes kann *ante quem* über das angelehnte Kindergrab 1 datiert werden. Die Radiokohlenstoff-Datierung (LTL16655A) eines Langknochens von Grab 1 (FN 35) hat das Alter 1315–1469 calAD (95,4 %) bzw. 1315–1356 (12,3 %) und 1388–1469 (83,1 %) ergeben (Tab. 1).

Auch das an die Apsis angelehnte Kindergrab 5 gehört wohl zu dieser Phase. Die Radiokohlenstoff-Datierung (LTL16658A) eines Langknochens von Grab 5 (FN 25) hat das Alter 1330–1619 calAD (95,4 %) bzw. 1330–1340 (0,8 %), 1397–1519 (90,2 %) und 1593–1619 (4,4 %) ergeben (Tab. 1).

Es ist anzunehmen, dass die beiden Kleinkinder in einem nicht allzu großen Zeitabstand bestattet wurden. Die Datierungen überschneiden sich im Zeitraum 1330–1469 oder auch nur im Zeitraum 1397–1469.

Bautypologisch bieten sich zur Mauertechnik mit großen Eckquadern gute Vergleiche an. Schon der romanische Turm der Kirche von Maria Himmelfahrt in Terlan aus der Zeit um ca. 1330 weist große Eckquader aus Porphyr auf.[115] Die Befestigungsanlage von Sigmundskron wurde von Herzog Sigmund ab 1474 errichtet.[116] Die spätgotischen Umbauphasen auf Hocheppan – Wirtschaftsgebäude, Arkadenhof, Zwinger, Basteien – datieren um 1500.[117] Auch die Bautypologie weist somit wie die ^{14}C-Datierungen auf das 14. und 15. Jahrhundert.

5.3.2.3. Phase C2 – Historische Einordnung

Auch für diese Umbauarbeiten an der Kirche im späten 14. und 15. Jahrhundert gibt es keine schriftlichen Hinweise. Die Errichtung des glockenturmartigen Aufsatzes von Schlaneid fällt in etwa in die Tiroler Regierungsjahre von Leopold II. dem Dicken/Stolzen (1396–1406), Friedrich IV. mit der leeren Tasche (1406–1439) oder Sigmund dem Münzreichen (1439–1490).

Die Umgestaltung der St.-Valentin-Kirche mit großen Ecksteinquadern ist im Zuge der regen gotischen

110 Nothdurfter, Stuppner o. J., 6: „Die Nordostecke ist jüngeres Mauerwerk und nach außen verstürzt."

111 Nothdurfter, Stuppner o. J., 10.

112 Hier waren wir Nothdurfter, Stuppner o. J., 5 gefolgt: „Zu den älteren Bauphasen, wahrscheinlich zur ersten Bauphase, gehören die ersten beiden Steinlagen auf einer Länge von 0,80 bis 0,85 m von der Apsis weg."

113 Putzer, Kaufmann 2015, 141.

114 Nothdurfter, Stuppner o. J., 10.

115 Mitterer, Nicolussi 2020, 35 und Abb. 18.

116 Landi, Beimrohr, Fingernagel-Grüll 2011, 255.

117 Palme-Comploy 2011, 94–95 und Abb. 17b.

Bautätigkeit des 14. und 15. Jahrhunderts im Etschtal zu sehen,[118] wie die Kirche Maria Himmelfahrt in Terlan (um 1370, um 1400, 1477 und 1492), die Michaelskapelle in Terlan (Ende des 14. und Ende des 15. Jahrhunderts),[119] die St.-Katharina-Kirche in Hafling (1452) und die Kirche Maria Himmelfahrt in Mölten (1482/9) bezeugen.[120] Die massive Neugestaltung im Stil der Gotik auf dem Tschögglberg und in Mölten reicht bis in das frühe 16. Jahrhundert. Dies belegen die Kirchen St. Blasius und Silvester in Verschneid (um 1500) sowie St. Jakob in Langfenn (1510).[121]

Die Pfarrer von Mölten hatten ab Mitte des 15. Jahrhunderts auch noch Terlan zu betreuen. Von da an hielten sie sich zumindest zeitweise auch in Terlan auf: Kaspar Kissinger (1394 Pfarrherr *auf den Melten*), Ulrich Harlander von Malspüchel (1445 Pfarrer auf *Melten*), Herr Kaspar (1450 Pfarrer von Terlan/Mölten), Sigmund Kann (1466 Pfarrvikar von Mölten), Johannes Croin (vor 1498 *Rector ecclesiarum in Meltina et Terlano*), Petrus Janus (nach 1498 Pfarrer von Terlan/Mölten).[122] Wer für die Errichtung des glockenturmartigen Aufsatzes und die Bestattung der beiden Kleinkinder verantwortlich war, bleibt offen.

Obwohl seit dem Hochmittelalter die Pfarrkirche von Mölten auch als Friedhofskirche der gesamten Pfarre fungierte, wurden in dieser Phase noch Kleinkinder bei St. Valentin bestattet.

Die gotischen Umbauten könnten mit der bereits vorhin genannten lokalen Wallfahrt bzw. den Bittprozessionen zu dem zum Nothelfer mutierten Heiligen (Valentin) erklärt werden.[123]

5.3.3. Phase C3

5.3.3.1. Phase C3 – Befund

Die letzte in die Bausubstanz der Kirche eingreifende Baumaßnahme ist die Neuerrichtung der Süd- und Westmauer sowie teilweise der Nordmauer (Abb. 19).

Die Westmauer steht zumindest teilweise, im Norden, auf den Fundamenten der romanischen Vorgängermauer. In Profil P5 (Taf. 8) sieht man die Fundamente der Kirchentürschwelle (6) direkt auf der hellbraunen lehmigen Erde mit darauf liegenden Resten roten Lehms (2); darüber befinden sich Estriche bzw. Mörtelreste, welche an die Fundamente anstoßen (3, 3b, 3a) oder über die Schwelle hinwegziehen (4). Die Westmauer ist bis zu den beiden Fenstersohlbänken südlich und nördlich des Eingangs ca. 1,10 m hoch erhalten und 75–78 cm dick. Sie besteht aus unregelmäßigem Bruchsteinmauerwerk mit kantig zugehauenen Steinen aus Porphyr. Teilweise sind auch sehr große behauene Porphyrquader eingefügt. Die Fenstersohlbänke innen sind etwa 95 cm breit und 20 cm tief. Die Fenster dürften laut Angabe der Ausgräber innen rot umrandet gewesen sein, worauf Verputzreste mit roter Farbe hinweisen.[124] Der Eingang ist zwischen den Mauerenden 1,20 m breit. Innen ist die Öffnung konisch und 50 cm lang, außen gibt es zwei Ausnehmungen von 20 × 20 cm und 18 × 16 cm, die von der entnommenen Portaleinfassung stammen. Das fehlende Portal war außen 1,52 m breit. Mit dem Bau der Westmauer dürfte das steingerahmte Spitzbogenportal eingelassen worden sein, das sich in der heutigen Kirche im Ortskern von Schlaneid erhalten hat. An der Außenseite der Westmauer war der Verputz nur stellenweise erhalten, laut den Ausgräbern geglättet und mit einer mattrötlichen Farbe übertüncht. An der Innenseite ist er zweimal mit weißer Tünche überzogen worden.[125]

Die Südmauer steht auf den Fundamenten der karolingischen Südmauer und vielleicht der/den untersten Lage(n) der romanischen Südmauer. Dies ist gut in Profil P7 (Taf. 9) zu sehen, die karolingische Baugrube blieb dort unangetastet. Auch aus den Profilen P1 und P2 (Taf. 6) geht hervor, dass für die Errichtung der Südmauer keine Baugrube ausgehoben wurde, möglicherweise baut sie auf älterem Mauerwerk auf; jüngere Schichten schließen an sie an. Die Südmauer ist 71–80 cm dick. Das aufgehende Mauerwerk (Abb. 20) entspricht bautechnisch der Westmauer, mit der die Südmauer verbunden ist. Die Südmauer schließt an das Mauerwerk des glockenturmartigen Aufsatzes (Phase C2) an. Die Südmauer ist aber rund 6 cm schmäler als der zum gotischen Turm gehörende, 80 cm breite Mauerstumpf, weshalb innen im Kirchenschiff ein Absatz zu sehen ist. In der Südmauer befindet sich auf etwa 1,40 m Höhe eine Öffnung (20 × 22 cm), die durch die gesamte Mauer hindurchreicht und somit eine Tiefe von 74 cm aufweist. An der Außenseite der Südmauer war laut den Ausgräbern der Verputz nur an wenigen Stellen erhalten geblieben, wo er durch Erdmaterial und Bauschutt verdeckt war. Die Tünche war nicht mehr erhalten.[126] Die Ausgräber haben in der Südmauer zwei Fensteröffnungen vermutet: eine 3,60 m von der Südostecke und die zweite

118 Laimer 2007.
119 Mitterer, Nicolussi 2020, 36–42 und Abb. 31; 48–52 und Abb. 34–35. – Stampfer 2020, 80–82.
120 Schwarz 1990, 105. – Laimer 2007, 168.
121 Andergassen 1993, 4, 17, 29.
122 Atz, Schatz 1903, 292. – Schwarz 1990, 117.
123 Die Darstellung der Nothelfer ist ein wichtiges Element der Ende des 14. Jahrhunderts erfolgten Ausmalung im Chor der Pfarrkirche von Terlan, siehe Atz, Schatz 1903, 293. – Stampfer 2020, 81.

124 Nothdurfter, Stuppner o. J., 7.
125 Nothdurfter, Stuppner o. J., 3.
126 Nothdurfter, Stuppner o. J., 3.

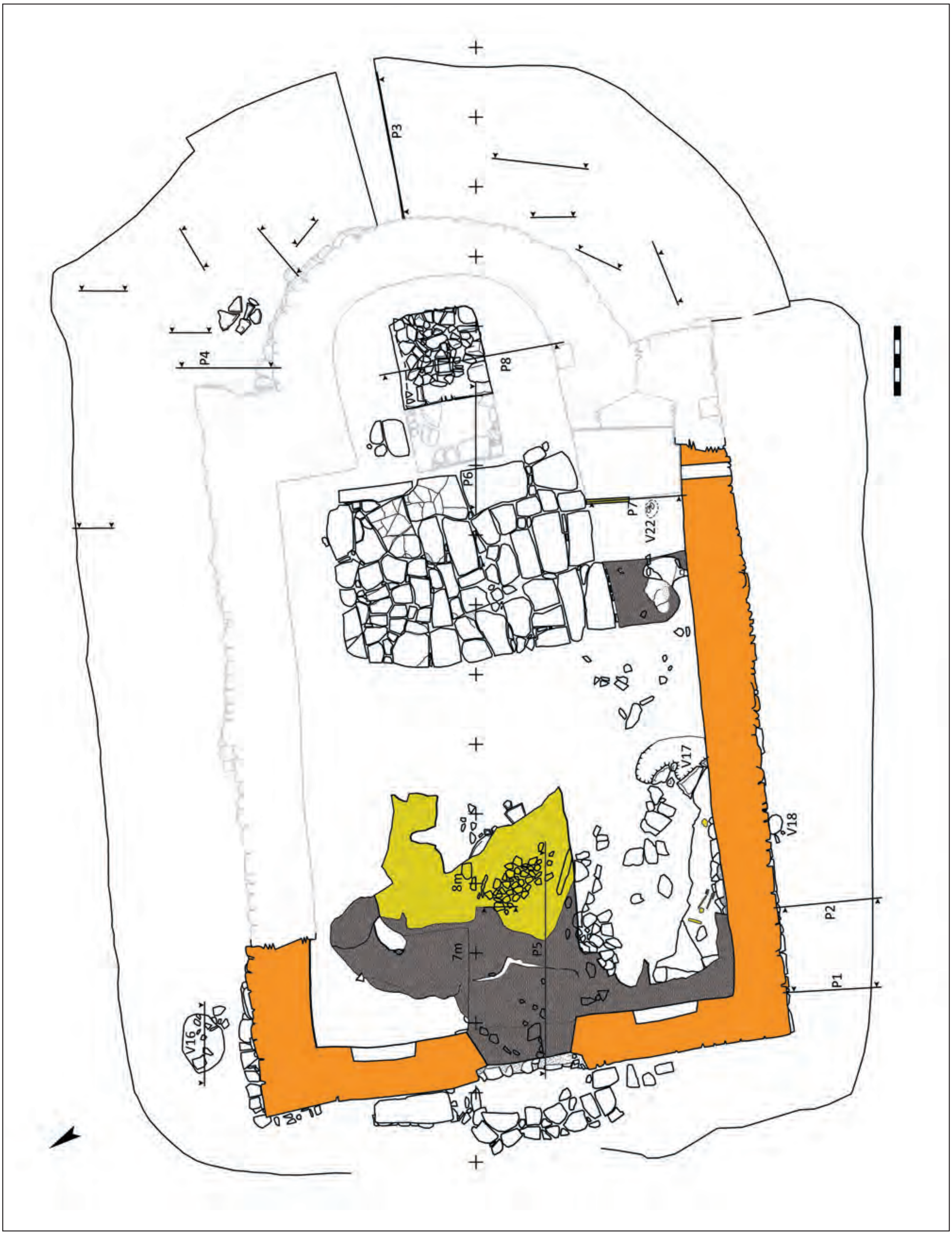


Abb. 19. St. Valentin, frühneuzeitliche Kirche, Rekonstruktionsversuch zu Phase C3. Maßstab 1 : 80 (Zeichnung: G. Kaufmann).

Abb. 20. St. Valentin, Außenansicht der frühneuzeitlichen Südmauer (Foto: G. Kaufmann).

4 m von der Südwestecke entfernt.[127] An der Innenseite sind der weißbraune Bindemörtel und Grobverputz sowie darüber der weißrote Feinverputz mit weißer Tünche nach wie vor sichtbar.

Die Nordmauer steht auf den Fundamenten der romanischen Nord-/Westmauer. Sie ist mit der Westmauer eingebunden und 80–84 cm dick. Auch die neu errichtete Nordmauer bindet im Aufgehenden an die ältere romanische, 90 cm breite Nordmauer (Phase B) an, ist aber gut 10 cm schmäler als diese, wodurch innen im Kirchensaal ein Absatz entstand. Außen war der Verputz nur teilweise erhalten,[128] innen ist es weiterhin der glatte Verputz mit weißer Tünche.

Die äußere Nordwest- und Südwestecke – die Verbindungen von Nord-, West- und Südmauer – wurden mit großen Porphyrsteinen als Eckquader gemauert.

Dieser letzte Umbau erbrachte eine Westfassade im Stil der Spätgotik, mit einem steingerahmten Spitzbogenportal und zwei seitlichen Fenstern. Die nicht gerade akkuraten Maurerarbeiten ergaben einen Kirchensaal mit unregelmäßigen Maueranbindungen und einer teilweisen Freskoausmalung an Nord- und Ostwand sowie einem mattrötlichen bis weißroten Feinverputz und (später) einer ersten weißen Tünchung an Nord-, West- und Südwand.

Für den Aufbau der neuen Mauern musste natürlich ein Gerüst aufgestellt werden bzw. brauchte es Verarbeitungsgruben. Einige Verfärbungen könnten mit dieser Bauphase in Verbindung gebracht werden, nur wenige aber dürften auf Pfostenlöcher eines Baugerüsts zurückzuführen sein. Die beiden Gruben V16 und V17 sollten zu diesem Bau gehören. V16 in Planum 1 (Taf. 1) liegt nördlich der neuen Nordmauer, sie ist mit weißgrauer Erde und Mörtel gefüllt. Handelt es sich dabei um eine im Zuge der Errichtung der Nordmauer ausgehobene und verfüllte Grube? Die Grube V17 in Planum 2 (Taf. 2) reicht innen direkt bis an die Südmauer, sie ist verfüllt mit weißem und graubraunem Mörtel und Kies. Das Pfostenloch V18 (20 × 30 cm) in Planum 1 (Taf. 1) stößt an die Südmauer außen an und könnte zu einem Baugerüst gehören. V22 in Planum 2 (Taf. 2) nahe der Südmauer ist sicher jünger als die Verfüllung der karolingischen Südmauer-Baugrube und ziemlich klein (18 × 24 cm), kann also nur zu einem Gerüst oder zu einer Chorschranke gehören.

Der Phase C3 ist ein gelbbrauner bis graubrauner Estrichboden (Estrich 2) zuzuweisen, der 1,5–2 cm stark war. Der Boden hat sich nur sehr lückenhaft im Kirchenschiff erhalten (Planum 2, Taf. 2). Er strich über die abgebrochene karolingische Westmauer hinweg, lag auf einer Schicht aus graubraunem Mörtel mit Kies – zum Teil mit Holzkohlestücken – und band an die neu errichtete West- und

127 Nothdurfter, Stuppner o. J., 7.
128 Nothdurfter, Stuppner o. J., 5.

Südmauer an (Profil P5, Planum 2). Die genannte graubraune Mörtelschicht als Unterlage des Estrichs 2 wurde von den Ausgräbern als umgelagerte Verputzschicht der abgebrochenen romanischen Westmauer interpretiert, auf welcher sich die gotischen Wandmalereien befanden.[129] Mit dem Abbruch der romanischen Westmauer kamen also Freskostücke in den Bereich der karolingischen Westmauer, weshalb wohl fälschlicherweise auch Freskoreste in der karolingischen Baugrube dokumentiert wurden (siehe oben, Phase A). Im Bereich der Türschwelle ist dieser Estrich 2 widersprüchlich dokumentiert: Laut Planum 2 (Taf. 2) war der graubraune Estrich 2 über die Schwelle hinweg gegossen auf einer Höhe von +1,76 bis +1,78 m. Laut Profil P5 (Taf. 8) hingegen stieß der graubraune Estrich 2 (3) nur an die gelbgraue Schuttschicht (3a) an, die wiederum in einer Höhe von +1,72 m (Oberkante) an die Schwelle (6) anlehnte, aber keine dieser beiden Schichten zog über die gemauerte Schwelle (+1,77 m) hinweg. Nichtsdestotrotz ist Estrich 2 jünger oder gleich alt als die West- und Südmauer. Im Profil P5 ist auch (bei 8,20 m Ost) eine dazugehörige Rollierung unter Estrich 2 eingetragen, diese ist ebendort auch in Planum 2 eingezeichnet. Allerdings ist diese Rollierung laut Profil P5 auch die Trennlinie zwischen dem östlichen gelbbraunen (5) und dem westlichen graubraunen (3) Estrich, während laut Planum 2 die Rollierung noch mitten im gelbbraunen Estrich lag und erst 1 m weiter westlich (bei 7,20 m Ost) in den graubraunen Estrich überging. Teilweise war dieser Estrich 2 mit unterschiedlicher Farbgebung also von einer Rollierung aus kleinen Steinen gefüttert. Auf diesem Estrich 2 fand man eine schwarzbraune Schmutzschicht (3c) (Profil P5), welche die dazugehörige Nutzungsphase anzeigt. Auf dem neuen Estrich westlich des Plattenbodens waren wohl links und rechts der Mittelachse jeweils drei bis vier Reihen von Betbänken aufgestellt.

Außerhalb der Kirche konnten in Profil P2 (Taf. 6) an der Südmauer drei Gehhorizonte erfasst werden. Das oberste, jüngste Gehniveau liegt auf einer Bauschuttschicht aus aschgrauer Erde mit Mörtelresten (6) und ist durch einen Ost-West verlaufenden, also zur Südmauer parallelen, mit verwittertem Felsmaterial und rotbrauner sandiger Erde verfüllten Graben (7–8 in P2 und 5 in P1) gestört. Steht dieser Graben mit der Dachtraufe in Verbindung? Dieser obere Gehhorizont liegt höher als die Fundamente der (jüngsten) Südmauer und gehört der Zeit nach deren Errichtung an.

129 Nothdurfter, Stuppner o. J., 7: „nach Freskozeit, von Westmauer umgelagert."

Abb. 21. St. Valentin, Vierer von Kaiser Maximilian I. (1490–1519). Maßstab 2 : 1 (Foto: G. Kaufmann).

Der Blockaltar blieb unverändert derselbe seit der romanischen Errichtung und der frühgotischen Erneuerung.

Bestattungen der Phase C3, also Skelette in Gräbern, konnten keine nachgewiesen werden. Allerdings fanden sich innen in der Südwestecke drei Knochen (FN 42) zwischen Planum 3 und Planum 4, sie sind daher nirgends eingezeichnet. Während die dünne fragmentierte Schädeldecke eines Kindes wohl zu Grab 2/Grab 3 gehört und der Röhrenknochen nicht weiter zuzuweisen ist (siehe oben, Phase A), hat sich der untere Teil (Ellbogen) des Oberarmknochens (*Humerus*) eines Jugendlichen/Erwachsenen infolge der ^{14}C-Datierung als frühneuzeitlich erwiesen. Da aber das restliche Skelett des frühneuzeitlichen Toten nicht vorhanden und selbst der Oberarmknochen nur teilweise erhalten ist, kann es dafür nur zwei Erklärungsmöglichkeiten geben: Entweder wurde eine frühneuzeitliche Bestattung hastig exhumiert und ein Knochenrest zurückgelassen oder das Knochenstück ist mit der Verfüllung in eine Grube/Störung eingebracht worden. In Planum 3 (Taf. 3) wurde kein regelmäßiger Umriss eines Grabes dokumentiert, vielmehr eine unregelmäßig dreieckige Fläche einer rötlichbraunen Erde mit Holzkohle und Mörtelbrocken (2), die das ältere Grab 2 (Abb. 10, 19) nur teilweise beeinträchtigt. Teilweise über dieser dreieckigen Fläche lag in Planum 2 (Taf. 2) immer noch die rötlichbraune Schicht mit Holzkohle, Mörtel und Kalk (2) direkt unter Estrich 2. Mit dieser Schicht könnte der frühneuzeitliche Knochen so tief gelangt sein. Aber wo war die Person in der frühen Neuzeit ursprünglich bestattet worden? Vielleicht außen entlang der bald danach abgebrochenen und neu aufgebauten Süd-, West- und teilweise Nordmauern.

Ein weiterer Fund sollte zu dieser Phase gehören. Stratigraphisch nicht eindeutig diesem Umbau zuzuweisen, aber zeitlich in diese Phase zu datieren, ist eine Münze (Abb. 21). Sie wurde laut Fundprotokoll (FN 27) außen im Südosten der Apsis „zwischen Planum 1 und Planum 2 (aus keiner Verfärbung)" gefunden. Identisch ist die Angabe des Fundzettels. Die genaue Lage ist auf den Plänen nicht eingezeichnet. Die Münze lag also höher als die in Planum 2 (Taf. 2) eingetragenen Kindergräber 1 und 5 der Phase C2 und sollte daher der Phase C3 angehören.

Bei dieser Silbermünze handelt es sich um einen in Hall in Tirol geprägten Vierer des Kaisers Maximilian I. (1490–1519). Auf der Vorderseite ist ein Bindenschild im Sechspass innerhalb eines Perlkreises mit der Umschrift [ARC] HID[V]CIS dargestellt, auf der Rückseite der Tiroler Adler im Perlkreis mit der Umschrift COMES T[IROL]. Das Beizeichen ist nicht wirklich erkennbar, es handelt sich aber eher um ein Kleeblatt als um eine Rosette. Der Stempel mit Kleeblatt wurde seit dem Amtsantritt des Stempelschneiders Ulrich Ursentaler ab 1508 verwendet.[130]

5.3.3.2. Phase C3 – Datierung

Für die Datierung der Phase C3 gibt es bauanalytische und naturwissenschaftliche Anhaltspunkte.

Das Mauerwerk der neuen Süd-, West- und teilweise Nordmauer entspricht bautechnisch jenem des glockenturmartigen Aufsatzes (Phase C2) und dürfte daher nicht viel jünger sein. Zeitlich muss daher die Neuerrichtung der Mauern bald auf die Errichtung des gotischen glockenturmartigen Aufsatzes erfolgt sein. Die Mauertechnik ist noch vor der Barockzeit einzuordnen.

Das steingerahmte Spitzbogenportal, das jetzt in der St.-Valentin-Kirche im Dorfzentrum von Schlaneid eingelassen ist (Abb. 22) und ursprünglich in der Westmauer der Phase C3 verankert gewesen sein dürfte, ist spätgotisch und in etwa um 1500 oder in das frühe 16. Jahrhundert zu datieren.

Von den unter der FN 42 subsumierten Knochen wurde das Fragment des Oberarms (LTL16659A) einer Radiokohlenstoff-Datierung unterzogen. Diese hat das Alter 1471 calAD – heute (95,4 %) bzw. 1471–1670 (89,0 %), 1779–1799 (5,1 %) und 1943–heute (1,3 %) ergeben (Tab. 1). Aufgrund der Störung des ursprünglichen Grabes (wohl außerhalb der Kirche) und der sekundären Lage des Oberarmfragments in einer begrenzten Verfüllung, die wohl mit der Errichtung der neuen Südwestecke zusammenhängt, bedeutet dieses Datum einen *terminus post quem* für die Süd-/Westmauer, also eine Datierung nach 1471–1670.

Die Münze Maximilians I. (1490–1519) ist zwar nicht direkt mit dem Umbau der Phase C3 in Zusammenhang zu bringen, aber stratigraphisch und zeitlich jünger als die Phase C2. Sie datiert wohl zwischen 1508 und 1519.

Die spätgotische Erneuerung der romanischen Süd-, West- und teilweise Nordmauern mit Guss eines neuen

Abb. 22. St. Valentin, spätgotisches Portal, heute in der 1769/70 errichteten Kirche im Dorfzentrum von Schlaneid eingemauert (Foto: G. Kaufmann).

Estrichs wurde wahrscheinlich im ersten Viertel des 16. Jahrhunderts vollzogen.

5.3.3.3. Phase C3 – Historische Einordnung

Archivalische Quellen für diese spätgotischen Umbauten des frühen 16. Jahrhunderts sind keine bekannt. Zeitlich fallen die Arbeiten in die Zeit von Kaiser Maximilian I. (Landesfürst von Tirol 1490–1519), vielleicht auch noch von Kaiser Karl V. (Landesfürst von Tirol 1519–1521), aber nur eventuell auch noch von dessen Bruder Ferdinand I. (Landesfürst von Tirol 1522–1564).

Als Pfarrer von Mölten und Terlan sind damals belegt: 1498 Johannes Croin, 1498 Petrus Jani, 1500 Kaspar Kussig und 1520 Heinrich Markart.[131] Nachdem die Pfarrer von Mölten bereits in der zweiten Hälfte des 15. Jahrhunderts auch Terlan betreuten, verlagerten sie im 16. Jahrhundert ihren Schwerpunkt definitiv nach Terlan. In einem Vertrag von 1521 mit ihrem Seelsorger Heinrich Markart erstritt sich Terlan die Residenzpflicht des Pfarrers oder Vikars von Al-

130 Egg 1971, 142–143. – Moser, Tursky 1977, 34 und Abb. 67.

131 Schwarz 1990, 117–118.

lerheiligen bis Ostern.[132] Bei der Visitation von 1538 wohnte der Pfarrer Ulrich Maynstainer in Terlan und ein Kaplan in Mölten, laut Visitationsprotokoll hatte die Pfarre mehrere Filialen auf dem Gebirge, so die Marien-Kirche in Mölten.[133] Nun betreute der Pfarrer von Terlan auch Mölten.

Trotz des/der bestehenden Friedhofsrechts/-pflicht bei der Pfarrkirche von Mölten wurden auch während dieser Phase bzw. unmittelbar davor immer noch Tote bei St. Valentin bestattet.

Durch die Baumaßnahmen an der St.-Valentin-Kirche wurde der Kirchensaal zu mehr als die Hälfte erneuert, vor allem die Westfassade. Das neue Portal und die neuen Fenster an West- und Südmauer verhalfen dem Innenraum zu mehr Licht. Zu einer vollständig neuen spätgotischen Kirche hat es nicht gereicht. Der Innenraum erhielt keine neuen Wandmalereien, er wurde nur weiß getüncht bzw. die Fenster rot umrandet. Die Kirche war ein unbedeutendes Kleinheiligtum in einem abgelegenen Weiler von Mölten.

5.3.4. Phase C4

5.3.4.1. Phase C4 – Befund

In der Phase C4 kommt es zu keinen größeren Umbauten der Bausubstanz. Man hat also keine neuen Mauern aufgezogen oder an bestehenden Mauern Veränderungen vorgenommen. Daher sind auch keine Gerüste nachweisbar. Allerdings wurden ein neuer Boden (Estrich 1) gegossen und vor dem Hauptaltar ein gemauertes Podium sowie an der südlichen Ostmauer ein Seitenaltar errichtet (Abb. 23).

Der neue Estrich 1 liegt direkt über dem älteren Estrich 2 und bindet an alle Innenwände der Kirche sowie an den weiterhin verwendeten Plattenboden an (Planum 1, Profil P5 bis P8). Der Estrich ist von hellrotbrauner bis rotbrauner Farbe und besteht aus 5–6 cm starkem Mörtel mit Kies. Er wurde den Innenmauern des Kirchensaals entlang, auf einer Breite von 0,80–1,20 m, und in der gesamten Apsis angetroffen (Planum 1, Taf. 1). Davon ausgespart blieben nur der Steinplattenboden im vorderen Teil des Kirchensaals, die Basis eines Weihwasserbeckens an der nördlichen Eingangsseite und die Basis des Altars und eines Altarpodiums in der Apsis. Im zentralen Bereich des Kirchensaals war der Estrich nicht mehr erhalten, dort kamen braune Erde und in der Mitte ein größerer Störungstrichter zum Vorschein (siehe auch unter 5.4.1. Phase D). Entlang der Südmauer weist der Estrich im Abstand von 1,00–1,20 m parallele Risse auf. Hierbei handelt es sich wohl um Fugenrisse der Arbeitsschritte beim Estrichgießen. Bei der Eingangstür reicht der Estrich bis zur engsten Stelle der Maueröffnung und bricht dort geradlinig mit einer 8 cm hohen Kante ab, darunter tritt die westliche Außenmauer 20 cm hervor. Die geradlinige Abbruchkante des Estrichs ist gleichzeitig der Negativabdruck der nicht mehr vorhandenen steinernen Türschwelle. Diese war 1,20 m lang und etwa 20 cm breit. Vor der Eingangsschwelle war in der jüngsten Phase eine ovale Einfassung aus trocken verlegten Steinplatten angebracht. Die Maße dieser Einfassung betragen 1,60 × 0,60 m.[134]

Westlich an den Plattenboden anschließend, im hinteren Kirchensaal, standen auf Estrich 1 wohl wieder drei bis vier Doppelreihen Betbänke. Der Boden seinerseits hat im Verlauf der Zeit mehrere Flickarbeiten erfahren. An ausgebrochenen Stellen wurden jüngere Estrichflecken eingegossen. Am nördlichen Rand des Steinplattenbodens wies der Estrich Ausbesserungen mit einem rötlichen Mörtel auf.[135]

Nördlich der Eingangstür wies der Estrich an der Westwand eine rundliche Ausnehmung mit 60 cm Durchmesser und 16–20 cm Tiefe auf. Dies ist wohl der Negativabdruck eines marmornen Weihwasserbeckens.[136] Die Basis dieses Weihwasserbeckens stand zum Teil noch auf dem bereits gestörten Estrich 2 (Planum 2) und wurde dann mit dem neuen Estrich 1 umgossen (siehe auch unter 5.4.1. Phase D).

In der Apsis umgab Estrich 1 den Blockaltar und ein Altarpodium (Planum 1, Profil P6). Beide sind somit älter als der Estrich. Der Blockaltar stand seit seiner Errichtung in der romanischen Phase B direkt auf dem roten Lehmboden. Das gemauerte Altarpodium ist bautechnisch ebenfalls älter als Estrich 1. Es schließt unmittelbar westlich an den Blockaltar an, ist 1,28 m breit und 0,91 cm lang. Erhalten sind nur die von Estrich 1 umgebenen Fundament-/Randsteine, unter denen sich ein 18 cm hoher Sandsteinquader befindet, der auf derselben Höhe wie der Plattenboden (Oberkante +1,80 m) liegt. Das Aufgehende des Podiums bzw. dessen Abdeckplatte(n) sind nicht erhalten. Das Podium liegt ebenfalls direkt auf dem roten Lehm auf und stört den Lehmboden; Estrich 2 ist nirgends ersichtlich (Profil P6, Taf. 8). Der Sandsteinquader ist in eine Baugrube gesetzt, östlich mit losem Mörtelschutt und westlich mit 2 cm hellgelbem körnigem Verputz, der auch an den Altar anbindet.[137] Das gemauerte Altarpodium könnte somit entweder zusammen mit dem Blockaltar bereits in Phase B errichtet worden sein oder aber erst mit dem Estrich 1 in Phase C4. Laut Fund-

132 Atz, Schatz 1903, 292–293. – Schwarz 1990, 120.
133 Atz, Schatz 1903, 294–295. – Schwarz 1990, 120.
134 Nothdurfter, Stuppner o. J., 6–7.
135 Nothdurfter, Stuppner o. J., 8.
136 Nothdurfter, Stuppner o. J., 8.
137 Nothdurfter, Stuppner o. J., 8–9.

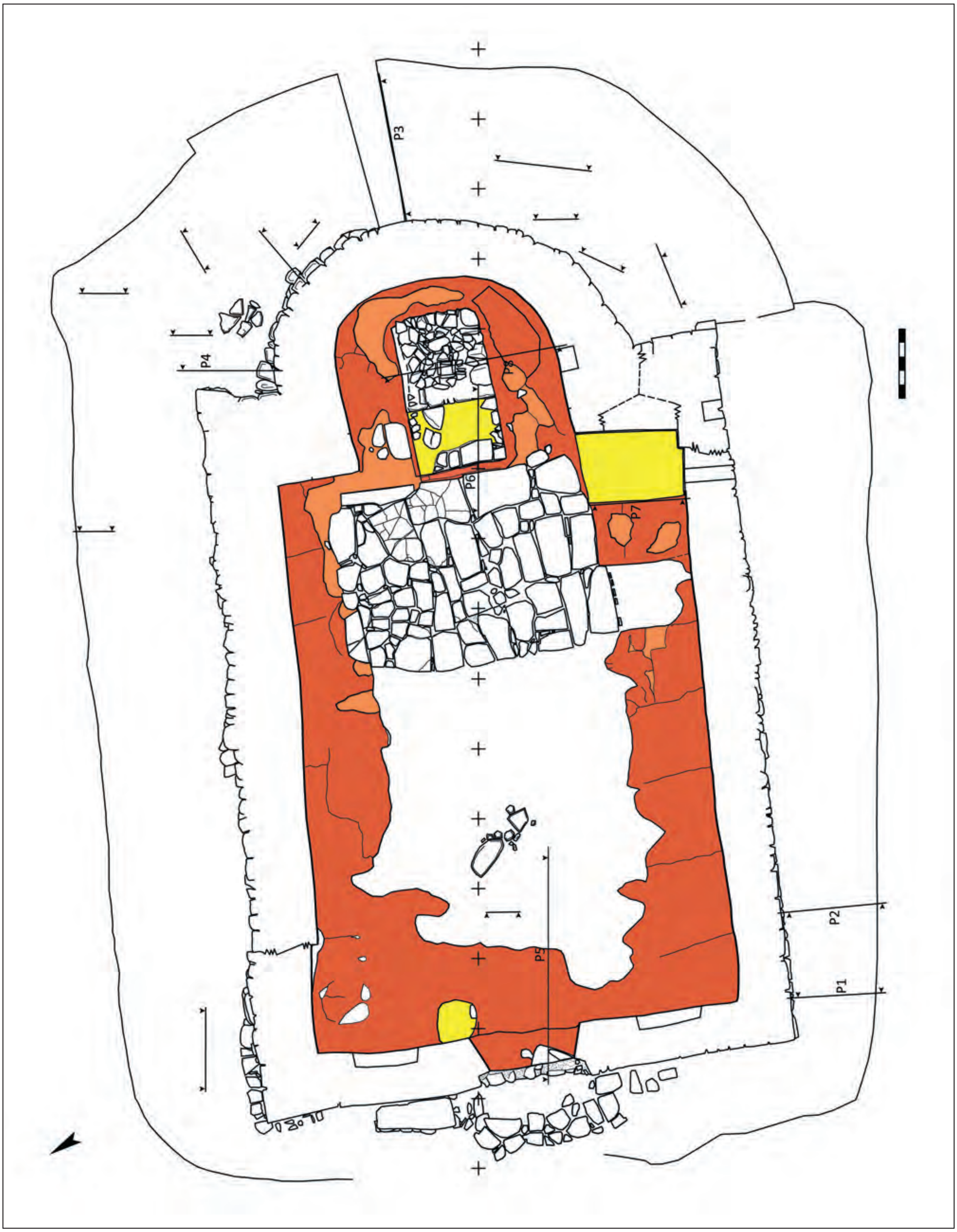


Abb. 23. St. Valentin, neuzeitliche Kirche, Rekonstruktionsversuch zu Phase C4. Maßstab 1 : 80 (Zeichnung: G. Kaufmann).

protokoll wurde bei 14,02 m Ost und 0,52 m Nord, also genau im Bereich des Altarpodiums, eine bei der Bergung leider zerbrochene Münze (FN 63) gefunden. Weil aber weder die genaue Lage angegeben ist – ob auf oder unter den Podiumsrandsteinen – noch die Münze selbst bestimmt und auch nicht erhalten ist, hilft auch diese Notiz nicht bei der Datierung des Podiums.

Der Seitenaltar in der Südostecke des Kirchensaals steht auf Estrich 1 (9) und ist damit jünger (Profil P7, Taf. 9). Zumindest ist er zeitlich nach dem Guss des Estrichs aufgebaut worden, aber vielleicht nicht allzu lange danach. Er besteht aus Bruchsteinmauerwerk mit Eckquadern aus Porphyr und ist noch über 1 m hoch erhalten; die Altarplatte fehlt. Er ist 1,00 m lang, im Westen 1,36 m und im Osten 1,46 m breit (Planum 1, Taf. 1). An der westlichen Vorderseite sind noch die Negativabdrücke eines 28 cm hohen, 0,90 m langen und 1,30 m breiten Holzpodiums (10) erkennbar (Profil P7). Über die Außenseiten des Podiums wurde ein Verputz aus porösem, weißgrauem und mit Kalkeinschlüssen versehenem Mörtel und darüber weiße Tünche aufgetragen.[138]

Mit dem Seitenaltar wurden auch die Innenmauern nochmals geweißelt. Die jüngste weiße Tünche an den Mauern wurde erst zur Zeit der Errichtung des Seitenaltars aufgetragen.[139]

Bestattungen sind dieser Phase keine mehr zuzuweisen.

5.3.4.2. Phase C4 – Datierung

Für die Datierung der Phase C4 gibt es keine bauanalytischen und naturwissenschaftlichen Anhaltspunkte. Sie ist jünger als die Phase C3 aus dem ersten Viertel des 16. Jahrhunderts. Für die Erneuerung des Estrichbodens und die Errichtung des Seitenaltars kommt vor allem die zweite Hälfte des 16. Jahrhunderts in Frage.

Einen Datierungshinweis liefert die Patroziniumskunde. Die heutige Kirche im Ortskern war zu Ehren der heiligen Valentin und Laurentius am 14. Februar 1771 geweiht worden (siehe unten, Phase D).[140] Auf dem Hauptaltarbild sind der heilige Bischof Valentin mit Mitra und Stab und der heilige Laurentius mit Rost dargestellt. Da es aber nur einen Altar gibt, kann man darauf schließen, dass der zweite Heilige von der alten Kirche mit übernommen wurde. Bereits Leo Andergassen hat daher den Seitenaltar der Phase C4 als Altar des heiligen Diakons Laurentius gedeutet.[141] Laurentius ist nicht nur Patron früher Kirchen, auch am Ende des Frühmittelalters und im Hochmittelalter gab es Schübe seiner Kultverbreitung, besonders nach der Ungarnschlacht am Lechfeld mit dem Gelübde und Sieg Ottos I. am 10. August 955.[142] Dazu gibt es ein spätes Analogon, nämlich die Schlacht bei Saint-Quentin am Laurentiustag 1557, die nach dem Gelübde und Sieg Philipps II. von Spanien, des Sohnes von Karl V., zu einem neuerlichen Aufleben des Kultes in Habsburgerlanden führte.[143] Da es in Schlaneid für Laurentius keine weiteren Hinweise gibt – weder urkundliche Belege noch überlieferte Bittgänge oder Wallfahrten –, kann dieser Heilige nur spät, eben mit der Bauphase C4, hinzugekommen sein. Die Kirche selbst blieb weiterhin die St.-Valentin-Kirche, so noch in einem Dokument von 1767: *Übergab, Für Loblichen Sanct Valentins Gotteshaus zu Schlaneid*.[144] Die Schlacht von Saint-Quentin 1557 ergibt für den Seitenaltar an der südlichen Triumphbogenwand ein Datum *post quem*, also für die zweite Hälfte des 16. Jahrhunderts.

Beide Ansatzpunkte zur Datierung der Phase C4 weisen also auf das mittlere bis späte 16. Jahrhundert.

5.3.4.3. Phase C4 – Historische Einordnung

So wie für die vorhergehenden Bauarbeiten an der Kirche gibt es auch für die geringen Veränderungen der Phase C4 keine schriftlichen Unterlagen.

Der neue Estrich und der im Anschluss daran errichtete neue Seitenaltar fallen wohl in die späte Regierungszeit Ferdinands I. (Landesfürst von Tirol 1522–1564) oder Ferdinands II. (Landesfürst von Tirol 1564–1595), die ihrerseits Onkel und Cousin Philipps II. von Spanien waren. Erzherzog Ferdinand von Tirol erließ 1581 eine eigene Satzung des Gerichts Mölten, worin auch Bestimmungen für den Pfarrer festgelegt waren. Während seiner Regierungszeit waren Franzischk Kekh (1564–1578), Hannß Pilz (1580–1581), Jakob Miller (1582–1586), Philipp Sighart (1586–1587), Georg Mayer (1587–1590) und German Valussi (1590–1603) Pfarrer von Terlan und Mölten.[145]

Danach wurde an der Kirche nicht mehr viel verändert. Zwei Engelsstangen von 1626, die noch den gotischen Altar der alten Kirche begleitet haben müssen, befinden sich in der heutigen Dorfkirche.[146] Man hat damals also die Innenausstattung erneuert. Von 1623–1641 war Nikolaus de Pretis

138 Nothdurfter, Stuppner o. J., 8, 9.
139 Nothdurfter, Stuppner o. J., 5.
140 Pfarrarchiv Mölten: Vgl. Anm. 4. – Schwarz 1990, 121.
141 Andergassen 1993, 23, allerdings hält er Laurentius für den ursprünglichen Patron, der von Valentin an die zweite Stelle verdrängt worden sei.
142 Zimmermann 1959, I 114–118; II 81–82.
143 Fink 1928, 16.
144 Pfarrarchiv Mölten: Position: 213.
145 Schwarz 1990, 56, 118.
146 Andergassen 1993, 25.

Pfarrer, er legte 1626 auch das erste Tauf- und Sterbebuch an und schlug seinen ständigen Wohnsitz 1636 in Mölten auf.[147]

Ferner hat man am spätgotischen Portal die Kämpfersteine ersetzt. Sie tragen die Jahreszahl 1747 und zieren die heutige Dorfkirche.[148] Damals (1738–1762) war Josef Anton Fenner von und zu Fennberg Pfarrer.[149]

Bei einer Visitation 1749 wurde das Eindringen des Wassers in den Fußboden der Pfarrkirche in Terlan bemängelt.[150] Für St. Valentin in Schlaneid gibt es keine Visitationsnotiz, doch hat man auch dort im Laufe der Zeit öfters den Boden geflickt.

Die Bestattungspflicht bei der Pfarrkirche von Mölten wurde nun auch in Schlaneid akzeptiert. Aus der letzten Nutzungsphase der Kirche St. Valentin sind keine Gräber erfasst.

5.4. Der neuzeitliche Abbruch und Verfall (Phase D)

5.4.1. Phase D – Befund

Die Kirche ist bewusst aufgelassen und abgebaut worden. Dies lässt sich auch anhand des archäologischen Grabungsbefundes gut belegen (Abb. 24).

Beim Auflassen der Kirche hat man die Altarplatte und die Abdeckung des Reliquienloculus entfernt sowie den Reliquienbehälter entnommen (Planum 1, Profil P8). Ferner wurde(n) die Abdeckplatte(n) des gemauerten Altarpodiums abgetragen (Planum 1, Profil P6). Auch die Altarplatte des Seitenaltars hat man entfernt (Planum 1, Profil P7).

Nördlich der Eingangstür wies Estrich 1 an der Westwand eine rundliche Ausnehmung mit 60 cm Durchmesser und 16–20 cm Tiefe auf (Planum 1, Taf. 1). Hier könnte es sich um den Negativabdruck des Grundsteines eines Weihwasserbeckens handeln.[151] Auch diesen an die Westmauer angelehnten und in den Boden eingelassenen Weihwasserbehälter hat man entfernt.

Ferner wurden an der Westmauer die Fenstersohlbänke und das Eingangsportal herausgerissen und abtransportiert.

Der Mauereinsturz ist nur in Profil P3 (Taf. 7) dokumentiert. Die anderen Profile sind erst nach dem Abräumen des eingestürzten Mauerwerks gezeichnet worden. In Profil P3 liegt auf dem humosen Gehhorizont um die Kirche (4) (ab Phase A) und auf der Schicht aus reinem Mörtelsand bzw. zerfallenen Verputzen (5) (ab Phase B) unmittelbar die schräg abgelagerte Schicht aus Mörtel und Steinen (6). Diese schräge Schicht stellt den Verfall und den Mauereinsturz dar. Sie wird mit zunehmendem Abstand von der Mauer immer schmäler und nimmt von gut 52 cm auf 14 cm ab. Darüber hat sich seitdem ein nur 4 cm mächtiger Waldhumus (7) angehäuft, der zum Zeitpunkt der Grabung die Oberfläche bildete. Der Mauereinsturz ist unmittelbar bei der Mauer nur ½ m hoch, die Maueraußenseite samt Fundament beträgt nur 88 cm.

Laut den Ausgräbern befanden sich drei Viertel des Bauschutts im Inneren der Kirche, nur ein kleinerer Teil des eingestürzten Mauerwerks hat sich außen abgelagert.[152] Letztendlich muss man wohl davon ausgehen, dass nur mehr ein Teil der ursprünglichen Bausubstanz vor Ort verblieben ist. Ein nicht unbeachtlicher Teil des Mauerwerks dürfte abgetragen und abtransportiert worden sein.

An der Südostseite der Apsis sind in Planum 1 (Taf. 1) mehrere Verfärbungen (V24, V25, V26, V27, V28 und vielleicht V3) und Flecken in Mörtelschichten dokumentiert. Planum 1 liegt höher als die Schicht mit der Silbermünze Maximilians I. aus der Zeit von 1508–1519 (siehe oben, Phase C3). Gerade die Mörtelschichten weisen diesen Horizont bereits als Abbau-/Verfallshorizont der Kirche aus. Die Verfärbungen sollten zumindest teilweise Pfostenlöcher eines Gerüsts gewesen sein. Dieses Gerüst in der Südostecke diente wohl zum Abbau der Glocke und vielleicht des Kirchendachs, letztendlich wohl auch des glockenturmartigen Aufsatzes und der Kirchenmauern.

Im Außenbereich hat man in Planum 1 im Norden und im Süden der Apsis bei den Gerüstlöchern einen Befund erfasst, der ein Gehhorizont sein könnte. Hier gibt es mehrere Flecken mit Holzkohle, mehr oder weniger große Brandnester, in welchen auffällig viele geschmiedete Eisennägel gefunden wurden. Bei den Gerüstlöchern im Süden, zwischen und inmitten der Mörtelschichten, sind sogar einige Funde in den Brandflecken erhalten (Abb. 25). Während die FN 13 (Abb. 25/1–4) und FN 14 (Abb. 25/5–7) laut Fundprotokoll vom Süden der Apsis stammen, ist die FN 46 (Abb. 25/8–13) im Südosten der Apsis ausgegraben worden. Zwei Nägel mit quadratischem Schaftquerschnitt und quadratischem Flachkopf (Abb. 25/2, 8) und acht Nägel mit quadratischem bis rundem Schaftquerschnitt und Spatel-/Hammerkopf (Abb. 25/5–7, 9–13) finden exakte Vergleiche in Funden von dem vom zweiten Drittel des 13. Jahrhunderts bis in das 18. Jahrhundert genutzten Schlossberg bei Seefeld in Tirol.[153] Die Nägel stammen wohl vom abmontierten und zum Teil verbrannten Dachstuhl der Kirche. Nicht

147 Schwarz 1990, 109, 118.

148 Andergassen 1993, 24: „1749“.

149 Schwarz 1990, 120.

150 Atz, Schatz, 1903, 301, 320, 321. – Schwarz 1990, 120. – Andergassen 1993, 11. – Am 24. August 1749 weihte Leopold von Firmian, Bischof von Seckau und Koadjutor des Fürstbischofs von Trient, die Seitenaltäre der Kirche von Maria Himmelfahrt in Mölten.

151 Nothdurfter, Stuppner o. J., 8.

152 Nothdurfter, Stuppner o. J., 1.

153 Haller 2007, H205–H216, H225–H242.

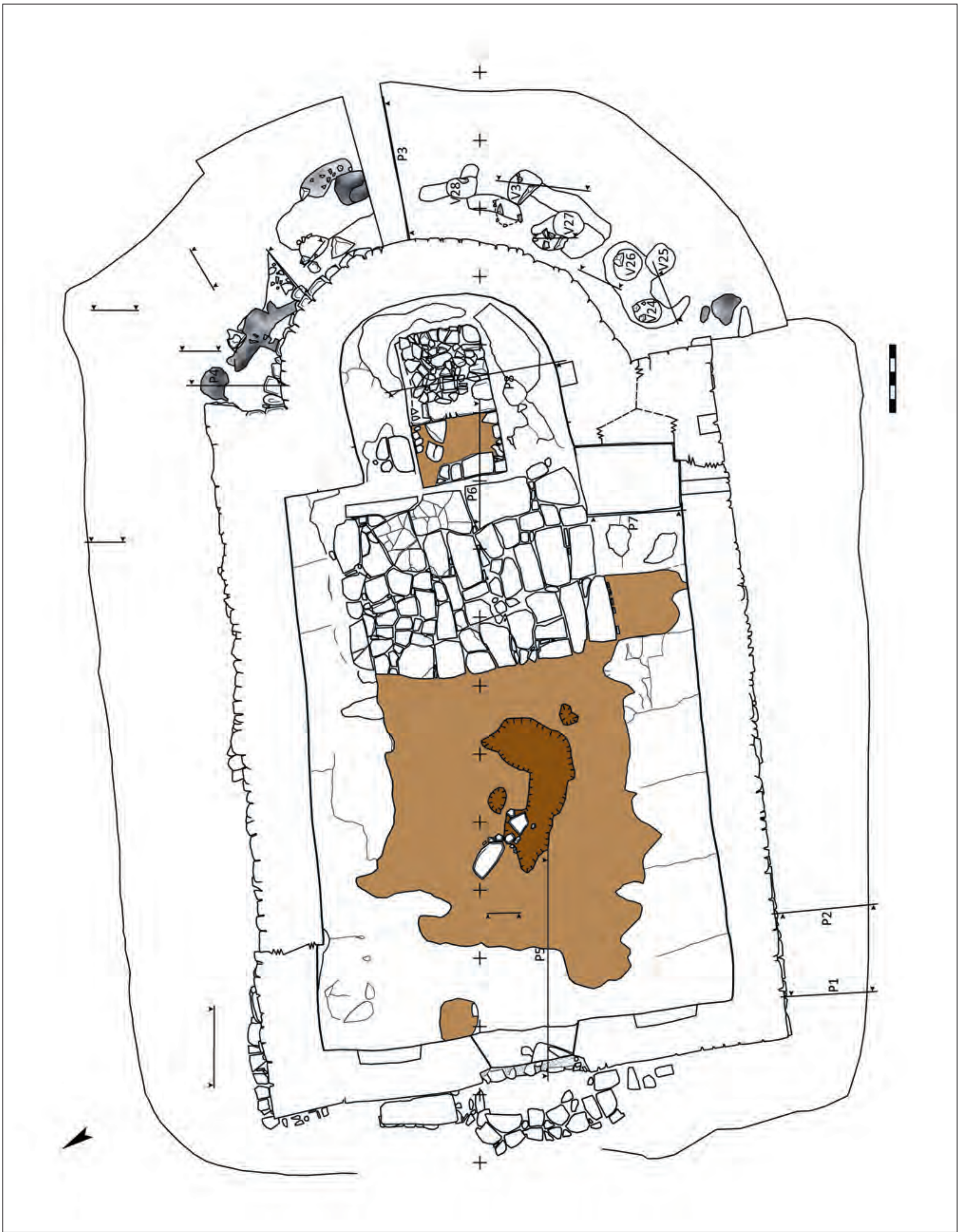


Abb. 24. St. Valentin, neuzeitliche Kirche, Rekonstruktionsversuch zu Phase D. Maßstab 1 : 80 (Zeichnung: G. Kaufmann).

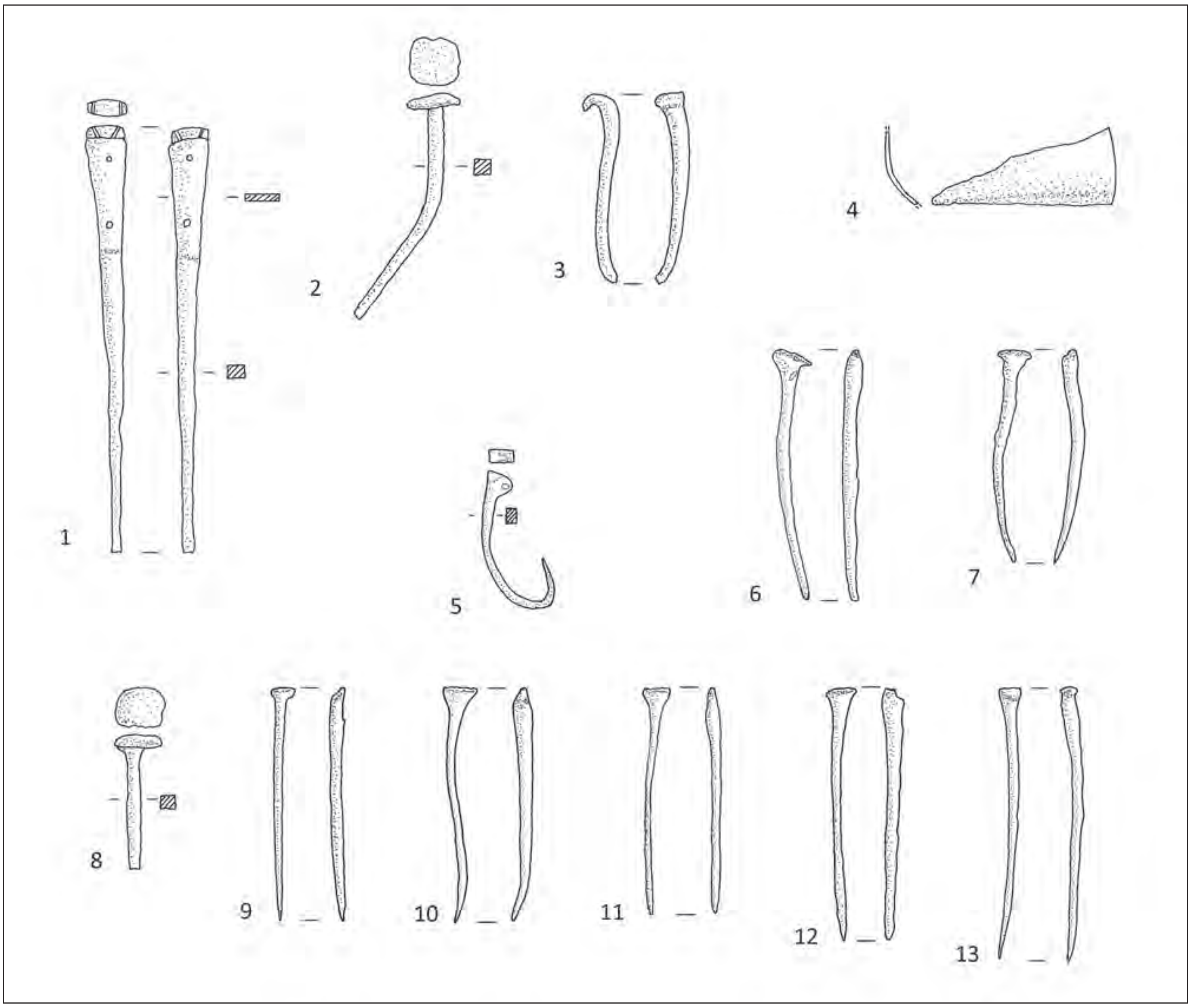


Abb. 25. St. Valentin, 1. messingverzierter Eisenspieß. – 2–3, 5–13. Eisennägel. – 4. bauchige(r) Glasbecher/Glasflasche. Maßstab 1 : 2 (Zeichnung: A. Putzer).

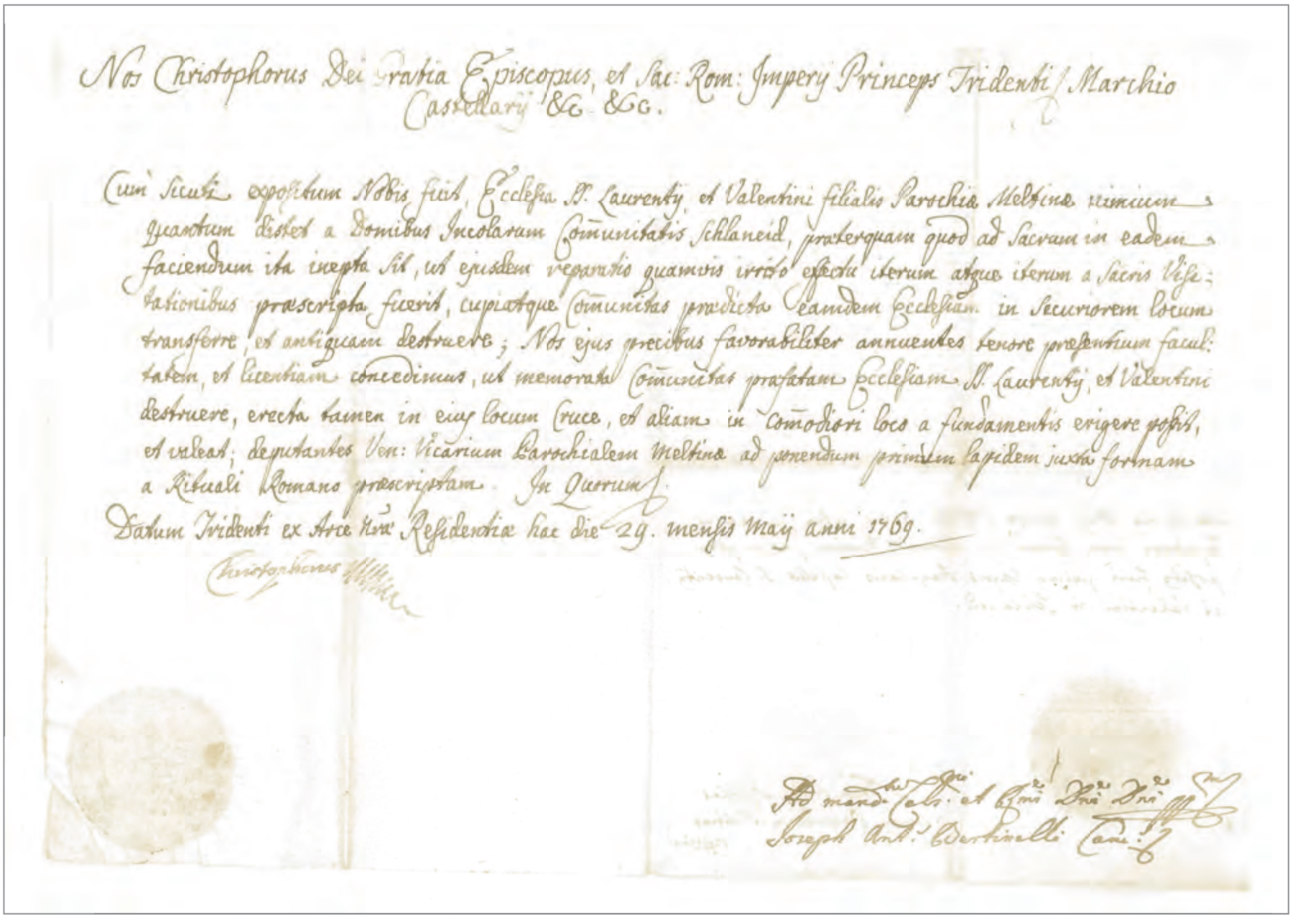
näher bestimmbar sind ein weiterer Eisenstift (Abb. 25/3) und der/die bauchige Glasbecher/Glasflasche (Abb. 25/4). Auch der kleine Eisenspieß mit vierkantigem Schaft und trapezförmiger Griffplatte mit zwei Nietlöchern sowie verziertem Messingende (Abb. 25/1) ist für uns zeitlich nicht einzuordnen. Laut Fundprotokoll wurde beim Reinigen von Planum 1 außen an der Kirche – 40 cm von der Nordwestecke und 10 cm von der Westmauer entfernt – auf einem ehemaligen Gehhorizont vermeintlich eine Münze (FN 51) gefunden. Sie ist aber weder bestimmt noch erhalten.

In der Apsis und entlang den Kirchensaalmauern war Estrich 1 unbeschädigt erhalten, also nicht durch den Abbau zerstört worden. Nur im zentralen Bereich des Kirchensaals war der Estrich 1 nicht mehr erhalten, dort kamen die braune Erde und in der Mitte ein größerer Störungstrichter zum Vorschein. Estrich 1 (und Estrich 2) war(en) im zentralen Bereich wohl schon vor dem Verfall der Mauern, also eventuell beim Abbau des Dachstuhls, beschädigt worden. Der spätere Störungstrichter hat nur mehr den Bauschutt des Mauereinsturzes und die bereits unter den Estrichen anstehende braune Erde beschädigt. Hier hat sich wohl jemand als Hobbyarchäologe bzw. Raubgräber betätigt.

Bestattungen in der Ruine der profanierten Kirche sind natürlich keine mehr getätigt worden.

5.4.2. Phase D – Datierung

Für das Ende der Kirche gibt es erstmals schriftliche Belege, die im Pfarrarchiv aufbewahrt werden. Demnach erbat Pfarrer Kofler im Jahr 1769 vom Ordinariat zu Trient, St. Valentin wegen der Baufälligkeit und der Entfernung


Nos Christophorus Dei Gratia Episcopus, et Sac: Rom: Impery Princeps Tridenti, Marchio Castellary &c. &c.

Cum sicuti expositum Nobis fuit, Ecclesia S. Laurenty et Valentini filialis Parochia Meltina nimium quantum distet a Domibus Incolarum Comunitatis Schlaneid, praeterquam quod ad Sacram in eadem faciendum ita inepta sit, ut ejusdem reparatio quamvis irrito effectu iterum atque iterum a Sacris Visitationibus praescripta fuerit, cupiatque Comunitas praedicta eamdem Ecclesiam in Securiorem locum transferre, et antiquam destruere; Nos ejus precibus favorabiliter annuentes tenore praesentium facultatem, et licentiam concedimus, ut memorata Comunitas praefatam Ecclesiam S. Laurenty, et Valentini destruere, erecta tamen in ejus locum Cruce, et aliam in comodiori loco a fundamentis erigere possit, et valeat; deputantes Ven: Vicarium Parochialem Meltina ad ponendum primum lapidem juxta formam a Rituali Romano praescriptam. In Quorum &.

Datum Tridenti ex Arce Nra Residentiae hac die 29. mensis Maij anni 1769.

Christophorus

Ad mand: Cels:mi et R:mi D:ni D:ni
Joseph Ant: Bertinelli Can:

Abb. 26. St. Valentin, Abriss- und Baugenehmigung durch Fürstbischof Cristoforo Sizzo de Noris am 29. Mai 1769 (mit freundlicher Genehmigung des Pfarrarchivs von Mölten).

vom Ort abreißen und mitten im Dorf neu errichten zu dürfen. Im Herbst 1770 waren die Bauarbeiten an der neuen Kirche abgeschlossen. Die Weihe fand am 14. Februar 1771 statt.[154]

5.4.3. Phase D – Historische Einordnung

Die Aufgabe der alten Kirche und der Neubau im Dorf fanden zu Zeiten Maria Theresias von Österreich (1740–1780) statt, gerade noch vor den kaiserlichen Verordnungen Josephs II., infolge derer die Kirchen St. Jakob in Langfenn, St. Ulrich in Gschleir und St. Georg in Versein geschlossen und das Kirchenvermögen dem Religionsfond zugeteilt werden musste.

Pfarrer war von 1762–1785 Franz Anton von Kofler zu Rundenstein. Im Jahr 1769 erging also seine Bitte an das Ordinariat von Trient, St. Valentin wegen Baufälligkeit und Entlegenheit niederreißen und mitten im Dorf eine neue Kirche bauen zu dürfen. Die Genehmigung von Fürstbischof Cristoforo Sizzo de Noris wurde am 29. Mai 1769 ausgestellt (Abb. 26), die alte Kirche wurde abgerissen. Am 12. Mai 1770 hat Anton Kofler den Grundstein zur neuen Kirche gelegt (*posita fuit prima lapis Angularis Capella S. Laurentii et Valentini in Schlaneid*). Teile der alten Kirche sollen wiederverwendet worden sein. Auch das spätgotische Portal hat man in die neue Kirche eingesetzt. Im Herbst 1770 waren die Bauarbeiten abgeschlossen. Am 14. Oktober 1770 gab der Fürstbischof seinen Auftrag zur feierlichen Weihe. Pfarrer Franz Anton von Kofler zu Rundenstein weihte am 14. Februar 1771 die neue Kirche mitten im Dorf (*benedicta fuit iuxta forma Ritualis Romani ecclesia S.S. Valentini et Laurentii in Schlaneid, eademas die celebratur primum officium*).[155]

Der 14. Februar ist der Tag des Märtyrers Valentin von Terni, nicht jener des heiligen Bischofs von Rätien. Es liegt

154 Schwarz 1973, 369. – Schwarz 1990, 109, 120–121. – Andergassen 1993, 24–25.

155 Pfarrarchiv Mölten: Vgl. Anm. 4. – Schwarz 1973, 369. – Schwarz 1990, 109, 120–121. – Andergassen 1993, 24–25.

hier – wie bei vielen anderen Tiroler Kirchen[156] – eine mit der Zeit einhergegangene Verwechslung und Vermischung vor. Dargestellt ist auf dem Schlaneider Hochaltarbild aber Bischof Valentin von Rätien, dessen Festtag der 7. Jänner ist.[157]

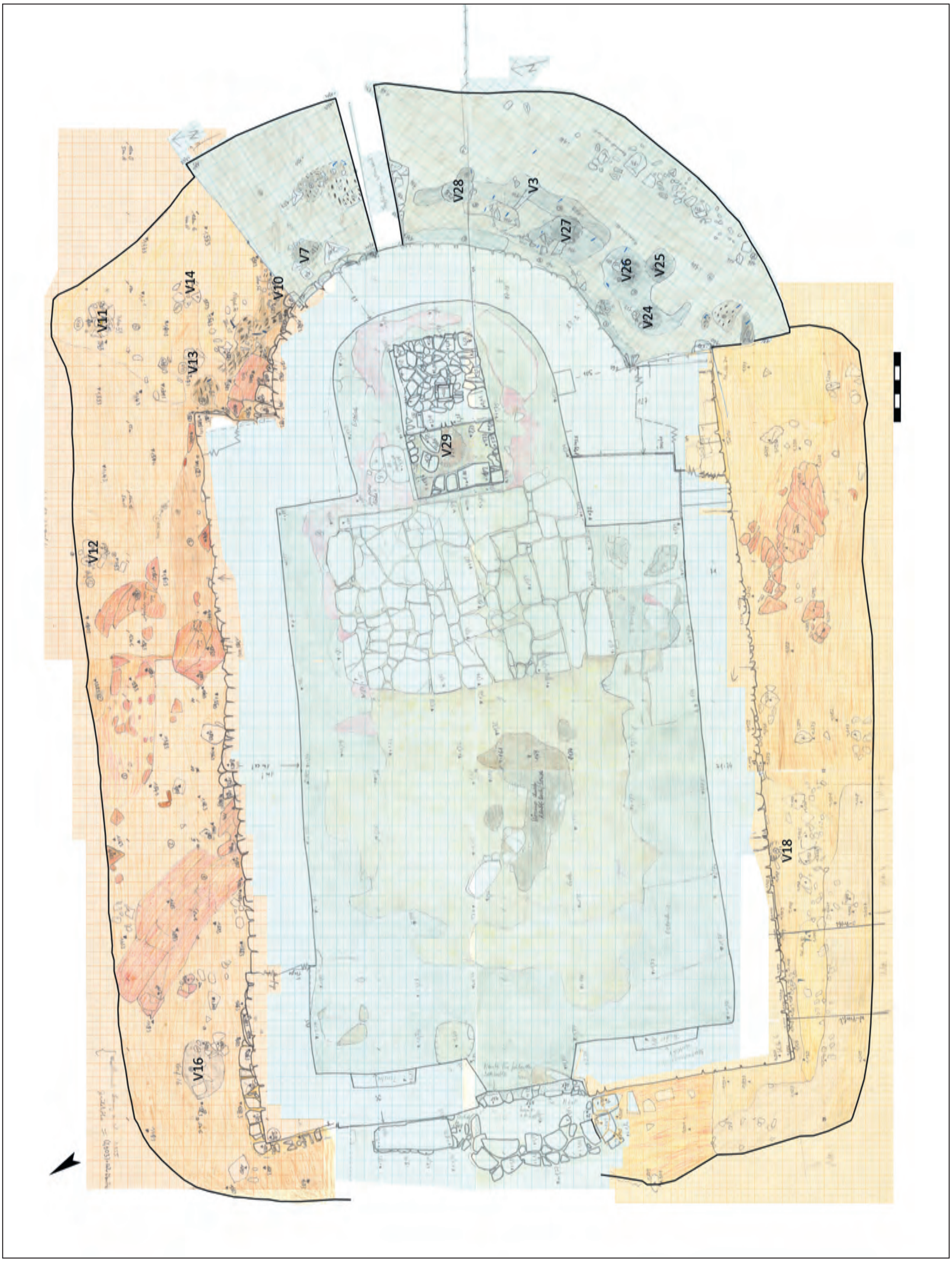
Seit 1770 war die alte St.-Valentin-Kirche nur mehr ein baufälliges Relikt im Valteswald und dem Verfall preisgegeben. Im 19. und 20. Jahrhundert hat sich über dem Bauschutt der eingestürzten Mauern ein nur 4 cm dicker Waldhumus gebildet. Selbst auf und in der Ruine wuchsen Bäume.

Im Jahr 1957 ließ Dekan Sebastian Kröß im Eingangsbereich der Ruine ein Kreuz aufstellen.[158] Dieses Kreuz hat man zu Grabungsbeginn entfernt.[159] Später wurde wieder ein neues aufgestellt.

Der Störungstrichter in der Mitte des Kirchensaals soll laut den Ausgräbern einige Jahre vor der Grabung gemacht worden sein.[160] Wer der Übeltäter war, bleibt unbekannt.

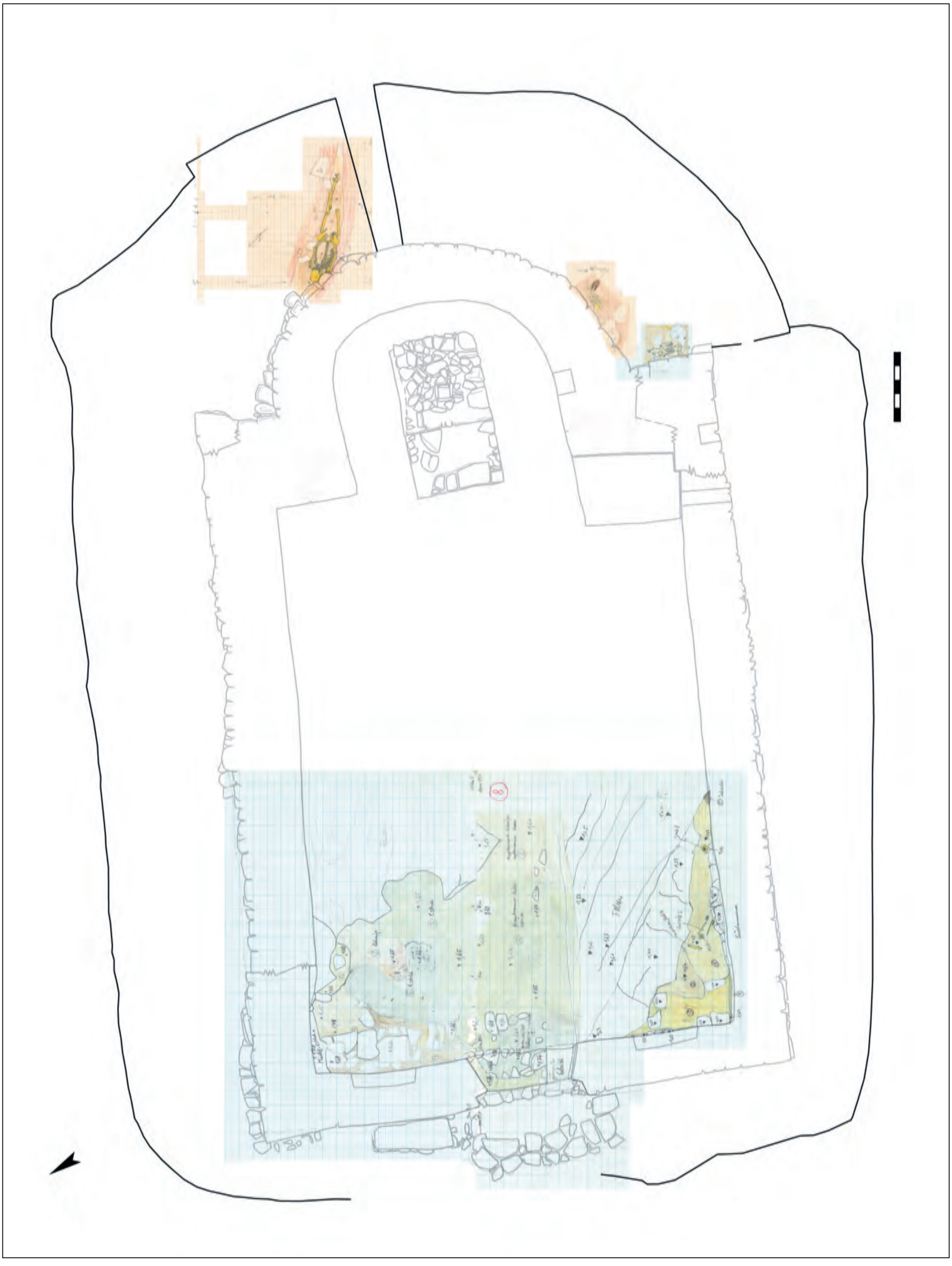
In den Jahren 1990 und 1991 haben Hans Nothdurfter und Alois Stuppner die Kirche ausgegraben. Seitdem kümmert sich das Amt für Bau- und Kunstdenkmäler um die Konservierung. Die Abdeckung der Ruine mit einer Dachkonstruktion ist mehrmals erneuert worden. Im Jahr 2012/2013 hat man die Oberflächen der Wandmalereien in der Apsis gefestigt, Hohlstellen hinterfüllt und lose Putzstellen im Langhaus wieder an den Untergrund gebunden.[161] Zuletzt wurden im Jahr 2018 die Mauern und Mauerkronen, die Blockaltäre und der Turmstumpf verstärkt, zudem ein hölzerner Schutzboden, ein Geländer und ein neues Schutzdach errichtet.[162]

156 Fink 1928, 213. – Kaufmann 2011, 48.
157 Schwarz 1990, 108.
158 Schwarz 1990, 109 („1957“), 121 („1960“), 123.
159 Grabungsprotokoll vom 1.10.1990: „Nach dem Entfernen des Wetterkreuzes, das sich im Eingangsbereich befand, wurde mit dem Freilegen des Eingangs der Ruine begonnen.“
160 Grabungsprotokoll vom 4.10.1990: „Sie dürfte vom ‚Raubtrichter‘ stammen, der vor einigen Jahren gemacht wurde.“
161 Kofler-Engl 2016.
162 Schroffenegger 2021.

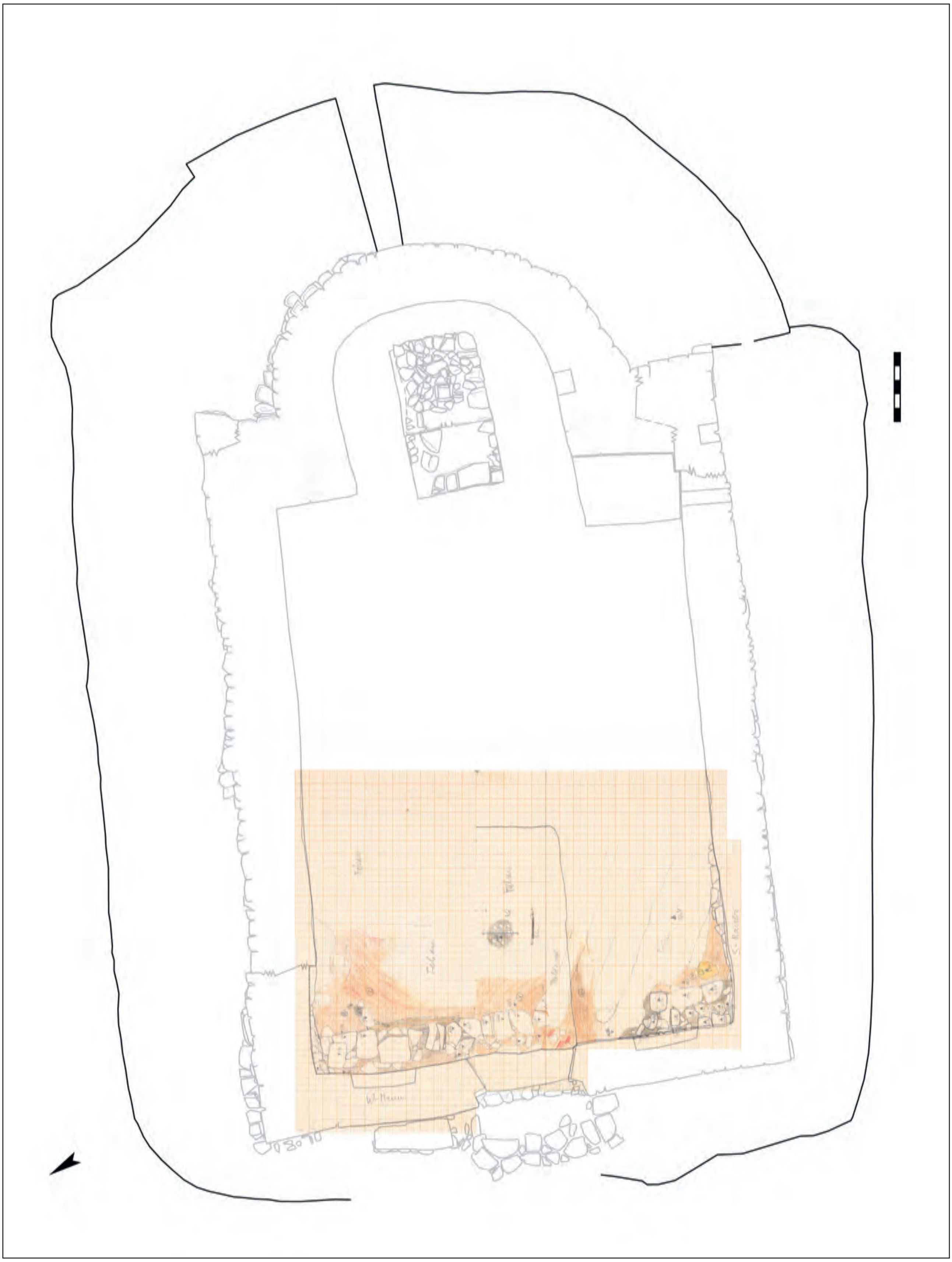


Taf. 1. St. Valentin, Planum 1. Maßstab 1 : 80 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).

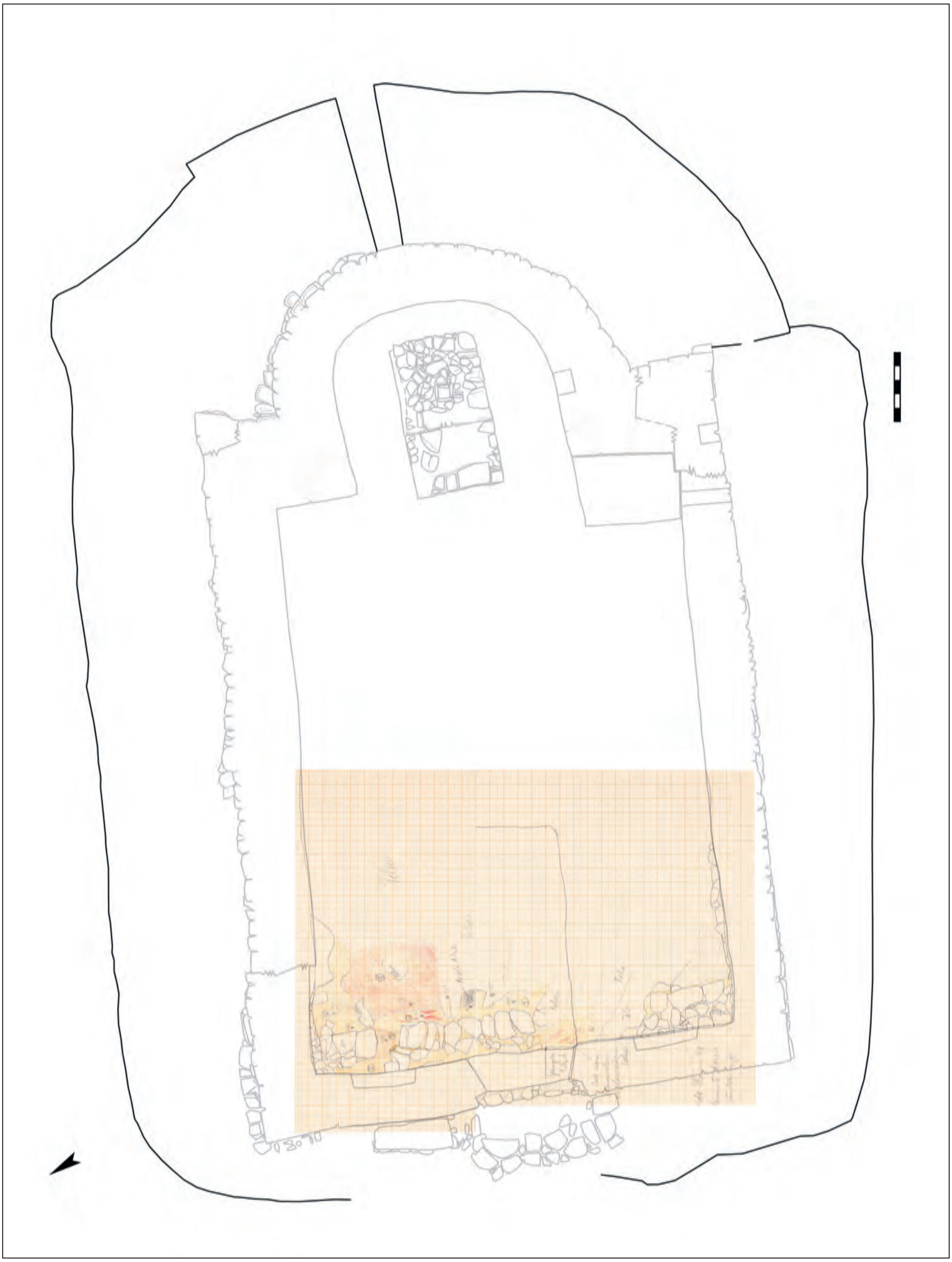
Taf. 2. St. Valentin, Planum 2. Maßstab 1 : 80 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).



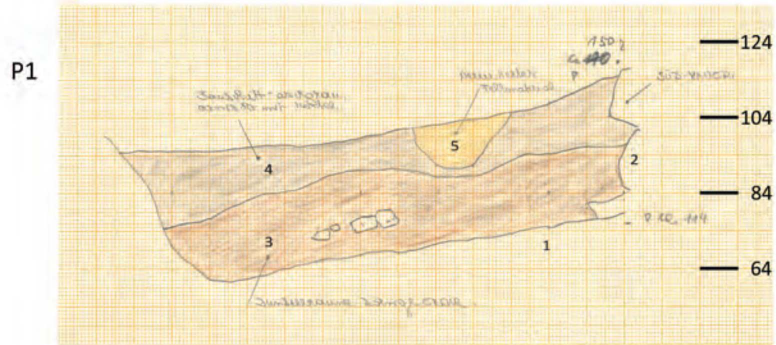
Taf. 3. St. Valentin, Planum 3. Maßstab 1 : 80 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).



