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Searching for Gold

Resources and Networks in the Bronze Age of the Eastern Balkans

Reinhard Jung
Hristo Popov (Eds.)

AUSTRIAN ACADEMY OF SCIENCES PRESS

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Contents

Preface by the Series Editor 7

Reinhard Jung – Hristo Popov
Introduction 9

Ada Tepe

Hristo Popov – Reinhard Jung – Bernhard Weninger – Plamen Georgiev – Yana Dimitrova – Hans Mommsen
Dating the Early Mining and Settlement Activities at Ada Tepe: Contributions to the Absolute and Relative Chronology 19

Laura Burkhardt
Comparative Examination of Two House Inventories of the Late Bronze Age Settlement at Ada Tepe (Bulgaria) and its Cultural and Chronological Context in the Late Bronze Age of the Eastern Balkans 137

The Bronze Age within the Territory of Present-Day Bulgaria

Raiko Krauß
The Lower Danube Region and Thrace at the End of the 3rd and the First Half of the 2nd Millennium BC 167

Georgi Ivanov – Tanya Hristova – Stefan Alexandrov
Dynamics of Burial Practices in the Necropolis of Baley (Bronze Age – Beginning of the Iron Age) 193

Yana Dimitrova
Late Bronze Age Pottery in the Eastern Rhodope Mountains 213

Elena Bozhinova
The Late Bronze Age Site of Dragoyna 231

Early Metalwork in the Balkans

Radu Băjenaru
Technology and Fragmentation: A Case Study of the Early Bronze Age Shaft-Hole Axes from the Northeastern Balkan Peninsula 257

Ildikó Szathmári – Boglárka Maróti – János Gábor Tarbay – Viktória Kiss
Archaeological and Archaeometallurgical Analyses of Bronze Age Gold Hair-Rings from the Collection of the Hungarian National Museum and the British Museum 281

Mathias Mehofer – Petya Penkova – Ernst Pernicka
The Valchitran Hoard: Production Technology and Chemical Analyses 307

Aleksandar Bulatović – Mario Gavranović – Aleksandar Kapuran
New Absolute Dates for the Middle and Late Bronze Ages in the Central Balkans and Some Indications of the Local Bronze Metallurgy and Workshops 325

Trade Networks

Christoph Schwall – Barbara Horejs – Moritz Numrich – Ernst Pernicka
First Golden Times: The ‘Treasures’ of Troy as an Indicator for Long-Distance Trade Networks in the 3rd Millennium BC 347

Zheni Vasileva
Making the Difference – Crafting Jewellery in the Early Bronze Age Eastern Balkans: The Role and the Place of the Eastern Balkans as a Crossroad between the Balkans, the Aegean, Anatolia and the World Beyond 367

Petar P. Minkov
Contacts between Anatolia, the Aegean, Southeast and Central Europe: The Significance of Four Middle Bronze Age Bone Objects from Shekerdzha Tumulus 387

Julia Tzvetkova – Georgi Nekhrizov
Thrace beyond the Gold: Some Questions on the Unequal Exchange during the Late Bronze Age 403

Eleni Konstantinidi-Syvridi
Mycenaean Gold: Provenance, Technology and Trade 423

Stefanos Gimatzidis
Social Interaction in Thrace: Rivers Shape Landscapes – Mountains Define History 437

Index 451

Preface by the Series Editor

The 31st volume of the OREA series is dedicated to the long-term basic research on the role of gold for Bronze Age societies in southeastern Europe and beyond. The eastern Balkans have always been a crucial region for studying the impact of precious metals on human history, not least due to the famous Copper Age necropolis of Varna with its unique and golden objects, intensively discussed since it was first detected in 1972. Approximately 30 years later, the discovery of the Ada Tepe gold mining area in Bulgaria constituted the point of departure for significant new research initiatives and international projects initiated and mainly driven by the National Archaeological Institute with Museum of the Bulgarian Academy of Sciences. Our team from the former Institute for Oriental and European Archaeology – OREA (now Austrian Archaeological Institute – OeAI) of the Austrian Academy of Sciences was invited to join in this dynamic new research with our expertise, which led to a fruitful and ongoing collaboration of the Bulgarian and Austrian institutions since then.

The FWF-funded project "Bronze Age Gold Roads of the Balkans", notable exhibitions in Vienna and Sofia accompanied by books and videos, numerous articles in international journals and book chapters, accomplished master's and doctoral theses and the jointly organized conference in 2017 with its present proceedings are the immediate, tangible outcomes. Interdisciplinary analyses, radiocarbon modelling, contextual studies of the archaeological areas and detailed material investigations produced a huge amount of new primary data and offer the fundament for a new understanding of Bronze Age societies in the Balkans in manifold respects. Some of these results are presented in this volume for the first time and have also been integrated in the exhibition at the impressive new museum in Krumovgrad dedicated to the Ada Tepe gold mine since 2022. It is this author's considered opinion that any interested reader would be well advised to pay a visit to this museum, which provides a best-practice model for integrating complex scientific results into an appealing and attractive exhibition for the broader public.

I would like to express my sincerest gratitude to Reinhard Jung and Hristo Popov for their invaluable contribution to the editing of this volume and their meticulous compilation of 16 contributions by 34 authors. The editors' substantial introduction provides a good overview of the topic, the structure and the main outcome of the four sections of the book. Special thanks go to all contributors to the conference and to this book for sharing their expertise. I would like to thank the Austrian Science Fund for financing our scientific studies at Ada Tepe, as well as for the funding of this volume. Additional financial support for the book has been provided by the Austrian Archaeological Institute and the National Archaeological Institute with Museum, Sofia. I warmly thank our well-practised publication team with Ulrike Schuh responsible for the editorial management and Nicola Wood for correction of the English. The graphics and layout were prepared by Andrea Pancheri. Special thanks go to the Austrian Academy of Sciences Press for their ongoing support of the OREA series.

Barbara Horejs
Scientific director of the Austrian Archaeological Institute
Vienna, 9 July 2024

Introduction

Reinhard Jung[1] – *Hristo Popov*[2]

In June 2017, the international conference "Searching for Gold – Resources and Networks in the Bronze Age of the Eastern Balkans" took place in Vienna. It was organized by the former Institute for Oriental and European Archaeology (OREA, now part of the Austrian Archaeological Institute, OeAI) at the Austrian Academy of Sciences (OeAW) and the National Archaeological Institute with Museum (NAIM) at the Bulgarian Academy of Sciences (BAS), as part of their partnership for the implementation of the scientific project "Bronze Age Gold Road of the Balkans. Ada Tepe Mining", funded from 2016 to 2020 by the Austrian Science Fund, FWF (project no. P 28451).

The important part here is Ada Tepe – a small peak in the Eastern Rhodopes, near present-day Krumovgrad in what is now Bulgaria. More than 20 years ago, rescue archaeological investigations started at that site. The geological prospections that detected gold deposits and the resulting development projects to organize its extraction clashed with another discovery – that of archaeological remains, which were also registered on the hilltop. Twenty years are a long time. Many things could and did change during this period, among them reactions, understanding, and ideas about what could and should be done. The archaeological investigations themselves underwent many changes, even more so after it had been established that there were traces of ancient gold mining at the peak – a rare chance for scholars to learn more about the economy, production, and social processes during late prehistory in this part of Europe. In 2009 and 2010, leading European scholars had to write to the Bulgarian Ministry of Culture in order to emphasize the importance of the site and to explain that complete investigation of it should be organized in accordance with the highest professional standards. After the reactions of experts like Albrecht Jockenhövel, Hartmut Matthäus, Ernst Pernicka, Thomas Stöllner, and Reinhard Jung, of numerous Bulgarian scholars (Stanislav Iliev, Daniela Kodzhamanova, Rumen Mikov, Vassil Nikolov, Jana Topalova, Katja Trendafilova, Ljudmil Vagalinski, Margarita Vaklinova, among others, as well as all the members of the Department for Thracian Archaeology at NAIM-BAS), and of institutions like the National Institute of Immovable Cultural Heritage at the Ministry of Culture and the National Archaeological Institute with Museum at the Bulgarian Academy of Sciences, Ada Tepe was given the chance to be investigated in its entirety.

After the initial, frequently interrupted short-term rescue excavations, and a small Bulgarian-German project conducted from 2008 to 2010 and supported by the Alexander von Humboldt Foundation with the aim of obtaining more information about the traces of ancient mining and metallurgy in the Eastern Rhodopes, a dynamic decade followed that offered opportunities on an incomparably larger scale to carry out archaeological investigations at Ada Tepe.

Eventually, the joint efforts of the investor (Dundee Precious Metals Inc.), the Krumovgrad municipal authorities, the Ministry of Culture of the Republic of Bulgaria, NAIM-BAS, and experts from numerous Bulgarian and international research communities led to long-term rescue archaeological investigations of the entire area of the archaeological site (in 2010–2013 and 2015).

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The conditions were good for implementing a strategy that would make the field investigations, the processing of the huge amount of acquired data and materials, their introduction into scholarly circulation, and the presentation of the site to the wider public all integral parts of a comprehensive plan. It was precisely during the last stages of this long and complex process that the already mentioned project "Bronze Age Gold Road of the Balkans. Ada Tepe Mining: Producers and Consumers" became central, emphasizing the partnership between OREA-OeAW[3] and NAIM-BAS. We are extremely grateful to both institutions, as well as to the FWF for their support.

In the course of the project, important initiatives were successfully carried out, among them two international exhibitions, one at the Kunsthistorisches Museum in Vienna ("Das erste Gold. Ada Tepe: das älteste Goldbergwerk Europas") and the other at the National Archaeological Museum in Sofia ("Злато & Бронз / Gold & Bronze"). The experts that took part in the project were instrumental in the publication of a kind of almanac of the Bronze Age in the eastern Balkans.[4] Between 2016 and 2020, several joint research campaigns were carried out, aiming at processing the numerous and diverse archaeological materials that had been accumulated and the accompanying documentation.

Within the framework of this long and complex process, the archaeological conference that was held in Vienna in the summer of 2017 had the important objective of bringing together a large circle of experts with professional interests that were close to the subject of the scholarly forum. We are grateful to all who accepted our invitation. Publishing the papers of the conference is of utmost importance, both to introduce to the professional audience the latest results on the subject in various parts of the Balkans and to put into international scholarly circulation some of the most important results of the investigations at Ada Tepe. There are extremely intriguing questions with various aspects – about the social and professional structure of the Bronze Age communities; about the discovery, extraction, and use of various natural resources; and about the creation of important transregional networks that circulated not only materials and resources that were important for the ancient economy, but also technologies and professional knowledge and skills. The Ada Tepe gold became something of a catalyst that spurred on a scholarly discussion involving the latest discoveries and tackling these questions that have always provoked the interest of the scholarly community.

Holding the conference "Searching for Gold – Resources and Networks in the Bronze Age of the Eastern Balkans" is among the leading achievements of the project P 28451. The Ada Tepe excavations that provided the motivation for the conference were presented in considerable detail. Our purpose was to make available to the scholarly community as much primary data as possible, so these results can be used to reinterpret well-known evidence as well as new finds from the wider area of southeastern Europe.

Unfortunately, the crisis in the last two years, related to the COVID-19 pandemic, and some additional organizational hurdles slowed down the editing of the papers submitted by the participants in the conference. We extend our apologies for the delay to all authors.

The publication of the conference proceedings is a happy event for all of us and yet another source of satisfaction in our work together. At the same time, this publication is not the final, but yet another step along the way for Ada Tepe, both for the producers and the consumers of the positive results of this fruitful scholarly cooperation. On 18th August 2022, a new museum was opened in Krumovgrad. It presents the results of the long-term studies of Ada Tepe. Visitors can see the most important finds and results and can become acquainted with the lives of the ancient miners and the history of the Ada Tepe project. They can also learn more about ancient and modern gold mining methods. The international team of the aforementioned research project did much of the preliminary work for the exhibition.

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[3] Now part of the Austrian Archaeological Institute as the Department of Prehistory & West Asian/Northeast African Archaeology.

[4] Alexandrov et al. 2018.

Furthermore, a number of subjects that were developed during the time of the project have reached a decisive stage and their final publication is at hand.

However, here and now the editors have the pleasure of presenting to you the volume "Searching for Gold – Resources and Networks in the Bronze Age of the Eastern Balkans". In the following pages, we will discuss briefly the main emphases of the submitted papers. The structure and arrangement of the volume is consistent both with the main focus – the Late Bronze Age gold mine at Ada Tepe in the Eastern Rhodope Mountains – and with the main topics presented in the reports at the conference in Vienna, held in June 2017. The following sections are presented below: 1. Ada Tepe; 2. The Bronze Age in the Territory of Present-Day Bulgaria; 3. Early Metalworking in the Balkans; 4. Trade Networks.

Ada Tepe

The paper by Hristo Popov, Reinhard Jung, Bernhard Weninger, Plamen Georgiev, Yana Dimitrova and Hans Mommsen presents some of the most important results achieved by the research project "Bronze Age Gold Road of the Balkans. Ada Tepe Mining". It is a result of the joint efforts of the authors to process and analyse the absolute dates that were obtained during the rescue investigations in combination with the pottery from the main archaeological contexts related to the early stages of mining and habitation at Ada Tepe. The paper makes use of a substantial database of evidence and the possibilities it provides for determining the relative and absolute chronology of the Late Bronze Age gold mine on the Ada Tepe hill.

The proposed detailed reconstruction of the absolute and relative chronology and periodization of the archaeological site not only enables a precise analysis of the main stages of its early development, but also supports placing it within the much larger framework of interregional contacts and presumed economic relations within the Aegean in the middle and the second half of the 2nd millennium BCE.

The present article summarizes the research results that were presented in two papers and one poster at the Vienna conference. During the preparation of the texts, the authors realized that the results of the individual studies presented by the authors are interrelated and largely complementary, which led them to combine their individual papers (and to include additional sections by further specialists) in a more extensive study, which thus grew considerably longer than the other contributions collected in the present volume.

In another paper focusing on Ada Tepe, Laura Burkhardt analyses house inventories from the regularly planned and single-phased northeastern settlement area of that site. Her analysis, which results from her PhD, written within the framework of the "Bronze Age Gold Road of the Balkans" project, takes into consideration the totality of pottery and small finds and proceeds by means of typological classification and quantitative evaluation of sherd material based on the rims and the method of 'estimated rim equivalent'. In this way, she is able to identify functional differences between house units, a conclusion that is further corroborated by an analogous variability in the house architecture. The absence of long-term storage facilities suggests a cooperation of the inhabitants – in all probability the gold miners – with the population of the region in a certain type of division of labour between the different settlements. Burkhardt further undertakes interregional comparisons of pottery types and thus connects the Ada Tepe settlement with its regional aspect of the Čerkovna Group to different contexts and sequences at other sites in southeastern Europe, including the vertical stratigraphies of the central Macedonian tells (toumbas).

The Bronze Age within the Territory of Present-Day Bulgaria

For a long time, research has been struggling with a precise definition, subdivision and absolute chronology of the Middle Bronze Age (MBA) in the eastern Balkans, but also further to the south, along the northern Aegean coastal regions. Raiko Krauß's contribution addresses this complicated issue with an absolute chronology approach based on a series of recently published radiocarbon dates from Wallachia, Bulgaria and northern Greece, falling into the time interval between c. 2200 and 1600 calBCE. Regarding the regions from the Lower Danube to the Thracian Plain, Krauß suggests uniting the so-called EBA III and the MBA in a single chronological unit, for neither the settlements nor the artefacts show any differentiation of chronological relevance. Consequently, he opts for a redefinition of the Middle Bronze Age with a starting point at about 2300/2200 BCE and an end around 1600 BCE. This time frame would be closer in date to the use of the MBA term in the Aegean, although complete congruency cannot be expected – especially if the comparison were to be extended to the southern Aegean with its well-established typological and stratigraphic sequences and ^{14}C dates (with specific research problems of a different kind, especially regarding their comparison with historical-archaeological dates).

Georgi Ivanov, Tanya Hristova and Stefan Alexandrov give an overview of the cremation necropolis of Baley in the neighbouring region of northwest Bulgaria. A trait of major importance is the longevity of this burial ground, as it was used since approximately the second quarter of the 2nd millennium BCE (eastern Balkan MBA) and subsequently during the period of the Encrusted Pottery Culture in the Late Bronze Age, as well as in its final phase dating to the late 2nd millennium. The three major use periods are supported by ^{14}C dates, but as numbers of graves differ considerably between these three periods, the question of whether they represent a truly uninterrupted sequence of burial practices lasting more than 500 years remains open at present – especially regarding the succession of the first and second phases. The number of closed find complexes with anthropological and zooarchaeological data and the mentioned radiocarbon data make the Baley cemetery a key point of reference for regional and interregional synchronization of and comparison between the well-known mosaic of culture groups in the Lower Danube area.

Based on stratified pottery finds from three sites in the Rhodope region, Ada Tepe, Dragoyna and Kush Kaya, Yana Dimitrova presents us with an outline of the regional development of LBA pottery styles. She orders the material in three successive stages. Rather than defining phases of relative chronology for that region, she chose to employ the ^{14}C dates from Ada Tepe and Kush Kaya, as well as the Aegean pottery imports found at Dragoyna, in order to create a framework of absolute dates. She then proceeds by enumerating the pottery characteristics of the 15th century, the 14th–13th centuries and the 12th century BCE and illustrating selective vessels and better-preserved fragments from those key sites.

Elena Bozhinova presents the results of many years of excavation that she conducted at the fortified mountain site of Dragoyna in the northwestern part of the Eastern Rhodopes. It extended over the two peaks of Golyama and Malka Dragoyna, the former of which yielded the earliest, but poorly preserved habitation structures. Mycenaean pottery dated to LH IIIA1 and imported from Dimini in Thessaly belongs to the artefact material uncovered on this higher peak. The most recent excavations on the Malka Dragoyna peak show that in this habitation area the prehistoric structures are much better preserved and include built fortification walls dated by pottery to the LBA. Malka Dragoyna also yielded sherds of imported wheelmade pots, which, based on their context, must date to the LBA, but are too worn for typological and chronological assessment. Furthermore, LBA evidence also comes from the surrounding region and points to traces of mining at Ropkite on the shore of the Mechka River. Bozhinova concludes that Dragoyna may have functioned as a centre for the wider region, also regulating its distant exchange relationships with the Mycenaean south.

Early Metalwork in the Balkans

The paper by Radu Băjenaru deals with specific typological and technological features of shaft-hole axes in the eastern and northeastern Balkans during the second half of the 4th and throughout the 3rd millennium BCE. Input of external know-how and resulting regional developments in technology, as well as specific consumption patterns, right through to the deliberate destruction of the products in specific ways, become intelligible.

In their contribution, Ildikó Szathmári, Boglárka Maróti, János Gábor Tarbay and Viktória Kiss deal with the geographical area immediately to the north of the Balkans, i.e. the Carpathian Basin. The authors discuss a series of gold dress accessories which belong to the categories of *Lockenringe* and *Noppenringe* and have parallels in the central European Early Bronze Age A2 (Reinecke Bronze Age A2). They present new chemical analyses obtained using a portable XRF device, as well as detailed results of microscopic and macroscopic observations pertaining to manufacturing methods, including the lost-wax technique, and use wear. The results of the chemical analyses assign the examined objects to Hartmann's gold groups A3 and B respectively. The most important conclusion to be drawn from these results is the chemical non-homogeneity of objects assembled in any of the three examined artefact assemblages, which in turn suggests that these may have been assembled over a prolonged time span (or after variable periods of individual circulation/use).

The contribution by Mathias Mehofer, Petya Penkova and Ernst Pernicka demonstrates the huge potential of mass spectrometry combined with the laser ablation technique for establishing the chemical composition of gold finds as well as the knowledge to be gained by a detailed technological investigation of the same objects. The well-known hoard assemblage of Valchitran and the new finds from tumulus 1 at Izvorovo serve as their case studies. The technological analysis of the Valchitran gold vessels anchors the kantharos and the loop-handled cups as well as the *phalerae* firmly in the Late Bronze Age craft traditions of the eastern Balkans, while the composite instrument with triple vessels must be set apart from these. This conclusion is also borne out by the processing of the chemical analysis results, which put the cups and kantharos in one group, and the *phalerae* in a second one, while the triple vessel is distinctly separate from both of these. The different beads of the early LBA tumulus 1 at Izvorovo are close to the Valchitran *phalerae* in terms of their copper and silver concentrations, but the platinum and palladium concentrations assign the respective artefacts to different compositional groups. None of these finds contains gold from the Ada Tepe mine, as all were produced by using gold of alluvial origin, underlining the fact that the thriving gold workshops in the eastern Balkans employed a variety of procurement strategies. Moreover, the exploitation of mountain and alluvial gold sources seems to have been closely related, as is shown by a melted globule of alluvial gold found on Ada Tepe itself.

New evidence for the absolute chronology of the Middle Bronze Age in the central Balkans (i.e. Serbia south of the Sava and Danube rivers) constitutes the subject of the contribution by Aleksandar Bulatović, Mario Gavranović and Aleksandar Kapuran. However in this area of the Balkans, the use of the 'MBA' label is more in line with central European conventions rather than with that of the eastern Balkan and Aegean research traditions. Yet, determining the exact time ranges for the cultural groups defined in the central Balkan regions is still a *desideratum*. In this sense, the new closed contexts with ^{14}C dates are therefore of key importance for solving those issues. The settlement of Mediana representing the Brnjica culture group can now be dated to the 14th/first half of the 13th century calBCE. The Brnjica phase of a second settlement, Gradina near Svinjište, falls in the same time span, while the dated object, wood from a socketed axe, provides an absolute chronological as well as a typological connection of this horizon to the Bulgarian Lesura-Vărbitsa stage in the eastern Balkan regions. In addition, the authors present new evidence for local bronze metallurgy in northeastern Serbia, with a special focus on the sites of Ružana 1 and 2, close to the industrial-metallurgical centre of Bor.

Trade Networks

Christoph Schwall, Barbara Horejs, Moritz Numrich and Ernst Pernicka provide an insight into exchange networks of the Early Bronze Age, with a special focus on the 3rd millennium BCE. In addition to the known parallels between jewellery types from hoard depositions at Poliochni on Lemnos, Troy in northwestern Asia Minor and Eskiyapar in central Asia Minor, they discuss wider interregional relationships connecting regions as far apart as Bahrain, Turkmenistan and the Indus Valley in the east and the eastern Peloponnese, as well as the island of Aegina in the west. The authors propose interpreting the distribution patterns of those luxury items as a reflection of raw material acquirement routes controlled by the ruling groups and classes in the various local and regional political systems. In fact, recent provenance analyses of gold artefacts from Mesopotamia, as well as further distribution patterns of lapis lazuli and carnelian artefacts, now tend to support these conclusions.

How these communication and exchange patterns of the Early Bronze Age found expression in precious items made of gold and silver is the subject of Zheni Vasileva's contribution. By analysing specific types and their distribution, she investigates the possibilities of defining local jewellery production in the eastern Balkan regions. Archaeometric studies may subsequently verify whether certain types with wide interregional distribution and seemingly local varieties such as spiral ornaments or beads used in necklaces relate to specific raw material groups. However, it is beyond doubt that dominant social groups in the eastern Balkans maintained far-reaching exchange relationships with analogous groups in the neighbouring regions of the Aegean and Asia Minor, especially during the second half of the 3rd millennium BCE.

The middle of the 2nd millennium BCE is marked by renewed and intensified exchange processes traversing southeastern Europe. This is exemplified by a recent exceptional find group from a tumulus burial at Shekerdzha in eastern Bulgaria, just south of the Balkan range. Petar P. Minkov discusses the composite bone artefacts featuring the 'Carpathian-East Mediterranean wave band decoration', as Wolfgang David dubbed it. A major important aspect of this new find assemblage is the fact that it fills the gap between the main distribution regions of that specific wave band style, i.e. Greece in the south and the Carpathian Basin in the north. However, the extraordinary nature of this find lies in several further aspects. First, the bird of prey iconography is without any close parallel, as the author underlines. Second, certain parallels for the staff elements of the object, as well as its position inside the stratigraphic sequence of the tumulus, might suggest that this was a particularly early example of that style. Third, the combination of the Carpathian-East Mediterranean wave band decoration on the shaft elements with the crowning bird finials means combining a style consisting of abstract motifs with a representational motif taken from the natural world, i.e. combining two iconographic spheres that were regularly kept apart – with a few exceptions being found on the Shaft Grave stelae from Mycenae.[5] However, Minkov's two restoration proposals for the composite object (or objects, if two staffs were crowned by one bird each) from Grave 1 in the Shekerdzha tumulus make one wonder whether some of the similar cylindrical, shaft-like objects with wavy bands and meander decoration[6] might originally have been crowned by small sculptures of animals in 'heraldic' poses, too. This would then tend to give those objects more of a sceptre connotation. Though the object may have been manufactured in the region of its discovery, the iconographic inspiration might have come from some region where representational depictions were more common than in the eastern Balkans. For instance, one of the closest iconographic parallels for the sitting birds of prey with raised but bent wings is to be found on the famous Neopalatial golden signet ring from the 'Tiryns treasure' – sitting on the back of a goddess's throne.[7] It is unfortunate that Shekerdzha Grave 1 did not preserve or contain any

5 David 2007, pl. 104.a1–a3.
6 David 1997, 284–287.
7 CMS I, 202–203 cat. no. 179.

other grave gifts that would help in our understanding of what was possibly an individual with a special position in society.

Julia Tzvetkova and Georgi Nekhrizov explore the unequal character of exchange relations between the eastern Balkans and the Mycenaean world through reference to different artefact groups, while in an appendix to the article, Yannis Maniatis and Dimitris Tambakopoulos present new analytical results for one of the main groups of Mycenaean imports in the regions between the Rhodopes and the Danube, i.e. the type C swords. Previous research was able to establish that most of the type C swords conform to the varieties produced in the Aegean during the Mycenaean Palace period, while a smaller group represents a northern variety. However, this division by type, variety and distribution area does not fully solve the question of import versus local production, for recent chemical and lead isotope analyses of oxhide ingots found at different eastern Balkan sites confirmed the importation of Cypriot copper to those sites.[8] Therefore, the results of chemical analyses of the marble sword pommels, which in all likelihood were once mounted on swords of the Mycenaean Palace period, is of crucial importance for this matter. In their appendix, Maniatis and Tambakopoulos are able to relate the marble used in the manufacturing of the Ada Tepe and Dolno Cherkovishte (Aul Kaya) pommels to different areas on the island of Naxos, which in turn proves the importation of Mycenaean swords at least to the area of the Eastern Rhodopes.

For the Mycenaean world, Eleni Konstantinidi-Syvridi provides a diachronic overview of the different stylistic influences apparent in the Mycenaean goldwork from the Early Mycenaean times to the Palace period, as well as of the potential gold sources discussed in the scholarly debate. She juxtaposes this evidence with the different types of gold objects known from the eastern Balkan regions in order to evaluate the importance of the different importation routes for gold worked in Mycenaean Greece. She furthermore summarizes the results of analytical projects that investigated objects from Grave Circle A at Mycenae, the tholos tombs of Kazanaki and Kapakli in Thessaly and the toumba of Kastanas in Macedonia and concludes that the available data do not yet permit determining between the various primary gold producing regions to the north and south of Greece.

Stefanos Gimatzidis presents a fresh look at the routes of traffic in ancient Thrace by referring to archaeological as well as (Greek and Roman) written sources. He challenges the widely held view of the crucial importance of river communication and instead highlights the role of mountain passes. Even the often-repeated argument pointing to the frequent establishment of Greek and Phoenician colonies at major Mediterranean and Black Sea river mouths can be shown not to be entirely representative for the choice of Greek and Phoenician settlement sites. Gimatzidis demonstrates the point through comparative reference to settlement patterns in the plains, river valleys and the Rhodope Mountains. The distribution patterns of Bronze as well as Iron Age finds help in tracing those routes. The production and main consumption areas of the K-22 pottery ware of the 8th century BCE serve to illustrate the case, as its distribution pattern contradicts a linear spread along the Hebros River, for instance. In general, artefacts indicating the resumption of contacts between the Aegean and the eastern Balkans in the Early Iron Age are more frequent at hinterland sites than along the northern Aegean coast. A network operating among the numerous hilltop sites of the mountainous regions must have been instrumental for those new contacts, probably driven by the interest of the local populations rather than those of the Aegean zone.

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[8] Consequently, even if a Mycenaean-type sword from a site in Bulgaria was found to contain Cypriot copper, this need not necessarily imply that it was an Aegean import. For the ingot analyses see Athanassov et al. 2020, 322–332.

We would like to express our gratitude for the additional organizational and financial support during the time of the project to Dundee Precious Metals Inc., the National Archaeological Institute with Museum at the Bulgarian Academy of Sciences, and the municipality of Krumovgrad.

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We owe an enormous debt of gratitude to Albrecht Jockenhövel for his visionary thinking, his tolerance, his work and support for introducing into scholarly circulation the results of the investigations at Ada Tepe, and last but not least, for his wonderful skill for bringing people together.

Finally, we would like to dedicate this volume to the memory of our dear friend and colleague Stanislav Iliev (Stancho). To everyone's great regret, after a serious illness, he left us at the end of 2023. Stanislav was an indispensable part of the Ada Tepe team, right from the very beginning of the studies launched by Georgi Nekhrizov in the early 2000s. Later, after 2005 and in the following years, he was indispensable in the excavation of the old gold mine. Together with him, side by side, we traveled the long and difficult path of hard rescue research, requiring a huge workload and personal commitment. It was a long and hard road, but it was done together with a good friend. A large part of the scientific contributions of these studies is due to the professional skills and diligence of Stanislav. His good smile, his sense of humor and human kindness will be missed.

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CMS
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Ada Tepe

Dating the Early Mining and Settlement Activities at Ada Tepe: Contributions to the Absolute and Relative Chronology

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Abstract: The paper is based on the accumulation of a substantial database of evidence and the possibility it provides to determine the relative and absolute chronology of the Late Bronze Age gold mine on the Ada Tepe hill in the Eastern Rhodope Mountains, in the vicinity of the modern town of Krumovgrad. It comes as a consequence of the large-scale processing of the archaeological and ^{14}C-radiometric data from the rescue archaeological excavations of the only fully investigated Late Bronze Age and Early Iron Age site in Bulgaria. Over the course of nearly two decades (~ 2010–2020), the Ada Tepe site has been investigated extensively, almost in its entirety, by the members of a large international interdisciplinary team. The paper discusses the stratigraphy of the structures associated with the mining activities, as well as the special features that are related to the coeval and later human presence in various sectors on the peak.

Keywords: Ada Tepe, Late Bronze Age, gold mine, absolute and relative chronology, series of radiocarbon samples, wheelmade pottery imports, settlement, interregional contacts, interdisciplinary methods

This study is the result of the joint work of an international research team that combined their efforts for the analysis and interpretation of the longest series of ^{14}C samples accumulated from an individual archaeological site from present-day Bulgaria.[7] The substantial ^{14}C database from Ada Tepe, which is presented here for the first time (Tab. 1), comprises a long series of radiocarbon ages (mainly measured on short-lived animal bones, i.e. representing single-event dates), which covers the entire second half of the 2nd millennium BC and the early 1st millennium BC.

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Tab. 1 ^{14}C dates from Ada Tepe discussed in the present paper

ID	Lab Code	^{14}C Age (BP)	±1σ (BP)	δ 13C (‰ PDB)	Material	Species	Topography	Sector
1	SUERC-37372	3170	30	-17.5	bone	*Equus caballus*	NW slope	Sector G-9
2	SUERC-37373	3100	30	-20	bone	*Sus scrofa*	NW slope	Sector G-9
3	SUERC-37381	2915	30	-16.40	bone	*Bos taurus*	hilltop	Sector G-11
4	SUERC-37382	2875	30	-18.40	bone	*Bos taurus*	hilltop	Sector G-11
5	SUERC-37383	2710	30	-18.90	bone	*Cervus elaphus*	hilltop	Sector G-11
6	SUERC-37384	2815	30	-15.90	bone	*Bos taurus*	hilltop	Sector G-11
7	SUERC-37385	3000	30	-12.60	bone	*Bos taurus*	hilltop	Sector G-11
8	SUERC-37386	2490	30	-20.20	bone	*Ovis/Capra*	hilltop	Sector G-11
9	SUERC-37387	2855	30	-19.50	bone	nd	hilltop	Sector G-11
10	SUERC-40959	2940	35	-18.00	tooth	*Bos taurus*	hilltop	Sector G-11
11	SUERC-40960	2950	35	-20.10	tooth	*Ovis/Capra*	hilltop	Sector G-11
12	SUERC-40964	2485	35	-19.20	bone	*Bos taurus*	hilltop	Sector G-11
13	SUERC-40965	2750	35	-17.60	bone	*Bos taurus*	hilltop	Sector G-11
14	SUERC-40966	2945	35	-16.90	tooth	*Bos taurus*	hilltop	Sector G-11
15	SUERC-40967	2920	35	-18.70	bone	*Bos taurus*	hilltop	Sector G-11
16	SUERC-40968	2965	35	-16.70	tooth	*Bos taurus*	hilltop	Sector G-11
17	SUERC-40969	2995	35	-17.40	tooth	*Bos taurus*	hilltop	Sector G-10
18	SUERC-40978	2965	35	-22.50	charcoal	nd	hilltop	Sector G-11
19	SUERC-43384	2942	27	-19.90	tooth	*Bos taurus*	hilltop	Sector G-11
20	SUERC-43385	2847	27	-20.90	bone	*Bos taurus*	hilltop	Sector G-11
21	SUERC-43386	2883	27	-17.60	bone	*Bos taurus*	hilltop	Sector G-11
22	SUERC-43387	2960	27	-20.20	bone	*Ovis/Capra*	hilltop	Sector G-11
23	SUERC-43388	2891	27	-14.60	bone	*Bos taurus*	hilltop	Sector G-11
24	SUERC-43389	2950	27	-19.90	tooth	*Bos taurus*	hilltop	Sector G-11
25	SUERC-43393	2973	22	-19.40	bone	*Bos taurus*	hilltop	Sector G-11
26	SUERC-43394	3012	27	-19.80	bone	*Bos taurus*	hilltop	Sector G-11
27	SUERC-43395	2897	27	-16.50	bone	*Bos taurus*	hilltop	Sector G-11
28	SUERC-43396	2925	27	-15.50	bone	*Bos taurus*	hilltop	Sector G-11
29	SUERC-43397	2827	27	-18.20	bone	nd	hilltop	Sector G-11
30	SUERC-43398	2954	27	-19.40	tooth	*Bos taurus*	hilltop	Sector G-11

Period/ Group	Square/ Trench	Context	Cal Age (calBC)	Cal Std (68%)	Additional Stratigraphic Information	ID
A	Trench 1/2009	working place	1450	35	working area, secondary hut, under waste heap	1
A	Trench 1/2009	working place	1356	50	working area, secondary hut, under waste heap	2
nd	Sq. 65	nd	1110	60	destruction of defensive wall	3
nd	Sq. 85	nd	1050	50	destruction (cannot be ascribed to structure), d. 0.10–0.25m	4
nd	Sq. 65	nd	860	40	cultural layer brown soil, d. 0.15m	5
D	Sq. 65	nd	960	40	border of Structure 3, d. 0.15m	6
nd	Sq. 53	nd	1230	50	layer brown soil, pottery and stone, d. 0.25m	7
D	Sq. 65	Structure 3	640	90	between the stone destruction, d. 0.15m, level of registration of Structure 3	8
E	Sq. 79	Structure 8	1020	50	layer under first level stone destruction, on the level of registration of Structure 8, d. 0.10–0.20m, EIA	9
nd	Sq. 6	nd	1140	60	d. 0.10m, outside defensive wall	10
C	Sq. 7	nd	1150	60	d. 0.20–0.30m, between defensive wall and Structure 9	11
D	Sq. 45	Structure 1	630	90	d. 0.15–0.20m, S -0.30 / W -0.33m Structure 1, black-brown soil	12
D	Sq. 54	Structure 1	890	50	d. 0.15–0.20m, N -2.12 / E -0.88m, level of registration	13
D	Sq. 54	nd	1150	60	d. 0.15–0.20m; W -0.58 / S -2.58m, west periphery of Structure 1, level of registration	14
nd	Sq. 74	nd	1110	60	d. 0.15–0.20m, W -2.82 / N -2.66m, probable structure	15
D	Sq. 64	nd	1180	60	d. 0.15–0.20m, S -0.38 / E -0.10m, south of Structure 1	16
nd	Sq. 98	nd	1220	60	d. 0.10–0.20m, destruction of defensive wall	17
nd	Sq. 73	nd	1180	60	d. 0.20–0.30m, E -0.70 / N -2.82m	18
nd	Sq. 17	nd	1140	50	d. 0.30m, between defensive wall and Structure 9	19
nd	Sq. 17	nd	1010	50	d. 0.10m, S -0.10 / W -1.50m, in front of inner face of defensive wall, S of Structure 9	20
C	Sq. 27	nd	1060	50	d. 0.25m, N -1.98 / W -0.86m, N of Structure 18	21
C	Sq. 27	nd	1170	50	d. 0.45–0.50m, N -1.50 / W -1.20m, N of Structure 18	22
nd	Sq. 30	nd	1070	50	d. 0.40–0.50m, S -0.50 / W -0.70m	23
C	Sq. 36	nd	1160	50	d. 0.30–0.40m, E -1.45m / N -2.6m, E of the inner face of defensive wall, accumulation in brown soil, between defensive wall and Structure 18	24
B	Sq. 38	Structure 12	1190	40	d. 0.30–0.35m, N -1.80 / W -1.90m, N half of Structure 12, brown soil	25
B	Sq. 38	Structure 12	1260	50	d. 0.20–0.25m, Structure 12	26
nd	Sq. 39	nd	1080	50	d. 0.10–0.15m, N -1.26 / W -0.44m, between the rocks above the mining structure, area previously excavated	27
nd	Sq. 40	nd	1120	60	d. 0.30m, brown soil between the rocks, above the mining structure, area previously excavated	28
D	Sq. 44	Structure 1	980	40	d. 0.20–0.40m, Structure 1 (NE border of Structure 1)	29
D	Sq. 44	Structure 2	1160	50	d. 0.30–0.35m, N -2.70 / W -1.62m, E half of Structure 2, brown ash-coloured soil and small stones	30

Tab. 1 (continued)

ID	Lab Code	^{14}C Age (BP)	±1σ (BP)	δ 13C (‰ PDB)	Material	Species	Topography	Sector
31	SUERC-43399	2819	27	-18.50	bone	*Bos taurus*	hilltop	Sector G-11
32	SUERC-43404	3061	27	-18.50	bone	human	hilltop	Sector G-11
33	SUERC-43405	2868	27	-18.20	tooth	*Bos taurus*	hilltop	Sector G-11
34	SUERC-43408	2846	27	-21.30	bone	*Ovis/Capra*	hilltop	Sector G-11
35	SUERC-43416	2966	27	-17,30	tooth	*Bos taurus*	hilltop	Sector G-11
36	SUERC-43417	3088	27	-19.50	tooth	*Bos taurus*	hilltop	Sector G-11
37	SUERC-43418	2919	27	-18.70	bone	*Equus caballus*	hilltop	Sector G-11
38	SUERC-43423	2926	27	-18.00	bone	*Bos taurus*	hilltop	Sector G-11
39	SUERC-43424	2449	24	-18.70	tooth	*Bos taurus*	hilltop	Sector G-11
40	SUERC-43425	2920	24	-19.80	bone	*Bos taurus*	hilltop	Sector G-11
41	SUERC-43618	2941	29	-20,50	tooth	*Bos taurus*	hilltop	Sector G-11
42	SUERC-43622	2860	29	-17.90	bone	*Bos taurus*	hilltop	Sector G-11
43	SUERC-43623	3099	29	-18.30	tooth	*Equus caballus*	hilltop	Sector G-11
44	SUERC-43624	2957	29	-20,30	bone	*Ovis/Capra*	hilltop	Sector G-11
45	SUERC-43625	3213	29	-15.40	tooth	*Bos taurus*	hilltop	Sector G-10
46	SUERC-43626	2783	29	-20.80	bone	*Bos taurus*	hilltop	Sector G-12
47	SUERC-43628	3269	29	-25.60	charcoal	nd	hilltop	Sector G-11
48	SUERC-43632	3124	27	-26.10	charcoal	nd	hilltop	Sector G-11
49	SUERC-43633	2990	29	-24.10	charcoal	nd	hilltop	Sector G-11
50	SUERC-64176	2940	32	-17.80	bone	*Bos taurus*	hilltop	Sector G-11
51	SUERC-64177	3223	32	-20.00	bone	*Bos taurus*	hilltop	Sector G-11
52	SUERC-64178	2975	32	-19.60	bone	*Bos taurus*	hilltop	Sector G-11
53	SUERC-64179	3058	36	-19.50	bone	*Ovis*	hilltop	Sector G-11
54	SUERC-64180	3045	32	-18.00	bone	*Bos taurus*	hilltop	Sector G-11

Period/ Group	Square/ Trench	Context	Cal Age (calBC)	Cal Std (68%)	Additional Stratigraphic Information	ID
D	Sq. 44	Structure 1	970	40	d. 0.35m, E -0.80 / S -0.20m, NW part of Structure 1, dark-brown soil	31
C	Sq. 46	nd	1330	50	d. 0.25–0.30m, S -0.30 / W -1.45m, disturbed part of defensive wall	32
C	Sq. 47	Structure 4	1040	50	d. 0.40–0.45m, S -0.60 / E -0.04m, Structure 4	33
D	Sq. 54	nd	1000	50	d. 0.25–0.40m, N -0.16 / E -0.13m, intrusions possible, Structure 1, in front of W boundary of structure	34
nd	Sq. 55	nd	1180	50	d .0.25m, concentration of stones and pottery E of Structure 1 and above	35
C	Sq. 56	nd	1350	50	d. 0.30m, S -1.74 / E -2.14m, disturbed part of defensive wall, dark-brown soil	36
nd	Sq. 60	nd	1110	60	d. 0.15m, S -1.50 / W -0.40m, dark-brown soil between the rocks above the mining structures, area previously excavated	37
C	Sq. 66	nd	1120	60	d. 0.25–0.30m, N -0.53 / W -1.10m, destruction of the defensive wall	38
C	Sq. 66	nd	590	120	d. 0.25–0.30m, N -1.20m, between stones of the inner face of the defensive wall	39
nd	Sq. 74	nd	1110	50	d. 0.35m, 0.79m from NE corner	40
C	Sq. 75	nd	1140	50	d. 0.20m, Structure 3?, above or corresponding with defensive wall	41
C	Sq. 84	nd	1030	50	d. 0.20–0.30m, E -1.84 / N -1.21m, above Structure 17	42
B	Sq. 84	Structure 17	1360	50	d. 0.30, S -0.57 / W -0.97m, perhaps disturbed, destroyed E part of Structure 17 (trench of previous excavations, perhaps disturbed)	43
nd	Sq. 89	nd	1170	50	d. 0.76m, N -3.20 / E -3.90m, between the rocks, area of previous excavations	44
B	Sq. 97	Structure 11	1480	30	d. 0.15–0.20m, SW part, Structure 11, W of defensive wall, assigned to B	45
E	Sq. 81	Structure in F	930	40	d. 0.10–0.20m, N -1.42 / E -1.15m, structure in F, outside fortification	46
A	Sq. 29	working place	1550	40	NW part, underneath the whole vessel in negative mining structure / rock cut pit	47
C	Sq. 47	Structure 4	1380	50	d. 0.25m, start of Phase C, from beams of Structure 4	48
C	Sq. 47	Structure 4	1210	50	d. 0.25–0.30m, E -0.19–0.90 / N -2.15–2.25m, start of Phase C, from beams of Structure 4	49
C	Sq. 8	Structure 9	1140	60	d. 0.30–0.40m, Structure 9, black soil	50
B	Sq. 8	Structure 13-A	1490	40	d. 0.55m, W -2.20 / N -0.50m, W edge of Structure 13 (close to sterile soil), assigned to early B	51
B/C	Sq. 17	nd	1190	50	d. 0.55m, S -1.30 / E -2.00m, between the inner face of the fortification wall and the curving wall, probably house	52
D	Sq. 5	nd	1320	60	d. 0.35m, W -1.40 / S -0.30m, intrusions possible	53
B	Sq. 66	Structure 3-A (late stage)	1310	60	d. 0.45–0.60m, Structure 3, early (first) level	54

Tab. 1 (continued)

ID	Lab Code	^{14}C Age (BP)	±1σ (BP)	δ 13C (‰ PDB)	Material	Species	Topography	Sector
55	SUERC-64181	3173	32	-14.30	bone	*Bos taurus*	hilltop	Sector G-11
56	SUERC-64182	3054	28	-20.20	bone	*Bos taurus*	hilltop	Sector G-11
57	SUERC-64186	3200	32	-20.40	tooth	*Equus caballus*	hilltop	Sector G-11
58	SUERC-64187	2964	32	-20.20	bone	*Bos taurus*	hilltop	Sector G-11
59	SUERC-64188	3051	32	-19.90	bone	*Bos taurus*	hilltop	Sector G-11
60	SUERC-64189	2952	32	-20.10	bone	*Ovis/Capra*	hilltop	Sector G-11
61	SUERC-64190	2911	32	-20.80	bone	*Ovis/Capra*	hilltop	Sector G-11
62	SUERC-64258	3190	27	-16.90	tooth	*Bos taurus*	hilltop	Sector G-11
63	SUERC-64259	3010	20	-21.00	bone	*Sus scrofa domestica*	hilltop	Sector G-11
64	SUERC-64260	3055	21	-17.80	bone	*Bos taurus*	hilltop	Sector G-11
65	SUERC-64266	2712	21	-16.90	bone	*Bos taurus*	hilltop	Sector G-11
66	SUERC-64267	3004	22	-20.20	bone	*Ovis/Capra*	hilltop	Sector G-11
67	SUERC-64268	3005	22	-17.30	bone	*Bos taurus*	hilltop	Sector G-11
68	SUERC-64269	3014	22	-18.80	bone	*Ovis/Capra*	hilltop	Sector G-11
69	SUERC-64270	3035	22	-20.60	bone	*Ovis/Capra*	hilltop	Sector G-11
70	SUERC-63848	3247	29	-26.10	charcoal	nd	NE quarter	Sector I-7
71	SUERC-63849	3264	29	-24.50	charcoal	nd	NE quarter	Sector I-7
72	SUERC-63851	3185	24	-26.10	charcoal	nd	NE quarter	Sector I-7
73	SUERC-63853	3268	29	-28.80	charcoal	nd	NE quarter	Sector I-7
74	SUERC-37374	2900	30	-16.60	bone	*Bos taurus*	E slope	Sector I-11
75	SUERC-37375	2790	25	-15.00	bone	*Bos taurus*	E slope	Sector I-11
76	SUERC-37376	2880	30	-15.40	bone	*Bos taurus*	E slope	Sector I-11

Period/ Group	Square/ Trench	Context	Cal Age (calBC)	Cal Std (68%)	Additional Stratigraphic Information	ID
B	Sq. 66	Structure 3-A (early stage or predating Structure 3-A)	1450	40	d. 0.55–0.60m, N -2.72 / E -0.52m, Structure 3 NE part, bottom of the structure, border with the sterile soil, assigned to early B	55
B	Sq. 47–48	Structure 22	1320	50	d. 0.55–0.60m, Structure 22	56
nd	Sq. 84	nd	1470	30	d. 0.50–0.60m, N -0.16 / E -2.07m, N of Structure 17, border with the sterile soil	57
nd	Sq. 8	nd	1180	50	d. 0.40–0.50m, W -1.60 / N -1.25m, dark-brown soil between the structures 9 and 13	58
B	Sq. 38	Structure 12	1320	60	d. 0.30–0.35m, N -1.80 / W -1.90m, N part of Structure 12	59
D	Sq. 54	Structure 1	1160	50	d. 0.35–0.45m, N -3.00 / E -0.50m, Structure 1	60
nd	Sq. 69	nd	1100	60	d. 0.35–0.50m, N of Structure 8, dark-brown soil under stones	61
B	Sq. 7	Structure 9-A	1460	30	d. 0.60–0.70m, Structure 9-A, E half close to early mining structures, assigned to (early) B due to possible hearth	62
nd	Sq. 7	nd	1250	40	d. 1.00–1.20m, N -1.30 / W -1.70m, under the defensive wall (last layer border with sterile soil)	63
B	Sq. 38	Structure 12	1320	50	d. 0.65–0.85m, Structure 12 at the bottom of the structure	64
D	Sq. 45	Structure 1-A	860	30	d. 0.45–0.55m, S half of the square Structure 1-A, N part (pottery carpet), intrusions possible	65
B	Sq. 66	Structure 3-A (late stage)	1240	40	d. 0.50–0.55m, N -2.84 / W -0.54m, Structure 3, early (first) level), (under level with flat stones)	66
B	Sq. 48	Structure 10	1240	40	d. 0.50–0.55m, registration of Structure 10 E wall and Structure 22 SE part	67
B	Sq. 47–48	Structure 22	1260	40	d. 0.40–0.85m, Structure 22, profile EW dark-brown soil, context with wheelmade sherd	68
B	Sq. 47	Structure 22	1300	60	d. 0.90–1.00m Structure 22, near the bottom of the structure	69
nd	Sq. 54	House 5	1520	50	SW part, layer with ceramic concentration, south of vessel 7	70
nd	Sq. 54	House 5	1540	50	SW part, layer with ceramic concentration, area of vessel 7	71
nd	Sq. 75	House 7	1460	30	N -2.65m / E -0.98m	72
nd	Sq. 98	House 9	1550	40	N -1.20m / W -3.15m	73
nd	Trench A	waste heap	1080	50	d. 0.60–0.80m, so-called middle layer over dump layer with earlier materials, Trench S-4 (area of future trench A)	74
nd	Trench A	waste heap	940	40	d. 0.60–0.80m, layer with mixed materials (different periods), Trench S-4 (area of future trench A)	75
nd	Trench A	waste heap	1060	50	d. 0.55–0.60m, Mixed dump layer	76

Tab. 1 (continued)

ID	Lab Code	^{14}C Age (BP)	±1σ (BP)	δ 13C (‰ PDB)	Material	Species	Topography	Sector
77	SUERC-37377	2840	30	-16.40	bone	*Sus scrofa domestica*	E slope	Sector I-11
78	SUERC-37391	2890	30	-17.30	bone	*Cervus elaphus*	E slope	Sector I-10
79	SUERC-37392	2885	30	-17.50	bone	*Bos taurus*	E slope	Sector I-10
80	SUERC-37393	3225	30	-14.70	bone	*Bos taurus*	E slope	Sector I-10
81	SUERC-40970	2530	35	-15.80	tooth	*Bos taurus*	E slope	Sector I-10
82	SUERC-40974	4055	35	-22.80	bone	*Capreolus capreolus*	E slope	Sector I-9
83	SUERC-40975	2940	35	-14.70	tooth	*Bos taurus*	E slope	Sector I-10
84	SUERC-40976	3000	35	-15.00	bone	*Bos taurus*	E slope	Sector I-11
85	SUERC-40977	3170	35	-15.10	tooth	*Bos taurus*	E slope	Sector I-11, I-10
86	SUERC-40986	9460	35	-25.70	charcoal	nd	E slope	Sector I-11
87	SUERC-40987	8210	35	-25.00	charcoal	nd	E slope	Sector I-10
88	SUERC-40988	8170	35	-25.90	charcoal	nd	E slope	Sector I-10
89	SUERC-40989	8200	35	-25.40	charcoal	nd	E slope	Sector I-10
90	SUERC-40994	7030	35	-25.50	charcoal	nd	E slope	Sector I-10
91	SUERC-40999	2475	35	-23.60	charcoal	nd	E slope	Sector I-10
92	SUERC-41000	7960	35	-25.50	charcoal	nd	E slope	Sector I-10
93	SUERC-41004	4065	35	-24.10	charcoal	nd	E slope	Sector I-10
94	SUERC-41005	4050	35	-25.00	charcoal	nd	E slope	Sector I-10
95	SUERC-43627	2899	27	-17.80	bone	*Bos taurus*	E slope	Sector I-11
96	SUERC-64277	2993	20	-16.40	bone	*Bos taurus*	E slope	Sector I-11
97	SUERC-64278	3252	20	-19.30	bone	*Bos taurus*	E slope	Sector J-9

Period/ Group	Square/ Trench	Context	Cal Age (calBC)	Cal Std (68%)	Additional Stratigraphic Information	ID
nd	Trench A	waste heap	1000	50	d. 0.60–0.80m, dump	77
nd	Trench D	waste heap	1070	50	d. 1.10–1.30m, dump	78
nd	Trench C	waste heap	1060	50	d. 1.00m, dump, E -1.15m / N -1.00m	79
A	Trench C-1	working place	1490	40	d. 0.70m, dump, layer with crushed stones in the north periphery of the working place excavated in Trench B–B-1, dump layer in the front of line of the pit mine	80
nd	Trench Br.1	waste heap	670	90	d. 1.60–2.00m, dump layer, mixed materials (probably materials from the top of the hill)	81
nd	Trench Br.3	waste heap	2590	70	d. 1.00m, mixed material into the dump layer	82
nd	Trench C	waste heap	1140	60	d. 1.40m, dump, S -0.60 / E -1.80m	83
nd	Trench A-1	waste heap	1230	60	d. 0.40m, dump, mixed layer, E -0.10 / N -1.40m	84
A	Trenches B/C-1	working place	1450	40	d. 2.50m, layer from the working place level / in the front of the open pit mine line, down the slope, a dump with small stones crushed, ash and charcoals begins, E extension of Trench B (situation corresponds with A-1, B-1)	85
nd	Trench A-1	waste heap	8740	60	d. 2.20m, brown-yellow layer with small crushed stones, without remains from anthropogenic activities, S -0.70 / W -1.40m	86
nd	Trench E	waste heap	7220	70	d. 3.05m, from the yellow layer without anthropogenic material, E -2.60 / S -1.10m	87
nd	Trench E	waste heap	7170	70	d. 2.00m, from the layer under the layer with anthropogenic materials, E -1.00 / S -0.80m	88
nd	Trench E	waste heap	7210	80	d. 2.10m, from the red layer under the ruined stones, E -1.45 / S -0.50m	89
nd	Trench C-1	waste heap	5930	50	d. 2.30m, from the yellow layer without anthropogenic material, W -3.30 / S -0.55m	90
nd	Trench B	waste heap	620	100	d. 1.86m, 0.90m east of the face of the rock, upper part of the layer of the earlier material, N -1.50 / E -1.30m	91
nd	Trench B	waste heap	6880	110	d. 2.10 m, above fireplace in the working area in the trench, N -0.40 / W -1.10m	92
nd	Trench A	waste heap	2630	100	d. 1.80m, N -1.20 / E -1.50m	93
nd	Trench A	waste heap	2580	70	d. 2.60m, yellow layer with small crushed stones, E -2.00 / S -0.10m	94
nd	Trench A	waste heap	1080	50	d. 0.20–0.40m, north profile near to the stairs, material from the top of hill taken from place situated over the line of the open pit mine in the upper part of the trench, Trench A-control cross-section	95
nd	Trench A	waste heap	1220	40	d. 2.00m from S profile, E -2.50m, E end of trench	96
A	Trench D	working place	1530	40	d. 1.30m, dark-brown soil, at border between lowest layer of dump and sterile soil, layers only with LBA materials, Trench D south extension beneath NE mining area	97

By means of dendrochronological calibration of the individual (single-event) ^{14}C ages, in combination with a variety of sample-grouping and age-modelling studies based on the documented stratigraphic sample properties, as well as on the accompanying archaeological materials, the authors propose a general reconstruction of the chronological and spatial parameters of the human activities at Ada Tepe during the early stages of the Late Bronze Age.

A special focus of the paper is on the questions regarding the initial stages of the human presence on the hilltop, the evidence for which was uncovered in several main sectors – the central one with remains of the settlement and traces of preceding mining activities; the sector of the northeastern settlement; the sector of the eastern slopes of the hill, where some of the main mining pits and associated waste heaps are located; and parts of the western and northwestern slopes with some remains related to ore processing.

Another detailed analysis, based on the stratigraphic observations, was supported by the discovery of certain materials, including several groups of finds that were studied by morpho-typological comparative, stratigraphic, and interdisciplinary methods. These studies allowed an essentially continuous tracing – in parallel – of the cultural and technical developments at Ada Tepe from the first stages of the mining operations and associated human habitation in the 15th century BC all the way through to the 13th century BC. Several isolated fragments of imported wheelmade pottery provide an additional point of reference for the analysis.

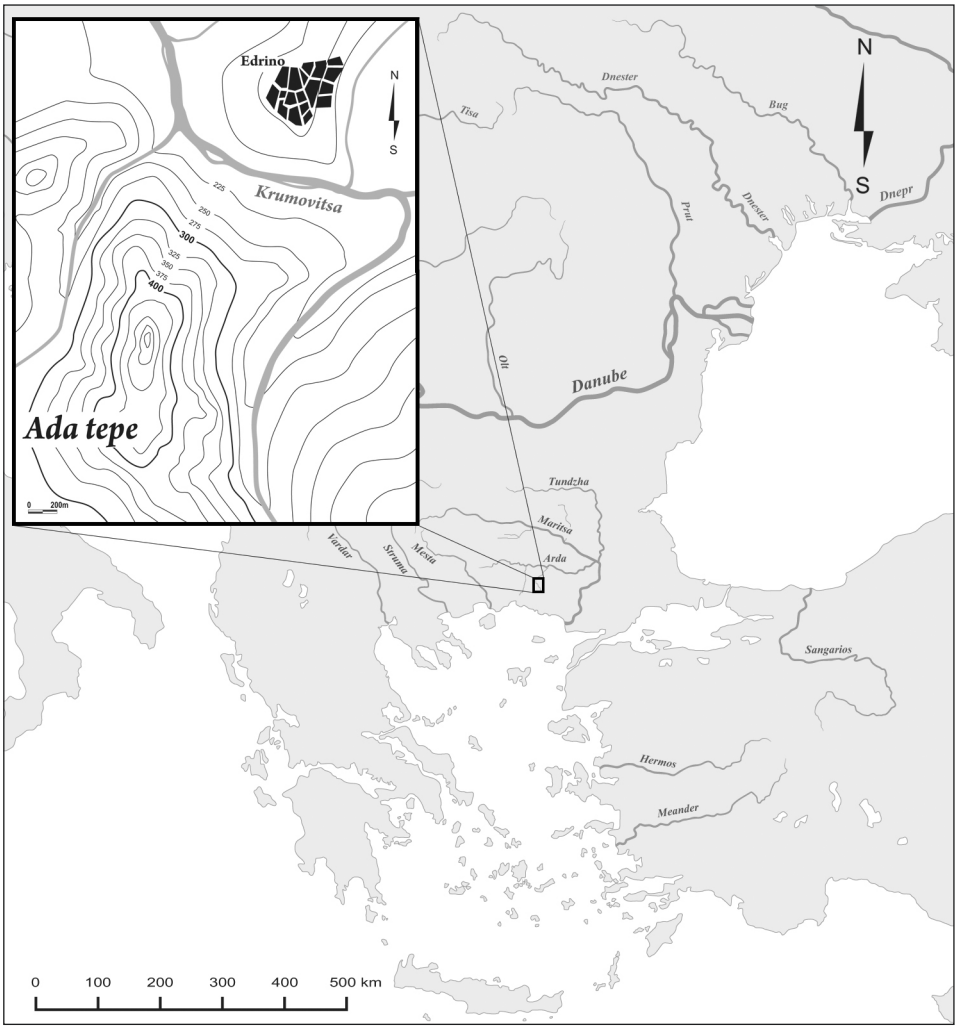

Fig. 1 The location of the archaeological site Ada Tepe in the context of the Balkan Peninsula and the North Aegean region (© S. Iliev)



Fig. 2 Panoramic view from northwest of the Ada Tepe hill and the valley of the Krumovitsa River near the present-day town of Krumovgrad (© H. Popov)

The proposed detailed reconstruction of the absolute and relative chronology and periodization of the archaeological site not only enables a precise analysis of the main stages of its early development, but also supports its emplacement within the much larger framework of interregional contacts and presumed economic relations within the Aegean in the middle and the second half of the 2nd millennium BC.

The extensive rescue archaeological investigations on the Late Bronze Age gold mine at Ada Tepe peak in the Eastern Rhodopes, in the vicinity of the modern town of Krumovgrad (Figs. 1–2), made possible the accumulation of a substantial informational database, which in turn has created the opportunity to develop academic research in a very wide range of topics. Among the research directions most important for the holistic analysis of the site is the one dedicated to determining the relative and absolute chronology of the mine, of the associated satellite structures, and of the features related to later human presence in various sectors on the peak.

Due to this unique chance, in the course of a number of archaeological seasons of varying length between 2000 and 2006 and then from 2008 to 2015, large amounts of materials and a huge volume of data were obtained relating to the different periods of human occupation of the peak and its close surroundings in the Late Bronze Age, the Early Iron Age, and the Hellenistic period, as well as in Late Antiquity. A considerable part of this huge database is still being processed, although one could already highlight several important steps related to the publication of archaeological structures and stratigraphy, accompanied by the processing of the entire ceramic complex and the assemblage of small finds from Ada Tepe's Northeastern Quarter.[8] The present

[8] Burkhardt in press.

text does not aim to review the history of research – something that has been offered by a number of publications in recent years.[9] Rather, it will emphasize some details concerning the proper understanding of the complex scholarly problems relating to the processing and publishing of the results from the archaeological investigations of Ada Tepe, as well as to comprehending the scholarly potential and the challenges raised by this multifaceted and complex process.

Due to a concurrence of circumstances, Ada Tepe is the only Late Bronze Age and Early Iron Age site in Bulgaria that has been investigated over a large area almost in its entire extension and depth, as it is preserved at present. In the last century or so, all other settlements providing evidence for the second half of the 2nd millennium BC and the first half of the 1st millennium BC have been investigated via small trenches, compared to the entire area of the site, and a few (often isolated) structures – dwellings or pits – have been uncovered together with the associated find assemblages. This is also true for sites designated as eponymous like Razkopanitsa, Asenovets, Pshenichevo, Ovcharovo, etc. (Fig. 3).[10] Until recently, the only exception was the Shumen Fortress – an Early Iron Age settlement that was investigated over most of its area.[11] This is a very different situation compared to the Early Bronze Age and to some extent the Middle Bronze Age, for which sites that have been investigated extensively during numerous successive campaigns, such as Ezero, Yunatsite and Galabovo, offer a picture that is much more complete statistically.

In the past two decades, with the carrying out of numerous rescue archaeological investigations along the routes of various highways and gas pipelines, mainly in the plains of southern and northern Bulgaria, this picture begins to change. In a number of cases, not only remains of individual structures (dwellings/buildings with household functions, pits, etc.) were detected and investigated, but also the relationships between the structures as well as between the settlement and its surroundings. Thus, the setting of these elements of the settlement was considered in a broader context. At least for the latest phases of the Late Bronze Age and the earliest of the Early Iron Age, our knowledge has been considerably enriched by the investigations of sites like Zheleznik, Nova Nadezhda, Chepintsi, Letnitsa, Orlovets, Voditsa and Gradishte,[12] which enabled a more detailed analysis of the internal organization and the types of architectural structures in the settlements in the plains of the country (Fig. 3). Certainly one could also mention, as related to the problem about the scope of investigating LBA and EIA sites, the issue of the numerous fields of pits (including their functional interpretation) that have been excavated in the last two decades, precisely in the course of the large-scale rescue investigations along the routes of various infrastructure projects. Many of these pit complexes date precisely to various well-known chronological phases of the Early Iron Age. At the same time the information about the settlement pattern during the early and the developed phases of the Late Bronze Age, both in the plains and in the hilly and mountainous areas, is still lacking in detail.

The state of research on the structure of the Late Bronze Age and Early Iron Age settlements in the Rhodopes and the valley of the river Mesta that adjoins them to the west is much better.

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9 See the summarizing publications for the history of the investigations, an overview of the results from the field, and the main directions of archaeological and interdisciplinary investigations that emerged at Ada Tepe: Nekhrizov – Mikov 2002; Nekhrizov 2003; Popov – Jockenhövel 2011; Popov et al. 2015; Horejs 2017; Horejs – Jung 2017; Nikov 2017; Popov 2017; Popov – Jockenhövel 2017; Popov et al. 2017; Horejs – Jung 2018; Nekhrizov – Tzvetkova 2018b; Popov 2018a; Popov – Jockenhövel 2018; Popov – Nikov 2018 among others.

10 Čičikova 1968; Čičikova 1972; Kănčev 1974; Detev 1981; Kănchev 1984; Aladjov – Balabanjan 1984; Balabanjan 1986. For up-to-date overviews with references on the state of research of settlements from the Late Bronze Age and Early Iron Age in the Rhodopes and the Thracian Plain, see: Athanassov et al. 2012; Popov 2015; Nenova 2019; Georgiev 2021; Burkhardt in press.

11 Antonova – Popov 1984.

12 Daskalov et al. 2010, 147–148, figs. 1–2; Băchvarov et al. 2014, 59–60; Băchvarov et al. 2015a, 65–66; Băchvarov et al. 2015b, 68–69; Hristova – Petrova 2018, 446–448, figs. 1–2; Georgiev et al. 2020, 332–335, figs. 2–4; Leshtakov et al. 2020a, 253–255, figs. 2–4; Leshtakov et al. 2020b, 410–411, fig. 1; Leshtakov – Babadzanov 2020, 434–436, figs. 1–2; Petrova et al. 2020, 313–315, figs. 1, 5.



Fig. 3 Archaeological sites from the Late Bronze and Early Iron Ages commented upon in the text. Investigations between the 1970s and 2020. 1. Kush Kaya; 2. Gluhite Kamani; 3. Dolno Cherkoviste; 4. Tatul; 5. Vishegrad; 6. Perperikon; 7. Gorski Izvor; 8. Dragoyna; 9. Razkopanitsa; 10. Lilovo; 11. Koprivlen; 12. Bresto; 13. Kamenska Chuka; 14. Yunatsite; 15. Kanlagechit; 16. Michalich; 17. Simeonovgrad/Konstantsija 18. Ovcharovo; 19. Izvorovo; 20. Ovchartsi; 21. Galabovo; 22. Ezero; 23. Pshenichevo; 24. Assenovets; 25. Bikovo; 26. Chokoba; 27. Zheleznik; 28. Vratitsa; 29. Shumenska krepost; 30. Pobit kamak; 31. Cherkovna (Razgrad District); 32. Gradishte (Shumen District); 33. Voditsa; 34. Orlovets; 35. Letnitsa; 36. Vladinya; 37. Chepintsi; 38. Argilos; 39. Olynthus; 40. Assiros; 41. Kastanas; 42. Volos; 43. Skopelos; 44. Mikro Vouni; 45. Troy (© N. Ketcheva, S. Iliev, H. Popov)

Due to the activities of the local museums and of individual researchers in this region, a far larger amount of evidence has been accumulated about the period that is the subject of the present publication.[13]

Here, there are a considerably larger number of registered sites, many of them interpreted as settlements, and long-term systematic archaeological excavations have been conducted over many years in some places. For almost four decades already, a number of projects have been pursued periodically with longer seasons and a larger scale of investigations in the field. However, even at settlements like Vishegrad, Koprivlen, Dragoyna, Kush Kaya, and Bresto (Fig. 3), only the remains of single dwellings and household structures have been uncovered – or isolated elements of fortifications within sectors of a limited area.[14] The massive two-storey stone building of Kamenska Chuka in the middle Struma Valley is a special case of a Late Bronze Age settlement

[13] See the summarized information on the state of field research on the Late Bronze Age and the Early Iron Age in: Kulov 1991; Kulov 1999; Baralis 2008; Athanassov et al. 2012; Nechrizov – Cvetkova 2017; Nekhrizov – Tzvetkova 2018a; Burkhardt in press.

[14] Dremsizova-Nelchinova 1984, 104–132, figs. 1–10, 14, 16, 23, 24; Alexandrov 2002, 63–82; Popov 2009, 22–30, figs. 3–9; Bozhinova et al. 2013, 46–52, figs. 2–3; Bozhinova 2014, 47–48, 51–54, 56–57; Athanassov et al. 2016, 465–474, fig. 1; Alexandrov 2018a, 416–419, figs. 2–3; Athanassov et al. 2018, 420–423, figs. 1–2; Bozhinova – Andonova 2018, 398–400, figs. 1–2.

structure (of the 14th–13th centuries calBC according to available ^{14}C dates).[15] These circumstances allow for some general conclusions, but not for a detailed treatment of the specifics of the overall internal organization of the given settlement or for a spatial analysis of the successive chronological stages of its development.

Certainly, field investigations of limited scope that only uncover separate structures in an area, without clarity about how they belong to the overall internal organization and structure of the archaeological site, offer limited possibilities for interpretation. To an even greater extent, the same is true about the sites that, although numerous at first glance, are only registered on the ground and have a preliminary dating based on materials collected from the surface. Such a situation in relation to the evidence and the ensuing problems in analysing and interpreting it is seen clearly in the recently published doctoral thesis of Denitsa Nenova. There is a huge disproportion between the archaeological sites from the Late Bronze Age that are only preliminarily registered (with all the reservations regarding the proposed interpretations for some of them as settlements, sanctuaries, necropoleis, etc.) and those that are able to offer real evidence with the potential for analysis, resulting from actual archaeological investigations.[16]

Quite revealing in this respect is the long discussion in Bulgarian archaeology about archaeological sites from the Bronze and Iron ages situated in a mountainous or hilly environment, on dominating hills or peaks (the so-called "hill sites" in the English-language publications). Their hasty interpretation in the literature either as sanctuaries or as forts and settlements is equally incorrect, regardless of the chosen version, as in most cases the site's 'archaeological biography' does not contain actual excavations of sufficient scale and duration to offer adequate results for a compelling functional interpretation.[17]

Professionally speaking, archaeological rescue excavations have both advantages and drawbacks. However, while avoiding discussing them in detail, regarding Ada Tepe we could note that in spite of the complicated circumstances, the need to investigate over the largest area possible provided the opportunity – for the first time in the Late Bronze Age archaeology of the region – to obtain the maximum amount of field information. One could list such major topics as the internal organization of the site; information about various types of structures, related to various functional characteristics; the general specifics of the architecture; the general stratigraphy; and the information about the interconnections and the spatial regularities of the locations of various sectors/parts of the site. What should be added is the full volume of the ceramic assemblage and the diverse repertoire of small finds. The present study is also an attempt – while discussing a scholarly problem that is very important for the general characteristics of the site – to profit from the advantages provided by the large volume of primary data and of the materials obtained in the field.

Ada Tepe should not be regarded as a single site but rather as an archaeological complex composed of several main elements, some of which are functionally related and contemporary, while others are diachronous and in some cases have completely different characteristics. During numerous campaigns on the peak and its slopes, the following sites were investigated: 1. the gold mine (numerous traces of open pits on the hilltop and at several places on the slopes, and waste heaps accompanying the remains of primary mining activities); 2. processing sites for initial separation and secondary processing of the gold-bearing ore; 3. isolated remains of sheds/structures adjacent to the working sites and scattered along various parts of the slopes; 4. two settlement nuclei, one on the northeastern periphery of the hilltop and another in its central part, the latter with several phases of occupation in the Late Bronze Age and the Early Iron Age; 5. a sanctuary from the Hellenistic period located on the central sector of the hilltop and isolated accompanying dwellings in its immediate surroundings; and 6. a settlement from Late Antiquity on the southern slopes of the hilltop (Figs. 4–5).

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15 The building has been excavated to a large extent (Stefanovich – Bankoff 1998).

16 Nenova 2019, 35–43, figs. 5.1–5.4.

17 For a more detailed commentary on this discussion with references see: Gotzev 2005, 159–161; Popov 2006, 53–57; Popov 2009, 34–36; Bozhinova 2018, 339–342, 349–350.

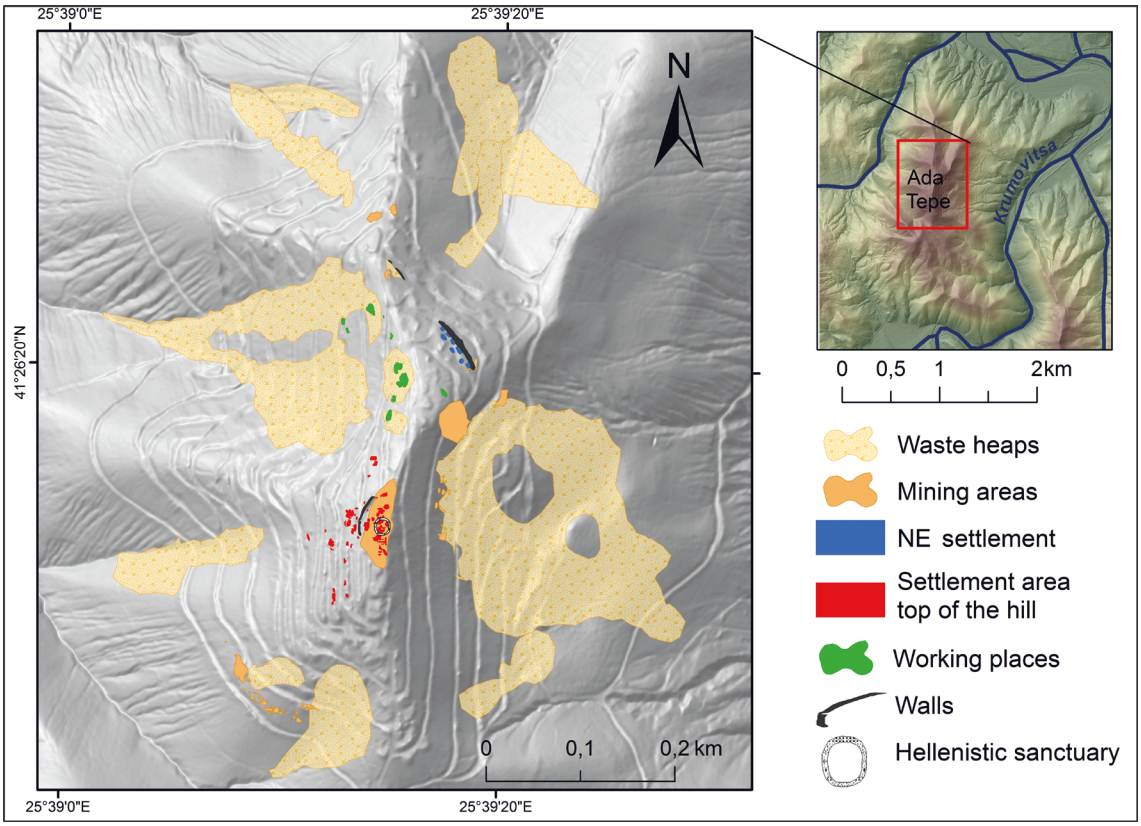

Fig. 4 Ada Tepe. 3D hillshade model (left) derived from the digital terrain model (DTM) (right) with grid size 1m, created from airborne laser scanning (ALS), also known as LiDAR (Light Detection and Ranging) DTM data. ALS data acquisition: performed by the company Bloom Bulgaria EOOD in December 2010. – Archaeological structures of various functional and chronological characteristics, excavated in 2001–2015: 1. Waste heaps scattered over the slopes; 2. Primary mining areas; 3. NE settlement; 4. Settlement area on top of the hill; 5. Working places, connected with the mining activities; 6. Walls; 7. Hellenistic sanctuary. – Coordinate Reference System UTM, Zone 35 N, Datum World Geodetic System 1984 and Ellipsoid WGS84 (© E. Tcherkezova, H. Popov)

Table: Technical details of ALS data

Digital Terrain Model	
Aircraft	Eurocopter AS-350
Laser scanner	TopEye LRF (Laser rangefinder) 2
Number of points per m²	25 points per km²
Point distance	20cm
Relative vertical accuracy	4cm
Relative position and orientation accuracy	6cm
Scan angle (degree)	
Pulse repetition frequency (PRF) (Hz)	50 000
Effective frequency of pulses (Hz)	50 000
Frequency (Hz)	35
Data format	.las (cloud class numbers) with information for each point: x, y, and z coordinates, intensity, laser scanning angle and time of their recording
True orthophotos	
Height of shooting	300m
Resolution	32px/inch
Geometrical resolution (ground sample distance – GSD)	5cm
Relative position accuracy	10cm
Data format	Geotif

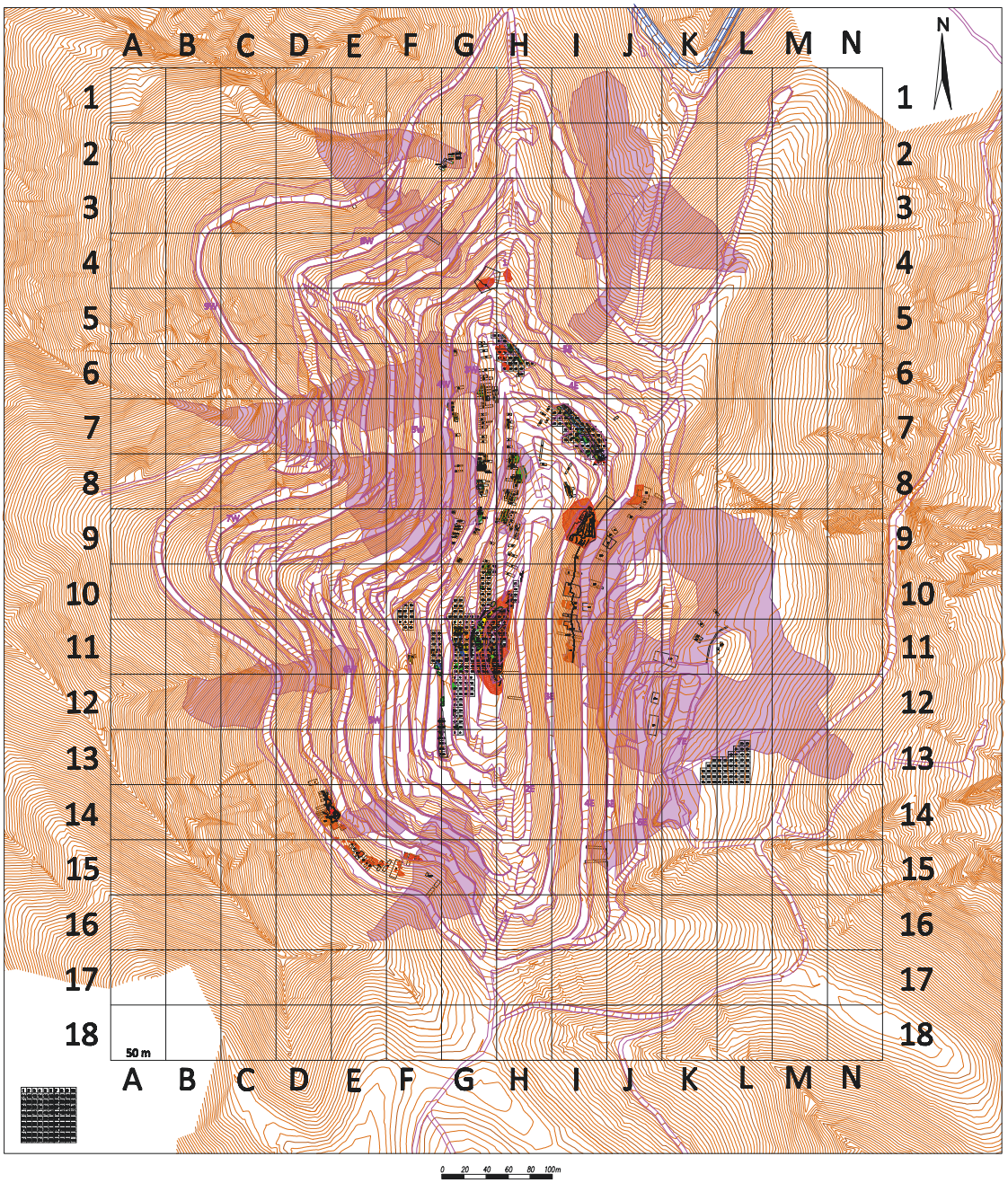

Fig. 5 General geodetic plan of the archaeological features excavated on the upper sectors of Ada Tepe in 2009–2015 (© B. Gjaurova, H. Popov)

In the multidisciplinary treatment of this complex mosaic of archaeological remains that are so diverse in terms of chronology and function, it is especially the questions regarding the initial stages of the human presence on the hilltop that are of principal significance.

Materials and structures from the earliest phases of the site have been discovered in several main sectors. These are: the central sector of the hilltop with the mentioned remains of the settlement and traces of earlier mining activities; the sector of the northeastern settlement; the sector of the eastern slopes of the hill, where some of the main mining pits and associated waste heaps are located; and parts of the western and northwestern slopes with some remains related to ore processing in this area (Fig. 5).

The chronological span of the various periods of human activities at Ada Tepe, although with some interruptions, falls within the broad limits of almost two millennia, from the middle of

the 2nd millennium BC to the middle of the 1st millennium AD. In many cases, the later human presence on the hill disturbed, contaminated or even erased the traces of earlier occupation. This is particularly true for the central sector of the hilltop, where the same area has been occupied several times (with hiatuses) from the Late Bronze Age to the Late Hellenistic period (Figs. 4, 6). Mixed and transported materials are regularly found in the waste heaps that descend from the central part of the hilltop down the eastern and western slopes (Figs. 7–9). Taking into account this complex stratigraphic and topographic situation, in the present study we offer an analysis based on the combined use of several major groups of finds and the application of both the conventional morpho-typological comparative and stratigraphic analyses and various interdisciplinary methods. The analysis we offer here discusses the subjects of the relative and absolute chronology, the periodization of the first stages of the mining operations, and the associated human habitation on the hill of Ada Tepe.

1. First, the entire study rests on the numerous radiocarbon dates obtained for various archaeological structures and remains at the site. Thanks to the targeted funding secured for the rescue excavations, Ada Tepe became the first archaeological site from the Late Bronze Age on the territory of modern-day Bulgaria where dating of a long series of radiocarbon samples was carried out, from which a precise absolute chronology and periodization of the site could be obtained. The programme for providing ^{14}C dates from the investigations of other sites from adjacent regions that are comparable with Ada Tepe in terms of chronology offered the chance to compile a supplementary group of dates from the region of the Eastern Rhodopes and the Thracian Plain, some of them already published.[18]

In recent years, there has been a gradual increase in the number of Late Bronze Age sites in present-day Bulgarian lands, from which small series of absolute radiocarbon dates that fall in the middle and the second half of the 2nd millennium BC are available. Together with some preliminary publications of dates from the investigations at Ada Tepe, for the Rhodopes, one could also mention Koprivlen, Gluhite Kamani, Kush Kaya, Tatul, Bresto, and Stambolovo.[19] Despite the attempts to draw more general conclusions,[20] the summarized presentation giving overviews of the radiocarbon dates accumulated in the last 30 years[21] clearly reveals that at this stage, there are no sites with published long and consistent series.

Against this background, the Ada Tepe project provides the largest group of absolute dates that cover the entire second half of the 2nd millennium BC and the early 1st millennium BC for the area of the Rhodopes and the Thracian Plain.

At present, the radiocarbon evidence from Ada Tepe is as follows: adhering to the principles presented above, between 2011 and 2015, a total of 156 samples (bone and charcoal) were sent to the AMS laboratory of the Scottish Universities Environmental Research Centre (SUERC) at Glasgow, of which 133 were successfully dated and 23 failed. The majority of ^{14}C determinations were obtained on individual animal bones, and therefore represent dates not only measured on short-lived samples (as is often emphasized), but also – of equal importance – they constitute single-event dates.[22]

In cases where bones were not present, or for purposes of comparison, samples were also taken from charcoals.

The progressive publication of this substantial ^{14}C database and its introduction into scholarly circulation, together with the accompanying finds and stratigraphic contexts, is one of the main

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18 Popov 2016; Nekhrizov – Tzvetkova 2018b, 33–36, tab. 5; Tsirtsoni 2016; Popov – Nikov 2018, 376–377, fig. 14; Tsirtsoni 2021.

19 Alexandrov 2002, 77–80; Nekhrizov – Tzvetkova 2011, 178–179; Athanassov et al. 2016, 465–474; Popov 2016; Popov et al. 2017, 169, 200, fig. 7; Leshtakov 2018, 9–17; Nekhrizov – Tzvetkova 2018b, 33–37, tab. 6.

20 Nenova 2019, 107, fig. 9.5.

21 Dzhanfezova 2018, 309–312, fig. 1; Nenova 2019, 102–107, tab. 9.2, fig. 9.2.

22 *Sensu* Ashmore 1999.



Fig. 6 Panoramic view of the central part of the hill (state of research in 2012–2013), where remains and layers were discovered that overlap and destroy each other, related to different stages of the human presence on the hill from the middle of the 2nd until the end of the 1st millennium BC (© H. Popov, P. Georgiev)



Fig. 7 The eastern slopes of Ada Tepe. Sectors of excavated open cast mining works and upper parts of waste heaps that descend down the slopes. Investigations in 2010–2011 (© H. Popov, P. Georgiev)



Fig. 8 The eastern slopes of Ada Tepe. Sectors of excavated open cast mining works and waste heaps that descend down the slopes. Investigations in 2011–2013 (© H. Popov, P. Georgiev)

tasks of the entire project. In the present publication, the main focus of the analysis is on the large group of absolute dates from the first centuries of human presence on Ada Tepe.

2. The absolute dates provided by the ^{14}C ages will be linked to the relative chronology of the Bronze Age in the Rhodopes and neighbouring regions by means of the pottery finds stratigraphically associated with the radiocarbon-dated materials. The local handmade pottery serves to establish the relative dates in terms of regional chronology, while the imported wheelmade ceramics allow references to the Helladic chronological system to be made. Finally, the archaeometric provenance analyses of the imported class potentially allow the identification of specific pottery-exporting regions and thus help in the reconstruction of interregional contacts that the inhabitants of the Eastern Rhodopes maintained during the Late Bronze Age.[23] Naturally, using the ceramic finds from the well-stratified contexts on Ada Tepe for the mentioned purposes also has certain limits. It is, for instance, not possible to assign the local handmade classes of the eastern Balkans to short-lived chronological phases. These classes can rather serve to circumscribe general chronological aspects such as an early and a middle-to-late stage of the Late Bronze Age.[24] Their comparison with analogous handmade ceramics from the northern Aegean tell-sites can provide some more chronological information, but again, one cannot expect to arrive at a particularly fine chronological resolution. The wheelmade imports generally allow for more precise dating results, i.e. an assignation to a specific Late Helladic (sub)phase – provided they are

[23] We note that some Aegean imports are already published from the wider region of the Rhodopes (Bozhinova et al. 2013; Jung et al. 2017), which taken together with the Ada Tepe finds, can contribute to shaping an interpretative model for the interaction of several contemporary sites and a more detailed critical analysis.

[24] Burkhardt forthcoming, fig. 7.



Fig. 9 Panoramic view of one of the waste heaps on the western slopes of Ada Tepe. The discovered archaeological materials slid there from the central parts of the hill. Investigations in 2009 and 2015 (© E. Mihov)

well preserved, but which unfortunately is rather not the case, with only seven very fragmentary wheelmade vessels identified among the Ada Tepe finds (Fig. 10).

3. Based on the analysis of the groups of samples and finds described above, as well as on the observations on the stratigraphic positions and situations on the terrain, a general absolute chronological model is offered for the beginning and the first stages of the mining operations and habitation of Ada Tepe. The results, in combination, together provide a preliminary model of the interactions and contextual connections between the different sectors of the archaeological site in the 15th–13th centuries BC.

The Radiocarbon Evidence

Accounting for the financial provisions, the characteristics of the various sectors where rescue archaeological interventions took place, and based on the experience acquired over the last two decades and the countless discussions on topics related to radiocarbon dating and absolute chronology (especially in the North Aegean region), we have devised a strategy for the collection of samples for radiocarbon dating from Ada Tepe:

1. Samples are to be collected (provided suitable material is available) from all areas undergoing rescue excavations, and from all types of archaeological features.

2. Samples are to be collected from all stratigraphic positions, as work progresses in depth.

3. The collection of short-lived carbonized materials (bones, seeds) is prioritized. This is because charcoal sampling, as practised for many decades, has created considerable confusion and contradiction (e.g. cases of Late Bronze Age sites from the North Aegean region), which is due to the (often underestimated) complexity of the ‘old wood’ effect.

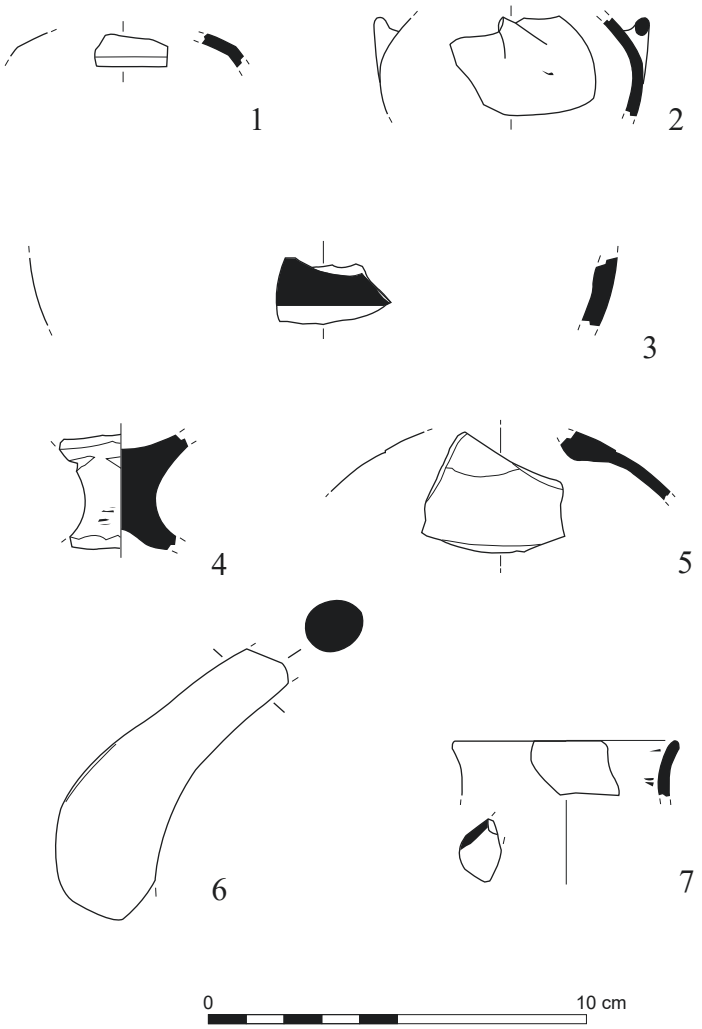


Fig. 10 Wheelmade pottery fragments of Mycenaean type (1–5, 7) and probable wheelmade pottery fragment (6) from Ada Tepe, excavation campaigns 2011–2013 and 2015 (numbers correspond to catalogue numbers). Scale 1:2 (drawings: R. Jung, digitization: R. Yassine)

4. Dating of series of synchronous sites in the Eastern Rhodopes and the Upper Thracian Valley (Ada Tepe, seasons 2001–2005, Kush Kaya, Dolno Cherkovishte, Gluhite Kamani, Sambolovo, Dragoyna, Tatul, Izvorovo, Semercheto, Zheleznik, etc.) that could be used in the correlation of the assemblages and dates from Ada Tepe (Fig. 3).

5. Submission of all samples to one ^{14}C laboratory and one scientific team.

Based on the considerable empirical evidence amassed, the samples were pre-sorted according to the requested archaeological context diversity, then subsampled for materials in prime condition and for which the stratigraphic position was judged to be of the highest integrity. The selected samples were sent to Glasgow for dating, in parallel to which the empirical evidence was carefully documented for later correlation studies.

The Glasgow ^{14}C measurements[25] relevant for this paper include 60 ^{14}C measurements on bone collagen (mainly *Bos taurus*), 20 on teeth (again mainly *Bos taurus*), and 17 on charcoal (unidentified species). All ^{14}C measurements have standard deviations of ±35 BP or better. Terrestrial δ^{13}C

[25] We express our deep gratitude to Gordon Cook from SUERC for his contribution to the sample processing and for the ^{14}C measurements during the rescue archaeological excavations.

values are provided for all samples (bone, teeth, charcoal). In addition, for the collagen samples, the measured $\delta^{15}N$ values and C/N ratios are given. In the following, we describe the preliminary results of the archaeological ^{14}C analysis, which aims at providing a chronological model for the first stages of the human presence on Ada Tepe, connected to the early and classical phases of the Late Bronze Age.[26] For statistical processing, we used the calibration software CalPal (version 2016.8), which incorporates a large package of chronological methods, including single age calibration, the construction of summed calibrated probability distributions, as well as a variety of algorithms for archaeological wiggle matching, based on ordinal and metric sample sequencing according to archaeological phases and stratigraphic depth. The archaeological modelling errors are largely based on sample order (Monte Carlo) randomization, with empirical factorization chosen according to joint archaeological and statistical considerations.

The present study mainly discusses those groups of dates that belong to the period from the beginning of the 15th to the first half of the 13th century BC (Tab. 1; Fig. 73).

Prior to the actual analysis of the dates and the implementation of the proposed age models, it is necessary to account for the sectors from which these dates were collected, and for the specifics of the contexts and stratigraphic positions of the samples. The analysed radiocarbon samples and associated archaeological finds come from four Ada Tepe excavation areas:

1. Sector I-7 (northeastern slope)
2. Sectors I-9, I-10, I-11, J-9 (eastern slopes)
3. Sector G-9 (western and northwestern slopes)
4. Sectors G-10, G-11, G-12 (the largest group from the central area of the hilltop).

The materials from the four sectors will be presented consecutively in the above order. Regarding the contexts, the four areas are distributed into two clearly defined groups:

1. A first group of ^{14}C samples, originating from different sectors and archaeological features, characterized by a short chronology and homogenous material from only one period. The samples of this group (I-7, G-9, J-9) present the additional benefit of provenance from sealed situations – contexts where there are no later materials in a higher stratigraphic position and there are no disturbances of the strata or redeposition of transported materials from the earlier human activities in these areas of the peak.
2. A second group of ^{14}C samples, originating from sectors with long-term human presence over an extended period of time and with the mixing of materials and strata associated with these processes. Some of the samples of this group, although early, were taken from contexts with intrusive later materials, while others are procured from clearly defined contexts, subsequently buried under (but not mixed with) materials associated with the later human activities on the same spot. To this group belong the samples taken from sectors G-10 and G-11 and the samples collected from waste heaps with mixed materials on the eastern slopes of Ada Tepe (sectors I-10 and I-11).

The analysis of the samples must also account for yet another circumstance, encountered by the excavation team in the course of the rescue works. North of the sectors F-9/G-9/H-9/I-9 the soil is highly acidic. As a result, although the excavated area of these sectors located on the crest exceeds 40,000m², there were no preserved bones, and the pottery displays highly eroded surfaces. Because of this, the ^{14}C ages from these areas are based exclusively on charcoal or burnt wood samples. The samples from the waste heaps and the settlement areas situated south of this line have yielded both bones (although often in poor condition) and charcoal.

[26] The general chronological model that includes all periods presented in the absolute dates from Ada Tepe (incl. the late phases of the Late Bronze Age, the Early Iron Age, the Hellenistic period and Late Antiquity) will be the topic of a resumptive paper.



Fig. 11 Sector I-7. Remains from a settlement on this part of the hill, related to the early stages of the human presence. Stone foundations of a large levelling wall and two parallel rows of dwellings (© H. Popov)

The Archaeological Evidence

Northeastern Settlement (Sectors I-7, I-8, H-5, H-6)

The area occupies the northeastern periphery of the main crest of Ada Tepe, which has a north-south orientation. In its northeastern periphery, there is a natural broad terrace relatively suitable for habitation. Here, in 2012–2013, the remains of a settlement were registered and investigated (Figs. 11–12).

In sectors I-7 and I-8, the excavations revealed a total of ten houses, all of which have similar size and orientation. In sectors H-5 and H-6, the ruins of three more houses were uncovered and studied, this time arranged in a row. The natural terrain in parts of sectors H-6 and H-7 has been disturbed by geological probing in 2003–2004, when parts of the northwestern and the central portions of the settlement were destroyed. Based on the hypothetical reconstruction, taking into account the scale of the devastation and the investigated characteristics of the preserved parts, it could be presumed that there were originally around twenty or slightly more dwellings in the settlement. The characteristics of the architectural appearance and the stratigraphy of the north-eastern settlement at Ada Tepe have already been published.[27] The pottery and the small finds assemblage have been processed and analysed as needed for a doctoral thesis, and their publication

[27] Popov et al. 2017.



Fig. 12 Sectors I-7 and I-8. Part of the northeastern settlement. Remains of dwellings (© H. Popov)

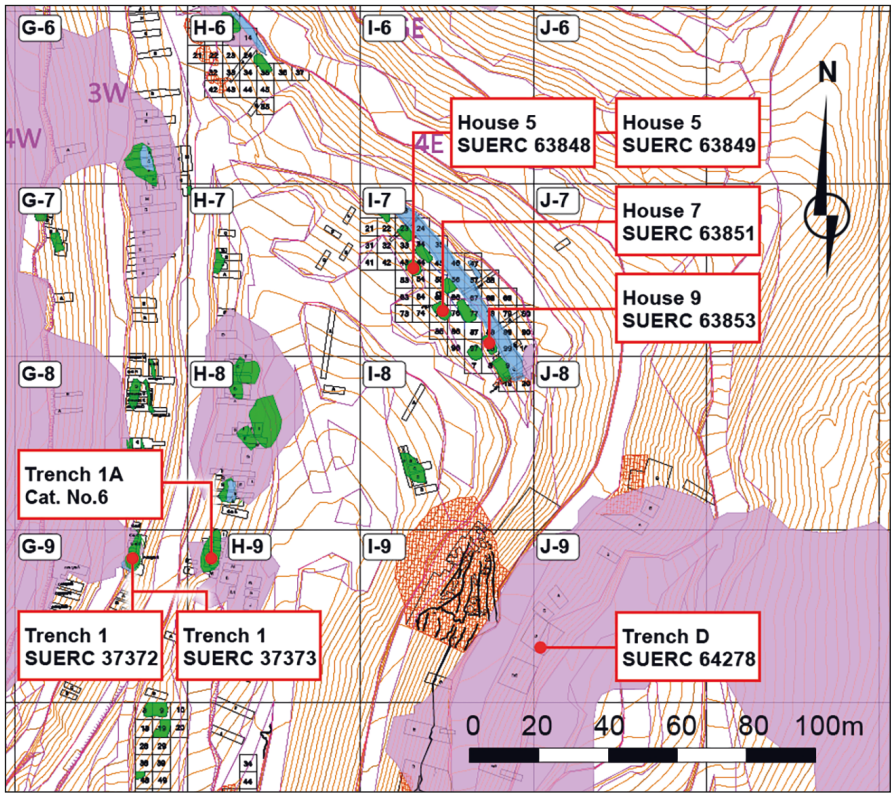


Fig. 13 General plan of the sectors excavated in the northern part of Ada Tepe ridge, with parts of the adjacent western and eastern slopes and the positions of the radiocarbon samples mentioned in the text (© H. Popov, S. Iliev, B. Gjaurova)

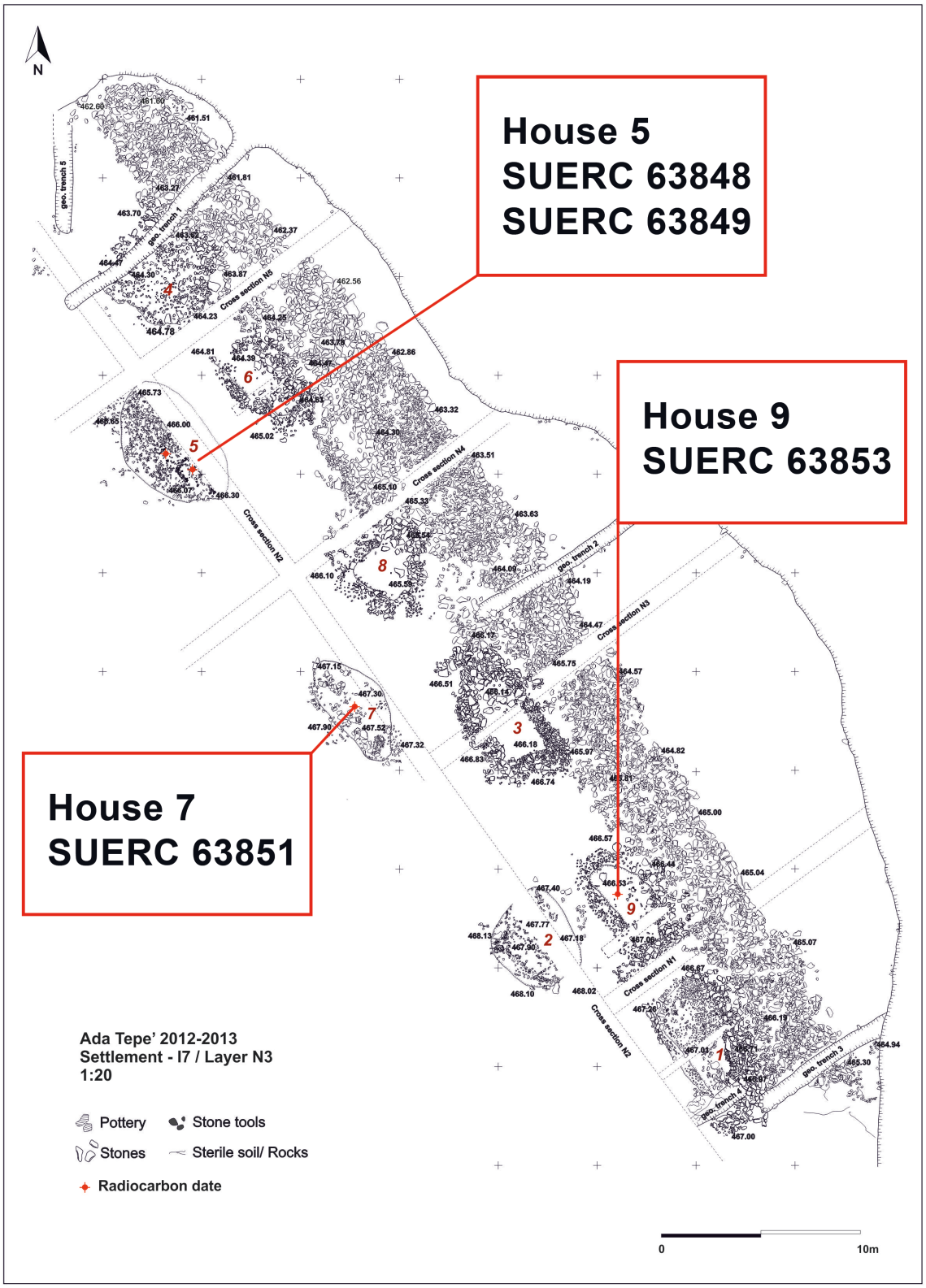


Fig. 14 Sector I-7/I-8. Plan of the excavated sectors of the northeastern settlement with indicated locations of the absolute dates from dwellings nos. 5, 7, and 9 (© H. Popov, M. Koleva, A. Andonova, I. Valchev, E. Nikolova, S. Iliev)

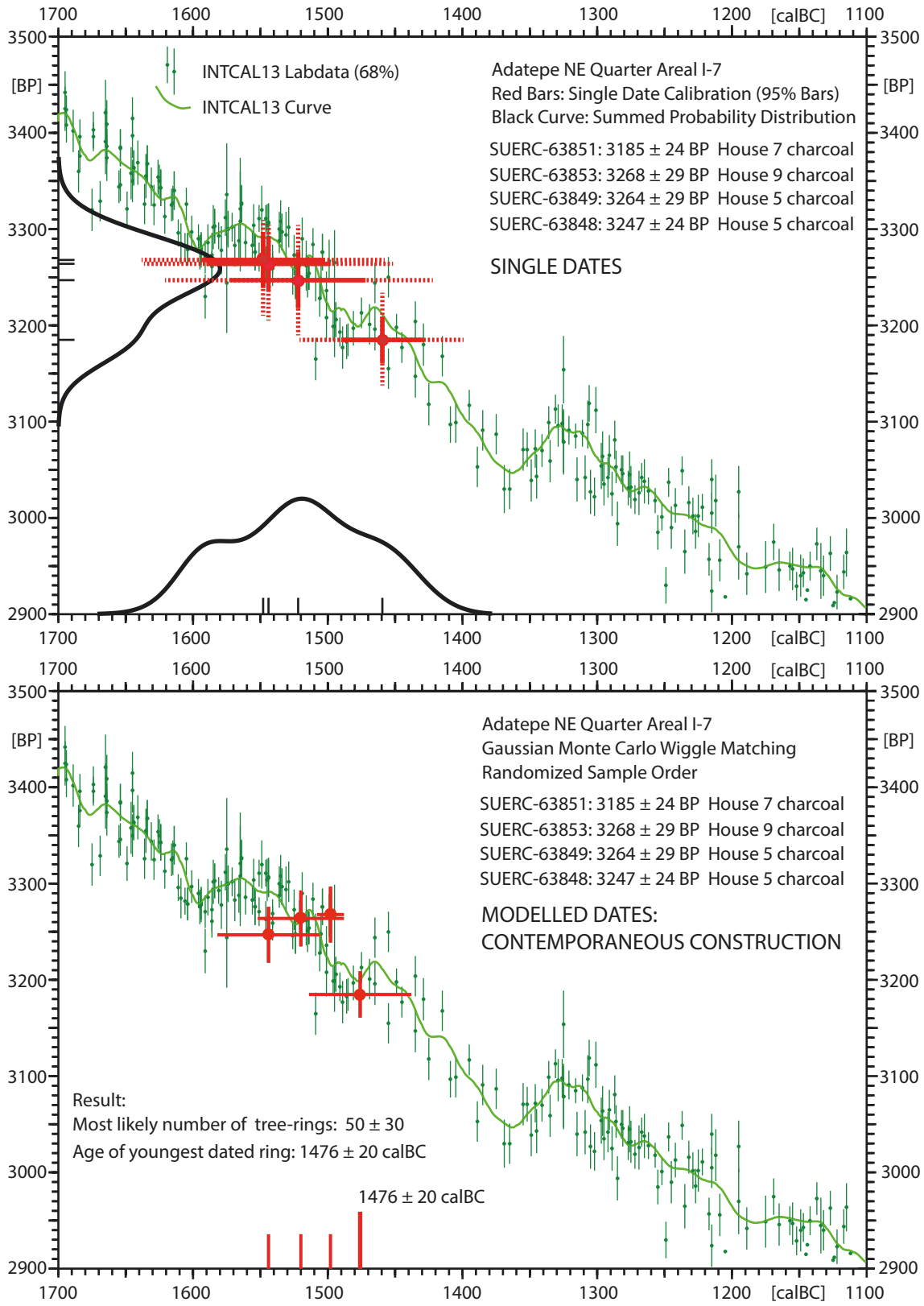


Fig. 15 Ada Tepe, NE Quarter: a. single age calibration and summed calibrated distributions of four charcoal samples from three (probably contemporaneous) houses. The observed wide (~200yr) but clearly artificial spread of the calendric readings is easily explained by the shape of the calibration curve (graphics: Bernhard Weninger); b. Monte Carlo Wiggle Matching of the same data as in a, with statistical contemporaneity modelling of the dated charcoals. The properties common to all four charcoals are that they have 50 ± 30 tree-rings and a youngest ring that dates to 1476 ± 20 calBC (graphics: B. Weninger).