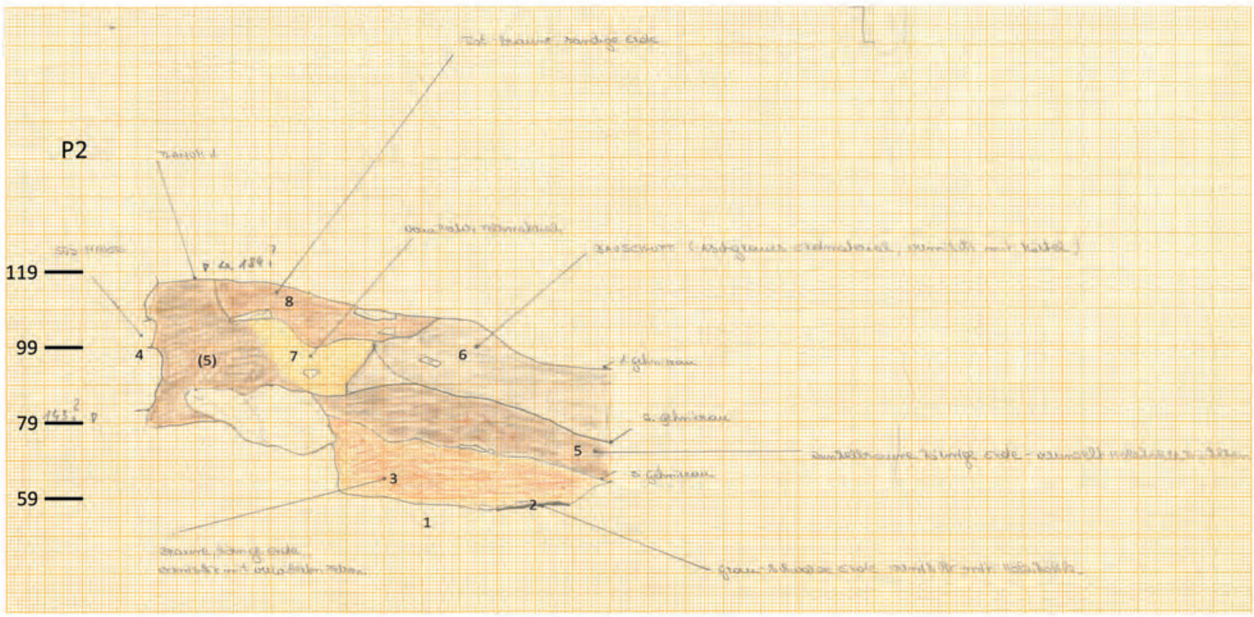
Taf. 4. St. Valentin, Planum 4. Maßstab 1 : 80 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).



Taf. 5. St. Valentin, Planum 5. Maßstab 1 : 80 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).

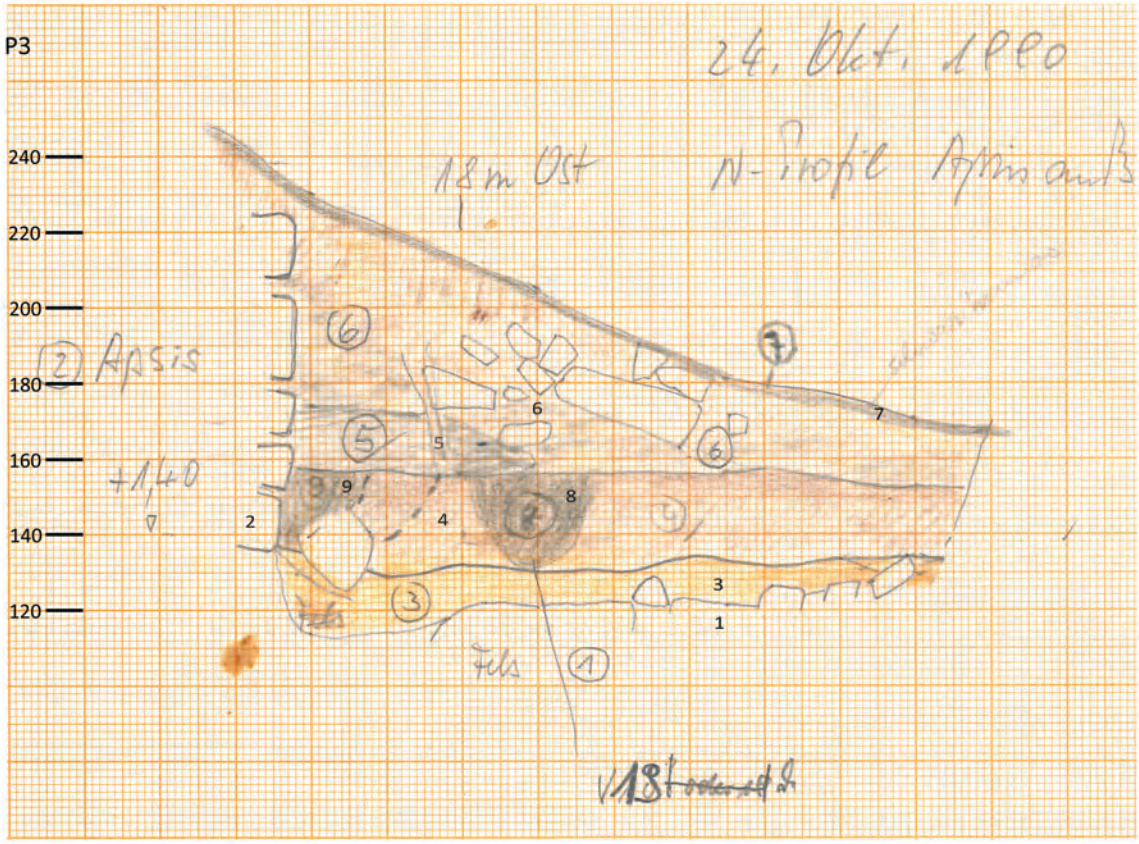


West-Profil P1: 1. Fels. – 2. Südmauer Kirche. – 3. dunkelbraune körnige Erde. – 4. aschgraue mit Mörtel vermischte Erde (Bauschutt). – 5. verwittertes Felsmaterial.

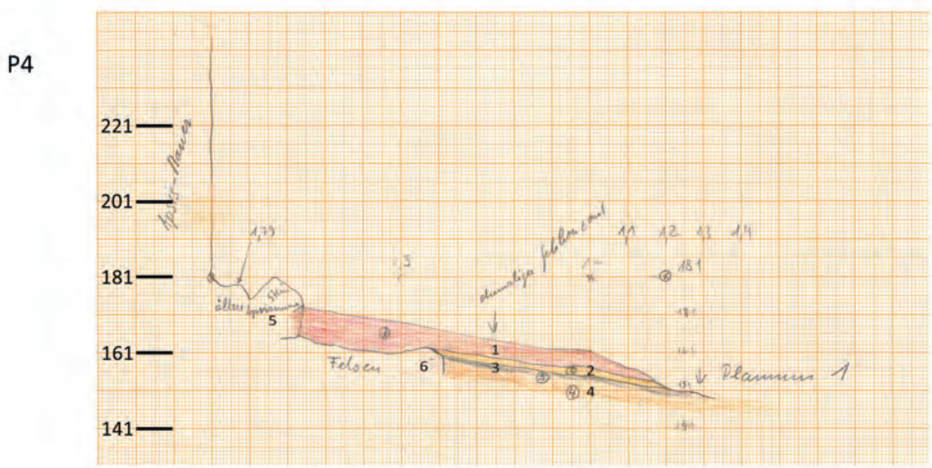


Ost-Profil P2: 1. Fels. – 2. grauschwarze mit Holzkohle vermischte Erde. – 3. braune körnige mit verwittertem Fels vermischte Erde. – 4. Südmauer Kirche. – 5. dunkelbraune körnige Erde mit vereinzelten Holzkohlestückchen. – 6. aschgraue mit Mörtel vermischte Erde (Bauschutt). – 7 verwittertes Felsmaterial. – 8. rotbraune sandige Erde.

Taf. 6. Profile P1 und P2. Maßstab 1 : 40 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).

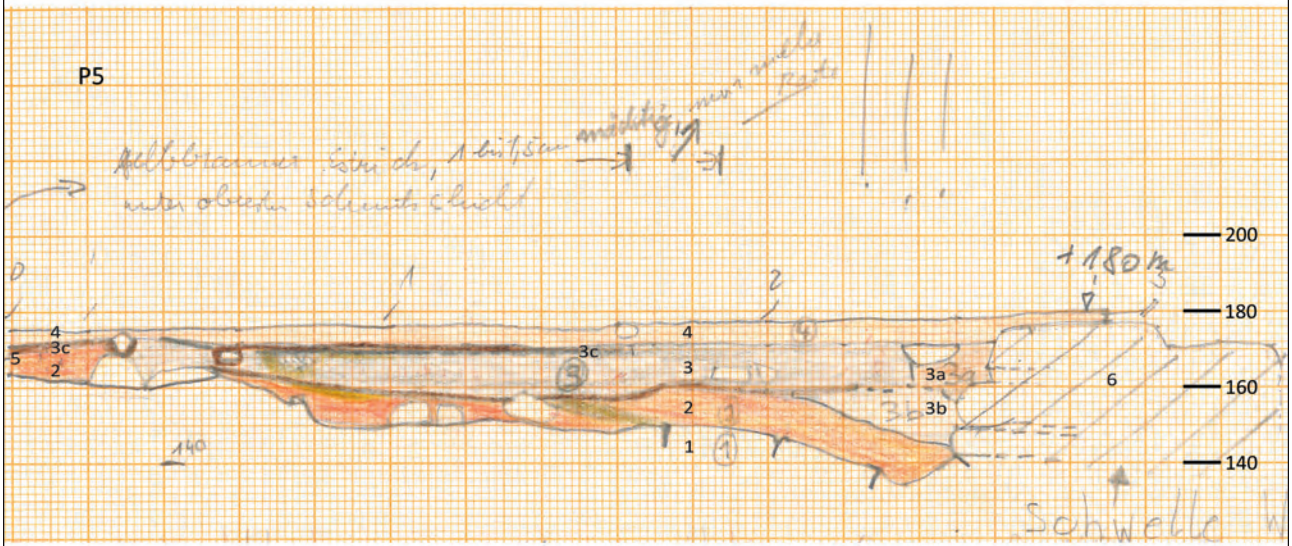


Nord-Profil P3: 1. Fels und steriler Lehm zwischen dem Fels. – 2. Apsis der Kirche. – 3. steriler gelber Lehm. – 4. humoser Gehhorizont um die Kirche, an der Oberfläche im Planum zahlreiche Dachnägel. – 5. reiner Mörtelsand, zerfallene Putze. – 6. Mörtel, Steine, Mauereinsturz, Humus. – 7. Waldhumus, Oberfläche. – 8. schwarzbraungraue aschige mit Holzkohle vermischte Erde (V19). – 9. aschgraue Erde (Baugrube Apsis).

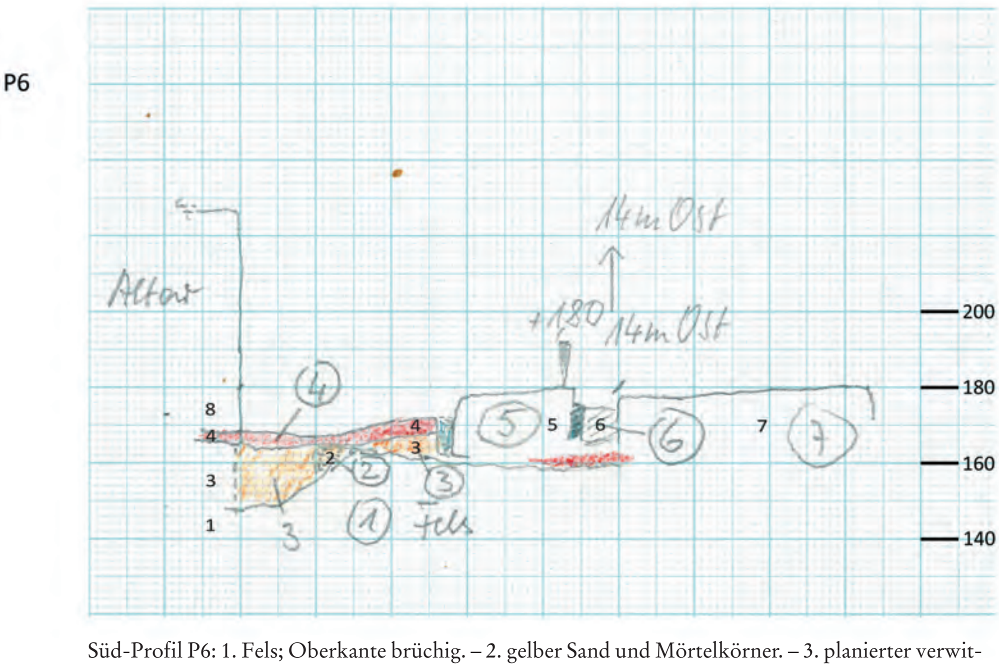


West-Profil P4: 1. braune sandige Erde; in dieser Schicht fanden sich Nägel und eine Münze; oberster Gehhorizont entlang der gesamten Nordmauer. – 2. ockerbraune lehmig-sandige Erde. – 3. braune stark mit Holzkohle vermischte Erde. – 4. (hell)braune sandige bis lehmige stark mit Steinen vermischte Erde. – 5. ältere Apsismauer. – 6 Fels.

Taf. 7. Profile P3 und P4. Maßstab 1: 20 (P3) bzw. 1 : 40 (P4) (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).



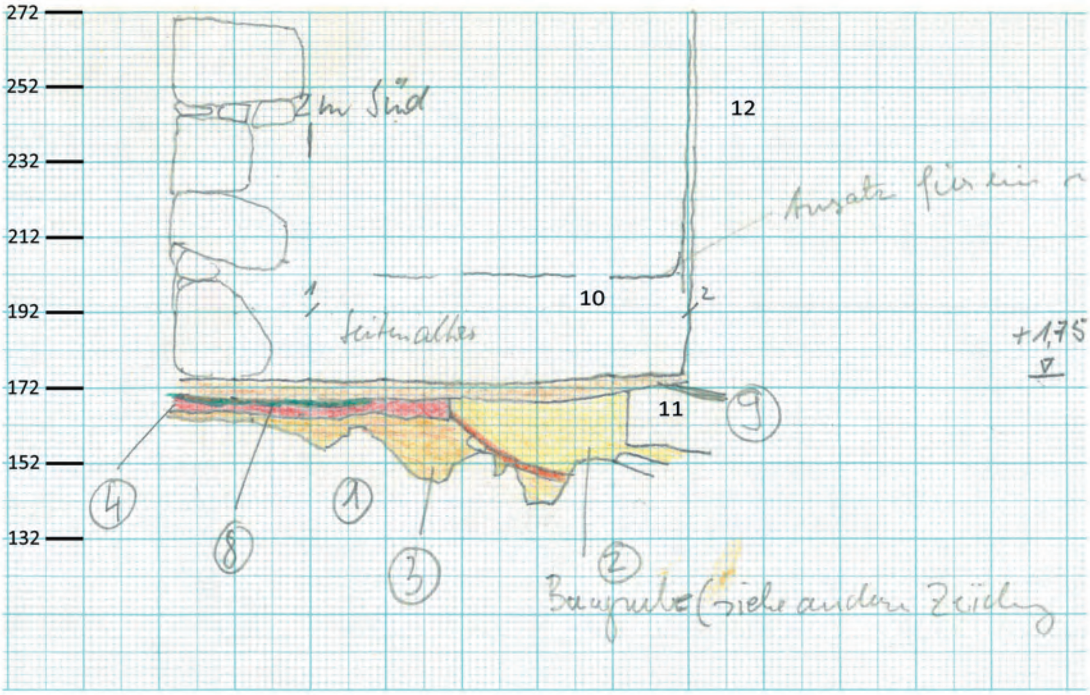
Süd-Profil P5: 1. Fels. – 2. hellbraune lehmige Erde mit Resten roten Lehms; Gehhorizont. – 3. graubrauner Estrich, Mörtel mit Kies und Holzkohle. – 3a. gelbgrauer loser Mörtel (Bauschutt). – 3b. grauweißer loser Mörtel (Bauschutt). – 3c. schwarzbraune Schmutzschicht; Gehhorizont. – 4. rotbrauner Estrich, Mörtel mit Kies. – 5. gelbbrauner Estrich, 1–1,5 cm mächtiger Mörtel (nur mehr unter oberster Schmutzschicht). – 6. Türschwelle Kirche.



Süd-Profil P6: 1. Fels; Oberkante brüchig. – 2. gelber Sand und Mörtelkörner. – 3. planierter verwitterter Fels, rötlicher Lehm mit Steinchen. – 4. sehr feiner roter Lehm. – 5. Sandsteinquader (Altarpodium) in Baugrube; links: loser Bauschutt; rechts: 2 cm hellgelber körniger Verputz. – 6. rotbrauner Estrich (in der Apsis). – 7. Steinplatte (Plattenboden im Kirchensaal). – 8. Altar.

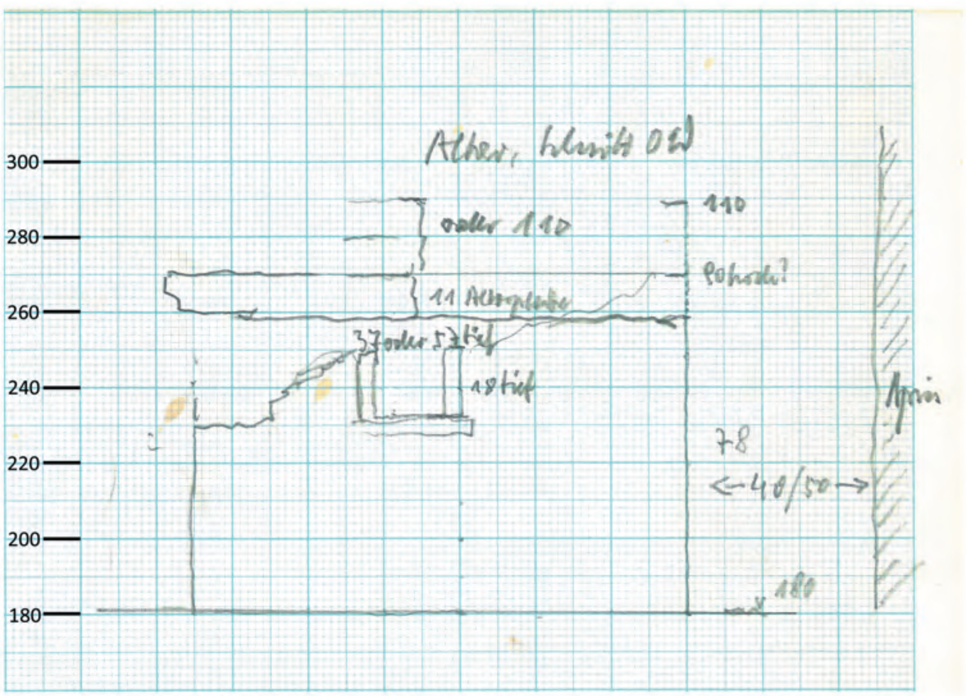
Taf. 8. Profile P5 und P6. Maßstab 1 : 20 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).

P7



Ost-Profil P7: 1. Fels. – 2. Baugrube für Südmauer. – 3. planierter verwitterter Fels, rötlicher Lehm mit Steinchen. – 4. sehr feiner roter Lehm. – 8. gelbbrauner Estrich. – 9. rotbrauner Estrich, jüngster Boden. – 10. Seitenaltar mit Ansatz für ein vorgesetztes 15 cm hohes Podium. – 11. Fundament des Vorgängers der Südmauer. – 12. aufgehende Südmauer.

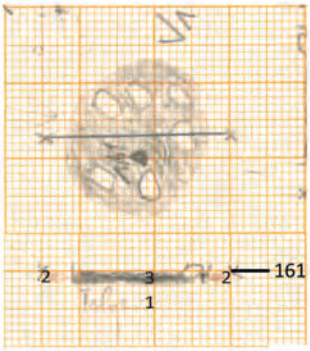
P8



Ost-Profil P8: Altar, Schnitt Nord-Süd.

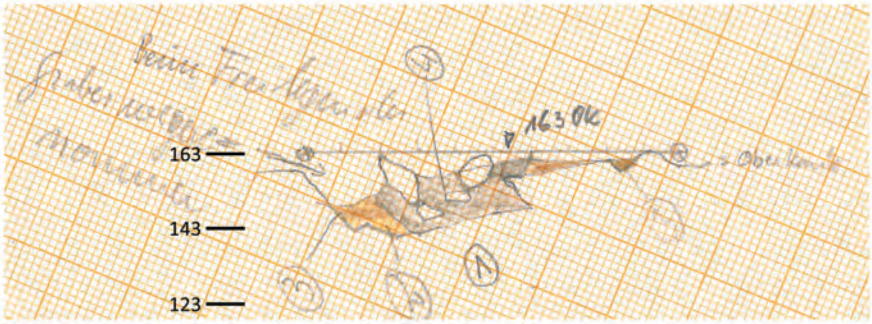
Taf. 9. Profile P7 und P8. Maßstab 1 : 20 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).

V1



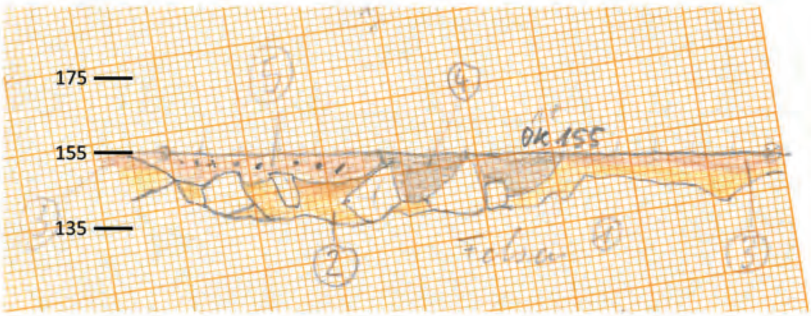
Ost-Profil V1: 1. Fels. – 2. hellbraune lehmige Erde. – 3. holzkohlehaltige Erde.

V2



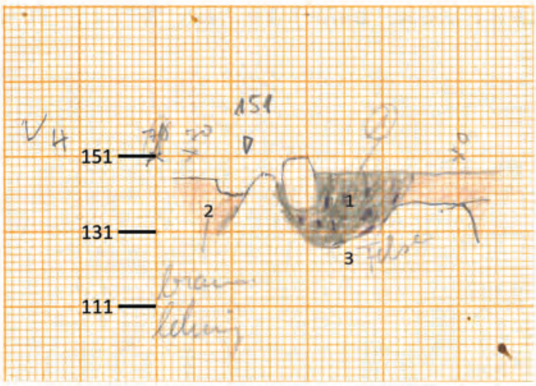
Nord-Profil V2: 1. Fels. – 2. hellbraune lehmige Erde, verwitterter Fels. – 3. braune lehmige Erde mit Steinchen, umgelagerter Waldboden. – 4. dunkel-/schwarzbraune lehmige Erde.

V3



West-Profil V3: 1. Fels. – 2. hellbraune lehmige Erde, verwitterter Fels. – 3. braune lehmige Erde mit Steinchen, umgelagerter Waldboden. – 4. dunkel-/schwarzbraune lehmige Erde. – 5. braune Erde mit Steinchen, Holzkohle und Mörtel.

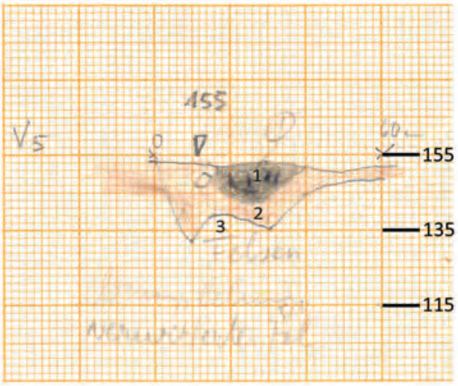
V4



Nord-West-Profil V4: 1. braungraue bis oben hellbraune lehmige Erde mit Holzkohle. – 2. braune lehmige Erde. – 3. Fels.

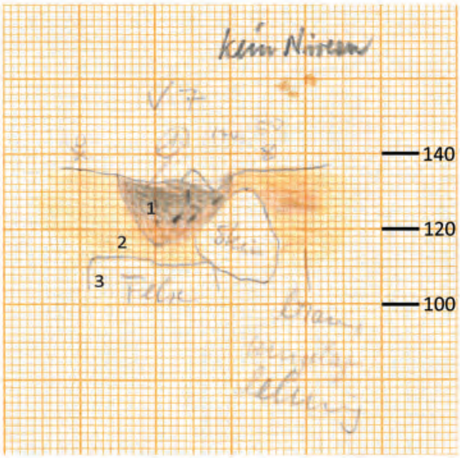
Taf. 10. Profile V1, V2, V3 und V4. Maßstab 1 : 20 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).

V5



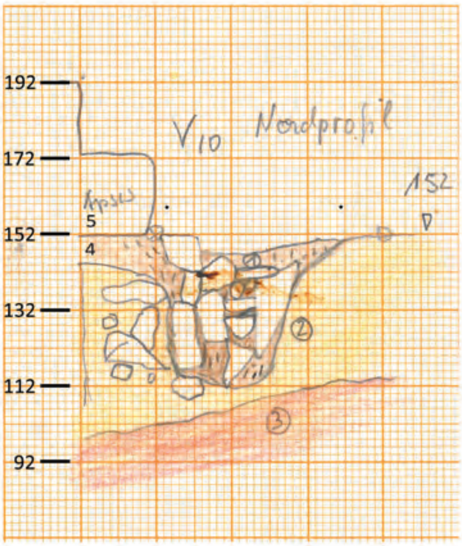
West-Profil V5: 1. braungraue bis oben hellbraune lehmige Erde mit Holzkohle. – 2. braune lehmige Erde, verwitterter Fels. – 3. Fels.

V7



Süd-West-Profil V7: 1. braungraue bis oben hellbraune lehmige Erde mit Holzkohle. – 2. braune lehmige umgelagerte Erde. – 3. Fels.

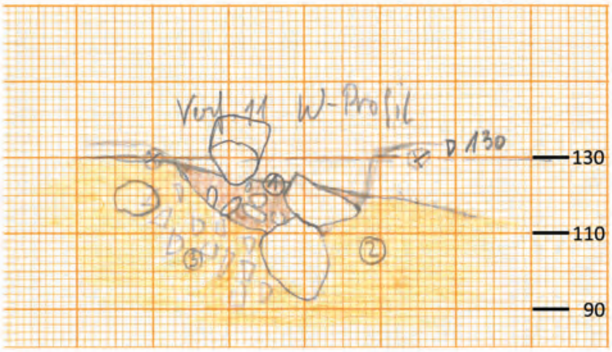
V10



Nord-West-Profil V10: 1. braune bis dunkelbraune Erde mit sehr viel Holzkohle. – 2. hellbraune bis braune Erde, stark vermischt mit Steinchen. – 3. Fels. – 4. braune Erde. – 5. Apsis Kirchenfundament.

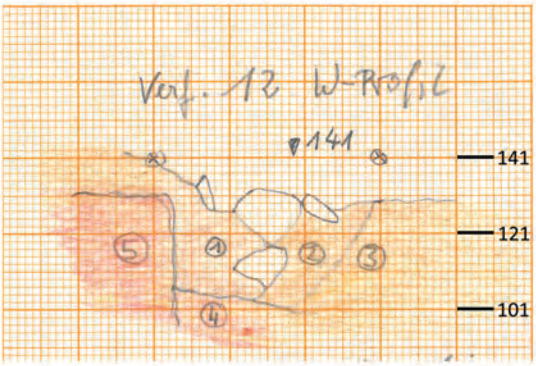
Taf. 11. Profile V5, V7 und V10. Maßstab 1 : 20 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).

V11



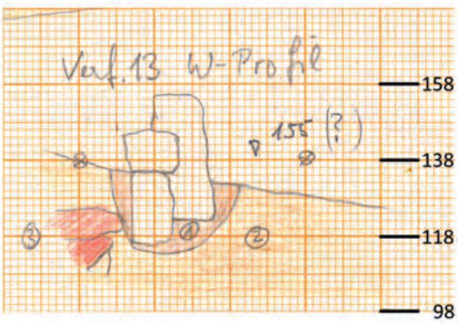
West-Profil V11: 1. dunkelbraune Erde, Holzkohle, Mörtel und kleine Steine. – 2. hellbraune Erde mit Steinchen. – 3. hellbraune Erde mit zahlreichen Kieselsteinen.

V12



West-Profil V12: 1. dunkelbraune sandige Erde mit wenig Holzkohle. – 2. hellbraune Erde. – 3. hellbraune Erde mit sehr vielen Steinchen. – 4. verwittertes Felsmaterial. – 5. Fels.

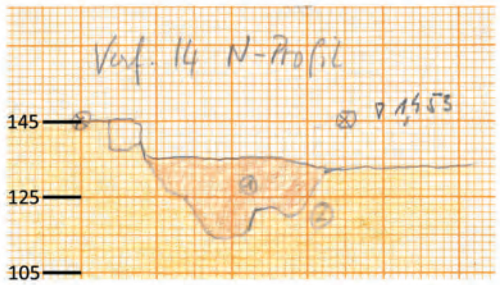
V13



West-Profil V13: 1. dunkelbraune sandige Erde, Holzkohle und Mörtel. – 2. braune sandige Erde. – 3. Fels.

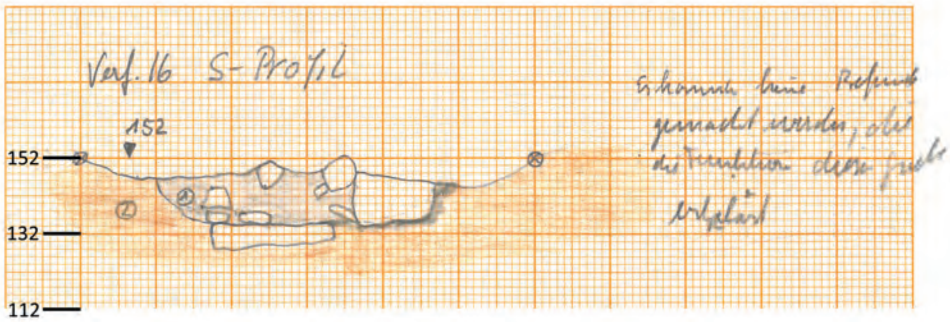
Taf. 12. Profile V11, V12 und V13. Maßstab 1 : 20 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).

V14



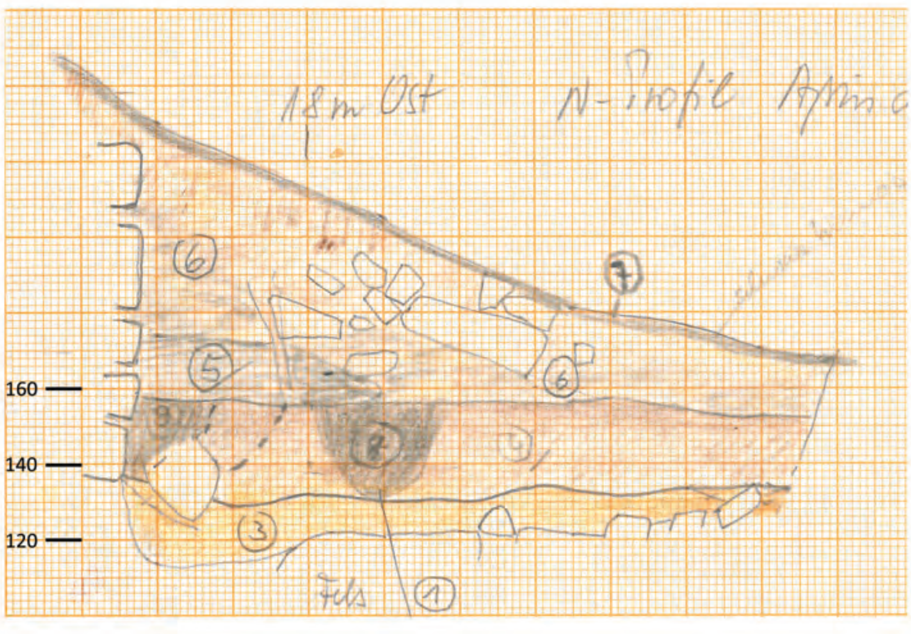
Nord-Profil V14: 1. braune sandige Erde mit Holzkohle. – 2. hellbraune Erde mit kleinen bis faustgroßen Steinen.

V16



Süd-Profil V16: 1. weißgraue sandige Erde mit sehr viel Mörtel. – 2. braune Erde.

V19



Nord-Profil V19: siehe Profil P3.

Taf. 13. Profile V14, V16 und V19. Maßstab 1 : 20 (Originalzeichnungen: A. Stuppner und H. Nothdurfter, Bearbeitung: G. Kaufmann).

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Stratigraphy from Topography I. Theoretical and Practical Considerations for the Application of the Harris Matrix for the GIS-based Spatio-temporal Archaeological Interpretation of Topographical Data

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Abstract

Archaeological stratigraphy is usually associated with an archaeological excavation. We show that the principles of archaeological stratigraphy can be extended to the analysis of prospection data. Specifically, we present a theoretical basis for archaeological stratigraphy with particular reference to the analysis of topographic data acquired from, e.g., airborne laser scans (ALS). Building on previous approaches to archaeological stratigraphy, we present an interval-based time model for constructing a stratigraphic sequence based on a combination of the spatial and temporal parameters of an archaeological stratification. Moving from an approach based on single points in time to a relative chronological structuring of a stratigraphic sequence, we postulate the use of an interval-based approach, based on Allen's interval algebra. For this purpose, the existing software for the creation of a stratigraphic sequence (Harris Matrix) has been extended, which allows a relative chronological layout of the stratigraphic sequence in combination with an absolute chronological timeline. By linking this tool to a GIS, a comprehensible and digital creation of period and phase maps based on a spatio-temporal analysis of the underlying topographic data is enabled. The system we have developed provides a consistent visual representation, which means that a correct stratigraphic layout is maintained while the units of the stratigraphic sequence are aligned with the intervals of the time model.

Keywords

Archaeological stratigraphy, Harris Matrix, ALS, GIS, Allen's interval algebra

Zusammenfassung – *Stratigraphie aus Topographie I. Theoretische und praktische Überlegungen zur Anwendung der Harris-Matrix für die GIS-gestützte räumlich-zeitliche Interpretation von topographischen Daten*

Archäologische Stratigraphie wird normalerweise mit einer archäologischen Ausgrabung in Verbindung gebracht. Wir zeigen, dass sich die Prinzipien der archäologischen Stratigraphie auch auf die Analyse von Prospektionsdaten ausweiten lassen. Im Besonderen stellen wir eine theoretische Grundlage für die archäologische Stratigraphie mit besonderer Berücksichtigung der Analyse von topographischen Daten aus beispielsweise Airborne Laser Scans (ALS) vor. Aufbauend auf den bisherigen Ansätzen zur archäologischen Stratigraphie postulieren wir ein intervallbasiertes Zeitmodell für die Erstellung einer stratigraphischen Sequenz, das auf einer Verbindung der räumlichen und zeitlichen Parameter einer archäologischen Stratifikation beruht. Im Gegensatz zu einem auf einzelnen Zeitpunkten beruhenden Zugang zur relativchronologischen Gliederung einer stratigraphischen Sequenz postulieren wir die Verwendung einer intervallbasierten Sichtweise, ausgehend von der Allen Intervallalgebra. Zu diesem Zweck wurde bestehende Software zur Erstellung einer stratigraphischen Sequenz oder Harris-Matrix erweitert, sodass eine relativchronologische Gliederung der stratigraphischen Sequenz in Verbindung mit einer absolut chronologischen Zeitlinie möglich ist. Durch eine Verknüpfung dieses Werkzeugs mit einem GIS wird eine nachvollziehbare und digitale Erstellung von Perioden- und Phasenplänen auf Basis der spatio-temporalen Analyse der zugrundeliegenden topographischen Daten ermöglicht. Das entwickelte System sorgt für eine konsistente visuelle Darstellung, was bedeutet, dass sowohl ein korrektes stratigraphisches Layout als auch eine Ausrichtung der stratigraphischen Sequenz an den Intervallen des Zeitmodells gegeben sind.

Schlüsselbegriffe
Archäologische Stratigraphie, Harris-Matrix, ALS, GIS, Allen Intervallalgebra

1. Introduction

The stratigraphic excavation process aims at the unearthing of single units of stratification in reverse order of their formation, along with all their descriptive attributes and topological relations, and to create a stratigraphic sequence known as a Harris Matrix, the formal description and illustration of the unique stratification of an archaeological site, all with the goal of arriving at an archaeological interpretation. As a stratigraphic excavation is invasive and irreversible, it demands application of the highest standards for the respective unearthing practices and the respective three-dimensional recording of the unique archaeological stratification destroyed during the excavation. Since the first comprehensive publication by Edward C. Harris on the principles of archaeological stratigraphy,[1] many of the aspects he introduced have been reconsidered and, in some cases, re-evaluated or expanded.[2]

Especially due to technical developments, the documentation methods for stratigraphic excavations have been simplified in many respects and the transition to digital documentation yielded numerous new opportunities for stratigraphic analysis.[3] In connection with this, the question of the essential components to be documented during the stratigraphic excavation process has also moved into the focus of research.[4] The advent of geographic information systems (GIS) in the 1990s provided a wide set of applicable functionalities for the documentation, analysis, and visualization of stratigraphic excavation records.[5]

In this context, the importance of the immaterial aspects of an archaeological stratification has become particularly significant. Originally introduced as interfaces by Harris, these immaterial components of stratigraphy are now more generally named surfaces.[6] The ability to capture surfaces in high resolution using 3D recording techniques like laser scanning or image-based modelling has resulted in new requirements for the documentation process[7] applied for a stratigraphic excavation process or the analysis of topographic datasets in landscape archaeology, the theoretical interrelations of which have, until now, not been adapted to fit the basic principles of stratigraphy.

While excavated stratification is open to stratigraphic analyses, a pervious non-invasive archaeological prospection, dealing with individual archaeological sites or archaeological landscapes, is generally not considered as a stratigraphic challenge. Archaeological prospection comprises a multitude of different methods that investigate and map the various physical or chemical parameters of an unexcavated stratification as abstract 2D or 3D representations.[8] Stratigraphic interpretation should, in principle, be applicable. The primary aim of this two-partite work is to examine the potential of high-resolution topographic datasets derived from state-of-the-art airborne laser scanning (ALS) to be analysed stratigraphically. The challenge is thus to determine whether fundamental considerations regarding archaeological stratigraphic theory based on excavations can also be applied to the practical archaeological interpretation of the topography of a complete archaeological site or an archaeological landscape. The second part demonstrates that this is possible in practice.[9] This paper focuses on the theoretical foundations, which first demands a consistent definition of the terms archaeological site or archaeological landscape that includes their stratigraphic nature.

2. Topography as a Key Element of an Archaeological Landscape

The topography of many parts of the globe today is the result of countless transformations caused directly or indirectly by man, incorporating various traces remaining from our past in the sense of a palimpsest. The current topography is thus regarded as a key element of an archaeological landscape. Topography is also a key element of any archaeological site, each of which has a unique archaeological stratification, as first clearly stated by Harris,[10] and wherein its unique value to history lies. When a part of an archaeological site is investigated by stratigraphic excavation, the current topography in the area of the excavation trench is the first essential stratification unit to be documented as a

1 Harris 1979.
2 Harris 1989.
3 Doneus, Neubauer 2006. – Lieberwirth 2021.
4 Doneus, Neubauer, Studnicka 2003. – Doneus, Neubauer 2010. – Doneus et al. 2011.
5 Neubauer 2004. – Lieberwirth 2008.
6 Edward Harris (personal communication 2022) suggests that the term 'interface' is an unnecessary complication and should be replaced solely by 'surface'.
7 Doneus, Neubauer 2005. – Doneus, Neubauer 2006. – Neubauer 2007. – Doneus et al. 2011.
8 Bowden, McOmish 2011. – Neubauer, Doneus, Trinks 2012. – Ainsworth, Oswald, Went 2013. – Verhagen 2013. – Fradley 2018.
9 See Doneus et al. 2022.
10 Harris 1979.

surface. This surface is made up of the individual surfaces of the underlying archaeological deposits and standalone surfaces, which are partially or fully exposed by excavation.

Within an archaeological landscape there are usually numerous discernible archaeological sites with individual and unique stratifications. They are usually interconnected and related to each other, e.g. by roadways or shared natural resources. Under favourable conditions, e.g. if vegetation like woodland protected the archaeological landscape from massive erosion, connecting features can often be recognized in the topography (e.g. hollow ways, quarries, ancient field systems) and thus are components of the first unit of stratification. If made accessible in their entirety to a sophisticated archaeological analysis, these surface traces can literally be used for the reconstruction of the past, or in more scientific terms, for the reconstruction of the history or evolution of an archaeological landscape through time, which is the primary goal of any archaeological investigation.

With regard to the detectable changes in the topography, a distinction can be made between two fundamental anthropogenic processes. The first is the deposition of material which leads to a local rise or accumulation of the topography. This can be a series of deposits in connection with the construction of a distinct archaeological feature like a burial mound, or much more complex in connection with the construction of a building or a complete settlement. In the second case, it is a matter of locally limited removal of material that leads to a lowered terrain. This might be the digging of a ditch, a quarry, or a sand pit right through to the complete destruction of a settlement. In addition, natural processes such as erosive processes or sedimentation processes are involved in the continuous transformation of the landscape, which has to be seen as a dynamic system.

These anthropogenic and/or natural processes of deposition – or more generally *accumulation/construction* – and removal – or more generally *erosion/destruction* – each have their counterpart. A destructive process at one location usually leads to a depositional process or accumulation at another place within the respective site or landscape, or outside of it. If we set the scope of consideration to archaeological landscapes, these complementary processes often take place directly within the defined landscape, for example the construction of a castle and the quarrying of stones in an often, but not necessarily, nearby quarry. They occur within a defined interval of time starting with the quarrying and deposition of the first stone and ending with the quarrying and deposition of the last stone.

In this context, however, it seems indispensable to define the term 'archaeological landscape' to further understand our approach: we understand an *archaeological landscape* as a geographically defined volumetric body or 3D volume in which archaeological sites are located. An *archaeological site* is in itself a geographically limited 3D volume with a unique *archaeological stratification*. Such a stratification consists of material and immaterial entities named *units of stratification* (US),[11] i.e. *deposits and features* that form a finitely complicated volume that is delimited at its bottom by the surface of geological stratification uninfluenced by man, and at its top – as part of the earth's surface or *ground surface* – directly interacts with the atmosphere. The theoretical connection of the individual sites to each other within an archaeological landscape is determined by the respective *ground surface* of the archaeological landscape. The geographically delimited part of the ground surface is defined as the *top surface* of an archaeological landscape and is therefore a vivid element of an archaeological landscape, understood as a stratified three-dimensional volume of limited extent.

The changes that have taken place over time in the area of the individual archaeological sites, i.e. accumulation/construction and erosion/destruction, have repeatedly changed the respective part of the ground surface. We postulate that if we succeed in spatially identifying or delimiting these individual changes of the ground surface and likewise succeed in ordering them temporally, we will be able to reconstruct the topographical transformation of an archaeological site or even an archaeological landscape through time.

To do so we regard the *archaeological landscape* AL as a three-dimensional volumetric body whose lateral delimitation is given by a reasonable geographical demarcation. In practice, it will often not be clearly definable at first, and will need to be updated as knowledge in this regard increases. The delimitation downwards is the surface of the volume to the geological stratification not influenced by man, and upwards, the ground surface (or surface exposed to the atmosphere) at the time of our investigation or measurement. These two interfaces, which can generally be described as surfaces, will subsequently be named *top surface* T_{AL} and *bottom surface* B_{AL} of our archaeological landscape. This view also applies to an individual *archaeological site* AS in the way that a delimited part of the ground surface is seen as the *top surface* T_{AS} and the interface of the respective site to the geological stratification as the *bottom surface* B_{AS} of the archaeological site. The two surfaces T_{AS} and B_{AS} of the site completely enclose the hitherto unexcavated stratification $unexcavated_{AS}$ of the site. Thus, the basic stratigraphic notation of an archaeological site AS can be based on a bottom

11 Harris 1979. – Traxler, Neubauer 2008.

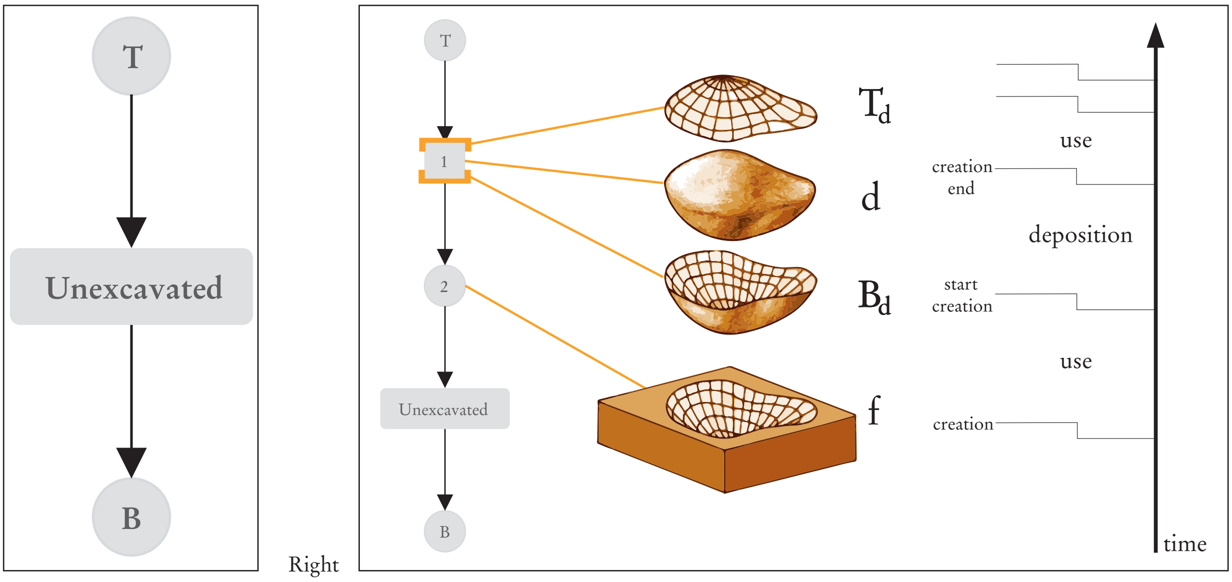


Fig. 1. Left: The basic stratigraphic sequence of any *archaeological site* AS with the unexcavated stratification and its delimiting *top* and *bottom surfaces* T_{AS} and B_{AS}. – Right: The infilling of a pit, visualized as a distinct immaterial feature represented by its *feature surface* f in superposition with the material *deposit* d enclosed by its *top* and *bottom surfaces* T_d and B_d. After its creation, the pit f is in use for a certain time span as a hollow shape, until a later deposit d infills the pit in connection with a depositional process that lasts for a certain time span. The end of the depositional process creates a new surface, which then might be in use for another certain time span and open to the creation of new features or the deposition of further deposits (Graphics: A. Lenzhofer, W. Neubauer).

and a top surface of a hitherto unexcavated volumetric body of limited extent.

If we consider a single material *deposit* d as one instant of the basic entities of our archaeological site so that we consider the *top surface* T_d of a single deposit as the boundary surface of this deposit as once exposed to the atmosphere and its *bottom surface* B_d as the surface of the single deposit on pre-existing stratification at the beginning of the depositional process, we define the basic surfaces that completely enclose the material *deposit* d (Fig. 1/right, "1"; Fig. 4/left). Removal of material or a destructive process (e.g. digging of a pit) in this context leads to the formation of a localized surface or *feature* f (e.g. the pit), an entity which must be seen as consisting of an immaterial interface or surface in its own right (e.g. the hollow shape of the pit). Even in the case of an immaterial *feature* f represented solely by its surface, a distinction must be made between a *top surface* T_f and a *bottom surface* B_f of the unique surface of the *feature* f, being spatially identical but incorporating separate temporal aspects of this type of entity. The *bottom surface* B_f corresponds to the surface created by the destructive process at the *time instant* t of completion of this process. The *top surface* T_f corresponds to the *time instant* t+Δt of the superposition of this surface by another deposit or destruction. These two surfaces define the time instances for the beginning and the end of this vivid immaterial entity of stratification in the temporal domain. This can be understood as a *time interval* [t, t+Δt] where Δt represents the lifetime of the surface or its use as a corresponding surface or hollow form (Fig. 1/right, "2"; Fig. 4/right). The same can also be applied to the *deposit* d, whereby the deposit can be seen analogously in relation to the depositional process and its use between the beginning of the deposition process and the superposition or destruction by a later unit. Thus, also for the *deposit* d as the material entity of stratification, a time interval [t, t+Δt] is defined by the *top surface* T_d and the *bottom surface* B_d that represents the two time limits of the duration Δt of its deposition.

An *archaeological site* AS can therefore be defined as the union of all *deposits* d_i and *features* f_j. An *archaeological landscape* AL can thus be defined as the union of all *archaeological sites* AS_k with the *ground surface* GS_{AL} within the demarcation of the archaeological landscape. Within an *archaeological landscape* AL, depositional and erosive or destructive processes that are directly or indirectly caused by humans, or that can be traced back to natural causes, take place in highly complex forms in parallel throughout an archaeological landscape. This leads to corresponding terrain changes in the area of the individual sites AS_i, which in themselves are equally complex and unique.

Theoretically, however, a consistent *ground surface* GS can be postulated for any given point in time t, which combines the respective top surface of the most recent *deposits* T_{di} and *features* T_{fj} of the individual *archaeological sites* AS_k within an *archaeological landscape* AL. The respective discrete manifestation of the *ground surface* GS(t) in the course of time connects all *archaeological landscapes* AL(t) at the specific *time instant* t. The *top surface* T_{AL} at a specific point of time or *time instant* t_x, which we have already understood as an essential element of an archaeological landscape, is the delimited part of the *ground surface* GS at the *time instant* t_x. The *top surface* T_{AL} of an archaeological landscape is thus the theoretical basis for the spatio-temporal analysis and reconstruction of this three-dimensional model based on a volumetric concept that changes dynamically over time. The *top surface* T_{AL} can therefore be defined as the union of all top surfaces of the individual sites with the *ground surface* GS_{AL} which is the same as the union of all *top surfaces* of individual *deposits* T_{di} or *features* T_{fj} with the *ground surface* GS_{AL}. Thus, we postulate that if we succeed in localizing and chronologically classifying some of the visible fragments of *top surfaces* T_{di} and T_{fj} of the units of our archaeological stratification based on available topographic data, i.e. the *ground surface* GS_{AL}, we might be able to structure the entire topographic record of the landscape through time and reconstruct the historic topography accordingly. If we access a series of unordered top surfaces of deposits and features and put them in relative chronological order, we might derive discrete approximations of our *top surface* T_{AL} at specific *time instants* t_x representing the reconstructed topography at this specific point in time.

Since we cannot resolve the entire archaeological stratification in our non-invasive approach based solely on topographic data, but access only the most recent units of stratification adjacent to the recent ground surface, it is clear that our information is incomplete, as the volume AL is only accessible through its *top surface* T_{AL}. Nevertheless, we postulate in this and a subsequent paper[12] that the methodological approach we have chosen based on the presented theoretical model allows for a temporal structuring of an archaeological landscape in detailed form based on a high-resolution digital terrain model derived from airborne laser scanning, and that the basics of archaeological stratigraphy already established by Harris[13] and further developed by the first author[14] can be successfully applied.

3. Archaeological Stratification and Stratigraphic Sequences

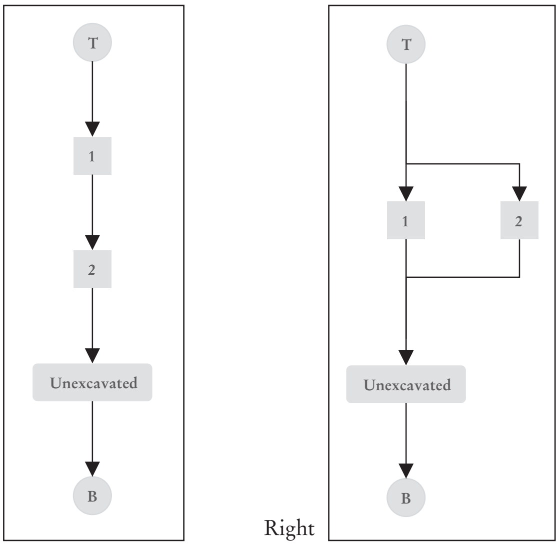
Every archaeological site is stratified, and any archaeological stratification is unique. This finding, first formulated by Harris, is among the most important recognitions for archaeological theory and for the further development of archaeological stratigraphy.[15] Therefore, any archaeological site which is investigated is open to *archaeological stratigraphy*, defined as the partial or complete spatio-temporal description and interpretation of the unique stratification of an archaeological site.

As introduced above, any individual *archaeological site* AS or *archaeological landscape* AL (defined as a union of sites over a defined area) can be physically understood as a geographically defined, physical volumetric body with limited spatial extent, formed over a period of time. Usually natural, anthropogenic and anthropogenically influenced physical or chemical processes contribute to the formation of an archaeological site or archaeological landscape, reflecting its environmental, historical, and cultural settings. Based on our theoretical model, these volumes consist of individual and discrete entities, the *units of stratification* US to be separated into *deposits* and *features.* They form an ordered series of entities representing the unique *archaeological stratification*.[16] A further subdivision of these entities and their related *top* and *bottom surfaces* does not make sense in regard to the archaeological excavation and documentation process; they are thus the elementary three-dimensional material and immaterial entities of an archaeological stratification and its description, the *archaeological stratigraphy*. Every single unit of stratification can be characterized by its geographical position, extent, observed topological relations to the other units, and its specific temporal characteristics.

The individual *units of stratification* US_i incorporate spatial and temporal aspects of the *archaeological site* AS corresponding to distinct events or *time instants* t_x and related durations or *time intervals* [t, t+Δt]. They can partly be observed within the volumetric body in physical superposition, defining direct temporal succession. A direct superposition of three units of stratification can thus be noted as: if (US_1 is above US_2 is above US_3), then it follows that (US_1 is above US_3). The direct superpositions also defined the relative temporal succession of the three units of stratification; thus it also follows that (US_1 is later than US_2) and (US_2 is later than US_3) and (US_1 is later than US_3).

As stated in the introduction, the stratigraphic archaeological excavation and recording process aims at dividing the stratification of an archaeological site into its components, the units of stratification and observing their superpositions. In the same way, the archaeological analysis of the topography, seen as an essential part of the stratification, should aim at

12 Doneus et al. 2022.
13 Harris 1989.
14 Neubauer 2007.
15 Harris 1989.
16 Harris 1979.



Left Right

Fig. 2. Left: In case 1 the stratigraphic units US_1 and US_2 are in superposition, where US_1 *isabove* US_2 and thus connected by a directed edge. – Right: In case 2 the stratigraphic units US_1 and US_2 are not in superposition, where US_1 *isnot ∊ relationwith* US_2 and thus not connected by a directed edge but placed parallel to each other in the sequential graph (Graphics: A. Lenzhofer).

dividing the respective surface into its components, the units of stratification directly bordering the ground surface. The archaeological research is thus reduced to the units of stratification accessible at the ground surface, but this does not affect the applicability of a stratigraphic approach. A stratigraphic topographic analysis should be focused on the determination of the topological relations of the units of stratification observed on the surface to derive respective superpositions.

The *Harris Matrix*, initially introduced in 1973 by Edward C. Harris,[17] is the *de facto* standard for the documentation of the topological relations of an archaeological stratification. The Harris Matrix is a sequential diagram representing the topological relations of all individual units of stratification based on the analysis of superposition of the individual units of stratification. Due to major shortcomings of the initial definition in relation to the theoretical model presented in this paper, the initial definition and layout of a Harris Matrix (Fig. 3/b) has been developed further by the first author in accordance with Harris and led to a new convention implemented in a software application named Harris Matrix Composer (HMC).[18]

Such a revised Harris Matrix, or in more general terms an *archaeological stratigraphic sequence* (Fig. 3/c), is, in mathematical terms, an acyclic directed graph with different nodes for the two types of stratigraphic units, i.e. *deposits* and *features*, where edges define the topological relation 'is above' based on superposition. A stratigraphic sequence consists of two distinct types of nodes, rectangular symbols (□) representing material *deposits* and circular symbols (○) representing immaterial *features*. The directed edges represent the topological relations also known as the *stratigraphic relations* between them.[19] These topological relations are defined by two instances, an existing (case 1) or missing (case 2) connection by a directed edge:

Ad case 1. Two units of stratification are in superposition:

$US_1 \downarrow US_2$ (US_1 *isabove* US_2)

Ad case 2. Two units of stratification are not in superposition:

$US_1 \not\downarrow US_2$ (US_1 *isnot ∊ relationwith* US_2)

We can thus distinguish between the following two cases 1 and 2 (Fig. 2).

As a stratigraphic sequence is an ordered series of units of stratification, it is convenient to attach a unique alphanumeric identifier to the individual unit regardless of whether it is a deposit (□) or a feature (○). A directed edge running from unit 1 to 2 means that 1 lies stratigraphically above 2, or in other words, 1 is in superposition to 2. This implies that 1 is later than 2 in respect of their relative temporal succession. If 1 and 2 are not in relation, their temporal succession is undefined and cannot be directly derived from the stratigraphic sequence (Fig. 2).

4. Stratigraphic Segmentation of Topographic Data

In the situation where we are confined to a high-resolution representation of the topography of an *archaeological landscape* AL for our detailed stratigraphic investigations, our database is reduced to the *top surfaces* or the exposed parts of the *top surfaces* of the units of stratification, which are in direct superposition with T_{AL}. Deposits can only be defined and delimited based on their material aspects, which are inaccessible in a topographic dataset. Consequently, the *top surface* T_d cannot be delimited on comprehensible arguments as the material aspects for the delineation are not accessible. Thus, within the analysis of topographic data from an archaeological landscape, the database is reduced to the top surfaces of features which are in direct superposition with T_{AL}. This is also valid for an upstanding wall, as the uppermost visible and thus relevant part in the topographic data is the top surface formed by the feature type wall.

17 Harris 1979.
18 Traxler, Neubauer 2008.
19 Traxler, Neubauer 2008, 14.

Despite this reduction of information, it is still possible to perform a stratigraphic analysis based on specific features, defined as manmade alterations observed in the topographic data (e.g. pit, ditch, hollow way, wall, mound, or bank). The stratigraphic analysis is based on the spatial definition, archaeological classification and the temporal or chronological ordering of the elementary top surfaces of the observed types of features, based on an expert segmentation of the topographic data and the comprehensive definition of superposition of individual feature surfaces. The process differs from a stratigraphic excavation process mainly in that we have a restricted database available as we do not access the full 3D volume but only the respective parts of the *top surfaces* of the units in direct superposition with T_{AL}. However, the general theoretical considerations remain valid and can be adapted to create a stratigraphic sequence of an archaeological landscape. One remaining problem is the temporal ordering of stratigraphic units identified through such a topology-based approach.

So far, there has not been any convincing attempt to relate temporal aspects inherent in the sequence with the initially developed symbology, even though superposition defines relative temporal succession.[20] This needs to be regarded as a major shortcoming of the stratigraphic theory. In our previous considerations, we have shown that it is the elementary *top* and *bottom surfaces* that have a crucial importance regarding the temporal aspects inherent in the individual units of stratification. Their consequent differentiation, both in relation to the *top* and *bottom surfaces* of the material deposits and the immaterial features, is of fundamental importance for the considerations in relation to the chronological ordering of a stratigraphic sequence.

A further related major shortcoming of the initially defined Harris Matrix with regard to a comprehensive chronological ordering of the sequence is the fact that based on the rules to build a sequence, the horizontal alignment of units in the sequence had no chronological meaning. Thus, in the absence of direct stratigraphic relations individual units that are in a chronological sequence may also be represented next to each other. This applies equally to the stratigraphic interpretation of excavations and archaeological landscapes. The integration of spatial and temporal properties of the single units of stratification within the sequence could resolve this problem. It would allow a more efficient and accurate analysis, more robust interpretation, and visualization of the result of the stratigraphic analysis. In order to be able to follow this argumentation, in the following section we will review the initial definition and further development of the rules and practice for compiling a Harris Matrix or stratigraphic sequence in regard to the terminology introduced above.

20 For a discussion, see Traxler, Neubauer 2008. – Neubauer et al. 2018.

5. Creation of a Valid Archaeological Stratigraphic Sequence

When Harris introduced the *Harris Matrix* as a new method for recording units of stratification together with their stratigraphic relationships in the year 1973, the term matrix resulted from the practice of drawing a stratigraphic sequence based on a regular grid of symbols (□) organized like a matrix (Fig. 3/b) on pre-printed sheets of paper before computers were used.[21] It was Irwin Scollar[22] who provided a first MS-DOS-based software solution as part of the Bonn Archaeological Software Package (BASP) that could draw a Harris Matrix from textual input in 1990.[23] In 1998 Christoph Hundack and colleagues presented an interactive Windows-based editor building on the graph-drawing algorithms of Scollar called ArchEd, which found widespread application in the archaeological community but was not developed further.[24] Irmela Herzog, initially involved in the implementation of the BASP Harris Matrix programme, developed a new Windows-based solution, named Stratify, in 2003.[25] This tool did not support direct graph manipulation but supported the grouping and colour coding of dated units. Herzog and Jürgen Hansohm used monotone regression to correct exact dates that contradicted stratigraphic relations such that they only need to be minimally changed.[26] The approach assumes that the stratigraphic sequence is always correct and minimizes date changes necessary for a consistent documentation. However, such contradictions indicate that an error was made either when recording the stratigraphy or during dating, which should be resolved by the pertinent scientists rather than by an algorithm.

Since the above-mentioned tools do not accord completely with the theoretical background of the Harris Matrix or were already technologically outdated in 2006, the first two authors of this article started development of a new software solution for the compilation and validation of a stratigraphic sequence named Harris Matrix Composer

21 Harris 1979.

22 Scollar 1994.

23 https://baspsoftware.org/.

24 Hundack et al. 1997.

25 http://www.stratify.org/Download/Stratify_Manual.pdf. – Herzog 2004. – Herzog 2010.

26 Herzog, Hansohm 2008.

(HMC) with the goal of overcoming shortcomings in existing solutions and supporting all the principles of archaeological stratigraphy published by Harris.[27] The software devised and specified by the first author was implemented within a project funded by the Vienna Science and Technology Fund (WWTF)[28] and further developed into a commercially available software application programmed in Java[29] that is currently widespread in the archaeological community and has even found application in forensics.[30] It is based on the graph library yFiles from yWorks[31] and described in detail by Christoph Traxler and Wolfgang Neubauer.[32] The HMC can handle huge directed acyclic graphs with a high degree of usability and efficiency. Automatic validation and layout computation by an adapted Sugiyama algorithm[33] guarantees that a logically correct and thus valid stratigraphic sequence is generated (Fig. 3/c). HMC was the first software that explicitly separated the two basic types of units of stratification, i.e. material deposits from immaterial features, by introducing two separate symbols (□, ○) with unique identifiers as the basic graphical element for the elementary units of stratification and a *top* and *bottom surface* T and B to represent the delimiting surfaces of an archaeological stratification (Fig. 3/c).

Apart from the stratigraphic or topological relations based on superposition (1 is above 2), displayed as directed solid arrows, the HMC also supports event-based temporal relations to define relationships of units of stratification that are not in superposition but can be defined such that (1 is contemporary with 2) or (1 is later than 2), displayed by directed dotted arrows (Fig. 3/c). However, these concepts, developed to integrate temporal attributes into the sequence, proved to be unintuitive and were rarely used. From our current perspective, they are even misleading and should be avoided. In particular, temporal edges are easily confused with stratigraphic ones, impairing the analysis. Therefore, it was necessary to reconsider the temporal attributes of a stratigraphic sequence and to research new concepts for how to combine the topological or stratigraphic relations with the temporal relations, or more generally, how to integrate spatial and temporal attributes within a valid stratigraphic sequence and how to define a comprehensive layout of such an enhanced stratigraphic sequence.

6. Temporal Aspects of Deposits and Features

So far, the conventional way of considering temporal aspects has been based on an event-based approach. The individual unit of stratification has been seen as the material remains of an event, therefore it was related to a *time instant*, defined as a time entity with zero extent or duration.[34] Duration has been related to the respective edge joining two units with their respective time instant or *temporal position*, which is the position on a directed timeline. By combining two time instants, it became possible to deduce a respective *time interval*. We define such a time interval as a temporal entity with an extent or duration. In the above-mentioned initial design, the horizontal alignment of the units of stratification had no chronological meaning and it was therefore neither possible to display duration in the matrix nor was it possible to display a consistent sequence of events for the complete sequence. Consequently, the chronological interpretation of the stratigraphic sequence was solved within the narrative.

We therefore decided to apply temporal relevance to the horizontal position of the units by assigning the symbols for deposits and features to respective *time intervals*, relatively ordered subdivisions of the absolute *timeline*, based on the theoretical considerations outlined above. The timeline is directed from the past towards today and ends at the time instant *now*. Now is defined as the time of the archaeological investigation or analysis, bearing in mind that we are dealing with an archaeological stratification which is a 4D dynamic system.

Since combining time with the material components of an archaeological stratification is not straightforward, we use the elementary immaterial components inherent in our archaeological stratification. These are the elementary surfaces, which we have consistently defined for the individual deposits and for the individual features, as well as for archaeological sites or entire archaeological landscapes. These elementary surfaces are elements of stratification that were created at a precisely defined point in time. Although it is not possible for us to determine the absolute time instant without further knowledge, the relative sequence of these time instants can be determined through superposition.

Let us first consider a *deposit* d for which we have already determined that the *bottom surface* B_d and the *top surface* T_d define the start and the end time of the depositional

27 Traxler, Neubauer 2008.

28 Institute of Visual Computing & Human-Centered Technology 2006–2008. – VIAS 2006–2008.

29 LBI ArchPro 2018.

30 Hanson 2004. – Icove, Haynes 2017.

31 yWorks 2004–2018.

32 Traxler, Neubauer 2008.

33 Sugiyama, Tagawa, Toda 1981. – Sugiyama, Misue 1991. – Eiglsperger, Siebenhaller, Kaufmann 2004.

34 Definitions of the temporal entities introduced are derived from Cox, Little 2020.

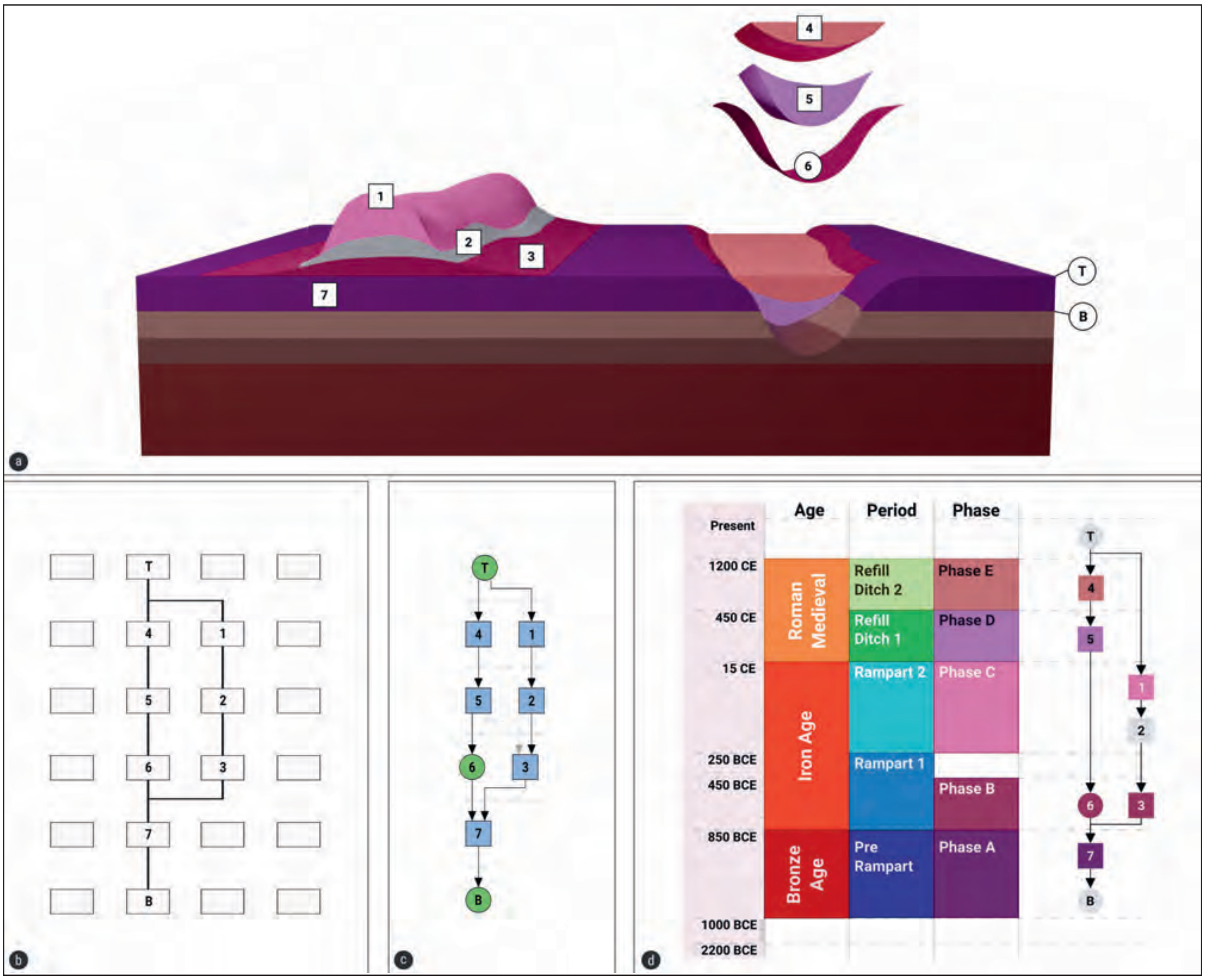


Fig. 3. Evolution of Harris Matrix layouts based on the example of a rampart formed by a ditch and a bank on top of an earlier deposit superimposed on the geological stratification (a). – b. The traditional Harris Matrix. – c. The same matrix arranged by HMC software indicating that deposit US_5 is later than deposit US_3. – d. The enhanced layout of the Harris Matrix, based on the integration of interval-based temporal attributes, generated by the HMC+ software. The narrative derived from the stratigraphic sequence Fig. 3/d would read as follows: In the Iron Age a ditch US_6 is dug into the pre-existing stratification formed by a Bronze Age deposit US_7 on top of the geological stratification consisting of a soil with two horizons on parent rock. The earth material consisting of the Bronze Age material and the two soil horizons is mixed by the digging of the ditch and deposited parallel to the ditch as the primary deposit US_3 of the bank. US_6 and US_3 are dated to the construction phase B of rampart 1, which was in use for a certain time. In phase C, the rampart 1 was reinforced by two deposits US_2 and US_1, earth material dug away somewhere else and used for the enhancement of rampart 1 forming rampart 2, still dated to the Iron Age. During phase C, the ditch US_6 was still in use and intact. The rampart was in use in the Iron Age in the time span 850 BCE to 15 BCE. During Roman and medieval times, the ditch was partly refilled by two deposits US_5 and US_4. The stratigraphy clearly indicates two phases of the refilling process, with US_4 exposing a horizontal *top surface* indicating a natural and slow depositional process, most likely by natural agents, whereas the bent *top surface* of US_5 indicates a fast refilling, most likely by human agents. The refilling process can be roughly dated to the time span 15 BCE to 1200 BCE. The rampart survived in the landscape and is detectable by high-resolution ALS. The ditch is represented in the topography by the *top surface* of US_4 unified with the remaining parts of the *top surface* of the original ditch US_6. The bank is visible within the topography as combination of the top surface of US_1 and the parts of the *top surface* of US_2 and US_3 still exposed to the atmosphere. The *top surface* of the archaeological stratification T is formed by the union of the remaining surfaces of ditch and bank and parts of the *top surface* of the Bronze Age deposit US_7. The *top surface* T is part of the current ground surface of the archaeological landscape investigated by ALS (Graphics: A. Bornik, A. Lenzhofer).

process with the *duration* Δt. We have justified the end of this depositional process by it being overlain by another unit of stratification. Similarly, for a *feature* f, the *bottom surface* B_f and the *top surface* T_f represent the temporal boundaries for the *duration* Δt of the use of a corresponding hollow form. We therefore introduce temporal terms for

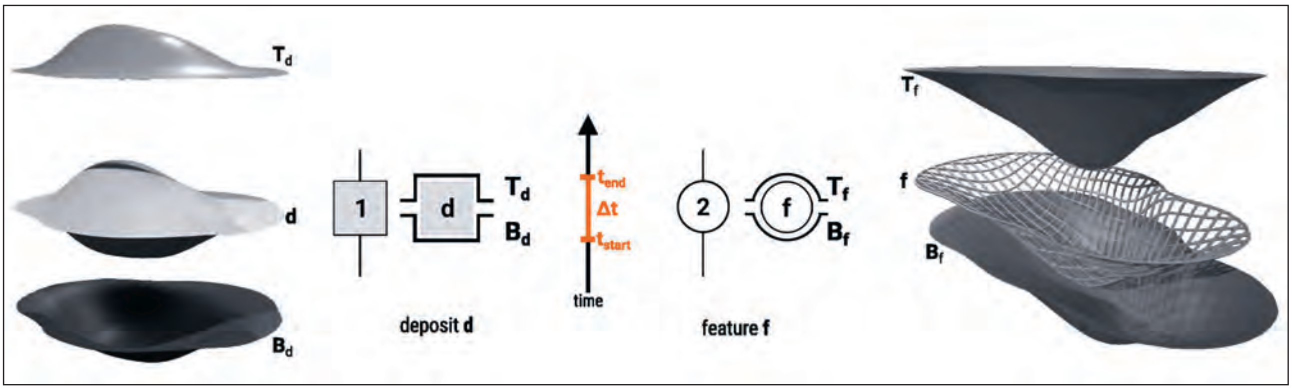


Fig. 4. Explanation of the symbolism used to create a Harris Matrix and its relationship to the geometric representations and their temporal relevance. A *deposit* d (left) is geometrically represented by a 3D material volumetric body enclosed by its basic *top* and *bottom surfaces* T_d and B_d. In the stratigraphic sequence it is a filled or shaded rectangular symbol with a unique identifier. The rectangular shape is to be interpreted as the immaterial envelope or hull of the volumetric body d to be separated into its *top* and *bottom surfaces* T_d and B_d. The *top* and *bottom surfaces* represent the time instants t_{end} and t_{start} for the start and the end of the depositional process with a duration Δt. A *feature* f (right) is geometrically represented by an immaterial 3D surface. In the stratigraphic sequence it is an unfilled circular symbol with a unique identifier. The circular shape is to be interpreted as the feature surface, to be separated into its *top* and *bottom surfaces* T_d and B_d. The *top* and *bottom surfaces* are geometrically identical with the feature surface but represent the time instants t_{end} and t_{start} for the start and the end of the use of the feature, e.g. as a hollow with a duration Δt (Graphics: A. Bornik, A. Lenzhofer).

the respective surfaces, which can be represented both in the symbolic representation within a stratigraphic sequence and in the form of a geographical object within a 3D mapping of these single surfaces (Fig. 4).

The *bottom surface* of a single deposit (□) or feature (○), i.e. a single US, is temporally defined as the *time instant* t_{start}, representing the start of the depositional process or the removal of a part of the pre-existing stratification. The *top surface* of a single US is defined as the *time instant* t_{end}, representing the end of the depositional process or the use of a hollow form by it being overlain by another unit of stratification. The duration Δt for the depositional process of a deposit or use of a feature is defined by the *time interval* $[t_{start}, t_{end}]$ represented in spatial terms by the *top* and *bottom surface* of the deposit or feature respectively. The symbols of the deposit □ and feature ○ will be interpreted as outlined in Fig. 4, in relation to the temporal and the spatial terminology.

This makes it obvious that the integration of an *interval-based time model* was the next challenge to be taken up to develop the Harris Matrix into a useful spatio-temporal analysis tool. For this reason, we investigated how to combine stratigraphic and interval-based temporal relations in a consistent visual representation of an archaeological stratigraphic sequence.

7. Integration of an Interval-based Time Model into the Stratigraphic Sequence

Spatial attributes are definite and can therefore be represented by respective georeferenced geometric objects (Fig. 4), attributes and metadata in a GIS database linked to the stratigraphic sequence. By contrast, the temporal attributes of the single units of stratification are indefinite. The stratigraphic sequence as initially developed by Harris implies a relative chronological sequence of all units of stratification but only for units of stratification which are in superposition. If they are not in superposition, a temporal relationship or relative succession cannot be derived from the stratigraphic sequence. This problem was first discussed by Clive Orton in his considerations on how finds can be related to the stratigraphic sequence.[35] Likewise, the requirements for an absolute dating of units of stratification were not considered, and thus the temporal order cannot be derived from the stratigraphic sequence. However, the temporal aspects are to be determined by temporal reasoning by the expert(s) on the basis of a series of relative measures based on complex archaeological find analysis and/or various absolute measures derived from scientific dating methods, delivering respective absolute time intervals and related probabilities. James F. Allen introduced a sound theoretical framework for temporal reasoning also known as Allen's interval algebra,[36] well suited for our chronological problem.

For our purpose we use an *interval-based time model* such that we assume $S = \{t_1; t_2; \ldots t_n\}$ as a strictly ordered set of *time instants*. We perceive the time axis as discrete with a resolution set in absolute terms to 1 year. Time instant t_n is defined as *now*, which is the point of the end time of our

35 Orton 1980.
36 Allen 1983.

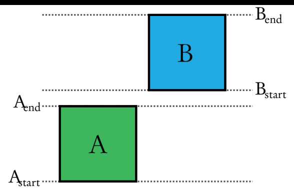
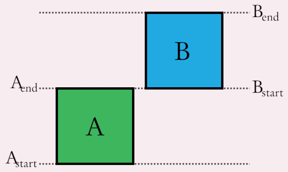
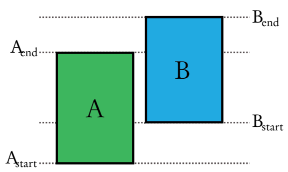
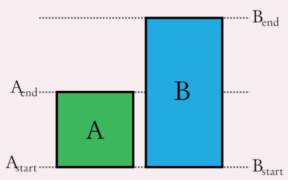
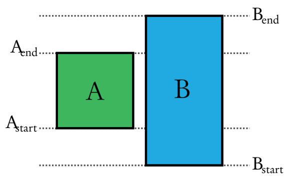
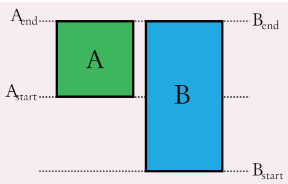
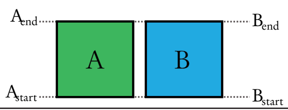
Allen Symbol	Allen Relation	Logic Condition	HMC+ Symbol
A<B	A "before" B	$(A_{start} < B_{start}) \wedge (A_{end} < B_{end}) \wedge (A_{end} < B_{start})$	
A m B	A "meets" B	$(A_{start} < B_{start}) \wedge (A_{end} < B_{end}) \wedge (A_{end} = B_{start})$	
A o B	A "overlaps" B	$(A_{start} < B_{start}) \wedge (A_{end} > B_{start}) \wedge (A_{end} < B_{end})$	
A s B	A "starts" B	$(A_{start} = B_{start}) \wedge (A_{end} < B_{end})$	
A d B	A "during" B	$(A_{start} > B_{start}) \wedge (A_{end} < B_{end})$	
A f B	A "finishes" B	$(A_{start} > B_{start}) \wedge (A_{end} = B_{end})$	
A=B	A "equals" B	$(A_{start} = B_{start}) \wedge (A_{end} = B_{end})$	

Fig. 5. Allen relations for the temporal relations of two units displayed as mathematical symbols, the respective Allen relation, the logic condition, and the symbology used by the HMC+ software (Graphics: A. Lenzhofer).

archaeological investigation. A *time interval* is an ordered pair of points in time with the first endpoint less or equal to the second endpoint, or in our terms, t_{start} t_{end}. Following Allen's temporal relations, there are 13 ways in which two such time intervals as the temporal representation of two units of stratification A and B can be related (Fig. 5).

In our archaeological application we are not dealing with the past and the future but only looking back in time. Therefore, our timeline is directed and finite, which implies that the temporal relations to be displayed are reduced to seven instances since we do not have to consider the respective inverse relations defined by Allen. Thus, for two time intervals A and B with

$$(t_{startA} \leq t_{startB}) \wedge (t_{endA} \leq t_{endB})$$

we get seven basic temporal relations as displayed in Fig. 5. The interval-based time model presented here adapts well

Relation	Narrative
A < B	The stones were quarried before they were later used in the wall.
A m B	The stones were quarried immediately before they were used in the wall.
A o B	The stones were quarried before the construction of the wall and the quarrying stopped before the completion of the wall.
A d B	Stones were quarried for centuries and used during the construction of the wall.
A f B	The stone quarrying stopped right after the completion of the wall, but its construction began long ago.
A s B	The stone quarrying was started by the construction of the wall, but the quarrying ended before completion of the latter.

Tab. 1. The potential temporal relationships between two time intervals illustrated by a simple example. – A. Quarrying of stones. – B. Construction of the castle walls.

to the archaeological problem. The temporal relations defined by superposition and displayed in the stratigraphic sequence are strictly relative. Their relation to absolute time is in most cases *a priori* unknown. There is a large degree of uncertainty in our case as the exact temporal relationship between two units of stratification and the related time intervals is not known. Archaeological dating of related finds or natural science dating of material samples provides respective constraining information for the chronological position, which must be solved in relation to the defined topological relations.

If we again consider the superposition of two units A and B, we would infer that if A is in superposition to B, then it follows that (B is temporally before A) or (B meets A). These are the two cases of interval-based temporal relations that are implicitly defined within a stratigraphic sequence. If A and B are not in superposition, we would infer that all seven temporal relations might be valid.

If we consider again our simple example, i.e. the distant quarrying of stones (A) and the related construction of a wall (B) of the castle, we might get the following situations shown in Tab. 1.

If we were able to add a constraint like a document stating that the builder of the wall of the castle became the owner of the area of the quarry and started the quarrying, our cases would be reduced to (A m B) or (A s B). If the volume of the quarried stones is much smaller than the volume of the built walls, we might have a good argument to exclude (A s B).

With this example we have tried to show that interval-based temporal reasoning for archaeological chronological problems is much more sophisticated than the time-instant-based approach where (A is earlier/later B) or (A is contemporary B) and thus provides a much higher degree of options for a comprehensive narrative.

The problem thus is how to represent interval-based temporal information in relation to a stratigraphic sequence and how to implement a respective validation algorithm that preserves the initial topological relations. HMC was therefore enhanced with an interval-based time model founded on absolutely dated time intervals and given a temporal reasoning core satisfying Allen's interval algebra, resulting in the new tool named *Harris Matrix Composer Plus* (*HMC*+).[37] Software development was supported in part by the research conducted in relation to the project 'A Puzzle in 4D: Digital Preservation and Reconstruction of an Egyptian Palace',[38] in a cooperation between the Ludwig Boltzmann Institute ArchPro and the Austrian Academy of Sciences within the research framework 'Digital Humanities – Long-term Cultural Heritage Projects' funded by the Austrian National Foundation for Research, Technology and Development.

Combining the stratigraphic sequence with relative and absolute time intervals demanded the definition of a new layout with the integration of an archaeological time scale. Our approach uses a hierarchically ordered set of archaeologically relevant, absolutely or relatively dated time periods or phases named time frames. The layout of the time scale followed a conventional archaeological design known from several diachronic diagrams used to display archaeological chronology (Fig. 6).

37 Neubauer et al. 2018.

38 Kucera et al. 2020.

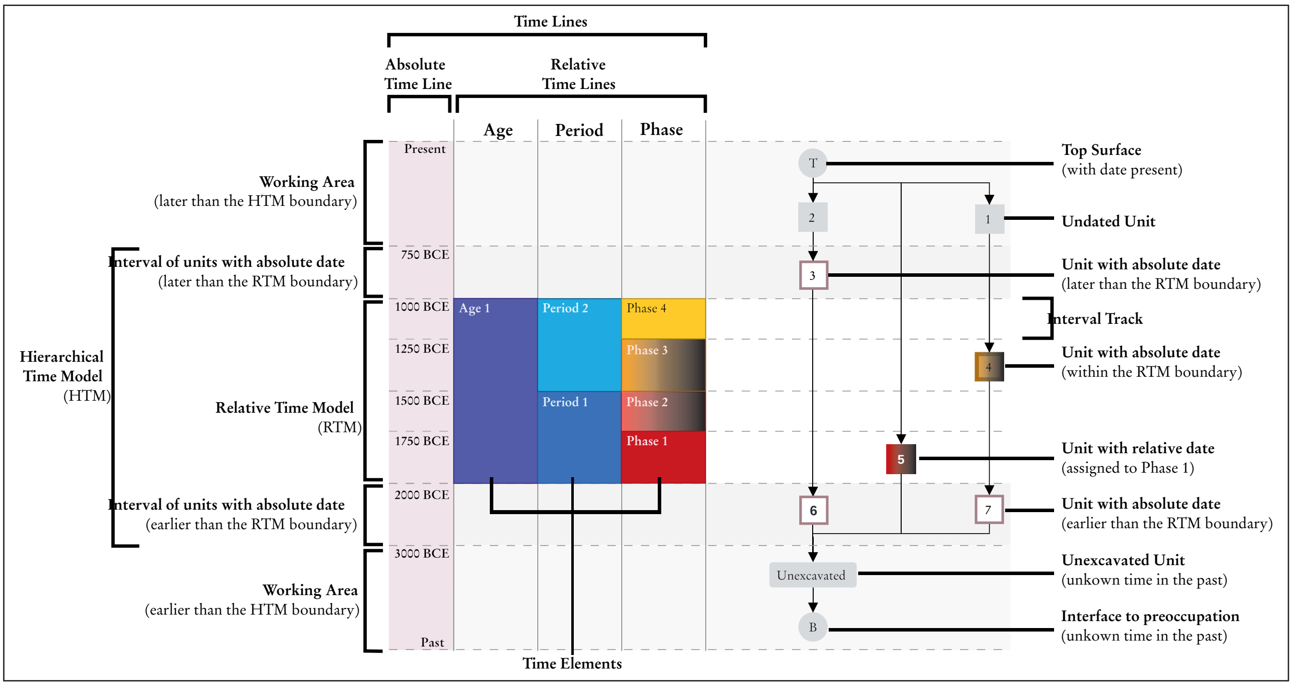


Fig. 6. Explanation of the terminology used within the HMC+ software for the hierarchical interval-based time model and the layout of the stratigraphic sequence (Graphics: A. Lenzhofer).

We introduced the following timelines as the main elements to represent the interval-based hierarchical time model:

1. An absolute time frame with a resolution of one year displayed as a variably ticked and annotated time axis.
2. The second time frame is named *ages*, and its role is to display the main *supra-regional* archaeological periods like the Stone Age, Bronze Age etc.
3. The third time frame is named *periods* and is used for the typical *regional* periodization of an age as Early Bronze Age (EBA), Late Bronze Age (LBA) or even broken down to smaller entities like the periods LBA I, LBA II, LBA III, etc.
4. The fourth time frame is named *phases* and is intended for *site-specific* phases like Knossos phase A, Knossos phase B etc. They are derived from site-specific time intervals resulting from the analysis of the stratification and the dating of finds and samples of the respective site.
5. The last time frame is integrated into the display of the *site-specific* stratigraphic sequence such that every unit linked to a time interval interactively displays its dating, i.e. the respective assigned time interval.

It is of crucial importance that the time frames, especially at the lower level of the hierarchy are designed to display fuzzy and overlapping time intervals assigned to them, since almost any archaeological dating method has respective uncertainties. Sharp absolute time points or time intervals are the exception in archaeological dating.

Time frames and their respective subdivisions can be created from scratch or loaded from templates. They can later be revised throughout the analysis process. Per convention, *ages* and *periods* currently do not allow for overlapping intervals.[39] This means that every new element in the respective time frame, except the first one, must share a common border with an existing temporal element. By contrast, temporal elements in the *phases* time frame can be fuzzy, thus overlap with other phases or have gaps between each other. This means that two consecutive elements must satisfy one of the following Allen relations:

$$\{A < B;\ A \text{ m } B;\ A \text{ o } B\}$$

HMC+ offers two different modes to assign a time interval or *date* to a unit: First, an existing interval of one of the three time frames can be assigned. Alternatively, an individual and distinct time interval can be defined and assigned to the stratigraphic unit, which is typically done after employing archaeological or scientific dating methods such as typology or radiocarbon dating.

39 This might be changed in a future version to allow for regional and super-regional diachronic comparisons and display of stratigraphic sequences from various sites.

8. Enhanced Validation and Layout for Stratigraphic Sequences

The visual representations of the time frames and the layout of the stratigraphic sequence mutually affect each other. Thus, the rule initially developed for the Harris Matrix, i.e. to fill in the respective units from the top, is no longer valid, as the individual units in the sequence need to be rearranged vertically to align them with an assigned time interval without affecting the defined stratigraphic relations based on superpositions. The visual representations of time frames need to adapt to encompass all branches of the sequence with units of stratification assigned or dated to the respective time frame. Therefore, the time model is non-linearly stretched, i.e. the height of the displayed time intervals does not necessarily correspond to their duration. Horizontal dotted lines at the upper and lower bounds of the respective time frame indicate the absolute time range indicated on the time axis.

Maintaining a linked view between the time model and the sequential graph in real time is not trivial, since a stratigraphic sequence is often large and therefore a lot of cases need to be discerned. Allen's interval algebra[40] is the basis to check and validate the different cases occurring during the layout of the stratigraphic sequence within the hierarchically organized time frames. All dating information is processed by a customized Sugiyama layout algorithm,[41] which computes vertical positions for all units according to their assigned time interval.[42] The relative stratigraphic ordering of units in the sequence, as primary information, is preserved. Thus, the dating cannot overrule the stratigraphic relations based on observed superposition.

The conventions for the algorithm used for the validation and the layout of the stratigraphic sequence are as follows:

- Stratigraphy overrules chronology
- Every unit, except the *top* and *bottom surfaces* of the site or landscape, must have at least one predecessor and one successor
- A dated unit is always assigned to an interval, never to a specific point in time
- An undated unit is placed in the same time frame as its oldest dated predecessor
- The layout is oriented from top to bottom. The arrow of time is pointing in the opposite direction
- Units with a custom interval are drawn with a thick border

The computed layout is further enhanced by a colour coding for dated units. The vertically rearranged layout enables the expert to visually derive temporal relations between units that are not stratigraphically related. This can also enhance the comparison and analysis of sequences from different sites within an archaeological landscape. The colour of a unit with a custom interval is mapped to the interval of the time model that completely contains the custom interval.

First, the colour assignment algorithm searches the time frame of the phases to find an interval that contains the custom interval. If no interval is found, intervals in the period time frame are checked next. Finally, the ages time frame is checked. The colour of the custom-dated unit is mapped to the matching interval of the time frame. If the algorithm finds no match, the unit is coloured white. In addition, custom-dated units are decorated with a thick border to distinguish them from relatively dated units. Furthermore, undated units are coloured grey.

9. Clustering and Grouping

A stratigraphic sequence can typically become very large and contain hundreds to thousands of individual units of stratification. To reduce visual complexity, HMC+ supports hierarchical clustering of stratigraphic units organized in parent groups (Fig. 7). Parent groups can be collapsed for clearer and more compact presentation (Fig. 8). Depending on the time intervals assigned to the children in the parent group, all children are combined into a single unit, which can extend over several time intervals. The collapsed representation still reflects the time intervals of its children.

10. Interfacing the Stratigraphic Sequence with the Geographical Information System (GIS)

So far, we have presented the fundamental theoretical background for the application of archaeological stratigraphy equally to an archaeological site or to a landscape based on the specific aspects of the spatio-temporal relevance of surfaces. It is the immaterial aspects of stratigraphy inherent in topographic data recorded throughout a stratigraphic excavation process or observed during the analysis of the ground surface of an archaeological site or landscape based on high-resolution ALS data or prospection data in general.[43]

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40 Allen 1983.

41 Sugiyama, Tagawa, Toda 1981.

42 The software was implemented in Java. The yFiles graph library (Eiglsperger, Siebenhaller, Kaufmann 2004. – Wiese, Eiglsperger, Kaufmann 2004) was used as a foundation for the layout algorithm. The approach can be decomposed into three phases: layer assignment, crossing minimization, and coordinate assignment, see Jünger, Mutzel 2004, 24.

43 Neubauer 2004.

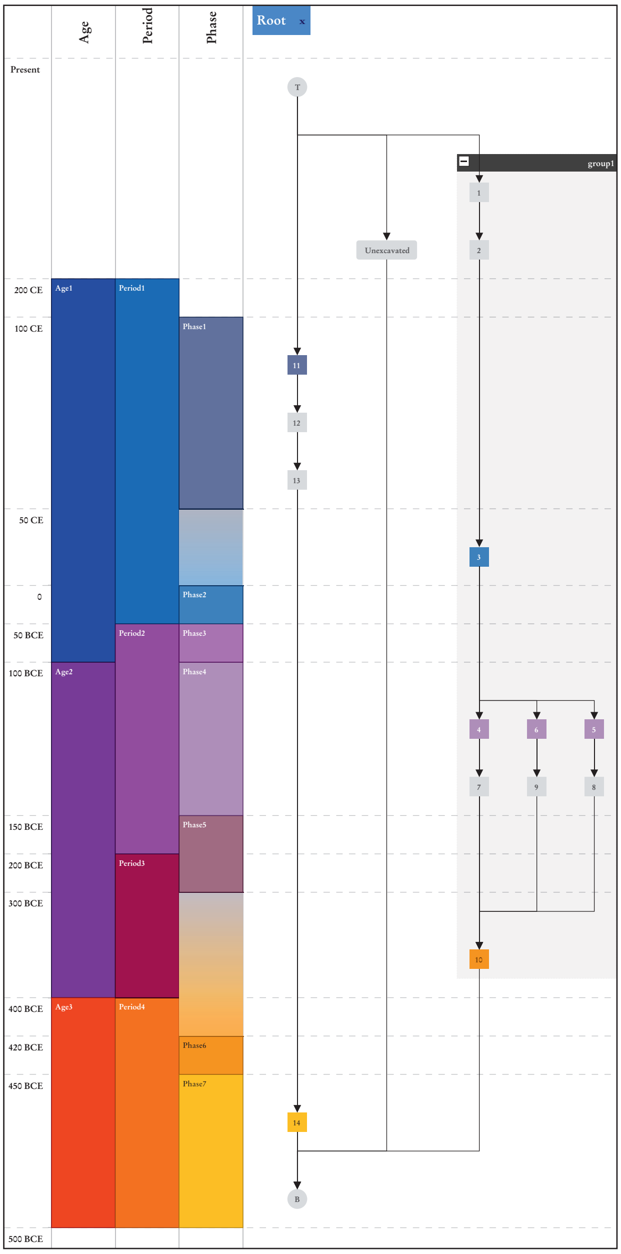

Fig. 7. Example of organizing stratigraphic units within a group. The group itself gets a unique alphanumeric identifier (Graphics: A. Lenzhofer).

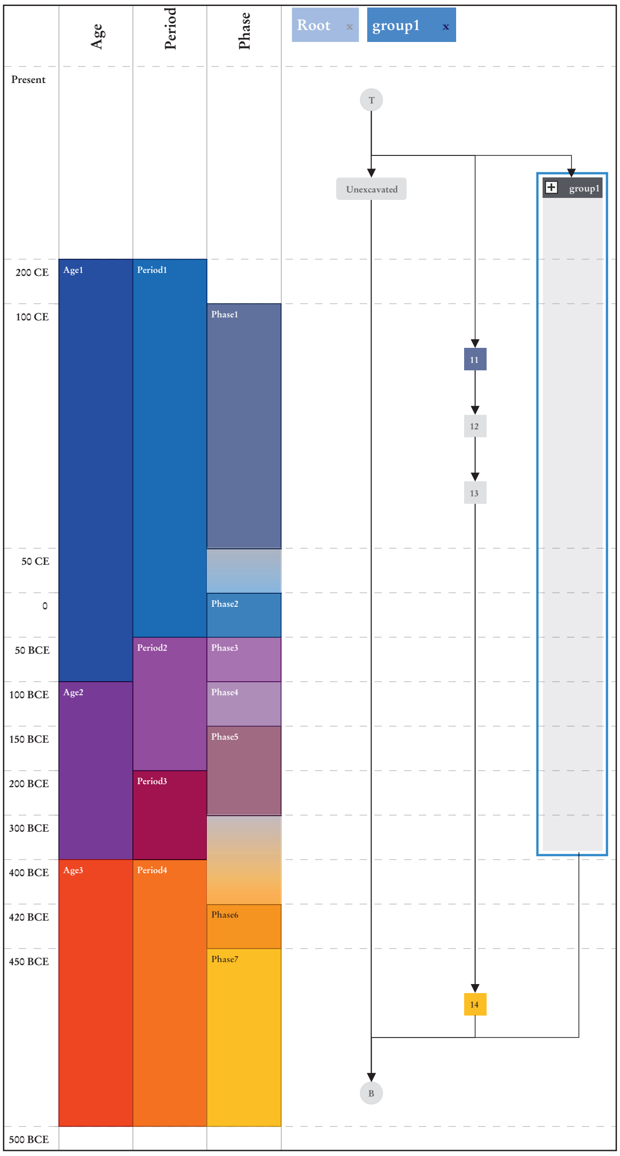

Fig. 8. Layout of the sequence from Fig. 7 after the collapsing of the parent group simplifying the layout of the sequence (Graphics: A. Lenzhofer).

State-of-the-art spatial analysis of topographic data of archaeological landscapes is performed in a GIS.[44]

Besides the need to spatially represent archaeological features that can be identified in the topographic data through the appropriate geometric representation in a GIS and the definition of the comprehensive arguments to establish superpositions defining temporal relations, discussed further in the following paper,[45] the task to be solved is the linking of the information stored in the GIS to a stratigraphic sequence. Commonly, geographic objects, named features in GIS terminology, can be represented by points, lines, or polygons in respective feature classes.

They are organized into different themes or classified by attributes in the database. Both the themes and the attributes control the representation of the geometric primitives by

44 Doneus, Kühtreiber 2013. – Opitz, Cowley 2013. – Verhoeven 2017. – Lozić, Štular 2021.

45 Doneus et al. 2022.

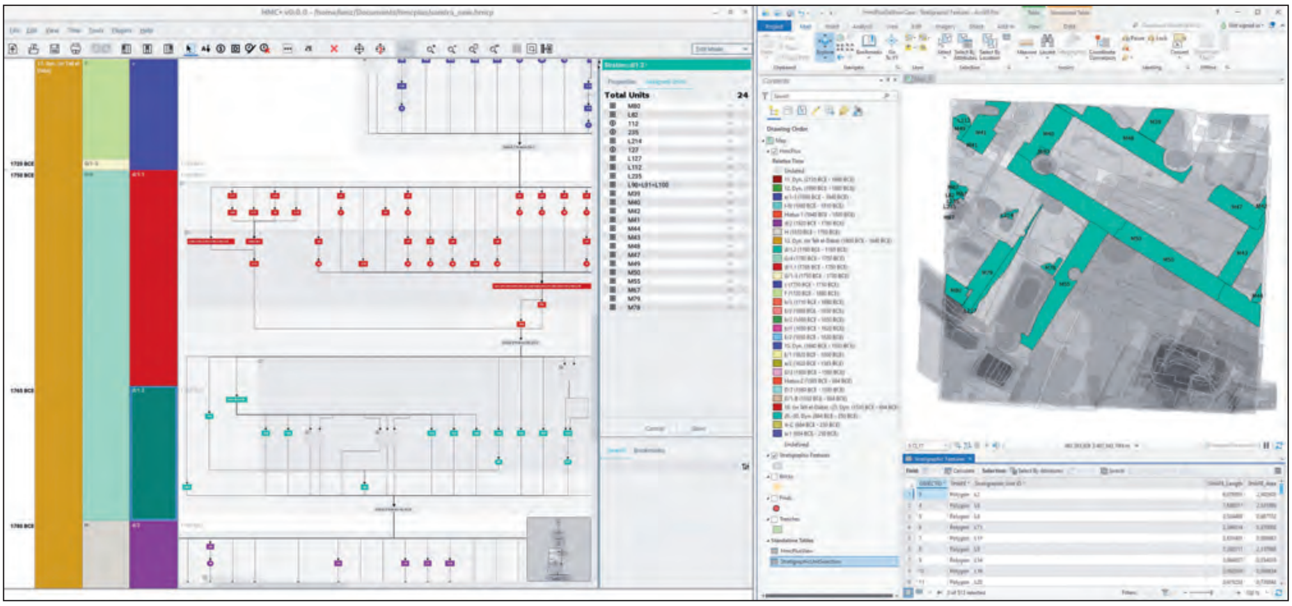

Fig. 9. Screenshot of a linked view between HMC+ and GIS combining its functionality with the stratigraphic sequencing software (Graphics: A. Lenzhofer).

appropriate selection in order to compile them into thematic maps. In our case, the requirement is to perform the selection and visual highlighting of the geometric objects representing our archaeological geometric primitives within the investigated archaeological landscape depending on time intervals, and to create the corresponding period and/or phase maps. A series of such period and/or phase plans are the primary result of the spatio-temporal analysis of an archaeological landscape based on the topographic data.

Therefore, an interface to GIS for the HMC+ had to be created to facilitate the spatio-temporal analysis of digital archaeological topographic data and thereby close a gap in the workflow for the analysing archaeologist. In a first attempt we established a simple interface to a GIS, in our case ESRI ArcGIS (Pro), where the stratigraphic sequence or the revised Harris Matrix is used directly to access data in the GIS for visualization and analysis by selecting stratigraphic units in HMC+ (Fig. 9). This overrules the conventional layer or theme-based user interface of a GIS. Each stratigraphic unit in the sequence is associated with a georeferenced geometrical object or shape in the GIS representing the boundary polygon of a distinct surface feature, using its unique identifier as key. Distinct archaeological features like a pit, a ditch or a wall are thus represented by a 2D polygon defining their extent or area and classified in the GIS environment by addressing a specific predefined feature class. Such a feature class is a homogeneous collection of features with a common spatial representation and a common set of attributes stored in a database table, e.g. a polygon feature class for representing the extent of a *top surface* of an archaeological *deposit* or *feature*.

If a linked view is established between HMC+ and the GIS (Fig. 9), interactions in one tool immediately affect the other. For example, when selecting a stratigraphic unit in HMC+, all the associated georeferenced feature polygons are selected, highlighted, or made visible in the GIS. The view in the GIS changes smoothly to display the boundary polygons of selected features in an optimal way. A mapping table summarizes the current selection in HMC+ and lists possible inconsistencies in the datasets of the two tools (like missing units).

Moreover, a selected feature in the GIS environment highlights the corresponding stratigraphic unit in HMC+. Again, the mapping table in the GIS environment (ArcMap or ArcGIS Pro) is updated. Thus, data in both applications can be compared and synchronized in a convenient way. Such linked views close the circle and push digital archaeology to the next level by tightly integrating all data channels (geographic, geometric, stratigraphic, and chronologic), and make them available for scientific analysis in a consistent way.

11. Conclusions

The Harris Matrix is the fundamental diagrammatic representation of relative time for an archaeological site and the *de facto* standard for the diagrammatic representation of a stratigraphic sequence – the backbone for archaeological stratigraphy. It displays all uniquely identified units of stratification in a sequential diagram representing their relative temporal succession and provides an inherent relative calendar, which is the testing pattern for the integration of any additional relative or absolute temporal information derived from archaeological analysis.

In this paper we described an integrated approach for the digital documentation and visual analysis of a combination of stratigraphic and chronologic relations originating from an archaeological site or an archaeological landscape.

Any archaeological stratification incorporates the spatial and temporal aspects of the site in a largely distinct manner. The single units and their topological relations reflect distinct events or durations relevant to the formation of the complete 4D dynamic system. Every stratigraphic unit, i.e. material deposits (□) and immaterial features (○), can be characterized by its 3D geographical position and extent measured in a global coordinate system, its observed topological relations, and its specific temporal characteristics. The geographic location and the topological relations of the units are definite and are recorded/observed during a stratigraphic excavation process or in our respective case during a topographic analysis.[46]

The implicit chronological sequence given by the stratigraphic sequences or Harris Matrix becomes explicit as scientists are enabled to define a hierarchical time model and assign units of the Harris Matrix to temporal intervals or provide exact dating. The system maintains a consistent visual representation, which means that a correct stratigraphic layout is preserved while units are aligned to intervals of the time model. Evaluation of several cases showed that this combined visualization makes the scientific analysis and interpretation more efficient and reliable.[47]

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46 Doneus et al. 2022.

47 Doneus et al. 2022.

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Stratigraphy from Topography II. The Practical Application of the Harris Matrix for the GIS-based Spatio-temporal Archaeological Interpretation of Topographical Data

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Abstract
Traces of human activity preserved in ground surface relief can be documented using airborne laser scanning (ALS). Various visualization techniques for ALS-based digital terrain models help to enhance the micro relief and display abundant information about the earthworks of settlements, pathways, field systems, burial grounds and the like. Such remains can express a complex pattern of intersecting and overlapping relief features produced by millennia of human activity. To 'read', or better decipher, this palimpsest or 'messiness', archaeological features must be classified, and their temporal relationship determined during interpretative mapping. While much interpretation of relief features is based on the relatively straightforward analysis of parameters like shape, morphology, topographical location or patterning, chronological sequencing of relief features can be very challenging. In this paper we propose a solution for the compilation of relative chronological sequences when mapping relief features from topographic data. We combine an interactive GIS-based archaeological interpretation with the creation of a stratigraphic sequence known as a Harris Matrix, which is extended by an interval-based hierarchical time model. This allows individual features and groups of features to be assigned to user-defined chronological periods and phases. The features extracted from the topographic data are grouped in a final Harris Matrix according to their temporal relations and can be translated into period or phase maps within the GIS environment. The value of this approach is demonstrated in a case study from Lower Austria, a complex archaeological landscape within which more than 1,450 archaeological relief features have been mapped into a coherent spatio-temporal model. The results give a detailed insight into the development of an archaeological landscape over at least 2,500 years, broken down into 10 periods, and have helped to answer specific historical questions. The approach presented here represents a starting point for further targeted analysis and investigation to provide an absolute chronological framework.

Keywords
Airborne laser scanning, LiDAR, archaeological interpretation, Harris Matrix, diachronic, 4D, interpretative mapping, landscape

Zusammenfassung – *Stratigraphie aus Topographie II. Die praktische Anwendung der Harris-Matrix für die GIS-gestützte räumlich-zeitliche archäologische Interpretation von topographischen Daten*

Menschliche Aktivitäten hinterlassen Spuren im Geländerelief, die sich vor allem in Waldgebieten über lange Zeit erhalten und durch eine detaillierte Geländeaufnahme mit Hilfe von Airborne Laser Scanning (ALS) dokumentiert werden können. Die daraus resultierenden und durch unterschiedliche Techniken visualisierten Geländemodelle zeigen bisweilen ein komplexes Muster von sich überschneidenden und überlappenden (mikro-)topographischen Merkmalen von ehemaligen Siedlungen, Wegen, Flursystemen, Materialentnahmen und dergleichen. Um dieses Palimpsest oder „Durcheinander" von Spuren, die während jahrtausendelanger menschlicher Aktivitäten entstanden sind, zu „lesen" oder besser zu entziffern, müssen die archäologischen Merkmale interpretiert und ihre zeitliche Abfolge bestimmt werden. Die Ausarbeitung einer relativen Sequenz kann dabei angesichts der sich über große Gebiete erstreckenden Merkmale eine große Herausforderung sein. In diesem Artikel stellen wir einen Ansatz vor, mit dessen Hilfe sich die diachrone Interpretation von ALS-basierten Geländemodellen durchführen lässt. Dabei werden die topographischen Merkmale als Oberflächen einer Stratifikation interpretiert. Dadurch lässt sich die GIS-basierte archäologische Interpretation mit der Erstellung einer stratigraphischen Sequenz, die als Harris-Matrix bekannt ist, kombinieren. Die durch ein intervallbasiertes hierarchisches Zeitmodell erweiterte Harris-Matrix ermöglicht die Zuordnung einzelner Befunde und Befundgruppen zu benutzerdefinierten Phasen. Diese lassen sich durch eine interaktive Verknüpfung zwischen Harris-Matrix und GIS in Perioden- oder Phasenkarten darstellen. Anhand einer Fallstudie aus Niederösterreich wird dabei demonstriert, wie sich eine komplexe archäologische Landschaft mit mehr als 1450 archäologischen Reliefmerkmalen in einem kohärenten räumlich-zeitlichen Modell kartieren lässt. Die Ergebnisse geben einen detaillierten Einblick in die Entwicklung einer archäologischen Landschaft über einen Zeitraum von mindestens 2500 Jahren und haben dazu beigetragen, spezifische historische Fragen zu beantworten.

Schlüsselbegriffe
Airborne Laser Scanning, LiDAR, archäologische Interpretation, Harris-Matrix, diachron, 4D, interpretative Kartierung, Landschaft

1. Introduction

Stratigraphy is a key concept in archaeology. Historically, its principles were derived from disciplines such as geology and historical geography[1] and most often considered unreflected in the context of archaeological application. Edward C. Harris was the first to focus on respective contradictions and proposed specific principles of archaeological stratigraphy of excavations.[2] However, the same principles apply to the archaeological landscape, where stratigraphic observations are an 'implicit backdrop' to the archaeologist's observations.[3] The previous paper summarized the current state of stratigraphic theory for archaeological applications and highlighted the relevant concepts to be extended from the analysis of an archaeological excavation to the analysis of an archaeological landscape.[4]

The present-day ground surface is a product of innumerable natural anthropogenic and anthropogenically influenced natural processes that have formed the surface over millennia, and which can be characterized as being 'engraved' into topography. Thus, the complex history of an archaeological landscape can, in a figurative way, be read from the ground surface.[5] In recent years, such observations have been greatly aided through interpretation of visualizations based on high-resolution digital surface (DSM), terrain (DTM), or feature models (DFM)[6] documented using, e.g., airborne laser scanning (ALS)[7] or image-based modelling (IBM).[8]

The visualizations of such highly detailed digital elevation models of archaeological landscapes reveal a vast quantity of topographic objects of diverse human, animal, and natural origin. Often the term 'palimpsest' is used to describe the complexity of visualized surface features.[9] However, this concept does not capture the full complexity of an archaeological landscape, as processes like destruction/erosion and accumulation/deposition are dynamic and end in a permanent change of the ground surface used for human activities.

Therefore, to come to terms with the intricacy of 'reading' the landscape, Dimitrij Mlekuž denies the palimpsest analogy[10] coining the term 'messy landscape'.[11] This perspective forms our starting point: the topography of the landscape can be a complex, often seen as a chaotic expression of activity and processes over time, and consequently needs a diachronic interpretation approach that isolates and defines periods of construction, use and reuse to create a reasonable understanding of the chronological development of the observed situation we are presented with today. As the archaeological landscape is a stratified 3D volumetric body,[12] we postulate that this respective stratified body is a dynamic but ordered system. Thus its diachronic analysis can be achieved using the evidence present in the current topography and by dissolving its inner order in the logical framework of a stratigraphic sequence as postulated in the previous paper,[13] as will be exemplified below.

To build a coherent picture of the diachronic development of a landscape from topography, archaeological features have to be identified and ordered/organized to allow an understanding of their disposition, function, meaning and temporal position. While spatially discrete groups of features are usually easy to identify (e.g., patterns of similar features, parallel and/or perpendicular lines), interpreting their temporal attributes is usually only possible by means of analogy, field observations or excavations. Establishing a solid chronology through conventional excavation for diffuse topographic features can be difficult, as artefact recovery usually lacks context information and is subject to disturbances from ploughing, forest management or animal activity. Invasive methods such as excavations and coring with subsequent analyses are also difficult to employ for the widespread understanding of complex landscape remains as they lack scalability. Dating methods such as optically stimulated luminescence profiling and dating (OSL-PD) show significant promise for deciphering the chronological development of a variety of diffuse topographic features. However, on a broad level, relational

1 As summarized in e.g. Lucas 2001. – Trigger 2006.
2 Harris 1989.
3 Johnson 2007, 75.
4 Neubauer et al. 2022.
5 Rippon 2008. – Opitz, Cowley 2013.
6 Štular, Lozić, Eichert 2021.
7 Crutchley 2010. – Fernandez-Diaz et al. 2014.
8 Verhoeven et al. 2012. – Sevara et al. 2017.
9 For a discussion, see Johnson, Ouimet 2018.
10 Mlekuž 2012.
11 Mlekuž 2011. – Mlekuž 2013.
12 Neubauer et al. 2022.
13 Neubauer et al. 2022.

interpretive mapping methodology is still necessary to tie these discrete results into the wider landscape chronology.[14]

The increasing availability of detailed digital topographic data and a proliferation of means to visualize that data to support interpretation make the limitations of tools for interpretative mapping and considerations of complex sequences of topographic features even more evident. Approaches for establishing relative landscape chronologies in archaeology stretch at least as far back as Osbert G. S. Crawford,[15] and many are rooted in approaches developed in historical geography.[16] These include representation and interpretation of relative chronological information based on the superposition of cropmarks,[17] the 'Dalland Matrix',[18] or land use diagrams.[19] Techniques such as retrogressive analysis and landscape deconstruction analysis trace feature superposition, peeling away modern and more recently used features to estimate the age-depth of the built environment through evaluation of the relative position and direction of objects depicted on a map or in an image.[20] For instance, a road or path may bisect a field system, and the road can be assumed to be later if it cuts the field system at an angle which interrupts the layout of the fields.[21] This type of retrogressive approach builds hypotheses for age-depth starting with the identification of the most recent landscape features and works backward from them. This allows for the 'excavation' of landscapes in a method conceptually similar to excavating an archaeological site.[22] Diagrams based on a Harris Matrix[23] have been used on a smaller scale during the resurvey of the complex site of Braidwood,[24] for intersecting hollow ways[25] or in a Mediterranean dry walled landscape.[26] Additionally, hachured maps produced by topographic surveyors often inherently display stratigraphic relations.[27]

These examples demonstrate that the concept of landscape stratigraphy and the interpretative mapping of topographic features has long been established in archaeological practice, but the consideration of sequencing based on stratigraphic superposition of identified features or units and the analysis of the temporal aspects of the units to derive a comprehensive chronology across an archaeological landscape is still a major challenge. It has become even more so with the advent of high-resolution spatial datasets such as those derived from ALS. While archaeological landscapes are a rich source for understanding our past, their elements are very challenging to place within a chronological framework. The approach presented here offers a solution to that challenge. It provides a conceptual and practical link between understandings of stratigraphy most often considered in archaeological excavations and the analysis of complex landscape remains, providing a tool that supports the articulation and analysis of extensive interdigitated and overlapping topographic features at a landscape scale.

The scope of this paper is, therefore, to investigate the potential of systematic observations of stratigraphic relations in a complex landscape. After some theoretical considerations and an introduction to the case study area, a GIS-based interpretation linked with a Harris Matrix is used to order a large number of stratigraphic units observed through the interpretation of the archaeological area of St. Anna in der Wüste, a friary complex embedded into a landscape that had been subject to repeated human presence.[28] The applied workflow is described in detail, and the results analysed. Finally, the applicability of the Harris Matrix for landscape analysis and its caveats are discussed.

2. Theoretical Considerations

It is a basic axiom of archaeology that "all archaeological sites … are stratified".[29] To expand on this[30] and keeping in mind the points made in the introduction, we can state that the present-day ground surface of the Earth is composed of many distinct and discernible surfaces, which are results of either direct human action, such as built structures, deforestation and afforestation, interference in river systems, or their indirect consequences as, for example, erosion or accumulation events. Consequently, we can also state that every landscape is stratified. In this way, the *archaeological landscape* can be regarded as a three-dimensional volumetric body that springs from its interface with geological stratification and extends to the ground surface.

14 See, e.g., Vervust et al. 2020 for a recent application of OSL-PD and landscape chronology.
15 Crawford, Keiller 1928, 159.
16 Denecke 1979. See also Johnson 2007 for a summary.
17 Alexander, Armit 1993.
18 Dalland 1984.
19 Pouncett 2005.
20 Cousins 2000. – Oosthuizen 2006, 77. – Rippon 2008, 79. – Antonson 2018.
21 Oosthuizen 2006, 80.
22 Cousins 2000, 18.
23 Harris 1989.
24 Gannon 1999.
25 Vletter, Schloen 2017, 423. – Filzwieser 2018, 105.
26 Doneus, Doneus, Cowley 2022.
27 RCAHMS 1997. – Bowden 1999. – Bowden 2001. – RCAHMS 2001.
28 Doneus, Briese, Kühtreiber 2008. – Doneus, Kühtreiber 2013a. – Doneus, Kühtreiber 2013b.
29 Harris 1989, 29.
30 Neubauer et al. 2022.

The present-day ground or terrain can be considered as the top surface of the stratified archaeological landscape and can be documented and visualized as a digital terrain model. Formation of any stratification occurs on the top surface at any given time, either through depositional or accumulation processes or through the removal of material by the construction of features such as pits or ditches, or erosive processes. Therefore, the ground surface is composed of parts of the individual top surfaces of adjacent deposits and the top surfaces of adjacent features, which are elements of the landscape's stratification visible at the ground surface. All of these top surfaces are subject to the laws of stratification, formulated by E. C. Harris[31] and most often considered only in the context of excavation. Harris outlines four laws of archaeological stratigraphy, each of which is also applicable to non-invasive interpretation based on ALS-derived DTMs or DFMs:

1. **Law of superposition**. All the identifiable top surfaces of stratigraphic units were 'constructed', used and disused in different periods, potentially over a span of many millennia. In many cases, these surfaces are not discrete but overlap and intersect other surfaces. At intersections, the stratigraphic relationship (older/younger) can often be established based on an appropriate visualization of the ground surface.
2. **Law of original horizontality**. All deposits have a natural tendency towards becoming horizontal. The degree of horizontality of any top surface is a result of its original composition, agricultural and geomorphological processes, vegetation cover and time. Under the same conditions, a more horizontal surface could indicate a longer time span of exposure. However, this does not mean that the age of an earthwork can be read off from the degree of its flattening, as too many different factors are involved in this process.
3. **Law of original continuity**. The edges of upstanding deposits on the top surface may be softened or blurred making them difficult to discern in an archaeological interpretation based on DTM-visualizations. Appropriate visualization techniques, like openness,[32] can help in identifying respective boundaries.
4. **Law of stratigraphical succession**. The concept of succession reduces redundancies in a stratigraphic sequence and is important here for the chronological sequencing of extensive landscape features, such as a hollow way with multiple intersections.

Fig. 1. Map of eastern Austria with the location of the case study area (Graphics: M. Doneus).

It is well established that archaeological topographic surveys can draw out relative chronological sequences expressed in the remains of (micro-)topography[33] on the basis of observations in the field or interpretations of remote sensing datasets (e.g., ALS or aerial photographs), though the application of such an approach to relief features is uneven. Specifically, when interpreting an ALS-derived visualization of an elevation model, many intersections can be observed, each of which provides information on stratigraphic relations. Therefore, like for an excavation, a Harris Matrix can be used to systematically document and chronologically analyse these observations.[34] However, when approaching a landscape based on the interpretation of derivatives of an elevation model, some specific issues need to be considered:

1. While a deposit may be built during a short time span, surfaces can be exposed for long periods, even of several millennia. In our case study area, we can see Early Iron Age barrows and earthworks that have survived as relief features in the present-day landscape.
2. Surfaces are dynamic. Geomorphological processes, as well as animal and vegetation activity, change the form of surfaces over time. It is therefore important to distinguish between traces formed by anthropogenic and natural processes.
3. While the top surface of deposits can be visible in an elevation model, only those that are the topmost in a stratigraphic sequence are most fully exposed. All other surfaces are partly covered by younger surfaces of deposits or features.

31 Harris 1989, 29–39.
32 Doneus 2013b.
33 RCAHMS 1997. – Bowden 1999. – RCAHMS 2001.
34 See Gannon 1999 for a simple example.

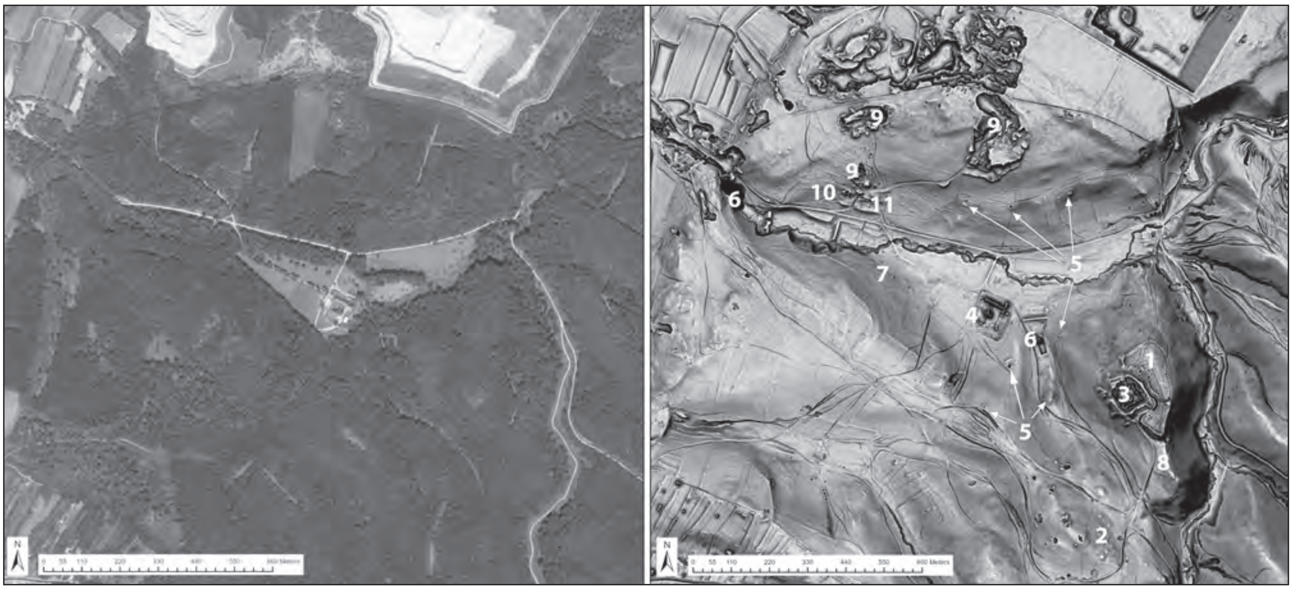

Fig. 2. Left: Orthophotograph of the case study area. The area is covered by woodland. Only the area next to the friary (centre) is clear of trees (no. 4 in right image). To the right, the remains of Scharfeneck Castle (no. 3 in right image) rise above the canopy (source: basemap.at). – Right: Ground-point filtered digital feature model of the same area based on a high-resolution airborne laser scanning data acquisition from April 2007 (visualization: combined visualization for archaeological topography). See text for description of numbers (Graphics: M. Doneus).

4. Working at a landscape scale, one is confronted with spatially large (e.g., field systems) and often elongated linear (e.g., roads) features. Parts of these can be subject to a varying range of factors that may alter them differentially, including (but not limited to) different vegetation, partial reuse, partial destruction, or localized animal action.
5. Building on (4), features being interpreted in terrain models are often the result of long-term, non-linear dynamic processes that contribute to their development. Generally, interpretive mapping based on terrain models tends to favour documenting the results of processes, and processes must be inferred from the progression of documented events. This means that interpretations may appear to have more uniform (temporal) progression than they actually do: it will be easier to directly identify and map the result of a process (such as a lynchet or field boundary) rather than the potentially non-linear, non-uniform process (such as repeated ploughing) that created it.

These factors express the intrinsic complexity of an archaeological landscape, evident in elevation models. The challenge is the ordering and display of the spatial and temporal relationships of individual surfaces observed during an archaeological analysis of a topographic dataset. To address this challenge, we propose the use of a Harris Matrix or stratigraphic sequence and demonstrate its applicability in combination with a GIS-based environment that supports the stratigraphic interpretation of ALS-based elevation models. The value of this approach is demonstrated through a case study based on a detailed ALS-based model of a complex landscape south of Vienna, explored in combination with historical maps and geophysical prospection results.

3. Case Study Area

The case study area of St. Anna in der Wüste (*Saint Anna in the Wilderness*) is located on the northwestern slope of the Leithagebirge (*Leitha Mountains*) some 30 kilometres southeast of Vienna (Fig. 1). It is situated alongside the small Arbach Valley, which is flanked by two ridges rising about 50 m above the valley bottom (Fig. 2).

The area has a long history of occupation, including a prehistoric hillfort (Fig. 2/1) on top of the *Schlossberg* (castle hill). Artefacts recovered from the surface suggest repeated occupation from the Late Neolithic onwards, with a focus in the Early Iron Age (Hallstatt period). A group of round barrows (Fig. 2/2, presumably Early Iron Age on the basis of analogy with excavated examples) are situated 400 m south of the hillfort in a prominent location. Today, the Schlossberg is occupied by the ruins of Scharfeneck Castle (Fig. 2/3). The first documentary reference to a noble family called Scharfeneck in this area is in 1385, while the castle is first mentioned in 1417.[35]

35 Rödel 2019, 499. – Filzwieser 2021.

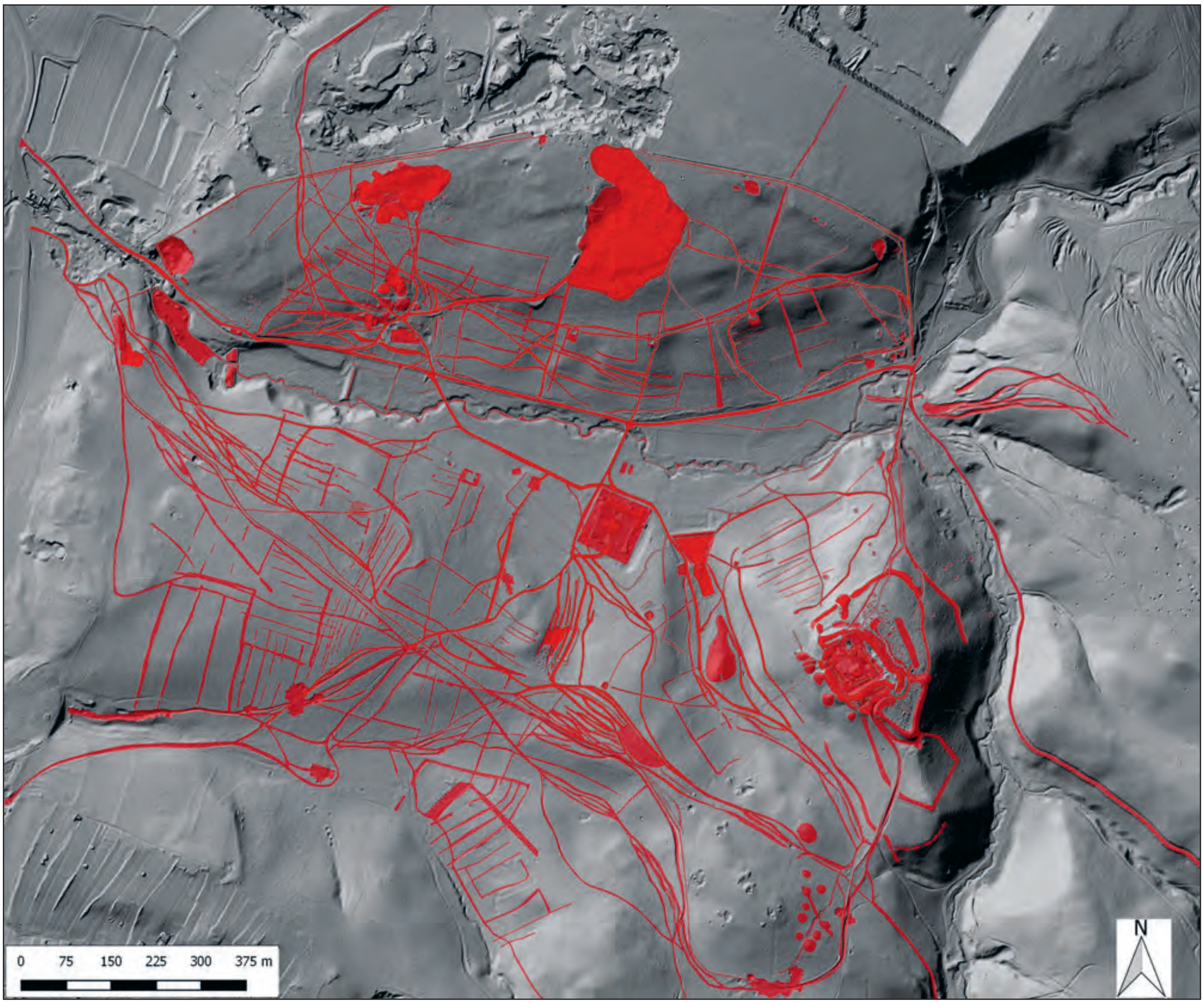

Fig. 3. Archaeological interpretative mapping of the entire area of St. Anna in der Wüste. Altogether, more than 1,450 archaeological features can be identified and mapped (Graphics: M. Doneus).

Scharfeneck Castle seems to have been built by the second half of the 14th century. At this time, the central tower was erected. Later, the remaining parts were added during two remodelling extensions in the 15th and 16th centuries.[36] The central tower of the castle was destroyed during a thunderstorm in 1555 and never rebuilt. After the castle's abandonment in the second half of the 16th century, the area was repeatedly reused as a refuge, such as in 1683, when the ruin with its fortifications served the local population as a place of refuge from Turkish troops,[37] who besieged Vienna and laid waste to large parts of eastern Austria as the Ottoman Empire expanded westwards.

In 1644, parts of the Lordship of Scharfeneck were given to the order of the Discalced Carmelites who founded a friary (Fig. 2) named St. Anna in der Wüste.[38] Between its foundation and its abandonment in 1783 the complex consisted of a church in the central part of the valley floor surrounded by the residence buildings of the friary (Fig. 2/4), seven hermitage buildings (Fig. 2/5), fishponds (Fig. 2/6), fish basins (Fig. 2/7), fields, an orchard (Fig. 2/8), stone quarries (Fig. 2/9), and at least one lime kiln (Fig. 2/10).

36 Kühtreiber 2011, 110.

37 Schatek 1938.

38 Schatek 1938. – Aguinaga 1993.

ALS-Project	Leithagebirge
Purpose of Scan	Archaeology
Time of Data Acquisition	26 March – 12 April 2007
Ground Points (after filtering per sq m)	5.4 (31 % / 55 %)
Mean Point-Density (last echoes per sq m)	9.7
Mean Point-Density (all echoes per sq m)	17
Strip Overlap	70 %
Scanner Type	Riegl LMS-Q560 Full-Waveform
Scan Angle (whole FOV)	45°
Flying Height above Ground	600 m
Speed of Aircraft (TAS)	70 kts (36 m/s)
Laser Pulse Rate	100 000 Hz
Scan Rate	66 000 Hz
Strip Adjustment	Yes
Filtering	Robust interpolation (SCOP++)
DTM-Resolution	0.5 m

Tab. 1. Metadata of the ALS data acquisition.

This multitude of traces from several millennia is part of a complex archaeological landscape that is still visible in micro-topography. Remains of most of these structures can, to varying degrees, be seen as features in a detailed DFM.[39] In addition to the remnants of the friary, the visualizations of the DFM show a complex archaeological landscape with more than 1,450 archaeological features (Fig. 3). Many of these can be interpreted as former tracks and field boundaries. Remains of farm buildings (Fig. 2/11) on the valley slope north of the brook are also clearly recognizable remains of the friary's economic base, which may have utilized pre-existing structures from the noble residence. Numerous abandoned quarries of varying size are scattered over the entire area, including a large quarry north of the ruined friary farm. The area also contains bomb and/or artillery craters from World War 2 (WW2), as the Leitha Mountains were part of the air raid defence system protecting Vienna.

To understand better the complexity of these traces, it is necessary to interpret the DFM, assigning discrete boundaries to observed features (as far as possible) by manually digitizing their extents in a GIS environment. However, due to the complexity of the archaeological traces, a 'traditional' 2D mapping as depicted in Fig. 3 does not perform sufficiently well. While it captures the layout, it does not help to articulate the complex relationships across time and space that are suggested by these remains. This makes St. Anna an ideal case study for the research presented in this study.

4. Data

The main data source used for the current research is a detailed elevation model acquired via airborne laser scanning. This method was added to the canon of archaeological prospection methods about two decades ago and has massively expanded our archaeological knowledge, especially in forested areas, by creating the possibility of recording detailed terrain models even under dense vegetation.[40] These models show archaeological traces preserved in the terrain relief, which can be further enhanced by appropriate visualization methods.[41] The area of St. Anna was one of the test sites for the development of archaeological airborne laser scanning back in 2006, when it was scanned twice during the "LiDAR-supported archaeological prospection in forested areas" project funded by the Austrian Science Fund

39 For a discussion about the terms DSM/DTM/DFM, see Štular, Lozić, Eichert 2021.

40 Good introductory texts about the method can be found in Crutchley 2010. – Opitz 2013. – Fernandez-Diaz et al. 2014. – Lozić, Štular 2021. – Štular, Eichert, Lozić 2021.

41 See chapter 5.1. For introductions to the topic of visualization, see Bennett et al. 2012. – Kokalj, Zakšek, Oštir 2013. – Kokalj, Hesse 2017. – Kokalj et al. 2020.

(P18674-G02) between 2006 and 2008.[42] The visualizations used for the archaeological interpretation were derived from a dataset acquired at the end of March/beginning of April 2007. The laser scan was acquired with settings optimized for archaeological purposes at a favourable time of year (i.e., when vegetation growth was at a low point).

A full-waveform scanner (RIEGL LMS-Q560) was used for data acquisition (see parameters in Tab. 1). The resulting point density (after filtering) was good enough to interpolate the model with a grid size of 0.5 m. For classification of the ALS points into terrain and off-terrain points, the software SCOP++[43] was used. Parameters were adjusted to fit our archaeological purpose, meaning that remains of walls, buildings, and other anthropogenic relief objects were retained in the terrain dataset as far as possible. The final elevation model can therefore be regarded as a DFM.

Historical maps, two volumes of friary annals, and an engraving from 1689 were consulted to inform the archaeological mapping. The historical maps span the period between 1754 and 1941, the most important of these being the Walter-Karte (1754–1756),[44] the First Military Survey (Josephinische Landesaufnahme (1763–1787) – the first map covering the entire Austro-Hungarian monarchy at a scale of 1:28,800), and the Franciscan Cadastral Map (Franziszeischer Kataster (1817–1861) – a cadastral map at a scale of 1:2,880).[45] All of these were helpful to the dating of individual road and field alignments identified in the archaeological mapping.

The two-volume friary annals, preserved in the archive of the surviving Carmelite friary in Döbling, Vienna,[46] provide a detailed description of the life of the monks living in the area, and – more importantly for this paper – give a detailed chronological account of building activities (friary, surrounding wall, hermitages, fishpond, fish basins etc.). Finally, the engraving by Johann Martin Lerch from Vienna from 1689[47] depicts the whole area from a bird eye's view and gives important insights about the spatial concept behind the friary complex.[48] Although, in contrast to modern mapping, the engraving is not an exact geometric representation of the physical space, it offers important information about the physical setting (extent of woodland, fields, pathways, existing buildings) of the area in the late 17th century (Fig. 16).

42 Doneus, Briese 2006a. – Doneus, Briese 2006b. – Doneus et al. 2008.

43 See Kraus, Pfeifer 1998. – Kraus, Otepka 2005.

44 Ulbrich 1952.

45 Fuhrmann 2007. – Mansberger et al. 2016.

46 Schatek 1938.

47 Schatek 1938, 8.

48 Doneus, Kühtreiber 2013b.

5. Methodology

5.1. Data Preparation and Visualization

After geo-referencing, strip adjustment and filtering of the ALS-derived point cloud,[49] an archaeological DFM with a grid size of 0.5 m was generated. From the wide range of available visualization techniques,[50] hillshade, slope, positive and negative openness, and local relief model (LRM) were chosen as most appropriate to our interpretative task. Often, visualizations were displayed in combination (e.g., hillshade plus slope, LRM plus slope).

Simple shaded relief has become a standard visualization of ALS-derived DFMs, and while it is easily read, its limited information content in comparison to other techniques is a major drawback.[51] LRM[52] is particularly useful in areas where archaeological relief features are extremely shallow. It also provides an indication of the preserved height (or depth) of any relief feature. The strength of both positive and negative openness[53] is that they enhance and delineate the edges of topographic features and are therefore particularly suitable for interpretative mapping.

Computing of LRM and openness is, however, not straightforward. Both are calculated by applying various processing steps, where a kernel is used to derive statistical parameters from the original DFM. The resulting visualizations will differ depending on the kernel size. In the study presented here, kernel sizes of 5 and 30 cell units (i.e., 2.5 and 15 m) were applied. These two sizes were optimal for visualizing smaller and larger objects, respectively, as well as different topographic settings.

5.2. Interpretative Mapping and Harris Matrix

All visualizations were interpreted in a GIS. As every unit of stratification has a geographical position and an extent, the boundary of each feature of archaeological relevance was drawn as a polygon. The spatial database table connected with the polygons included a unique feature number and classification (i.e., extraction, border marking, field boundary, field, building, ditch, pit, sunken floored building, barrow, kiln, wall, oven, spoil heap, pond, terrace, bank, road, hollow way), which were structured hierarchically (i.e., individual features were combined into named groups). As each drawn feature represents a stratigraphic unit, the

49 A more detailed account of the process can be found in Doneus et al. 2008, 887–888. – Doneus, Briese 2011, 64–66.

50 Challis, Forlin, Kincey 2011. – Bennett et al. 2012. – Doneus 2013b. – Kokalj, Zakšek, Oštir 2013.

51 Doneus, Briese 2006b. – Devereux, Amable, Crow 2008.

52 Hesse 2010.

53 Doneus 2013b.

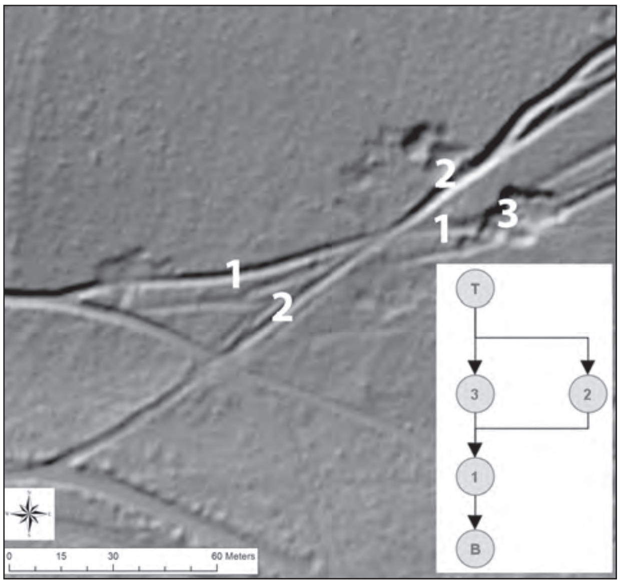

Fig. 4. Reconstruction of the relative chronology from an ALS-derived terrain model. Intersections of linear features often give a good indication of their stratigraphic relation. In this example, hollow way '1' is cut by hollow way '2' and must therefore be older. Extraction pit '3' again cuts hollow way '1' and is therefore younger, while we do not see any direct stratigraphic relation between pit '3' and hollow way '2'. This image demonstrates the complexity of such remains, with further phases of hollow ways visible in the centre of the image between hollow ways 1 and 2, and predating hollow way 2 (Graphics: M. Doneus).

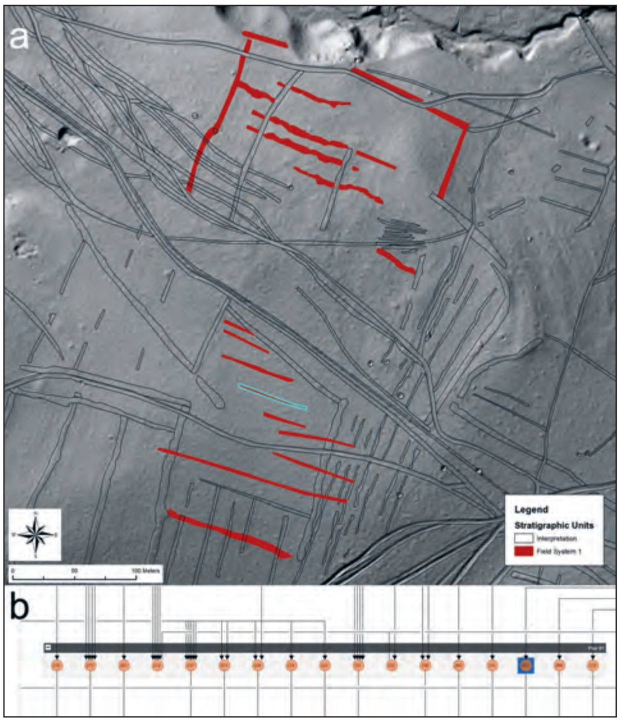

Fig. 5. Interpreting functional groups in (a) GIS and (b) Harris Matrix Composer. 'Field System 1' contains both features with abundant stratigraphic relations and features without any relation except 'below top surface' and 'above bottom' (e.g., the highlighted feature). In HMC+ these can be combined into a group and consequently the position of stratigraphically unrelated features can be defined in the Harris Matrix. The selected feature is highlighted in cyan both in GIS and in the Harris Matrix (Graphics: M. Doneus).

unique feature number was used as a unique identifier in the Harris Matrix. Linear features such as hollow ways intersected by other features were drawn in parts but attributed the same number, so that they were linked in the GIS.

The Harris Matrix was built using the software Harris Matrix Composer Plus (HMC+),[54] which is a newly developed version based on the Harris Matrix Composer[55] with additional functionality. Most importantly, it has sophisticated tools to assign individual units to user-defined chronological 'ages', 'periods', and 'phases' within an interval-based hierarchic time model. Additionally, the latest version offers a direct link to ArcGIS. Using this link, it is possible to control the subset of visible polygons in ArcGIS by selection of stratigraphic units and groups of units in HMC+. The link works in both directions, i.e., any selection of features in ArcGIS will be highlighted in the Harris Matrix. This feature is of prime importance in the development of a diachronic interpretation of the complex landscape depicted in the ALS-derived DFM.

5.3. Developing a Relative Chronology

The relative dating of overlapping and intersecting topographic features in the DFM is usually straightforward (Fig. 4). Whenever a new stratigraphic unit is inserted in the sequence, all available stratigraphic relations to intersecting units are entered.

Both GIS-based interpretation and the Harris Matrix were developed iteratively by alternately drawing the outlines of a feature and defining its stratigraphic relations to other features already present in the stratigraphic sequence, with validation and removal of redundant relations subsequently undertaken as necessary. On a few occasions, HMC+ detected a logical error during validation (e.g., feature a is above feature b, which is above feature a). In these cases, the interpretations of the contradictory intersections were resolved in the GIS.

If a mapped feature was isolated and did not intersect with other units, it could be tied into the matrix only with the relations 'below top surface' and 'above bottom surface'. Beyond that, its position within the stratigraphic sequence

54 Neubauer et al. 2018. – Kucera et al. 2020. – Neubauer et al. 2022.
55 Traxler, Neubauer 2008.

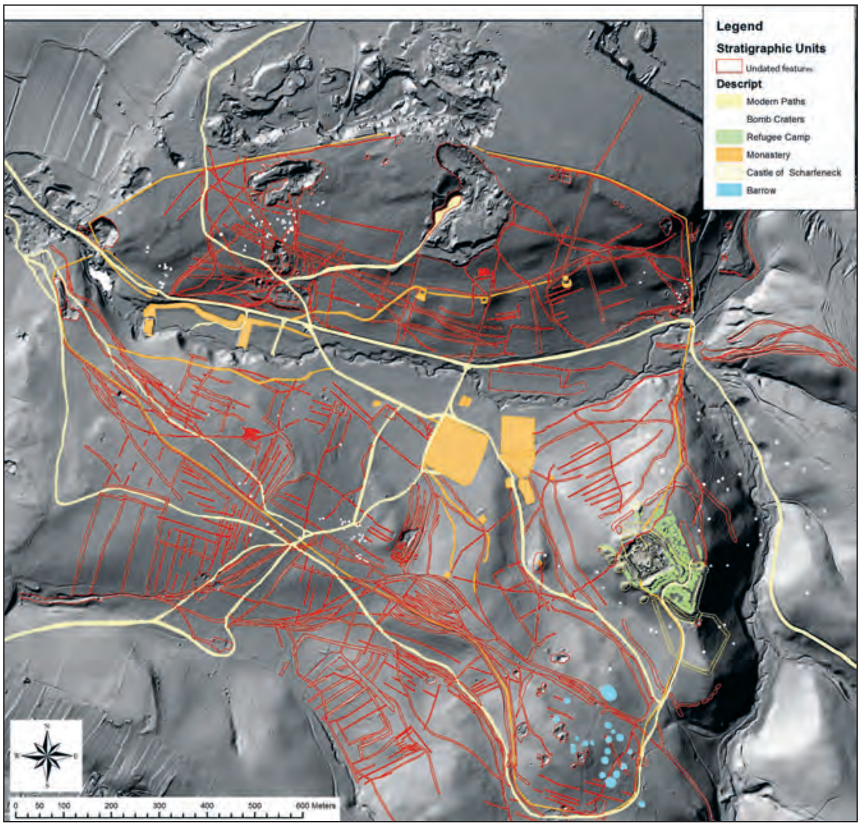

Fig. 6. Archaeological interpretation of the case study area indicating all datable features. See main text and legend (Graphics: M. Doneus).

remained undefined. As this was the case with many features, the periodization of the final matrix would have been challenging. Here, the implementation of the concept of groups[56] in HMC+ proved to be important. Units which seemingly belong together by a similar structural relation forming a pattern can be grouped together regardless of whether they intersect or are isolated. In practice, features being interpreted as belonging together (e.g., ridges of a field system) can be grouped and named (e.g., 'Field system 1') both in GIS and in HMC+ (see Fig. 5). During grouping, HMC+ checks any stratigraphic contradictions. Grouping features was important to structure the Harris Matrix and to understand the spatio-temporal relations in the interpretative map.

5.4. Creating Relative Chronological Period Maps

One of the most important developments of HMC+ is the implementation of an interval-based hierarchical time model. It allows individual units and groups to be assigned to user-defined chronological periods and phases. These are grouped in the final Harris Matrix according to their temporal succession while the correct stratigraphic layout is preserved.[57]

This temporal model was defined after interpretative mapping of all archaeologically relevant features. The starting point for the definition of phases and periods were temporal nodes known from the abovementioned archaeological and historical sources (Fig. 6):

- Recent network of forest roads
- Roads, paths, and fields from dated historical maps
- Bomb craters from WW2
- Remains of a refugee camp built around Scharfeneck Castle in 1683
- Buildings of the monastery founded in 1644, which were therefore built within in the following years, as well as the surrounding wall built between 1644 and 1769
- Scharfeneck Castle, which was first mentioned in the early 15th century
- Ramparts of a hillfort, dated to the Early Iron Age according to archaeological analogies and finds

56 Traxler, Neubauer 2008.

57 Neubauer et al. 2022.

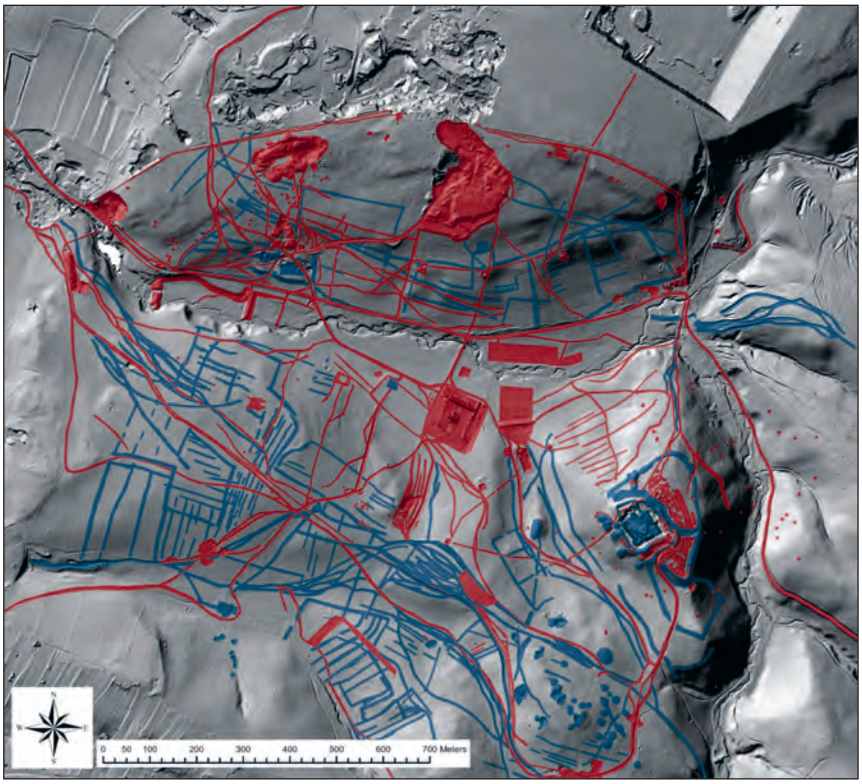

Fig. 7. Archaeological interpretation of case study area. All stratigraphic layers older than the monastery have been selected in the Harris Matrix. The interface between the matrix and GIS allows all selected units to be highlighted in the GIS workspace (blue features) (Graphics: M. Doneus).

Units and groups that could be assigned to one of these historical nodes were assigned to the respective phase of the chronological model. As a result, units with direct stratigraphic relations to other features are situated in a relative chronological framework, identifying whether a unit was older or younger than any of the historical nodes (e.g., the construction of the monastery, see Fig. 7).

Fig. 7 shows a selection of surfaces from the Harris Matrix with all stratigraphic units and groups older than the monastery. These are highlighted in blue in the GIS mapping, and it is evident that the mapping needs further temporal differentiation, i.e., the matrix of this selection needs to be divided into further periods. This process was done interactively, with units and groups selected in the Harris Matrix based on their stratigraphic position. The highlighted selection was cross-checked in GIS, addressing whether it fit into a narrative of the diachronic model of the landscape without any contradiction to previous or later periods.

Altogether, at least 10 periods could be distinguished (Fig. 8; see also Tab. 2 in section 7). The determination of a period is partly based on archaeological (e.g., round barrows) and historical (e.g., castle, monastery) information. Additionally, periods were identified by observation of intersections of groups of features: e.g., when a hollow way overlaid a field system, the hollow way would belong to a separate, later period. Fig. 8 shows the resulting Harris Matrix vertically ordered by the periods identified (middle column on the left side). The numbers indicate groups of features (see caption of Fig. 8 for more information).

One of the main difficulties encountered is that long-lasting features that remained in use during multiple periods are difficult to handle, despite the fact that HMC+ allows a temporal model to be added to the Harris Matrix. This can be observed for the surface representing Scharfeneck Castle (Fig. 8/18). In the matrix, it is placed at the end of period 5, the date when the castle fell out of use and was overlain by other features from period 7. However, the castle seems to have been built already in period 4, and inspecting the matrix makes it apparent that its vertical (chronological) position is not fixed and that it could be shifted to period 4.

5.5. Field Check

During the whole process of interpretation, St. Anna was visited regularly and aspects of the interpretation were observed on the ground. In this way, additional

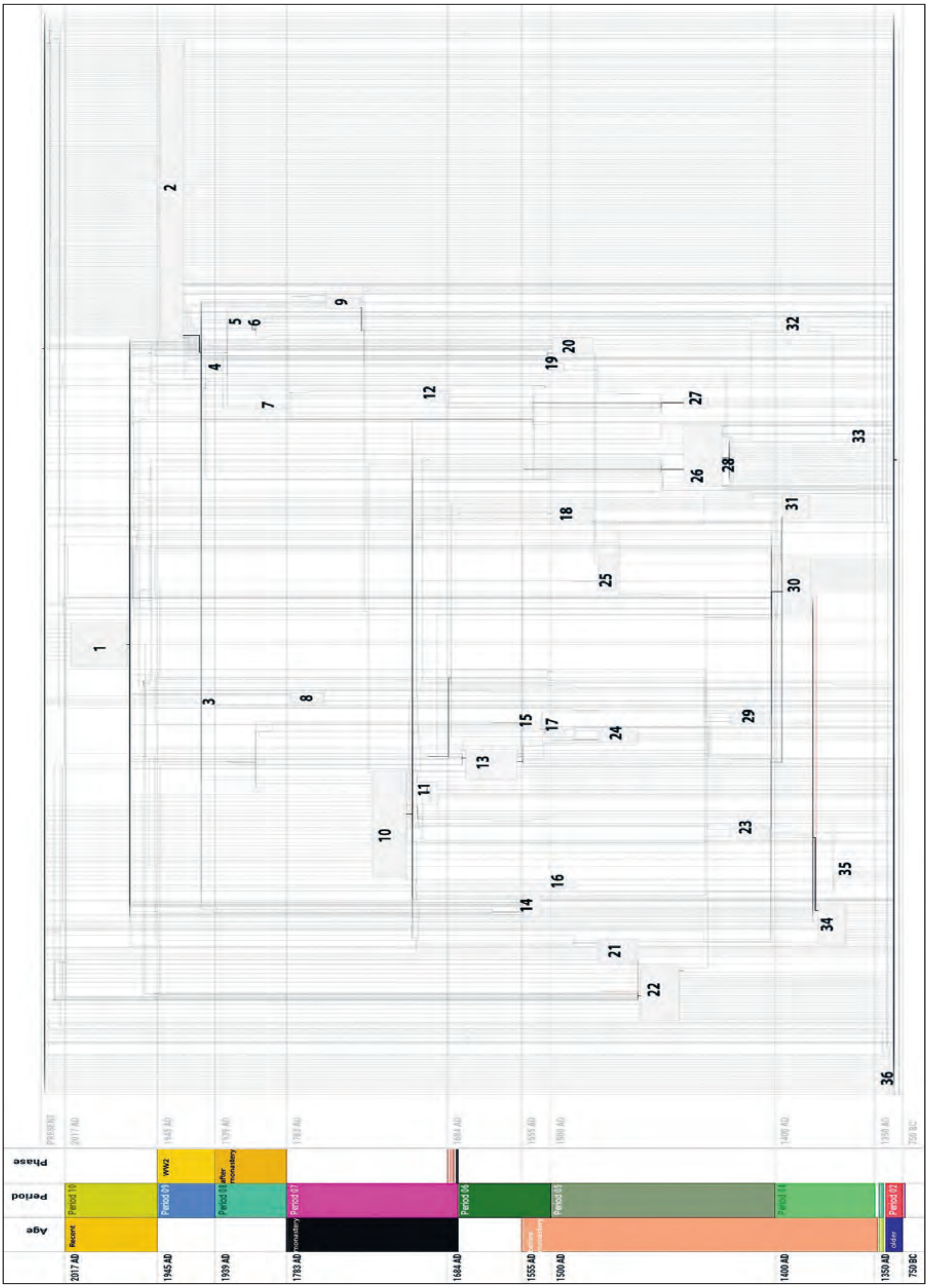

Fig. 8. Final Harris Matrix (turned 90° clockwise) including periodization and without any validation errors. The numbers locate grouped features. – 1. Modern roads. – 2. Bomb craters. – 3. Trenches from WW 2. – 4. Stone quarry 3. – 5. Lime kiln No. 2. – 6. Lime kiln No 1. – 7. Lime kiln No. 3. – 8. Fishpond. – 9. Field system 09. – 10. Monastery. – 11. Field system 12. – 12. Lime kiln of Steward's Estate. – 13. Hollow way route 03. – 14. Field system 03. – 15. Hollow way route 04. – 16. Hollow way route 05. – 17. Field system 11. – 18. Scharfeneck Castle. – 19. Steward's Estate. – 20. Field system 04. – 21. Stone quarry. – 22. Filed system 06. – 23. Hollow way system 02a. – 24. Hollow way system 01. – 25. Castle gardens. – 26. Field system 10. – 27. Field system 20. – 28. Field system 17. – 29. Hollow ways 02. – 30. Field system 02. – 31. Field system 19. – 32. Field system 08. – 33. Field system 18. – 34. Field system 01. – 35. Buildings near brick furnace. – 36. Barrows (Graphics: M. Doneus).

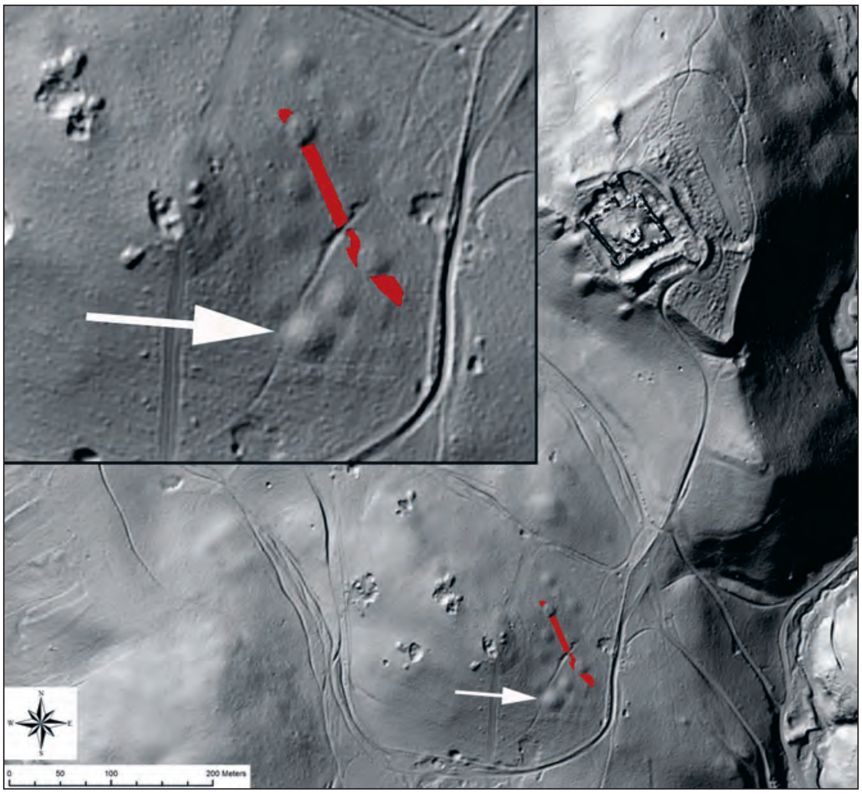

Fig. 9. St. Anna in der Wüste, period 1 (probably Late Bronze Age/Early Iron Age). The red feature marks a largely eroded part of a bank or terrace overbuilt by two round barrows. The arrow indicates a hollow way that has been partly covered by the slumping of a round barrow (Graphics: M. Doneus).

complementary information not deducible from the ALS-based feature model was gathered, including construction materials (stone type and mortar), mason's marks and artefacts, which helped to advance the interpretation and provided further dating evidence. Furthermore, the on-site visits were used to establish the nature of features that were ambiguous in the DFM. For example, small features in the DFM might be dense bushes, fallen trees, stones, tree stumps and the like. Ground observation was crucial to correctly classify such features. This information, as well as the general appearance of earthwork structures was documented on photographs and incorporated into the interpretation of the archaeological landscape.

6. Results

More than 1,450 individual archaeologically relevant features were mapped. These correspond to 705 stratigraphic units (Fig. 8) covering a wide range of anthropogenic relief remains including roads, hollow ways, field boundaries, terraces, walls, barrows, extraction pits, bomb craters, deposits, border markers, buildings, ditches, banks, and lime kilns. During the workflow described above, a total of 10 periods were distinguished based on the Harris Matrix and the spatial relations of the mapped evidence. The following sections provide a detailed narrative description of each period (see also Tab. 2 in section 7).

6.1. Periods 1 and 2

Periods 1 and 2 represent the earliest chronological entities in the temporal model of our case study. Both are of prehistoric date, most probably no later than the Late Bronze Age/Early Iron Age. Period 1 contains a single feature (Fig. 9), which is the oldest surface according to the Harris Matrix. It is interpreted as a largely eroded part of a terrace or bank feature on a northeastern slope facing the hillfort in the area of Scharfeneck Castle. Its prehistoric date is inferred from the fact that it is overlain by two round barrows from period 2 that might be interpreted as contemporary with the hillfort. It was also possible to map segments of the hillfort that were not subsequently overbuilt by the castle. For these features, a Late Bronze Age/Early Iron Age date has been inferred due to the presence of artefacts from the Urnfield and Hallstatt cultures. While artefacts recovered near the summit of the hillfort also indicate an

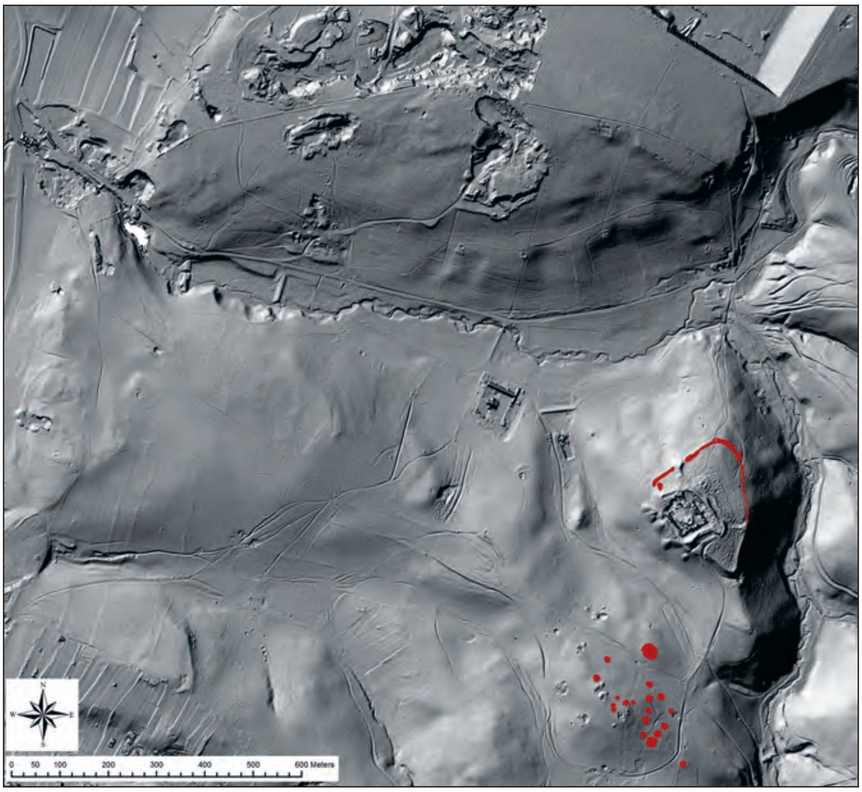

Fig. 10. St. Anna in der Wüste, period 2 (probably Early Iron Age) with 18 round barrows and ramparts of a Late Bronze Age/Early Iron Age hillfort (Graphics: M. Doneus).

earlier use in the late Neolithic,[58] no relief traces can be assigned to this period.

Period 2 contains at least 18 round barrows, some of which are well preserved. The largest is 30 m in diameter and, according to the local relief model, protrudes roughly 1 m above the surrounding average terrain height (Fig. 10). All of the other barrows are smaller in size (between 10 and 20 m in diameter) and less well preserved, rising to between a few centimetres and 0.2 m in height. Their sizes, layout, and location are comparable with the cemetery of Purbach.[59] At both sites, the barrows are erected outside the ramparts of a Late Bronze Age/Early Iron Age hillfort and there are indications that in both cases the barrows lay along roads leading to the hillforts. Nevertheless, a Roman age cannot be completely ruled out, given the nearby remains of buildings of possible Roman date in the valley area northwest of the mounds (see Period 3).

The white arrow in Fig. 9 points to a shallow hollow way that lies below the eroded flanks of one of the barrows. It is not known when the hollow way was covered by this erosive event, but it must have happened after period 4, as the hollow way cuts a field system of period 4 and therefore must have been in use during that time (see below). According to the matrix, the path is clearly older than the monastery. Therefore, it seems to have at least belonged to a route out of Scharfeneck Castle during periods 5 and 6 and was covered by the erosion of the round barrow afterwards.

6.2. Period 3

A group of buildings in the valley bottom represents period 3 (Fig. 11). Strictly speaking, the buildings are not part of the ALS-based interpretation, as they were discovered during a geophysical survey in March 2014.[60] However, the ensemble could be included in the Harris Matrix, as the traces of a former path and field boundaries cross the buildings and are therefore younger. The survey conducted by the LBI ArchPro using ground penetrating radar (GPR) covered the entirety of the open areas of the valley floor. The archaeological interpretation of the resulting radargram shows two buildings, both roughly 16 × 20 m. They are accompanied by three smaller structures (between 7 × 5 m and 10 × 7 m).

58 Melzer 1980.

59 Doneus et al. 2008. – Doneus 2010.

60 Doneus 2014.

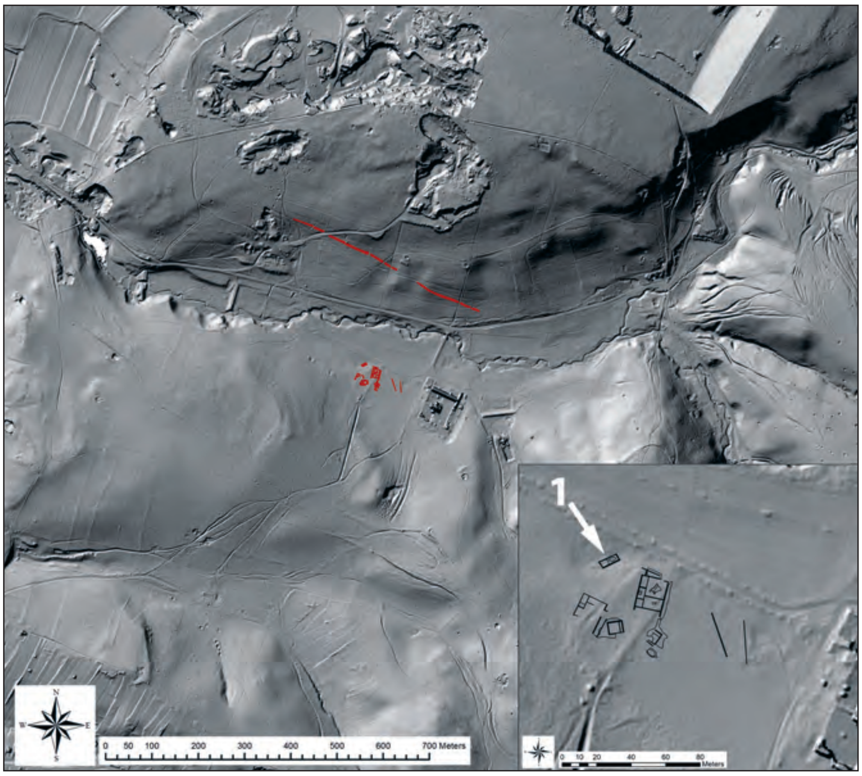

Fig. 11. St. Anna in der Wüste, period 3. The group of buildings were recorded by GPR measurements (probably Roman). Structure 1 was reused as fish basin in 1771 (Graphics: M. Doneus).

Their date is unclear. No artefacts have been found on the surface, which may indicate a relatively good state of preservation, as the top surfaces of the walls are still buried below 0.5 m of sediment. According to the layout and structure, the buildings could be interpreted as remains of a building complex, perhaps parts of a Roman villa rustica.

Support for a Roman occupation of the area is indicated in a historical source that states that when the foundations for the monastery were dug after 1644, a heathen altar with the statue of a goddess and coins were unearthed.[61] Although the monastery is roughly 100 m west of the buildings identified in the GPR survey, the story provides support for a Roman presence in the area and could be used as an argument for a Roman dating of the building complex.

Furthermore, there is a second mention of this area in the friary annals, which note the discovery of a large stone basin with a plastered floor and a (still functioning) wooden pipe, when a pit for a fish basin was dug in 1771.[62] According to the annals, the basin was reused. Following the description of its location, it can be identified as one of the smaller rectangular structures visible in the interpretation (Fig. 11/1). Even today, the vegetation in this area is different from the rest of the valley, probably because the soil below is wetter, perhaps caused by the intact bottom of the fish basin. Additional evidence for this is provided in the GPR data, where what can be interpreted as a distinctive, highly reflective floor can be made out in the same area.