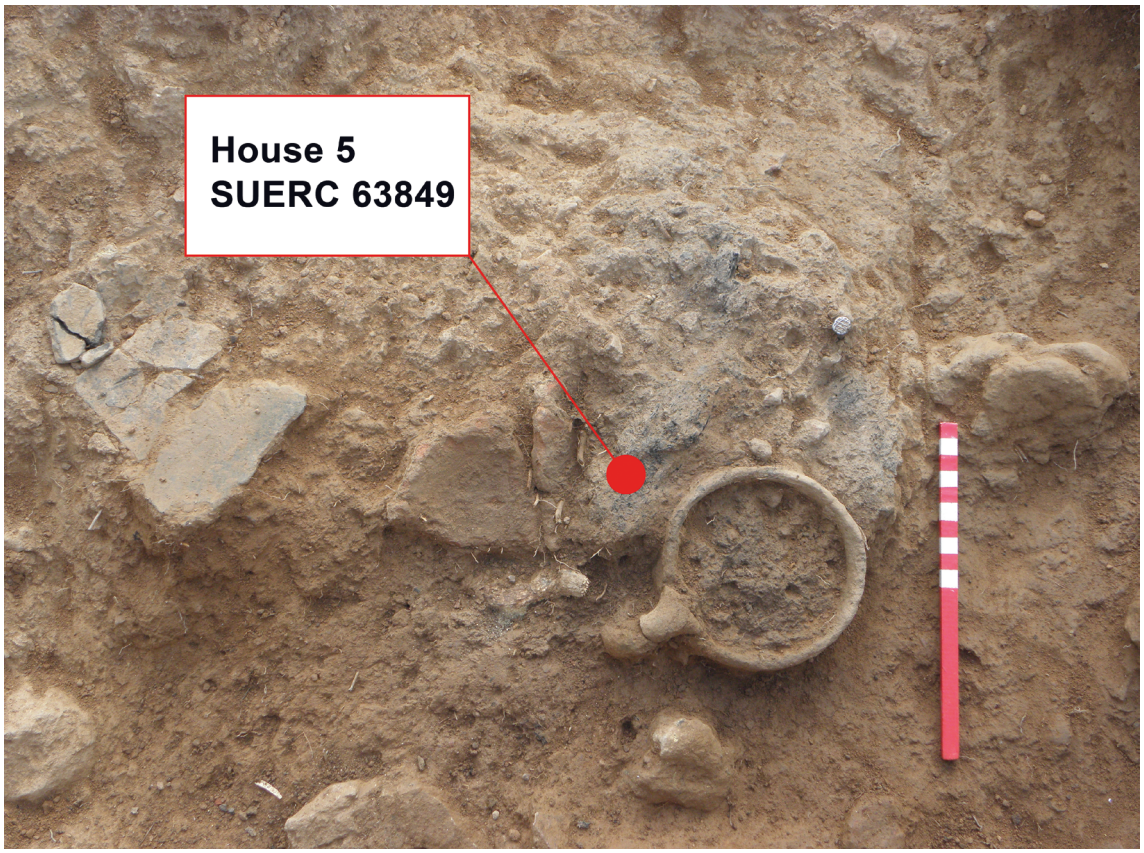


Fig. 16 Ceramic inventory (one-handled cup/vessel no. 6, Fig. 17) from Dwelling No. 5, with location of the remains of wood, sampled as SUERC-63849, indicated (© H. Popov, S. Iliev)

is forthcoming.[28] For these reasons, no detailed descriptions of archaeological contexts and the accompanying materials will be offered here.[29]

Due to the systematic layout of the settlement, it is highly probable that the NE Quarter is the result of organized planning. The houses are arranged in two parallel rows next to a massive fortification or terrace wall that borders the area from the NE (Figs. 11–14). No superimposed architectural structures were detected, and all collected evidence suggests that the NE Quarter is a single-phase settlement.

The samples were taken from buildings nos. 5, 7 and 9 (Fig. 14). The collected material is charred wood. This raises questions about the 'old wood' effect, in this case meaning that the construction date of the houses might postdate by an unknown number of decades the actual date of the wood material.

For a more refined dating of the NE Quarter, one should take a closer look at the four ^{14}C ages already shown in the multi-group graph in Fig. 15. The dated charcoals are all of very small size, with the exception of sample SUERC-63849: 3264 ± 29 BP, taken from a larger piece of charcoal that was found directly next to a completely preserved handmade cup (Figs. 16, 17.6). This assemblage of pottery and charcoal represents part of the floor deposit inside House 5 (Fig. 17.2–6). This specific situation suggests that we are not dealing with charred wood from a hearth. It is more probable that the dated charcoal is from a burnt wooden construction. This hypothesis is further

28 Burkhardt in press.

29 See detailed description, stratigraphical analysis and discussion on the interpretation of the archaeological remains in these sectors in the above-mentioned publications.

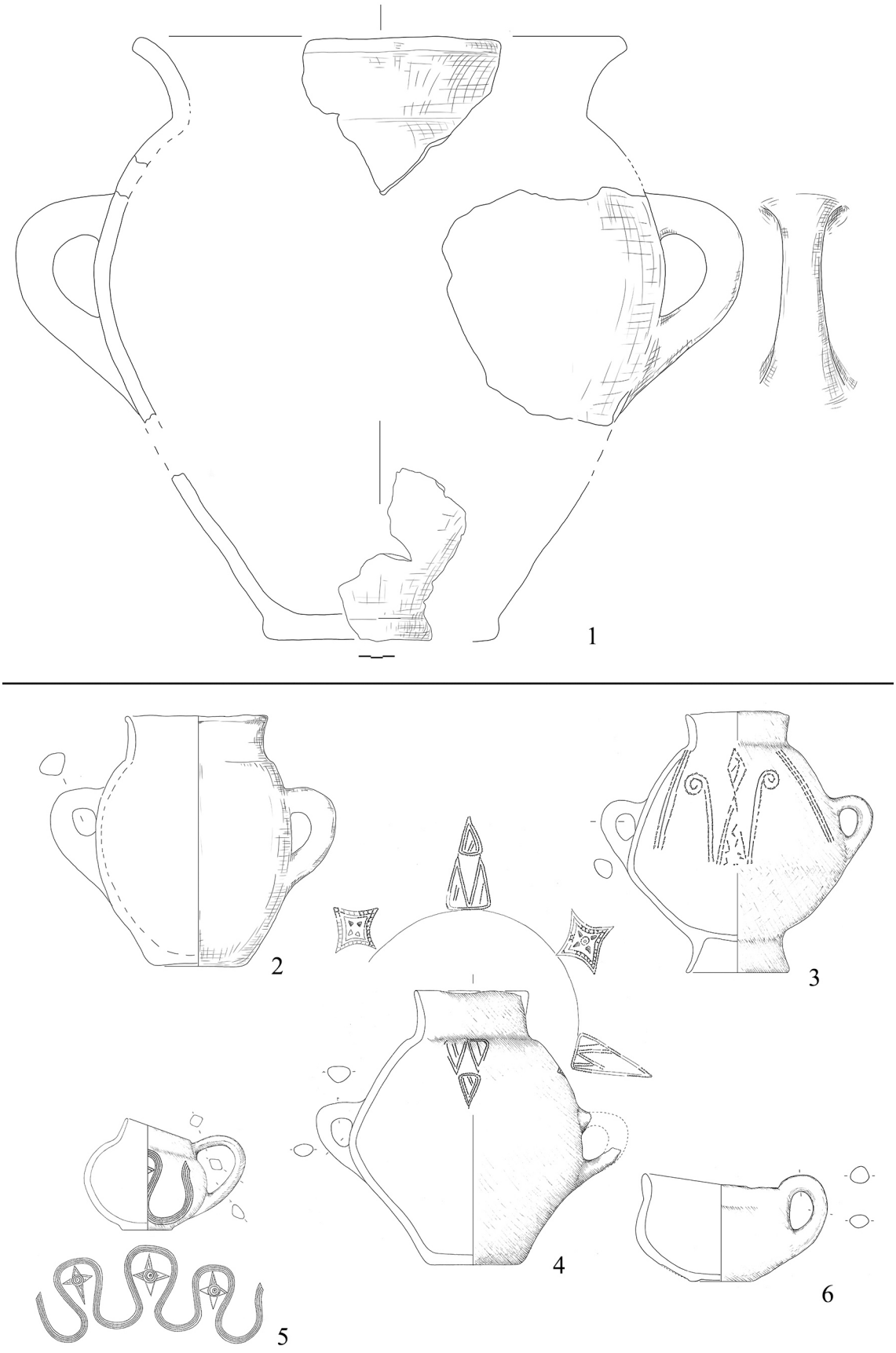


Fig. 17 Ceramic inventory from various features, excavated at the northeastern settlement.
1. Dwelling no. 2; 2–6. Dwelling no. 5. Scale 1:5 (© K. Nikov, Y. Dimitrova, S. Vassileva)

supported by the fact that House 5 contained several small concentrations of burnt daub fragments bearing impressions made by wood.

Therefore, in the chronological modelling we decided to treat all four charcoal samples as contemporary and reflecting the construction rather than the abandonment of the three ^{14}C-dated houses in the NE Quarter.

Taking into account that the houses of the NE Quarter had rubble walls and upper structures made of wattle and daub, the settlement phase of this habitation quarter cannot have lasted for many decades. The analysis of the radiocarbon measurements provides us with a latest possible date around the middle of the 15th century calBC for the abandonment of the houses in the NE Quarter (see the discussion of the chronological model below).

Comments on the Overall Stratigraphic Context

The relatively thin cultural layers, in which it is not possible to distinguish separate phases, and the close grouping of the four radiocarbon dates from this sector of the hill indicate a short period, during which this area was affected by processes related to the Late Bronze Age occupation. The comprehensive analysis should take into account a few additional details that are important for the general chronological reconstruction and the functional interpretation of the site.

1. During the construction of the massive terrace wall, broken grinding stones were used as building material in some places. In sectors I-7 and I-8, the southeastern part of the wall and parts of House No. 1 sit directly on top of depleted ore veins, and these small-scale open pits were apparently exploited before the construction of the settlement. The same is true for the northwestern periphery of the settlement in sectors H-5 and H-6, where in the levelled area behind the first row of houses, one could clearly see gold-bearing quartz veins with traces of fire-setting around them. At the same time, in the walls and the stone foundations of some of the dwellings, there are small and medium-sized stone blocks (up to 0.30–0.40m) with traces of lean ore content and with a clear difference in the colour due to the application of fire. The evidence from these particular situations on the terrain could provide a terminus post quem for the organized construction of the settlement in the northeastern sector of the peak. It testifies to the fact that it was preceded by small-scale mining activities, after the completion of which it was possible to proceed with the preparation of a place that would allow for a more permanent presence here. Some of the technological waste from the mining and sorting of the richer and leaner pieces of ore was subsequently used as construction material for the massive wall and the adjacent structures. Taking into account the information that we have from the model created from the absolute dates and the additional information about the duration of the occupation obtained from the cultural layers and the ceramic assemblage, these early mining activities that predated the construction of the northeastern settlement could presumably be dated to the beginning or the first decades of the 15th century calBC. Bearing in mind the volume of the ore deposits that were exploited here, these activities could hardly have lasted for many seasons/campaigns before the creation of the settlement.

2. When developing the absolute chronological model of the Northeastern Quarter, additional attention should be paid to the way in which some of its remains were covered by waste from later exploitation. The latest contribution made by the doctoral dissertation of Laura Burkhardt offers an interpretation, according to which the remains of structures/dwellings from the settlement can be divided into three groups; the groups in the central and eastern parts may have been abandoned slightly later than those in the Northeastern Quarter.[30] Irrespective of whether the settlement in the Northeastern Quarter was deserted gradually or all at once, there are clear indications of an organized abandonment of this settlement area and the removal of the inhabitants to other parts of the peak.

[30] Burkhardt in press, chapter 3.3, figs. 28, 123.



Fig. 18 Panoramic view from the north of the eastern slopes of Ada Tepe, sectors J-9, I-9, I-10, I-11. Dumps of technological waste, working sites and open cast mining works, excavated by means of transverse cross-sections (© H. Popov, P. Georgiev)

The fact that large parts of the area of this early settlement were buried beneath layers of broken-up rock materials related to ore-dressing at the working sites in the northern periphery of the peak testifies that the mining and ore-processing activities definitely continued after the middle of the 15th century BC, when the early northeastern settlement was abandoned for good. This stratigraphic situation was particularly clear in the western and central parts of the settlement, where the subsequent layer of technological waste was more than 0.40–0.50m thick. In the southeastern parts of the settlement, this process is less pronounced.

3. Based on the analysis of the entire stratigraphic evidence and of the absolute chronological model, it can be assumed that the ceramic inventory of the northeastern settlement should be dated to the first half of the 15th century BC, but not later than the middle of the same century. The short time frame for the existence of the pottery assemblage (only three decades in the first half of the 15th century BC) makes it a very useful, highly precise benchmark for the pottery repertoire in this part of the Balkan Peninsula. As a rule, the pottery assemblages of other sites known so far are dated to much wider and relative chronological frames. The combination of the series of absolute dates with the short period of existence of the settlement on the northeastern slopes makes the pottery assemblage of this Ada Tepe sector very important for determining the pottery characteristics during the early stages of the Late Bronze Age.[31]

[31] Detailed information about the context of the discovery, the formal-typological and functional characteristics of the pottery assemblage and its statistical parameters are published in Popov et al. 2017, 172–192; Horejs 2017; Burkhardt in press, chapters 6 and 8.1.3, figs. 43, 48, 56, 62, 67, 74, 77, 83, 86, 91, 93; Burkhardt this volume; and Burkhardt forthcoming, fig. 7.

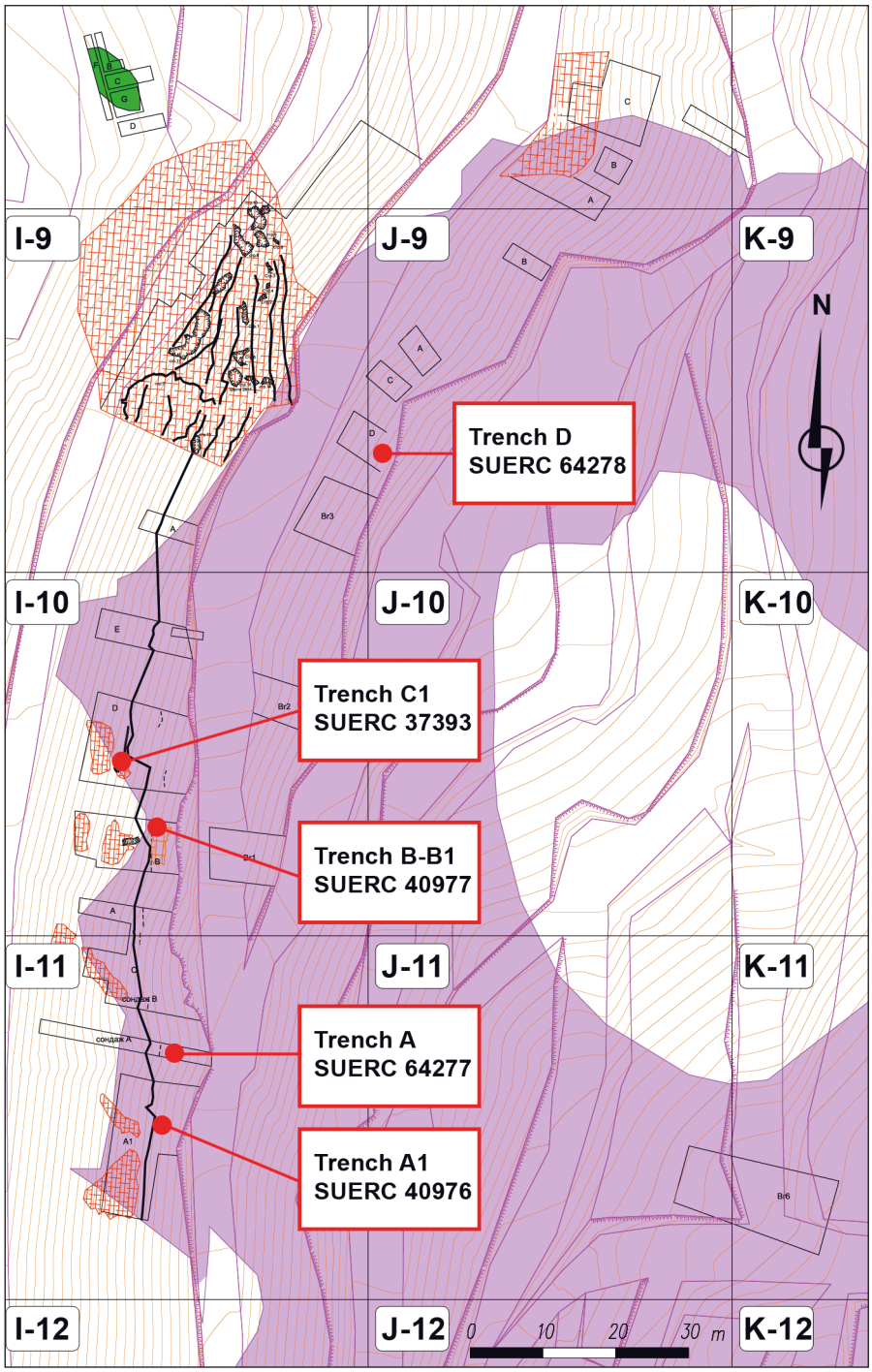


Fig. 19 Eastern slopes of Ada Tepe. General plan of sectors J-9, I-9, I-10, I-11 with locations of the absolute dates related to the waste heaps, working sites, and open cast mining works in this zone of the hill indicated (© H. Popov, S. Iliev, B. Gjaurova)

The Mining Waste Heaps and Working Areas on the Eastern Slopes (Sectors I-9, I-10, I-11, J-9)

The next group of dates is from the sectors I-9, I-10, and J-9 (on the eastern slopes). Some of the largest mining pits are located in this area, as well as accompanying working sites and waste heaps that form a broad front descending to the base of the slope, covering an area of 50,000m² (Figs. 8, 18, 19).

The very landscape in these areas of the peak presupposes the emergence of complex stratigraphic situations. In places, the pitch of the slopes is up to 45–50° or even more. This situation is favourable for active erosion processes that lead to the redeposition and mixing of materials from different chronological periods. Such processes were often observed by the archaeological team during the rescue investigations. The deforestation that is a constant companion of mining was another factor that aided the accumulation of thick layers on the slopes of the peak. The preparation of the terrain for rescue archaeological investigation also entailed such deforestation, which circumstance allowed us to observe the intenseness of the erosion processes.

In the area of the eastern and northeastern slopes, some of the largest mining pits on Ada Tepe were investigated. The extraction of gold was carried out by means of open cast mining. The stratigraphic observations in these sectors were obtained on the basis of the investigation of the waste heaps and of associated satellite areas.

There were two main sources for the accumulation of layers on the eastern slopes: 1. the mining pits that moved from one area to another over time; and 2. the slipping and redeposition of materials related to the contemporary or later human occupation of the crest of Ada Tepe. The thickness of the layers in the waste heaps often surpasses 2m, and they are particularly thick at the base of the slope, immediately below the main mining areas in sectors I-9, I-10, I-11, J-9, K-10 and K-11.

When analysing the stratigraphic situation, it should be noted that as a rule, the waste heaps in sectors I-9 and I-10 and to the south of them contain mixed materials; there, down to a depth of 0.80–1.00m, Late Bronze Age and Early Iron Age materials and even isolated Hellenistic finds were discovered. This is due to the fact that these sectors are located immediately below the central part of the peak. Here, the slopes are at their steepest. Such mixing should be explained in terms of the redeposition from the peak and down the slopes of materials related to the human presence on the peak itself during the successive chronological periods. The same regularity is also observed on the western slopes, where the waste heaps descended directly from the peak (like those in sectors E-9 and F-9 or to the south of them, in sectors D-11, D-12, E-11, and E-12). In the layers close to the surface, these waste heaps yielded mixed materials, mainly from the Late Bronze Age and the Early Iron Age, but also some materials from the Hellenistic period. When considering the topographical regularities as a factor for the distribution of the archaeological evidence, it should be stressed that to the north of sectors F-10 and G-10 and to the north of the central parts of H-9 and I-9, there were no materials from the Early Iron Age and the Hellenistic period. Taking into account the overall stratigraphic picture, one must conclude that the entire area to the north of the line traced above was affected more durably only by human activities (inhabitation, mining, etc.) during various stages of the Late Bronze Age. Isolated finds from the Early Iron Age and the Hellenistic period that were collected in this area, predominantly close to the surface, should be dismissed and treated as inconsequential for the overall analysis.

An important place in the comments on the eastern slopes is occupied by a group of three radiocarbon samples – SUERC-37393, SUERC-40977, and SUERC-64278 (Fig. 19). The fact that all three of them are taken from bone material (of cattle) should be mentioned as a favourable circumstance. All three dates fall within the limits of the 15th century calBC (Fig. 20).

Sample SUERC-37393: 3225 ± 30 BP was discovered at -0.70m below the surface, in a clearly defined layer of technological waste in Trench C-1 of Sector I-10. The reddish-brown maroon colour and the large amount of crushed rock materials with clearly visible traces of fire-setting are an explicit testimony to this. The sample could be related to mining activities carried out in this area. With its age of 1490 ± 40 calBC, this is one of the earliest absolute dates from the archaeological site. At the same time, taking into account the observations in the field outlined above, namely that the waste heaps contain mixed materials to a depth of almost 1m, one cannot completely exclude the possibility that the bone has been transported down the slope – either from one of the numerous rock outcrops situated higher up to the west, or from the peak itself, which also yielded 15th-century calBC materials. The date corresponds well to some of the earliest dates

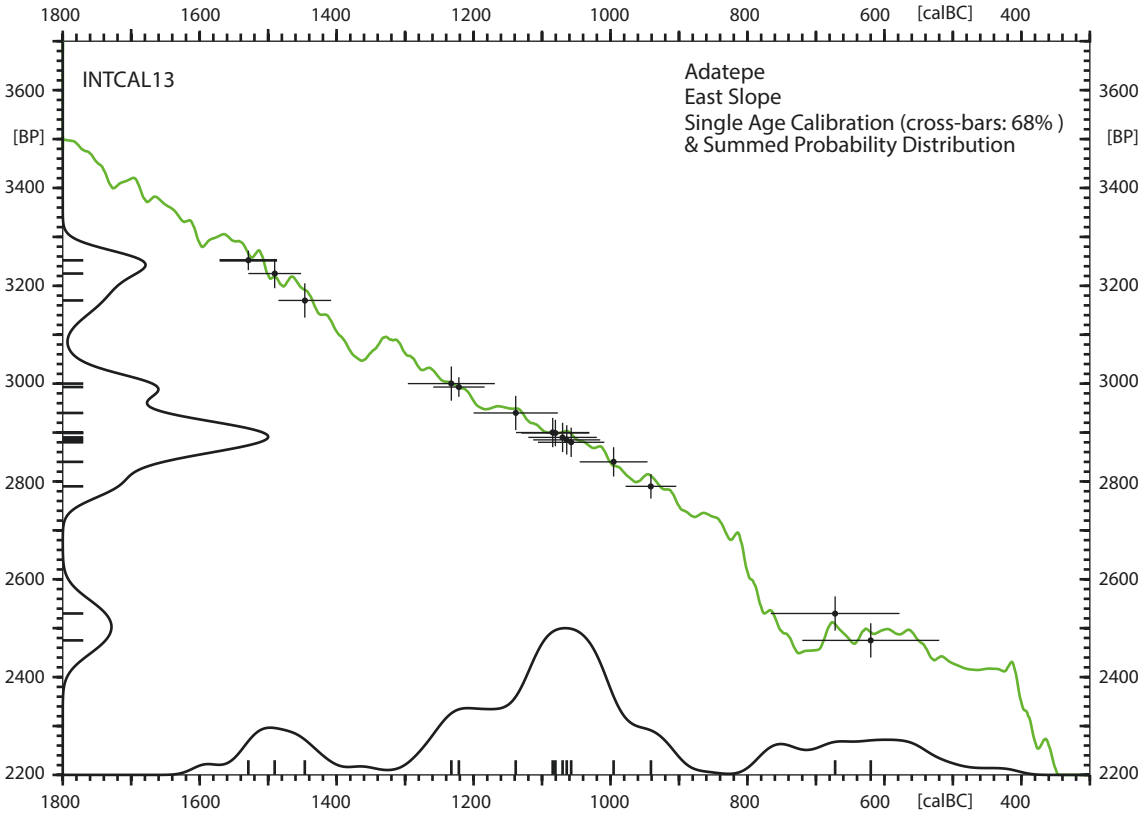


Fig. 20 Ada Tepe, East Slope: single age calibration of all available data (graphics: B. Weninger)

from the central part of the hill – samples SUERC-43625, SUERC-64177 and SUERC-64258 (see below).

The last two samples are of particular importance for the overall interpretation in the area of the eastern slopes of Ada Tepe and its interpretational relation to the other sectors of the archaeological complex.

Sample SUERC-40977: 3170 ± 35 BP was discovered at a workplace, probably with the remains of a shed or another light construction, uncovered in trenches B and C-1 of Sector I-10. The shed was built immediately in front of the heading in the rock reached by the open mining. In fact, the rock from the west served as a wall and shelter. There was a fireplace in the shed, and remains of finely crushed rock materials were discovered in the northern and the northwestern parts of the structure; they are probably related to the process of sorting and preliminary processing of the ore that was mined in the immediate vicinity (Figs. 21–22). The situation is a good parallel of what was discovered in the neighbouring trenches A-1 and B, where in front of the face of the vertically hewn rock, the remains of a ledge/path were uncovered, with traces of terracing and of reinforcing of its path along the slope; it runs along that slope from north to south and provided immediate access to the mining area (Fig. 23). The situations revealed in the field in this area of the archaeological site positively testify to remains of initial exploitation and activities related to the preliminary sorting and dressing of the ore. At a later stage, the shed was buried beneath a layer that slid down directly from the exposed rocks (the low degree of quartzification of the sedimentary rocks makes them prone to erosion and crumbling within a few seasons). In absolute values, the date falls around the middle of the 15th century BC (1450 ± 40 calBC). Later, on top of this layer, debris from mining at places higher up the slope accumulated, as well as layers from the later occupation periods of the peak. In this manner, the remains of the shed and the fireplace were buried at a depth of more than -2.50m below the slope's surface. In the area of Trench C-1,

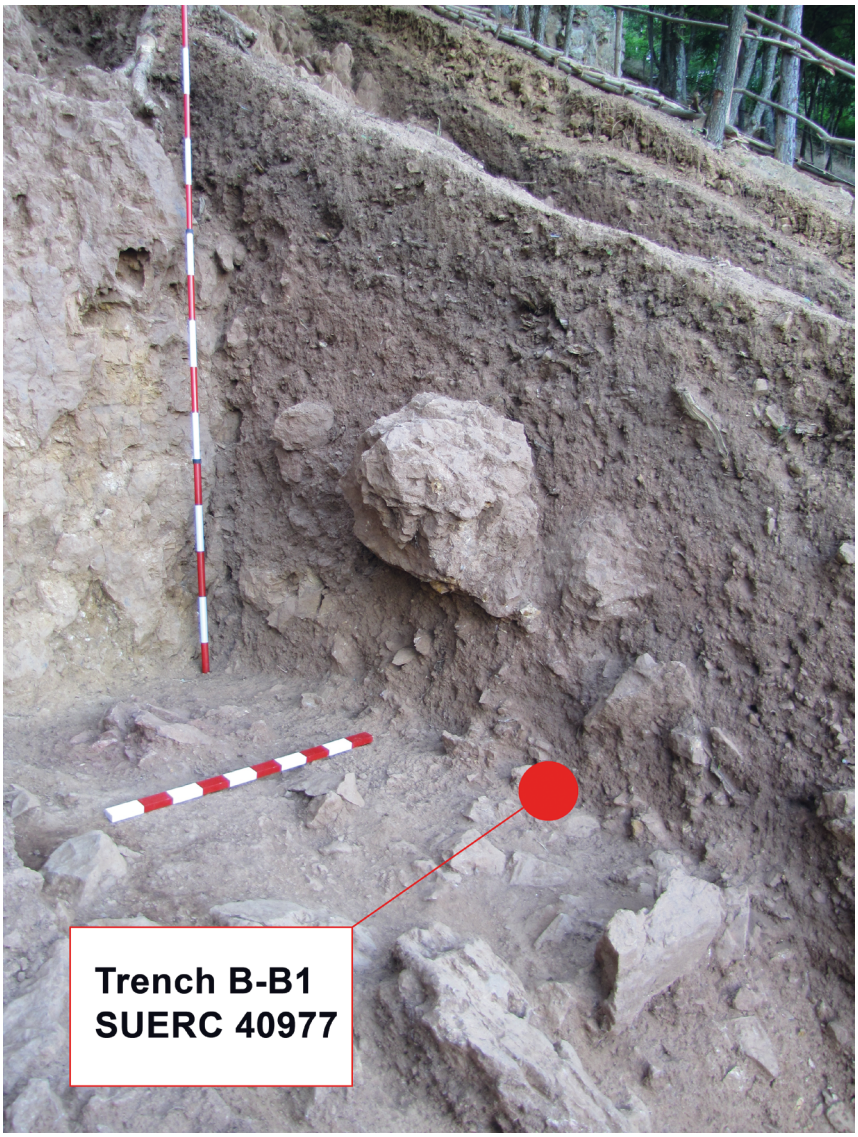


Fig. 21 Trench B-B1 in Sector I-10, with the location of the radiocarbon sample SUERC-40977 indicated (© H. Popov, P. Georgiev, S. Iliev)

the mining did not last long, which helped the place, after it was abandoned, to remain sealed beneath the thick layers.

Sample SUERC-64278: 3252 ± 20 BP is the earliest of the entire complex. It has a calibrated date of 1530 ± 40 calBC. The sample was discovered in Trench D of Sector J-9, at a depth of -1.30m from the surface of the slope. It is important to remember that in this area the peak further uphill yielded only materials from the Late Bronze Age. The stratigraphic position of the sample is between two pronounced layers of waste heaps and it comes from the layer immediately overlying the deeper one (Fig. 24). The area of archaeological trenches in Sector J-9 lies immediately at the foot of the large rock massifs in Sector I-9, where numerous traces of ore exploitation were identified during the campaigns in 2012 and 2013 (Fig. 7).

The very position of the sample makes it a terminus ante quem for the remains of waste heaps situated beneath it, as well as for the remains of a rectangular working site that was reinforced with large rocks along the edges (Fig. 25). This is one of the earliest dates, connected to the mining and, in general, to the human presence on Ada Tepe. One should keep in mind that in this case it is a bone sample (*Bos taurus*), in contrast to the samples from Sector I-7 (the early settlement of

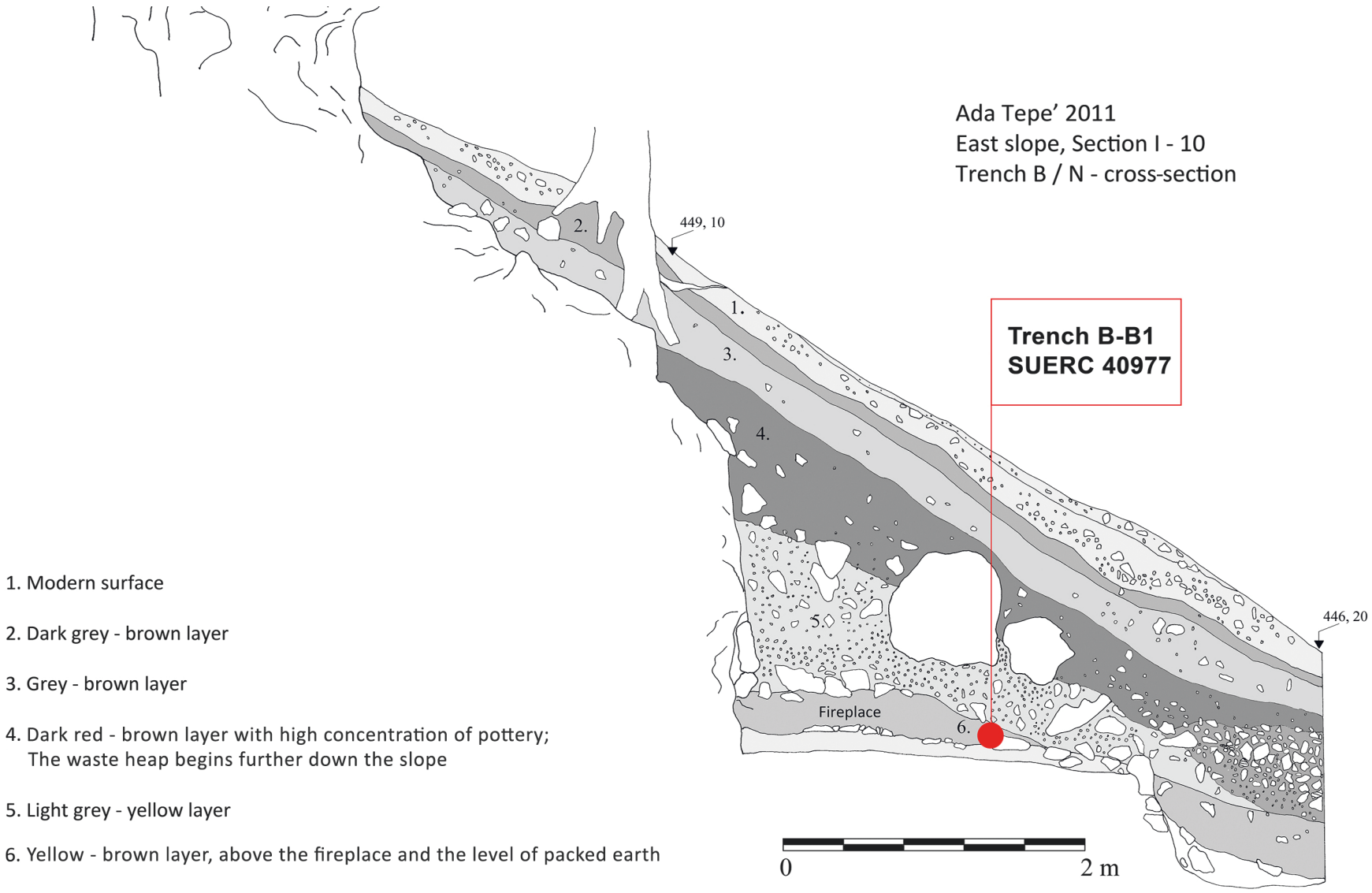


Fig. 22 Stratigraphic section of the waste heap and the working site covered by it in Trench B-B1, Sector I-10, with the location of the radiocarbon sample SUERC-40977 indicated (© H. Popov, E. Nikolova, S. Iliev)



Fig. 23 Sector I-11, trenches A1 and B. Remains of ledge/path with traces of terracing and reinforcing along the slope (© H. Popov, P. Georgiev)

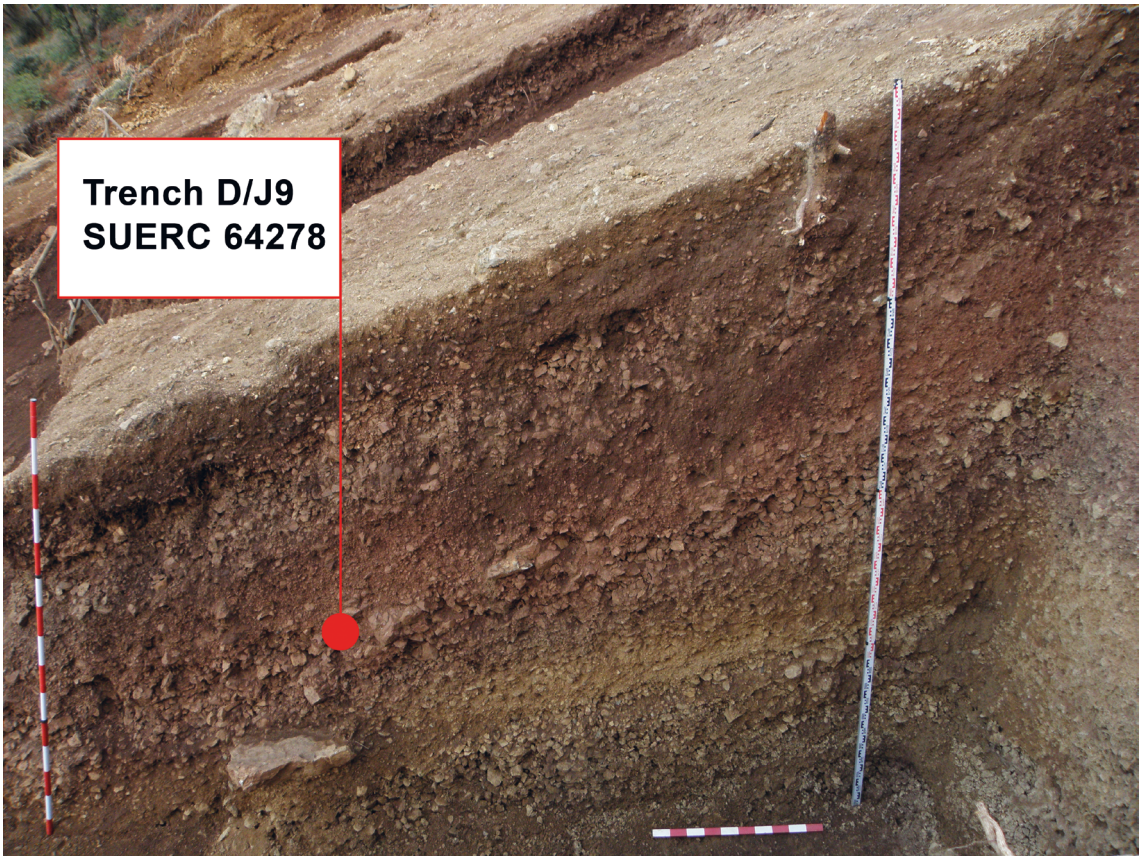


Fig. 24 Trench D in Sector J-9. Stratigraphic section of dumps of technological waste. Stratigraphic location of radiocarbon sample SUERC-64278 (© P. Georgiev, S. Iliev)

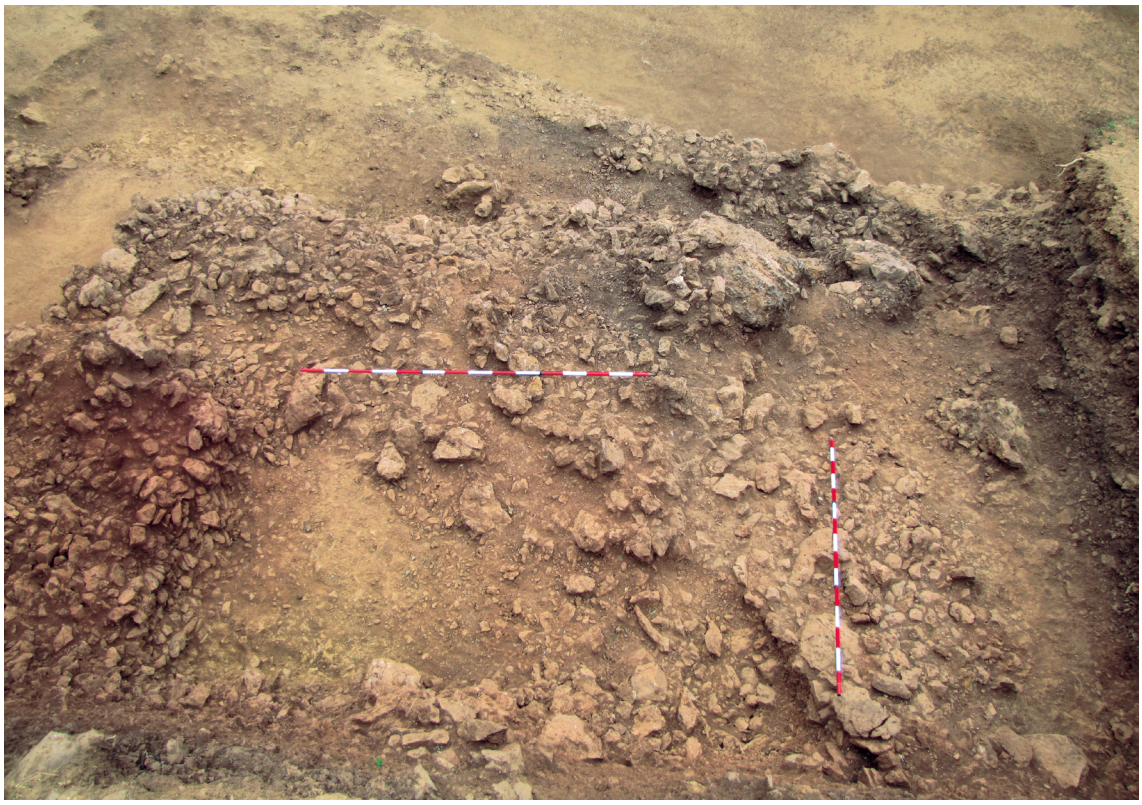


Fig. 25 Remains of a working site, covered by layers of waste heaps, in Sector J-9 (© P. Georgiev)

the northeastern part of the hill), where the 'old wood' effect should be taken into consideration. Taking into account the clear traces of thermal processes in the entire area of the structure (reddish-brown layer, ash, numerous traces of fire-setting on the surfaces of all stones in the area), it could be interpreted as a place where crushing of the ore was carried out in order to separate the richer pieces in preparation for subsequent grinding and dressing. The stratigraphic situation implies that these activities predated the sample SUERC-64278. In this context, a small jug could be adduced as an important find (Fig. 26). It was discovered during the preliminary trench investigations in 2009, (as it turned out subsequently, when the entire structure was uncovered and interpreted) between the terracing blocks that reinforced the slope in the southeastern periphery of the working place.

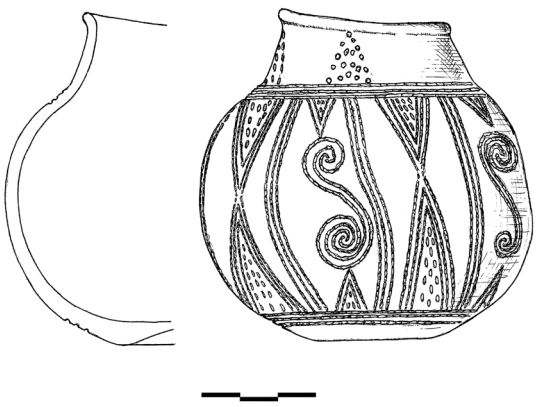


Fig. 26 Ceramic jug with *Furchenstich* decoration, found during preliminary trench excavations in 2009 on the southwestern periphery of the working site (Fig. 25), excavated in 2012–2013. Scale 1:2 (© K. Nikov)

A large number of the ceramic artefacts from the waste heaps in Sector J-9 are heavily fragmented, but are homogenous in terms of their chronological characteristics and confirm the observations on this part of the top that mainly Late Bronze Age materials were found here (Figs. 27–28). This pottery assemblage should also be accepted as one with a short chronology and related to the first stage of the human presence on the hilltop (15th century calBC, see below). The general observations on the assemblage from those waste heaps are quite similar to the ones from the other features (including working places and huts) of that earliest activity

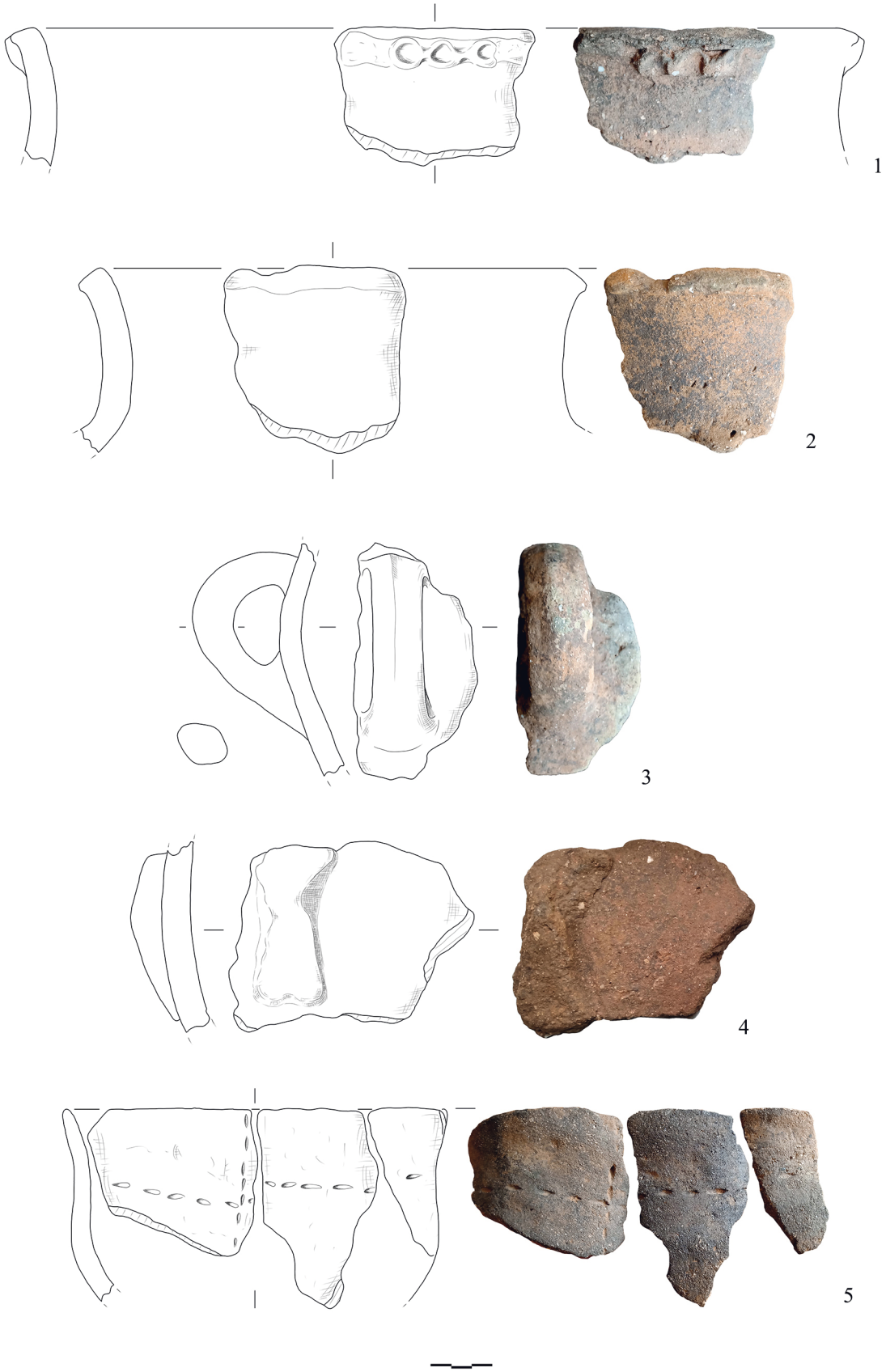


Fig. 27 Pottery from the waste heaps, accumulated in Sector J-9. Scale 1:3 (© Y. Dimitrova)

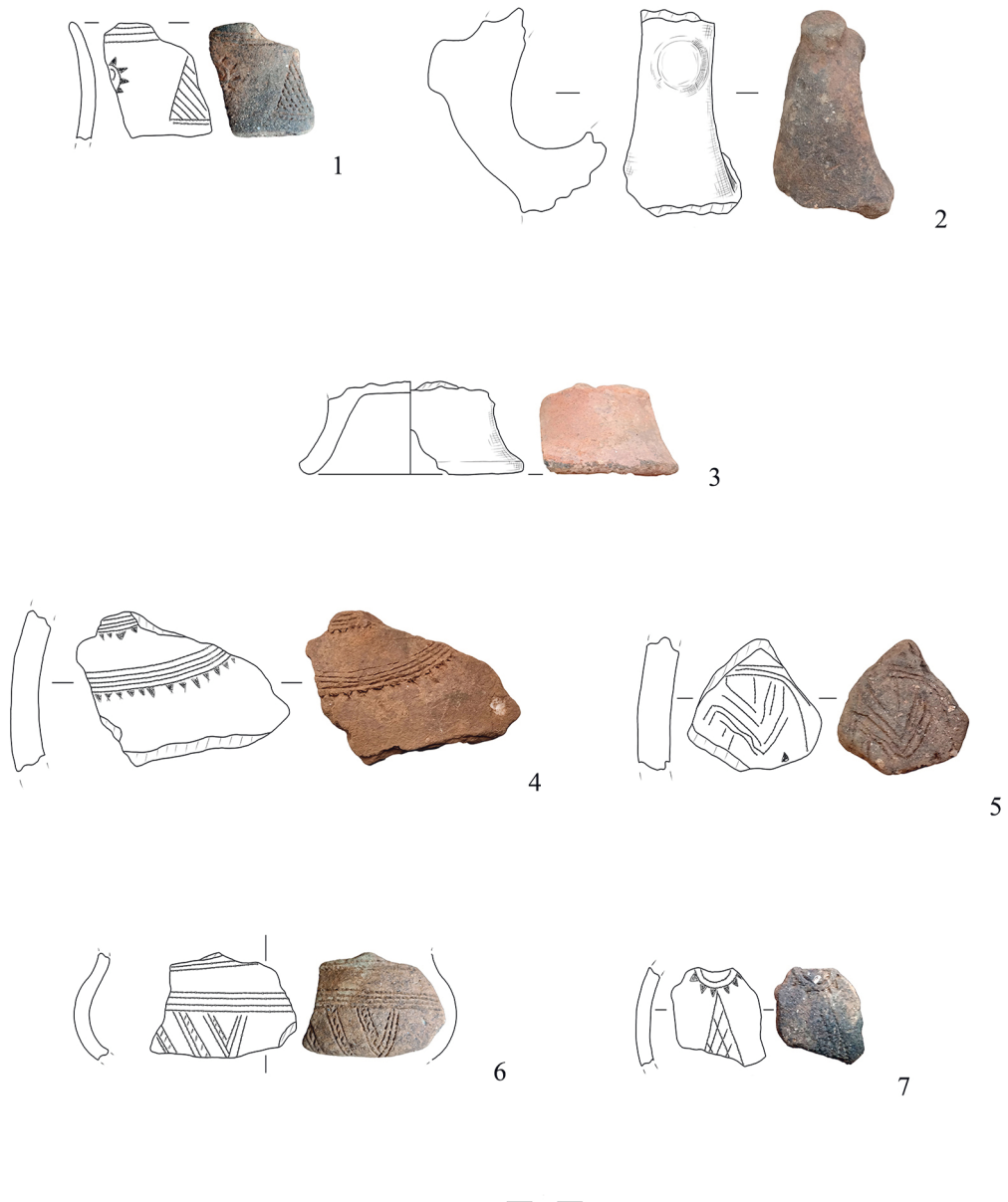


Fig. 28 Pottery from the waste heaps, accumulated in Sector J-9. Scale 1:3 (© Y. Dimitrova)

phase.[32] As the material originates from technological waste, only the characteristics related to the chronology should be taken into consideration. The material demonstrates a fully developed pottery repertoire, with all technological groups of coarse, semi-fine and fine ware, and well-developed categories of vessels for long- and short-term storage of liquids and products (storage vessels of two technological groups – coarse (Fig. 27.1) and semi-fine ware (Fig. 27.2); amphorae (Fig. 27.3), jugs and bowls of big size, representatives of the semi-fine and fine ware, food preparation (coarse ware jars, Fig. 27.5) and consumption of food and liquids (bowls, cups, kantharoi) (Fig. 28). Just one category is not represented in this complex – the flat baking trays. The basic forms of the vessels of the first activity and settlement phase continue their development in the following phase, as is visible in the preference for slight, s-shaped forms during the earlier phase. New forms and silhouettes appear during the second settlement phase in the categories of bowls

[32] See Dimitrova this volume

and cups/kantharoi; by contrast, the typical form of the elongated, s-shaped jar with one vertical handle is typical only for the first phase. The biconical shape of some vessel bodies in some categories can be seen as a local characteristic for the Ada Tepe complex. Some other elements are also typical for the early period; among the coarse ware pots (storage vessels and jars) still no tongue-like handles are detected (these are typical for these vessels in all other Late Bronze, Early Iron and even Late Iron Age handmade pottery classes). In this early stage of the Late Bronze Age, perhaps the most remarkable element of the assemblage, which can also be observed in the waste heaps' pottery repertoire, is the comparatively high presence of *Furchenstich* decoration on fine ware vessels and in some cases also on semi-fine ware pots. The percentage of fragments decorated with this technique is higher than 8% of all processed pottery sherds from this sector, or approximately 70%[33] of all decorated sherds, including the coarse ware sherds with plastic decoration.

Comments on the Overall Stratigraphic Context

1. The comprehensive analysis of the group of early radiocarbon dates and the model they present, as well as the interrelations between the stratigraphic observations for the area of the eastern slopes of Ada Tepe and those for the other sectors of the peak, indicate that here the mining activities started during the earliest phases of human presence on the peak. The dates correspond well with those from the Northeastern Quarter, as well as with the early evidence from the hilltop (Fig. 20). The close proximity to the northeastern settlement testifies to the functional connection between these two parts of the complex. At the same time, the mining at this place probably continued after the middle of the 15th century BC, i.e. after the abandonment of the northeastern settlement and the organized transfer of the habitation to other areas of the peak.

2. An important question is raised by the fact that the radiocarbon dates from the eastern slopes could be divided into two separate and chronologically quite distant groups. Both in terms of context and stratigraphy, the group of early samples that was discussed above is clearly related to the traces of mining and ore processing at this place.

At the same time, a group of 10 more samples is clearly clustered in the period of the 12th, 11th and 10th centuries calBC.[34] As a rule, these dates come from the layers in sectors I-10 and I-11, where mixed materials from the Late Bronze Age and the Early Iron Age are found at a considerable depth. The stratigraphic positions of the second group also suggest that one should take into account redeposition processes related to the later occupation of the hilltop of Ada Tepe. The depth from the surface at which the samples were discovered varies from -0.40 to -0.80–1.00m. In the case of the two exceptions (-1.10–1.20m and -1.30m) from trenches C and D in Sector I-10, the specific stratigraphic situations support the conclusion that the mixing and redeposition of materials from different periods has reached a greater depth due to the erosion processes on the slopes.

The situation in the field described above and the presence of a chronological hiatus of more than 250 years raises the legitimate question of to what extent the gold mining at Ada Tepe (or at least in these parts of the peak) could be related to the later stages of the Late Bronze Age and the early phases of the Early Iron Age attested in the human presence on the peak. The only samples, SUERC-40976: 3000 ± 35 BP and SUERC-64277: 2993 ± 20 BP, both bones from mixed layers in Sector I-11, that have calibrated dates in the 13th to early 12th centuries calBC and could therefore be regarded as a link between the two very distant chronological groups of absolute dates from the eastern slopes, should also be dismissed (Figs. 19–20). The fact they were discovered in the shallow layers in Sector I-11, trenches A-1 and A, respectively, suggests that they should be

[33] In later periods, this presence is visibly lower.

[34] These are SUERC-37374, SUERC-37375, SUERC-37376, SUERC-37377, SUERC-37391, SUERC-37392, SUERC-40975, SUERC-40976, SUERC-43627 and SUERC-64277.



Fig. 29 Remains of a dwelling with a fireplace investigated in Sector G-9, Trench 1/2009 (© H. Popov)

related to the redeposited materials from the later occupation of the hilltop, all the more since this period in the absolute chronology of Ada Tepe is attested precisely in the central sector.

The Date of the Activity Zones in Sectors G-9 and H-9 (Western Slopes)

The next group of materials is relatively small, but is very important for establishing the connections between and the overall interpretation of the two settlements and the areas of mining activities. In sectors H-7, H-8, H-9, G-6, G-7, G-8, G-9, F-8, F-9, and F-11, during the investigations in 2005, 2009–2012, and 2015, waste heaps, working places and isolated light structures were discovered at considerable distances from one another but in immediate proximity to some of the areas related to various stages of the *chaîne opératoire* of extraction, sorting and dressing of the gold-bearing ore (Figs. 5, 13). The sectors under consideration occupy the western and northwestern slopes of the peak, as well as some parts of the ridge between the northeastern and central settlements. The general stratigraphic situation and some of the archaeological structures have already been published; therefore, no detailed descriptions will be offered here.[35] Two structures are important for the present study, uncovered in sectors G-9 and H-9, respectively.

In Sector G-9, Trench 1/2009, parts of a structure were investigated, revealing that it underwent three use phases within a relatively short period. Initially, small-scale mining was carried out here (probably as part of the probing for richer ore bodies in the outcrops of heavily quartzified rocks). Then, the slope was additionally levelled, and a structure of light construction (dwelling, shed?) was built in the resulting hollow space (Figs. 29–30). There was a hearth in its southern part and the well-preserved remains of several vases were found in situ next to it – including a jug with rich *Furchenstich* decoration. The sample SUERC-37372: 3170 ± 30 BP comes from the floor level and the first layer of destruction above it (Fig. 31). Another intriguing circumstance is that the bone used for the AMS analysis is from a horse.

[35] For more detailed stratigraphic description and analysis see Popov et al. 2017, 194–199, figs. 29–35.



Fig. 30 Sector G-9, Trench 1/2009. Stratigraphic section of the remains of a small building, covered by layers of waste heaps (© H. Popov, P. Georgiev)

After the structure was abandoned, its remains and the hollow in the slope were gradually filled with spills of technological waste from the working places immediately above Sector G-9, in sectors H-8 and H-9 of the area of the crest. Another bone sample, SUERC-37373: 3100 ± 30 BP, from domestic pig, and a fragmentary mould for a Beguntsi-type double axe (the mould from Ada Tepe is very similar to the axe from Kirkovo) were discovered in the layers of the waste heap that filled the space of the abandoned structure (Fig. 31).[36]

Taking a closer look at these two radiocarbon samples, we note that their calibrated central values are in correct stratigraphic order, that is to say, the upper strata are dated to 1356 ± 50 calBC by SUERC-37373 (3100 ± 30 BP) and the lower strata have an age of 1450 ± 35 calBC (SUERC-37372: 3170± 30 BP). Nevertheless, to remain on the safe side of the analysis, given that stratigraphic reworking of the two samples cannot be excluded, and also because the two ^{14}C ages are statistically identical (with a weighted average of 3135 ± 21 BP; p=9.9%), it would appear most Solomonic to assign the (non-weighted) calibrated average of 1390 ± 55 calBC to their joint context and thereby accept that further chronological distinction would be unreliable. What we also observe is that the complex described above was sealed due to natural processes (erosion and soil formation in a forest environment) with a layer of earth, and was not contaminated with later materials. In this area, there are only Late Bronze Age materials, and the Early Iron Age is not represented.

The pottery from the building remains and the waste heap that cover it are homogenous in terms of their typological characteristics and date to the Late Bronze Age. More specifically, they

[36] Popov – Jockenhövel 2011, 276, fig. 12.

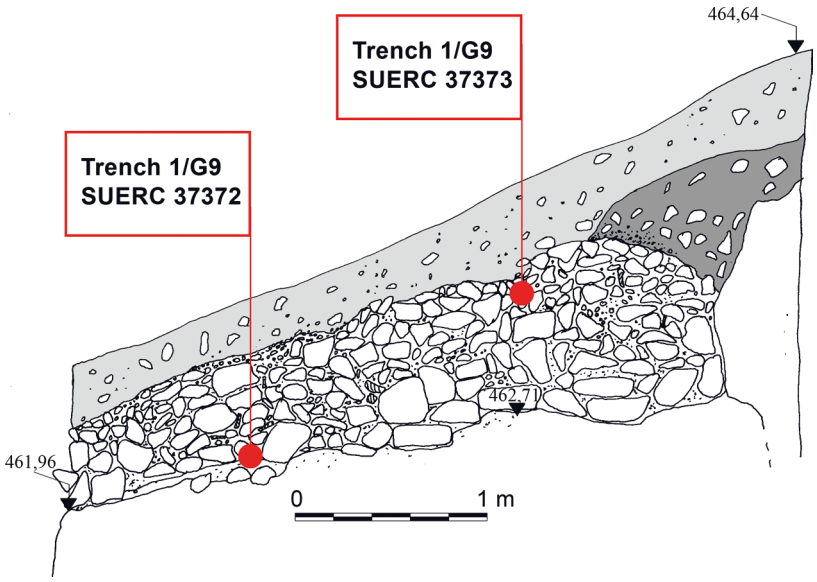


Fig. 31 Sector G-9, Trench 1/2009. Stratigraphic locations of two radiocarbon samples – SUERC-37372 and SUERC-37373 (© H. Popov, S. Iliev)

correspond to the materials from the early settlement on the northeastern slopes and from the waste heaps on the east slopes in Sector J-9 (Fig. 32). The assemblage from the building presents all the technological pottery groups – coarse, semi-fine and fine ware –, while the fine tableware is present as no more than 10% of all processed sherds. Based on the rim sherds, which amount to almost 7% of the processed fragments, the vessel repertoire can be determined. The storage vessels from the two technological groups (coarse and semi-fine) and the amphorae (for storage of liquids) together exceed 50% of all identified rim sherds. In this small house complex, vessels for food preparation (jars) and consumption (bowls) are also present, while there are only single rim sherds from cups and kantharoi; jugs are absent. Most probably, the set of vessels corresponds to the specific activity of the household members and their needs regarding the storage and consumption of liquids/food. The percentage of *Furchenstich* decoration is lower than in the J-9 waste heap due to the low presence of the fine ware. However, among the decorated sherds, this technique is almost twice as frequent as the plastic and pierced decoration.

Higher up the slope, to the west, in Sector H-9 (Fig. 13), a very similar situation was uncovered, with small rocky outcrops with traces of ore extraction on the surface. Later, at the same spot, a small structure of light construction was built. Unlike the situation in G-9, there were no traces of a fireplace here. The collected ceramic materials can only be dated to the Late Bronze Age in general terms. The entire surface of the area around Trench H-9-1-A, where the remains of the structure were investigated, was covered with a thin layer (up to 0.05–0.10m thick) of finely crushed rock that could be interpreted as waste from ore processing in the area of the crest between the northeastern and the central settlement. Unfortunately, the structure did not yield materials suitable for radiocarbon dating.

Finally, we briefly address the archaeological remains in Trench H-9-1-A. Their relevance for this article consists in the discovery of a handle fragment probably belonging to a wheelmade vessel (cat. no. 6, Fig. 10).[37] Two more sherds (tiny pieces with dimensions of 0.5–1.0cm) are body sherds, found in very poor condition, and the paste was crumbling. The surface of the handle fragment is completely worn off. It is therefore impossible to say if it once bore painted decoration. One cannot even determine whether this was the handle of an open or of a closed vessel. However, it is certain that we are dealing with a horizontal handle from a large vessel, probably

[37] See the catalogue of wheelmade vessels from Ada Tepe.

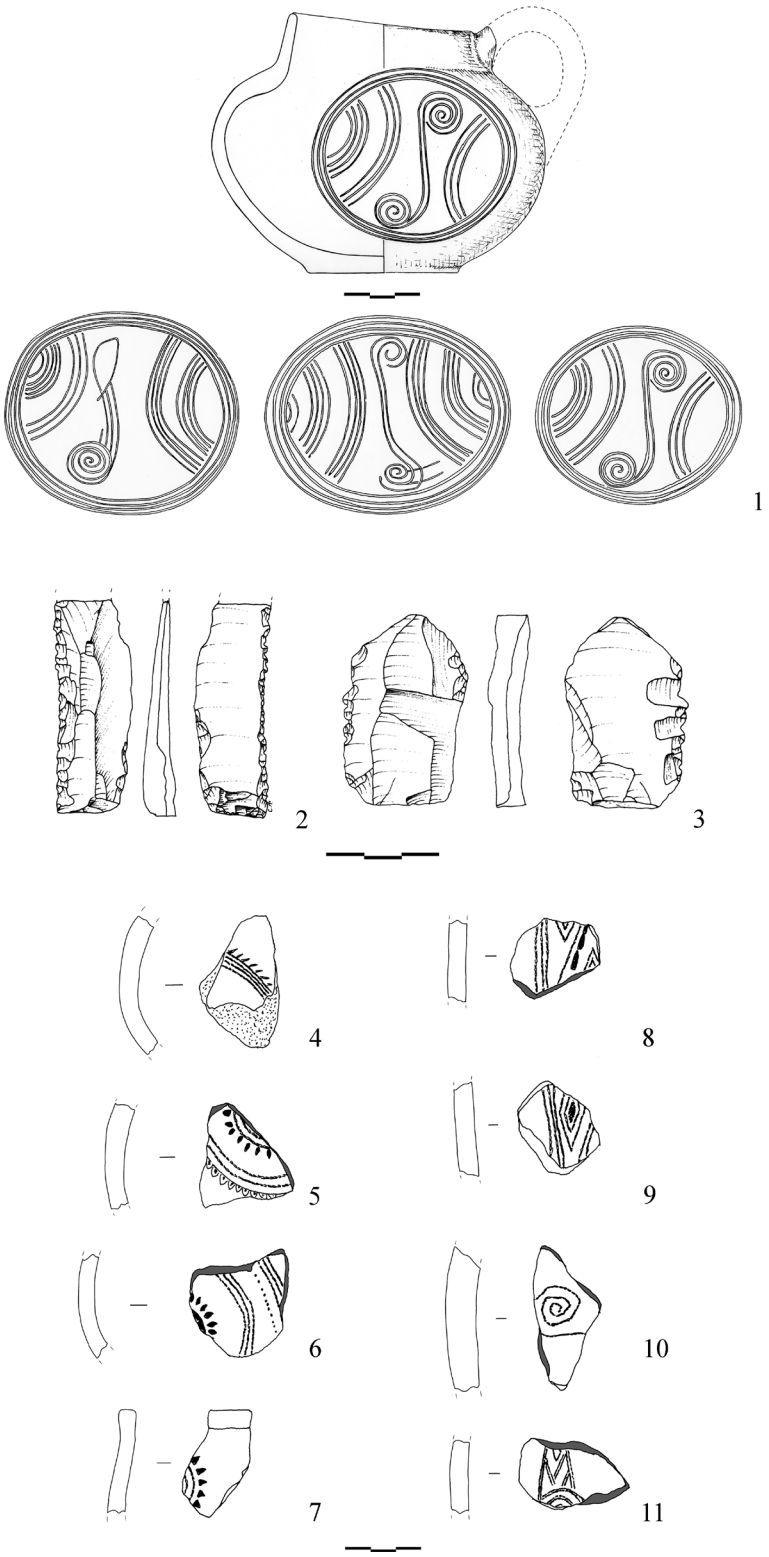


Fig. 32 Pottery and other finds from the remains of a dwelling in Trench 1/2009, Sector G-9. 1, 4–11: scale 1:3; 2–3: scale 1:2 (© K. Nikov, H. Popov, S. Taneva)

placed on its belly. This sherd differs from all the other wheelmade sherds found in the Bronze Age levels on the Ada Tepe hill in having a rather coarse fabric. Yet, it is still finer than the local handmade pottery, and it also shows a lighter colour than those local vessels. Cat. no. 6 might still have belonged to a vessel of Mycenaean type, but even this is not certain. Alternatively, it might be of Iron Age date or – though this is rather unlikely – of late Middle Bronze Age date.[38] The result of the NAA does not help in this respect, as the piece is a chemical singleton (NAA sample Ada Tepe 6, see below). Consequently, one cannot draw any chronological conclusions from this handle fragment.

Comments on the Overall Stratigraphic Context

The remains of the two structures described above belong to a group with a few more similar structures, uncovered in nearby sectors on the western slopes, such as H-7 and F-11. They are all situated relatively far from one another (except for the two in H-7), but are close to other archaeological remains (small-scale mining pits, working places, waste heaps). In terms of shape (elongated rectangular, in some cases irregular) and dimensions (up to 6–7m long and up to 3.0–3.5m wide), they correspond well to the structures detected and investigated in the NE settlement and to isolated buildings excavated in the western sectors of Ada Tepe. Their proximity to the traces of mining and ore processing described above indicates that they were related to these activities and probably served the needs of the people who worked here.

Meanwhile, the general chronological time span of the human activities detected on this part of the hill is longer compared to the few decades during which the settlement on the northeastern slopes was inhabited. Unfortunately, the poorly preserved and small wheelmade sherds from Trench H-9-1-A are not useful for dating purposes. The combined analysis of the information from the small number of absolute dates, the stratigraphic positions of the various structures (mining places, waste heaps, working sites, remains from single buildings) and the general characteristics of the pottery repertoire of this part of the hill (Figs. 32–34) nevertheless allow a number of chronological conclusions to be established.

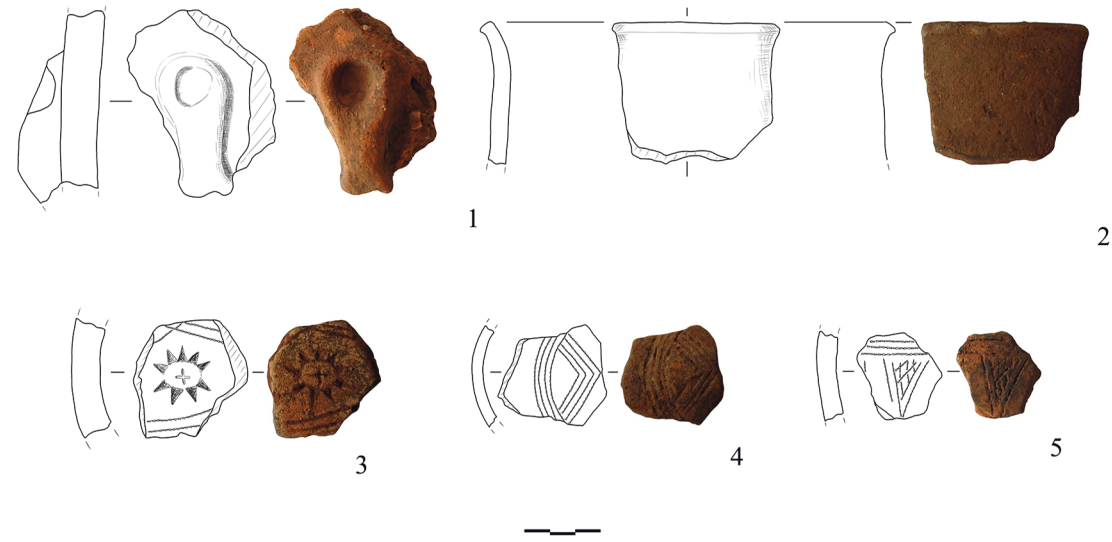
The relative and the absolute dates both support the hypothesis that the human activities in these western parts of the Ada Tepe hill date to the 15th and probably the 14th century calBC. These structures were most likely short-lived and they were apparently abandoned after the completion of the mining activities in the respective sector and their transfer to another one. At the same time, another question about the duration of the mining and ore-processing activities should be raised. Certainly, the calibrated value of SUERC-37373: 3100 ± 30 BP (1360 ± 50 calBC) does indeed (seemingly) fall beyond the limits of the 15th century calBC. Nevertheless, this young age is most likely nothing more than the chance result of age distortion due to the specific shape of the calibration curve in this time interval. Nor does the specific choice of a pig bone for ^{14}C dating, although unusual, appear to be in any way problematic – despite the conspicuous lack of other kinds of animal bones.

The fact that the remains of the two buildings in sectors G-9 and H-9 were later buried beneath waste heaps should be interpreted as an indication that the ore processing at the hilltop (or the gold mining at Ada Tepe in general) continued after the period of the absolute dates available from these sectors. Based on the scarce evidence at hand, it is difficult to estimate its duration. The answers to this question should rather be sought in the materials from the settlement on the hilltop and in the combined analysis of the results from the different sectors.

[38] The presence of non-Mycenaean wheelmade vessels in Bronze Age contexts in Bulgaria is demonstrated by the belly-handled amphora which was found inside grave no. 7 of the Ovchartsi tumulus and has a parallel in a Middle Helladic IIIB context at Mycenae, see Jung et al. 2017, 287 n. 115 (for the vessel itself see: Haag et al. 2017, 172 cat. no. 44; Alexandrov 2018b, 368, fig. 1; Alexandrov et al. 2018a, 490 cat. no. 219).



Fig. 33 Pottery from the remains of a dwelling in Sector H-9, Trench 1-G. Scale 1:3 (© Y. Dimitrova)



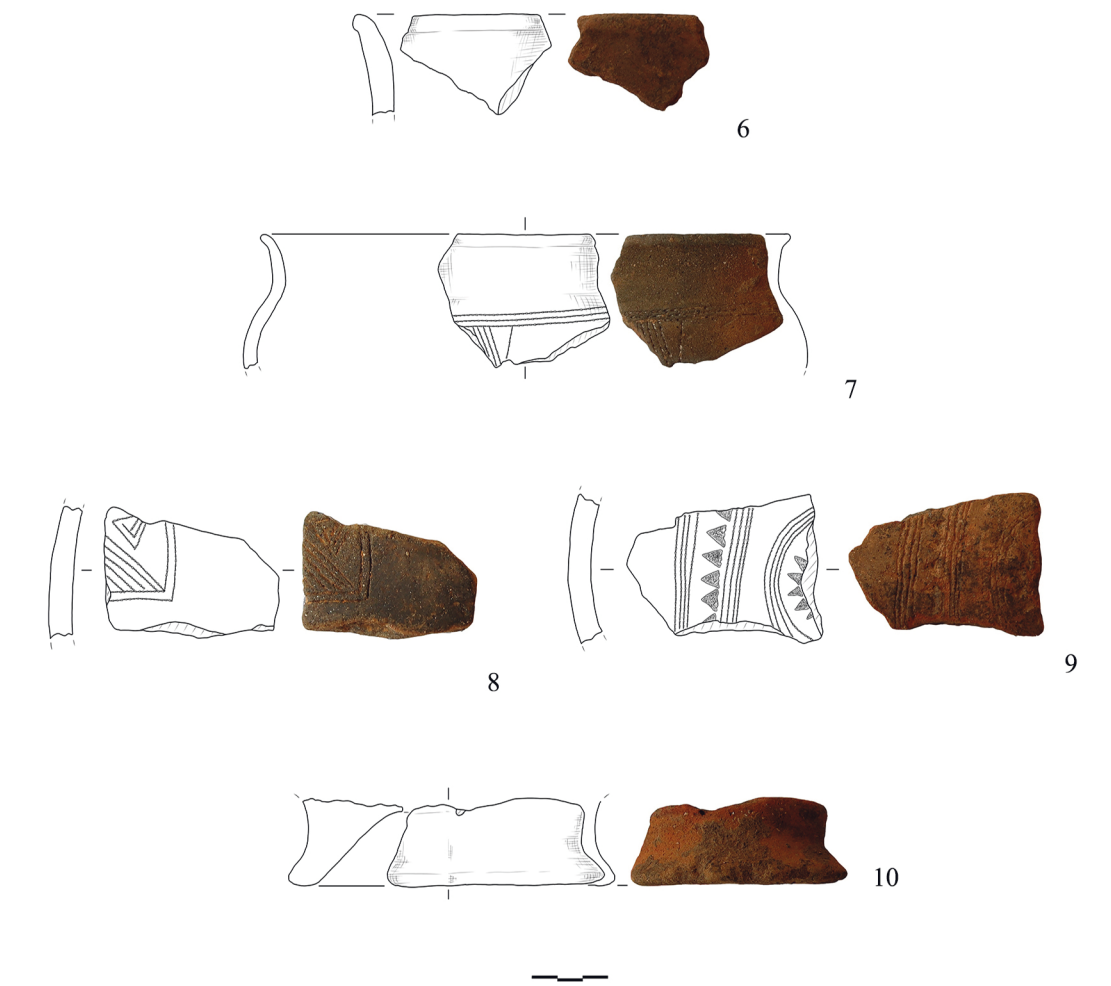


Fig. 34 Pottery from Trench H-9-1-A. Scale 1:3 (© Y. Dimitrova)



Fig. 35 The ridge of Ada Tepe. Remains of open cast mining works in Sectors G-11 and H-11 (© H. Popov, P. Georgiev)

The Activity Zones on the Hilltop (Sectors G10, G-11, G-12, H-11, F-11)

Most complex is the stratigraphic situation in the central sector at the top of Ada Tepe. The most numerous remains from different periods of human occupation are concentrated in sectors G-11 and G-10. Isolated structures that are peripheral to the central part of the peak have also been investigated in the sectors F-11 and G-12 (Fig. 5). The topographic overlap of structures from different periods is most pronounced at the top itself (Fig. 4). Already in 2001–2005, the team of Georgi Nekhrizov investigated a sanctuary from the Hellenistic period, as well as structures and thick cultural layers from earlier periods (different phases of the Early Iron Age and of the Late Bronze Age). According to the published results, the thickness of the cultural deposits is more than 1.50–1.60m.[39] According to the squares and sectors, established during the full rescue excavations of the territory of Ada Tepe in the 2010–2013 and 2015 campaigns, the areas of the hill excavated by Georgi Nekhrizov's team fall in the eastern parts of Sector G-11 and the western parts of Sector H-11.[40] The investigations in the central parts of the peak were resumed during the campaigns related to the ancient gold mine in 2010–2013. In 2012, in the central parts of the peak (Sector H-11, squares 1, 2, 11, 21, 31, 32, 41, 42, 61, 71, 81; Sector G-11, squares 19, 20, 29, 30, 38, 39, 40, 49, 50, 59, 60, 70–78, 80, 90, 100), beneath the remains of habitation from the different phases of the settlement (investigations in 2001–2005 and 2010–2013), traces of mining activities were revealed, as well as hollows resulting from the extraction of gold-bearing quartz veins (Fig. 35). In the other parts of the central area, investigated in 2010–2013, the thickness of

[39] Nekhrizov – Tzvetkova 2018b; Tzvetkova – Nekhrizov this volume.

[40] The geodesic plans for the research by G. Nekhrizov and H. Popov were made by the same geodesist, Bistra Gyaurova from NAIM-BAS.

the cultural deposits does not surpass 0.80–0.90m on top of the bedrock. Particularly complex for analysis and interpretation is the situation in squares (G10/88, 89, 98; G11/7, 8, 16, 17, 26, 36, 46, 56, 66, 75, 76) where the excavations uncovered part of the foundations of a massive fortification wall comprising two faces with emplecton. Around it, some of the most numerous remains of structures investigated in 2011–2013 are clustered. However, for the overall stratigraphic analysis, it is important to note that the deepest-lying course of the wall lies on top of earlier structures and thus offers an important terminus for the interpretation of various periods of the human presence at the top.

The excavation area on the hilltop (in Sector G-11 in particular) yielded the largest number of ^{14}C dates from the Ada Tepe site. Twenty-seven of the 67 dates come from 14 numbered structures, most of which can be interpreted as remains of houses. One should also mention the 15 samples that were taken to support the results from the investigations at Ada Tepe in 2001–2005 and already published by the directors of these campaigns.[41]

The only materials that were recognized as imports, therefore providing the opportunity to tie the site to the relative chronology of the Helladic periodization system, were also discovered in sectors G-11 and G-10; these are the fragments of imported wheelmade pottery vessels and a marble pommel from a Mycenaean sword.[42]

The overview that is offered below is organized by structures and stratigraphic positions with absolute dates from the 15th–13th century BC and with wheelmade pottery and follows a chronological order from earlier to later results. Additional relative chronological evidence is offered by some representative specimens of local handmade pottery, found in contexts together with the organic materials giving the early radiocarbon dates from Ada Tepe and the imported wheelmade pottery.

An overview of the earliest dates from the hilltop of Ada Tepe indicates that, in terms of spatial distribution, they mainly come from the northern and the northeastern periphery of the peak (Fig. 36). This peculiarity could be explained by several circumstances. In the central and eastern parts of the very top, the ancient terrain has been most affected by later human activities in the later phases of the Late Bronze Age, the Early Iron Age, and the Hellenistic period. Preserved remains from the earliest periods are registered on the periphery of the space that was enclosed within the later fortification wall (such as structures 11 and 21 in the northern parts of G-11 and the southern parts of G-10). More early remains, such as structures 9-A and 13-A, were sealed beneath the remains of the later wall and the adjacent structures. An exception to this situation is the early dates from Square 29, related to traces of open cast mining, and a sample from Square 84, taken from the northern periphery of Structure 17. In terms of context, the latter could be regarded as redeposited from earlier habitation, as the other available dates and the analysis of the ceramic assemblage from Structure 17 rather point to a date in the following chronological period of the 14th to 13th century BC.

Of particular importance for the overall interpretation of the succession of the human activities at the hilltop is the situation in Square 29 (Fig. 36). Here, in the southern periphery of a small mining pit, an intact ceramic vase (jug) was discovered in situ, and a sample was taken from charcoals beneath it (Figs. 37–38). Another interesting fact is that the samples taken from the crushed ore mixed with quartz that was left at the bottom of the pit revealed one of the richest gold (Au) contents among the geological prospections that were carried out in parallel with the archaeological investigations. The analysis of the sample SU-ERC-43628 yielded one of the earliest dates from Ada Tepe, i.e. 3269 ± 29 BP. Certainly, in this case, like with the samples from the Northeastern Quarter, one should take into account the old wood effect.

The geological prospections and their correlation with the archaeological investigations indicate that the top of the cone of the hill was gradually demolished and depleted by the first mining

41 Nekhrizov – Tzvetkova 2018b.

42 See Tzvetkova – Nekhrizov this volume.

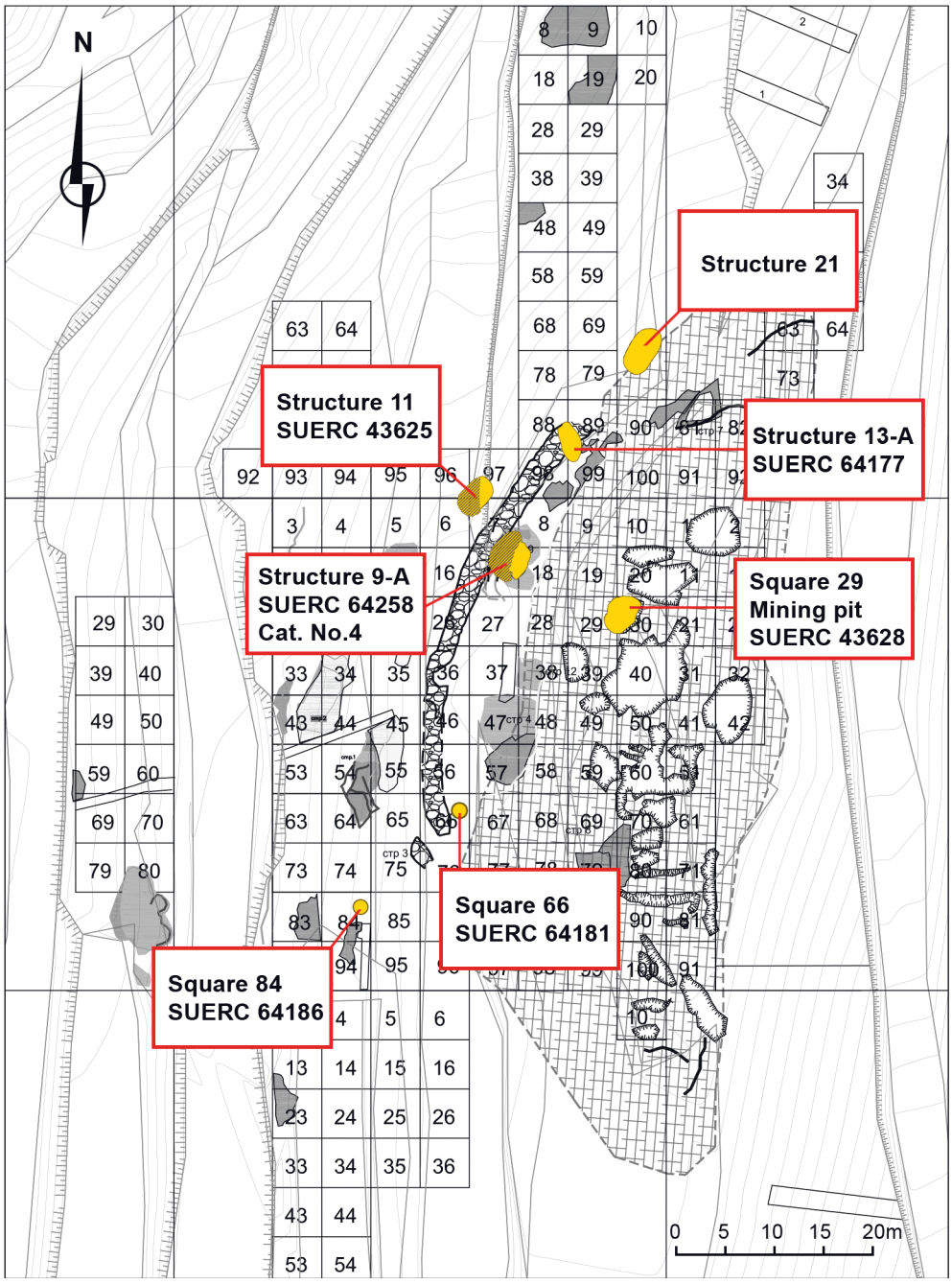


Fig. 36 The central parts of the ridge of Ada Tepe, with the locations of the earliest known dates (15th century BC), the fragments of wheelmade imported pottery, and the numbers of the respective features indicated (© H. Popov, S. Iliev, B. Gjaurova, Y. Dimitrova, P. Minkov)

activities in the Late Bronze Age (Figs. 35, 37, 39). Thus, the context and the stratigraphic position of that sample could be taken as the terminus ante quem for the mining activities at the very top of Ada Tepe. In fact, the structure in Square 29 marks one of the lowest levels reached by the ancient miners. The resulting relatively level space of irregular oval plan, N–S orientation, and an area of some 1500–2000m², slightly sloping to the west, was later occupied by the settlement. The fortification wall was built along the outlines of this levelled area, and the Hellenistic sanctuary also fits within its limits.



Fig. 37 Remains of a small mining pit (Square 29, Sector G-11) and pottery jug in situ. Place of origin of sample SUERC-43628 (© K. Nikov, R. Stoychev)

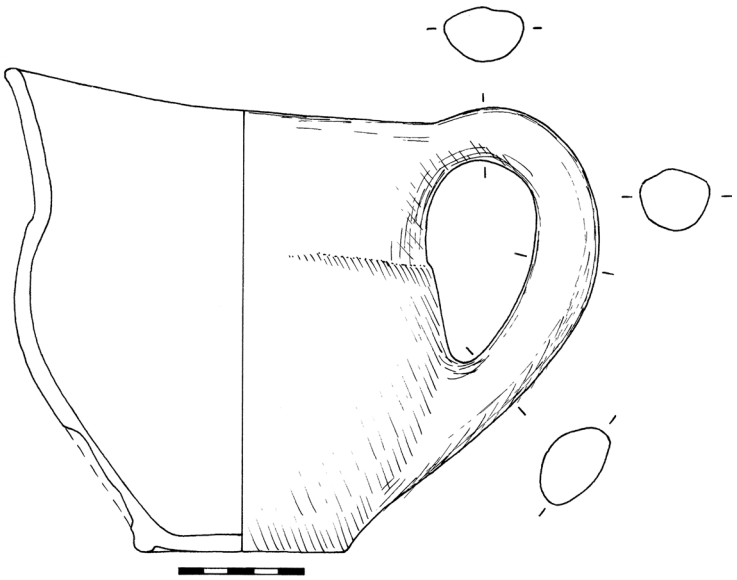


Fig. 38 Late Bronze Age jug from the small mining pit in Square 29, Sector G-11. Scale 1:3 (© K. Nikov)



Fig. 39 Traces of cast mining activities in the topmost zone of Ada Tepe. Detail: pits left from depleting the veins and traces of fire setting. Subsequently, after the end of the mining activities in this area, the pits were covered by the material remains from the later occupational phases (© H. Popov, P. Georgiev)

Structure 9-A

The structure was uncovered in Sector G-11, squares 7–8 and 17–18 (Figs. 36, 40), registered at a depth of -0.60–0.70m. It is a sunken structure of irregular oval shape and diameter of some 1.90m. Part of it lies beneath the later fortification wall that overlaps its western end (Fig. 40). In terms of stratigraphy, it also lies beneath Structure 9, which was adjacent to the inner side of the fortification wall. The fill is dark brown to black and contrasts starkly with the bedrock, which is of a light-brown colour. The collected ceramic finds are very scarce and fragmentary. The specifics of the structure define it as the remains of a pit or another similar structure, the upper parts of which were destroyed during the later habitation of the hilltop. Only the parts close to the bottom are preserved. The structure was completely excavated, down to a depth of -0.80–0.90m (depending on the configuration of the rock, which was unevenly hewn). The materials in the fill of the rock-cut structure (small charcoals, isolated bones, heavily fragmented pottery of the earlier stage of settlement activity), overbuilt and sealed by the later Structure 9, provide another early date from the Ada Tepe hilltop. Sample SUERC-64258 (3190 ± 27 BP) was taken from bone material, bovine teeth to be precise. In terms of relative chronology, it relates to the last phase of the hilltop mining and/or the early phase of the central settlement. In terms of calendar years, the date is 1460 ± 30 calBC.

Regarding the relative chronology of Structure 9-A, a fragment of a wheelmade vessel needs to be discussed here, although it was encountered on the periphery of Structure 9-A and at a higher level, together with Early Iron Age material (cat. no. 4, Fig. 10). This wheelmade sherd is the earliest typologically datable Mycenaean find from Ada Tepe. It belongs to the low and slender foot of either a pattern-decorated goblet FT 255 or a monochrome/linear goblet



Fig. 40 Excavating the fill of Structure 9-A, partially that lying beneath the foundations of the fortification wall (© K. Nikov, R. Stoychev)

FT 263.[43] This typological classification suggests a dating to LH IIB or LH IIIA1.[44] Taking into consideration the heavily fragmented state of this pottery artefact, the similarly fragmented local pottery from the refuse layer in the ruins of the sunken structure 9-A, and the relative date of the vessel compared with the absolute date of SUERC-64258,[45] it seems reasonable to assume that the Mycenaean goblet was part of the Structure 9-A inventory or at least belonged generally to the coeval settlement in that area.

A very good morphological parallel – also in terms of its small size – is a goblet from cist tomb 6 at the Néa Ionía quarter in Vólos. In this cist, the vessel in question belongs to the older interment (warrior burial I) dated to LH IIB.[46] This chronological range could also apply to the Mycenaean sword pommel made of marble and found during the excavations by Nekhrizov on the hilltop.[47] The fabric of this small goblet from Ada Tepe clearly differs from the fabrics of the

43 As opposed to a stemmed goblet (FT 304/305), which would have a more massive foot. There is a very small possibility that the Ada Tepe foot belongs to a kylix FT 256 (see e.g. Mountjoy 1999, 539, fig. 195.189, 190), but usually the foot of this early kylix type (characteristic of LH IIIA2) is higher.

44 I.e. roughly contemporary with the LH IIIA1 goblet fragments from Dragoyna (Bozhinova et al. 2013, 67–68 cat. nos. 1–4, pl. 14.1–4).

45 For the absolute chronology of LH IIB see Manning 2010, 23, tab. 2.2; for new ^{14}C dates related to that phase see Eder – Hadzi-Spiliopoulou 2021, 72–73, fig. 13 and tab. 1.

46 Theocharis – Theochari 1970, 199, fig. 3; 202–203, drawing 1; Mountjoy 1999, 834–835, fig. 334.41. For the other vessels from burial I see: Theocharis – Theochari 1970, 198, fig. 2; 202; Mountjoy 1999, 833–834, fig. 334.36; for its weapons see: Theocharis – Theochari 1970, 200, fig. 6; 202; Avila 1983, 15 cat. no. 29; 34 cat. no. 72, pls. 4.29; 12.72; Kilian-Dirlmeier 1993, 46 cat. no. 76, pl. 15.76.

47 See Tzvetkova – Nekhrizov in the present volume. In fact, the sword from tomb 6 at Néa Ionía belongs to one of those types, which are well attested throughout the eastern Balkans (Bozhinova et al. 2013; Jung 2017; Jung 2018).

small and large goblets, as well as of the small closed vessel found at Dragoyna.[48] Unfortunately, the NAA result does not assign the vessel to any known chemical group (see below, NAA sample Ada Tepe 4), which means we cannot determine whence it was imported to the site.

To the north, northwest of squares 29, 7–8, and 17–18, two more structures were revealed and investigated that yielded early absolute dates – structures nos. 11 and 21. In this area, that lies immediately below the old dirt road and the later avenue opened during the geological prospections, the preserved thickness of the superficial forest soil and the cultural deposits beneath is relatively thin.

Structure 11

This structure was investigated in sectors G-10, Square 97, and G-11, Square 7 (Fig. 36). It has an elongated plan along the N-E axis, with preserved dimensions 4.70 × 1.20–1.50m, and was detected at a depth of 0.20–0.30m. In the layers close to the surface, there were mixed materials. The structure is disturbed by modern geological prospections and only its western part is preserved. The bottom of the layers was reached at 0.50m. The sample SUERC-43625: 3213 ± 29 BP was taken from a bovine bone and was discovered at the level of detection of Structure 11, i.e. at -0.20–0.30m from the surface. At this level, a layer of stones was discovered (debris), and deeper down the structure is sunken, excavated from the bedrock, with a filling of dark-brown earth. Bearing in mind the preserved dimensions, it could be interpreted as the remains of a building. It is located to the outside of the fortification wall and was not affected by its foundations. Nonetheless, mixed materials from the Late Bronze Age and the Early Iron Age were only found in the layers close to the surface. Excluding the materials from different periods spread in the surface layer (0.0 to -0.20m), the remains from this building demonstrate a homogenous and diverse pottery inventory (Figs. 41–43). Its formal and typological characteristics belong to an early stage of the Late Bronze Age, and it is associated with an early radiocarbon date (1480 ± 30 calBC) as well, while the chronological relevance of this context is supported by the preservation of Structure 11, undisturbed by later interventions. This stratigraphic assemblage is thus an important point of reference for the ceramics of the first half of the 15th century calBC.

Structure 13-A

This structure was excavated in Sector G-10, in squares 88-89 and 98-99. The structure was detected to the west of Structure 13 and lies next to and beneath the inner face of the fortification wall. It first appeared as a dark spot with the shape of a half ellipse. As in the case of Structure 9A, these are probably the remains of a pit or a similar structure, of which only the bottom part is preserved. After the fortification wall was dismantled, the structure was traced beneath it as well. Its dimensions are 1.30 × 0.75m and it was filled with dark-brown earth with numerous ceramic fragments and bones, one of which (again from *Bos taurus*) was taken for AMS analysis; the sample SUERC-64177: 3223 ± 32 BP gives a calibrated date of 1490 ± 40 calBC.

Structure 13-A corresponds well to the remains of Structure 9-A. Both of them (as well as Structure 21) are located on the edge of the line of the highest part of the ridge, along which the fortification wall, which partially destroyed them, was built in a later period. Their aligned position (Fig. 36) and their similar orientation support the hypothesis concerning their relation to remains from buildings of an early settlement, situated on the central part of the ridge, in maximum proximity to the first mining activities. Probably this structure had a similar linear organization to the settlement on the northeast slopes. The local handmade pottery finds are more numerous and diverse, compared to those found in 9-A. As a pottery set and chronological features, they correspond well to the neighbouring structures 11 and 21.

[48] See the fabric descriptions in Bozhinova et al. 2013, 67–69 cat. nos. 1–5.