Although both stories provide clues to the existence of buried buildings in the area that could date to the Roman period, no clear conclusion about the dating of the structures can be drawn at present. However, the fact that the structures from this period are covered by 0.5 m of alluvium and/or colluvium could indicate an older date, as the burial of the remains must have happened before the monastery was built. It is therefore unlikely that these buildings could have been in use during a later period, i.e. as agricultural facilities for Scharfeneck Castle. Given this evidence, a date corresponding to the Roman period seems plausible. It is further worth mentioning that a linear structure in the north of the building complex is one of the oldest structures according to the Harris Matrix (Fig. 11). It is, however, not clear, when this feature was first constructed, and it could equally well belong to the following period 4, although it is intersected by a field system from period 4 (see below). If it is interpreted in connection

61 Historia Conventus 1644–1762 quoted after Aguinaga 1993, 6.
62 Schatek 1938, 32, 131.

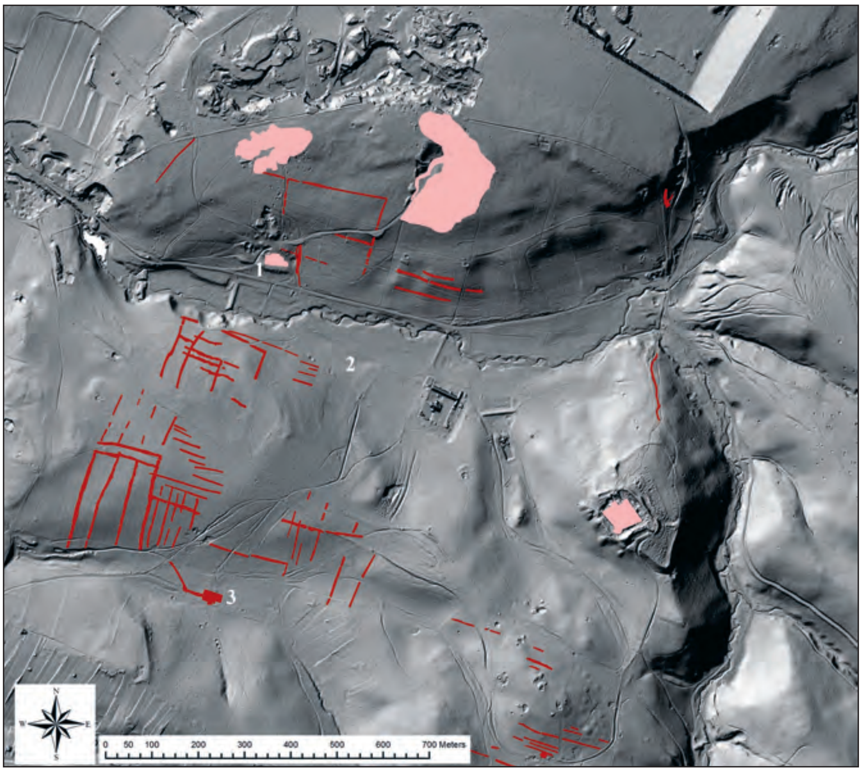

Fig. 12. St. Anna in der Wüste, period 4. The numbers indicate positions of potential farmyards that might be related to the extensive field system (Graphics: M. Doneus).

with the building complex, it might be the remains of a field boundary extending at least 500 m from east to west.

6.3. Period 4

Period 4 is characterized by extensive fields belonging to a northwest-southeast-oriented rectangular agricultural system dating to a period prior to the construction of Scharfeneck Castle. Within the fields, the mapped area shows three buildings that can be interpreted as farmsteads, although none of them demonstrate stratigraphic relationships that could indicate the date of their establishment. The building in the centre of the interpreted area (Fig. 12/2) represents the potential Roman buildings detected during the GPR survey and appears to belong to period 3, as discussed above. This is the reason why its structures are not depicted in Fig. 12. Both of the other buildings (Fig. 12/1, 3) were in use until the late 19th and 20th centuries, though their starting date is unknown and might reach back to period 4.

Building 1 is known as the Meierhof (Steward's Estate) and was in use until the 1870s.[63] Although it could have been built as early as period 4, its location within the large field (whose boundaries are visible north and east of the farmstead) could be seen as an argument for a slightly later date. Due to this uncertainty, building 1 is depicted in a lighter red colour on Fig. 12.

Building 3 was in use until the 20th century. It also lacks stratigraphic evidence, making it difficult to infer its origins. However, it is depicted on all maps of the Austro-Hungarian Empire since 1755. From the 19th century on it is attributed as the Abdeckerei (Knackery). It has the same orientation as the adjacent fields in the north, which are stratigraphically the oldest structures in the area. Therefore, a starting date in period 4 seems plausible.

Although period 4 seems to be older than Scharfeneck Castle, it is possible that it might slightly overlap with the first phase of the castle, when the central tower was erected. This most likely happened in the earliest phase of the castle in the late 14th century. The stone material used for the tower seems to be locally sourced[64] and might have been derived directly from the Schlossberg. On the other hand, certain bespoke stonework from the second phase of the castle, like the stones around the windows or at corners, is of limestone

63 Schatek 1938, 45.

64 Filzwieser 2021, 58–59.

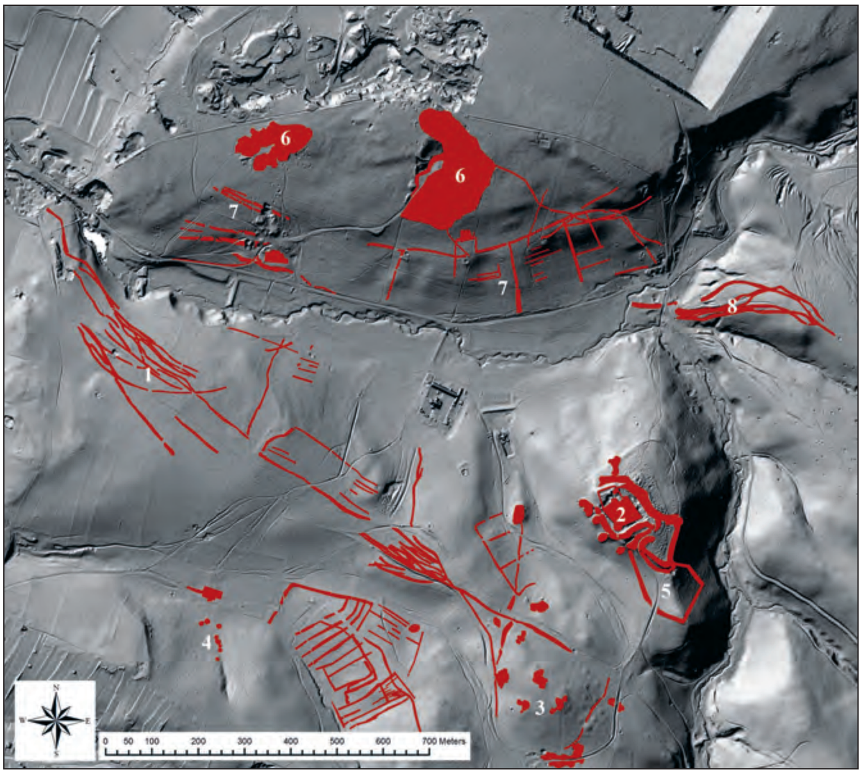

Fig. 13. St. Anna in der Wüste, period 5 (15th/16th century). – 1. Hollow ways leading towards the recently erected Scharfeneck Castle. – 2. Scharfeneck Castle. – 3. Stone extraction pits. – 4. Lime kilns. – 5. Boundaries of a potential orchard. – 6. Stone quarries. – 7. Field system. – 8. Hollow ways leading across the Leitha Mountains (Graphics: M. Doneus).

and could have been mined at the two stone quarries in the north. Both quarries lack stratigraphic evidence as they had been in use for a long time, extracting an increasing area while simultaneously erasing any older traces. Written evidence, however, shows that there were shipments of limestone from the lordship of Scharfeneck to Vienna as early as 1404 and 1407.[65] Therefore, it is a distinct possibility that the quarries were already in use during, or even prior to, the construction of the castle.

It is not possible to establish the time and duration of the field system without any further dating evidence. Its contemporaneity with Scharfeneck is also not certain. While it seems likely that the castle had an immediate surrounding economical basis, the fields still seem to be older. If at all, it seems to be contemporary with Scharfeneck only for a short time span during the erection of the central tower. This interpretation is based on the observation that large parts of the slightly later extension of Scharfeneck (15th century, period 5) were built with local 'Arkose', a stone that might have come from a few quarries south of the castle. At least one of the quarries cuts the fields from period 4, making it younger than the fields. Also, the hollow way system of phase 5 links the quarries with the castle, and thus it seems clear that it is related to the main phase of the castle. Furthermore, there are indications that the castle was built after a relocation of the lordship's residence from a motte-and-bailey castle at the nearby Leitha River,[66] which might explain the transitional character of period 4. The break between periods 4 and 5 could also be explained by the sudden disappearance of the lords of Scharfeneck, who are last mentioned in 1412. The castle itself is mentioned in 1417 as "New-Scharfeneck" and is then under royal rule, which led Josef Lampel to suspect a change of ownership as well as a renovation of the castle during this time.[67]

6.4. Period 5

In period 5, the period 4 fields fall out of use and are cut by hollow ways that extend across the area from northwest to southeast (Fig. 13/1). Parts of the hollow ways seem to

65 Rohatsch 2011, 50.

66 Filzwieser 2021.

67 Lampel 1900.

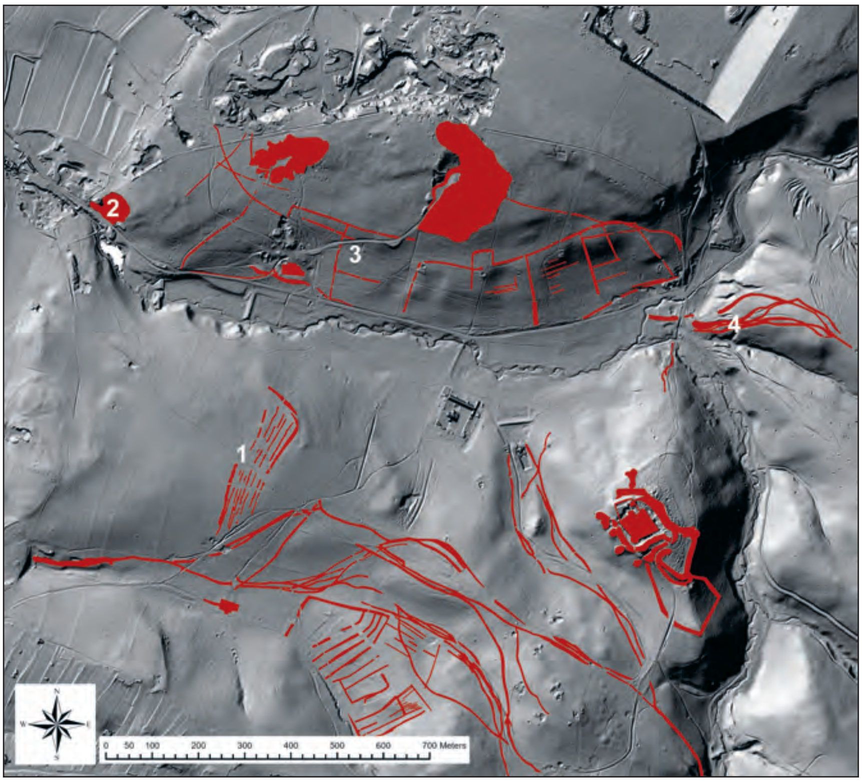

Fig. 14. St. Anna in der Wüste, period 6 (16th/first half of 17th century). – 1. New fields. – 2. Western stone quarry. – 3. Larger fields around Meierhof (Steward's Estate). – 4. East-west route leading across the Leitha Mountains (Graphics: M. Doneus).

cross the valley in an east-west direction, coming from the Leitha Mountains. This could be in connection with the erection and existence of Scharfeneck Castle, which would have been an attractor for traffic coming from the Leitha area and crossing the Leitha Mountains in this direction. A second east-west route leading across the Leitha Mountains towards the villages of Purbach and Donnerskirchen (Fig. 13/8) also appears to have been established.[68]

The stone walled castle is located on top of the Schlossberg in a prominent position (Fig. 13/2). Its layout, with massive banks and ditches, covers a large part of the prehistoric hillfort. Additional stone material for the outer walls ('Arkose' – see above) could have come from extraction pits to the south of the castle (Fig. 13/3), where geological maps and field visits indicate the same stone source as on the Schlossberg that was used for the walls of the castle.[69] In addition, stratigraphic relations suggest a date earlier than the wall of the monastery. Therefore, both the castle and the extraction pits are grouped into period 5. The same is true for a battery of lime kilns in the southwestern part of the mapped area (Fig. 13/4). As they are located along a path leading to nearby building remains, they seem to be connected to this building and could have been related to the castle's need for lime.[70] Further terrace features surrounding the banks of the castle in the south (Fig. 13/5) could be of agricultural origin, indicating the boundaries of an orchard. Evidence for this orchard may also be indicated in the engraving by Lerch (see Fig. 16).

As mentioned above, according to historical sources, the lords of Scharfeneck sold limestone to Vienna during the 15th century.[71] A high volume of limestone extraction is indicated by the two stone quarries in the north of the interpreted area (Fig. 13/6) and their use in period 5 is therefore even more likely than in period 4. In the northern part (area of building 1), the field system seems (maybe due to a change of ploughing direction) to have changed into terraces and extended into the eastern area closer to Scharfeneck (Fig. 13/7). This could be associated with the founding of

68 See Doneus 2013a, 323–335.
69 Filzwieser 2021.
70 Filzwieser 2021, 58–59.
71 Rohatsch 2011, 50.

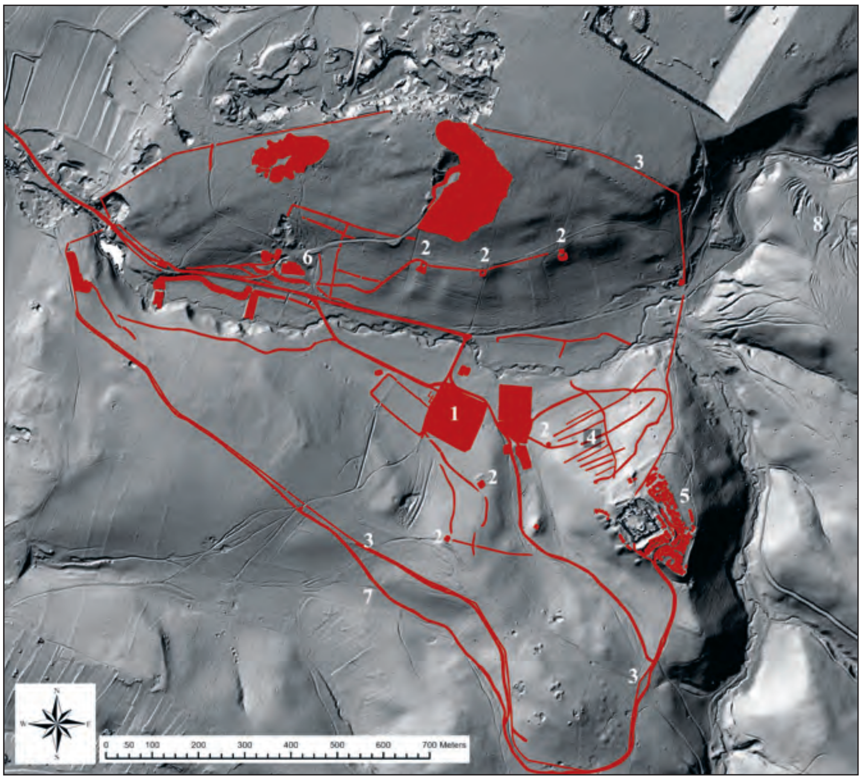

Fig. 15. St. Anna in der Wüste, period 7. Between 1644 and 1783. The landscape was completely remodelled and a monastery with its infrastructure was built. – 1. Church and friary. – 2. Hermit's cells. – 3. Surrounding wall. – 4. Fields (wine?). – 5. Temporary refugee camp of local population during the Turkish siege in 1683. – 6. Steward's Estate. – 7. Path along surrounding wall. – 8 New route across the Leitha Mountains, now approaching Mannersdorf (Graphics: M. Doneus).

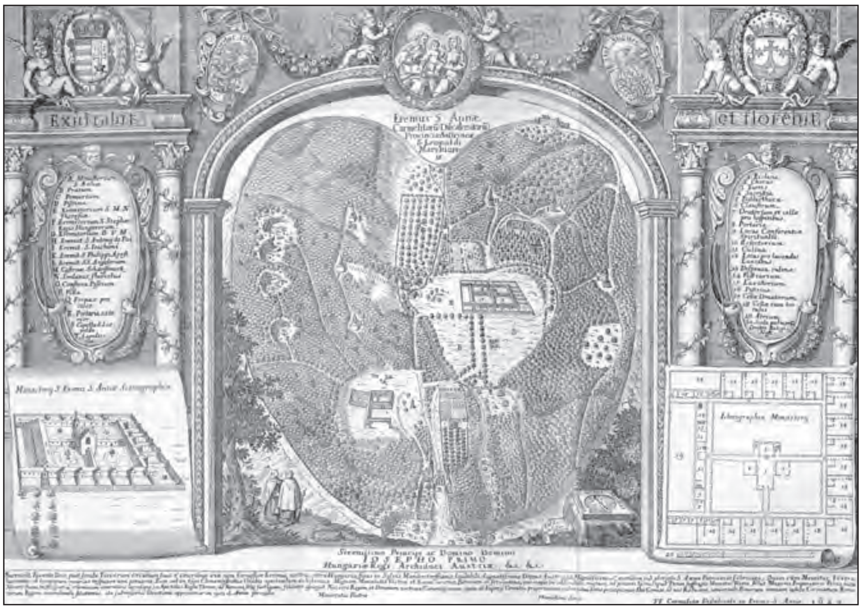

Fig. 16. Engraving of the friary St. Anna in der Wüste by Johann Martin Lerch, 1689 (Federal Museum of Lower Austria, Topographic Department, Sign. 5337).

the Meierhof (Steward's Estate). Additionally, new fields appear close to the castle in the south and west.

6.5. Period 6

While the fields in the northeast and south were still in existence, the system of hollow ways crossing from northwest to southeast was no longer in use. The hollow ways were replaced by a route from the village of Hof in the west and leading eastwards. New fields occur in the central-western part of the area (Fig. 14/1). This could be a result of the collapse of the main tower of Scharfeneck in 1555, which brought an end to the use of Scharfeneck Castle, which in turn might have led to the abandonment of the hollow ways from period 5 that connected the castle with the village of Mannersdorf.

In the northwestern area (Fig. 14/2) lie the remains of a stone quarry that must have been used in this period, as it is stratigraphically below the surrounding wall of the monastery. It is also mentioned in the friary annals.[72] The two big quarries in the north might also have been in use, but no direct stratigraphic relations can be observed. Finally, the terraces in the northern area around the Meierhof (Steward's Estate) have been replaced by larger fields (Fig. 14/3).

6.6. Period 7

In period 7 the landscape is completely remodelled. A monasterial complex was erected in the centre of the interpreted area (Fig. 15/1) with seven hermitages (Fig. 15/2) in the surrounding areas to the north and the south. According to historical sources,[73] the construction of the roughly 4.5 km-long enclosing wall took more than 120 years to complete (Fig. 15/3). This wall is especially important for our analysis, as it crosses several former field boundaries and hollow ways and therefore provides good stratigraphic evidence. The wall also blocked the east-west route of hollow ways from periods 5 and 6 (Fig. 14/4), which are out of use from period 7 on. The crossing over the Leitha Mountains took another route towards the village of Mannersdorf (Fig. 15/8).

Several features visible in the DFM are mentioned in the friary's annals as well as depicted in the 1689 Lerch engraving. In addition to the friary and the enclosing wall, the seven hermitages, agricultural features (field boundaries next to the friary, fishponds (for fish farming), fish basins (to keep fish fresh)), the Meierhof (Steward's Estate) with surrounding fields (Fig. 15/6), stone quarries, lime kilns, and several pathways (Fig. 15/8) can be identified as belonging to this phase. Interestingly, the Lerch engraving seems to be quite accurate with regard to the features mentioned above, with the exception of the enclosing wall. The reason for this is that the engraving seems to aim to depict the enclosing wall as a sacred heart, and it may have been more important to communicate this religious concept rather than to accurately depict the spatial extent of the wall, which is much less heart-like in reality.[74] Additionally, the area is mapped in the First Military Survey between 1763–1787, which helps to date some of the pathways.[75]

Some field structures on the northwestern slope of the Schlossberg (Fig. 15/4) seem to belong to this period and could be associated with viniculture, as a vineyard is mentioned in the annals in 1709 and according to Albert Schatek, stumps of vine have been found in this area.[76]

In the area of the ruined Scharfeneck Castle, 260 sunken floored building-like structures can be identified (Fig. 15/5), many of which have been dug into the medieval banks of the castle. They are rectangular in plan and their sizes range from 4 × 2.5 m to 7 × 5.5 m. These can be interpreted as the remains of a refugee camp which was erected when the local population of the nearby villages (3,000 people are mentioned) sought temporary shelter from the Turkish siege in the area in 1683.[77] Additionally, three stone quarries (also depicted in Lerch's engraving) are now in use.[78] However, the ALS-based DFM shows only two quarries. A third one, located close to the Meierhof (Steward's Estate) is dated stratigraphically to period 8. It is, however, possible that the larger easternmost of the two quarries was itself originally two smaller quarries that have been joined together by subsequent quarrying activity during later phases.

6.7. Period 8

After the abandonment of the friary in 1783, large parts of the case study area seem to fall out of use, or at least uses that might leave an archaeological imprint. The only evident traces of activity are in the north around the Meierhof (Steward's Estate). Otherwise, a few pathways cross the area, which is still largely enclosed by the friary's boundary wall, now broken in a few places in order to create access ways.

The Steward's Estate was still in existence until the 1870s (Fig. 17), though the surrounding fields seem to have been abandoned. This can be seen both from information in the

72 Schatek 1938, 4.
73 Schatek 1938.

74 For a detailed discussion, see Doneus, Kühtreiber 2013b.
75 Arcanum 2022a.
76 Schatek 1938, 166.
77 Schatek 1938, 53–54. – Kühtreiber, Obenaus 2017, 203–205.
78 See also Schatek 1938, 4.

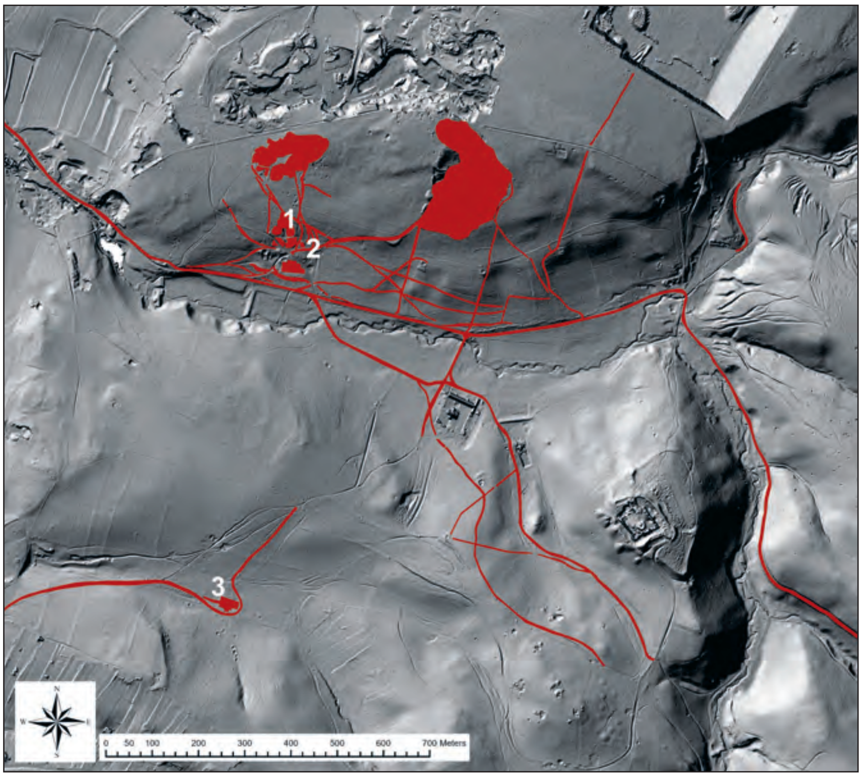

Fig. 17. St. Anna in der Wüste, period 8 (after 1783). – 1. Stone quarry. – 2. Lime kilns. – 3. Abdeckerei (Knackery) (Graphics: M. Doneus).

Harris Matrix and the Franciscan Cadastral Map.[79] Next to the two large stone quarries, a third one is now in use (Fig. 17/1), which cuts the field boundaries from periods 6 and 7. Two lime kilns slightly east of the estate are constructed (Fig. 17/2). However, their construction date could also have been in period 7. In the south, building 3 (Fig. 17/3) is now referred to as the Abdeckerei (Knackery) on all historical maps.

Additionally, all the historical maps mentioned earlier (see section 4) provide information for the dating of some of the pathways. Most importantly, the Franciscan Cadastral Map from 1819[80] gives a detailed account of the land register, routes and agricultural use at a scale of 1:2,880. However, it shows only one stone quarry, although the other ones displayed in Fig. 17 must have been clearly visible. Maybe they were not in use during that time and are therefore not represented in the map.

6.8. Periods 9 and 10

Periods 9 and 10 represent the most recent activity in the area, mainly corresponding to the mid- to late 20th century. Only a very few traces can be assigned to period 9 (Fig. 18, blue features), which relates to WW2. In the northeast of the area, traces of what may be military installations can be found. Bomb and/or artillery craters are spread over the area, reflecting the disposition of an anti-aircraft defence line in the Leitha Mountains. A few paths along the friary wall also fit stratigraphically into this period. Period 10 is characterized by the modern path network and three recently used fields (Fig. 18, red features). Although the paths are dated to the recent periods, we lack information regarding when they began to be used. We can only assume that some segments of the path network were in use from as early as period 5.

7. Discussion

Using the Harris Matrix in combination with archaeological interpretative mapping based on ALS-derived DFMs has proven to be a highly effective means of generating deep understanding of a complex area of landscape remains, providing new insights into the spatial structure, archaeological meaning, and temporal sequencing of the features around St. Anna in der Wüste. More than 1,450 archaeological features have been functionally and stratigraphically grouped into 10 periods, helping to order and interpret the landscape and supporting the creation of a coherent temporal narrative

79 Arcanum 2022b.
80 Arcanum 2022b.

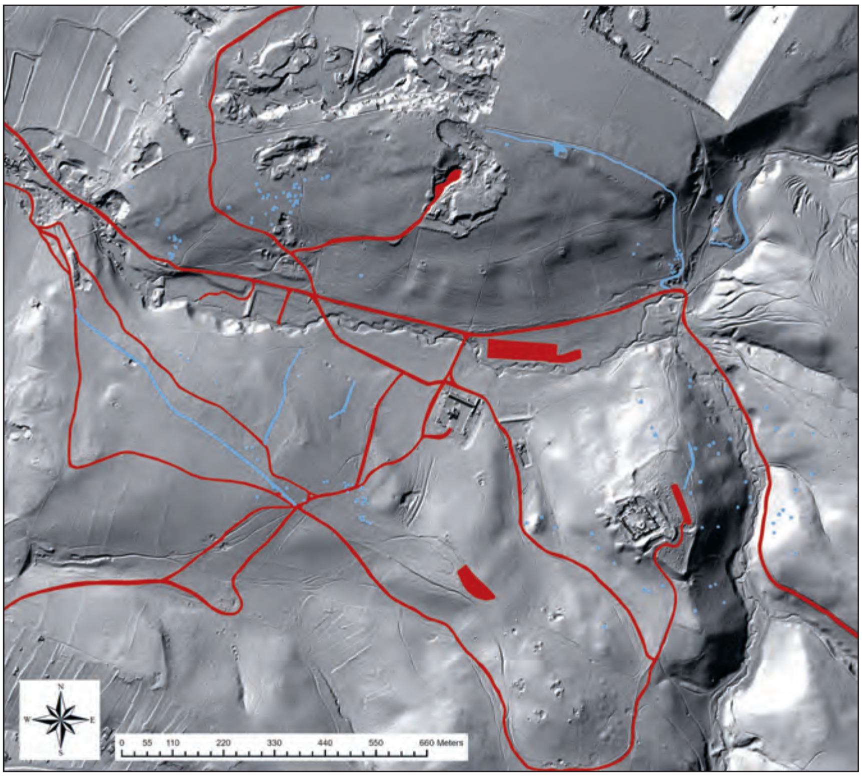

Fig. 18. St. Anna in der Wüste, periods 9–10 (WW 2 [blue] and present time [red]) (Graphics: M. Doneus).

of the extant relief features in the landscape (Tab. 2). This demonstrates that the Harris Matrix can be used as a framework for the diachronic interpretation of relief features found in ALS-based DFMs and their accompanying derivative visualizations. Furthermore, our approach is based on a widely acknowledged conceptual framework and standard for the illustration of temporal data in archaeology (i.e., the Harris Matrix).

Interpretation of the St. Anna landscape began with visualizations derived from a modern dataset: a DFM filtered to custom specifications and processed using specific algorithms to visualize archaeological topography. Mapping of the features did not necessarily start with the youngest features in the landscape, rather features were mapped as they were identified and assigned to a series of temporal nodes identified from archaeological and historical sources. The act of interpretative mapping could also be conducted using a purely retrogressive approach,[81] i.e., starting with drawing modern roads, fields, etc. and working backwards through time by mapping the features that are intersected by the previously recorded ones. Even if this seems to be the most sensible approach, it is difficult to put into practice with complex scenes such as the one presented here. There are very many overlaps that can be organized into a chronological order with the help of the Harris Matrix only after they have been mapped. This shows the importance of our approach, as without a systematic GIS-based interpretative mapping in combination with the Harris Matrix, the landscape of St. Anna could not be disentangled and understood. The connection with the Harris Matrix also allowed for the easy presentation of the result in a retrospective way, showing the development of the landscape around St. Anna from prehistory until today. In our case study area, this is preferable, as the narrative is better able to show the development of the landscape within its historical context. We believe that it is also a more cognitive way to communicate the results.

Despite the success of the approach, there are several caveats that need to be addressed. First, we recognize that dividing a span of more than two millennia into 10 periods or time-slices represents a very simplified and, in many ways, idealized framework. While the simplification aids the general understanding of the complexity of the remains, the reality is certainly considerably more complicated. Any landscape is in a state of a more or less continuous change. Thus, only at events of targeted and organized restructuring

81 For a discussion, see Antonson 2018.

Period Nr.	approx. start date	approx. end date	Archaeological content
Period 10	AD 1945	AD 2007	modern road network, fields
Period 09	AD 1939	AD 1945	bomb craters, military installations
Period 08	AD 1783	AD 1939	monastery abandoned, Meierhof (Steward's Estate) still in use
Period 07	AD 1644	AD 1783	monastery "St. Anna in der Wüste"
Period 06	AD 1555	AD 1644	Scharfeneck Castle abandoned, replacement of hollow ways, fields
Period 05	c. AD 1400	AD 1555	hollow ways leading to Scharfeneck Castle, stone quarries
Period 04	before c. AD 1400		extensive field system
Period 03	Roman Time		Roman villa (?)
Period 02	Early Iron Age		hillfort, barrows
Period 01	Iron Age or earlier		terrace

Tab. 2. Periods based on spatial patterns, stratigraphic relations, and historical information.

(e.g., the foundation of the friary in period 7 and perhaps the building of Scharfeneck in period 5) will the landscape transition from one state to something fundamentally and comprehensively different. Additionally, other features assigned to the same period (but not directly affected by the events) might not have been present throughout the entire time-slice and might well overlap to a certain degree with the preceding or following periods.[82]

In a stratification, there are units representing short-term time intervals or distinct events (e.g., refilling a pit) and units for processes that are difficult to define in terms of time. The construction of a building is an event, its use and degradation a process. In the case of a field system or a cultivated area, the beginning may be marked by the digging of field trenches or the construction of boundary walls. Its abandonment is an event. Its process of use results in a combination of erosion and deposition which is not accessible to us from the perspective of a DFM, and this does have an impact on the certainty with which remains can be slotted into a chronological framework. Our non-invasive perspective, which is based on the interpretation of a DFM, is, of course, strongly limited in this respect.

This problem is also evident in the Harris Matrix, where each unit is symbolized by a rectangle (deposit) or circle (feature). All have the same dimension, regardless of their duration. Therefore, while the Harris Matrix coherently shows a stratigraphic sequence, it does not display the duration of the individual deposit/surface. Consequently, it is often not possible to ascertain whether a feature was present during more than one period. For example, in the case of the field system in periods 3 and 4, we must assume that structures are not exclusive to single periods. Therefore, some of the fields depicted in period 4 could have also been present during period 5. We cannot even tell whether all fields were in use at the same time. Moreover, we cannot recognize the point in time of the abandonment, and it is difficult to assess possible gaps in the chronological sequence, e.g., the duration of periods of abandonment of a field in the absence of intersecting superstructures. The same is true for today's pathways drawn into period 10. Some of them might have already been in use for a long time, but it is almost impossible to decide from which period onwards. Therefore, the allocation of a feature to more than one period also needs to be based on its interpretation into a coherent narrative and whether it represents an event or a process. The same is certainly also true for other structures with multiple phases of use, including the castle, the Meierhof (Steward's Estate), or the big stone quarries in the north of the mapped area.

The feature-to-period mapping presented here is therefore based on stratigraphic relations and on spatial interpretation. It is an evidence-based, coherent narrative governed by rules. As discussed in section 5.3 (Developing a relative chronology), many of the mapped features do not have any stratigraphic relation other than 'below top surface' and 'above bottom surface'. Attributing them to a certain period is based on interpretative evidence, i.e., on the probability that it is part of a structure whose stratigraphic relation is clear. This is often the case within field systems and bundles of hollow ways and it is certainly one

82 For a schematic illustration, see Fig. 1 in Antonson 2018.

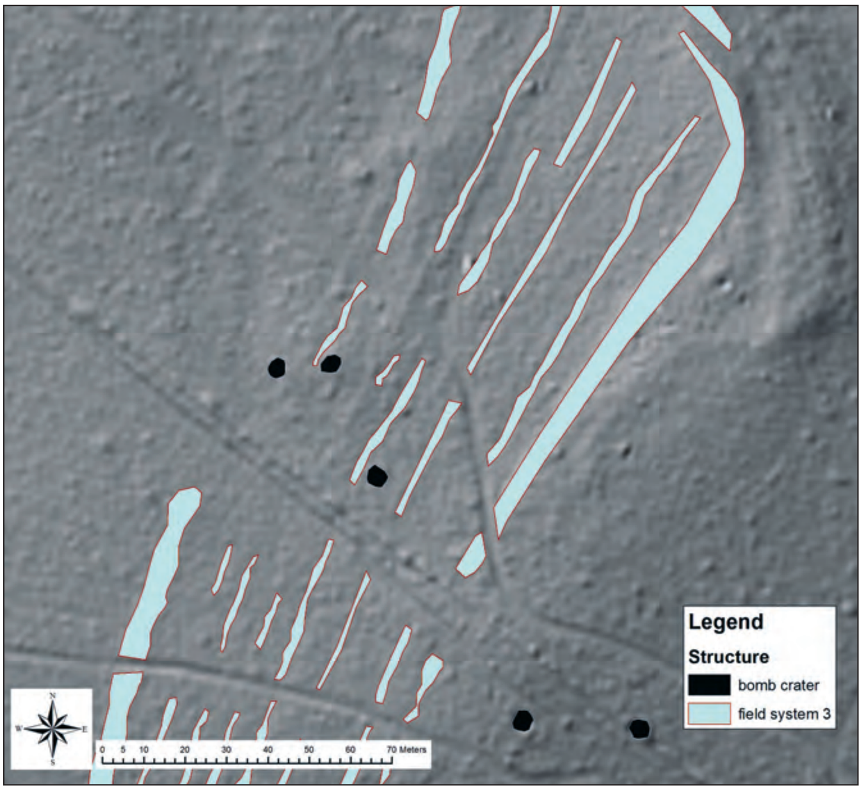

Fig. 19. Although the bomb craters (black polygons) do not show any direct stratigraphic relationships with other features, they must be younger than the fields of 'field system 3' from period 6 (see also Fig. 14) (Graphics: M. Doneus).

of the weaknesses of our approach: combining features into functional groups may be purely based on a similar orientation or pattern and is therefore hypothetical. Misallocations might have consequences for the final periodization of the Harris Matrix. Consequently, the period maps provided in the results should be considered as hypothetical. There are also several features which have no direct stratigraphic relationships and cannot be assigned to any group, for which reason they cannot be added to periods and are therefore not part of the narrative. For example, this is true for most of the bomb craters. They do not exhibit any direct temporal relation with other features. To account for this issue, one possibility would be to interpret fields as extensive structures and not as an alignment of linear boundaries accompanied by linear ridges and furrows. The fields would thus contain the craters, and the bomb craters would therefore acquire direct stratigraphic evidence that they must be younger than the agricultural use of the fields, as they were not refilled (Fig. 19).

It is important to understand that ALS-derived terrain and feature models provide a view of a compilation of upper surfaces of deposits and feature interfaces in their state of erosion on the date of scanning. As many factors influence the act of erosion, the degree of preservation does not translate into dating evidence. Moreover, the density and distribution of ground points has an effect on the appearance of relief features,[83] so it is difficult to tell solely from the DFM how long any feature has been out of use. Only when a feature is intersected by a datable structure do we get a *terminus ante quem* for its end of use. For example, this is relevant to the friary's surrounding wall, as all pathways and fields that are cut by the wall certainly ceased to be in use when the wall was built (after 1644). However, we do not know whether, or for how long, they had been abandoned prior to the building of the wall.

Despite these issues, the Harris Matrix and its accompanying GIS interpretations already clearly indicate that there were at least two phases of field systems before the establishment of the Carmelite friary. This interpretation is also reinforced by information in the available historical maps and the engraving by Lerch, the earliest date of which starts in period 7 (occupation of the area by the Carmelites). None of those sources depict any of the fields found during the

83 Doneus, Banaszek, Verhoeven 2022.

archaeological interpretation of the ALS-based DFM. This indicates that at the time of the friary, the fields had already vanished and were replaced by woodland, as indicated in the Harris Matrix. Thus, our stratigraphic analysis of the landscape around St. Anna in der Wüste could answer specific historical questions that cannot be clearly understood based solely on the written record. This includes the date of construction as well as the development and restructuring of the castle, and the possible adaptation and reuse of medieval structures by the early modern friary.

Any interpretation of prospection data usually results in more questions than answers, which has to be regarded as the most important contribution of archaeological prospection: it allows the formulation of specific research questions, which can be investigated with targeted measures, thus saving ourselves from arbitrarily digging holes in the landscape in the hope of finding useful contextual information. Additionally, as with any interpretation, it must be stated that what we have mapped is to a certain degree provisional. What we provide here is therefore not 'fact' but a rigorously tested hypothesis of landscape development. This means that the resulting mapping is based on our current data, knowledge and experience. Thus, future developments in airborne laser scanning (data acquisition, classification, or visualization) might result in more and clearer topographic traces and a better identification of stratigraphic relationships. Further contextual information and the experience of the interpreters might result in different mapping. Nevertheless, we believe the core framework outlined above is a robust analysis of key events in the landscape development in this area. What is important is that the approach presented is repeatable, transparent and able to be communicated via commonly accepted archaeological principles. Through a rigorous application of such principles, the interpretations we make can be challenged, modified, discarded or verified as new evidence comes to light.

Still, the results presented here are not the end of a landscape analysis. Rather, they mark a start, providing a series of hypotheses that can be explored further in a landscape archaeological context[84] and through targeted excavation or other field methods. For instance, using the interpretations made for this study, key intersecting landscape features can now be targeted for absolute dating using a combination of techniques such as luminescence profiling and dating (OSL-PD), potentially allowing us to understand better both the development sequence and foundation dates of the many diffuse earthwork features in our study area.[85] Using the landscape matrix developed in this study, these dates can then be linked to features interpreted as contemporary. Targeted approaches such as this will serve to further refine the feature chronologies outlined here.

Finally, it needs to be stated that to identify correctly the temporal sequence of intersecting features, a suitable DFM is required. Our data are based on a 0.5 m grid, a spatial resolution sufficient for our purposes. Depending on the size and condition of the structures present, a grid size of 1 m could already be too coarse to represent certain features.[86] In addition to an appropriate spatial resolution, the point clouds from an ALS scan should be classified using algorithms appropriate for the preservation of relief features prior to generation of a DFM that will be used for archaeological interpretation. This is of particular concern in areas with extremely dense vegetation. Additionally, the combination of various visualization techniques proved advantageous during interpretation. Without LRM, extremely shallow features could not have been mapped, and positive openness was particularly useful during the interpretation of hollow ways and the sunken floored structures around the ruins of Scharfeneck. Often the combination of both techniques with hillshade or slope helped us to understand better the nature of features during the interpretation process.[87]

8. Conclusion

This paper has presented a methodology which combines a GIS-based archaeological interpretation mapped from visualizations of ALS-derived digital feature models with a chronological model derived from a Harris Matrix. The results show a detailed functional-chronological model of a complex archaeological landscape from prehistoric times to the present. The approach presented here can be considered an essential tool for building spatiotemporal interpretations of landscape development, works particularly well in archaeological landscapes such as the one presented in this paper, and has the flexibility to be used with different approaches to landscape interpretation in general. Importantly, this approach allows for the development of landscape interpretations from the bottom up – by identifying discrete features or even feature components and connecting them together in space and time.

84 E.g., Doneus, Kühtreiber 2013b.

85 See e.g. Kinnaird et al. 2017. – Vervust et al. 2020. – Turner et al. 2021.

86 Risbøl et al. 2013. – Fernandez-Diaz et al. 2014, 9966. – Štular, Lozić, Eichert 2021, 10.

87 See e. g. Kokalj, Hesse 2017. – Kokalj, Somrak 2019.

Using the methodology presented in this paper, a coherent stratigraphic analysis of the landscape around the friary complex of St. Anna in der Wüste and Scharfeneck Castle has been created. Over 1,450 features from 10 distinct periods of use could be identified and connected to known archaeological and historical events in the landscape. Despite some caveats, the resulting diachronic model indicates an extensive agricultural use of the landscape prior to both the castle and the friary. The spatio-temporal model could therefore answer specific historical questions that could otherwise not be clarified from the few available written sources.

New tools have been used to create a coherent narrative of landscape development based on the information present in archaeological topography. This narrative is based on well-known principles of stratigraphy, a dataset with spatial resolution appropriate for identification of feature boundaries, abutments and other events, and expert input. In-field visits have confirmed observations made using the ALS visualizations. Therefore, we have high confidence in the overall integrity of the spatio-temporal model of landscape development presented here. Still, the results must be regarded as a temporary diachronic archaeological interpretation. Future research will have to focus on targeted analyses of these results using other prospection methods (especially magnetics) and field methods (coring and small-scale excavations with ^{14}C and optically stimulated luminescence profiling and dating (OSL-PD)) for verification and to provide an absolute chronological framework. Such analyses may also give us further insight into the complexity of the processes which contributed to the formation of the events documented in this paper. Nevertheless, using novel geospatial tools, we have made a significant step toward understanding the landscape of our project area and developed an approach usable in complex landscapes around the world.

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Author Contributions

Michael Doneus: conceptualization, methodology, data curation (archaeological interpretation and Harris Matrix), visualization, writing of original draft; Wolfgang Neubauer: conceptualization, software, writing, review and editing; Roland Filzwieser: writing parts of section 6, review and editing; Christopher Sevara: conceptualization, review and editing.

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New Multi-disciplinary Data from the Neolithic in Serbia. The 2019 and 2021 Excavations at Svinjarička Čuka

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Abstract

The excavations at Svinjarička Čuka in the South Morava Valley in Serbia are presented with new primary data from the field and related material and scientific analyses. Newly recovered architectural remains from the classical Starčevo period revealed a variety of domestic features, so far belonging to an earlier and later occupation phase at the river terrace dating between 5700/5600 and 5500 BC. Details of the stratigraphy and certain materials are presented for selected domestic contexts, including one potential 'Starčevo house'. Archaeological and scientific analyses are discussed and contextualised within the Neolithisation process in the chapters on new radiocarbon data and their Bayesian modelling, pottery studies, chipped stones and their raw material analyses, grinding kits, animal remains, archaeobotanical results and charcoal analysis. The later occupation at the site is presented with new results for the Middle and Late Bronze Age and the Early Iron Age, including domestic contexts, radiocarbon data and materials.

Keywords

Starčevo, Serbia, Neolithic, Bronze Age, radiocarbon dating, subsistence, vegetation

Zusammenfassung – *Neue multidisziplinäre Daten aus dem Neolithikum Serbiens. Die Ausgrabungen der Jahre 2019 und 2021 von Svinjarička Čuka*

Der Text bietet einen Überblick zu neuen Ergebnissen der Ausgrabungen und naturwissenschaftlichen Untersuchungen an der Fundstelle Svinjarička Čuka im südlichen Morava-Tal in Serbien. Kürzlich gefundene Architekturreste der klassischen Starčevo Kultur belegen eine Reihe unterschiedlicher Siedlungsbefunde, die sich bislang einer früheren und einer späteren Besiedlungsphase auf der Flussterrasse zuordnen lassen, die absolut zwischen 5700/5600 und 5500 calBC datiert werden kann. Die Stratigraphie und Aspekte des Fundmaterials ausgewählter Kontexte werden vorgestellt, darunter ein potentielles „Starčevo Haus“. Archäologische und naturwissenschaftliche Untersuchungen werden diskutiert und im Rahmen des Neolithisierungsprozesses kontextualisiert, mit Abschnitten zu neuen Radiokarbondatierungen und ihrer Bayesschen Modellierung, Keramikuntersuchungen, der geschlagenen Steinindustrie mit ihren Rohstoffquellen, Reibsteinen, den Faunenresten, den Ergebnissen von archäobotanischen und Holzkohleuntersuchungen. Die späteren Besiedlungsphasen des Fundplatzes werden mit neuen Ergebnissen zu Siedlungskontexten, Radiokarbondatierungen und Fundmaterial der mittleren und späten Bronzezeit und der frühen Eisenzeit vorgestellt.

Schlüsselbegriffe

Starčevo, Serbien, Neolithikum, Bronzezeit, Radiokarbondatierung, Subsistenz, Vegetation

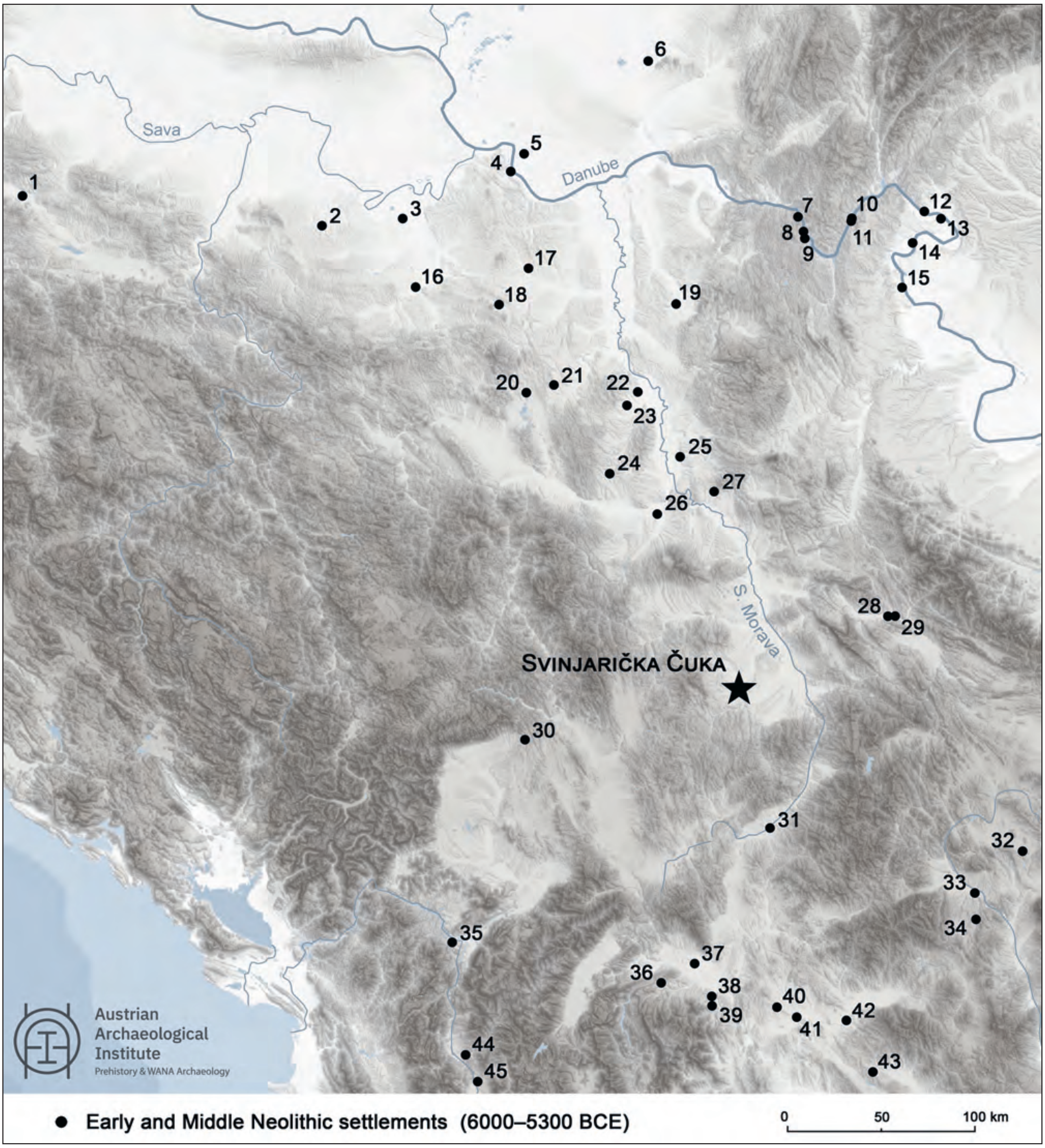

Fig. 1. Early and Middle Neolithic settlements in the central Balkans. – 1. Korića Han. – 2. Belotić. – 3. Grabovac-Đurića vinogradi. – 4. Vinča-Belo brdo. – 5. Starčevo Grad. – 6. At. – 7. Padina B. – 8. Lepenski Vir. – 9. Vlasac. – 10. Icoana. – 11. Cuina Turcului. – 12. Schela Cladovei. – 13. Ajmana-Mala Vrbica. – 14. Velesnica. – 15. Mihajlovac-Knjepište. – 16. Jaričište. – 17. Bataševo. – 18. Banja Aranđelovac. – 19. Belovode. – 20. Grivac. – 21. Divostin I. – 22. Bukovačka Česma. – 23. Međureč-Dunjićki Šljivari. – 24. Blagotin. – 25. Drenovac. – 26. Lazarev grad. – 27. Crnokalačka Bara. – 28. Selište-Sinjac. – 29. Crnoklište. – 30. Rudnik Kosovski. – 31. Kovačke Njive. – 32. Gălăbnik. – 33. Nevestino. – 34. Vaksevo. – 35. Kolsh. – 36. Cerje-Govrlevo. – 37. Tumba Madžari. – 38. Zelenikovo. – 39. Grnčarica. – 40. Rug Bair. – 41. Anzabegovo. – 42. Vršnik. – 43. Damjan. – 44. Cetush. – 45. Burim (Map: M. Börner, B. Horejs, N. Schinnerl, D. Filipović).

1. Introduction

The Neolithisation process along the Axios-Vardar-Morava river corridor forms a key for understanding the complexity of the substantial transformation from hunter-gatherers into sedentary and farming communities on the Balkans starting around 6200–6000 BC. While the main routes of the Neolithic dispersal from West Asia into Europe are roughly identified based on archaeological, scientific and genetic data,[1] the complex process summarised as *Neolithisation* is only scarcely understood in both a socio-cultural and a chronological sense. Analysing the open questions, such as the timescale of adoption or adaptation of agriculture or its intensity, quality and impact for early Neolithic communities, requires well-contextualised data from state-of-the-art fieldwork. While the important and well-known Neolithic key sites in southeast Europe form the basis for our understanding of the cultural horizons known as Starčevo, Karanovo, Lepenski Vir or Anzabegovo, they left many blanks in a geographical and cultural sense (Fig. 1).[2]

Filling these gaps was the starting point of our research investigations in southern Serbia within the framework of a collaboration between the Archaeological Institute Belgrade and the Austrian Academy of Sciences with a focus on the region along the South Morava Valley and its tributaries (*Pusta Reka Research*). Extensive, intensive and geo-archaeological surveys allowed the identification of new prehistoric sites,[3] of which Svinjarička Čuka was to become the focus of our excavations since 2018 in collaboration with the National Museum of Leskovac.[4] The site is located on a flat river terrace within a hilly and fertile landscape west of the South Morava River floodlands. The environmental conditions appear very suitable for agricultural communities even until today in terms of soils, fresh water sources and climate.[5] Moreover, various and good-quality lithic raw material sources are available in this micro-region, as shown by Michael Brandl and Christoph Hauzenberger,[6] presumably representing an important factor in choosing this particular site for prehistoric communities.

The associated research project *Neolithic Technologies Trajectories of the Balkans* was designed to study the socio-cultural process along the southern Morava River region, in particular the built environment and the impact of new material technologies during the Starčevo Neolithic.[7] Both the excavations at Svinjarička Čuka and the NEOTECH project faced some delay during the Covid-19 pandemic, including a pause in fieldwork in 2020 as well as in material and scientific analyses until summer 2021. After a restart in the field in August 2021, the study campaign in April 2022 was also able to take place; both offer a new set of contextualised data and results. The research aspects related to the project aims, environmental conditions, excavation strategies and methodologies should not be repeated and will only be summarised when necessary as they follow the already published concept.[8] This contribution aims to offer new data and their interpretation in the context of the Neolithisation of the region with a special focus on stratigraphy and radiocarbon chronology, dwellings, faunal and floral remains including charcoal analysis as well as various materials, including the first presentation of grinding kits, which are important in understanding the food preparation process. The main excavation results are summarised below with a focus on one distinct context preliminarily defined as a potential 'Starčevo house', which is presented in more detail by means of stratigraphy and material analyses.

The Covid-related restrictions on working and travelling during the last two years complicated the post-excavation analyses and affected our original project schedule in many respects. Hence, not all materials from the 2019 and 2021 fieldwork have been analysed in detail yet, which affects the balance in this contribution. The younger occupation phase of the Metal Ages at the river terrace is studied by Aleksandar Bulatović and Ognjen Mladenović and is presented at the end of the paper.

2. Excavations 2019 and 2021

The fieldwork in the years 2019 and 2021 continued in the already opened trenches N1 and S1 (Fig. 2),[9] and was conducted for altogether eleven weeks in both years (19.8.–13.9.2019 and 2.8.–10.9.2021) with a Serbian-Austrian team of experts, students and workers.

The excavations directly continued the former ones from 2018 and followed the same methodological framework and documentation system with a focus on the 5 × 5 m squares R27–R28 in trench N1 and S22–T22 in trench S1.

1 Whittle et al. 2002. – Haak et al. 2015. – Hofmanová et al. 2016. – Krauss et al. 2017. – Borić et al. 2018. – Shennan 2018. – Brami, Horejs 2019. – Stefanović et al. 2020. – Gronenborn et al. 2021. – Marchi et al. 2022.

2 Cf. Porčić et al. 2020.

3 Horejs et al. 2018.

4 Horejs et al. 2019a.

5 Krauss et al. 2017. Cf. Obradović, Bajčev 2016 for the agricultural potential of soils in the Middle Morava Valley.

6 Brandl, Hauzenberger 2018.

7 FWF project no. P32096. Cf. Horejs et al. 2020.

8 Horejs et al. 2019a.

9 For the geophysical results, their interpretation and related location of the excavation trenches, see Horejs et al. 2019a, Fig. 2.

Fig. 2. View of the Svinjarička Čuka river terrace towards the south with the excavation trenches N1 (in front) and S1 (back) (Photo: M. Börner).

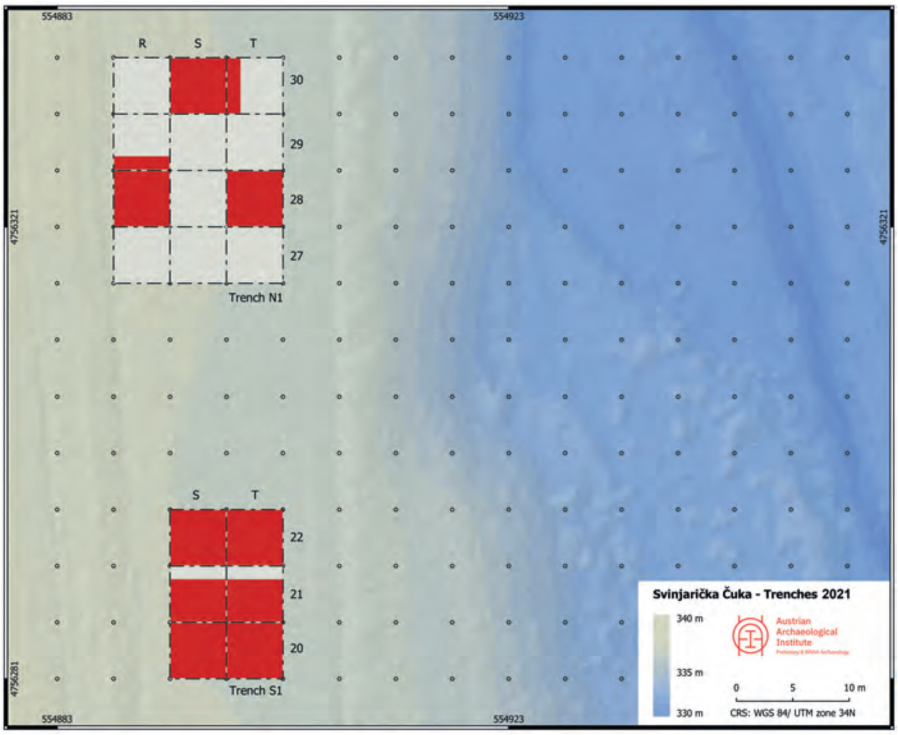

Fig. 3. Trenches N1 and S1 in the Svinjarička Čuka excavations 2019 and 2021 with opened and/or continued grids marked red (Map: M. Börner).

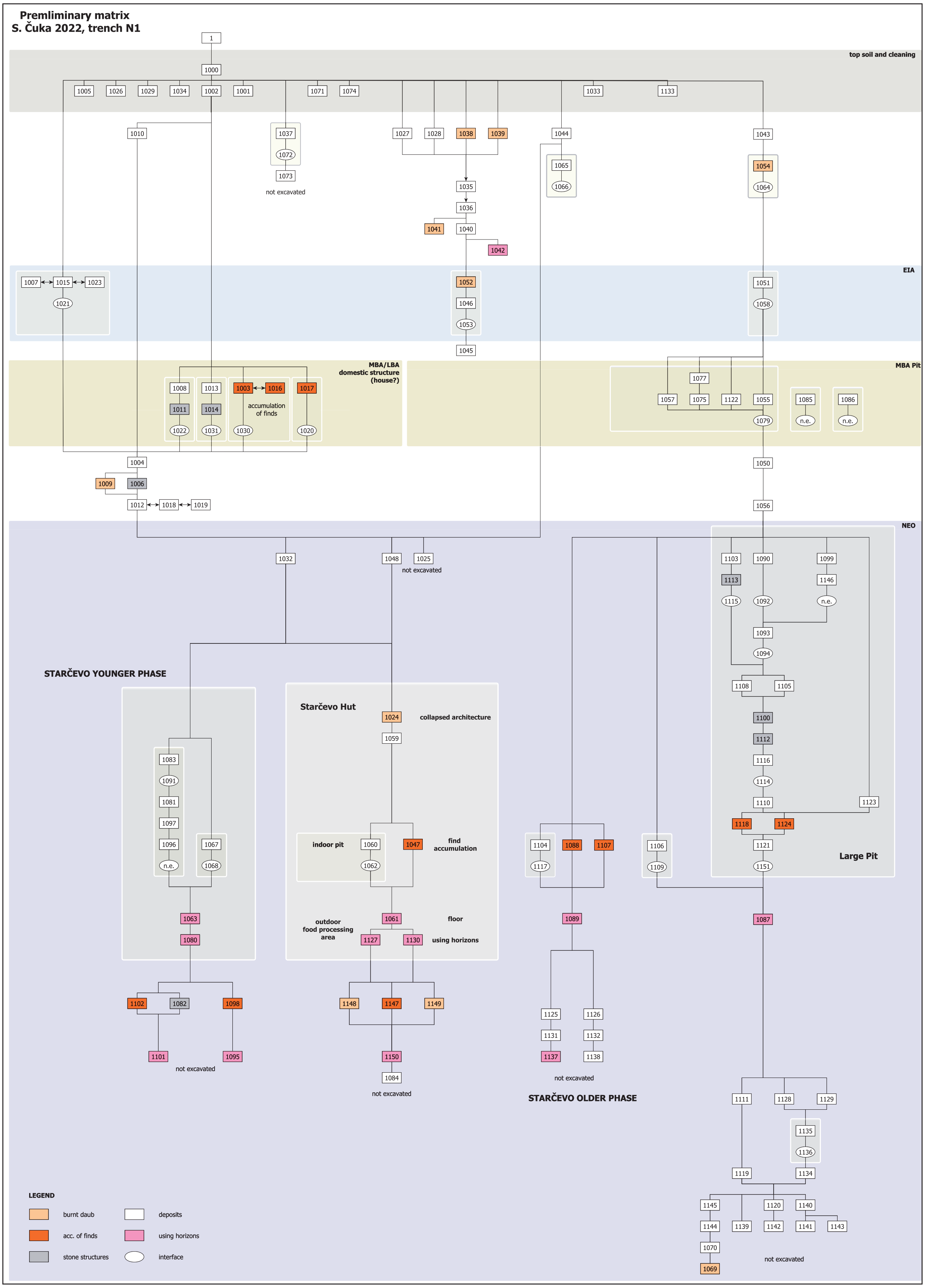

Fig. 4. Matrix of the stratigraphical units (SUs) excavated in trench N1 at Svinjarička Čuka (Graphics: M. Börner, O. Mladenović, F. Ostmann, B. Horejs).

Fig. 5. Overview of a collapsed wattle-and-daub structure within a use horizon designated as 'Starčevo hut' excavated in trench N1 (Photo: F. Ostmann).

The additional squares S30–T30 and T28 were opened in N1 and S–T/20–21 in trench S1 (Fig. 3), doubling the area of investigation to altogether 225 m².

The main anthropogenic phases at the river terrace are so far evident for the Early and Middle Neolithic, the Eneolithic, the Middle and Late Bronze Age and the Early Iron Age. Aside from many detailed questions, the main aims of both seasons were the recovering of pure Starčevo Neolithic contexts, the definition and clarification of the younger occupation phases during the Metal Ages at the river terrace and gaining more insights into the vertical and horizontal stratigraphy of its occupation history. The main results of the excavations can be summarised as follows, starting with the Neolithic: two different phases of Starčevo domestic occupation have been recovered so far, which can be divided into an older and a younger phase. Both revealed various features (Figs. 4–5). The radiocarbon modelling outlined by Lyndelle Webster below supports our stratigraphical assumption of an earlier and later occupation recovered so far. The bedrock has not yet been reached, and this allows us to expect another, earlier Starčevo phase(s) below, as evident in the ^{14}C data from a drilling core (6087–6021 BC, 68.3 %).

2.1. Later Starčevo Features

The younger domestic Starčevo phase can be defined in the northern trench N1 in the squares S–T30 and R28–29, and although they are not physically related yet, their stratigraphical position, height and characterisation allow us to assume that they are roughly contemporaneous, radiocarbon dated to c. 5500 BC (Fig. 4 and below Figs. 10–14).

The uppermost Starčevo-related layer SU 1050 (S–T30 in trench N1) cannot be defined as a use horizon, but appears to represent a layer of possibly relocated Neolithic deposits that contains pure Starčevo materials in large amounts without any younger intrusions. The next following horizontal layers underneath (SUs 1087, 1089) represent a use horizon in an *in situ* position. The accumulation of finds defined as SU 1088 (sherds, small finds) and an accumulation of animal bones are scattered above a stamped clay floor (SU 1089) preserved in large parts of the area. The yellowish-beige clay floor shows a very comparable character to floor SU 1061 in the neighbouring squares R28–29 and appears at the same height level. This youngest identified floor (SUs 1087, 1089) is evident in most parts of the squares S–T30 and allows the definition of the uppermost and youngest Starčevo pure use horizon in this area. A large pit feature (IF 1151) is associated with this youngest floor SU 1087, but can only roughly be defined in its borders due to the later Middle Bronze Age pit (IF 1079) cutting into it (Fig. 36). This large Starčevo pit contains several domestic features, including smaller pits (IF 1092, 1094, 1114) with in-filings, a stone installation (SU 1110) and floor-like limy layers with find accumulations in a horizontal position, including one large Barbotine storage vessel and a bunch of small finds and artefacts (SU 1118). The next layers underneath the 'Large Pit' have been partially recovered (Fig. 4: SUs 1111, 1128, 1129 until 1069), but not finally excavated yet and presumably belong to the next older Starčevo horizon of this area. Another domestic structure related to the younger Starčevo phase at Svinjarička Čuka has been recovered in the squares R28–29, composed of massive stamped clay floors with renewals (SUs 1127, 1150, 1061), a pit feature (IF 1962) and a massive deposition of artefacts and vessels (SU 1047), which represent the horizon of a collapsed 'Starčevo hut' (Fig. 5). This domestic space covers around 2 × 3 m, as indicated by the floors and associated layers. The massive deposition of burnt daub (SU 1024) derives from a collapsed vertical wattle-and-daub structure, which can be interpreted as the remains of a light building or hut.

Two other large features in these squares can be assigned as roughly contemporaneous in stratigraphic terms. A stone installation composed of at least three stones in a horizontal position (SU 1082) is associated with a horizontal brown clay layer and the scattered remains of a vessel. The other large feature of roughly the same date appears as a large pit with brown to dark-brown in-fillings (SU 1096) that presumably continues into the neighbouring squares R27–28 and S28. The recovered levels of the upper fillings contain accumulations of finds (SU 1097), artefacts and implements, medium-sized and small inclusions of burnt daub fragments and small to medium-sized stones, altogether indicating the remains of another domestic feature, which requires further excavation. Overall, three Starčevo features can be associated with the younger phase of the Neolithic site so far: the collapsed remains of a wattle-and-daub hut ('Starčevo hut'), a stone installation in a horizontal position associated with an *in situ* vessel, and finally, a large pit with pure Starčevo material as in-filling and burnt daub fragments indicating the third set of potential architectural remains.

2.2. A Potential 'Starčevo House' of the Earlier Phase

The so far older Starčevo phase has been located in the southern trench S1 as well as in the northern trench N1 in square S30. It remains unclear if these older layers in the two trenches are related to each other or if they represent different chronological horizons at the site. In any case, the extensively excavated features in the squares S–T22 (50 m^2) in trench S1 point towards a large domestic feature, preliminary interpreted as the remains of a 'Starčevo house' (Figs. 6–8).[10] The remains in these squares belong to at least one particular large built structure with several levels of use and presumably also repair subphases, which demonstrates the creation of a domestic space used at least multi-seasonally. The Bayesian models of the radiocarbon dates support our assumption by revealing earlier and later activities during the 57th and 56th centuries BC for the house-related structures (see below with Figs. 10–14). A number of large to very large schist-stone slabs are placed in a horizontal position and frame the outline of the architectural structure, which cannot be securely defined in its borders yet, but measures at least around 7.50 × 4.30 m (Fig. 8).

Altogether five stone slabs or clusters of slabs have been recovered (Fig. 6: SUs 24, 33, 99, 100, 101, 110, 122), which can presumably be reconstructed into a rectangular-shaped ground plan with a potential southeast corner (?) and a limiting north-south-oriented structure preserved to a length of 3.80 m, potentially representing the small side wall in the east (Fig. 7). This eastern row consists of the large stone installations SUs 101 and 100, accompanied by a series of three pits (IF 106, 105, 102) within a north-south line (Fig. 8). These small to medium-sized shallow pits (diameter 0.7–1 m and depth 5–10 cm) contained a small quantity of old, fragmented and small material, such as sherds, stones and pieces of daub, in their in-fillings (Fig. 7). The connected features of the massive flat stones with associated pits point towards wooden (and therefore not preserved) post installations, originally positioned within the pits and/or upon the stabilising plates (Fig. 8).

This technical concept is also evident in the presumably inner part of the structure in the stabilising installations for a wooden post composed of a shallow pit and a cluster of the same kind of flat massive stones in a circular arrangement (SU 122). The addition of further stabilising stones (SU 24) in younger and above-laying floors allows us to assume repair activities (Figs. 6, 9). The presumable inner part of the structure contains a sequence of at least five floors and use horizons, one on top of the other, characterised by particular layers of scattered materials and artefacts in horizontal deposition. The so far oldest recovered floor (SUs 103, 120) was identified in the area west of the north-south-oriented post installation row within an area of c. 4.20 × 4.30 m. The floor is composed of hard stamped clayish soil with lots of

10 The stratigraphical units lying above the building and the covering younger layers have been presented in Horejs et al. 2019a, 182–185.

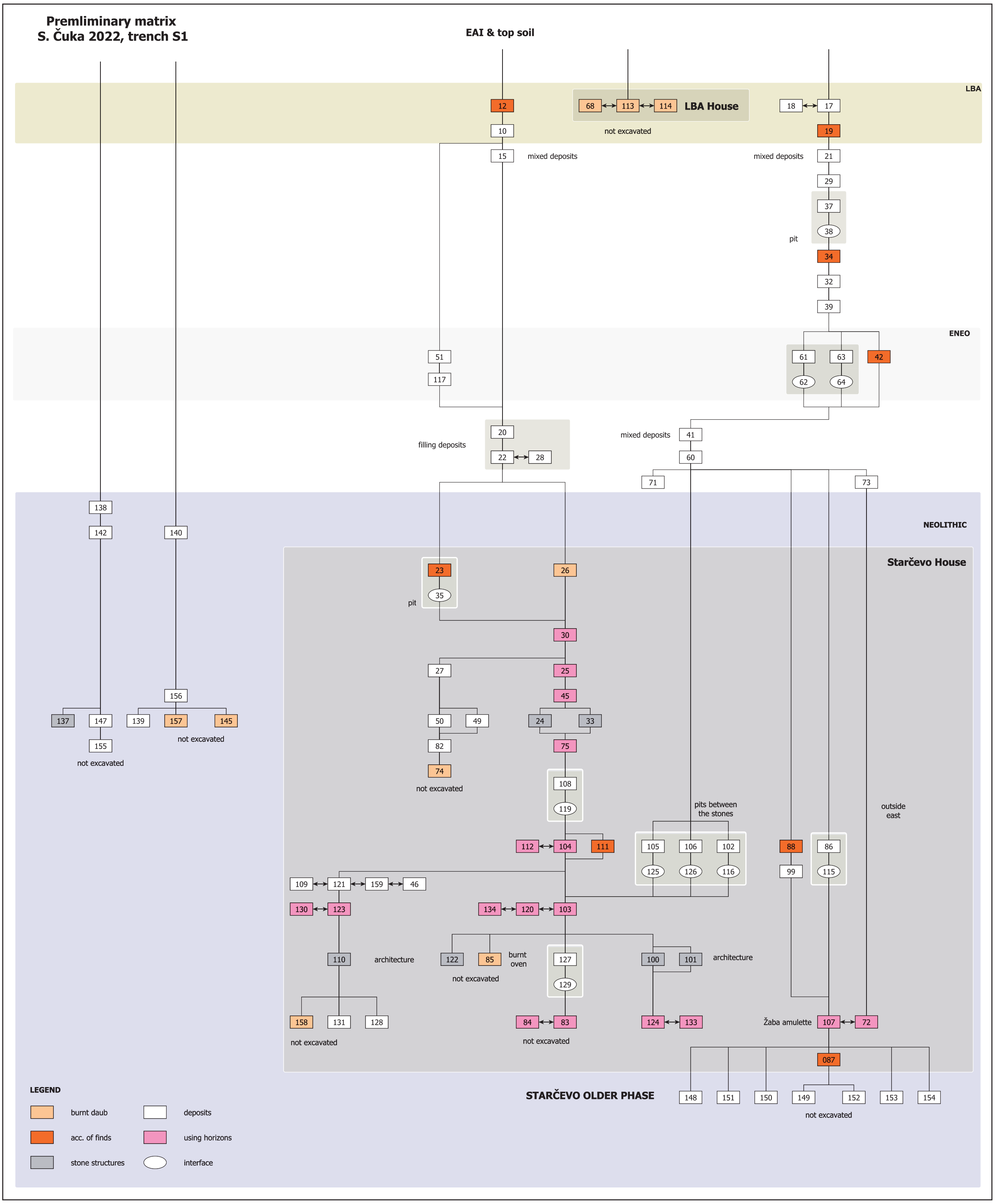

Fig. 6. Matrix of the stratigraphical units (SUs) excavated in trench S1 at Svinjarička Čuka (Graphics: M. Börner, N. Schinnerl, F. Ostmann, B. Horejs).

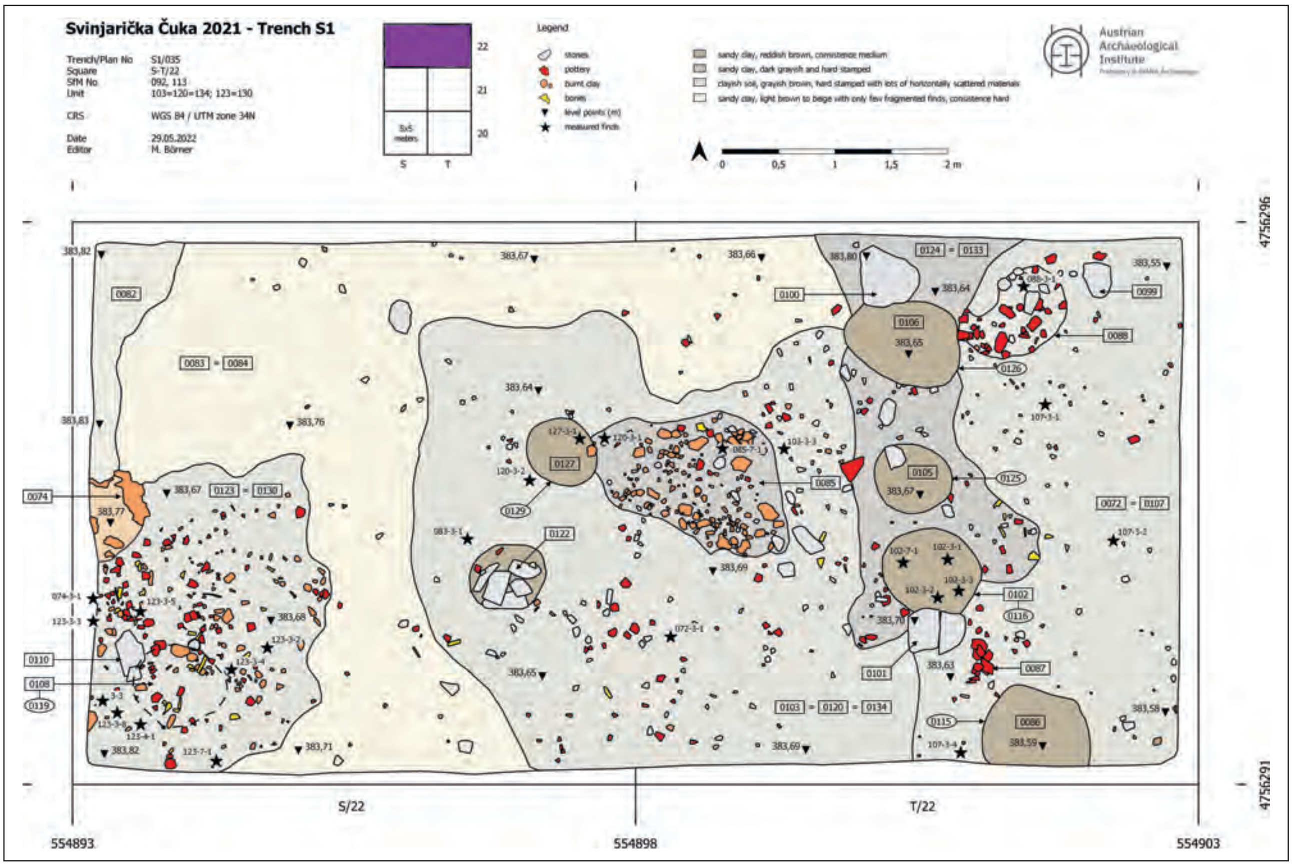

Fig. 7. Detailed mapping of the layers in trench S1, squares S–T/22 of the earlier phase in the 'Starčevo house' with floors (SUs 103, 120, 134), a pyrotechnical installation (SU 85), the architectural remains of pits and wooden-post beddings (SUs 100, 102; IF 116, 105, 106) (Graphics: M. Börner, B. Horejs).

horizontally scattered materials (sherds, bones, artefacts) (Fig. 7). The next layers underneath (SUs 83, 84) differ markedly as light-brown to beige sediments with only a few fragmented finds. The remains of a pyrotechnical installation (SU 85) built with daub and stones (Figs. 7–8) are probably associated with this use horizon. Detailed analyses of this installation have not been accomplished yet. The preliminary assessment of its remains (partially with flattened, white to grey burnt sides) allows us to assume a hearth. The next following younger floor (SU 104) shows the same characteristics of a very hard clayish soil with abundant sherds, artefacts, tools, bones and other implements above it. The floor covers a larger area towards the west, within a total space of 6.50 × 4.30 m. The succeeding floor horizon (SU 75) covers c. 5.60 × 4.30 m and contains larger fragments of pottery (Fig. 9), perhaps indicating some *in situ* depositions, but mostly in-fillings (see below chapter 4). Associated with this use horizon is the renewal of the post installation facility (SU 122) with additional stones (SUs 24, 33).

The next following younger floor (SU 45) stretched over an area of 5.90 × 4.80 m. Later intrusions dating to the Metal Ages are evident, especially in square S22, but the Starčevo materials dominate the assemblage. The succeeding floors SUs 25 and 30 above presumably belong to one use horizon. They are again composed of hard to very hard clayish soil with abundant finds and can be linked with a contemporaneous small platform (SU 26) of burnt daub and a small pit (IF 35); all features of the youngest horizon have been presented already.[11]

While the potential inner part of this 'Starčevo house' with its five use horizons shows abundant materials in fragmented, scattered, dense and horizontal position, the layers east of the north-south post installation line are different (Figs. 8–9). The darker (and partially not so hard) soil of these layers (SUs 72, 107) contains only very small and highly fragmented finds. The remains of one storage vessel (SU 87) can be associated with this horizon and indicate the trampling/floor level. Although further detailed analyses

11 See also Horejs et al. 2019a, 184, 187 and Fig. 9; 190, 192–193 and Figs. 14–15.

Fig. 8. Overview of the 'Starčevo house' in trench S1/T22 with post installation structures in a row composed of massive stone plates (left: SU 101. – right: SU 100) associated with pits (from left to right: IF 116, 125, 126). The remains of a storage vessel (SU 87) and a pyrotechnical installation (SU 85) inside the building belong to the same use horizon (Photo and graphics: F. Ostmann).

are required, our preliminary interpretation suggests another spatial function compared to the floors further west, perhaps an outdoor area associated with the 'house'. Radiocarbon dating supports this interpretation and shows a contemporaneous use of this space with the potential hearth (SU 85) and the earlier floors (SUs 124, 123, 120, 103) of the house (Figs. 6, 11).

Overall, the Starčevo remains in trench S1/S–T22 show intensive domestic activities in this area that can be linked to a built structure preliminarily interpreted as a 'Starčevo house'. Within the dimensions of at least 7.50 × 4.30 m, large stone slabs indicate wooden post footings or beddings, of which one in the inner part has been renewed. So far, it has been possible to identify five floors associated with various installations (platform, hearth, pits, storage), supporting the reconstruction of a domestic space in use during the 57th and 56th centuries BC.

2.3. Metal Ages and Post-Prehistory

The new excavated features from the Metal Ages are presented in detail below (see chapter 11) and will be summarised only roughly. Additional pure contexts of the Eneolithic, as previously recovered in trench S1, are not attested yet, although pottery of the 4th millennium BC is evident as a few later intrusions in some Starčevo layers. Presumable pits or dug-ins of this period were hardly visible in the soil so far. The already indicated potential Middle Bronze Age occupation of the river terrace is supported by a large pit feature recovered in trench N1 dug into the Starčevo Neolithic layers (SU 1050) described above. The domestic use of the terrace during the Late Bronze Age is evident due to the newly recovered remains of a house in trench S1. The Early Iron Age (c. 1000 BC) evidence already attested by pits in trench S1 is supplemented with further domestic features of comparable dating in the same area (squares S–T/20–21) as well as in trench N1. Some later materials at the site indicate short-term activities after the prehistory. One shallow pit feature in trench N1, square T28 (IF 1072, SU 1037) was excavated and defined by Ivan Bugarski, an expert from the Caričin Grad team. Thanks to this team's engagement, these remains are dated to the 15th–16th centuries AD.

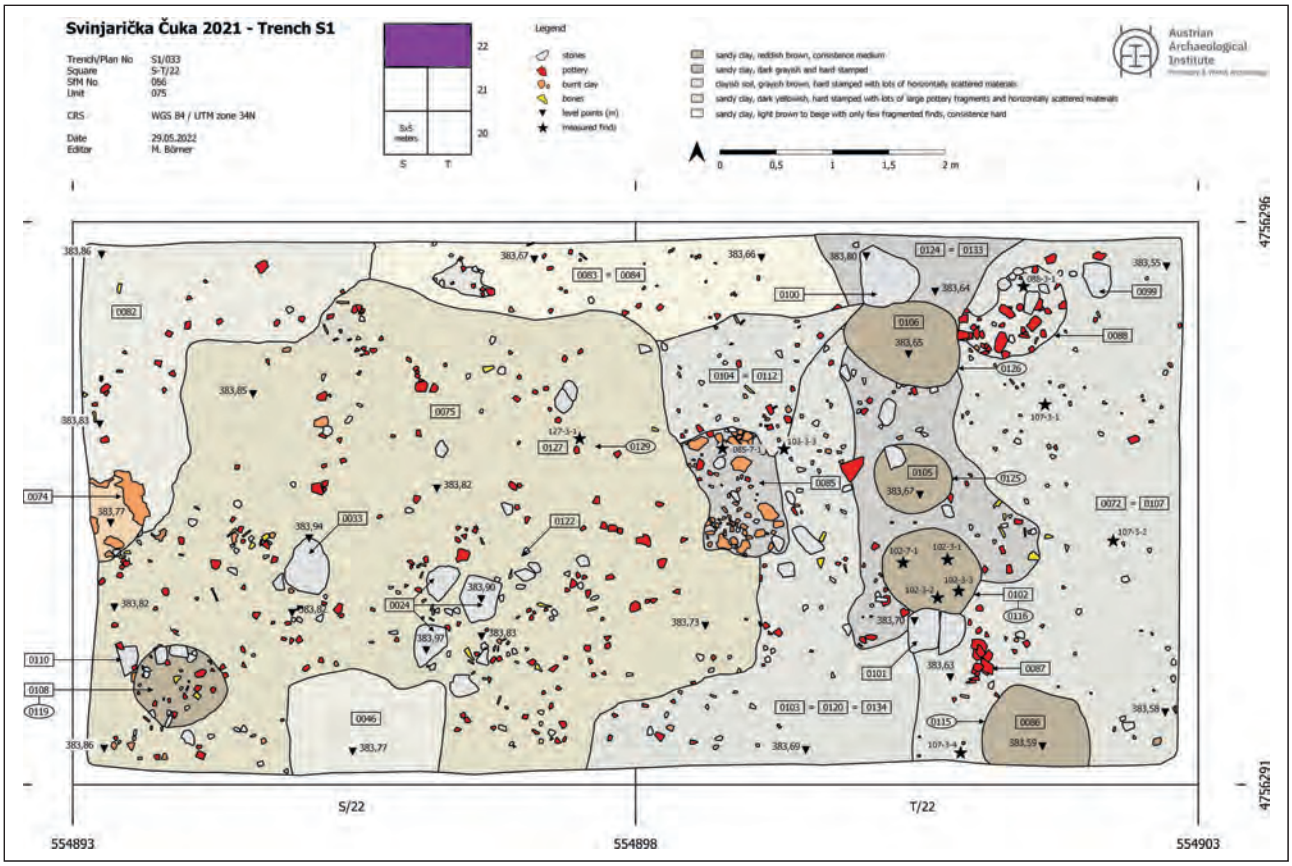

Fig. 9. Detailed mapping of the layers in trench S1, squares S–T/22 of the later phase in the 'Starčevo house' with floors (SU 75) and the architectural remains of pits and wooden-post beddings in the east (SUs 100, 102; IF 116, 105, 106) and the west (central?) part (SUs 102, 24, 33) (Graphics: M. Börner, B. Horejs).

3. Radiocarbon Dating

Twenty-six samples from Neolithic horizons at Svinjarička Čuka have thus far been radiocarbon dated: 19 from trench S1 and seven from trench N1 (Tab. 1). Each represents short-lived material (charred seeds) retrieved by flotation from the series of use horizons. Here we also consider one result (MAMS-34883) from a survey core, since the sample (charcoal) represents a deposit underlying all excavated strata in trench S1. All measurements except one were carried out in the AMS radiocarbon laboratory of the Curt-Engelhorn-Centre for Archaeometry in Mannheim. One measurement was made at the Leibniz AMS laboratory at Kiel University. The radiocarbon ages (^{14}C years before present, BP) and individual calibrated dates (BC; 68.3 % and 95.4 % probability ranges) are reported in Tab. 1. Calibration was undertaken using OxCal v4.4.2 and the IntCal20 curve interpolated to yearly intervals (Resolution = 1).[12]

The dates from all horizons consistently place Neolithic activity at Svinjarička Čuka between c. 5800 BC and 5400 BC (Fig. 10). The survey core date falls markedly earlier, in the late 7th millennium, and may hint at earlier horizons not yet exposed in the excavation. One date from trench N1 and four from trench S1 are obviously outliers (not shown in Fig. 10); four point to late 2nd-millennium BC activity, while one date in trench S1 belongs to the mid-4th millennium BC. Notably, these obvious outliers come from the upper portion of the Neolithic sequences in both trenches, where the risk of intrusive material is higher. Since the samples represent a series of overlying use horizons (shown schematically in Fig. 11), using a Bayesian approach, we can take advantage of this *a priori* relative chronological information to help constrain the radiocarbon results.

Separate models generated in OxCal are presented for trench S1 (Fig. 12) and trench N1 (Fig. 13). These include all data from the excavation trenches except for the five clear outliers. The survey core date is simply plotted below the trench S1 sequence; since there is a substantial time gap (c. 400 years)

12 Bronk Ramsey 2009a. – Reimer et al. 2020.

Period	Lab #	Material	SU		%C	$\delta^{13}C$ (‰)†	^{14}C Age ± 1σ (years BP)	Unmodelled Calibrated Age Range (BC) 68.3 % prob.	Unmodelled Calibrated Age Range (BC) 95.4 % prob.
TRENCH S1									
EARLY NEOLITHIC / STARČEVO	MAMS-40139	emmer grain	20	deposit incl. some burnt clay	42.2	-20.5	3857 ± 21	2434–2236	2456–2208
	MAMS-40138	emmer grain	22	deposit incl. finds, burnt clay and patches of charcoal	56.5	-23.2	6597 ± 24	5610–5483	5616–5480
	MAMS-40137	emmer grain	22	deposit incl. finds, burnt clay and patches of charcoal	59.6	-22.0	6611 ± 24	5612–5486	5619–5482
	MAMS-54201	barley grain	140	deposit with find accumulation	51.4	-19.8	3814 ± 23	2289–2204	2343–2146
	MAMS-54200	Prunus fruit stone	138	deposit with find accumulation	64.6	-15.1	6512 ± 24	5520–5409	5532–5380
STARČEVO	MAMS-40136	emmer grain	26	remains of daub structure	30.6	-23.0	6734 ± 25	5667–5623	5714–5569
	MAMS-40135	emmer grain	26	remains of daub structure	27.1	-23.6	4822 ± 24	3643–3536	3648–3528
	MAMS-46944	emmer grain	26	remains of daub structure	44.3	-21.4	6842 ± 25	5742–5671	5786–5662
	MAMS-46941	emmer grain	30	use horizon incl. finds and burnt clay	43.2	-21.8	6617 ± 25	5615–5486	5621–5482
	MAMS-46943	einkorn grain	45	use horizon incl. finds and burnt clay	42.8	-20.2	6579 ± 25	5552–5480	5611–5478
	MAMS-46942	einkorn grain	45	use horizon incl. finds and burnt clay	53.9	-26.6	3785 ± 22	2281–2146	2289–2141
	KIA-56229	Timopheev's wheat grain	50	deposit with burnt clay	62.0	-21.0	6625 ± 35	5618–5486	5623–5482
	MAMS-54194	barley grain	104	use horizon with find accumulation, incl. occasional charcoal	58.8	-24.1	6613 ± 29	5615–5485	5620–5481
	MAMS-54193	barley grain	103	use horizon with find accumulation	55.8	-29.2	6791 ± 31	5718–5661	5728–5632
	MAMS-54197	emmer grain	120	use horizon with find accumulation, incl. few charcoal fragments	58.0	-19.6	6642 ± 30	5622–5540	5627–5484
	MAMS-54198	hulled barley grain	123	use horizon with find accumulation	47.2	-26.5	6612 ± 31	5615–5485	5620–5480
	MAMS-54192	hazelnut shell	85	accumulation of daub	63.8	-24.4	6606 ± 29	5612–5484	5618–5481
	MAMS-54195	einkorn grain	107	use horizon incl. plentiful daub	59.3	-22.7	6579 ± 30	5553–5480	5613–5478
	MAMS-54199	barley grain	124	use horizon with find accumulation	51.2	-23.7	6846 ± 30	5750–5669	5801–5656
TRENCH N1									
NEOLITHIC	MAMS-46945	emmer grain	1024	remains of daub structure	55.9	-22.8	3770 ± 22	2275–2141	2287–2062
	MAMS-46948	emmer grain	1060	deposit within pit	57.3	-20.7	6585 ± 26	5555–5481	5612–5479
	MAMS-54204	Cornelian cherry fruit stone	1104	use horizon with dense concentration of finds	62.9	-20.5	6762 ± 25	5709–5632	5718–5627
	MAMS-54202	barley grain	1061	use horizon, incl. plentiful daub	59.6	-21.1	6465 ± 25	5473–5386	5479–5374
	MAMS-54203	barley grain	1089	use horizon	57.3	-17.4	6533 ± 24	5525–5474	5608–5411
	MAMS-54205	barley grain	1129	use horizon and clay floor, with small charcoal pieces and burnt clay	48.5	-19.9	6528 ± 25	5527–5473	5557–5388
	MAMS-54206	pea seed	1134	use horizon with scattered charcoal	61.7	-58.6	6488 ± 34	5479–5385	5521–5371
SURVEY CORE SAMPLE									
	MAMS-34883	charcoal	§68	core PR07 220 cm depth	0.5	-32.9	7221 ± 31	6087–6021	6220–6011

Tab. 1. Radiocarbon dates from Neolithic levels of Svinjarička Čuka († $\delta^{13}C$ error is 2 ‰).

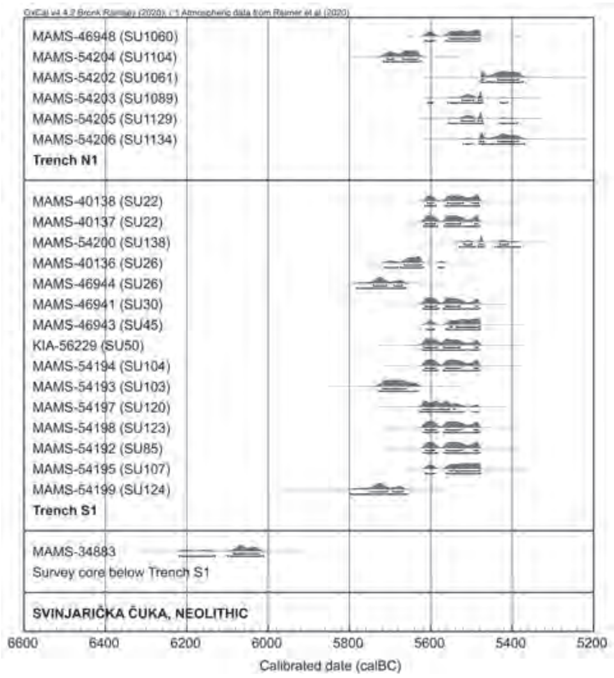

Fig. 10. Independently calibrated dates from Neolithic levels. Bars indicate 68.3 % and 95.4 % probability ranges (Graphics: L. Webster).

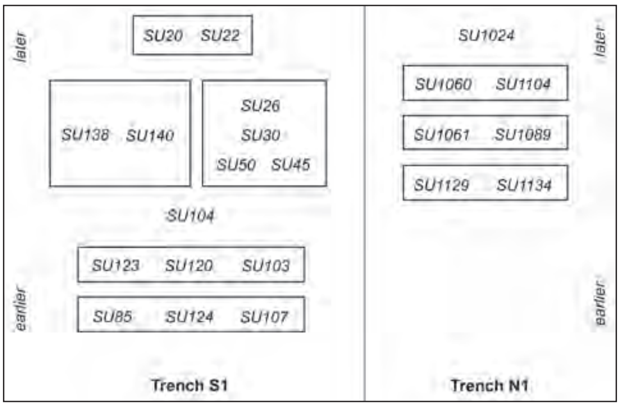

Fig. 11. Schematic of relative chronological order assumed for the Bayesian models, based on stratigraphy (Graphics: L. Webster).

between this date and the excavation sequence, including it in the model adds no useful constraint. OxCal's outlier functionality is applied in the models to help identify and downweigh poorly fitting data.[13] Dates are assigned an initial 5 % *prior* probability of being an outlier, and the model calculates a *posterior* outlier probability, assuming that outliers follow a Student's *t* distribution.[14]

The Bayesian models date the Neolithic activity exposed in trench N1 close to 5500 BC (5525–5470 BC, 68.3 %; 5560–5375 BC, 95.4 %). The upper Neolithic layers of trench S1 seem to reflect the same timeframe, though the multi-mode result caused by the shape of the calibration curve allows some probability (~16 %) close to 5600 BC. The lower part of the S1 sequence likely reflects activity between 5625 and 5525 BC (68.3 %).

4. Starčevo Pottery Analyses

All the Neolithic pottery from well-defined Starčevo stratigraphical units excavated to date has been processed, photographed and undergone basic statistical recording. In addition, nearly 4000 diagnostic Starčevo fragments (rims, bases, handles and decorated wall sherds, see Fig. 14) have been recorded in the project database in terms of dimensions, decoration, ware group and aspects of their production. The sherds recorded in the database form the basis of the proportional estimations of the different pottery types discussed below in order to provide a provisional overview of the assemblage to date whilst excavations, pottery recording and refitting work is ongoing. There is no discernible difference between the types of pottery found in the north and south trenches, with joins found for vessels between the trenches (SU 1054 joins with SU 51) which suggests movement of pottery across the site generally. As such, the pottery will be discussed together to give an overall impression of the repertoire of shapes in use at the site, followed by a more detailed discussion of the pottery associated with the possible 'Starčevo house' in the south trench.

To complement the typological work, 48 sherds from the site are currently undergoing raw material and technological analysis, the results of which will be published in a separate article focused on pottery production. In summary, the technological and raw materials analysis has confirmed macroscopic observations[15] that the pottery was made using a limited variety of silicate-rich sandy raw materials, geologically compatible to the area surrounding the site, and often with the addition of organic temper (Fig. 15). Additionally, the pottery was made and decorated using a range of different techniques and tools to achieve different finishes, such as the layering of wet clay onto a vessel to produce barbotine

13 Bronk Ramsey 2009b.

14 For example, with a 100 % posterior outlier probability, MAMS-46944 [O:100/5] is identified as a likely outlier and its influence accordingly downweighted; MAMS-46941 [O:2/5] is unlikely to be an outlier. Note that fully removing dates with a high posterior outlier probability from the trench N1 and S1 models does not substantially affect the outcome; it is preferable instead to allow the model to downweigh them.

15 Horejs et al 2019a, 194. – Burke 2022a, 73–74.

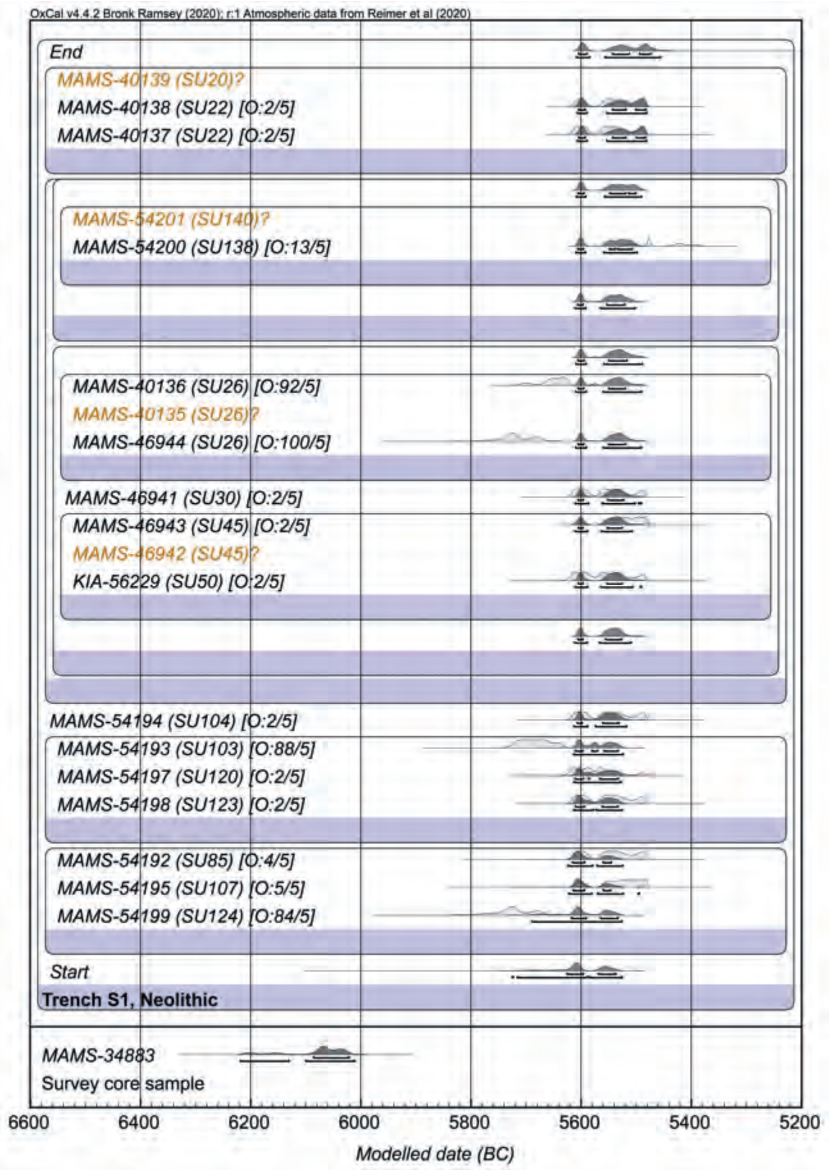

Fig. 12. Bayesian model for the Neolithic in trench S1. Independently calibrated dates before modelling appear in light grey; posterior probability distributions after modelling are shown in dark grey, with 68.3 % and 95.4 % probability ranges indicated. Dates coloured brown (followed by '?') indicate where obvious outliers (younger by millennia) have been excluded. MAMS-34883 (survey core sample) is not included in the model, but simply plotted below (Graphics: L. Webster).

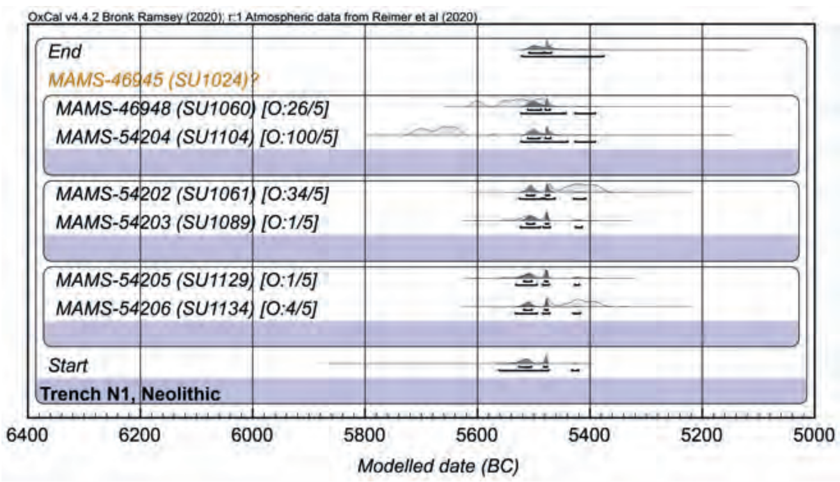

Fig. 13. Bayesian model for the Neolithic in trench N1 (Graphics: L. Webster).

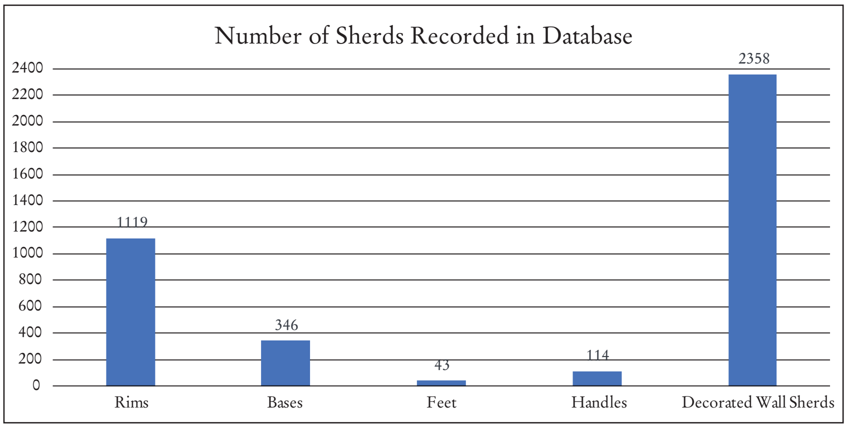

Fig. 14. Graph showing the proportion of different diagnostic sherd categories recorded in the project database up until April 2022 (Graphics: C. Burke).

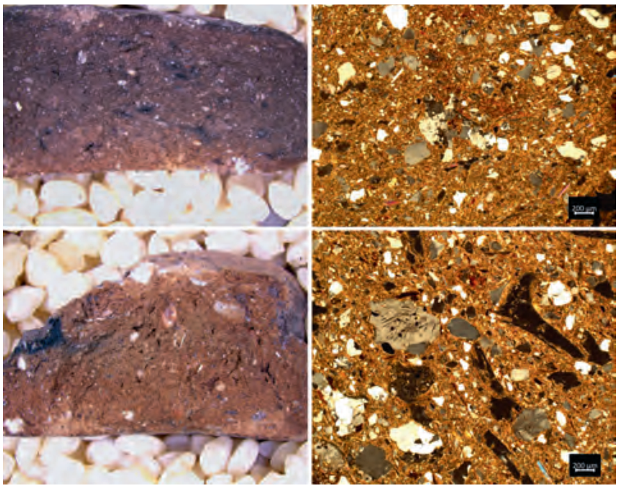

Fig. 15. Macro and micro images of the silicate rich sandy fabrics at Svinjarička Čuka, the bottom image also showing dark elongated remains of organic temper (Photos: C. Burke).

finishes. The varied techniques used are indicative of production by multiple potters who had different approaches to their craft but shared raw material choices in relation to utilising clay sources within the local environment of the site and shared ideas of what the vessel should look like, no doubt more heavily informed by consumer preferences as well as their own cultural context of learning. These results are comparable to technological practices and raw material choices found in other analytical studies of Starčevo pottery from sites across southeast Europe[16] indicative of a broader Starčevo ceramic koine.

As with all Starčevo assemblages, the pottery at Svinjarička Čuka is broadly divided between jars (207 diagnostic sherds in database) and bowls (730 diagnostic sherds in database) (Figs. 16–17), with excavation of deeper layers during 2021 and additional refitting work at the National Museum Leskovac, helping to expand the previously published range of shape variation.[17]

Jars and thick-walled large shapes can be more difficult to identify compared to fine ware and painted bowls due to a lack of diagnostic features, particularly in relation to wall sherds and some smaller jar types sharing similar rim profiles to unpainted bowl types. However, those that are definitely categorised as jars can be roughly divided between smaller and larger types, the largest being classified as storage jars due to their profile and diagnostic dimensions (with an average wall thickness of 2 cm and average rim diameter of 30 cm). Their large sizes suggest they were probably quite cumbersome and less portable than other jar types, although there is, of course, the possibility of a range of different functions.[18] The larger jars are usually globular with slightly flaring rims or with a short neck/collar, whilst medium to smaller types, which are more common, display globular, conical or pear-shaped profiles, and include funnel necks and narrow conical mouths (Fig. 16). Jars can display horizontal or vertical loop handles, with smaller varieties including pierced knob handles on the belly, most likely for hanging the vessel up. The jar profiles and rim types are especially comparable to types LO00, LO10, LO30, LO40, LO50 and LO60 at Blagotin[19] and similar to the Early

16 Kreiter et al. 2013. – Dzhanfezova, Doherty, Elenski 2014. – Vuković, Svilar 2016. – de Groot 2019. – Spataro 2019. – Spataro et al. 2019. – Dzhanfezova, Doherty, Grębska-Kulow 2020. – Papadakou, Kotsakis, Urem-Kotsou 2021.

17 Horejs et al. 2019a. – Burke 2022a. – Burke 2022b.
18 Burke 2022a, 77.
19 Vuković 2004, 151–153.

Fig. 16. Examples of jar profiles from Svinjarička Čuka. – Top row left to right: pear-shaped jar from SU 87, globular jar with flaring rim from SU 1047. – Bottom row left to right: conical-necked jar from SU 1044, funnel neck amphora from SU 124, globular-biconical closed vessel from SU 45 (Graphics: D. Blattner, M. Börner).

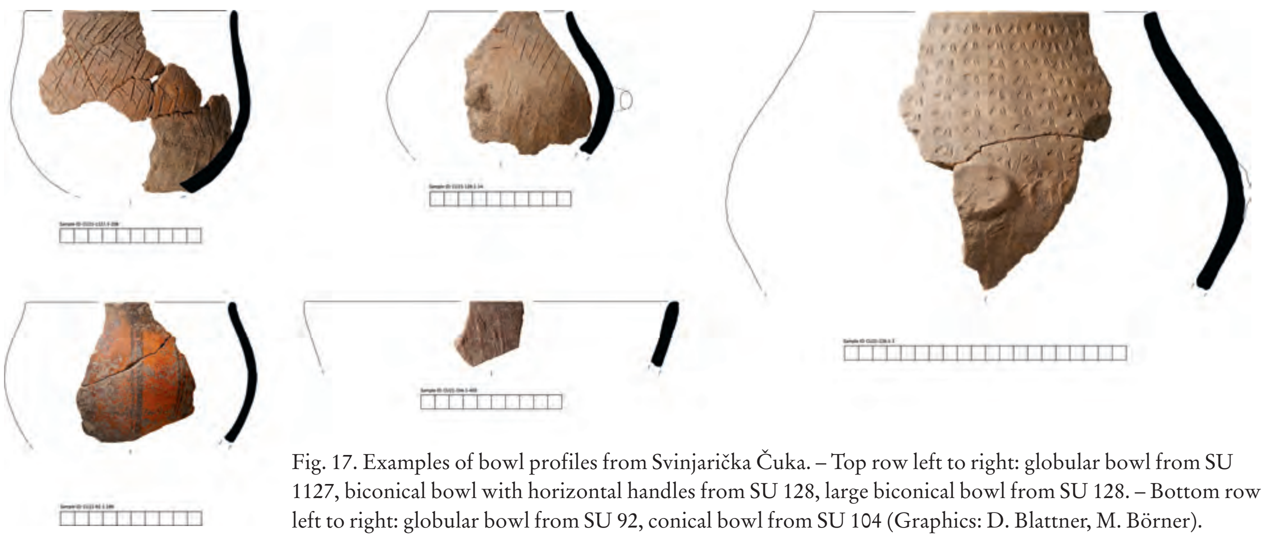

Fig. 17. Examples of bowl profiles from Svinjarička Čuka. – Top row left to right: globular bowl from SU 1127, biconical bowl with horizontal handles from SU 128, large biconical bowl from SU 128. – Bottom row left to right: globular bowl from SU 92, conical bowl from SU 104 (Graphics: D. Blattner, M. Börner).

Neolithic profiles at Lepenski Vir[20] and Gălăbnik phases VI–IX.[21]

Like the jars, bowls can be broadly divided between smaller and larger shapes, the former being more abundant in the assemblage. Larger types, with an average rim diameter of 30 cm and wall thickness of 1 cm, are usually conical, globular, or in some cases, biconical in shape (Fig. 17) and most likely relate to larger-scale activities compared

20 Perić, Nikolić 2016, 252 and Fig. 212.
21 Pavúk, Bakamska 2021, 122–126.

Fig. 18. Examples of surface modification and decorative styles (Photos: F. Ostmann, N. Pantic).

to the more abundant smaller types. The smaller varieties have an average rim diameter between 16 and 20 cm and a wall thickness of 0.6 cm, and are often biconical with either a sharp or more rounded carination at the belly, accompanied by globular and hemispherical to S-profile types. The bowl shapes at Svinjarička Čuka are comparable to profiles from many Starčevo sites both within and outside of Serbia, such as Blagotin (e.g. types ZL00 ZL40, ZL50 and ZP00),[22] Starčevo Grad,[23] Alsónyék,[24] Gălăbnik VII–X[25] and Balgarchevo I, particularly bowl type 2.2b.[26] However, at Svinjarička Čuka monochrome polished or burnished finishes are not common. Instead, surfaces are predominantly treated with barbotine, roughened, incised or painted finishes, indicative of being later in the Starčevo sequence (see below). As previously discussed,[27] the majority of the recorded pottery at Svinjarička Čuka is unpainted (Fig. 18), dominated by roughened or pseudo barbotine (35 %) and barbotine types (12 %), alongside incised wares (12 %), accompanied by smaller amounts of impressed (1 %) and 'Impresso' wares (<1 %). Smoothed, polished and burnished surfaces, and surfaces with applied decoration combined make up approximately 12 % of the fully recorded assemblage that displays some form of surface modification.

Barbotine is divided between structured barbotine, where there are vertical grooves and striations on the vessel, and the unstructured variety, where the surface displays clay droplets and an unorganised patterning, whilst roughened surfaces display no striking features. Both barbotine and roughened surfaces appear on a wide variety of vessel shapes and sizes, from large storage jars to small bowls, although notably, these finishes are more common on jars and conical bowl shapes. The broad distribution of these surface finishes demonstrates that they are not associated with a specific functional class, vessel size, or consumption activity at Svinjarička Čuka, but are more likely related to general aesthetic qualities and pottery sets. Incised pottery is usually linear with chevron, zig-zag and cross-hatch designs, the former being common on biconical bowls in particular but also including small and medium jar shapes. These finishes and motifs are consistent with those of other Starčevo assemblages such as linear incised pottery at Grivac II–III,[28] Blagotin,[29] and Donja Branjevina;[30] the small number of applied cordons also find parallels at Donja Branjevina such as the zig-zag type,[31] as do the rosettes of both barbotine and incised style.[32] The Impresso wares encompass a variety of motifs and decorative techniques, being both impressed and incised, with and without tools, and represent a type of

22 Vuković 2004, 152–153.
23 Arandjelović, Garašanin 1954, 69–73.
24 Oross et al. 2016, 97–98.
25 Pavúk, Bakamska 2021, 108–109, 158–162.
26 Pernicheva-Perets, Grębska-Kulow, Kulov 2011, 175.
27 Horejs et al. 2019a. – Burke 2022a. – Burke 2022b.

28 Bogdanović 2008a, 102.
29 Vuković 2004, 148.
30 Karmanski 2005, 306 and Pl. CCIX.
31 Karmanski 2005, 112 and Pl. XXVIII.
32 Karmanski 2005, 302 and Pl. CCV.

SU	Rims	Bases	Decorated Wall Sherds	Handles	Total Diagnostic Sherds	Undiagnostic Wall Sherds
45	195	59	486	20	760	1608
72	22	11	64	4	101	336
75	65	31	210	9	315	399
104	184	50	477	19	730	1030
107	41	15	131	3	190	565
120	40	12	121	2	175	189
123	28	15	67	5	115	143
124	10	3	25	0	38	61
130	6	2	21	1	30	21

Tab. 2. Overview of pottery statistics and broad dating for SUs associated with the possible 'Starčevo house'.

surface decoration that has a very large distribution which has formed a central focus in discussions of spheres of cultural influence and contact.[33] The motifs and techniques of execution at Svinjarička Čuka correspond particularly well with those analysed at Pavlovac,[34] as well as Impresso types at Blagotin, and outside of Serbia, such as at Galovo in Croatia[35] and Anzabegovo in North Macedonia.[36]

Pottery with slipped or coated surfaces (Fig. 18) accounts for up to 20 % of the fully recorded assemblage, whilst painted pottery forms less than 6 %; certainly, the low proportion of painted pottery is typical of Starčevo assemblages. Slipped or coated surfaces at Svinjarička Čuka are usually red in colour, alongside smaller amounts of cream-buff examples. Painted motifs can appear on pottery that is slipped or on vessels that do not appear to have been coated first but are commonly polished or burnished. Motifs on the pottery recorded to date are commonly black linear, spiraloid or curvilinear, although a small number of red painted and some brown painted sherds have also been excavated in 2021 (both less than 1 % of the pottery recorded to date). The motifs on the pottery have parallels to Starčevo sites across southeast Europe such as Starčevo Grad,[37] Alsónyék,[38] and Gălăbnik VIII–X.[39] There are particularly striking parallels to the black on red spiral, and the brown on brown painted spiraloid motifs from Balgarchevo I[40] and parallels to brown on orange motifs from Anzabegovo II (spiraloid) and III (linear),[41] all of which usually occur on similar bowl shapes.

The range of sizes, shapes and decorative styles found at Svinjarička Čuka suggests not only a degree of chronological variation between earlier and later phases, but also different contexts and methods of use for these vessels that probably included food preparation, potential craft activities and small-scale storage.[42]

4.1. Pottery from the Potential 'Starčevo House'

This section will discuss the pottery from SUs 45, 72, 75, 104, 107, 120, 123, 124 and 130 (See Tab. 1 for overview). Of these SUs, 45, 75 and 104 have had all their diagnostic sherds entered into the project database, whilst the remaining SUs have undergone basic processing, photographic and statistical recording. Generally, all SUs contain five or fewer sherds from later periods, whilst SUs 124 and 130 have no later material; as such, all layers are considered as Starčevo.

The pottery from this area is commonly fragmented and abraded, and whilst it was not possible to identify a specific distribution pattern for particular pottery types, it was notable that certain SU and grid squares contained higher sherd counts and better-preserved sherds with more joins. In general, the SUs associated with the potential structure yielded a very varied repertoire of shapes and surface finishes, from storage jars to painted bowls (Fig. 19). Of particular

33 Çilingiroğlu 2010.
34 Vuković, Svilar 2016.
35 Minichreiter 2007.
36 Gimbutas 1976, 55.
37 Fewkes, Goldman, Ehrich 1933, 45–45.
38 Oross et al. 2016, 96–98.
39 Pavúk, Bakamska 2021, 156–171.
40 Pernicheva-Perets, Grębska-Kulow, Kulov 2011, 457–458 and Pls. I/5–14, II/1–7.
41 Gimbutas 1976, 55–64.
42 Burke 2022a.

note was the presence of a number of monochrome sherds belonging to a large globular vessel from SU 75 that could be partially refitted (Fig. 19/left image in row two). Additionally, SUs 104, 123 and 124 contained many of the best-preserved sherds and refits, suggesting that the pottery had not moved around as much as in other SUs, with a good mix of bowl and jar types. Of special note was a dark linear painted bowl refitted from SUs 104 and 123 (Fig. 18/middle of row four) whose decoration is a direct match for a dark linear painted piece from the nearby site of Čekmin,[43] highlighting strong local typo-technological traditions. The area also yielded several pieces of a spiraloid bowl (Fig. 19/row one) and well-executed linear incised decorated pottery (Fig. 19/row two).

Also of note was the high number of pedestal bases in this area (18 fully recorded to date, 10 of which come from SU 45 alone), including an unusual red pedestal base with a curvy profile from SU 104 (Fig.19/left image in row three), for which, although it is similar to tripod bases published from other sites such as Donja Branjevina,[44] we have yet to find an exact match. Additionally, there were a number of semi-pierced pedestal bases in relatively close proximity, with two in grid A4 of SU 75 and one in grid B4 of SU 104. As discussed elsewhere,[45] the semi-frilled holes are from secondary use of these bases and may be related to something like a bow drill, and whilst pedestal bases, including those with such holes have been found in other parts of the site, they are not usually found in this abundance in close proximity. As such, the examples within these SUs may relate to original activities within the potential 'Starčevo house'. In addition to the Starčevo ceramics, well-preserved Vinča small and large bowl types were found in SUs 45, 104 and 123 related to disturbance from a probable Vinča pit (examples in Fig. 19/right image in row four), and testify to the continued use of the site during the Neolithic. Taken together, the assemblage from the SUs associated with the potential 'Starčevo house' fit well with the pottery types and their relative proportions found from the majority of other SUs at Svinjarička Čuka. The condition of the pottery, with a high level of fragmentation but low number of refits, and the general absence of distinctive distribution patterning, suggests that the pottery was not lying within its primary context of use. Instead, it seems more likely this relates to the trampling of pottery within possible floor layers identified by the excavators, and the infilling of the potential structure after its abandonment, when it was probably used as a refuse area.

4.2. Starčevo Pottery Dating

The absence of polychrome and of white painted pottery at Svinjarička Čuka and the comparatively small amounts of Impresso ware suggest that the assemblage excavated to date is Starčevo II–III but not before Starčevo II, with similar pottery styles at Rudnik III–IV,[46] Dubrava I,[47] and Tečić.[48] The radiocarbon dating of layers containing similar pottery styles at other Starčevo sites matches the dates from Svinjarička Čuka, with such assemblages dating to between 5700/5600–5500, including those outside of Serbia, in particular related to similar painted motifs and frequencies (e.g. Alsónyék).[49] The relative proportions of the different pottery surface finishes at Svinjarička Čuka also correspond to the 5700/5600–5500 range within the large-scale study by Michela Spataro which has collated radiocarbon dates and pottery frequencies at 13 different sites.[50] Importantly, the presence of shared pottery types and styles not only shows similar chronological synchronicity to other Early Neolithic sites across southeast Europe, but also demonstrates that the community at Svinjarička Čuka subscribed to widely held ideas about what vessels should look like.

5. Lithic Analyses

As for the previous season, lithic raw materials used for chipped stone production were identified according to the methodological approach outlined in Barbara Horejs and colleagues.[51] In brief, each individual artefact was macroscopically and stereo-microscopically grouped to gain petrological and microfacies information, which helps to assign particular materials to local or extra local source regions based on our knowledge from previous raw material surveys and geological studies in the wider region.[52] The study of technological features was carried out following the *chaîne opératoire* concept, determining which stages of the lithic reduction process are present within the assemblage to gain first insights into the economic behaviour of Svinjarička Čuka's Neolithic inhabitants. For the current study, the focus was on use horizons associated with what has been interpreted as a Starčevo house structure to test

43 Bulatović, Jović 2009, 340.
44 Karmanski 2005, 165 and Pl. LXXVII.
45 Burke 2022b.
46 Dimitrijević 1974, 74. – Nikolić 2005, 55–56.
47 Nikolić 2005, 57.
48 Galović 1962 cited in Nikolić 2005, 58.
49 Oross et al. 2016, 103–106.
50 Spataro 2019, 43.
51 Horejs et al. 2019a, 202–203.
52 Brandl, Hauzenberger 2018.

Fig. 19. Examples of diagnostic pottery from SUs relating to the potential 'Starčevo house'. – Row one: SU 45. – Row two: SU 75. – Row three: SU 104. – Row four left: SU 107. – Row four right: examples including Vinča sherds from SU 123 (Photos: F. Ostmann).

Raw material	NLS local	NLS prov. indet.	NLS white	NLS/opal	'Balkan Flint'	Chert prov. indet.	Indet. burnt	Jasper	Clear quartz	Quartz
technical category	no#	no#	no#	no#	no#	no#	no#	no#	no#	no#
raw/unworked	2									
tested	2									1
pre-prep/precore	1									
cores	9							1		1
blade unretouched	9									1
blade used/retouched	6									
flakes unretouched	87									13
flakes used/retouched	10							1		
debris unretouched	138							4		
debris used/retouched	0									
minidebitage <15 mm	10									
ALL	**274**							**6**		**16**
weight in g	3642.7							72.95		201.6

Fig. 20. Lithic assemblage from SU 45 (Graphics: M. Brandl).

variability in raw material use inside in contrast to outside of the building, which is one important step towards identifying the lithic raw material economy. Additionally, the assemblage from each individual use horizon is discussed from a lithic perspective.

5.1. Sequence of Use Horizons inside the 'Starčevo House'

From youngest to oldest, the use horizons SUs 45–75–104 and 120–123–130 (interpreted as the inside area of the house) and 72=107 (outside area) as displayed in Fig. 6 were investigated, displaying different patterns of raw material and artefact distribution. In the uppermost horizon SU 45, only local lacustrine chert (NLS), jaspers and quartz were identified. Of those, NLS makes up the largest group by far, followed by quartz and only accompanied by a small number of jasper artefacts (Fig. 20).

While all elements of the *chaîne opératoire* are represented in NLS, only selected parts of the sequence are documented for the other two raw material groups. Interestingly, cores exist from all three raw material types, while unretouched flakes are entirely missing from the jasper group, which yielded one retouched flake instead. The lithic assemblage from SU 75 consists of NLS, clear quartz and vein quartz. As in SU 45, local NLS dominated this assemblage, covering all stages of lithic production from prepared nodules to discarded chipping and heat debris, which makes up the majority of all lithics in this context (Fig. 21). In the small quartz assemblage, one core is made from clear quartz and one from vein quartz, with the latter yielding few pieces of unretouched debitage.

The next oldest use horizon, SU 104, is the archaeological horizon with the richest and most diverse lithic collection (Fig. 22). This assemblage covers all lithic raw material varieties documented so far from Svinjarička Čuka, except for obsidian. Again, local cherts (NLS) represent the majority of all lithics, whereby debris and unretouched flakes clearly dominate. Except precores, all stages of the *chaîne opératoire* are present, indicating on-site production using the local material. All other materials are only present in marginal amounts. NLS of undetermined origin (including a characteristic white variety which was frequently used for modified tools) is also present in small amounts. The potential sources of those types are still the subject of ongoing raw material and provenance analyses. Jasper, a locally available resource, is only represented by five specimens; however, the total weight contrasts with this low number of pieces, showing that large nodules (one flake core and a piece of fire debris) were used at the site. Clear quartz and vein quartz occur in very small numbers, which corresponds to the general observation from this context. Worth mentioning is the presence of two blades (one of which is retouched) and two unretouched flakes produced from 'Balkan Flint' (BF), which attests to the embeddedness of the site's inhabitants within the larger socio-economic framework of the time around the middle of the 6th millennium BC in the Balkans.

The lowest level of use horizons inside the Starčevo house structure is represented by SUs 120, 123 and 130 (Fig. 23). Consistently, local cherts make up the vast majority of the assemblage, with unretouched flakes and

Raw material	NLS local	NLS prov. indet.	NLS white	NLS/opal	'Balkan Flint'	Chert prov. indet.	Indet. burnt	Jasper	Clear quartz	Quartz
technical category	no#	no#	no#	no#	no#	no#	no#	no#	no#	no#
raw/unworked										
tested										
pre-prep/precore	1									
cores	2								1	1
blade unretouched	6									
blade used/retouched	2									
flakes unretouched	23									2
flakes used/retouched	1									
debris unretouched	49									
debris used/retouched	1									
minidebitage <15 mm										
ALL	**85**								**1**	**3**
weight in g	1747.7								2.5	89.2

Fig. 21. Lithic assemblage from SU 75 (Graphics: M. Brandl).

Raw material	NLS local	NLS prov. indet.	NLS white	NLS/opal	'Balkan Flint'	Chert prov. indet.	Indet. burnt	Jasper	Clear quartz	Quartz
technical category	no#	no#	no#	no#	no#	no#	no#	no#	no#	no#
raw/unworked										
tested	2									
pre-prep/precore										
cores	7	1				1		1		
blade unretouched	12				1		1	1		
blade used/retouched	4		2		1					
flakes unretouched	64			1	2	1		1	1	4
flakes used/retouched	6									1
debris unretouched	110						2	2		
debris used/retouched	1									
minidebitage <15 mm	10									
ALL	**216**	**1**	**2**	**1**	**4**	**2**	**3**	**5**	**1**	**5**
weight in g	2229.4	5.8	4.25	5.5	10.2	8.3	5.7	111	2.9	42.9

Fig. 22. Lithic assemblage from SU 104 (Graphics: M. Brandl).

debris being the dominating types. One jasper precore and an unretouched blade of opal from the same geological context as the local NLS, together with flakes produced on local quartz (one of which is additionally retouched), complete this lithic collection, which altogether fits well into the observed overall pattern of raw material use within this house structure.

The overall pattern of lithic raw material use from all use horizons within the Starčevo structure is illustrated in Fig. 24.

5.2. Use Horizons outside the 'Starčevo House'

Adjacent to the documented structure are SUs 72 and 107, which were ultimately equated. The lithic assemblage of SU 72=107 (Fig. 25) displays similar trends compared to the patterns observed inside the house structure (compare Figs. 24, 26): local NLS is the dominating raw material variety, covering most elements of the *chaîne opératoire* including minidebitage, which indicates on-site lithic production. Modified tools are represented in the form of retouched blades and flakes, demonstrating that the finished tools

Raw material	NLS local	NLS prov. indet.	NLS white	NLS/opal	'Balkan Flint'	Chert prov. indet.	Indet. burnt	Jasper	Clear quartz	Quartz
technical category	no#	no#	no#	no#	no#	no#	no#	no#	no#	no#
raw/unworked										
tested										
pre-prep/precore										
cores	6								1	1
blade unretouched	2									
blade used/retouched	2			1						
flakes unretouched	13									3
flakes used/retouched	4									1
debris unretouched	29									
debris used/retouched										
minidebitage <15 mm										
ALL	**56**			**1**				**1**		**4**
weight in g	497.2			1.2				55.7		31.2

Fig. 23. Lithic assemblage from SU 120–123–130 (Graphics: M. Brandl).

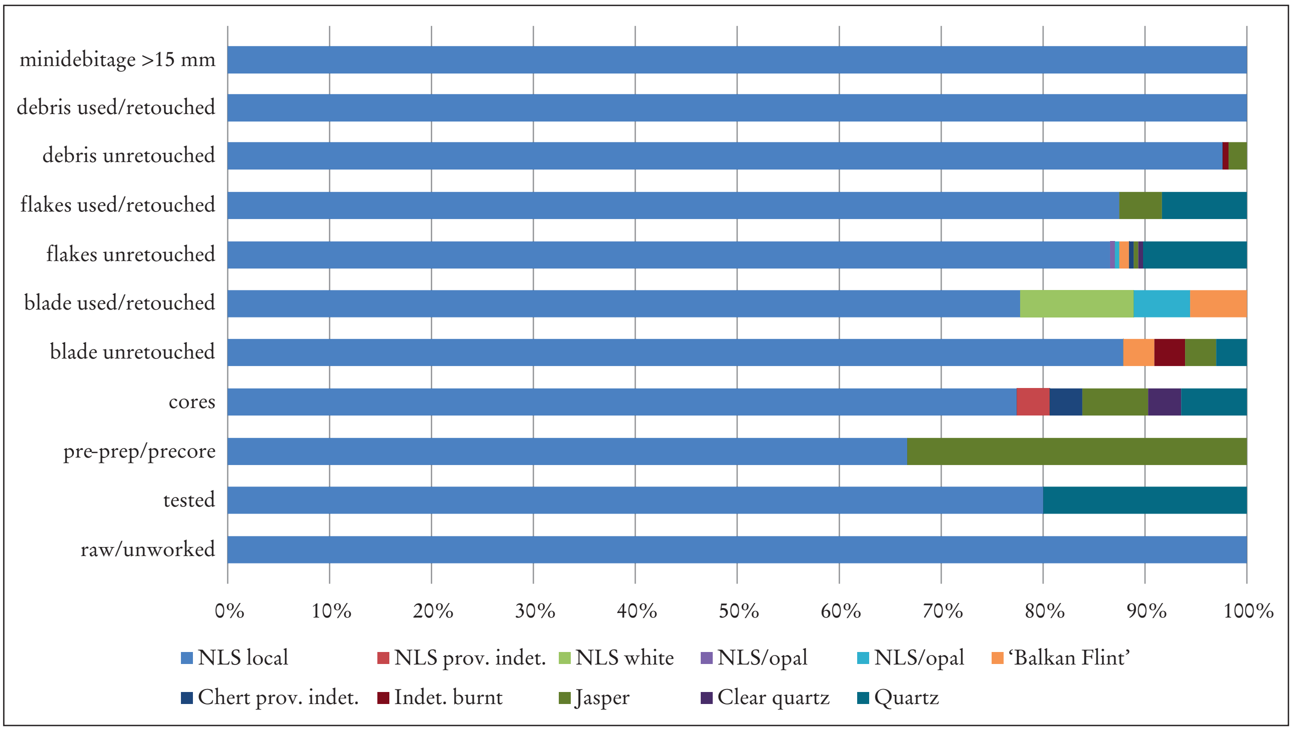

Fig. 24. Overall distribution of lithic raw materials in relation to technological elements in all use horizons inside the 'Starčevo house' (Graphics: M. Brandl).

were also readily used. Two blades from cherts (NLS) of unknown provenance, one piece of jasper debris and – like in SUs 120, 123, 130 – four quartz flakes, of which one is a retouched tool, represent the additional components of this lithic assemblage.

5.3. Conclusion

Within the investigated lithic assemblage connected to a 'Starčevo house' structure, including finds from the inside as well as outside use horizons, raw material use overall follows a consistent pattern in which local cherts of

Raw material	NLS local	NLS prov. indet.	NLS white	NLS/opal	'Balkan Flint'	Chert prov. indet.	Indet. burnt	Jasper	Clear quartz	Quartz
technical category	no#	no#	no#	no#	no#	no#	no#	no#	no#	no#
raw/unworked										
tested										
pre-prep/precore										
cores	2									
blade unretouched	1	1	1							
blade used/retouched	3									
flakes unretouched	16									3
flakes used/retouched	5									1
debris unretouched	46							1		
debris used/retouched										
minidebitage <15 mm	1									
ALL	**74**	**1**	**1**					**1**		**4**
weight in g	513.9	0.5	0.4					0.8		26.3

Fig. 25. Lithic assemblage from SU 72=107 (Graphics: M. Brandl).

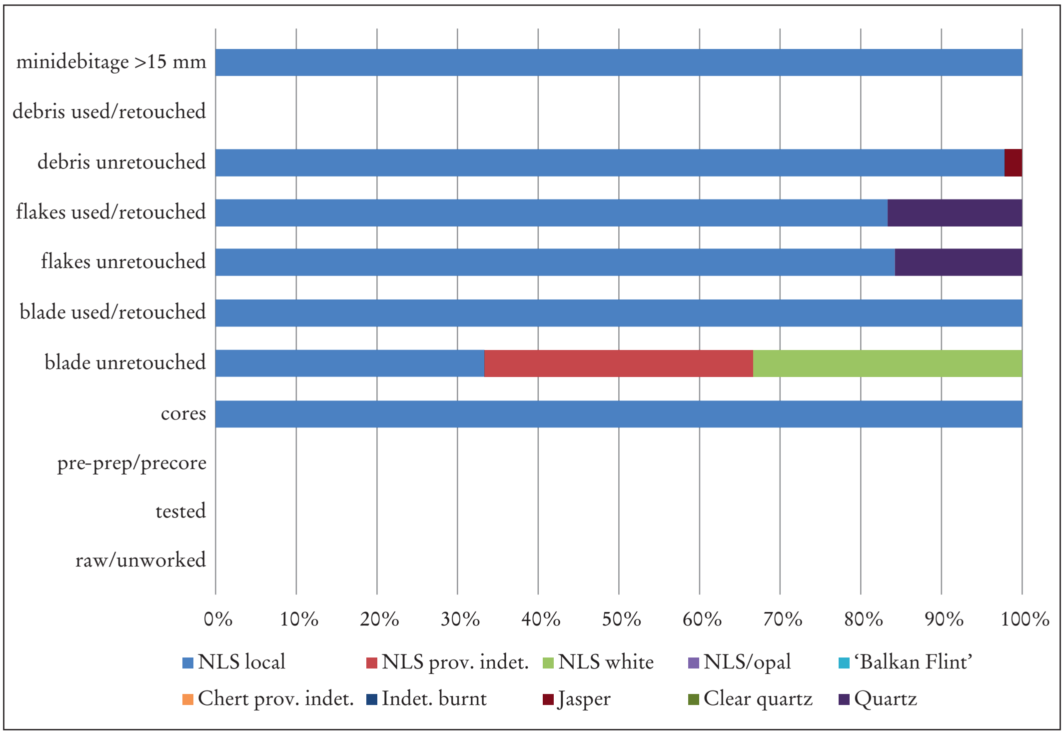

Fig. 26. Overall distribution of lithic raw materials in relation to technological elements in the use horizons outside of the Starčevo structure (SU 72=107) (Graphics: M. Brandl).

Neogene lacustrine origin (NLS) represent the dominating elements. The most diverse assemblage is connected with SU 104, which yielded the richest selection of lithic raw materials, including 'Balkan Flint' and clear quartz (Fig. 22). Technological observations based on the study of the house context point towards a basic core reduction strategy for producing simple flakes of varying sizes and shapes, predominantly using locally available raw materials (Figs. 27–28).

Additionally, blades were produced in the framework of a mixed flake-blade technology as observable from discarded cores. Consequently, both flakes and blades represent target

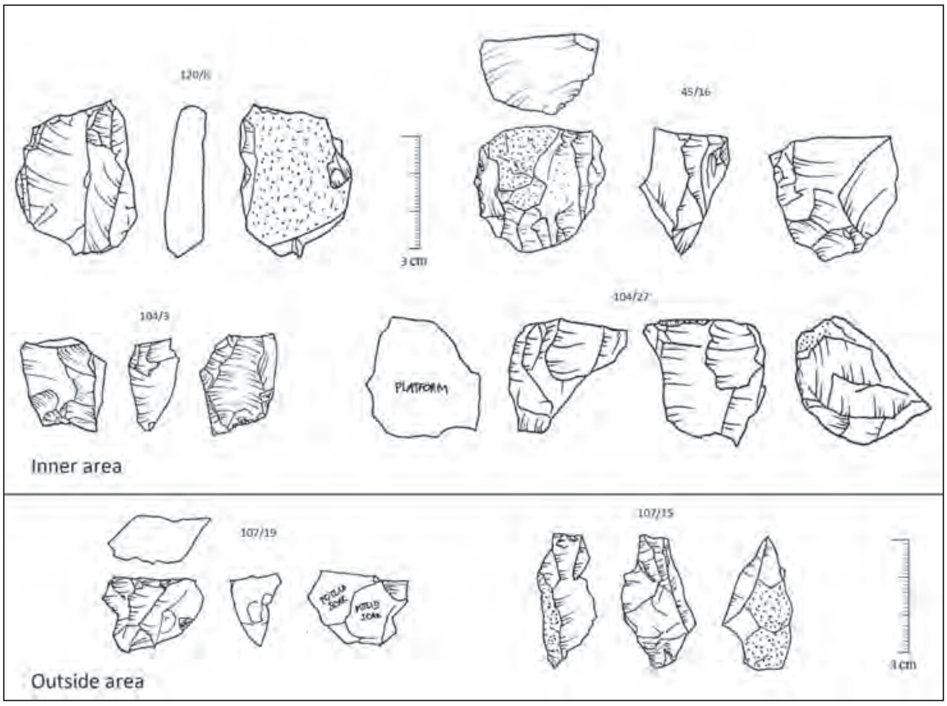

Fig. 27. Different core types from the inner and outside areas of the house structure (uni-, multidirectional and bipolar cores) (Graphics: B. Milić).

Fig. 28. Selected lithics from SU 104 illustrating elements of the *chaîne opératoire* and raw material varieties (Photo: F. Ostmann).

products as indicated by the frequency of retouched tools from both categories. The most common production method was hard hammer percussion within this generally 'expedient' technology, mainly involving cherts (NLS) of local origin, supplemented by minor components of local jasper and quartz. Cherts of unknown origin are clearly underrepresented, whereby one specific material, a white non-translucent variety, was more frequently used for regular blade production and modified tools (see Figs. 22, 25). Generally, regular blade production is very rare on local materials and is mainly attested for exogenous materials in the assemblage discussed here, for example two blade fragments (No. 2 and 21) from SU 104 produced on 'Balkan Flint'.

'Balkan Flint', a honey-yellow, high-quality raw material with characteristic white spots, has been proposed as one marker for tracing the spread of the Neolithic lifeway in the Balkans.[53] The best-known deposits of this kind of material are located in northern Bulgaria, more precisely on the Moesian platform.[54] Other potential source areas of visually similar materials were reported from the Lower Danube Valley in Romania[55] and northeastern Serbia within the wider Đerdap area.[56] Additional deposits carrying similar materials have to be expected in areas further to the south and west;[57] however, in-depth characterisation and provenance analyses of 'Balkan Flint' on a broader scale, especially beyond Bulgaria,[58] have only just commenced.

Despite these difficulties associated with the 'Balkan Flint' phenomenon, preliminary assessments are possible: the distribution of more or less standardised toolkits mainly comprising blade products (often used as sickle blades) made from this particular kind of raw material commencing around 6200 BC is closely related to the wider Karanovo I-Starčevo-Körös-Criș cultural complexes.[59] These toolkits, as well as individual pieces of 'Balkan Flint' occur in Early Neolithic sites in Bulgaria, Romania, Hungary, Serbia and North Macedonia.[60]

From this perspective, Svinjarička Čuka represents a settlement located at the southern fringe of the main 'Balkan Flint' distribution area during the Early Neolithic that was well integrated into the supra-regional economic networks at play in the Balkans, facilitating Neolithisation processes on various scales.

The enlarged dataset from the new excavations at Svinjarička Čuka enabled us to evaluate the preliminary insights we were able to gain from the lithic assemblage available in 2018. As in the specific context which was the focus of our study in this paper, the general core reduction system rests on detaching flakes and blades (to a much lesser extent than flakes) from uni- and multidirectional cores, with the use of direct hard and soft percussion in most cases. The presence of numerous hammerstones confirms the use of direct hard percussion, which is visible from cores and flakes. The recycling of old cores towards their secondary use as hammerstones speaks in favour of a full exploitation of the available material. This is also noticed from the presence of a number of exhausted cores that had often undergone repair, despite a minimal initial preparation. An expedient technology and material recycling is also visible through the existence of a quite significant number of bipolar cores and corresponding products made on an anvil, which suggests a continuous use of small nodules and various flake blanks. Only rarely does the local character relate to a more regular blade or bladelet production from the tiny cores, which appear to be executed with much more careful preparation of raw materials and core maintenance. Finally, the entire assemblage, with numerous cores, final products and knapping debris, undoubtedly shows the on-site production of tools related to local raw materials, while parts of the *chaîne opératoire* linked to the presence of other raw materials are still missing, for instance in the case of artefacts corresponding to 'Balkan Flint' and some more regular blade products from as yet unprovenanced raw materials. The previous observations,[61] including comparisons with other sites relevant for our study region and time period, e.g. Blagotin, Šalitrena pećina, Donja Branjevina, Ušće Kameničkog potoka and Knjepište,[62] were confirmed in the course of this new investigation. Beneficially, however, they now rest on a more solid database after individual raw material and technological analysis of altogether over 4000 lithic artefacts. Currently, the lithic evidence at Svinjarička Čuka appears slightly different, with the technological character of the assemblage remaining highly predetermined and influenced by locally available raw materials, knapped in an expedient way, with less curation of cores and a high percentage of flakes, in tandem with an important element associated with the recycling of raw materials and produced blanks. Moreover, comparisons of our material with assemblages from North Macedonia are important for assessing potential links with regions in the south as a special interest of the NEOTECH project. Despite variation in the published records in terms of available completed studies and discrepancies in site chronologies, we see differences in general trends of blank production, particularly related to blade-based and/or blade-oriented components, which denote the Early and Middle Neolithic (first half of the 6th millennium BC) as far as evidence from Pelagonia (Vrbjanska Čuka) and the Skopje Plain (Govrlevo) is concerned.[63] However, further evidence from Svinjarička Čuka is necessary (referring to different site phases rather than a larger assemblage size) to examine the potential connections with sites in the south such as Anzabegovo (with the initial study of chipped stones

53 See, e.g., Gurova 2012. – Gurova et al. 2016.
54 Gurova, Nachev 2008. – Gurova 2012. – Gurova et al. 2016.
55 Ciornei, Maris, Soare 2014.
56 Šarić 2003. – Antonović, Vitezović, Šarić 2019, 64.
57 See, e.g., Perlès 2001, 202.
58 Andreeva, Stefanova, Gurova 2014. – Gurova et al. 2022.
59 Gurova 2008. – Gurova et al. 2016, 423–424.
60 See, e.g., Elster 1976, 265. – Biagi, Starnini 2010. – Gurova 2012. – Biagi, Starnini 2013. – Gurova 2016.
61 Horejs et al. 2019a, 207–208.
62 Šarić 2005. – Šarić 2006. – Šarić 2014. – Bogosavljević, Petrovic, Starović 2016.
63 Mazzucco et al. 2022, 20.

Small finds from Neolithic contexts	Total	S1	N1
Polished stone tool	23	11	12
Bead	19	4	15
Bone tool	19	3	16
Ceramic object	20	9	11
'Cult table'	29	8	21
Disc	8	3	5
Figurine	35	17	18
Loom weight	58	18	40
Pendant	2	1	1
Perforated disc	22	8	14
Sling bullet	7	3	4
Spindle whorl	18	4	14
Stamp	2	1	1
Stone tool	38	15	23
Undefined/Unclear	4	0	4
Total	326	111	216

Tab. 3. Categories and amounts of Neolithic artefacts and small finds at Svinjarička Čuka 2019 and 2021.

by Ernestine S. Elster)[64] or Rug Bair,[65] which was already used for comparisons with Serbian chipped stone collections from the 6th millennium BC with regard to the role of local production and use of certain raw materials (e.g. quartz or 'Balkan Flint'), production of regular blades, and the presence of specific retouched tool types (e.g. drills scrapers, macro-blades, and geometrics).

6. Starčevo Artefacts and Small Finds

Altogether 326 artefacts and small finds have been newly excavated in the Neolithic contexts (Tab. 3). The most numerous categories in the Neolithic deposits are loom weights (58 pieces), followed by fragments of figurines (35 pieces), stone tools (23 axes/adzes, 38 miscellaneous stone tools), so-called 'cult tables' (29 pieces) and ceramic discs (22 perforated, 8 not perforated). The study of the figurines has not been accomplished yet; the detailed and contextual analyses of the artefacts are currently in progress, which is why they are only described briefly and presented summarily in this report.

6.1. Textile Production

Loom weights, spindle whorls and perforated discs indicate textile production at the site (Fig. 29). The 58 loom weights appear in all stages of fragmentation, from complete or only slightly damaged pieces to those present only as small fragments. Their forms are almost always oval or round (3–7 cm diameter), sometimes with a flattened base, and a perforation through the middle (0.60–1.60 cm diameter). Two weights show a more uncommon conical form with a flat bottom and a perforation through the top part, possibly related to a later intrusion.[66] In addition to the large number of loom weights, 18 spindle whorls with a flattened biconical form (3.50–4.40 cm diameter) and central perforation (0.50–1 cm diameter) attest to textile production at the site. Several of the spindle whorls are only roughly made with an uneven or dented surface or off-centre perforation. This also applies to the one decorated piece. Secondarily used sherds with a hole drilled through the middle and the breaks ground into a roughly circular shape are also frequently interpreted as spindle whorls,[67] although smaller pieces – especially those made from painted or slipped sherds – could have been used as beads or pendants, too.[68] Most of the perforated sherds were only present in fragments, but, where observable, their diameter (3.30–5.70 cm diameter) and perforation (0.50–1.20 cm diameter) were similar to spindle whorls. Two reused sherds were only partly perforated. Assemblages of loom weights, spindle whorls and perforated discs were also recovered in the context of the 'Starčevo house', indicating textile production within this area (Fig. 29).

6.2. Personal Ornaments

19 beads were recovered from Neolithic contexts, with the majority coming from the northern trench N1. Both beads made of stone (8 beads) and ceramic ones (11 beads) were present and measured around 1–1.30 cm in diameter. The stone beads all showed flat, disc-like shapes and were made from orange-brown stone, while most of the ceramic beads were slightly thicker but still disc-shaped. Two other ceramic beads had a biconical shape and two ceramic beads were spherical, while one of the spherical beads was hollow. Similar shapes and materials are known from Starčevo contexts in Serbia, Romania and Hungary,[69] although the orange-brown colour of the stone beads is uncommon. The flat ceramic beads also show parallels to beads recovered from Ilindentsi in southwest Bulgaria.[70] A fragment of a cylindrical ceramic pendant with a horizontal perforation and two polished and perforated bone discs probably had a similar ornamental function (Fig. 30).

64 Ester 1976.
65 Anastasova, Dimitrovska 2014.
66 McPherron et al. 1988, 337.
67 Oross, Whittle 2007. – Bogdanović 2008b.
68 McPherron, Rasson, Galdikas 1988, 325.
69 Boroneanț, Mărgărit, Bonsall 2019.
70 Grębska-Kulow, Gurova, Zidarov 2021.

Fig. 29. Tools for textile production recovered in the 'Starčevo house' (SUs 104, 120, 128) (Photo: F. Ostmann).

Fig. 30. Beads, fragment of a bangle and a bone disc from trench N1 (Photo: F. Ostmann).

Three ring-like ceramic fragments with a round cross-section, highly polished surface and a diameter of 4–6 cm and a fourth one with a trapezoidal cross-section are interpreted as fragments of ceramic bangles. Similar bangles are known from Drenovac.[71] An additional labret derived from the Neolithic layers, in this case smaller (1 cm length) and T-shaped.[72]

6.3. Stone Tools

Altogether 23 polished stones tools were recovered in Neolithic contexts, of which 13 were axes and 10 adzes, ranging from 3 cm in length and 7.5 g in weight for the smallest complete adze to 10 cm in length and 174 g in weight for the largest complete axe. Three axes show damage on the neck, possibly from secondary use as a pounder or pestle. Eight of the polished tools were only present as small fragments with less than 30 % of the original preserved, while another seven were mostly preserved but showed damage either on the chipping edge or had parts broken off, rendering them unsuitable for use. By contrast, six adzes and two axes were completely preserved and still functional, leading to the question of why they were deposited.

One intriguing context in this regard is a floor horizon of the earlier Starčevo house phase (SU 104 Fig. 9). Six polished stone tools were recovered from this layer (Fig. 31), while the find accumulations above it held no polished stone tools at all.

One of the recovered tools was present as a small fragment, but three more showed only slight damage and two adzes were completely preserved. These complete adzes were, however, much more roughly made than similar tools from the site, with their surface only cursorily polished and uneven parts of the stone ignored. Evidence for stone tool production at the site comes from one of the slightly damaged pieces in this context, a semi-finished product. A smoothed blank was only partly, but finely polished on one side, with the other side left rough. A break at the top might have been the reason for it being discarded. A stone fragment chipped from a larger stone tool, probably for recycling purposes, comes from the same layer. In addition to the polished stone tools, there were a number of miscellaneous stone tools showing signs of use, often only present as fragments. Among these are three quartz hammerstones as well as six small fragments of whetstones, which show heavy signs of use.

71 Perić 2008 and personal communication.
72 Cf. Horejs et al. 2019a, 200–201 and Fig. 3.

Fig. 31. Assemblage of polished stone tools from the earlier floor SU 104 in the 'Starčevo house' (Photo: F. Ostmann).

6.4. 'Cult Tables'

The group of the so-called 'cult tables' was enlarged by 29 additionally recovered fragments. Both triangular and square forms were present and decorations show a wide variety from impressed or incised triangles, crosshatching, linear incisions, fluting and applied knobs to a slipped and polished surface. The quality of the decoration and form varies greatly as well: roughly formed pieces with lopsided decoration as well as finely made pieces are present, which is common with 'cult tables'.[73] The legs have a U-shaped, V-shaped or round cross-section, while the receptacles are triangular or round. All of the 'cult tables' were only present in fragments, mostly of the legs, but sometimes with part of the receptacle still attached, or only fragments of the receptacle present. It is also notable that despite their characteristic decorations, which should facilitate refitting of the pieces, only one join was found for two pieces, again coming from the earlier floor SU 104 in the 'Starčevo house'.

6.5. Other Small Finds

Other newly recovered Neolithic small finds include seven sling bullets made of clay and with a biconical form, two stamps and several small ceramic 'tokens'. The two stamps were completely or almost completely preserved and both showed incised zig-zag motifs. Eight small ceramic 'tokens' in geometric shapes (4 cones, 1 round, 2 teardrop-shaped, 1 rectangular) with a length between 1.30 and 1.90 cm were recovered from different contexts, though their function remains unclear.

7. Grinding Kits and Related Analyses

Grinding and pounding tools are among the most frequent find categories in the archaeological record, as they are universal crushers for foodstuffs and other materials. Usually, they are part of the standard inventory of households, where they appear as pairs of active and passive tools (Tab. 4). The analysis of these grinding kits rather than single objects is essential to understand the functional roles of the tools.

The grinding stones from Svinjarička Čuka belong in a time frame coinciding with the start of the Neolithisation process of the central Balkans[74] and are among the earliest studied in southeastern Europe. Overall, the state of research for these tools is very inconsistent in time and space. However, in periods and regions linked to the earliest large-scale integration of cereals into the diet and the onset of agricultural societies, like the period discussed here (Starčevo-Körös-Criş, 6200–5500 BC), grinding stones have to gain

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73 Cf. Horejs et al. 2019a, 200–201 and Figs. 6–10 with further literature.

74 Horejs et al. 2019a.

Terms	Other known labels	Role	Possible use	Haptic	Possible motions
Handstone Flat active tools that are held horizontal	grinder, ball, sphere, rubbing stones, Läufer, Molette, hammerstones	Active: it is moved on another surface	Grinding (= crushing by applying pressure) Pounding (= crushing by hitting) Dehusking	One or two hands, depending on the size	Horizontal: circular, oval, bidirectional flat, bidirectional pendular Vertical: bidirectional
Pestle Active tools that are held vertical	pounders for mortars, pilons, Stößel	Active: it is moved on another surface	Grinding (= crushing by applying pressure) Pounding (= crushing by hitting) Dehusking	One or two hands, depending on the size	Horizontal: bidirectional-rolling on the surface, circular-flat, bidirectional flat Vertical: bidirectional Oblique: circular-lateral
Netherstones Passive tools standing on the ground, set into the ground, or on stone pavements and other installations	grinding stones, querns, slabs, grinding dishes, mortars, mortiers, Reibsteine, Unterlieger	Passive: remains immobile during work	Grinding (= crushing by applying pressure) Pounding (= crushing by hitting) Dehusking	Lying horizontally or standing oblique	See above

Tab. 4. Overview of the terminology used.

more attention, as their role as indicators for changes in diets, innovations in cooking practices and in the development of local cuisines is a central one. For Serbia there are two main studies including Neolithic grinding tools in the analyses: a comprehensive study on all macro-lithic tools conducted by Dragana Antonović,[75] comprising finds of grinding stones from Belovode, Čučuge, Divostin, Donja Branjevina, Lepenski Vir, Supska, Velesnica, and Vinča, and a more recent study by Vesna Vučković[76] on macro-lithic tools from the central Balkans, including several grinding stones from the sites Motel Slatina, Turska Česma, Medjureč, At, Potporanj, Benska bara, Kremenilo, Vrajano, Čelina, Koraća Han, Pavlovac, Tumba Madžari; the focus is on the Late Neolithic layers of all these sites.

Fifty-nine grinding stones (including abraders) have been discovered at Svinjarička Čuka between 2019 and 2021. Their documentation was carried out through an innovative, multivariate method called *4M* (*The Multivariate Macro Micro Method*)[77] to obtain a maximum of information. The other important aim was to establish a fast and practical documentation and analysis workflow, particularly for the excavation and for research into grinding stones in general. Four *attributes* have been regarded as essential for the description of the material and the functional determination, which is the focus of our analyses (Tab. 5).

75 Antonović 2003.
76 Vučković 2019.
77 Dietrich, Horejs, Brandl in preparation.

For each attribute, different documentation and analysis methods have been chosen. All attributes and the results of their analysis have then been combined in a single explanatory model to reconstruct motions during work, processing techniques, positions of the body, products processed, and a secure functional interpretation.[78]

Jenny Adams,[79] Laure Dubreuil,[80] Caroline Hamon,[81] Elspeth Hayes and colleagues[82] and Laura Dietrich[83] have described macroscopic and microscopic shapes and wear. Based on these characteristics, the following features and descriptive criteria have been defined for the attributes outlined above, with 'markers' being a combination of two or more attributes.

So far, there is evidence for three types of grinding kits and one type of abrader from the site (Fig. 32). Most Neolithic grinding stones (selected finds on Pls. 1–3) were made of vulcanite and sandstone and belong to kits 1 and 3, including a fragment of a handstone from the 'Starčevo house' (SU 104, Pl. 3/2). One other comes from a large Neolithic pit (SU 1099, Pl. 3/1), and four are reused implements found in a later context (SU 1057, Pls. 1–2).

Kit 1 is the most widespread type in the Neolithic of the central Balkans.[84] All objects from the site are heavily

78 Dietrich, Horejs, Brandl in preparation.
79 Adams 2002. – Adams et al. 2009. – Adams 2014.
80 Dubreuil 2002. – Dubreuil et al. 2015.
81 Hamon 2008.
82 Hayes, Pardoe, Fullagar 2018.
83 Dietrich 2021a. – Dietrich 2021b.
84 Cf. Vučković 2019.

Attributes	Relevant documentation and analysis methods
1. Morphology respectively shape deformations	Macroscopic analysis and 3D documentation: photogrammetry and 3D modelling using *Reality Capture*
2. Surface topography	Computed roughness of point clouds using the open source software *CloudCompare*
3. Surface texture	Macrophotography; tactile analyses directly on objects; transfer of the results through drawing on 3D models and macrophotographs in *Procreate* (the size of the 3D models was reduced with the open access software *Meshmixer*); macroscopic analyses; geological analysis
4. Production and wear markers including residues	Macroscopic and microscopic analyses with a digital microscope at 10–20× resolution; microphotography; residue analyses by polarised light microscopy (starch and phytoliths)

Tab. 5. Attributes and relevant documentation and analysis methods.

Feature	Descriptive criteria
Flattening of the surface	strong/medium/weak
Grains	rounded/flattened/broken
Striations	deep/fine; short/long
Polish (intensity)	highly reflective/low reflective/dull
Polish (distribution)	covering/concentrated
Erosion	thinning down at sides and corners
Concaveness	thinning down in a concave shape
Wear marker 1	deep parallel gouges (large striations) with rounded and flat spots in between; fine striation on grains
Wear marker 2	flattened area with medium thick, dense striations
Wear marker 3	loose rounded spots with fine striations
Wear marker 4	field of scar negatives
Wear marker 5	extended zone with flat plateaus on grains
Wear marker 6	strong flattening, dense striations, and pigment
Burning traces	black spots
Pigments	pigments of different colours
Breakage	scar marks
Texture (tactile)	very smooth/smooth/rough
Production marker 1	flake negatives
Production marker 2	pecking in steps
Production marker 3	pecking
Curation marker 1	pecking/roughening
Curation marker 2	both sides as active working faces

Tab. 6. The descriptive criteria for the attributes and features.

used, as visible on the 3D-model surfaces after removing the coloured textures (examples on Pls. 1–3), and most of them are broken. The combined documentation through photogrammetry and macrophotography has the advantage of permitting analysis of the surface topography by removing the coloured texture (see the grey meshes on Pls. 1–3) and by using directed side lighting, which adds dimensions in comparison with the frontal light used in photogrammetry.

The combination of attributes and features indicates bi-directional grinding motions with both hands and very hard pressure as the main processing technique (Fig. 33), as well as regular roughening as maintenance and curation. Wear marker 1 (Fig. 33), which is consistent with the processing of cereals,[85] is most frequent on the Neolithic finds, including the handstone from the large pit (SU 1099, Pl. 3/1) and all four reused objects (SU 1057, Pls. 1–2).

The latter are highly interesting for the study of use wear as well as of practices of use and reuse at the site.[86] The complex is composed of four objects – three fragmented handstones (Pl. 2) and a completely preserved netherstone Pl. 1)

85 Hayes, Pardoe, Fullagar 2018.

86 Dietrich, Horejs, Brandl in preparation.

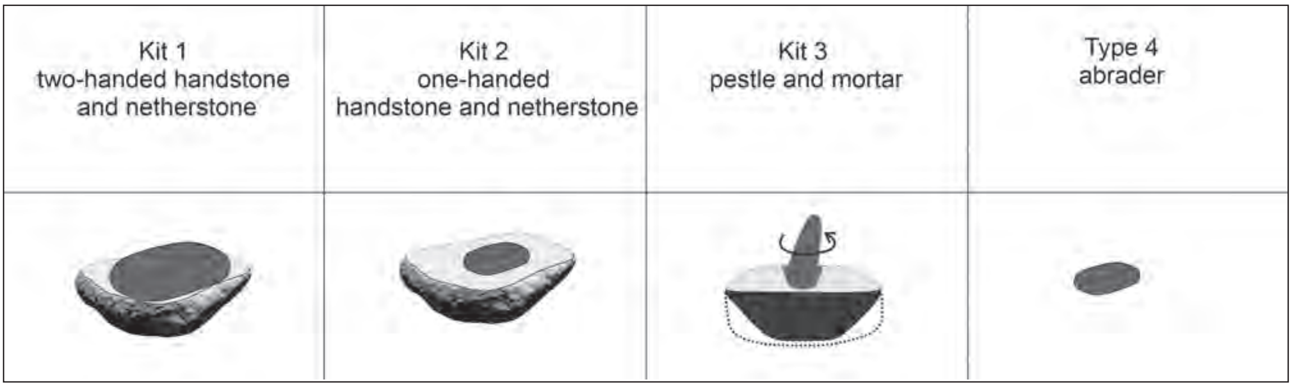


Fig. 32. Schematic reconstruction of the grinding tool types at Svinjarička Čuka (Graphics: L. Dietrich).

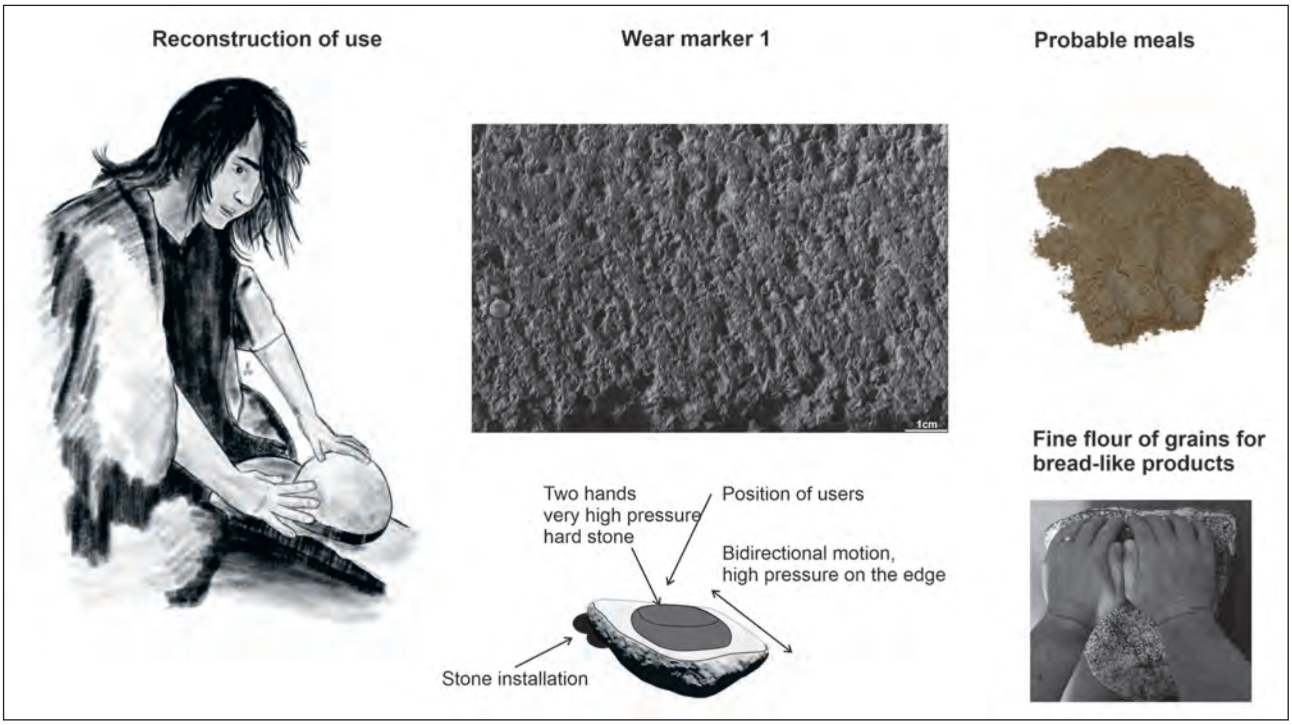


Fig. 33. Reconstruction of Neolithic kit 1 and its use at Svinjarička Čuka (Left, drawing: J. Notroff. – Middle, macrophoto and reconstruction: L. Dietrich. – Right, experimental work with einkorn: L. Dietrich).

– which have good analogies in the Neolithic[87] but were found in the fill of a Bronze Age pit (SU 1057). On the netherstone (Pl. 1), the Neolithic wear and curation markers (Tab. 6/wear markers 1, 4 and curation marker 1) are partially superposed by non-Neolithic wear markers (Tab. 6/wear marker 2). The specific configuration of wear marker 1 shows harder pressure on one of the broad sides, indicating an initial oblique position of the netherstone during grinding, best explained by the stone being fixed in an installation. Such fixed installations on stone bases are very frequently known from ethnographic studies.[88] In this setup, during grinding, the entire body is contributing to this very exhausting task, helping to raise pressure in order to obtain fine flour from the processed grains. This has also been observed during experimental work.[89] The use-wear analysis

87 Antonović 2003. – Antonović 2006. – Vučković 2019.

88 Robitaille 2016.

89 Dietrich 2021b.

PERIOD	Stratigraphic Unit (SU)	TNF
Neolithic	23, 25, 26, 27, 30, 45, 46, 49, 50, 51, 72, 74, 75, 82, 83, 84, 85, 86, 88, 1024, 1032, 1047, 1048, 1059, 1060, 1061, 1063, 1067, 1069, 1070	2072
Eneolithic	42, 61, 63	49
MBA/LBA	1014, 1055, 1057	42
EIA	1046, 1051	412
Mixed	3, 32, 36, 37, 39, 40, 41, 43, 48, 52, 60, 67, 70, 71, 76, 77, 79, 81, 1034, 1035, 1036, 1037, 1040, 1041, 1043, 1044, 1045, 1050, 1054, 1065, 1071	2176
TOTAL	69 SUs	4751

Tab. 7. Total number of animal fragments (TNF) by period and (combined) SUs discovered at the site of Svinjarička Čuka during the 2019 excavation season.

thus indicates an original (Neolithic) use of the netherstone in a fixed installation, most probably followed by a displacement and a secondary, possibly Bronze Age, use, as its context indicates. The younger wear marker 2 covers only the centre of the netherstone, indicating secondary grinding within a kit of type 2.

Not only finds of kit type 1 but also other finds, belonging to kit type 3, indicate the use of grinding stones in fixed installations in the Neolithic. Two mortars and one pestle are currently the subject of a combined use-wear and residue analysis in order to reconstruct processing practices and the products in relation to the archaeological context. Preliminary observations indicate their use for rotary grinding, similar to Anatolian finds.[90]

In conclusion, the preliminary analysis of the grinding stones gives important insights not only into the processing practices and the use of plant food resources at Svinjarička Čuka (in addition to the macro-botanical information), but also on the Anatolian connections during the Early and Middle Neolithic. Also, it will establish a documentation methodology and practicable workflow within the 4M method to gain a maximum of information from traces on these objects.

8. Animal Remains

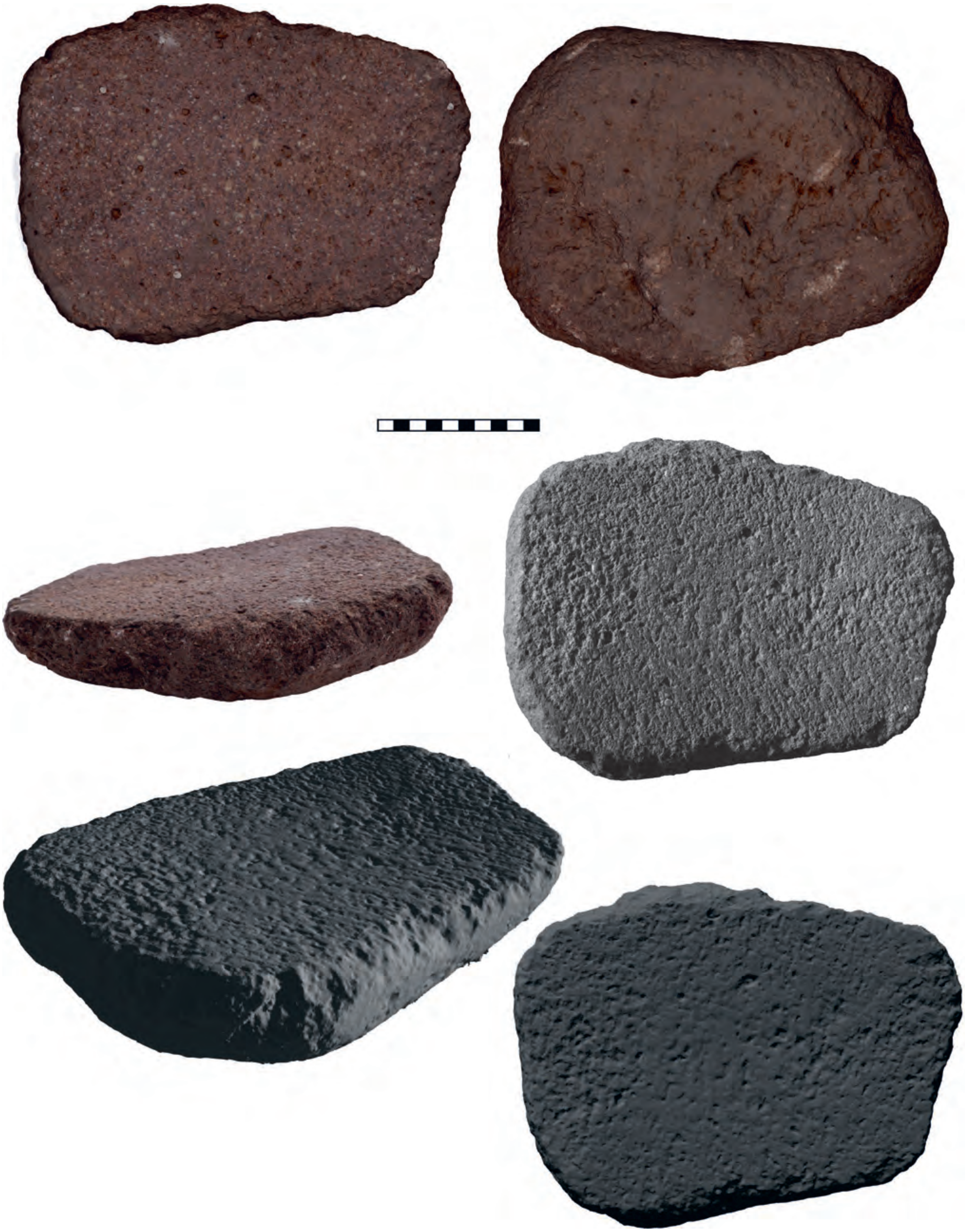
Animal remains recovered during the 2019 excavation season at the site of Svinjarička Čuka were analysed, and preliminary results are presented and discussed here, while the analysis of animal remains from 2021 is still ongoing and the results will be published additionally elsewhere. The applied recording protocol and zooarchaeological methods were the same as the ones used and described in detail previously.[91]

In total, 4751 animal remains were recovered at the site in the 2019 excavation season. Out of this total number of animal fragments (TNF) from the site, 2728 specimens were collected from the SUs excavated in trench S1, while the remaining 2023 were recovered from those in trench N1. Along with animal remains, five human skull fragments were also found. Out of the total number (69) of SUs with animal remains excavated in 2019, 30 SUs were dated to the Early Neolithic, 3 to the Eneolithic, 3 to the Middle/Late Bronze Age (MBA/LBA), and 2 to the Early Iron Age (EIA) (Tab. 7). The remaining 31 SUs (Tab. 7) are unsecure contexts, i.e. topsoil or artificial layers with relocated and mixed archaeological material from different periods, and animal remains found in them, although recorded, have not been analysed further.