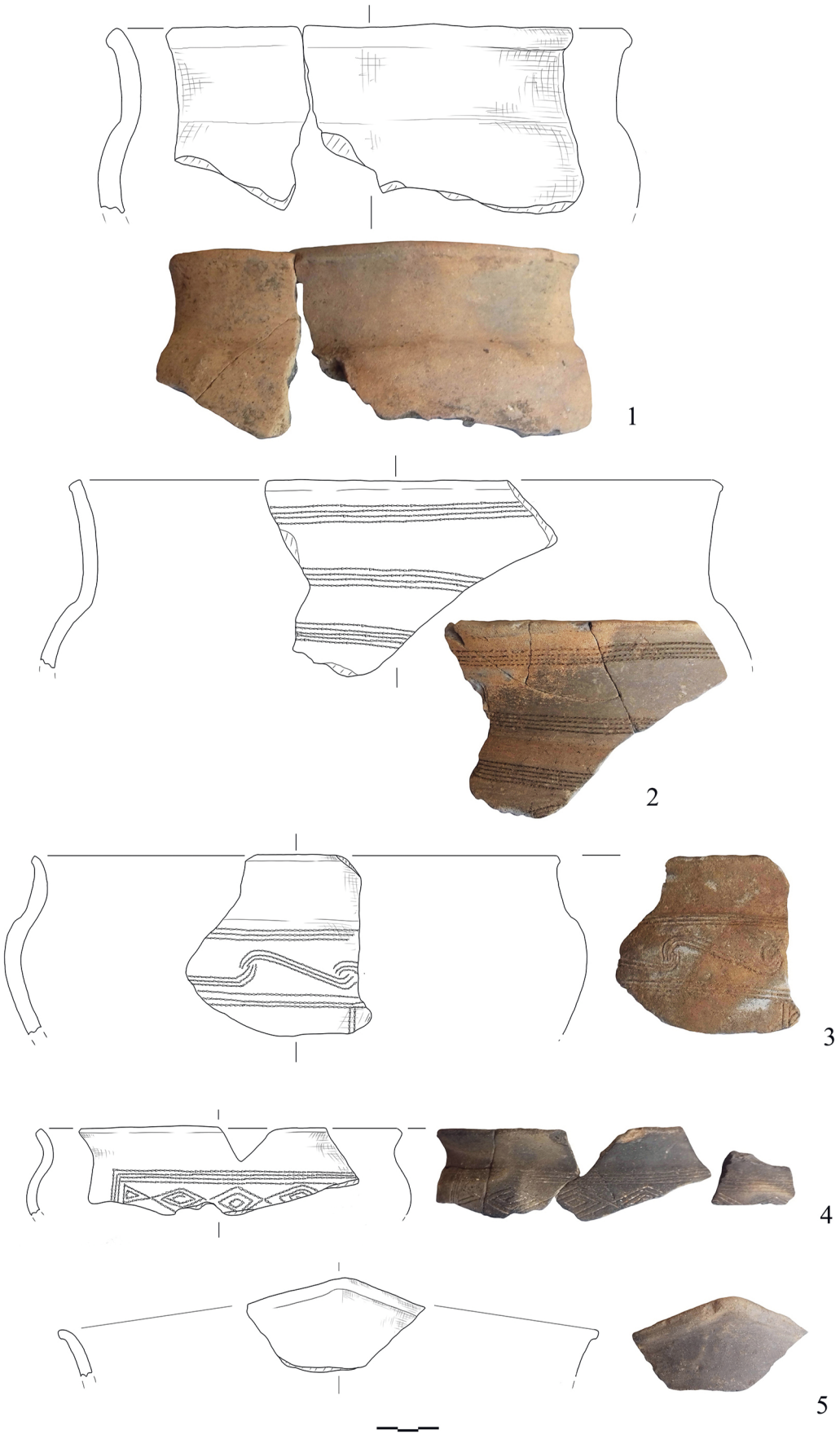


Fig. 41 Pottery from Structure 11 in Sector G-11. Scale 1:3 (© Y. Dimitrova)

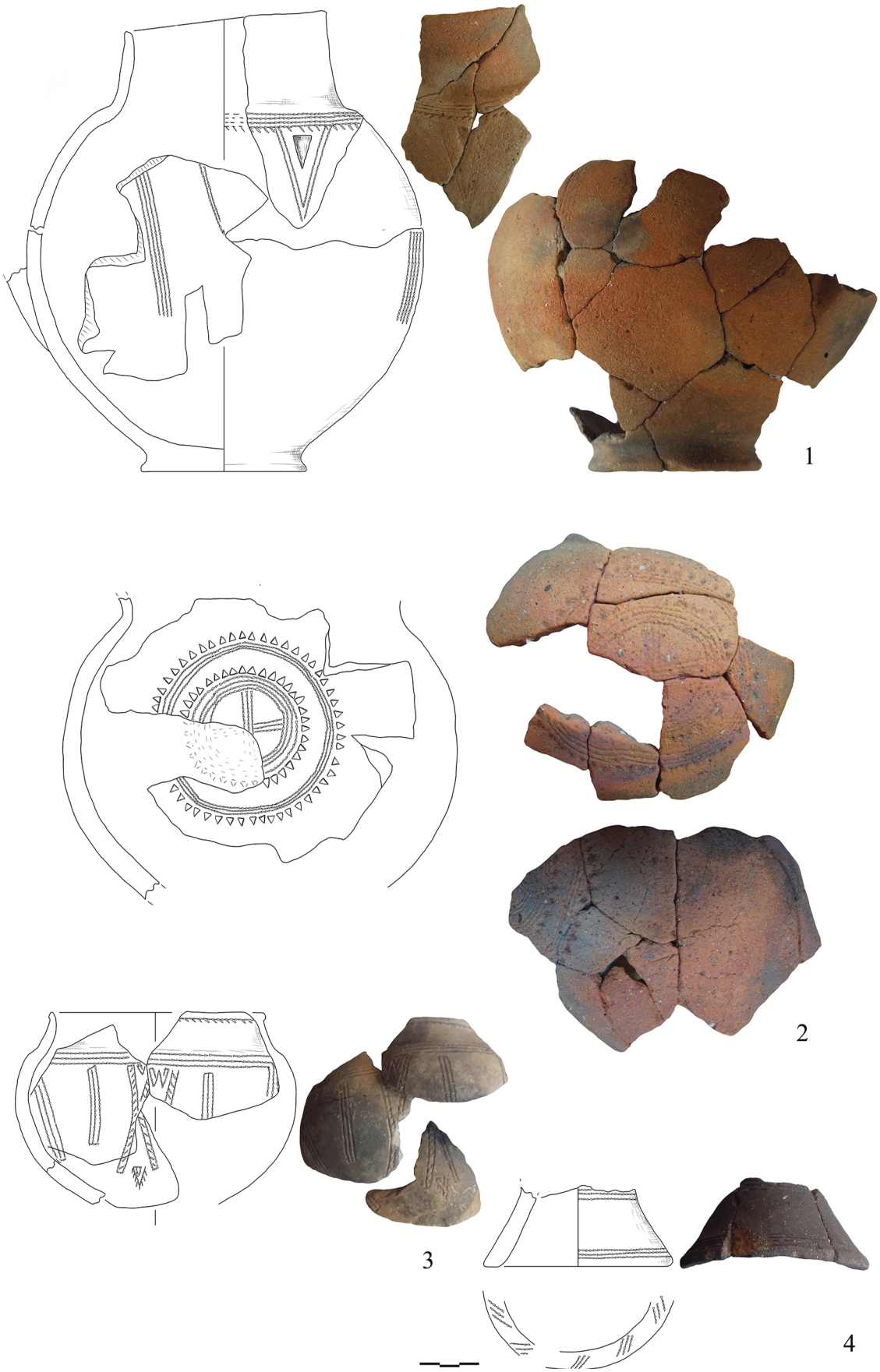


Fig. 42 Pottery from Structure 11 in Sector G-11. Scale 1:3 (© Y. Dimitrova)

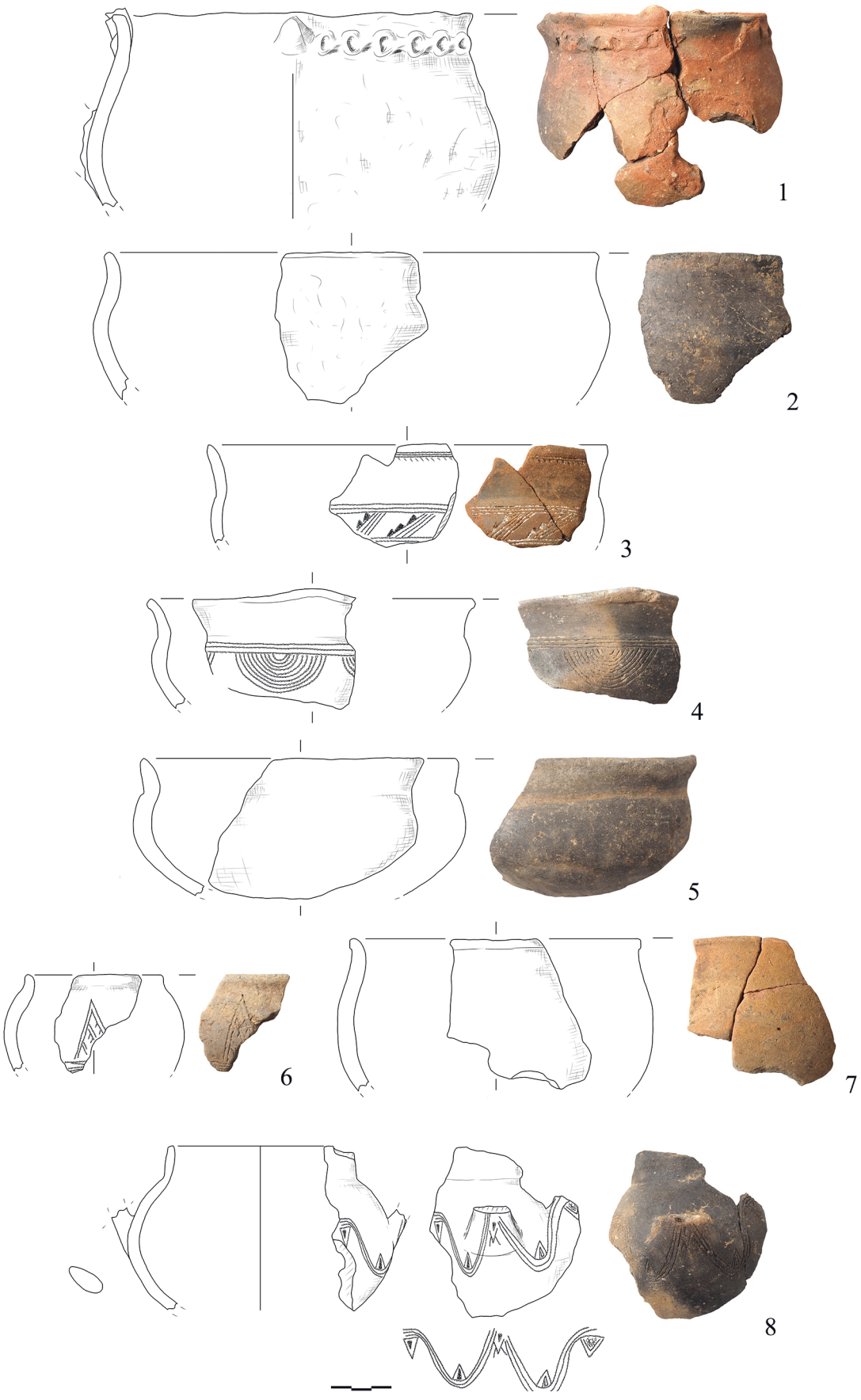


Fig. 43 Pottery from Structure 13-A in Sector G-11. Scale 1:3 (© Y. Dimitrova)



Fig. 44 Structure 21 in Sector G-10, pottery vessels in situ (© H. Popov)

Structure 21

This feature is situated in Sector G10/squares 70–80. It was detected at c. -0.25m below the surface and the bottom (on the bedrock) was reached at -0.50m. The slope has been dug away and levelled in order to shape the space where the structure was situated. It could be interpreted as a dwelling (?) of light construction. It has an oval form, with its long axis oriented NE–SW, and has dimensions of 5.20 × 3.50m. At a depth of -0.35m, several vessels were discovered in situ (Fig. 44) close to one another: a storage vessel with a small one-handled cup in it, and a large and deep jug with a wide rim; nearby, a fireplace (burned layers of plaster on a levelled layer of stones) and a grinding stone were found. The pottery inventory corresponds to the one located in the neighbouring Structure 11 (Figs. 45–46). The sherds that allow typological classification demonstrate a slightly different picture from the one in the small building in Sector H-9 on the western slope (cf. Fig. 33). The fragments found in Structure 21 represent the three usual technological groups. The coarse and semi-fine wares are present in similar quantities to the fine ware sherds, which amount to about 22% of the total. This is twice as much as in the light construction in H-9. The pottery set of Structure 21, determined by the identified rim sherds and entirely preserved vessel profiles, is characterized by a lower presence of vessels for the storage of food/liquids. Still, the storage vessels of both groups (coarse, Fig. 45.4, and semi-fine, Fig. 45.1, 3) and amphorae (Fig. 45.5–7) make up a share of about 40% of the total. Contrary to the hut in H-9, here sherds from all vessel categories are present. Vessels for the serving/consumption of liquids (jugs, cups and cups/kantharoi, Fig. 46.3–5) are most numerous. The smallest portion belongs to vessels for food preparation and consumption (jars and bowls, Fig. 46.1–2). One possible explanation for the differences could be sought in the function of the structure or the duration of its use. The datable features of the ceramic complex do not differ from that in the H-9 structure (Fig. 33), or from that in the waste heap in J-9 (Figs. 27–28) i.e. the vessel shapes, the presence of *Furchenstich*

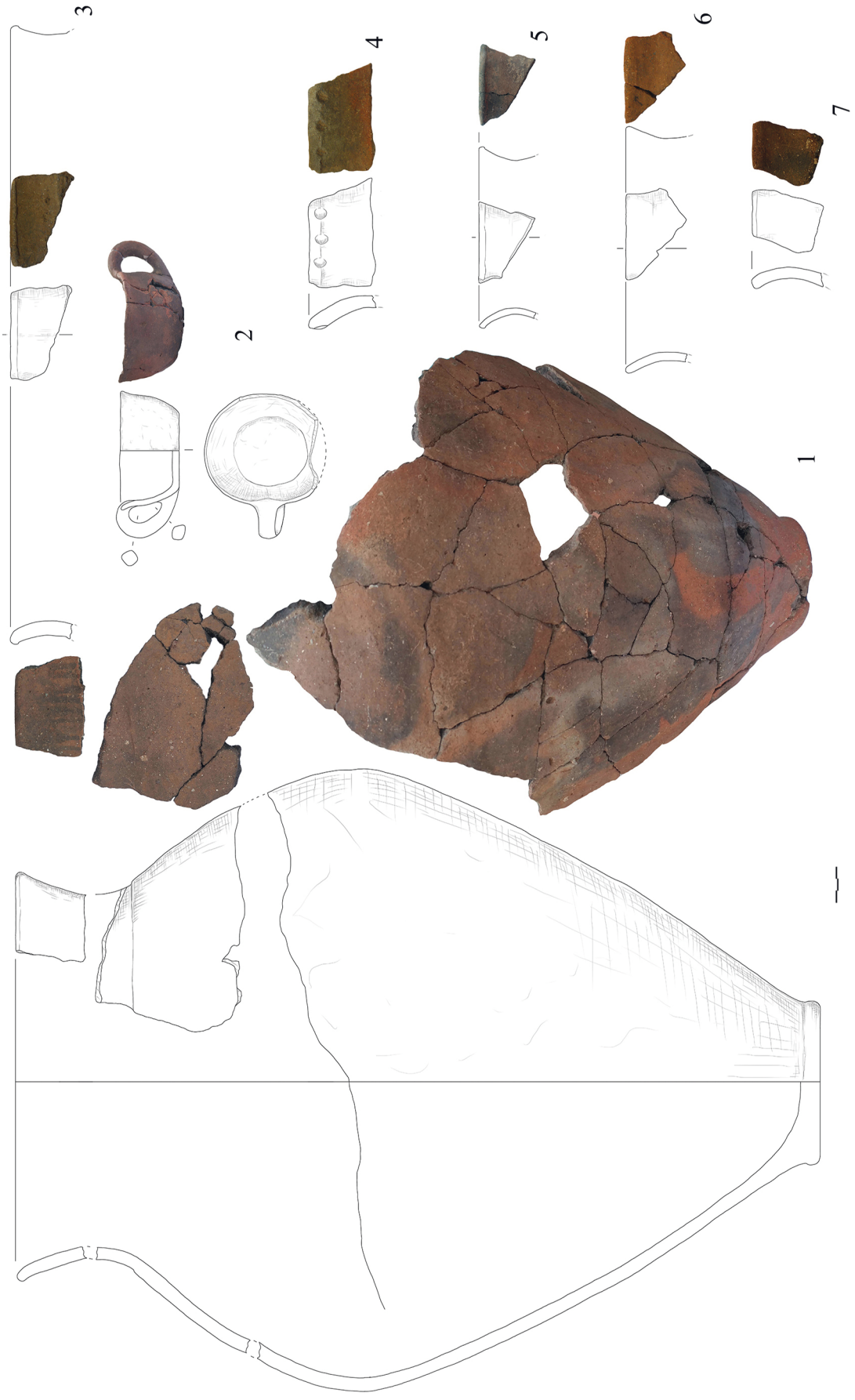


Fig. 45 Pottery from Structure 21 in Sector G-10. Scale 1:5 (© Y. Dimitrova)

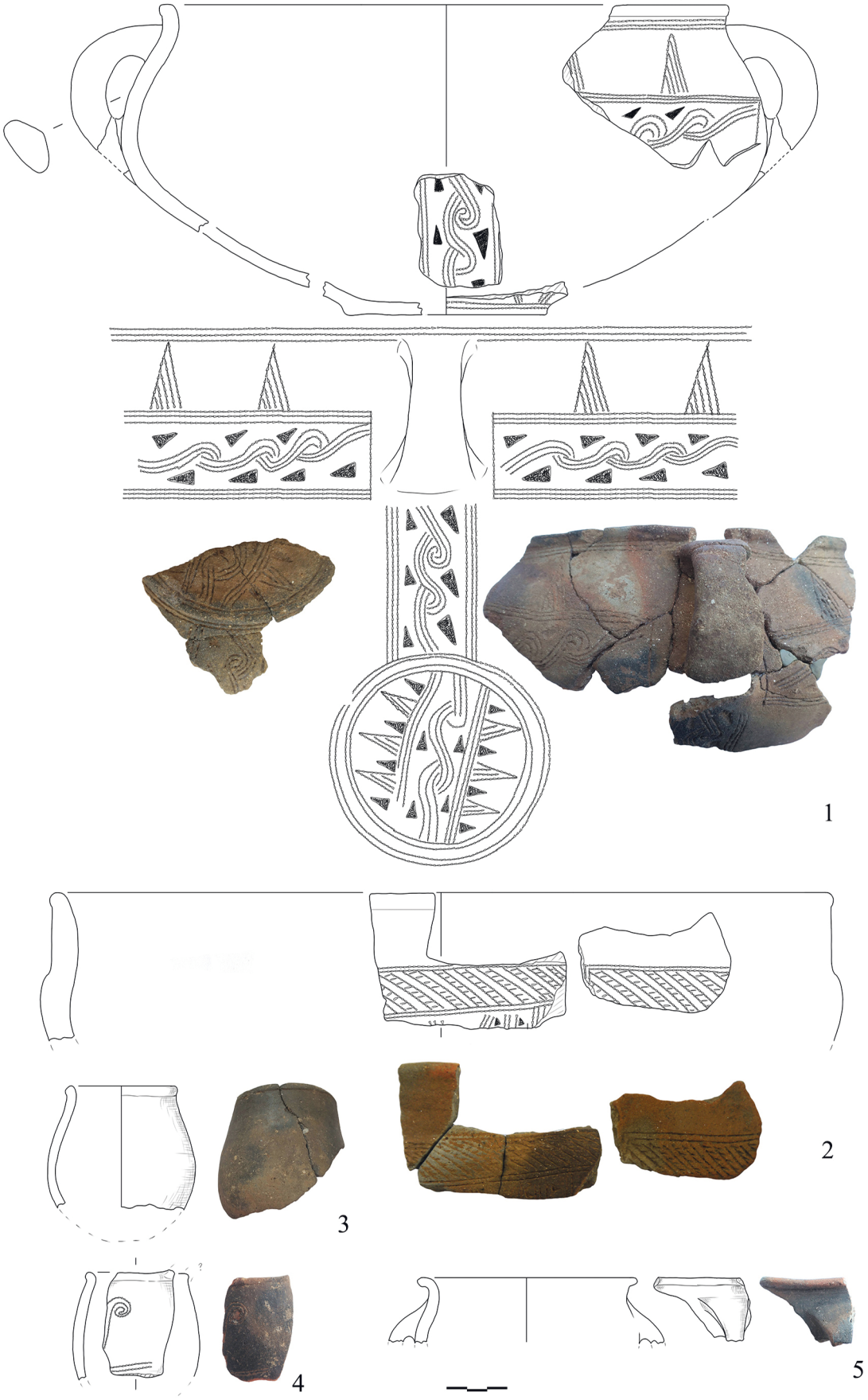


Fig. 46 Pottery from Structure 21 in Sector G-10. Scale 1:3 (© Y. Dimitrova)

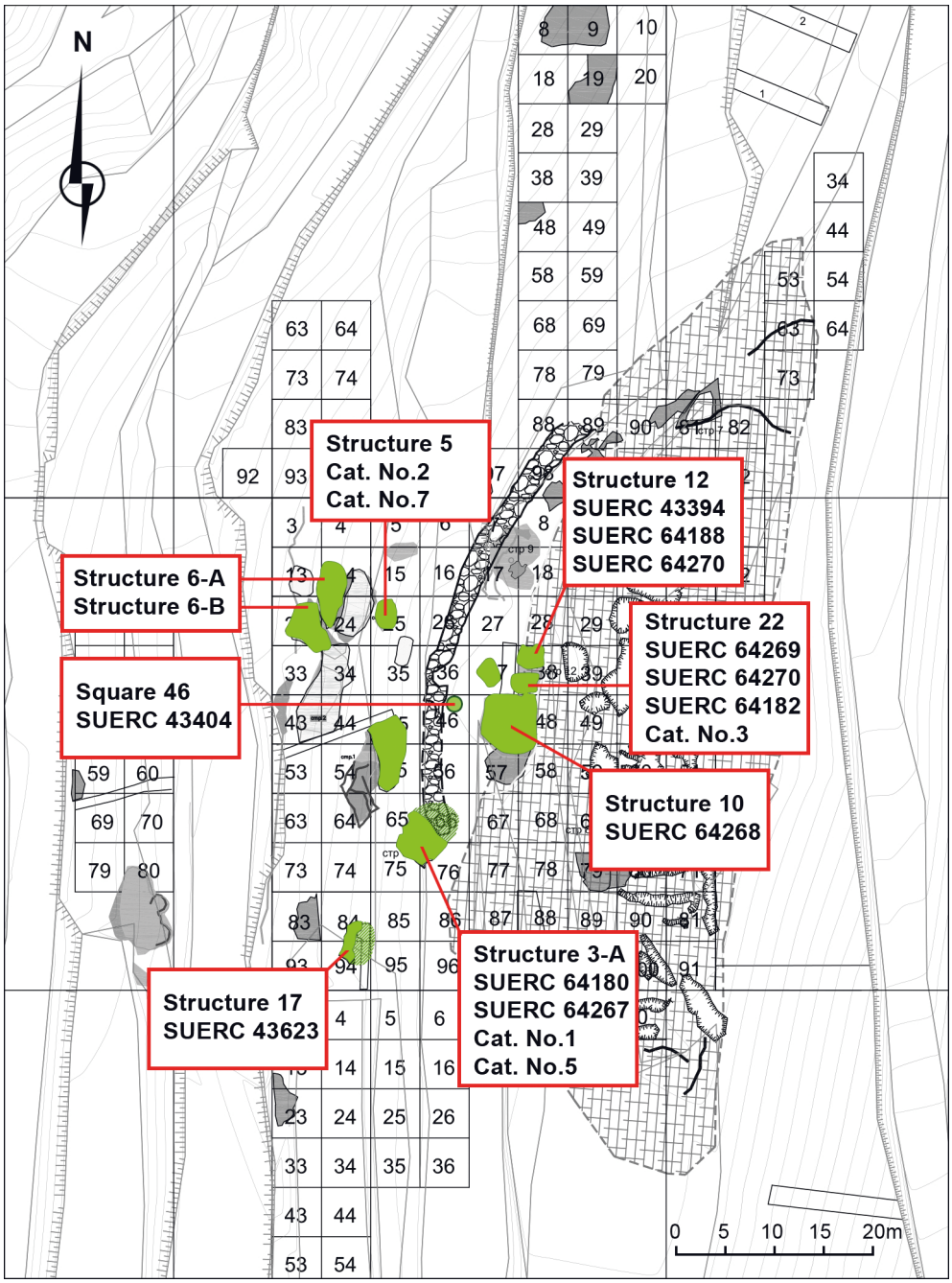


Fig. 47 The central part of the Ada Tepe ridge with the locations of the absolute dates from the 14th and the first half of the 13th century BC, find spots of wheelmade imported pottery, and the numbers of the respective features indicated (© H. Popov, S. Iliev, B. Gjaurova, Y. Dimitrova, P. Minkov)

decoration, the lack of some elements that appear in the following chronological period of the more advanced Late Bronze Age. The small finds include flints, small ceramic discs, and small round stones. Animal bones and charcoals were also found in the dwelling. Its orientation is the same as that of Structure 11. As mentioned above, both of them probably belong to a row of dwellings located in this area of the hilltop.

The last two samples with early radiocarbon dates related to the 15th century calBC and coming from the hilltop of Ada Tepe, i.e. SUERC 64181: 3173 ± 32 BP from Square 66 (see below, chapter on Structure 3-A) and SUERC 64186: 3200 ± 32 BP from Square 84 (see below, chapter on Structure 17), are from the southern parts of Sector G-11 (Fig. 36), but there is no clear stratigraphic evidence relating them to buildings, pits, or mining features in this area.

The radiocarbon dates from the 14th–13th century calBC are more numerous, but they also show regularities in their topographic distribution. They are mainly related to features situated in the central part of the hilltop (Fig. 47). Some of them are disturbed by later features from the last phases of the Late Bronze Age or the Early Iron Age. Here one has to take into account a further issue. The question of the dating of the earliest archaeological remains underneath the Hellenistic sanctuary, which were studied in the period 2002–2005, remains open.[49] Some of them are ascribed to the Late Bronze Age by the researchers. Their location underneath the foundation of the sanctuary wall (i.e. unrelated to its use levels) and the given possibility of their general spatial connection to some of the features excavated later (2010–2013) in Sector G-11 further to the east, northwest and southwest, allows for the hypothesis that they belong to the second Late Bronze age habitation period of the Ada Tepe hill with absolute dates in the 14th and 13th centuries calBC.

Structure 3-A

The structure was investigated in Sector G-11, in squares 65, 66, 75, and 76. When Structure 3 was first detected, it was uncovered at the same depth as the fortification wall, the preserved part of which extends into squares 66, 75, and 76. However, the stratigraphic relation of Structure 3 to the fortification is not entirely clear. In the course of the investigations, below the level of the wall's foundations, the remains of an earlier structure were discovered, overlain by the foundations of the wall and more or less overlapping with Structure 3. The earlier structure was labelled 3-A (Fig. 48). It was detected at a depth of -0.45–0.55m below the surface and the bottom was reached at 0.70–0.80m from the surface. The entire area of the structure was uncovered during the removal of the stones from the faces and the filling of the wall in the area of the entrance of the fortification wall. Based on the excavation results, Structure 3-A is interpreted as the remains of a building with the following preserved dimensions: length c. 7.60m (N–S) and width c. 4.00m (E–W). It was detected as a rectangular feature with rounded corners and a filling of dark (dark-brown to black) soil. In some places it preserved not only stone debris, but also stones in situ from the foundations (in one course) of the walls – as known from other structures, the remains of which have been investigated in various sectors on the hilltop. The building was partially dug into the slope. In the northwestern part of the remains, part of the floor is preserved – a spot of burnt light-brown to reddish earth. The preserved foundations are built of mostly large stone slabs with dimensions of 0.30–0.50m. In the northeastern part, one could clearly see the stones that are tightly arranged in a row. In the central part of the structure, there was a compact cluster of small and midsize stones, among them stones that are identical in terms of shape and size with the slabs of the walls. Two parts of the structure – a northern and a southern part – could be clearly distinguished. Thus, one may assume that the building was divided into two separate rooms. The materials that were discovered in addition to pottery – grinding stones, large amounts of bones, spindle whorls – indicate that this was probably a dwelling or a place where food was prepared.

[49] See: Nekhrizov – Tzvetkova 2018b, fig. 2; Tzvetkova – Nekhrizov this volume.



Fig. 48 The remains of Structure 3-A, uncovered beneath the foundations of the fortification wall in Sector G-11. In the foreground, partially preserved floor with the fired base of a hearth (© H. Popov)

A total of 12 bone samples for radiocarbon dating were collected from squares 65, 66, and 75, although dating for two of them failed. Of the remaining ten samples, seven belong to later stages of the Late Bronze Age and the Early Iron Age and, in terms of stratigraphy, come from layers at -0.10 to -0.30m below the surface; their context is that of Structure 3 and the fortification wall. The three early samples come from depths of between -0.45 and -0.70m and are directly related to Structure 3-A, detected under the foundations of the wall (Fig. 49). All three samples come from square 66 and were taken from bone (cattle and sheep/goat respectively). Samples SUERC-64180: 3045 ± 32 BP and SUERC-64267: 3004 ± 22 BP (at a depth between -0.45 and -0.55m) are relatively close to one another in terms of chronology. Both date from between the late 14th and the middle of the 13th century calBC. The two ^{14}C ages are statistically identical (p=29%). Their weighted average is 3017 ± 18 BP, which would correspond to a calibrated age of 1260 ± 40 calBC. As they were discovered in stratigraphic layers immediately beneath the level of the foundations of the fortress wall, they could be related in terms of chronology to different phases of the use of Structure 3-A. The sample SUERC-64181: 3173 ± 32 BP, also from cattle bone, has a different context. Stratigraphically, it belongs to layers (-0.60–0.65m below the surface) close to the bottom of the structure, immediately above the sterile rock. Its calibrated date (1450 ± 40 calBC), appears to be considerably earlier than those of the other two samples from Structure 3-A. If all three calibrated intervals are taken at face value, the stratigraphically deeper sample SUERC-64181 would be nearly a century and half earlier than SUERC-64180 (1310 ± 60 calBC) and more than two centuries earlier than SUERC-64267 (1240 ± 40 calBC). We cannot exclude the possibility that the discarded bone, on which the ^{14}C age of SUERC-64181 was measured, indeed belongs to the earlier stages of occupation of the hilltop, without being definitely related to the context of Structure 3-A. The accidental redeposition of remains from the earlier human activities on the hilltop when Structure 3-A was built is a plausible hypothesis.

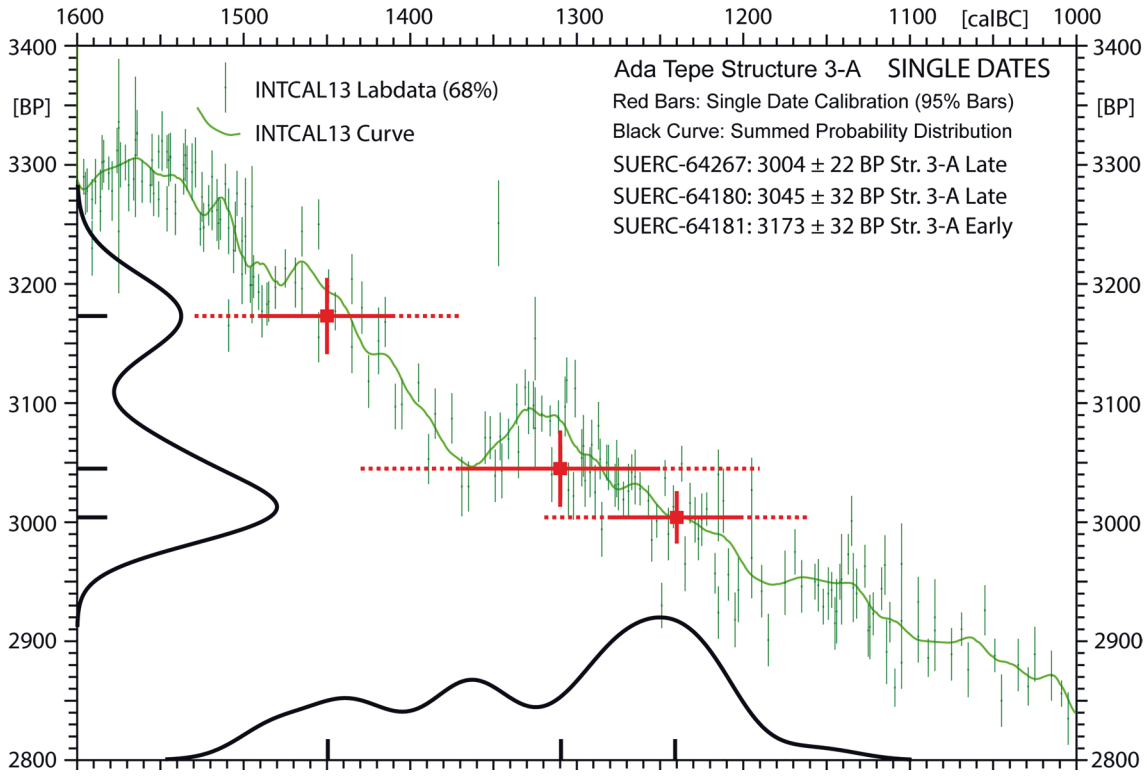


Fig. 49 Ada Tepe, hilltop, Square 66, single age calibration and summed calibrated distribution for three bone samples from Structure 3A. Note: Within given error limits of ± 32 BP, the seemingly very old (~1450 calBC) ^{14}C measurement SUERC-64181 can easily be assigned a reading on the calibration curve close to 1320 calBC, in which case all three ^{14}C ages would be compatible with a much shorter use interval (e.g. 1320–1280 calBC) for Structure 3A than is indicated by the probably only artificial 330yr length of the summed dispersion distribution (95%: 1490–1150 calBC) (graphics: B. Weninger)

Such an interpretation could explain the presence of the sample in the deepest levels of Structure 3-A. However, as already noted in the caption to Fig. 49, it is entirely plausible that SUERC-64181 simply derives from the top of the calibration curve wiggle at 1320 calBC, in which case the three samples would be much closer together in time than is indicated by the calibrated age intervals. The interpretational difficulty in this is that we know, from experience gained in the archaeological application of IntCal curves over the last decades, that many of the wiggles are excessively smoothed. This is due to the lack of higher quality and more dense (annual scale) calibration data. But we cannot prove the corresponding loss of true wiggles for the very same reason (lack of data). This leads to the dilemma that, in applying the internationally recommended ^{14}C age calibration, we risk construction of some not necessarily plausible archaeological chronologies, which may very soon become obsolete. The solution we have chosen is to apply the recommended calibration but provide comments, as can be seen from the figure captions (Fig. 49 and Fig. 61). This situation is very similar to that of Structure 17, where a considerable discrepancy is also observed between the chronological positions of a sample discovered with materials related to the remains of the dwelling that existed in this place, and another one that was discovered in deeper stratigraphic layers on the periphery of the structure from the 14th–13th century calBC.

The stratigraphic position of Structure 3-A beneath the entrance and part of the curtain of the later fortification wall underlines its importance for the overall chronological interpretation of the spatial and functional development of the settlement at the top of Ada Tepe during different stages of the Late Bronze Age. The clustering of most of the dates in the last quarter and the end of 14th century calBC determines the next stage of the Late Bronze Age habitation of the hill (cf. Fig. 73).

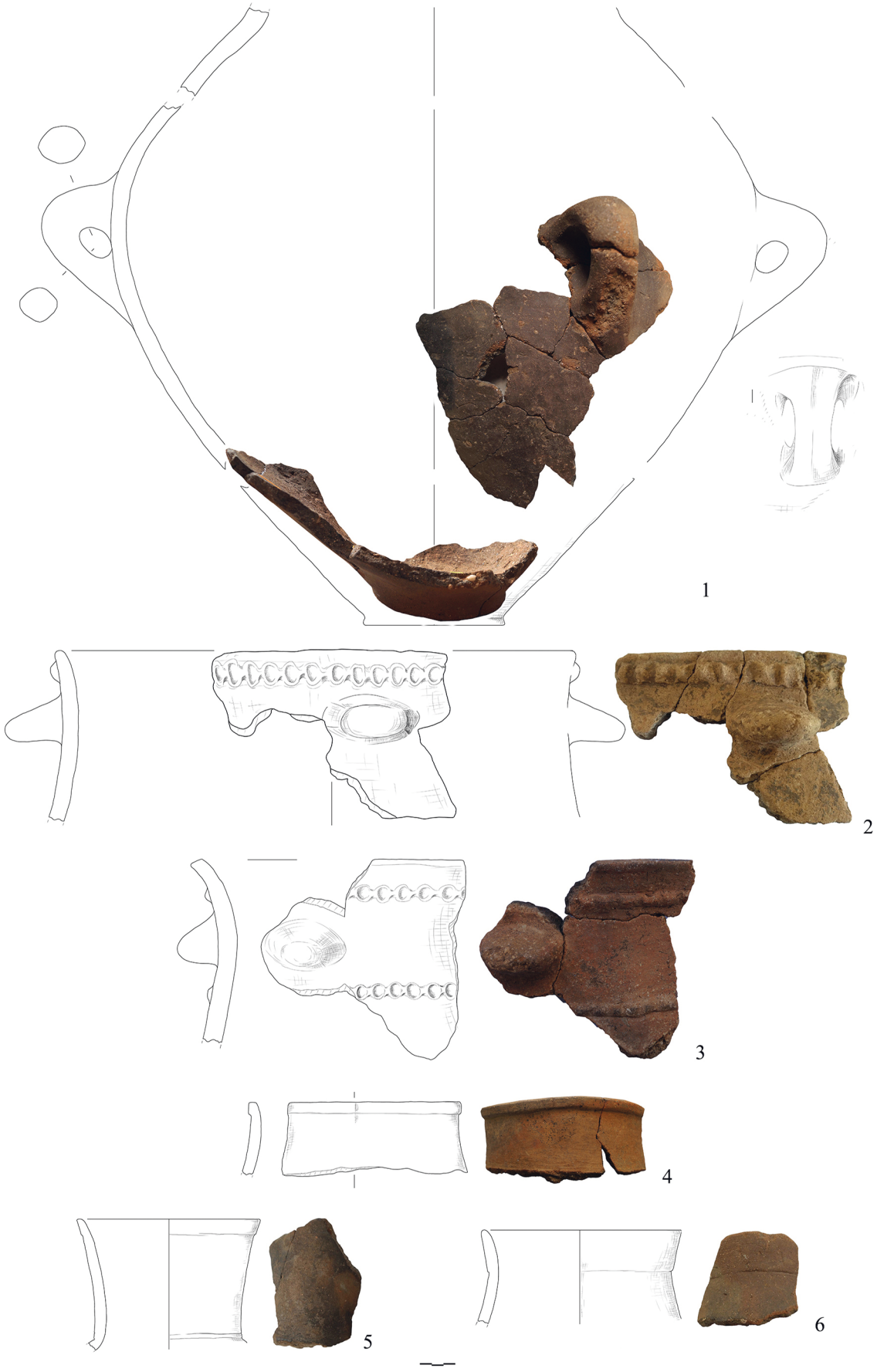


Fig. 50 Pottery from Structure 3-A in Sector G-11. Scale 1:5 (© Y. Dimitrova)

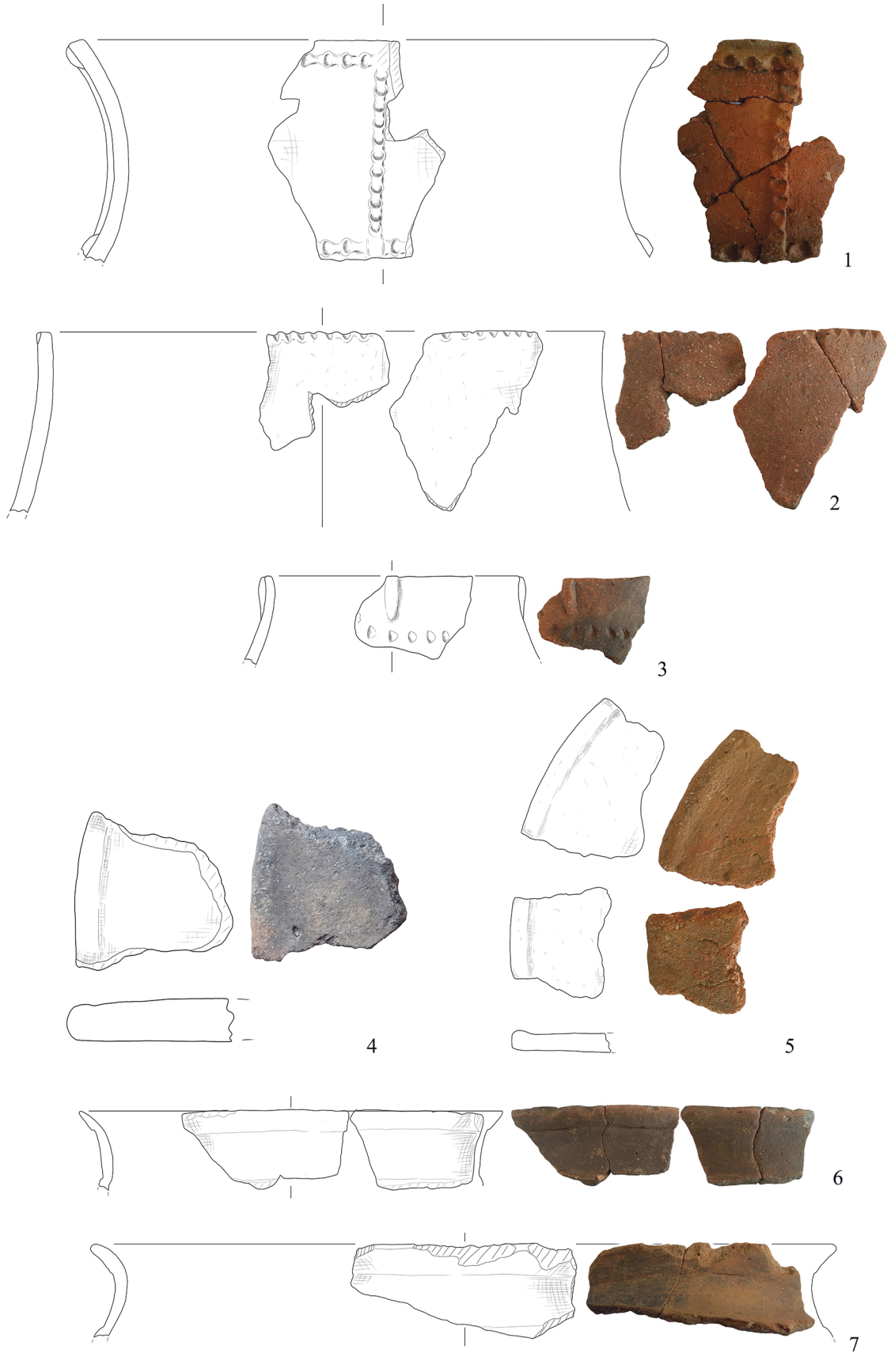


Fig. 51 Pottery from Structure 3-A in Sector G-11. Scale 1:4 (© Y. Dimitrova)

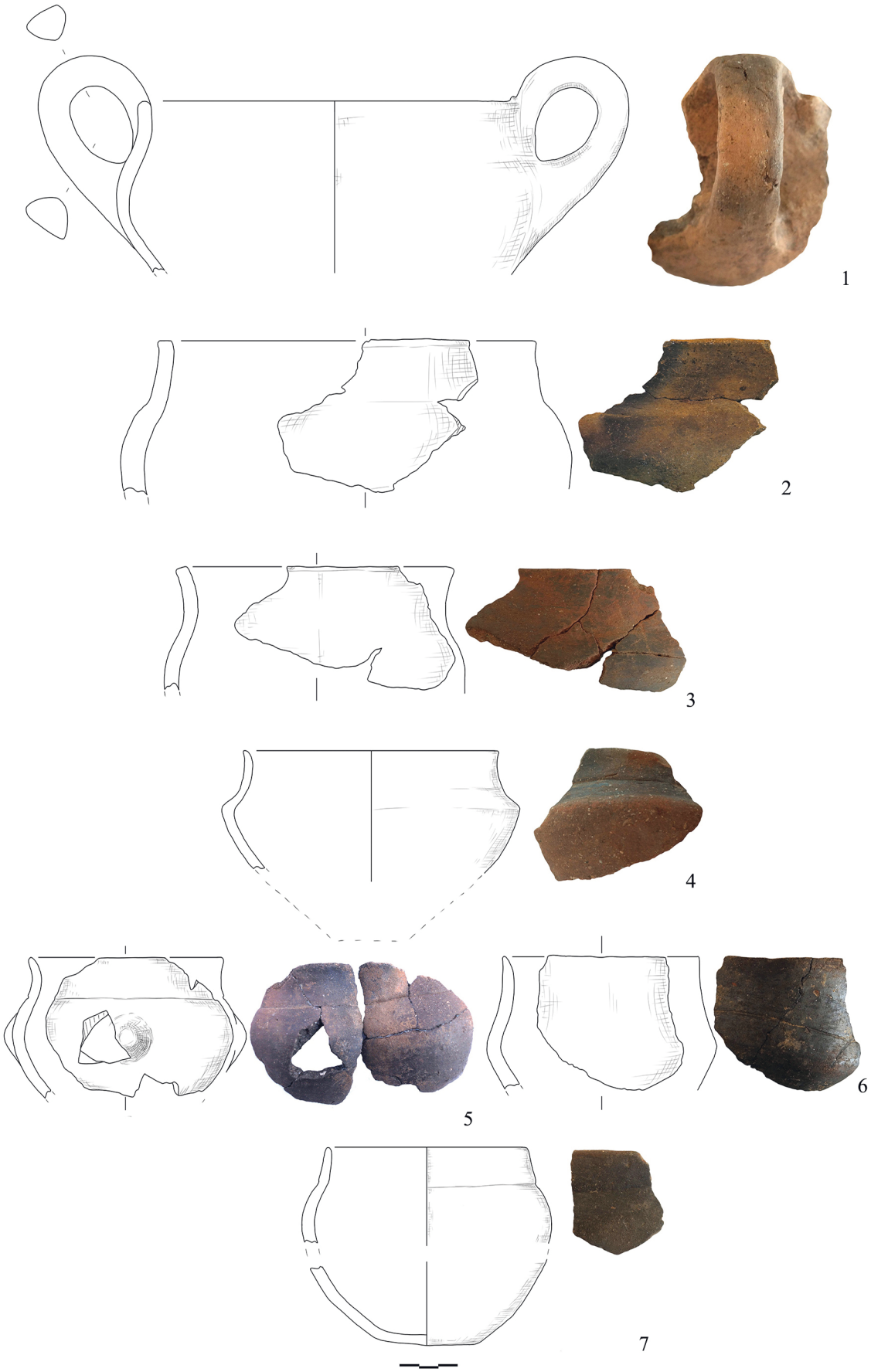


Fig. 52 Pottery from Structure 3-A in Sector G-11. Scale 1:3 (© Y. Dimitrova)

The pottery assemblage demonstrates some new features compared to the one from the first habitation stage (of the 15th century calBC) (Figs. 50–52). Still, the assemblage from this structure confirms its interpretation as a dwelling with a household organized around everyday-life activities. As in the earlier settlement phase, the vessel repertoire covers all known technological groups. A new element for this period is the appearance of a separate class of coarse storage vessels, made of coarse clay fired to an ochre colour, sometimes almost white (Fig. 50.2). The rim count demonstrates that in Structure 3-A, the sherds of vessels for long- and short-term storage of agricultural products and/or liquids amount to almost half of all identified rim fragments. The interpretation of the structure as a dwelling or as a place for food preparation and storage as well as consumption is confirmed by the presence of jars (Fig. 51.1–3) and baking trays (Fig. 51.4–5). These two categories together make up about 20% of all identified rim sherds. The baking trays appear for the first time in this period.[50] Another innovative feature of this second settlement phase consists in tongue-shaped lugs applied to jars and other coarse-ware storage vessels (Fig. 50.2–3). Finally, there are vessels for the serving and consumption of food and liquid i.e. bowls, cups and/or kantharoi, as well as jugs (Figs. 51.6–7; 52.1–7), made in fine and semi-fine wares. Cups/kantharos-like vessels now show a sharply biconical profile (Fig. 52.4). The *Furchenstich* decoration decreased in this phase, as fragments decorated in this technique do not exceed 2% of all processed sherds, which stands in marked contrast to the previous stage, in which their number was three times as high.

The significance of the structure and its pottery assemblage is emphasized not only by the numerous absolute dates (a total of ten) from squares 65, 66, 75, and 76, but also by the circumstance that two fragments of wheelmade vessels were discovered in Square 66 (cat. nos. 1, 5, Fig. 10).

The first fragment comes from levels (-0.25m beneath the surface) related to the later Structure 3 and the fortification wall (cat. no. 1). It could have been redeposited from the earlier remains situated beneath the wall. This fragment comes from either the shoulder or the lower body of a small closed vessel. As it shows a slight carination, it might have belonged to an angular alabastron. Due to the very small size and bad preservation of the fragment, the initial surface of which is not preserved, one cannot say anything more about that vessel. The NAA has grouped it in a pair with cat. no. 2 from G-11, Square 25; depth 0.25m (NAA samples Ada Tepe 1 and 2). From the analytical point of view, both sherds might even come from the same vessel, but the preserved parts of the wall sections do not support this idea.

The second fragment (cat. no. 5) was discovered at a depth between -0.45 and -0.65m, in levels that are directly related to the earlier Structure 3-A, by the samples SUERC-64180, SUERC-64181 and SUERC-64267. This sherd comes from the shoulder zone of a medium-sized closed vessel. Unfortunately, its surface is totally worn off and no structural elements of the vessel are preserved. Thus we cannot use this fragment for dating Structure 3-A in relative terms. The NAA has shown that this vessel (NAA sample Ada Tepe 5) belongs to a small group with four members (group X133). The second member of this group was also found at Ada Tepe (cat. no. 3, NAA sample Ada Tepe 3), while the other two come from Troy (see below). Keeping in mind that much Trojan wheelmade pottery of Late Bronze Age date has been analysed by NAA in the Bonn laboratory[51] and that the two X133 members found at Troy do not belong to any of the large and well-defined chemical groups at that site, we may surmise that those two vessels possibly reached Troy as imports. We could only speculate about where the production region of all four vessels may have been. The distribution pattern with two members in northwestern Asia Minor and two in the Eastern Rhodopes does not give us any firm evidence either. The northeastern Aegean in the widest sense might be a reasonable guess, but nothing more.

[50] However, they do not appear in all structures of that phase. They are absent from structures 6A-B and 5.

[51] Mommsen et al. 2001; Mountjoy – Mommsen 2006; Mommsen – Pavúk 2007.



Fig. 53 View of the southern periphery of Structure 3-A (on the left) with the stone debris from Structure 17 (in the centre) in the process of investigation. The cross-section from north to south in the western part of Structure 17 is part of an old geological trench (© H. Popov, P. Georgiev)

Structure 17

This structure is situated at some 6–7m immediately to the S-SW of Structure 3-A, in squares 84 and 94 of Sector G-11 (Figs. 47, 53, 54). It was detected at a depth of -0.40–0.45m below the surface and the bottom was reached at -0.80m. The structure is oriented N–S. The western part is disturbed and partially destroyed by a geological sounding and by the road that was subsequently built here to service the geological prospections. At the level of the uppermost layers, the preserved part is of irregular oval shape, with a maximum length of 4.20m and a width that varies from 1.84 in the northern part to 0.66m in the south, where the structure is most disturbed by modern activities. At a depth of -0.60m below the surface, the structure has an almost regular rectangular shape of 4.65 × 1.80m, still disturbed in its western part. Based on the preserved parts and on parallels with similar structures, one may assume that the original length of the structure was c. 5.5–6.0m, with a width of 3.0–3.5m. At -0.70–0.75m beneath the rubble layer (originating from the collapsed walls), a large ceramic deposit was uncovered that could be related to the floor of the building that existed here.

The ceramic materials are similar to those found in structures 3-A, 6-A, and 22. The small finds, grinding stones, spindle whorls, stone pestles and smoothers, a stone adze, and a small bronze chisel, point to activities of everyday life, but also to craft specialization in a certain way. Similar find assemblages, possibly related to workshop activities, are also present in the synchronous Structure 3-A, located not far away to the north.

Bones and charcoal samples were taken from different stratigraphical contexts related to Structure 17. Five samples were taken from various stratigraphic positions in Square 84, dating on two of which unfortunately failed. One sample from the surface layers (-0.20m) dates from the Early



Fig. 54 Investigations of Structure 17, detail (© H. Popov)

Iron Age and is without context. There are two samples of Bronze Age date; both were measured on horse bones.

The sample SUERC-43623: 3099 ± 29 BP comes from a stratigraphic position related to the level at which Structure 17 was detected, while the first layers of the debris had been removed mechanically during the excavations (at -0.45–0.60m below the surface). It dates from the 14th century BC (1350 ± 50 calBC).

The second sample SUERC-64186: 3200 ± 32 BP with a calibrated date of 1470 ± 30 calBC was discovered at a depth of -0.75 to -0.80m below the surface in the northern periphery of Structure 17, but outside the limits of its sunken part. Its stratigraphic position was at the very base of the cultural layers, immediately above sterile ground. As in the case of Structure 3-A, the question arises of whether the bone that is dated a century earlier than SUERC-43623 belongs to the occupation period of Structure 17, or if it is a redeposited piece of waste from earlier human activities on the hilltop of Ade Tepe. Despite these opposing interpretative possibilities, it is clear that here, at Structure 17 and in its immediate surroundings, there are traces from activities that date from the first two centuries (15th–14th century calBC) of human presence on the hilltop of Ada Tepe.

The pottery assemblage of this structure (Figs. 55–58) is quite similar to that of Structure 3-A as a set. Almost 50% of all identified rim sherds belong to storage vessels of coarse and semi-fine ware (some of them with quite thick walls, which probably belong to pithoi) and to amphorae (Fig. 55). About 20% of the assemblage consists of cooking jars (Fig. 56.1–4, 6) and around 25% of the total belongs to tableware vessels (Figs. 57–58). Certain special shapes are worth mentioning, e.g. double vessels of fine ware and a small kitchenware strainer (Fig. 56.5). The ceramic assemblage suggests that this structure was a dwelling place, in which food preparation and storage of agricultural products and liquids were practised. All characteristics of the

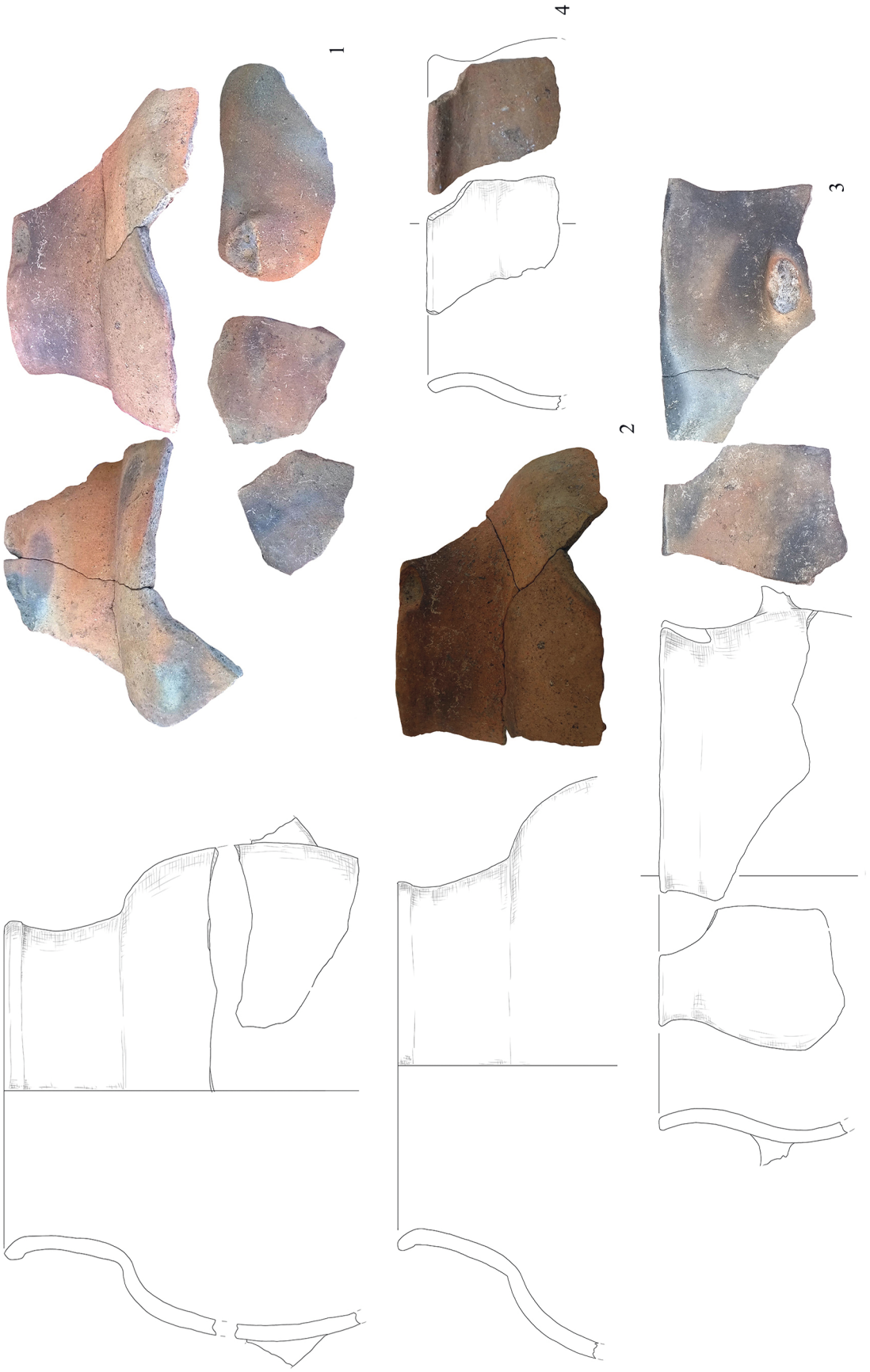


Fig. 55 Pottery from Structure 17 in Sector G-11. Scale 1:5 (© Y. Dimitrova)

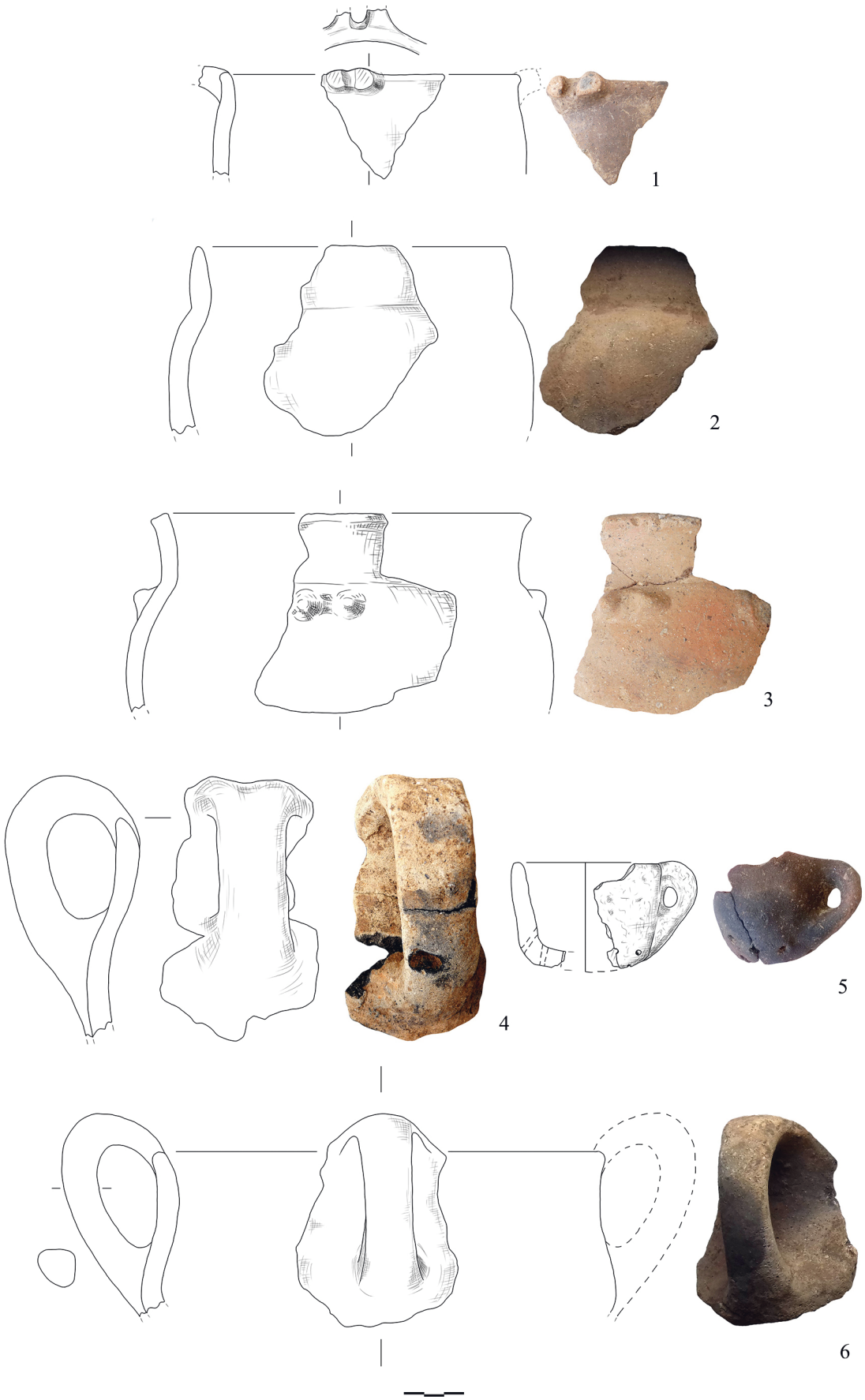


Fig. 56 Pottery from Structure 17 in Sector G-11. Scale 1:3 (© Y. Dimitrova)

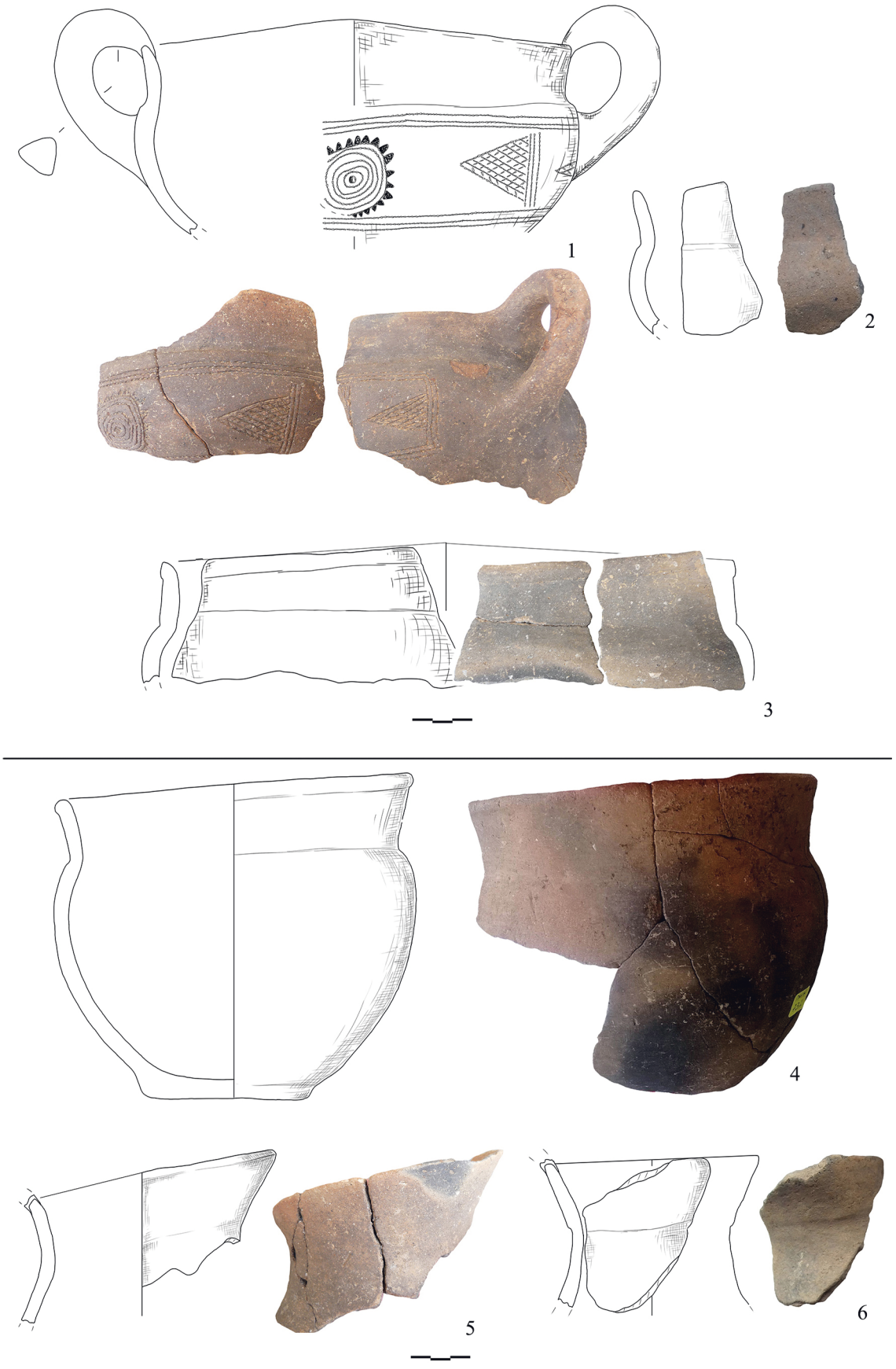


Fig. 57 Pottery from Structure 17 in Sector G-11. Scale 1:3 (© Y. Dimitrova)



Fig. 58 Pottery from Structure 17 in Sector G-11. Scale 1:3 (© Y. Dimitrova)



Fig. 59 Structure 10, remains of a dwelling of oval or round ground plan. Parts of the stone foundations and of the clay plaster floor are preserved, as well as a fireplace. To the right, part of the sunken Structure 22, adjacent to N–NE (© H. Popov)

second Late Bronze Age phase of Ada Tepe are present among this assemblage: the new class of ochre-white storage vessels, the new category of the flat baking trays, the tongue-like lugs on the storage vessels and jars; and the lower number of *Furchenstich*-decorated sherds in the fine and semi-fine ware groups (not exceeding 2% of the total of the processed sherds of all technological groups).

Structures 10 and 22

These two structures have to be considered together, as they are related in terms of context. They are situated in Sector G-11, while Structure 10 is located in squares 47, 48, 57, and 58. Structure 22 is located directly to the east of Structure 10, while at certain spots their walls touch, and is located in squares 37, 38, 47, and 48 (Fig. 47). In their western parts they are partially disturbed by the earth road that follows the ridge of the Ada Tepe hill, while in their eastern and northeastern parts they are disturbed by a trench that was excavated during modern activities at the hilltop. This part of Sector G-11 is situated in the immediate western periphery of the area investigated on the hilltop by the Nekhrizov's team from 2001 to 2005.

The first indications of the existence of structures in this area were detected already at a depth of -0.15m, but the levels were mixed. In squares 37, 38 and 47, the Early Iron Age Structure 4 was investigated. Debris and higher concentrations of materials, related to earlier phases of the Late Bronze Age and not disturbed by later occupation, were discovered at a depth of -0.40–0.50m in Structure 22, and at -0.35–0.40m in Structure 10. The pottery from both structures, as well as from Structure 18 immediately to the north, is uniform and quite similar.



Fig. 60 Stratigraphic section in the eastern part (sunken into the slope) of Structure 10. The stepped levelling/terracing of the slope is visible, as well as parts of the stone foundations and of the clay plaster of the floor (© H. Popov)

Structure 10 is of oval, almost circular shape (Fig. 59). In the periphery of the preserved parts, there are aligned stone slabs that could be interpreted as a socle on which the walls of lighter construction of the building were founded. In the central parts, a very well-levelled clay plaster floor is preserved. Based on the analysis of the preserved parts, the approximate dimensions of the oval/circular structure were 5.50–6.00m E–W (the structure was destroyed in its western part) by 8.20m (N–S). In the better-preserved eastern part of the structure there were the remains of a hearth and a floor coating, and also vessels, which had been placed close to the hearth (Figs. 59–60).

Based on the finds (storage vessels, cooking and tableware, including numerous double vessels, grinding stones, fragmented stone, ceramic, and metal tools), and on the presence of a fireplace in the eastern part, Structure 10 could be interpreted as the remains of a dwelling. The related layers were investigated from -0.35–0.40m to -0.80m below the surface. The sample SUERC-64268: 3005 ± 22 BP is from cattle bone and was taken from the levels of the first detection of Structure 10 and from the clearing of its debris. Its calibrated date is 1240 ± 40 calBC (Fig. 61). Unfortunately, the dating of all other samples from the structure failed. The fact that the sample SUERC-64268 was taken from the upper levels of debris from the dwelling may suggest that it is related to the latest phases of its existence, thus it could be considered a terminus ante quem for the early use of the building. At the same time, this date corresponds well to the absolute dates from Structure 22, described below. This can also be said for the characteristics of the pottery assemblages, which show close similarities in both structures (Figs. 62–64, 68–70).

Immediately to the northeast of Structure 10, Structure 22 adheres to it (Figs. 47, 59, 60, 65). Structure 10 partially overlaps it, and Structure 22 is dug into the ground to a greater depth – its bottom was reached at -1.10m below the surface. It is clearly sunken into the bedrock and has an irregular rectangular to trapezoidal shape with maximum dimensions 4.10m (NW–SE) by 3.50m (SW–NE). At -0.60–0.70m below the surface, parts of a destroyed hearth were uncovered (Fig. 66).

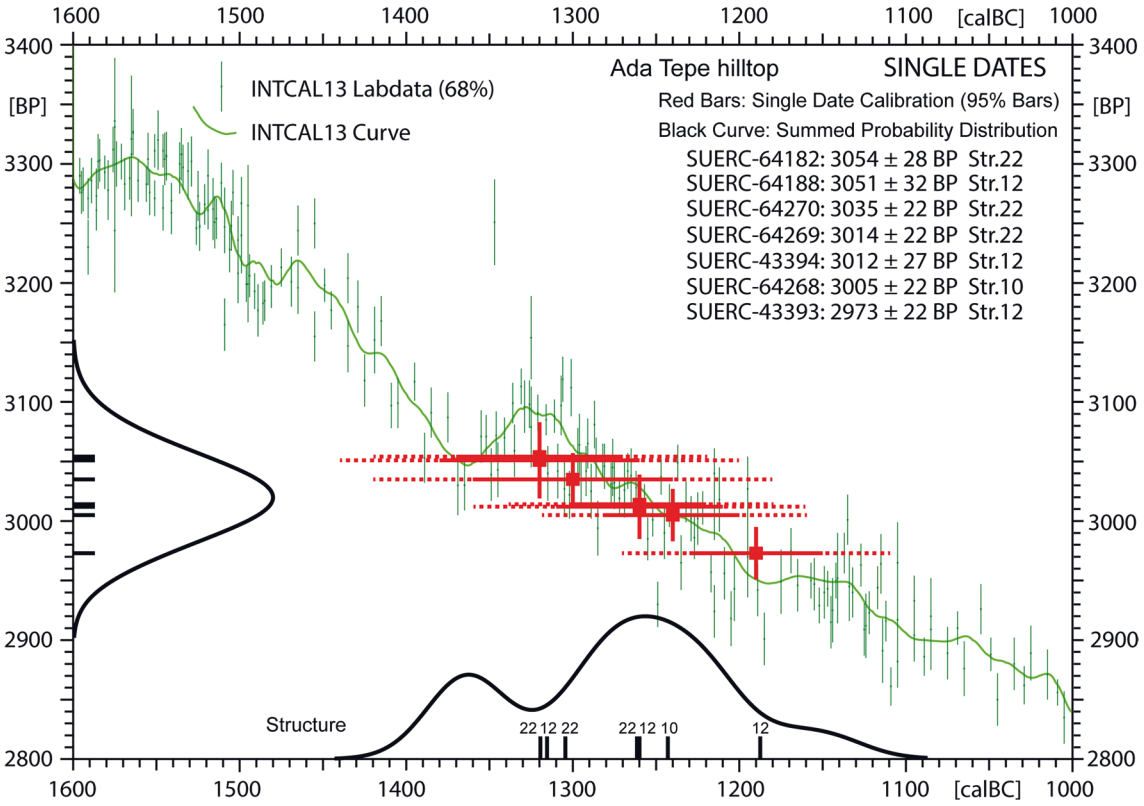


Fig. 61 Ada Tepe, hilltop, single age calibration and summed calibrated distribution for seven bone samples from three structures (Structure 22: N=3; Structure 12: N=3, and Structure 10: N=1). Note: The weighted average of the seven 14C ages is 3016 ± 9 BP (p=24.7%). From a statistical perspective, it cannot be disproven that all seven samples derive from one and the same calendric scale interval 1280–1220 calBC (95% confidence). From an archaeological perspective, this dating would be compatible with a contemporaneous use of the three structures, which is furthermore quite short (annual to decadal scale) (graphics: B. Weninger)

There are three absolute dates that were taken from various depths of Structure 22 – SUERC-64269: 3014 ± 22 BP, SUERC-64270: 3035 ± 22 BP, and SUERC-64182: 3054 ± 28 BP (Fig. 61). Sample SUERC-64270 was taken from the layers near to the bottom of the structure. However, given the oscillating structure of the calibration curve in the relevant time window, and especially allowing for the statistical correspondence of the three ^{14}C ages (weighted average 3031 ± 14 BP, p=52%), further refinement of the otherwise highly reproducible and robust (although bimodal) age of 1301 ± 56 calBC is not possible.

The ceramic inventory is analogous to that from the neighbouring Structure 10 to the west and to those from structures 12 and 18, situated nearby to the N-NW (see below).

Based on the similar specifics of structures 10 and 22, on the materials collected from them, and on the samples taken from various stratigraphic positions in this part of Sector G-11, two functional and chronological interpretations are possible.

If the two structures are considered completely contemporary, then they could be regarded as one complex of one larger above-ground dwelling, to which a smaller structure that was partially sunken into the ground was added from the northeast, having household functions. In terms of location and stratigraphic position, the situation is very similar to Structure 12, situated in close proximity to the north. One would then have to assume the existence of a bigger, main building (Structure 10) and adjacent smaller, service structures/premises (structures 22 and 12).

Of course, another possibility should not be excluded. Due to the fact that Structure 22 is dug into the ground in steps and to a considerably greater depth compared to Structure 10, that in its western part the sunken portion of Structure 22 lies partly beneath the northern part of Structure 10

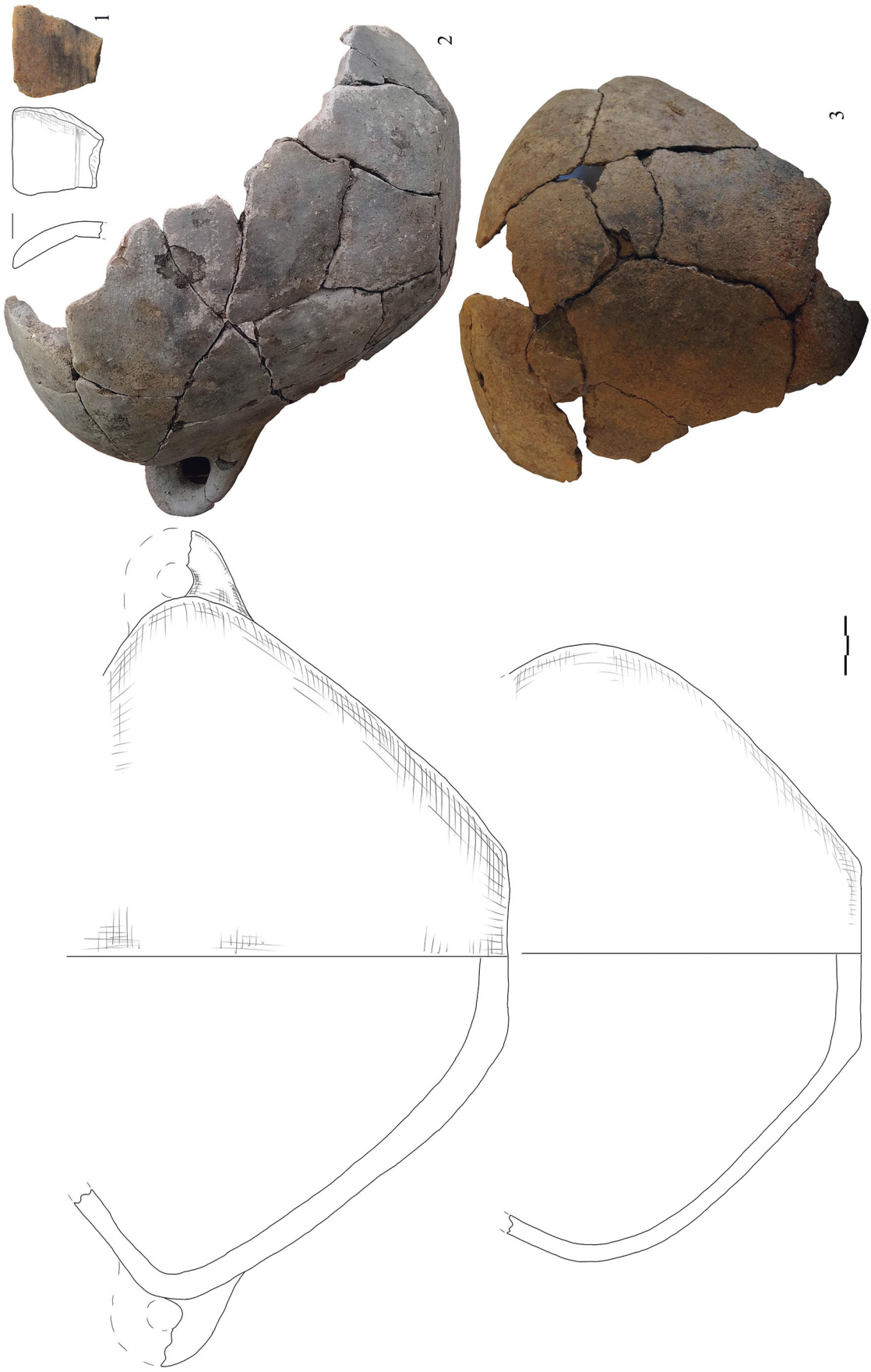


Fig. 62 Pottery from Structure 10 in Sector G-11. Scale 1:3 (© Y. Dimitrova)

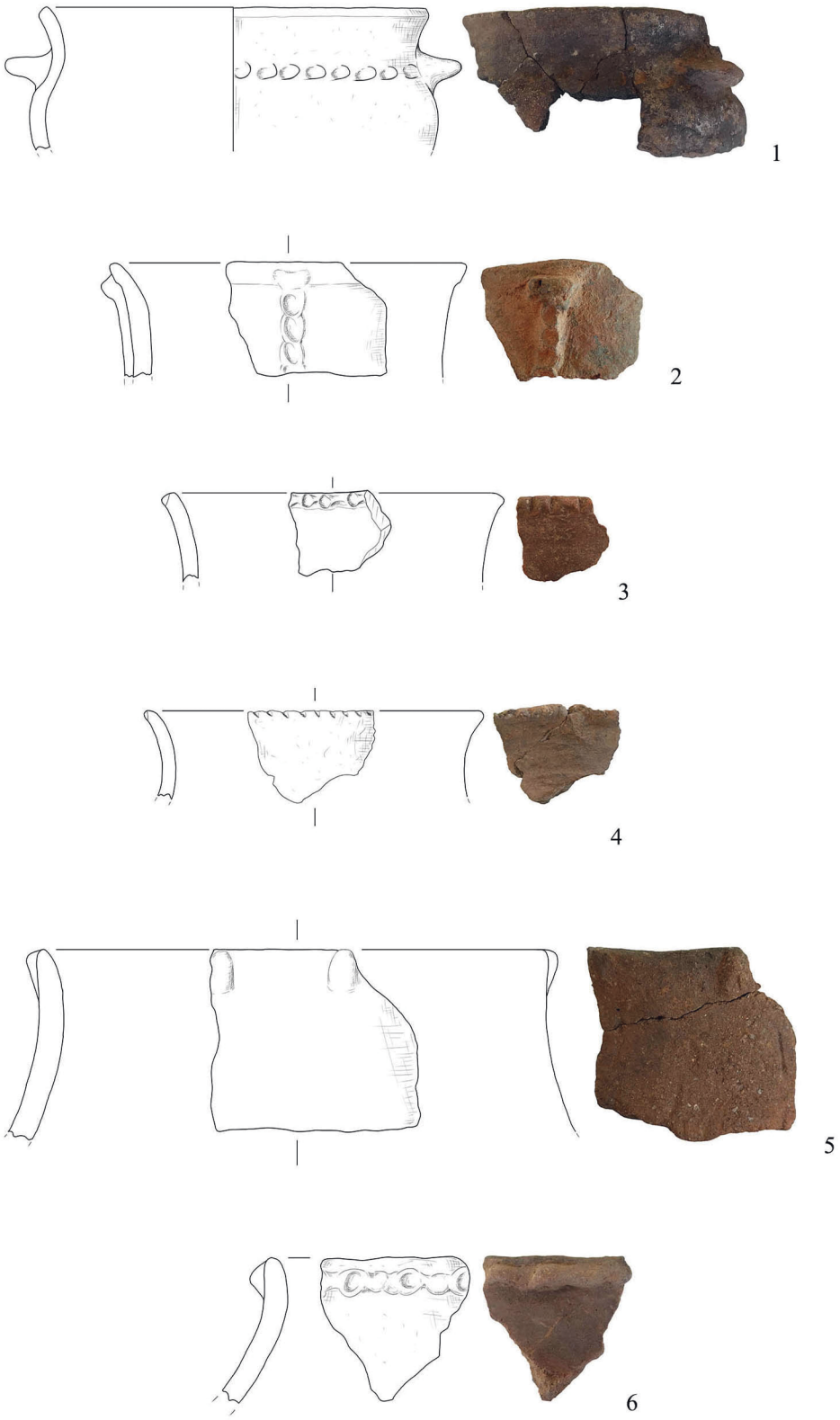


Fig. 63 Pottery from Structure 10 in Sector G-11. Scale 1:3 (© Y. Dimitrova)



Fig. 64 Pottery from Structure 10 in Sector G-11. Scale 1:3 (© Y. Dimitrova)



Fig. 65 Sunken Structure 22, situated on the N–NE periphery of Structure 10 (© H. Popov)

and that no clear border could be distinguished between the two, another interpretation is also possible. Perhaps Structure 22 comprises the remains of an earlier building (possibly a dwelling, as there are a hearth, grinding stones and other small finds), that had sunken and above-ground parts and existed at this location some decades earlier. It was contemporary with the neighbouring Structure 12 to the north, and the rock between them was levelled. Later, a new structure was built immediately to the south and southwest, which partially overlapped the remains of Structure 22.

Irrespective of which of the two hypotheses is correct, there is no considerable chronological difference or discontinuation in the occupation of the place in the period under consideration. It is impossible to trace internal distinctions in the ceramic material and the finds are very similar – standard household inventory that does not differ from what is usual for the period. Thus, the chrono-typological comparison between the pottery inventories of structures 10 and 22 suggests a continuous occupation of this spot. The pottery assemblages of both structures are typical for the households of the Ada Tepe dwellings in the second LBA phase. The storage vessels, taken together with the amphorae (Figs. 62; 68.1–3), are less frequent than in structures 3-A and 17, as they amount to around one third (c. 32%) of all identified sherds. Vessels for the serving and consumption of liquids (jugs, kantharoi, cups, Figs. 67, 68.4–5) and food (bowls, Figs. 64, 69.1–2) are slightly more numerous – around 35%. The vessels for food preparation and storage (jars, baking trays, Figs. 63, 68.6–7) are as common as in the structures mentioned above, ranging from 13 to 14%. The innovative shapes among the cups/kantharoi that appear in this period are also attested (Fig. 70.2–4). The new form of the s-shaped, open bowl is detected, i.e. the one with clearly distinguished parts of the body and strongly everted mouth rim (Figs. 64.1–2; 69.1–2).[52] The new

[52] Some sherds of this form were also found in Structure 3-A.

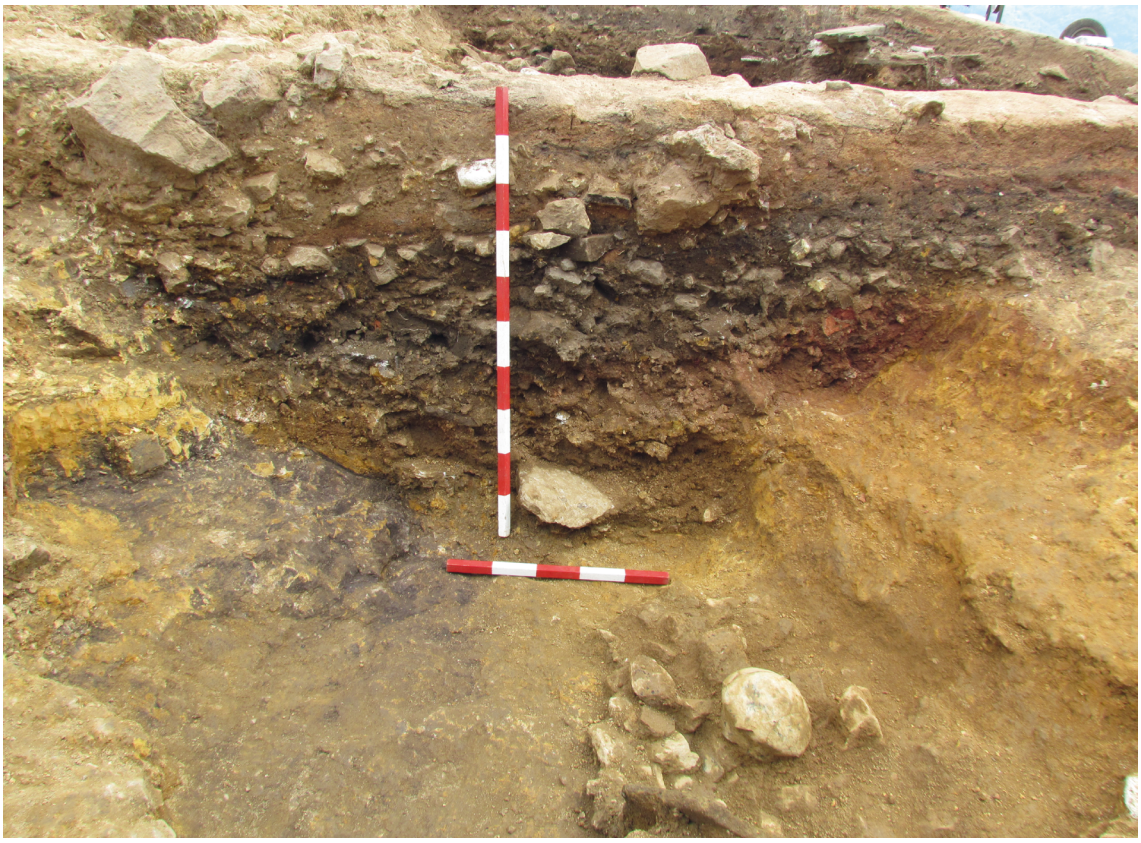


Fig. 66 Stratigraphic section of Structure 22. A fragment of a grinding stone and a ceramic vessel could be seen near the bottom of the sunken structure (© H. Popov)



Fig. 67 Ceramic vessel discovered at the bottom of the sunken Structure 22. Detail (© H. Popov)

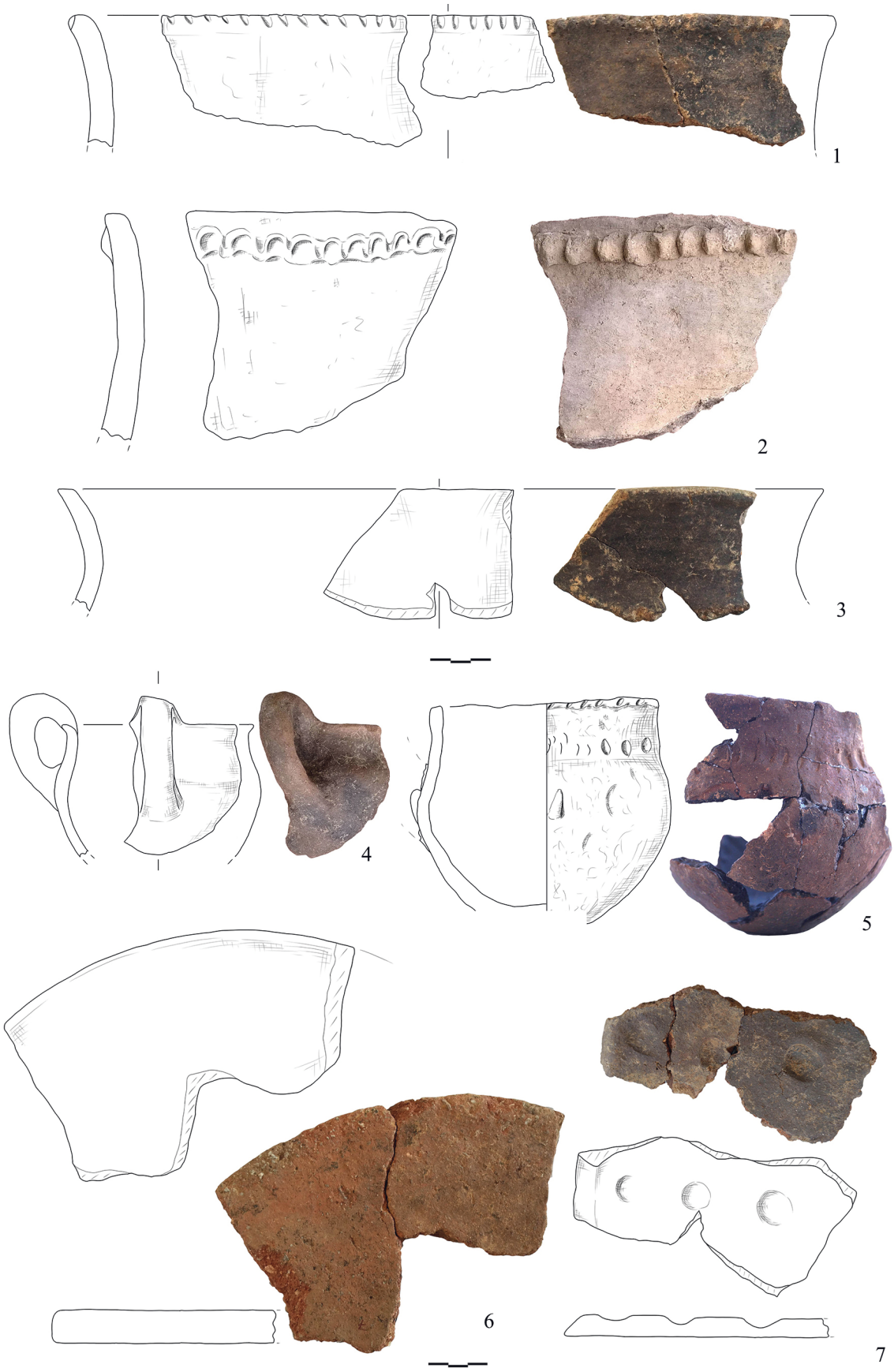


Fig. 68 Pottery from Structure 22 in Sector G-11. Scale 1:3 (© Y. Dimitrova)



Fig. 69 Pottery from Structure 22 in Sector G-11. Scale 1:3 (© Y. Dimitrova)

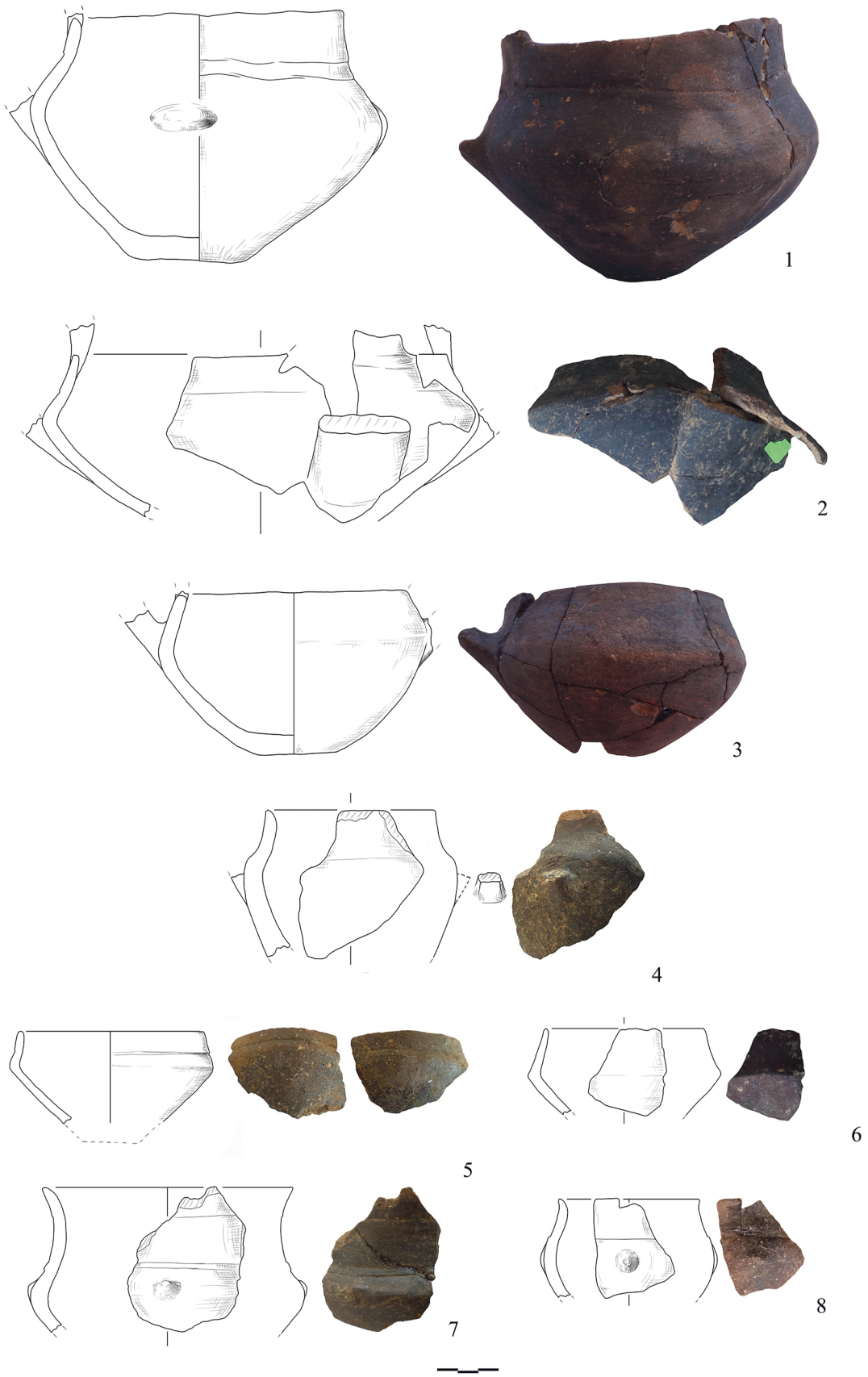


Fig. 70 Pottery from Structure 22 in Sector G-11. Scale 1:3 (© Y. Dimitrova)

typological traits of the coarse ware vessels are also present, in particular the tongue-shaped lugs. We furthermore note the absence of the jar with elongated, ovoid body and one vertical handle, which is characteristic for the 15th-century calBC structures. Finally, Structure 22 yielded in its undisturbed layers (the same from which the sample SUERC-64269 was taken) one wheelmade sherd, a belly fragment of a closed vessel with the remains of one belly band on it (cat. no. 3, Fig. 10). Unfortunately, the tiny part of the vessel that is preserved does not allow any chronological conclusions to be drawn from it.

The statistical coincidence of the ^{14}C ages on samples SUERC-64268: 3005 ± 22 BP (from Structure 10) and the three ^{14}C ages from Structure 22 with a weighted average of 3031 ± 14 BP also suggests that these structures either belonged to a single complex of houses, or that the two structures followed each other in an uninterrupted chronological sequence.

Structure 12

Structure 12 is the last one on the hilltop that yielded several samples with absolute dates from the 14th–13th century calBC and was already mentioned in the description of structures 10 and 22 (Fig. 47). It was investigated in Sector G-11, squares 38 and 48. To the south, the structure is attached to the periphery of the aforementioned Structure 22.

Down to -0.40–0.45m below the surface, mixed materials from the Early Iron Age and the Late Bronze Age were discovered. At this depth, the shape of the structure is elongated (5.30m N–S) and of irregular shape, which fact could be explained by the disturbance caused by the Early Iron Age Structure 4 to the south. From this level downwards, the shape is rectangular, with dimensions of c. 3m (NE–SW) by 2.50m.

From a depth of -0.50–0.55m downwards, two separate sunken parts are distinguished, the one to the southwest with a bottom at -0.65–0.70m, and the one to the northeast with a bottom at -0.85–0.90m. The overall irregular rectangular shape remains constant down to the deepest levels. The ceramic inventory (storage vessels, cooking and tableware), although poorer than the assemblages from structures 10 and 22, is very similar to those in terms of morphological and functional characteristics, as here the storage vessels are abundant – more than 40% of all identified rim sherds, in contrast to the consumption and serving vessels such as kantharoi, cups, jugs, and bowls. Vessels for food preparation (jars) are present here, while baking trays are represented only by single sherds. The isolated stone and flint tools that were discovered are also quite simple and repetitive.

Based on the specifics described above and on parallels from other structures, investigated in various sectors of Ada Tepe, the remains of Structure 12 in squares 38 and 48 could be interpreted as belonging to a building that was dug into the bedrock. The situation is very similar to the one uncovered in Structure 22, and the step left in the south-southwestern part also has a direct parallel there. The contemporaneity of the two structures is supported by the series of radiocarbon dates. All samples from the area of Structure 12 come from cattle bones (Fig. 61). The first two, SUERC-43393: 2973 ± 22 BP and SUERC-43394: 3012 ± 27 BP, were taken from layers with mixed materials of Early Iron Age and Late Bronze Age date (at -0.20–0.35m below the surface). Of course, strictly speaking, the two ^{14}C ages are identical.

The sample SUERC-64188: 3051 ± 32 BP was taken from the uppermost levels, in which Structure 12 was detected (at -0.35–0.45m below the surface), and has a calibrated date of 1320 ± 60 calBC. In this case, a redeposition may be assumed because of its position in the topmost levels of the debris of the structure. Meanwhile, although (again strictly speaking) samples SUERC-64188: 3051 ± 22 BP (from Structure 12), SUERC-64270: 3035 ± 22 BP (see above, Structure 22) and SUERC-43394: 3012 ± 27 BP (from Structure 12) have statistically identical ^{14}C ages, they could also be interpreted as a consistent (even if only small) series, which is readily grouped into the framework of a few decades in the late 14th and the early 13th century BC. SUERC-64270 was collected at the borderline between structures 12 and 22 from levels close to the sterile bedrock. Therefore, we discuss it in connection with these two structures (Fig. 47).



Fig. 71 Structures 5, 6-A, and 6-B in Sector G-11. Panoramic view from the southwest (© H. Popov, P. Georgiev)

This circumstance again raises the question of the common context and the synchronism of structures 10, 22, and in this case, 12. All these structures can now be seen – especially when based on a critical evaluation of the shape of the calibration curve – as representing different parts of the same complex. As already noted in the caption to Fig. 61, the seemingly wide spread of the calibrated ^{14}C ages can easily and without further constraint be interpreted as having a purely statistical background. The available (N=7) ^{14}C ages from the three structures are statistically identical (p=24.7%), with a weighted average ^{14}C age of 3016 ± 9 BP that would correspond to a central occupation age of 1250 ± 30 calBC for the hilltop buildings, which were quite likely only occupied for a few consecutive decades.

Structures 5, 6-A, and 6-B

These three structures are situated in immediate proximity to one another in squares 12, 14 (Structure 6-A), 23, 24, 33, 34 (Structure 6-B), and 25 (Structure 5) of Sector G-11, at a distance of some 25–30m to the N-NW from Structure 3-A (Fig. 47). They are situated in the northwestern periphery of the settlement, at the beginning of the slope that gradually descends from the edge of the levelled ground, where later the fortification wall around the central area of the peak was built (Figs. 47, 71). They are all oriented north-south. Structures 6-A and 6-B have an elongated plan and similar dimensions, 6.90 × 3.00m and 6.70 × 3.80m respectively. Structure 5 is smaller (2.80 × 1.74m). They were all detected at the same level, -0.30–0.35m below the surface, and all three are relatively thin-layered, with bottoms reached at -0.50–0.55m below the surface. Structure 5 was detected at -0.20–0.25m below the surface.

The diverse ceramic materials in combination with the total absence of small finds such as spindle whorls, stone, flint or metal tools, etc. that are regularly discovered in other dwellings

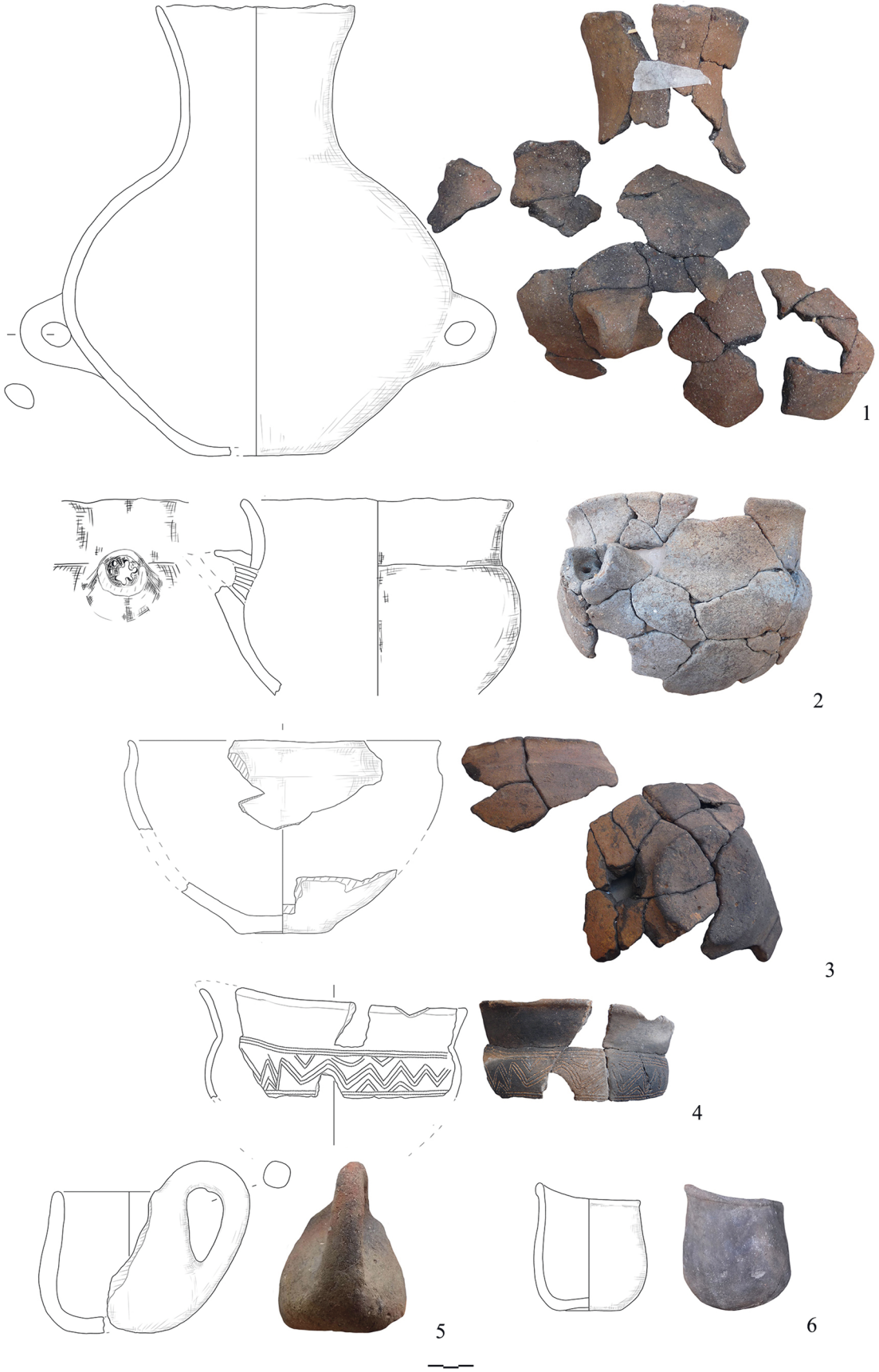


Fig. 72 Pottery from Structure 6A in Sector G-11. Scale 1:4 (© Y. Dimitrova)

within the settlement provide evidence for the hypothesis that these three structures were not used for habitation, but rather for storage. They were, then, sheds of light construction, where food supplies and vessels were kept. The ceramic inventory of the structures as a set and in terms of chronological characteristics is analogous to those in the structures mentioned above, with one exception – the lack of baking trays. This fact most probably corresponds to the proposed interpretation of the structures. One interesting vessel from the complex that is not typical for Ada Tepe is a small deep bowl with strainer spout (Fig. 72.2).

Unfortunately, materials suitable for radiocarbon dating were extremely scarce in this part of the settlement, and despite the attempts that were undertaken, no absolute dates could be obtained from these contexts. The pottery is similar to the materials from other structures in the second Late Bronze Age phase of the settlement. However, what makes the area of structures 5, 6-A, and 6-B important for the present analysis is the fact that three fragments of two wheelmade vases were found in Structure 5 (cat. nos. 2 and 7, Fig. 10).

One of the fragments from Structure 5 (cat. no. 2) comes from the level at which the structure was detected (-0.25m). Its similarity to one of the fragments from Structure 3 (cat. no. 1) and the possibility that they may belong to the same vase (according to the NAA, samples Ada Tepe 1 and 2) – though contradicted by the vessel profiles –, as well as their discovery in cultural layers of mixed character close to the surface, may suggest that this is another case of ceramic materials that were redeposited during later occupation phases. The other fragment from Structure 5, however, comes from a depth of -0.40–0.45m and its relation to the structure and the other materials from it cannot be doubted (cat. no. 7). Cat. nos. 2 and 7 seem to belong to small piriform jars, but as only very small fragments of them with faint traces of paint are preserved, we cannot name any solid arguments for dating these vessels to a specific Mycenaean period, let alone phase.

The general characteristics of the local pottery assemblages from structures 5, 6-A, and 6-B relate them to the second phase of the Late Bronze Age of the habitation of Ada Tepe.

Comments on the Overall Stratigraphic Context at the Hilltop

The description of the archaeological structures and the stratigraphic positions of the absolute dates related to the human presence at the hilltop of Ada Tepe in the 15th to 13th centuries calBC reveals a complex and heterogeneous picture. It is difficult to restore the panorama of the occupation of the peak during this early stage in its entirety due to disturbances from later phases of the existence of the Late Bronze Age settlement. The stratigraphy is further complicated by the habitation and ensuing destruction from the Early Iron Age and the Hellenistic period. Nonetheless, the relatively large number of absolute dates and the regularities that could be detected during the analysis of the situation on the terrain provide evidence for a more complete reconstruction (Fig. 73).

Least numerous are the dates from the 15th century calBC (Figs. 36, 74). In terms of spatial distribution, they mostly come from remains that have been partially disturbed by later human presence. In the case of structures 9-A, 13-A, and 11, these are remains that have been preserved due to the fact that they were dug into the ground to a greater depth or because they were "sealed" by later archaeological structures (fortification wall, remains of later buildings, etc.). Two more samples could be added, discovered among redeposited materials in structures 3-A and 17. It is typical of all these earliest samples (with contexts in partially preserved sunken structures or in redeposited layers) that they come from the western periphery of the levelled space at the very top of the peak that was left by the open mining there. There are practically no early dates from the levelled space itself, with the single exception of the charcoal sample SUERC-43628: 3269 ± 29 BP from Square 29. Its discovery at the bottom of one of the latest mining pits opened on the hilltop indicates that the entire process of demolishing the top of the peak should be dated to the years or decades that preceded it.

It is equally important to emphasize that some of the samples from structures 9-A, 13-A, and 11 come from bones that are quite likely to date from the first decades of the 15th century calBC,

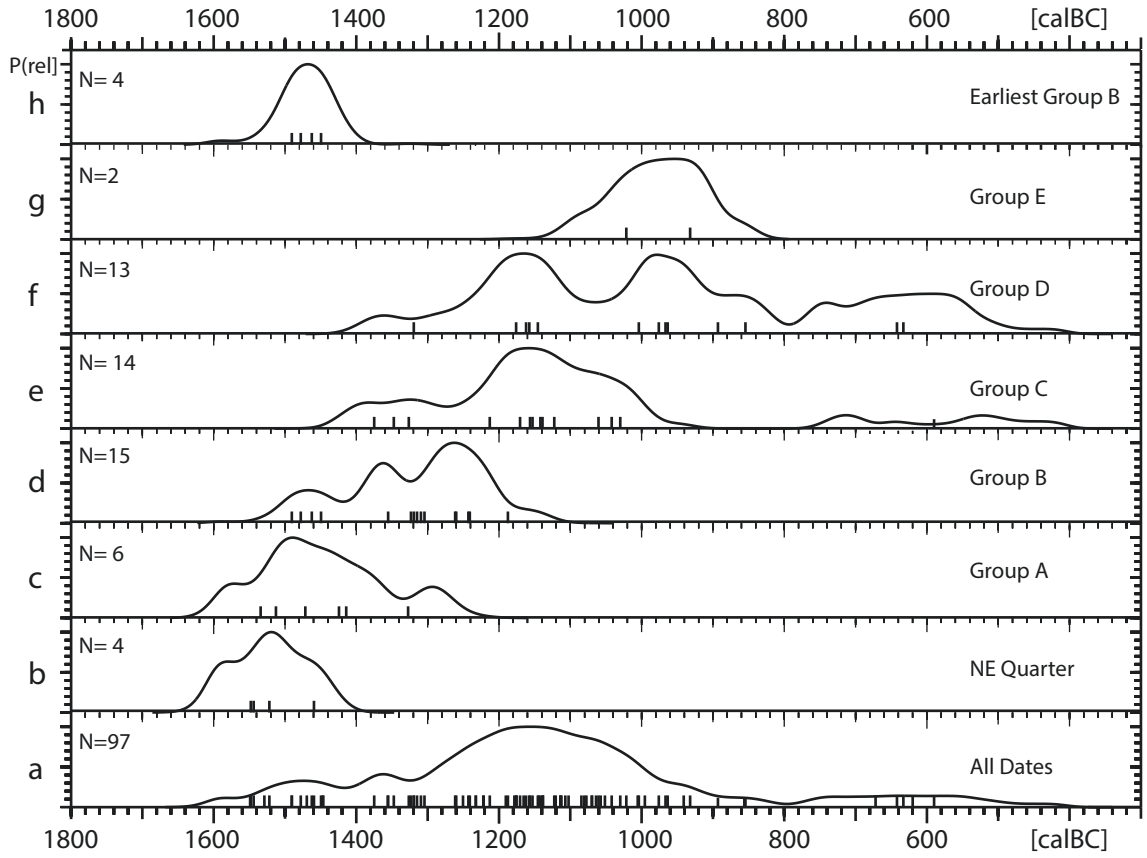


Fig. 73 CalPal Multigroup showing the sequence of summed calibrated radiocarbon distributions for Ada Tepe. a. All ^{14}C dates from Ada Tepe discussed in the present paper; b. Dates from the NE Quarter; c. Dates from working places and early mining activities on the hilltop as well as on the NW and E slopes; d. Dates from houses built on rock/virgin soil on the hilltop; e. Dates from houses of the second settlement phase on the hilltop (houses and fortification wall); f. Dates from houses of the third settlement phase on the hilltop (LBA/EIA, less well defined by architecture, mainly defined by pottery); g. Dates from houses of the fourth settlement phase on the hilltop (EIA, less well defined by architecture, mainly defined by pottery); h. Earliest dates of the second settlement phase on the hilltop (graphics: B. Weninger)

although we cannot entirely exclude that they cover the second half of the 15th century as well. The fragment of a wheelmade vessel from Structure 9-A corresponds well with these early dates. These early dates from the hilltop are contemporary with or even to some extent earlier than the absolute dates from the northeastern settlement in Sector I-7. The remains from structures 9-A, 13-A, and 11 indicate that there were buildings on the periphery of the mining works at the hilltop.

The absolute dates from the 14th–13th century calBC are considerably more numerous than those discussed above (Figs. 47, 73.d–e). Many of them come from structures that were better preserved, and some of them could be positively interpreted as remains of buildings of various functions – dwellings, storage and household facilities. Also, the area of their spatial distribution on the hilltop is much larger, comprising the western parts of the oval levelled space that was left by the early mining and spreading down the higher parts of the western slopes of Ada Tepe. Beneath the settlement that existed on the hilltop of Ada Tepe in this period, traces of the early mining were sealed. The terrain was levelled and used for the needs of the inhabitants. At the same time, the occupation spread over a larger area and took over areas on the high terraces of the western slopes that were previously unoccupied. This period, 14th–13th century calBC, can be considered to represent a second phase of the human presence on Ada Tepe during the Late Bronze Age.

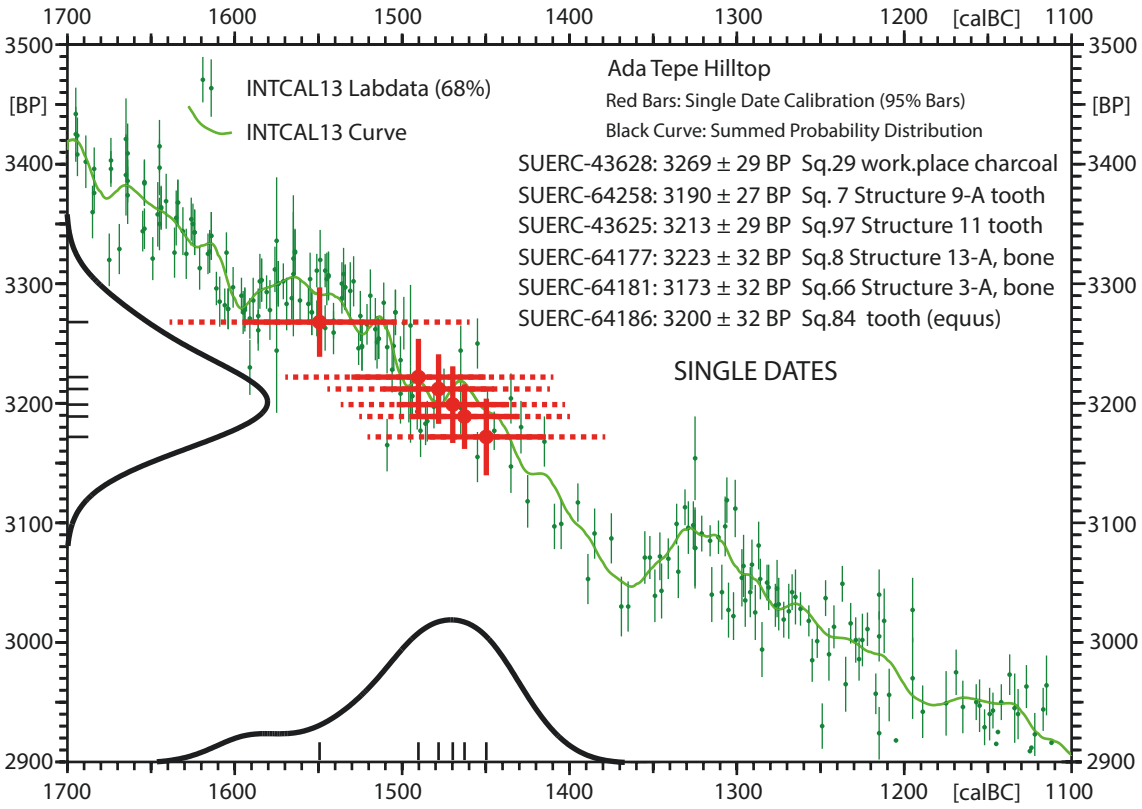


Fig. 74 Ada Tepe, hilltop, single age calibration of dates from contexts of mining activities and early habitation structures. Note that, despite its seemingly older ^{14}C age, it is statistically quite possible that the charcoal sample SUERC-43628 derives from the same few calendric decades (1500–1450 calBC) as the five other (short-lived) hilltop samples. Even if it were an old-wood sample, and actually did have an earlier (0–100 yrs) growth period (which cannot be proven), this would reinforce our conclusion that the earliest hilltop occupation is likely to date from the first decades of the 15th century BC (see text) (graphics: B. Weninger)

Catalogue of Wheelmade Vessels from Ada Tepe

1. AT11/48/1/1. – G-11, Square 66; Structure 3; depth -0.25m. – Small closed vessel, shoulder or lower body fragment, surface totally worn off. – Max. diameter 6.3cm. – NAA sample Ada Tepe 1.