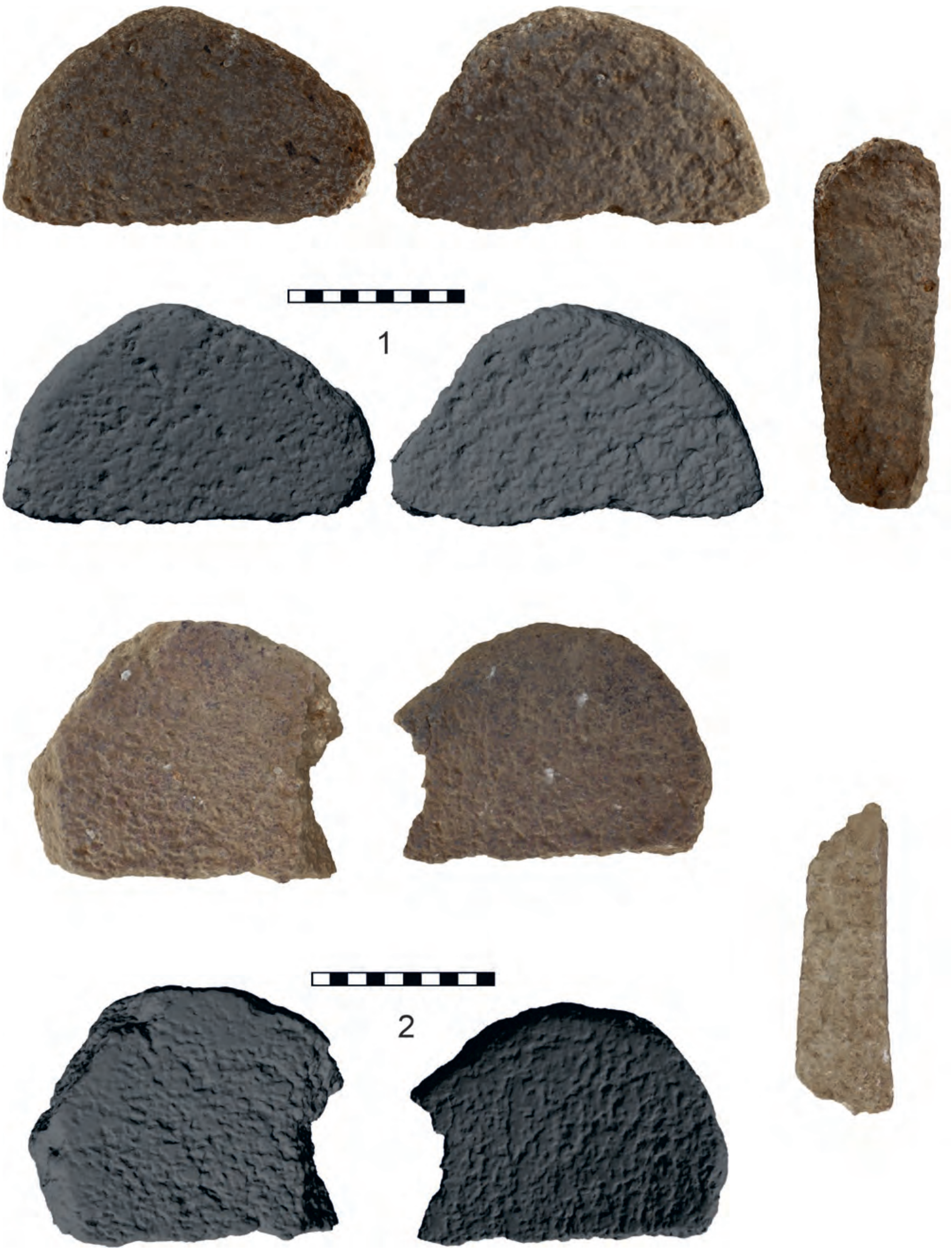
8.1. Distribution of Taxa

Out of 2575 animal remains from undisturbed SUs excavated in 2019, the majority of them (80.5 %) are from SUs dated to the Early Neolithic, followed by those from the Early Iron Age (16 %), Eneolithic (1.9 %) and Middle Bronze Age/Late Bronze Age (1.6 %) (Tab. 7). Only 291 (11.3 %) animal remains from these undisturbed SUs (Tab. 7) were identified to a species or at least to a genus level due to their high level of fragmentation. This low percentage of specimens identified to the lowest taxonomic level is the consequence of their fragmentation. In general, animal remains from Svinjarička Čuka are very highly fragmented. Complete specimens constitute only 0.9 % of the sample, and except one sheep metatarsal bone from the Early Neolithic SU 75, all the others are dense and firm short bones – carpals, tarsals or phalanges. Bone fragmentation appears to have primarily been the result of human activities – butchery, marrow exploitation, tool making, or their disposal. However, although highly fragmented, the animal remains from the site of Svinjarička Čuka are well preserved, and only an extremely small proportion (around 0.2 % of the total) of mammal remains bear marks of light

90 Dietrich 2021a.
91 Horejs et al. 2019a.



Pl. 1. CU21-1057-3 (Graphics: L. Dietrich).



Pl. 2. 1. CU21-1057-4. – 2. CU21-1057-1 (Graphics: L. Dietrich).

Pl. 3. 1. CU21-1099-7-1. – 2. CU21-104-15 (Graphics: L. Dietrich).

		EARLY NEOLITHIC	ENEOLITHIC	MBA/LBA	EARLY IRON AGE
Common name	**Latin name**	NISP	NISP	NISP	NISP
Domestic cattle	*Bos taurus*	70	2	1	20
Domestic pig	*Sus domesticus*	36	1	4	14
Wild pig	*Sus scrofa*	1	/	/	/
Sheep/goat	*Ovis/Capra*	84	3	3	33
Dog	*Canis familiaris*	1	/	/	1
Horse	*Equus caballus*	/	/	/	1
Red deer	*Cervus elaphus*	8	/	/	2
Roe deer	*Capreolus capreolus*	/	/	/	1
Bear	*Ursus arctos*	1	/	/	/
Wolf	*Canis lupus*	1	/	/	/
Hare	*Lepus europaeus*	1	/	/	1
Total identified mammals		**203**	**6**	**8**	**73**
Unidentified mammals		1869	43	34	338
Frog	*Rana* sp.	/	/	/	1
TOTAL		**2072**	**49**	**42**	**412**

Tab. 8. Distribution of various animal taxa at Svinjarička Čuka by period as NISP (= Number of Identified Specimens).

surface weathering (e.g. flaking or cracking of the surface) (stage 1, following Anna K. Behrensmeyer criteria).[92] This indicates that animal remains were not exposed for a long time on the surface, and that they were buried soon after disposal.

With the exception of one humerus of a frog (*Rana* sp.), all the other recovered specimens belong to mammals (Tab. 8). In total, remains of 13 mammal species – 6 domestic and 7 wild – were identified in the 2019 faunal assemblage from Svinjarička Čuka. Except one horse calcaneus found in the Early Iron Age SU 1051, remains of all the other domesticates – cattle, pig, caprines and dog – were identified previously in the 2018 faunal assemblage from the site.[93] Remains of the following wild species were also identified in the 2019 faunal assemblage: red and roe deer, wild boar, bear, wolf and hare (Tab. 8).

Early Neolithic SUs (taken together) from trench S1 yielded more animal remains then those SUs from trench N1. Around 77 % of the Early Neolithic faunal sample was collected in SUs from trench S1. The number of animal remains varies by SUs in both trenches. Animal remains were the most numerous in SU 45 from trench S1, and this unit alone yielded 43 % of the total Early Neolithic faunal sample. Overall, remains of caprines are the most abundant and comprise 41.9 % NISP of the Early Neolithic faunal sample (Tab. 2). They are followed by domestic cattle (34.5 % NISP), domestic pig (17.7 % NISP) and red deer (3.9 % NISP). All other identified species in the Early Neolithic faunal sample – dog, wild pig, bear, wolf and hare – are represented by one specimen each. Approximately 3 % of specimens from the Early Neolithic faunal sample had visible traces of burning, and their colour ranged from black in carbonised to white in calcined specimens. Gnawing marks were noticed on 1.3 % of the specimens, while butchery marks, in the form of short and long cuts, were found in only five specimens (domestic cattle radius and humerus, caprine astragalus and rib, and red deer skull fragment). Also, seven worked-bone/tool fragments were found in the Early Neolithic SUs. Except for one domestic cattle astragalus which was used as an ad hoc tool (polisher), all the other specimens with modifications were long and metapodial bones or ribs of large(cattle)-sized mammals.

Faunal samples from the Eneolithic SUs in trench S1 and the Middle Bronze Age/Late Bronze Age SUs in trench N1 are extremely small, and due to the high fragmentation, only six and eight specimens respectively were identified to the species level (Tab. 8), all of them belonging to the main domesticates – cattle, caprines and pig. Only one domestic cattle calcaneus from the Eneolithic sample had gnawing marks, as well as one pig humerus from the Middle Bronze Age/Late Bronze Age sample. Two specimens from the Middle Bronze Age/Late Bronze Age sample were carbonised, while one long bone of medium(sheep)-sized mammal had manufacturing traces.

92 Behrensmeyer 1978.

93 Horejs et al. 2019a.

In the Early Iron Age faunal sample (Tab. 8) from the SUs in trench N1, remains of caprines comprise 45.1 % NISP, and they are followed by domestic cattle (27.4 % NISP) and domestic pig (19.2 % NISP). Other identified species are horse, dog, hare, red and roe deer. Carbonised or calcined specimens comprise 4.4 % of the Early Iron Age faunal sample, while gnawing marks were observed on 3.9 % of specimens. Only three specimens – one caprine tibia and two medium(sheep)-sized mammal ribs had butchery marks, while manufacturing traces were observed on four specimens (domestic pig tibia, two large(cattle)-sized mammal long bones and one rib).

9. Archaeobotanical Results from the Neolithic Contexts Excavated in 2018–2019 and their Place in a Broader Spatiotemporal Context

The archaeobotanical samples taken during the 2018, 2019 and 2021 excavation seasons at Svinjarička Čuka included many from the Neolithic contexts (SUs) identified in trenches S1 and N1. Results of the analysis of a subset of these samples have been described in the previous report.[94] Here, we combine the published data and observations with those generated following the 2019 excavation season. The analysis of the samples taken during the 2021 season is in progress and the results will be presented together with those that will be produced after the 2022 field season. Back in 2018, an initial set of questions was posed in relation to the preservation of plant remains and the evidence of plant production and consumption at Svinjarička Čuka.[95] The results of the first two seasons of archaeobotanical field- and laboratory work provide answers to some of them. The Neolithic evidence is particularly significant for understanding the diffusion of crops and their growing conditions in the first millennium of agricultural history of the central Balkans. This underscores the importance of the assemblage from Svinjarička Čuka in a wider spatiotemporal context.

9.1. Summary Description of the Archaeobotanical Sampling, Recovery and Analysis

Archaeological layers, features and other units of general importance to the researchers were sampled for macroscopic plant remains. A variety of contexts is represented in the archaeobotanical dataset: pits, daub structures, stratigraphic or arbitrary layers, vessel content. From large or complex SUs (e.g. pits or use surfaces), multiple samples were taken. In 2018, 38 samples from 21 contexts were selected, totalling 446 litres of sediment. In 2019, 89 samples from 24 SUs were taken, amounting to c. 1042 litres of sediment. Processing of the samples took place in the immediate vicinity of the excavation area and was done using the water tank constructed in 2018, to which water was supplied from a large plastic reservoir placed on elevated terrain. Flotation was conducted by a student (Amalia Sabanov, Belgrade) and a local worker (Đokica Kostić, Lebane), and was partly supervised by a senior flotation officer (Dragana Perovanović, Belgrade). As noted in the previous season, processing of the samples was rather time-consuming and the outcome not always satisfactory due to the water pressure being too low to break down the hard, clayey sediment. In the 2021 season, flotation was carried out in Lebane, at the location where the team was accommodated; water was supplied from the tap, and this accelerated the process.

The light and heavy fractions of the samples were collected and dried in pieces of fine-meshed cloth (with openings of less than 0.5 mm) for the floating residue, and mosquito net (with openings of 1 mm) for the non-floating material; they were subsequently transferred into labelled plastic bags for transport to the lab. Dragana Perovanović sorted heavy fractions in their entirety (100 %), with the naked eye, and extracted the following materials: plant remains (seed/fruit and wood charcoal), lithics, animal bone, pieces of malachite and beads. Light fractions were observed under a low-magnification (8×–40×) stereo-microscope and seed/fruit and wood charcoal remains were extracted, which were then combined with the remains from the respective heavy fractions. Seed/fruit remains were identified to the level of family, genus or species. Some of them were too eroded or fragmented to allow (precise) identification; they are recorded as broadly determined or indeterminate taxonomic categories. A small selection of the remains was submitted for radiocarbon dating.

Wood charcoal fragments from each sample were recorded by volume. Those from the samples attributed to Neolithic contexts were selected for anthracological analysis (see below). Three of the SUs (SUs 43, 1043 and 1051) contained large charcoal pieces; these were collected directly from the soil and wrapped up in aluminium foil. In 2019, sampling for plant micro-remains (phytoliths and starch) was also carried out in the field for the first time at a site in Serbia. Micro-botanical subsamples were selected from 14 flotation samples by taking three tablespoons of the sediment and emptying them into a clean resealable plastic bag. Another 8 samples were taken in the same way, directly from the SUs of interest – for instance, the inside of a wholly preserved pot and the area around a ground stone (possible quern base).

94 Horejs et al. 2019a.
95 Horejs et al. 2019a.

9.2. Results

So far, 68 samples (779 litres of sediment) from 12 Neolithic SUs in trenches S1 and N1 have been analysed. The taxonomic category and quantity of the remains per SU are given in Tab. 9. Many of the SUs were sampled more than once (e.g. 30 samples were selected from the use horizon SU 45). The quantities of the remains within each SU are here amalgamated because no obvious differences have been observed in the composition and richness between the samples from the same SU; detailed sample-by-sample data are available in the project's archive.

Charring was the major route of preservation; only one mineralised seed was present. Most of the remains are fragmented or heavily eroded, which conforms to their derivation from 'secondary' contexts, that is, not those in/near which they were charred (e.g. hearths, ovens, ash pits). They were redeposited in the course of the use of the site and this caused damage, particularly to cereal grains, while also being a reason for the overall low quantities of plant remains. In terms of abundance and density of plant remains in the samples from the 2019 season, they repeat the pattern seen in the samples from the previous season – both are generally low, especially in trench N1, with the majority of samples yielding less than one seed/fruit item per litre of soil. This applies to wood charcoal as well: only c. 60 ml of it was present in the samples, with 2.8 ml as a maximum in a single sample. Late intrusion into Neolithic layers from overlying deposits is documented by the presence of 3 charred grains of common millet in two samples; one of them (sample 8, SU 45) was AMS-dated to the Iron Age.[96] Intrusions are possible among other remains too, as demonstrated by some of the absolute dates on grains recovered in 2018.[97] The repertoire of plants identified in the 2019 assemblage is similar to that documented in the samples from the 2018 season. Sorting of the heavy residue was particularly useful for retrieving fragments of fruit stone of (damson) plum and shell of hazelnut. Together with the remains of Cornelian cherry and sloe, they testify to the collection and use of fruit from small trees growing along the edges of forests or woodland openings. These habitats also provided wild berries, such as those recorded in the samples (wild strawberry, raspberry, elderberry). Among crop remains, those of barley (primarily grain) are the most prominent; many of them belong to the hulled variety and perhaps this was the main cereal type grown by the Neolithic dwellers of Svinjarička Čuka. Based on the quantity and frequency of occurrence, emmer may have been the principal wheat type, followed by einkorn. The few finds of Timopheev's wheat add to the spectrum of wheat types. These three glume wheat species could have been grown in a combination, as a maslin crop, perhaps to reduce the risk of crop failure. Of the two pulses recognised in the Neolithic dataset, lentil seeds are more common than pea seeds. The assemblage of potential crop weeds (arable and ruderal plants) is floristically highly diverse. Future examination of the functional ecology of these species will shed some light on the agricultural field management and crop growing conditions.

9.3. The Neolithic Plant Evidence in a Wider Chronological and Geographical Context

A recent study used a large set of radiocarbon dates to reconstruct the population dynamics in the Neolithic central Balkans.[98] It identified two 'boom' episodes: one starting around 6250 BC and culminating towards 6000 BC; and one starting after about 5800 BC and peaking around 5600 BC. Based on the radiocarbon dates from Neolithic layers at Svinjarička Čuka, including those on crop remains, the earliest excavated traces of occupation here would fall in the second 'population boom' phase. The Pusta Reka may also have been settled in the earlier phase of Neolithisation of the central Balkans, as suggested by the results of the systematic surveys of the Leskovac Basin.[99] Evidence of an earlier Neolithic occupation would add to the so far very scarce settlement record from the end of the 7th millennium BC in the territory of Serbia; out of more than 300 Early Neolithic sites known, fewer than 30 returned pre-6th millennium BC dates.[100] Archaeobotanical analysis at a few of these sites confirmed the presence of cereals and pulses – at Blagotin (einkorn and emmer), Medjureč (wheat and barley) and Drenovac (einkorn, emmer and barley) perhaps as early as 6200 BC.[101] Moreover, at Drenovac, a large deposit of lentils and peas was discovered in a daub structure dated to the end of the 7th millennium BC.[102] These early sites are located in areas of relatively open landscape with access to different kinds of vegetation and diverse soils.[103] Svinjarička Čuka is also situated in a geographical zone characterised by different soil types, including hydromorphic and forest soils, and exposed to a sub-Mediterranean influence penetrating up

96 Filipović, Obradović, de Vareilles in press.
97 Horejs et al. 2019a, 185–186.

98 Porčić et al. 2021.
99 Horejs et al. 2018.
100 Porčić et al. 2021.
101 Jezik 1998. – Whittle et al. 2002. – Perić 2012. – Perić et al. 2020.
102 Obradović 2013.
103 Cf. Barker 1975. – Marinova et al. 2013.

Svinjarička Čuka, Neolithic SUs		SU		23	26	27	30	45	50	1024	1060	1063	1067	1127	1130
		Trench		S1	S1	S1	S1	S1	S1	N1	N1	N1	N1	N1	N1
		Number of samples		1	3	1	3	30	4	12	9	1	1	2	1
		Sample volume (l)	779	12	36	12	36	353	48	144	96	12	5	15	10
		Wood charcoal (ml)	59.3	0.6	1.9	0.7	2.4	28.2	3.4	12.0	5.7	0.6	1.3	0.7	1.8
		Total remains	714	6	24	13	30	373	129	58	29	10	7	20	15
		Density	0.9	0.5	0.7	1.1	0.8	1.1	2.7	0.4	0.3	0.8	1.4	1.3	1.5
Plant taxon		**Plant part**	**Total**												
CEREALS															
Triticum monococcum	einkorn	grain	28					15	3	4	1			1	4
Triticum dicoccum	emmer	grain	44		4		1	25	5	2	3	2		1	1
Triticum dicoccum	emmer	glume base	2					2							
Triticum monococcum/dicoccum	einkorn/emmer	grain	19		1	3		9	4	1	1				
Triticum timopheevii s.l.	Timopheev's wheat	grain	3					2	1						
Triticum timopheevii s.l.	Timopheev's wheat	glume base	4		2					2					
Triticum sp., hulled	glume wheat	grain	10	1	2			6			1				
Triticum sp.	wheat	grain	26				2	16	2	4	1		1		
Hordeum vulgare var. *vulgare*	hulled barley	grain	77		1		1	44	24	2	1	1		3	
Hordeum vulgare, cf. hulled	hulled barley	rachis	1					1							
Hordeum vulgare	barley	grain	143	1	5		8	79	35	4	3	1	1	3	3
Panicum miliaceum	common millet	grain	3					2			1				
Cerealia indeterminata	indeterminate cereal	grain	96	2	2	2	6	54	9	9	4	1	1	4	2
PULSES															
Lens culinaris	lentil	seed	25			3		8	10	1	2		1		
Pisum sativum	pea	seed	4				1		2		1				
Leguminosae sativae	indeterminate pulse	seed	7		2			1	2		1	1			
WILD-GATHERED PLANTS															
Cornus mas	Cornelian cherry	fruit stone fragment	22					7	7	7				1	
Cornus sanguinea	dogwood	fruit stone fragment	2						2						
Corylus avellana	common hazel	fragment of nutshell	9					3						6	
cf. *Ficus carica*	fig	seed	1					1							
Fragaria vesca	wild strawberry	seed	16		1		4	8	3						
Phragmites communis	common reed	culm fragment	1										1		
Physalis alkekengi	Chinese lantern	seed	3		1			1	1						
Prunus domestica var. *insititia*	European plum	fruit stone fragment	20			2		15		3					
Prunus spinosa	sloe	fruit stone fragment	6					2	3	1					
Prunus sp.	plum	fruit stone fragment	8					3	1	1	1	2			
Quercus sp.	oak	cotyledon	1					1							
Rubus idaeus	raspberry	seed	2					2							
Sambucus nigra	elderberry	seed	2									1		1	
Sambucus nigra/racemosa	(red) elderberry	seed	1							1					
Sambucus ebulus	dwarf elder	seed	10	1			1	5	1		2				
Sambucus sp.		seed	2					1		1					
ARABLE/RUDERAL PLANTS															
Artemisia sp.		seed	1							1					
Atriplex sp.		seed	1										1		
cf. *Avena* sp.		fruit	2				1	1							
Bromus secalinus		fruit	1					1							
Chenopodium album		seed	4		1			1			1		1		
Chenopodium sp.		seed	5				2	3							
Digitaria sp.		fruit	1						1						
Echinochloa crus-galli		fruit	1								1				
Fallopia convolvulus		fruit	8	1	1			3	1		1				1
Galium aparine		seed	1					1							
Galium cf. *spurium*		seed	1					1							

Svinjarička Čuka, Neolithic SUs	SU		23	26	27	30	45	50	1024	1060	1063	1067	1127	1130
	Trench		S1	S1	S1	S1	S1	S1	N1	N1	N1	N1	N1	N1
	Number of samples		1	3	1	3	30	4	12	9	1	1	2	1
	Sample volume (l)	779	12	36	12	36	353	48	144	96	12	5	15	10
	Wood charcoal (ml)	59.3	0.6	1.9	0.7	2.4	28.2	3.4	12.0	5.7	0.6	1.3	0.7	1.8
	Total remains	714	6	24	13	30	373	129	58	29	10	7	20	15
	Density	0.9	0.5	0.7	1.1	0.8	1.1	2.7	0.4	0.3	0.8	1.4	1.3	1.5
Galium palustre type	seed	1								1				
Galium sp.	seed	1					1							
Galium/Asperulla	seed	1					1							
Hypericum perforatum	seed	6					6							
Lamium type	seed	1					1							
Lolium sp., small-seeded	fruit	3						1	2					
Mentha sp.	seed	1					1							
Phleum sp.	fruit	1												1
Plantago sp.	seed	1					1							
Poa sp.	fruit	3					2	1						
Polycnemum arvense	seed	1					1							
Polygonum aviculare	fruit	2						1	1					
Polygonum lapathifolium	fruit	1					1							
Rumex acetosella	fruit	1						1						
Setaria viridis/verticillata	fruit	1					1							
Solanum dulcamara	seed	2		1	1									
Solanum sp.	seed	1								1				
Tecurium chamaedrys	seed	1					1							
Teucrium sp.	seed	1					1							
Trifolium arvense	seed	2							1					1
Trifolium pratense type	seed	2					1			1				
cf. *Trifolium* sp.	seed	1					1							
Verbena officinalis	seed	4					3	1						
Veronica hederifolia	seed	1					1							
Veronica hederifolia	seed, mineralised	3							3					
Vicia/Lathyrus sp.	seed	1						1						
BROADLY IDENTIFIED														
Brassicaceae, small-seeded	seed	2							1		1			
Compositae, small-seeded	seed	1					1							
Fabaceae/Crucifereae	seed	1							1					
Lamiaceae, small-seeded	seed	2					2							
Poaceae, large-seeded	fruit	2			1				1					
Poaceae, small-seeded	fruit	3				1	1	1						
Solanaceae	seed	1					1							
indeterminate seed		11					8	2	1					
indeterminate seed	fragment	11			1	2	3	3	1					1
fruit stone	fragment	1							1					
nutshell/fruit stone	fragment	9					7		1					1
pod	fragment	2					2							
indeterminate fruit	fragment	19					12	1			6			
cf. fruit flesh or skin	fragments	38					29	4		2			1	2
"food" (volume in ml)	amorphous fragments	0.05					0.26	0.03						
"food"/fruit	amorphous fragments	2							2					
needle leaf (? *Pinus* sp.)	fragment	1					1							
indeterminate vegetal matter	amorphous fragments	21					25			2	3		1	
fungal spore		11					8					1	1	1
mouse pellet		1							1					

Tab. 9. Botanical taxa from Neolithic contexts excavated 2018–2019 at Svinjarička Čuka.

the Vardar and down the Južna and Velika Morava River courses.[104] These conditions would have been favourable for growing Neolithic crops; whether crop cultivation was indeed practised at (all of the) Early Neolithic sites, and on what scale, is impossible to tell based on the current, limited evidence. There is a little more archaeobotanical evidence from the second quarter of the 6th millennium BC, the later phase of the Starčevo Culture in the central Balkans. By this time, communities residing in the Iron Gates were consuming cereals, as documented by the presence of cereal starch in the dental calculus of some of the individuals buried in the area.[105] The so far available ^{14}C-dates for Starčevo layers at Belovode, At, Jaričište and Svinjarička Čuka place the finds of crops at these sites in the period 5700–5300 BC.[106] In comparison to the archaeobotanical evidence from these other, earlier and contemporary Neolithic sites, where einkorn and emmer represent the most prominent components of the crop spectrum, the crop assemblage from Svinjarička Čuka is different, as it is dominated by (hulled) barley. At most of the other analysed Early and Late Neolithic sites in the central Balkans, remains of barley are much less common than wheat; therefore, the importance of barley as a crop to the early farmers was questioned.[107] Barley is frequently found at Late Neolithic sites in the western Balkans and, at least in one case, in a relatively high quantity – at the site of Korića Han in Bosnia and Herzegovina, where 160 grains of naked barley were discovered within a concentration of cereals dominated by einkorn.[108] It is suggested that the greater visibility of barley along the Adriatic coast perhaps shows that this crop was better suited to cultivation on the thin karstic soils.[109] In reference to Svinjarička Čuka, it might be that the prehistoric soil cover in the Leskovac Basin was more favourable to barley than wheat cultivation, and/or that the local climate, receiving sub-Mediterranean influences, supported this. That einkorn, emmer and Timopheev's wheat were all present at Svinjarička Čuka, probably from as early as 5600 BC, is significant, as it adds to the growing evidence of a diverse spectrum of crops available to the Early Neolithic groups in the Balkans. Three or four types of wheat, one or two types of barley, lentil and pea mark the first centuries of farming in the central and western Balkans. What was grown or consumed locally may have had to do with the local biogeoclimatic conditions and the farmers' or consumers' choice. Along with the wide range of cultivars, throughout the Neolithic, advantage was taken of locally available sources of edible wild fruit and nuts.

It is expected that the continuing archaeobotanical and other analyses at Svinjarička Čuka will bring us closer to understanding how important crop cultivation, and plant consumption in general, were to the Early Neolithic dwellers. We hope to be able to make inferences on how much effort they invested into creation of the agricultural niche in the Leskovac Basin and through what kind of plant-related practices. This should lead us to a refined reconstruction of the subsistence base and strategies of the first food producers of the central Balkans.

10. Charcoal Collected during the Field Campaigns in 2018–2019

In the following, the analysis of charred wood remains derived from Neolithic sediment samples collected during the 2018 and 2019 field seasons at Svinjarička Čuka is presented. The aim of the investigation was twofold: to get an overview of the exploited woodland, and to start to investigate the use of wood resources by the Neolithic inhabitants. Therefore, 66 samples from promising archaeological structures attributed to the Neolithic contexts were selected for the analysis.

10.1. Sample Collection and Treatment

Charcoal remains from floated samples were chosen for the wood anatomical identification. For each of the samples, five identifications were made in order to achieve the 330 identified pieces desired. This amount is seen to be a minimum number to allow a first insight into the wood resources used at the site, and it also corresponds to the generally small amounts of charcoals in the samples.[110] The size of the identified fragments varied between edge lengths of c. 7 mm and 2 mm; smaller fragments were dismissed due to the high proportion of indeterminate ones among them[111] and their susceptibility to being relocated between different occupation layers.[112] The identification of the charred wood remains was done to the highest possible level, usually to the genus, and in some cases to the subfamily or wood type. The latter include two or more genera that cannot be distinguished based on their anatomical features. For identification, a binocular microscope and a reflected light microscope were used, with magnification of up to 500×.

104 Milovanović et al. 2017. – Pavlović et al. 2017.
105 Jovanović et al. 2021.
106 See overview in Filipović, Obradović, de Vareilles in press.
107 Filipović 2014.
108 de Vareilles 2018.
109 de Vareilles 2018.
110 Cf. Asouti, Austin 2005, 7.
111 Cf. Asouti, Austin 2005, 7.
112 Carcaillet 2001, 26.

10.2. Results

The charred wood material allows for an initial insight into the wood assemblage from the Neolithic phase of life at Svinjarička Čuka. The 330 charred wood fragments contained 302 fragments that could be identified, and they document 12 taxa. Another 17 fragments could be identified as presumably belonging to a specific taxon ('cf.') and 11 fragments remained undetermined (Tab. 10), the reasons being bad preservation, vitrification or anatomical irregularities such as branching. One sample was excluded from the analysis because it originates from the Eneolithic layer. In total, 297 identified fragments come from the Starčevo contexts. The assemblage (Tab. 10) is dominated by *Quercus* (oak), followed by *Cornus* (dogwood) and *Carpinus/Ostrya* type (hornbeam type). Further regularly occurring taxa are Maloideae (pomaceous fruit), *Corylus* (hazel) and *Prunus* (wild plum). Other trees are present as single finds: *Abies* (fir), *Acer* (maple), *Fraxinus* (ash), *Pinus* (pine) and *Ulmus* (elm). Due to the low number of fragments, not only count percentages but also the frequency of occurrence of the taxa were used to interpret the results.

10.3. Discussion

Figs. 34 and 35 illustrate the count percentages and frequencies of the wood taxa documented in trenches N1 and S1. The assemblage includes the remains of a range of plants, with varying ecological requirements. In general, all these plants can today be found in mixed deciduous forests or along forest edges. Before commenting on the specific taxa, some general thoughts on the evidence of exploitation of wood resources are offered.

In order to be able to interpret an assemblage, the origin of the investigated material has to be understood: understanding the archaeological context is crucial for the interpretation of anthracological data. The nature of archaeological features preconditions the value of the charcoal assemblage for specific research. In order to collect general data on the exploited vegetation, the investigation of wood assemblages derived from non-specialised archaeological features is desired. Archaeological contexts built up over longer periods – the so-called 'synthetic deposits'[113] – tend to accumulate remains of a wide range of taxa present in the surrounding vegetation, because the material in them originates from varied activities and is, therefore, more diverse than what would be expected in deposits created by single activities or events. For instance, contexts such as collapsed walls and fireplaces may have been created in a short time span or may have even been connected to single events. Thus, the likely uniform composition of their wood charcoal content can be misleading due to a possibly high degree of selectivity of resources for the particular activity/use. Due to the selective human use of wood resources, the quantitative anthracological data cannot be taken as a precise reflection of the quantitative presence of individual taxa in the exploited woodland resources. The 'human filter' distorts the amounts of individual taxa in archaeological assemblages compared to their occurrence in the exploited vegetation.[114]

In addition to these limitations, the small number of charcoal fragments retrieved from Svinjarička Čuka does not offer a detailed insight into the composition of the vegetation in the surroundings of the site. Nevertheless, the investigated material gives valuable hints as to the Neolithic exploitation of wood resources and vegetation on a local scale.

The investigated features belong to building structures. Several of the analysed SUs can be interpreted as synthetic deposits (SUs 23, 27, 30, 45, 1060, 1063, 1067). Other archaeological contexts seem to represent short time intervals, such as SUs 26 and 1024, which represent collapsed architecture and are thus thought to be mainly dominated by timber; they may be less representative in terms of the structure of near-site vegetation. As Figs. 34 and 35 illustrate, the suggested distinction between long-term and short-term deposits is not evident in the wood charcoal record. The results for SU 26 may be misleading due to the small number of fragments identified. The synthetic deposits from trench S1 fit well into the assumed composition of charcoal assemblages of varied origin: the large number of taxa allows for the interpretation of the material as representing the remains of fuel. Although the material from SU1024 is probably mainly derived from timber, the assemblage contains a larger number of taxa than the synthetic deposits. Here, the small numbers of identifications particularly complicate the interpretation and, therefore, the differentiation between timber versus fuel wood was not attempted.

Acquisition of wood is thought to have followed the principle of least effort.[115] This means that wood for fuel was probably collected within a short spatial range, either seasonally or during other everyday activities. It can be assumed that the Neolithic residents of Svinjarička Čuka had certain knowledge of wood properties (e.g. burning quality, durability). Thus, selective use of some taxa may have been

113 Théry-Parisot, Chabal, Chrzavzez 2010, 143.

114 Théry-Parisot, Chabal, Chrzavzez 2010, 142–143.

115 Shackleton, Prins 1992.

Sample	Trench	SU	Deposit	Phase	Taxon	*Abies*	*Taxus*	*Pinus*	*Acer*	*Carpinus/ Ostrya*	*Cornus*	*Corylus*
						Fir	Yew	Pine	Maple	Hornbeam type	Dogwood	Hazel
1024-10-01	N1	1024	architecture	Starčevo		.	.	.	.	.	.	.
1024-10-02	N2	1024	architecture	Starčevo		.	.	.	.	.	.	.
1024-10-03	N3	1024	architecture	Starčevo		.	.	.	.	.	.	.
1024-10-04	N4	1024	architecture	Starčevo		.	.	.	.	.	1	.
1024-10-05	N5	1024	architecture	Starčevo		.	.	.	.	.	.	.
1024-10-06	N6	1024	architecture	Starčevo		.	.	.	.	.	1	.
1024-10-07	N7	1024	architecture	Starčevo		.	.	.	.	.	2	.
1024-10-08	N8	1024	architecture	Starčevo		.	.	.	.	.	1	1
1024-10-08	N9	1024	architecture	Starčevo		.	.	.	.	.	.	.
1024-10-09	N10	1024	architecture	Starčevo		.	.	.	.	.	1	1
1024-10-10	N11	1024	architecture	Starčevo		.	.	.	.	.	1	.
1024-10-11	N12	1024	architecture	Starčevo		.	.	.	1	1	1	.
1060-10-01	N13	1060	synthetic	Starčevo		.	.	.	.	.	.	.
1060-10-02	N14	1060	synthetic	Starčevo		.	.	.	.	.	.	.
1060-10-08	N15	1060	synthetic	Starčevo		.	.	.	.	.	2	.
1060-10-10	N16	1060	synthetic	Starčevo		.	.	.	.	.	.	.
1060-10-11	N17	1060	synthetic	Starčevo		.	.	.	.	.	.	.
1060-10-12	N18	1060	synthetic	Starčevo		.	.	.	.	.	.	.
1060-10-13	N19	1060	synthetic	Starčevo		.	.	.	.	.	1	.
1060-10-14	N20	1060	synthetic	Starčevo		.	1	.	.	.	1	.
1060-10-15	N21	1060	synthetic	Starčevo		.	.	.	.	.	.	.
1063-10-01	N22	1063	synthetic	Starčevo		.	.	.	.	.	.	.
1067-10-01	N23	1067	synthetic	Starčevo		.	.	.	.	.	.	.
25-10-01	S1	25	synthetic	Starčevo		.	.	.	.	.	.	1
26-10-01	S2	26	arichtecture	Starčevo		.	.	.	.	.	.	.
26-10-02	S3	26	arichtecture	Starčevo		.	.	.	.	.	1	2
26-10-03	S4	26	arichtecture	Starčevo		.	.	.	.	.	.	.
27-10-01	S5	27	synthetic	Starčevo		.	.	.	.	.	.	.
30-10-01	S6	30	synthetic	Starčevo		.	.	.	.	.	.	.
30-10-02	S7	30	synthetic	Starčevo		.	.	.	.	.	3	1
30-10-03	S8	30	synthetic	Starčevo		.	.	.	.	.	.	.
45-10-01	S9	45	synthetic	Starčevo		.	.	.	.	.	.	3
45-10-02	S10	45	synthetic	Starčevo		.	.	.	.	.	2	.
45-10-03	S11	45	synthetic	Starčevo		.	.	.	.	1	2	.
45-10-04	S12	45	synthetic	Starčevo		.	.	.	.	.	2	.
45-10-05	S13	45	synthetic	Starčevo		1	.	.	.	.	.	.
45-10-06	S14	45	synthetic	Starčevo		.	.	.	.	4	.	.
45-10-07	S15	45	synthetic	Starčevo		.	.	.	.	.	3	.
45-10-08	S16	45	synthetic	Starčevo		.	.	.	2	.	.	.

Tab. 10. Total amounts of charred wood fragments with edge lengths >355 µm from the field campaigns at Svinjarička Čuka 2018–2019.

Fraxinus	*Maloideae*	*Prunus*	*Quercus*	*Ulmus*	*Indet*	cf. *Acer*	cf. *Cornus*	cf. *Corylus*	cf. *Fraxinus*	cf. Maloideae	cf. *Prunus*	cf. *Quercus*	Sum	Sample
Ash	Pomaceous fruit	Stone fruit	Oak	Elm	Undetermined	cf. Maple	cf. Dogwood	cf. Hazel	cf. Ash	cf. Pomaceous fruit	cf. Stone fruit	cf. Oak		
.	.	.	5	.	.	.	.	.	.	.	.		5	1024-10-01
.	.	.	5	.	.	.	.	.	.	.	.	.	5	1024-10-02
.	.	1	2	.	1	.	.	.	.	.	1	.	5	1024-10-03
.	.	.	3	.	1	.	.	.	.	.	.	.	5	1024-10-04
.	.	.	5	.	.	.	.	.	.	.	.	.	5	1024-10-05
.	.	.	4	.	.	.	.	.	.	.	.	.	5	1024-10-06
.	.	.	3	.	.	.	.	.	.	.	.	.	5	1024-10-07
.	.	.	3	.	.	.	.	.	.	.	.	.	5	1024-10-08
.	1	.	4	.	.	.	.	.	.	.	.	.	5	1024-10-08
.	1	.	1	.	.	.	1	.	.	.	.	.	5	1024-10-09
.	.	.	4	.	.	.	.	.	.	.	.	.	5	1024-10-10
.	.	.	1	.	1	.	.	.	.	.	.	.	5	1024-10-11
.	.	.	5	.	.	.	.	.	.	.	.	.	5	1060-10-01
.	.	.	4	.	.	.	.	.	.	.	.	1	5	1060-10-02
.	.	.	3	.	.	.	.	.	.	.	.	.	5	1060-10-08
.	.	.	4	.	.	.	.	.	.	.	1	.	5	1060-10-10
.	.	.	5	.	.	.	.	.	.	.	.	.	5	1060-10-11
.	.	2	3	.	.	.	.	.	.	.	.	.	5	1060-10-12
.	.	.	4	.	.	.	.	.	.	.	.	.	5	1060-10-13
.	.	.	3	.	.	.	.	.	.	.	.	.	5	1060-10-14
.	.	.	4	.	1	.	.	.	.	.	.	.	5	1060-10-15
1	1	.	2	.	.	.	.	.	.	.	.	1	5	1063-10-01
.	.	.	4	.	.	.	1	.	.	.	.	.	5	1067-10-01
.	1	.	3	.	.	.	.	.	.	.	.	.	5	25-10-01
.	.	.	3	.	1	.	.	.	.	.	.	1	5	26-10-01
.	1	.	1	.	.	.	.	.	.	.	.	.	5	26-10-02
1	.	1	1	.	1	.	.	.	.	.	1	.	5	26-10-03
.	2	.	3	.	.	.	.	.	.	.	.	.	5	27-10-01
.	3	.	1	.	1	.	.	.	.	.	.	.	5	30-10-01
.	.	.	1	.	.	.	.	.	.	.	.	.	5	30-10-02
.	.	1	2	.	1	.	.	1	.	.	.	.	5	30-10-03
.	.	1	1	.	.	.	.	.	.	.	.	.	5	45-10-01
1	.	1	1	.	.	.	.	.	.	.	.	.	5	45-10-02
.	.	1	1	.	.	.	.	.	.	.	.	.	5	45-10-03
.	.	.	3	.	.	.	.	.	.	.	.	.	5	45-10-04
.	1	.	2	1	.	.	.	.	.	.	.	.	5	45-10-05
.	.	.	1	.	.	.	.	.	.	.	.	.	5	45-10-06
.	.	.	2	.	.	.	.	.	.	.	.	.	5	45-10-07
.	.	.	3	.	.	.	.	.	.	.	.	.	5	45-10-08

Sample	Trench	SU	Deposit	Phase	Taxon	*Abies*	*Taxus*	*Pinus*	*Acer*	*Carpinus/ Ostrya*	*Cornus*	*Corylus*
						Fir	Yew	Pine	Maple	Hornbeam type	Dogwood	Hazel
45-10-09	S17	45	synthetic	Starčevo		.	.	.	.	.	2	1
45-10-10	S18	45	synthetic	Starčevo		.	.	.	.	.	1	.
45-10-11	S19	45	synthetic	Starčevo		.	.	.	.	.	1	1
45-10-12	S20	45	synthetic	Starčevo		.	.	.	.	1	2	.
45-10-14	S21	45	synthetic	Starčevo		.	.	.	.	2	1	.
45-10-15	S22	45	synthetic	Starčevo		.	.	.	.	1	.	.
45-10-16	S23	45	synthetic	Starčevo		.	.	.	.	4	1	.
45-10-17	S24	45	synthetic	Starčevo		.	.	.	.	.	.	.
45-10-18	S25	45	synthetic	Starčevo		.	.	.	.	.	.	.
45-10-19	S26	45	synthetic	Starčevo		.	.	.	.	.	.	.
45-10-19	S27	45	synthetic	Starčevo		.	.	.	.	.	2	.
45-10-20	S28	45	synthetic	Starčevo		.	.	.	.	.	.	.
45-10-21	S29	45	synthetic	Starčevo		.	.	1	.	1	.	.
45-10-22	S30	45	synthetic	Starčevo		.	.	.	1	2	.	.
45-10-23	S31	45	synthetic	Starčevo		.	.	.	.	3	1	.
45-10-24	S32	45	synthetic	Starčevo		.	.	.	.	.	1	.
45-10-25	S33	45	synthetic	Starčevo		.	.	.	.	1	1	.
45-10-26	S34	45	synthetic	Starčevo			.	.	.	.	.	.
45-10-27	S35	45	synthetic	Starčevo			.	.	.	.	.	.
45-10-28	S36	45	synthetic	Starčevo			.	.	.	4	.	.
45-10-29	S37	45	synthetic	Starčevo			.	.	.	.	.	.
45-10-30	S38	45	synthetic	Starčevo		1	.	.	.	.	1	.
50-10-01	S39	50	synthetic	Starčevo			.	.	.	1	2	.
50-10-02	S40	50	synthetic	Starčevo			.	.	.	.	.	2
50-10-03	S41	50	synthetic	Starčevo			.	.	.	.	3	1
50-10-04	S42	50	synthetic	Starčevo			.	.	.	1	1	.
51-10-01	S43	51	?	Eneolithic			.	.	.	.	3	.
Sum						2	1	1	4	27	48	14
Sum N1						0	1	0	1	1	12	2
Architecture N1 (fragments)						.	.	.	1	1	8	2
Synthetic deposits N1 (fragments)						.	1	.	.	.	4	.
Sum S1						2	0	1	3	26	36	12
Architecture S1 (fragments)						.	.	.	.	.	1	2
Synthetic deposits S1 (fragments)						2	.	1	3	26	32	10
Count percentages N1						0.0	0.9	0.0	0.9	0.9	10.4	1.7
Count percentages S1						0.9	0.0	0.5	1.4	12.1	16.7	5.6
Count percentages total						0.6	0.3	0.3	1.2	8.2	14.5	4.2

Tab. 10 continued.

Fraxinus	*Maloideae*	*Prunus*	*Quercus*	*Ulmus*	*Indet*	cf. *Acer*	cf. *Cornus*	cf. *Corylus*	cf. *Fraxinus*	cf. Maloideae	cf. *Prunus*	cf. *Quercus*	Sum	Sample
Ash	Pomaceous fruit	Stone fruit	Oak	Elm	Undetermined	cf. Maple	cf. Dogwood	cf. Hazel	cf. Ash	cf. Pomaceous fruit	cf. Stone fruit	cf. Oak		
.	.	.	2	.	.	.	.	.	.	.	.	.	5	45-10-09
.	.	.	2	.	1	.	.	.	.	.	1	.	5	45-10-10
2	.	.	.	.	.	.	.	.	1	.	.	.	5	45-10-11
.	.	.	2	.	.	.	.	.	.	.	.	.	5	45-10-12
.	.	.	1	.	1	.	.	.	.	.	.	.	5	45-10-14
.	2	.	2	.	.	.	.	.	.	.	.	.	5	45-10-15
.	.	.	.	.	.	.	.	.	.	.	.	.	5	45-10-16
.	.	.	5	.	.	.	.	.	.	.	.	.	5	45-10-17
.	.	.	5	.	.	.	.	.	.	.	.	.	5	45-10-18
.	.	.	5	.	.	.	.	.	.	.	.	.	5	45-10-19
.	.	.	3	.	.	.	.	.	.	.	.	.	5	45-10-19
.	.	.	5	.	.	.	.	.	.	.	.	.	5	45-10-20
.	1	.	1	.	.	.	.	.	.	.	.	1	5	45-10-21
.	.	.	1	.	.	1	.	.	.	.	.	.	5	45-10-22
.	.	.	1	.	.	.	.	.	.	.	.	.	5	45-10-23
.	1	.	2	.	1	.	.	.	.	.	.	.	5	45-10-24
1	1	.	1	.	.	.	.	.	.	.	.	.	5	45-10-25
.	.	.	5	.	.	.	.	.	.	.	.	.	5	45-10-26
.	2	.	3	.	.	.	.	.	.	.	.	.	5	45-10-27
.	.	.	1	.	.	.	.	.	.	.	.	.	5	45-10-28
.	.	.	2	.	.	.	1	.	2	.	.	.	5	45-10-29
.	1	.	2	.	.	.	.	.	.	.	.	.	5	45-10-30
.	.	1	1	.	.	.	.	.	.	.	.	.	5	50-10-01
.	.	.	3	.	.	.	.	.	.	.	.	.	5	50-10-02
.	.	.	1	.	.	.	.	.	.	.	.	.	5	50-10-03
.	.	.	2	.	.	.	.	.	.	1	.	.	5	50-10-04
.	.	.	1	1	.	.	.	.	.	.	.	.	5	51-10-01
6	19	9	169	2	11	1	3	1	3	1	4	4	330	Sum
1	3	3	81	0	4	0	2	0	0	0	2	2	115	Sum N1
.	2	1	40	.	3	.	1	.	.	.	1	.	60	Architecture N1 (fragments)
1	1	2	41	.	1	.	1	.	.	.	1	2	55	Synthetic deposits N1 (fragments)
5	16	6	88	2	7	1	1	1	3	1	2	2	215	Sum S1
1	1	1	5	.	2	.	.	.	.	.	1	1	15	Architecture S1 (fragments)
4	15	5	82	1	5	1	1	1	3	1	1	1	195	Synthetic deposits S1 (fragments)
0.9	2.6	2.6	70.4	0.0	3.5	0.0	1.7	0.0	0.0	0.0	1.7	1.7	100.0	Count percentages N1
2.3	7.4	2.8	40.9	0.9	3.3	0.5	0.5	0.5	1.4	0.5	0.9	0.9	100.0	Count percentages S1
1.8	5.8	2.7	51.2	0.6	3.3	0.3	0.9	0.3	0.9	0.3	1.2	1.2	100.0	Count percentages total

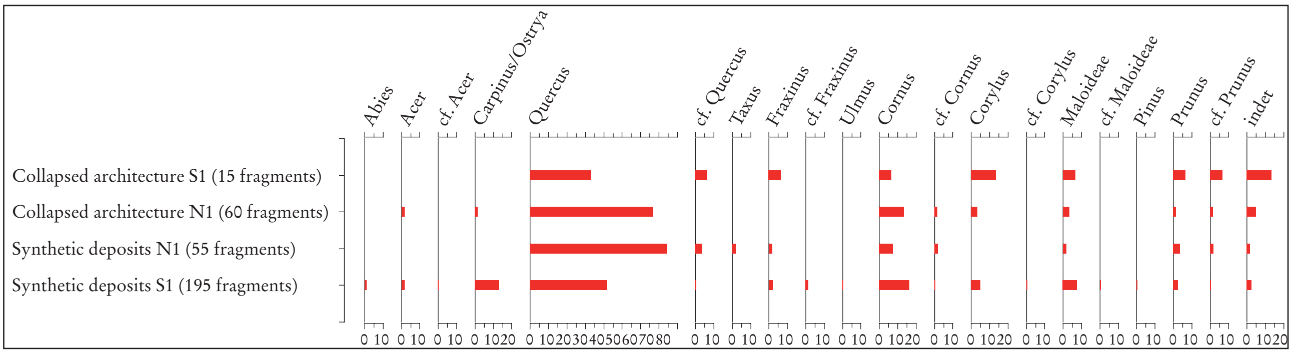


Fig. 34. Count percentages of taxa in trenches N1 and S1 in distinct archaeological structures (Graphics: T. Schroedter).

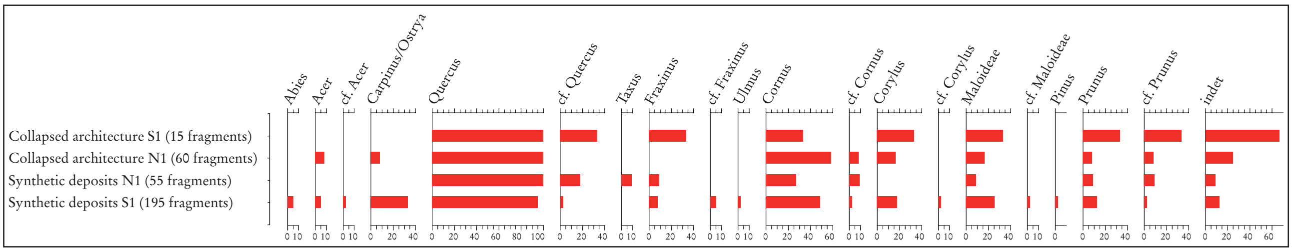


Fig. 35. Frequencies of taxa in trenches N1 and S1 in distinct archaeological structures (Graphics: T. Schroedter).

practised, as long as the preferred resource was available in sufficient amounts in the local landscape.

10.4. Exploited Vegetation

The assemblage suggests the use of oak-dominated mixed deciduous woodland, with rich understorey, documented as the presence of light-demanding trees (e.g. hazel, dogwood, plum). The occurrence of hornbeam and maple can be associated with the mixed deciduous woodland. This corresponds to evidence from the wider region.[116] Even today, the potential natural vegetation in the region consists of mixed deciduous woodland.[117] Ash and elm indicate zones characterised by a certain level of moisture, as indicated by the regular occurrence of these taxa in riparian forests. The presence of possible riparian vegetation in the direct vicinity of the site is not clearly visible in the wood charcoal record, otherwise the amounts of ash and elm would probably be higher and remains of alder (*Alnus*) would be expected. The light-demanding taxa, primarily dogwood, but also pomaceous fruits, hazel and plum, indicate the presence of bright stands. These could have taken different forms, such as rich understorey in oak-dominated woodland, or small to medium openings in the landscape to establish agriculture and animal husbandry, where the margins of the intensively used areas would have offered good conditions for a range of light-demanding species.

10.5. Timber and Fuel Wood

The predominance in the assemblage of oak and dogwood indicates the prevailing use of these taxa. Oak was likely the dominant tree in the surroundings; its preferential use was probably determined by its availability but also by its favourable qualities in terms of building and burning. It is likely that the Neolithic demand for oak as timber was met by the local woodland. The percentages of light-demanding taxa do not reflect major opening of the landscape – they suggest small-scale opening and the exploitation of nearby vegetation as part of the daily activities. The SUs representing architectural structures contain some taxa not typically used as building material, perhaps indicating a more complex archaeological situation or (also) their use as wattle.

10.6. Dual Use of Light-demanding Species?

All documented light-demanding taxa were regularly exploited for their fruits during the Neolithic in the Balkans.[118]

116 Marinova, Ntinou 2018.
117 Bohn, Neuhäusl 2000.
118 Kroll 2013. – Marinova, Krauss 2014. – de Vareilles et al. 2022, 20.

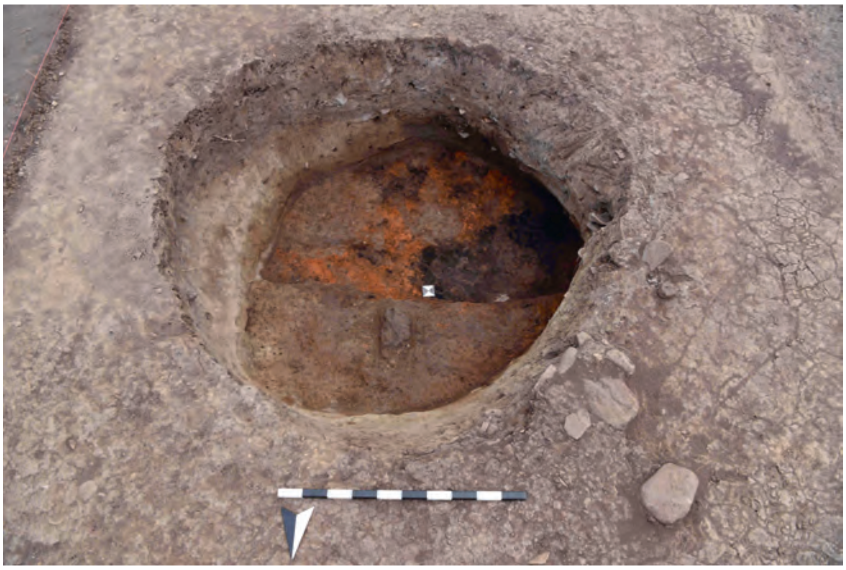


Fig. 36. Top view of the Middle Bronze Age pit (SUs 1055, 1074) following the excavations (Photo: F. Ostmann).

In this region, the genus hazel includes two species, *Corylus avellana* and *Corylus colurna*, both of which grow fruits of high caloric value. The genus *Cornus* here includes two species: *Cornus mas* (Cornelian cherry) and *Cornus sanguinea* (common dogwood). Cornelian cherry fruits are regularly consumed fresh or in another form, while the fruit stones contain oil that can also be used. The genus *Prunus* includes several species exploited for their juicy fruits. The subfamily Maloideae includes, among others, apple (*Malus*), pear (*Pyrus*) and hawthorn (*Crataegus*), all providing edible fruit. This group is regularly present in wood charcoal assemblages in the Neolithic.[119] Except for dogwood, these trees and shrubs are present in very low numbers or single finds in the analysed samples from Svinjarička Čuka. The hardness and flexibility of *Cornus* wood may have been the properties desired for woodworking or the manufacture of implements and weapons (arrows, lances).[120]

10.7. Conclusion

The investigated wood charcoal material gives an initial insight into the wood resources in the surroundings of Svinjarička Čuka. Despite the limited material, a range of taxa was documented, offering valuable insight into the Neolithic vegetation in the area of Svinjarička Čuka. Mixed deciduous oak woodland was exploited, providing sufficient resources for timber and fuel. Only small-scale landscape openness is reflected in the wood charcoal assemblage, as the percentages and frequencies of the light-demanding taxa suggest. The identified light-demanding taxa support the macro-botanical record, suggesting their dual exploitation – as sources of edible fruits and wood for fuel.

11. Excavation Results for the Metal Ages

11.1. A Middle Bronze Age Pit

An irregularly oval pit (SUs 1055, 1074) was recorded in quadrant S30 in trench N1 (Figs. 3–4). The pit was cut by a later Early Iron Age pit (SUs 1051, 1054), and the separation of archaeological materials was based on the difference in the quality and colour of soil infill and the typological characteristics of recorded potsherds. The upper dimensions of the Middle Bronze Age pit were not defined completely due to the aforementioned Iron Age disturbances, yet the excavated area in total covered approximately 2.2 × 2.5 m (including both the Middle Bronze Age and the Early Iron Age pit) (Fig. 36).

The depth of the pit, measured from the surrounding SU 1050 (Neolithic level) is approximately 1.2 m. The infill of the pit was comprised of loose light-grey ashy soil mixed with potsherds, animal bones, and lumps of daub. The soil within the pit was interspersed with small chunks of charcoal and pieces of burnt wood, all indicating a significant degree of burning. Besides numerous potsherds, the pit yielded finds of ceramic loom weights and bone tools. Pottery recorded within the pit bears typological characteristics of

119 Kreuz 1990. – Marinova, Thiébault 2008. – Schroedter et al. 2012.
120 Hegi 1926, 1553.

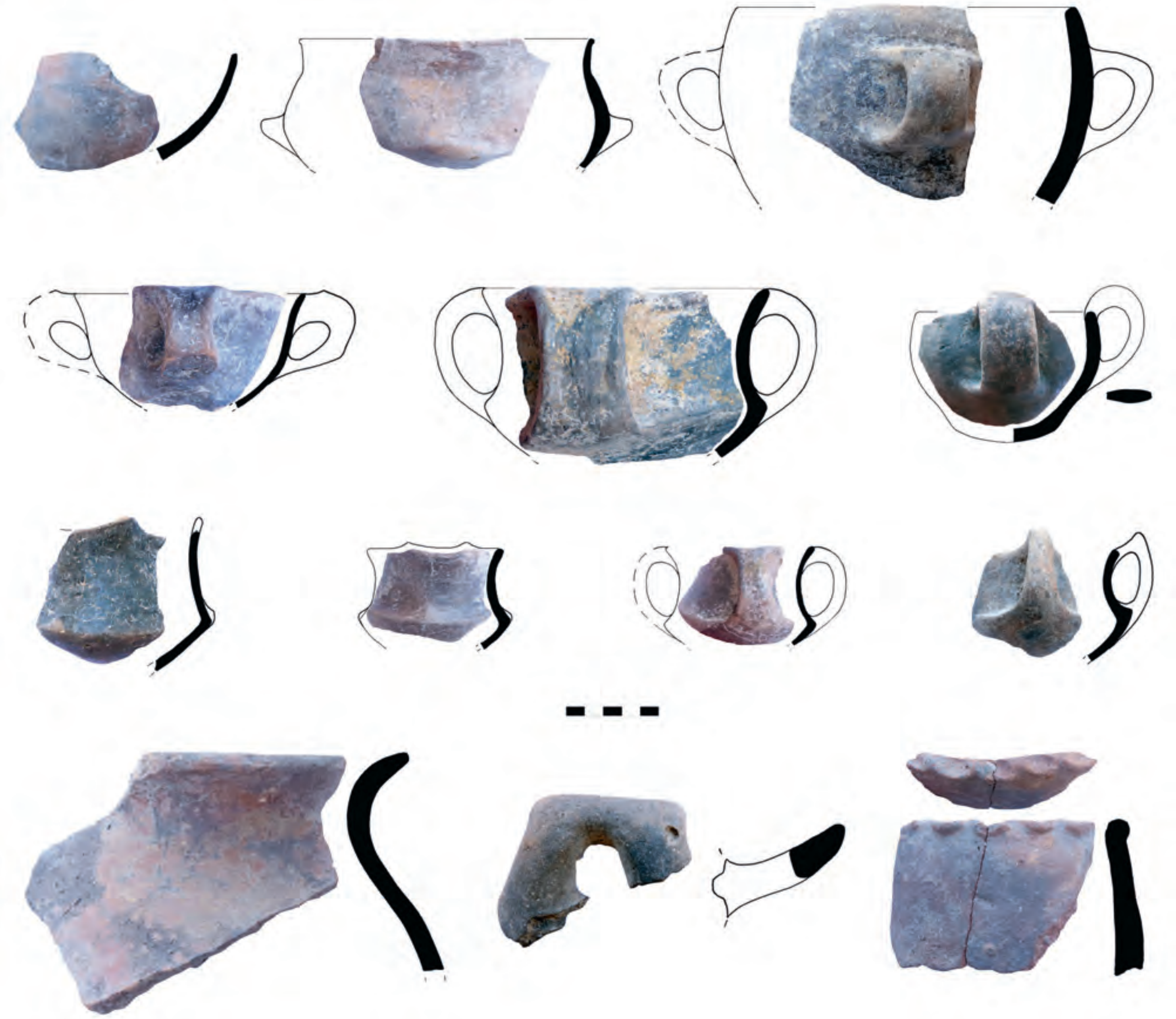


Fig. 37. A selection of characteristic pottery from the Middle Bronze Age pit (SUs 1055, 1074) (Graphics: A. Bulatović).

the so-called Bubanj-Hum IV-Ljuljaci cultural group.[121] Its main characteristics are beakers with emphasised junctions, two handles that slightly surpass the rim, and triangular and trapezoidal modelled extensions on the vessel mouth.[122] Other forms recorded within the pit are conical and S-profiled bowls with or without handles, conical or S-profiled cups with one or two handles and larger pots decorated with finger impressions on the body or the rim (Fig. 37).

Two radiocarbon dates (MAMS-46947 and MAMS-46940, a seed and a tooth respectively) originate from the pit and place it most likely in the 18th–17th centuries BC (Fig. 38).

Such dates correspond to the existing Middle Bronze Age date from the site,[123] as well as radiocarbon dates from sites that display similar typological characteristics (Ljuljaci, Trnjane, Hajdučka Česma, Čoka Njica, Ružana).[124]

11.2. A Late Bronze Age House

The feature was recorded during the 2017 geomagnetic survey, as a rectangular anomaly with the dimensions of

121 Bulatović, Stankowski 2012.
122 Bulatović 2021.
123 Horejs et al. 2019a.
124 Gogâltan 1999. – Gavranović et al. 2020. – Kapuran, Gavranović, Mehofer 2020.

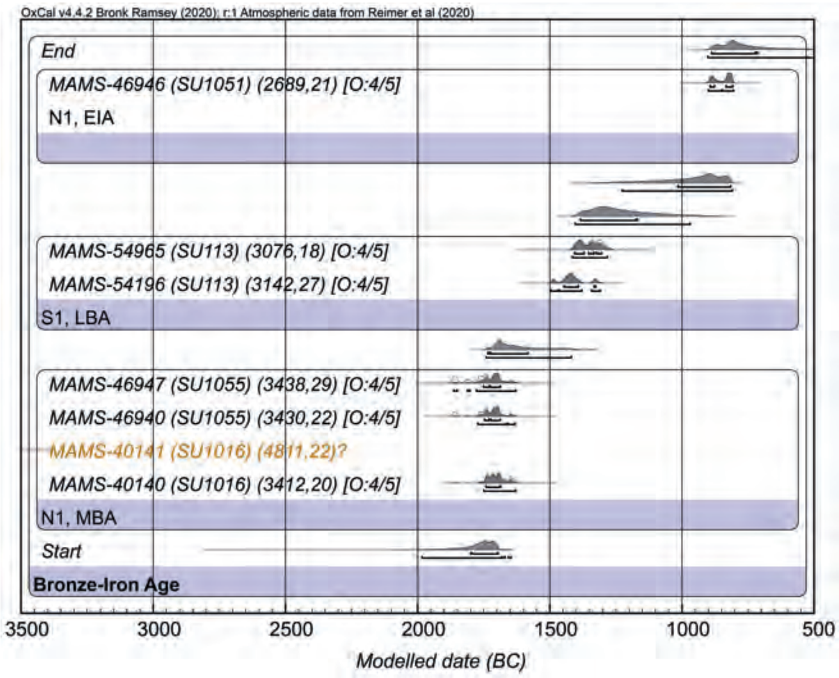


Fig. 38. Modelled absolute dates for Bronze and Iron Age features (Graphics: L Webster).

approximately 7 × 5 m, oriented northwest-southeast. The feature, recorded in squares S20–21 and T20–21 in trench S1, was marked as an area of high archaeological potential.[125] The ongoing excavations of the structure started in 2019 when the first remains of solid architecture were recorded in square S21, represented by burnt daub. Since the excavations in 2021, which were focused on square T21, the northern portion of the house is excavated up to the level of architecture, meaning the level at which the presumed house walls become completely visible. The vertical stratigraphy within squares S21 and T21 is identical. The topsoil, with mixed material including late antique finds, is followed by a thin and disturbed layer with mixed pottery (Neolithic, Bronze Age, Iron Age), corresponding to the Early Iron Age layer within trench S1, as indicated by potsherds recorded within it such as slightly biconical bowls with an inverted and faceted rim.[126] This layer is followed by the Late Bronze Age layer (SUs 67, 113 and 114), defined as the inventory of the house (house destruction layer), which lies above SU 68, meaning house walls represented by articulated pieces of burnt daub. The aforementioned layer yielded numerous potsherds typical for the Late Bronze Age Brnjica group, common for the South Morava Basin and its surroundings.[127] Some of those characteristic elements connected with the Brnjica group are amphorae with a ring-shaped thickening on the inner side of the rim, S-profiled bowls, arched handles with button-shaped extensions, fan-shaped and wishbone handles, all recorded within the so-called inventory layer.[128] However, it should be highlighted that those ceramic forms typical for the Brnjica group possess a distinct style in decoration, comprised of incised triangles filled with triangular pricks and circular motifs comprised of triangular pricks, positioned on almost any part of the vessel, with the emphasis on the upper and outer sides of rims and handles (Fig. 39).

The decoration is often filled with white paste. Such a manner of decoration is known from other Brnjica-related sites within the entire territory of the cultural group, and represents an exception rather than a common characteristic (Končulj and Krševica near Vranje, Bobište and Sastanci near Leskovac, Donja Toponica in Niš, Mađilka in Pirot, Graštica in Kosovo).[129] Aside from potsherds, the layer yielded a number of ceramic spindle whorls, a clay firedog, a grindstone, and several bronze objects, possibly indicating

125 Horejs et al. 2019a, 180 and Fig. 2.
126 Bulatović 2019.

127 Srejović 1960. – Lasić 1996. – Bulatović 2000. – Stojić 2001a. – Stojić 2001b. – Bulatović, Stankowski 2012.
128 Bulatović, Stankowski 2012, 355–357, 389–391 and Tab. 16.
129 Jevtić 1990, Pl. III/5, 7, 9; IV/1, 6, 7; V/5. – Lazić 1996, Pl. XIX/1a-3. – Bulatović 2007, Pl. LI/46–48, LXII/14–16. – Bulatović, Jović 2009, Pl. X/27, XXV/86–89. – Bulatović, Stankowski 2012, Pl. XV/1–9.

Fig. 39. A selection of characteristic pottery from the Late Bronze Age house (SUs 67, 113, 114) (Graphics: A. Bulatović).

the everyday activities of its inhabitants, such as weaving and food processing. The architectural remains of the Late Bronze Age house (SU 68) are comprised of variously sized pieces of burnt daub, with wattle impressions, articulated in an approximately rectangular shape and therefore completely matching the recorded anomaly. The state of preservation of the daub varies due to agricultural activities at the site and the superimposed layers. Some of the well-preserved pieces of daub indicate a possible existence of decorated portions of walls and a stamped clay floor (Fig. 40).

The concentration and disposition of daub pieces in the central portion of the excavated part of the house indicates the possible existence of a kiln, which again corresponds to the anomaly recorded during the geomagnetic survey.[130] An absolute date (seed) from the inventory layer places the house in the 15th–14th century BC, which at the moment is one of the earliest dates for the Brnjica group.[131]

130 The northern half of the anomaly/house, spatially corresponding to the potential kiln, was marked as a possible deeper pit.

131 Bulatović, Gori, Vander Linden 2018.

Fig. 40. Remains of a stamped clay floor from the Late Bronze Age house (SUs 67, 113, 114) (Photo: F. Ostmann).

Fig. 41. Burnt daub which sealed the Early Iron Age pit (SUs 1051) after its removal (Photo: F. Ostmann).

11.3. Early Iron Age Pits

The Early Iron Age pit recorded in quadrant S30 cuts into the aforementioned Middle Bronze Age pit (SUs 1055, 1074). The pit itself was comprised of two distinct and clearly separated features. The upper portion of the pit (SU 1054) was represented by a concentration of medium- to large-sized lumps of burnt daub with wattle impressions that covered the surface of approximately 1.1 × 1.5 m (Fig. 41).

Apart from the daub, the SU was comprised of small chunks of carbonised wood, reddish soil, and sporadically occurring potsherds. The lower portion of the pit (SU 1051), in fact, sealed with the daub, was comprised of dark-brown soil mixed with carbonised wood, smaller lumps of daub, stone, and potsherds. The dimensions of the pit correspond to the given dimensions of the Middle Bronze Age pit (2.2 × 2.5 m, with a depth of 1.2 m compared to the SU 1050). The ceramic inventory of the pit is comprised of a considerable number of slightly biconical bowls with inverted rims, decorated with parallel oblique channels. Rims of those bowls often possess a rectangular extension decorated with incised hatched triangles or grooves, or combinations of incisions and grooves (Fig. 42).

Other decorative elements characteristic of the pit are modelled bands with finger impressions on pots, corded motifs, oblique channels on vessel bellies, incised hatched triangles, and pricks. The absolute date (seed) positions the pit in the 9th century BC.

The excavation campaigns in 2019 and 2021 have further supplemented our knowledge of prehistoric settling at the site of Svinjarička Čuka during the Metal Ages. In addition

Fig. 42. A selection of characteristic pottery from the Early Iron Age pit (SU 1051) (Graphics: A. Bulatović).

to the excavated features attributed to the Middle and Late Bronze Age, as well as the Early Iron Age, the ceramic inventory of certain stratigraphic units and several absolute dates indicate that the settling at the site can be traced back to the Late Eneolithic. Indicative potsherds from SUs 1035 and 1036, decorated with fields comprised of vertical rows of short incisions and oval notches, display the typological characteristics of the Late Eneolithic Coţofeni-Kostolac group.[132] On the other hand, several absolute dates and scarce potsherds point towards the Early Bronze Age settling at the site, yet unfortunately, a cultural layer of this

132 Kapuran, Bulatović 2012.

period has not been recorded. Therefore, one could suggest the possible existence of the Early Bronze Age settlement on the top of the site, a few dozen metres toward the west. The recorded features and layers from the Metal Ages fit into the existing cultural and chronological narrative of the given territory. During the Early Bronze Age, this territory was inhabited by the bearers of the Bubanj-Hum III group, which gradually evolved into the Bubanj-Hum IV-Ljuljaci group,[133] with stylistic and typological characteristics identical to the ceramic inventory of the Middle Bronze Age pit from the site (SU 1055). Further, the pit chronologically corresponds to the Middle Bronze Age of the South Morava Basin, meaning the Bubanj-Hum IV-Ljuljaci group. The remains of the Late Bronze Age house (SU 68) and its ceramic inventory (SUs 67, 113 and 114) are firmly attributed to the Brnjica group, as the main representative of the period in the southern parts of the central Balkans. Chronologically, the absolute date from the Late Bronze Age house precedes the existing dates for the Brnjica group (Svinjište, Medijana, Pelince),[134] and together with a characteristic style in decoration might represent an earlier variant of the Brnjica group, or the closest link between the Middle and Late Bronze Age in the South Morava Basin. Likewise, the Early Iron Age pits from the site (SUs 1046, 1051) both typologically and chronologically correspond to the concurrent sites within the Leskovac Basin. Those sites are attributed to the later phase of the Early Iron Age I, characterised by intensive contacts with the bearers of cultural groups from the north and the east (Insula Banului, Kalakača, and Pšeničevo-Babadag groups), such as incised hatched triangles, parallel grooves, channels and stamped concentric circles.[135] The continuation of excavations at the site will focus on the total research of the Late Bronze Age house, its architecture and its absolute chronology, as well as a more precise definition of possible features attributed to the Late Eneolithic and the Early Bronze Age at the site.

12. Summary

Excavations and related material and scientific analyses at Svinjarička Čuka in 2019 and 2021 offer new data for the Neolithisation process of the central Balkans, and the important river corridor along the Vardar-Morava route in particular. The interdisciplinary approach provides various perspectives for this Starčevo site, including first solid results for domestic activities and dwellings, subsistence and food preparation processes and environmental conditions. An area totalling 225 m^2 in the small elevated river terrace has been investigated so far and revealed Starčevo Neolithic domestic features of an earlier and later phase dating to the 57th and 56th centuries BC. The stratigraphical results are supported by 26 radiocarbon dates of short-lived material, presented and discussed using a Bayesian approach. One radiocarbon date of the late 7th millennium from a drilling core points to an earlier occupation below the excavated layers. The younger Starčevo occupation phase revealed a variety of domestic features, including the remains of a wattle-and-daub light dwelling ('Starčevo hut'), a stone installation with an associated vessel and a large pit with burnt daub material indicating another architectural feature not yet excavated.

The remains of a large rectangular (?) structure came from the earlier Neolithic phase and is assigned as a potential 'Starčevo house'. Massive stone slabs and related pits indicate wooden post footings, of which one in the inner part has been renewed. So far, five floors have been identified, which are associated with various installations (platform, hearth, pits, storage) as well as abundant materials (pottery, artefacts, tools, figurines, ornaments). This large structure demonstrates the creation of a domestic space with several renewals by the Svinjarička Čuka community during the 57th and 56th centuries BC. The analyses of the associated pottery allow us to assume that the majority was secondarily deposited within the 'Starčevo house' during the multiple floor installations and/or as infilling after abandonment. Nevertheless, some floor layers contained many of the best-preserved sherds and refits, interpreted by the expert to mean that the pottery had not moved around as much as in other layers. The very varied pottery repertoire from this context includes a good mix of bowl and jar types, such as storage jars, bowls and monochrome globular vessels, dark linear painted and spiraloid painted bowls, linear incised pottery and a high number of pedestal bases. The technological observations on the chipped stones from the 'Starčevo house' point towards a basic core reduction strategy for producing simple flakes of varying sizes and shapes. The lithic raw materials from this context mainly comprises local cherts of Neogene lacustrine origin (NLS). A diverse lithic assemblage also includes 'Balkan Flint' and clear quartz and is connected with one of the identified 'Starčevo house' floors. Various domestic activities can be related to the house context, such as textile production, polished stone tool production or food preparation.

The material studies of Neolithic pottery, chipped stones, other artefacts and small finds demonstrate that the Svinjarička Čuka communities were broadly embedded in

133 Bulatović, Stankowski 2012. – Bulatović 2021.

134 Bulatović, Gori, Vander Linden 2018, 124–125 and Tab. 1.

135 Bulatović 2009. – Bulatović, Jović 2009, 45-47, with cited literature.

the Starčevo technological knowledge, practice and stylistic concepts during the early and middle Neolithic period. First differences come to light in ongoing raw material and technological analyses (e.g. lithics), indicating the impact of locally available sources on particular local technological characters. Furthermore, ongoing scientific analyses of various materials are expected to offer a deeper insight into local versus regional technologies or practice in the future. The first multidisciplinary approach to the Svinjarička Čuka grinding stones and mortars shows very promising results and revealed different types of grinding kits, including the reconstruction of grinding stones in fixed installations.

The study of the Neolithic faunal remains is based on a smaller sample and shows the dominance of caprines, followed by cattle, domestic pig and red deer. Dog, wild pig, bear, wolf and hare are only evident in singular pieces. Burning traces, gnawing and butchery marks are only scarcely observed. The plant repertoire shows a diverse spectrum of crops (barley, einkorn, emmer and Timopheev's wheat), lentil, pea, wild fruits and nuts. Differences from other Starčevo sites become visible and may indicate local varieties related to biogeoclimatic conditions and the community's choice in crop cultivation and plant consumption. Further results allow the first reconstruction of the natural vegetation in the region as oak-dominated mixed deciduous woodland including light-demanding trees such as hazel, dogwood and plum. The preferred exploitation of oak and dogwood by the inhabitants of Svinjarička Čuka not only demonstrates its availability, but also indicates its use as building materials and fuel.

The new results for the Metal Ages allow a preliminary reconstruction of the later occupation on the river terrace going back to the Late Eneolithic period associated with the Coţofeni-Kostolac group. The Early Bronze Age (Bubanj-Hum III group) is not identified with cultural layers yet, but with a few ceramics and radiocarbon dates pointing towards a potential horizontal shift of the human activities upon the terrace. The Middle Bronze Age (Bubanj-Hum IV-Ljuljaci group) occupation of the 19th and 17th centuries BC is well attested with a large pit and infilled material. The following Late Bronze Age (Brnjica group) architectural remains of a house are partially excavated and radiocarbon-dated to the 15th and 14th centuries BC, the later pits belong to the Early Iron Age I period.

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Making the Most of Soils in Archaeology. A Review

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Abstract
Sediments serve as an archive of human and animal activity and environmental conditions through their physical and chemical properties as well as captured biological traces. Archaeologists have been extracting information from archaeological soils and sediments for decades, but recent technological developments, such as the analysis of lipid biomarkers, proteins, and ancient DNA from soil and the diversification of approaches necessitate a re-examination of standard field practice and a renewed emphasis on soil and sediments as archaeological materials. This review paper brings together a range of specialists to introduce cutting-edge approaches to analysing soils and sediments. From the large to the small scale, pioneering methods can complement established soil analytical methods to address issues of soil formation and erosion processes, heritage preservation, mobility, domestication, land use, human-environmental interactions, cultural and biological complexity, and ecosystem legacies. Soil analyses are poised to enable archaeologists to ask new questions and generate innovative hypotheses in an interdisciplinary research framework.

Keywords
Sediments, micromorphology, lipid biomarkers, palaeoproteomics, sedimentary aDNA, soilscapes

Zusammenfassung – *Die optimale Nutzung des Erkenntnispotentials von Böden in der Archäologie: Ein Überblick*

Sedimente dienen aufgrund ihrer physikalischen und chemischen Eigenschaften sowie der in ihnen enthaltenen biologischen Spuren als Archiv menschlicher Aktivitäten und Umweltbedingungen. Seit Jahrzehnten extrahieren Archäolog*innen Informationen aus Böden und Sedimenten, aber die jüngsten technologischen Entwicklungen wie die Analyse von Lipid-Biomarkern, Proteinen und alter DNA im Boden, sowie die Diversifizierung dieser Ansätze, erfordern eine Überprüfung der Standardpraxis im Feld und eine erneute Hervorhebung der Bedeutung von Böden und Sedimenten als archäologische Materialien. Dieser Überblick stellt ausgehend von der Expertise unterschiedlicher Fachleute die modernsten Ansätze der Boden- und Sedimentanalyse vor. Vom großen bis zum kleinen Maßstab können bahnbrechende Methoden etablierte Bodenanalyseverfahren ergänzen, um Fragen der Bodenbildung und Erosionsprozesse, der Bewahrung des kulturellen Erbes, der Mobilität, der Domestizierung, der Landnutzung, der Wechselwirkungen zwischen Mensch und Umwelt, der kulturellen und biologischen Komplexität und der Hinterlassenschaften von Ökosystemen zu behandeln. Aufgrund von Bodenanalysen können neue Fragen gestellt und innovative Hypothesen in einem interdisziplinären Forschungsrahmen entwickelt werden.

Schlüsselbegriffe
Sedimente, Mikromorphologie, Boden-Biomarker, Paläoproteomik, sedimentäre aDNA, Bodenlandschaften

1. Introduction

Soils and sediments are inconstant, changing components of the Earth's surface that play a fundamental role in reconstructing palaeoenvironments and archaeological landscapes.[1] Soils and sediments are also an archive of past cultural and non-cultural events, from volcanic eruptions to domestication and early agriculture, storing the microremains of

1 Bede et al. 2015. – Crombé, Verhegge 2015. – Kluiving et al. 2016.

settlement and production activities,[2] traces of pollution,[3] evidence of ecological changes, and the environmental impact of cultural behaviour.[4]

Despite the relevance of these traces, systematic applications of geochemistry and geo-biochemistry of soils and sediments are still underused in archaeology. This is all the more regrettable in light of the rapidly expanding toolbox of conjoined methods from geo, bio, and eco sciences, which allow us to target new high-potential proxies such as lipid biomarkers,[5] ancient human and environmental DNA (aDNA),[6] and ancient proteins.[7] Full exploitation of the soil archive remains sporadic. Keith W. Kintigh and colleagues[8] set out 25 grand challenges for archaeology to address the fundamental nature of human societies, of which the emergence of complexity, resilience, mobility, and human-environment interactions are just a few examples. Organic and inorganic microtraces in sediments, and microstructure of deposits, can contribute data to each of these challenges.

Soils and sediments are steadily evolving materials with very heterogeneous ages, origins, and formations. Soils form in place on some parent material, which can include sediments, and are spatially immobile. Pedogenesis (soil formation) occurs through the combined influences of climate, topography, and biological and geochemical processes on the parent material over time. A well-developed soil profile will have a distinct sequence of soil horizons. In contrast, layering in sediments is related to depositional events. Sediments are mineral particles formed by weathering of rocks and then transported by water, wind, ice, gravitation, people, or animals. Some sediment clasts can travel thousands of kilometres by air, while others experience shorter transport by river, lake, or seawater; some originate from local sources, transported by a variety of processes including local surface runoff or human activity, and some components may have formed autochthonously.[9] Accordingly, different soils and sediments can have very different properties, inherited from the different source regions. Some sediment grains could be many millions of years old, possibly (re-)eroded and (re-) deposited in several cycles, while others, formed during soil formation or by calcium precipitation or other geochemical processes, are very young.

This variability becomes even more relevant when considering soil/sediment mixing by bioturbation (e.g. rodents, earthworms, roots), cryoturbation, and along desiccation cracks. Earthworms and the roots of many plants can reach several metres in depth, disturbing deeper levels of soils and palaeosols and moving particles up or down. In addition to 'natural' processes, the anthropogenic effects on erosion, sedimentation, and pedogenesis, such as forest clearance, animal husbandry, water management, and agricultural practices, often act much faster and with more energy than non-cultural processes.[10] The geogenic, biogenic, and anthropogenic processes that act on sediments can be synchronous with deposition (syn-depositional) or post-depositional. Soils and sediments can be influenced by various amounts of syn- to post-depositional erosion, generating sediment deposition elsewhere as colluvium or increased sediment load in waterways. During depositional and post-depositional phases, variations in many large-scale and small-scale factors, including relief, climate, hydrology, mineral inputs, vegetation, and fauna can influence soils and sediments. In addition, soil formation (pedogenesis) frequently occurs as a post-depositional process on cultural deposits. Due to the nature of evolution and alteration, sediments/soils form discontinuous, patchy layers, highly variable in horizontal and vertical extent.[11]

To get the most out of soils and sediments, therefore, requires a solid understanding of formation processes and depositional environments, as well as the analytical techniques available in the second decade of the 21st century. In this article, we have three objectives: i) to advocate a conceptual reframing of soils and sediments as archaeological materials, ii) to review cutting-edge approaches to soil analysis, including recommendations for sampling and storage (see Tab. 1), and iii) to make suggestions for a re-examination of standard field practices and integration with established soil analytical methods to move towards a fully integrated bio-geoarchaeology framework, thus making the most out of archaeological soils and sediments.

2. Sedimentology

Sediments serve as archives from which to extract pollen, phytoliths, diatoms, black carbon, datable organics,

2 Migliavacca et al. 2013. – Pecci, Barba, Ortiz 2017. – Salisbury 2017.

3 Martínez Cortizas et al. 2016. – Lentz et al. 2020.

4 Karkanas et al. 2011. – Schumacher, Schier, Schütt 2016.

5 Bull, Betancourt, Evershed 2001. – Kovaleva, Kovalev 2015. – Zocatelli et al. 2017.

6 Slon et al. 2017. – Crump et al. 2021.

7 Oonk, Cappellini, Collins 2012.

8 Kintigh et al. 2014.

9 Pope 2013.

10 Zalasiewicz et al. 2019.

11 Pope 2013.

Method	Research possibilities	Sample type / quantity	Limitations	References
Sedimentology	Stratigraphy, depositional environments, human/animal activities, formation processes. Particle size, mineralogy, magnetic susceptibility, soil organic carbon, soil nitrogen, pH, carbonates. Extraction of pollen, phytoliths, diatoms, black carbon, datable organics, biomolecules, and other proxies	Core Bulk (loose); quantity depends on desired analyses; for multiple analyses, up to 1000 g may be needed Block samples; size depends on research questions and sediment types (larger blocks in looser sediments)	Most analytical methods require the destruction of a sample	Leopold, Völkel 2007; Gerlach, Eckmeier 2012; Nicoll, Murphy 2014; Vrydaghs, Ball, Devos 2016; Dreslerová et al. 2019; Jansen et al. 2019; Rick et al. 2022
Micromorphology	Micro-stratigraphy, micro-structure, mineralogy, walking surfaces, formation processes. Extraction of DNA	Block samples; plaster preferred to Kubiena tins	Coarse-grained sediments can lose structural integrity	Courty, Goldberg, Macphail 1989; Stoops 2014; Macphail, Goldberg 2017; Karkanas et al. 2019
Trace-element chemistry	site boundaries, activity zones, task areas, areas, spatial organization, land use, manuring, 'empty' burials	Bulk (loose); c. 3–5 g per analysis; in-situ pXRF	Contamination from leaching; ambiguity from overlapping activities; best as complementary data	Holliday, Gartner 2007; Wilson, Davidson, Cresser 2008; Lubos, Dreibrodt, Bahr 2016; Salisbury 2016; Salisbury 2017; Šmejda et al. 2018
Total C / N	depletion or enrichment due to agricultural and pastoral activities, ancient manuring, nutrition/diet	Bulk (loose); c. 5 g per analysis	C3 and C4 plant proportions influence $\delta^{13}C$ values; climate during decomposition influences $\delta^{15}N$ values; acid treatment may fractionate nitrogen	Beach et al. 2011; Terwilliger et al. 2011; Lauer et al. 2014; Sandor et al. 2022
Fatty acids (lipids) Faecal and plant leaf waxes	animal husbandry, land use, manuring, species change, vegetation change, environmental monitoring	Bulk (loose); c. 5 g per analysis	contamination from plasticizers; pedological conditions influence lipid preservation	Bull et al. 2000; Killops, Killops 2005; Shillito et al. 2011; Gerlach et al. 2012; Prost et al. 2017; Schirrmacher et al. 2019; Patalano, Zech, Roberts 2020
aDNA	evolutionary history (human, animal, plant), ecosystem monitoring and reconstruction, biodiversity	Cores or bulk samples from terrestrial, marine and lake sediments	contamination, degradation	Taberlet et al. 2012; Slon et al. 2017; Giguet-Covex et al. 2019; Edwards 2020; Kanbar et al. 2020; Vernot et al. 2021; Zavala et al. 2021
Amino acids (proteins)	human occupation, activities, animal husbandry, land use	Bulk (loose)	contamination, degradation	Oonk, Cappellini, Collins 2012; Cappellini et al. 2018; Hendy et al. 2018

Tab. 1. Summary of methods discussed in the text, with research questions and limitations.

biomolecules, and other environmental proxies.[12] Therefore, a thorough understanding of landscape formation processes, providing context for these archives, should be an integral part of any bio-geoarchaeological approach, in addition to being fundamental to reconstructions of land use and palaeoenvironments. Classical sedimentological analysis, based on coring campaigns and examination of exposed profiles,[13] represents one of the most powerful approaches to understanding formation processes that play out on the landscape level as well as mapping the complex entanglement of cultural and non-cultural drivers of these processes.

This analysis provides information about geomorphology, erosion/accumulation history, hydrological activity, and topographic changes.[14] Data is generally collected from exposed profiles, cores or drillings, including vibracores, hydraulic percussion drills, and Russian corers, among others. When using plastic or polycarbonate tubes within the corer, the resultant cores can be stored and subsampled for many of the other methods presented in this paper. Analysing the sediment grains themselves aids in determining the differences between sedimentation and erosion, depositional alterations such as (de)calcification or bioturbation and argillipedoturbation, and the identification of palaeosurfaces and phases of landscape stability or activity in the form of buried topsoils or redeposited soil sediments. Analyses include one or more of sediment colour, grain size, mineralogical composition, magnetic susceptibility, soil organic carbon, soil nitrogen, pH, and carbonates, as well as chemical enrichment.[15] Sediment particle size is typically measured using a laser granulometer or nested sieves. Soil organic matter and carbonate content are quantified through total carbon analyses.[16]

The application of these methods to reconstructing palaeolandscapes and human settlements, as well as the effects of both cultural and non-cultural processes on the archaeological record, is exemplified in the following studies. Studies of coastal plains in southern and central Italy, for example, demonstrated that sedimentation in these plains biases our understanding of archaeological settlement patterns; at the same time, sedimentation serves as a proxy for determining the relative sustainability of ancient agriculture on coastal plains.[17] In the coastal karst setting of the ancient Roman city of Apsorus (modern Osor) in the Adriatic Sea, airborne laser scanning (ALS) and airborne laser bathymetric (ALB) data combined with lithostratigraphic documentation, radiocarbon dating, and X-ray diffraction (XRD) of karst sinkhole sediments from vibracores allowed for the reconstruction of the palaeocoastline and the early onset of erosion.[18] Investigations of the fluvial hinterland of the ancient salt mine at Chehrābād, located at an altitude of c. 1450 m in the northwestern Iranian Plateau, used high-resolution digital elevation models, geotechnical rotary drilling, sedimentological analyses, and radiocarbon dating to document the long-term effect of centuries of irrigation on the fluvial landscape.[19] In another example, from the Ecse-halom burial mound in eastern Hungary, particle size, magnetic susceptibility, soil organic and carbonate content, and thin-section microscopy indicated that layers originated from the immediate vicinity of the mound, but have different characteristics than present-day soils. Results also suggest continuous salinization of the Hortobágy marshlands throughout the Holocene.[20] In the Seille Valley in eastern France, an integrated approach relying largely on borehole surveys, sedimentological analysis, geochronology, and palynology revealed the fundamental impact of prehistoric salt production on the hydrological regime and subsequently on landscape formation.[21] The scale of landscape alteration was such that these early industrial activities still influence land use and hydrology today.

3. Sediment Thin-section Microscopy

Micromorphology is the study of undisturbed, oriented, and resin-impregnated soil/sediment samples, ground to a thickness of 30 µm and observed under a petrographic microscope, which is a transmitted light microscope with a polarizing filter.[22] The identification and description of the soil/sediment components – their nature, geometry, and spatial arrangement – facilitates the recognition of distinct depositional environments and agents, thus providing a detailed understanding of the genesis of investigated contexts.

Since the 1970s and 1980s, micromorphological studies have been growing within archaeology.[23] Investigated topics include the reconstruction of past environments and land management strategies, the integrity and preservation of archaeological sequences, spatial differentiations at the

12 E.g. Gerlach, Eckmeir 2012. – Nicoll, Murphy 2014. – Vrydaghs, Ball, Devos 2016. – Jansen et al. 2019.
13 Rick et al. 2022.
14 Leopold, Völkel 2007. – Dreslerová et al. 2019.
15 Bede et al. 2015. – Draganits et al. 2019.
16 E.g. Nejman et al. 2018.
17 Attema 2017.
18 Draganits et al. 2019.
19 Draganits 2020.
20 Bede et al. 2015.
21 Riddiford et al. 2016.
22 Courty, Goldberg, Macphail 1989. – Macphail, Goldberg 2017.
23 Stoops 2014.

intra-settlement and intra-building scales, experimental and ethno-geoarchaeological studies aimed at defining pathways of deposition and degradation of specific materials as well as their distinctive features in thin section (e.g. mudbricks, dung, combustion features), the use of resources, and the study of ancient technologies.[24]

Other research focuses on the presence/absence of material residues from daily-life activities and how people dealt with these materials (e.g. by discarding, recycling, or incorporating them into the built environment). Examples of such investigations include middens, pits, ditches, constructed and informal floors, streets, open spaces, and penning areas.[25]

The main contribution of these studies lies in the reconstruction of the complex relationship between people, animals, and their physical surroundings, in turn offering insights into past living conditions, health as well as socially and culturally-driven perceptions of wellbeing and propriety. Also, in combination with other lines of evidence (e.g. organic chemistry, parasitology, mycology), the microstratigraphic study of waste, rubbish, and cleaning practices has the potential of addressing past health challenges, thus stimulating new interdisciplinary avenues for archaeological research.

By providing crucial microcontextual, microstratigraphical information, micromorphology is particularly well suited for multi-proxy research. For this reason, sampling strategies must preserve the structural integrity and orientation of the sediment blocks. Once in the laboratory, samples can be temporarily stored either at room temperature – in dry and ventilated places – or cold conditions (i.e. refrigerated), depending on the moisture and organic content. However, since weathering and mechanical disturbances eventually affect unconsolidated samples, at present the best way to ensure their long-term preservation is by consolidating them with resin.

The process of impregnating a block with resin is irreversible, and microsampling of loose sediment for further tests (e.g. gas chromatography-mass spectrometry (GC-MS), x-ray diffraction (XRD), ^{14}C) should be carried out before the impregnation. Other measurements (e.g. micro-computed tomography (µCT), micro-x-ray fluorescence spectroscopy (µXRF), micro-Fourier transform infrared spectroscopy (µFTIR), µRaman spectroscopy, etc.) can be carried out directly on the thin sections (with no coverslip) or by drilling the blocks.[26] However, one recent study suggests that GC-MS and GC-isotope ratio mass spectrometry (GC-IRMS) can be performed on dust drilled from impregnated slabs.[27] Another recent paper suggests that aDNA can be successfully extracted from impregnated blocks, directly linking genetic information with archaeological and ecological records on a microstratigraphic scale.[28]

4. Multi-element Chemistry

Anthropogenic processes, combined with the chemical and physical properties of soils, allow for the accumulation of chemical residues as indicators of past human activities. Many different soil characteristics and chemical analyses can be used to examine anthropogenic markers in the sediment archive, including phosphates, trace elements, plant nutrients, soil organic carbon, and biomarkers. Established methods of inorganic chemistry, including soil phosphate analyses and multi-element inductively coupled plasma mass spectroscopy or optical emission spectroscopy (ICP-MS or OES), along with recent developments in portable, handheld x-ray fluorescence (pXRF), provide information on site boundaries, activity areas, spatial organization, and land use.[29] Colorimetry tests are useful for soil phosphates, albeit providing qualitative results.[30]

The established process for inorganic multi-element soil chemistry involves the chemical digestion of a soil sample using acid, followed by measurement of the elements using ICP-MS or ICP-OES. Which acids are best suited for this has been subject to extensive debate,[31] with quasi-total extraction and sequential extractions emerging as the most reliable and replicable methods.[32] Handheld pXRF is now being widely used for soil analyses, returning total elemental composition comparable to total and quasi-total chemical extractions.[33]

Soil chemistry has contributed to understanding the uses and organization of space. Plazas at Mesoamerican settlements most likely served as multi-purpose areas, hosting

24 See Macphail, Goldberg 2017, and references therein.
25 See, recently, Macphail et al. 2017. – Koromila et al. 2018. – Furlan, Bonetto, Nicosia 2019. – Borderie et al. 2020. – Brönnimann et al. 2020. – Lisá et al. 2020. – Portillo, García-Suárez, Matthews 2020. – Shillito, Mackay 2020.
26 Nicosia, Stoops 2017. – Karkanas et al. 2019.
27 Rodríguez de Vera et al. 2020.
28 Massilani et al. 2022.
29 Holliday, Gartner 2007. – Wilson, Davidson, Cresser 2008. – Salisbury 2016. – Šmejda et al. 2018.
30 Holliday, Gartner 2007.
31 Middleton, Price 1996. – Wells 2004. – Vyncke et al. 2011.
32 Wilson, Cresser, Davidson 2006. – Wilson, Davidson, Cresser 2008.
33 Lubos, Dreibrodt, Bahr 2016. – Horák et al. 2018. – Šmejda et al. 2018. – Dreslerová et al. 2020.

markets, rituals, and feasts, based on the results of phosphate colorimetry, ICP-OES, and pXRF.[34] Soil chemistry conducted using pXRF at Tel Burna in the southern Levant identified several activity areas, including copper working.[35] Soil phosphates have been included in several attempts to locate prehistoric garden plots and agricultural fields.[36]

Future research combining established multi-element methods with soil biomarkers and micromorphology will strengthen the interpretational power of soil chemistry. Lipids and multi-element chemistry have been used together, for example, to identify activity areas in a Danish Iron Age longhouse.[37] Subsamples for trace element and lipid analysis can be taken from block samples prior to resin impregnation. The continued development of these methods, and potentially lower costs, should contribute to increased visibility of geochemical applications.

5. C/N Isotopes

Carbon (C) and nitrogen (N) are important elements, especially in terms of depletion or enrichment due to agricultural and pastoral activities and the ability to link these to isotope values in human and animal bone and cereal grains.[38] Traditional methods for soil carbon have employed wet or dry combustion methods to determine total carbon by measuring captured CO_2,[39] or to determine organic carbon through titration or loss on ignition using a muffle furnace and digital scales;[40] thermogravimetric analysers automated the process with computerized analysis and outputs. Current analytical techniques for percent total organic C and percent total N use combustion and elemental analysers, often linked to isotope-ratio mass spectrometers for $\delta^{13}C$ and $\delta^{15}N$.[41]

Results of studies on specifically archaeological soils indicate that anthropogenic activities result in increased C and N values.[42] For example, indications of C and $\delta^{15}N$ enrichment were recovered in relict topsoils found in excavated pit infillings.[43] In East Africa, before c. 1200 BP, changes in $\delta^{15}N$ most likely due to decreased precipitation were found in conjunction with changes in $\delta^{13}C$ associated with changes in the quantity of C_4 relative to C_3 plants.[44] Analysis of C and N isotopes from buried relict topsoil layers would significantly improve our interpretations of ancient ecosystems, manured agricultural plots, and human-environmental interactions. Soil and sediment archives provide archaeological material for analysis in the absence of preserved seeds and grains. Moreover, ^{14}C dating of the soil organic carbon, in conjunction with $\delta^{13}C$ analysis, increases the confidence that chronologies and interpretations are complementary.[45]

6. Soil Biomarkers

Approaches using lipid biomarkers to derive information about the history of a soil are particularly useful since information may be obtained in the absence of any morphological evidence. The specificity of particular biomarkers for different faecal sources makes them a valuable resource for environmental monitoring as well as archaeology.[46] A defining characteristic of biomarkers is the retention and stability of structural traits indicating the biogenic source, despite diagenesis,[47] although pedological conditions influence biomarker preservation.[48]

Methods for lipid analyses vary depending on the type of compound(s) being targeted. Pre-analysis preparation of samples typically involves several extraction and clean-up steps. In general, the process involves extraction into a solvent system of medium polarity such as dichloromethane (DCM)/methanol (2:1 *v/v*) to acquire a total lipid extract (TLE). Subsequently, the TLE is chromatographically separated into polarity-based fractions containing the target compounds, which are then derivatized with additional reagents (to ensure gas chromatographic amenability), and analysed by some form of chromatographic instrumentation, most commonly GC-MS.[49]

Faecal biomarkers (5β stanols and, to a lesser extent, bile acids), have proved to be reliable and environmentally recalcitrant indicators of cultural activity and therefore have been widely deployed in the archaeological sciences.[50] In addition to manuring studies,[51] geochemical biomarkers have aided in reconstructing palaeoenvironmental conditions

34 Coronel et al. 2015.
35 Šmejda et al. 2018.
36 Roos, Nolan 2012.
37 Hjulström, Isaksson 2009.
38 E.g. Kanstrup et al. 2014. – Dreslerová et al. 2021.
39 Nelson, Sommers 1982.
40 Dean 1974.
41 Beach et al. 2011. – Lauer et al. 2014. – Dreslerová et al. 2021.
42 Beach et al. 2011. – Lauer et al. 2014. – Sandor et al. 2022.
43 Lauer et al. 2014.
44 Terwilliger et al. 2011.
45 van der Plicht, Streurman, van Mourik 2019.
46 Walker et al. 1982. – Dinel, Schnitzer, Mehuys 1990. – Bethell, Goad, Evershed 1994.
47 Peters, Moldowan 1993.
48 Bull et al. 2000. – Killops, Killops 2005.
49 Elhmmali, Roberts, Evershed 1997. – Bull et al. 1999. – Gerlach et al. 2012.
50 Evershed et al. 1997. – D'Anjou et al. 2012. – White et al. 2018.
51 Bull et al. 1999. – Simpson et al. 1999.

and other human activities.[52] Faecal biomarkers provide data on pastoral practices and land use in France,[53] animal husbandry and uses of dung in Anatolia,[54] and plants as a significant component of Neanderthal diet in Spain.[55] They have long been used to make basic distinctions between different animal groups and/or species such as humans, ruminants, and pigs; this approach has recently been extended and refined to increase the range of animal species (e.g. reindeer, lemming, goat, sheep, horse, moose, dog, pig, goose, donkey), significantly increasing its usefulness for research on early domestication and animal husbandry.[56]

Other lipids are also being used as proxies for a range of activities in various archaeological contexts at multiple analytical scales. For example, combined archaeological and experimental data revealed that fatty acids recovered from ancient hearths most likely derive from the burning of large animal bones.[57] Similar to faecal biomarkers, *n*-alkanes and plant sterols from leaf waxes can exhibit chemical signatures specific to different plant types and can survive in sediments for thousands of years or more.[58] They can be used to reconstruct plant communities and species changes, such as from lacustrine to terrestrial or from forest to grassland.[59] Carbon and hydrogen stable isotopes comprising these compounds can be used to infer palaeoclimate variability[60] and resultant expansion and contraction of forests.[61] In another application, *n*-alkanes indicated significant Neolithic biomass burning.[62]

7. Ancient DNA from Sediments

The analysis of ancient sediment DNA (*seda*DNA) from terrestrial, marine, and lake sediments has become an increasingly powerful tool for understanding past ecosystems, biodiversity, and evolutionary history as it enables the examination of DNA from many different taxa (flora, fauna, and microorganisms) from each sample and can be applied across large temporal ranges.[63] This has been demonstrated through various studies, including, for example, the dating of the appearance of a viable ice-free corridor between Beringia and North America[64] and tracking changes in the arctic ecosystem during the last interglacial.[65]

The basic processing of *seda*DNA involves three steps: (1) DNA extraction; (2) data generation through (i) metabarcoding (sequencing of amplicons targeted for taxa of interest), (ii) shotgun sequencing (direct sequencing of DNA libraries), or (iii) enrichment of DNA libraries for specific genomic targets by hybridization capture; and (3) data analysis (data authentication and taxa identification).[66] Methodological studies in *seda*DNA have increased our understanding of how DNA is bound to various sediment components,[67] but there are still open questions surrounding *seda*DNA taphonomy. Current known temporal limits are similar to skeletal remains at over 300,000 years in cool environments.[68] Studies have also found minimal evidence of DNA leaching, but large impacts of bioturbation.[69] It is therefore critical to work closely with micromorphologists, chronologists, and geologists to evaluate stratigraphic integrity. Detailed studies on the impacts of sampling locations and flow rates on lake *seda*DNA emphasize that large sample sets are needed to accurately understand past environments.[70]

Recently, *seda*DNA has been integrated with archaeological data to study patterns of human occupation.[71] This was taken a step further when it was demonstrated that hominin DNA could not only be recovered from Pleistocene sediments,[72] but also be used to reconstruct population histories and directly compare them to changes in climate and faunal diversity.[73] Moreover, aDNA has been successfully extracted from impregnated block samples and uncovered thin section slides, expanding the range of potential sampling strategies.[74] *Seda*DNA studies will continue to provide new insights on past eco-diversity and how it was shaped by changes in climate.

8. Palaeoproteomics from Sediments

Much like lipids and DNA, proteins are important biomarkers that should become fundamental to archaeological research. An increasing body of evidence and models

52 Hjulström, Isaksson 2009. – Shillito et al. 2011. – Prost et al. 2017.
53 Zocatelli et al. 2017.
54 Portillo, García-Suárez, Matthews 2020.
55 Sistiaga et al. 2014.
56 Prost et al. 2017. – Harrault et al. 2019.
57 Kedrowski et al. 2009.
58 Patalano, Zech, Roberts 2020.
59 Schwark, Zink, Lechterbeck 2002. – Zech et al. 2010. – Schatz et al. 2011.
60 Schirrmacher et al. 2019. – Patalano, Zech, Roberts 2020.
61 Wurster et al. 2010.
62 Eckmeier, Wiesenberg 2009.
63 Giguet-Covex et al. 2014. – Parducci et al. 2017.
64 Pedersen et al. 2016.
65 Crump et al. 2021.
66 Edwards 2020.
67 Giguet-Covex et al. 2019. – Kanbar et al. 2020.
68 Rawlence et al. 2014. – Slon et al. 2017.
69 Edwards 2020.
70 Edwards 2020. – Vernot et al. 2021.
71 Bálint et al. 2018.
72 Slon et al. 2017.
73 Vernot et al. 2021. – Zavala et al. 2021.
74 Massilani et al. 2022.

demonstrates that proteins can be recovered from ancient contexts and geographic regions with generally poor preservation of ancient biomolecules.[75] Soils are an abundant archaeological artefact and may function as a sink for molecules such as proteins, which hold specific information about their origin, enabling the detection of human occupation and activities.[76] This information yield is often limited by contamination and degradation. Proteins have been presumed to be especially prone to microbial degradation, as they have a high nutrition value for soil organisms.[77] However, just as DNA molecules can successfully survive degradation by absorption onto mineral matrices and adsorption on clays and to humic substances in the soils,[78] so can proteins.[79] Moreover, studies have shown that amino acids are more stable than nucleic acids in many environments.[80] Nevertheless, although the potential of proteins as archaeological biomarkers is widely appreciated and already used for a variety of different archaeological materials,[81] the applicability of soil proteomics to archaeological soil material is still in its infancy and has a great need for testing and development. A first exploratory study done in 2012 investigated the effects of different soil components on the fraction of proteins in soils, the isolation efficiency of different reagents, and how the detection and identification of proteins in soils are affected by protein retention, isolation reagents, and co-isolated soil particles.[82] Since then (as far as the authors are aware), no substantial progress has been made in the utilization of ancient proteins from archaeological soils. Recently, soil proteomics analysis has been applied to investigate the soil textile imprints of a tomb at the Dahekou Cemetery site in China.[83] More work is necessary to fully develop the methodology and exploit the great potential of this biomarker in archaeological soils and sediments.

9. Sampling and Storage Recommendations

Collecting and storing sediments for multi-element chemistry, phosphates, magnetic susceptibility, and total carbon are relatively straightforward and easily done by archaeologists in most field settings. Samples should be air-dried or freeze-dried as soon as possible to limit organic activity, such as the continued action of tiny insects and microorganisms or germination of seeds. These samples can be stored indefinitely at cool temperatures. The greatest concern is rapid or extreme changes in temperature or humidity.

These older methods of sampling for inorganic soil chemistry are inadequate for current capabilities involving biomolecules. One immediate methodological aim in archaeological soil chemistry, and geoarchaeology more broadly, should be to establish new and standardized sampling and storage methods focused on the preservation of biomolecules, in particular those collected directly from archaeological contexts. For sediment cores collected in sealed tubes, this is not as problematic. In most other cases, geoarchaeologists should be able to take *in situ* measurements before sampling, for example using pXRF or magnetic susceptibility.[84]

Sampling schemes should be developed with archaeologists and geochronologists to discuss research questions and ensure as far as possible the stratigraphic integrity of the material. With the right sampling approach, soil samples can be taken for both aDNA and protein analysis together. Samples for inorganic chemistry can later be subsampled and freeze-dried to expedite analysis, or parallel sampling should be undertaken. In caves and other terrestrial archaeological sites, samples should be taken from exposed archaeological profiles in a grid-like pattern (approximately every 10 cm or adapted to the specific situations and research questions) if possible, or in multiple columns of block samples, to facilitate microstratigraphic analysis of sample locations. Including samples from above and below each layer of interest is critical for understanding the context of the results. To limit the number of samples tested, a preliminary screening may be completed of 1–2 samples per layer of interest to determine the success of DNA and/or protein preservation at the site. Sampling is also possible from drill cores, following similar considerations.

While sampling, minimization of modern contamination is essential. We encourage the use of plastic (non-latex) gloves, facemasks, and hair coverings when sampling, with frequent glove changes (ideally between samples, at minimum when they are visibly dirty). Furthermore, no wool, silk, rubber, or leather should be worn, and skin and hair should be covered at all times when sampling and handling samples, as protein and DNA from these sources could potentially contaminate the samples. If lipid analyses are to be conducted, then the

75 Cappellini et al. 2018.
76 Oonk, Cappellini, Collins 2012.
77 Cappellini et al. 2018.
78 Nielsen, Calamai, Pietramellara 2006. – Levy-Booth et al. 2007.
79 Quiquampoix et al. 1993. – Zang et al. 2000. – Nielsen, Calamai, Pietramellara 2006.
80 Buckley 2019.
81 Hendy et al. 2018.
82 Oonk, Cappellini, Collins 2012.
83 Li, Zhu, Xie 2021.
84 Kainz 2016. – Šmejda et al. 2018.

introduction of any extraneous chemical compounds, e.g., plasticizers and other additives from plastic implements or containers, should be avoided. Storage in furnaced glassware or, as a minimum, uncontaminated aluminium foil is recommended. Clean surfaces and equipment are essential. Metal or plastic tools are best washed with bleach solution or 70 % ethanol, and baked glassware should be used. Generally, all measures taken to reduce contamination from sampling/excavation, through storage and laboratory analysis should always be reported and described in publications. A thorough guide to handling palaeoproteomic samples in the lab, including a detailed explanation of why the use of non-latex gloves is necessary, is given in Jessica Hendy and colleagues.[85] When sampling vertical profiles, start with the bottommost sample in a column and remove the surface of the material with a sterile scalpel or spatula. Then sample about 0.5–5 grams of sediment into a sterile plastic tube or bag. Fresh tubes and scalpels should be used for each sample collected.

Vacuum freeze-drying should be considered the standard for the storage of small sediment samples because it has the advantage of preserving the sample's chemical and biological structures. The method was used for soil biomarker analyses in the Faroe Islands.[86] Another study revealed that vacuum freeze-drying minimized errors in mercury (Hg) fraction analysis, yielding Hg values close to those from fresh samples, as compared to air-drying and oven-drying.[87] Currently, vacuum freeze-drying is being investigated as a possible alternative for long-term storage of sediment cores, although the project is in a preliminary stage and the feasibility of this preservation strategy still needs to be fully evaluated.[88] Research is needed to assess the effect of the vacuum on stratigraphic integrity in cores. The impacts of different storage conditions on the survival of aDNA and proteins are not fully studied, but we recommend storing sediments in cool environments, ideally a refrigerator, or frozen if they were collected in permafrost. Lake sediment samples and any samples with highly organic layers should be stored at 4°C, ideally in a cold room, as soon as possible after sampling on site. Soil samples for aDNA or protein analysis should ideally be stored in a freezer at -80°C to avoid bacterial growth until processing. Freeze-thaw cycles should be avoided. The potential of impregnated micromorphological blocks as repositories of trace element and biomolecular data[89] will be resolved through additional testing but looks promising.

10. Summary: Analysis for the Future

Landscapes, soils, and sediments have for too long been solely treated as the backdrop of human existence, rather than as elements that can capture a wide range of traces of behaviours and cultural practices. Soil deposits store incredible amounts of information generated by both cultural and non-cultural processes. Information stored in the sediment archive includes the macro- and microstratigraphy, chemical signatures, isotopes and biomarkers, aDNA, and proteins. Bio-geoarchaeological work of the last decades has shown that new methods acquire data that was previously unavailable, and address new questions that were previously barely imaginable.

To get the most out of soil means incorporating micro-scale methods into a discipline for which the destruction of soil archives – excavation – is the primary approach. In practice, it is difficult to store vast quantities of soil from excavations without a clear goal and strategy, and it is also not necessary. Here, we present an outline of current methods and research questions they can address, with the goal of inspiring archaeologists to integrate smart soil sampling and storage in their research design. An interdisciplinary, integrative approach with the joint elaboration of questions and selection of the best methods is essential for making real progress. Methods are constantly being developed and in flux, and it remains a challenge to integrate the widest possible range of approaches and methods from increasingly smaller samples, by finding ways to produce several strands of evidence from single samples by applying different methods in optimal sequence and curating samples appropriately. Advances in extracting trace element and biomolecular data from thin-section blocks offer hope for consolidated sampling and storage in the future. However, we must emphasize that sedimentary palaeoproteomics, particularly extraction from terrestrial archaeological contexts, is underdeveloped in comparison with other methods.

Soils and sediments are the records that hold information about the lives of humans, animals, plants, and microbes, as well as their dynamic relationships with each other and the geosphere. It is time to make the most out of soils for archaeology, and the most of the archaeological record by flipping our methodological paradigm. Instead of discarding soils and sediments to get to objects of interest, sediments must become the objects of interest, analysed through the plethora of new technologies.

85 Hendy et al. 2018.
86 Curtin et al. 2021.
87 Liu et al. 2019.
88 Enevold et al. 2019.
89 Rodriguez de Vera et al. 2020. – Massilani et al. 2022.

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Data sharing does not apply to this article as no new data were created or analysed in this study.

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DAVID GRAEBER, DAVID WENGROW, *The Dawn of Everything: A New History of Humanity.* Farrar, Strauss and Giroux, New York 2021. 692 pages, 7 maps and b/w figures, hardcover, ISBN 978-0-3741-5735-7.

The Dawn of (Almost) Everything: Sample with Care

Inspiring insights may be the outcome whenever qualified archaeologists and experienced sociocultural anthropologists combine intersecting interests and skills to reactivate an interdisciplinary cooperation that has become increasingly attractive again in recent years. The present volume is a contribution to these efforts, but at the same time, its title and its goals aim at much more – which has to be sampled with care.

Premises and Orientation

This book has quite rapidly found its way to the top of international non-fiction best seller lists. In part this is due to the popular reputation of its co-authors, a generalist sociocultural anthropologist (who died shortly after the book's completion) and a comparative archaeologist. In part, however, its market success also indicates an enduring public interest in topics related to the history of humanity – which seems to be greatly increasing in times of obvious global turmoil and crisis. This reviewer combines his basic appreciation for the present cooperation project, including an endorsement of its scale and some of its main orientations, with some scepticism regarding a number of serious conceptual and methodological flaws. In terms of scale, the authors indeed address crucial issues in humanity's history with focal periods between 9000 BC (in Eurasia) and 1400 CE (in the Americas). Since its early beginnings, sociocultural anthropology has been pursuing a special interest in common and diverse features of humanity's history in general, and the field has indeed benefited from such a grand scale in some of its practices. In recent decades, however, this element in sociocultural anthropology's record has been somewhat neglected. In a sense therefore, David Graeber, as the anthropologist of the two co-authors, has reactivated and continued a post-1945 legacy dating back to "The Savage Mind" by Claude Lévi-Strauss (1962),[1] to "Stone Age Economics" by Marshall Sahlins (1972),[2] or Jack Goody's "The Oriental, the Ancient and the Primitive" (1990).[3] However, like the proverbial dwarf climbing on the shoulders of giants to gain a better perspective, this endeavour remains somewhat limited. To an extent, this has to do with the book's main thrust and orientation. In most of its crucial aspects, this volume communicates older insights and results from sociocultural anthropology's research records to a wider public of non-academic readers and of neighbouring academic fields. There is nothing basically wrong in such an endeavour – particularly not if these efforts are simultaneously brought into a productive dialogue with archaeology as in this case. Hence acknowledging the popularizing and outreach aspects (with regard to anthropology) in this book project does not imply even a grain of criticism. In fact, both anthropology and archaeology would benefit from any good outreach efforts. Readers from the field of sociocultural anthropology have to be aware, however, that within these contexts of premises, orientations and purpose, the present publication does not contain much that is entirely new. In that sense, it surprises by its omissions rather than by what it spells out. In fact, this review will argue that Graeber's summaries of selected, well-known insights are neither comprehensive nor exhaustive enough. Nevertheless, a partial and fragmented effort to summarize anthropology's contributions to such a project is better than no contribution at all. So what is innovative from sociocultural anthropology's perspectives is that several crucial insights from the field are indeed made accessible for wider archaeological and historical reasoning: humanity is united by a basic mental and affective equipment including aspects of *homo ludens*, i.e. a pragmatic interest in experimenting with various alternatives; there was never just one condition of foraging in humanity's history; that the history of diversity can no longer be viewed as a one-way road towards more complexity, and so forth. David Wengrow's part in this co-authored volume appears somewhat more balanced than Graeber's. His self-identification as a comparative archaeologist already indicates a somewhat heavier reliance on actual empirical evidence, and a somewhat less passionate commitment to certain theoretical paradigms, as displayed in Graeber's bibliography, which includes "Fragments of an Anarchist Anthropology".[4] Moreover, Wengrow does integrate his own, firsthand archaeological experience (the ancient Near East) into

1 LÉVI-STRAUSS 1966.
2 SAHLINS 1972.
3 GOODY 1990.
4 GRAEBER 2004.

this book's main arguments, while Graeber's ethnographic experience (in Madagascar) is not explicitly apparent. Be that as it may, both researchers have a shared authorship in all of the book's key premises, chapters, main arguments, methodological procedures, and results. As for the book's key rationale and purpose for specialists and non-specialist readers alike, this is focused on a clear and convincing criticism of conservative evolutionist bestsellers of recent years. That cluster of influential treatises ranges from Stephen Pinker's book on violence[5] to Jared Diamond's works related to the emergence of agriculture.[6] Explicitly rejecting these popular, almost paradigmatic narratives of an evolutionist worldview in sociocultural matters (while simultaneously not leaving out their progressive counterparts), Graeber and Wengrow basically argue (in my wording) that historical *possibility* is never identical with historical *necessity* in the human experience. In these discourses, as addressed by the authors, possibilities largely refer to socio-political and ritual relations whereas necessities more often than not entail environmental, demographic and/or economic constraints. Possibilities, the authors insist, have always included the playful trying out of alternatives, of pursuing some of them to an extent, and of retreating and withdrawing from them again for various reasons before trying again, or trying out something else.

In addition to schismogenetic processes (according to Gregory Bateson's terminology), some of humanity's diversity between groups thus was unavoidably also caused by the *possibility* of simultaneous alternatives. These pragmatic, experimental and at times playful dimensions in human existence are completely ignored by the evolutionist uni-directional, teleological meta-narratives of progress, from one necessity to the next, without any alternatives other than failure. "You can't simply jump from the beginning of the story to the end, and then just assume you know what happened in the middle. (…) That's one reason why imaginative in-filling is necessary." How the authors thereby[7] sum up their main methodological approach also clarifies that their own "imaginative in-filling" intends to be complementary to some of the remaining, valuable insights of evolutionist reasoning.

Indigenous Critique

A basic rationale for the volume's agenda of rewriting human history between the foraging ("beginning") and early state ("end") societies is provided by the narrative framework of its first and last chapters. That narrative frame presents today's evolutionist paradigm as the offspring of European Enlightenment discourses addressing humanity's development from its origins to the present. In their pessimistic version through Thomas Hobbes, and in their optimistic version through Jean-Jacques Rousseau, all those discourses maintained a focus on the secularized biblical theme of expulsion from Paradise. According to this argument, humanity had left *one original* condition of "equality" behind, when it entered into the alleged origins of "inequality". By continuing several previous debates on the same topic, Graeber and Wengrow argue that these European Enlightenment discourses had emerged, in part at least, as a defensive reaction to what is called the indigenous critique. The term primarily refers to representatives of native North American communities and to their reported statements about European lives and societies as they experienced them on both sides of the Atlantic by the early 17th century and thereafter. For this book's co-authors, the indigenous critique primarily focused on the prevalence of obedience and the absence of freedom among the European communities and representatives whom native Americans encountered. Freedom rather than inequality had thus been at the core of the indigenous critique; it was addressing political conditions rather than social distinctions. The narrative of one original egalitarian condition had hence been introduced as a defensive Eurocentric, post-biblical fiction to counter, and to marginalize, those very political issues raised by the indigenous critique.

Today's research therefore has to depart from this Eurocentric evolutionist legacy, according to Graeber and Wengrow, by leaving behind the search for any "origin of inequality". By taking the indigenous critique seriously, the diverse forms of freedoms should become a new focus of, as the authors phrase it, when and how humanity lost them ("How did we get stuck?"). Recent participants in this debate have pointed out that European thought also cherished ideas about humanity's egalitarian conditions before and beyond biblical influences, i.e. long before the Enlightenment. Graeber and Wengrow are aware of this argument, and the way they address it strengthens their main point that reactivating earlier traditions does not exclude but indeed assists contemporary challenges. Another set of criticisms concerns source materials. The authors' use of original sources for this debate has been questioned by several prominent reviewers, including Kwame Anthony Appiah.[8] In particular,

5 Pinker 2012.
6 Diamond 1987. – Diamond 2012.
7 p. 274.
8 Appiah 2021.

the validity of some of the materials from which proponents and contents of the indigenous critique have been teased out so far has been contested quite convincingly. This is an ongoing debate, primarily to be pursued by historians including historians of philosophy and literature. Graeber and Wengrow deserve credit, however, for having made some of the crucial aspects of the indigenous critique audible and visible to a wide readership, including at least the partial impact it had upon European academic thinking. This narrative framework constitutes a slender third of the entire volume, basically communicating and outlining the authors' empirical priorities for a focus on historical possibilities that underlay alternative options for agency with an interrelated interest in freedoms. At a conceptual level in this regard, the authors specify three primordial freedoms:[9] the freedom to move away, the freedom to disobey, and finally, the freedom to create new and different forms of social reality. These "primordial" freedoms, it should be noted right away, are phrased in a remarkably gender-neutral wording, while at the same time, these gender-free freedoms from the outset are not conceptualized in any interaction with constraints, as if possibility could ever exist *per se* without any necessity, e.g. environmental factors. In fact, a search for the presence or absence of these three primordial freedoms (with the conceptual limitations just indicated) is very much at the core of the authors' interest in "world history",[10] the "overall course of human history",[11] the "broad sweep of history"[12] and so forth. This informs and legitimizes the authors' general empirical priority for political freedoms related to their three necessity-free and gender-neutral criteria.

Foragers and Farmers against the State

More than a third of the book discusses such foraging and farming societies that were not integrated into any kingdom or similar state-like constellation. Ethnographic and archaeological findings are much more productively combined here than elsewhere in the volume. The authors' argument persuasively builds on seasonality as the crucial factor not only for regular fusion and fission processes but, even more importantly, for the widespread coexistence of correspondingly different ways of life. That seasonal coexistence of different ways of life thus represents a crucial referent for the authors' interest in the simultaneity of alternatives. Seasonality, with ensuing contraction and dispersal, may have represented a basic overarching feature for these societies, yet otherwise they never represented only one "type" or setting but several of them. In historical terms, this diversity between the Upper Palaeolithic and pre-colonial periods is discussed by also including corresponding ethnographic examples from more recent decades. Based on regional criteria, well-documented cases from native histories in the Americas, from sub-Saharan Africa and from indigenous Australia are taken into account to illustrate the main points. In addition to seasonal rhythms, interregional and even cross-continental connectivity through ritual, social relations and exchange always embedded foragers within wider networks in which small bands were often an exception rather than the rule. Seasonal contractions and their ensuing, extended periods of settlement could allow for a whole range of large-scale activities, including rich burials and grand monuments, as the authors already outlined in an earlier influential lecture and article.[13] The archaeological site of Poverty Point (1600 BC, Louisiana) and its interconnection with sacred geometry is convincingly associated with the seasonally settled contractual dimensions of comparable settings.

Eventually, the authors argue, humans' movement out of Africa in biologically much more diverse forms than is evident today[14] had been encouraged by the rich environmental diversity, especially along coasts and riverbanks.[15] Hence corresponding ethnographic examples are taken to be more representative of the "broad sweep of history" than those surviving in unfriendly and remote conditions as small bands.[16] While populations thereby tended to become larger in overall demographic terms, most foraging groups preferred to live their lives on ever-smaller scales, primarily by processes of inter-group schismogenesis (or contradistinction, as Edward E. Evans-Pritchard called it).[17] This is when Graeber and Wengrow turn to the ethnography of native American foraging and fishing populations along the northwest coast of America, famous for their dramatic social and linguistic diversity, including fortified settlements, slavery, and competitive prestige rituals. These short portrayals and interpretations of native American lives along the northwest American Pacific coastlands are fairly

9 p. 426.
10 p. 8.
11 p. 9.
12 p. 137.

13 Graeber, Wengrow 2015.
14 p. 82.
15 pp. 258–259.
16 It may be noted in passing that this is one of the few instances where the authors indeed bring environmental factors into their argument, in addition to the Fertile Crescent's role in the historical emergence of agriculture.
17 Evans-Pritchard 1940.

accurate if assessed in terms of how sociocultural anthropology was taught in the 1930s or the 1950s. Graeber and Wengrow elaborate conventional insights about indigenous lives in the region by arguing that local elites preferred to recruit slaves from captives because they could not impose slavery upon their resident freemen,[18] which they see as corroborating their reasoning about "primordial freedoms". Otherwise, the authors largely rely on findings by US anthropology's founding father Franz Boas and his immediate two generations of students. In part, this is also responsible for the authors' somewhat surprising yet coherent admission that what are called cultural areas do play a certain role in comparable historical constellations, although the concept had been repeatedly discarded as obsolete in post-1945 anthropology. In one of its original forms, Boas had brought it across the Atlantic from his native Germany. The concept hence does experience a minor renaissance here, through Graeber's and Wengrow's plausible emphasis on simultaneous alternatives, playful diversity, and even more importantly, on inter-group schismogenesis. While this deserves some acknowledgement, the authors largely ignore research results that have emerged about the Pacific Northwest ever since the Boas school. This does not just concern important insights into precolonial and early colonial regional history. More importantly still, within their general reluctance to absorb several decades of more recent research in those regional constellations, the specific topic of gender relations and of women's lives is conspicuous only by its complete absence in the authors' summaries, here and everywhere else when discussing foragers. Since Graeber and Wengrow nowhere care to explain this, readers are left puzzling: are gender-related topics not relevant enough for the authors' "imaginative in-filling" about the dawn of "humanity's" history? Do gender topics, in the authors' view, still lack enough empirical evidence to be sufficiently substantiated (a claim that would be difficult to defend)? Do these topics simply stand in the authors' way of pursuing their search for "free societies" based on the criteria of their "three primordial freedoms", without sufficient consideration of gendered inequalities, or freedoms? We shall return to this at the end of this review.

In addition to the book's strong points that there never was just one foraging constellation in human history and an indication of some non-environmental, systemic reasons for a corresponding diversity, the authors achieve another substantial point in these sections. They convincingly demonstrate that transitions to farming were never as radical as previous research (including Diamond's publications)[19] had assumed. In fact, a so-called Neolithic revolution never happened as a revolution, but instead as protracted, multiple, and complex processes over several centuries, if not millennia. In this case, the insight may be less surprising for regional experts among archaeologists than for other readers. Graeber and Wengrow convincingly summarize how experimental, diverse and pragmatic the first modes of integrating farming practices into other existing forms of subsistence actually were. Through a choice of very convincing examples and arguments, they discuss how often these modes were abandoned again for long periods, and how long it took from first integration until plant domestication became dominant – about 3000 years in the Middle East, for instance. The case examples presented in these contexts range from Stonehenge, as a ritual and observational focal site for a wide spectrum of groups that often seem to have abandoned first farming experiences again, to the Nambikwara native inhabitants of the Amazon region with their seasonal pendulum rhythm of switching from foraging to farming and back. Through a careful reconstruction of the Fertile Crescent as the earliest region of agricultural origins, the authors show that enduring transitions may have occurred where more permanent settlements allowed for the pursuit of other activities in the same region, such as foraging and exchange. Again, the authors coherently argue that the pragmatic freedom of experimental possibility played a greater role in these processes of "play farming"[20] than any direct constraints or necessities. As for related political forms, the authors consistently argue that "play chiefs", "temporary kings", and similar versions of limited sovereignty were possible and existed in various foraging and early farming settings of seasonal contraction, albeit not in all of them. Yet the strength of these three primordial freedoms, the authors maintain, did not allow for any enduring stability.

This part of the authors' argument is somewhat twisted, since it prefers one class of evidence while ignoring substantial testimonies pointing to alternative possibilities. For instance, the influence of gerontocratic councils (as testified for native Australian and American groups), and of Great Men and Big Men positions (as known from Melanesia) is strangely but not coincidentally ignored whenever the authors discuss these matters. Similar to the authors' insufficient discussion of the Pacific northwest coast record, this would have required a more comprehensive consideration

18 p. 267.

19 Diamond 1987. – Diamond 2012.

20 p. 246.

of the ethnographic record – but in that context, also of the works by Marilyn Strathern and Maurice Godelier, with their far-reaching relevance for understanding gender, exchange, and political hierarchies. Instead, in this regard for their theoretical interpretations Graeber and Wengrow follow the work of Pierre Clastres, the well-known anarchist author of "Society against the State",[21] and their intellectual hero James C. Scott.[22] Along the lines suggested by Clastres and Scott, the authors argue that something like early states were always within the reach of these specific foraging and incipient farming societies, but they never fully pursued these options because, in the authors' view, the freedom to disobey remained more important to them. This is a point where (again, if we remember the absence of gender-related topics) the authors' theoretical interests seem to override a substantial part of the ethnographic record. Are authoritative gerontocratic and Great Men decision processes *not* forms of limited political sovereignty? Do only "play chiefs and play kings" indicate the dawn of "everything"? Under these limited premises – with uneven care for detail – the authors then discuss how agriculture spread into various other parts of the world, including the Nile Valley, central Europe, and Oceania, and how it spread in the Americas.

Gender, City, State

After they have largely avoided addressing women's lives and gender relations among foragers, the authors almost fall into the opposite extreme when they discuss settings in which agriculture prevails. They rightly emphasize women's role in the consolidation and development of agriculture, domestic crafts and related specializations. Yet apart from their lack of acknowledgement of previous research to that effect,[23] they unnecessarily exaggerate the argument. Their counter-intuitive return to the matrifocal thesis for Neolithic East Mediterranean village life by Marija Gimbutas is not sufficiently well substantiated.[24] This would have required a much more detailed assessment of regional diversity[25] than the two authors were apparently aware of, precisely in view of the recent findings to which they frequently appeal. Their subsequent praise for ancient Crete as a more recent survival of an East Mediterranean post-Neolithic legacy of balanced gender relations has to be treated with similar caution, as German sociocultural anthropologist Karl Heinz Kohl has aptly observed.[26]

In empirical terms, the book's final sections discuss cities and states, which the authors claim should not be called states but kingdoms, empires and so forth. In the authors' opinion, the term "state" always by necessity implies definitional features of modern (Euro-American) states. This may be a small terminological issue of little sophistication. Yet to my mind, the argument has a Eurocentric taste, as if indigenous peoples in pre-modern times were not capable of building any states in their own manner.[27] More important than this irrelevant definitional matter (on which the authors spend far too much text), however, is the fact that the section on cities and states is also the book's weakest part in terms of interdisciplinary logic and coherence. Throughout long sections, this is an enumeration of more or less detailed summaries about various archaeological findings, yet without corresponding ethnographic case examples to substantiate the points to be made. As if urban anthropology never counted, ethnography and sociocultural anthropology are therefore not sufficiently employed for any productive dialogue with archaeology in many of these sections – except when it comes to divine kingship and its relevance for states-that-should-be-called-something-else.

Somewhere in between their discussions of seasonal and permanent agriculture and its possible but not unavoidable transitions to city life, the authors insert a far too brief reflection about what is called the Hopewell Interaction Sphere (in today's Ohio, 100 BC – AD 400 but dating back to preceding centuries around 1000 BC), to demonstrate the far-reaching and cross-continental effects of regular gathering areas. These included large earthworks, innovative mathematical reasoning, and supra-local social relations that may have comprised possible effects for widely shared native American clan names. This specific discussion would have deserved a much clearer distinction between facts and theory. Moreover, it would also have benefited from integrating more recent historical and ethnographic research, including probable interactions with urban centres in pre-Columbian Mesoamerica.[28] Cities, the authors then elaborate, required the sustained production of agricultural surpluses as their indispensable logical and historical prerequisite – but again, it took centuries and millennia to get there while trying out various alternatives. There was no built-in teleological arrow inherent to these processes. The authors

21 Clastres 1989.
22 See, e.g., Scott 1985. – Scott 2009.
23 For example, Jack Goody by his synthesis of the earlier work of authors in German, see Goody 1990.
24 Gimbutas 1982.
25 See, for example, Cvečeк 2022.
26 Kohl 2022.
27 Gingrich 2021.
28 Christian Feest, personal communication, April 4 2022.

spend some interpretative effort to then demonstrate that the earliest cities did not feature any clear indications of central rule or sovereignty. Hence, they argue, early cities such as in Çatalhöyük or Uruk, may very well have represented "free" conglomerates of more or less loosely associated co-residents. This is a valid hypothesis, but not much more than that at this point. In this argumentative context, in his widely acclaimed review, Appiah has raised the question of whether the authors sometimes tend to introduce what he calls a "fallacy fallacy" argument: the "absence of evidence routinely serves as evidence of absence" – as in the case of Uruk. "A naked 'what if ?' conjecture has wandered off and returned in the three-piece suit of an established fact."[29] Here, as much as in the case of Trypillia megasites in the Ukrainian forest steppe, the "Dawn of Everything" could have avoided some of these weaknesses if fewer archaeological examples had been integrated with more substantial ethnographic cases – including ethnographic examples that do indeed correspond to the archaeological settings discussed (i.e. without leaving any specific traces of sovereignty). In short, more ethnography and less archaeology would have strengthened the argument in these sections where the authors' valid hypotheses might have deserved it.

At long last, Graeber and Wengrow thus arrive at the topic of the state-that-should-be-called-something-else, which leads readers to Pharaonic Egypt and pre-Columbian Meso- and South America. To make a long story very short, the authors highlight divine kingship as a common denominator at the root of these developments. This was also the topic of a separate and useful book by Graeber, co-authored with his erstwhile PhD adviser Marshall Sahlins.[30] Empirically, the ethnographic case of enduring sovereignty by the Great Sun monarch among the Natchez (in today's Louisiana) is skilfully brought in to make the point that the ruler or sovereign is the divine's first representative among the people. This combines well with the authors' earlier argument that, from the outset, central religious values have always been something that is mentally set aside as unreachable and untouchable. Nevertheless, whether this was the one and only road to political subordination remains questionable. Graeber and Wengrow, however, thereby arrive at some (Weberian) answer to their original question about how primordial freedoms were lost ("How did we get stuck?"): whenever royal or imperial sovereignty managed to attain an enduring position, beyond charisma and central religious knowledge, this was accomplished by establishing a bureaucracy at its service.

Methodology and Summary

This review concludes slightly less negatively than Arjun Appadurai's.[31] Instead, it combines an explicit scepticism about a number of grave flaws with an appreciation of certain merits and strengths. To begin with the latter, sociocultural anthropology indeed has a task to pursue not only in contemporary but also in wider historical matters. At a time when representatives of various academic fields ranging from evolutionary psychology to human biology pose as the only providers of relevant master narratives, it is high time that archaeology and sociocultural anthropology joined forces to contribute towards more pluralist debates and discourses, including public outreach efforts that are clearly based in the humanities. This contributes to an agenda of intellectual resistance against illiberal determinism, teleological evolutionism, and biological reductionism. Within such premises of intellectual scholarly resistance, an outline of crucial periods and phases in premodern human history that is based on an assessment of archaeological and ethnographic records is both necessary as well as fundamentally useful these days.

Regarding biases, mistakes and limitations, a certain number of them is almost unavoidable inasmuch as any project of such a scale has to be selective, and the case examples themselves by definition always will remain vignettes and summaries. Moreover, some of the inconsistencies mentioned (such as a weak interaction between archaeology and ethnography on most topics related to cities and states) in fact have less to do with the authors than with the fields they come from. After years of ignoring these issues, sociocultural anthropology, for instance, is not all too well prepared to re-engage with this good and productive legacy of research in wider historical topics. Apart from feminist anthropologists, any other internal disciplinary debates, among the field's main journals for instance, from which an author like Graeber could have benefited more extensively, have in fact been infrequent. So in my view, in addition to the co-authors' public and outreach contribution, Graeber in particular also deserves credit with regard to internal matters and fashions within sociocultural anthropology – for contributing to a subfield that had been too marginalized, and for far too long at that.

29 Appiah 2021.

30 Graeber, Sahlins 2017.

31 Appadurai 2022, 2: "The history is wrong in crucial regards, but the fable is compelling."

Content-wise, the volume's major merits build on this productive cooperation between the two fields where it actually is carried out in practice. As ensuing strong points, this review has highlighted, first, an emphasis on systemic diversity in human history regarding foraging societies, as opposed to the myth of just one foraging condition, and relating that diversity to two non-necessary factors, namely schismogenetic processes including cultural areas, and to the simultaneity of alternative options of agency, including "play chiefs" and similar forms. Moreover, discarding the idea of a Neolithic "revolution" and demonstrating the long-lasting relevance of multiple ways of integrating farming into diverse other activities without any built-in teleological arrow pointing to the emergence of domesticated plants as the prevailing subsistence activities may have been clear for archaeologists, but is now bound to also enter the canon of all neighbouring fields as well. In addition, I also tend to view the focus on divine kingship as an important transition towards exclusive sovereignty, in addition to being a well-deserved tribute to the late work of Sahlins.

The book's major flaws have been identified, first, as a preferred focus on possibilities that often leaves out their interactive relation with actual necessities, and a consequent reluctance to adequately consider environmental history, let alone climate history, as an intrinsic part of human history. This is not only bizarre but strangely old-fashioned at a point in time when senior and junior non-academic and academic persons around the globe are increasingly engaging in considering environmental challenges profoundly and acting accordingly. Second, ignoring women's lives and gender relations under foraging conditions has been addressed as an unacceptable weakness in this volume. The point has been made abundantly clear by a global leader in feminist anthropology. In her review, Nancy Lindisfarne said: "Because they hold that inequality has always been with us, Graeber and Wengrow have next to nothing to say about the origins of gendered inequality among humans (…) There is a striking feature of the historical, anthropological and archaeological record. In almost every case, where people lived in economically and politically equal societies, women and men too were equal. And wherever there have been class societies with economic inequality, there too men have dominated women."[32] I endorse this critique: the avoidance of gender topics among foragers in Graeber's and Wengrow's volume is neither an omission nor a mistake – instead, this is a systematic outcome of their basic conceptual and theoretical approach.

I would like to end with a few methodological points that emerge from this main critique about neglecting major environmental factors and ignoring gendered topics among foragers. Within any legitimate academic pluralism, Graeber's and Wengrow's theoretical preferences are as valid as any others. My first methodological critique therefore respects their theoretical orientation without sharing it, but argues that the authors too often bend their empirical evidence according to their theoretical orientations. When, for instance, they ignore gerontocratic or Great Men forms of political influence, this comes close to manipulating the overall ethnographic record in such a way that it fits their theoretical assumptions. My second methodological critique builds on the first. "Imaginative in-filling" should better remain limited to those instances where and when no other methodological procedure is available. Otherwise, authors tend to be carried away by their theoretical (and ideological) assumptions without addressing and explaining the actual evidence at hand. Thirdly, I remain sceptical that any joint treatise by archaeologists and anthropologists can be sustained if it remains focused on the "broad sweep of history" alone, without being very well based on detailed examinations of exemplary phases in regional, cross-continental, and intercontinental history.[33] As long as archaeologists and sociocultural anthropologists use regional examples merely as illustrations for the generalized points they want to make about humans in world history, the methodology remains flawed and the danger of ideological distortions is ever present. Unavoidably, any outcome of such a methodological orientation will have to be sampled with highly critical care.

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Robert Whallon (Ed.), *Crvena Stijena in Cultural and Ecological Context: Multidisciplinary Archaeological Research in Montenegro*. Montenegrin Academy of Sciences and Arts, Special Editions (Monographies and Studies) 138, Section of Humanities 18. National Museum of Montenegro, Podgorica 2017. 463 pages, 263 illustrations, ISBN 978-86-7215-413-9 (Montenegrin Academy of Sciences and Arts), ISBN 978-86-85567-83-4 (National Museum of Montenegro).

This is the third monograph about the famous Balkan rock shelter site Crvena Stijena which is located in the western part of Montenegro near the border with Bosnia and Herzegovina. Crvena Stijena was the key site for the development of prehistoric research in the post-World War II Montenegro when local museums and national scientific networks started to develop. Lack of Montenegrin scholars at that time was the reason why first systematic excavations of this site were directed by researchers from two other Yugoslav centres, namely Ljubljana (Mitja Brodar) and Sarajevo (Alojz Benac and Đuro Basler).[1] The site has a long stratigraphic sequence of more than 20 m of archaeological and geological layers with Middle and Upper Palaeolithic, Mesolithic, Neolithic and Bronze Age remains.[2]

The first monograph was published in 1975 as a volume edited by Basler, one of the field directors who excavated the greatest portion of sediments during many years of research conducted continuously from 1954 to 1964.[3] The monograph was published in Bosnian, Croatian and Serbian (hereafter BCS) in Cyrillic, and for this reason, the archaeology of Crvena Stijena was hardly accessible to international scholars of that time interested in early Balkan prehistory.[4] The second monograph was published in 2009 in English and it was dedicated to the restudying of Upper Palaeolithic and Mesolithic knapped stone assemblages that were found earlier, during Benac's, Brodar's and Basler's excavations at the site.[5]

This third monograph primarily builds upon the results of the fieldwork conducted between 2004 and 2015 (with interruptions in 2009 and 2013, but with two extra field campaigns in 2011 and 2015).[6] This long-term project concentrates on Middle Palaeolithic layers just below Campanian Ignimbrite (Y5) tephra (Basler's Layer XI) because all Upper Palaeolithic and Mesolithic layers were almost entirely excavated earlier. Just a few small remnants of Mesolithic and Upper Palaeolithic layers have been found in these recent excavations.[7] The Mesolithic layers were reported earlier in a preliminary report that was the first publication arising from this project.[8] A couple of chapters provide reviews of previous work but also give perspectives for future work at this important site. It should be noted that the monograph was published only a couple of years after the project fieldwork finished, as it is not very common in archaeology that site monographs are published such a short time after the fieldwork. Just a few papers have been published[9] during the course of the project, and that is why this prompt publication of the monograph is very important.

The book consists of twenty chapters authored by a long list of researchers from sixteen different institutions, both Montenegrin and international. Chapters cover different topics including the theoretical framework of the project; the history of research at the site; the geography, geology and ecology of Crvena Stijena and its surroundings; the geoarchaeology of the stratigraphic sequence; radiometric dating; interpretation of the site in a regional Palaeolithic, Mesolithic and Neolithic context; zooarchaeology; archaeobotany; malacology; and a study of fire structures. The last two chapters provide a synthesis of the results and perspectives for future research at this site. I will not review every chapter but will refer to those that I find most interesting in terms of giving greater insight into this exceptional site.

The introductory Chapter 1 provides the editor's explanation as to why this project actually started at a time when so many Middle Palaeolithic sites are known and currently being excavated. One of the main driving forces for starting such a complex and demanding project, in the opinion of Robert Whallon, editor and project director, is the long stratigraphic sequence of Middle Palaeolithic layers

1 Novaković 2015.
2 Basler 1975a.
3 Basler 1975a.
4 However, a short paper about Crvena Stijena was published in German, see Basler, Malez, Brunnacker 1966.
5 Mihailović 2009.
6 pp. 49–81.
7 pp. 49–81, 132–139.
8 Baković et al. 2009.
9 Baković et al. 2009. – Morley, Woodward 2011.

(without touching the bedrock) that provides a good opportunity for studying different aspects of Neanderthal behaviour and changes in the sediment record.[10] The long sequence encompassing warm and cold episodes was another reason behind this project, as it creates an opportunity to propose the main research question and hypotheses about different Neanderthals' subsistence strategies as adaptive responses to different environmental conditions and how these strategies could be recognized in the archaeological evidence of the site.

In Chapter 5, Zvezdana Vušović-Lučić and colleagues give a concise and very useful overview of the course of the fieldwork in Crvena Stijena between 1954 and 1964 referring to all publications about the site that were published until 1975, including the first monograph.[11] This overview could be very useful for all those scholars who are not native speakers of BCS. However, it should be mentioned that there are several publications cited in the reference list of this chapter that have a short summary in other languages (German, French), and Karl Brunnacker's study of Crvena Stijena sediments was published entirely in German.[12]

Writing in Chapter 6, Robert Whallon provides details of the course of the excavation year by year, illustrating it with plans showing excavated areas in different years.[13] From this overview it becomes completely clear how complex and hard preparation of the site for the excavation was. This preparatory work, including the removal of enormous amounts of sterile sediments, was a prerequisite not only for this project but also for current and all other future projects at this site. While horizontal plans illustrate the pace of work very well, it remains unclear to the reader how thick the excavated layers were. This becomes clearer with the complementary data (layer descriptions and profiles) from Chapter 8, which add more information about the excavation process, stratigraphy and new layer labelling system (M2, M3, M4, M5) relative to Basler's layers (XII, XIII, XIV, XV, XVI, XVII).[14]

Chapters about geoarchaeology[15] and zooarchaeology[16] are of special importance for testing the project's main hypothesis. Mike W. Morley provides a detailed study of the sediment record of part of the sequence (Layers XXV–X), micromorphological analysis of thick Layer XXIV, where numerous hearth features were found *in situ*, explaining methods in detail and referring to earlier palaeoenvironmental reconstructions undertaken by Brunnacker. Morley's study, when compared to Brunnacker's, has a much better sampling resolution, hence enabling more precise detection of warm and cold depositional episodes in the sequence. To paint a broader picture, Morley tries to correlate these episodes to existing palaeoenvironmental and palaeoclimatic records. Morley also refers in detail to Layer XI, which represents the Campanian Ignimbrite (Y5) tephra layer,[17] because it is a very important chronological marker in the stratigraphic sequence.

However, much more chronostratigraphic data have been acquired through the application of different radiometric techniques (thermoluminescence [TL], electron spin resonance [ESR], optically stimulated luminescence [OSL] and radiocarbon dating by Accelerator Mass Spectrometry [AMS ^{14}C]), and these are presented in Chapter 9 by Norbert Mercier and colleagues.[18] Before this project there was only one radiometric date (^{14}C) available for the whole sequence of Crvena Stijena. A charcoal sample dated decades ago comes from Layer XII (just below the Campanian Ignimbrite tephra layer) and gives the radiocarbon age of 40,770 ± 900 BP (GrN-6083).[19] The calibrated age (44,337 ± 973 cal year BP) fits well with the age of the tephra.[20] Before this radiometric dating programme, the age of Crvena Stijena layers was tentatively proposed based on the observations of the sedimentary, faunal and lithic record.[21] Dosimetric dating methods have been applied for Middle Palaeolithic layers, giving an age for Layer XXIV of around 78 ka (mean ESR-Linear Uptake [LU]) and 70 ka (TL), for Layer XX around 48 ka (mean ESR-LU), and for Layers XII and XIII around 43 ka and 44 ka respectively. AMS ^{14}C (ultrafiltration technique) dates for Layers XII and XIII give a minimum age of c. 45 and 49 ka cal BP respectively. One could suppose that this is just the beginning of the dating of Middle Palaeolithic layers because there are a lot more Middle Palaeolithic sediments below Layer XXIV; the deepest one is Layer XXXI and the bedrock has not yet been reached. Radiocarbon dating of the latest Middle Palaeolithic (Layers XIII and XII), Upper Palaeolithic, and Mesolithic layers was based on samples from both recent and old excavations. Two samples that provided a Late Mesolithic age (mid-9th

10 pp. 1–10.
11 pp. 45–48.
12 Brunnacker 1967.
13 pp. 49–81.
14 pp. 132–139.
15 pp. 82–131.
16 pp. 266–294.
17 But see also the paper by Morley, Woodward 2011.
18 pp. 140–149.
19 Vogel, Waterbolk 1972, 61. – Basler 1975b, 90.
20 pp. 82–131.
21 Basler 1975b. – Brunnacker 1975. – Malez 1975. – Mihailović 2009.

millennium cal BP) give good additional information about Castelnovian chronology in the eastern Adriatic, which is valuable in itself, as there are only a couple of sites known so far in this region.[22] The radiocarbon date from Layer 4 from recent excavations, which probably could be correlated to Layer IVb2 from earlier excavations, provides the first evidence for early Mesolithic occupation on this site.[23] With dosimetric dates for Middle Palaeolithic layers and ^{14}C AMS dates for Upper Palaeolithic Layers VIII and X, and Mesolithic Layers VI and IV, Crvena Stijena's sequence is one of the best dated sequences in the Balkan Peninsula. However, it should be noted that some Palaeolithic layers' age is ambiguous because there are discrepancies between different samples from the same layers (for example, the difference between two samples from Layer X is more than fifteen millennia).[24] In the future, one could expect more data about the Middle Palaeolithic chronology of the site, but not much more about Upper Palaeolithic and later layers, as those have already been excavated. Furthermore, any future work with the samples from old excavations would encounter the same uncertainties regarding the stratigraphic origin of the samples that Mercier and colleagues mentioned in their paper.

Dušan Mihailović, Bojana Mihailović and Robert Whallon present the main features of Middle Palaeolithic, Upper Palaeolithic and Mesolithic knapped stone assemblages in Chapter 10.[25] They reanalysed Middle Palaeolithic assemblages from Brodar's and Basler's excavations, also providing redrawings of stone artefacts that were published earlier, as well as some new drawings of lithics from older excavations done by Basler and Brodar that were left unpublished until now. In comparison to earlier conclusions about the Late Middle Palaeolithic at Crvena Stijena (Layers XIV–XII), it should be stressed that D. Mihailović and colleagues recognized Uluzzian elements in the lithic assemblage (laminar and microlaminar technology, diverse reduction strategies employed in knapping flakes and splintered pieces, and backed tools, including segments and arched points).[26] These Uluzzian features are important in the context of the Middle/Upper Palaeolithic transition in the Adriatic basin.[27] The authors also refer to small Middle Palaeolithic, Upper Palaeolithic and Mesolithic assemblages that were found during the course of Whallon's project. These assemblages are small and correspond very well to earlier collections. When considering Upper Palaeolithic and Mesolithic lithic production, the authors mainly repeat data and conclusions that were published earlier by D. Mihailović.[28]

In Chapter 12, Nikola Borovinić, Mile Baković and Robert Whallon[29] review the archaeological evidence from ceramic layers of Crvena Stijena (excavated in the 1950s) where Layers (Strata) III, II and I were dated to the Early Neolithic, Middle Neolithic and Bronze Age, respectively. Each of these layers was considered within the Montenegrin and wider eastern Adriatic context. When referring to the early Neolithic of the Croatian coast, the authors state the following: "The influence of Mesolithic tradition on the life of Early Neolithic groups, which was maintained in the continuity of settlement, the lithic industry, and the remains of animal bones, can be seen at many sites (Gudnja, Markova Špilja, Kopaćina, and others)."[30] It is hard to support this statement in its entirety, given the fact that very few Mesolithic sites are known on the Dalmatian coast and islands, and especially ones dated to the Late Mesolithic. Just to note that Early Mesolithic remains are known only from Vlakno cave[31] and Late Mesolithic remains from Vela spila[32] and Žukovica[33] caves on the island of Korćula. These two Late Mesolithic sites are dated to the mid–late 7th millennium BC and show that the first farmers in the eastern Adriatic did not enter an empty land. However, the role of Mesolithic hunter-gatherers in the process of Neolithisation is far from being well understood. Two techniques in lithic production for obtaining regular blades, i.e. indirect percussion and pressure flaking, are present in both the Late Mesolithic and the Early Neolithic, although the origin of pressure flaking for these two periods is different.[34] It seems that in the Early Neolithic, pressure flaking is used to produce larger blades by applying more complex pressure flaking modes. Marine resources seem to have lost their importance in Early Neolithic subsistence strategies, and the same could be said for terrestrial malacofauna. Fishing also changed from a seasonal activity to year-round opportunistic fishing.[35] On the other hand, continuity across the Mesolithic/Neolithic transition in Montenegro can be observed in the Early Neolithic

22 Kačar 2020. – Vukosavljević, Perhoč 2020.
23 pp. 138, 152, 200.
24 pp. 147–148.
25 pp. 150–204.
26 See also Mihailović, Whallon 2017.
27 Mihailović, Whallon 2017 provide several possible explanations for the appearance of Uluzzian elements.
28 Mihailović 2009.
29 pp. 230–256.
30 p. 244.
31 Vukosavljević, Perhoč, Altherr 2014.
32 Vukosavljević, Perhoč, Radić 2022.
33 Vukosavljević, Perhoč 2020.
34 Kačar 2019.
35 Rainsford, O'Connor, Miracle 2014.

barbed point technology of Odmut and Vruća caves, where it represents a Mesolithic technological tradition.[36]

In Chapter 13, Goran Ćulafić, Gilbert Tostevin and Nikola Borovinić describe the sources of lithic raw material (mostly cherts, but also siliceous sandstones, silicified dolomites, and quartzites) that were discovered during the field survey within a 40 km radius of Crvena Stijena.[37] The authors provide a description of the sources, location and geological age. As they sampled all found sources, more data about lithic raw materials are expected to be published in the future. This fieldwork is the first step towards correlating lithic raw materials from Crvena Stijena with sources that could potentially have been exploited in the past. Earlier work by Jakob Pamić included petrographic analyses of selected artefacts from Crvena Stijena, but Pamić did not include a field survey in his work that would allow correlation of artefacts from Crvena Stijena with possible lithic raw material sources.[38] D. Mihailović classified Upper Palaeolithic and Mesolithic lithic assemblages from Crvena Stijena according to macroscopic features and provides data about diachronic changes in raw material use.[39] But again, data about sources is significantly missing. Since Ćulafić and colleagues plan to continue the field survey not only in Montenegro, but also in neighbouring Bosnia and Herzegovina, and Croatia, the wealth of data on lithic raw material sources collected and presented by Zlatko Perhoč would certainly be a valuable source of information for these authors' future work.[40]

Taxonomic determination was the main purpose of earlier analyses of faunal remains from Crvena Stijena. Additionally, recognized taxa were used as proxies for palaeoenvironmental reconstructions of the area where Crvena Stijena is located.[41] In this monograph, Eugène Morin and Marie-Cécile Soulier conducted the first detailed zooarchaeological analysis including taphonomic observations in Chapter 14.[42] Analysed faunal assemblages were found in recent excavations and they originate from excavated Layers M5-X.[43] Small samples were also collected for micromorphological analysis and dating from Layers XXVI–XVI; however, they have not been presented in this paper, with the exception of Layer XXIV.[44] There are also several bone retouchers presented in the paper.[45] The most important conclusions about the analysed assemblages are that: 1) humans are the main accumulators of ungulate faunal remains during the deposition of analysed layers, but non-human predators also contribute to the accumulation of a small number of faunal remains,[46] and 2) the taxonomic composition of the assemblages showed that there are no major faunal turnovers.[47] This is the very first time that data about seasonality is available for Crvena Stijena. For Layer M3 and Layer X, late spring and/or summer are proposed as season(s) of animal procurement, while for Layer M1 and Layer XXIV, this is mid-winter and/or spring and mid-winter to mid-spring respectively.[48] Referring to experimental and ethnoarchaeological data, the authors proposed the hypothesis that long longitudinal cut-marks on shaft portions of proximal long bones could be connected to filleting activities, including the drying and smoking of meat, but they are cautious with their interpretation as such cut-marks could be caused in small numbers by simple defleshing.[49] Hopefully in the future more data will become available to support or refute this interesting hypothesis. More zooarchaeological data is provided in the next chapter by Vesna Dimitrijević about Mesolithic faunal remains that were found during Whallon's excavation of the site.

Goran Ćulafić describes an archaeomalacological assemblage found in the 2000s and discusses its dietary and ornamental potential,[50] also referring to earlier observations about malacological material from Crvena Stijena. It is worth mentioning that for Late Mesolithic layers (1 and 2), Ćulafić reports on 27 perforated marine snail shells *Columbella rustica*, which together with 23 specimens that were reported earlier from the surface layer[51] and 10 specimens in another paper,[52] represents one of the biggest Mesolithic perforated marine assemblages in the Adriatic hinterland.

In Chapter 17, Jennie D. Shaw reports on the results of analyses of charcoal originating from combustion features from Layers XXIV, XX, M5, M4, M3 and M1.[53] Up until now, no such study had been undertaken for Crvena Stijena. The author explains methods very thoroughly

36 Borić et al. 2019.
37 pp. 257–265.
38 Pamić 1975.
39 Mihailović 2009.
40 Perhoč 2020. – Vukosavljević, Perhoč, Radić 2022, with references.
41 Rakovec 1958. – Malez 1967. – Malez 1975.
42 pp. 266–294.
43 M5–M1 are new labels for layers. The correlation to the older labelling system is given on p. 267 and Fig. 14.1.
44 p. 268.
45 p. 281.
46 pp. 277, 280.
47 p. 282.
48 pp. 281–282.
49 pp. 277, 284.
50 pp. 299–306.
51 Vušović-Lučić 2008, 151.
52 Borić, Cristiani 2019, 220 and Tab. 1.
53 pp. 307–339.

i.e., sampling, flotation and taxonomic identification. The results of charcoal fragment identification are presented in a meticulous way. The main conclusion is that *Pinus* spp. was the most often burnt wood in the analysed layers.[54] The author combines taxonomic identification with fuel value indices (FVIs) for different wood taxa to try to infer whether hearths had different functions (cooking/heating vs. smoking/drying).

Chapter 18 by Ramiro J. March, Robert Whallon and Mike W. Morley is the longest contribution in this monograph. It deals with Middle Palaeolithic fire structures at the site from Layers XXIV and XX.[55] This empirical *tour de force* could easily stand as a book by itself. The main goal of the paper is to try to detect the nature and possible functions of different fire structures that are described and sampled exclusively from the exposed profiles. The paper is divided into two parts. The first one is dedicated to descriptive stratigraphic observations of the fire structures from analysed layers and experimental work, while the second is the analytical part that uses different methods (X-ray fluorescence, XRD, GC, GC-MS, and GC-C-IRMS) for analysing chemical, mineralogical and organic matter composition in selected samples. A great wealth of different data is presented in numerous photographs, tables, drawings, 3D schematic models and graphs.

Robert Whallon and Eugène Morin provide an overview of the most important results that refer to the main questions raised at the beginning and throughout the course of the project in Chapter 20.[56] The volume closes with a short chapter by Gilbert Tostevin, current director of the Crvena Stijena excavation, who presents his plan and vision for further investigations of Crvena Stijena, including the potential challenges. Tostevin's plans are to include microarchaeological research in parallel to the classical archaeological fieldwork. A couple of recent papers show that these plans are already in motion.[57]

As announced in the title of the monograph, this truly is a multidisciplinary piece of work. This kind of monograph is one of a very few in the field of Balkan Palaeolithic archaeology and it stands next to the monumental two-volume monograph on Klithi rock shelter and other Palaeolithic sites in the Epirus region of northwestern Greece.[58]

54 pp. 325–326 and Figs. 17.8–17.10.

55 pp. 340–449.

56 pp. 450–455.

57 Jones et al. 2021. – Frahm et al. 2022.

58 Bailey 1997. – Just to mention that several volumes about the hunter-gatherer archaeology of the Franchthi cave have also been published.

The Crvena Stijena monograph is a very important reference point for all archaeologists who are interested in Balkan Stone Age archaeology, and particularly for those involved in Middle Palaeolithic research.

As the monograph was published by the end of 2017, one could say this review is essentially old news. However, a web search for the monograph reveals that it is almost impossible to purchase it, and for this reason, I think it is important to draw greater attention to this excellent edited volume, even a couple of years after publication, as it is not very likely that many people have had the opportunity to read it. The book is available to read online on the website of the Montenegrin Academy of Sciences and Arts.[59] After all the hard work invested in the field and in the subsequent writing and publishing of the monograph, it would be a great pity not to make this book available for individuals and libraries worldwide.

This monograph is not the only outcome of the project led by Whallon and his Montenegrin colleagues. The project also resulted in a research and accommodation centre for those studying Crvena Stijena which has the potential to become an important regional research hub.[60] This is yet another indication that Crvena Stijena can provide more valuable information about Middle Palaeolithic societies in southeast Europe. A new project led by Tostevin, following immediately on Whallon's, definitely shows the researchers' optimism about the future potential of the site.[61]

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Lázaros Kolónas, *Βούντενη I: Ένα σημαντικό μυκηναϊκό κέντρο της Αχαΐας*. Οργανισμός Διαχείρισης και Ανάπτυξης Πολιτιστικών Πόρων (Ο.Δ.Α.Π.), Athen 2021. Bd. 1: 756 Seiten, 89 Zeichnungen und zahlreiche Farbabbildungen, 258 Tafeln; Bd. 2: 491 Seiten, zahlreiche Zeichnungen und Farbabbildungen, 484 Tafeln, Paperback, ISBN 978-960-386-484-4 (Bd. 1), ISBN 978-960-386-501-8 (Bd. 2).

Das zweibändige Werk Βούντενη I bildet den ersten Teil der Abschlusspublikation der größten systematisch ausgegrabenen Nekropole von Achaia in der Nordwestpeloponnes. Vorgelegt werden die Grabungsergebnisse zu den in der Osthälfte der Nekropole von Voúdeni gelegenen Gräbern (Gräber 1–44), die unter der Leitung des Autors, Lazaros Kolonas, zwischen 1988 und 1997 ausgegraben wurden. Eine fast gleich große Zahl von Gräbern ließ er ab dem Jahr 2000 freilegen (Gräber 45–78); diese sollen Gegenstand der zweiten geplanten Teilpublikation sein.[1] Βούντενη I beruht auf der vom Autor verfassten und 1998 an der Universität Kreta angenommenen Dissertation. Die Publikation hat eine lange und schwierige Editionsgeschichte hinter sich, mit dem Ergebnis, dass nach 1998 erschienene Literatur nur in Ausnahmefällen berücksichtigt werden konnte.[2] Dass sie jetzt erschienen ist, hat große Bedeutung für die Bronzezeitforschung in Griechenland, was schon ein erster Blick in das reich ausgestattete Werk deutlich erkennen lässt.

Die Befundvorlage eröffnet mit Teil 1 des ersten Bands ein topographischer und geologischer Überblick. Er bietet Informationen zur Einbettung des Fundorts in die Landschaft Westachaias und deren östlichster Mikroregion, in der die Nekropole und weiter südwestlich, auf dem Plateau Bórdsi, die größte zugehörige Siedlung liegen. Über das Tal des westlich an Nekropole und Siedlung vorbeifließenden Meilichos waren beide mit dessen antiker Mündungsbucht, dem heutigen Sumpf von Ajiá, verbunden, der als mykenischer Hafen gedient haben dürfte. Die Nekropole von Voúdeni erstreckt sich in einer Höhe von 225 m über dem Meeresspiegel über 1,8 ha auf zwei Terrassen mit den Flurnamen Amighdhaliá und Liapéika, die Teil eines hügeligen Ausläufers des Panachaikongebirges sind. Von diesen natürlich geschützten Terrassen aus hat man einen Panoramablick auf die Meerenge von Río und Andírrio, d.h. den westlichen Zugang zum Korinthischen Golf. Alle diese topographischen Gunstfaktoren machen die strategische Lage von Voúdeni aus, die der Autor sicher zu Recht als entscheidendes Motiv hinter der Platzwahl seitens der bronzezeitlichen Siedlungsgemeinschaft ansieht. Die Nekropole wurde 1987 nach einer Grabplünderung wiederentdeckt, vor Überbauung geschützt und sukzessive ausgegraben.[3] Heute ist das Gelände ein archäologischer Park des Denkmalamts von Achaia.[4]

Im zweiten Teil des ersten Bands erfolgt die detaillierte Befund- und Fundvorlage nach Gräbern getrennt. Jedes Kammergrab ist mit Grundriss, Querschnitt und – bei den Kammergräbern, die die Mehrzahl der Gräber ausmachen – einem oder zwei Aufrissen der Kammerfassade (mit und ohne Stomionvermauerung) dokumentiert; die zeichnerische Dokumentation wird durch Grabungsfotos im Tafelteil ergänzt. Für jedes Grab wird die Befundsituation detailliert beschrieben: Alle Funde werden mit ihrer Fundnummer und ihrer Position im Grab genannt; alle Primär- und Sekundärbestattungen sind anhand einer Nummer identifizierbar, bestehend aus dem Buchstaben „T“ (für τάφος = Grab), einer arabischen Grabnummer und einer von dieser durch einen Schrägstrich getrennten griechischen Ordinalzahl. Die Pläne sind recht kleinformatig gedruckt und beinhalten neben den genannten Bestattungsnummern keine weiteren Bezeichnungen – etwa für Fundgruppen oder Einzelobjekte. Zusätzlich bietet aber ein in den Band 1 eingeklebtes Etikett einen QR-Code, der zu einer Webseite führt, auf der sämtliche Plan-, Schnitt- und Aufrisszeichnungen der Gräber in hoher Auflösung in Form eines pdf abrufbar sind. Die Zeichnungen sind sehr detailliert, was in vielen Fällen auch eine eindeutige Identifikation einzelner Gefäße oder Metallobjekte in ihrer genauen Fundposition im Bezug zu den Skeletten ermöglicht, wenn dazu der Text der Befundbeschreibung gelesen und die Objektzeichnungen herangezogen werden. An die Befundbeschreibung schließt sich jeweils ein Katalog aller im Grab und teilweise im Dromos sowie in besonderen Fällen in Dromos- oder Fassadennischen gemachten Funde an.

1 Bd. 1, S. 30. Vgl. Bd. 2, S. 490 mit dem Gesamtplan der heute bekannten Nekropole.

2 Diese Lücke soll mit dem Erscheinen von Βούντενη II gefüllt werden, siehe Bd. 2, S. 197 Anm. 835.

3 Bd. 1, S. 34–43.

4 Moschos 2007, 18–21. – Kolonas 2008.

Jedes Artefakt ist mit Fundnummer („T“ + Grabnummer + laufende Nummer) und Museumsinventarnummer („AEB“ + laufende Nummer), einer detaillierten Beschreibung, einer Einzeldatierung und einem oder zwei Farbfoto(s) im Text aufgeführt. Im Tafelteil des ersten Bands sind diese Farbfotos nach der Reihenfolge ihrer Fundnummern noch einmal abgedruckt, werden dort aber noch um eine, oft auch zwei Zeichnungen ergänzt. Diese opulente Bilddokumentation ist von hohem Wert für die typologische und stilistische Diskussion und setzt einen neuen Standard für die Region, da vorangegangene Abschlusspublikationen achaischer Nekropolen fast immer nur Fotos jedes einzelnen Keramikgefäßes enthalten und nur für eine kleinere Auswahl auch Zeichnungen bieten.[5] Bisweilen hatte die Druckerei allerdings Probleme mit der Reproduktion der Zeichnungen, und zwar was den Innendekor der Gefäße angeht. Dieser ist nach der üblichen Konvention mit einer Schattierung bzw. einem Raster angegeben,[6] kann aber beim Druck auch ganz verblasst sein.[7] Das Problem lässt sich mit Hilfe der detaillierten Beschreibungen der Gefäße in den Beigabenkatalogen ausgleichen.

Ein wesentlicher Faktor, der die vorliegende Monographie wissenschaftlich so ergiebig macht, sind die zahlreichen Primärbestattungen, die mit ihren zuweisbaren Beigaben detailliert beschrieben werden. Einige Beispiele sollen dies veranschaulichen.

Kammergrab 21 stürzte anscheinend bereits in mykenischer Zeit ein und wurde danach mit Schutt aus der Nekropole verfüllt, wie vier offene Gefäße – zwei Kratere, eine Schale mit Rundhenkeln und ein Skyphos mit Vertikalhenkeln unterschiedlicher Zeitstellung – sowie die Fragmente eines bemalten Wannensarkophags aus diesem Schutt verdeutlichen.[8] Aufgrund des Einsturzes wurde das Grab nur ein einziges Mal belegt; auf dem Kammerboden lag das Beigabenensemble eines Kriegers der späten Palastzeit, allerdings kein Skelett. Kolonas vermutet, dass die menschlichen Überreste noch vor dem Deckeneinsturz verlagert wurden, da sich ein Schädel (T21/A) 1,23 m oberhalb des Stomionbodens in der Stomionvermauerung fand.[9] Die gut erhaltenen Beigaben lagen in zwei Gruppen nahe der hinteren südwestlichen Ecke der Grabkammer: einmal die aus einem Langdolch, einer Pinzette, einem Messer sowie einem größeren und einem kleineren Schöpfer bestehenden Bronzen und zweitens die unmittelbar vor der rückwärtigen Kammerwand niedergelegten sieben Bügelkannen, von denen der Bearbeiter sechs allgemein in SH IIIB datiert, eine hingegen in SH IIIB–IIIC Früh.[10] Bügelkannen sind schwer phasengenau zu datieren; die Gefäße aus Kammergrab 21 könnten jedoch in SH IIIB Ende gehören.[11] Bedeutsam ist die mit Waffen und Bronzegefäßen ausgestattete Bestattung, da wir aus der späten Palastzeit im gesamten Griechenland nur wenige vergleichbare Grabbefunde kennen.[12]

Kammergrab 22 bietet neben einer seltenen Minikammer hoch oben in der Grabfassade, die die Knochenreste wohl eines Kleinkinds enthielt,[13] an Interessantem eine stratigraphische Abfolge vom Ende der mykenischen Nachpalastzeit: Die Primärbestattung T22/Γ war in gestreckter Rückenlage auf einer Schicht ungebrannten Tons niederlegt worden, eine regionaltypische Variante der Skelettbestattung, deren anthropologisch unangenehmer Nebeneffekt in aller Regel die aufgrund der gesammelten Feuchtigkeit schlechte Erhaltung der Knochen ist. Sie wurde begleitet von zwei Bügelkannen (T22/22, T22/24) sowie einem eckigen Alabastron (T22/23). Diese Bestattung wird partiell überlagert von der Primärbestattung T22/Δ, einem Rückenhocker, dem vier Bügelkannen (T22/25–T22/27, T22/29) und eine vierhenkelige Amphore (T22/28) zugeordnet werden können: Diese Gefäße sind stilistisch deutlich fortgeschrittener als die Beigaben von T22/Γ und zeigen zumindest teilweise submykenische Motive und Dekormerkmale.[14]

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5 Vgl. Aktypi 2017. – Paschalidis 2018. Die Funde aus Mitópoli wurden ausschließlich in Fotos vorgelegt, siehe Christakopoulou-Somakou 2010. Die Ausnahme bildet die Nekropole von ´Äjio, da hier von den meisten Funden nicht nur Fotos, sondern auch Zeichnungen vorgelegt wurden, siehe Papadopoulos 1976. – Papadopoulos, Papadopoulou-Chrysikopoulou 2017.