2. AT11/49/1/1. – G-11, Square 25; Structure 5; depth -0.25m. – Small closed vessel, fragment of shoulder and belly with one horizontal handle partially preserved, surface totally worn off. – Max. diameter 7cm. – NAA sample Ada Tepe 2.

3. AT13/17/1/1. – G-11, squares 47, 48; Structure 22 (III C X); depth -0.40–0.85m. – Closed vessel, belly fragment. – Max. diameter 15.5cm. – One partially preserved belly band. – Fired hard. – Surface very well smoothed, fine wheelmarks on the interior. – Paint slightly lustrous. – Colour of paint 2.5YR 4/6 (red), 5YR 4/6 (yellowish red); colour of interior surface 2.5YR 7/6 (light red); colour of break 2.5YR 6/6 (light red). – Pottery matrix dense; few inclusions (mainly mica, very few quartz and white particles); size fine (mica) and coarse to very coarse (quartz, white particle). – NAA sample Ada Tepe 3.

4. AT12/18/1/1. – G-11, Square 8; NE of Structure 9-A; depth -0.40–0.60m. – Goblet FT 255 or FT 263, foot, surface worn off, perhaps traces of paint. – Foot diameter 1.9cm. – Soft (most probably due to preservation). – Colour of break 7.5YR 7/4 (pink). – Pottery matrix with few small to medium voids; medium amount of fine inclusions (white particles). – NAA sample Ada Tepe 4.

5. AT13/167/1/1. – G-11, Square 66; Structure 3-A, northern part; depth -0.45–0.65m. – Closed vessel, shoulder fragment, surface totally worn off. – Max. diameter 10cm. – Fired clinky hard. – Colour of break 7.5YR 6/6 (reddish yellow). – Pottery matrix dense; few inclusions (white particles, quartz); size mainly fine to medium, in addition a few coarse particles. – NAA sample Ada Tepe 5.

6. AT10/176/1/1. – Trench H-9-1-A; depth -0.40–0.70m. – Fragment of a horizontal handle, surface totally worn off. – Handle diameter 1.5cm. – Fired clinky hard. – Colour of break c. 10YR 6/4 (light yellowish brown). – Pottery matrix with a medium amount of large voids; medium amount of medium to coarse inclusions (dark particles, in addition a few white particles as well as quartz). – NAA sample Ada Tepe 6.

7. AT12/19/1/1. – G-11, Square 25; Structure 5, depth -0.40m. – AT13/20/171. – G-11, squares 24–25, depth 0.55m. – Small closed vessel, rim fragment and fragmentary horizontal handle, rim variety 1, surface partially worn off. – Rim diameter 6cm (10%). – Traces of reddish paint on the interior of the rim and across the back of the handle. – Soft (most probably due to preservation). – Colour of break c. 5YR 7/6 (reddish yellow). – Pottery matrix with few small to medium voids; few fine inclusions (silver mica).

Neutron Activation Analysis (NAA) of Six Wheelmade Vessels from Ada Tepe

The measurement of trace and minor elemental concentrations in pottery by NAA has for many years been performed routinely in the Bonn archaeometry laboratory with the aim of determining the place of production.[53]

Only six samples from Ada Tepe (1–6) have been treated here. The raw data are shown in Table 2. The statistical evaluation of these data to find samples of similar origin was undertaken using the Bonn filter method, which is able to include measurement uncertainties and, in addition, a correction of a possible dilution/enhancement of the clay paste to perform a best relative fit.[54]

It revealed that two samples are chemical loners (Ada Tepe 4 and 6). Nothing can be concluded from such chemical loners, also called singles, in our databank. They are either first examples of a still unknown pottery paste used in a workshop somewhere, or they have been in some way contaminated in Antiquity or today.

The sherds Ada Tepe 1 and 2 form a pair (=245) of unknown provenance. Their composition is so close to each other, both with a best relative fit factor of 1.00, that both may have been made from the same clay ball or belong to the same vessel.

Another pair (Ada Tepe 3 and 5) can now be joined with a pair of sherds from Troy (Troia 93 and 135). They form a new group of 4 members called X133 that has an unusual high Cs value. Troia 93 is a painted angular alabastron FT 94 with fabric characteristics analogous to the unpainted Trojan Tan Ware. It has been published not as a member, but as only associated to A-Troy, and Troia 135 was a single.[55] According to Penelope Mountjoy, sample 135[56] might belong to the fragments of a large painted piriform jar FT 20 found by Carl Blegen in House VI F, synchronized by Mountjoy with LH IIB.[57] Troia 93 contains gold and silver mica,[58] whereas no information on the inclusions of Troia 135 is published.[59] Of the Ada Tepe group members, only Ada Tepe 3 contains mica, but not Ada Tepe 5.

53 See Gilboa et al. 2017 and references therein.
54 Beier – Mommsen 1994; Mommsen – Sjöberg 2007.
55 Mommsen et al. 2001, 182 (sample Troia 135); 187–188, fig. 16.33 (sample Troia 93); Mountjoy 2008, 39–40, fig. 12.62; 53 cat. no. 62.
56 Mountjoy 2008, 33–34, fig. 6.5; 51 cat. no. 5. Perhaps it is identical with Schmidt 1902, 166 cat. no. 3477.
57 Blegen et al. 1953, 304–305 cat. no. 35.1076, fig. 406.10; Mountjoy 1997, 281, fig. 4.6.
58 Mountjoy 2008, 53 cat. no. 62.
59 Cf. Mountjoy 2008, 51 cat. no. 5.

Tab. 2 Results of neutron activation analyses (NAA) on six pottery samples from Ada Tepe. Given are the concentrations C of 30 elements in µg/g (ppm), if not indicated otherwise, and below, the average experimental uncertainties (measurement errors), also in % of C, to indicate the measurement precision of the Bonn NAA procedure. Missing values are below the detection limit

Sample	As	Ba	Br	Ca%	Ce	Co	Cr	Cs	Eu	Fe%
Ada Tepe 1	12.8	1725.	12.5	3.27	77.4	29.0	283.	4.67	1.58	6.04
Ada Tepe 2	14.3	1844.	13.1	2.56	75.6	28.7	264.	4.85	1.46	6.02
Ada Tepe 3	12.6	837.	7.28	4.71	66.6	26.2	247.	14.9	1.35	5.79
Ada Tepe 4	14.9	881.	7.90	3.88	79.2	29.0	276.	6.12	1.41	6.08
Ada Tepe 5	15.2	1488.	10.8	4.67	66.5	25.9	237.	13.4	1.27	5.64
Ada Tepe 6	43.4	570.	11.2	4.86	67.2	31.5	284.	9.04	1.49	6.33
ave. error	0.49	104.	0.85	0.32	1.2	0.21	2.0	0.21	0.033	0.027
in%	2.6	8.6	8.3	7.7	1.6	0.7	0.8	2.4	2.3	0.5

Sample	Ga	Hf	K %	La	Lu	Na%	Nd	Ni	Rb	Sb
Ada Tepe 1	24.8	6.65	1.87	41.0	0.63	1.58	35.8	172.	102.	1.95
Ada Tepe 2	–	6.69	1.84	40.1	0.64	1.34	38.3	139.	103.	1.65
Ada Tepe 3	28.0	4.64	2.46	32.1	0.49	1.08	30.9	304.	137.	0.63
Ada Tepe 4	24.9	6.49	2.31	38.7	0.62	1.64	37.2	163.	122.	1.97
Ada Tepe 5	31.6	4.52	2.38	30.1	0.48	0.95	24.8	167.	125.	0.53
Ada Tepe 6	39.8	5.24	2.32	35.3	0.64	0.91	30.9	–	130.	0.61
ave. error	4.2	0.11	0.079	0.26	0.033	0.019	2.6	39.	4.4	0.094
in%	15.	2.0	3.6	0.7	5.7	1.5	7.9	20.	3.7	7.8

Sample	Sc	Sm	Ta	Tb	Th	U	W	Yb	Zn	Zr
Ada Tepe 1	26.3	7.66	1.10	0.96	14.2	2.99	3.38	4.01	127.	222.
Ada Tepe 2	25.6	7.62	1.14	1.03	14.2	6.66	3.99	3.76	134.	263.
Ada Tepe 3	23.6	5.56	0.85	0.73	11.6	2.45	2.81	3.12	115.	158.
Ada Tepe 4	26.5	6.81	1.10	1.03	14.1	3.35	4.07	3.91	119.	213.
Ada Tepe 5	22.7	5.14	0.64	0.78	10.7	2.02	3.33	2.94	107.	86.0
Ada Tepe 6	25.8	6.74	0.83	0.81	13.4	2.76	3.57	3.61	104.	–
ave. error	0.039	0.16	0.061	0.086	0.15	0.41	0.32	0.14	3.4	31.
in%	0.2	2.4	6.4	9.5	1.2	14.	9.3	4.1	2.9	15.

Dating the Early Mining and Settlement Activities at Ada Tepe

Analysis and General Interpretation in the Context of the Archaeological Site

The accumulated rich empirical database and its conventional and interdisciplinary processing allows us to formulate several main theses concerning the chronological and functional characteristics of the early stages of human presence at Ada Tepe. Summarizing the evidence presented above of the absolute radiocarbon dates, together with their stratigraphic position and spatial distribution in the main sectors of the archaeological site; combining this database with the presence and the stratigraphic positions of finds that could serve as additional chronological benchmarks (for example wheelmade pottery tied to the relative Helladic periodization); and putting this summarized information within the general setting of the mass materials provides the opportunity to

combine them into a uniform system that aims to explain the main characteristics and specifics of the early stages of human activity on the peak.

The earliest absolute dates reveal the presence of several well-defined groups. These are the dates from the so-called NE Quarter, the settlement on the northeastern slopes (SUERC-63848: 3247 ± 29 BP, SUERC-63849: 3264 ± 29 BP, SUERC-63851: 3185 ± 24 BP, SUERC-63853: 3268 ± 29 BP [Figs. 15, 73.b]), a group of dates from the sectors of open cast mining on the northeastern and eastern slopes of the peak (SUERC-37393: 3225 ± 30 BP, SUERC-40977: 3170 ± 35 BP, SUERC-64278: 3252 ± 20 BP [members of Group A, Fig. 73.c]), and a group of dates from the central parts of the peak, from sectors related to mining and early settlement structures (SUERC-43628: 3269 ± 29 BP, SUERC-64258: 3190 ± 27 BP, SUERC-43625: 3213 ± 29 BP, SUERC-64177: 3223 ± 32 BP, SUERC-64181: 3173 ± 32 BP, SUERC-64186: 3200 ± 32 BP [members of Groups A and B, Figs. 73.c, h and 74]). To them, one should add two dates from the sector of the upper western slopes and the remains of working places and isolated structures that were discovered there – SUERC-37372: 3170 ± 30 BP and SUERC-37373: 3100 ± 30 BP (members of Group A, Fig. 73.c). Taking into account their absolute values, it should be noted that these samples are mostly contemporary and with few exceptions belong to the first half of the 15th century BC. To the finds that could serve as important chronological benchmarks for the early stages of Ade Tepe, we can add the fragment from a wheelmade vase that was found in the higher (disturbed) levels of Structure 9-A (cat. no. 4, Fig. 10) and the marble rapier pommel that was discovered redeposited in a later context in 2002.[60]

The mostly overlapping dates from the northeastern settlement and from the summit, together with even earlier dates from the summit (taken from bone samples of shorter chronological frames, compared to those from charcoal from the northeastern settlement), provide the opportunity to complement significantly and to some extent to correct the already established picture of the emergence of the first settlements and the beginnings of the more permanent human presence at the peak.[61]

Of particular importance for the argumentation regarding the earliest traces of human activity at Ada Tepe is the sample SUERC-64278: 3252 ± 20 BP with a calibrated date of 1530 ± 40 cal-BC, as well as some stratigraphic contexts of both settlement nuclei, the one on the northeastern part of the hill and the one of the hilltop, that indicate that parts of them were built on ground that was previously affected by earlier mining activities (see the description of the individual sectors above). Thus, these stratigraphic contexts and the date SUERC-64278 should be regarded as directly related to the earliest traces of human activities on the peak and could serve as a terminus ante quem for their beginnings.

Based on the detailed stratigraphic and chronological assessment presented above, we suggest the following reconstruction:

1. We can date the earliest Bronze Age activities on the Ada Tepe hill by means of radiocarbon dates from contexts related to the early mining sectors on the northeastern slopes, or from materials that were redeposited in various parts of the numerous waste heaps. A comparatively easy exercise, from the viewpoint of radiocarbon analysis, is to provide an estimation of the age of the one charcoal sample and the many bones related to the mining work. Although found stratified in the waste heaps of the eastern and northeastern Ada Tepe slope, it is very likely that the majority of these materials have been reworked and redeposited in the course of the continuous downhill movement of these dumps. Hence, we might expect a comparatively large spread of the ^{14}C ages. Despite this, as shown in Fig. 20, in the slope data it is possible to detect two main chronological phases, as indicated by materials connected with the early mining activities, the earliest of which

[60] Jung 2017; Jung 2018, 246, fig. 4a; 248; Nekhrizov – Tzvetkova 2018a, 191, fig. 2.1; Tzvetkova – Nekhrizov this volume.

[61] Popov et al. 2017, 192–196, 200.

fall in the decades around 1500 calBC, while later materials come from the second half of the 13th to the 10th centuries calBC.

Among the otherwise strongly reworked slope data, of particular interest are the ages for samples SUERC-37393: 3225 ± 30 BP and SUERC-40977: 3170 ± 35 BP from the east slope, as well as SUERC-37372: 3170 ± 30 BP and SUERC-37373: 3100 ± 30 BP from the west slope. They were taken from limited working areas established inside the waste heaps by the prehistoric miners. Their calibrated ages coincide well with SUERC-43628: 3269 ± 29 BP from a third working place, situated on the top of the hill (see Fig. 35–39). Calibrated as a separate group, these five samples have a summed calibration distribution with a centre between 1510–1400 calBC (50% probability).[62] They represent the earliest mining and the main activities at Ada Tepe that are both archaeologically and chronologically verified.

This means, we can date the first Bronze Age mining activities on the Ada Tepe hill to the last decades of the 16th and to the 15th century calBC. They are related to the discovery of the gold deposit and the beginning of its exploitation. There is no evidence from this early period of the creation of a more permanent settlement infrastructure. Despite this situation, bearing in mind the spatial distribution of the earliest traces of mining at the summit, we may assume that some of the richest parts of the gold deposits, in the central parts of the crest and on the northeastern slopes, had been identified by that time. It is precisely here that the clearest direct and indirect clues of an earlier stage that preceded the period of the permanent settlement are clustered. In the overall chronological system of the site, we would designate this stage as AT Ia (for the full chronological table see below).

2. Two settlements/camps were created during the second main activity phase, one on the northeastern periphery of the crest, and one at the very summit.

As explained above in the stratigraphy chapter, we have four charcoal dates at our disposition for the Northeastern Quarter, and in all probability they reflect the construction date of that settlement area.

A first quick look at the radiocarbon ages based on single age calibration reveals that the oldest three dates cannot be discriminated. This is due to their position inside a strong wiggle of the calibration curve between c. 1600 and 1500 calBC (Fig. 15.a). By contrast, the sample SUERC-63851: 3185 ± 24 BP from House 7 is not only slightly younger than the wiggle, but also comparatively well dated to 1460 ± 30 calBC.

Building on our first hypothesis, that the charred wood derives from construction elements of the three houses, and the second hypothesis, that all houses in the NE Quarter were built contemporaneously, we have applied Gaussian Monte Carlo Wiggle Matching with random sample order in order to verify these hypotheses and to date this common building event as precisely as possible.

The results of Gaussian Monte Carlo Wiggle Matching are shown in Fig. 15.b. The first result of the statistical analysis is that the most likely (total) number of tree-rings in the dated charcoals amounts to 50 ± 30 calendar years. This is the growth period of the dated tree-rings. The second and main result is that the youngest preserved ring dates to 1476 ± 20 calBC. Although it is, in principle, not possible to relate any of the four calculated sequence-internal age positions to individual houses, we have nevertheless achieved a more precise dating of the common building event, which is now given as 1476 ± 20 calBC in comparison to the previous value of 1460 ± 30 calBC for House 7 only. For purposes of comparison, we have placed Figs. 15a and 15b on one page.

Based on the architectural assessment of the houses (see above), we may estimate a maximum use period of some 30 years to be added to the calculated tree-cutting date and would thus arrive at a latest possible date of c. 1450 calBC for the abandonment of the houses in the NE Quarter.

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[62] To establish these values we are applying the interquartile approach as proposed by Barbara Ottaway (Ottaway 1973).

The excavation area on the hilltop provides us with the largest number of ^{14}C dates from the Ada Tepe site. Apart from the one sample that originates from a working place (SUERC-43628), the earliest ^{14}C ages from the hilltop belong to remains from structures that can most probably be interpreted as houses. Three of these structures belong to one row of houses, possibly reflecting the earliest planned settlement on the hilltop (structures 3, 9-A, 13 with samples SUERC-64181: 3173 ± 32 BP, SUERC-64258: 3190 ± 27 BP, SUERC-64177: 3223 ± 32 BP). The relevant samples were collected from the lowermost levels of these houses and can therefore be assigned to the earliest stage of the settlement on the hilltop, but might also antedate it – if ascribed to mining activities preceding the construction of houses. Sample SUERC-43625 comes from a fourth structure (11) that would then belong to the next row of houses, situated further west on the slope. These earliest B contexts were measured on two tooth and two bone samples (all *Bos taurus*). For these dates, again using the group calibration method, we arrive at a summed calibration distribution with interquartile centre between 1500–1440 calBC (50% probability). Thus, this is the time frame for the earliest clearly documented settlement on the Ada Tepe hilltop (Figs. 36, 73.h).

As a result of the radiocarbon data analysis, we conclude that the early dates from the hilltop and the NE settlement are roughly synchronous (NE settlement: 1480–1450 calBC; central settlement on the summit: 1500–1440 calBC). This means, both settlement nuclei were founded simultaneously or with a very short delay and then existed parallel to each other as components of a larger production complex. Based on the analysis presented above, we believe they were directly related to the expansion of the mining and the permanent settling of people at Ada Tepe. This second main stage, which covers the first half of the 15th century calBC, can be labelled AT Ib. This period partially overlaps with phase AT Ia. However, on the hilltop, the earliest mining activities stratigraphically precede the establishment of habitation structures in this area. In fact, like AT Ia, period AT Ib was functionally related to the extraction of gold in the hilltop zone. Taking into account their spatial positions, a regular pattern can be noted in both early settlement areas, the one in the northeastern periphery of the crest and the one in the centre of the hilltop. They were situated in immediate proximity to some of the areas with the richest ore deposits, i.e. those on the summit and those on the pronounced rocky outcrops on the northeastern slopes.[63]

Independent of the scholarly dispute as to whether the dwellings on Ada Tepe constituted permanent or seasonal settlements,[64] they provide very rich information about the general characteristics of habitation during this period. In terms of internal organization, structures and mobile inventory, they correspond to the standard of the Late Bronze Age in the eastern parts of the Balkan Peninsula. Due to the state of preservation and the sealed context, the northeastern settlement offers much more detailed evidence. Nonetheless, despite the considerable disturbances and the mixing of contexts and materials resulting from later human activities on the summit, the distribution of the remains from the early occupation of the peak support the hypothesis that this settlement, related to the earliest human presence, also had a similar organization – the dwellings were built in parallel rows that were terraced along the slope. In the Eastern Rhodopes, there are other settlement sites that show this type of organization, which is typical of mountainous and hilly regions.[65]

It is not a coincidence that in the limited space between the two settlements/camps, situated in the northern half of Ada Tepe's crest, there are large areas dedicated to secondary ore processing activities. Here, the terrain is relatively flat and suitable for carrying out various technological activities. Some of the main working places were uncovered in this area. The concentration of these activities of the *chaîne opératoire* in the area was confirmed not only by direct archaeological

[63] Bearing in mind the geological characteristics of the Han Krum gold deposit, these were probably the most recognizable sectors at the surface, see: Želev 2007, 104–112, figs. 38, 40, 55–57; Popov et al. 2014, 28–32; Tsintsov et al. 2016, 110–111.

[64] Popov et al. 2017; Burkhardt in press.

[65] Dremsizova-Nelchinova 1984, figs. 2–3; Popov 2009, 27; Popov et al. 2017, 193 n. 24.

evidence from fieldwork, but also by secondary interdisciplinary investigations.[66] The regularities in the spatial distribution of the main mining works, the areas of secondary sorting and processing of the ore, and the camps of the people that were engaged in gold production indicate the functioning of a complex that followed a general plan. The locations and the distances between the main sectors indicate a search for convenience, saving time and resources, and organizing the work process in accordance with the principles of a uniform plan.

An interesting and largely open question remains the one about the last phase and the end of this period that was directly related to gold mining on the peak. The absolute dates and the stratigraphic positions of the main structures related to the northeastern settlement indicate that it was gradually abandoned about the middle of the 15th century calBC. At the same time, the accumulation of large amounts of technological waste – processed rock that was piled on top of large parts of the former settlement/camp –[67] testifies to the fact that gold mining at Ada Tepe continued during the time when this area was no longer used to meet habitation needs.

Another important remark should be made. There is a large gap in the series of absolute radiocarbon dates from Ada Tepe from the second half of the 15th century calBC to the third quarter of the 14th century calBC (or the 1360s calBC). There are basically no absolute dates after the middle of the 15th century calBC from either the central parts of the summit or the eastern slopes (Fig. 73). At the top, the next series of absolute dates starts only around the middle of the 14th century BC. Whether this hiatus in the values of the absolute dates is due to an accidental lack of samples that could fill the gap, or to an actual chronological and functional discontinuation with a complete absence or very limited presence of people at the peak is a legitimate question.

Taking into account the circumstance that during the rescue investigations samples were regularly taken from all stratigraphic layers and structures – and were regularly sent for processing, we would rather accept the conclusion that this chronological period is not represented in the extremely detailed selection. In other words, the reasons for this phenomenon should be sought in the actual absence of related materials, and not in a technical failure to take samples in the course of the investigations.

At the same time, one should take into account the fact that, despite the lack of absolute chronological benchmarks, there is stratigraphic evidence suggesting that various technological activities directly related to mining and ore processing continued for some time after 1450 BC. The piling up of technological waste on top of parts of the northeastern settlement and the direct attribution to the Late Bronze Age of various structures (working places, buildings, waste heaps) scattered across the northern and the western parts of the peak[68] indicate that mining and the human presence on Ada Tepe continued for some time.

Taking into account the substantial change in their quantity, it could be suggested that the human activities at Ada Tepe were gradually reduced in terms of intensity and permanence of occupation.

It is difficult to say how long this low activity period continued (years or decades?). Another open question is how it was related to the next phase of habitation, dated to the middle and the second half of the 14th century BC.

Despite remaining problems that accompany the more precise determination of the chronological parameters and the functional specifics of the human presence at Ada Tepe in the second half of the 15th and the first half of the 14th century BC, we can positively state that the first half of the 15th century BC was the period of most intensive exploitation of the gold deposit. The absolute dates and the numerous archaeological materials from the sectors where the main traces of mining, ore processing and accompanying habitation are concentrated belong almost exclusively to this period, or the one before it.

66 Jordanova et al. 2020, 13–16, fig. 8.
67 Popov et al. 2017, 168, fig. 6; 185–188, figs. 23–25.
68 Popov et al. 2017, 195–196, figs 30–35.

3. The second largest series of absolute dates from Ada Tepe commented upon in the present study belongs to the period from the 1360s BC (or mid-14th century calBC) to the 1240s BC (or mid-13th century calBC). These are eleven samples related to various structures uncovered and investigated only in the central parts of the peak and its immediate periphery (Fig. 47).[69] Most of them are grouped in the last decades of the 14th and the early 13th century calBC (structures 3-A, 10, 22, and 12) or about the middle of the 13th century calBC (structures 10, 22, and 12). Broadly speaking, the period could be designated as AT Ic.

In our commentary on this group of samples and its general position in the chronological series from Ada Tepe, we emphasize the fact that no other sector of the archaeological site has yielded materials to provide absolute dates from this chronological period. Consequently, our sampling is concentrated exclusively in the area of the later habitation at the peak, and only in exceptional cases were isolated dates from the second half of the 13th century BC discovered in waste heaps with mixed materials that descended from the upper parts of the summit down the slopes of Ada Tepe (Fig. 20). This latter circumstance could explain their origin and secondary redeposition in the already mixed context of the waste heaps in these parts of the slopes. Absolute dates from the period of the 14th–13th century BC are definitely absent from the areas on the northeastern, northern, and western slopes that were directly related to mining, ore processing and accompanying habitation.

One of the possible explanations for the gradual abandonment and subsequent discontinuation of the human presence in many of the areas that were essential for gold production in the previous period could be sought in economic or technological factors. The depletion of the richest veins in the rocky outcrops at the summit could have led to a gradual decrease in productivity, and later, to abandoning the mine in search of new and more promising sources of precious metals. Whether this transition was dynamic and quick, or whether there was initially a considerable decrease, followed by cessation of the gold production functions, remains an open question.

In any case, the dates related to the next phase of habitation come from the remains of a settlement that was located mainly on the topmost flattened part of the peak that was directly affected by the earliest mining. Taking into account also the sectors that were investigated in 2002 and 2005 by Nekhrizov's team,[70] one might conclude that the layers with structures from this later period (dwellings, hearths, working places, pits) cover and seal completely the central parts of the hill where mining was practised from the late 16th to the middle or the second half (?) of the 15th century calBC.

An axe of Kalugerovo type that was discovered during the investigations in 2005 can be dated broadly to the 15th–13th century BC[71] and may be attributed to this second stage, although one cannot exclude the hypothesis that it was left in situ among the remains of earlier mining, as the dating range of the type is rather wide.

There is one more set of evidence that is relevant for the question regarding the discontinuity and eventual cessation of gold mining in Ada Tepe. In the area of structures 3-A, 17, and partially 10, one can observe the highest concentration of finds related to crafts and to metallurgy and the production of metal items in particular. The numerous fragments of moulds illustrate the great diversity of the artefacts that were produced, including axes, chisels, pins, personal adornments, and last but not least, ingots.[72] Fragments of moulds or complete moulds were discovered not

[69] Samples SUERC-64180: 3045 ± 32 BP; SUERC-64267: 3004 ± 22 BP; SUERC-43623: 3099 ± 29 BP; SUERC-64269: 3014 ± 22 BP; SUERC-64270: 3035 ± 22 BP; SUERC-64182: 3054 ± 28 BP; SUERC-64188: 3051 ± 32 BP; SUERC-43394: 3012 ± 27 BP; SUERC-64260: 3055 ± 21 BP; SUERC-64268: 3005 ± 22 BP; SUERC-43404: 3061 ± 27 BP (all dates belong to Group B, except for the last date SUERC-43404, which belongs to Group C in Fig. 71).

[70] Tzvetkova – Nekhrizov this volume.

[71] Nekhrizov – Tzvetkova 2018a, 191; for a dated Aegean parallel see: Horejs – Jung 2024, 18, fig. 3; Tzvetkova – Nekhrizov this volume.

[72] Popov 2018a, 410, 413, fig. 13.

only during the investigations in 2011–2013, but also during the first campaigns in 2001–2002 and 2005.

If we accept that in this phase there was production of precious metal ingots on the summit,[73] then we should also assume that the gold mining also continued in this late period, although on a limited scale.

The details of the internal organization and the structures of the settlement that existed on the summit from the 14th to the 13th century calBC do not differ from what was typical of the sites that were commented upon above. Of particular interest is a structure of oval or round ground plan, designated as Structure 10, as no such structures are known from the earlier periods of Ada Tepe. Nonetheless, it also has parallels in terms of shape and construction in neighbouring regions – from settlements dated to various phases of the Middle and the Late Bronze Age, such as Izvorovo, Koprivlen, and Chepintsi.[74]

4. Combining the radiocarbon and archaeological-historical dating evidence

The only artefacts that can be dated by reference to the phases of the Mycenaean relative chronology are from the hilltop. In Sector G-11, several Mycenaean sherds were found in different contexts (cat. nos. 1–5, 7 in structures 3, 3-A, 5 and 22), some of which included local pottery of the Early Iron Age apparently post-dating LH IIIC. One Mycenaean sherd was found in situ in LBA Structure 22 (cat. no. 3); a second one belongs to the use levels of the LBA Structure 3-A (cat. no. 5). Unfortunately, however, for these sherds, no precise Mycenaean phase assignation is possible.

In view of these facts, it is important to note that the only typologically datable Mycenaean sherd, found in context with mixed LBA and EIA pottery but probably originally coming from LBA Structure 9-A, belongs to the low and slender foot of either a pattern-decorated goblet FT 255 or a monochrome/linear goblet FT 263 (cat. no. 4). This typological classification suggests a dating to LH IIB or LH IIIA1. The same chronological range is indicated by the Mycenaean sword pommel made of marble and found during the excavations by Nekhrizov on the hilltop. Applying the ^{14}C-based absolute chronology of LH IIB,[75] a LH IIB date of the goblet and the sword pommel would fit precisely with the earliest ^{14}C ages from the structures assigned to the earliest stage of the hilltop settlement dated to 1500–1440 calBC (50% probability). These early ^{14}C dates include SUERC-64258, which comes from the fill of Structure 9-A, and more precisely, from undisturbed layers beneath the disturbed one that contained the goblet sherd.

If we now bring in the archaeological and chronological evidence from the NE Quarter, one may discuss different models in order to interpret the exclusive presence of Mycenaean-type artefacts of probable LH IIB date on the hilltop and their possible relation to settlement structures.[76] According to the first model, the limited topographic distribution of Mycenaean-type artefacts would have chronological reasons; according to a second model, these reasons would be social; while a third model may suggest a more functional rather than social differentiation of the two settlement areas.

Model 1. If the NE Quarter preceded the first establishment of houses on the hilltop, the Ada Tepe mining community did not have access to Mycenaean luxury goods during the first decades of its existence.[77] The exchange of the gold mined at Ada Tepe would only have allowed interregional contacts to be established in a subsequent phase. However, our discussion of the radiocarbon evidence (see above) does not suggest a chronological differentiation between the houses

[73] Results of unpublished research by Petya Penkova, Hristo Popov, and Elitsa Stefanova. Their publication is forthcoming.

[74] Alexandrov 2002, 61–82; Alexandrov 2018a, 419, figs. 2–3; Borislavov 2018, 377, fig. 7; Borislavov 2019, 99–100, figs. 1, 3; Hristova – Petrova 2018, 446–447, fig. 1.

[75] See above n. 45.

[76] In a mining area the use of fine tableware and of an imported sword appears unlikely.

[77] If Mycenaean pottery had been in use in the NE Quarter, we would expect that at least a small sherd of such ceramics would have been stratified in the area. Yet even Burkhardt's detailed study and final publication of the artefacts from the NE Quarter did not bring such finds to light (cf. Burkhardt in press).

of the NE Quarter and the earliest houses on the hilltop, and the relative date of the goblet FT 255/263 and the sword pommel fits with the absolute dates of both the early habitation structures on the hilltop and the NE Quarter.

Model 2. If we therefore assume that the NE Quarter was inhabited contemporaneously with the earliest houses on the hilltop, the differentiated distribution of Mycenaean-type objects may be indicative of social differences between the inhabitants of the two areas. Thus, during that phase, the mining workers may have inhabited the NE Quarter, while the social group appropriating the surplus of the gold production would have inhabited the hilltop houses. However, the architecture does not give any indication of social differences between the inhabitants of the two habitation areas. One also has to admit that the hilltop has yielded only two Mycenaean imports dating to LH IIB (the pottery vessel and the sword), which constitutes weak evidence for supporting such a social differentiation within the Ada Tepe community.

Model 3. Taking into account the mining evidence and the related *chaîne opératoire*, a final model can be formulated. The establishment of the NE Quarter and of the Hilltop Quarter happened at roughly the same time (or at least in close chronological proximity) and precisely at the periphery of the richest parts of the gold deposit. In this case, the choice of the locations would most probably have been due to technological and logistic considerations. Furthermore, the way in which the communal gold mining was organized suggests that the production of food for supplying the community of mimers living on the hill, as well as the last technological processes in the *chaîne opératoire* of gold production, happened elsewhere, at some distance from the ore deposits. The hilltop settlement gained in size only when the mining activities ceased in that area, while the NE Quarter had a quite limited chronological duration ending around the middle of the 15th century BC. The nature of the artefact assemblage stratified in the NE Quarter speaks in favour of an organized abandonment of that habitation area, during which all usable items were taken away – probably by moving to the hilltop area. In this model, the hilltop area assumed a central role, perhaps for better coordination of the communal production processes, in a second phase perhaps starting around the middle of the 15th century. The prolonged habitation phase of the Hilltop Quarter might then also explain the accumulation of exotic/imported items in that area. Following that line of thought, the presence of wheelmade pottery in the remains of at least three different hilltop structures that provided ^{14}C dates of the 14th–13th century BC (structures 3-A, 12 and 22) might be interpreted as an indication of ongoing contacts with the coastal regions of the northern Aegean, although the fragments themselves do not provide direct evidence for such late production dates of the vessels in question.

5. At the end of the present text, dedicated to the human presence at Ada Tepe from the 15th to the 13th century BC, we will turn our attention to one piece of stratigraphic evidence that concerns the perception and interpretation of the next stages, which comprise the last phases of the Late Bronze Age and the beginning of the Early Iron Age.

The stratigraphic position of some structures in relation to an important architectural construction and their absolute dates of the 15th–13th century calBC allow for conclusions regarding the various phases of the occupation of the hilltop. This important construction is the fortification wall that was built along the periphery of the levelled oval area of the ridge. Beneath the wall, or partially disturbed by it to the sides, are remains of structures related to both the earliest human activities here (structures 9-A and 13-A) and to the settlement from the 14th–13th century BC (Structure 3-A and redeposited materials on the western peripheries of structures 10 and 18). Based on these observations, one may safely conclude that when the fortification wall was built, these structures were no longer in use and their remains were disturbed by the wall. The latest dates from structures 3-A and 10,[78] as well as from other contemporary structures from the same period of human habitation (although not disturbed by the wall), could serve as a terminus post

[78] SUERC-64267: 3004 ± 22 BP, 1240 ± 40 calBC; SUERC-64268: 3005 ± 22 BP, 1240 ± 40 calBC.

quem for its construction. Based on the available absolute dates and their stratigraphic position, we think that the fortification wall was built in the 13th or in the beginning of the 12th century calBC at the latest. It is difficult to say whether the construction of the wall was related to the periods of uncertainty and demographic changes that began then. It is, however, interesting to note that this fortification wall displays very close similarities to the wall that was uncovered by the investigations at Bresto, the construction of which, based on the stratigraphy of the site, is related to the events of the 12th century BC.[79]

In order to summarize this part, we will return to one of the main questions related to the perception and the interpretation of the specific characteristics of the Ada Tepe site, i.e. when exactly did the extraction of precious metals on the peak take place and when did the mining activities end? The culture-chronological framework that surrounds the answer is of crucial importance for the interpretation of the site and also for placing the site within a more general interregional context. Taking into account the evidence from the analysis of the numerous available absolute dates and of the additional chronological benchmarks, as well as the stratigraphic information from the main sectors of the site, we must admit that some of our earlier hypotheses – as they were based on the preliminary results from the investigations in 2005 and in 2008–2011 and dated the extraction of gold from Ada Tepe broadly to the Late Bronze Age and Early Iron Age[80] – should now be corrected. After evaluating the general picture that comprises the information from the complete rescue investigations and the processing of the accumulated materials, we can positively state that the gold mining at Ada Tepe is uniquely related only to the Late Bronze Age. The gold deposit and its exploitation were the main reason for the appearance and permanent settling of people at this place in the Eastern Rhodopes at some point in the middle of the 2nd millennium BC (in the last decades of the 16th or the early 15th century calBC). After the very intensive first stages of exploitation that lasted at least to the middle or the third quarter of the 15th century calBC, a period of decline followed and the mine was abandoned. The question remains whether the extraction of gold continued on a smaller scale during this reduced human presence at the peak between approximately the middle of the 14th and the middle of the 13th century calBC; additional arguments are required.

There are absolutely no traces of mining from any other historical periods of human presence at various parts of Ada Tepe – the last stages of the Late Bronze Age, the various phases of the Early Iron Age, the Hellenistic period and Late Antiquity. We can definitely state that the ore deposits were not exploited in these periods.

Finally, we would like to take into account the relative and absolute chronology of the human habitation on Ada Tepe, as proposed by Georgi Nekhrizov and Julia Tzvetkova, which was based on the results of their investigations in 2001–2006. Their later periods from AT II (transition Late Bronze Age – Early Iron Age) to AT V[81] mainly comprise our later phases, that is from the end of the Late Bronze Age to the end of the Hellenistic Period, inclusive. If we were to follow this model of division of the main periods, then the entire Late Bronze Age at Ada Tepe would fall within the period Ada Tepe I (AT I), hence creating the necessity to create subperiods that would have to be designated with additional letters in order to distinguish the successive stages and the specifics of this major period of human presence at the peak – AT Ia, AT Ib, AT Ic, etc. As an alternative, we propose the following phase system for the Ada Tepe site:

- Phase Ia: early mining activities on the hilltop, northeastern slope and working places on the eastern and northwestern slopes;
- Phase Ib: first settlement phase (oldest houses on rock/virgin soil) on the northeastern slope and the hilltop, in immediate proximity to the richest ore deposits that were mined; isolated

[79] Athanassov et al. 2018, 423.
[80] Popov – Jockenhövel 2011; Popov et al. 2011b.
[81] Nekhrizov – Tsvetkova 2018b, 20–29.

structures mainly scattered across the western and northwestern parts of the peak, next to the working places and smaller mining areas.
- Phase Ic: second settlement phase (houses on the hilltop)
- Phase Id: third settlement phase (LBA/EIA), corresponding to the transitional AT II period between the Late Bronze Age and the Early Iron Age, proposed by Nekhrizov and Tzvetkova.

The Place of Ada Tepe in the Context of the Regional and Interregional Processes in the Northern Aegean and Eastern Balkan Area Around the Middle of the 2nd Millennium BC

The rich empirical information yielded by the large-scale rescue investigations of Ada Tepe and the subsequent campaigns to process and analyse the uncovered materials now support an appropriate incorporation of the site into a recently intensifying scholarly discussion. The question about the degree of involvement and the place of the eastern Balkans in the dynamic developments of the transregional economic network of the Aegean and the eastern Mediterranean in the Bronze Age and during the 2nd millennium BC in particular has been repeatedly raised in recent years.[82]

Taking into account the specific conditions of a gold mine and the importance of such an undoubtedly strategic resource as gold, the hypothetical connections between Ada Tepe and the major state and economic centres of the then Aegean world (Mycenaean Greece and the societies in western Asia Minor) have been mentioned on various occasions since more evidence was obtained about the functional and chronological characteristics of the site.[83] Recognizing the mine as one of the sources of precious metals in the Balkans in the Bronze Age was a question that was indirectly addressed by the name of the project that was implemented in 2016–2020 as a partnership between NAIM-BAS and OREA-OeAW, i.e. "Bronze Age Gold Road of the Balkans Ada Tepe Mining: Producers and Consumers".

As of today, several years later, we can state that the results obtained from the analysis of the numerous absolute dates, of their empirical setting and their stratigraphic and functional context, enabled us to situate Ada Tepe in the broader picture of the general processes that developed in the eastern parts of the Balkans in the middle of the 2nd millennium BC.

Several major trends may be noticed in this reconstruction process. It has already been noted in the scholarly literature that the up-to-date evidence from the field indicates a very scarce and incidental human presence in the Rhodopes during the Early and the Middle Bronze Age.[84] On the other hand, there is a substantial growth in the number of Late Bronze Age sites that illustrate a considerable density and a sharp increase in the intensity of human presence in the mountains. In recent years, this observation has been clearly confirmed by sites with absolute dates or relative chronological benchmarks that allow for more precise dating. For example, the beginning of the occupation of Dragoyna is dated to the 16th century BC, and at Kush Kaya to the early 15th century BC.[85] Based on the available absolute dates and the analysis in the present publication, we could definitely add to this group Ada Tepe, where the beginning of the human presence dates from the late 16th or early 15th century BC.

The trend of permanent human occupation and colonization of the foothills and the lower parts of the Rhodopes, Strandzha, Sakar, and Sredna Gora is clearly perceptible from the middle of the

[82] Nikov 2001; Lichardus et al. 2002; Leshtakov 2006; Leshtakov 2007; Leshtakov 2009; Doncheva 2012; Athanassov – Krauß 2015; Horejs – Jung 2017; Jung 2017; Jung et al. 2017; Horejs – Jung 2018; Jung 2018; Nekhrizov – Tzvetkova 2018b; Nenova 2018; Pavúk 2018; Nenova 2019; Athanassov et al. 2020; Horejs – Jung 2024; Tzvetkova – Nekhrizov this volume.

[83] Popov – Jockenhövel 2011, 279–280; Popov – Nikov 2018, 376–381.

[84] Nekhrizov – Tzvetkova 2018a, 182–183, 187; Marinova et al. 2018, 38; Georgiev 2021.

[85] Bozhinova et al. 2013, 64–65; Popov 2016, 433; Jung et al. 2017, 271; Bozhinova – Andonova 2018, 399; Bozhinova this volume.

2nd millennium BC onwards.[86] It is revealing that, based on the results of the pollen analyses, it could be established that in the Thracian Plain a much larger scale of human presence can be detected from the mid-17th century BC onwards, and this had a lasting influence on the environment and the vegetation.[87] That is to say that once more, the end of the Middle Bronze Age and the early stages of the Late Bronze Age are the period when more global and supraregional processes can be registered in the eastern parts of the Balkans.

One cannot be certain whether this was the result of favourable changes in the environment, as indicated by the evidence of the regional evolution of the climate, or if it was due to social and economic processes and the increasing demand and exploitation of new resources. It is perfectly possible for a combination of several factors to have driven the lasting transformations in the economy and the gradual occupation of new territories.

The reason for the acceleration of the demographic, economic, and ultimately of the socio-economic processes at the transition from the Middle to the Late Bronze Age in the eastern parts of the Balkan Peninsula could also be sought in contacts that were instigated from the outside. The growing demand for new resources and precious metals, in particular on the part of the expanding Aegean and western Anatolian centres, could have been an additional accelerator of the dynamics of the processes towards the end of the Middle Bronze Age and the early stages of the Late Bronze Age.

Regarding the contacts between Thrace and Asia Minor, especially the Troad and the northeastern Aegean region, there are enough examples of their existence and active maintenance during various phases of the Early and Middle Bronze Age, between the second half of the 3rd and the early centuries of the 2nd millennium BC. In the last few decades, there has been a substantial increase in the archaeological evidence of the participation of Troy and Minoan Crete in the exchange of goods in the North Aegean and the southeastern Balkans during that period.[88] Southeastern Thrace became part of a common network with western Asia Minor and the eastern Aegean.[89]

The finds from Izvorovo, Ovchartsi, and Vratitsa clearly indicate that similar contacts to the wider Aegean, including the Troas, existed in the second quarter and around the middle of the 2nd millennium BC, at the transition from the Middle to the Late Bronze Age, contemporary to the late Middle Helladic and Early Mycenaean periods.[90]

Only by that Early Mycenaean period (LH I–IIA or 17th/16th to early 15th century calBC according to the revised high Aegean chronology)[91] can Aegean contacts be clearly detected in the area between the large river valleys of southern Thrace and the mountain ranges around them, i.e. the Rhodopes, Strandzha, Sakar, and Sredna Gora. The earliest finds of slender Mycenaean thrusting swords (rapiers) of Karo's type A in the region (Lilovo in the Central Rhodopes and Drama on the middle reaches of the Tundzha River) are Early Mycenaean in date.[92] The fact that the Izvorovo tumuli contained not only rich gold jewellery of local invention but also characteristic Aegean-type grain-shaped beads[93] – in combination with the already mentioned adoption of the Mycenaean sword types that is visible at other sites – shows two things. First, as part of the inventory of rich tombs, those prestigious goods testify to rapidly evolving social inequality; and second, they clearly suggest that this newly appearing minority of persons, who could appropriate a considerable production surplus, used part of that surplus for establishing exchange relationships

86 Marinova 2017; Marinova et al. 2018, 38; Georgiev 2021.
87 Marinova et al. 2018, 40.
88 See the examples and the references in Leshtakov – Tsirtsoni 2016; Pieniążek 2016, 514–519; Alexandrov 2018c; Leshtakov 2018; Pavúk 2018; Vasileva – Minkov 2018; Pavúk 2018, 271–272.
89 See the last results regarding the interregional contacts and the exchange of resources such as copper, with comments and references, in Stos-Gale – Băjenaru 2020; Alexandrov 2020.
90 Hristova 2011; Alexandrov 2018b, 370; Borislavov 2018; Horejs – Jung 2018, 237; Pavúk 2018, 272–274.
91 For LH I Manning 2010, 23, tab. 2.2, is superseded by Pearson 2022.
92 Jung 2018, 242–243, map 1 (with references), 245–246, fig. 1; Borislavov 2018, 396–397, fig. 3.
93 Borislavov 2018; Alexandrov et al. 2018a, 492–493 cat. nos. 232, 235–237.

with some of the Early Mycenaean rulers who subsequently evolved into the ruling classes of the palace state.

Slightly later, during the Aegean phases LH IIB and IIIA1, i.e. in the 15th and early 14th century BC, when the Mycenaean state economy had been established,[94] there is a substantial increase in Mycenaean weapon finds from the Thermaic Gulf, the Rhodopes, the valley of Maritsa and up to the Danube in the north, clearly outlining zones of contacts and tracing transregional communications. They consist of horned swords of Minoan/Mycenaean type (1a and 1b according to Kilian-Dirlmeier), of local/regional products inspired by those types, as well as of the new horned sword type 3b (called C3 by Hänsel), while this weapon package included Aegean-type spearheads as well.[95] Some of these are certainly imports, as is proven by the most recent analyses by the Demokritos institute of two marble pommels belonging to such horned swords.[96] They most probably imply direct contacts to the ruling classes of the newly established Mycenaean palace system that was expanding its territories by that time, which went hand in hand with intensifying external exchange contacts.[97]

The fact that one of these sword pommels made in the Aegean was found on the Ada Tepe peak suggests that the Mycenaean palaces may have received gold from the Rhodopes in return.

The search for sources of raw materials of strategical importance, like non-ferrous and precious metals, for the rapidly developing Mycenaean state system can be taken as an important catalyst for socio-economic processes in the peripheral zones outside direct palatial control. That could have had an impact on the northern Aegean region and its hinterland, which was rich in various mineral resources.

As the Aegean weapon types found in the eastern Balkan regions have a very wide distribution,[98] we have to refer to the contemporary LH IIB and IIIA1 pottery finds in order to identify specific Aegean regions that might have become recipients of the Rhodopian gold. The increased intensity of contacts between the Mycenaean world and the North Aegean becomes visible in the increasing concentration of Mycenaean ceramics in the area of the Thermaic Gulf and its immediate hinterland.[99] However, during the early phases LH IIB and IIIA1, to which we can date the earliest Mycenaean fragment from Ada Tepe (the goblet cat. no. 4) and the sherds from Dragoyna, such pottery is still very rare, even along the Central Macedonian coasts.[100] The Mycenaean imports found at Dragoyna, goblets and a small closed vessel, could be assigned to a Thessalian production region at the Gulf of Volos,[101] while the Ada Tepe goblet remained a chemical loner (see above).

Furthermore, at Dragoyna, a possible connection with the Troad has been noted for a closed Grey Ware vessel.[102] In this general context, it may be of interest that the results of the NAA of the paste of two of the fragments of wheelmade vases found at Ada Tepe (the small closed vessels cat. nos. 3 and 5) correspond with two finds from Troy and might imply that we should seek their production region in the northeastern Aegean region.[103] However, this is by no means a certain

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94 On the latest evidence for the formation of the earliest state society on the European continent see the contributions in Eder – Zavadil 2021.

95 Jung 2018, 242–248, map 2 (with references), figs. 2–7. The map can be updated, as marble pommels with shapes attested for LH IIB/IIIA1 horned swords also appear at Troy (Pieniążek 2020, 865, pls. 13.2 [Troy VI–VIII], 4 [Troy VI Late, coeval with LH IIIA1–IIIA2]; 14.1, 3).

96 See the appendix by Yannis Maniatis and Dimitris Tambakopoulos in Tzvetkova – Nekhrizov this volume.

97 Cf. Eder – Jung 2015.

98 Kilian-Dirlmeier 1993, 43–45, pl. 62; Bozhinova et al. 2013, 78–82, 87.

99 Horejs 2012, 141 (n. 760 with references), 178–180. It remains a puzzling phenomenon that the Aegean coastal regions to the south of the Rhodope range are very poor in finds of Aegean-type pottery (Jung et al. 2017, 287).

100 Bozhinova et al. 2013, 79, fig. 4; 86.

101 Bozhinova et al. 2013, 73–77.

102 Pavúk 2018, 274 (referring to Bozhinova et al. 2013, 62, pl. 14.6).

103 For the NAA results and their interpretation see the relevant chapter above.

provenance ascription (see above). We shall therefore refrain from drawing any more specific historical conclusion from this analytical result.

The beginnings of the human presence and particularly the gold mining on Ada Tepe clearly coincide chronologically with the period during which the interregional contacts of the eastern Balkan regions intensified for the first time in the second millennium, i.e. the time of the transition from the Middle to the Late Bronze Age. As we have seen, those contacts included mainland Greece and the Aegean region on the one hand, and the Rhodopes, together with the valleys of Maritsa and Tundzha leading to the Thracian Plain, on the other.

The time of active exploitation of the gold mine is dated by the stratified radiocarbon dates between the end of the 16th and the second half of the 15th or the early 14th century BC and roughly corresponds to the beginning of the early stage of the Mycenaean palace regime, i.e. LH IIB–IIIA1, and the direct exchange connection with this regime is demonstrated by the already mentioned LH IIB goblet fragment from Structure 9-A. Although the NAA could not assign this vessel to any specific production region, the chemical diversity of the Mycenaean vessels found at Ada Tepe probably suggests contacts of that gold-producing community with different Aegean regions in the south.

By contrast, the results of the provenance analyses of three vessels of late palatial (LH IIIA2–IIIB) to early postpalatial (LH IIIC Early) date from Koprivlen and Bresto, on the Nestos/Mesta route,[104] have to be interpreted in a different way. The assignation of one deep bowl to Aetolia-Acarnania in northwestern Greece and two small closed vessels (both probably alabastra) to a central Macedonian production region reflect historical realities of those centuries (late 14th–12th century BC), for which there is no archaeological evidence for the importation of Mycenaean luxury or prestigious items such as weapons and jewellery to the eastern Balkans. It seems that the northern Aegean communities were the mediators in the exchange activities of those later periods, and it is possible the gold[105] from the Rhodopes no longer figured prominently among the goods exported to the south (or only in reduced quantities). This would also fit with our interpretation of the Ada Tepe evidence, according to which, the gold mining works declined during the Mycenaean Palace period (see above).

However, in the second half of the 2nd millennium BC, the communities in the eastern Balkans also exchanged other raw materials with the state societies in Asia Minor and the eastern Mediterranean. The latest results of the lead isotope analyses of several oxhide ingots, mainly discovered in present-day eastern Bulgaria, identified the copper as coming from Cyprus.[106] What is more, those ingots – though apart from the one belonging to the Kozman Dere hoard not part of closed find contexts – seem to differ in terms of chronology and may belong to a longer time span extending from the 15th/14th to the 13th century BC.[107] If that recent dating proposal is accepted, the Cypriot copper ingots and their distribution might testify to continuity and lasting tradition in the use of the corridors that followed the valleys of the major rivers to the south of the Balkan Range (Maritsa, Tundzha) and reached to the Danube to the north of it. Certainly Athanassov and co-authors are right in emphasizing that the oxhide ingot evidence in the eastern Balkans (and in central Europe) cannot be taken as evidence of any ‘marketing strategy’ used by the Cypriot copper producers to sell their raw material. The evidence rather suggests indirect connections working through regional exchange networks.[108] What economic relevance the LBA import of Cypriot copper had, and whether it was related to the export of gold from the Rhodope region, is impossible to determine at present.

[104] Jung et al. 2017, 276–285, fig. 7, tabs. 1–2; Stockhammer et al. 2020, 95, fig. 3; 96–97, tab. 1.
[105] Cf. Jung et al. 2017, 292.
[106] Athanassov et al. 2020, 300, fig. 1; 314, fig. 10; 325–332, figs. 14–16; 339–344.
[107] Athanassov et al. 2020, 318–322, fig. 11; 324, tab. 4.
[108] Athanassov et al. 2020, 337–342.

In this general context, it should be noted that the region between the lower reaches of the Axios, Strymon, and Nestos, together with Chalcidice and the island of Thasos, has always been known as rich in various resources, and in precious metals and copper in particular.[109] The favourable geological conditions and the concentration of sites and finds give grounds to identify it as one of the main sources of raw materials during the Aegean Bronze Age.[110]

While the Thermaic Gulf and the lower reaches of the Nestos and Strymon trace the western limits, at this stage, Ada Tepe, together with Dragoyna, Dolno Cherkovishte, and Gorski Izvor, delineates the eastern periphery of this space, which is situated in immediate proximity to the northern Aegean coast and has relatively easy access to open flat terrain and the main transregional corridors (like the valleys of the large rivers Maritsa, Tundzha, Struma, Vardar), or directly to the seashore.

In terms of natural resources, the Eastern Rhodopes are equally rich in mineral raw materials, and often offer far easier and convenient access, compared to the Western Rhodopes or the mountains between the lower reaches of the Strymon and Vardar.

Apparently, the process, around the middle of the 2nd millennium BC, of actively taking possession of the mountainous regions and of the diverse natural resources they could offer marks a turning point in the life of the communities that inhabited the northern Aegean area and the southeastern Balkans.

The important similarities in the local ceramic repertoire and in various other elements of the material culture – despite the possibility to distinguish regional cultural groups – have already been noted, with detailed comments and taking into account the accumulation of a large amount of empirical evidence, in the most recent publications of Barbara Horejs, Yana Dimitrova, Denitsa Nenova, and Laura Burkhardt.[111] For this reason, we will not dwell in detail on the specifics of the material culture of the gold producers from Ada Tepe, but will focus instead on several important additional conclusions.

Seen in the context of the material culture, the analysis of the absolute dates from the early periods of Ada Tepe and their interpretation indicates that when the gold deposit was discovered in the last decades of the 16th century calBC and active mining subsequently started, a community settled here that already possessed advanced professional specialization and was able to establish good organization of the working process, to ensure the supply of food and materials, and probably also take care of the distribution of the extracted mineral riches.[112] It is notable that all of this happened at such an early stage. However, the evidence is clear, so that we should accept that the professional knowledge and skills were acquired elsewhere and in an earlier period, preceding the late 16th century BC.

At a relatively early stage (at the turn of the 15th century and in its early decades), two camps were created in the immediate vicinity of the richest ore deposits. Technologically, there were no changes in the process of extraction. There was no evolution or progress, but rather continued practising of a well-established working process.

Taking into account that the active mining at Ada Tepe was relatively short-lived and that the site was gradually abandoned, this would mean that Ada Tepe was not an exception or a special case, but rather a model of the lifestyle and the livelihood of specialized professional communities that made a living from the exploitation of different ore deposits they were able to discover in the mountains. In the course of the gradual human colonization of the Rhodopes, this socio-economic model of social and professional organization was created and perfected, so that we have been able to witness it in an already developed form in the early 15th century BC at Ada Tepe.

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[109] Unger 1987; Unger – Schütz 1982; Pernicka 1987, 619–623, figs. 5–7; Wagner – Weisgerber 1988; Vavelidis 2007, 54; Vavelidis – Andreou 2008; Andreou – Vavelidis 2014, 452–455, fig. 1; Popov 2018b; Vaxevanopoulos et al. 2022.

[110] Andreou – Vavelidis 2014, 456–461, tab. 3, fig. 7.

[111] Dimitrova 2015; Horejs 2017; Nenova 2019; Burkhardt in press; Burkhardt this volume; Dimitrova this volume.

[112] Horejs 2017, 219–220; Popov et al. 2017, 193–196.

When discussing the distribution of the extracted gold and how it reached its final consumers in the Bronze Age Aegean, it is justified to raise the crucial question concerning the parity of exchange and the material value of the goods that were received in return for the much-coveted gold.[113] Unfortunately, at this stage, we are unable to say what the highland miners actually received in return for the gold they laboured so hard for. The isolated remains of imported objects (weapons and weapon parts, fine ware pottery and potentially their contents) are very rare, even put together. However, instead of simply adding them, it is probably more appropriate to perceive even these few artefacts as strong markers for the existence of contacts in specific directions and consequently, they should not be regarded as material resources that were little more than reciprocal in terms of quantity and value. Instead, the penetration of these decisive – albeit seldom – imports belonging to various phases of the Late Bronze Age from LH I to LH IIIC appears to have been a lasting trend in the eastern Balkans and this demonstrates that these interregional contacts were continuous. Furthermore, taking into account the changing quantity and quality of the discovered imports, we are even able to identify a diachronically changing intensity in these contacts. The emergence and the development of Ada Tepe was related precisely to one of the periods of higher intensity of the contacts with the Aegean world and with mainland Greece and an early phase of the Mycenaean state system (LH IIB/IIIA1) in particular.

One important circumstance should be noted in the analysis of the material culture of the population occupied in gold mining at Ada Tepe. The ceramic repertoire that was discovered in the remains of both camps and at various working places is extremely diverse, and some of it displays the developed features of the Encrusted Pottery Culture (or pottery with *Furchenstich* decoration).[114] Until recently, such features were considered typical of the developed stages of the Late Bronze Age in these parts of Thrace, and not of the early phases. Due to the large series of absolute dates from Ada Tepe, some of these concepts may have to be reconsidered. Naturally, the question emerges about when this phenomenon started to evolve, as we see it as early as the beginning of the 15th century BC in the material culture of the people that came to Ada Tepe.

A good example in this respect is the determination of the chronological position of some cultural groups that developed in ancient Thrace and date from the end of the Late Bronze Age. Such an example is the so called Cherkovna Group[115], spread throughout Bulgaria and the eastern Danubian regions of Romania. Together with the Zimnicea necropolis, the Kamenitsa vessels and the Essenitsa Hoard, it forms a chronological horizon, dated by the researchers to different phases of the Late Bronze Age: the late 14th–13th century BC[116] or the late 13th–12th century BC.[117] Recently, taking into account the series of dates from the early periods of Ada Tepe and the close similarities in the silhouettes of vases from Ada Tepe to the amphorae and one of the kantharoi from Cherkovna,[118] we were able to suggest a possible earlier date for these phenomena. In recent times, the Svishtov Hoard, dated to the mid-2nd millennium BC, has also entered the scientific discussion.[119] The similarities that its objects, and especially the pottery vessel – an amphora with shoulder handle – show with the cultural groups mentioned above, suggest that this hoard was part of those phenomena.

The opportunity to analyse a long series of absolute dates in their relative contexts, in combination with numerous finds from the same stratigraphic complexes, allowed us to obtain rich information about a particularly interesting period that until recently remained relatively poorly known in the Balkan interior – unlike the Aegean regions. Until now, the available information about this period was based mainly on eponymous (but chance) finds and on small-scale, mainly

[113] Tzvetkova – Nekhrizov this volume.
[114] For a summary on the subject of the encrusted pottery see: Burkhardt in press; Burkhardt forthcoming.
[115] Hänsel 1976, 76–80.
[116] Bonev 1988, 55.
[117] Hänsel 1976, 86–87.
[118] Dimitrova – Dilov 2018
[119] Alexandrov et al. 2017; Alexandrov et al. 2018b.

trench investigations. The early periods of human presence at Ada Tepe could be dated to a chronological stage that in the numerous scholarly publications is either regarded as the beginning of the Late Bronze Age or as a transitional phase between the Middle and the Late Bronze Age in these parts of the eastern Balkans.[120] At the same time, the opportunity to grasp the developed stage of the material culture of the population that produced gold on the peak in the mid-second millennium BC and its apparently accomplished professional specialization raises questions about the emergence and the unfolding of the processes that preceded and influenced these cultural and social phenomena. As it seems, their origins should be sought in the preceding period, and some of the existing traditional (relative) dates for the beginning and the development of the Late Bronze Age in Thrace should be reconsidered. In this respect, the questions raised by Raiko Krauß regarding the need to modify our views about the chronological parameters of the so-called Middle Bronze Age in the eastern Balkans, and of its later phases in particular, are timely.[121]

In this respect, we will be pleased if the results of the study of the early stages of human presence at Ada Tepe can contribute to the development of this discussion, which is both extremely interesting and important for the study of the Bronze Age in the Balkans.

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[121] See Krauß this volume.

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Comparative Examination of Two House Inventories of the Late Bronze Age Settlement at Ada Tepe (Bulgaria) and its Cultural and Chronological Context in the Late Bronze Age of the Eastern Balkans

Laura Burkhardt[1]

Abstract: The northeast settlement lies next to the Late Bronze Age gold mine at Ada Tepe and offers the unique opportunity to reconstruct the everyday life of the people who worked at the mine. A comparative statistical analysis of the ceramics excavated from two house complexes enables a preliminary functional interpretation of the organization of the settlement. The analysis of the ceramic inventories points to the subdivision of the houses into living, storage and working areas, and provides a detailed insight into the everyday life of the gold mine workers. Furthermore, this article includes a short comparative study of the assemblage of completely preserved vessels from House 5, discussing their relative chronology and cultural background.

Keywords: Ada Tepe, Late Bronze Age settlement, pottery, contextual analysis, everyday life, Plovdiv-Zimnicea-Čerkovna Group, Late Bronze Age chronology, functional interpretation

The Late Bronze Age gold mine on the Ada Tepe hill is located near the town of Krumovgrad, in the Eastern Rhodopes (southeastern Bulgaria).[2] Recent gold mining provided the opportunity to investigate the area between 2009 and 2015 through rescue excavations led by Hristo Popov and his team from the National Institute of Archaeology, with Museum at the Bulgarian Academy of Science (NAIM-BAS). Their work provides evidence for mining structures, middens and two settlements from the Late Bronze Age and Early Iron Age. One settlement is located on the northeastern slope,[3] dating back to the first half of the 15th century BC,[4] and can be associated with the earliest mining activities on the Ada Tepe hill.[5]

This article focuses on the settlement on the northeastern slope, where the hill has a small terrace which forms a suitable terrain for the dwellings. It is a systematically planned settlement area with two rows of houses and an enclosure on the sloping area of the hill, where the natural topography of the small terrace was used efficiently. Different architectural concepts were used in the construction of these rows. The row next to the enclosure was built with stone foundations, on top of which sat uprising wattle-and-daub walls, while the inner row consists of pit houses with

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2 For a broad overview of the site and its cultural context see: Popov et al. 2011a; Haag et al. 2017; Popov – Jockenhövel 2017; Alexandrov et al. 2018 and the Archaeologica Austriaca Special Section: Ada Tepe and the Rhodopes in the Late Bronze Age (Archaeologica Austriaca 101, 2017, 161–304). For a summary of the history of research of the site see Popov – Nikov 2018.

3 The northeastern settlement is situated in sectors I8, I7 and H6.

4 Popov et al. this volume.

5 The second settlement is located on the hilltop and dates back to the Late Bronze Age and Early Iron Age. It is being processed by Yana Dimitrova (NAIM-BAS). A preliminary report has been published by Popov et al. 2005. Further: Popov et al. 2011b; Popov et al. 2015.

potentially wattle-and-daub walls that can be reconstructed as poorly built huts.[6] All the alignments run parallel to the slope. This and the conspicuously regular distances between the houses suggest a planned construction of the settlement as recently defined by the excavator.[7]

Stratigraphic Remarks on the Eleven Houses of the Northeastern Settlement

The features do not overlap and no indicators of multiple floor sequences or repair phases were detected.[8] Shortly after its existence, which lasted about 30–40 years,[9] the settlement was overlaid, and thus sealed, by debris probably originating from the workplaces uphill.[10] Since it is assumed that the northeastern settlement was systematically abandoned,[11] the house contexts reflect the last use phase without later activities or disturbances.[12] The ceramic material therefore does not represent a single moment of a settlement, but rather its short-term use with subsequent wear and abrasion of objects, especially in terms of waste. This is proven by the stratigraphy, the deposition processes that differ greatly between a 'closed house context' and the 'area between the houses', as well as the ^{14}C dates.[13]

House Inventories – the Ceramic Assemblage

The processing of the pottery of the northeastern settlement is being carried out in cooperation with the Bulgarian and Austrian Academies of Sciences,[14] drawing on the methods of typological characterization and the terminology and description of ceramic fabrics developed by Barbara Horejs. This contextual approach takes into account the statistical recording of all fragments, a description of their condition, as well as the recording and typological characterization of all characteristic fragments.[15] The individual recording of morphological characteristics[16] led to the development of a local typology of the Late Bronze Age settlement in the northeastern area, where, due to the heavily fragmented state of the pottery, some vessel shapes could not be completely reconstructed. This was supplemented by a description of the macroscopic fabric types, which will be complemented with petrographic studies to examine raw materials and technological aspects in more detail.[17]

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6 Detailed architectural studies of the northeastern settlement were recently published: Popov et al. 2017.

7 Popov et al. 2017.

8 Popov et al. 2017, 195.

9 This is proven by the ^{14}C-dates. Popov et al. this volume.

10 The layers are not disturbed; in addition, they are divided by a very thin colluvium, which indicates a successive process: Popov et al. 2017, 195–200.

11 The low number of small finds indicates a systematic abandonment: Popov et al. 2017, 195.

12 Popov et al. 2017, 166.

13 Detailed stratigraphic studies of the northeastern settlement were recently published: Popov et al. 2017, 164–192, figs. 5–7, 11, 13, 15, 17–18, 20, 25, 27; Horejs 2017, 207–208, figs. 2, 10.

14 Funded by the FWF, Project "Ada Tepe – Bronze Age Gold Road of the Balkans" (Project-number: P-28451, PI: B. Horejs). The results presented here form part of a PhD thesis by the author, supervized by B. Horejs, H. Popov and R. Krauß.

15 Horejs 2007a, 48–49, 53–73; Horejs 2010. See also: Hochstetter 1984, 29–38.

16 The terminology is based on the works on prehistoric Olynthus (Horejs 2010) and Kastanas (Hochstetter 1984). A detailed presentation of the typology of House 7 in the northeastern settlement was recently published by Horejs (Horejs 2017, 209–215, fig. 5).

17 Therefore the well-established system of Horejs was used, according to which technological wares are defined by a macroscopic analysis of hardness, porosity, breakage, colour, surface treatment and temper (Horejs 2007a, 52–59; Horejs 2010, 20–23). The petrographic studies are carried out by Clare Burke. The recording and analysis of the pottery assemblage was conducted within the PhD thesis of the author (Burkhardt 2019; Burkhardt in press).

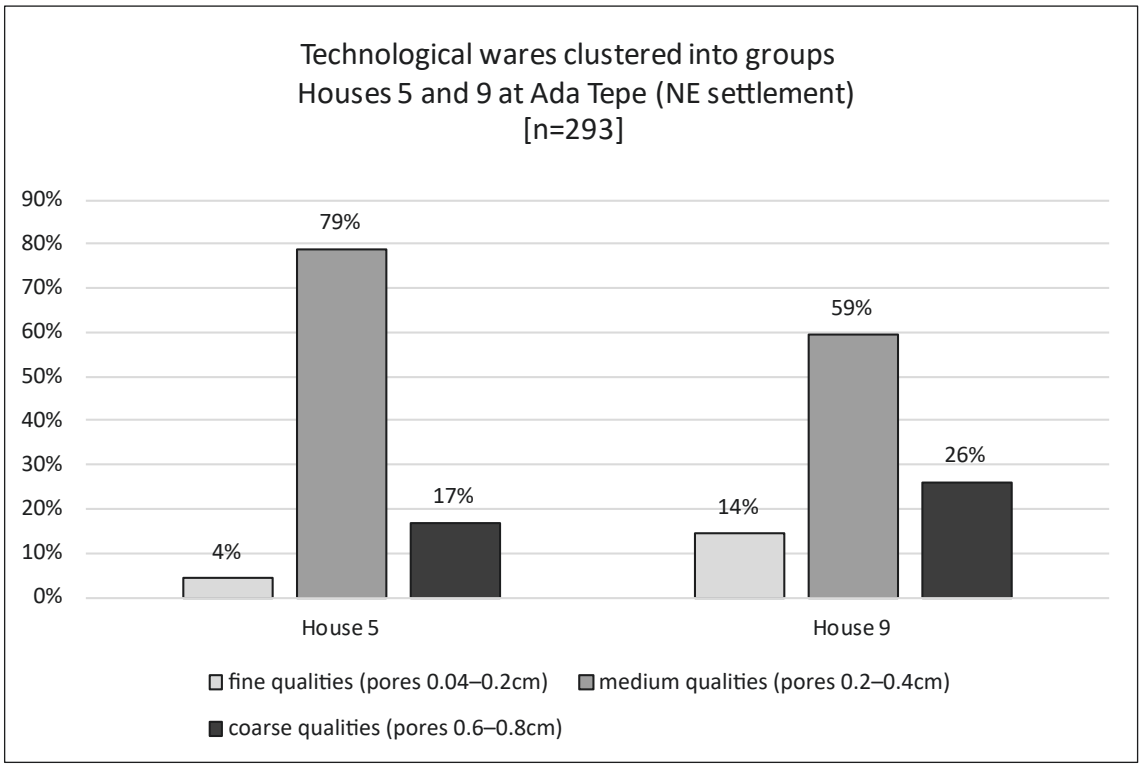

Fig. 1 Technological fabrics of all characteristic fragments from Houses 5 and 9 at the northeastern settlement at Ada Tepe (L. Burkhardt)

This article focuses on a statistical analysis of ceramics from houses 5 and 9 and a functional interpretation. House 9[18] is located in the eastern row of houses, next to the enclosure, while House 5[19] is in the western row, representing the two different construction methods of this settlement area. The inventory of House 5 contains 82 characteristic sherds (from a total of 468 sherds), a spindle whorl, two ceramic discs, a pounder, a rectangular flat stone plate (possibly used as a whetstone) and the fragments of a baking pan. Also worth mentioning are four whole vessels, and it should also be noted that a ^{14}C sample[20] was taken here. In House 9 the finds include 129 significant sherds (in total 1013 sherds), five ceramic discs and a hammer stone. All pottery from the northeastern settlement is handmade and its place of production is to be tested through ceramic petrography. Examination of the ceramic assemblages from the two houses has revealed an uneven distribution of macroscopic fabrics: in the assemblage of House 9 a total of 17 macroscopic fabrics were recorded; however, in House 5, there were only 13. By dividing the fabrics into three categories (fine, medium and coarse quality)[21] according to grain size, pore visibility and visible inclusions,[22] you can see different distribution patterns. The inventory of House 9 has a heterogeneous distribution with an emphasis on medium and coarse wares (the most common one

18 Popov et al. 2017, 172, fig. 13.
19 Popov et al. 2017, 175–185, fig. 20.
20 Popov et al. this volume.
21 Ware categories are defined by porosity. Fabrics of fine quality have pores between 0.04 and 0.2mm, medium quality 0.2–0.5mm, and coarse wares <0.5mm: Horejs et al. 2010, 21; Burkhardt in press, chapter 6.1.1.2. Regarding the material in the northeastern settlement, fine-quality wares are: fabrics 5, 12, 19, 20, 21, 25. Medium-quality wares are: fabrics 2, 3, 4, 6, 7, 9, 10, 13, 14, 15, 16, 17, 23, 27. Coarse-quality wares are: fabrics 1, 8, 11, 18, 22, 24, 26 (Burkhardt 2019, 59–63; Burkhardt in press, chapter 6.1.2).
22 Horejs 2017, 209, fig. 3.

is no. 6 at 16% and of medium quality) (Fig. 1),[23] whilst House 5 ceramics exhibit a prevalence of medium-quality fabrics, of which fabric no. 10 (medium quality) accounts for almost 30%.[24] Accordingly, the assemblages vary not only in the different quantities of ceramics, but also in the different qualities of the macroscopic fabrics and their relation to shapes. In terms of surface colour, the spectrum ranges from orange-brown to brown-grey to the black fabric group 10, which is often decorated with incised/encrusted ornaments.[25]

Typology

Both ceramic assemblages have a homogeneous range of shapes with a domestic character which is well embedded in the local and regional pottery traditions of the Rhodopes.[26] The assemblages are dominated by storage vessels and include amphorae, jars, deep and shallow bowls, kantharoi, a cup and a baking pan. Based on the differently shaped necks of the vessels, a general typological subdivision was made. In most cases, the poor state of preservation has not given any further indications, so that the remaining profiles and the correlation of neck, body and base often remains uncertain. The only exceptions are three amphorae and a cup from House 5, which have been completely restored (Fig. 2). They provide information on the entire profile of the vessels. Each of the three amphorae has a short neck, which can be cylindrical[27] or slightly conical[28] with a rounded or slightly thickened lip. The shape of the body is biconical in two cases, with a pronounced carination on the body. The handles are arranged centrally on the body (cat. III nos. 1294–1295)[29] and the necks are shaped differently: one is cylindrical (cat. III no. 1294), the other conical (cat. III no. 1295). In addition, the base varies between a flat base (cat. III no. 1294) and a pedestal (cat. III no. 1295). Both are decorated with encrusted ornaments in an area reaching from the shoulder to the belly. The third amphora (cat. III no. 1296)[30] is undecorated with a slightly conical neck, a less angular profile and an oval-shaped body with two handles.

With a few exceptions, all jars are narrow-mouthed and have a conical,[31] concave[32] or cylindrical[33] neck; in addition, there are jars without a pronounced neck.[34] Most commonly used are

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23 The most frequent wares are no. 6 (16%, medium quality), no. 5 (12%, fine quality), no. 10 (10%, medium quality), and no. 18 (10%, coarse quality).

24 Here the most frequent wares are no. 10 (29%, medium quality), no. 6 (9%, medium quality), no. 11 (7%, coarse quality) and no. 7 (6%, medium quality).

25 For a study of technological wares from House 7 see Horejs 2017, 209–211, fig. 3. Petrographic analyses by Clare Burke are forthcoming.

26 Hänsel 1976; Hochstetter 1984; Leshtakov 1990; Kisyov 1993; Nekhrizov 1995, 309–325; Bozhinova et al. 2013, 45–98, esp. 53–58; Horejs 2010; Dimitrova 2011; Horejs 2017, 209–211, fig. 4; Nechrizov – Cvetkova 2017; Nikov 2017; Nenova 2018; Burkhardt in press, chapter 8.1. For a discussion of pottery traditions in adjoining regions to the south see Kiriatzi et al. 1997; and for the west see Bulatović 2011.

27 That corresponds to type A3 (amphora with a cylindrical neck – straight). Horejs 2017, 211–213, fig. 5, pl. 3.1; Burkhardt in press, chapter 6.2.2.1.3.

28 That corresponds to type A2 (amphora with a conical neck – bent outwards). Horejs 2017, 211–213, fig. 5, pls. 1.3; 4.1; 5.3; 8.2; 10.7; 11.3–4; Burkhardt in press, 6.2.2.1.2.

29 Cat. nos. refer to Burkhardt in press: cat. III no. 1294 (Burkhardt in press, pl. 152.1); cat. III no. 1295 (Burkhardt in press, pl. 153.1).

30 Burkhardt in press, pl. 153.2.

31 That corresponds to type J2 (narrow-mouthed jar with a conical neck). Horejs 2017, 213–214, fig. 5, pls. 1.6; 2.7; 5.1; 4.4; 7.1–2; 8.4; 9.4; Burkhardt in press, chapter 6.2.1.5.2.

32 That corresponds to type J1 (narrow-mouthed jar with a concave neck). Horejs 2017, 213–214, fig. 5, pl. 1.2; Burkhardt in press, chapter 6.2.1.5.1.

33 That corresponds to type J3 (jar with a cylindrical neck). Horejs 2017, 213–214, fig. 5, pl. 10.6; Burkhardt in press, chapter 6.2.1.5.3.

34 That corresponds to types J4 (narrow-mouthed jar) (Horejs 2017, 213–214, fig. 5, pl. 10.3) and J5 (wide-mouthed jar) (Burkhardt in press, chapters 6.2.1.5.4 and 6.2.1.5.5).



Fig. 2 Complete preserved vessels from House 5. From left to right: cat. III no. 1292, no. 1295, no. 12954, no. 1296 (photo: F. Ostmann/OeAI-OeAW)

regularly rounded or slightly thickened lips. Due to the poor state of preservation, most of the profiles of the jars must remain uncertain, but, based on the macroscopic fabrics and comparisons, it can be assumed that they had flat bases. Cooking pot shapes could not be specifically identified, with the abraded nature of much of the material making identification of diagnostic indicators such as sooting on vessels particularly difficult. For this reason, jars and amphorae are usually grouped together according to their assumed function as storage vessels. Such functional differentiation in storage and consumption vessels is based on the morphological and technological characteristics of the vessels.[35] Kantharoi do not belong to these two groups as they are suitable for both the storage and the consumption of liquids.[36] They have a spherical body, two high-standing handles and either a short cylindrical[37] or a concave neck.[38] Their macroscopic fabric usually has medium and fine qualities, and the frequent, encrusted decoration supports their use as tableware. Kantharoi are typical for this region in the Late Bronze Age.[39] Other consumption vessels include deep and shallow bowls and cups. The shallow bowls have s-shaped profiles[40] and occur only in the house complex 9. Deep bowls have funnel-shaped[41] or cylindrical-shaped necks[42] or simply appear hemispherical-shaped, in addition, a completely preserved

35 Riemer 1997, 117–131.

36 Andreou et al. 2013. In the special case of the northeastern settlement on Ada Tepe, the thin walls of the kantharoi and their small rim diameters, as well as their frequent ornamentation, are more likely to indicate their use for consumption (Burkhardt in press, chapter 6.2.1.3, fig. 58).

37 That corresponds to type K1 (globular kantharoi with a cylindrical neck). Horejs 2017, 215, fig. 5, pls. 1.4–5; 3.6; Burkhardt in press, chapter 6.2.1.3.1.

38 That corresponds to type K2 (globular kantharoi with a concave neck). Horejs 2017, 215, fig. 5; one exception is biconical (Burkhardt in press, chapter 6.2.1.3.2).

39 Horejs 2007a, 122, fig. 66; Burkhardt in press, chapter 6.2.1.3, figs. 59–61.

40 That corresponds to type SB1 (shallow bowl with an s-shaped profile). Horejs 2017, 215, fig. 5, pls. 2.5; 9.3; Burkhardt in press, chapter 6.2.1.1.1.

41 That corresponds to type DB1 (deep bowl with a funnel-shaped neck). Horejs 2017, 215, fig. 5, pls. 2.3; 11.5; Burkhardt in press, chapter 6.2.1.2.1.

42 That corresponds to type DB2 (deep bowl with a cylindrical neck). Horejs 2017, 215, fig. 5, pls. 4.5; 10.4; Burkhardt in press, chapter 6.2.1.2.2.

cup was recorded from House 5 providing us with a full profile (cat. III no. 1292)[43]. It is an open shape with a sloping rim, a single, slightly high-standing handle and a discreetly concave rim. Aside from these vessels, a fragment of a rare double vessel[44] was recovered from House 9, and the rim fragments of a baking pan from House 5, the latter being the only clear indication of the preparation of food in both inventories.

Decoration[45] can appear as fingerprints (directly or in combination with the application of a plastic cordon) on the rim or as incised and sometimes also encrusted decorations. Whether the incised ornaments were additionally encrusted or not is often not clearly distinguishable due to the poorly preserved surfaces. The motifs are geometric patterns composed of sets of lines forming frames, triangles, spirals or simple straight lines. In some cases, *Kerbschnitt* ornaments are added to encrusted decorations, as shown in the example of the completely preserved amphorae (Fig. 2). On vessel cat. III no. 1294, rhombic incised decoration with concave sides has been added to the body above each handle. In the centre of the motif there is a small circle surrounded by four triangles (*Kerbschnitt*). The main decorations are large hanging triangles placed under the neck which are subdivided by three smaller hatched triangles. The second decorated amphora (cat. III no. 1295) has incised decoration on its upper body consisting of two large arrangements bordered by two vertical lines. In the middle, a thin, cross-hatched triangle opens to form a rhomb, which is accompanied by slightly diagonal sets of lines with rolled ends. This amphora also has small ornaments (triangles) above the handles.

Plastic cordons with finger impressions regularly appear on jars, while incised and encrusted decorations, with a few exceptions, are often associated with consumption vessels. Thirty-six per cent of the jars[46] in the assemblage of House 9 have plastic decoration and 66% of the kantharoi[47] have incised/encrusted decoration. In the inventory of House 5, one amphora has plastic decoration[48] and two have encrusted decoration[49] (as mentioned above). In addition, two kantharoi have incised/encrusted decoration and a deep bowl displays a grooved line under the rim.

Although there is a range of decorative methods, it is often difficult to assign sherds to particular shapes unless they relate to diagnostic parts of the vessel. This is best illustrated by two completely preserved amphorae: the decorated area is located under the neck on the upper shoulder, which is often an area that is found fragmented; as such, it is rarely possible to assign such decorated body sherds to the vessel type to which they belong. Based on the analysis of wares and macroscopic fabrics, it is possible to generally correlate encrusted wall sherds with consumption vessels (such as fabric no. 10 and kantharoi).

In summary, the most common vessels are amphorae and jars (storage vessels), whilst tableware such as deep and shallow bowls, kantharoi and cups is less abundant (Fig. 3).

Functional Differentiation of the House Assemblages

The potential functional differentiation of the two house assemblages is analysed by means of different compositions of macroscopic fabric and vessel types and their spatial distribution. The basis for this is the determination of functional groups[50] (storage/consumption/food preparation).[51] There are currently several approaches for the measurement of sherd quantities; in this case the

43 Burkhardt in press, pl. 152.2.
44 It this case the two vessels partly shared one wall.
45 In order to avoid any statistical distortion, only decorated rim sherds were included.
46 9 out of 25 rim sherds.
47 4 out of 6 rim sherds.
48 12% (in total 8 amphorae).
49 25% (in total 8 amphorae).
50 Riemer 1997, 117–131.
51 Residue analyses were not carried out since, due to the bad state of preservation, they are not very promising.

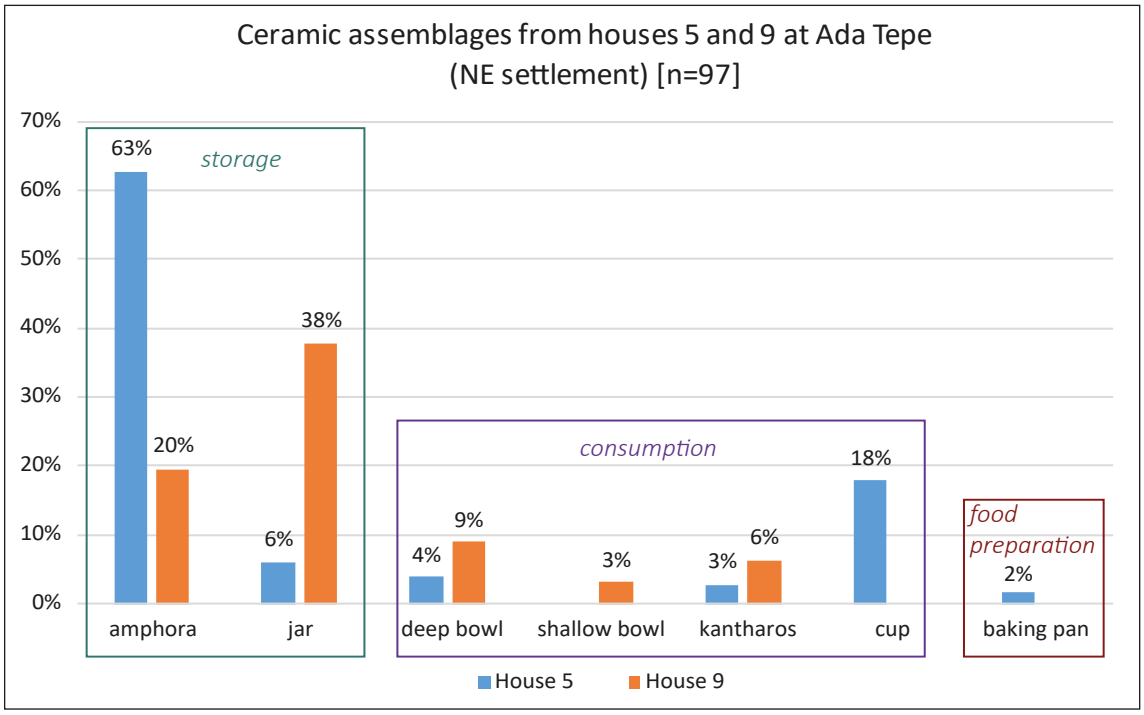

Fig. 3 Typological classification of house inventories 5 and 9, using the method 'estimated rim equivalent' (L. Burkhardt)

method 'estimated rim equivalent'[52] is used for an exact count. In this process, each sherd is evaluated as a fragment of an entire vessel. A distortion of the statistics can be compensated for by measuring not only the diameter of the rim, but also the percentage of the circumference preserved. For example, the completely preserved vessels have rims with a circumference of 100%.

There are a number of significant differences between the assemblages from House 5 and House 9, with that of House 9 showing a concentration of jars and amphorae, while in contrast, the inventory of House 5 is mainly represented by amphorae and consumption vessels, although, House 5 with its four completely preserved vessels (three amphorae, one cup) may seem a little over-represented here (Fig. 3).

However, taking into account the wall thickness and the rim diameter, an additional detailed insight can be gained which adds weight to the idea of a significant difference between these houses. The vessels from House 5 have walls with a thickness between 0.6 and 1cm;[53] the vessels from House 9 have thicker walls, between 0.7 and 1.5cm.[54] Interestingly, the storage vessels from House 5 are thinner-walled than their equivalents from House 9, and further evidence for the different sizes is found in the rim diameters, which tend to be smaller in House 5 than in House 9.[55] This correlation (which indirectly points to different volume capacities of the vessels)[56] is grouped into two overlapping clusters (Fig. 4) and can be related to different functional aspects.

52 Orton 1989; Orton – Tyers 1992; Bader 2010; Jung 2010.

53 The amphorae from the House 5 inventory have on average a wall thickness of 0.76cm, and the jars of 0.81cm.

54 The amphorae from the inventory of House 9 have on average a wall thickness of 0.95cm, and the jars likewise.

55 The rim diameters of the amphorae from House 5 are on average 20.65cm, and the jars 21.98cm. Conversely, the amphorae of House 9 have on average rim diameters of 25.48cm and the jars of 26.13cm. For a discussion about storage capacities within the houses of the northeastern settlement see Burkhardt in press, chapter 7.4.1, figs. 124–126.

56 The different sizes indicate that the volumes of the vessels vary in size, but unfortunately, due to the poor state of preservation, the volumes of distinct vessels could only seldom be reconstructed. The comparative statistical examination of all pottery inventories of the settlement (taking into account the formation processes) showed different functional assemblages (Burkhardt in press, fig. 123). For house 5 see also: Burkhardt in press, chapter 7.3.11, fig. 121. For house 9 see also: Burkhardt in press, chapter 7.3.2, fig. 104.

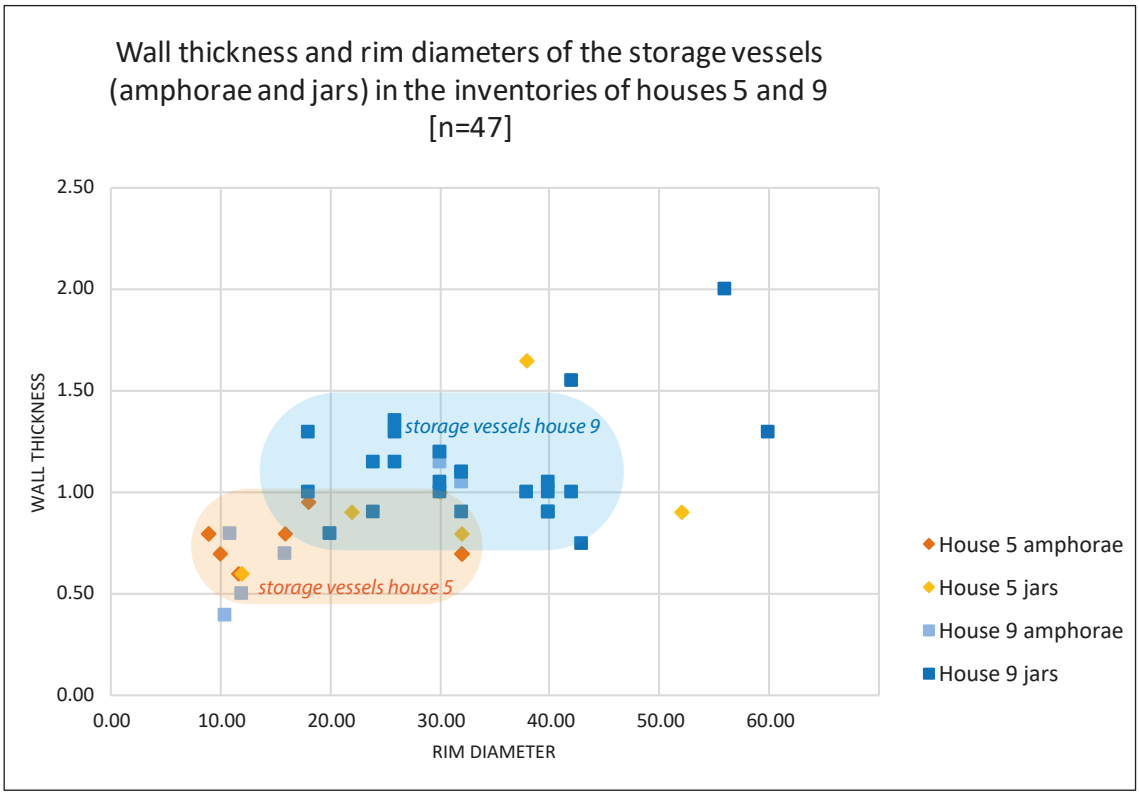

Fig. 4 Distribution of the storage vessels according to their rim diameters and wall thicknesses (L. Burkhardt)

Due to the different rim diameters and wall thicknesses and the different quantity of vessels, House 5 had significantly lower storage capacities than House 9, which leads to a different functional interpretation: the storage vessels of House 9 were most probably used for long-term storage, such as the storage of food. The pots from House 5 are smaller in number and size and were suited for short-term storage, probably for the storage of liquids and daily consumption. In summary, it can be said that both houses mainly contain storage vessels, but in House 5 these are mainly vessels for the storage of liquids (amphorae) and smaller consumption vessels.[57]

As far as the details of ceramic production are concerned, the almost uniform production methods of repetitive types suggest that production is undertaken to satisfy a specific demand for domestic use for a small community's everyday needs in relation to the storage, preparation and consumption of food.[58] Although the vessels may have had a range of uses, the nature of the assemblage is consistent with ceramic production to meet the needs of the gold mining society.

Discussion of the House Assemblages

Different functional purposes of houses 5 and 9 are indicated not only by the different distribution of vessel types and their characteristics, but also by the different architectural features of the houses. House 9, with a foundation of stones and uprising structures of wattle and daub on top of

[57] Deep and shallow bowls and cups fall into this category. Andreou – Psaraki 2007, 397–420. For house 5 see also: Burkhardt in press, chapter 7.3.11, fig. 121. For house 9 see also: Burkhardt in press, chapter 7.3.2, fig. 104.

[58] Horejs 2017, 210, 215–219, figs. 8, 9.

them, was a solid building, whilst House 5 had no stone architecture and appears to have been a hut, according to the excavator.[59]

These differences in architectural features match the ceramic inventories; a massive building is better suited than a hut to storing supplies. On the other hand, a hut is more suitable for an everyday dwelling where cooking[60] and consumption take place. Using the data from House 7, analysed by Horejs,[61] we can include another building in this discussion. In House 7, the ceramic assemblage indicates a storage facility and a place for food preparation.[62] In addition to these functional aspects, the small finds suggest that a range of activities took place in the houses. Grinding stones, hammer stones, spindle whorls and ceramic discs characterize the houses as working areas for a variety of domestic crafts. Neither the house inventories nor other excavated structures indicate that a large surplus was stored and distributed on the mountain,[63] which is why the gold mining community had to be supplied by external sources, probably by farmers in the plains.[64] That might suggest the presence of an organized food supply within the specialized gold mining society at Ada Tepe.

When we consider the architectural, ceramic and small finds evidence from the northeastern settlement at Ada Tepe, it appears that the site was a systematically planned settlement, probably organized in living, working and storage areas. The lack of evidence for food production and large-scale food storage and processing strongly indicates that the mining settlement was integrated into a network of other settlements for its food supply. As the vessel types and decorative styles undoubtedly show, the northeastern settlement at Ada Tepe was embedded in a larger socio-economic organization of the surrounding area in which the mineworkers of Ada Tepe certainly played a prominent role as specialists in their craft.[65]

The Cultural and Chronological Context in the Late Bronze Age of the Eastern Balkans (based on the well-preserved vessels from House 5)

The completely preserved vessels from House 5 (Fig. 2) are of particular interest in two respects. On the one hand, due to the ^{14}C model of the whole northeastern settlement,[66] a rare absolute chronological anchor for the Late Bronze Age is available for the Eastern Rhodopes; on the other hand, amphorae are rarely completely preserved, with the exception of ceramic depositions in wells. The latter are of historical importance for the Late Bronze Age in Bulgaria, since the Čerkovna Group[67] was described by Bernhard Hänsel on the basis of these ceramic depositions. After a brief typological description of the amphorae of the deposits, which is provided because of their importance for the history of research, follows a comparative study

59 Popov et al. 2017, 175–185, fig. 20.

60 In House 5 two rim-fragments of a baking pan have been found. Horejs 2005, 71–94.

61 Horejs 2017.

62 Horejs 2017, 217–220, pl. 8.1; Burkhardt in press, chapter 7.3.10, fig. 119.

63 This is suggested by comparisons of settlements with clear storage facilities like Koprivlen (Alexandrov 2002) or Assiros (Jones et al. 1986). Popov et al. 2017, 195.

64 Nikov et al. 2018; Burkhardt in press, chapter 7.4.1.

65 Burkhardt 2020a; Burkhardt in press, chapter 7.4.

66 See Popov et al. this volume. For radiocarbon dates from the hilltop settlement at Ada Tepe see: Nekhrizov – Tzvetkova 2018.

67 This group is also mentioned in the literature under the name Plovdiv-Zimnicea on the basis of the Romanian cemetery Zimnicea (Alexandrescu 1973). A first definition was made by B. Hänsel 1976 on the basis of the ceramic depositions in wells from Cherkovna and Plovdiv (Detev 1964), building on the works of Morintz – Angelescu 1970 (Hänsel 1976, 80, pl. II, 21.25–30). In the Thracian region, the Late Bronze Age is described with the Horizons V (Asenovec-Razkopanitsa-VII Culture) and VI (Plovdiv-Čerkovna) (Panayotov 1995, 248.) This complex is summarized in the following under the term Čerkovna Group or PZC Complex. For a summary of the definitions of the PZC Complex see Dzhanfezova 2018.

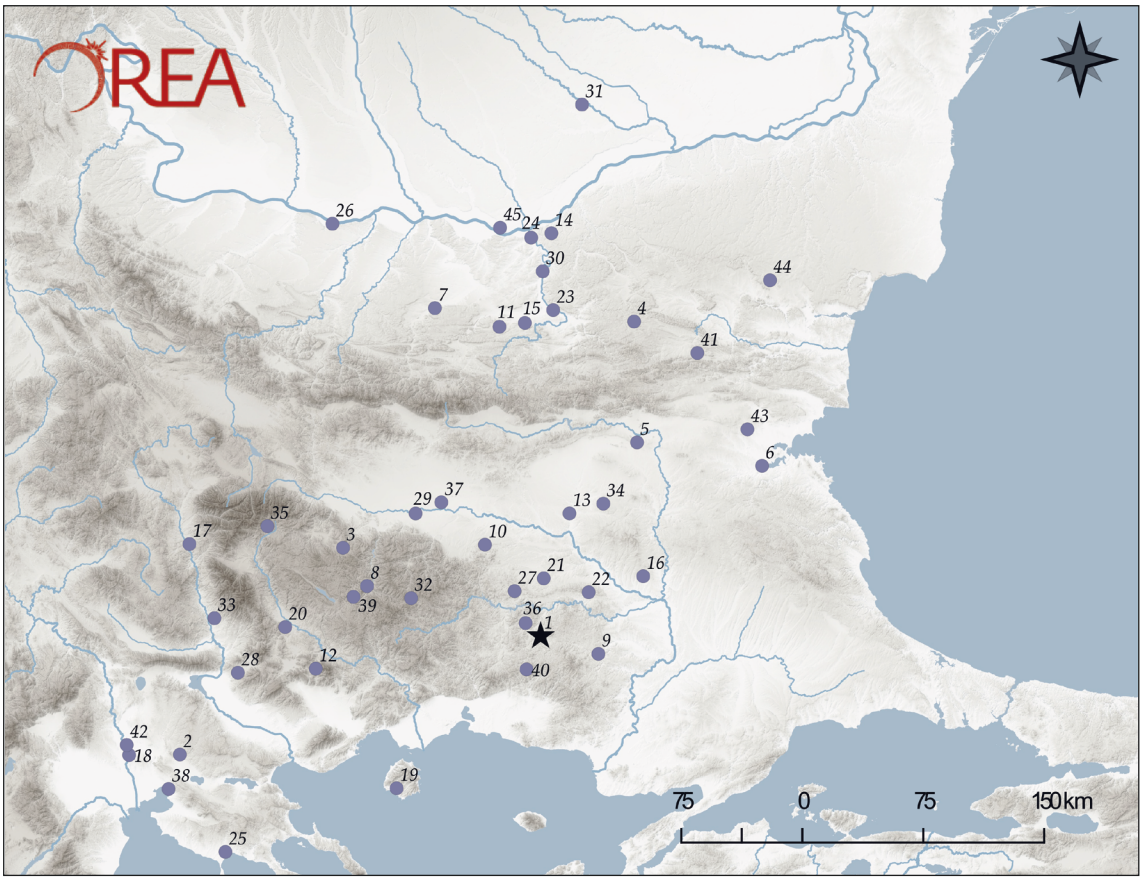

Fig. 5 Map of mentioned sites. 1. Ada Tepe; 2. Assiros Toumba; 3. Batak; 4. Cherkovna; 5. Chokoba; 6. Debelt; 7. Devetaki Cave; 8. Devin; 9. Dolno Lukovo; 10. Dragoyna; 11. Emen Cave; 12. Exochi; 13. Galabovo; 14. Gorno Ablanovo; 15. Hotnitsa-Osmankin Dol; 16. Izvorovo; 17. Kamenska Chuka; 18. Kastanas; 19. Kastri (Thasos); 20. Koprivlen; 21. Kralevo; 22. Kush Kaya; 23. Moltepe-Draganovo; 24. Novgrad; 25. Olynthus; 26. Ostrov; 27. Peperikon; 28. Phäa Petra; 29. Plovdiv; 30. Polsko Kosovo; 31. Popeşti; 32. Progled; 33. Sandanski; 34. Selishteto, Polski Gradets; 35. Skaleto; 36. Tatul; 37. Razkopanitsa; 38. Toumba Thessaloniki; 39. Tsarkvishteto (Borino); 40. Tsouka; 41. Varbitsa; 42. Vardarophtsa/Axiochiori; 43. Vratitsa; 44. Yagnilo; 45. Zimnicea (L. Burkhardt)

which tries to shed light on the chronological aspects of the well-preserved amphorae from House 5.

The amphora types from the Cherkovna deposit do not have a defined neck section, rather, the elongated, ovoid body (which in one case also appears slightly compressed) merges harmoniously, marginally conical, into a rim that is slightly thickened.[68] The paired vertical handles of the amphorae are positioned in marginally different positions.[69] Each position is present, from high-standing, sitting on the neck to below the belly. Apart from the fact that their handle positions are quite variable, they form a homogeneous group with regard to their remaining morphological characteristics, which with one exception is undecorated and has flat bases. The amphorae from the Plovdiv well deposit form a less homogeneous group, including the elongated, ovoid type of amphora without a neck,[70] but in one case it has a slight shoulder.[71] This

[68] This corresponds to amphora type A1 from the northeastern settlement on Ada Tepe. This type of amphora is also described by Hänsel as barrel-shaped (Hänsel 1976, 81 pl. 9.6).

[69] Hänsel 1976, pl. 9.

[70] Detev 1964, fig. 6a.

[71] Detev 1964, fig. 7o. By this slight shoulder step, the type A1 amphora (without developed shoulder section) combines the morphological characteristics of the *Kegelhalsamphora* and the amphorae without shoulder step.

is also a feature of all other Plovdiv amphorae. In two cases these are amphorae with a conical neck and stepped shoulder (in the following named Olynthus type II/*Kegelhalsamphore*),[72] while the other amphorae have a curved, conical neck composition. The compact proportions of some amphorae, which can sometimes be as wide as they are high and also have a foot, are remarkable.[73] No amphora from the Plovdiv deposit is decorated, something Hänsel already described as characteristic for the Čerkovna Group.[74] The beginnings of the group remain puzzling as the complexes where they were described suggest that the group was already fully developed by the 13th century BC. Therefore, based on the complete preserved vessels from House 5 and in the context of several radiocarbon dates from the northeastern settlement at Ada Tepe, a short comparative study of Late Bronze Age amphorae from the eastern Balkans follows. It aims to make a small contribution to the chronology and the development of Late Bronze Age amphorae in the eastern Balkans and to shed some light on the puzzling beginning of the Čerkovna Group.

Due to a similar chronological position (based on ^{14}C dates), the sites Kush Kaya (Area I), Tatul, Koprivlen and the northern Greek tell-settlements with a vertical stratigraphy Olynthus (Levels 7-6), Kastanas (Levels 18-17) and Assiros are of particular importance for comparisons with the presented amphorae from House 5 of the northeastern settlement at Ada Tepe. Furthermore, the hilltop settlement of Dragoyna, which dates to a slightly later period, is well published and is located on the northern edge of the Rhodopes, is also suitable for comparative studies.[75] A general problem in the study of Late Bronze Age amphorae is the reconstruction of the complete profile of the vessel, as only a few are in very good condition, which is why the comparative studies often have to be based on rim fragments. Thus, for House 5 (northeastern settlement at Ada Tepe) too, most of the amphorae have been identified only by their rim fragments, and while the completely preserved amphorae are, in each case, types with elaborated neck sections, the characteristic amphora type for the Čerkovna Group 'without elaborated neck section' also appears in the inventory, even if only represented by rim and neck fragments.

Amphorae without elaborated necks (type A1) (Fig. 6) are widespread in the Rhodopes and eastern Bulgaria, with Kastanas[76] and Cherkovna[77] being the most distant find spots. The well-preserved vessels from Cherkovna and Plovdiv suggest a very harmonious profile and the handles are repeatedly attached slightly above the maximal belly diameter. Dimitrova and Dilov[78] compared the amphorae from Cherkovna with an amphora from Toumba Thessaloniki (KA 875) which is dated by Andreou to the later Late Bronze Age (phase V–IV).[79] Most amphorae without elaborated necks from the PZC Complex have an even, oval body with the maximum belly diameter at the mid-height of the vessel, in contrast to the ovoid shape of the amphora from Toumba Thessaloniki. From the settlement Vratitsa, an example of the type A1[80] has been published; thus

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72 Detev 1964, fig. 7б, a.

73 Detev 1964, fig. 6, 7б. These compact proportions can also be found in an amphora from Zimnicea. Hänsel 1976, pl. 11. 5.

74 Hänsel 1976, 80.

75 See the article by E. Bozhinova in the present volume.

76 Kastanas levels 18 and 14b (Hochstetter 1984, pls. 7.3; 43.2).

77 Hänsel 1976, pl. II. 21, 29.

78 Dimitrova – Dilov 2017, 125–154.

79 Andreou – Psaraki 2007, 410, fig. 12. KA 875; Andreou 2009, 7. The ovoid body shape of the amphora from the Toumba Thessaloniki could also fit to an amphora with conical neck and stepped shoulder, which cannot be completely clarified due to the fracture in the neck region. A good parallel to this amphora can be found in the sanctuary of Kokkino in Nort Macedonia (Bulatović 2011, pl. II.8). These two examples share the characteristic that the maximum belly diameter lies below the central vessel height, while in the amphorae from the depot of Cherkovna, the maximum belly diameter lies at the central vessel height. This gives the latter a less ovoid and a more symmetrical, ellipsoid shape.