6 Sichtbar etwa bei Bd. 1, S. 591 und Taf. 93/T7/2; S. 628 und Taf. 130/T12/5; S. 656 und Taf. 21/T21/1–T21/3; S. 737 und Taf. 239/T39/4.

7 Bd. 1, S. 590 und Taf. 92/T6/5; S. 642 und Taf. 144/T16/7; S. 645 und Taf. 147/T16/23–T16/24.

8 Bd. 1, S. 262–264; S. 656 und Taf. 158.

9 Bd. 1, S. 261–262. Leider ist dieser Schädel nicht unter jenen, die vermessen und nach Alter und Geschlecht bestimmt wurden (vgl. Bd. 2, S. 242 mit Tab. 2).

10 Bd. 1, S. 261–262 und Zeichnung 46; S. 264–268, 657–658 und Taf. 159–160 (bei den Bügelkannen T21/9 und T21/11 fehlen zum Teil die feinen Liniengruppen in den Zeichnungen); Bd. 2, S. 117.

11 Vgl. aus der so genannten Epichosis von Tiryns, dem vor allem in SH IIIB Ende und zum kleineren Teil in SH IIIC Früh 1 zu datierenden Schutt, der von der Oberburg hinuntergekippt wurde, die Fragmente bei Voigtländer 2003, Taf. 73/Bü 5, Bü 14; 76/Bü 42; 135/Bü 14.

12 Vgl. Jung 2005, 48–49 und Abb. 1, sowie das neuere Fundensemble von Bestattung 2 (SH IIIB Früh–Mitte) in Kammergrab 1 der attischen Nekropole von Ghliká Nerá: Kurzschwert des Typs F, Pinzette, Achatsiegel und zwei Bügelkannen (Vrettou 2020, 515–517 und Abb. 3, 4/c, 5–6).

13 Bd. 1, S. 269–270 und Zeichnung 48–49.

14 Bd. 1, S. 270–280, 662–664 und Taf. 164/T22/22; 165–166.

Sicher ins Submykenische zu datieren ist die Primärbestattung T26/B, die wiederum auf eine Tonlage gebettet war. Direkt auf dem Skelett wurden eine kleine Bügelkanne (T26/14) und eine durchbohrte Terrakottakugel, vom Autor als „Knopf" (s. u.) angesprochen (T22/15), gefunden. Weiter westlich, zwischen T26/B und einer weiteren Primärbestattung (T26/A), lagen eine kleine Bügelkanne (T26/12) und ein Terrakottakonulus (T26/13), die der Ausgräber aus chronologischen Erwägungen T26/B zuschreibt. Östlich von T26/B und nicht in der Nähe einer anderen Primärbestattung lag schließlich noch eine größere Bügelkanne (T26/16). Die genannten drei Bügelkannen haben – neben morphologisch späten Merkmalen – alle die für das submykenische Achaia typischen Schultermuster aus konzentrischen, außen mit langen Fransen versehenen bzw. mit komplexen Mustern gefüllten und ebenfalls von langen Fransen umgebenen Dreiecken.[15]

Das Kammergrab 27 erbrachte eine interessante Fundgruppe von sechs Bernsteinperlen (T27/17), die zusammen mit einem Steatit- und einem Terrakottakonulus (T27/18 bzw. T27/19), drei amygdaloiden Karneolperlen (T27/22), mindestens 38 Glas- und wohl auch Fayenceperlen unterschiedlicher Typen (T27/24), einem Krug (T27/20, SH IIIC Früh), einer kleinen Bügelkanne (T27/21, SH IIIC Früh) und einem mit Schuppenmustern verzierten Doppelgefäß mit Korbhenkel (T27/23, SH IIIB/IIIC Früh) und vier flachen Bronzepfeilspitzen die Beigaben einer sekundär verlagerten Bestattung direkt vor der östlichen Kammerwand ohne erhaltene Knochen bilden sollen.[16] Wenn man sich der Interpretation als ursprüngliche Beigaben einer einzigen Bestattung anschließen möchte, dann bildet diese Fundgruppe den ältesten Beleg für das Vorkommen des Bernsteinperlentyps Tiryns in Griechenland,[17] denn an der hohen Datierung der drei Keramikgefäße[18] kann kein Zweifel bestehen; man könnte sie auch durchaus noch ins späte SH IIIB datieren, wozu im Übrigen auch die Karneol- und Glasperlen passen würden. Vier der Bernsteinperlen wurden vom Autor als vierkantig mit abgerundeten Ecken bezeichnet,[19] wofür sicher der schlechte Erhaltungszustand verantwortlich ist, doch mindestens eine, wenn nicht zwei, haben die für den Typ Tiryns definierende Querrippe.

Einen im mykenischen Griechenland seltenen Schutzwaffenfund erbrachte das Kammergrab 29: Vor der rückwärtigen Kammerwand lag neben halb vergangenen Langknochen ein gut erhaltener bronzener Schildbuckel (T29/28). Leider ist seine Zugehörigkeit zu einer Primärbestattung unklar, und die in seiner Nähe gefundenen Gefäße datieren in unterschiedliche Zeitphasen: ein Schulterhenkelamphoriskos in die späte Palastzeit (T29/27) und eine Bügelkanne in die späte Nachpalastzeit (T29/30).[20] Vermutlich aufgrund des letztgenannten Gefäßes datiert der Autor den Schildbuckel in SH IIIC Spät, doch ist dieser Schluss aufgrund des zweiten genannten Keramikgefäßes nicht zwingend. Der Schildbuckel, dessen flache Scheibe vier Punzbuckel zieren und der 17,8 cm im Durchmesser misst, ist in der Mitte seines Omphalos (Dm 4,2 cm) mit einem nach außen leicht vorstehenden, stark profilierten Dorn versehen, mit dem auf der Innenseite des Buckels ein massiver Ring verbunden ist. Aufgrund eines analogen Funds im Kammergrab 2 der westachaischen Nekropole von Spaliaréika-Lousiká, der bei einem eigenen Durchmesser von 19,5 cm von kreisförmigen, vergangenen Resten des organischen Schilds umgeben war, deren Gesamtdurchmesser 50–60 cm erreichte, weiß man, dass derartige Objekte tatsächlich als Schildbuckel zu interpretieren sind. Der Schildbuckel von Spaliaréika ist jedoch in seinem Zentrum so beschädigt, dass ihm Dorn und Ring fehlen.[21]

Einen schönen geschlossenen Kontext der palastzeitlichen Phase SH IIIA2, für die man generell gern mehr geschlossene Kontexte aus Griechenland zur Verfügung hätte, bietet die Kammer 34α, eine Seitenkammer des Dromos von Kammergrab 34, die eine einzelne Bestattung, wohl eines Kinds, von dem nur der Schädel und wenige Knochenfragmente erhalten waren,[22] enthielt. Die Beigaben umfassen drei gerundete Alabastra (T34α/1, T34α/2, T34α/3), eine Schnabelkanne (T34α/4) – alles sehr kleine Exemplare von nur 6,8 bis 7,0 cm Höhe –, und eine kurze Kette aus sieben Glas-/Fayenceperlen, einem Steatitkonulus und zwei Kaurischnecken (T34α/5), die in ihrer ursprünglichen Anordnung

15 Bd. 1, S. 319 und Zeichnung 56; S. 321, 325–326, 683–684 und Taf. 185/T22/12, T26/14; 186/T26/16.

16 Bd. 1, S. 346 und Zeichnung 58; S. 348, 354–356.

17 Kein mykenischer Fundkontext mit Bernsteinperlen dieses Typs konnte bislang sicher in SH III C Früh datiert werden; das Auftreten des Typs in der Zerstörungsschicht des Königspalasts von Ugarit ließ jedoch bereits mykenische Funde aus der späten Palastzeit bzw. der frühesten Nachpalastzeit erwarten. Vgl. Jung 2020, 175–176 mit Anm. 4.

18 Bd. 1, S. 698–699 und Taf. 200/T27/20; 201/T27/21, T27/23.

19 Bd. 1, S. 354; Bd. 2, S. 164, 167 (Typ 9β); S. 479 und Taf. 475/T27/17.

20 Bd. 1, S. 382, 391–392, 714 und Taf. 216/T29/27–T29/30; Bd. 2, S. 140.

21 Giannopoulos 2008, 121 Kat. Nr. Sp.G2-57 und Taf. 35/57.

22 Auch dieser Schädel ist nicht unter jenen, deren Alters- und Geschlechtsbestimmungen von dem Anthropologenteam in einem Appendix veröffentlicht wurden (vgl. Bd. 2, S. 242 mit Tab. 2).

liegend angetroffen wurden. Ein weiterer Steatitkonulus (T34α/6) lag im Inneren des Alabastrons T34α/1.[23]

Besonders interessant aufgrund seiner ausschließlich palastzeitlichen Belegung ist auch Kammergrab 36, zumal es acht parallel zueinander angeordnete Primärbestattungen enthielt, die laut der sieben gefundenen Gefäße des SH IIIA2 alle in diese Phase datieren könnten. Zwischen den Bestattungen T36/A und T36/B lag eine Lanzenspitze (T36/2), allerdings nicht unmittelbar auf dem Kammerboden, sondern auf einem Schichtpaket von 23–32 cm Mächtigkeit. Diese Fundlage erklärt der Autor damit, dass die Lanze ursprünglich an die Kammerwand gelehnt war und umfiel, als sich der Lanzenschaft zersetzt hatte.[24] Denkbar wäre aber auch, dass die Lanze auf dem 10 cm breiten Kammerwandrücksprung abgelegt gewesen war, der in 1,50 m Höhe umlaufend den Übergang von der senkrechten Kammerwand zur gewölbten Kammerdecke markiert. Die zweite, typengleiche Lanzenspitze des Grabs (T36/1) wurde nämlich auf diesem Rücksprung liegend angetroffen, und zwar oberhalb der Westwand, nahe der Südwestecke der rechteckigen Grabkammer.[25] Der Autor erklärt diese ungewöhnliche Positionierung allerdings mit einem Beraubungsszenario, demzufolge ein Grabräuber die Lanzenspitze aus der Bestattungsschicht entnommen, sie dann auf dem Wandrücksprung abgelegt und dort schließlich vergessen hätte.[26] Es ließen sich aber die Fundpositionen beider Lanzenspitzen zwangloser erklären, wenn man für beide Lanzen eine ursprüngliche Deponierung auf dem Wandrücksprung annähme. Dann hätte der Deckeneinsturz, der in oder nach der klassischen Zeit erfolgte,[27] zum Herabfallen der einen Lanzenspitze (T36/2) geführt. Einen weiteren erwähnenswerten Befund des Grabs stellt die in Rückenlange und mit angewinkeltem linken Arm angetroffene Primärbestattung T36/Z dar, auf deren rechtem Oberschenkel eine Pinzette lag (T36/18), während schräg auf dem Brustkorb ein Kleinkind bestattet worden war (T36/H).[28] Leider enthalten die anthropologischen Appendizes in Band 2 weder Geschlechts- noch Altersbestimmungen zu den Skeletten aus diesem Grab.

Am Ende des ersten Teilbands stehen Tafeln, von denen die ersten 66 Stück Befundfotos zeigen, denen man Informationen zur Grabarchitektur und ausgewählten Beigabengruppen entnehmen kann, während die folgenden 192 Tafeln Farbfotos und Zeichnungen der Funde bieten.

Der zweite Teilband von *Βούντενη* I ist der Auswertung der Befunde und Funde gewidmet und beginnt mit der Grabarchitektur. Bei den 47 im Ostteil der Nekropole von Voúdeni ausgegrabenen Gräbern handelt es sich um 37 Kammergräber, drei Nebenkammern (die von Dromoi abgehen), fünf Grubengräber und zwei nicht fertig gestellte Dromoi.[29]

Basierend auf der Grundrissform der Grabkammern unterscheidet Kolonas die Kammergrabtypen I bis VI, von denen Typ II mit rechteckigem Kammergrundriss gemäß der Deckenform (z. B. Satteldach, Walmdach, Gewölbe mit Wandrücksprung, Satteldach mit angeritzten Tympana etc.) weiter in die Untertypen IIα bis IIε unterteilt ist.[30]

Gruben wurden im Kammerboden hauptsächlich für Sekundärbestattungen ausgehoben, und zwar vor allem in kleineren Gräbern, in den größeren fast nie. Das Platzsparen war der Grund für diese Praxis, so die plausible Schlussfolgerung des Autors. Gruben für Primärbestattungen sind seltener und unterscheiden sich von den Sekundärbestattungsgruben durch ihre größere Tiefe sowie die Tatsache, dass sie an ihren Rändern alle einen Wandungsrücksprung als Auflager für Deckplatten aufweisen. Solche Primärbestattungen in Gruben scheinen ein rein nachpalastzeitliches Phänomen zu sein.[31]

Ein weiteres interessantes architektonisches Detail stellen die in den Kammergräbern 4 und 29 beobachteten viereckigen Ausmeißelungen mit 10–18 cm Kantenlänge im Kammerboden dar, die zu asymmetrischen Vierecken angeordnet sind und der Interpretation des Autors nach zur Aufnahme der Beine von Totenbetten dienten,[32] was angesichts der bildlichen Darstellungen derartiger Klinen auf nachpalastzeitlichen mykenischen Gefäßen aus der südlich an Achaia grenzenden Region Elis[33] als sehr wahrscheinlich angesehen werden kann.

Im zweiten Kapitel des auswertenden Bands, das der Autor als dritten Teil seiner Publikation betitelt, widmet sich dieser den Bestattungssitten. 34 der 47 Gräber erbrachten insgesamt 222 Bestattungen, von denen 87 Primärbestattungen in 29 Gräbern darstellen. 62 der Primärbestattungen sind hinreichend gut erhalten, um Rückschlüsse auf die Bestattungssitten zu erlauben.[34]

23 Bd. 1, S. 436–438, 734 und Taf. 236.
24 Bd. 1, S. 440–443 und Zeichnung 75; S. 735 und Taf. 237/T36/2.
25 Bd. 1, S. 441, 443, 735 und Taf. 237/T36/1.
26 Bd. 2, S. 27–28.
27 Aufgrund der im Deckenversturz gefundenen klassischen Keramik (Bd. 1, S. 441).
28 Bd. 1, S. 440 und Zeichnung 75; S. 442.
29 Bd. 2, S. 11.
30 Bd. 2, S. 17–20.
31 Bd. 2, S. 21–22.
32 Bd. 2, S. 23.
33 Zuletzt dazu Vikatou 2019b.
34 Bd. 2, S. 23.

Die in Voúdeni geübte Bestattungsform war prinzipiell die Körperbestattung. Seit der frühesten Belegungsphase der Nekropole (SH IIB/IIIA1) wurden die Toten dabei einfach auf den Kammerboden gebettet, wobei die häufigste Positionierung die Rückenlage mit angezogenen Beinen ist; seltener als diese Rückenhocker sind die in gestreckter Rückenlage beigesetzten Toten und noch seltener die Seitenhocker. Erst ab der Periode SH IIIC trat die spezifische Bestattungsvariante auf, bei der der/die Tote auf einer ganz dünnen Schicht ungebrannten Tons beigesetzt wurde und die etwa auch in der westachaischen Nekropole von Pórtes belegt ist.[35] Die meisten erhaltenen Primärbestattungen (69) fallen in die Nachpalastzeit, was angesichts der auch sonst geübten mykenischen Praxis, ältere Bestattungen zugunsten jüngerer in Gruben oder Haufen entlang der Kammerwände umzubetten, nicht weiter verwundert.[36] Nur 13 Bestattungen sind dem Autor zufolge beigabenlos,[37] wobei diese Zahl noch kleiner gewesen sein mag, wenn man die schlechten Erhaltungsbedingungen für organische Materialien im mediterranen Klima bedenkt. Die mit weitem Abstand häufigste Grabbeigabe ist das Keramikgefäß; nur fünf der mit Beigaben ausgestatteten Toten hatten kein Gefäß.

Teil vier der Publikation (das zweite Kapitel von Band 2) behandelt das Fundmaterial. Die Keramik wird zumeist nach Gefäßformen, in der Regel unter Verweis auf die üblichen Furumark'schen Typennummern (vom Autor „FS", nicht „FT" abgekürzt), vorgestellt. Eine Wareneinteilung ist unterblieben, in den Katalogeinträgen zu den Gefäßen in Band 1 finden sich jedoch Angaben zu den Farben von Bemalung, Scherben und Engobe, während die Magerung nur in speziellen Fällen Erwähnung findet und auch nur hinsichtlich ihrer Quantität, nicht der Qualität ihrer Partikel.[38]

Am Beginn des Keramikabschnitts steht eine übersichtliche Tabelle zu den Häufigkeiten der Gefäßformen. Aus dieser geht hervor, dass die geschlossenen Gefäßformen gegenüber den offenen bei weitem überwiegen: Wenn man die zwei Deckel, die sechs handgemachten Gefäße und die eine Larnax (den Wannensarkophag) abzieht, finden sich unter den 769 Drehscheibengefäßen nur 72 Exemplare oder 9,36 % offener Formen.[39] Wenn man sich ausschließlich auf die eigentlichen Grabbeigaben bezieht, müsste man noch einige weitere offene Gefäße aus der Statistik ausscheiden – so etwa die vier Gefäße, die mit dem Deckeneinsturz von Kammergrab 21 in dessen Verfüllung gelangten (s. o.). Eine derartig starke Dominanz von geschlossenen Gefäßen in der Grabkeramik ist auch von anderen mykenischen Nekropolen bekannt.[40]

Die mit großem Abstand häufigste Gefäßform ist die Bügelkanne; 404 oder 52,53 % von 769 Drehscheibengefäßen gehören verschiedenen Bügelkannentypen an.[41] Bügelkannen sind notorisch schwer zu datieren, da sie in den feinchronologisch am besten nutzbaren Siedlungsstratigraphien weitaus seltener als die dominanten offenen Gefäßformen vorkommen, wobei noch erschwerend hinzukommt, dass der für Siedlungsmaterial charakteristische Zerscherbungsgrad eine präzise Typenansprache häufiger erschwert als dies bei den meist weitgehend vollständig erhaltenen oder restaurierbaren Grabbeigaben der Fall ist. Daher sollen hier auch keine detaillierten Kommentare zu den einzelnen vom Autor vorgenommenen Datierungen abgegeben werden.

Bemerkt sei nur, dass der Rezensent zwar in einigen Einzelfällen anderer Meinung als der Autor ist, dies aber am Gesamtbild nichts Wesentliches ändert. Unklar bleibt etwa, warum alle Ringaskoi in SH IIIC Früh zu datieren sein sollten.[42] Der Ringaskos aus Kammergrab 16 (T16/13) gehörte zusammen mit mindestens fünf Bügelkannen zur Primärbestattung T16/B, die aufgrund eben jener Bügelkannen (T16/8–12), in deren Mitte der Askos stand, in SH IIIC Spät zu datieren ist.[43] Einen ähnlich problematischen Fall stellt der Askos FT 195 aus Kammergrab 25 dar (T25/60), der gemäß Kolonas aufgrund seiner Beifunde eindeutig in SH IIIC Früh zu datieren sei.[44] Der betreffende Askos auf Ringfuß wird zusammen mit 13 weiteren Gefäßen, darunter auch einem Ringaskos (T25/61), der Primärbestattung T25/Γ zugeschrieben.[45] Die meisten Gefäße dieser Beigabengruppe datiert der Autor in SH IIIC Spät, zwei Bügelkannen in SH IIIC Mitte–Spät, eine Bügelkanne in

35 Bd. 2, S. 24. Diese Beisetzungsvariante wurde beispielsweise auch in der westachaischen Nekropole von Achaia Clauss (Paschalidis 2018, 447) und der ostachaischen von Trapesá praktiziert (Borgna, de Angeli 2019, 37, 39 und Abb. 10).

36 Bd. 2, S. 24–25.

37 Bd. 2, S. 27.

38 Einige Bemerkungen zu den regionaltypischen Warencharakteristika sind aber in Bd. 2, S. 31 zu finden.

39 Bd. 2, S. 31.

40 Zu Achaia Clauss siehe Paschalidis 2018, 333; zu Peratí siehe Podzuweit 2007, Beilage 70b.

41 Der Prozentsatz in Achaia Clauss ist fast identisch, siehe Paschalidis 2018, 333.

42 Bd. 2, S. 78.

43 Bd. 1, S. 227–228 und Zeichnung 36; S. 642–644 und Taf. 144/T16/8–T16/13. Der Autor datiert den Ringaskos in SH IIIC Früh, die begleitenden Bügelkannen jedoch in SH IIIC Spät (Bd. 1, S. 233–234). Letzteres ist sicher richtig, doch sprechen der monochrome Dekor mit ausgespartem Bildfeld des Askos sowie dessen durch ein Band getrennte zwei Zickzackbänder ebenfalls für eine Datierung in SH IIIC Spät.

44 Bd. 2, S. 78.

45 Bd. 1, S. 296 und Zeichnung 54; S. 298.

SH IIIC Früh–Mitte und nur den Askos sowie den Ringaskos in SH IIIC Früh.[46] Askos und Ringaskos zeigen jedoch Motive wie Zickzackbänder, die besonders häufig im späten SH IIIC anzutreffen sind, weshalb man beide den mit ihnen vergesellschafteten Gefäßen entsprechend in die Phase SH IIIC Spät datieren sollte.

Ein sehr interessantes Kapitel ist den handgemachten Gefäßen gewidmet, von denen eines ein feinkeramisches bemaltes Miniaturgefäß ist, wie man es etwa aus palastzeitlichen Siedlungskontexten der Argolis kennt.[47] Die übrigen fünf jedoch sind eher grobkeramisch und unbemalt,[48] womit sie einer Kategorie angehören, die normalerweise nicht als Grabbeigaben Verwendung fand – zumindest nicht auf der Peloponnes, in Attika oder Böotien. Keines kann aufgrund seiner typologischen Merkmale der italienischen so genannten Impastokeramik subapenninischen Typs zugewiesen werden, die in Siedlungen vor allem der frühen Nachpalastzeit weit verbreitet ist, aber immer in beschränkter Menge auftritt.[49] Die Typen sind zum Teil Unikate – so etwa das Hängegefäß aus Kammergrab 20 (T20/10), das aus einer Sekundärbestattungsgrube stammt und vielleicht in die Palastzeit zu datieren ist.[50] Ein handgemachter und geglätteter Bauchhenkelamphoriskos (T11*α*/2) aus der Seitenkammer 11*α* des Dromos von Kammergrab 11 lag neben einem einzelnen Schädel, ebenso wie ein palastzeitlicher Schulterhenkelamphoriskos und ein frühnachpalastzeitlicher Bauchhenkelamphoriskos und ist daher grob in den Zeitraum von SH IIIB–IIIC Früh datierbar, etwas jünger als vom Autor vorgeschlagen.[51] Handgemachte geglättete Gefäße, die mykenischen Gefäßformen nahestehen, sind in der späten Palast- sowie in der Nachpalastzeit vielfach belegt; eine Parallele für T11*α*/2 kommt beispielsweise aus einem Kontext der Phase SH IIIB Entwickelt in der Tirynther Unterburg und passt damit auch zeitlich zu dem Gefäß aus Achaia.[52] Bemerkenswerterweise erbrachte die Nebenkammer T11*α* noch ein weiteres handgemachtes geschlossenes Gefäß, das allerdings nur sehr schlecht erhalten ist und ebenfalls nicht sicher kontextuell datiert werden kann (T11*α*/5).[53]

Sehr viel seltener als Keramikbeigaben sind Beigaben aus Bronze. Der Autor hat sicher Recht, wenn er für diese Seltenheit partiell die Beraubung der Gräber verantwortlich macht. Als Begründung führt er hierzu u. a. das nur anhand seiner Griffzunge im Kammergrab 4 nachgewiesene Schwert (T4/30) und den ähnlich gelagerten Fall der drei Schwertniete aus Kammergrab 27 (T27/75) an.[54] Obgleich diese Schwertfragmente nicht im Kontext mit Primärbestattungen aufgefunden wurden, geben ihre Beifunde Anlass, sie für Beigaben der höchsten Ausstattungsklasse der Nekropole von Voúdeni zu halten.

Die bronzene Griffzunge von Grab 4 wurde zusammen mit einigen Bronzenieten und granulierten goldenen Nietköpfen in einem Haufen von Sekundärbestattungen mit sehr schlecht erhaltenen Skelettresten vor der Südwestwand der Kammer gefunden.[55] Zu den übrigen Beigaben dieses Haufens zählt Keramik der Phasen SH IIIA1 bis IIIA2, v. a. zehn verzinnte Gefäße (die Bandhenkelschalen, Kylikes und konische Näpfe T4/68–T4/77) sowie vier bemalte geschlossene Gefäße (T4/78–T4/81).[56] Die im selben Haufen stratifizierten Kleinfunde umfassen zahlreiche Perlen, vor allem aus Glas bzw. Fayence, aber auch 241 Stück aus Karneol (T4/31 und T4/32) und 14 aus Gold (T4/38), einzelne Glasreliefperlen unterschiedlicher Form (T4/44–T4/52), von denen einige mit Goldblechen verkleidet waren (T4/55–T4/56), sowie weitere Goldbleche (T4/54, T4/57–T4/61), einen goldverkleideten Niet (T4/62), Fragmente einer Lanzenspitze (T4/63), 17 fragmentarische Pfeilspitzen (T4/64) und schließlich drei Hartsteinsiegel (T4/65–T4/67).[57]

Die Schwertniete von Grab 27 kommen aus der unteren Schicht der Sekundärbestattungsgrube II, die die Knochen zweier Toter (T27/H und T27/Θ) enthielt. Aus derselben Schicht stammen u. a. acht Keramikgefäße (T27/58–T27/65, meist SH IIB/IIIA1, teilweise aus der jüngeren Palastzeit), das Fragment eines Rasiermessers (T27/76), sechs fragmentarische Pfeilspitzen (T27/77) und zahlreiche Perlen. Aus diesen Perlen wurden eine Goldperlenkette (T27/81) und zwei Karneolperlenketten (T27/82–T27/83) – mit jeweils

46 Bd. 1, S. 311–315, 677–679 und Taf. 179–181 (Nr. T25/48–T25/50, T25/54–T25/64).

47 Bd. 1, S. 146, 599 und Taf. 101/T9/15; Bd. 2, S. 96, 458 und Taf. 454/T9/15.

48 Bd. 2, S. 96.

49 Zur Verbreitung der palast- und nachpalastzeitlichen Kategorien handgemachter und geglätteter Keramik (HGK) siehe Jung 2017, 27–29 und Abb. 2. In Achaia erbrachte die Befestigung von Teichos Dymaion eine Reihe subapenninischer handgemachter Gefäße, siehe Gazis 2017, 464–465 und Taf. 187/b–i, k; 188/c.

50 Bd. 1, S. 256–257 und Zeichnung 45; S. 260, 655 und Taf. 157/T20/10; Bd. 2, S. 96, 458 und Taf. 454/T20/10.

51 Bd. 1, S. 194 und Zeichnung 24; S. 197–198, 626 und Taf. 128/T11*α*/1–T11*α*/3.

52 Kilian 2007, 97 Kat. Nr. 187 und Taf. 16/187. Das Gefäß ist mit 17 cm Höhe aber größer als sein Gegenstück aus Voúdeni, das nur 7,6 cm hoch ist.

53 Bd. 1, S. 194 und Zeichnung 24; S. 197, 199, 626 und Taf. 128/T11*α*/5.

54 Bd. 2, S. 27, 138.

55 Bd. 1, S. 71 und Zeichnung 7; S. 73, 80, 572 und Taf. 74/T4/30.

56 Bd. 1, S. 73, 87–90, 573–575 und Taf. 75–76, 77/T4/80–T4/81.

57 Bd. 1, S. 73, 80–87, 572 und Taf. 74/T4/44–T4/64.

unterschiedlich großen Perlen – rekonstruiert. Hinzu kommen zwei ebenfalls rekonstruierte Glas-/Fayenceperlenketten (T27/84–T27/85).[58]

Schutzwaffen sind seltenere Grabbeigaben als Angriffswaffen; Voúdeni bildet hier keine Ausnahme unter den mykenischen Nekropolen. Während neun Lanzenspitzen, ein Dolch und die Fragmente zweier Schwerter aus den in der besprochenen Monographie publizierten Gräbern stammen, erbrachten diese Gräber nur drei Beispiele für Schutzwaffen.[59] Der Schildbuckel aus Kammergrab 29 wurde bereits gewürdigt (s. o.); ansonsten gibt es noch die zu Helmen gehörigen Eber- oder Keilerzahnlamellen aus den Kammergräbern 8 und 27.

Überraschend ist die Datierung des Eberzahnhelms von Kammergrab 8 (T8/31), der ebenso wie die Glasreliefperlen (T8/29–T8/30) und weitere Kleinfunde aus Stein, Terrakotta und Bronze (T8/21–T8/28) aus der Grube mit den Sekundärbestattungen T8/E und T8/ΣT stammt. Der Autor datiert die gesamte Fundgruppe in SH IIIC Früh.[60] Die phasengenaue Datierung des Helms wird im auswertenden Band 2 damit begründet, dass das Kammergrab 8 in SH IIIC angelegt und nur in dieser Periode belegt wurde.[61] Tatsächlich sind alle Keramikbeigaben des Grabs korrekt in die Nachpalastzeit und zwar überwiegend in die letzten IIIC-Phasen datiert worden.[62] Dennoch stellt sich die Frage, ob man eine längere Belegungszeit des Grabs, die zumindest einen Teil der Periode SH IIIB umfasst hätte, wirklich ausschließen kann. Die Funde aus der Sekundärbestattungsgrube sind zwar nicht aus sich heraus präzise datierbar, Glasreliefperlen werden jedoch begründet für Produkte der mykenischen Palastwerkstätten gehalten, so dass deren Untergang auch das Ende dieser speziellen Glasperlenproduktion bedeutete.[63] Die Grube selbst enthielt keinerlei Keramik; andere Grubenbefunde der Nekropole zeigen aber, dass nicht damit zu rechnen ist, dass beim Verlagern von Skeletten und Beigaben vom Kammerboden in Gruben sämtliche Objekte umgebettet wurden, da in solche Gruben etwa auch kleine Fragmente von stark beschädigten Gegenständen gelangten, die ansonsten großteils verloren sind (s. u.).

Einen großen Teil der Bronzebeigaben von Voúdeni machen die Werkzeuge und Geräte aus, zu denen ein Meißel, einige Nadel- und Ahlenfragmente sowie vor allem 26 Messer zählen. Unter die Messer subsummiert der Autor auch drei zweischneidige Klingen sowie eine Sichel,[64] aber selbst 22 Exemplare der typischen spätbronzezeitlichen einschneidigen Messer mit meist geradem, bisweilen aber auch leicht geschweiftem oder einfach gebogenem Rücken sind noch eine stattliche Anzahl, auch wenn Messer zu den häufigeren mykenischen Bronzebeigaben zählen und Sicheln eher typisch für Siedlungen sind.[65] Messer waren auch im mykenischen Griechenland Gegenstände des täglichen Gebrauchs und so wurden sie nach bisweilen langer Nutzung auch den Toten mitgegeben. Der Autor macht wichtige Beobachtungen zur Abnutzung der Messer sowie zur Tatsache, dass diese regelmäßig nachgeschärft wurden. Dies kann er etwa anhand des Schleifsteins T4/26, der zusammen mit dem durch vielfaches Schleifen im Klingenbereich stark verschmälerten Messer T4/24 als Beigaben der Primärbestattung T4/E gefunden wurde, demonstrieren.[66] Aufgrund dieser Beobachtungen könnte man allerdings die Ausgliederung von Kolonas' Messertyp B3 mit breiter Griffzunge, geradem Rücken und dreieckiger Klinge[67] infrage stellen und die betreffenden Objekte einfach als stark nachgeschliffene Messer interpretieren – zumal alle Exemplare, die er dem Typ zurechnet, sehr kurze Klingen haben. Die einzige Ausnahme stellt T42/9 mit (noch) langer Klinge dar; doch wurde auch diese aufgrund ihres stark konkaven Schneidenverlaufs offensichtlich mehrfach nachgeschärft.[68]

Gut vertreten sind in der Nekropole auch die Kosmetikgeräte wie Rasiermesser (sieben vom Autor identifizierte Exemplare) und Pinzetten. Letztere erscheinen mit 18 Exemplaren in den vom Autor bearbeiteten Gräbern, und er weist zurecht darauf hin, dass diese Zahl im Vergleich zu anderen mykenischen Nekropolen bemerkenswert hoch ist; so zählte etwa Agnes Xenaki-Sakellariou in den von Christos Tsountas in Mykene ausgegrabenen Gräbern dreizehn Pinzetten, während Mario Benzi in den von ihm bearbeiteten Gräbern von

58 Bd. 1, S. 348–349 und Zeichnung 60/oben; S. 366–372, 704–705 und Taf. 206–207. Zu dem vom Autor als Dolchgriffzunge angesprochenen Rasiermesserfragment T27/76 (Bd. 1, S. 370; Bd. 2, S. 140) vgl. Bd. 1, S. 445, 736 und Taf. 238/T36/15, zum Typ vgl. Weber 1996, 82–83 und Taf. 10/114, 117, 122.

59 Bd. 2, S. 138–142.

60 Bd. 1, S. 128 und Zeichnung 17; S. 135–136.

61 Bd. 2, S. 141.

62 Bd. 1, S. 129–134.

63 Nightingale 2004.

64 Bd. 2, S. 143–150, 464–467 und Taf. 460–463.

65 So erbrachte die nachpalastzeitliche Siedlung von Aigeira in Ostachaia zwei Sicheln und acht einschneidige Messer bzw. Messerfragmente, siehe Alram-Stern 2006, 105–108 und Taf. 23.

66 Bd. 1, S. 71 und Zeichnung 7; S. 73, 79, 572 und Taf. 74/T4/24, T4/26; Bd. 2, S. 149, 465 und Taf. 461/T4/24; S. 467 und Taf. 463/T4/26. Die ebenfalls zugehörige Bügelkanne T4/25 datiert die Grablege in SH IIIC Spät (Bd. 1, S. 73, 79).

67 Bd. 2, S. 148.

68 Bd. 1, S. 475–476; Bd. 2, S. 148 (Nr. AEB 1304).

Rhodos nur zwei katalogisieren konnte und Spyros Iakovidis in Peratí nur vier.[69]

Zu den Trachtbestandteilen zählt Kolonas Fibeln und „Knöpfe“ aus Steatit oder Terrakotta. Vier Fibeln liegen vor, von denen drei zu den spätbronzezeitlichen Grabbeigaben zählen und eine in römische Zeit datiert.[70] Da Fibeln in spätmykenischer Zeit nur selten Bestandteil der Kleidung waren oder zumindest nur selten ins Grab mitgegeben wurden, sind datierte Fibelfunde stets ein wichtiger Zugewinn für die Forschung. Die tordierte Bogenfibel aus Kammergrab 4 (T4/28) lag zwischen den Primärbestattungen T4/ΣT und T4/Z; zusammen mit ihr wurde aber keine Keramik, sondern nur eine Schlitztüllenlanzenspitze (T4/29) gefunden.[71] Die Bogenfibel mit leicht verdicktem Bügel und zwei Bügelknoten (T7/1) war die einzige Beigabe der oberhalb des Stomions von Kammergrab 7 beigesetzten Dromosbestattung T7/A.[72] Einzig die Blattbügelfibel mit unverziertem Bügel (T5/57) wurde im Kontext mit Keramik gefunden, allerdings nicht als Beigabe einer Primärbestattung, sondern in einem Knochenhaufen von Sekundärbestattungen (T5/B) in der zweiten, oberen Bestattungsschicht des Kammergrabs 5. Die vier nahe der Fibel gefundenen Keramikgefäße (T5/23–T5/26) können in SH IIIC Fortgeschritten–Spät datiert werden.[73]

Die vom Autor κομβία (= Knöpfe) genannten Artefakte stellen eine interessante Objektgruppe dar. Kolonas fasst unter dieser Bezeichnung einerseits durchbohrte Steatitkonuli und andererseits konische und bikonische durchbohrte Terrakottaobjekte zusammen. Während die letzteren – in Voúdeni mit 70 Exemplaren die größte der „Knopf“-Gruppen[74] – zumeist als Spinnwirtel gelten, wobei aber einzelne, kleinere Stücke auch als Perlen gebraucht worden sein dürften,[75] existieren für die Steatitkonuli ganz unterschiedliche Interpretationsvorschläge: Diskutiert werden Funktionen als Spinnwirtel, Perlen (kleinere Exemplare), Knöpfe, Gewandbeschwerer.[76]

Einige Beigabengruppen von Primärbestattungen erlauben in Voúdeni die Funktionsbestimmung zumindest einiger dieser knopfähnlichen Objekte. Der Autor nennt hier an erster Stelle die oben erwähnte Kette (T34α/5) der Kinderbestattung im Dromos von Kammergrab 34 (T34α), denn eines der Kettenglieder war ein Steatitkonulus.[77] Drei bikonische Terrakottawirtel interpretiert Kolonas in Analogie zu einem Befund von Peratí als Gewandbeschwerer, da sie im Beinbereich der Primärbestattung T17/N gefunden wurden.[78] Eine weitere Funktion, nämlich als Gewichte eines Schleiers, erschloss er aus gemischten Gruppen von vier bis fünf durchbohrten Objekten, sowohl Steatitkonuli unterschiedlicher Form als auch bikonischen Terrakottawirteln, die jeweils in Kopfnähe, genauer gesagt neben der Schädelkalotte, zweier Primärbestattungen in verschiedenen Gräbern gefunden worden waren. Bei einigen größeren konischen wie bikonischen durchbohrten Terrakottaobjekten geht hingegen auch Kolonas von einer Verwendung als Spinnwirtel aus.[79]

Schmuck kommt in den Gräbern von Voúdeni abgesehen von wenigen Spiraldrähten aus Gold oder Silber mit Durchmessern zwischen 1,1 und 1,5 cm, die der Autor als Haarspiralen anspricht, und von sieben Bronzeringen und einem Silberring[80] vor allem in Form von Perlen vor. Er zählte insgesamt 8.112 Perlen aus verschiedenen Materialien und von unterschiedlicher Form und Größe. Zwei Drittel der in der Monographie publizierten Gräber enthielten Perlen. Am zahlreichsten sind die Perlen aus Glas mit 5.105 Stück,[81] wobei hier zu vermerken ist, dass der Autor begrifflich nicht zwischen Glas und Fayence unterscheidet, was ohne naturwissenschaftliche Analysen in der Tat schwierig ist.[82] Karneol steht bezüglich seiner Häufigkeit als Perlenmaterial an zweiter Stelle (2.155 Perlen), während an dritter Stelle interessanterweise aus Muschelschalen gefertigte Perlen mit 609 Stück kommen. Goldperlen besetzen mit 212 Exemplaren den vierten Rang. Alle weiteren Materialien sind für Perlen selten belegt, vom bereits erwähnten Bernstein (13 Perlen) bis zu der nur bei einer einzigen Perle vorkommende Bronze,[83] einem Material, das im gesamten mykenischen Griechenland nur in Ausnahmefällen zur Perlenproduktion herangezogen wurde. Die Perlenformen sind äußerst vielfältig, so dass der Autor 50 verschiedene Typen definieren konnte, die weitestgehend auch Parallelen an anderen mykenischen Fundorten haben.[84]

69 Bd. 2, S. 152–153 mit Anm. 649.
70 Bd. 2, S. 156–157, 471 und Taf. 467.
71 Bd. 1, S. 71 und Zeichnung 7; S. 73, 80, 572 und Taf. 74/T4/28–T4/29.
72 Bd. 1, S. 124–125, 591 und Taf. 93/T7/1.
73 Bd. 1, S. 93–95 und Zeichnung 8; S. 105–106, 583 und Taf. 85/T5/23–T5/25; S. 584 und Taf. 86/T5/26; S. 589 und Taf. 91/T5/57.
74 Bd. 2, S. 157–160, 471 und Taf. 467.
75 Rahmstorf 2008, 17–37.
76 Rahmstorf 2008, 134–138.
77 Bd. 2, S. 159.
78 Bd. 1, S. 244–245 und Zeichnung 39; S. 251 Nr. T17/25, T17/27–T17/28; Bd. 2, S. 160.
79 Bd. 2, S. 160.
80 Bd. 2, S. 161–162.
81 Bd. 2, S. 163.
82 Vgl. Nightingale 2004. – Rahmstorf 2008, 215–230.
83 Bd. 2, S. 163.
84 Bd. 2, S. 164–169.

Siegel sind demgegenüber deutlich seltener. 20 Stück wurden gefunden, die zudem ungleichmäßig auf zwölf Gräber verteilt sind: Drei Gräber enthielten je drei Siegel, in einem Grab wurden zwei Siegel gefunden, und acht Siegel sind Einzelstücke in ihrem jeweiligen Grab (das zwanzigste ist ein Oberflächenfund). Ein Zylindersiegel ist aus Karneol gefertigt, zehn Siegel schnitt man aus dem weichen Steatit, eines aus dem ebenfalls weichen Mineral Chlorit; bei dem Rest handelt es sich um Siegel verschiedener harter Gesteinsarten.[85] Sie wurden in den Bänden V Suppl. 1B und V Suppl. 3, 2 des Corpus der minoischen und mykenischen Siegel publiziert, und nun bietet die vorliegende Publikation die zur Auswertung so wichtigen stratigraphischen Kontexte und Beifunde.

Voúdeni ist somit die an Siegeln reichste mykenische Nekropole von Achaia. Achaia Clauss etwa erbrachte nur sechs Siegel (alle aus weichem Stein bzw. Glas),[86] Pórtes 15 Stück (acht aus Steatit, eines aus Fluorit, eines aus Schiefer, drei aus Glas, eines aus Karneol und eines aus Gold),[87] Mitópoli drei (ein importiertes Zylindersiegel aus Fayence und zwei mykenische aus Achat bzw. Karneol),[88] Chalandrítsa und ´Äjio jeweils kein einziges.[89]

Die Diskussion der Funde schließt ein Kapitel zu der figürlich bemalten Keramik ab. Nur vier der ganz rekonstruierbaren Gefäße tragen figürliche Motive, ebenso die fragmentarische Larnax. Hinzu kommen Fragmente von 17 weiteren figürlich bemalten Gefäßen, zumeist Krateren. Mit Ausnahme einer importierten palastzeitlichen Bügelkanne (T25/74) und einer lokalen vierhenkeligen Amphore (T34/10), die in Grabkammern gefunden wurden, stammen alle übrigen figürlich bemalten Gefäße aus den Dromosverfüllungen bzw. zwei aus dem Einsturztrichter der Kammer von Kammergrab 21.[90] Generell kommen die Kratere der Nekropole von Voúdeni aus den Dromoi; sie waren also keine Grabbeigaben.[91] Im Führer zum neuen archäologischen Museum von Patras äußerte der Ausgräber bereits die Hypothese, dass der zu großen Teilen erhaltene Bildfeldkrater mit Raubtierfries (T4/1) als Sēma, also Grabmal, über Kammergrab 4 aufgestellt gewesen sein dürfte,[92] und in der Tat hat diese Interpretation viel für sich, wenn man die Fundposition dreier figürlich bemalter Gefäße aus Elis zum Vergleich betrachtet: Sie wurden hoch oben in Dromosverfüllungen gefunden, und zwar jeweils nahe der Grabfassade, weshalb sie die Ausgräberin Olympia Vikatou als Grabmarkierungen interpretiert.[93] Einen analogen Fall gibt es nun auch in Ostachaia.[94] Vielleicht kann man nicht alle figürlich verzierten Kratere der Nekropole von Voúdeni in diesem Sinne interpretieren – vor allem nicht den großen Streitwagenkrater mit beigeordneten Raubtier- und Vogeldarstellungen (AEB 1364), dessen Fragmente in den Dromoi der einander benachbarten Kammergräber 7, 9, 11, 14 sowie 36 und wohl auch im Einsturztrichter des Kammergrabs 21 gefunden wurden[95] –, doch zeichnet sich zumindest ab, dass Kratere und insbesondere figürlich verzierte im Nekropolenareal spezielle Funktionen hatten.

Gemäß den in Bonn von Hans Mommsen durchgeführten Herkunftsbestimmungen mittels Neutronenaktivierungsanalyse (NAA) handelt es sich bei sieben der neun analysierten Proben von figürlich bemalten Krateren um lokale Produkte der chemischen Gruppe Ach-b, während eine Probe der ebenfalls lokalen Gruppe Ach-a zugewiesen wurde.[96] Die Darstellungen zeigen verschiedene Tiere und Menschen. Mehrfach anzutreffen sind Streitwagenmotive, wobei das komplexeste auf dem oben erwähnten, weit verstreut gefundenen Krater (AEB 1364) vom Autor als Jagdszene interpretiert wird.[97] Es verwundert allerdings, dass er diesen Krater ebenso wie den gesamten Lokalstil der Nekropole im Kapitel zur Ikonographie in den Zeitraum von SH IIIB2 bis IIIC Früh datiert.[98] Im Kapitel zur Endauswertung der Nekropole weist er hingegen die Mehrzahl der figürlich bemalten Gefäße dem von ihm so genannten

85 Bd. 2, S. 170–172, 480–484 und Taf. 476/T1/16, T9/103; 477–480.

86 Auf 13 Kammergräber kommen hier sechs Siegel, s. Paschalidis 2018, 437–438.

87 Diese 15 Siegel stammen aus einer Nekropole, die aus drei Tumuli mit 18 gebauten Kammer- bzw. Steinkistengräbern, zwei Tholosgräbern sowie 30 Kammergräbern besteht, siehe Kolonas 2009, 34–47. Vgl. CMS V Suppl. 3, 2, 430–445 Kat. Nr. 278–292.

88 Sie stammen aus zwei der sieben ausgegrabenen Kammergräber, siehe Christakopoulou-Somakou 2010, 71 und Taf. 12/34; 72 und Taf. 13/37; 94 und Taf. 19/17; 143.

89 Papadopoulos 1976. – Aktypi 2017. – Papadopoulos, Papadopoulou-Chrysikopoulou 2017.

90 Bd. 2, S. 174–182, 486–488 und Taf. 482–484.

91 Bd. 2, S. 80. Der palastzeitliche Krater T7/2 wird hier als mögliche Ausnahme genannt, doch auch seine Scherben stammen gemäß der Befundbeschreibung aus einer Dromosverfüllung (Bd. 1, S. 124).

92 Bd. 1, S. 71, 74. – Kolonas, Stavropoulou 2017, 33 und Abb. 28.

93 Zuletzt dazu Vikatou 2019a, 251–252 und Abb. 26. – Vikatou 2019b, 270–271 und Abb. 3–4; 275–277 und Abb. 9–10; 290–291.

94 Borgna et al. 2019, 335 und Taf. 134/9.

95 Bd. 2, S. 80, 181–182, 488 und Taf. 484.

96 Bd. 2, S. 175. – Mommsen, Maran 2001, 98 und Tab. 1; 104. Nach den Kurzbeschreibungen lassen sich folgende NAA-Proben identifizieren: Voud 36 and Voud 37 = Bd. 2, S. 181–182 Kat. Nr. 17; Voud 38 = Bd. 2, S. 176 Kat. Nr. 1; Voud 39 = Bd. 2, S. 176–177 Kat. Nr. 4; Voud 40 = Bd. 2, S. 177 Kat. Nr. 6; Voud 41 = Bd. 2, S. 179 Kat. Nr. 12; Voud 42 = Bd. 2, S. 176 Kat. Nr. 2; Voud 43 = Bd. 2, S. 178 Kat. Nr. 9; Voud 45 = AEB 206 (Bd. 2, Taf. 440/T4/1).

97 Bd. 2, S. 174.

98 Bd. 2, S. 174–175.

Reifen Achaia-Stil zu und stellt fest, es habe zu Beginn von SH IIIC Spät mehrere Maler gegeben.[99] Man wird dieser späten Datierung zustimmen. Was den am besten erhaltenen Streitwagenkrater (AEB 1364) angeht, so sprechen zunächst seine Strickhenkel für eine Datierung nicht vor SH IIIC Fortgeschritten.[100] Des Weiteren finden sich vergleichbare Füllmotive, wie sie über und unter den Pferden erscheinen, nicht auf Gefäßen von Bestattungen der Phase SH IIIC Früh, sondern nur auf solchen von Bestattungen der fortgeschrittenen bis späten IIIC-Phasen, nämlich gefranste Dreiecke mit doppelter oder dreifacher Rahmenlinie und komplexer Füllung[101] sowie gefranste konzentrische Halbkreise.[102]

Der figürliche Stil der „Voúdeni-Werkstatt" aus der späten Nachpalastzeit ist recht charakteristisch, so dass dieser Werkstatt inzwischen auch Gefäße zugewiesen wurden, die von Fundorten außerhalb Achaias stammen, so ein Kriegerkrater aus Thermon nördlich des Golfs von Patras.[103]

Es ist bedauerlich, dass gerade die Fotos der figürlich verzierten Fragmente nur in unzureichender Auflösung reproduziert wurden (während die übrigen Fotos von exzellenter Druckqualität sind);[104] dies ist selbstverständlich nicht dem Autor, sondern dem Verlag anzulasten.

Am Ende und bevor er alle Ergebnisse seiner Studie auf Griechisch und kurz auf Englisch zusammenfasst,[105] zieht der Autor einige allgemeine Schlussfolgerungen, die hier bezüglich einiger wichtiger Aspekte angesprochen werden sollen. Die Nekropole sei nicht nur von den Bewohnern der Zentralsiedlung auf dem Bórdsi-Plateau, sondern auch von denen kleinerer Siedlungen in der Umgebung genutzt worden, und zwar aus dem einfachen Grund, dass letztere nicht auf einem geeigneten Felsuntergrund lagen, was als plausible Hypothese erscheint.

Voúdeni liegt zwar am Ostrand Westachaias, wird jedoch von den Ausläufern des Panachaikongebirges von der Aigialeia, also dem küstennahen Ostachaia, getrennt. Aufgrund der Ausdehnung des Panachaikon sei Voúdeni auch nicht zum Inland hin orientiert, sondern vielmehr einerseits auf das Meer hin und andererseits zu der westachaischen Ebene und darüber hinaus in Richtung benachbartes Elis.[106]

Die Seltenheit der Waffen kommentiert Kolonas dahingehend, dass deren nachgewiesene Zahl aufgrund der offensichtlichen Beraubungsspuren (s. o.) ein verfälschtes Bild vermittle. Auch das Fehlen der für die nachpalastzeitlichen Kriegergräber Achaias so typischen Schwerter der Naue-II-Familie führt er letztlich auf sekundäre Entnahme von Bronzen früherer Belegungsphasen durch die spätere Bestattungsgemeinschaft zurück.[107] Inzwischen konnte der Ausgräber diese Überlieferungslücke jedoch selbst schließen, wie zwei kürzlich publizierte Naue-II-Schwerter aus dem Westteil der Nekropole zeigen.[108] Das ändert jedoch nichts daran, dass wir von einer ursprünglich größeren Waffendichte in der Nekropole auszugehen haben.

Der Autor geht im Folgenden noch auf die besondere Bedeutung des Kammergrabs 4 ein. Aufgrund seines Beigabenreichtums, der auch Goldobjekte umfasst,[109] aber auch aufgrund seiner monomentalen Größe sei dieses Grab in der Phase SH IIIA1 für den lokalen Herrscher angelegt worden.[110] Es lohnt sich, hier auch an den Status zu erinnern, den die drei Siegel vermitteln: Im Gegensatz zu den drei Siegeln aus Kammergrab 1, von denen zwei aus Steatit bestehen und eines aus Glas,[111] sind alle drei Siegel aus Kammergrab 4 fein gravierte Hartsteinsiegel,[112] somit deutlich wertvoller und

99 Bd. 2, S. 195.

100 Vgl. dazu etwa den bekannten Kriegerkrater aus Mykene (Sakellarakis 1992, 36–37, 124 Nr. 32) und einen der Schicht 10 (SH IIIC Fortgeschritten) von Kalapódhi zugewiesenen Krater (Jacob-Felsch 1996, 31, 146 Kat. Nr. 232 und Taf. 36/232).

101 Bügelkanne T12/14 von Bestattung T12/A (Bd. 1, S. 200 und Zeichnung 26; S. 205); Bügelkanne T12/16, vermutlich zu Primärbestattung T12/B gehörig (Bd. 1, S. 200–201 und Zeichnung 26; S. 206); Bügelkanne T31/6 von Primärbestattung T31/A (Bd. 1, S. 402 und Zeichnung 66; S. 404, 407).

102 Bügelkannen T12/13 und T12/14 von Bestattung T12/A (Bd. 1, S. 200 und Zeichnung 26; S. 205); Bügelkanne T12/15 von Primärbestattung T12/B (Bd. 1, S. 200 und Zeichnung 26; S. 206).

103 Moschos 2009a, 360. Farbfoto und Zeichnung des betreffenden Kraters bietet Papapostolou 2012, 96–97 und Abb. 38; Taf. 72/a. Kolonas wies bereits auf den Export von Keramik aus Voúdeni nach Thermon hin (Bd. 2, S. 196).

104 Bd. 2, S. 176–182, 486–488 und Taf. 482–484.

105 Bd. 2, S. 198–215, 260–262.

106 Bd. 2, S. 185.

107 Bd. 2, S. 186–187.

108 Kolonas, Stavropoulou-Gatsi 2017, 124–125 und Abb. 131 (Schwert des Typs C / Allerona / Stätzling). – I. Moschos in: Badisches Landesmuseum Karlsruhe 2018, 351 Kat. Nr. 279 (Schwert des Typs A / Cetona / Reutlingen aus Kammergrab 67, abgebildet bei Jung 2018, 232).

109 Vgl. dazu oben die Zusammenstellung der mit der Schwertgriffzunge vergesellschafteten Objekte.

110 Bd. 2, S. 187. Inzwischen wurde bei Ausgrabungen am westlichen Nekropolenrand ein noch größeres Grab freigelegt (Kammergrab 75, s. auch Bd. 2, S. 490), das ebenfalls während SH IIIA angelegt wurde und zu dessen Beigaben Goldschmuck und Karneolperlen, Siegel, verzinnte Keramikgefäße und Elfenbeineinlegearbeiten gehören (Kolonas 2008, 27–29 und Abb. 49–55), die größtenteils palastzeitlichen Datums sein dürften.

111 Bd. 1, S. 57–58; Bd. 2, S. 480–481 und Taf. 477/T1/14–T1/17.

112 Bd. 1, S. 86–87; Bd. 2, S. 481–482 und Taf. 477/T4/65–T4/66; 478/T4/67.

wohl auch in der administrativen Hierarchie der Siegelbenutzer höherrangig,[113] auf jeden Fall aber in ihrer Kombination unter den publizierten Gräbern ohne Parallele. Kammergrab 4 gehört zu den reichsten Gräbern der Nekropole und wurde von SH IIIA1 bis SH IIIC Spät belegt. Kolonas macht hier aber noch eine weitere wichtige Beobachtung: Während die palastzeitlichen Beigaben das Kammergrab 4 heraushöben, würden sich dessen Bestattungen aus der Periode SH IIIC in Nichts von jenen in anderen zeitgleichen Kammergräbern unterscheiden, so dass man nicht fehlgehe, wenn man sie gewöhnlichen Sterblichen der Siedlung zuschreibe. Es wäre interessant zu erfahren, so der Ausgräber weiter, ob das Grab die Besitzer gewechselt habe oder ob nach wie vor dieselbe Familie hier bestattete; mit einer Antwort müsse man warten, bis hierzu DNA-Analysen durchgeführt seien. Auf jeden Fall weise das Fehlen bedeutender Bestattungen der Nachpalastzeit in Kammergrab 4 auf eine Änderung der Machtverhältnisse in Voúdeni hin, was durchaus überzeugt.[114] Das Fehlen eines herausgehobenen Kammergrabs der Nachpalastzeit in dem Nekropolenareal, das in der Monographie behandelt werde, führe dazu, dass wir nicht wüssten, wer in dieser Periode die Zügel in der Hand gehalten hätte.[115] Die inzwischen im südlichen bis westlichen Nekropolenareal gemachten reichen Funde auch der Periode SH IIIC versprechen jedoch baldige Antworten auf diese Frage.[116] Die Vielfalt und Menge der nachpalastzeitlichen Grabbeigaben verdeutliche jedenfalls die Blüte der Siedlung während der gesamten Periode SH IIIC; diese Blütezeit zeige sich auch im übrigen Westachaia. Der Autor führt sie in Voúdeni auf ein lokales Bevölkerungswachstum zurück, da hauptsächlich ältere Kammergräber weiterbelegt und kaum neue während SH IIIC angelegt wurden. Es habe keinen wellenweisen Zuzug gegeben, wie das die ältere Forschung behauptet habe.[117]

Kolonas unterscheidet nach den Waffenbeigaben Westachaias drei Hierarchiestufen der lokalen Machthaber in der Periode SH IIIC: eine höchste von Personen, die mit Naue-II-Schwertern und Schutzwaffen ausgestattet waren, eine hohe von solchen, die nur Naue-II-Schwerter als Grabbeigaben hatten, und eine niedrige von Lanzenträgern.[118]

Was die Keramik Voúdenis angeht, so seien die Gefäße der Perioden SH IIIA und IIIB bereits überwiegend lokal hergestellt. Importe seien selten, und die Qualität der lokalen Produkte stehe der der argivischen Gefäße in Nichts nach.[119] Während SH IIIC Früh, vielleicht schon ab SH IIIB Ende erschienen lokale Merkmale der Keramik. Kolonas spricht vom Frühen Achaischen Stil und vom Reifen Achaischen Stil. Bereits seit dem Frühen Achaischen Stil sei der Bügelkannendekor mit durchgehender gleichmäßiger Bänderung aufgetreten, allerdings selten; er werde dann typisch für den Reifen Stil. Der Frühe Stil kennzeichne die Phase SH IIIC Früh, habe aber partiell bis SH IIIC Mitte überlebt. Der Reife Stil habe in einem fortgeschrittenen Stadium von SH IIIC Früh seinen Anfang genommen und sich dann bis nach Elis und Arkadien verbreitet. Die Farbe des Scherbens sei während des Reifen Stils rotbraun gewesen. Als typische Gefäßform des Reifen Stils identifiziert er die lokale Variante des Bügelkannentyps FT 175 mit einem glockenförmigen Gefäßkörper und einem größten Durchmesser, der bei 2/3 der Gefäßhöhe erreicht werde, sowie einem konischen Fuß. Die typischen Motive des Reifen Stils seien erstens konzentrische gefranste Halbkreise und zweitens Dreiecke, einfach oder gefranst. Komplexe Motive aus Dreiecken, Halbkreisen und Winkeln erschienen ab SH IIIC Mitte.[120] Die submykenischen Werkstätten setzten den Reifen Stil fort und sorgten für die Vermittlung grundlegender Dekormerkmale an die protogeometrische Keramik Westgriechenlands. Ab SH IIIC Mitte werde das Unterteil der Gefäße monochrom bemalt, und zwar mit zunehmender Tendenz. Bis SH IIIC Spät überdauerte die Durchbänderung der Gefäßkörper, die aber für sich genommen keine chronologische Relevanz habe, da sie den gesamten Reifen Stil charakterisiere. Sie könne auch mit einem monochromen Unterteil kombiniert sein.[121]

Die Bedeutung des Zentrums Voúdeni habe in seiner strategischen Lage bestanden, von der aus sowohl der Weg nach Süden, ins Inland, als auch nach Osten, in die Aigialeia kontrolliert wurde, ebenso auch die Meerenge von Río und Andírrio. Während dies sicher zutrifft, würde man sich eine ausführlichere Begründung für die These des Autors wünschen, Voúdeni sei der Befestigung von Teichos Dymaion (auf dem Kap Araxos) untergeordnet gewesen, habe aber eine gewisse Autonomie besessen, die sich im Kammergrab 4 niedergeschlagen habe und mit der Schutzfunktion am Ostrand der Region zusammenhänge.[122]

Am Ende des Bands sind schließlich einige Graphiken platziert, die einen Überblick über das in den verschiedenen

113 Vgl. hierzu Eder 2007.
114 Bd. 2, S. 187–188.
115 Bd. 2, S. 189.
116 Vgl. oben Anm. 108.
117 Bd. 2, S. 189.
118 Bd. 2, S. 189.
119 Bd. 2, S. 191.
120 Bd. 2, S. 193–194.
121 Bd. 2, S. 194.
122 Bd. 2, S. 195.

Zeitabschnitten der Nekropole verwendete Formenrepertoire der Keramik geben,[123] sowie Konkordanzlisten mit Fundnummern und Museumsinventarnummern aller Funde.[124]

Es folgen Appendizes, zunächst einer des Autors mit ausgewählten Keramikfunden der ausgehenden mittelhelladischen und frühmykenischen Zeit (MH III – SH I) aus dem Bereich der Siedlung, die in Zeichnungen vorgelegt werden.[125] In einem zweiten Appendix publiziert Eleni Andreopoulou-Mangou Ergebnisse ihrer mittels Atomabsorptionsspektroskopie (AAS) durchgeführten chemischen Analysen von sieben Metallobjekten der Nekropole. Bedauerlicherweise bezeichnet sie jedoch die von Kolonas als römisch erkannte Messingfibel aus dem Stomionbereich von Kammergrab 4 (T4/4) als vermeintlich ältesten Nachweis von Messing in Griechenland, und zwar aufgrund ihrer SH IIIC-Datierung,[126] obwohl der Ausgräber deutlich darauf hingewiesen hatte, dass diese Fibel als römisches Objekt nichts mit dem Grabinhalt des Kammergrabs 4 zu tun habe.[127]

Die letzten Appendizes der Monographie wurden von einem Team von physischen Anthropologen – Eleni Stravopodi, Anastasios A. Neroutsos, Christos Karatsoras, Sotiris K. Manolis und Christos Tsapardonis – verfasst, die 383 verschiedene Individuen identifizieren konnten, und zwar größtenteils komplette Skelette. 58 Skelette seien in den Gräbern verblieben, und von diesen habe man nur das Geschlecht und – so möglich – das Alter bestimmt. Insgesamt listen die Autor/inn/en der Anthropologieappendizes 170 männliche Tote, 80 weibliche und 30 Kinder bis zum Alter von 15 Jahren auf. Die mittlere Lebenserwartung habe bei 20–23 Jahren gelegen, das mittlere Sterbealter bei 28–31 Jahren.[128] Altersbestimmungen hätten bei 289 Individuen durchgeführt werden können, bei 94 sei das nicht gelungen.[129]

Vermutlich wird der Rezensent nicht der einzige Leser bleiben, dem unverständlich bleibt, dass diese wertvollen anthropologischen Ergebnisse nicht in ihrer Gänze publiziert wurden. Man findet in den genannten Appendizes lediglich Angaben zu Geschlecht und Alter von 30 Individuen, deren Schädelmaße publiziert werden,[130] sowie von 28 Individuen, deren Langknochenmaße angegeben und zur Körpergrößenberechnung genutzt werden.[131] Schlimmer noch wiegt die Tatsache, dass keine der publizierten anthropologischen Tabellen mit Ausnahme der Grabnummer stratigraphische Angaben enthält. Die Bestattungsnummern fehlen in allen Tabellen, obwohl jede bei der Grabung identifizierte Bestattung anhand einer separaten Bestattungsnummer eindeutig identifizierbar ist (s. o.). Warum also machten diese Wissenschaftler keinen Gebrauch von den sorgfältig durch den Ausgräber dokumentierten Bestattungskontexten? Da dies unterblieben ist, kann weder der Autor der Monographie noch die Leserin oder der Leser auch nur eine einzige Bestattung mit einer Alters- und/oder Geschlechtsbestimmung verbinden.

Die Anthropologen blieben ausschließlich ihren fachspezifischen Fragestellungen verhaftet und nutzten das große historische Potential der Nekropole von Voúdeni nicht; sie verhindern mit ihrer unvollständigen Publikation darüber hinaus, dass Archäologinnen und Archäologen ihre Ergebnisse historisch sinnvoll auswerten können.[132] Leider sind derartige, von der Stratigraphie losgelöste anthropologische Studien in der mykenischen Archäologie keineswegs eine Seltenheit, so dass hier betont werden soll, dass einer umfänglichen Nutzung der durch die Archäologie zur Verfügung gestellten Daten durch die Vertreterinnen und Vertreter der Naturwissenschaften in Zukunft deutlich mehr Beachtung geschenkt werden sollte.

Glücklicherweise ist kürzlich eine Neubearbeitung der menschlichen Skelettreste der Osthälfte der Nekropole von Voúdeni erschienen, die auf den stratigraphischen Befunden basiert und somit die Anthropologieappendizes von *Βούντενη* I ersetzen kann.[133]

Den zweiten Teilband beschließen noch einmal Tafeln, auf denen die Funde nicht wie im ersten Teilband nach Gräbern, sondern nach Artefaktgattungen und -typen gegliedert und mit Farbfotos abgebildet werden. Diese doppelte Illustration, die auf die Art der Behandlung des Materials in den beiden Bänden präzise abgestimmt ist, ist ein

123 Bd. 2, S. 216–218.
124 Bd. 2, S. 219–231.
125 Bd. 2, S. 232–234.
126 Bd. 2, S. 235–237.
127 Bd. 1, S. 71.
128 Bd. 2, S. 238.
129 Bd. 2, S. 257.
130 Bd. 2, S. 242 mit Tab. 2.

131 Teilweise sind diese identisch mit jenen, deren Schädelmaße publiziert werden (Bd. 2, S. 249 mit Tab. 10).

132 Sie diskutieren etwa die Größenentwicklung von Populationen in Griechenland vom Neolithikum über die Mittel- bis zur Spätbronzezeit (Bd. 2, S. 250), machen aber keine Angaben dazu, ob Änderungen auch an der sozialhistorisch so wichtigen Schwelle zwischen Palast- und Nachpalastzeit eintraten, obwohl die zahlreichen vom Ausgräber ausgezeichnet stratigraphisch isolierten und anhand ihrer Beigaben datierten Primärbestattungen dazu reiches Material geboten hätten.

133 Moutafi 2021. Die Autorin behandelt das gesamte Skelettmaterial mit Ausnahme jener Fundkomplexe, deren Knochen nicht mehr auffindbar waren.

besonderer Service des Autors, der eine noch einfachere Nutzung der Gesamtpublikation ermöglicht.

Resümierend sei noch einmal der große wissenschaftliche Gebrauchswert der Studie von Lazaros Kolonas herausgestellt. Die sorgfältige Grabungsdokumentation, für die er als Ausgräber verantwortlich zeichnet und die er dem Fachpublikum in zwei reich ausgestatteten Bänden detailliert zur Verfügung stellt – sowohl die Befunde als auch die Funde betreffend –, garantiert, dass *Βούντενη* I ein Referenzwerk ersten Ranges nicht nur für die Archäologie Achaias, sondern für die gesamte europäische Bronzezeitforschung werden kann. Die Wichtigkeit der Studie zeigt sich bereits heute darin, dass die Bearbeiterinnen und Bearbeiter anderer achaischer Nekropolen die Dissertationsversion, die Ihnen der Autor bereits vor dem Druck zur Verfügung gestellt hatte, nutzbringend verwenden und zitieren konnten.[134] Somit warten wir gespannt auf den angekündigten Teil II zum westlichen und südlichen Nekropolenareal von Voúdeni, jener größten und reichsten mykenischen Nekropole Achaias, die zweifellos zu den bedeutendsten in Griechenland zu zählen ist.

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Károly Tankó, *Kelta falu Győr határában: a ménfőcsanaki késő vaskori település / A Celtic Village in North-West Hungary.* Archaeolingua: Studien zur Eisenzeit im Ostalpenraum 2. Archaeolingua, Budapest 2020. 320 Seiten, 96 Schwarzweiß- und Farbabbildungen, 52 Tafeln, Hardcover, ISBN 978-615-5766-41-1, HU-ISSN 1416-8510.

Dieses 320-seitige Werk widmet sich der Aufarbeitung der latènezeitlichen Siedlungsfunde und Siedlungsbefunde der polykulturellen Fundstelle von Győr-Ménfőcsanak. Es stellt den zweiten Band der Reihe „Studien zur Eisenzeit im Ostalpenraum" in der Schriftenreihe Archaeolingua dar, die von Erzsébet Jerem herausgegeben wird. Den ersten Band dieser in Rot gehaltenen, hart gebundenen Serie bildeten die Akten des internationalen, in St. Pölten abgehaltenen Symposiums „Die Kelten in den Alpen und an der Donau" aus dem Jahr 1996.[1] Ziel dieses Bandes war es, einen Überblick über den Stand der Latèneforschung in Österreich und Umgebung zu diesem Zeitpunkt zu geben.

Der Autor Károly Tankó ist an der Eötvös-Loránd-Universität in Budapest tätig und Mitglied der Magyar Tudományos Akadémia-Eötvös Loránd Tudományegyetem (MTA-ELTE) Forschungsgruppe für interdisziplinäre Archäologie. Er kommt aus der Schule von Miklós Szabó und ist einer der renommiertesten Forscher der Latènezeit in Ungarn. Vor allem in den letzten zehn Jahren leitete er zahlreiche Grabungen und seine Publikationen gehören zu den Standardwerken über die „Kelten" in Ungarn. So konnten sowohl über Siedlungen (Sajópetri,[2] Ménfőcsanak[3]) als auch über Gräberfelder (Ludas,[4] Sajópetri[5]) hoch qualitative Publikationen erscheinen, bei denen er federführend tätig war. Bei dem zu beschreibenden Band handelt es sich um die 2005 abgeschlossene Dissertation des Autors, die zur Publikation vorbereitet sowie mehrfach aktualisiert, ergänzt und erweitert wurde.

Das Buch[6] ist hauptsächlich in Ungarisch verfasst, allerdings enthält es eine großzügige, 18-seitige Zusammenfassung in Englisch[7] und auch die Bildunterschriften sind zweisprachig gehalten.[8]

Im Vorwort[9] werden die Untersuchungen des mit der Siedlung gleichzeitigen Gräberfeldes erwähnt, die bislang ca. 300 Gräber ergaben, aber unpubliziert sind. Seit 1991 werden moderne Grabungen durchgeführt, die letzte im Buch angeführte Grabungskampagne fand von 2009 bis 2011 statt.[10] Bearbeitet und vorgelegt werden in diesem Band die Ergebnisse der Grabungen der Jahre 1993–1998.

Ménfőcsanak stellt flächenmäßig die größte und am vollständigsten erforschte Siedlung der Latènezeit in Ungarn, wenn nicht im ganzen Karpatenbecken dar. Die Bedeutung der Siedlung kann mit jener von Sajópetri aus Ostungarn verglichen werden, aber hinsichtlich der Anzahl ihrer Befunde, der Fundmenge und Fundqualität übertrifft Ménfőcsanak auch diese. In Ménfőcsanak bekommen wir einen Einblick in den Alltag einer landwirtschaftlich geprägten Siedlung. Damit liegt nach Sajópetri und Polgár erstmals auch eine westungarische ausgewertete Fundstelle vor. Die frühere Forschung hat in Transdanubien vor allem befestigte Höhensiedlungen der zweiten Hälfte der Latènezeit untersucht und somit ein verzerrtes Bild der späteisenzeitlichen Siedlungsstruktur wiedergegeben.

Nach der Einführung[11] folgt der Teil über den Naturraum, in dem sich die Fundstelle befindet, samt alten Karten (1. und 2. militärische Aufnahme aus dem 18. Jh.) und einem Vergleich der Veränderungen am Flusslauf der Donau bei Győr.[12] Die Forschungs- und Grabungsgeschichte der Fundstelle bilden zusammen mit der Grabungsmethodik den Abschluss dieses Kapitels.[13] Hier wird berichtet, dass die Grabungen in den Jahren 2009–2011 auf einer Fläche von 277.165 m² in Folge des Baus einer neuen Zubringerstraße (Nr. 38) zur Autobahn M1 und des Ausbaus des anschließenden Gewerbegebiets (mit Einkaufszentren) veranlasst wurden. Auch wenn man die ungarische Sprache nicht beherrscht, bietet sich aufgrund der zahlreichen Abbildungen ein guter Überblick über die Grundlagen des Fundorts.

1 Jerem et al. 1996.
2 Szabó, Tankó, Szabó 2007.
3 Vaday, Tankó 2020.
4 Szabó, Tankó 2012.
5 Szabó, Tankó 2018.
6 Leider stimmen die Seitenzahlen im Inhaltsverzeichnis bei Vorwort, Einführung und Kapitel 1 nicht mit jenen des Buches überein.
7 S. 217–234.
8 Für Kenner der Materie stellen diese „Sprachbarrieren" (egal welcher Sprache) aber kein Hindernis dar.

9 S. 7.
10 S. 24.
11 S. 9.
12 S. 11–15.
13 S. 15–25.

Die Lage der Siedlung im Vergleich zu den dazugehörigen Gräberfeldern ist auf Abb. 9 dargestellt.[14]

Im Anschluss findet sich der Katalog der Befunde mit Beschreibungen.[15] Zahlreiche Strichzeichnungen, Schwarzweiß- und Farbfotos stellen dem archäologisch gebildeten Fachpublikum ausreichend Informationen zur Verfügung, um sich ein Bild über die dokumentierten Befunde machen zu können. Allerdings wird Abb. 41 vermisst.

Es folgt ein Abschnitt über die Auswertung der Befunde, wobei beispielsweise eine Typologie der Grubenhütten (mit innen liegenden Pfostengruben)[16] erstellt worden ist. Der Abschnitt mit den Rekonstruktionen und einigen noch nicht publizierten historischen Archivaufnahmen[17] ist besonders interessant, da hier die Quellenlage entscheidend erweitert wird. Ebenso spannend ist der Befund eines Rundhauses, das bisher in der mitteleuropäischen Latènezeit einzigartig und bislang lediglich aus Großbritannien bzw. Nordwestfrankreich bekannt ist; allerdings ist es mit einem Durchmesser von 3,1 m sehr klein. Sein bisher singuläres Auftreten im östlichen Latènekreis wird vom Autor unter anderem mit einer möglichen derzeit bestehenden Forschungslücke erklärt.[18]

Auf Seite 135 beginnt die Analyse der Artefakte. Im Vorwort erwähnt der Autor, dass der Bearbeitung der Keramik nicht das Typologieschema, das anhand der Funde von Sajópetri erstellt worden ist, zugrunde liegt, da die vorliegende Keramikanalyse vor dessen Erstellung abgeschlossen wurde. Zuerst werden technische Aspekte der Keramik, die den Großteil des Fundmaterials ausmacht, erläutert. Dabei wird auf den Fragmentierungsgrad, die Mindestanzahl und die Anzahl der Gefäße in den einzelnen Befunden eingegangen.[19] Weiters ist eine Kartierung der Passscherben abgebildet.[20] Auch die Drehtechnik sowie die unterschiedlichen Arten der Magerung, der Oberflächenbehandlung und des Brandes werden untersucht und diskutiert.[21]

Schließlich folgt die typologische Auswertung der Keramik.[22] In diesem Abschnitt werden zuerst die verschiedenen Breitformen auf Basis formaler Kriterien definiert.[23] Weiters werden andere Grundformen (z. B. Töpfe) anhand von Randformen[24] geordnet und schließlich verschiedene Zierleisten der „Tonsitulen“[25] betrachtet. Die allgemeinen Typentafeln[26] ergänzen das Bild in praktischer Weise. Auch die verschiedenen Verzierungstechniken (Stempel, Ritzungen) werden behandelt. Hier ist ein kurzer Abriss über ein im Waldalgesheimstil verziertes Keramikfragment angeschlossen.[27]

Anschließend wird ein Einblick in das Ensemble der Kleinfunde aus Keramik wie Webgewichte, Spinnwirtel und Tonscheiben gegeben.[28] Die meist paarweise vorkommenden Webgewichte stammen aus Grubenhäusern, wobei ihre im Vergleich zu anderen Siedlungen geringe Zahl auffällt. Es folgt eine Präsentation des Metallschmucks und Metallwerkzeugs,[29] wobei der im Textteil angegebene Hinweis auf die Münsinger Fibel nicht Taf. 1, Nr. 2, sondern Nr. 3 sowie der Verweis auf eine der Ahlen von S. 187 (Taf. XVII, Nr. 10) in Wirklichkeit einem Spinnwirtel entspricht. Unter den Steinwerkzeugen[30] wird ein bisher aus zeitgleichen Siedlungen nicht bekanntes Steinbeil (Taf. XVII, Nr. 7) und ein weiteres Steingerät aus Eklogit (Taf. XVII, Nr. 4) hervorgehoben. Letzteres wird aufgrund seines alpinen Materials als ortsfremd angesehen. Im Anschluss werden die in der Siedlung nur sporadisch vorkommenden Glasperlen erörtert und Knochengeräte wie Nadeln, Meißel, Pfrieme und Werkzeuggriffe aufgezählt.[31]

Mit Hinweisen auf Metallurgie befasst sich das nächste Kapitel,[32] in dem auch Analysen von Verhüttungsschlacken inkludiert sind. Aufgrund des aktuellen Forschungsstandes wird die Herkunft des Eisenerzes im Burgenland gesehen.[33] Von besonderem Interesse ist der Fund einer Tondüse bzw. eines Gebläsetopfes,[34] der jedoch auch als Trichter interpretiert werden könnte. Auch wird auf das Vorkommen von Rohgraphit in verschiedenen Befunden mit einigen anschließenden Analysen eingegangen.[35] In der Siedlung verstreut finden sich nämlich Graphitknollen, die wohl für die Keramikherstellung verwendet wurden.[36] Ein Befund, der etwa 40 kg Rohgraphit beinhaltet, wird von dieser Interpretation

14 S. 19.
15 S. 27–114.
16 S. 116–117 und Abb. 48.
17 S. 127, 130 und Abb. 53–54.
18 S. 50 (Objekt 93/88), 132 und Abb. 18, 48.
19 S. 137–144.
20 S. 139–140 und Abb. 59.
21 S. 144–149.
22 S. 150–182.
23 S. 153–156 und Abb. 65.
24 S. 164.
25 S. 167.
26 S. 150–170 und Abb. 69–71.
27 S. 180.
28 S. 183–185.
29 S. 185–187.
30 S. 188.
31 S. 189.
32 S. 189–194 (Kapitel 4.7).
33 S. 191.
34 S. 194.
35 S. 195–197.
36 S. 195–197.

ausgenommen. In Übereinstimmung mit dem Forschungsstand zur Herkunft von Graphit in der Latènezeit und den durchgeführten chemischen Analysen von Graphit aus mehreren Fundorten,[37] zeigt sich, dass der Rohgraphitfund aus Ménfőcsanak dem Vorkommen aus dem südtschechischen Raum ähnelt und nicht, wie bis dahin angenommen, aus dem Raum Passau importiert wurde. Allerdings wird darauf aufmerksam gemacht, dass diese Aussage auf einer einzelnen Analyse beruht. Nichtsdestotrotz verleitet die große Menge an Rohgraphit aus der Siedlung den Autor zu der Interpretation, dass das latènezeitliche Ménfőcsanak eine wesentliche Rolle beim Handel mit Graphit entlang der Donau spielte. Um Klarheit in der Frage zu erzielen, ob Ménfőcsanak Zielort oder Drehscheibe des angenommenen Graphithandels war, empfiehlt der Autor weitere Untersuchungen.

Ab Seite 199 analysiert der Autor die Struktur der Siedlung. Dabei folgt er der Grundlage von begrenzenden Gräbchen mit innenliegenden Grubenhütten sowie Hausgrundrissen, die sich aufgrund von regelmäßigen Pfostengruben beobachten lassen. Daraus wird die anschauliche Vorlage zu einer Rekonstruktion der Siedlung gewonnen.[38] Ebenso werden die „funktionalen Einheiten" aus den Verbindungen zwischen diversen Häusern, Hütten und Zäunen rekonstruiert und besprochen. Weiters wurde jedes einzelne Gebäude in Hinblick auf die Ausrichtung und das Verhältnis zur Windrichtung analysiert. Es scheint, dass die Siedlung entlang einer von Südwesten nach Nordosten führenden Straße orthogonal organisiert war.[39] Dabei konnten funktionale Zonen in Form von Wohn- und Wirtschaftsbereichen identifiziert werden, unter letzteren auch ein Bereich für Viehzucht, bei dem es sich um ein eingehegtes Areal mit zwei Brunnen handelt.[40] An anderer Stelle sind eine Knochenwerkstatt und ein Speichergebäude festgestellt worden.[41] Nördlich der Straße befindet sich ein aus mehreren Gebäuden bestehender Komplex, dem ein zur Straße hin weitläufiger Hof vorgelagert ist. Diese Einheit, vor dessen Eingang ein Brunnen zu finden ist, wird als Herrenhof angesprochen.[42] Die einzelnen Siedlungseinheiten sind von landwirtschaftlich genutzten Parzellen umgeben, sodass man insgesamt das Bild eines locker strukturierten Ortes von dörflichem Charakter vor sich hat. Die zahlreichen Daten weisen darauf hin, dass man vor Ort mit einer bedeutenden Handwerkstätigkeit rechnen muss. Weberei, Tischlerei, Töpferei sowie Bereiche für die Lederverarbeitung und Eisenverarbeitung sind eindeutig belegt. Im Vorhandensein solcher Strukturen, wie sie in Ménfőcsanak vorliegen, sieht der Autor die wirtschaftliche Basis früher „keltischer" Gesellschaften. Auch wenn diese Siedlungen in mancher Hinsicht, wie in der Landwirtschaft, autark waren, erforderte der Handel mit benötigten Rohmaterialien (Graphit, Eisenerz und vermutlich Salz) die Herstellung von eigenen marktfähigen Produkten, was wiederum eine gut organisierte Siedlungsstruktur voraussetzte. Weiters wird angeführt, dass eine Konzentration von Gehöften zu Dörfern (wie Ménfőcsanak) später – als Ergebnis einer längeren Entwicklung – zur Bildung von Zentren mit Oppidacharakter führte.[43]

Die relativchronologischen Phasen der Siedlung sind auf den Abb. 92 und 93 dargestellt;[44] hervorzuheben und ausgesprochen leserfreundlich sind die dazugehörigen Abbildungen der Artefakte auf den folgenden Seiten.[45]

Auf Grundlage der vorgelegten Funde und Befunde folgert der Autor, dass die Siedlung von Ménfőcsanak in der Phase Latène (Lt) B1 (2. Hälfte 4. Jh. v. Chr.) beginnt und bis Lt B2/C1 (2. Hälfte 3. Jh. v. Chr.) andauert. Die Siedlung reiht sich topographisch in eine Reihe von anderen eisenzeitlichen Siedlungen, wie unter anderem Árpás, Koroncó, Gyirmót oder auch Győr-Újszállás entlang des Flusses Rába (Raab).

Als nächstes wird die Beziehung zwischen Siedlung und Gräberfeld erörtert. Die Nekropole (derzeit sind 277 latènezeitliche Gräber bekannt) befindet sich 400–500 m westlich der Siedlung. Die Nutzungsdauer entspricht derjenigen der Siedlung, die Keramik aus der Siedlung lässt sich mit jener aus dem Gräberfeld gut vergleichen. Die Unterschiede sind hauptsächlich ihren unterschiedlichen Funktionen geschuldet: Gebrauchskeramik auf der einen und Grabkeramik auf der anderen Seite.[46] Aufgrund der Vergleichbarkeit dieser Keramikarten wird angenommen, dass die Bewohner der Siedlung hier bestattet sind.

Den Abschluss bildet eine kurze ungarische Zusammenfassung,[47] der eine ausführliche Zusammenfassung in Englisch,[48] das umfassende Literaturverzeichnis[49] – das

37 S. 195–197 und Tab. 11.
38 S. 207 und Abb. 91.
39 S. 200, 207.
40 S. 202.
41 S. 207.
42 S. 207 und Abb. 91.
43 S. 207.
44 S. 209–210.
45 S. 211–213 und Abb. 94–96.
46 S. 213–214 und Abb. 96.
47 S. 215–216.
48 S. 217–234.
49 S. 235–265.

überaus vollständig erscheint – und der Tafelteil folgen.[50] Die sauber und klar gezeichneten Abbildungen der Artefakte erlauben einen guten Vergleich mit Vorlagen anderer Grabungspublikationen.

Zielpublikum dieses vorgelegten Werks sind vor allem Kolleg*innen, die sich intensiv mit der Latènezeit befassen bzw. Vergleichsmaterial und Beispiele zur Auswertung von latènezeitlichen Siedlungen suchen. Im Vergleich zu anderen Beiträgen über latènezeitliche Siedlungen ist die Vollständigkeit der Vorlagen mit allen Auswertungen und den eingebundenen Analysen (Eisenschlacke, Graphit) zu betonen. Auch die graphisch saubere Ausführung ist zu loben.

Zusammenfassend kann gesagt werden, dass der vorliegende Band die lang erwartete Vorlage und Auswertung der latènezeitlichen Siedlung von Ménfőcsanak darstellt und von hohem wissenschaftlichem Niveau ist. Damit ist eine große Lücke in der Erforschung der latènezeitlichen Siedlungen im Gebiet von Westungarn, Ostösterreich und der Südwestslowakei geschlossen. Eine Zusammenfassung in Deutsch und in Slowakisch wäre aufgrund der Nachbarschaft wünschenswert und praktisch gewesen. Die im Buch angekündigten Vorlagen von weiterem Material des Fundortes werden von der Fachwelt sehnlichst erwartet.

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