80 Hristova 2011, fig. 7.4.

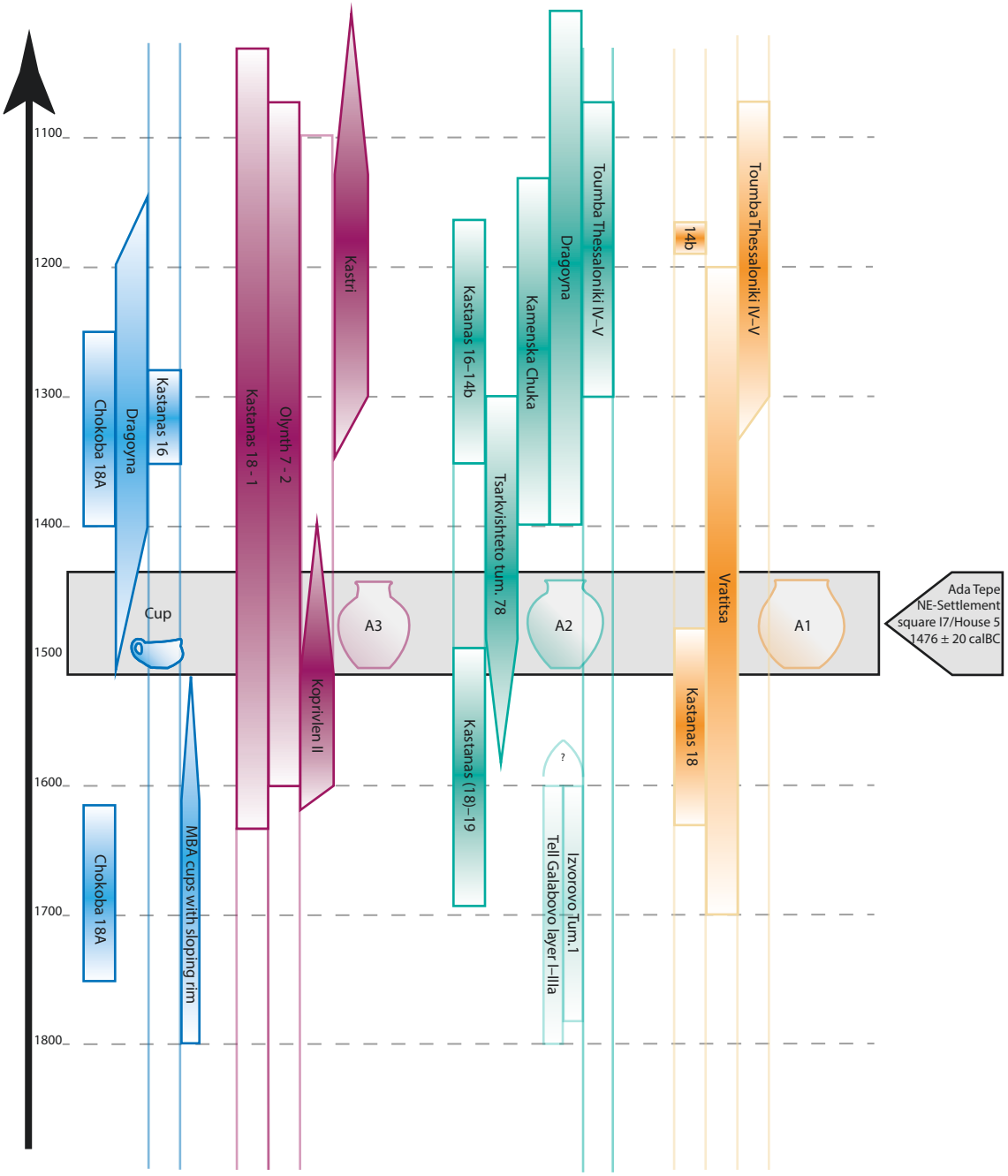

Fig. 6 The ensemble of completely preserved vessels from House 5 (northeastern settlement on Ada Tepe) and the chronological position of the comparable and well-dated vessels which are mentioned in the text (L. Burkhardt)

the settlement covers several phases of the Late Bronze Age, between the 17th and the 12th century BC.[81] Two A1 amphorae from Level 18 and Level 14b were found in Kastanas,[82] which corresponds to a period similar to that of the settlement of Vratitsa.

[81] Hristova 2011. An interpretation of the settlement as a waste disposal area of a settlement can be found at Leshtakov 2007, 456.

[82] Hochstetter 1984, pls. 7.3; 43.2.

Amphorae with a conical neck (type A2) (Fig. 6) are particularly widespread in the Rhodopes.[83] Since the ^{14}C model of the northeastern settlement at Ada Tepe proves a dating in the early Late Bronze Age, connections to earlier amphora types were examined. Even though only a few sites from Bulgaria can be assigned to the Middle Bronze Age,[84] there are a few indications about what the amphorae looked like in this period. For example, an amphora with conical neck was found in tumulus 1 at the northeastern Bulgarian site of Izvorovo.[85] Its neck merges with a distinctive shoulder step into a biconical body, where two handles are placed slightly above the belly. Its rim is formed so that it turns slightly outwards, and below the neck there are hanging triangles (filled with embossed dots), as well as plastic knob applications in the upper part of the vessel. The combination of embossed, encrusted ornaments and plastic applications, as well as similar motifs and morphological characteristics, can be found, for example, on the Middle Bronze Age amphorae from Tatul (deep layer, end of the first quarter of the 2nd millennium BC)[86] from Tell Galabovo (layers I–IIIa)[87] and in Debelt.[88] They all have a relatively long neck section in common, which is sharply set off from the often biconical body. The handles are placed on, or slightly above, the maximum belly diameter. These sharply contrasted profiles cannot be found so prominently in the typical Late Bronze Age amphorae,[89] whereby the already presented amphorae of Ada Tepe (cat. III no. 1295) (Fig. 2, the first amphora from the left side) with their slightly biconical bodies, the sharp shoulder transition and the decoration confined to the shoulder are potentially reminiscent of these Middle Bronze Age amphorae, even if the neck is now very short.[90] Other comparisons for type A2 are undecorated, and the profile is often gently curved (cat. III no. 1296 [Fig. 2, on the right side], Kastanas,[91] Sandanski,[92] Plovdiv,[93] Selishteto[94]). The neck can likewise be set off from the body, but is then shorter compared to the Middle Bronze Age amphorae, and the body is globular – which led to the name globular amphorae/*Kugelamphoren* (Kamenska Chuka,[95] Dragoyna,[96] Progled[97]). The globular amphorae from Dragoyna can be dated to the second half of the Late Bronze Age (LH III) and they are comparable with vessels from Toumba Thessaloniki (phases V–IV),[98] while the globular amphorae from

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83 The amphora from the site Kokkino in North Macedonia is the westernmost distribution point of this specific type and corresponds in its body form rather to the ovoid amphora from the Toumba Thessaloniki (Andreou – Psaraki 2007, 410, fig. 12. KA 875), even if it has a conically shaped rim. It is therefore not to be included among the globular amphorae with a conical neck, but could represent a subvariant (Bulatović 2011, tab. II,8).

84 This problem is discussed by Krauß 2006b.

85 Borislavov 2010, 11–12, fig. 12.

86 Ovcharov et al. 2008, fig. 5б.

87 Leshtakov 1993, figs. 16.4; 12.4–5; 11.5 The amphora from layer II can be compared with one from Athenian Agora and Lerna V (MH). The three uppermost layers of Tell Galabovo are dated on the basis of ^{14}C dates and ceramic comparisons with Anatolia to the beginning of the 2nd millennium BC. (in the 17th century BC) (Leshtakov 2006, 182). Borislavov discusses the comparisons for Izvorovo and Galabovo for the 17th century BC (Borislavov 2010, 24).

88 Leshtakov 1993, fig. 16.1.

89 Which mostly date later than the 15th century.

90 There are also some amphorae of this type that stand out from the others through a long neck. For example, the amphora from Novgrad (Hänsel 1976, pl. 62.5) or the amphora from Koprivlen (Alexandrov 2002, fig. 17); these variants could be a subtype.

91 Hochstetter 1984, pls. 5.9; 37.6; 43.1.

92 Alexandrov et al. 2007, pl. 4g.

93 Detev 1964, fig.6b.

94 Nikov 2001, fig. 3a.

95 Stefanovich – Bankoff 1998, figs. 29, 30a–b.

96 Bozhinova et al. 2013, pl. 2.9.

97 Kisyov 1993, fig. 3a.

98 Bozhinova et al. 2013, 66.

Kamenska Chuka are dated to the 14th–12th centuries BC.[99] The association of the amphorae in Kamenska Chuka with so-called fruit bowls (open, sharply profiled bowls with a pedestal with an applied cordon at the transition from bowl to pedestal) can also indicate an older date, if one follows the discussion about the derivation of these bowls.[100] The find association of a pedestal bowl (without an applied cordon on the transition to the pedestal) with a small jug reminiscent of Middle Bronze Age forms in the central Rhodope tumuli no. 78 of Tsarkvishteto (near Borino) points in a similar direction.[101] Furthermore, the find association of an amphora with conical neck and slightly biconical body and pedestal bowls in tumulus no. 84 in Tsarkvishteto[102] (near Borino) links this amphora type chronologically to the group of pedestalled bowls. In Kastanas, type A2 amphorae are already present in levels (18)–19, 15–16 and 14b. Therefore, they can be seen as a constant component of the Late Bronze Age pottery tradition (Fig. 6).[103]

Amphorae with a cylindrical neck (type A3) (Fig. 6) are widespread in the Rhodopes but can be found all the way to the Lower Danube (Novgrad,[104] Polsko Kosovo,[105] Ostrov[106]) and northern Greece (Olynthus,[107] Kastanas,[108] Toumba Thessaloniki[109]). They may have a biconical body (such as Ada Tepe cat. III no. 1294 [Fig. 2, the second from the right side], Koprivlen,[110] Novgrad,[111] Skaleto[112]) or an evenly rounded/oval body (Polsko Kosovo, Toumba Thessaloniki). Furthermore, they differ in the length of the neck. For instance, the amphorae from House 5 belong to the short variant, while the amphorae from Novgrad[113] and Olynthus[114] belong to a second, longer, variant. In Olynthus they exist from Level 7 onwards and they run constantly until Level 2,[115] and in Kastanas they exist from Level 18 and likewise have a long lifespan.[116] In Koprivlen they are evenly distributed in both Late Bronze Age horizons (LH I–II and LH IIIB–IIIC early),[117] after which one can assume an extended lifespan. This type of amphora dates to the same time frame on Kastri on Thasos,[118] where it is documented in the two oldest phases in the cemetery

[99] Stefanovich – Bankoff 1998, 279, 281. ^{14}C dates: Beta-67012: 3140 ± 90 BP, calibrated with Calpal (quickcal2007 ver.1.5): 1400 ± 103 calBC and Beta-67013: 3040 ± 60 BP, calibrated with Calpal (quickcal2007 ver.1.5) 1294 ± 84 calBC.

[100] Krauß 2006a, 91. A slightly older date is also indicated by a ^{14}C date from Kamenska Chuka that dates back to the 14th century BC, even though the second ^{14}C date refers to the 13th/12th century BC.

[101] Kisyov 1993, figs. 4, 5з (named tum. 1 Turlata, near Borino). Kisyov 2002, fig. 4 (named tum. 78 Tsarkvishteto, near Borino).

[102] Kisyov 1993, fig. 8. Kisyov 2002, tab. IV–V.

[103] Hochstetter 1984, 42.

[104] Hänsel 1976, pl. 62.5.

[105] Krauß 2006b, fig. 12.2.

[106] Hänsel 1976, pl. 36.6.

[107] Horejs 2007a, pl. 38.4017, 4020.

[108] Hochstetter 1984, pl. 7.4.

[109] Kiriatzi 2000, pl. 5.37 no. KA 468.

[110] Alexandrov 2002, fig. 17.1.

[111] Hänsel 1976, pl. 62.5.

[112] Domaradski 1986, fig. 5b.

[113] Hänsel 1976, pl. 62.5.

[114] Horejs 2007a, pl. 38.4015, 4020. Whereby the amphorae from Olynthus have a strongly curved, profiled rim which cannot be found in materials from the Rhodopes.

[115] Olynthus amphora type I (Horejs 2007a, 155–157).

[116] Kastanas amphora type 2a and 2b (Hochstetter 1984, 43–44).

[117] Alexandrov 2002, 72–73. For a detailed chronological discussion of the Mycenaean pottery from Koprivlen see Jung et al. 2017, 276–281.

[118] Koukouli-Chrysanthaki 1992, pls. 4.30; 7.4–5; 20.7; 23.1; 27.2; 53.6; 69.9. The first phase (IA) is dated by the excavator between 1350/1300–1200 BC (LH IIIB) and synchronized with the levels 17–14b from Kastanas. The second phase (IB) dates between 1200 and 1100 BC on the basis of the synchronization with the Mycenaean pottery sequence from Kastanas, in particular the levels 14b to 13 maybe also 12, LH IIIC Early–Advanced (Jung 2002, 241).

and the settlement (phases IA and IB). Two further comparisons from Ada Tepe itself have been published which can be dated to the Late Bronze Age and the Early Iron Age.[119]

Amphora with conical neck and stepped shoulder (Olynthus type II[120]/Kegelhals-amphore) (Fig. 6) are very widespread in the Late Bronze Age and occur in Serbia, along the Lower Danube, in northeastern Bulgaria, in the Rhodopes and in northern Greece. The rim is often funnel-shaped, the neck conical and usually separated from the rest of the body by a small shoulder. A shoulder carination that separates the vessel into two parts does not necessarily have to be present, as illustrated by the amphora from Vardarophtsa.[121] The amphorae from House 5 of the northeastern settlement on Ada Tepe do not include any amphora with a conical neck and stepped shoulder (Olynthus type II) but they do appear to be associated with the already presented amphorae types; as such, they will only be outlined briefly here.[122] From area I in Kush Kaya,[123] an Olynthus type II amphora was recovered, associated with a small cup with sloping rim, a double vessel and bowls, which corresponds very well to the material from the northeastern settlement on Ada Tepe. Area I in Kush Kaya dates from the early 15th to the late 13th/end of the early 12th century BC.[124] In addition to its contemporaneity with Ada Tepe, Kush Kaya also offers probably the most numerous parallels to the northeastern settlement on Ada Tepe in terms of material culture, settlement organization and architecture. For Dragoyna, a hilltop settlement on the northern edge of the Rhodope Mountains, the Olynthus type II is the most common type of amphora. It has an asymmetrical ovoid body and a cylindrical to conical neck with a prominent rim and two or four vertical handles.[125] At Olynthus, the Late Bronze Age layers (levels 13 to 3) contain Olynthus type II amphorae, which are most common in the middle Late Bronze Age before their percentage slowly decreases in the later periods.[126] In Kastanas,[127] Olynthus type II/*Kegelhals* amphorae are found in the levels 18 to 13, whereby they are particularly frequent in levels 15 and 14b.[128] In Assiros[129] they occur from phase 9, and at Toumba Thessaloniki[130] they occur in levels VIII to VI. Some of the North Aegean Olynthus type II amphorae also have a pedestal,[131] a feature that can perhaps also be found in some Olynthus type II amphorae in the Rhodopes (Plovdiv,[132] perhaps Batak;[133] Elena Bozhinova also discusses on the basis of the ceramic material from Dragoyna whether some conical foot fragments may belong to amphorae). In the area of present-day Serbia, large numbers of Olynthus type II amphorae are known from the Brnjica and the Paraćin cultures. There too, they occur together with incised/encrusted decorated globular kantharoi, an important ceramic class of the Late Bronze Age.[134]

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119 Nikov 2017, fig. 2. They do not originate from the northeastern settlement.

120 To clarify this type, the author refers to the definition by Horejs, where this vessel type is designated Olynthus type II (Horejs 2007a, 157–158).

121 Heurtley 1939, 214, no. 408.

122 It is possible for some rim fragments to belong to this type, which of course, cannot be stated for sure.

123 Popov 2009, figs. 10–11.

124 Popov 2009.

125 Bozhinova et al. 2013, 54–55.

126 In Olynthus the amphora types IB, IIA (funnel rim), IIB (round bending rim) occur from Level 13 and Level 11 onwards. In the middle Late Bronze Age levels 7 and 6 they are found with increasing frequency, whereby they no longer occur after Level 3 (Horejs 2007a, 158).

127 Hochstetter 1984, 43 fig. 9; 46 f. pls.10.1, 4; 15.2–3; 50.1–2; 34.3; 48.1–3; 28.8.

128 Kastanas amphora type 3d, 3e (Hochstetter 1976, 46–47).

129 Wardle et al. 2003, fig. 2; Wardle – Wardle 2007, pls. 7a, 11.

130 Kiriatzi 2000; Andreou – Psaraki 2007.

131 Amphora with a conical neck and stepped shoulder: Assiros phase 6. Wardle – Wardle 2007, pl. 11.

132 Detev 1964, figs. 6; 7a–c.

133 Hänsel 1976, 78 no. 9.

134 There they are often used as cremation urns. Ivanov 2007; Bulatović 2011.

The appearance of the decorated globular kantharoi and their association with the Olynthus type II amphorae is assigned to the 15th[135] and 14th[136] century BC.

Even though shouldered amphorae with a conical neck were sometimes discussed as characteristic for the end of the Late Bronze Age,[137] the comparative finds, especially the ones from the vertical stratigraphies of the tell-settlements in northern Greece, suggest a long-lasting and widespread distribution of this type, to which Hänsel already referred in 1976.[138]

Pedestals

For one of the amphorae from House 5, a pedestal is documented. Individual fragments of pedestals can also belong to so-called fruit bowls/pedestal bowls (Kamenska Chuka, Tsarkvishteto, Sandanski[139]), a ceramic type that is known from several graves in the central Rhodopian area. There is discussion about a possible earlier date for bowls from Kamenska Chuka due to morphological details which might refer back to older examples made of metal.[140] In addition to these possibly older examples, the association of the grave inventories of Tsarkvishteto (near Borino, tumulus no. 78) with older-looking ceramic forms[141] also suggests a possibly older date.[142] Interestingly, these possibly older amphorae from the Central Rhodopes (Progled[143], Tsarkvishteto Tum. 84[144]) have a similar double-conical shape to the amphorae from House 5 on Ada Tepe. The biconical shape and the presence of pedestals need not necessarily be chronologically explained – it could also be a local Rhodopian variant.[145] This is strongly suggested by the distribution of amphorae with pedestals, which are mainly found in the Rhodopes and in northern Greece.[146] The fact that this distribution coincides with the preference for encrusted decoration indicates the close connection between the Rhodopian and Macedonian ceramic traditions.

Decoration

Based on the amphorae from Dragoyna and their comparisons, Bozhinova states that amphorae are mostly undecorated,[147] which is consistent with Hänsel's observations.[148] A decorated body

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135 Bulatović 2011. On the basis of comparisons of the Olynthus type II amphorae/*Kegelhalsamphoren* from Donja Brnjica and Kastanas, Hochstetter assumed that the Serbian amphorae are approximately contemporary with the most recent one from Kastanas (Hochstetter 1984, 351).

136 An emergence of Olynthus type II amphorae in the Brnjica Culture in the 14th century BC is discussed by Ivanov 2007. New ^{14}C dates on this complex of topics are presented in the same volume by A. Bulatović, M. Gavranović and A. Kapuran (Bulatović et al. this volume).

137 Ivanov 2007, 252.

138 Hänsel 1976, 85.

139 Alexandrov et al. 2007, tab. 5, c–d.

140 Stefanovich – Bankoff 1998, 278. A detailed discussion of their original models can also be found at Krauß 2006a, 91.

141 Kisyov 1993, fig. 5з.

142 Krauß 2006b, 91; Kisyov 1993, figs. 4–7.

143 Kisyov 1993, fig. 3.

144 Kisyov 1993, fig. 8.

145 The date of the oldest horizon (phase IA) of the necropolis Kastri on Thasos, which begins around 1300 BC, does not indicate a chronologically older positioning (Koukouli-Chrysanthaki 1992, fig. 158).

146 They originate relatively often from grave contexts (Exochi, Kastri, Potami, possibly Batak, Phaea Petra), which could point to a special ceramic tradition in the context of grave customs.

147 Bozhinova et al. 2013, 55.

148 Hänsel divided the ceramic material from the Devetaki cave into three typological groups, of which the one with encrusted ceramics is separated from the previous one with little decoration. He was able to assign some finds to the Govora Group, which corresponds to the Čerkovna horizon (Hänsel 1976, 61, pl. XII).

fragment with a stepped shoulder from Dragoyna could perhaps be assigned to an amphora.[149] Another possible parallel for this can be seen in the elaborately decorated jug with sloping rim and pedestal from the tomb of Devin.[150] Similarly, most amphorae in the northeastern settlement at Ada Tepe are probably undecorated, although as already noted, they are, with few exceptions, all very fragmented s, making it difficult to be sure about the nature of decoration on these vessels, which was probably located below the neck/shoulder, as suggested by preserved examples. The distribution of macroscopic fabric groups of amphorae and decorated body fragments from the northeastern settlement at Ada Tepe also does not enable clear differentiation between decorated wall fragments belonging to kantharoi and those belonging to amphorae; however, the association of the same decorative techniques and style suggests that these vessel types together form a set.

The elaborately encrusted vessels of eastern Macedonia open up a different perspective on this topic, namely the pottery from the necropoleis of Phaea Petra, Kastri on Thasos[151] and the burial mounds of Potami and Exochi.[152] These elaborately decorated amphorae are occasionally equipped with pedestals and associated with pedestal bowls. They seem to appear particularly in burial contexts, leading Horejs to consider the possibility of specific vessels being produced solely for burial rites. This coincides with cremations in the Rhodopes with regard to the find association, but not with regard to the elaborate incrustations on the amphorae.[153] There is one exception, namely the tomb from Devin, where a jug with pedestal and a globular kantharos are decorated with encrusted motifs and additionally are associated with an open kantharos with a pedestal, which fits well with the pattern of the eastern Macedonian tombs.[154] Of particular concern is the lack of encrusted decorated amphorae in central Macedonia – they only occur in eastern Macedonia, where they are extensively encrusted.[155] Interestingly west of the Strymon, painted amphorae with a conical neck and stepped shoulder (Olynthus – amphora type IIA) are found, a decoration technique that was apparently unknown in eastern Macedonia, where they favoured encrusted decoration.[156] In the Rhodopes, amphorae are rarely incised/encrusted, in contrast to globular kantharoi, which are usually incised/encrusted.

In summary, the amphorae from House 5 can be embedded within a wide regional context between the Lower Danube and the northern Aegean region, with the closest and most frequent parallels found in the Late Bronze Age material from the Rhodopes. Chronologically, most amphorae can generally be dated to the Late Bronze Age (Fig. 6). Comparisons for an early phase can hardly be found for the amphorae and a connection to Middle Bronze Age amphorae cannot be argued convincingly.[157] The higher number of comparable amphorae in a later phase of the Late Bronze Age is also related to the number of excavated sites in general. These include only a small number dating back to the beginning of the Late Bronze Age. The evidence of the Ada Tepe assemblage nevertheless proves the existence of A1, A2 and A3 amphorae already by the early Late Bronze Age.

149 Bozhinova et al. 2013, pl. 8.8.
150 Leshtakov 2008, fig. 5.8.
151 Koukouli-Chrysanthaki 1992, pl. 3.23.
152 Grammenos 1981.
153 It may be due to the state of research and the poor state of conservation of finds from settlements in the Rhodopes that decorated amphorae and pedestals in graves were more frequently preserved than those in settlements.
154 Leshtakov 2008, 72, fig. 5-1.
155 Horejs 2007a, 125.
156 Horejs 2007a, 77, fig. 32; 161.
157 The fact that there are few direct comparisons, especially for the double-conical shape of the amphorae from House 5, could be due to the small number of contemporaneous sites, which furthermore have quite fragmented ceramic material – this makes it difficult to reconstruct complete profiles.

Cups with a Sloping Rim (Fig. 6)

The cup from the inventory of House 5 belongs to the wide, shallow cup types, whose mouth is usually wider than (or just as wide as) its height. Its handle rises slightly above the rim and its lip can be sloping. Below the rim, the body of the vessel is often slightly narrower, giving it a gentle s-profile. A second type of cup is found, being tall and sometimes cylindrical. Also, in this case the handle rises slightly above the rim and the lip can be sloping, which is why they sometimes have the shape of small jugs. Both cup types are an integral part of the ceramic tradition of the Čerkovna Group, which is shown by the regular association with globular kantharoi, encrusted decorated ceramics and other characteristic Late Bronze Age shapes, as well as the encrusted decoration of some cups themselves.[158] Comparable shallow cups can be found in Gorno Ablanovo[159] (which are dated by Raiko Krauß to the Late Bronze Age), in the well-known necropolis of Zimnicea[160] and in the settlement of Dragoyna[161]. For the latter, ^{14}C dates exist. Another dating is offered by a similar cup from Kastanas Level 16.[162] Both point to the 14th and 13th centuries BC. Their typological development can be traced to the early Iron Age, as the examples from Dolno Lukovo[163], Tsouka[164], Kralevo[165] and Ada Tepe[166] (hilltop settlement) show. Although in many cases the sloping mouth rim is maintained, the shape of the handles changes from a triangular cross-section in the Late Bronze Age to an oval/rectangular cross-section in the Early Iron Age.

Although the connection of the Late Bronze Age pottery to previous Middle Bronze Age shapes is problematic in several respects,[167] both cup types show good links and the morphological characteristic of the sloping rim in particular finds previous analogies.[168] Shallow cups are found in the material of the Middle Bronze Age sites Chokoba 18A[169] Varbitsa[170] and the Devetaki cave[171]. Elongated, jug-shaped cups come from the Middle Bronze Age sites Moltepe-Draganovo,[172] Hotnitsa-Osmankin Dol,[173] from the Devetaki cave[174] and the Emen cave[175]. Both Late Bronze Age cup types seem to depend on previous forms. This can be observed in the examples

158 This can be seen particularly well in the case of the necropolis in Nova Zagora, where Tei influences can be observed at the same time. Kanchev – Kancheva 1990, figs. 8–9. Further sites are Chokoba, Izvor, Razkopanitsa, Kralevo, Zimnicea, Kastanas (Level 16), Tatul, Grono Ablanovo, Tsouka, Dolno Lukovo, Plovdiv, Dragoyna, Perperikon and Yagnilo. Further: Hristova 2002.

159 Krauß 2006a, pl. 55.3.

160 Hänsel 1973, pl. 10.6.

161 Bozhinova et al. 2013, pl. 5.10.

162 Hochstetter 1984, pl. 28.7.

163 Nekhrizov 2005, pl. 48.11–12.

164 Efstratiou 1993, fig. 18.3.

165 Nekhrizov 2005, pl. 24.11–12.

166 Nekhrizov 2005, pls. 3.7; 7.11–14.

167 There are only a few Middle Bronze Age sites from today's Bulgaria. One of the reasons for this is the state of research and particularly briefly inhabited settlements, whose houses were built in a way that left few archaeological traces (Athanassov – Krauß 2015). A Middle Bronze Age ceramic inventory is distinguished by a few characteristics (Krauß 2006b).

168 Cups with high-standing handles (type Sveti Kirilovo) are dated by Alexandrov to the end of the Early Bronze Age. (Alexandrov 1998, 223).

169 Leshtakov – Tsirtsoni 2016, fig. 5.3–4.

170 Krauß 2006b, fig. 4.5.

171 Hänsel 1976, pl. XII; Krauß 2006b, fig. 4.9. I wish to thank Stefan Alexandrov for the discussion and support regarding the material from Devetaki Cave.

172 Krauß 2006b, fig. 4.4.

173 Krauß 2006b, figs. 6, 9–10.

174 Krauß 2006b, fig. 4.8.

175 Krauß 2006b, fig. 5.5.

from Izvor,[176] Razkopanitsa,[177] Dragoyna,[178] Devetaki Cave, Ada Tepe[179] and Chokoba[180]. The cup from Chokoba 18A is of special interest because its shape corresponds extraordinary well to the cup from House 5 of Ada Tepe.[181] The site is also interesting in chronological terms because in Chokoba 18 and 18A, the ceramic inventory contains Middle Bronze Age forms[182] such as spouted bowls or 'tea pots' and handles of the 'Assenovets' type.[183] The exact context of the decorated cup from Chokoba 18A is unfortunately not yet published.[184] Of course, this leaves room for uncertainties, but it is possible that this cup is from the Middle Bronze Age or early Late Bronze Age. Another hint is offered by the cups from the sanctuary of Tatul, where this shallow cup type occurs, as well as cup shapes from the Middle Bronze Age.[185] Types such as spouted bowls, bowls with tunnel lugs, and tall jugs with handles (which have a plastic knob) are clearly referred to as Middle Bronze Age characteristics and belong to the first quarter of the 2nd millennium BC. They originate from the 2.5m-thick anthropogenic layer that was formed by repetitive rituals at the sanctuary.[186]

Formal similarities of Middle Bronze Age cups with the cup from House 5 at Ada Tepe dating to an early phase of the Late Bronze Age are present. Thus, it is possible to cautiously suggest a degree of continuity which can be postulated between the cups with morphological characteristics of Middle Bronze Age pottery and the Late Bronze Age ones.[187] In this regard, the sloping rim and the perpetual embedment of cups in the pottery assemblage seems to be a continuity that can even be followed until the Early Iron Age.

176 Nikov 2011, fig. 4f.

177 Detev 1981, fig. 36.4.

178 Bozhinova et al. 2013, pl. 5.10.

179 They are not from the northeastern settlement but from the hilltop settlement at Ada Tepe (Nikov 2017, fig. 3; Nekhrizov 2005, pls. 3.7; 7.13–14).

180 Chokoba is mentioned as the place of discovery on the illustration, but Tatul is mentioned as the place of discovery in the plate caption (Leshtakov 2017, pl. 3.1). However, the cup was once again published as originating from Chokoba 18A (Leshtakov 2011, 126–129, fig. 3).

181 Furthermore it originates from the Thracian Plain, an area from where little encrusted pottery is known, but which lies between the two areas with encrusted pottery traditions, on the one hand the Lower Danube (cultural groups of the Lower Danube with encrusted pottery are Žuto Brdo-Gîrla Mare [Şandor-Chicideanu 2003] Tei [Hänsel 1976], and Coslogeni [Hänsel 1976]), and on the other hand the Rhodopes/Central Macedonia.

182 Leshtakov – Tsirtsoni 2016, 483, fig. 5. These types were addressed by Krauß as Middle Bronze Age characteristics (Krauß 2006b, figs. 5–6).

183 The published ^{14}C dates have also revealed Middle Bronze Age data (2200/2000 and 1600/1500 calBC), as well as Late Bronze Age data (between 1500/1400 and 1200 calBC) (Leshtakov – Tsirtsoni 2016, 488).

184 Therefore, the published ^{14}C dates cannot be linked to a concrete context (areas A 43–45 and C 43–45), or even a concrete vessel, in our case the mentioned cup. But the published ^{14}C dates come from secure contexts (Leshtakov – Tsirtsoni 2016, 483) and mainly fall into the second quarter and the middle of the 2nd millennium BC. Only in one case is the third quarter of the 2nd millennium BC indicated (Leshtakov – Tsirtsoni 2016, fig. 4). The publication of Middle Bronze Age ceramics from Chokoba is in preparation by V. Petrova, K. Leshtakov and G. Katsarov.

185 These are mainly the tall, slim jug-shaped cups with a sloping lip (Ovcharov et al. 2008, fig. 5.3, 7, 9.) which have good equivalents in Middle Bronze Age cups from the Devetaki cave (Krauß 2006b, fig. 4.4, 8) and from the Emen cave (Krauß 2006b, fig. 5.5). The jug-shaped cup with the handle with a saddle-shaped transition to the rim (Ovcharov et al. 2008, fig. 5.3) in particular is reminiscent of the jugs from Tell Ruse (Kraus 2006b, fig. 7) but also of the already discussed vessel from tumulus no. 78 Tsarkvishteto (near the village Borino) (Kisyov 1993, fig. 5.3; Kisyov 2002, tab. I, fig. 4).

186 Ovcharov et al. 2008, 34–44, fig. 6A.

187 This typological development does not end in the Late Bronze Age and can also be found in characteristics of early Iron Age cups.

Summary

When Hänsel first described the Čerkovna Group in 1976, he discovered that the group was already established in a developed form in a broad area (reaching from the Lower Danube to central and southeastern Bulgaria) by the 13th century BC; however, not much was known about its origins.[188] New excavations can now gradually refine this picture 40 years later, including the data from the northeastern settlement on Ada Tepe, which dates to an early phase of the Late Bronze Age, in the first half of the 15th century BC, based on the ^{14}C model and detailed statistical and contextual studies of the settlement area. It thus marks the beginning of a development in pottery whose origins in the Middle Bronze Age are largely unknown. However, morphological characteristics of the cups share some similarities with those of Middle Bronze Age cups.

The area of the Rhodopes also has some local characteristics, for example pedestalled bowls and footed amphorae rarely occur further north. The encrusted decoration is also a typical element which can be connected to the Rhodopian and Macedonian area. On a small regional level, the best typological parallels can be found in tablewares from the Rhodopes, as illustrated by the amphorae, cups and encrusted decorated kantharoi, revealing a cultural embedding in the local ceramic tradition of the Late Bronze Age.[189] Furthermore, close connections between the encrusted ceramics of the Rhodopes and Macedonia are evident. At the same time, a supraregional contextualization is possible in an area ranging from the Rhodopes to the Lower Danube. This can be seen, for example, in the morphological similarities of globular kantharoi and the wide distribution of the discussed amphora types and other pottery types of the Čerkovna Group.[190]

This leads to the not undisputed definition of the Plovdiv-(Zimnicea-)Čerkovna Group, which was made on the basis of ceramic types occurring in a very wide area between the Lower Danube and the Rhodopes.[191] Similarly widespread uniform burial rites or settlement patterns are unknown, which is why one can only speak about a ceramic group.[192] On the basis of the ornamentation, regional groups become apparent, whose connections to each other are not always unproblematic due to sometimes very long distances, the different state of research and possible chronological inequalities.[193] A particular case of typological similarities of ceramics over a long distance is the comparability of ceramics from the Br II layer of the Romanian settlement of Popeşti with the pottery of the northeastern settlement on Ada Tepe, especially in terms of kantharoi shapes and decorative motifs. Significantly, although a large spatial distance (approx. 450km) separates the locations, the radiocarbon dates show a very precise synchronism.[194] Based on similarities of the material from the Br II layer at Popeşti with the Govora Group, which was described by Hänsel, Nona Palincaș defines this level as belonging to the Govora-Fundeni Group. According to her, the Late Bronze Age (1450/1400–1100 BC) can be subdivided between two groups, the older one being the Govora-Fundeni Group and the younger the Plovdiv-Zimnicea Group.[195]

Differences on a superregional level are reflected in the settlement patterns[196]. While during the Late Bronze Age in the Aegean region, tell-settlements were built with mud-brick architec-

188 Hänsel 1976, 87.
189 Burkhardt forthcoming.
190 Horejs 2007a, 80, figs. 32, 66.
191 For a discussion see: Panayotov – Valcheva 1989; Lichardus et al. 2002.
192 For the Rhodopes, the preference for hilltop settlements seems to be a common characteristic.
193 Thus Hochstetter saw the Macedonian encrusted ceramic tradition within a southeastern European cultural area, consisting of several groups, which she showed by means of decoration patterns (Hochstetter 1982, 114). Koukouli-Chrysanthaki was able to show connections between Thasos and the Late Bronze Age cultures of the Lower Danube (Tei IV–V, Verbicioara IV, Zimnicea-Plovdiv and Gîrla Mare-Dubrovac-Žuto Brdo), which she sees as a 'Balkan *koine*', due to the distribution of the globular kantharoi (Koukouli-Chrysanthaki 1992, 492).
194 The radiocarbon date B-6105: 3200 ± 30 BP gives a calibrated date of 1473 ± 26 calBC (calibrated with CalPal). Palincaş 2000, 223.
195 Palincaş 2000, 219.
196 Athanassov – Krauß 2015, 74.

ture, we find a different picture in Thrace and the Balkan region. In those regions, only settlements with very thin occupation/activity deposits are known. The Rhodopes show an analogous picture in terms of thin occupation/activity deposits, but here partially fortified hilltop settlements/sanctuaries were excavated. Similarly to the pottery record, the entanglement between distinguishable areas in terms of settlement structure are fluent, as the settlement of Kamenska Chuka[197] shows. A similar picture emerges if we consider the Mycenaean rapier types of the 15th to the early 14th centuries BC, that also reached the eastern Balkan area.[198] While the southern swords often originate from grave contexts, north of the Rhodopes they are frequently part of hoard assemblages – a practice that has no equivalent in the south during that time. Although there are significant differences, pottery appears to be a connecting element, particularly the use of globular kantharoi,[199] whose different decoration techniques and motifs reflect different communication areas.[200]

A further indication of the complexity and multidimensionality of the Late Bronze Age in the eastern Balkans is provided by the settlement on Ada Tepe itself. The settlement, whose inhabitants were specialized mineworkers who, as previously explained, could not have worked independently of a wider settlement and exchange network connecting the producers with the consumers, shows that the system must have been based on complex organized societies, which can be seen in the pottery traditions shared with surrounding communities.[201]

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197 The settlement in the Strymon/Struma Valley shows a similar storage strategy to the North-Aegean tell-settlements due to the use of pithoi (Stefanovich – Bankoff 1998). The same phenomena can be seen in the settlement of Koprivlen, where not only were pithoi used but also fragments of Mycenaean pottery were found (Jung et al. 2017).

198 Athanassov – Krauß 2000. For the latest discussion see Jung 2017.

199 It should not be forgotten that this is a pottery shape that can be described as 'fine tableware' but can also be a functional type that is known from different contexts (settlements, graves). For residue analyses on globular kantharoi see: Andreou et al. 2013.

200 Undecorated kantharoi can be found along the Strymon as part of the Čerkovna Group in the east and matt-painted vessels in the middle and upper Vardar Valley in the west. The encrusted kantharoi appear in the central Balkan Morava region, while various groups with encrusted pottery existed along the Lower Danube in the Late Bronze Age (Horejs 2007a, 80). Further: Horejs 2007b.

201 See also: Burkhardt 2020a; Burkhardt 2020b; Burkhardt 2024.

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The Bronze Age within the Territory of Present-Day Bulgaria

The Lower Danube Region and Thrace at the End of the 3rd and the First Half of the 2nd Millennium BC

Raiko Krauß[1]

Abstract: This article deals with the changes in the settlement system and in the material culture in the area of the lower reaches of the Danube at the transition from the 3rd to the 2nd millennium BC. Typical for the Early Bronze Age in this region are tell-settlements, inhumation burials, and the use of arsenic copper. The Late Bronze Age is characterized by a scattered settlement system, cremation burials and the sustainable establishment of the tin bronze metallurgy. The transition between the two cultural-historical epochs has so far been poorly examined. Recent archaeological excavations have brought to light several settlement and burial structures, which now allow the long-known material of this time horizon to be connected with specific contexts for the first time. A compilation of all radiocarbon data available so far shows a continuous development in the area between the southern Carpathian arch and the Aegean, with a range of shapes of ceramic vessels that is specific to the time. As a result of this study, I would like to consider the period between 2300 and 1600 calBC in this region as a single chronological unit. Supraregionally, this period, known as the Middle Bronze Age, can be paralleled with the Unetice Culture in central Europe and the Middle Helladic Culture in the Aegean

Keywords: Bronze Age, Lower Danube, Thrace, early silver metallurgy, early tin bronzes, radiocarbon chronology

For a long time now, prehistoric research has been undertaken in order to reconstruct the relationships between the Reinecke system of Bronze Age chronology for southern Germany and the Aegean Bronze Age. Nevertheless, the zone culturally and historically lying between these different worlds, the Balkan-Carpathian region, remains remarkably devoid of finds on most maps. Here, difficulties already arise due to the use of different chronological and cultural terminologies in the various countries within this geographical region. In Romania and Serbia, it is customary to use predominantly the Reinecke system, not only for the inner Carpathian provinces, but also for the landscapes south and east of the Carpathian Range. In Bulgaria, on the other hand, the chronology follows the terminology of the Aegean Bronze Age. To overcome this methodological dichotomy, Bernhard Hänsel established the so-called Danubian chronology, which simultaneously emphasizes both the autonomy and the connectivity of this region. However, his system for the Bronze Age is rarely employed and, if at all, only applied regionally to finds from the Carpathian Basin. Hence, the original aims and intentions underlying the development of the Danubian chronology are seldom achieved. The fact remains that the connection of the southeast European finds of the Bronze Age to central Europe or the Aegean is rarely justified. It is, indeed, almost impossible to replace these two long-established traditional terminologies. Nevertheless, there is still hope that the Bronze Age chronology of the Balkan-Carpathian region can be established in its own right. Today, at the very least, the absolute age component of the chronology can be based independently on a steadily growing number of radiocarbon dates. These absolute dates provide a time frame, offering the possibility of reliably synchronizing the many different archaeologically defined find horizons which were previously often based solely on postulated typological comparisons. With reference to the entire course of the river Danube, the lower course refers to the area between the passing of the river through the Balkano-Carpathian Arch at the Danube Gorges and its confluence

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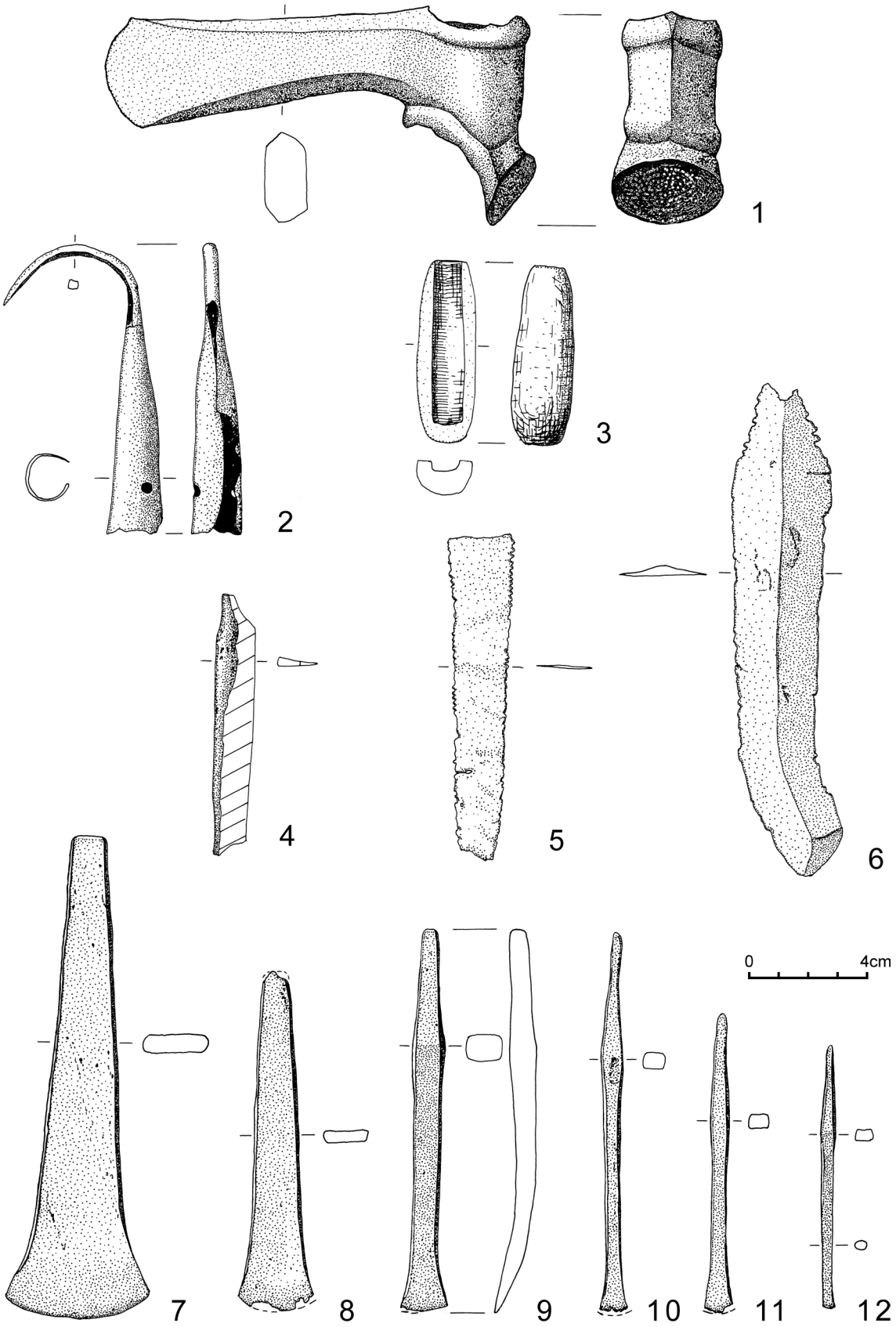

Fig. 1 Hoard of bronze objects from the Bronze Age layer B of Emen Cave
(Museum Veliko Tarnovo, drawing: R. Krauß)

with the Black Sea. In this article, I specifically focus on the area between the southern Carpathians and the northern coast of the Aegean Sea.

The Evidence from Metal Finds

The horizon of the Apa-Hajdúsámson hoard has long been viewed as a period during which ideas and goods travelled from the Mediterranean to as far afield as central Europe and Scandinavia, and vice versa. Particular attention was paid to the spiral ornaments on Apa Scheibenknauf axes and swords, which were compared with Mycenaean ornamental motifs on jewellery and weapons.[2] This horizon is preceded by contacts with the central European Unetice cultural sphere, which may have involved not only tin bronzes, but also certain religiously motivated hoarding practices.[3] The recent find of bronze weapons and gold jewellery in the hoard from Svishtov[4] (see Fig. 3) demonstrates once again the importance of this chronological horizon for the cultural history of the region on the lower reaches of the Danube.

Of importance for the connection of the Aegean-Anatolian Bronze Age with the Bronze Age in central and northern Europe is a well-known hoard of bronze objects from the cave of Emen in northern Bulgaria (Fig. 1). Its significance is derived, on the one hand, from the geographical position of the find location approximately midway between the northern Aegean and the southern Carpathians and, on the other hand, on the forms arranged therein, which display connections not only to the south, but also and especially to the north.

The cave from which the hoard stems is located north of the village of Emen in the district of Veliko Tarnovo, on the left bank of the Negovanka River.[5] The cave has been recognized as an archaeological site for some time, having been studied since the 1920s. The need for a large-scale excavation arose in 1959 due to construction work in the cave for the purposes of mushroom cultivation. Six excavation trenches with a total area of about 200m² were dug into the cave sediment. The depth of the cultural layer was up to 0.70m thick and could be divided into five different phases of occupation: А Palaeolith, Б Eneolith, В Bronze Age, Г Iron Age, and Д Late Antiquity. The hoard of metal objects comes from the Bronze Age layer B. This find consists of a shaft-hole axe of the Pădureni type, six chisels in graded sizes (from a hatchet with a broad blade to very narrow spatulas with a length of 16.3 to 8.9cm), a double-sided serrated saw, a curved dagger with truncated tip, a spouted hook, a fragment of a small knife and half of a mould for a spatula-like device. The allocation of three other items sampled by Evgeniy Chernykh with the label ‘Emen hoard’ (Lab Codes 10912, 10914 und 10920) is uncertain.[6]

All of these objects were found close to one another next to the northern wall of the cave. Only the dagger and the smallest chisel were found a little astray from the main group, albeit also lying together. Chernykh defined his Middle Bronze Age stage of metal production in the Balkans on the strength of this particular find ensemble.[7]

The unusually curved dagger with a truncated blade and a triangular cross-section from the Emen ensemble finds a parallel in the golden dagger from ritual structure no. 5 at Dabene.[8] Its blade is unusually truncated and has a triangular cross-section with a flat bottom. The dagger from Dabene, however, is made of gold. Through this particular material, it is connected with other finds of gold and silver from the graves and ritual structures of this extraordinary site. The gold beads and spacers arranged as a necklace from structure 5 at Dabene are so far unique and cannot be easily compared

2 David 2002.
3 Gerloff 1993; see also Metzner-Nebelsick 2013.
4 Alexandrov et al. 2018a.
5 Here and in the following Nikolova – Angelov 1961, 297.
6 Chernykh 1978, 343–344.
7 Chernykh 1978, 174–175.
8 Hristov 2012; Hristov 2015, 487–488 fig. 9; Alexandrov et al. 2018a, 464 cat. no. 60.

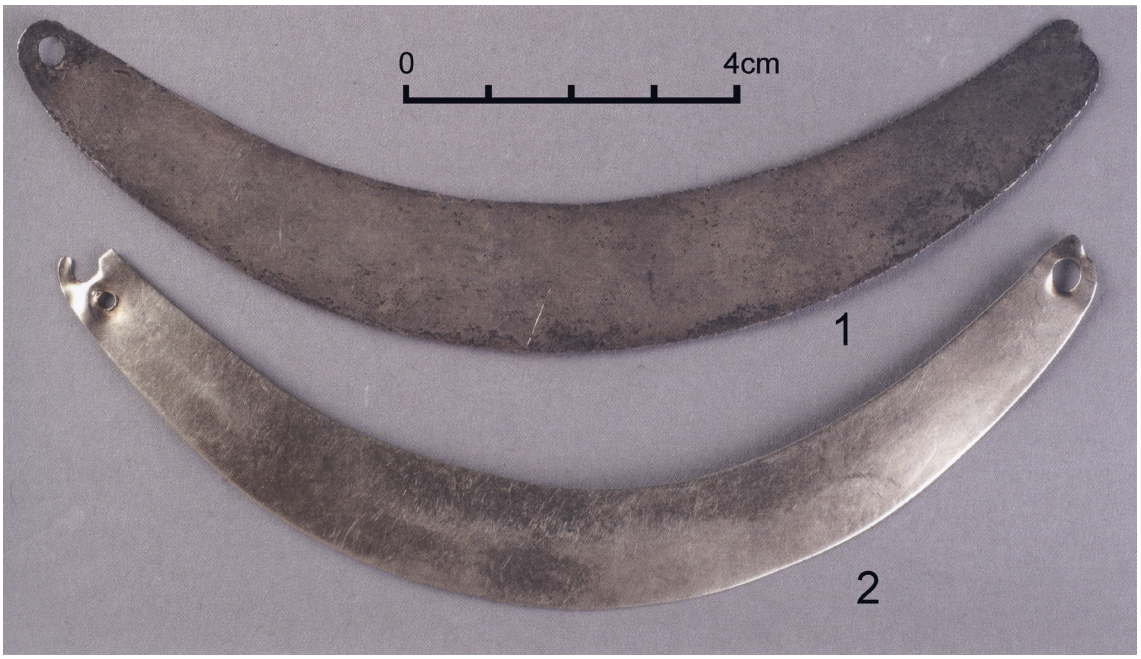

Fig. 2 Silver (1) and electrum (2) sheets from the Bronze Age layer B of Emen Cave (after Chukalev 2018, fig. 4)

with the Trojan gold jewellery, except for the general similarity of the golden placers from Dabene's structure 5 with that from treasure F from Troy.[9] The Trojan jewellery from hoards A, D, F, Ha and J will probably be a bit older.[10] So there are precursors for such golden jewellery. Besides the gold finds, a special feature among the finds from Dabene's structure 5 is a small box made of silver plate.[11] Silver is a material that occurs only rarely in southeastern Europe from the 4th millennium BC, usually in the form of massive *Lockenringe* and ceremonial weapons. With the Middle Bronze Age, the finds become more numerous. Noticeable in this context are two pieces of silver sheets in the form of arches from the Bronze Age layer of Emen Cave (Fig. 2), which fit well into a series of similar silver sheets in the form of lunulae, lamellas or boar tusks in the hoard of Panayot Hitovo.[12] Also very similar in shape is a long arcuate gold sheet from the Tabashka Cave,[13] which has perforations at both ends, like the two sheets from Emen. Remarkably, the smaller piece from Emen has such a high proportion of gold in the silver alloy that it is listed in the literature as electrum.[14]

The functional composition of the deposit of Emen Cave also displays remarkable similarities to Early Bronze Age hoard assemblages in central Europe. In addition to the sky disc and copper arm spirals, the hoard of Nebra contained two swords of the Apa type, two flanged axes with a wide blade, and a flanged chisel.[15] This inventory is repeated in the hoard of Sigriswil-Ringoldswil im Sack, Switzerland, but, instead of the swords, there are two daggers and a lance-head, as well as a piece of a broken lance-head.[16] This hoard has a structure characteristic of many other metal depositions in central and northern Europe. Instead of the swords/daggers, the Emen hoard contained the unusually shaped dagger and a shaft-hole axe of the Pădureni type. Vulpe places

9 Tolstikow – Trejster 1996, cat. no. 124.
10 Tolstikow – Trejster 1996, 226–230; Sazcı – Treister 2006.
11 Hristov 2015, 489 fig. 10; Alexandrov et al. 2018a, 464 cat. no. 58.
12 Konova 2018.
13 Alexandrov et al. 2018a, 495 cat. no. 243.
14 Alexandrov et al. 2018a, 473 cat. no. 133.
15 Meller 2010, 44–59.
16 David-Elbiali – Hafner 2013, 223–235.

the axes of the Pădureni type together with the axes of the Monteoru type at the beginning of the Wietenberg Culture.[17] Remarkably, swords and shaft-hole axes often appear together in the Early Bronze Age hoards of the Carpathian region. In the areas to the south of the Carpathians, on the other hand, daggers and shaft-hole axes existed in this time period, but no swords. The connecting feature of the central European metal deposits and the Emen hoard are the chisels. In the hoard from Emen Cave, six examples exist in differing sizes, ranging from an axe with a broad edge to very narrow spatulas. Comparable is the hoard of Ferdinandshof, district of Uecker-Randow, Germany,[18] with similar transitional forms between chisels and axes. While the function of the chisel as a weapon can be discussed,[19] the saw-blade in the Emen hoard indicates that this was more an assemblage of tools than of weapons. For instance, such chisels are thought to have been used in the damascening work on the sky disc of Nebra.[20] The chemical composition of the Emen hoard is remarkable because in addition to quantities of arsenic common in the Early Bronze Age, the tools also contained larger amounts of tin (Tab. 1), a phenomenon attested here for the first time.[21]

With the new discovery from the area of Svishtov, a mixed hoard of weapons and jewellery is now also available for the Lower Danube region.[22] Here again, the shaft-hole axe appears as the region's common weapon, complemented by three double axes, one fragment of a double axe, and the fragment of a winged axe with almost closed wings (Fig. 3). The relationship to the Carpathian Basin and to central Europe further afield results from the gold jewellery: an arm spiral with triangular shaped ends, three twisted and three smooth torques, and six *Lockenringe* made of folded gold sheet with swirled endings. Directly comparable to the hoard from Svishtov is the hoard of Ţufalău in Transylvania.[23] This applies not only to the gold objects in this hoard, such as the *Lockenringe*, twisted torques and shaft-hole axes, but also to the structure of both deposits, which display a similar inventory pattern of weapons and jewellery.

Tab. 1 Spectral analytical data of the metal objects in the Emen hoard according to Chernykh 1978, 368–369. Measurements by the Archaeological Institute of the Academy of Science of the USSR; values in %; X = main element

Item	Lab-code	Cu	Sn	Pb	Zn	Bi	Ag	Sb	As	Fe	Ni	Co	Mn	Au
small knife	10913	X	5	0.08	0.015	0.002	0.07	0.1	2	0.15	0.05	0	<0.01	~0.001
chisel	10915	X	10	0.1	–	–	0.05	0.1	2	1	0.07	0.01	<0.01	~0.003
chisel	10916	X	6	0.25	0.005	0.003	0.03	0.1	2	0.7	0.03	0.01	<0.01	>0.003
chisel	10917	X	5	0.25	0.006	–	0.05	0.1	1.8	0.4	0.02	0	–	<0.003
chisel	10918	X	4	0.1	0.012	–	0.03	0.1	1.8	0.25	0.03	0	<0.01	~0.01
spouted hook	10919	X	1	0.15	–	–	0.08	0.1	1	0.25	0.05	0	<0.01	~0.01
saw	10921	X	0.8	0.2	?	0.001	0.05	0.1	1.5	0.03	0.03	–	–	<0.01
curved dagger	10922	X	2	0.1	0.005	?	0.03	0.1	2	0.35	0.02	0	–	<0.01
small hatchet	10923	X	9	0.3	0.02	0.003	0.01	0.1	2	0.25	0.025	0	<0.01	>0.001
hatchet	10924	X	15	0.3	–	0.003	0.05	0.1	2.5	0.07	0.025	0.01	–	~0.001
shaft-hole axe	10925	X	2	0.25	?	0.001	0.03	0.1	1.5	3.5	0.025	?	0.01	>0.001

17 Vulpe 1970, 48.
18 Hänsel 1997, 131.
19 Hansen 2010, 79.
20 Berger et al. 2010, 752–753.
21 Chernykh 1978, 166.
22 Alexandrov et al. 2018b, 364–367.
23 Hänsel 1968, tab. 7; Metzner-Nebelsick 2010, 188–189; Metzner-Nebelsick 2013, 327–353, fig. 3.



Fig. 3 The hoard from the area of Svishtov. Without scale, the vessel is recorded with a height of 23.7cm (Alexandrov et al. 2018a, esp. 452, 486–490 cat. nos. 199–218, photo: K. Georgiev)

Ceramic Groups from the Lower Danube

In the first half of the 2nd millennium BC, the Balkan area occupied an intermediate position between the Aegean Middle Bronze Age and the Continental Early Bronze Age, not only geographically, but also culturally (Fig. 4). Direct contact with northwestern Anatolia and the Aegean can be attested by means of special vessels. The imported pottery could have served as containers for popular goods from the south or represent the adoption of specific customs from these regions. This obviously also influenced local ceramic production, which proves to be mostly homogeneous within the larger area south and north of the Lower Danube.

More than a decade ago, I already compiled a number of finds from northern Bulgaria, which can be connected, on the one hand, with the phases Tei I–III and Verbicioara I–II in southern Romania and, on the other hand, with Middle Bronze Age materials from Thrace.[24] As an example, here again, the ceramic finds from Emen Cave found in the same layer as the metal hoard (layer B) are reproduced (Figs. 5–6). As chronologically specific features, I would identify the wishbone and tenon handles, bowls with tubular spouts and small, pointed or round-bottomed jugs or kantharoi of the so-called 'Yunatsite' type. These small jugs display some of the same characteristics as the *depata amphikypella*, and, in fact, are possibly a Balkan adaptation of the Anatolian jugs. Like the depata, for example, they are unsuited for placing upright due to their pointed or round base. Furthermore, the two-sided or single handles begin similarly at the base, and their size is also comparable. Altogether, this makes them ideal drinking vessels.

[24] Krauß 2006a.

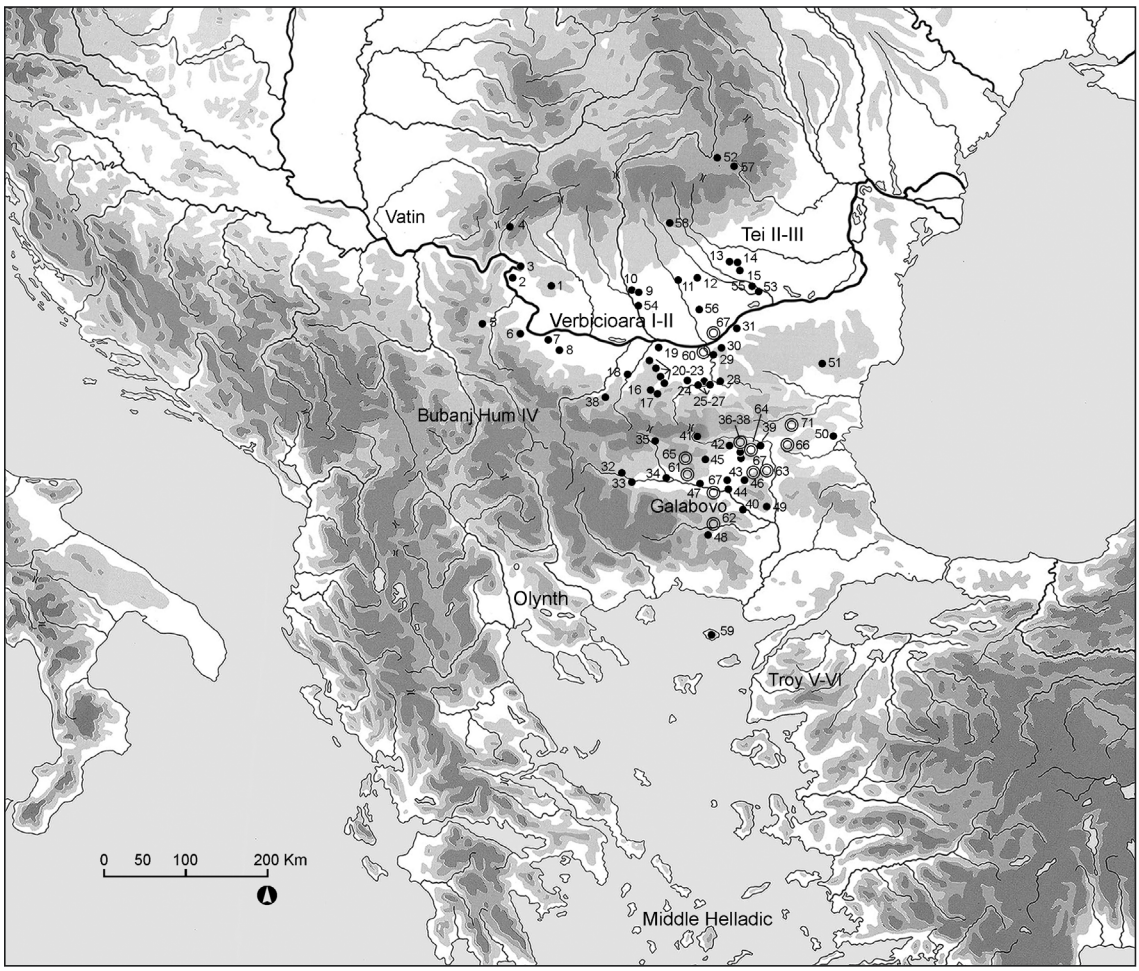

Fig. 4 Southeast Europe and the northern Aegean at the turn of the 3rd to the 2nd millennium BC. Sites of the Late Bronze Age III and Middle Bronze Age along the Lower Danube and in Thrace: 1. Verbicioara; 2. Gogoşu; 3. Ostrovul Corbului; 4. Baile Herculane; 5. Gamzigrad (Magura); 6. Dimovo; 7. Staliyska Mahala (Bagachina); 8. Yakimovo; 9. Coşoveni; 10. Cîrcea La Hanuri; 11. Slatina; 12. Orodel; 13. Bucureşti Noi; 14. Baneasa; 15. Tei; 16. Lovech; 17. Gorno Pavlikeni; 18. Sadovec; 19. Muselievo; 20. Drenov; 21. Zgalevo; 22. Varbitsa; 23. Devetaki Cave; 24. Emen Cave; 25. Hotnica Osmankin dol; 26. Hotnica Gorno selishte; 27. Hotnica Vartopa; 28. Draganovo (Moltepe); 29. Tsenovo; 30. Eksarh Yosif; 31. Ruse; 32. Yunatsite; 33. Ognyanovo (Maltepe); 34. Razkopanitsa; 35. Dabene; 36. Nova Zagora; 37. Ezero; 38. Sadovets; 39. Chokoba; 40. Biser; 41. Kazanlak; 42. Karanovo; 43. Galabovo; 44. Constantsiya (Assara); 45. Sveti Kirilovo; 46. Madrets; 47. Zlatna Livada; 48. Tatul; 49. Mihalich (Baadere); 50. Vratitsa; 51. Yagnilo; 52. Rotbav; 53. Radovanu; 54. Locusteni; 55. Crivăţ; 56. Orbeasca de Sus; 57. Zăbala; 58. Odaia Turcului; 59. Mikro Vouni. Settlements with roundels (concentric circles): 60. Novgrad; 61. Cherna Gora I; 62. Konyovo; 63. Drama-Merdzhumekya; 64. Bikovo; 65. Rupkite (Karasura); 66. Ovcharitsa II; 67. Yabalkovo; 68. Poslki Gradets; 69. Pietrele; 70. Dyadovo; 71. Vesselinovo (map: R. Krauß)

In the meantime, several other find complexes have been published which can now be linked to this time horizon. These are the finds from an old excavation at the site of Bagachina in northwestern Bulgaria,[25] previously known under its erstwhile name of Staliyska mahala,[26] and new materials from Dimovo, also in northwestern Bulgaria.[27] The finds from Bagachina were assigned to the phase Glina IV, but they also contain Yunatsite cups.[28] At the time, I mentioned these cups as one of the connecting characteristics between the Middle Bronze Age cultural groups

25 Alexandrov 2007.
26 Bonev – Aleksandrov 1986.
27 Aleksandrov – Hristova 2014.
28 Alexandrov 2007, 230–231.



Fig. 5 Ceramic finds from the Bronze Age layer B of Emen Cave (after Nikolova – Angelov 1961)

in southern Romania and Thrace. This thesis is now confirmed in the finds of Dimovo, where in addition to typical Verbicioara forms, also cups of the Yunatsite type were recorded.[29] The very slender vessels from Ruse (Fig. 7) show typological similarities with some forms from the well-known site at Novgrad near the Yantra's confluence with the Danube, which I reproduce here once again (Fig. 8). near the Yantra's confluence with the Danube, which I reproduce here once again (Fig. 8). Already mentioned by Mikov,[30] it is a site also yielding finds from the Late Bronze and the Iron Age.[31] In comparison with the cups and jugs of the other northern Bulgarian sites, I would attribute the material pictured here to the Middle Bronze Age. A reinspection of the site revealed no further finds.[32] Recently, two more small jugs from Maydos-Kilisetepe were published, which can be considered as the southeasternmost representatives of this type.[33]

Remarks on Settlement Organization

With the exception of the geographically isolated hoards, the finds described come solely from settlements. However, surprisingly little is known of these settlements themselves. We lack detailed

29 Aleksandrov – Hristova 2014, 87–91.
30 Minkov 1933, 103.
31 Stefanov 1956, 41–44.
32 Krauß 2006b, 307 cat. no. 45.
33 Sazcı – Başaran Mutlu 2018, fig. 9a–b.

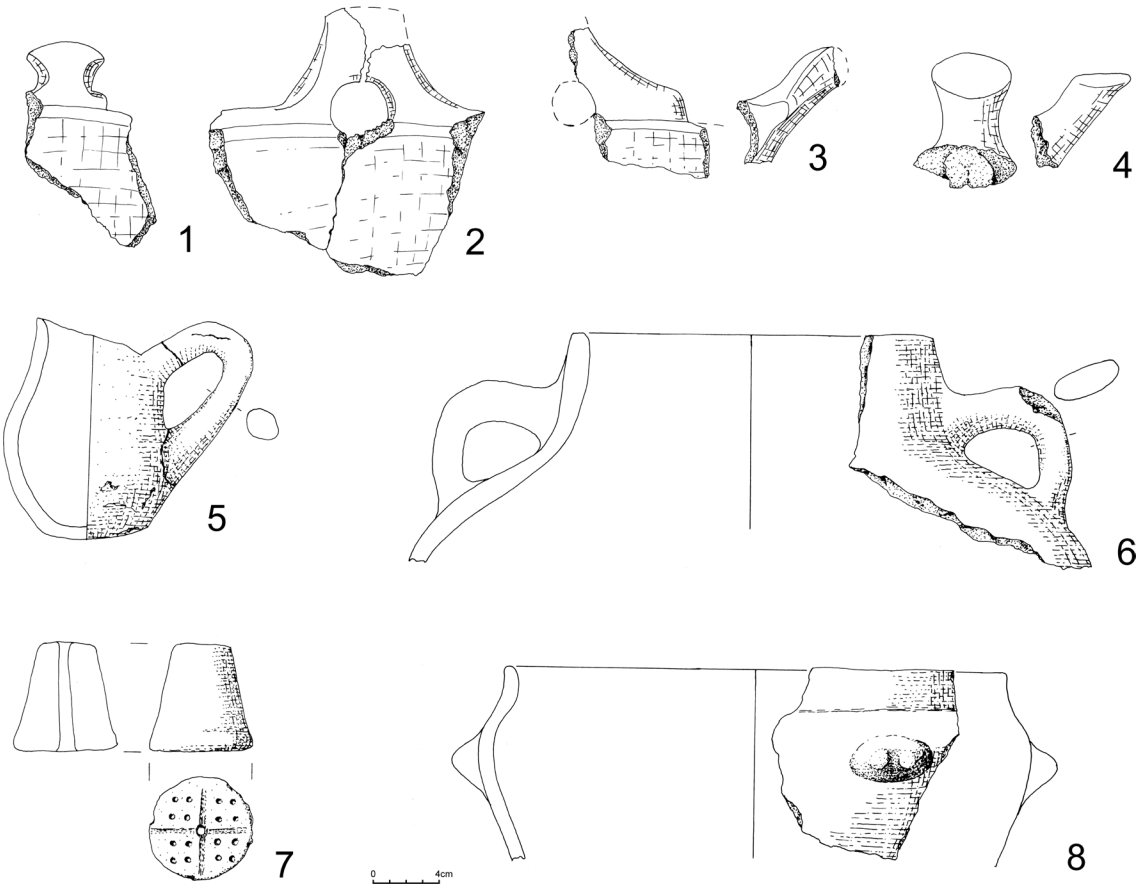

Fig. 6 Ceramic finds from the Bronze Age layer B of Emen Cave (Museum Veliko Tarnovo, drawing: R. Krauß)

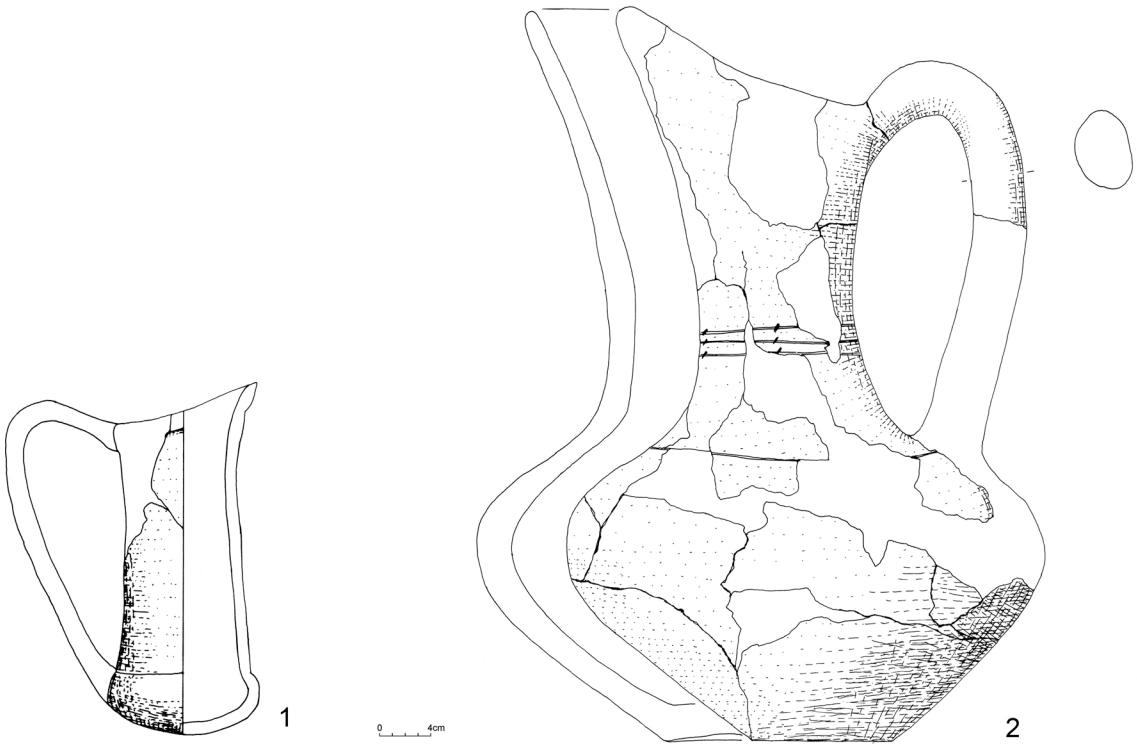

Fig. 7 Middle Bronze Age jugs from Ruse (Museum Ruse, drawing: R. Krauß)

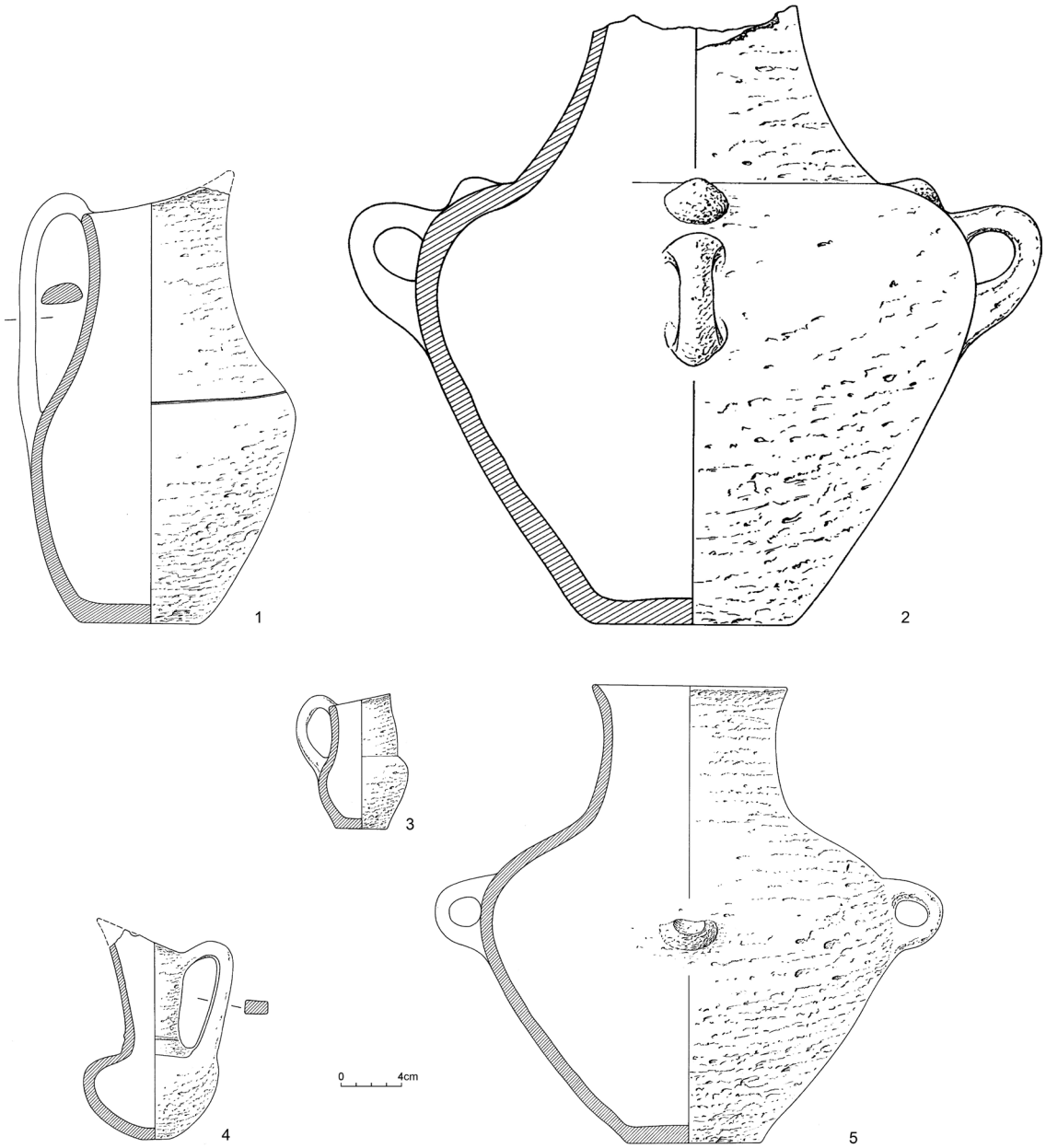

Fig. 8 Middle Bronze Age ceramic finds from Novgrad (after Hänsel 1976, pl. 62)

information on their surface area and structural organization, as well as even simple details as to their housing structures. Some sites were populated over several phases, but from northern Bulgaria at least there are no regular tell-settlements.

Carola Metzner-Nebelsick presented a model according to which a reason for the end of the tell-settlements in the Carpathian Basin in the 16th century BC could be understood within the context of overexploiting natural resources and a concurrent unwillingness to accept the economic and social model which the tell-settlements entailed.[34] Trade contacts in use since the early 2nd millennium BC were abandoned in this period because of increasing differences in the social makeup in the Aegean and Anatolia, on the one hand, and within the Carpathian Basin, on the

[34] Metzner-Nebelsick 2013, 342–346.

other. However, the situation in northern Bulgaria is hardly comparable, as even during the Early Bronze Age there were no tell-settlements in this region.

The settlements of the Middle Bronze Age were modest in size, and compared to the Early Bronze Age, they were only inhabited for a short time period. At the few sites from Thrace that count as tell-settlements within scholarly literature, the Middle Bronze Age cultural layers are relatively thin. Therefore, they cannot be regarded as a mere continuation of the tradition of Early Bronze Age tell-settlements.[35] No preferred settlement locations exist because they are situated in the frugal river basins, as well as on the slopes of the promontory lands and on hills.

Particular to the Early and Middle Bronze Age settlements are the concentric ditch systems interpreted as ritual sites.[36] Most of these enclosures have only recently been discovered during excavations accompanying road construction. Future research will determine whether these structures were distributed throughout the entire Balkan area, or whether they were a speciality of the Thracian Plain. Geomagnetic measurements have recently revealed a new double circular ditch near Novgrad, above the Yantra estuary.[37] Perhaps this site can be connected with the aforementioned Middle Bronze Age finds of Novgrad from the other side of the Yantra River valley. These systems differ from the usual trenches for fortifying settlements in that they lie freely in the landscape and represent actual circular ditches. In this respect, they are to be assessed differently than, for example, the known fortification ditches of the settlements of Verbicioara, Radovanu, Cârcea la Hanuri, Locusteni, Crivăț, Orbeasca de Sus, Zăbala and Odaia Turcului on the Romanian side[38] as well as Sadovets, Biser and Kazanlak on the Bulgarian side.[39] I would only count the sites of Pietrele,[40] Novgrad,[41] Dyadovo,[42] Vesselinovo,[43] Cherna Gora I,[44] Konyovo,[45] Drama-Merdzhumekya,[46] Bikovo,[47] Rupkite (Karasura),[48] Ovcharitsa II,[49] Yabalkovo[50] and Poslki Gradets[51] as actual circular enclosures.

Absolute Chronological Framework

For the Bronze Age on the Lower Danube, work with ^{14}C data is still in its infancy. Although a number of Bronze Age radiocarbon dates have been published, at least from southern Romania, their context is often not well explained, and information about the sample material is only available in rare cases from academic literature. The evaluation of the data is still limited to a numerical order of ^{14}C ages. A modelling of the data based on archaeological observations (stratigraphy, pottery seriation, CA) has not been undertaken. In Table 2, data for the transition from the 3rd to the 2nd millennium BC collected over the past 30 years in the area between the northern Aegean and the southern Carpathian Mountains are listed.

35 Athanassov 2011, 179.
36 Leshtakov 2006.
37 Investigations as part of the DFG project CO 288/2-1 (Vagalinski et al. 2019; Vagalinski et al. 2020).
38 Schuster 2007; Băjenaru 2014.
39 Nikolov 2010; Nekhrizov 2015; Ivanov – Dzhurkovska 2018.
40 Hansen et al. 2017, 97–99.
41 Vagalinski et al. 2019; Vagalinski et al. 2020.
42 Gergova et al. 2011.
43 Nikolov 2004.
44 Leshtakov 2006.
45 Nikolov 2004.
46 Nikolov 2010.
47 Hristova 2018.
48 Nikolov 2010, 334.
49 Kančev – Kančeva-Russeva 1996.
50 Leshtakov et al. 2012.
51 Nikov – Georgieva 2018.

Tab. 2 List of radiocarbon dates for the Bronze Age from the northern Aegean to the Carpathians

		Lab Code	^{14}C age (BP)	STD	Calender Age calBC (95%)	Material	Context	Reference
Wallachia								
1	**Sărata Monteoru**	Bln-4619	3919	48	2540–2260	unknown	Ic2	Motzoi-Chicideanu – Șandor-Chicideanu 2015
2		Bln-3065	3690	60	2260–1900	unknown	Ic3	
3	**Cârlomănești**	Poz-5062 (50602)	3710	35	2220–1980	bone, *Homo*	grave 19	Motzoi-Chicideanu – Șandor-Chicideanu 2015
4		Hd-26957	3576	28	2010–1850	bone, *Homo*	grave 24	
5		Hd-28597	3583	19	2000–1880	bone, *Homo*	grave 25a	
6		Hd-28808	3570	23	1980–1860	bone, *Homo*	grave 25b	
7		Hd-28065	3588	21	2020–1860	bone, *Homo*	grave 27b	
8		Hd-28857	3641	22	2090–1930	bone, *Homo*	grave 28a	
9		Poz-50603	3685	35	2190–1950	bone, *Homo*	grave 55	
10	**Pietroasa Mică – Gruiu Dării**	Hd-28110	3738	21	2250–2010	unknown	Ic3	Motzoi-Chicideanu – Șandor-Chicideanu 2015
11	**Cârlomănești-Cetățuia**	Hd-28577	3696	16	2170–2010	unknown	Ic3	Motzoi-Chicideanu – Șandor-Chicideanu 2015
12		Hd-28524	3692	17	2160–2000	unknown	Ic3	
13		Hd-27971	3314	20	1670–1510	unknown		
14	**Năeni-Zănoaga**	Hd-28858	3439	23	1850–1650	bone, animal		Motzoi-Chicideanu – Șandor-Chicideanu 2015
15		Poz-52926	3365	35	1760–1560	bone, *Homo*	grave b	
16	**Câmpina-Slobozia**	Hd-29799	3159	23	1490–1370	unknown	grave 20	Motzoi-Chicideanu – Șandor-Chicideanu 2015
17		Hd-29820	3107	18	1460–1260	unknown	grave 13	
18		Hd-29813	3081	18	1420–1260	unknown	grave 2	
19		Hd-29866	3054	18	1420–1220	unknown	grave 7	
20		Hd-30034	3039	20	1430–1190	unknown	grave 31	
21		Hd-30157	3022	23	1410–1170	unknown	grave 30	
22		Hd-29800	2972	21	1270–1110	unknown	grave 23	
23	**Crasna-leuca**	GrN-21797	3250	50	1650–1410	unknown		Motzoi-Chicideanu – Șandor-Chicideanu 2015
24		GrN-21798	3240	40	1640–1400	unknown		
25		GrN-21796	3190	45	1560–1360	unknown		
26	**Mahala**	GrN-5135	3100	55	1490–1210	unknown		Motzoi-Chicideanu – Șandor-Chicideanu 2015

Tab. 2 (continued)

		Lab Code	^{14}C age (BP)	STD	Calender Age calBC (95%)	Material	Context	Reference
North Bulgaria								
27	**Duran-kulak**	Bln-2570	2960	60	1350–990	charcoal, detritus & sand	house IVa	Görsdorf – Bojadžiev 1996
28		Bln-2569	2850	50	1180–860	charcoal, detritus & sand	house Vb	
29		Bln-2571	2930	50	1290–970	charcoal, detritus & sand	house 1	
30		Bln-3528	3400	60	1890–1530	charcoal & charred sediment	house 15	
31		Bln-3529	3490	60	1970–1650	charcoal & charred sediment	house 15	
32		Bln-3530	3160	60	1570–1250	charcoal & charred sediment	house 15	
33		Bln-3532	3910	70	2580–2180	charcoal & charred sediment	house 15	
34	**Tash bair**	Poz-115331	2990	30	1310–1110	charcoal	trench 3.3	unpublished
35		Poz-115804	3100	30	1460–1260	bone	trench 3.3	
36		Poz-115806	3035	35	1440–1160	bone, *Bos taurus*	trench 3.1	
37		Poz-115807	3165	30	1520–1360	bone, *Bos taurus*	trench 3.1	
38		Poz-108793	3035	30	1420–1180	bone, *Bos?*	trench 3.1	
39		Poz-115808	3135	30	1490–1290	bone	trench 3.1	
40		Poz-108792	3585	35	2050–1850	bone, *Bos taurus*	trench 3.6, ditch filling	
41		Poz-108794	3555	35	2010–1770	bone	trench 3.6, ditch filling	

Tab. 2 (continued)

		Lab Code	^{14}C age (BP)	STD	Calender Age calBC (95%)	Material	Context	Reference
Thrace								
42	**Dabene**	MAMS-23529	3963	23	2580–2420	charcoal		Hristov 2015
43		MAMS-23531	3414	35	1810–1610	bone		
44		MAMS-23532	3676	37	2180–1940	bone		
45	**Galabovo**	Bln-4101	3890	80	2570–2130	charcoal		Görsdorf – Bojadžiev 1996
46		Bln-4102	3745	50	2330–1970	charcoal		
47	**Yunatsite**	Bln-3658	3780	50	2370–2050	charred acorns	Hor. 5	Görsdorf – Bojadžiev 1996
48		Bln-3659	3700	50	2230–1950	charred acorns	Hor. 5	
49		Bln-3657	3760	50	2350–1990	charred acorns	Hor. 4	
50		Bln-3656	3760	50	2350–1990	charred acorns	Hor. 4	
51		Ly-14795	4280	40	2990–2830	charred grains	K7-8, house 34	Tsirtsoni 2016
52	**Cherna Gora**	Bln-5346	3701	27	2190–1990	charcoal		Görsdorf 2003
53		Bln-5368	3790	37	2340–2100	charcoal		
54	**Tatul**	Ly-8566	3425	30	1830–1630	charcoal	T01, E4-E5, feature 4, 393.33 m	Leshtakov 2018
55		Ly-8567	3975	30	2610–2410	charcoal	feature 27	
56		Ly-8568	4040	30	2660–2460	charcoal	T05, F4, feature 20, 391,80 m	
57		Ly-8569	4005	30	2610–2450	charcoal	T08, 392,25 m	
58		Ly-15681	3520	30	1940–1740	charcoal	T02, C5, feature 1, 393,68 m	
59		SUERC-40110	2925	30	1240–1000	bone, *Cervus elaphus*	D5	
60		SUERC-40111	2680	30	900–780	bone, *Bos taurus*	F5	
61		SUERC-63741	4099	31	2930–2490	charcoal	E5, 392.00 m	
62		SUERC-63777	4063	26	2740–2460	charcoal	fireplace 20	
63		SUERC-63778	4049	29	2690–2450	charcoal	fireplace 14	
64		SUERC-63780	4034	25	2620–2460	charcoal	fireplace 20	
65		SUERC-63781	3517	29	1940–1740	charcoal	fireplace 19	
66		SUERC-63787	3941	33	2550–2310	bone, *Bos taurus*	at level of fireplace 42	
67	**Mikro Vouni**	DEM 15-17	3580	35	2040–1840	bone		Matsas 1991
68		HD 11956-11747	3555	40	2020–1740	bone		

The two radiocarbon dates for the transition from the Early to the Middle Bronze Age from Mikro Vouni are hardly usable for chronological purposes because of the lack of contextual information (Fig. 9).[52] Nevertheless, they provide a first indication that bowls with spouts and the typical rim-standing handles are to be placed in the first centuries of the 2nd millennium BC.

It is unsurprising that the first data from Dabene fall into the last decades of the 3rd millennium and the beginning of the 2nd millennium BC.[53] The excellent encrusted fine ceramics from the tumuli, including cups and kantharoi of the Yunatsite type, belong typologically to the transition from the Early to the Middle Bronze Age. The golden dagger with a truncated tip with its singular equivalent in the bronze dagger from the Emen hoard indicates the chronological proximity of both finds. Martin Hristov sees the dagger from the Emen hoard as a further development of the dagger from Dabene.[54] Indeed, there are some decisive differences in both pieces. As far as the absolute dating of structure 5 is concerned, however, we would like to note that one date from charcoal deviates so much from the other two data on bone that this needs an explanation – an old-wood effect would be a simple one. In fixing the absolute chronological position of structure 5, this date can at most represent a terminus ante quem.

The two older conventional dates from the Berlin lab for Galabovo and Cherna Gora show a typical old-wood effect.[55] If this is subtracted, then the corresponding settlements are likely to be dated to the turn of the 3rd to the 2nd millennium BC.

This transition can be detected more precisely between settlement horizons 5 and 4 of the Yunatsite tell.[56] The short-lived specimen (charred acorns) renders a fairly precise date for the beginning of the Middle Bronze Age in the first half of the 20th century BC.

For Thrace, a set of dates was recently published as a calibration, but without disclosing the raw data.[57] Only the raw data for Tatul were published recently.[58] The data series from Tatul appears in three parts. A first block falls in the first half to the middle of the 3rd millennium BC and therefore still belongs to the end of the Early Bronze Age. Three charcoal dates fall in the first half of the 2nd millennium and document the Middle Bronze Age, while the rest of the data series belongs to the Late Bronze Age. The sites of Chokoba, Bikovo, Radnevo, and Chorkvata seem to be multi-periodic, as is suggested by the scattering of the ^{14}C data. Bikovo and Radnevo show an overlap of dates in the first half of the 2nd millennium. The data series from Chokoba starts already at the end of the 3rd millennium, and then is spread over a very long period within the 2nd millennium. The dates from Chorkvata cover the 14th and 13th centuries and should therefore be Late Bronze Age.

From another series of dates for the transition from the Late Bronze to the Early Iron Age,[59] the data from the sites Gluhite Kamani and Ada Tepe[60] are relevant here, as they provide further evidence for the chronological fixing of the Late Bronze Age in Thrace. Thus, the single date from Chorkvata is now well integrated, as are the younger extensions of the data sequence from Chokoba.

In the comparison of the data series from the areas south and north of the Lower Danube, a sequence of ^{14}C data for the outgoing 3rd and 2nd millennium emerges for the first time, with only shorter gaps. Nevertheless, it should be noted that these series are based to a large extent on conventional dates on charcoal samples. The new AMS dates on short-living samples cluster at the end of the Early Bronze Age and Late Bronze Age. This picture is sure to change quite soon.

52 Matsas 1991, 168.
53 Hristov 2015, 490–492.
54 Hristov 2016, 234.
55 Görsdorf – Bojadžiev 1996, 163–164; Görsdorf 2003.
56 Görsdorf – Bojadžiev 1996, 158–160.
57 Leshtakov – Tsirtsoni 2016.
58 Leshtakov 2018. However, some of the data in the text and in the tables are contradictory.
59 Nekhrizov – Tzvetkova 2018.
60 For Ada Tepe see Popov et al. this volume.

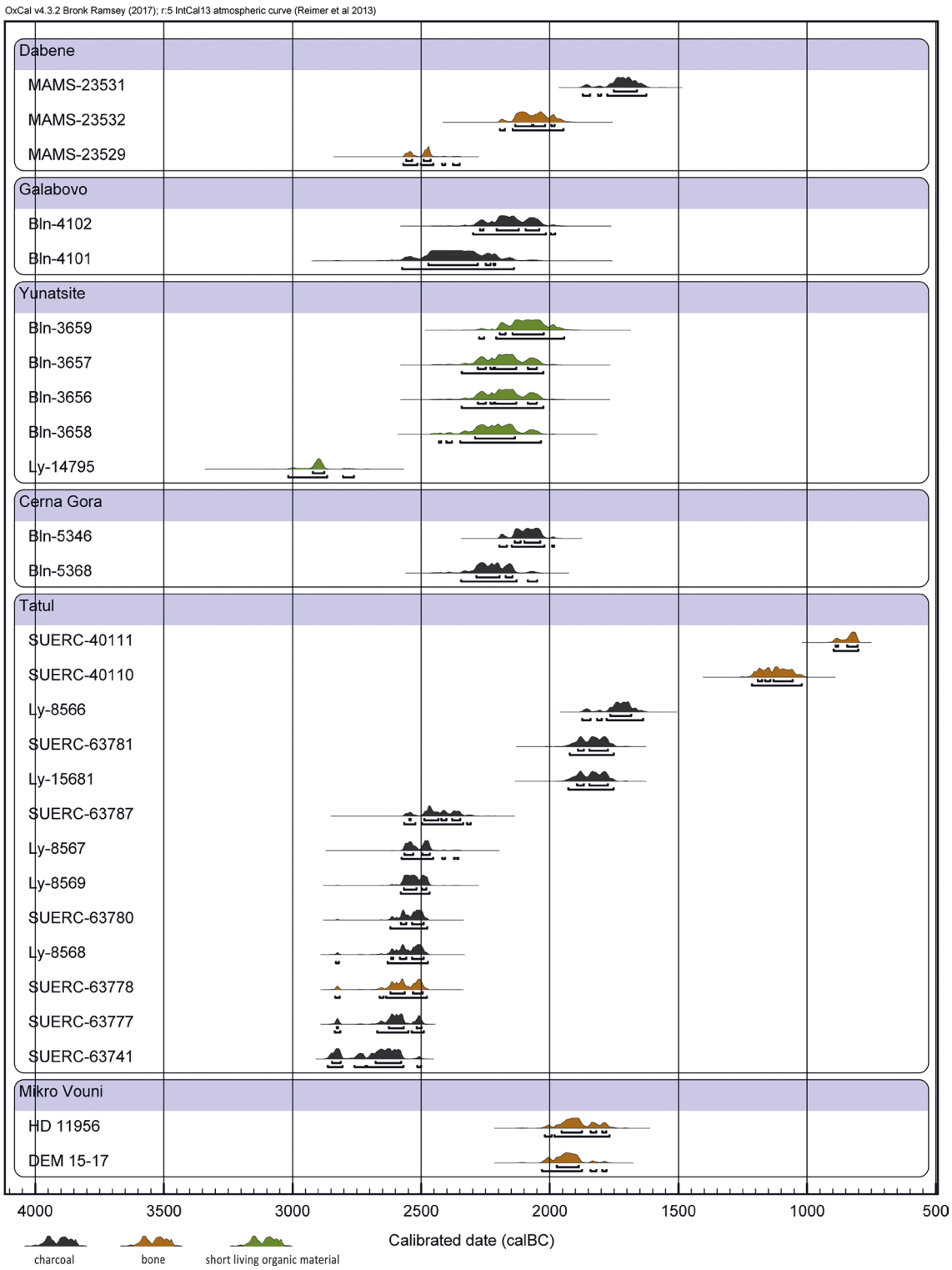

Fig. 9 Calibration of radiocarbon dates for the 3rd and 2nd millennium BC from Thrace according to the data in Table 2 (graphics: R. Krauß)

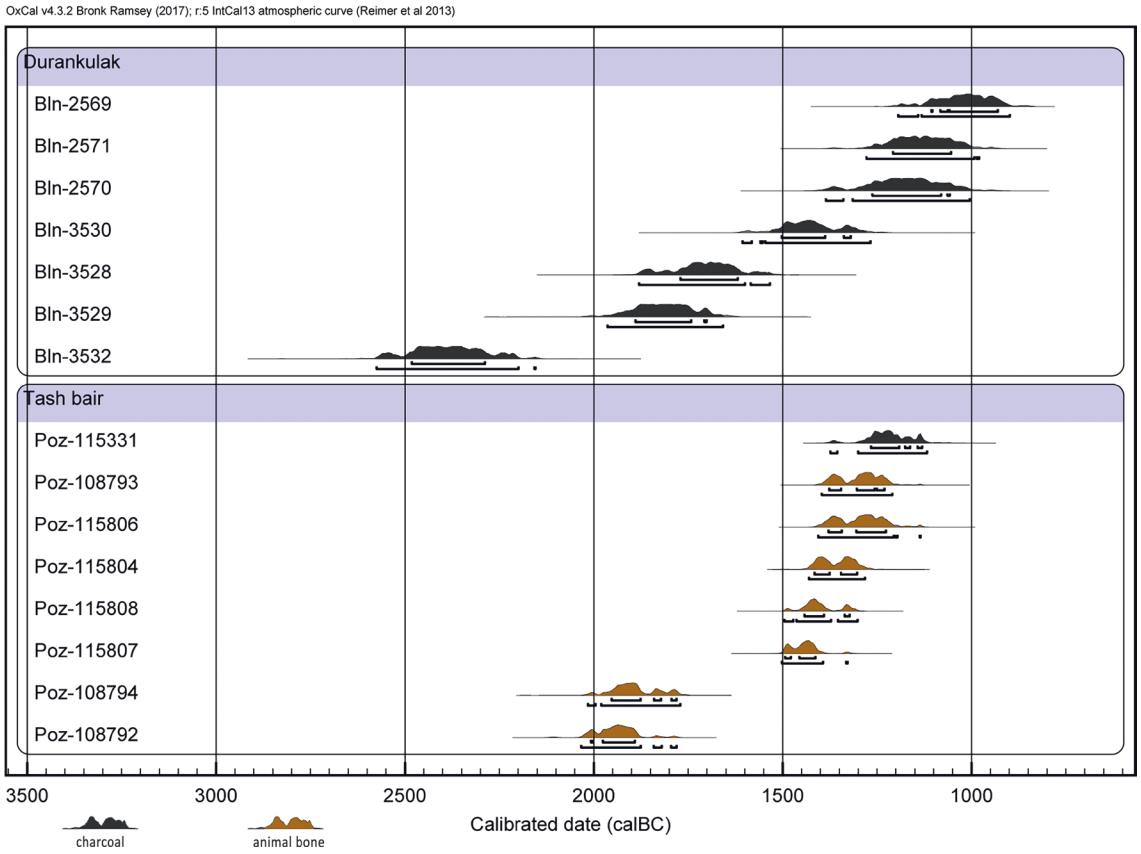

Fig. 10 Calibration of radiocarbon dates for the 3rd and 2nd millennium BC from northern Bulgaria according to the data in Table 2 (graphics: R. Krauß)

Although there are numerous materials from the Middle Bronze Age, especially from northern Bulgaria, the settlements are still largely unexplored. We have an older series of dates from Durankulak that was measured conventionally on charcoal (Fig. 10).[61] For the first time, a new ^{14}C series on short-lived samples, especially animal bones, was obtained from a newly known settlement of the Middle to Late Bronze Age on the Tash bair hill with a circular ditch system.[62] Two dates on animal bones confirm the beginning of the roundel immediately after 2000 calBC. The site was apparently still used until the beginning of the Late Bronze Age.

The difference between conventionally measured charcoal samples and more recent AMS dates on short-lived samples is very evident in the series for the Tei-Monteoru cultural group from southeastern Romania (Fig. 11).[63] While the two dates from the Berlin laboratory for Sărata Monteoru are still directly before or around 2000 BC, the AMS dates from graves at the sites of Cârlomăneşti and Năeni-Zănoaga display a well-documented sequence in the first half of the 2nd millennium until about 1600 BC. These values are also confirmed in the dates from the settlements of Cârlomăneşti-Cetăţuia and Pietroasa Mică-Gruiu Dării.

61 Görsdorf – Bojadžiev 1996, 150–151.
62 Vagalinski et al. 2019; Vagalinski et al. 2020.
63 Motzoi-Chicideanu – Șandor-Chicideanu 2015.

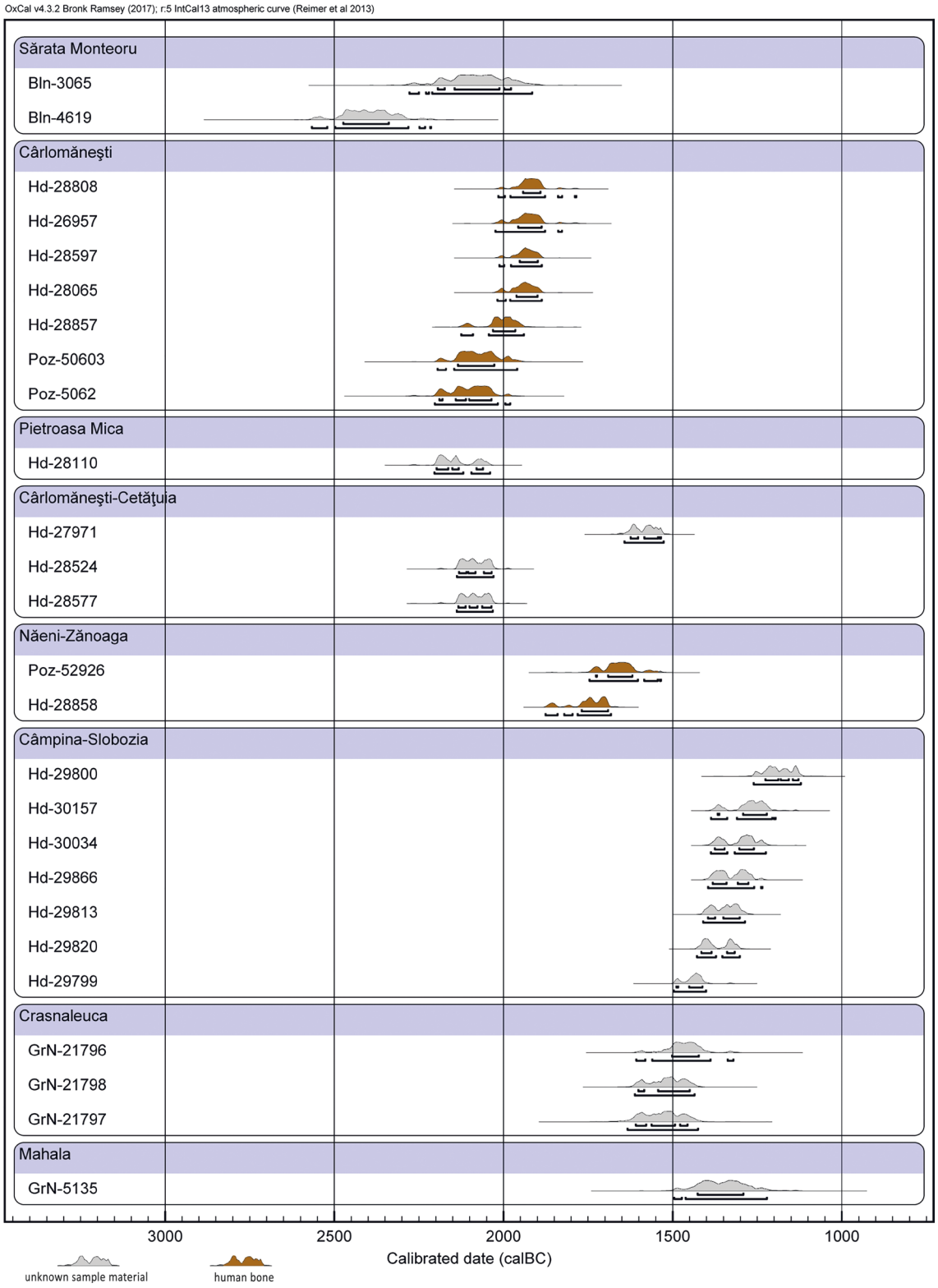

Fig. 11 Calibration of radiocarbon dates for the 3rd and 2nd millennium BC from Wallachia according to the data in Table 2 (graphics: R. Krauß)

The graves of the Noua Culture date from 1500 to 1200 BC, as confirmed by the recent dates from the Câmpina-Slobozia burial ground.[64] As expected, these ^{14}C dates are in the range of the known sites of Rotbav[65] and Odaia-Miciurin.[66]

However, the compilation of the dates should not obscure the fact that not a single radiocarbon date from the Early, Middle, or Late Bronze Age has been published from northern Bulgaria.[67] There is an urgent need for action here because the references to southern Romania and Thrace previously described require confirmation by means of stratigraphically integrated ^{14}C dates.

Supraregional Parallelization of the MBA

Our investigations show a clear cluster of radiocarbon data between 2200 and 1600 calBC. This time interval corresponds to the so-called Early Bronze Age III at the beginning and the Middle Bronze Age at the end (Fig. 12). I would like to consider this time period as a single chronological unit. The reasons for this are as follows: during this period, no differentiations can be made in the material culture, nor does the way of settlement change. The period is comparatively short at only 600 years. Supraregionally, it can be paralleled with the beginning of the Unetice Culture in central Europe and the Middle Helladic Culture in the Aegean. The beginning of the Middle Bronze Age in Thrace and at the Lower Danube overlaps partially with Phase I of Tei-Monteoru in the north of Muntenia.[68] South of the Balkan Mountains, the material of Galabovo[69] should correspond to the older phase, but, as yet, no radiocarbon dates from there exist. The old dates from Mikro Vouni[70] fit well into this phase, something which also seems to be typologically reasonable. It would be interesting to know which material exactly matches the younger ^{14}C data from Tatul and the older ones from Bikovo, which also fall into the older phase of the Middle Bronze Age.[71] Moreover, the ritual structures of Dabene extend into this time horizon,[72] as well as settlement layers 5 and 4 of Yunatsite's tell.[73]

The later phase of the Middle Bronze Age occupies the time interval between 1800 and about 1500 BC and corresponds to Tei-Monteoru II. In Thrace, this time horizon is well represented by the dates from Radnevo, as well as the younger series of dates from Bikovo and Chokoba. Here again, it would be interesting to know which material belongs to these layers. The more recent excavations have made a significant contribution to enlarging the data series in this period.

Over a broader area, the following references can be shown. The sequence of radiocarbon dates from the Kanlıgeçit in Turkish Thrace[74] offers a terminus ante quem of sorts for the Middle Bronze Age. The material provides a good overview of the sequence of the Early Bronze Age groups Mihalich, Sveti Kirilovo, and Nova Zagora, none of which have yet been substantiated with ^{14}C data. The settlement of Kanlıgeçit ends in the period during which the settlement of Galabovo, and thus the Middle Bronze Age, begins.

The Middle Bronze Age development can be better connected with Macedonia because long settlement sequences secured by means of ^{14}C dates are known from there. The older phase of the

64 Motzoi-Chicideanu – Șandor-Chicideanu 2015.
65 Dietrich 2014, appendix 2.
66 Kaiser – Sava 2009.
67 A data series from Durankulak analysed by the Berlin laboratory has questionable values because of various flood events in the lake. Only three Late Bronze Age dates are accepted by the authors (Görsdorf – Bojadžiev 1996, 150–151).
68 Motzoi-Chicideanu – Șandor-Chicideanu 2015.
69 Leštakov 1993.
70 Matsas 1991.
71 Leshtakov – Tsirtsoni 2016.
72 Hristov 2015.
73 Görsdorf – Bojadžiev 1996, 158–160.
74 Özdoğan – Parzinger 2012, 267–280.

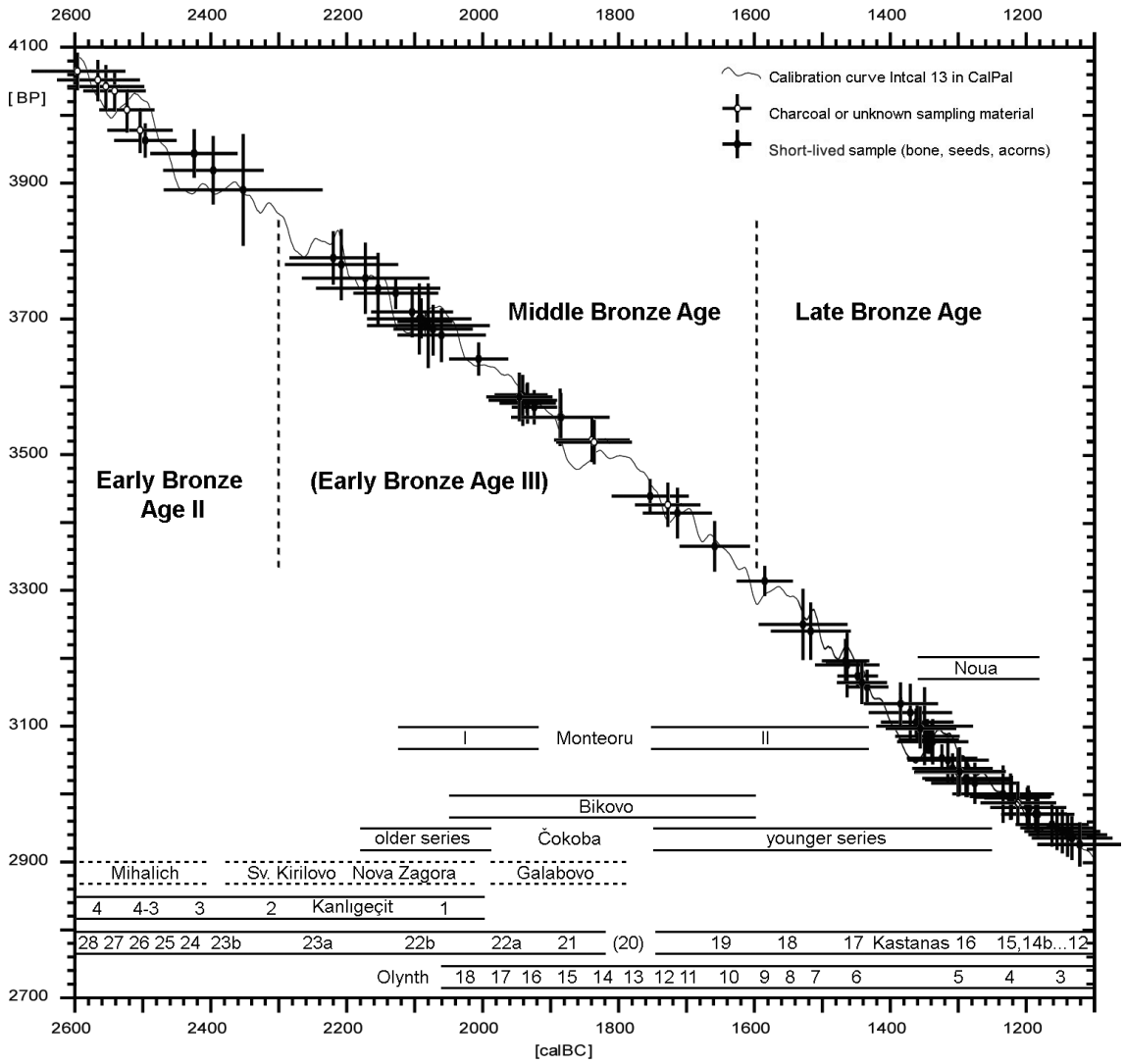

Fig. 12 Calibration of Bronze Age radiocarbon dates on the calibration curve Intcal 13, performed with the program CalPal, version 2014. In the upper part of the frame, the duration of Monteoru is given according to the dates and conclusions from Motzoi-Chicideanu – Șandor-Chicideanu 2015. The durations of the sequences from Chokoba and Bikovo are given according to the information from Leshtakov – Tsirtsoni 2016, those from Kanlıgeçit, Kastanas and Olynthus according to Aslanis 1985, Jung 2002, Horejs 2007, Hänsel et al. 2010, Özdoğan –Parzinger 2012 and Leshtakov 2018 (graphics: R. Krauß)

Middle Bronze Age on the Lower Danube corresponds to the older phases 18 to 14 in the tell of Agios Mamas (prehistoric Olynthus).[75] The younger phase can be connected to phases 13 to 7 accordingly. The separation between the earlier and later phases of the Middle Bronze Age becomes most tangible in a hiatus at the tell of Kastanas (Layer 20).[76] The older phase of the Middle Bronze Age therefore corresponds to settlement layers 22a and 21, and the younger to layers 19 and 18.

As a consequence, I would like to advocate that the Early Bronze Age no longer be extended into the 2nd millennium BC. According to the neighbouring areas, the caesura between 2300 and 2200 calBC visible in the data should be regarded as the starting point for the Middle Bronze Age. Most of the Early Bronze Age tell-settlements in Thrace end before this date. At the end of this

[75] Horejs 2007.
[76] Aslanis 1985; Hänsel et al. 2010.

period, but probably before 1600 calBC, the hoard from the Emen Cave represents a tool set that is made entirely of tin bronze. This marks the beginning of a new era in which the regional groups in the Balkans refer directly or indirectly to the processes in Mycenaean Greece, on the one hand, and to the metal-rich groups of the Carpathian Middle Bronze Age, on the other. The Late Bronze Age on the Lower Danube can be connected with the Noua Culture in the areas north of the Danube[77] and the Late Bronze Age layers of the Macedonian tells: Kastanas 17–12 and Agios Mamas 7–3.[78] According to the absolute data, this should be the second half of the 2nd millennium BC. This time interval is also well represented with ^{14}C dates in the area between the Southern Carpathian Arch and the northern Aegean. It is the era of encrusted and channelled ceramics, mainly known historically under the names of the cultural groups of Gîrla Mare, Zimnicea-Plovdiv, and Cherkovna. It should be clear that these groups have their roots in the second phase of the Middle Bronze Age, the period from which both the characteristic decorative motifs and the basic forms of vessels originate.

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Dynamics of Burial Practices in the Necropolis of Baley (Bronze Age – Beginning of the Iron Age)

Georgi Ivanov[1] – *Tanya Hristova*[2] – *Stefan Alexandrov*[3]

Abstract: The paper offers a preliminary and summary discussion of the burial features from the necropolis of Baley, excavated in 2010–2015. The 2009 chance finds, which led to the discovery of the necropolis, are considered in the context of the securely identified graves. The necropolis is among the largest in the Lower Danube region. The graves and the pottery resulted in synchronization with the chronological periods well known since the 1970s. The totality of artefacts, from positively established burial contexts at Baley and with established synchronicity with the developmental stages of the Lower Danube cultures, permit us to expand on and compare them to other finds – accidental, or from settlement sites with uncertain stratigraphy. The graves are grouped into three chronological periods, based on pottery analogies. We list the characteristic burial containers (urns), the pottery and the burial inventory for each of the hitherto defined periods, also providing comparanda from synchronous sites or finds. The data from the physical anthropology analyses and the spatial distribution supplement the picture of the burial practices. We close with an overview of the data from the three stages, with special attention to traditions and innovations.

Keywords: Baley necropolis, urnfield necropolis, Bronze Age, Iron Age, burial practices, grave inventory

Introduction

The modern village of Baley (northwest Bulgaria) (Fig. 1.1) is located on the right bank of the Timok River, approximately 2km south of its confluence with the Danube (Fig. 1.3). The necropolis presented here was discovered accidentally in 2009, with the finding of ten vessels and one anthropomorphic figurine, provisionally designated as 'grave 0'. It is located in the village's eastern neighbourhood and partially overlaps with the residential estates. Archaeological investigations were carried out for five seasons till 2015, restricted to the non-privately owned land, of which a relatively compact area of 600m² was opened. Additional grave structures were excavated some 100m southwest of this area, but still within the present-day urbanization, suggesting the necropolis extended along a northeast–southwest axis for at least 100m (Fig. 1.2).[4] In the two preliminary publications, we presented some of the burial complexes informing on the relative chronology, as well as the four AMS radiocarbon dates from the graves.[5] In this paper, our goal is to attempt to present and assess the funeral practices from the necropolis through a review of the tradition and the changes from the Middle Bronze, through the Late Bronze, and up to the beginning of the Early Iron Age.

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[4] Alexandrov et al. 2011, 127–128; Alexandrov et al. 2013, 315–316.

[5] Alexandrov et al. 2016, fig. 9.

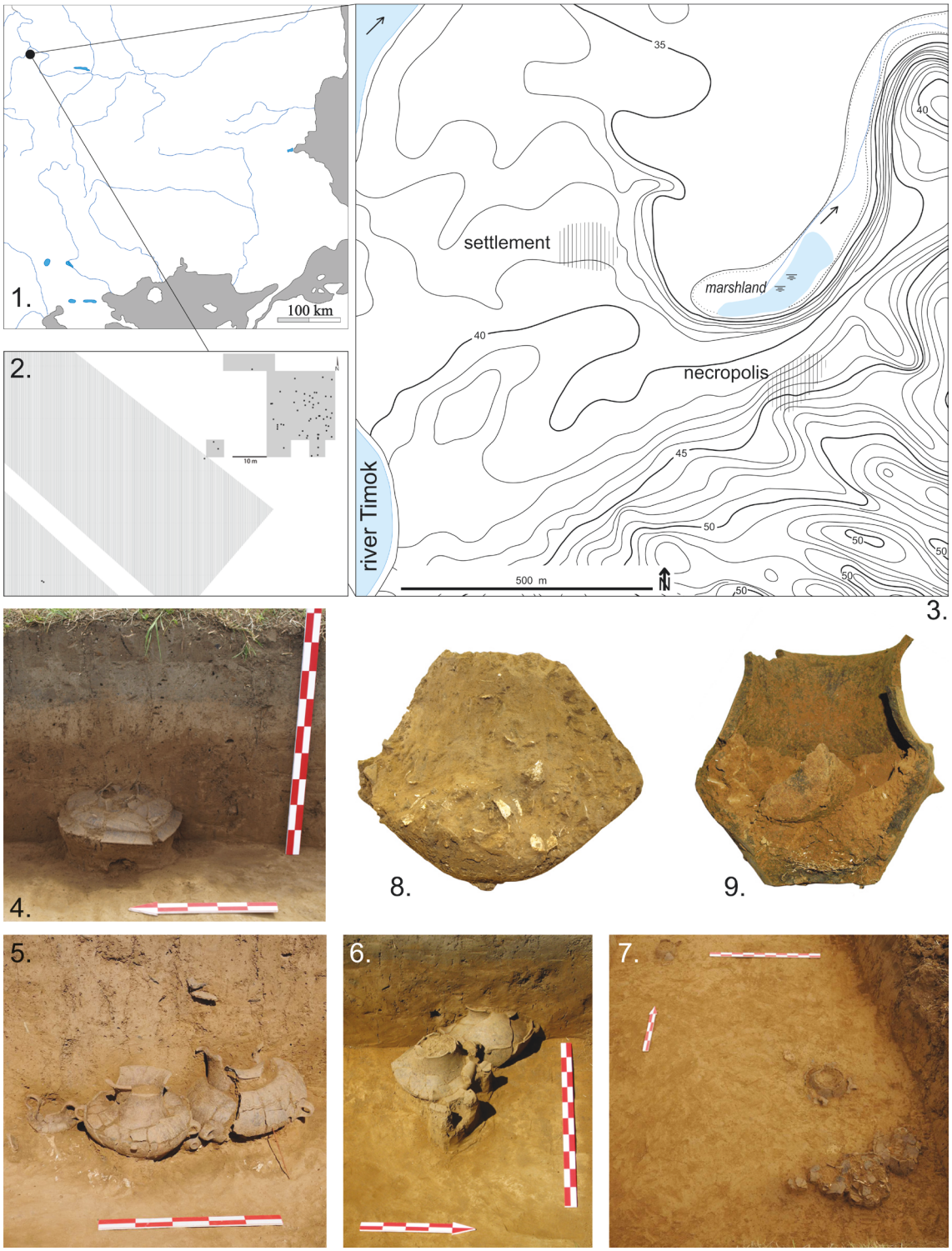

Fig. 1 1. Location of the site near the Danube River in the Balkan peninsula; 2. Excavated area (grey) and graves till 2015; 3. Prehistoric settlement and necropolis; 4–7. Graves dug into sand dunes; 8–9. Cremated bones in the urns (photos and drawings: S. Alexandrov, G. Ivanov)

The Necropolis

The graves are discriminated based on the clustering of ceramic vessels within a narrow space and the essential presence of cremated human bones, placed in or spread around the vessels. The composition of the soil – river sand dunes – significantly obstructs recognition of negative features and recording the dimensions of the burial pits where the vessels were placed (Fig. 1.4–7). Probably, some of the vessels found near more conspicuous pottery clusters (the latter interpreted as graves) were associated with those. In several instances, pottery vessels discovered in situ lacked burnt human bones whether in or around them. In addition, finds of single vessels, fragmented stone axes, pieces of anthropomorphic figurines and pottery sherds were also found in the spaces between the graves – all likely associated with the burial practices.

Within the excavated area, there are no documented remains of a pyre, suggesting that cremation was carried out away from the burial structures, possibly outside of the necropolis. As attested in other necropolises, after the conclusion of the cremation, some burnt bones were removed from the pyre, cleaned of ash and charcoal residue, and placed in the urns (Fig. 1.8–9).

Grave Complexes and Individuals

Analysis of the human osteological remains is performed by Nadezhda Atanassova-Timeva and Borsilava Galabova, with the results from the 2014 season already published.[6] Up until 2015, the team excavated 59 features – interpreted as graves –, all of which contained cremations. All cremated remains had been placed in pottery vessels – burial urns. From these graves we have anthropological evidence of the cremated remains of 71 individuals. Of the 59 graves, two are double and seven are collective graves. Double graves are graves in which the remains of each different individual are interred in a separate vessel and the vessels are placed side by side. Collective graves are those in which the cremated remains of more than one individual are mixed and then distributed between several containers. In all but seven graves with an insufficient number of bones, it was possible to determine the age of the deceased. However, more than half of the remains could not be sexed.

Chronological Groups

Based on pottery analogies, the burials could be categorized into three principal chronological groups. Certain elements of the funerary practices are common to all three groups, while other traits are exclusive to only one. In terms of chronology, the first group of 17 structures dates to the Middle Bronze Age. The rest of the burial structures (including ‘grave no. 0’) contain materials associated with the well-known and published settlement of the second half of the 2nd millennium BC, located c. 500m to the northwest (Fig. 1.2) and excavated between 1970 and 1989. Two graves currently remain unassigned due to the highly fragmented state of the pottery assemblage.

Funerary Practices

1. Early Stage: Middle Bronze Age

The total number of burial features from the Middle Bronze Age is 17. In contrast to the subsequent stages, this stage is not registered at the excavated settlement site.

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6 Galabova – Atanassova-Timeva 2013–2014.

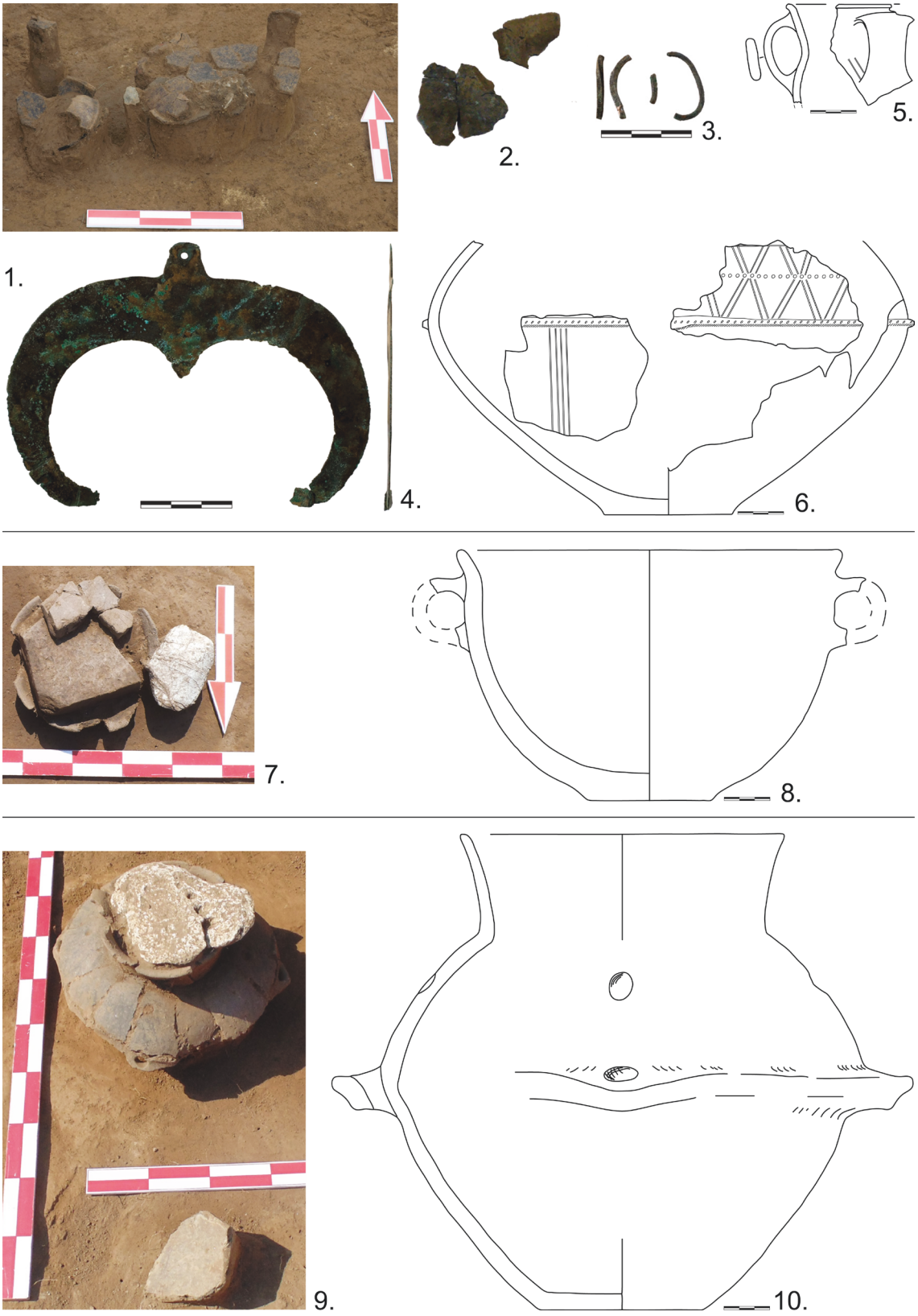

Fig. 2 1. Grave 52; 2. Fragments of a bronze plate; 3. Fragments of a bronze bracelet; 4. A bronze pendant; 5. Fragments of a bowl that covers the urn; 6. Burial urn; 7. Grave 33; 8. Burial urn. The urn covered with a stone; 9. Grave 32. The urn topped with a stone; 10. Burial urn (photos and drawings: S. Alexandrov, G. Ivanov)

Pottery, Urns and Lids (Fig. 2)

The principal ceramic form utilized as an urn is the short-necked globular jar, attested in 14 graves. Distinctive traits include horizontal handles and a horizontal swell, located at the maximum diameter. In two instances a deep bowl is utilized as an urn (Fig. 2.8), and in one, a globular jar, but with drawn-out handles raised above the rim. In 12 graves the urns lack lids, while in five, the urns are topped by an upturned bowl. Two urns are covered by a slab, with a second stone placed nearby (Fig. 2.7, 9).

Pottery Analogies

The pottery assemblage from the Middle Bronze Age graves finds very good analogies at several sites in northwestern Bulgaria – Antimovo, Dimovo, Magurata Cave, etc.[7] Similar vessels, bowls with a drawn-out sinuous profile and kantharoi with *ansa lunata* handles are also widely distributed in the north – modern-day Romania – and are assigned to the Verbicioara II–III Culture (Padea-Dealul Vii and Cârcea-Viaduct, Craiova County; Ceplea-Plopșoru, Gorj County, etc.).[8] On the other hand, the globular amphora with a short neck and four horizontal handles (Fig. 2.10) and the rest of the forms find analogies among the assemblages from the synchronous necropolises at Trnjane, Gamzigrad-Magura and Zvezdana (Zaječar)[9] in eastern Serbia, of the Paraćin/Gamzigrad Culture. Fine line decoration (Fig. 2.5–6) is found at Obala-Korbovo.[10] In light of the synchronicity between the necropolises at Gamzigrad and Trnjane, and the classical phase of the Vatin Culture, and of the numerous parallels between the artefacts from Baley and those from Vatin and Verbicioara,[11] the graves could be dated to the second quarter of the 2nd millennium BC.

Grave Inventory

The majority of the burial complexes contain only an urn, less often an urn with a lid. Burial inventory is recorded in only one feature, a small cup. Bronze items are found only in one feature, where a bronze pendant (Fig. 2.4), fragments of a bronze plate (Fig. 2.2) and what could be bracelet elements (Fig. 2.3) were placed in and next to the urn. The bronze pendant (height: 9.3cm; width: 12.2cm), finds excellent parallels among the crescent-shaped pendants with middle knob (*halbmondförmige Blechanhänger*) known from Slovakia, Hungary and northwestern Romania. The one from Baley belongs to the group of undecorated pendants. Its closest parallels are in the Satu Mare collective find, in the Hodejov depot I, as well as in the collective finds from Včelince-Lászlófala, and Spišský Štvrtok-Myša Hurka.[12] Chronologically, these pendants date to the phase Bronze B early or the Koszider period.[13]

Area

The graves are spread over the entire excavated area. Most are clustered relatively close together, within the eastern portion of the excavated area, fairly evenly spaced (Fig. 6.1). Three features are cut by graves from the final (third) stage (Fig. 1.6).

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7 Alexandrov – Daskalov 2005, 83–84; Alexandrov – Hristova 2014, 87, 89–91.

8 Berciu 1961, 132–141, figs. 3.2; 4.8; 7.1, 3; 11.1; Nica 1997, 164–165, figs. 8.8; 9.10; Calotoiu 2010, 62–63, fig. II.1.

9 Jovanović – Janković 1996, fig. 4; Srejović – Lazić 1997, 226–231, figs. 1, 26, 28, 31.

10 Krstić 1986, fig. 81.4.

11 Morintz 1978, 21, 26, fig. 5; Srejović – Lazić 1997, 233–242.

12 David 2002, pls. 140.1; 142.3; 150.13–14; 173.4–7; 177.7.

13 Mozsolics 1967, 89; 124–125; David 2002, 216–217.

Physical Anthropology Data

All grave complexes from this period received the remains of just one individual; all age sets are represented.

2. Middle Stage: Late Bronze Age (Fig. 3.1–7)

The period to which we assign this group of graves is known in the Bulgarian literature as Baley-Orsoia.[14] More commonly, it is referred to as the Encrusted Pottery Culture, or Žuto Brdo-Gârla Mare period, and is representative of the Late Bronze Age in the Lower Danube reaches. Based on the pottery, there are eight graves belonging to this period, plus the finds from the so-called grave no. 0, i.e. the chance find of artefacts, discovered clustered within a rather confined area, that led to the discovery of the necropolis.[15] Apart from these specific Late Bronze Age pottery forms, four additional graves yield ceramics with analogies in both this and the subsequent stage.

Pottery, Urns and Lids

The 'grave no. 0' group includes eleven artefacts – three four-handled jars, one two-handled jar, two dishes, two bowls, two lids, and one anthropomorphic figurine.[16] Probably, the two- and four-handled jars functioned as urns, and the lids and the decorated dishes sealed them, as is suggested by the analogous vessels from the other graves of the period. In two graves, the urns were left uncovered.

In three instances the remains are placed in relatively small containers – a jug, a bowl and a small jar. These are typical of the so-called Bistreț-Işalnița style, distinguished by biconical forms, a quadrangular cross-section and decoration of burnished stripes or shallow grooves.[17] The style is difficult to discriminate chronologically from the one representative for the Late Bronze Age, as they co-occur.[18] Small vessels and special lids are also present in the 'grave no. 0' find, but whether they were used to cover the containers is unclear.

We further assign four more graves to this stage. They yielded more peculiar urns, and likewise unusual dishes, used as lids, which find equally convincing analogies in the earlier and the later phase.[19]

Pottery Analogies and Dates

The pottery assemblage from two graves (Fig. 3.1–6) is representative of the classical phase of the Encrusted Pottery Culture and could be connected to Horizon IV of the Baley settlement.[20] The only AMS radiocarbon date (on charred wood from the so-called 'megaron' from Horizon IV) from the Baley settlement puts the date of the synchronous graves between 1550 and 1390 cal-BC.[21] The pottery assemblage of the period includes two- and four-handled jars, occasionally with two swellings on the globular body and a funnel neck. Ornamentation by means of incised and white inlayed designs or stamped patterns, along with the anthropomorphic figurines, is one of the distinctive traits of the period.[22]

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14 Panayotov – Valcheva 1989, 7–10.
15 Alexandrov et al. 2011, 130.
16 Alexandrov et al. 2011, 134–135.
17 Alexandrov et al. 2013, 318–319, fig. 2.
18 Alexandrov et al. 2013, fig. 1; Alexandrov et al. 2016, fig. 4.b–g.
19 Alexandrov et al. 2013, 319.
20 Yotsova et al. 2012, 23.
21 Bln-1577: 3192 ± 40 BP (1550–1390 calBC, 95% confidence), see: Alexandrov et al. 2016, 452–453, fig. 9.
22 Alexandrov et al. 2013, 317.

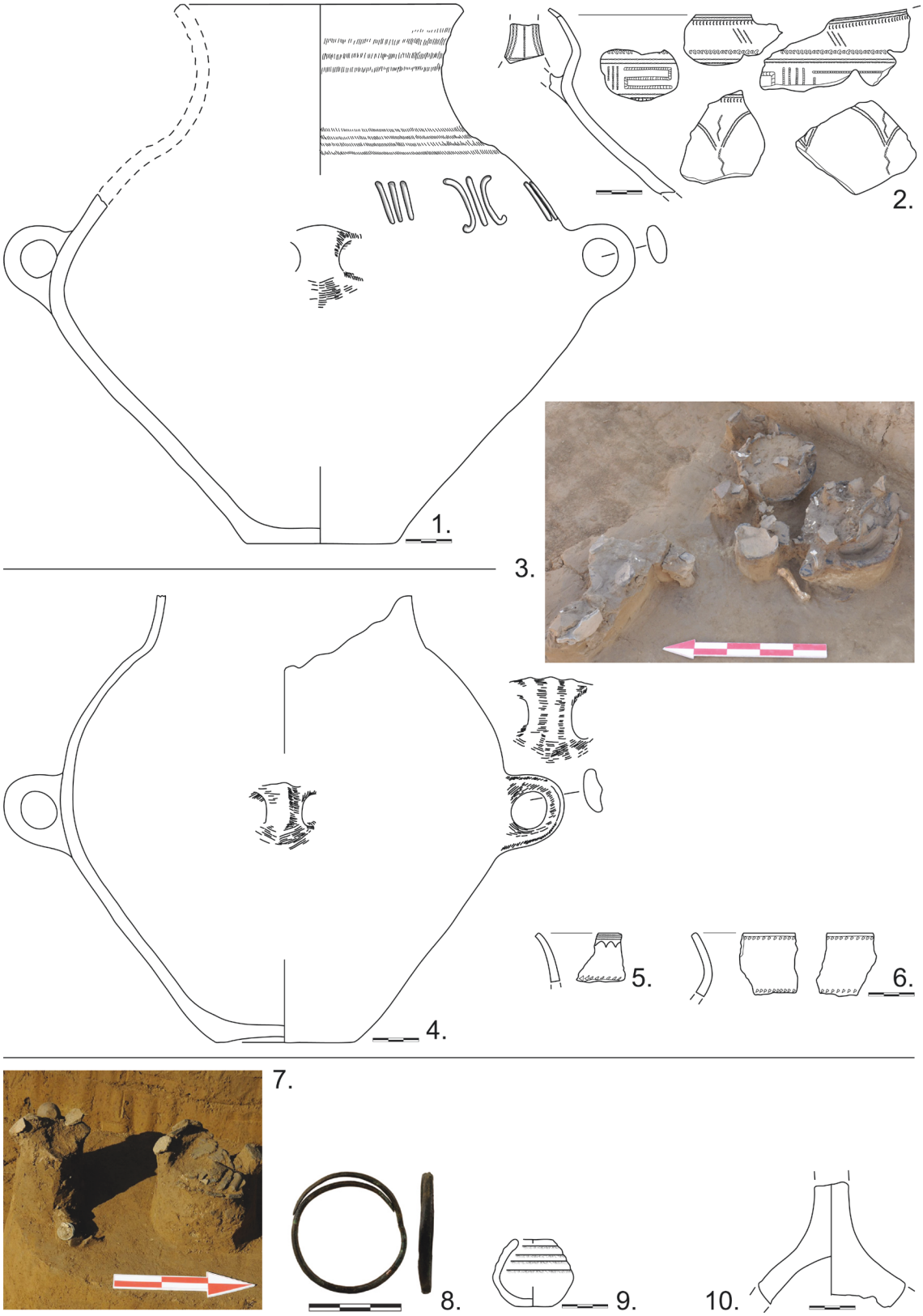

Fig. 3 1. Grave 13, grave urn; 2. Fragment of a dish used to cover the urn; 3. Graves 13 (top left) and 14 (bottom right); 4. Grave 14, a burial urn; 5–6. Fragments of two dishes, probably covering the urn; 7. Grave 43 (right); 8. A bronze bracelet; 9. Small grave urn; 10. Fragments of a lid (?) (photos and drawings: S. Alexandrov, G. Ivanov)

The pottery assemblage from six graves connects them to the horizons III–II on the settlement site, which should be dated to the final phase of the Encrusted Pottery Culture. Two of these graves are published together with two AMS radiocarbon dates (1440–1200 calBC and 1430–1230 calBC).[23] The two-handled pots (kantharoi) find parallels in the Orsoia necropolis[24] and in grave 11 of the Zimnicea necropolis.[25] The undecorated vessels, but also the forms of the decorated ones, find analogies within a broad region of the Balkans, including in the so-called Zimnicea-Plovdiv pottery style.[26] Similar forms have also been found in the Vajuga-Pesak necropolis[27] and in Vajuga-Korbovo.[28]

The decoration of burnished parallel stripes or shallow grooves, also attested within the graves of this group, is typical of the Encrusted Pottery Culture pottery assemblage.[29] In this set of graves, and in the assemblage of the above-listed horizons on the settlement site, urns with shallow flutes (Fig. 3.1) coexist with encrusted dishes, used as their lids (Fig. 3.2). The co-presence of round and square pots/cups (kantharoi) and the presence of certain new forms – like the biconical jars (amphorae), etc. – are usually associated with the Bistreț-Işalnița cultural group.[30] The graves from this phase confirm the proposed synchronicity between the final phase of the Encrusted Pottery Culture and the pottery from the Bistreț-Işalnița Group.[31] The AMS radiocarbon dates from those two graves, as well as artefact comparanda, make possible their dating, and respectively, the dating of the settlement horizons III–II at the settlement site, to the 14th – the first half of the 13th century BC. The chronological position of these graves, and our analysis, allow us to place the onset of the so-called Bistreț-Işalnița pottery style as early as the 14th century BC.

Four graves stand out from the ones typical of the period. One of them is already published.[32] Jars with markedly biconical body profiles, an out-turned rim and four pairs of knobs upon the maximum diameter are utilized as urns in the other three graves. The form becomes the prevalent one in the later phase. The urns are covered with deep bowls. The entire exterior surface of the bowls is covered with incised and encrusted designs, well-known from the Žuto Brdo-Gârla Mare pottery assemblage, where these are usually widely spaced, while here they cover the entire surface densely. Similar grave complexes are found in the Hinova[33] and Balta Verde[34] necropolises.

Physical Anthropology Data

We have no osteological data from the ‘grave no. 0’ feature, although it is quite possible that the jars contained cremated remains. Most commonly, the remains of one individual were placed in a single urn, but there are instances of up to three individuals placed in a single urn. In one instance, the remains of a single individual were placed in two urns. The remains placed in one urn belong to individuals from the entire age spectrum, from *infans* to *adultus+*, while the collective graves contain *infans* coupled with *adultus*.

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23 Grave 10 (Alexandrov et al. 2016, 447, fig. 4.a) with the date SUERC-63831: 3053 ± 32 BP (1440–1200 calBC, 95% confidence) and grave 27 (Alexandrov et al. 2016, 447, fig. 4b–g) with the date SUERC-63837: 3069 ± 32 BP (1430–1230 calBC, 95% confidence), see Alexandrov et al. 2016, 452–453, fig. 9.b, e.

24 Filipov 1976, pl. XIV, fig. 1.2–4, pls. LXIII; LXVIb.

25 Alexandrescu 1973, pl. XI.3.

26 Panayotov – Valcheva 1989, 14.

27 Premk et al. 1984, 114.

28 Krstić 1986, 152.

29 Hänsel 1976, 101–103.

30 Hänsel 1976, 164, pl. 40.1–3; Schuster 2002, figs. 14.2; 17.1–2; Șandor-Chicideanu 2003, pl. 171.4.

31 Shalganova 1995, 298.

32 Alexandrov et al. 2013, 319, fig. 3.

33 Davidescu – Vulpe 2010, 45, figs. 2.1.1; 3.1.2; 15.1.

34 Berciu – Comșa 1956, fig. 47.2.

Grave Inventory

There is only one grave containing just an urn. Three graves, including the accidental find of 'grave no. 0', include inventory (not considering the dishes/lids) – a dish/bowl, two-handled pot (kantharoi), two-handled cups and a fragment of an anthropomorphic figurine. No bronze artefacts have yet been discovered within this group of graves. Animal bones were found in three graves (*Bos taurus* in two and *Sus scrofa dom.* in one).

Area

Two structures (synchronous with Horizon IV) are located about 100m southwest of the main excavation area. Another 10 graves, synchronous with Horizons III–II of the settlement, were discovered in the central sector of the excavated area. The graves are separated by a considerable distance, and it is likely they were arranged in southwest-northeast rows (Fig. 6.2).

3. Late Stage: Late Bronze Age/Early Iron Age (Figs. 3.7–10; 4–5)

This is the best represented phase at the necropolis, with a total of 29 graves.

Urns and Lids

In most graves biconical jars were utilized as urns. The majority of the urns are covered by bowls; only six urns have no lids and are the only item in the grave. In four features large dishes – sometimes more than one – served as urns. Some of the burnt bones are placed in a bowl or a double vessel.

Pottery Characteristics

The most common vessels are the jars with markedly biconical body profiles and out-turned rims, featuring two or four singular or twin knobs attached to the maximum diameter (Figs. 4.5, 10–11; 5.3, 8, 10). Other common shapes include the dish and the bowl (Figs. 4.1; 5.1, 5). These are not always decorated. The decorated ones commonly feature a pair of shallow grooves, arranged in running arcs or festoons; deep grooves, closely spaced (i.e. on the neck of a jar); or oblique shallow or deep grooves on the rim of bowls or dishes and at the maximum diameter of jars, bowls, and double vessels. High-handled pots are infrequent.[35]

Pottery Analogies and Dates

The youngest graves are dated from the end of the Late Bronze to the beginning of the Early Iron Age. They are synchronous with Horizon I of the settlement site. Some of the vessels manifest affinity to the finds of the Bistreț-Işalnița type and to the Vârtop type. A comparable pottery assemblage is recorded at the necropolis from Hinova.[36] Based on the forms and ornamentation of the pottery attested in these graves at Baley, we can propose that the style known as Bistreț-Işalnița gradually evolved into what is known as the Vârtop type. The set of the most recent complexes from the Baley necropolis belong chronologically to the second half of the 13th/the first half of the 11th century BC, which coincides with the chronological frame provided by the AMS radiocarbon dates from two graves (1350–1110 and 1230–990 calBC).[37] The pottery assemblage from

[35] Alexandrov et al. 2013, fig. 4.5.

[36] Davidescu – Vulpe 2010, 58–60, figs. 2, 4, 6, 7.

[37] Grave 21 (Alexandrov et al. 2016, 448–450, figs. 5–6, 7.a–e) with the date SUERC-63832: 3001 ± 32 BP (1350–1110 calBC, 95% confidence) and grave 24 (Alexandrov et al. 2016, 450–451, figs. 7f–g, 8) with the date SUERC-63833: 2915 ± 32 BP (1230–990 calBC, 95% confidence), see Alexandrov et al. 2016, 452–453, fig. 9.c, d.

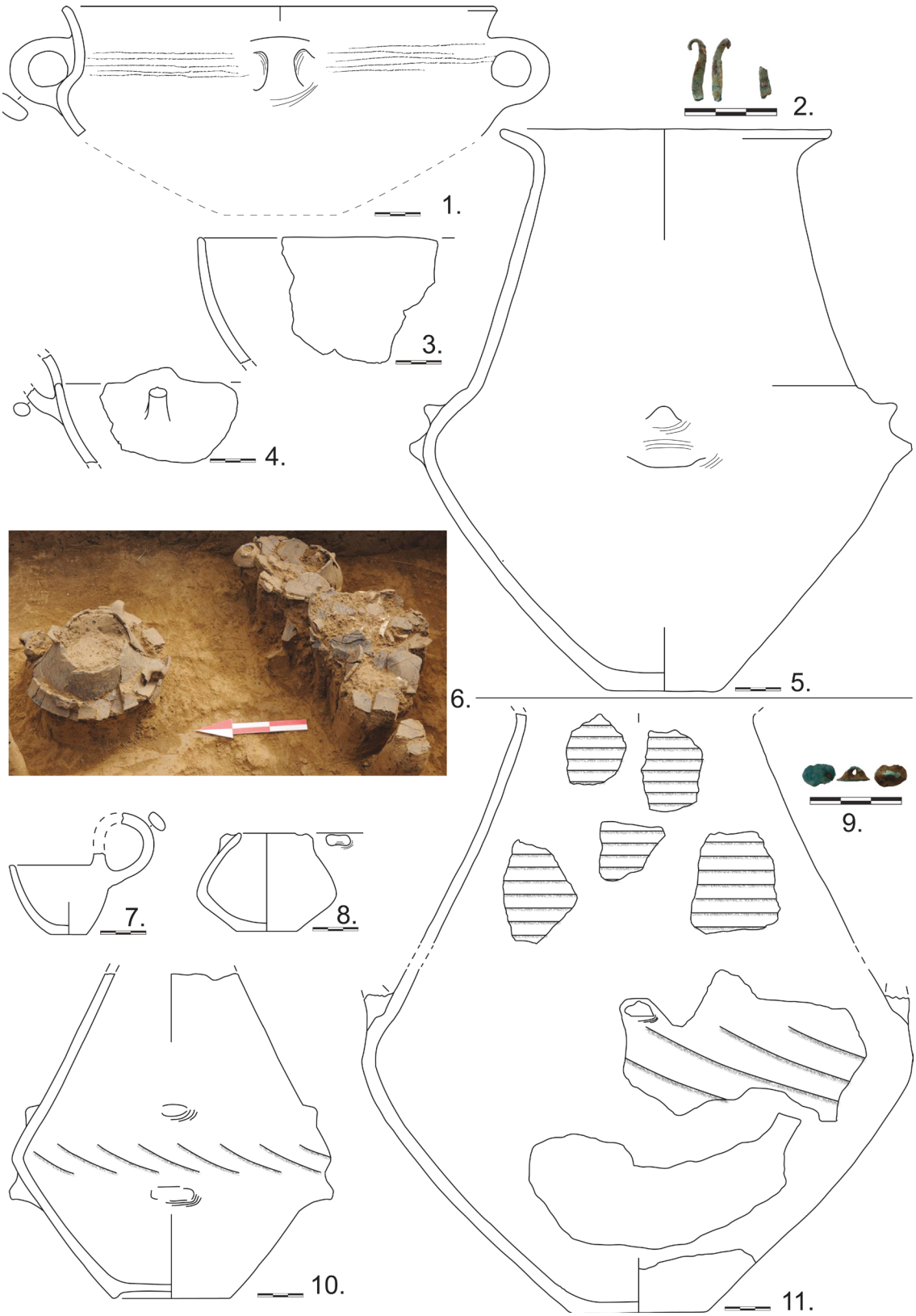

Fig. 4 1. Grave 17, dish covering an urn; 2. Fragments of a bronze adornment (bracelet?); 3. A bowl; 4. A jug; 5. Burial urn; 6. Graves 17 (left) and 18 (right); 7. Grave 18, a jug; 8. Small biconical jar; 9. A bronze button; 10. Biconical jar; 11. Burial urn (photos and drawings: S. Alexandrov, G. Ivanov)

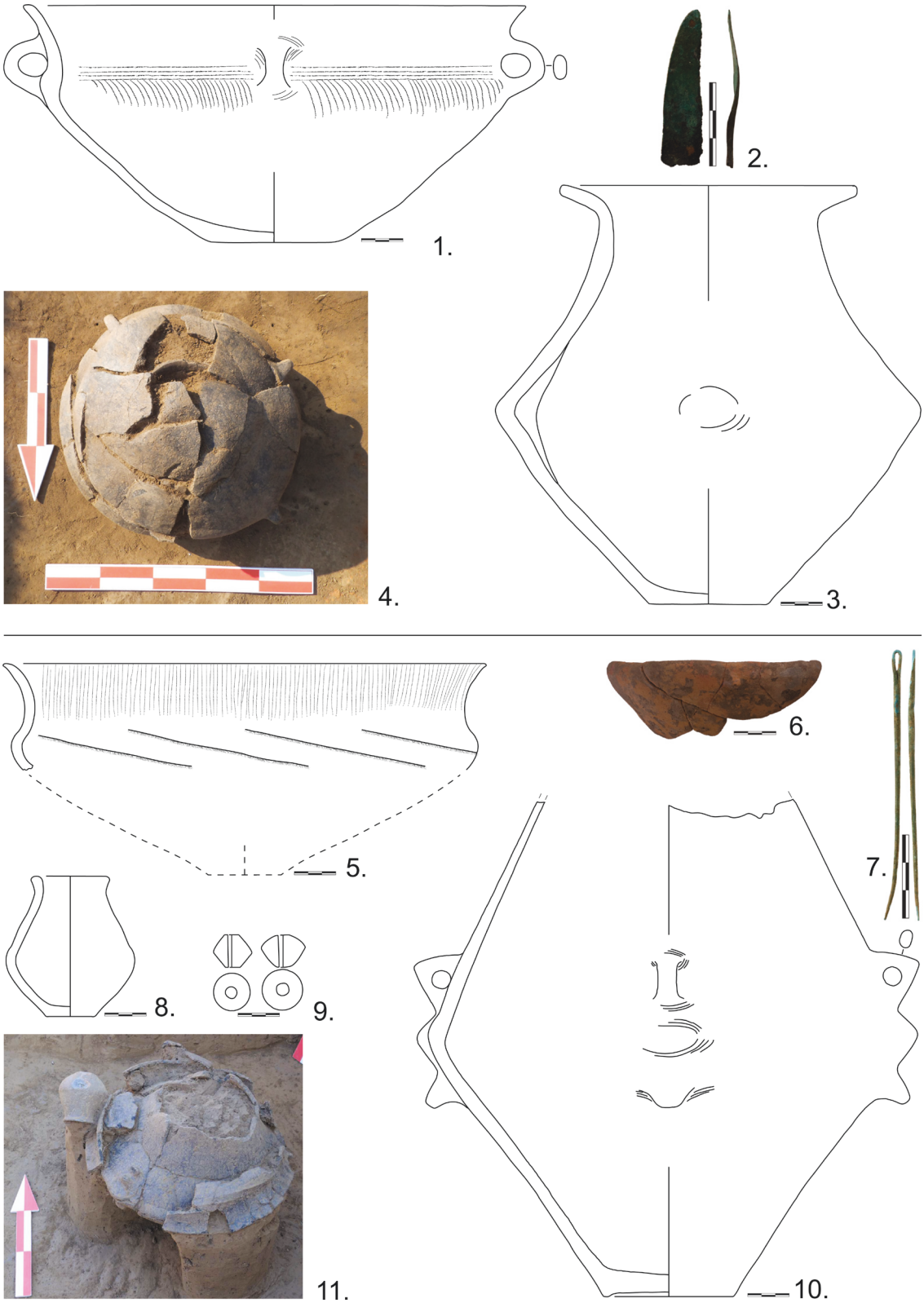

Fig. 5 1. Grave 35, dish used to cover an urn; 2. A bronze knife; 3. Burial urn; 4. Grave 19, a dish used to cover an urn; 6. Small bowl, secondary burning; 7. A bronze needle with eye; 8. Small biconical jar; 9. Two biconical spindle whorls; 10. A burial urn; 11. Grave 17 (photos and drawings: S. Alexandrov, G. Ivanov)

these features,[38] along with the date from one of the complexes, suggests a considerably earlier appearance of the Vârtop phenomenon than was usually assumed, i.e. in the 13th–12th century BC.

Physical Anthropology Data

Typically, the cremated remains are placed in a single urn. In two instances, the remains of two individuals were collected in two separate urns, but within one burial feature. In five instances the remains from more than one individual (up to four) were discovered in the urns – notably in the graves utilizing deep bowls as urns.

The cremated remains include individuals from all age sets. Where more than one individual within a complex (double or collective graves) was found, as a rule, at least one of the individuals is *adultus*, while the rest are *infans* or *iuvenilis*.

Grave Inventory

This phase produced the highest number of vessels – a total of 112 intact and fragmented ceramic containers. The graves often include an inventory; only six contained just the grave urn. Typically, the graves include urns, lids and one or more vessels placed as burial inventory. Five graves stand out, contributing half of the vessels and objects – alongside the urns and the lids there were five, eight, 11 or 14 vessels, and in grave 21, the number of vessels and objects is 22. In two of the graves with the most vessels, nearly the entire range of the pottery assemblage from the period was represented.[39] At least several small cups or bowls display traces of secondary exposure to fire (the funerary pyre) (Fig. 5.6). Biconical spindle whorls (Fig. 5.9) were placed in two urns.

The period is also rich in bronze artefacts. From the graves of the latest phase, including those rich in pottery, come adornments, dress accessories, and tools. Some were placed on the funerary pyre, which distorted them. Intact, well-preserved finds include a needle with eye (found in the urn together with two of the spindle whorls) (Fig. 5.7), a knife (Fig. 5.2), a button (Fig. 4.9), and a bracelet (Fig. 3.8). The button has a flat top and a semicircle for attachment at the back. From the knife, only the short broad blade is preserved. The bronze bracelet deserves special mention. It is made from a thick bronze wire with a quadrangular cross-section and rounded tips, twisted at one and a half revolutions. Its widest diameter (external) is 3.8cm. Artefacts analogous to the knife, button and bracelet are widespread during the Bronze and Early Iron Ages and their shape is not diagnostic. Parallels for the bracelet and the button are found in contexts and collective finds dated from the end of the Late Bronze Age to the beginning of the Early Iron Age in Transylvania, where they are assigned to Hallstatt A1–A2, at Sacoți, Războieni-Cetate, Uioara de Sus, Ungureni II, etc.[40]

Animal bones were found in three graves, all from *Sus scrofa dom*.

Area

In contrast to the graves from the previous phase, the features are now relatively compactly distributed, in the central and southern sector of the main excavation area (Fig. 7.1).

38 Alexandrov et al. 2016, 448–451, figs. 5–8.
39 Alexandrov et al. 2016, 448–451, figs. 5–8.
40 Petrescu-Dîmbovița 1977, pls. 181.10–11; 218.1–2; 274.10–11; 282.13.

Summary

Alongside the internal dynamics, manifest in the individual components of the funerary ritual, the excavated complexes also offer evidence of multidirectional cultural connections, reflected in the archaeological material from the necropolis. The latter connections bear directly upon the interpretation and the cultural association of the individual features.

The burial complexes from the three chronological groups identified demonstrate continuity on the one hand, and on the other, progression, linked to the introduction of new and the extinction of old elements in the funerary ritual.

Early Stage

In the early stage, the practice of using a single type of low-necked globular vessel as urns demonstrates utmost standardization. As an exception, bowls were utilized. Most urns were not covered by a bowl. The covering of the urns with a slab (and likely the placement of second stone nearby) is part of the funerary practice – something only recorded during this period. The forms and the designs are specific to the period, and it does not seem as though they survive into the subsequent phase. Several bowls are the exception, yet their form is atypical. As a whole, a grave inventory is almost absent, with the exception of a small vessel and several bronze artefacts, co-occurring in one context. In all vessels the remains of only one individual were placed. Two graves are cut by graves from the final stage, which demonstrates the great chronological lag between these phases, as well as the absence of recognizable grave markers.

Middle Stage

The vessels utilized as urns are quite standardized (jars with globular body and funnel neck). Urns with and without covers are equally represented – but for the peculiar circumstances of the 'grave no. 0' find. We would like to draw attention to several phenomena differing from the practices representative of the period (urns with or without a lid), exemplified by those registered in the big necropolises at Cîrna and Orsoia. Now, smaller urns began to be employed – small jars and bowls. Conceivably, the small jars from 'grave no. 0' were also used as urns. The practice is also attested in the subsequent phase, but quite infrequently.

The four AMS-dated grave features from this period demonstrate the supplanting of one pottery style with another. Their forms are of the kind which becomes the standard in the subsequent phase, but the covering bowls feature designs known from the Žuto Brdo-Gârla Mare pottery assemblage. The inclusion of vessels representative of different periods within the same grave feature demonstrates the gradual change and the continuity in the usage of specific vessel forms. Furthermore, their location is likewise intermediary between the graves from the middle and the late phase, and points toward the link between the phases.

Grave inventory occurs more often, but compared to the subsequent phase it is attested in smaller numbers. We believe that one of the reasons for the absence of richer complexes is that we are prevented from opening larger areas for excavation. However, their existence is demonstrated convincingly by the rich vessel assemblages in the so-called grave no. 0, as well as by the phase-diagnostic small vessels, flint and stone tools, and anthropomorphic figurines, found between the grave features.

From this phase onwards the use of a single urn for the remains of up to three individuals, as a rule *infans* in combination with *adultus*, becomes common. In the instances of small vessels utilized as urns, these were receptacles for submature individuals (*infans* and *subadultus*).

Late Stage

The urn containers of this phase are also standardized – biconical jars with emphasized sharp carination; however, in the graves the form is also attested as part of the grave inventory (Fig. 4.10). Within the same group of graves, other types of jars or dishes were utilized as urns as well. Beyond Baley, for the preceding phase, the practice of placing the bones in such vessels is documented at the necropolis of Vajuga-Pesak.[41]

The most common form is the biconical jar with marked carination and with double lugs. Also common are bowls without handles and dishes; bowls with high handles raised above the rim, cups and jugs with high handles are rarer. Decoration is the diagnostic trait of this phase. It consists of depressions or shallow grooves, arranged sparingly. The designs are distinctive, the most widely attested of which include parallel lines and conjoined arches or garlands. It might derive from the pottery decoration that was typical for the preceding period, when, however, the emphasis was on incision and white inlay. During this phase, for the first time, we see the deep, very densely grouped grooves, e.g. on the neck of a jar (Fig. 4.11),[42] as well as oblique shallow or deep flutes upon the rim of bowls or dishes (turban dish)[43] and upon the maximum diameter of the two-handled bowls,[44] jars,[45] bowls,[46] and the double vessels.[47]

During this stage, the graves often include grave inventories, vessels and bronze items, sometimes in large quantities.

In most graves, the cremated remains are placed in a single urn. The practice of placing the remains of more than one individual in one or more urns carries on from the previous phase. All age sets are represented in the remains. As a rule, when several individuals were interred within one complex, at least one of those is an *adultus*, and the rest are *infans* or *juvenilis*.

Conclusion

We reviewed the documented dynamics of the cultural characteristics and the components of the funerary ritual pertaining to the three chronological groups of graves. The funerary ritual attested in the Middle Bronze Age graves suggests standardization, manifest in the type of vessels utilized as urns, their quantity in the grave, the inventory, and the number of interred individuals. The funerary ritual documented in the Late Bronze Age graves is slightly more variable, and this tendency towards variability is most evident in the latest stage of graves.

Continuity between the earliest and the subsequent graves is difficult to spot. It is challenged by the recorded destruction of some graves belonging to the early phase by internments dated to the last phase. Furthermore, the nearby settlement lacks documented structures and materials, which could be linked to the early phase of the necropolis. Similarly, the pottery forms and the bronze artefacts from these Middle Bronze Age contexts are markedly different in terms of style, ornamentation and cultural association.

Considerably more demonstrable is the continuity and the dynamic within the complexes belonging to the second half of the 2nd millennium BC. The graves containing sharply biconical jars with four pairs of knobs on the belly, very often covered with deep ornamented bowls, appear during the Late Bronze Age and remain in use into the first years of the Early Iron Age. They represent a link between the phases Žuto Brdo-Gârla Mare and Vârtop.

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41 Premk et al. 1984, 112, 114, figs. 87, 100; Alexandrov et al. 2013, 322.
42 Alexandrov et al. 2016, fig. 5.a.
43 Alexandrov et al. 2016, figs. 5.a–d, f–g, k; 7.f.
44 Alexandrov et al. 2016, fig. 8.c.
45 Alexandrov et al. 2016, fig. 5.d–e.
46 Alexandrov et al. 2016, fig. 5.i, l.
47 Alexandrov et al. 2016, fig. 7.g.



Fig. 6 1. Location of the graves from the early stage; 2. Location of the graves from the middle stage (drawings: G. Ivanov)

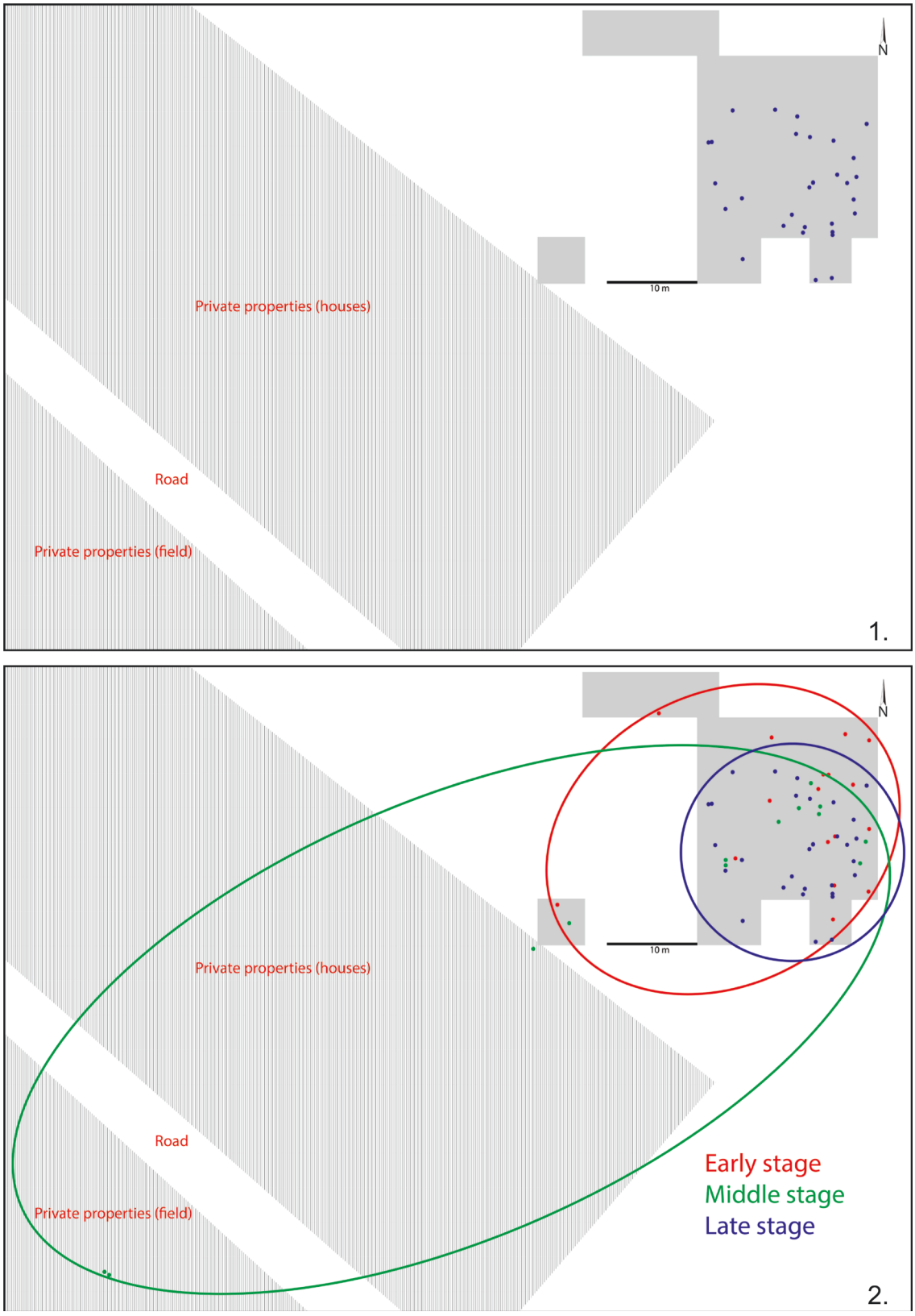

Fig. 7 1. Location of the graves from the late stage; 2. The graves from all three stages (drawings: G. Ivanov)

Similar dynamics are observed with regard to the placement of a rich inventory in the grave complexes. In the early phase, the graves have no inventory, with the exception of one grave with several bronze objects. At the beginning of the middle phase, there are still no graves with rich inventories, but this gradually changes over time. Rich graves with numerous vessels and artefact offerings become common in the final phase.

Another dynamic trait is the number of individuals per grave. The placement of burnt bones from more than one individual in one or several urns is first introduced in the middle phase and is carried on into the subsequent phase. From the preceding stage, the practice of placing the remains in small containers continues, but as an exception (Fig. 3.9). Sometimes the type of vessel used as an urn is also different.

Faunal remains are included as part of the burial practices only in the graves from the middle and the late phases.

The dynamic is also documented in terms of the spatial evolution of the necropolis and its links to the prehistoric settlement. From the location of the graves from the different periods we can infer that the majority of the graves from the early stage are grouped in the eastern sector; some are disturbed by the graves from the last stage (Fig. 6.1). The settlement associated with these graves remains unknown. During the middle stage, the graves are in the west and southwest sectors and occupy a vast area (Fig. 6.2). Today the sector is occupied by the modern residences and estates. The prehistoric settlement also dates to this period. During the final period, the graves do not overlap with those from the preceding period. They occupy the eastern sector of the necropolis and gradually move away from the graves of the preceding phase and from the settlement (Fig. 7.1). At present, this is the most exhaustively excavated area of the necropolis.

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Late Bronze Age Pottery in the Eastern Rhodope Mountains

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Abstract: This paper is based on the pottery accumulated by the excavations of three systematically studied Late Bronze Age sites in the Eastern Rhodope Mountains – Ada Tepe, Kush Kaya and Dragoyna. Their stratigraphy and radiocarbon data allow us to determine three general periods within the Late Bronze Age: 15th century BC, 14th–13th century BC and 12th century BC. The paper aims to identify some of the basic features of the pottery complexes of the first two periods and briefly to point out some of the tendencies in the third one. The complex develops naturally, as the new elements are incorporated into the traditional environment. The 15th-century assemblage appears in the region as a developed set of technological groups, categories and decorative schemes, which cover the needs of the everyday household activities. In the 14th–13th century BC, some new forms in the categories of kantharoi, cups and bowls, such as some elements in the plastic decoration, appear. After the end of 13th century, some new features in the complex are established, which become typical for the pottery complex of the subsequent Early Iron Age.

Keywords: Eastern Rhodope Mountains, Late Bronze Age, pottery complex, chronological development

The research on the Late Bronze Age pottery from the Eastern Rhodope Mountains has a long history. More than a hundred years of fieldwork (about 200 sites registered – settlements, sanctuaries or undetermined)[2] and processing of find material has led to the accumulation of an enormous amount of data. The current task is to identify clearly the chronological development of the complexes excavated and stored in the museum's depositories. Only a few of the sites discovered in the region (13 for both parts of the Rhodope Mountains) have been systematically studied and even fewer provide pottery complexes from features and layers with clear stratigraphic observations and radiocarbon data (Fig. 1).

The publication of the material found follows several tendencies: presentation of specific Late Bronze Age pottery complexes from particular sites[3]; description of the Late Bronze Age pottery characteristics from a wider region;[4] and including the pottery analysis in the general research of the cultural development of the area.[5] The publications lack precise chronological analysis of the complexes, based on radiocarbon dates (at least in the case of the Late Bronze Age). The recent research, based on accurate stratigraphy connected with the radiocarbon data of several sites in the Eastern Rhodope Mountains[6], provides the opportunity to distinguish some elements of the pottery complex in terms of chronology. This paper presents information from three hilltop settlements investigated by large-scale excavations and with a good amount of accumulated data and pottery.

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[2] Dimitrova 2015, 29, map 1.

[3] Dremsizova-Nelchinova 1984; Leshtakov 1990; Dimitrova 2009; Bozhinova et al. 2013; Nikov 2016; Nikov 2017.

[4] Nekhrizov 1995.

[5] Borislavov 1999; Nekhrizov 2005; Dimitrova 2015.

[6] Popov 2016; Horejs 2017, 206, n. 2; Popov 2017a, 61–62; Popov et al. 2017, 192, n. 22.

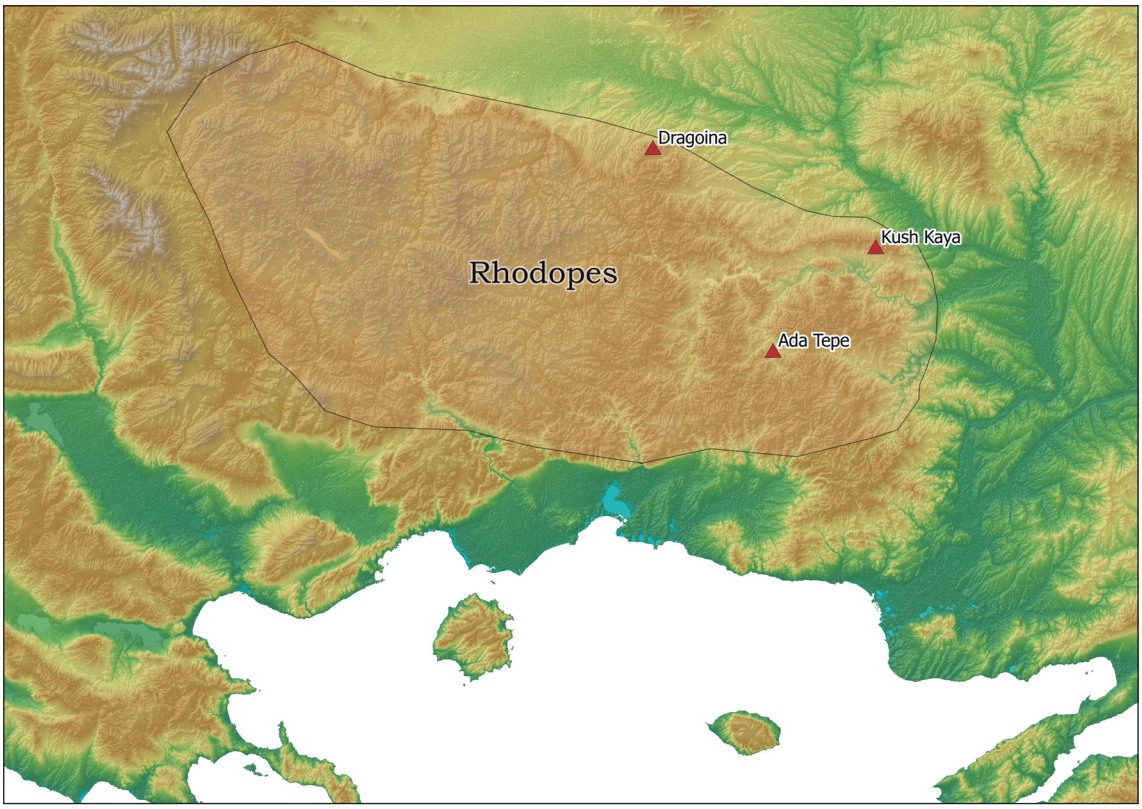

Fig. 1 Locations of mentioned sites (Y. Dimitrova)

Ada Tepe:[7] The pottery complex comes from the excavation of two settlements: one on the northern and northeastern slopes of the ridge[8], and the other on the top sector. The northeastern settlement consists of single-layer structures (identified as houses in two rows next to a wall) from the first half of the 15th century BC. The second settlement reveals a more complex situation with features of several layers, dated from the 15th to the 12th century. To the 15th century BC belong a few negative features (nos. 11 and 13N), two small pits (in Sq. G11/29 and Feature no. 9A) and a partially preserved small dwelling (Feature no. 21). To the mid-14th–13th century are dated a few dwellings (features nos. 1/2018; 10, 22; 3A), features with a non-residential purpose (storage facilities? – features nos. 12, 18, 1A, 6A and 6B; workshops (?) – Feature no. 17), some of them dug into the terrain (Feature no. 12).[9] Some preliminary observations are made on the material coming from several later features from the 12th century BC (features with a non-residential purpose, of smaller – nos. 9, 9B – or bigger size – nos. 1, 2 and 6).

Kush Kaya:[10] The pottery that covers the time span between the early 15th and the late 13th century BC comes from two areas, where houses, situated in terraced lines, one above the other, are located at the southern foot of a large cliff. In Sector I, two construction horizons are investigated: House no. 2, dated to the 15th century BC (existed for several decades) and houses nos. 1 and 3, dated to the second half of the 14th to the end of the 13th century BC. In Sector II, House no. 4 is dated to the second construction horizon of Sector I.[11]

7 Nekhrizov 2003; Nekhrizov 2006; Popov – Iliev 2006; Nekhrizov 2007; Popov – Jockenhövel 2011; Popov et al. 2011; Popov – Nikov 2012; Popov – Nikov 2013; Popov – Nikov 2014; Popov et al. 2015; Popov 2017a; Popov 2017b; Popov – Jockenhövel 2017; Popov – Nikov 2018; Nikov et al. 2018; Popov et al. this volume.

8 Horejs 2017; Popov et al. 2017.

9 Popov – Nikov 2013, 118; Popov – Nikov 2014, 118–119.

10 Popov 2006; Popov 2009; Popov 2016; Popov et al. 2018.

11 Popov 2016, 433–434.

Dragoyna:[12] The pottery comes from a structure (context 'L') situated on the big culmination (Golyama Dragoyna peak). The feature represents a floor level of a dwelling, placed on a natural rock setting levelled with stones and soil. Based on the imports discovered, the structure is dated to the Late Helladic IIIA1 period (early 14th century BC).[13]

Certain risks exist when a comparison of the materials from different sites is made. Despite the local specifics, however, the general observation of the pottery from these sites shows that the sites in the region of the Eastern Rhodope Mountains follow similar or very close tendencies and can be considered as a specific unit.

Thanks to the recent excavations, several phases within the Late Bronze Age pottery complex can be distinguished, as the periods are identified based on the settlement stratigraphies and the related modelled ^{14}C dates. The earliest settlement structures of Ada Tepe are located on the northern and the northeastern slopes;[14] later the settlement was moved to the top sectors, all within the 15th century BC.[15] In Kush Kaya, the 15th century BC is also represented by a separate construction horizon. Based on these two sites, it is reasonable to place the first period of the pottery development in the 15th century BC. The drawings of the vessels in the figures from the earliest settlement of Ada Tepe are distinguished from the ones coming from the other 15th-century structures.[16] The next period, based on stratigraphic and radiocarbon data, falls within the range of the 14th and 13th centuries BC. The pottery from Ada Tepe comes from several features with very complicated stratigraphy and dates which cover the entire period; for Kush Kaya it is from construction levels, dated to the second half of the 14th and covering the entire 13th century BC. In the case of Dragoyna, the information about the date of the Late Bronze pottery complex is not so precise. It is based on the date of some imported vessels and falls in the time after the beginning of the 14th century (as a terminus post quem), but based on its specific features, it probably does not go beyond the end of 13th century BC. From the 12th century BC, some new elements appeared in the pottery complex of the Rhodope Mountains, which became typical for the following Early Iron Age.

Usually the systematic pottery processing begins during the archaeological campaigns and continues long after their end. It is based on the statistical analysis of its specific features – function, technology, shape and decoration – taken together with the data on the stratigraphy of the features and layers in which the items were uncovered.[17] For example, the pottery processing of the Ada Tepe complex is based on all the material found in features with a stratigraphic position and interpretation. Until 2019, 61,112 sherds were statistically processed for the Top Sector, of these, 43 were entirely preserved profiles or whole vessels, and 7439 (or 12.17%) characteristic sherds. 9.76% of all processed sherds were identified by category. The vessels and sherds were separated according to the features, contexts and layers determined by the excavators. After the restoration work that took place in 2015–2017, the vessels and fragments from a structure were arranged on a working field and divided into ware groups. Five of these were identified (with 39 subgroups) based on the character and concentration of the inclusions, the wall thickness, firing and fracture, and the wall surface (colour, treatment of the outer surface and presence or lack of coating). These groups are: thick-walled vessels (5 subgroups); coarse ware (12 subgroups); medium group (12 subgroups); and fine ware (9 subgroups). The formative characteristic is based on whole vessels, entirely preserved profiles and mouth sherds and involves the following levels:

12 Bozhinova et al. 2013; Bozhinova 2014; Jung et al. 2017, 270–271; Bozhinova – Andonova 2018.
13 Bozhinova et al. 2013, 67–77, Jung et al. 2017, 271–273.
14 Horejs 2017; Popov et al. 2017; Burkhardt this volume.
15 Popov et al. this volume.
16 Popov et al. this volume.
17 Hochstetter 1984, 29–37; Shepard 1985; Leshtakov 1988; Orton et al. 1993; Stoyanov 1997, 50–51; Horejs 2007, 48–74; Gotzev – Bozhinova 2008, 5–76; Nekhrizov 2008, 114–115, 121–122; Horejs et al. 2010; Dimitrova 2014, 9; Horejs 2017, 209–210; Popov et al. 2017, 189.

category – form – type – subtype – variant.[18] The vessels are grouped into categories according to their function. As already mentioned in the literature, functional interpretation of the Late Bronze Age ceramic vessels from the region can only be based on morphological, technological and contextual evidence, as content analyses have not (yet) been carried out.[19] For the fine ware, these are vessels hypothetically used for drinking (cups in four forms and kantharoi in three forms; when the material is heavily fragmented, the sherds are placed in a specific category – cups/or kantharoi); for serving (jugs in three forms), for storage (amphorae in two forms) and for the consumption of food (bowls in five forms). The coarse ware is mainly represented by vessels for food preparation – jars (in five forms) and baking trays (one form). The group for long-term storage of products is represented by big vessels with thick walls and precise surface treatment (three forms) and by big vessels which morphologically relate to the category of jars, but are of a bigger size (mouth diameter bigger than 35–40cm and wall thickness over 1.5–2cm), in three forms.[20] Two are categories with disputable or unclear function – the double vessels and the miniature vessels. The categories are named after analogous antique or modern vessels presumed to have a similar purpose.[21] The decorative characteristic follows the method of its implementation – plastic (plastic bands, knobs, buckles, buttons), *Furchenstich* (13 groups of motifs detected so far for Ada Tepe), *Kerbschnitt*, pricking (small indentions made by a finger or punctures with a sharp instrument), or incised.

As the work with pottery assemblages from Ada Tepe and Kush Kaya is still in process,[22] the observations on the chronological development of the assemblage are also preliminary. The forthcoming publication of the detailed analyses of the pottery complexes could, of course, refine or change some of the details or conclusions.

The 15th-Century BC Pottery Complex

The earliest chronologically Late Bronze Age pottery complex has no Middle Bronze Age background in the region of the Eastern Rhodope Mountains. However, some forms from the eastern Balkans are dated to this period,[23] which allows us to search for the most probable prototypes of the Late Bronze Age pottery in this direction. Another argument is the existence in the Middle Bronze Age of a well-developed pottery set which covers the technological groups and forms necessary for the everyday life of the household.[24] Observations on the representative material from the earliest structures lead to the conclusion that vessels for storing products (or big storage vessels) and liquids (amphorae, of smaller size) predominate.[25]

The big storage vessels (Fig. 2.1–7) are of two technological groups: the first one (Fig. 2.1–2, 5–6) is made of semi-fine ware, with medium-sized grains in high concentrations in the clay

18 See n. 17.

19 Horejs 2017, 215. For the only publication of a content analysis of a vessel from Kush Kaya see Popov et al. 2018. The author correctly points to this single example as a confirmation of the theoretical functional analyses, based on morphological and technological observations of the pottery assemblages.

20 Dimitrova 2014, 9.

21 Leshtakov 1988, 6; Nekhrizov 2008, 115; Dimitrova 2015, 111–114 with references.

22 Part of the pottery assemblage is being statistically processed by the project "Bronze Age Gold Road of the Balkans. Ada Tepe Mining: Producers and Consumers" (PI: B. Horejs), funded by the Austrian Science Fund (FWF) and is a part of the PhD thesis of Laura Burkhardt (Burkhardt 2020); the full publication of the results of pottery processing campaigns from 2017–2020 is forthcoming; the publication of the results of pottery processing of Kush Kaya is forthcoming.

23 Leshtakov 2002; Leshtakov 2015.

24 '… stable and functional profiled ensemble of shapes' (Nikov 2017, 63).

25 Nikov 2017, 65; Popov et al. 2017, 189. Similar observations (prevalence of vessels for storage of foods and liquids) were made on the pottery complex from the northeastern settlement, e.g. House 7 (Horejs 2017, 205) and houses 5 and 9 (Burkhardt this volume).

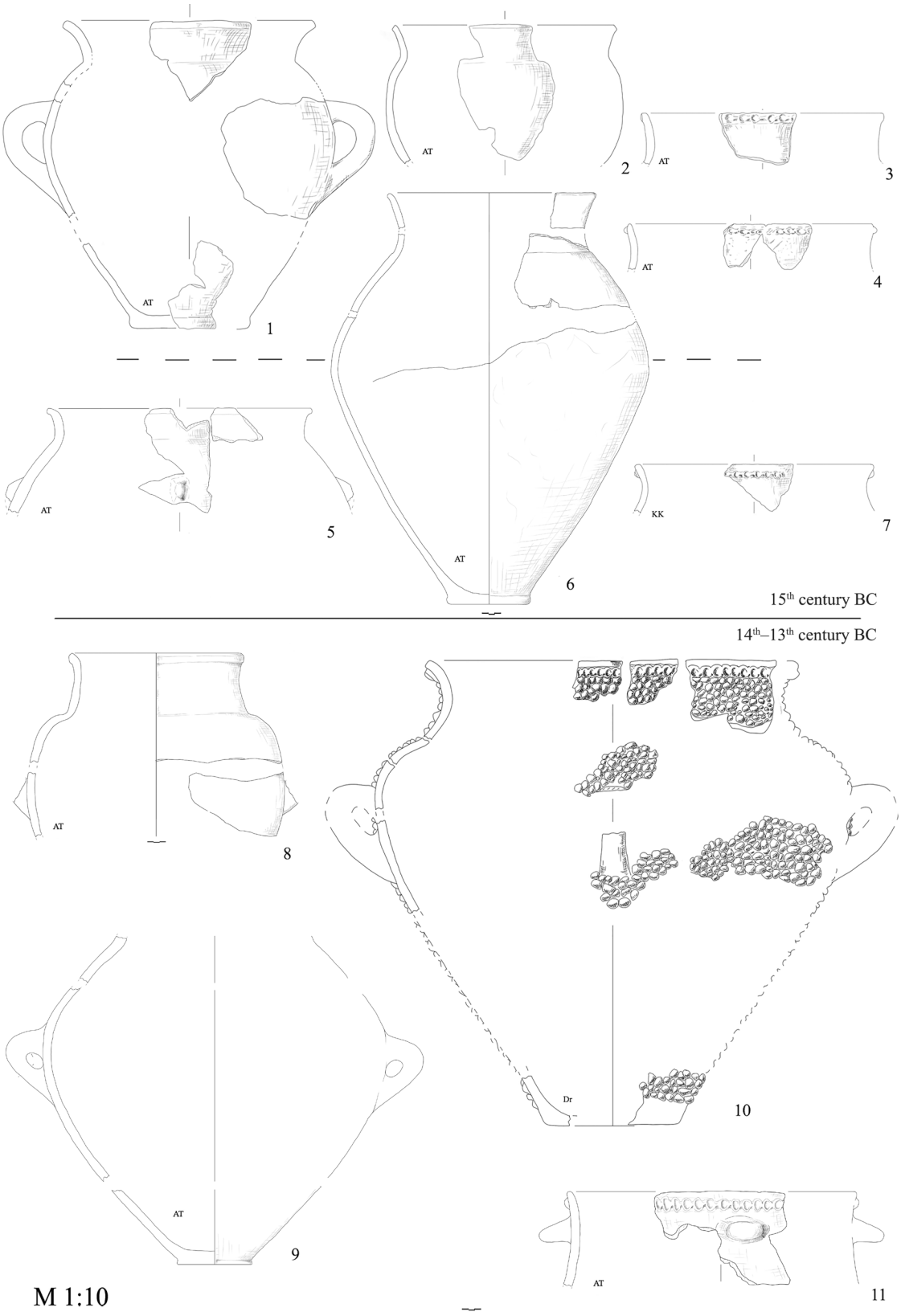

Fig. 2 Storage vessels, 15th century BC: 1–2. Ada Tepe, Sector I7, House 2; 3. Ada Tepe, Sector I7, House 4; 4. Ada Tepe, Sector I7, House 9; 5. Top Sector, Feature 11; 6. Ada Tepe, Top Sector, dwelling, Feature 21; 7. Kush Kaya, Sector II. 14th–13th century BC: 8. Ada Tepe, Top Sector, Feature 17; 9, 11. Ada Tepe, Top Sector, Feature 3A; 10. Dragoyna. Scale 1:10 (1–4 after Popov et al. 2017, figs. 14.6, 16.5, 19.1–2; 5, 9, 11 after Popov et al. this volume; 6, 8 unpublished, excavations of H. Popov and K. Nikov; 7 unpublished, excavations of H. Popov; 10 after Bozhinova 2014, 74, fig. 12.2)

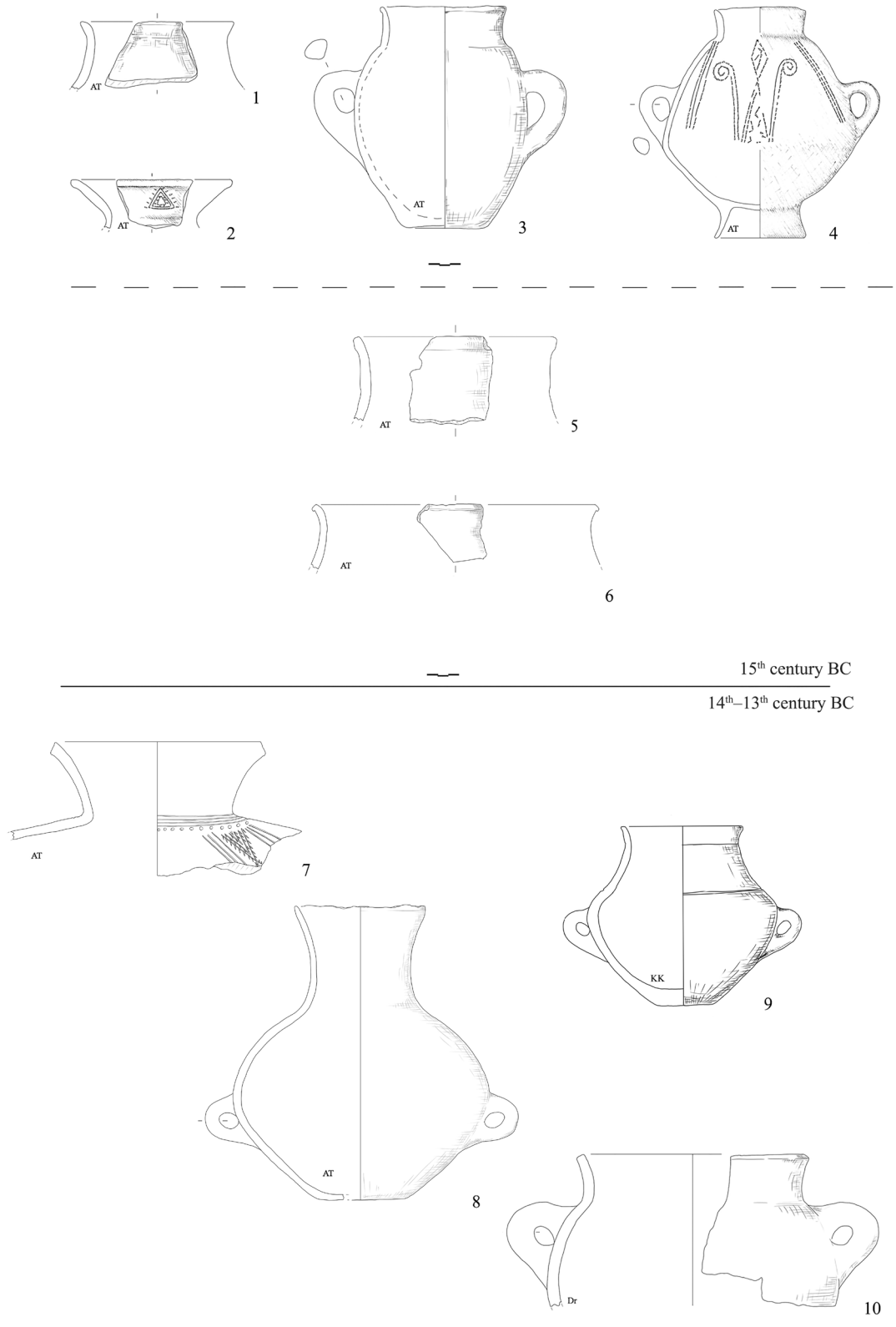

Fig. 3 Amphorae. 15th century BC: 1. Ada Tepe, Sector I7, House 6; 2. Ada Tepe, Sector I7, House 2; 3–4. Ada Tepe, Sector I7, House 5; 5–6. Ada Tepe, Top Sector, Feature 11. 14th–13th century BC: 7. Ada Tepe, Top Sector, Feature 18; 8. Ada Tepe, Top Sector, Feature 6A; 9. Kush Kaya, Sector I; 10. Dragoyna, dwelling 'context L'. Scale 1:6 (1–4 after Popov et al. 2017, figs. 14.3, 19.4, 21.1, 3; 5–6, 8 after Popov et al. this volume; 7 unpublished, excavations of H. Popov and K. Nikov; 9 after Popov 2009, fig. 10; 10 after Bozhinova et al. 2013, pl. 2.9)

paste and a precisely smoothed surface (in some cases covered with a thick coating) and thick walls. The surface colour varies within the beige and brown range. The vessels have an open, funnel-like mouth, a semi-spherical or ovoid body or else show high shoulders and a conical lower body. Similar in technological and formative features are the vessels from this category from the Western Rhodope Mountains (although there they lack ^{14}C dates)[26] and further to the west, from the same[27] and later periods of the Late Bronze Age[28]. The second technological group (Fig. 2.3–4, 7) comprises vessels which match the technological, formal and decorative features of the jars, but are of a bigger size (mouth diameter bigger than 35–40cm and wall thickness over 1.5–2cm).

The amphorae (Fig. 3.1–6) belong to the fine and medium ware group, with small grains in the clay, light to dark-brown colour and a well-burnished surface. They were probably used for short-term storage of liquid products[29] and are characterized by a narrow, funnel-like or cylindrical mouth, conical or cylindrical neck, clearly marked transition to the ovoid or biconical body (usually by thickening of the wall where the different parts of the vessel were connected) and a flat bottom or hollow, conical pedestal. Their features are typical for the Late Bronze Age, and vessels with similar profiles are widespread in the regions east of the Vardar-Morava line.[30] The biconical form of the body of some of the vessels can be identified as a specific local feature of Ada Tepe for both periods.

The sizes and profiles of the jugs vary significantly. There are three groups in this category: the first one (Fig. 4.1–2) combines vessels which share certain profile characteristics with other categories (e.g. spherical kantharoi – Fig. 4.1 – or shallow s-shaped cups – Fig. 4.2); the second one is deep vases with a wide neck (Fig. 4.3), and the third one, deep vessels with a narrow neck which vary in size (Fig. 4.4–6). The common feature for all of the vessels is the oblique mouth rim, which makes them uncomfortable for drinking but suitable for pouring liquids. Some of them are made of fine clay with a smoothed surface and coating, while the colours range from brown to grey; a few are decorated with the *Furchenstich* technique. Single vessels with an oblique mouth rim belong to the technological group of the kitchen (coarse) ware. The deep jugs with a wide or narrow neck/mouth continue their development in later contexts of Ada Tepe and some types are common for the Upper Thracian Plain, the Mesta River valley[31] and the area north of the Balkan mountain range (Stara Planina).[32] The tradition for producing shallow vessels with an oblique rim in the Rhodope Mountains continues to the Early Iron Age.[33]

It is difficult to distinguish the cups and kantharoi only on the basis of fragments with no preserved handles. Still, there are some examples from the earliest Late Bronze Age contexts (Fig. 5.3, 6–7) that allow the basic shapes to be determined. Both categories are vessels for the consumption of liquids or ones for short-term storage of small quantities of liquids. They belong to the tableware group and are usually made of fine clay, in some cases decorated with the *Furchenstich* technique. The smaller cups have an elongated s-shaped profile (Fig. 5.2), or conical (Fig. 5.5) or cylindrical (Fig. 5.1, 4) form. The kantharoi (Fig. 5.3, 7) have an s-shaped profile, cylindrical or conical neck/mouth, spherical body and two high handles (often with a triangular

[26] Babyak, excavations by A. Gotzev and Y. Dimitrova in 2010 (Gotzev – Dimitrova 2011); Dimitrova 2014, 10, 12–13, fig. 6.

[27] Horejs 2007, pls. 31, 33–34, 42, 45–47.

[28] Andreou – Psaraki 2007, 410, fig. 12KA 105.

[29] Hochstetter 1984, 48; Wardle 1997, 452; Nekhrizov 2008, 118.

[30] Hochstetter 1984, 38–48; Kisyov 1993, 3, figs. 3a, 8б; Stefanovich – Bankoff 1998, 302, fig. 29; Georgieva 2003, 160–161; Alexandrov et al. 2007, 378, pl. 4g; Horejs 2007, 153–159; Bozhinova et al. 2013, pl. 2.

[31] Profiles of the deep vessels with narrow and wide necks can be seen in the Plovdiv complex (Detev 1964, 68, fig. 4а–б) and in Koprivlen, second building horizon (Alexandrov 2002, 330, fig. 15.5).

[32] Zimnicea (Alexandrescu 1973, 94, pl. IX.11–19; Hänsel 1976, pl. 11.7, 9).

[33] Nekhrizov 2008, tabs. 3.2–4; 6.8–9.

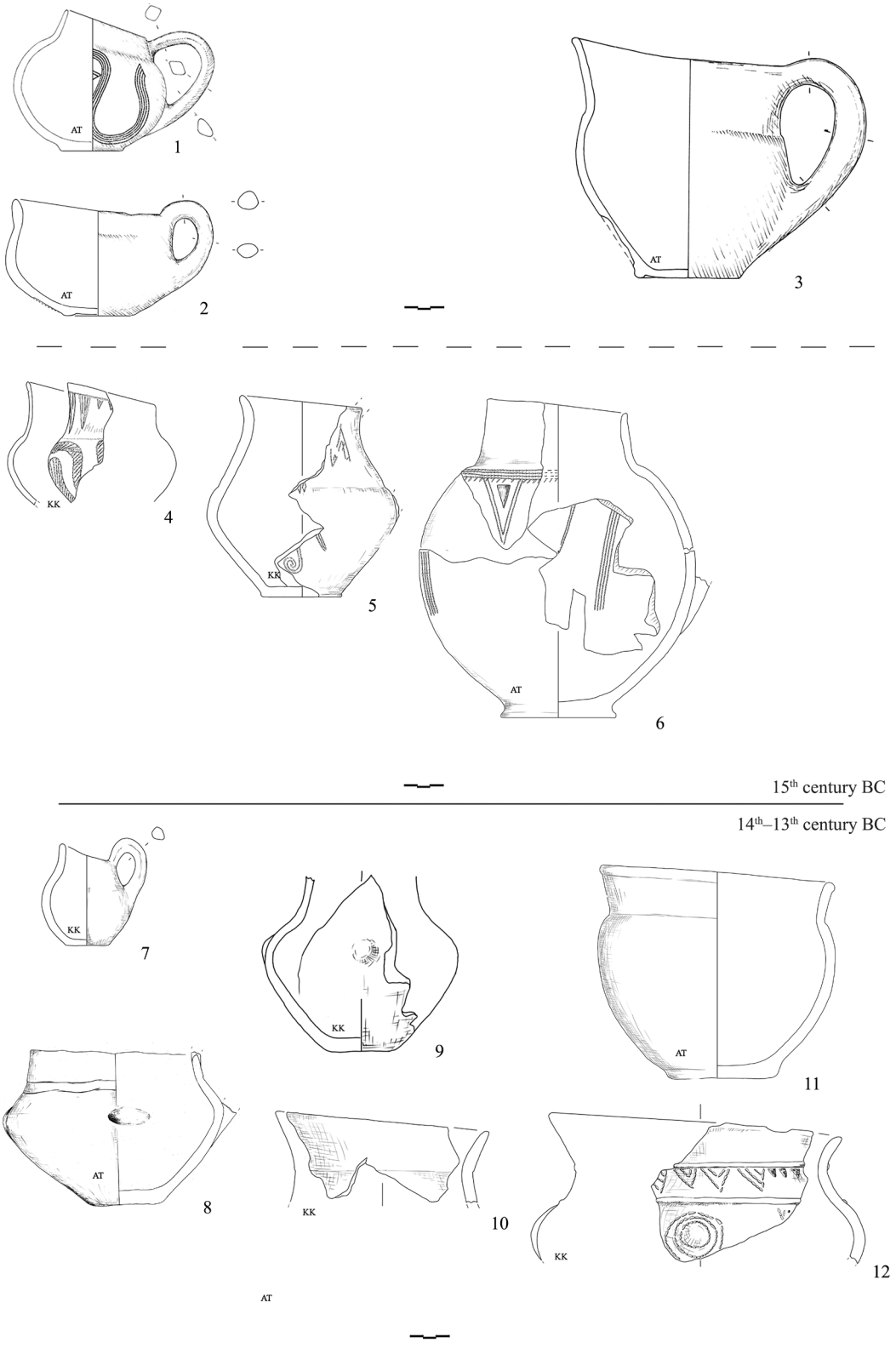

Fig. 4 Jugs. 15th century BC: 1–2. Ada Tepe, Sector I7, House 5; 3. Ada Tepe, Top Sector, pit in Sq. G11/29; 4–5. Kush Kaya, Sector I, Dwelling 2; 6. Ada Tepe, Top Sector, Feature 11. 14th–13th century BC: 7, 9–10, 12. Kush Kaya, Sectors I and II; 8. Ada Tepe, Top Sector, dwelling, Feature 22; 11. Ada Tepe, Top Sector, Feature 17. Scale 1:5 (1–2 after Popov et al. 2017, tab. 21.4–5; 3 after Nikov 2017, fig. 2; 4, 5 after Popov 2009, figs. 10–11; 6, 8 after Popov et al. this volume; 7, 9–10, 12 – unpublished, excavations of H. Popov; 11 after Nikov 2017, fig. 2)

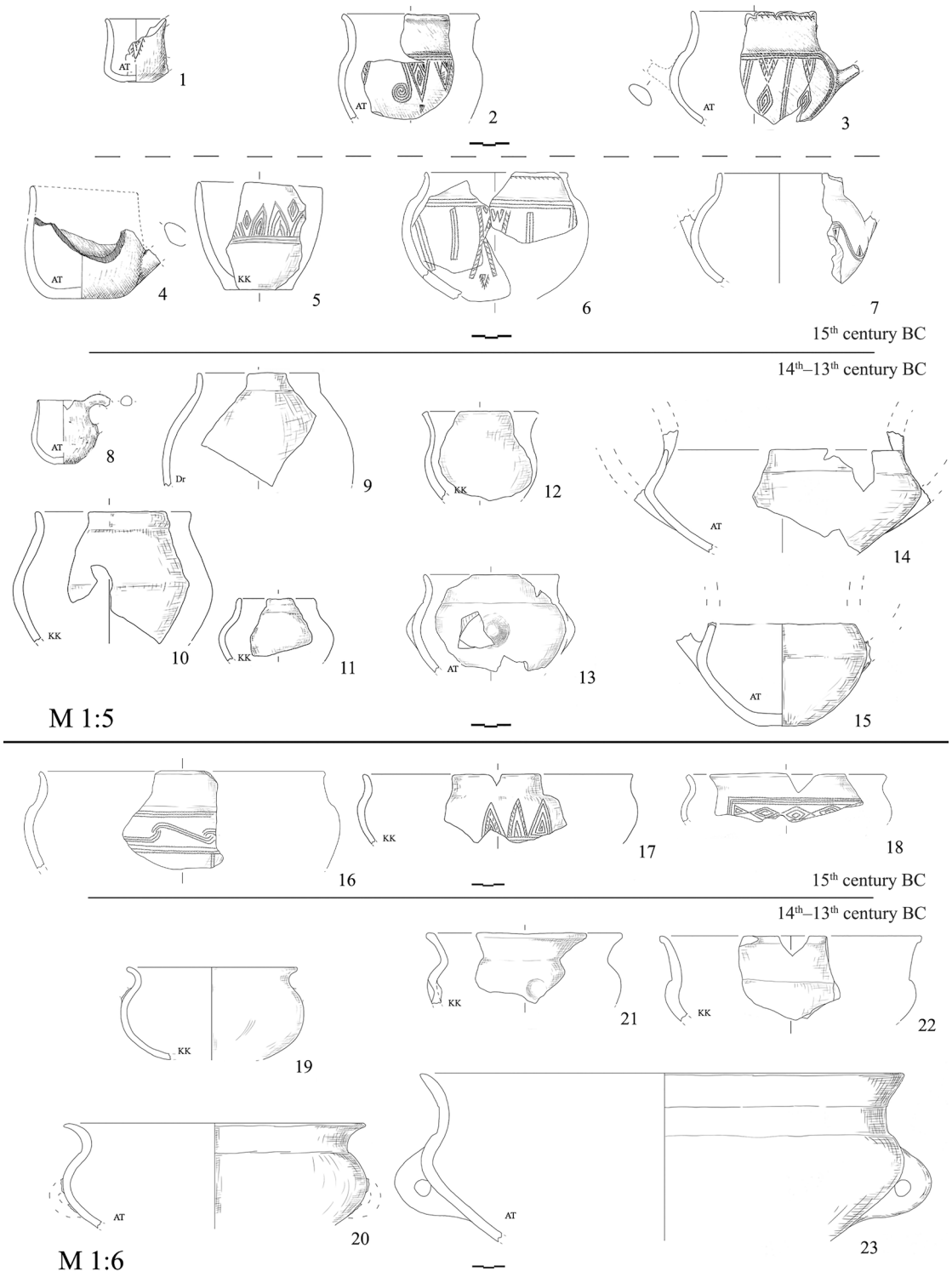

Fig. 5 Cups, kantharoi and bowls. 1–15. Cups and kantharoi, scale 1:5. 15th century BC: 1. Ada Tepe, Sector I8, House 1; 2–3. Ada Tepe, Sector I7, House 3; 4. Ada Tepe, Top Sector, Feature 9A; 5. Kush Kaya, Sector I; 6. Ada Tepe, Top Sector, Feature 11; 7. Ada Tepe, Top Sector, Feature 13N. 14th–13th century BC: 8. Ada Tepe, Top Sector, dwelling, Feature 10; 9. Dragoyna, dwelling 'context L'; 10–11. Kush Kaya, Sector I, dwelling 3; 12. Kush Kaya, Sector II, Dwelling 4; 13. Ada Tepe, Top Sector, Feature 3A; 14–15. Ada Tepe, Top Sector, dwelling, Feature 22; 16–23. Bowls, scale 1:6. 15th century BC: 16, 18. Ada Tepe, Top Sector, Feature 11; 17. Kush Kaya, Sector II. 14th–13th century BC: 19, 21. Kush Kaya, Sector I, Sq. E3–F3; 20. Ada Tepe, Top Sector, dwelling, Feature 22; 22. Kush Kaya, Sector II, Dwelling 4; 23. Ada Tepe, Top Sector, dwelling, Feature 10 (1–3 after Popov et al. 2017, figs. 12.8, 16.1, 3; 4, 6, 13 after Nikov 2017, fig. 2; 5 after Popov 2009, figs. 10–11; 7, 14–16, 18, 20 after Popov et al. this volume; 8, 23 unpublished, excavations of H. Popov and K. Nikov; 9 after Bozhinova et al. 2013, pl. 5.9; 10–12, 17, 19, 21–22 unpublished, excavations of H. Popov)

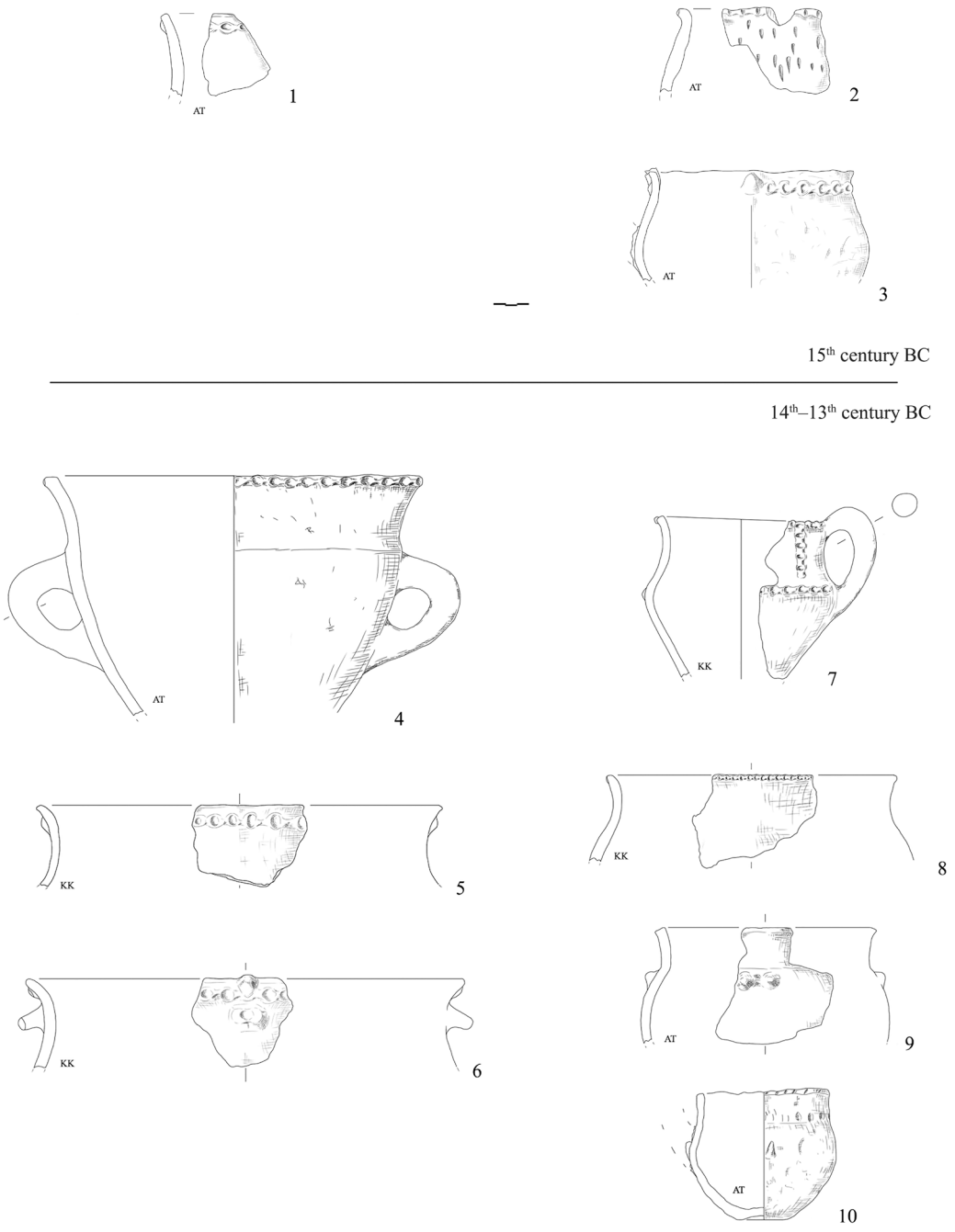

Fig. 6 Jars. 15th century BC: 1–2. Ada Tepe, Top Sector, Feature 11; 3. Ada Tepe, Top Sector, Feature 13N. 14th–13th century BC: 4, 9. Ada Tepe, Top Sector, Feature 17; 5–8. Kush Kaya, Sector I, Dwelling 3; 10. Ada Tepe, Top Sector, dwelling, Feature 22. Scale 1:5 (1–2 unpublished, excavations of H. Popov and K. Nikov; 3, 10 after Popov et al. this volume; 4, 9 after Nikov 2017, fig. 2.2; 5–6, 8 unpublished, excavations of H. Popov; 7 after Popov 2009, fig. 10)

cross-section). They find analogies in a broad area and have a long period of use, until the very end of the Late Bronze Age.[34]

Single items represent the category of bowls (Fig. 5.16–18). Technologically they belong to the fine ware group. In the Eastern Rhodope complex they appear rarely and only with s-shaped profiles, with two forms: a spherical body and thickened mouth (or mouth rim bent to the outside) and a funnel-shaped (or cylindrical) upper part. The early appearance of this category is also attested in Macedonia.[35]

The group of coarse ware is represented by the category of jars (Fig. 6.1–3). The two forms typical for the Rhodope Mountains (jars with a funnel-shaped mouth – Fig. 6.1 – and with an s-shaped profile – Fig. 6.2–3), decorated with a plastic band under the mouth rim, appear in this early period and develop until the end of the Late Bronze Age in both the western and the eastern parts of the Rhodope mountain chain, reaching the Mesta River valley to the west.[36] In the Upper Thracian Plain, the specific silhouette with a funnel-like mouth is not common.[37] The second form of s-shaped jar appears often, as it is one of the most typical vessels used in everyday household activities.[38]

The decoration of the vessels appears in two techniques – incised *Furchenstich* on some of the fine vessels (amphorae, cups, kantharoi, bowls and jugs) and plastic bands with finger impressions on jars and some of the storage vessels. In comparison to the later period, the incised decoration appears often on fine vessels (about 15 to 25% of all processed sherds of the group of the fine ware in the different 15th-century features of Ada Tepe, compared to 6 to 10% in the 14th–13th century complexes). For this early phase, the decorative schemes appear fully developed – rectangular, triangular and circle panels, rhomboids, meanders, solar motifs and spirals.

The pottery complex continues its development in the next period, as is evident from the data from the three settlements.

The 14th–13th-Century BC Pottery Complex

The full set of categories remains similar to the one from the 15th century, but some new shapes and decorative elements appear. Similar shapes and profiles vary in size, covering the full range of everyday-life activities connected with the consumption and storage of food and products. The s-shaped open bowls (Fig. 5.16–23) increase in frequency compared to the earlier LBA phase in the Rhodope Mountains[39] and develop their profiles. They are present in the west and southwest of the region.[40] The absence of these shapes in the Upper Thracian Plain is strange, as some

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34 Eastern (Dremsizova-Nelchinova 1984, 117, fig. 18; 118, fig. 20; Leshtakov 1990, 3, fig. 5а; 5, fig. 7б, д; Dimitrova 2009, 18, tab. 1.5–6; Dimitrova 2014, 9, fig. 3) and Western Rhodope Mountains (Kisyov 1993, 5, fig. 6и; 10, fig. 14б; Georgieva 2003, 162, figs. 1.9, 11; 3); Upper Thracian Plain (Hänsel 1976, pls. 36.1; 69.3–4; Detev 1981, 179, figs. 36.4; 50.6; Kanchev – Kancheva 1990, 10, fig. 9ж; Alexandrov et al. 2018, 548 cat. 574, 579); central and eastern Macedonia (Hochstetter 1984, 62–63, fig. 15; Koukouli-Chrysanthaki 1982, 240–242, pls. 9–10, 14–16; 248–250, pls. 21–22; Papazovska 2005, 387, 399, tab. I.1; Alexandrov et al. 2007, 381, tab. 6d; Horejs 2007, 116–127, figs. 61, 66), the region north of Stara Planina (Mikov – Dzhambazov 1960, 128, fig. 97; Alexandrescu 1973, 93, pl. VIII; Hänsel 1976, pls. 9.1–2; 10.1, 3–4, 7–8; 11.1–4; Tončeva 1977, 154, pl. VI.6; Alexandrov et al. 2018, 551 cat. no. 585).

35 Horejs 2017, 215 with references; for prehistoric Olynthus, its appearance is mentioned as early as the 16th/15th century BC; also in Kastanas (Hochstetter 1984, pls. 3.1–3; 7.2).

36 Grammenos 1979, pl. VIII.3; Domaradzski 1986, 13, fig. 4д, и; 15, fig. 6в; 20, fig. 12e; Kisyov 1993, 6, fig. 8a; 7, fig. 9a; Alexandrov 2002, 332, figs. 19.2; 20.2; Dimitrova 2014, 13, fig. 7.5–6.

37 Dimitrova 2014, 12.

38 For statistical observations on the pottery complex from the northeastern settlement at Ada Tepe see Horejs 2017, 213–214, for House 7 and Burkhardt this volume, for houses 5 and 9.

39 Dimitrova 2014, 11–12 with references.

40 Koukouli-Chrysanthaki 1982, 240, pl. 14; Alexandrov 2002, 332, fig. 19.1; 336, fig. 27.1; Georgieva 2003, 162; Horejs 2007, 101–103, fig. 46.

examples come from the region north of Stara Planina.[41] The development of the category in the Eastern Rhodopes is attested in the subsequent Early Iron Age.

Development of the complex can be seen in other categories: the small, closed vessel with elongated, ovoid body (Fig. 5.8–10) becomes one of the specific Late Bronze Age cup forms of the Eastern Rhodopes, the Thracian Plain and the region between the Danube River and Stara Planina.[42] Among the cups and kantharoi, the new shape is that of the shallow vessel with biconical body, which appears in different sizes (Fig. 5.14–15). This can be suggested as a specific feature for the Ada Tepe complex and its existence can be traced to the very end of the Late Bronze Age.

At this state of research, it is difficult to define new elements in the schemes of the *Furchenstich*-decorated vessels. During this period, some new features in the plastic decoration appear. These are the small semispherical or low conical knobs on the maximum diameter of some of the amphorae and kantharoi (Figs. 4.8–9; 5.13). Among the cooking vessels, apart from the typical jars (in this period the jars with a funnel-shaped mouth and spherical upper and conical lower part of the body prevail over the s-shaped vessels), the flat oval baking trays appear.

New Elements in the Pottery Complex from the 12th Century BC

The period after the 13th century BC is very important due to the establishment of some new features, which become a basis for the development of the pottery complex in the subsequent Early Iron Age. Among the vessels for storing food and liquids, a group of fine, black burnished ware, sometimes decorated, appears.

In the group of fine ware, the black and well-burnished surface also becomes popular. The new elements are evident in the decorative techniques. The traditional schemes from the previous phases continue to exist, as it is assumed that some (s-shaped spirals, concentric circles and circles with tangents) served as a basis for the development of some of the popular motifs in the Early Iron Age (executed in other decorative techniques – stamps and incisions).[43] The observations on the pottery from Kush Kaya and Ada Tepe showed the appearance of the stamped circles (the traces on the clay testify to the fact that they are created using a hollow bone;[44] in other examples a clay stamp can be identified as an implement for decoration).

Another important innovation in the decorative system is a new element not common for the local pottery – the flutes. Their incorporation in the local pottery tradition is widely discussed in the literature, as their appearance in the Balkans is connected with the beginning of the Early Iron Age and is placed in the LH IIIC or in the Protogeometric period.[45] At Kastanas, fluted ware is detected starting in Level 13, i.e. in the 12th century BC.[46] An early appearance in the Late Bronze Age or the transition to the Early Iron Age is attested at other sites in Macedonia.[47] The discovery of fluted ware in contexts from the end of the Late Bronze Age is also reported for a site on the

41 Alexandrescu 1973, 97, pl. XII.16; Alexandrov et al. 2018, 551 cat. no. 586.

42 Eastern Rhodopes: Dimitrova 2009, 18, tab. 1.5–6; Bozhinova et al. 2013, 58–59, tab. 5. – Thracian Plain: Detev 1981, fig. 36.4; Alexandrov et al. 2018, 549 cat. no. 579. – Zimnicea: Alexandrescu 1973, 94, pl. IX.1–5, 8; Hänsel 1976, pl. 11.1–2, 4.

43 Nikov 2016.

44 Popov 2009, 29; Dimitrova 2015; Nikov 2016, 461, fig. 3.4, 10.

45 For central Macedonia: Heurtley 1939, 125–126; later the appearance of the fluted ware is connected with layers of the beginning of the Early Iron Age (Wardle et al. 2007, 487) with the argumentation that the connection of the 'new' pottery with the Aegean one cannot be indisputably proven (Wardle et al. 2007, 489). Still, as in Assiros the beginning of the Protogeometric period is placed in the first quarter of the 11th century, the appearance of the fluted ware can be linked to this time (although the traditional date of the second half of the 11th century BC is problematic and discussed by Weninger – Jung 2009, 385–388).

46 Hochstetter 1984, 188–194, fig. 50; Jung 2002; Weninger – Jung 2009.

47 Mitrevski 1995, 77–84; Mitrevski 1997, 51–53.

Sakar Mountain.[48] Against this background, the discovery of fluted ware within 12th-century BC contexts in the Rhodope Mountains seems logical.[49] The observations on the Ada Tepe pottery complex show that the new decorative style of fluted ware finds its natural place in the Late Bronze Age pottery complex, as in some cases it appears on traditional pottery forms.

Conclusion

The excavations of several sites in the Eastern Rhodope Mountains allow the development of the Late Bronze Age pottery complex to be divided into several basic periods. In the earliest contexts from the 15th century BC, it appears as a well-developed set of vessels and decorative schemes, whose origins are, however, still not clear. Middle Bronze Age sites are not yet known from this region, but the most probable zone for the prototypes of the complex can be seen in the Upper Thracian Plain. From the 14th century BC, some new elements within the existing categories (new profiles and forms) and in the decoration are observed. From the period after the end of the 13th century BC, a new trend in the main technological groups appear (fine, black burnished clay) and new decorative techniques (stamps and flutes) are applied in the traditional pottery complex, which become typical for the subsequent Early Iron Age.

At the present state of knowledge for the Eastern Rhodope Mountains, the origin of the Late Bronze Age complex remains unclear, but its development through time seems gradual, and no abrupt changes can be seen, even in the transition to the Early Iron Age. The novelties in the pottery production find their natural place in the traditional complex.

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[48] Borislavov 1999.

[49] Nekhrizov – Tzvetkova 2018, 33–36. The authors discuss analyses performed in two laboratories – Beta Analytic (lab. code: BETA) and Scottish Universities Environmental Research Centre (lab. code: SUERC). They report eight dates from bone and seed samples for the Gluhite Kamani site – uncalibrated dates between 2970–2900 BP. By the 'combine function of the online version of OxCal and the performed wiggle matching analysis, the modelled age of the stratum falls within the period 1158–1109 calBC at 1 σ confidence, or 1184–1100 calBC at 2 σ confidence' (Nekhrizov – Tzvetkova 2018, 34). For their excavations in 2002 at Ada Tepe they report seven dates from bone samples (uncalibrated dates between 2955 and 2910 BP) with a modelled age within 1189–1115 calBC (1 σ) and 1208–1107 calBC (2 σ).

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The Late Bronze Age Site of Dragoyna

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Abstract: The Dragoyna site is a fortified settlement on a mountain peak inhabited in the period between the 16th and the 3rd century BC. The current paper presents the excavated Late Bronze Age remains together with further evidence from the same micro region. The site comprises two separate areas of habitation situated on the two culminations of the mountain peak – Golyama (Big) Dragoyna and Malka (Small) Dragoyna. The habitation on Golyama Dragoyna is concentrated on an area of 2500m² at the highest part of the peak. The only preserved structure from the Late Bronze Age here is a floor level constructed of two consecutive layers of stones and pottery sherds adjacent to the remnants of a stone wall. The types and decoration of the pottery support a date in the developed phases of the period between the 15th and 13th centuries BC. The pottery has a high quality, diversity of forms and types and rich ornamentation with a variety of geometric motifs presenting a classical Late Bronze Age assemblage from South Bulgaria in its Rhodopean variant. Pieces of imported vessels in Mycenaean style are identified by NAA analysis to originate from the site of Dimini. Sherds of Grey Ware and another pottery class remain unidentified regarding their provenance. Volcanic rocks cover nearly the whole upper part of the Malka Dragoyna peak. Pottery sherds from the Late Bronze Age reveal an intensive occupation of a broad area including the rocky summit and the terraced slopes. The central part is a flat terrace, 5 × 6.5m, cut in the rocks south of the highest point. It is fortified by a number of encircling walls, two of which are proven to have been built during an early stage of the Late Bronze Age. Their faces are made in a polygonal style. Two massive walls on the middle part of the northwestern and southwestern slope also possibly date back to this period, though the northern one was also in use during the Early Hellenistic period. The pottery from this sector suggests an earlier date than that from Golyama Dragoyna, but it remains unclear if the occupation of both sectors overlapped for some period of time or if a complete relocation of the preferred habitation area occurred. Two pieces of unidentified imported wheel-made vessels most probably belong to this period. The sites on the regional map show a dense net of fortified mountain peak sites with Iron Age materials on most of them. Late Bronze Age pottery is found only at two other sites apart from Dragoyna, one of which is situated in the plain. Data for mining activities are available for the region, but proof of a Late Bronze Age exploitation of the metal sources is lacking at the current state of research.

Keywords: Dragoyna, Eastern Rhodopes, fortified settlement, Late Bronze Age, mining, Mycenaean pottery

The Dragoyna site is a fortified settlement on a mountain peak inhabited in the period between the 16th and the 3rd century BC, which according to the archaeological periodization scheme in Bulgaria, comprises the periods of the Late Bronze, the Early Iron and the Late Iron Age. The current paper presents the excavated Late Bronze Age remains together with further evidence from the same micro region.

The site is located on the highest peak in a region named Dragoyna, situated in the northwestern part of the Eastern Rhodopes, just at the border with the Maritza Valley that is part of the vast Upper Thracian Plain. Being the highest point in a large region determines its strategic position with a view over a distance of 50km in radius. From the opposite perspective it is a basic landmark for all travellers with a specific silhouette to recognize and follow through the wooded Thracian Plain (Figs. 1, 17.1).

Excavations were carried out for a period of 12 years between 2004 and 2015, led by the Plovdiv Regional Archaeological Museum and funded by the Parvomai Municipality, which is

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Fig. 1 Dragoyna peak, a view from the north (photo: Ch. Tzochev)

the region's administrative centre.[2] The excavated areas were limited in extension but located in different sectors of the site, which allowed the dynamics of the settlement development during the separate periods to be outlined. Three field survey campaigns were conducted alongside the excavations in order to map the archaeological sites in the surrounding territory[3] and thus create an overview of the site's regional position.

The site is situated on two culminations of the mountain peak, Golyama (Big) Dragoyna and Malka (Small) Dragoyna. The slopes of the peaks and the large flat saddle between them remained unoccupied during the Late Bronze Age. Thus the site comprises two separate areas of habitation situated at a distance of about 400m and with an altitude difference of 100m (Fig. 2). In both areas, the occupation is concentrated on the peak summits. They have peculiarities due to their specific terrain as well as type of structures, while they most probably also differ by habitation phase within the period of the Late Bronze Age.

Golyama Dragoyna

The Golyama Dragoyna peak has a rounded ridge, elongated in a south-north direction, with steep western and eastern slopes. During the Hellenistic period, an area of 2500m², on the highest spot

[2] Results of the excavations are published in: Bozhinova 2007a; Bozhinova et al. 2013; Bozhinova 2014. Annual reports on the excavations are published in: Kisyov – Bozhinova 2005; Kisyov – Bozhinova 2006; Bozhinova 2007b; Bozhinova – Andonova 2008; Bozhinova – Andonova 2009; Bozhinova – Andonova 2010; Bozhinova – Andonova 2011; Bozhinova – Andonova 2012; Bozhinova – Andonova 2013; Bozhinova – Andonova 2015; Bozhinova – Zhekunova 2016.

[3] The results of the first campaign of the field survey are published in Bozhinova 2006; Bozhinova 2009. The following two campaigns are presented only in the annual reports in Andonova – Bozhinova 2010 and Bozhinova – Andonova 2015.

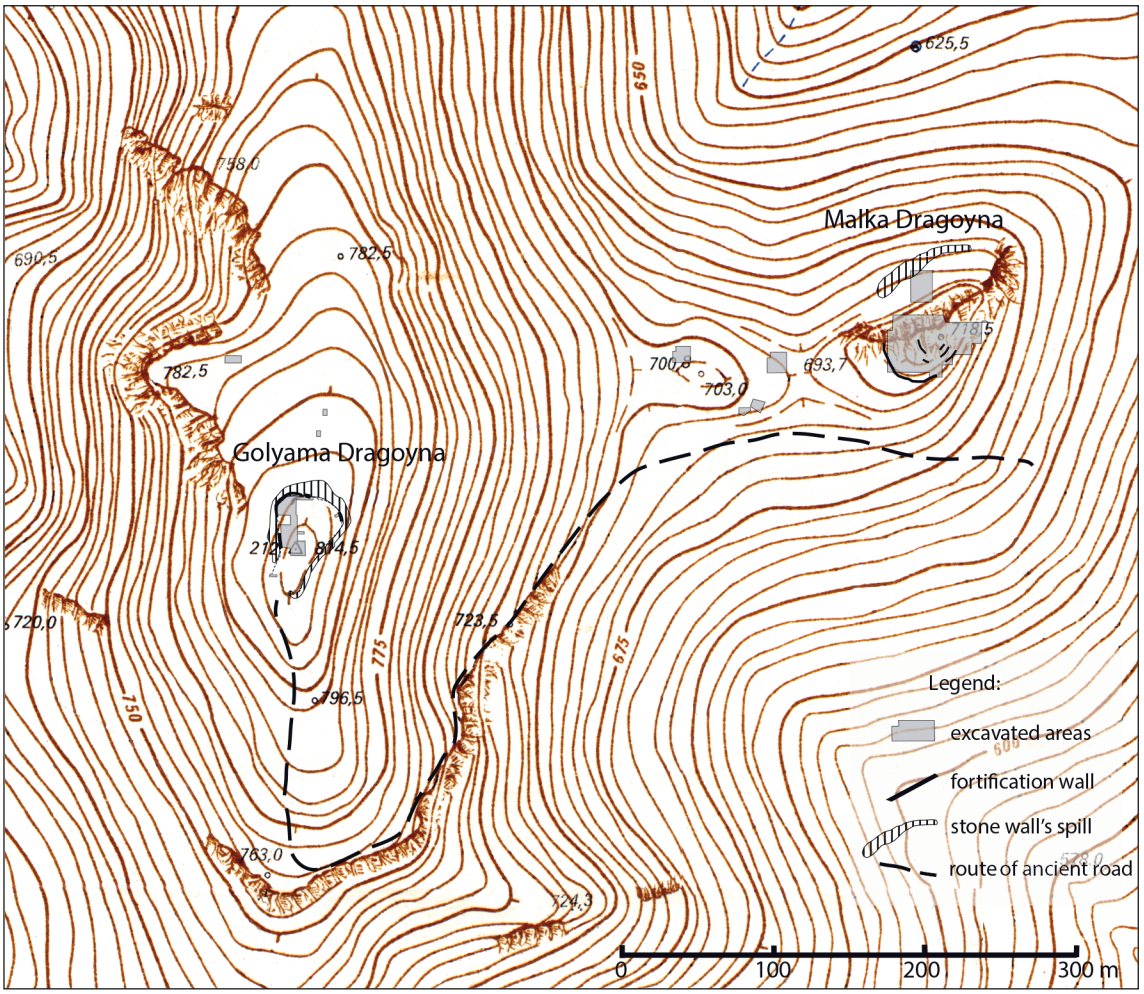

Fig. 2 A plan of the Dragoyna site (E. Bozhinova)

of the peak, was surrounded by a massive stone wall. The area inside the fortification is densely built, and some of the buildings date back to the Archaic period (Fig. 3). According to stratigraphic data, there must be an earlier, still unexcavated fortification wall. High concentrations of Late Bronze Age pottery only on the highest part of the peak suggests that the size of the inhabited area during this period coincides with the area of the later fortification.

The only preserved structure from the Late Bronze Age within the excavated area is a floor level among the rocks (Context L). The floor is thoroughly constructed of two consecutive layers of stones and pottery sherds to level the terrain, probably for a dwelling. The preserved remains measure 3 × 5m.[4] A row of stones at their northeastern border is probably the base of a wall, the upper parts of which were made of wood (Fig. 3.L). Traces of post holes or other dwelling facilities are not registered.

The pottery typical for this period is found all over the summit of the peak. The pottery from Dragoyna is a classical Late Bronze Age assemblage from South Bulgaria in its Rhodopean variant.[5] It has a high quality, diversity of forms and types and rich ornamentation with a variety of geometric motifs (Figs. 4–6). The types and decoration support a date in the developed phases of the period between the 15th and 13th centuries BC.

4 Bozhinova et al. 2013, 50–52, fig. 3.
5 Bozhinova et al. 2013 53–66, pls. 2–12.

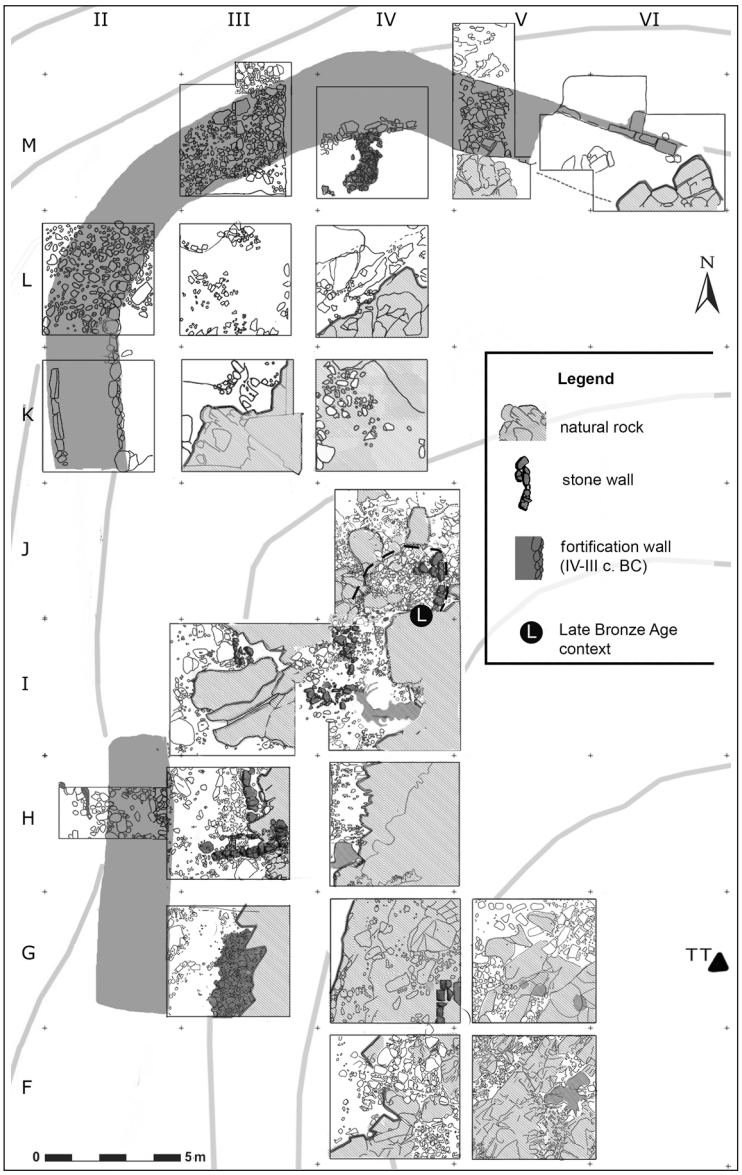

Fig. 3 A plan of the Golyama Dragoyna sector (E. Bozhinova)

A big storage jar is reconstructed from a large number of sherds found in nearly all excavated parts in the northwest part of the peak including the floor level mentioned above (Fig. 8). Its form is typical for the Late Bronze Age cooking/storage pots of the variant with large open orifice.[6] It has two or four vertical handles. A plastic band with finger prints is placed below the rim. The specific feature that distinguishes the vessel from all the others is its surface, covered all over with small clay buds. Only the handles and the base are left uncovered. Their function is to strengthen the vessels' walls. The same manner of strengthening the pot is known from sherds found at Malka Dragoyna (Fig. 16.16) and at the Bronze Age tell of Razkopanitsa.[7]

Twelve pieces of imported wheelmade Mycenaean style pots are found in different parts of the northwest sector of the peak. They come from two or more goblets and a small closed vessel (Fig. 7.1–5). The vessels date to the LH IIIA1 phase and, according to the NAA, are produced

6 Bozhinova et al. 2013, 60–61, pl. 6.1–5.
7 Detev 1981, fig. 41.

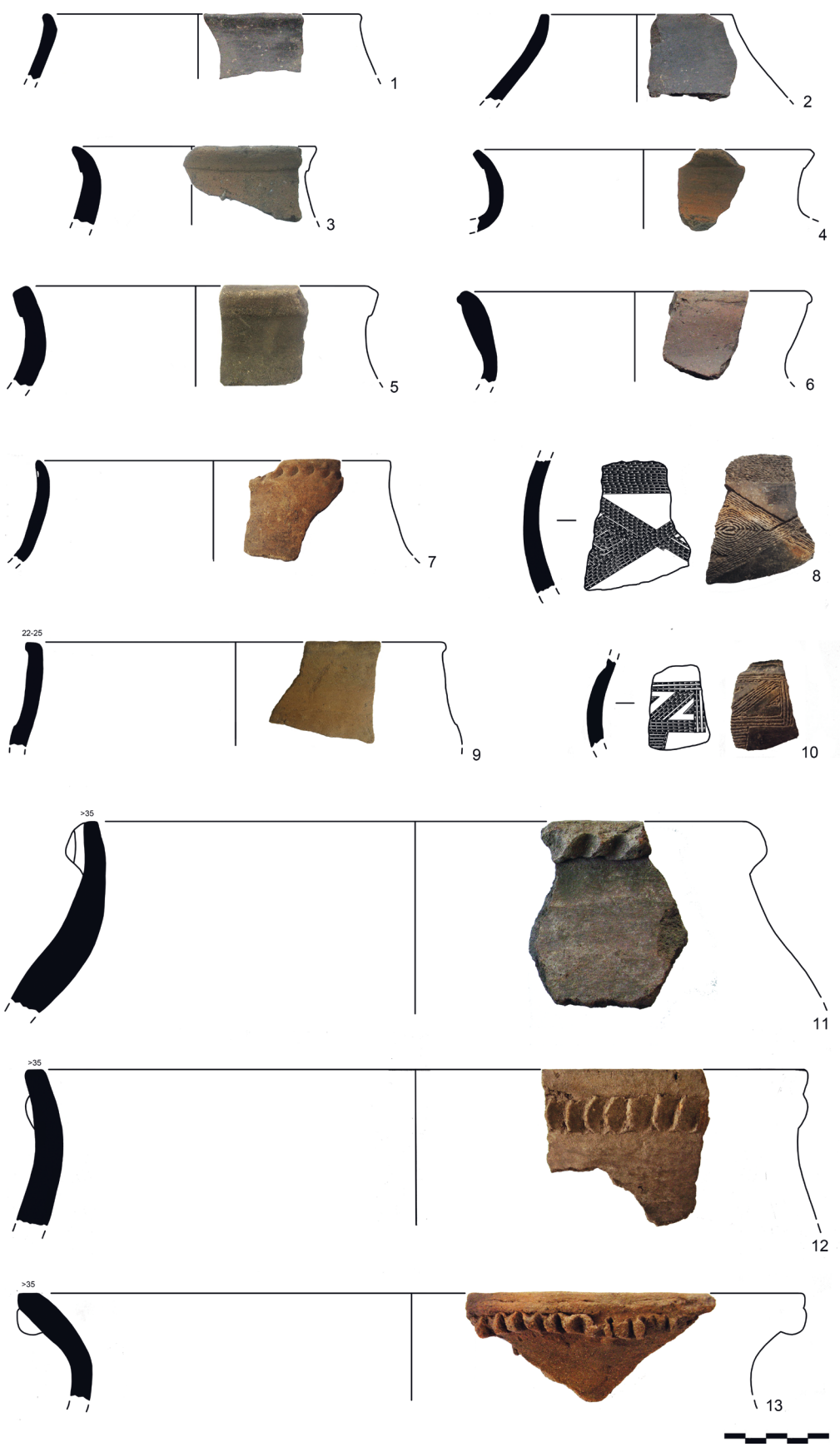

Fig. 4 Local pottery from Golyama Dragoyna; 1–6, 8. From a floor level (drawings: Y. Dimitrova, E. Bozhinova)

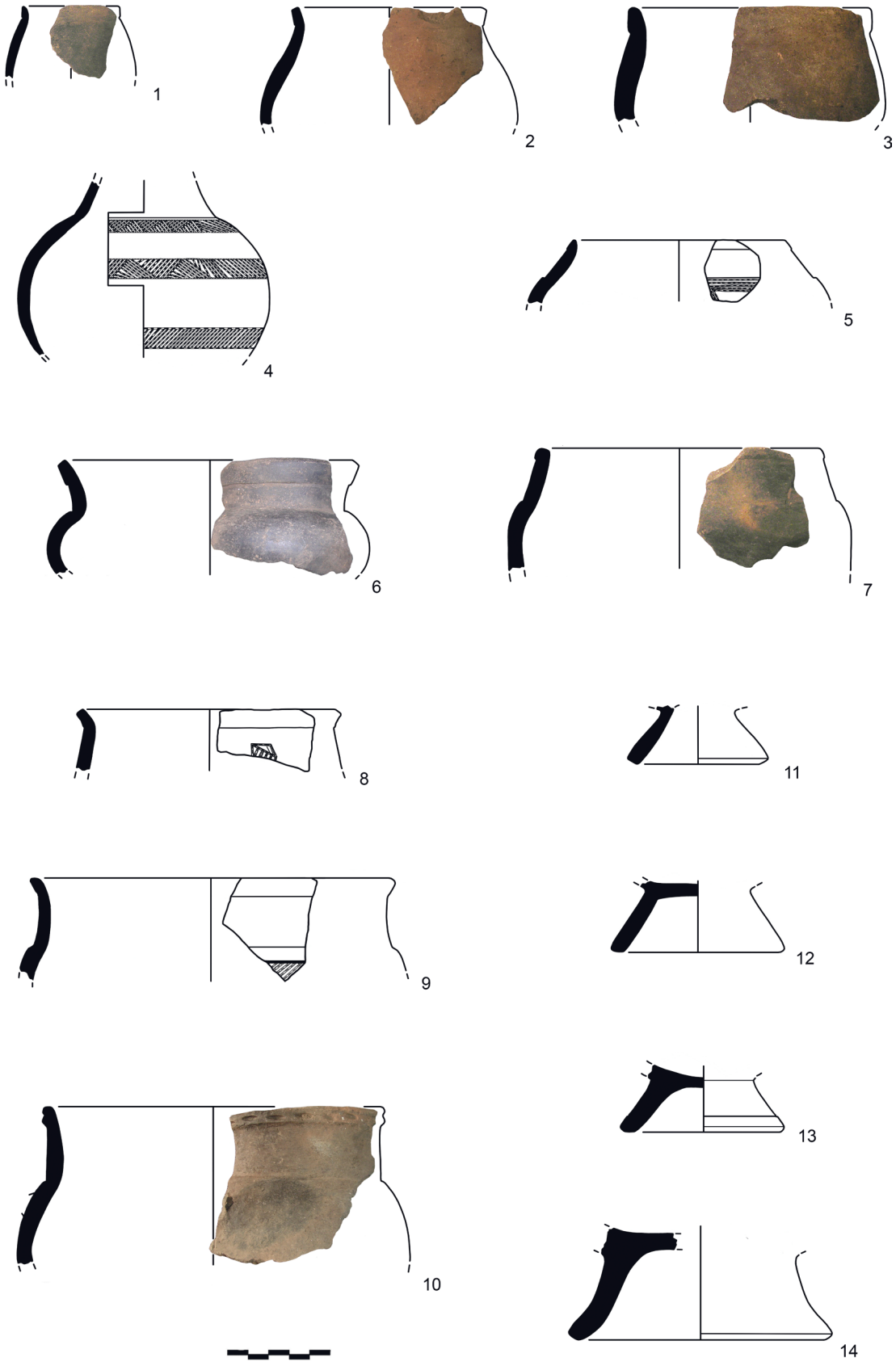

Fig. 5 Local pottery at Golyama Dragoyna (drawings: Y. Dimitrova, E. Bozhinova)

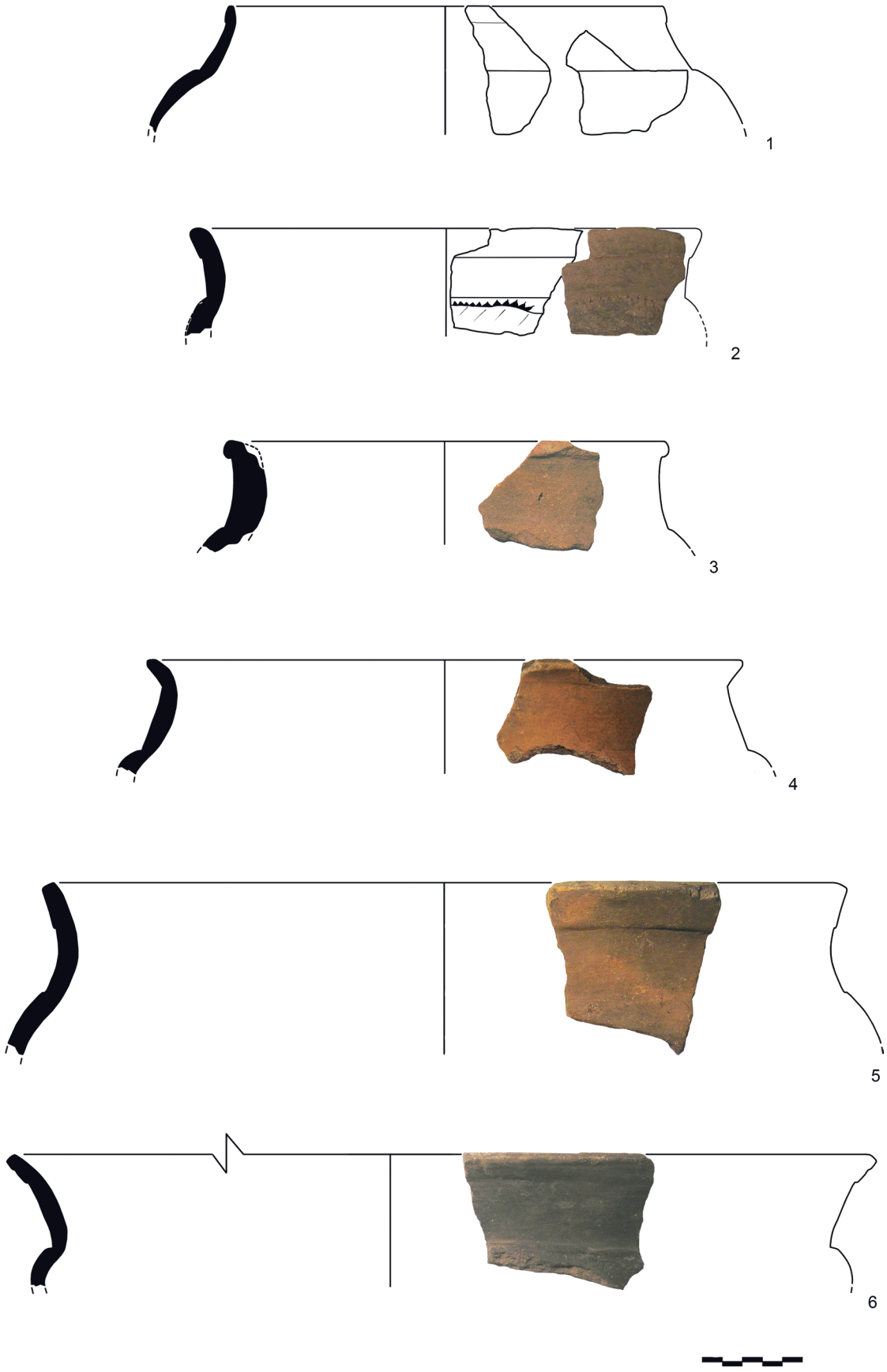

Fig. 6 Local pottery at Golyama Dragoyna (drawings: Y. Dimitrova, E. Bozhinova)

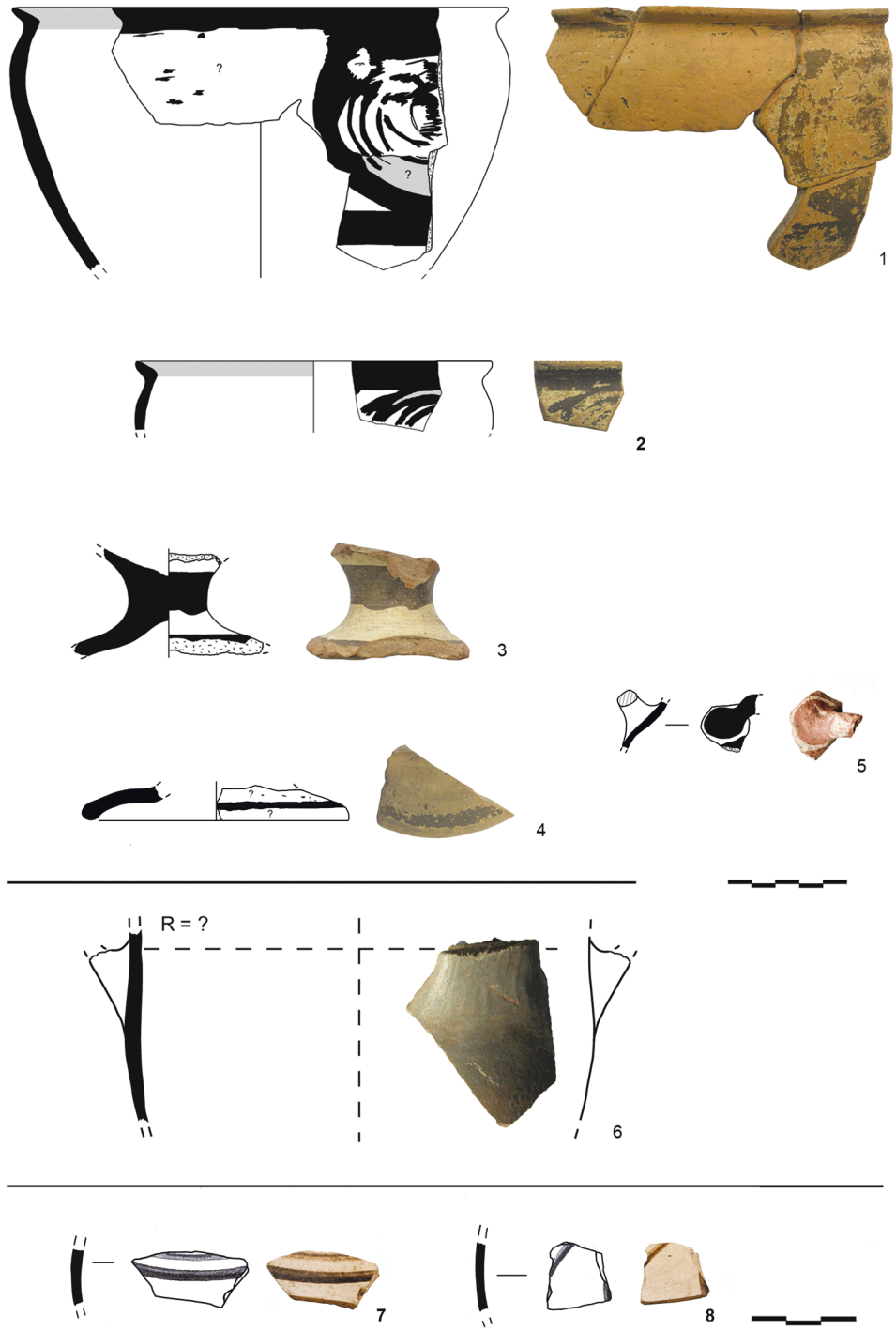

Fig. 7 Imported pottery from Golyama Dragoyna: 1–5. Pottery in the Mycenaean style (drawings: R. Jung); 6. Grey Ware (drawing: P. Pavuk); 7–8. Pottery with unknown provenance (drawings: E. Bozhinova)

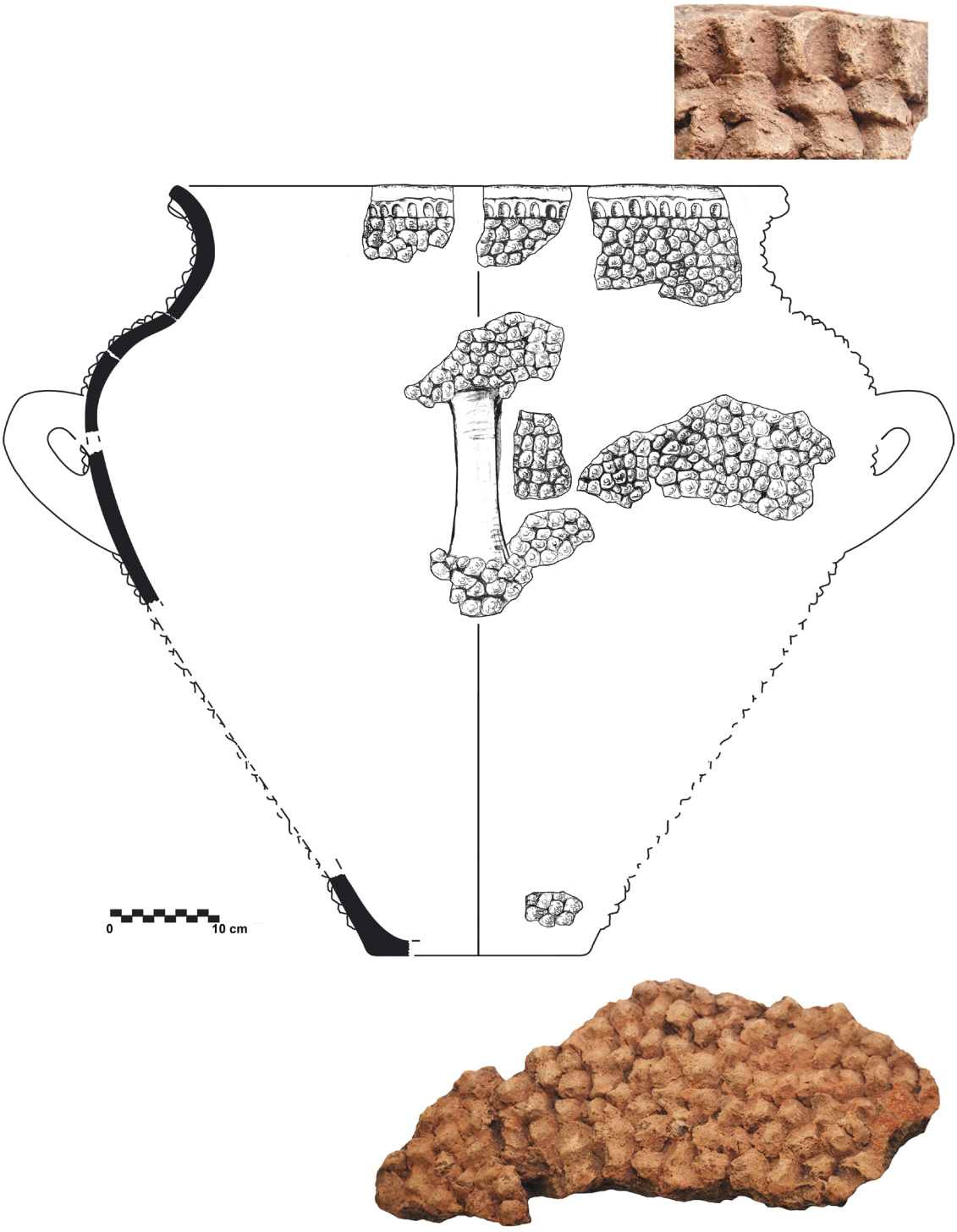

Fig. 8 A storage jar from Golyama Dragoyna (drawing: E. Bozhinova)



Fig. 9 Malka Dragoyna peak, aerial view from the southwest, from Golyama Dragoyna (drone picture: Ch. Tzochev)

at the site of Dimini.[8] A body fragment with part of a handle of an undecorated wheelmade Grey Ware vessel belongs to the sherds of the floor level (Fig. 7.6). Its provenance has not been identified so far. Another two sherds of a wheelmade pot of a very high quality and decorated with dark paint were found in the close vicinity of the floor level (Fig. 7.7–8). They are undoubtedly part of an imported vessel, but a dating to the Late Bronze Age is very questionable.

A few vessels have forms and decorations that refer to earlier stages of the Bronze Age.[9] These are short incisions or imprinted dots ordered in 'fish-bone' motifs, rows of imprints made with a triangular tool, a row of small holes under the rim, and vertical plastic bands with thwart incisions, all of which are uncommon for the Late Bronze Age but well known throughout the early phases of the Early Bronze Age. In as much as these decorative motifs are not used later, this small quantity of pottery sherds has to be considered an indication for a limited occupation of the site preceding the Late Bronze Age settlement.

It is not clear if the inhabitation at the site continued during the last phase of the Late Bronze Age and the so-called transitional Bronze/Iron period. As the pottery characteristics of this period are constitutive elements of both the preceding and the following periods, while there is a general lack of decoration, the identification of that 'transitional period' is impossible outside of stratified contexts.

8 Bozhinova et al. 2013, 67–77, pl. 14.1–5.
9 Bozhinova et al. 2013, 65, pl. 13.3–8.

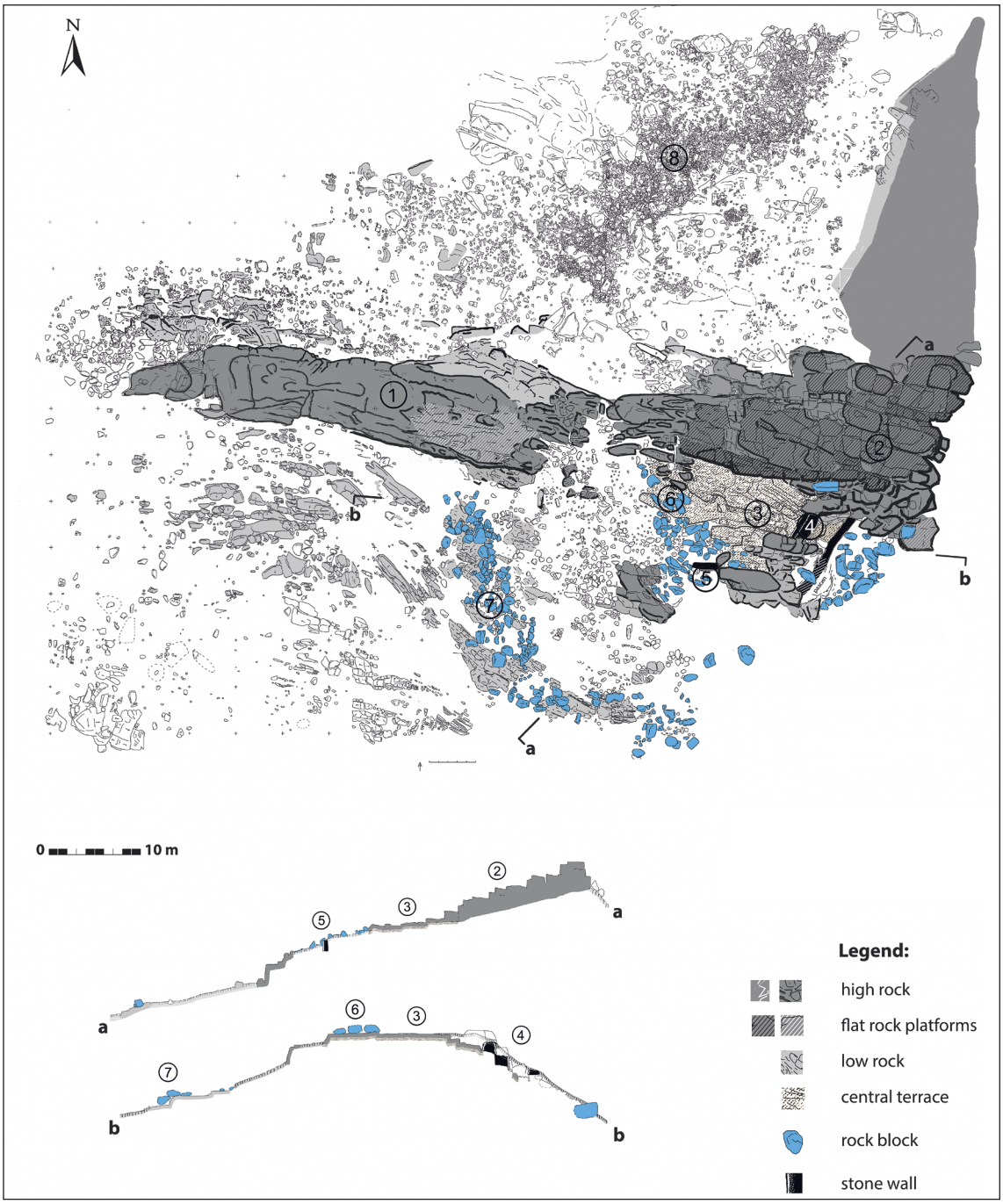

Fig. 10 Malka Dragoyna site plan (made by E. Bozhinova, A. Andonova, V. Zhekunova and Tz. Slavkova with geodetic base made by S. Nikolov and B. Giaurova)

Malka Dragoyna

While the activities during the Hellenistic period at Golyama Dragoyna destroyed the Late Bronze Age layers and most of the structures, the situation at Malka Dragoyna is rather different. Here the inhabitation during the Late Iron Age is not that intensive, which allowed for a better preservation of the earlier layers and structures. Pottery sherds from the Late Bronze Age are found all over the small peak and its slopes reveal an intensive occupation of a broad area during this period.

The peak has a steep rocky eastern slope and a glacis around its western and southern slopes, terraced for the purpose of inhabitation. In the western direction, the terrain ends smoothly at the

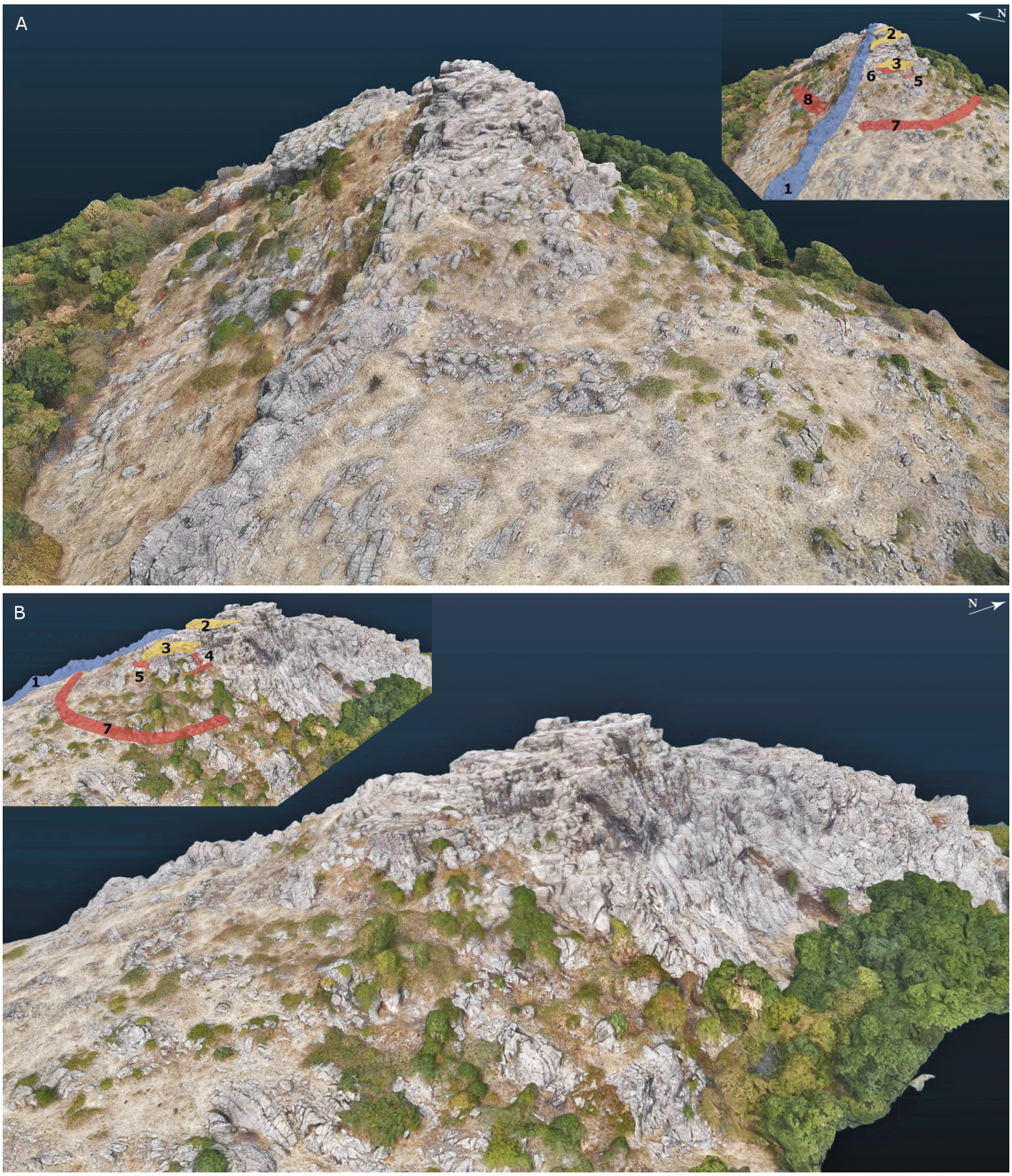

Fig. 11 Malka Dragoyna, 3D reconstruction after drone pictures: A. View from the west; B. View from the southeast; 1. A natural rock 'wall'; 2. Upper terrace; 3. Lower, central terrace; 4. Two stone walls in a polygonal style; 5. A stone wall; 6. Rock blocks and high cliffs forming a wall; 7. Southern part of a massive stone wall; 8. Northern part of the massive stone wall (made by Ch. Tzochev)

saddle between Golyama and Malka Dragoyna. Volcanic rocks cover nearly the whole upper part of the peak (Figs. 9–10). High cliffs form an L-shaped ridge, open to the northwest. Its longer southwestern part forms a natural 'wall', 10m wide and up to 4m high (Fig. 10, no. 1). It divides the peak into two parts – a steeper northern one and a slanting southern one. Both slopes are terraced, and the relative cultural layers are preserved in places with a thickness of up to 1m. At the very top, the rocky ridge is connected at right angles to another similar one, whose precipitous side makes the peak completely inaccessible from the east (Fig. 11.B).



Fig. 12 Malka Dragoyna, walls at the eastern side of the central terrace (photo: E. Bozhinova)

The rocks over the highest part of Malka Dragoyna are cut so that they form two broad terraces situated one above the other and connected by a stepped passage (Figs. 10–11, nos. 2–3). The terraces are south-facing, bounded to the north by higher, vertically cut rocks. On the upper terrace, a cultural layer is preserved only in a small area, where a hearth that dates to the Early Hellenistic period was studied.

The lower terrace is better shaped, with a horizontal base, limited to the south by a large, high cliff (Figs. 10–11, no. 3). This terrace measures 5 × 6.5m. Similarly to the upper terrace, hardly any cultural layers are preserved here. In its central part, a horseshoe structure is formed on the ground through rock cutting and the addition of stone packings. The structure is open to the south and a triangular cut is made in front of it. Traces of burning throughout the structure suggest that it has served as a hearth. The large number of sherds of Early Hellenistic pots found in it reveals a secondary use of the structure, probably as a storage room.

The terrace is fortified with a system of stone walls just above the steep slopes. On the western edge of the terrace, several rock blocks and high cliffs form a wall that protects the site from the west, which is the easiest access towards the peak (Figs. 10–11, no. 6). On its east and southwest side, just below the terrace, four walls were studied. The more advanced studies on the eastern slope provide information on how the walls were built and their chronology. Three walls were studied here. They are built stepwise, one above the other, enclosing small areas between them (up to 2 × 2m). The upper two walls close an ‘entrance’, 1.5m wide, between two vertically cut cliffs (Figs. 10, no. 4; 12; 13.1–2). These two walls are synchronous as part of one building plan to retain the slope and close the access towards the terrace from the east. The lower one has only an outer face. They are made of medium- and large-sized stones, tightly arranged side by side in a polygonal style. The preserved height is 1.50m for the upper wall and 1.40m for the lower one. The terrace in this part, between the two high cliffs flanking the walls, has a stepwise ground

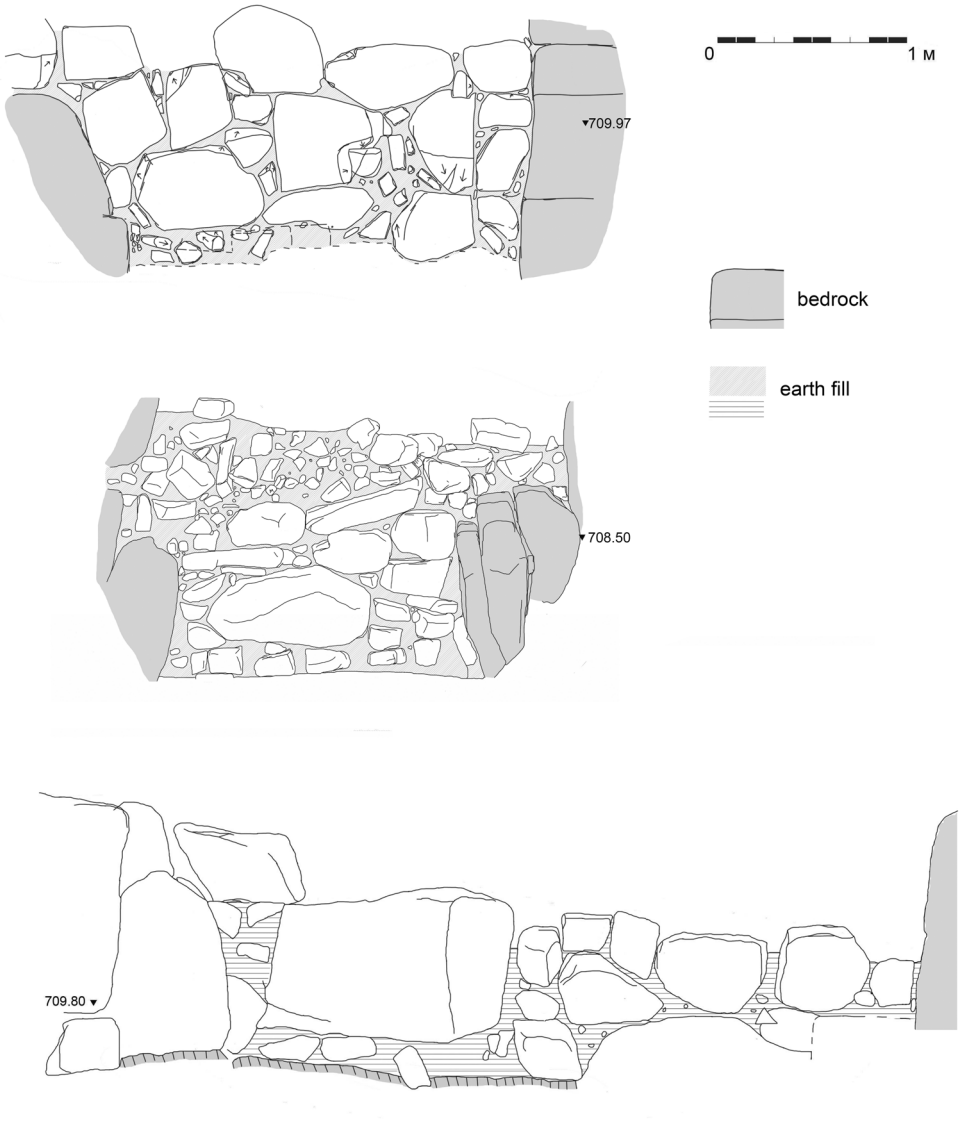

Fig. 13 Malka Dragoyna, eastern faces of the walls at the eastern side of the central terrace: 1–2. Wall no. 4 in Fig. 9–11; 3. Wall no. 5 in Fig. 9–10 (drawings: V. Zhekunova, A. Andonova)

going down the wall. Thus here the cliffs and the uppermost wall enclose a room measuring 2.50m × 3.80m, open to the west towards the terrace. Here we studied a 1.20m-thick cultural layer with two clearly distinguished strata. The upper one dates to the Early Hellenistic period and was probably accumulated intentionally to raise the level of the room so as to enlarge the area of the terrace. The lower stratum (Context B) has a thickness of 0.60m. It is related to the building phase of the walls and dates to the Late Bronze Age. A jasper vein with lots of traces of cutting is present in the bedrock; pieces of this jasper are found in large quantities in the Late Bronze Age stratum above it. The finds from this stratum comprise two fragments of biconical spindle whorls (Fig. 15.10–11) and pottery sherds, including most of a pot with four lug handles to be hung from a rope hanging (Fig. 15.5), a big fragment of an amphora-like vessel with imprinted circles (Fig. 15.8) and parts of two globular kantharoi with *Furchenstich* decoration (Fig. 15.3–4). The numerous pieces of wall plaster could suggest the existence of a high-raised construction in wattle-and-daub technique above this room.



Fig. 14 Stone wall on the middle of the southwestern slope (photo: E. Bozhinova).

A lower, third wall was built during the Early Hellenistic period. During its construction, the Late Bronze Age retaining walls were reused, as confirmed by several rammed floor levels studied in the area between this third one and the upper, second wall.

Having retaining and/or partition walls in the middle and lower parts of the same eastern slope is quite possible. Huge stone blocks in its lower parts suggest that the fortification of the terrace was much stronger and complex.

A similar system of walls is supposed to have existed on the southern side of the terrace, where a wall has been studied just below the terrace edge (Figs. 10–11, no. 5; 13.3). It is preserved in its lower part. The building technique is identical to that on the eastern slope, but there is nothing more to be said because of the limited range of the excavations carried out in this sector.

Beside the wall system around the central terrace at the summit, the Malka Dragoyna peak is additionally fortified by two massive stone walls built on the middle part of the slope (Figs. 10–11, nos. 7–8). They are divided by the natural rock barrier that intersects the western slope. These walls encircle the peak, except for the northeastern side, where vertical rocks make the slope impassable. Though the locations of these two walls suggest that they are part of a unified fortification concept, they differ in their mode of construction and probably also in their time of functioning.

The base of the southern part, made of very large rock blocks, is preserved up to 1 × 2m (Figs. 11, no. 7; 14). There is no debris around it. Immediately below a steep part of the slope, under the central terrace, there is a 5 to 10m-wide terrace that follows the central one radially from the southwest. The wall is located on the outer edge of this terrace, and thus the outer side of the wall uses 1m of the height of the terrace (Fig. 10, no. 7).

The wall on the northern slope is easily identifiable due to the large debris of stones (Figs. 10–11, no. 8). The specifics of the debris imply a construction technique close to that of the wall of



Fig. 15 Local pottery (1–9) and spindle whorls (10–11) from Malka Dragoyna, Late Bronze Age layer in the eastern part of the central terrace (drawings: E. Bozhinova, A. Andonova)

the fortification on the Golyama Dragoyna ridge built in the Early Hellenistic period. A fragment of an Olynthus type of mill, found amongst the destruction layer, supports a date in the Late Iron Age for the building of the wall on the northwestern slope of Malka Dragoyna.

These two walls are located concentrically around the central platform and are strategically connected to it as a lower fortification of the peak. A hypothetical explanation for the differences in the structures' character could be the utilization periods of the two walls. If the southern one dropped out of function earlier, then all the smaller stones from it were taken to be reused for other constructions and only the huge blocks are preserved in situ. The data presented above about the Hellenistic date of the northern wall does not exclude the possibility that it was built during an earlier period and reconstructed or only partially repaired to be in use in the 4th–3rd century BC. The materials found in the excavated areas around these walls do not help to define the chronology of their building and functioning. Excavations at the southern wall brought to light artefacts from the Late Bronze Age and the Early Iron Age, and at the northern one, from the Late Bronze Age, Early Iron Age and Early Hellenistic period.

Determining the absolute chronology of the general habitation at the Malka Dragoyna peak is also problematic. No bones or other organic materials were found in the few excavated Late Bronze Age contexts to provide samples for ^{14}C analysis.[10] Two sherds of an imported wheelmade vessel with light yellow colour are found in a context with Late Bronze Age pottery on the east slope of the peak. Their ware and colour are very similar to the unidentified imported sherds from the Golyama Dragoyna sector (Fig. 7.7–8). The small size of the sherds and the lack of decoration on both pieces preclude suggesting an origin and date for the vessel. Thus the only basis for chronological evaluation remains the typological analysis of the local pottery. Similarly to Golyama Dragoyna, the analysis of the Late Bronze Age pottery found on the small peak indicates a broad date between the 16th and the 13th century BC. The round-bottomed pot with four lug handles and the amphora with imprinted circle decoration support a date at the very beginning of the period (Fig. 15.5, 8). Both vessels are found just next to the stone wall east of the central terrace and thus define an early date for the erection of these structures. In general, most of the local vessels at Malka Dragoyna refer to the earlier phase of the Late Bronze Age; thus this must be the time of the most intensive occupation of this sector. The lack of great diversity in forms and decoration, which is characteristic for Golyama Dragoyna, is an argument to suggest that the habitation centre moved to the higher peak during the developed phase of the period. Pottery types typical for the end of the period are missing. These facts suggest that the occupation of the small peak is earlier than on Golyama Dragoyna. It is also not clear if the occupation periods of both sectors overlapped for some time or if a complete relocation of the preferred habitation area occurred.

Besides the chronological difficulties, the Dragoyna site with its large area of inhabitation, massive fortification features, local pottery with high quality and splendid ornamentation, and the early Aegean imports define the site as wealthy and powerful compared to a standard Late Bronze Age site in the eastern Balkans. The archaeological map of the region made after thorough field surveys determines the Dragoyna site as the biggest one in the region for all the periods of its existence. Most of the other Iron Age sites are situated in the mountainous part of the region and are nearly identical in location and features to Dragoyna, but smaller (Fig. 17). They are all situated on high mountain peaks that have a difficult access, often with high cliffs and with direct visual contact between each other. The lack of other sites in the plain areas suggests that the mountain sites had settlement functions. Their date is determined by a limited number of artefacts found on the surface, and inhabitation during the Late Bronze Age is probable for some of them.

It is only at Mitkovi kamani peak next to the village of Voden that Late Bronze Age pottery has been found (Figs. 17, no. 2; 18). The site is located on the easternmost peak of the Dragoyna

[10] The acid soil of the Dragoyna peak is the reason for the general scarcity of animal bones and the very bad quality of the small number of preserved ones.

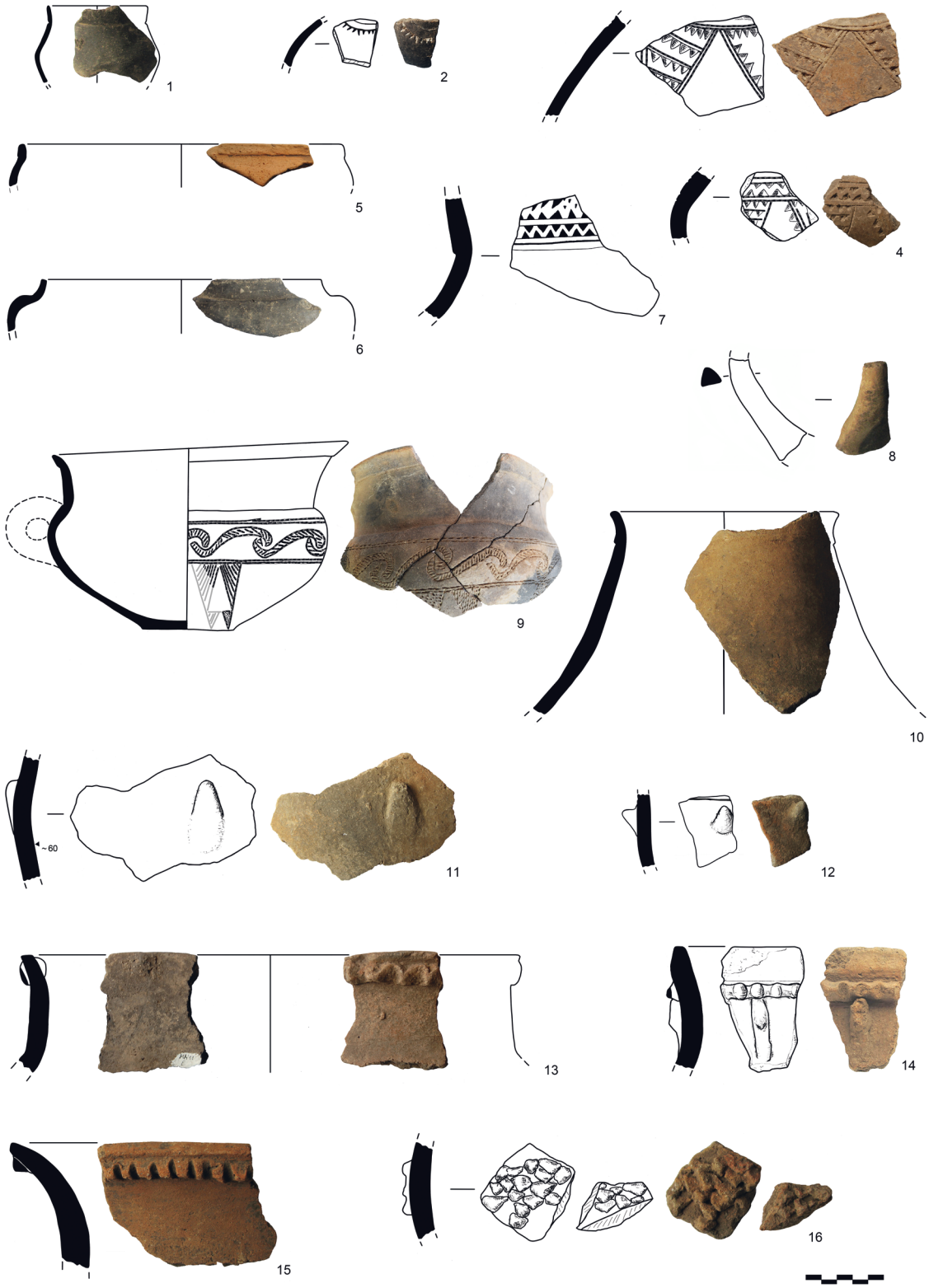

Fig. 16 Local pottery from Malka Dragoyna (drawings: E. Bozhinova)

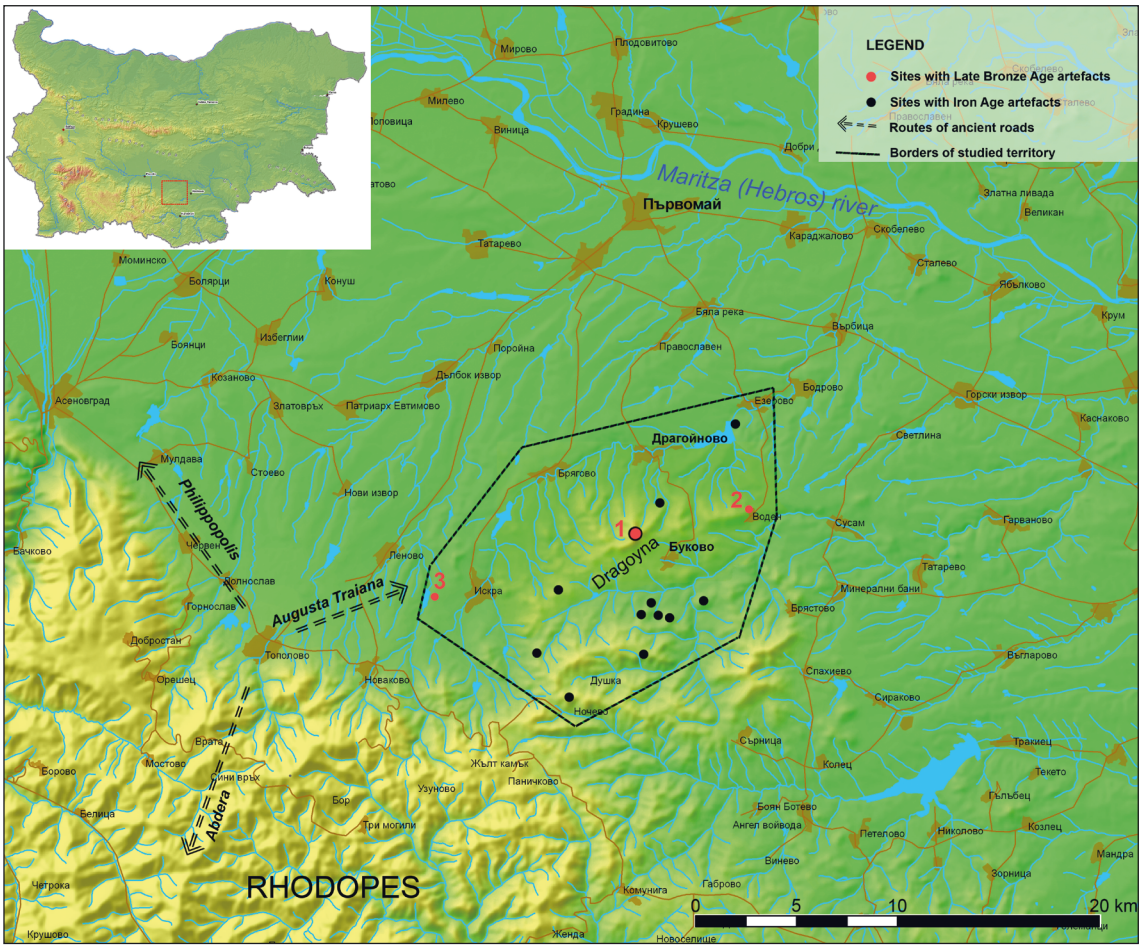

Fig. 17 Map of the region with Late Bronze Age sites: 1. Dragoyna; 2. Mitkovi kamani; 3. Ropkite (map: H. Hristov with additions by E. Bozhinova)

ridge, situated at a distance of 4km from the Dragoyna peak. The Mitkovi kamani site has an identical exposure to the one on Malka Dragoyna, similar rock formations and a terraced surface. All sherds found in a treasure hunters' pit belong to the Late Bronze Age (Fig. 19.1–7). Among them are a dozen pieces of a pithos with porous clay and a rough surface (Fig. 19.8).

One of the main roads connecting the Thracian valley with the Aegean coast passed through this region during the Late Iron Age (the second half of 1st millennium BC) and the Roman period (1st–4th century AD). The route is reconstructed on the basis of settlement locations and coin finds and it is probable that it was already being used in the Late Bronze Age. The so-called East Trans-Rhodopean road enters the Rhodopes from the north, just to the west of the Dragoyna ridge, through the Topolovo mountain passage as this is the junction of the western road from Philippopolis (Plovdiv) and the northeastern one from Augusta Traiana (Stara Zagora).[11] The three Late Bronze Age sites in the area are located along this last route. Controlling the road with its strategic location could be one of the reasons for choosing the Dragoyna peak to establish a settlement and its development as a centre for the region (Fig. 17).

The abundance of the regional natural resources is another potential source of wealth for the Dragoyna settlement, which is further supported by the dense net of Iron Age settlements in the whole mountain region. The Dragoyna ridge was formed as a result of volcanic activity, as it is

[11] Madzharov 2010, 333–334, fig. 1a.



Fig. 18 The Mitkovi kamani site, the village of Voden, view from the west (photo: E. Bozhinova)

one of the sides of a volcano caldera and is rich in metal deposits, namely zinc, lead, silver and gold. The deposits in the Chala locality, situated on the other side of the same volcano, are an object of mining today but were also so in Antiquity.[12] Large numbers of stone structures are registered in the mountain area south of the Dragoyna peak, on the southern hills of the ridge. In the locality of the Zhaltata peshtera site, where an ancient gallery is visible, pottery from the Chalcolithic period and the Iron Age is found.[13] A site dated to the 5th/6th century AD is registered on the northern slopes of the Dragoyna ridge just west of the Mitkovi kamani site. A number of stone structures are mapped there, spanning an area of 6km². They are supposedly the result of mining activities, as well as remnants of residential areas.[14]

Large digs/pits in the plain area on the high shore of the Mechka River constitute probable traces of ancient mining activities. They are found in the Ropkite area, next to the village of Iskra (Fig. 17, no. 3). On the surface around them we found artefacts dated to Late Antiquity, the Iron Age and the Late Bronze Age. The Late Bronze Age objects are pottery sherds (Fig. 19.10–11) and a nearly complete pottery stand with decoration typical for the period (Fig. 19.9). So far, the stand is the only artefact of this type from the period found in the territory of Bulgaria. A piece of a double vessel is also among the finds from the site (Fig. 19.12). Double vessels are known to have been produced during the Late Bronze and the Early Iron ages.[15] The one from the Ropkite location has a decoration with circles made with a stick or another, similar tool and could be

12 Popov – Jockenhövel 2017, 60, map 1.
13 Andonova – Bozhinova 2010, 662–663, fig. 3.1–6.
14 Bozhinova – Andonova 2015, 834–835, fig. 3.
15 Budakova 2017.

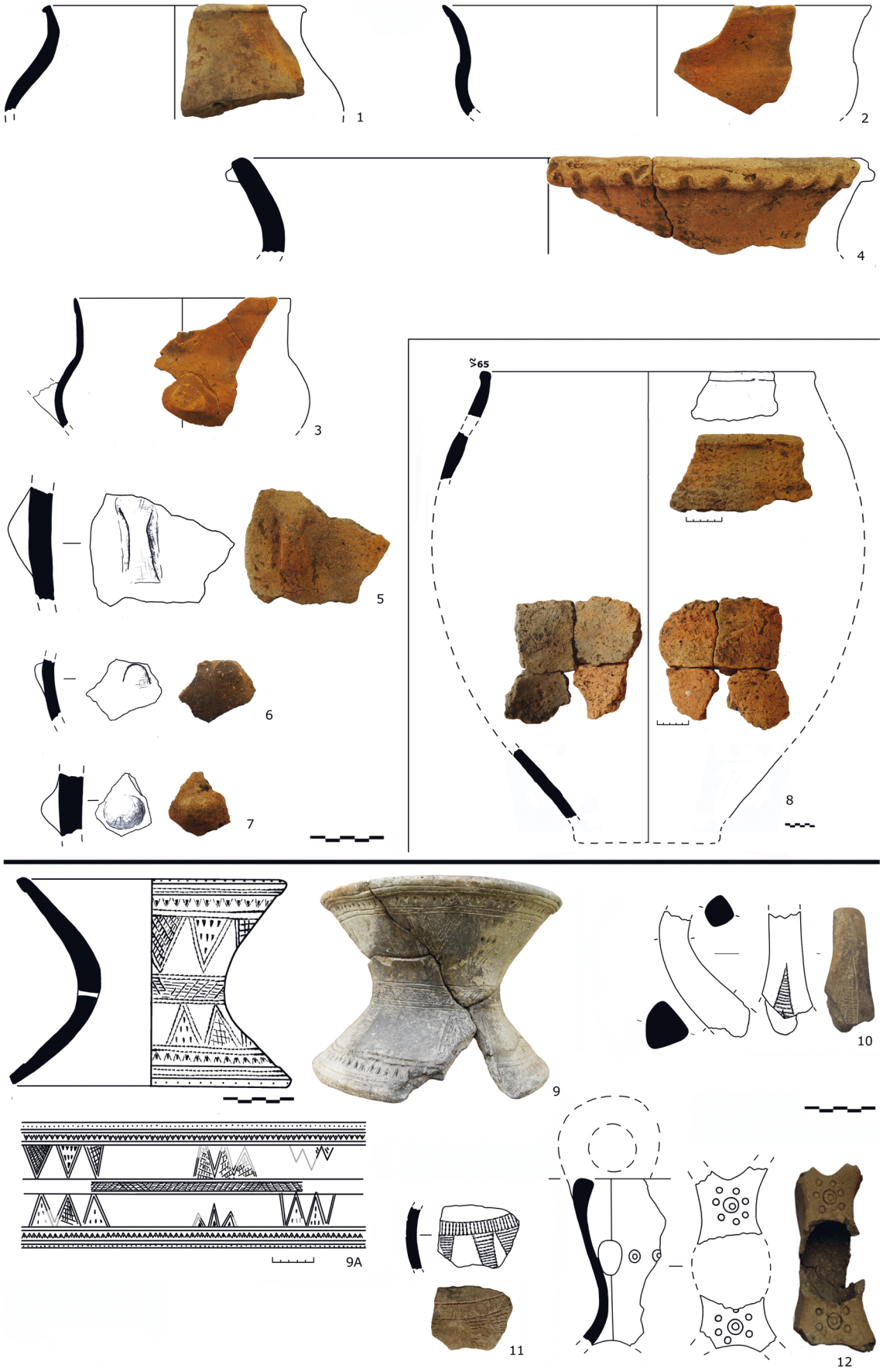

Fig. 19 Pottery: 1–8. Mitkovi kamani site; 9–12. Ropkite locality, the village of Iskra (drawings: E. Bozhinova)

regarded as diagnostic for the very beginning of the Iron Age, but this decoration technique was already used by the Bronze Age, e.g. on the amphora from Malka Dragoyna (Fig. 15.8).

The flourishing period of the Dragoyna settlement during the Late Bronze Age coincides with the time of the exploitation of the Ada Tepe gold mines.[16] Though it is a period of established contacts with the advanced Mycenaean culture to the south,[17] the Dragoyna site provides most of the pottery imports for this early phase, the end of the 15th to the 14th century BC, despite the growing number of excavated sites from the period.[18] The presence of other ceramic imports at Dragoyna (although so far without identified provenance), proves that their presence does not result from an occasional event or archaeological chance and strengthens the site's significance as a leading centre for a large area. Whether the inhabitants were directly involved in mining activities or only in the processing of the extracted raw materials and their distribution is a question that requires future research. Although there are data for mining activities in the region, we still need proof that mining was practised during the Late Bronze Age. Larger scale research is necessary to understand the regional position of Dragoyna but also its role in interregional communication during the Late Bronze Age. These tasks will fall to other archaeological teams, since the archaeologists involved in the surveys and excavations so far have been involved in other projects during the last few years.[19] Still, their efforts all led to sufficient results and made Dragoyna one of the key sites for studying the Late Bronze Age and the Iron Age cultures in the eastern Balkans.

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16 Popov 2018, 405–410.

17 Jung et al. 2017, 286–292.

18 For Mycenaean LH IIB/IIIA1 imports found at Ada Tepe see Popov et al. in the present volume.

19 It is impossible to list here all the participants in the Dragoyna expeditions. Among the most active team members were the archaeologists Antoaneta Andonova, Velina Zhekunova, Metodi Dimitrov, Maya Valentinova, Yana Dimitrova, Dessislava Kostadinova, Galina Samichkova, Sylvia Ivanova, Velislav Bonev, Ivailo Karadzhinov, Andrey Stoitzov, Tsvetelina Slavkova, Kostadin Kossev†, Nikolai Trifonov and Slavcho Spasov, to whom I express my sincere gratitude. A great impediment that is another reason for the interruption in the research is the recent alteration in the Bulgarian legislation. It concerns archaeological excavations in forest areas that are state property, as is the case for Dragoyna. The Ministry of Forestry requires expensive taxes to conduct archaeological excavations and direct permission by the Council of Ministers, in addition to a complicated documentation.

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Early Metalwork in the Balkans

Technology and Fragmentation: A Case Study of the Early Bronze Age Shaft-Hole Axes from the Northeastern Balkan Peninsula

Radu Băjenaru[1]

Abstract: Shaft-hole axes are both one of the most characteristic heavy metal items, and the most important innovation in metallurgy during the Early Bronze Age in the Carpathian-Balkan area. The first artefacts here probably appeared during the second half of the 4th millennium BC, originating from the northern Caucasus and North Pontic areas, as the Baniabic type indicates. But the further development of this kind of axe during the whole 3rd millennium BC is a local one. Considering their number, their particular typological traits and the availability of copper ores in the area, we can assume the presence of several centres of production of such objects in the northeastern Balkan Peninsula. It is generally accepted that shaft-hole metal axes range among the items with high social value, triggered by certain events they were used in (i.e. battles, duels, ceremonies, ownership change, social identity negotiations etc.). The intentional fragmentation of metal items is part of the biography of certain objects. The present author highlights the evolution of the casting technologies of these items and exemplifies some cases of their fragmentation in the northeastern Balkan area.

Keywords: Early Bronze Age, northeastern Balkan area, shaft-hole axes, technology, fragmentation, biography of objects

Introduction

The blade of a shaft-hole axe found near Lovech (Lovech District, Bulgaria), at present part of the collection of the Lovech Museum (inv. no. 216),[2] bears the stamp of a name and year: ‘МИНКО М. БЪКЪРЖИ. 1929. Г.’.[3] I do not know who Minko M. Băkărzhi was, but I assume 1929 was the year he acquired the axe, either as a purchase or as a chance find from the surrounding area of the town. We can thus retrieve one moment of the very recent biography[4] of this axe: the time spent in Băkărzhi’s ownership, leaving distinct and permanent marks on its body.

It is generally accepted that shaft-hole metal axes number among the items with high social value. Although there are cases of axes produced merely to be hoarded, with no visible use-wear marks, for most of them a longer period of use is to be presumed. An example at the extreme end is that of the Pătulele-type axe (c. mid-3rd millennium BC), part of the Vărbitsa II hoard (Pleven District, Bulgaria) (Fig. 1), associated with typical pieces of the second half of the 2nd millennium BC (socketed axes, spearheads, a sword fragment, etc.).[5] Whereas in this case we can estimate a period of c. 1000 years between the moment of the manufacturing and that of the deposition, in most cases such an estimate is impossible,

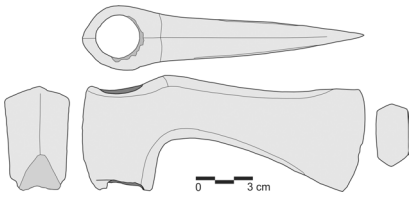

Fig. 1 The shaft-hole axe from the Vărbitsa II hoard (Pleven District, Bulgaria). Scale 1:4 (R. Băjenaru)

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[2] Chernykh 1978, 140, pl. 22.1.

[3] Băjenaru 2013, 126, cat. no. 335.

[4] *Senso* Kopytoff 1986.

[5] Kovacheva 1967, 55, fig. 5.

as the majority of the shaft-hole axes dated to the Early Bronze Age in the Carpathian-Balkan area were isolated finds or come from hoards consisting of similar artefacts.

It is very likely that the shaft-hole axes held a certain symbolic value from the very moment of their casting – their 'birth' – a symbolism expressed by a series of attributes acknowledged as such by the respective societies (shape, colour, etc.). It may be equally possible that their value and social impact changed with their active involvement in various events (ceremonies/processions, duels/battles, negotiations of social identities, etc.), by changing ownership and their transmission from generation to generation or by their travelling to other cultural areas.[6] Their active and long-term use in social practices gives them the capacity to dictate and shape specific behaviours in which they played the leading role. Thus, in the case of 'long-lived' items – the axes discussed in the present paper included – there are several distinctive cycles,[7] together defining the biography of the respective artefact. In certain cases, entering a new cycle assumes certain rites of passage[8] through which the object acquires new symbols and meanings. If in the 20th century such a cycle is marked by stamping on the axe blade the name of the new owner – as was the case for the Lovech artefact mentioned above – things may have been different in prehistoric times, but they still left distinct and permanent marks and signs on the morphology of the objects so that they were observed, perceived and more importantly, acknowledged as such by the respective societies.

Shaft-hole Axes in the Northeastern Balkan Area: Typology, Chronology and Technological Choices

The presence of the shaft-hole axes in the Carpathian-Balkan area is linked to the deep social transformations that occurred towards the middle of the 4th millennium BC throughout the entire West Pontic area,[9] such early artefacts being an essential part of the 'cultural package' that characterized the dawn of the Bronze Age in the respective region.[10] The typological similitude of these early axes in the Carpathian-Balkan area (the Baniabic type) and those from the Caucasus and North Pontic regions has long been noted[11] and their typological origin from the Novosvobodnaya cultural area is nowadays almost unanimously accepted.[12] Studies on the chronology of the shaft-hole axes are relatively numerous. Obviously, the attempts at chronological ordering of the various types of axes have as a starting point their contexts and associations with other artefacts. Unfortunately, most such axes in the Carpathian-Balkan area came from hoards or were isolated finds, and only in a limited number of cases could they be linked to pottery contexts. Thus, typology gains importance in the chronological ordering of the shaft-hole axes, with all classifications suggested in time bearing a chronological component. The most frequently employed typology, even today, is the one suggested by Alexandru Vulpe at the end of the 6th decade of the past century.[13] According to this, the typological evolution of the shaft-hole axes in the Carpathian-Danube area can be traced across five distinct chronological phases, the first two of them being of interest for the present case; they included the following types:

1. The Baniabic, Corbasca, Fajsz, Dumbrăvioara and Veselinovo I types. The first two types have unprofiled shafts but all have a pentagonal cross-section of the blade, indicative of a

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6 Ideas expressed by the human-thing entanglement theories: e.g. Olsen 2010; Hodder 2012; Stockhammer – Hahn 2015.

7 Hahn 2005, 40–45; Hahn – Weiss 2013.

8 Fogelin – Schiffer 2015.

9 Hansen 2014.

10 Băjenaru – Frînculeasa 2013, 14–15; Băjenaru 2014, 255.

11 E.g. Roska 1933, 355; Nestor 1933, 79; Vulpe 1970, 26.

12 More recently, Irimia 1998; Bátora 2003; Hansen 2009; Băjenaru 2010; Hansen 2011; Szeverényi 2013. To Alexandru Vulpe, the origin of the shaft-hole axes was the Near East (Vulpe 2020, 130).

13 Vulpe 1970, 9–13.

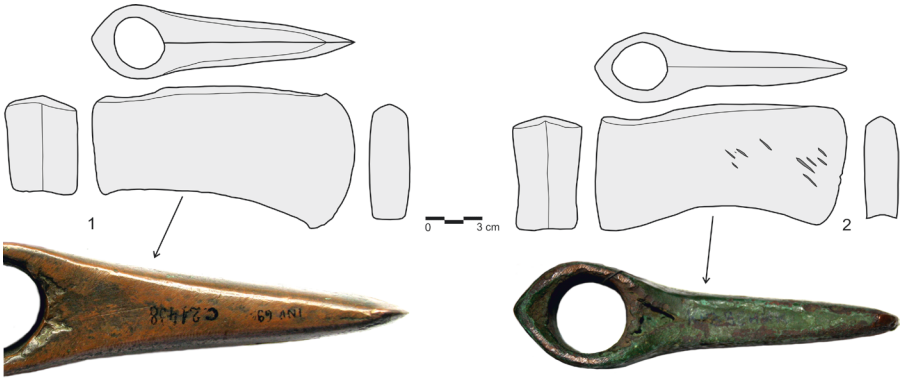

Fig. 2 1. The shaft-hole axe from 'Romania'; 2. The shaft-hole axe from Krăvenik (Gabrovo District, Bulgaria). Scale 1:4 (R. Băjenaru)

less developed (archaic) casting method in open bivalve moulds; they were assigned to the Early Bronze Age.

2. The Izvoarele, Veselinovo II, Pădureni I and Pătulele types. All have a profiled shaft and a hexagonal cross-section of the blade, indicating that they were cast in closed bivalve moulds; they were assigned to the early stage of the Middle Bronze Age.

In the course of the 50 years since Vulpe published the volume, the number of axes discovered has increased considerably, inevitably complicating the typology in use. This triggered a series of observations and corrections of the 1970 typology.[14] Vulpe himself, following the publication of the hoard from Thebes (Greece)[15] advocated for the inclusion of the Pătulele-type axes in a chronological horizon corresponding to the Early Bronze Age.[16] Considering that there had almost certainly been several metallurgical centres of production for the shaft-hole axes in the Carpathian-Balkan area, with their own traditions and craftsmanship, a close glance at the technologies employed may offer important information on the evolution of such artefacts during the Early Bronze Age at the Lower Danube. One may thus establish classes of axes with various typological characteristics, but grouped based on the casting technology used. I shall linger longer over the technological observations, as good appreciation of these processes allows for a better understanding of certain behaviours and interventions that affected the axes at certain moments during their use.[17]

It is difficult to say whether the Baniabic-related types in the Carpathian-Balkan area are local products imitating the ones in the Caucasus; to date, there is no proof of their moulding in metallurgic workshops in the West Pontic area.[18] All such pieces, from the Caucasus to the Middle and Lower Danube, were made using bivalve moulds, open at the lower edge of the axe,[19] and thus creating a pentagonal cross-section for the blade with the tip upwards, and only rarely rectangular. Given the relatively straight plan of the lower edge, filling the moulds was uniform, but in the

14 E.g. the general observations triggered by the discovery of the Mastacăn axe, Neamț County, Romania (Popescu 2006), or of the Pădureni type (Palincaș 1999/2000).

15 Maran 1989.

16 Vulpe 2001, 422.

17 This study is based on macroscopic examinations of c. 170 shaft-hole axes dated to the Early Bronze Age (ranging from the Baniabic to the Pădureni type), which I personally studied in museums from the northeast Balkan Peninsula (southern Romania and Bulgaria) between 2011 and 2013 (Fig. 18). For another 45 artefacts in the same area, only the published information was available to me (some of the artefacts had been lost or were unavailable at the time of my study) (Băjenaru 2013).

18 The only argument in favour of a local production is the relatively large number of Baniabic-related type axes from the Carpathian-Balkan area. For example, the Vâlcele (formerly Baniabic, Cluj County, Romania) hoard consisted of at least 40 axes (Soroceanu 2012, 110); Vajk Szeverényi estimated it consisted of c. 55 axes (Szeverényi 2013, 663).

19 Method illustrated at Chernykh 1992, 61, fig. 18.I.

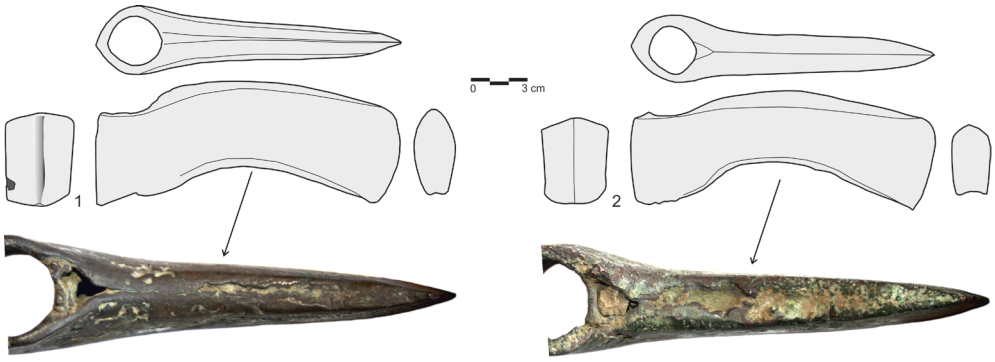

Fig. 3 1–2. The shaft-hole axes from the Dekov hoard (Pleven District, Bulgaria). Scale 1:4 (R. Băjenaru)

open area certain grooves and hollows remained, subsequently more or less finished by cold-hammering and polishing. There are artefacts with skilled finishing where almost no flaws are visible (Fig. 2.1), and others with marked hollows, mainly towards the shaft (Fig. 2.2). These differences also indicate that the artefacts in our region originate in several production centres with different traditions. I am tempted to attribute the axes with a well-finished lower edge to metallurgic workshops in the Caucasus area, and those with hollows at the inferior edge to production centres located further to the west in the North Pontic area, where the best analogies exist,[20] but this would be mere speculation. A last argument is represented by the presence at Dănceu (Mehedinți County, Romania)[21] of a Baniabic-type axe decorated on the lower edge in a similar manner to specimes in the Klady cemetery.[22] The relatively significant number of pieces of Baniabic-related types in the Carpathian-Balkan area at the beginning of the Bronze Age – suggesting a local production – may have been the result of a tradition of the Eneolithic period, the respective area being acknowledge from the 5th millennium as an axe area.[23] Their social function appears to be similar to that of the Eneolithic axes from the Lower Danube, the majority occurring as single finds or in hoards, contrary to the shaft-hole axes in the northern Caucasus, mostly recovered from funerary contexts.[24] As far as the chronology is concerned, there is pertinent data suggesting the second half of the 4th millennium BC for the Baniabic-related types in the Carpathian-Balkan area.[25]

First clear indications of a local production of shaft-hole axes along the Lower Danube were provided by the appearance of types with a limited regional distribution. This is the case for the axes that fall into a South Danubian variant of the Corbasca type, characterized by the strong arching of the blade and a shaft with little or no profiling; they are present between the Stara Planina and the Danube, mainly in the central area of northern Bulgaria (the districts of Gabrovo, Lovech and Pleven). Most representative are the two axes from the Dekov hoard (Pleven District)[26] (Fig. 3), having certain typological features also to be found in the Veselinovo-type axes. The casting technology is the same as for the Baniabic-type axes, in moulds open all along the lower edge of the axe, as indicated by the grooves and hollows left by this process.

I consider one of the earliest attempts at local shaft-hole axe casting on the Lower Danube to be that of the objects in the Ostrovu Corbului I hoard (Mehedinți County, Romania), consisting of four Corbasca-type axes, a flat axe and 15 miniatures of flat axes (which might be considered

20 E.g. Klochko – Kozymenko 2017, 24–26, 48.
21 Crăciunescu 1998, 146, no. 7, pl. 3.1.
22 Rezepkin 2000, pl. 54.7, 14.
23 Vulpe 1975; Todorova 1981; Patay 1984.
24 Bátora 2003; Hansen 2009; Băjenaru 2010; Hansen 2011; Szeverényi 2013.
25 Hansen 2009, 145–149.
26 Chernykh 1978, 138, pl. 21.2, 5; Băjenaru 2013, 67–68, nos. 154–155.

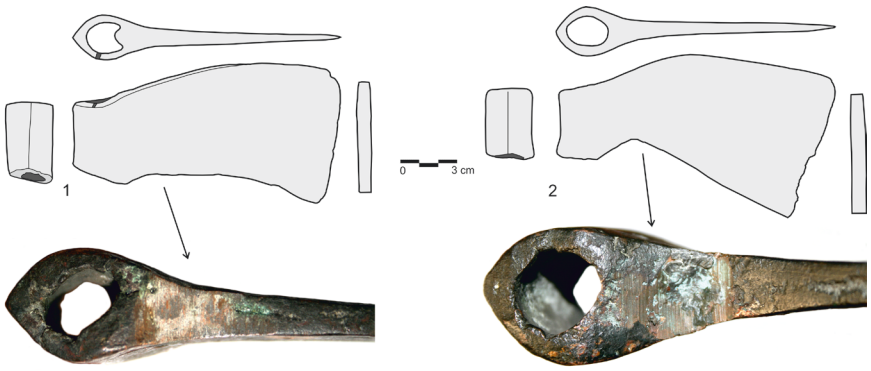

Fig. 4 1–2. The shaft-hole axes from the Ostrovu Corbului I hoard (Mehedinți County, Romania). Scale 1:4 (R. Băjenaru)

ingots), accidentally recovered during the interbellum period.[27] Dumitru Berciu assumed the four axes were made of a copper plate cast in a mono-valve mould; the edge had been rolled to form the shafting-hole and then stuck to the rest of the body.[28] The two axes that survived from this hoard do not confirm this technological reconstruction. They were cast in bivalve moulds open at the lower edge of the axe; the cross-section of the blade is rectangular with a well-marked seam on the butt; and the grooves and hollows on the lower edge resulting from the casting are still visible, although some have been recently filed by the finders (Fig. 4). Their general aspect and the proportion between the various parts of the objects indicate a certain lack of experience in manufacturing the design of the moulds and the casting of the items, especially where the shaft-holes are concerned; these have diameters of 1–2cm and are mostly irregularly shaped, obturated by casting scraps. There are several settlements dated to the Early Bronze Age on the island where the hoard was found. It is highly probable this hoard was connected to the Coțofeni settlement there, which would indicate a date during the second half of the 4th millennium BC, at the threshold between the 4th and the 3rd millennium. It is worth highlighting that a furnace used for ore reduction was also found at this settlement.[29] A rather similar date must be taken into consideration for the manufacture of the South Danubian variant of the Corbasca-type axes mentioned above.

The technology of bivalve moulds open at the lower edge of the axe was also used for casting the Veselinovo I-type axes, present over a large area comprising Wallachia, Dobrudja, the whole of Bulgaria and northern Greece.[30] Although typologically related axes are known from the Trans-Caucasus and eastern Anatolia,[31] the Veselinovo type could be considered local to the northeastern Balkan Peninsula, with a notable concentration in Thrace, where several manufacturing centres probably existed. In fact, the first known moulds in this area were used for the casting of such axes.[32] Contrary to the southern variant of the Corbasca type, with which it had an obvious typological affiliation, in most Veselinovo-type axes one notes a preoccupation with obliterating the grooves and hollows on the lower edge. In some cases, after the casting ended, metal was added to the remaining hollows and cold-hammered and polished. Such is the case for the artefact from Veselinovo (Yambol District, Bulgaria) (Fig. 5.1). In most cases the hollows towards the shaft are well polished and transformed into well-finished grooves (Fig. 5.2), and some

27 Vulpe 1970, 30, nos. 44–47, pl. 4.44–47; 65.E; Soroceanu 2012, 147–150, pl. 59; Băjenaru 2013, 148–149, nos. 409–412.

28 Berciu 1937, 306; the idea was also embraced by other authors (e.g. Soroceanu 2012, 149).

29 Roman – Dodd-Opriţescu 2008, 163, fig. 36.

30 Vulpe 1970, 35–37; Chernykh 1978, 144–145, pl. 20; Maran 2001; more recently, Kleitsas 2019.

31 Chernykh 1992, 63, fig. 20.1–4.

32 Vulpe mentions a mould from Cernavoda in Dobrudja, but without a clear context (Vulpe 1970, 36, no. 74). More numerous are those from Thrace (Chernykh 1978, 136–139, pls. 20.6–8; 21.10.). Their typological identification is difficult given the fact all valves were discarded following heavy fragmentation.

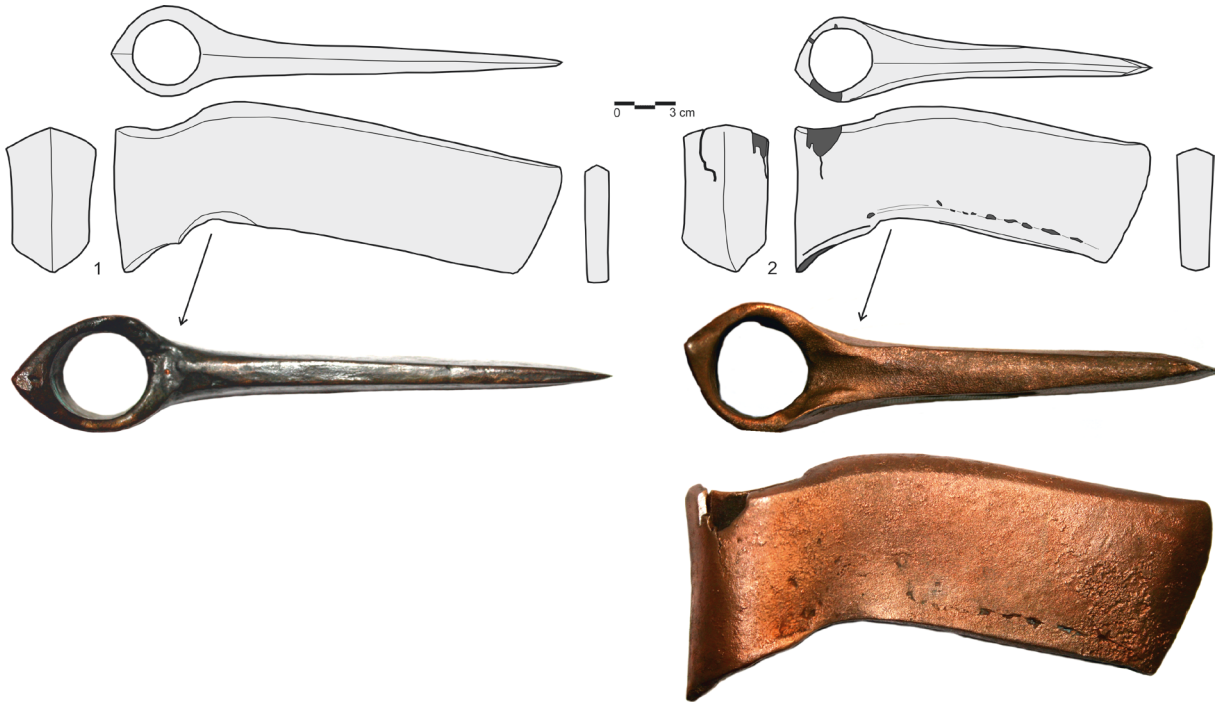

Fig. 5 1. The shaft-hole axe from Veselinovo (Yambol District, Bulgaria); 2. The shaft-hole axe from Crivăț (Călărași County, Romania). Scale 1:4 (R. Băjenaru)

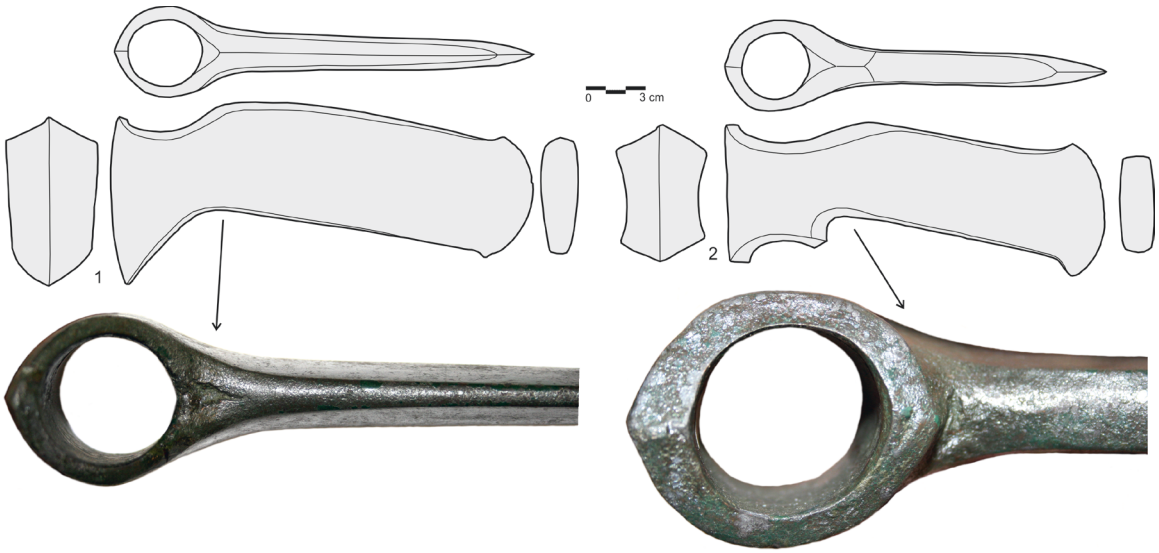

Fig. 6 1–2. Shaft-hole axes from the hoard of 'Bulgaria'. Scale 1:4 (R. Băjenaru)

of the axes are so skilfully polished that no flaw is visible on the lower edge other than on a small portion of 1–2cm near the shaft (Fig. 6).

For the metalsmiths though, the main problem was not necessarily about the aesthetics of the lower edge but about the ability to homogenously fill the mould, given that through the elongation of the butt in the Veselinovo-type axes, the level difference between the plan of the lower edge of the shaft and the plan of the lower edge of the blade becomes considerable. One solution was the gradual filling, in stages, of the various parts of the mould, first the shaft and then the blade. The skill consisted in estimating exactly the time between the stages, so that the metal retained its fluidity, ensuring the homogenization of the charges. An erroneous appreciation of the time is, I



Fig. 7 1. The shaft-hole axe from Găujani (Vâlcea County, Romania); 2. The shaft-hole axe from Pucioasa (Dâmbovița County, Romania). No scale (1. photo: A.-D. Popescu; 2: R. Băjenaru)

believe, illustrated by the Crivăț axe (Călărași County, Romania),[33] where the last charge – filling the lower part of the blade – was poured somewhat later than it should have been, preventing a good homogenization of the already cast metal, in time leading to a fracture in the lower part of the blade (Fig. 5.2).

There are two finds that have to be considered for the chronology of the Veselinovo type. The first is represented by the Veselinovo axe (Yambol District, Bulgaria) recovered from the third layer of the tell-settlement,[34] associated with materials dated to the second period of the Early Bronze Age in Thrace, most probably the middle of the first half of the 3rd millennium. The second one is represented by a hoard recovered in 1996 from the treasure hunters, also found in Bulgaria (most probably in Thrace, Stara Zagora District). It consisted of a flat axe, five shaft-hole axes and a stone axe.[35] All the metal objects displayed the same patina and colour, suggesting their association in one hoard. Moreover, all five shaft-hole axes have similar technological and typological characteristics, so their casting in the same metallurgical workshop is most probable. Four of them are typical of the Veselinovo I axe series (Fig. 6.1). The fifth presents the same arching of the blade but, differently, has a profiled shaft (Fig. 6.2). It is important that the casting technology is the same in all artefacts, in moulds open at the lower edge of the axe, with the edge well finished. The axe with a profiled shaft is typologically identical to the one from Vano 829 at Poliochni, on the Island of Lemnos, found in the *rosso* layer and datable to the middle of the first half of the 3rd millennium BC or to the second quarter of it.[36] Thus, we can assume that prior to 2700 BC, the Veselinovo I-type axes were still in use in the northeastern part of the Balkan Peninsula. I consider the most probable time for their manufacturing to range between 2900 and 2700 BC.

The technological limitations of casting in bivalve moulds opened towards the lower edge of the axe (highlighted above), mainly in the case of the artefacts with a more complex morphology and which were required more frequently by the societies of the Early Bronze Age in the Balkan Peninsula (and by this I mean the axes with a profiled shaft-hole), triggered the search for and experimentation with new casting technologies. It is noteworthy that a few extremely active and innovative metallurgical centres had already appeared in the Vučedol cultural area since the first half of the 3rd millennium BC, the casting of the shaft-hole axes included.[37] This refers firstly to the Kozarac-type axes, distributed over a wide area in the central and western part of the Balkan Peninsula and the Middle Danube, with most items cast in closed bivalve moulds, a technology which soon took over throughout the entire Carpathian-Balkan area. Along the Lower Danube, several casting technologies were being experimented with during the second quarter of the 3rd millennium BC, some of them employed independently from those used in the north-Pontic area.

33 Vulpe 1970, 35–36, pl. 5.72.
34 Mikov 1933, 105, no. 1, fig. 65.
35 Avramova 2004; Stefanova 2004; Băjenaru 2013, 37–39, nos. 49–54.
36 Bernabò-Brea 1964, pl. 173.
37 Dani et al. 2016, 220, fig. 1.

One of them is the lost-wax technique. I only know of two axes cast by this method in the area of interest, both from southern Romania, and they fall into the Dumbrăvioara type (Fig. 7). The distinctive feature is the lack of all seams which usually appear on the axes cast in bivalve moulds at the joint area of the valves. Given the very limited number of such artefacts, it follows that the method remained only an experiment in the area.[38] A major drawback seems to have been the difficulty in removing and polishing the numerous hollows and grooves left on the surface of the piece after the casting. The Dumbrăvioara-type axes represent a specific type consisting of c. 18 items, mainly originating from southern Romania and east and central Transylvania, frequently associated with Glina- and Jigodin-type pottery,[39] thus indicating the second quarter of the 3rd millennium BC. All the other artefacts attributed to the Dumbrăvioara type were cast in bivalve moulds open at the upper edge of the axe, resulting in a pentagonal cross-section of the blade, with the tip down.[40] This technological solution ensured the uniform spread of the metal in the mould in the axes with a profiled shaft-hole. The artefacts cast using this method have a depression on the upper part, indicating the area for pouring the metal. It is interesting that in the case of the Pucioasa axe (Dâmbovița County, Romania) (Fig. 7.2), which was cast using the lost-wax technique, the clay mould was similar to the bivalve ones, with the upper side open for the casting of the metal, as the artefacts shows the same specific depression.

The lack of such axes (cast into bivalve moulds open at the upper edge of the axe) south of the Danube makes probable the assumption that the Dumbrăvioara axes were manufactured in metallurgical centres in Transylvania, such as the one from the Leliceni settlement with cord-like impressed pottery already mentioned, as the respective technology did not exist south of the Carpathians. The presence of such axes at Glina-type sites south of the Carpathians can be explained by the more intense contacts between these cultural areas at the time. Also important is the presence in eastern central Europe of several axes of the Dumbrăvioara type, cast by the same technique.[41] The most important find comes from a Corded Ware burial at Szczytna (Jarosław District, Poland). The burial yielded abundant grave goods, among them a Dumbrăvioara-type axe.[42] This find highlights once again the connection between the technology of casting in bivalve moulds open on the upper edge and the pottery with cord-like impressions, a connection also observed in Transylvania, at Leliceni. Interesting but more difficult to explain is their presence in the South Alpine region, in the province of Friuli Venezia Giulia;[43] the most probable explanation being that they travelled through the western Balkan area.

The need for much better control over the casting of the metal and also for the possibility of manufacturing objects with a more complex morphology led to the appearance and wide distribution of casting into closed bivalve moulds. As mentioned above, this technology appeared early in the Carpathian-Balkan space, towards the middle of the first half of the 3rd millennium BC in metallurgic centres in the Vučedol cultural area, and was used for casting the Kozarac-type axes. I believe that the first attempts of this kind in the northeast of the Balkan Peninsula date to the second quarter of the same millennium, from the times of the technological attempts and experiments discussed earlier, as there was more than one method used; several technological choices existed, some rapidly abandoned, others used for a longer time period.

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38 The lost-wax technique appears to have been used successfully for the Perșinari hoard, dated to the middle of the 3rd millennium BC (Popescu 2020). It is equally interesting that a clay axe mould associated with this method was found in the already mentioned site of Poliochni, Megaron 605, dated to the middle of the first half of the 3rd millennium BC (Nakou 1997, 638).

39 Vulpe 1970, 31–32; Vulpe 1988. At the Jigodin-related site from Leliceni (Harghita County, Romania) several moulds for casting such axes were found (Roman et al. 1992, 157–158, pl. 78).

40 Method illustrated at Chernykh 1992, 61, fig. 18.IIb.

41 Gedl 2004, 27.

42 Czopek 2011, 249, no. 64.15.

43 Tasca – Visentini 2009, figs. 1; 2.8–9. The authors identify the two axes as the San Antonio/Kozarac type, but the Kozarac artefacts were usually cast in closed bivalve moulds.

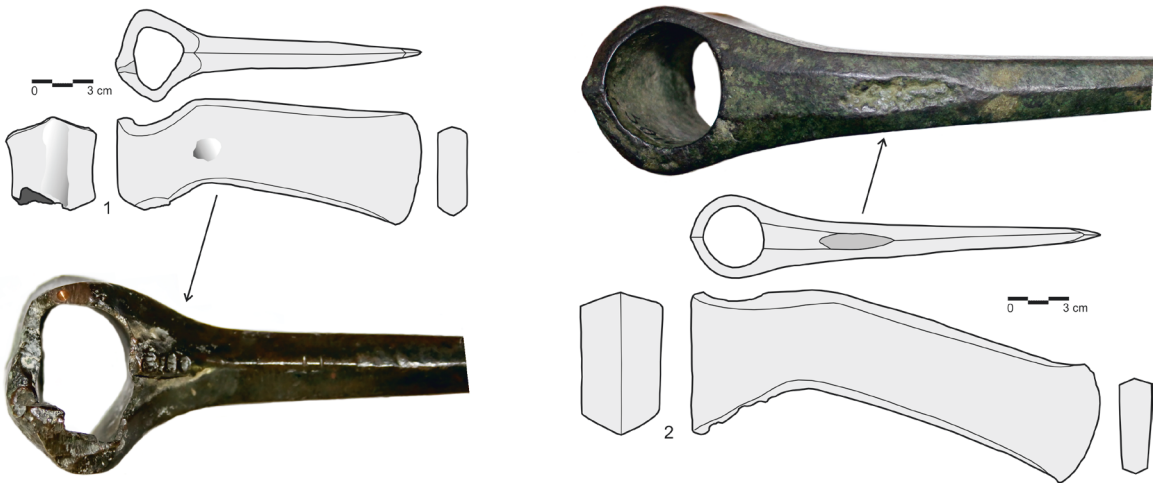

Fig. 8 1. The shaft-hole axe from Oryahovo (Vratsa District, Bulgaria); 2. The shaft-hole axe from an unknown findspot in Tulcea County (Romania). Scale 1:4 (R. Băjenaru)

An axe from Oryahovo (Vratsa District, Bulgaria),[44] which typologically resembles those of the Veselinovo type (Fig. 8.1), was cast in a closed bivalve mould with the sprue on the lower edge (of the axe), near the shaft. The hollow left on the spot of c. 2–3cm in diameter was later covered with a roughly finished fragment of metal. The use of a closed bivalve mould is clearly indicated by the presence of seams on both sides of the blade, which has a hexagonal cross-section. As far as I know, this is the only axe in the area studied cast using this method; as in the case of the bivalve moulds open at the lower edge (of the axe), the respective technology is not the best choice for casting axes with a profiled shaft-hole. Another axe, this time morphologically similar to the Veselinovo type came from an unknown findspot in Tulcea County, Dobrudja.[45] It was cast in a closed bivalve mould with the sprue on the upper edge of the axe (Fig. 8.2). This indicates that for the casting of the Veselinovo-related axes different methods and technologies had been used. Either this type was cast throughout a long time period, regardless of the technological changes, or contemporaneous manufacturing workshops using various technologies for the same type of axe must have existed.[46] But this method of casting axes in closed bivalve moulds through a hole on the upper edge is not very common in the northeastern part of the Balkan Peninsula either. It seems to have been used more frequently in the western region of the peninsula for manufacturing the Kozarac-type axes with arched blades; indeed, in the axes with an elongated shaft and strongly arched blade it appears to be a normal technological choice[47] (see also the Mărăști axe, Bacău County, Romania, Fig. 15.3). It is also possible that some of the earlier items of the Izvoarele- and Pătulele-related types had been cast by the same method but with better finishing and polishing, thus removing the grooves and hollows left by the casting hole and making them invisible to the naked eye. The same observation goes for the pieces possibly cast in closed bivalve moulds with the sprue located on the lower part of the axe, towards the cutting edge, as is the case for certain moulds in the Vučedol area.[48] It will only be possible to achieve clearer observations in this regard following microscopic and imaging examinations.

Nevertheless, for the axes with straight, non-arched blades, choosing as the casting method the closed bivalve moulds with the sprue on the upper edge of the axe was not the best technical solution. Thus, for most of the axes assigned to the Izvoarele, Pătulele and Pădureni types, the metal

44 Mikov 1933, 91, no. 20; Chernykh 1978, 141, pl. 23.2; Băjenaru 2013, 147, no. 406.
45 Vulpe 1970, 36, pl. 5.75
46 For a more detailed discussion see Popescu – Constantinescu 2021.
47 Method illustrated at Chernykh 1992, 61, fig. 18.IV–V.
48 Ecsedy 1983.

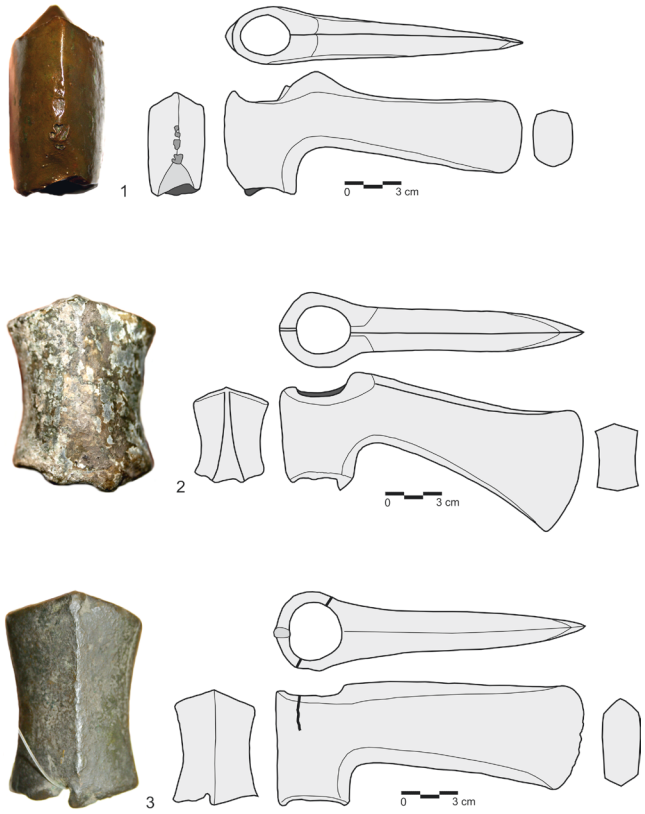

Fig. 9 1. The shaft-hole axe from 'Bulgaria'; 2. The shaft-hole axe from Provadya (Varna District, Bulgaria); 3. The shaft-hole axe from Vădastra (Olt County, Romania). Scale 1:4 (R. Băjenaru)

was cast through the lower edge of the shaft. I would tend to put the start of this method around 2600 BC (for the complete chronology see the discussion below). In certain axes, it is probable that the entire breadth of the lower edge of the shaft was used, as indicated by the flaws present on some finished artefacts, the area appearing wavy and thinned following hammering and finishing. For the most part though, the area used for pouring in the metal was on the lower part of the butt. In certain cases, a funnel was possibly used, fixed on the casting hole so that it covered the joint area of the valves and thus eliminated the seam on the butt in the finished pieces, but left visible the marks of the edges of the funnel (Figs. 9.2; 13.3; 14.3; 15.2). In many of the early variants of the Pătulele-type axes, the butt ends in a blunted triangle, probably indicating the area for fixing the end of the casting funnel (Figs. 1; 9.1). The next technological step was the elongation of the butt so that the casting zone became an integral part of the morphology of the axe.[49] The elongation was either plain, as it was in the Izvoarele and Pătulele-related types (Fig. 10.1), or more complex, ending in either a protruding or a blunted button, as was usually the case in the developed variants of the Pătulele, Pădureni[50] and Balșa axe types (Fig. 10.2–3). The chronology of this latter technological solution is indicated by an important landmark artefact – the axe from the Yunatsite tell (Pazardzhik District, Bulgaria).[51] It is closer typologically to the Balșa type,[52] has an elongated buttoned butt, and it came from Layer 6 of the tell, dated to the third period of the Early Bronze Age in Thrace (Sveti Kirilovo). The two radiocarbon dates available for Layer 6 indicate

[49] Chernykh 1992, 61, fig. 18.VI.
[50] The Pădureni type includes mainly the artefacts discussed and illustrated at Băjenaru 2017.
[51] Katincharov – Matsanova 1993, 157, fig. 18.7; Avilova – Mishina 2014, 183, fig. 1.11; Băjenaru 2017, 119, fig. 6.
[52] Vulpe 1970, 51–53.

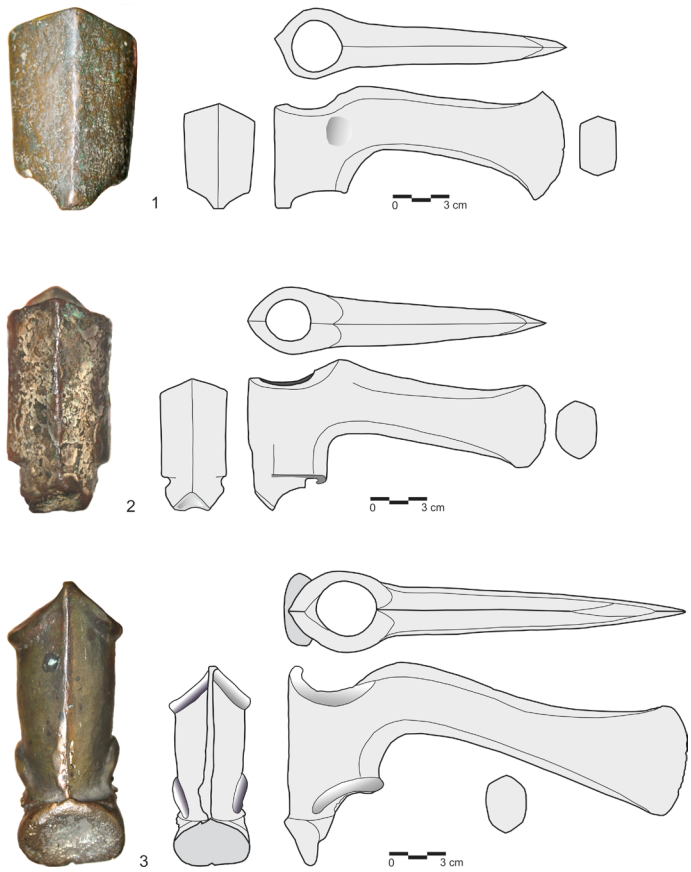

Fig. 10 1. The shaft-hole axe from Mircea Vodă (Dâmbovița County, Romania); 2. The shaft-hole axe from Lozen (Stara Zagora District, Bulgaria); 3. The shaft-hole axe from an unknown findspot in the Pazardzhik District, Bulgaria. Scale 1:4 (R. Băjenaru)

the large interval of c. 2800–2350 calBC,[53] but a combined modelling of all existing dates rather suggests the interval of 2500–2450 calBC as most probable.[54] One may thus suppose that during the first century of the second half of the 3rd millennium BC, the shaft-hole axes with an elongated buttoned butt were already circulating in the northeastern area of the Balkan Peninsula. Their dating to the second half of the 3rd millennium is indirectly confirmed by the dating of the more developed types, typical of the Middle Bronze Age to the beginning of the 2nd millennium BC.[55]

In conclusion, a series of transformations stretching over a period of almost 1000 years (c. 3400–2400 BC) can be noted in relation to the presence and the casting technology of the shaft-hole axes in the Carpathian-Balkan area. From the data presented above, the following image emerges:

1. C. 3400–3100 BC. The Baniabic- and Corbasca-related types appear in the Carpathian-Balkan area, most probably as 'imports' from the North Caucasian and North Pontic areas. All pieces were cast in bivalve moulds open at the lower edge of the axe.
2. C. 3100–2700 BC. It was probably then that the first shaft-hole axes manufactured in local workshops appeared, as indicated by specific types in the northeast Balkan area (such as the South Danubian variant of the Corbasca and mainly Veselinovo I types). They were

[53] Görsdorf – Bojadžiev 1996, 160.
[54] Boyadziev 1995, 155; Boyadzhiev – Aslanis 2016, 163.
[55] E.g. the axe from the Balatonakali burial (on the shores of Balaton Lake, Hungary), published by István Torma (Torma 1978) and recently revisited by Viktória Kiss, dated between 1950 and 1900 calBC (Kiss 2020).

cast using the same technology of bivalve moulds open at the lower edge of the axe. At about the same time and by the same method, the Fajsz axes were also manufactured. Towards the end of the period (c. 2800 BC) the metallurgic workshops in the Vučedol area started manufacturing axes in closed bivalve moulds (the Kozarac type).

3. C. 2750–2500 BC. It is a time of technological experiments and innovations for the casting of these axes, implicitly leading towards a greater typological diversity. It sees experiments with the lost-wax technique and that of the bivalve moulds open at the upper edge (see the few Dumbrăvioara axes), but the closed bivalve moulds with the sprue either at the upper or the lower edge, near the shaft or the cutting edge of the axes, are also present. It is also the time when the shaft-hole axes cast in closed bivalve moulds with the pouring zone located on the lower edge of the shaft of the axe appear in the northeastern area of the Balkan Peninsula, in most cases with the metal pouring taking place at the lower side of the butt. These comprise the axes of the Izvoarele and Veselinovo II types, and some of the early variants of the Pătulele type. The first axes with an elongated butt could also be dated to c. 2500 BC. It is also noteworthy that this diversity of technological and typological choices from the second quarter of the 3rd millennium BC coincides with the increasing use of the Cu+Sn alloy along the Lower Danube.[56]
4. Post-2500 BC. The technology of casting axes in closed moulds with the sprue on the lower edge of the butt generalized, and we see the appearance of the axes with elongated buttoned butts (the developed variants of the Pătulele, Balșa and Pădureni types). This technology was used for a long period of time (Middle Bronze Age included) for casting such artefacts.[57]

This technological evolution must not be seen as a linear process. It is obvious that during almost 1000 years there was significant technological progress, seen mostly in the quality and morphological complexity of the cast axes, but no innovation was accepted at once over the entire area of interest. As noted above, certain types of axes (such as the Veselinovo, Dumbrăvioara, Izvoarele and Pătulele) were cast using different methods, which might suggest a contemporaneous presence of metallurgical workshops with different traditions. On the other hand, the chronological intervals suggested above strictly apply to the emerging period of certain technologies, namely the most probable period when axes were cast by a certain technological method. It does not represent the period during which those axes travelled, as this is usually a longer one (see the axe in the Vărbitsa II hoard mentioned above). Thus, it may be suggested, for example, that towards the end of the 3rd millennium BC Veselinovo-type axes cast 500–600 years prior were in use and circulated along the Lower Danube, alongside the Pădureni-type axes cast only 50 years before. In the same way, we cannot exclude the casting of axes (towards the end of the 3rd millennium or the beginning of the 2nd millennium BC) in bivalve moulds open at the lower edge of the axe that were hundreds of years old. The metallurgic workshop at Koukonisi (Lemnos Island, not far from Poliochni) from an LM I context yielded a mould valve for casting shaft-hole axes, but with similar characteristics as those from the Early Bronze Age.[58] This could be a plausible alternative explanation for the presence of the Pătulele-type axe in the Vărbitsa II hoard. But in the end, it all depends on the symbolic load and the social role of the

[56] A substantial discussion regarding the use of tin during the 3rd millennium on the Lower Danube in Popescu – Constantinescu 2021.

[57] See, for the example, the moulds from Pobit Kamăk (Leschtakow 2019).

[58] Boulotis 2009, 203–204, fig. 24. The typology of the piece indicates it could have been cast similarly to certain axes in the Carpathian-Balkan area related to the Pătulele type. The published drawing shows that the area left open for the pouring of the metal stretched along the entire length of the butt's edge, a technology used in the Carpathian-Balkan area during the Middle Bronze Age (the first half of the 2nd millennium) for some of the Monteoru-type axes (Vulpe 1970, pl. 13.200). If we accept this and, implicitly, the dating of the axe, the chronological gap in relation to the archaeological context diminishes. I would like to thank Joseph Maran for indicating this particular find to me.



Fig. 11 1. Detail of the lower edge of the Corbasca-type axe from the Izvoare hoard (Dolj County, Romania); 2. Detail of one of the sides of an axe from 'Bulgaria'; 3. Detail of the depression on the Irechekovo axe (Yambol District, Bulgaria). No scale (R. Băjenaru)

respective artefacts (both the axes and the moulds) and ultimately, of the personal biography of each of them.

It is interesting that during the second half of the 3rd millennium BC, the butt of the axes gained special importance over the overall morphology of the shaft-hole axes, indicated by the way the butt was designed and worked; in fact, this was the area 'giving birth' to the axe.

Signs, Marks and Cuts

The presence of distinctive signs and cuts, intentional and repetitive, was noted from the earliest metal axes in southeastern Europe – the Eneolithic hammer axes and axe-adzes, dated to the 5th and 4th millennia BC.[59] A more recent analysis indicated that 20% of them bear such marks and they can be grouped according to chronological and geographic criteria.[60] These marks were left by the casting; the objects were designed in this way, with the respective marks likely assimilated to a decoration pattern with a certain symbolism, giving identity to the respective object. With regard to the axes of the Early Bronze Age, certain pieces with incisions on the lower edge can be interpreted in this way. It is the case for the Dănceu axe mentioned above, as well as one from the Izvoare hoard (Dolj County, Romania) assigned to the Corbasca type,[61] both displaying regular incisions covering the entire lower edge (Fig.11.1). Some incisions and outlined ribs also occur on the shaft of more developed axes of the Pătulele and Pădureni types (Fig. 10.2), but their number is too limited to allow for the observation or establishment of certain patterns.

Equally interesting are the signs and marks made after the casting of the object, during their use. In many cases though, it is difficult to establish whether they were ancient or modern. Most of the axes of this kind were isolated finds and the finders were often tempted to check the metal they had

[59] Schubert 1965, 286–295.

[60] Heeb 2014, 89, fig. 68.

[61] Vulpe 1970, 30, no. 43, pl. 3.43. The Baniabic-type axe from Izvoarele (Constanța County, Romania) with a series of incisions on the lower edge, some forming a regular pattern (Irimia 1998, fig. 2), falls in the same category.



Fig. 12 1–4. The shaft-hole axes from the Sinaia hoard (Prahova County, Romania). No scale (R. Băjenaru)

been made of, hoping to have found a treasure. Thus, the artefacts were scratched, cut and even broken before they got to the specialists. Sometimes, the objects remained in the possession of the finders for many years, having been used in the household, deformed, resharpened, etc. Some interventions could be identified as of ancient origin, though. Most of the axes exhibit use wear, the majority on the cutting edge area, but there are cases when such marks were observed on the butt area.

A significant number of shaft-hole axes of all types mentioned above display more or less regular rows of notches and incisions, usually on the edges of the artefacts, sometimes also grouped on the faces of the blade (Figs. 2.2; 7.2). Some of them, mainly those on the edges, might have resulted from their use in various situations, but their frequency and similar aspect on a significant number of axes make me also take into consideration the intentionality of those signs (Fig. 11.2). More meaningful from this point of view are some irregular but very visible notches located on one of the faces at the joint between the shaft and the blade (Figs. 8.1; 10.1; 16.2). They were the result of strokes applied after a certain interval from the casting; they appear exclusively on the Veselinovo II and early variants of Pătulele axe types, which are contemporaneous and similar in many ways (Fig. 11.3). I have identified c. 18 artefacts with such notches located on the same area, representing c. 10% of the number of studied axes. When compared to the artefacts of the mentioned types, the percentage increases greatly, and the probability becomes high that this kind of notch/stroke represent the marking of particular pieces, chosen based on certain considerations and bearing certain significations. It is also important that 9 out of the 14 axes of the Veselinovov II type from the Ostrovu Corbului II hoard (Mehedinți County, Romania) display such marks.

I have also observed a certain special treatment on the surfaces of the axes from the Sinaia hoard (Prahova County, Romania).[62] The hoard is a chance find from the end of the 19th century and the number of artefacts was never clearly established; only 25 axes still exist in the collections of the National History Museum of Romania in Bucharest. Although it is clear that several moulds were used for their casting, all the preserved artefacts are typologically uniform, of comparable sizes, and related to the Pădureni type. They were all cast in closed bivalve moulds, with the metal poured through the area on the lower part of the elongated buttoned butt ending. The artefacts meet all the conditions to belong to the same batch from a certain metallurgic workshop. The majority were unfinished, with coarse, uneven surfaces and no preoccupation with surface smoothing; on many of them the seams created by the joint of the valves were not visible (Fig. 12.1–2). In some of the axes it is evident that this unfinished surface represents only a thin metal

[62] Vulpe 1970, 46, no. 154–177, pl. 11; Soroceanu 2012, 159–161, pls. 64–71.

coating, not more than 1mm thick, which in time degraded and exfoliated, exposing well-finished and polished areas (Fig. 12.3–4). It thus becomes probable that at a certain moment in time after the casting and following a period of use, the axes were immersed in molten metal and thus covered by a very thin (unfinished) metal coating. The adherence of this coating to the surface of the axe was not very good, and thus in time it broke and exfoliated, exposing areas of the initial surface of the piece. I will not go into further details concerning this treatment, which is probably not a singular one. But it seems a simple and efficient method of removing and covering signs and marks with certain symbolic meanings which the artefacts might have acquired during their use within the social practices.

A Cut-Mark Specific to the Balkan Area

There are, though, certain interventions and marks that cannot be covered or removed, caused by the intentional fragmentation of the metal artefacts, and this is a subject equally debated in the literature. The situations generally taken into consideration were those of hoards dating to the *Urnenfelderzeit* period in central and western Europe[63] but the phenomenon was also noted during earlier periods in various cultural areas, arguing convincingly for its intentional ritual character.[64] There are of course several fragmented shaft-hole axes in the area of interest, dated to the Early Bronze Age. In many cases there is convincing information that the mutilation was modern, following the discovery of the artefacts. Some were broken in ancient times, the affected areas being mainly the cutting edge and the shaft, the areas most exposed to pressure during their use, so that intentionality is uncertain.

The present study attempts to highlight a practice noted on a series of axes in the Lower Danube area consisting of the intentional, controlled and careful removal of a part of the shaft: the cutting out of a roughly circular area from the lower part of the butt or, more rarely, from the lateral sides (Fig. 13.1), most often affecting the lower part of the shaft (Figs. 13.2–3; 14–15). This operation took place sometime after the casting, indicating good knowledge of the properties of the metal and probably requiring heating of the area prior to cutting. Regardless, skills and knowledge were required, as there was always the risk of breaking a larger area off the shaft than was intended. This is visible in the axe in Fig. 17, which on the left side of the shaft shows the controlled arched cutting, followed, during this operation, by the breaking of the entire butt. In certain artefacts, the edges of the cut are very well finished (Fig. 13.2–3). In others, the area of the butt was destroyed without having been completely cut, only damaged, but I believe the symbolism behind it is the same (Fig. 16). It is quite likely that this type of treatment of the butt in certain shaft-hole axes during the Early Bronze Age was more widely spread over the entire Carpathian-Balkan area, but generally, when publishing such artefacts, no view of the butt is given, and thus the real number of cases is difficult to estimate; it is noteworthy that a Kozarac-related axe with a cut-out butt, originates from Moldova (Fig. 15.3). As far as I know, in our area of interest there are c. 20 axes with cut-out or destroyed butts, making for c. 10% of the total. Their number would be greater if we included those axes displaying flaws on the lower part of the shaft (breaks and depressions on the edge), but it is difficult to determine macroscopically whether those were intentional post-casting interventions or if they were the results of the casting itself.

With regard to the typology of these axes, most of them belong to the Izvoarele, Veselinovo II and the early variants of the Pătulele types, without the elongated butt and thus worked in closed bivalve moulds with the metal poured in through the lower edge of the shaft of the axe, mainly the lower part of the butt. An exception is one of the axes in the Bolboși hoard (Gorj County, Romania)

63 E.g. Nebelsick 2000; Gabillot – Lagarde 2008; Rezi 2011.
64 E.g. Horn 2011; Hansen 2016.

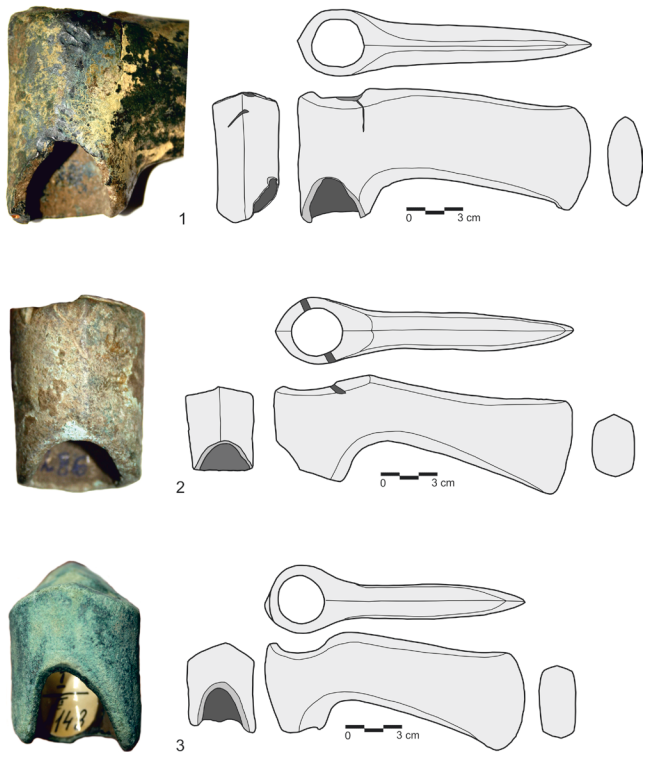

Fig. 13 1. The shaft-hole axes from Altimir (Vratsa District, Bulgaria); 2. The shaft-hole axes from Agatovo (Gabrovo District, Bulgaria); 3. The shaft-hole axes from 'Bulgaria'. Scale 1:4 (R. Băjenaru)

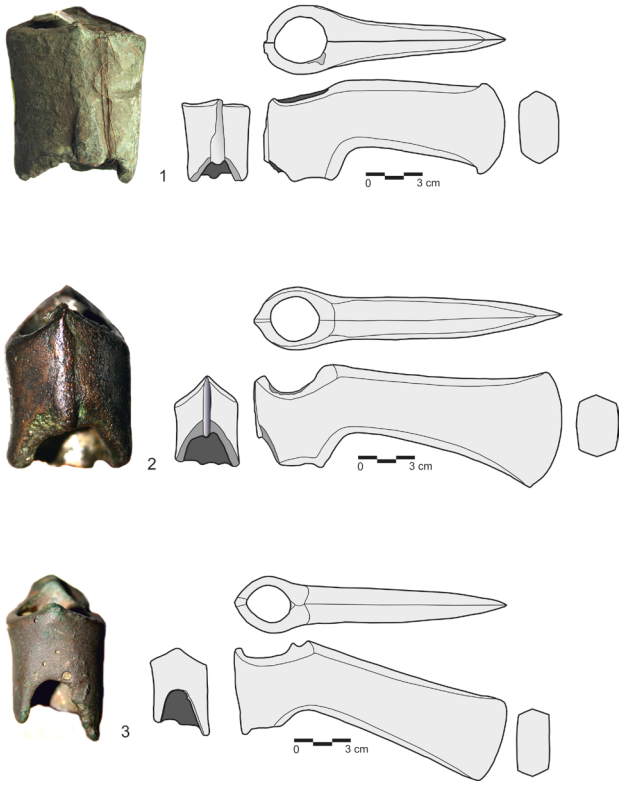

Fig. 14 1. The shaft-hole axe from Viforâta (Dâmbovița County, Romania); 2. The shaft-hole axe from Gradishte (Shumen District, Bulgaria); 3: The shaft-hole axe from 'NE Bulgaria'. Scale 1:4 (R. Băjenaru)

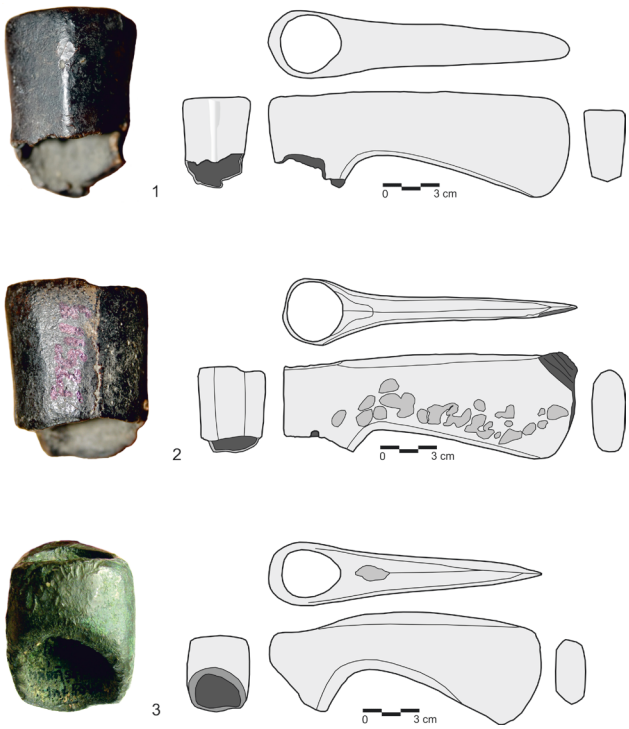

Fig. 15 1–2. The shaft-hole axes from the Bolboși hoard (Gorj County, Romania); 3. The shaft-hole axe from Mărășți (Bacău County, Romania). Scale 1:4 (1–2. R. Băjenaru; 3. photo and drawing: A.-D. Popescu)

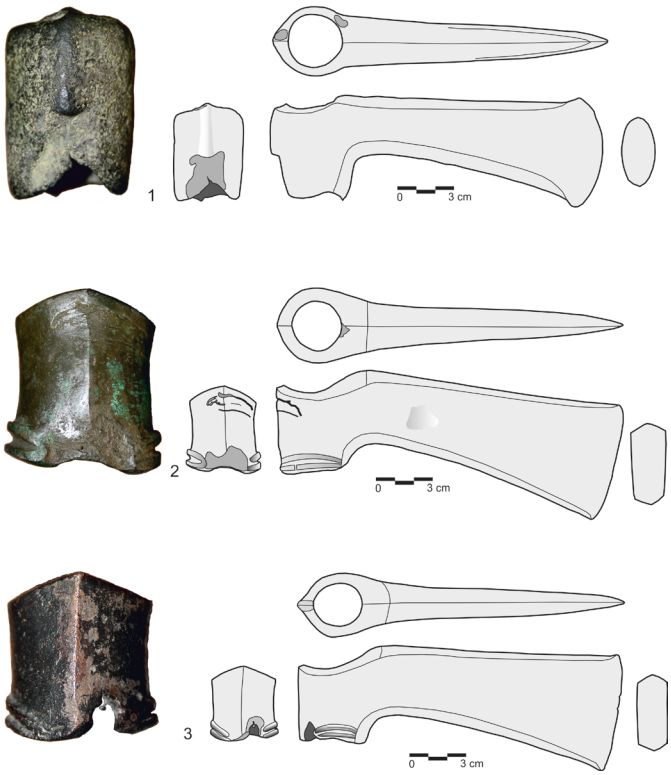

Fig. 16 1. The shaft-hole axe from Berbești (Vâlcea County, Romania); 2–3. Shaft-hole axes from the Ostrovu Corbului II hoard (Mehedinți County, Romania). Scale 1:4 (R. Băjenaru)

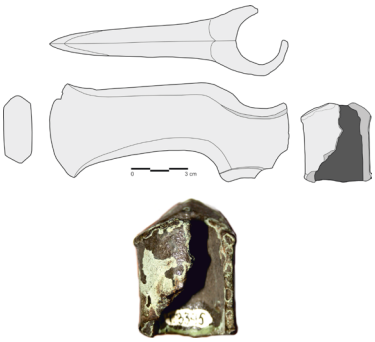

Fig. 17 The shaft-hole axe from 'NE Bulgaria'. Scale 1:4 (R. Băjenaru)

(Fig. 15.1), which was cast in a bivalve mould opened at the upper edge of the axe, a technology specific to the Dumbrăvioara type. However, given the fact it was associated with an Izvoarele-type axe, cast in a closed bivalve mould (Fig. 15.2), the damage to the lower edge of the shaft, towards the butt, was for symmetry, inflicted on both artefacts. Also, one must note that the Mărăști axe, (Bacău County, Romania) was cast in a closed bivalve mould with the metal poured in through a hole on the upper edge of the axe (Fig. 15.3).

According to the technological evolution scheme sketched above, most of these artefacts were cast, most probably during the second quarter of the 3rd millennium BC, possibly towards the middle of it, but it is difficult to estimate the moment of these mutilations. Bearing in mind the cut-out area, one may assume that at that moment the butt had already become an important zone in the morphology of the artefacts. Thus, the most probable period might have been the second half of the 3rd millennium BC, when the technology of metal casting through the lower part of the butt was widespread across the entire Carpathian-Balkan area and the butt acquired a more complex design. It is thus the moment when the butt was seen as the area 'giving birth' to the axe and its destruction might have equalled the ritual killing of the axe.

Conclusions

The existence of specialized metallurgic workshops for manufacturing shaft-hole axes along the Lower Danube and in Thrace is undisputable, but the small number of moulds that survived and their fragmented state hinder the reconstruction of the methods employed. This could change with the use of a series of imaging (X-rays, CT scans, etc.) and microscopic investigations of the artefacts, but at the moment, these are not available for the objects discussed. Nevertheless, two main casting methods existed: in bivalve moulds open at the lower edge (of the axe), and in closed bivalve moulds, with the sprue at the lower part of the butt; other methods observed (on a limited number of axes) are only seldom employed in our area of interest.

Shaft-hole axes are the main metal artefacts manufactured and travelling throughout the entire Carpathian-Balkan area during the Early Bronze Age (Fig. 18). They are undoubtedly objects with a special symbolic value, actively involved in practices and negotiations of a social nature. Such axes had long lives and were transmitted from generation to generation, with certain events and cycles in their biographies leaving behind signs and marks.

Based on several iconographic representations, a relationship between the axe – as a symbol of social representation – and manhood can be established. This relationship is further strengthened by the elongated aspect of the butt in certain axes (Fig. 10.3), dated in our area of interest to the second part of the 3rd millennium BC. The iconographic representations from Mesopotamia show the axes always associated with characters of high social status or divinities; some of the axes bear inscriptions giving the name of the owner, most frequently kings.[65] Their relative presence in burials strengthens the relationship between the individual and the axe as a sign of social demarcation. The same relationship was suggested by the presence of shaft-hole axes in the fastuous burials of the Maykop-Novosvobodnaya area. Contrary to the cultural areas mentioned above, the shaft-hole axes in the Carpathian-Balkan area that can be linked to funerary contexts are very

[65] Gernez 2008, 569, tab. 3.12; fig. 3.14. For the iconographic representations see also Gernez 2008, vol. II, figs. 196–202.

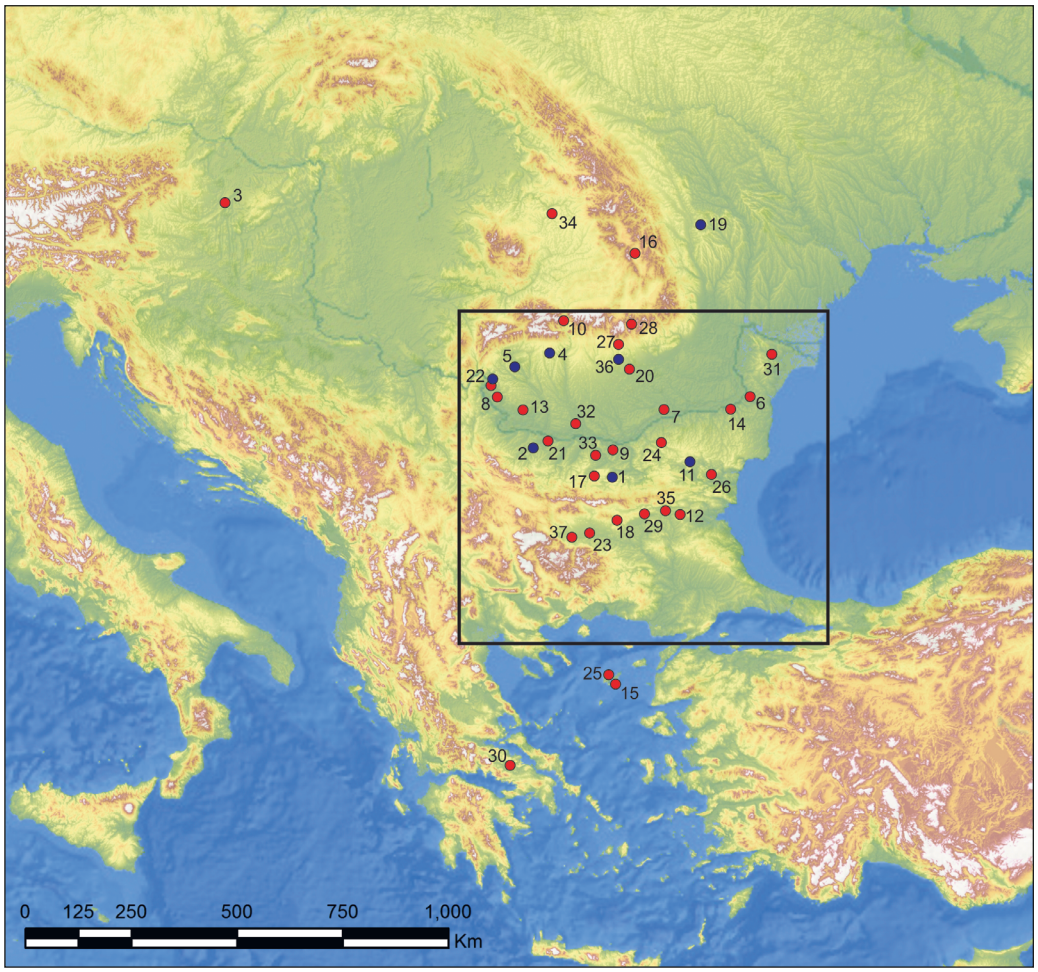

Fig. 18 Distribution of shaft-hole axes mentioned in the text (quadrant: area of study; blue dots: shaft-hole axes with a cutting-out in the butt). 1. Agatovo (Gabrovo District, BG); 2. Altimir (Vratsa District, BG); 3. Balatonakali (HU); 4. Berbești (Vâlcea County, RO); 5. Bolboși (Gorj County, RO); 6. Cernavoda (Constanța County, RO); 7. Crivăț (Călărași County, RO); 8. Dănceu (Mehedinți County, RO); 9. Dekov (Pleven District, BG); 10. Găujani (Vâlcea County, RO); 11. Gradishte (Shumen District, BG); 12. Irechekovo (Yambol District, BG); 13. Izvoare (Dolj County, RO); 14. Izvoarele (Constanța County, RO); 15. Koukonisi (Lemnos, GR); 16. Leliceni (Harghita County, RO); 17. Lovech (Lovech District, BG); 18. Lozen (Stara Zagora District, BG); 19. Mărăști (Bacău County, RO); 20. Mircea Vodă (Dâmbovița County, RO); 21. Oryahovo (Vratsa District, BG); 22. Ostrovu Corbului (Mehedinți County, RO); 23. Pazardzhik District (BG); 24. Pobit Kamak (Razgrad District, BG); 25. Poliochni (Lemnos, GR); 26. Provadya (Varna District, BG); 27. Pucioasa (Dâmbovița County, RO); 28. Sinaia (Prahova County, RO); 29. Stara Zagora District (BG): 30. Thebes (GR); 31. Tulcea County (RO); 32. Vădastra (Olt County, RO); 33. Varbitsa (Pleven District, BG); 34. Vâlcele/Baniabic (Cluj County, RO); 35. Veselinovo (Yambol District, BG); 36. Viforâta (Dâmbovița County, RO); 37. Yunatsite (Pazardzhik District, BG) (R. Băjenaru)

rare, as most of them were isolated finds or part of hoards.[66] It is thus plausible to interpret them as elements of social representation of the entire community, not only for a certain individual, and having thus been used during social negotiations among communities, not between the individual and the community.[67]

A relationship between the technology used for axe manufacture and certain treatments of the discussed axes is suggested by the cutting-out of the butt at a time when the latter had gained major importance, given the fact it was the area used for casting the metal into the mould. It is

66 Vulpe 1970; Maran 2001; Hansen 2009; Băjenaru 2010; Hansen 2011; Szeverényi 2013.

67 See also the discussions at Maran 2001, 282–283; Hansen 2009, 149–150; Băjenaru 2010, 157.

also noteworthy that the cutting-out took place in a controlled manner, not with the aim of destroying the object but only to eliminate one part with a special symbolism. Such an intervention on the morphology of the object can have different meanings, probably being the result of the inter-community social negotiations mentioned above; the object thus lost part of the symbolism and powers it previously held, in this way being excluded from certain social events in which it used to play an important part.

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Archaeological and Archaeometallurgical Analyses of Bronze Age Gold Hair-Rings from the Collection of the Hungarian National Museum and British Museum

Ildikó Szathmári[1] – *Boglárka Maróti*[2] – *János Gábor Tarbay*[3] – *Viktória Kiss*[4]

Abstract: The Hungarian National Museum has been curating a great number of Bronze Age metal hoards since the second half of the 19th century, including deposits which comprise exclusively gold objects. The museum's collection holds nearly 230 pieces of gold hair-rings (*Lockenringe* and *Noppenringe*) that belong to hoards consisting exclusively of gold hair-rings or were found in hoards together with bronze artefacts. This paper presents the archaeological and archaeometallurgical study of 16 gold hair-rings from three Middle Bronze Age (2000–1500 BC) hoard assemblages found in the Carpathian Basin that were formerly unpublished or misinterpreted. The compositional analyses carried out using the XRF method on the 15 Bronze Age gold hair-rings presented here are not sufficient for exact provenancing of the raw material. However, the less than 0.1wt% tin component implies that the raw material may have been native gold, classified as Hartmann's A3 or B based on the higher or lower silver content. Here the data generated are provided opportunity for a comparison which suggests that the raw material components of gold objects vary even within a single hoard. This also implies that the metal hoards in question consisted of artefacts made at different times or in different workshops, and that pieces of the three assemblages from Biia (Magyarbénye), Pincehely, and Komárom-Szőny (Szőny, Ószőny) published here were collected throughout a prolonged period. Based on the technological observations, the ornaments made of wire were probably easy to make; however, the cast hair-rings would have required significant technical skill and knowledge, and were created by using the lost-wax casting technique. Visible traces of use wear suggest that some of the ornaments were worn before their deposition.

Keywords: Bronze Age, gold, Carpathian Basin, hoards, raw material, production technique

Introduction

Gold was used by prehistoric communities as early as copper due to its natural occurrence and easy elaboration. Identification of manufacturing techniques and the raw material of gold artefacts is of crucial importance for understanding the craftworking and contacts of the Copper and Bronze Age social groups. Thus, gold finds from hoards, graves or settlements, usually defined as prestige items, constitute very important sources of information for archaeological studies.[5]

Typochronological assessment of the earliest gold objects dating to the Hungarian Copper and Bronze Ages started very early.[6] Later Amália Mozsolics analysed the eastern Hungarian and Transylvanian finds,[7] while Tibor Kovács collected information on the Middle Bronze Age burial

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[5] Kovács 1999a.

[6] Pulszky 1883; Tompa 1928; Bóna 1986; Kovács 1991; Kovács 1999a.

[7] Mozsolics 1951; Mozsolics 1958; Mozsolics 1968.

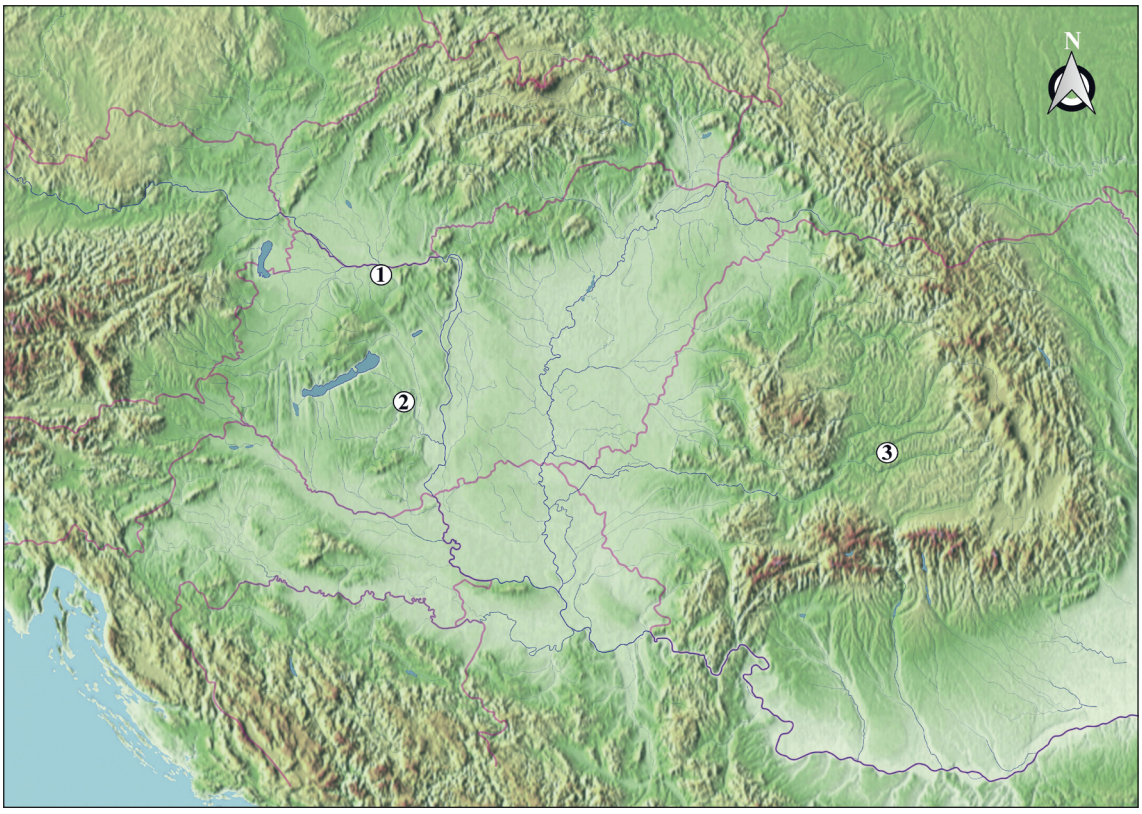

Fig. 1 Distribution of gold hoards: 1. Komárom-Szőny; 2. Pincehely-Görbő; 3. Biia (RO) (map: J. G. Tarbay)

finds from eastern Hungary, and gold hoards from central and western Hungary.[8] During the last one and a half decades there have been an increasing number of complex research projects targeting gold objects in particular – including metallographic and technological analyses.[9]

The Hungarian National Museum (HNM) has been curating a great number of Bronze Age metal hoards since the second half of the 19th century, including depots which consist solely of gold objects. The museum's collection holds nearly 230 pieces of gold hair-rings (*Lockenringe* and *Noppenringe*) that belong to hoards consisting exclusively of gold hair-rings (Szelevény, Tiszasüly, Kengyel, Uzdborjád/Kölesd-Hangospuszta, Nagyberki-Berkipuszta, Alba Julia/Gyulafehérvár, Tarpa) or that were found in deposits together with bronze artefacts (Şmig/Somogyom, Százhalombatta, Pecica/Pécska, Derecske). Most of them, however, are unprovenanced stray finds with unidentifiable find circumstances. This paper presents the recent archaeological and archaeometallurgical study of 16 gold hair-rings from three Middle Bronze Age hoards found in the Carpathian Basin that can be dated to the Middle Bronze Age according to Hungarian terminology (Reinecke Bronze A2, 2000/1900–1500 BC) (Fig. 1.), which were formerly unpublished or misinterpreted. All of the pieces published here are inventoried in the collection of the Hungarian National Museum, except for the finds from Komárom-Szőny (see below).

Komárom-Szőny (Komárom-Esztergom County)

In 1890, the Hungarian National Museum purchased a number of gold and silver artefacts from a well-known antiques dealer, Mór Wiesinger. Wiesinger, being a goldsmith, not only collected

[8] Kovács 1976; Kovács 1979; Kovács 1991; Kovács 1994; Kovács 1999b.
[9] Csedreki et al. 2011; Czajlik 2012; Kiss 2012a; Ilon 2015.

but also made fine gold pieces based on original items, mainly from the Middle Ages.[10] Among others, two gold hair-rings dating to the Bronze Age (a convex bipartite and a solid tripartite *Lockenring*), as well as two atypical spiral rings with a diameter of 2mm, made of 0.3mm-wide flat wire (HNM inv. no. 127.1890.2–3), inventoried under the site name of Ószőny,[11] were bought from him. These latter rings, made of flat wire, were, according to the original inventory, attached to the bipartite hair-ring. Based on the atypical flat wire, we suppose that these pieces are not prehistoric items and were only attached to the hair-ring at a later date.

1. Embossed bipartite, so-called 'heart-shaped' hair-ring (*Lockenring*) with a slightly convex inner part. On the outer part there are traces of modern punching. Length: 2.4cm; width: 2.4cm; weight: 7.93g. Hungarian National Museum (HNM) inv. no. 127.1890.1. Unpublished.[12] (Fig. 2.1)

2. Solid tripartite hair-ring (*Lockenring*) with a half-oval cross-section. Length: 1.1cm; width: 1.3cm; weight: 6.73g. HNM inv. no. 127.1890.4. Unpublished.[13] (Fig. 2.2)

In 1876, a convex bipartite gold hair-ring and a necklace made of gold beads of varying sizes was presented to the British Museum (BM) by Leopold Stuck (from Pesth) with the alleged provenance of Szőny.

3. Bipartite embossed gold hair-ring. Length: 4.6cm; width: 3.4cm; weight: 15.2g. BM inv. no. 1876.1104.1.[14] (Fig. 2.3).

4. Necklace made of 44 cast gold biconical beads and 6 gold wire spiral beads. Some biconical beads show abrasion-like traces (Fig. 2.4.2). Approximate length: 17cm; approximate weight (including the weight of the modern cord): 80.8g; the diameter of the biconical beads varies between 6.1 × 6mm and 8.2 × 7.9mm; the length of the biconical beads varies between 4.1 and 5.9mm; the length of the spiral beads varies between 12.5 and 34.6mm; the diameter of the spiral beads varies between 3.7 and 4.4mm. BM inv. no. 1876.1104.2. (Fig. 2.4.1–2).

Pincehely-Görbő (County Tolna)

There are ten gold artefacts from the Görbő site (three of them with a question mark) in the Archaeological Valuable Object Register of the Hungarian National Museum. This list was created after the Second World War based on the data of the original inventory and contains the complete inventory of the prehistoric gold finds purchased by the museum. According to the original notes of the inventory from the 1890s however, a set consisting of eight pieces of prehistoric gold ornaments was purchased by the Hungarian National Museum. The artefacts were found in a ceramic cup in a vineyard at Görbő (Kovács mentioned the finds with the erroneous provenance of Nagygörbő, in Zala County).[15] According to the inventory book, the ceramic cup did not make it into the museum, and now one of the *Noppenringe* (coiled of double wire) has also gone missing. The other seven gold ornaments remain unpublished, including the five *Noppenringe* and the two solid tripartite hair-rings, but can still be identified based on Wosinsky's descriptions of their size and weight. The three gold hair-rings ornamented with 'string of pearls' motif, appearing in the Archaeological Valuable Object Register, were certainly not part of the original assemblage.

1. *Noppenring*, circular-sectioned, made of double bent wire, one (double) end is pointed, the other is bent into a curve. The surface of the wire is facetted and the curved section is narrow; along its wider side, it is rectangular as a result of hammering. The thread of the *Noppenring* is

[10] Mozsolics 1973, 195–196; Kemenczei 2014.

[11] Szőny/Ószőny has been part of the city of Komárom since 1977, and belonged to the Roman period city of Brigetio, well-known for antiques dealers.

[12] Mentioned by Kovács 1991.

[13] Mentioned by Kovács 1991.

[14] Kiss 2012b, Fig. 27. See also: <https://www.britishmuseum.org/collection/object/H_1876-1104-1> (last accessed 13 June 2022).

[15] Wosinsky 1896, 434; Kovács 1991.



Fig. 2 1–2. Hair-rings from Komárom-Szőny (Szőny, Ószőny), collection of the Hungarian National Museum; 3–4.1. Hair-ring and necklace from Komárom-Szőny (Szőny), collection of the British Museum; 4.2. Abrasion traces on the biconical beads of the gold necklace (photo: J. G. Tarbay; 1–2. © Hungarian National Museum, Department of Archaeology, Prehistoric Collection, 3–4. © British Museum, Department of Britain, Europe and Prehistory)

tightly fitted. Length: 1.6cm; width: 2.2cm; weight: 22.08g. HNM inv. no. 123.1890.1 (Fig. 3.1). Unpublished.[16]

2. *Noppenring*, the same as the previous one; one end is broken, bent out. The bent part was hammered. The thread of the object fits incorrectly. Length: 2.3cm; width: 2.3cm; weight: 21.77g. HNM inv. no. 123.1890.2 (Fig. 3.2). Unpublished.

3. *Noppenring* fragment. Same as the previous ones; its double wire is bent. On its fractional part, some tool marks can be observed. Its bent parts do not fit correctly with one another. Length: 1.1cm; width: 2.1cm; weight: 9.04g. HNM inv. no. 123.1890.3 (Fig. 3.3). Unpublished.

4. *Noppenring*, made of double-bent wire. Both ends are bent backwards. The bent parts are hammered into a rectangular cross-section. Length: 1.3cm; width: 1.7cm; weight: 3.42g. HNM inv. no. 123.1890.5 (Fig. 3.4). Unpublished.

5. *Noppenring* fragment, similar to the previous one. One of its double bent parts is broken. It is hammered into a rectangular cross-section on its bent parts. On its outer surface, grinding marks are visible. Length: 0.9cm; width: 1.2cm; weight: 2.48g. HNM inv. no. 123.1890.6 (Fig. 3.5). Unpublished.

6. Solid-gold, so called tripartite *Lockenring*, with one end bent backwards, and with slightly widening (flattened) ends. Length: 1cm; width: 1.4cm; weight: 3.32g. HNM inv. no. 123.1890.7 (Fig. 3.6). Unpublished.

7. So-called three-part golden *Lockenring*, similar to the previous one, with one end bent back. Its ends are widening (flattened). Length: 1.1cm; width: 1cm; weight: 3.03g. HNM inv. no. 123.1890.8 (Fig. 3.7). Unpublished.

Biia/Magyarbénye (Alba County, Romania)

In 1880, a gold chain consisting of seven interlocking hair-rings was purchased by the Hungarian National Museum from a gold dealer from ‘Zalatna’ (Zlatna, Romania) with Magyarbénye (today Biia) as its provenance. The original entry in the inventory briefly describes the hair-rings as a ‘chain’, noting its length and weight accordingly. It is clear from the description that all of the hair-rings were decorated, most of them ornamented with a relatively rare ‘string of pearls’ motif. The inventory book contains the drawings of four parts of the ‘chain’. During the 1958 audit of the museum’s collection, however, the hair-rings from Biia could no longer be located.

In the 1960s Mozsolics was able to identify (probably relying on the drawings in the original inventory book) three solid, decorated pieces out of seven of the Biia hoard. Photos of these three pieces were published in her paper concerning Bronze Age gold finds.[17] Identification of these artefacts was not easy because in the Archaeological Valuable Object Register and in the photographic item catalogue (which was assembled later, based on the Valuable Object Register) the hair-rings were incorrectly listed under the site name of Késmárk (today Kežmarok, Slovakia).[18] Nevertheless, according to the original inventory book, the Hungarian National Museum purchased only four *Noppenring* fragments from Késmárk (Kežmarok) in 1874 (inv. no. 8.1874). The latter were also reported by József Hampel.[19] Three further hair-rings with a ‘string of pearls’ motif were mixed in with the above-mentioned Pincehely-Görbő assemblage, one of which is depicted in the original inventory book from 1880, along with the three other pieces published by Mozsolics. Therefore it is possible that the previous provenancing of these three hair-rings as Nagygörbő is inaccurate and that these pieces in fact belonged to the hair-ring ‘chain’ from

16 All pieces published here were mentioned by Kovács 1991.
17 Mozsolics 1968, 48, pl. 19.4–6.
18 Novotný – Novotná 1991 describe the items accordingly.
19 Hampel 1892, 63.

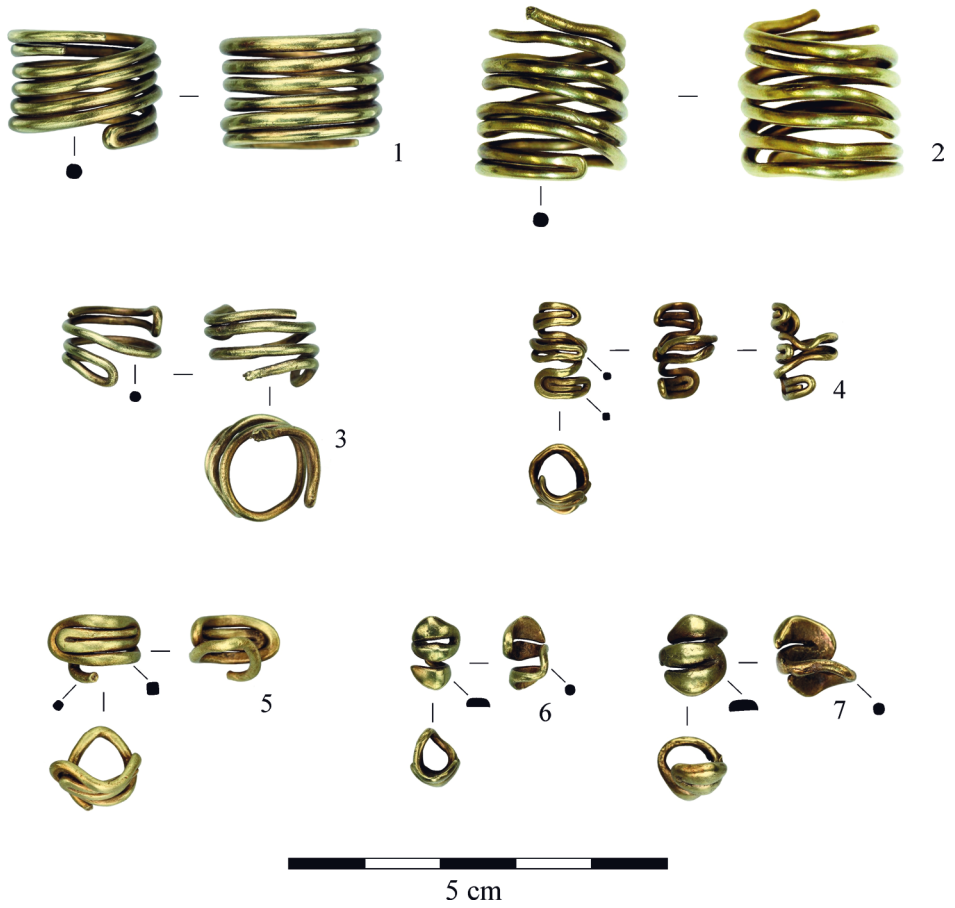

Fig. 3 1–5. *Noppenringe*; 6–7. Hair-rings from Pincehely-Görbő (photo: J. G. Tarbay; © Hungarian National Museum, Department of Archaeology, Prehistoric Collection)

Biia. In sum, it is feasible to claim that out of the seven objects of the hoard, six have now been successfully identified.

1. Thick, solid, *Lockenring*, with curled, blunt ends that are leaning on each other, and with an oval-shaped cross-section. On its outer surface, there is a bead-string ornament in three lines. The surface of the decoration is polished. A casting surface can be observed inside the rim. Length: 1.8cm; width: 1.3cm; weight: 21.51g. HNM inv. no. 117.1880 (A)[20] (Fig. 4.1).

2. A completely identical form, ornamentation and microscopic trace as for the previous one. Length: 1.9cm; width: 1.6cm; weight: 19.49g. HNM inv. no. 117.1880 (B) (Fig. 4.2).

3. Thick, solid gold *Lockenring*, with downward bent, strongly engrossing ends. Triangular cross-section, resulting from the sharp ribbed ornament in the middle, running through the outer surface. The irregular circular and semicircular pattern is richly decorated on both sides of the rib, which is framed by dotted decoration on its two edges. A less-finished casting surface can be observed on the inside. On its outer part, polished mould marks are visible. The decoration is heavily worn on the inner part of the bent sections. Length: 2.2cm; width: 1.8cm; weight: 15.36g. HNM inv. no. 117.1880 (C) (Fig. 4.3).

4. At one end, a double-folded *Lockenring* with tapered ends. It is slightly concave on its inner side, and on its outer surface, three rows of ribbed decoration can be detected. The surface of the decoration is polished, and the casting surface is visible between the ribbed ornaments. The

[20] Letters are not part of the inventory number, they are used here only to distinguish between the results of the archaeometry analyses.

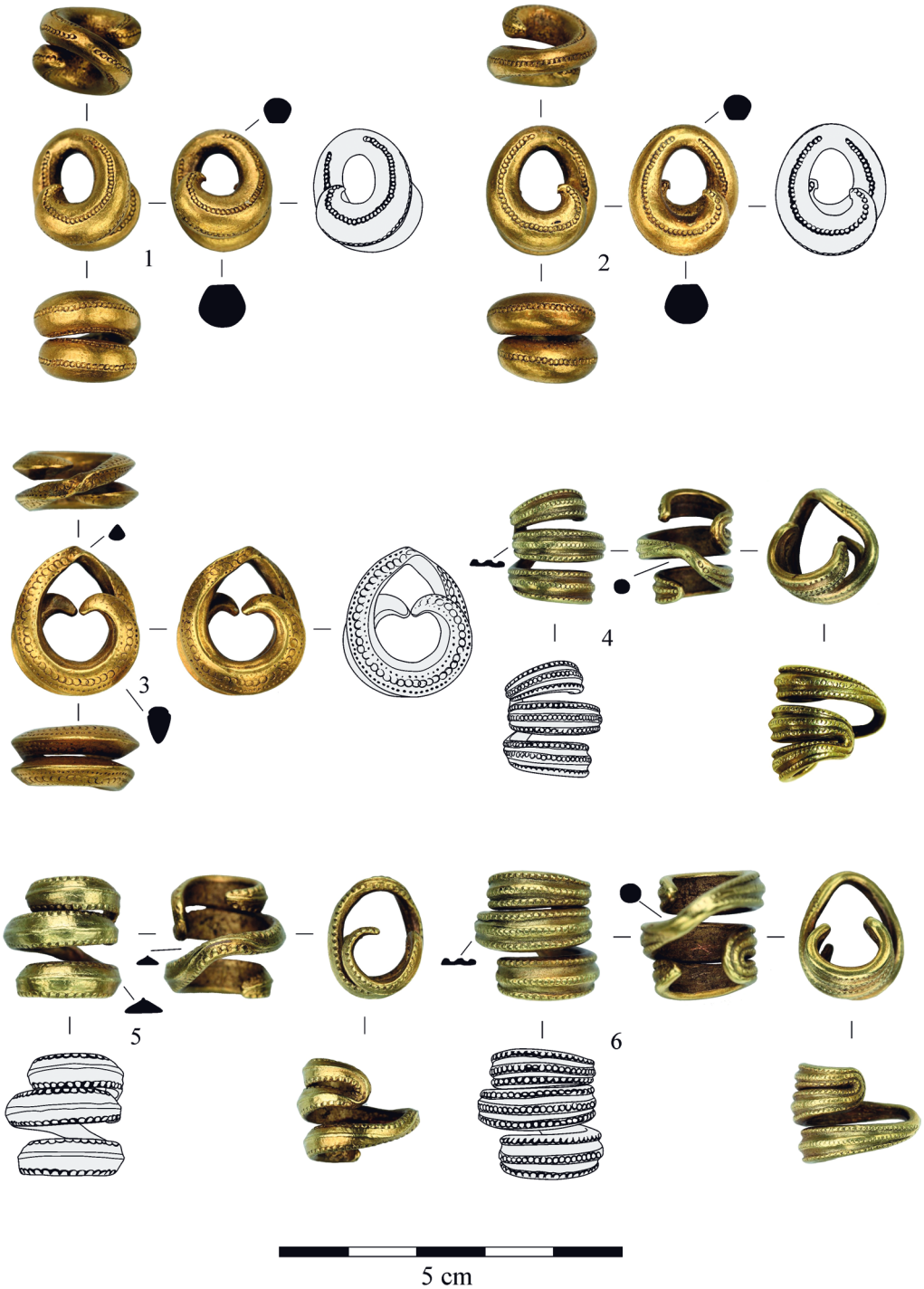

Fig. 4 1–6. Hair-rings from Biia (RO) (photo: J. G. Tarbay; © Hungarian National Museum, Department of Archaeology, Prehistoric Collection)

decoration pattern is distorted at the bent sections. Length: 1.7cm; width: 1.9cm; weight: 10.41g. HNM inv. no. 117.1880 (D) (Fig. 4.4).

5. A similar form to the previous one, except it is ornamented with only two lines of bead-string ornament on the two edges of the outer surface. Between the ornamentations, a profiled central rib runs through. The decorative pattern is distorted in the bent sections. Length: 1.8cm; width: 1.7cm; weight: 8.45g. HNM inv. no. 117.1880 (E) (Fig. 4.5).

6. A completely identical hair ring to the fourth *Lockenring* in shape and decoration. The surface of the decoration is polished by a modern tool and the casting surface can be observed between the decorated ribs. The decoration pattern is distorted at the bent sections. Length: 1.9cm; width: 1.6cm; weight: 10.32g. HNM inv. no. 117.1880 (F) (Fig. 4.6).

Typochronology

In the Bronze Age, hair-rings and *Noppenringe* were widely utilized as dress ornaments, not only in the central Danubian region but across the whole of Europe. Many different types of hair-rings crafted of a variety of materials such as electrum, silver, gold and bronze were in use between the 3rd and the 1st millennium BC. Various gold and bronze hair-rings from the Carpathian Basin, as well as their typochronological transformation were evaluated by Kovács.[21] Papers with a recent collection of finds from the Carpathian Basin and Transylvania were published by Bernhard Hänsel and Petra Weihermann in connection with a find assemblage of 136 gold hair-rings from the vicinity of Pécs, completed by questions on the use and production techniques of hair-rings. More recently, the hair-rings from the central European region were listed by Harald Meller.[22]

The assemblages mentioned above represent different types of gold hair-rings. *Noppenringe* made of coiled wire, which can be found in the Pincehely-Görbő hoard, appeared as early as the middle phase of the Hungarian Early Bronze Age (Bronze A1). The earliest pieces made of a simple coiled gold wire are known from the burials of the early Maros/Pitvaros Group,[23] similar copper or bronze pieces from the early Vatya period,[24] as well as gold and copper variants from the assemblages of the Kisapostag/Earliest Encrusted Pottery, Straubing and Aunjetitz cultures.[25] The *Noppenringe* of the Görbő hoard, which were of a thicker type of gold double wire and shaped into multiple-rotation coils, only began to emerge in the second phase of the Middle Bronze Age (Fig. 3.1–3). These types of *Noppenringe* were also part of the gold hoard from Kölesd-Hangospuszta and another hoard recovered in the vicinity of Pécs, both dating to the Koszider period (Bronze A2c–B).[26] Bronze and gold pieces made of thinner wire were discovered in the cemetery of the Tumulus Culture excavated at Tiszafüred.[27] *Noppenringe* from the Late Bronze Age are different, with their bigger size and their production technique made by multiple coiling and twisting (torsion).[28]

Noppenringe made with bent ends on both sides can be found in the Pincehely-Görbő assemblage (Fig. 3.4–5). This variant is not common in the Carpathian Basin; we hardly find it east of the Danube. The only gold piece was discovered as a stray find from the Tószeg tell-settlement, at Lajos Márton's excavation in 1908 (Hungarian National Museum inv. no. 121.1908). However, this variant is known from Czech regions of the Aunjetitz Culture,[29] and we can find it in one burial at the cemetery of the Gáta-Wieselburg Culture excavated at Rusovce.[30] We cannot exclude the possibility that an earlier version of this type was *Noppenringe* with a one-rotation coil and bent end on one side only, which were also transitory forms of tripartite hair-rings.[31]

21 Kovács 1991; Kovács 1999b.
22 Hänsel – Weihermann 2000; Weihermann 2001; Meller 2014.
23 Bóna 1965, pl. VI.3; Fischl – Kulcsár 2011, 77, tab. 1.
24 Mozsolics 1942, pl. 3.23.
25 Ruckdeschel 1978, 143; Moucha 1997, 155–158, pl. 19; Melis 2013, fig. 6.
26 Tompa 1928, fig. 94.25; Kovács 1999b, fig. 15, cat. no. 18.4 (described as a finger ring); Hänsel – Weihermann 2000, fig. 8.7; Kiss 2012b, 116–117.
27 Kovács 1975, pl. 21. gr. 217; pl. 8. gr. 82.
28 Szathmári 1982, 106–108.
29 Moucha 1997, fig. 6.11.4, pl. 19.Č340.
30 Bóna 1975, pl. 280.14–15.
31 Kiss 2012b, 116–117.

Tripartite solid hair-rings with noppen-like bent ends appear in the Komárom-Szőny assemblage (Fig. 2.2), as well as in the Pincehely-Görbő hoard (Fig. 3.6–7). The use of these oval or round hair-ring variants made of bronze or gold wire, began during the second half of the Early Bronze Age and peaked in the first phase of the Middle Bronze Age in the Carpathian Basin. Although with less intensity, their utilization continues until the later phases of the Middle Bronze Age, proven by the well-dated bronze pieces from the Füzesabony-Kettőshalom cemetery of the Füzesabony Culture.[32] Best analogies of the mentioned type, also made of gold, can be found both in Transdanubia with Late Kisapostag/early Encrusted Pottery finds (Balatonakali, Badacsony), and also in eastern Hungary within the material of the Hatvan Culture (Rétközberencs, Zaránk, Szécsény-Benczúrfalva-Dolyán, Mezőberény, Szelevény).[33] Bronze variants are known from many other sites: from Nagyrév and early Vatya burials of the Dunaújváros-Dunadűlő cemetery,[34] from western Hungary in burials nos. 2 and 7 excavated at Juta,[35] and also from the first phase of the Bonyhád-Biogas factory cemetery with inhumation burials (graves nos. 200 and 243; the last one's AMS dating is 1950–1890 calBC (DeA-5489, 3580 ± 23 BP, 68.2%), and from phase 2 and 3 cremation burials.[36]

A gold hair-ring from Komárom-Szőny (Fig. 2.1) with its convex interior and slightly protruding outer surface can be characterized as a solid heart-shaped hair-ring. Bipartite, oval or half-oval hair-rings, sometimes with a triangular cross-section, were well-known and generally used ornaments in the Carpathian Basin from the first half of the Middle Bronze Age until the Koszider period. Bronze pieces were discovered in the burials of the Füzesabony Culture,[37] Its gold variants appear most frequently in hoards from the Tisza region (Tiszaug, Jászdózsa, Tiszafüred, Szerencs).[38] The inner side of the bipartite heart-shaped solid hair-ring from Komárom-Szőny is concave. Scholars suggest that this form is characteristic for the younger pieces used until the Koszider period, while the hair-rings with a flat inner side are older. The gold hoard from Szerencs, where hair-rings were found together with a hollow-headed pin, corroborate this idea. The manufacture of this pin type (*Überfangguss* technique) became general at the end of the Middle Bronze Age, in the Koszider period, offering a good dating for the use of the solid, heart-shaped hair-rings with concave inner side.[39]

A bipartite gold hair-ring in the British Museum's collection listed with the site-name of Komárom-Szőny was hammered from a gold sheet to achieve concave ends and a hollow body (Fig. 2.3). The bipartite (heart-shaped) and tripartite hair-rings hammered from a gold sheet are characteristic ornament types of the Middle Bronze Age Koszider period. These variants can be found almost exclusively in assemblages and burials dating to the Koszider phase (Harc, Kaposvár, Uzdborjád/Kölesd-Hangospuszta, Nagyberki-Kisberki, Kengyel).[40] The dating to the Koszider period is proven by the vessel of the Kengyel hoard, as well as the hoard assemblage from Budapest-Remete Cave and Százhalombatta hoard II.[41]

Another important cornerstone for dating is the necklace made of gold beads from Komárom-Szőny, curated by the British Museum. Although necklaces made of gold beads do not occur very often, they can be found in several exceptional rich burials and hoards. Heart-shaped hair-rings

32 Szathmári 1997, 69, fig. 10.4–5.

33 Summarized by Kovács 1994; Honti – Kiss 2000, 92–93; Kiss 2012b, 116–119; Kiss 2020.

34 Vicze 2011, pls. 3.8; 46.5.

35 Honti – Kiss 1998, 56 pl. 2.1.

36 Graves nos. 84, 103, 141, 231. Szabó 2012; Kiss et al. 2015, fig. 11; Hajdu et al. 2016; Kiss et al. in press.

37 Hernádkak: Schalk 1992, pls. 25.1–4; 32.2–5; Megyaszó: Bóna 1975, pls. 183.9–10, 14–16; 189.16–17; Tiszafüred-Majoroshalom: Kovács 1982, figs. 4.1–2, 6; 5.4; Füzesabony-Kettőshalom: Szathmári 1997, figs. 9.4–5; 11.7–8; and sometimes can be found in hoards, too; cf. Szelevény: Kovács 1994, 1, figs. 6–12.

38 For a comprehensive summary see Csányi et al. 2000, 161–162.

39 Kovács 1979, 70–71, fig. 9.1–4.

40 Kovács 1999b, fig. 15, cat. no. 18; Hänsel – Weihermann 2000; Kiss 2012b, 118, pl. 67.7–8.

41 Mozsolics 1988, fig. 5.1–4; Kovács 1999b, fig. 28, cat. no. 35.

were discovered in the B 90 grave of the Tiszafüred-Majoroshalom cemetery, together with beads made of spiral wire and biconical beads, similarly to the Komárom-Szőny necklace.[42] The gold hoard from Şmig/Somogyom contains 149 different flat, round gold beads.[43] The short, cylinder-shaped beads of the Hangospuszta gold hoard are also characteristic finds of the Koszider period, with good analogies from the hoards discovered at Zsadány-Orosi-puszta and Kötegyán.[44]

According to the data of the original inventory and drawings and Mozsolics's results, it is highly probable that the six decorated hair rings from the Biia site (originally a chain with seven hair-rings) belong to one and the same assemblage. These hair-rings belong to the two main Middle Bronze Age hair-ring types. Three of them can be assigned to the group of the solid bipartite heart-shaped hair-rings (Fig. 4.1–3). The recently identified three pieces, formerly reckoned among the Pincehely-Görbő finds, belong to tripartite hair-rings with a bent back end (Fig. 4.4–6). The decoration of five hair-rings is nearly identical, with rows of round, so called 'string of pearls' motifs (Fig. 4.1–2, 4–6). The motif of the solid hair-ring with a triangular cross-section is different: on the surface we can see uneven, punctuated circles and semicircles, with lines of dots on both sides (Fig. 4.3).

In the 1960s, Mozsolics dealt with the dating of the Biia hair-rings, first in relation to the gold armlet from Bilje/Bellye (Croatia), then later in her publication on the Hajdúsámson hoard-horizon and its characteristic gold artefacts. In these papers she already raised the possibility that the gold arm ring with lunula-shaped ends and the 'chain' made of hair-rings might originally belong to the same find assemblage. Moreover both finds – with a small time difference of three months – were acquired by the museum via a mediation from Zlatna. Mozsolics could identify only three hair-rings. Based on the circular motifs and embossed ornaments of the bracelet and the hair-rings, the artefacts from Biia were related to the Hajdúsámson bronze hoards and to the Ţufalău/Cófalva (Romania)-type gold hoards.[45] Current research does not exclude the utilization of such armlets and hair-rings right until the very end of the Middle Bronze Age, i.e. they could be slightly younger than the Hajdúsámson-type assemblages.[46]

The fact that the hair-rings of Biia were assembled in a 'chain' and the ones from Görbő were placed in a ceramic vessel implies that these artefacts were deposited as metal hoards. Although the utilization of some artefact types dates to the first half of the Middle Bronze Age, it can be assumed that – similarly to other gold hoards – the deposition of these assemblages took place towards the end of the Middle Bronze Age, during the Koszider period.

Microscopic and Macroscopic Observations

Technological and use-wear analysis was carried out on the 16 gold *Noppenrings* and hair-rings (originating from 3 different sites) by using high-resolution photographic imagery and a DNT DigiMicro Mobile-type microscope camera (10×–500× magnification).

It is important to take into consideration the uncertain origin of the objects from a critical point of view. Neither the circumstance of their recovery, nor their condition on discovery is known. Moreover, some of them were given by goldsmiths to the collection of the Hungarian National Museum during the 19th century. In view of these facts, it cannot be excluded that recent marks and damage can be observed on their surfaces, caused during their recovery or acquisition into a private collection. From this point of view, the first hair-ring from Komárom-Szőny and the third

42 Kovács 1999b, 40, fig. 13.2.
43 Kovács 1999b, 40, fig. 23.
44 Kovács 1968, fig. 3; Kovács 1999b, 44–45, fig. 15.
45 Mozsolics 1951, 84, fig. 2; pls. 19.4–6; 20.21; Mozsolics 1968, pls. 19.4–6; 20–21.
46 Kovács 1991, 12–14; Tarbay 2022; Tarbay – Maróti 2022.

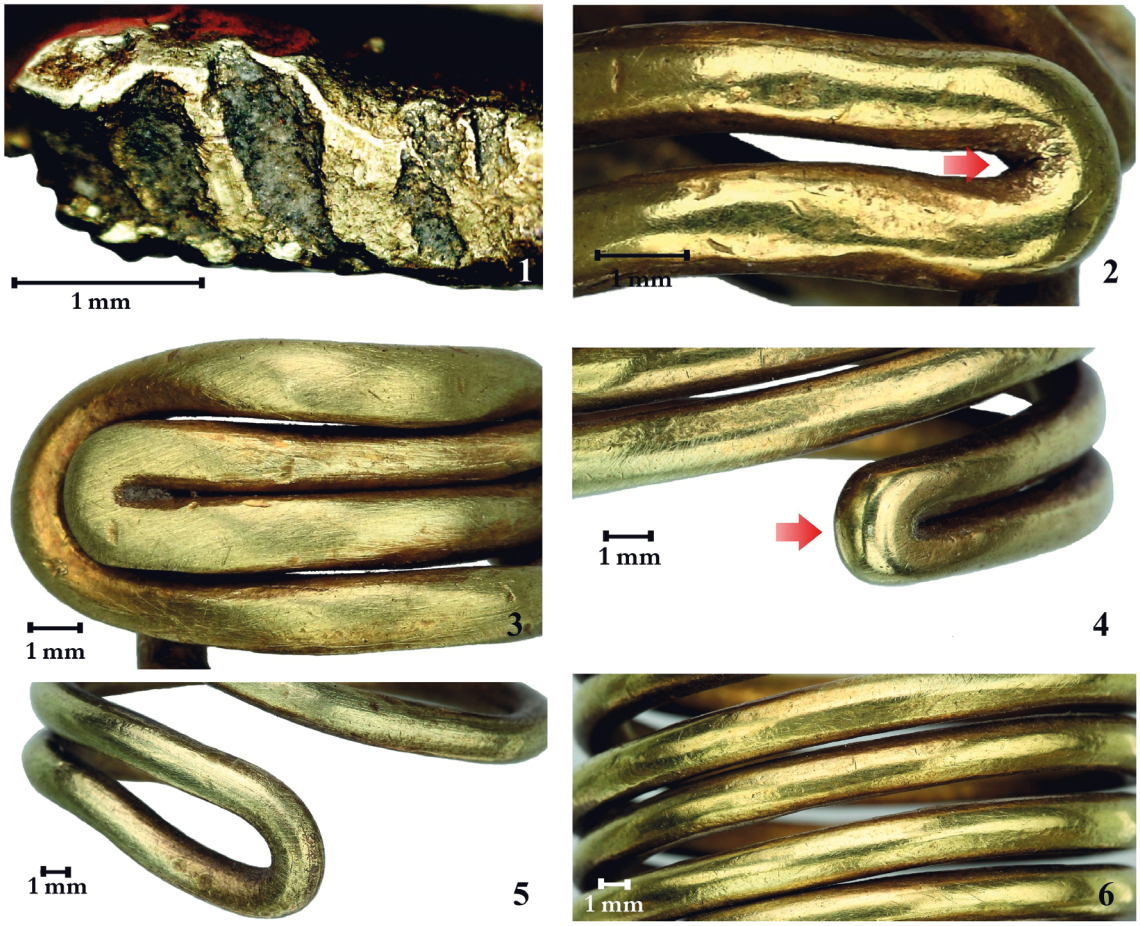

Fig. 5 Macroscopic observations on the *Noppenringe* from Pincehely-Görbő: 1. Marks of a tool with blade (no. 3); 2. Cracking resulting from bending (no. 4); 3. Bent part beaten rectangular, with traces of modern polishing (no. 5); 4. Bent end, beaten rectangular (no. 1); 5. End part without beating, probably shaped by hand (no. 3); 6. Surface of a faceted wire (no. 1) (photo: J. G. Tarbay; © Hungarian National Museum, Department of Archaeology, Prehistoric Collection)

Noppenring from Görbő is a good example. On the outside of the former, there are some coarse blow marks (Fig. 2.1), while the missing part of the latter was not simply broken off, but damaged by repeated punctuation (Figs. 3.3; 5.1). The damage types described above are not uncommon in Bronze Age objects. However, because of their undocumented find context, a recent origin of this damage cannot be excluded. Even the formation of the finer surface traces, such as the polishing traces on the outer surface on the fifth *Noppenring* fragment from Görbő (Figs. 3.5; 5.3), is not always clear.

Technological Observations

The ornaments under study could be divided into three distinct groups based on their production technologies: 1) wire ornaments, 2) hammered hair-rings, and 3) cast ornaments. However, certain shared characteristics can be observed between the three groups.

The *Noppenrings* of the Görbő hoard can be classified into Group 1 (Fig. 4.1–5). The wire as the basic component of these gold ornaments can be produced by using a range of techniques.[47]

[47] See Oddy 1977, 83–86, figs. 5–6; Foltz 1979, 216–218; Fischer 1995; Armbruster 2000, 102–105, figs. 54–55.

The slightly square, facetted outer surface of these objects suggests one of the most elementary production techniques, during which a rod-shaped gold ingot was hammered and shaped on a small anvil to achieve the desired length and form.[48] Although the *Noppenringe* nos. 1–3 from Görbő show a more regular, rounded cross-section, they were probably prepared with the same method as that mentioned above, since they are missing the twisted spirals on their sides formed by wire-drawing or the straight-running microscopic 'grooves'.[49] The second technological stage involved the bending (by hand) and further hammering of *Noppenringe*. The bending of the material resulted in tiny cracks,[50] which are clearly visible on the bent part of *Noppenring* no. 4 (Figs. 3.2; 5.2). Traces of hammering were also observable in the four-square cross-section of the objects. Whichever type from the *Noppenringe* nos. 1–5 is being examined (Fig. 3.1–5), the first step in their production started with a long wire, hammered to be narrow at its two ends, which could be folded by hand in the middle. The folded wire was hammered on the ends from both sides so that they would accurately fit each other (Fig. 5.4), traces of the latter can clearly be seen on the pieces nos. 1–2 and 4–5 (Fig. 3.1–2, 4–5). In our opinion, traces of manual folding can only be detected on *Noppering* no. 3, since its bent ends do not fit together and no hammering traces can be observed on its surface (Figs. 3.3; 5.5). From the manufacturing point of view, the various types of *Nopperinge* are separate. The simplest variant is represented by the ring-shaped *Noppenringe* nos. 1 and 2. Based on their regular diameter, these pieces would probably have been constructed such that, after forming the bent ends, the folded wire would be wrapped manually around a rod. Characteristic differences can be detected in the mode of twisting of the two objects: whereas the threads of the first object are perfectly fitted to each other (Figs. 3.1; 5.6), the second object shows a more irregular shape (Fig. 3.2). The latter can be created when the thread of the wire is not closely pressed together while rolling it on the rod. The *Noppenringe* nos. 2 and 4–5 could have been made in several steps (Fig. 3.2, 4–5). Based on their irregular, rectangular-shaped annular parts, it is likely that they were not twisted on a rod, but were shaped into a ring manually. According to its rectangular cross-section and interlacing (Fig. 5.3), the two folded ends could have been produced in a similar way to the half-folded middle part of the object.

The no. 1 hair-ring from Komárom-Szőny was difficult to characterize technologically; however, based on macro- and microscopic evidence, it was classified into Group 2 (Fig. 2.1). Given the curved cross-section of the ornament, it is likely that its final shape was achieved by hammering; nevertheless – based purely on the traces on the exterior – it is impossible to decide whether it was originally hammered from a small ingot or from a wire. Hair-ring no. 3 (Fig. 2.3) from the British Museum also belongs to this group. It was made of a thin metal sheet (thickness 0.7–0.5–0.3mm), which is easier to achieve through repeated hammering.

Cast hair-rings belonged to Group 3 (Figs. 2.2; 3.6–7; 4.1–6). The production technologies of these complex ornaments cannot be reconstructed simply based on the results of macroscopic and microscopic methods; detailed analysis of them requires further experiments. The possible production techniques from casting to finishing have been studied in detail by Weihermann, including the gold ornaments found in the Pécs hoard and further pieces from the collection of the Hungarian National Museum.[51] In her opinion, the types under analysis here were produced using the lost-wax casting technique for the following reasons: 1) the lack of casting seams on the outer surfaces, 2) the cross-section, 3) the impression left by the clay crust on the wax model, 4) lack of standardized sizes, and 5) lack of casting moulds in the archaeological assemblage.[52] The traces of the technology mentioned above can be distinguished based on the observations of Barbara

[48] Oddy 1977, 83, fig. 5e; Armbruster 2000, 102–105, figs. 54–55; Előry 2010, 135–136; Müller et al. 2023.

[49] Oddy 1977, 84–85, fig. 6c; Fischer 1995, fig. 4a, c–e; La Niece – Cartwright 2009, fig. 8.

[50] Armbruster 2000, fig. 56.

[51] Hänsel – Weihermann 2000, 17–19; Weihermann 2001, 168–172.

[52] Hänsel – Weihermann 2000, 17–18, fig. 11; Weihermann 2001, 168–169, fig. 3. On the lost-wax technique see: Goldmann 1981, 111, fig. 2; Armbruster 2000, 75–85, fig. 36; Armbruster 2003, 31–32; Rama – Berthelot 2003, 202–277.

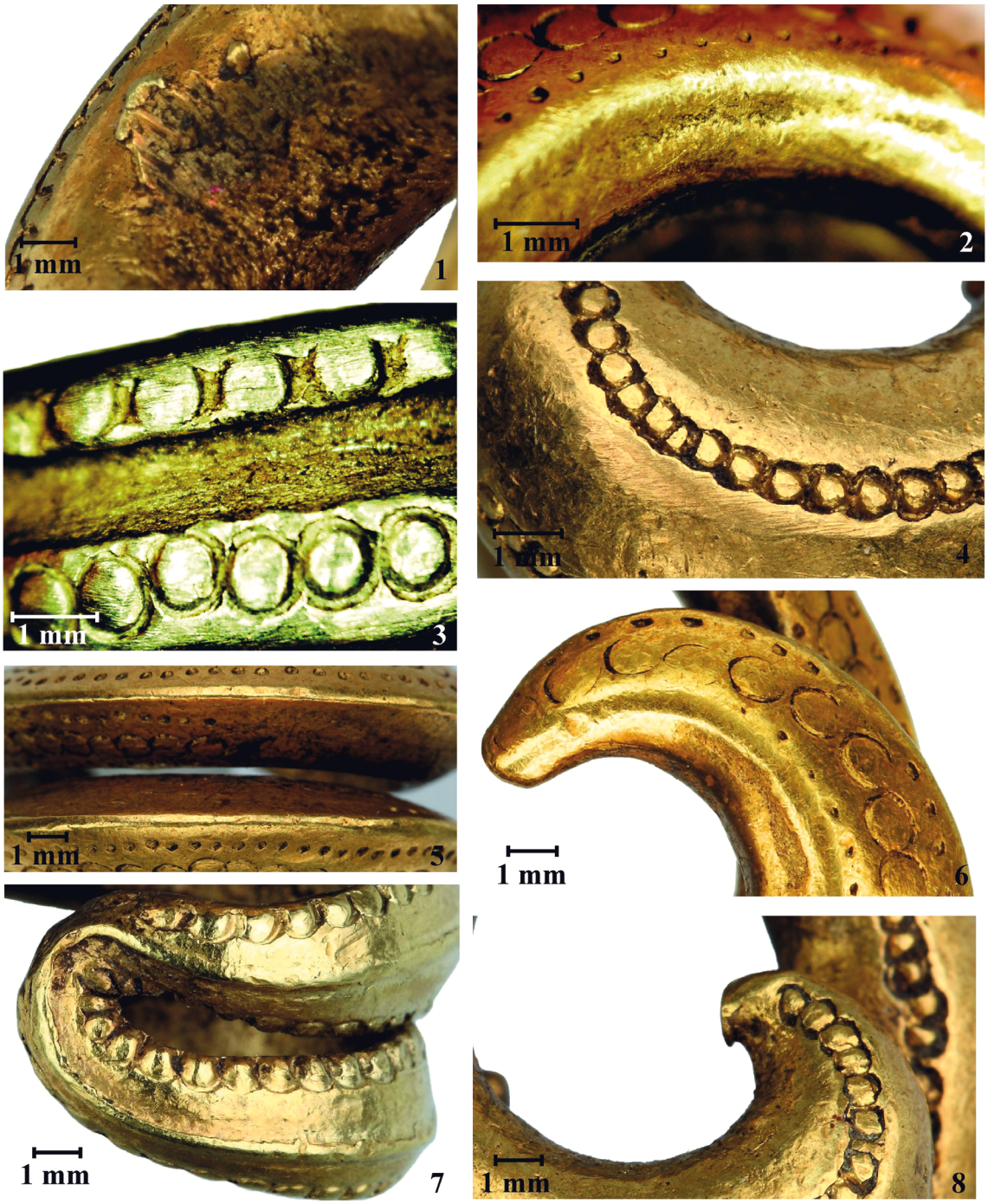

Fig. 6 Macroscopic observations on the hair-rings from Biia (RO): 1–2. Traces of casting on the inner side of hair-rings (nos. 2–3); 3. Ornamented ribs with modern polished surface and traces of casting between the ribs (no. 4); 4. Traces of polishing on the ornamented surface (no. 1); 5. Possible casting joints (no. 3); 6. Traces of abrasion at the end of the hair-ring with bent end (no. 3); 7. Ornament deformed by bending (no. 5); 8. End of a hair-ring with potential traces of a sprue or deliberate blunting of the tip (no. 2) (photo: J. G. Tarbay; © Hungarian National Museum, Department of Archaeology, Prehistoric Collection)

Armbruster and Marilou Nordez, such as the flaws and the minor damage from the wax models and the handprints of the maker.[53] During the analyses of the Biia hair-rings, traces of the casting procedure could also be observed, most often on rougher cast surfaces on the inner sides of ornaments (Biia nos. 1–3) (Figs. 4.1–3; 6.1–2).[54] Cast surfaces were also detected between the ribs of the hair-rings nos. 4 and 6 (Figs. 4.4, 6; 6.3), as well as on the outer surface and on the hinge of the hair-ring no. 7 from Görbő (Fig. 3.7). It cannot be excluded that these casting phenomena may not always have resulted from the lost-wax technique.

Following the casting process, as was pointed out by Weihermann, the outer surfaces of the objects were worked intensively, most often by polishing and buffing.[55] The exterior surface of hair-ring no. 1 from Biia shows traces of polishing (Figs. 4.1; 6.4), as do the outer ribs of hair-rings nos. 4 and 6 (Fig. 4.4, 6). These production stages and later use wear – due to the utilization of these ornaments on garments – can make traces of sand-casting[56] or the casting seams left by bipartite moulds disappear. Although it is more likely that the lost-wax casting technique is more common among these objects, the question can only be properly answered by a series of experiments relating to different casting techniques in the future.

In the case of the decoration on the hair-rings from Biia nos. 4–6, the plastic rib ornaments could have been carved into the wax model (Figs. 4.4–6; 6.3). However, in the case of the fine circular and point decorations on the hoard's jewellery (1–6), and because of the secondary elaboration on the surface and of the abrasion marks, it is no longer possible to distinguish whether the patterns were carved into the wax model or subsequently chased into the surface. Either the ornament was finished before the casting or after it: forming the ring into a circle was definitely carried out on the decorated object. It is best observable on the hinges of the rings from Biia nos. 3, 4 and 6 (Fig. 4.3–4, 6), where the patterns are distorted due to the twisting of the object (Fig. 6.7). Based on the foldings, P. Weihermann has pointed out that the hair-rings could have been cast in open (Biia nos. 1–3)[57] or even in straightened positions (e.g. Biia nos. 4–6). It cannot be excluded that the pouring cup could have been placed at the tip of the object; this may be indicated by the blunt end of the Biia no. 2 find (Figs. 4.2; 6.8). At the same time, the crease of the jewellery may indicate the deliberate blunting of the tip.

Use Wear

Traces undoubtedly due to use wear can only be observed on hair-ring no. 3 from Biia[58] (Fig. 4.3). The use wear manifests in intensively worn surfaces from the curving end up to the folded hinge, on the closed part of the ring on the external side of the jewellery, making the punctured dots and circle motifs undetectable in certain areas (Fig. 6.6). The ring's grooved surface in the narrow middle part may be related to use; however, the latter may be the result of twisting the object into a circle. It cannot be excluded that the heavily rounded edges of the hair-ring from Komárom-Szőny no. 2 and the ring from Görbő no. 7 (Fig. 2.2; 3.7) are also caused by use and abrasion. It should be noted that abrasion was not observed on the *Noppenring* (Komárom-Szőny no. 3) from the British Museum; however most biconical beads in the necklace had rounded edges, which can also be a sign of intensive use (Fig. 2.4.2).

53 Guérin et al. 2015, 61–98, III. 109.
54 Hänsel – Weihermann 2001, 18.
55 Hänsel – Weihermann 2000, 18, fig. 12; Weihermann 2001, 172.
56 Goldmann 1981, 115, fig. 5; Rama – Berthelot 2003, 63–76.
57 Weihermann 2001, 169.
58 Wunderlich 2014a, figs. 7, 9–11.

Raw Material Analyses

The raw material analysis of European prehistoric gold objects began in the 1960s, and by the 1980s, a series of tests were carried out on more than 4000 gold objects from the Chalcolithic to the Iron Age, organized by the Stuttgart SAM (*Studien zu den Anfängen der Metallurgie*) project, using atom emission spectroscopy. The results were later published by Axel Hartmann. Only a small number of gold objects (hair-rings, disc-shaped pectorals, gold cups and bracelets) were included in the above spectrometric analyses from the Carpathian Basin.[59] More recently, a couple of Early and Middle Bronze Age gold ornaments were tested for raw material components using various methods (XRF and scanning electron microanalysis: SEM-EMA).[60]

For the initial analyses of raw materials of the 15 Bronze Age[61] and 2 – most probably – later ornaments under study here, an Olympus Innov-X Delta Premium type hand-held XRF device was used (with Peltier cooling system and silicon drift detector [SDD]) to carry out XRF tests. The results are summarized in Table 1. XRF spectrometry is a completely non-destructive analytical method, which provides information about the surface chemical composition of the examined objects.[62] For the measurements, the equipment's Alloy Plus Precious Metals settings was used (tube voltage 40kV, tube current 100μA), which is suitable for the determination of the chemical composition in mass percentage (wt%). The analysed area was 7mm², as the spot size of the X-ray beam is 3mm in diameter. In the case of natural gold-silver alloys, the obtained compositional information is valid for the outer 10–20μm of the object.[63] This method provides essential information about the major components, such as gold and silver. The examined objects were of golden-yellow colour. XRF measurements were carried out on the flat, unornamented surfaces of the artefacts. Colour distortion of the surfaces of golden objects is a known phenomenon,[64] yet several research results proved that the so-called tarnishing is caused by a very thin layer of silver sulphide, not affecting the chemical composition measured by the XRF equipment.[65] Thus, XRF results can not only be interpreted for the surface, but also for the bulk. Results can readily be used to answer the question whether the objects from the same finding were produced using a similar type of alloy, or whether the *Lockenringe* of similar age and shape but from different archaeological sites can be categorized into groups based on their raw materials.

This shows that the objects were made of gold containing 5.9–28.4% silver per weight (wt%). The lowest amount of silver (5.9–11.1wt%) was detected in the three hair-rings from Biia; furthermore, two hair-rings from Pincehely-Görbő and one hair-ring from Komárom-Szőny contained less than 20wt% silver, whereas the rest of the ornaments under analysis here had higher than 20wt% silver content in their raw materials. Thus the raw material components of objects varied even within a single hoard assemblage.

The detection limit of the handheld XRF device for tin, lead and nickel is 0.1wt%, 0.09wt%, and 0.06wt%, respectively. There were hair-rings in all three hoards that contained 0.5–0.9wt% copper as well (Tab. 1). Tin was not present in either of the analysed hair-rings. Lead was detected in two instances: in the heart-shaped and the bent-ended hair-rings from Komárom-Szőny. The lead component in the former fell just within the range of measurement (0.09wt%), whereas the latter was nearly twice this value (0.16wt%).

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59 Hartmann 1968; Hartmann 1970; Hartmann 1982.

60 Ruttkay 1988–1989; Hänsel – Weihermann 2000; Fischl – Kulcsár 2011, 64, tab. 1; Endrődi 2012; Nagy 2013, 104–105, pl. 29.1–2.

61 The bipartite hair-ring from Komárom-Szőny (Szőny), held by the British Museum, was not part of the XRF analysis.

62 Janssens 2003.

63 Troalen et al. 2014.

64 Wunderlich 2014b; Ilon 2015.

65 Troalen et al. 2014; Tissot et al. 2015.

Tab. 1 Results of XRF analysis of the raw material of gold hair-rings examined in this paper

Site	Inv. Nr.	Au (weight%)	Ag (weight%)	Sn (weight%)	Cu (weight%)	Ni (weight%)	Pb (weight%)
Ószőny (bipartite hair ring)	127.1890.1	75.5±0.5	23.8±0.3	<0.1	0.54±0.02	<0.06	0.09±0.02
Ószőny (tripartite hair ring)	127.1890.4	82.6±0.5	16.1±0.4	<0.1	0.9±0.1	<0.06	0.16±0.02
Pincehely-Görbő (*Noppenring*)	123.1890.1	73.6±0.4	26.1±0.4	<0.1	0.14±0.05	<0.06	<0.09
Pincehely-Görbő (*Noppenring* fragment)	123.1890.2	73.6±0.2	26.1±0.1	<0.1	<0.1	<0.06	<0.09
Pincehely-Görbő (*Noppenring* fragment)	123.1890.3	71.0±0.3	28.4±0.3	<0.1	<0.1	0.10±0.01	<0.09
Pincehely-Görbő (*Noppenring* with bent ends)	123.1890.5	80.8±0.2	19.0±0.1	<0.1	<0.1	<0.06	<0.09
Pincehely-Görbő (*Noppenring* fr. with bent end)	123.1890.6	80.6±0.2	18.5±0.1	<0.1	0.61±0.04	<0.06	<0.09
Pincehely-Görbő (tripartite hair-ring)	123.1890.7	72.6±0.6	27.3±0.5	<0.1	<0.1	<0.06	<0.09
Pincehely-Görbő (tripartite hair-ring)	123.1890.8	74.8±0.8	25.2±0.6	<0.1	<0.1	<0.06	<0.09
Magyarbénye (Biia, RO) (bipartite, decorated hair-ring) (A)	117.1880	92.9±0.4	5.9±0.1	<0.1	0.69±0.03	<0.06	<0.09
Magyarbénye (Biia, RO) (bipartite, decorated hair-ring) (B)	117.1880	89.3±0.3	9.60±0.08	<0.1	0.68±0.05	<0.06	<0.09
Magyarbénye (Biia, RO) (bipartite, decorated hair-ring) (C)	117.1880	88.6±0.4	11.1±0.1	<0.1	<0.1	<0.06	<0.09
Magyarbénye (Biia, RO) (tripartite, decorated hair-ring) (D)	117.1880	75.4±0.6	24.1±0.5	<0.1	<0.1	<0.06	<0.09
Magyarbénye (Biia, RO) (tripartite, decorated hair-ring) (E)	117.1880	75.9±0.3	23.6±0.3	<0.1	<0.1	<0.06	<0.09
Magyarbénye (Biia, RO) (tripartite, decorated hair-ring) (F)	117.1880	74.9±1.1	24.4±0.8	<0.1	0.40±0.02	0.12±0.02	<0.09
Ószőny, probably not prehistoric	127.1890.2.	76.9±0.06	22.8±0.08	<0.1	<0.1	0.06±0.02	<0.09
Ószőny, probably not prehistoric	127.1890.3.	77.1±0.2	22.7±0.1	<0.1	<0.1	<0.06	<0.09

Collecting the data of 20 formerly analysed gold artefacts from various periods of the Bronze Age, without the demand of completeness, we find similar tendencies in the raw material (Tab. 2). Gold finds from the Early Bronze Age[66] burial from Dunakeszi and the Bell Beaker cemetery of Szigetszentmiklós-Üdülősor contained 19.4 and 14.84wt% silver.[67] Gold hair-rings from the Early Maros period (Kiskundorozsma, Szőreg, and Beba Veche/Óbéba [Romania]) have more than 20wt% silver content.[68] *Noppenringe* of the Kisapostag or Earliest Encrusted Pottery Culture that can be dated to the transition period of the Hungarian Early and Middle Bronze Age and were excavated at Győr-Ménfőcsanak contained 20.45wt% and 18.73wt% silver.[69] Gold finds from the Gáta-Wieselburg cemetery of Zsennye have 20wt% silver,[70] while from the Hainburg cemetery (Austria), we have various data: from one burial the examination of a hair-ring pair has shown 11–12wt%; gold sheet ornaments from two other graves have 24–26wt% silver; there is one wire ring with 52wt% silver (electrum), while another piece contained 87wt% silver and 12% gold.[71] Middle Bronze Age gold artefacts from Pécs have 88wt% gold, 11.4wt% silver, and 0.6wt% copper content.[72] During the SAM project, several Middle Bronze Age artefacts were also analysed: 13 solid gold hair-rings from Vinča (Serbia) had 25–27wt% silver content as well as 0.16–0.70wt% copper and 0.004–0.055wt% tin. Based on Hartmann's results for the arm rings from Bilje/Bellye (Croatia) and Pipea (Romania), Kovács called attention to the nearly identical raw material data of these arm rings' content (gold 69.7wt%, silver 30wt%, copper and tin), suggesting that these arm rings were probably produced in the same workshop from the same material, possibly from Transylvanian gold containing more than 20wt% silver.[73] The gold ornaments and the diadem from the Late Bronze Age Velem hoard contained 79–82wt% gold, 15–18wt% silver and 2–3wt% copper.[74]

Hartmann distinguished several raw material groups based on the gold, silver, copper and tin content of the artefacts. According to his important observations, one gold raw material type lacked the tin component, and this group can be connected to primary ore sources, that is native gold (also called *Berggold*), collected from the surface or from gold mines. This raw material type can be differentiated by silver content. According to these subgroups, the group containing less then 10wt% silver is called B, while group A3 has more than 20wt% silver content. The last-mentioned group originated from the region of Transylvanian Ore Mountains, also called the 'Golden Quadrangle', in the Romanian South Apuseni Mountains. Another type of gold artefact, however, contains more than 0.1wt% tin, which is not found in native gold. This type is obtained from secondary sources, by panning from alluvial gold, co-melted with cassiterite.[75] Another aspect of raw material differentiation is that more than two – or, according to several scholars, four – percent copper can be identified as a deliberate alloy, with the aim of replacing a small amount of gold with a material that has a similar colour but is easier to acquire. Hartmann was able to identify the use of panned gold with tin content from the central European Early Bronze Age, while deliberate alloying with more than 2–4wt% copper can be found among European Late Bronze Age gold artefacts.[76] Recent data suggest, however, that panned gold use, as well as deliberate alloying with copper (sometimes up to 30wt%) can be traced back to the period of the Varna cemetery.[77]

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66 For recent relative and absolute chronology see Fischl et al. 2013.
67 Fischl – Kulcsár 2011, tab. 1; Endrődi 2012, 16.
68 Fischl – Kulcsár 2011, 64, tab. 1.
69 Melis 2013.
70 Melis 2013; Nagy 2013.
71 Ruttkay 1988–1989.
72 Hänsel – Weihermann 2000, 19.
73 Hartmann 1968, 64; Mozsolics 1968; Kovács 1991, 15; Kovács 1999b, 47.
74 Ilon 2015, 39.
75 Hartmann 1968; Hartmann 1970; Hartmann 1978; Ehser et al. 2011.
76 Pernicka et al. 2008.
77 Leusch et al. 2014; Leusch et al. 2015.

Tab. 2 Results of published raw material analyses of Bronze Age gold artefacts from the Carpathian Basin

Site	Artefact type	Au (weight%)	Ag (weight%)	Sn (weight%)	Cu (weight%)	References
Bilje	arm ring	69.712	30	0.018	0.27	Hartmann 1968
Dunakeszi-Székes-dűlő, Grave 391	disc	79.3	19.4	1.3		Kulcsár 2011
Hainburg	*Lockenring*	89	11	–	–	Ruttkay 1988–1989
Hainburg	*Lockenring*	88	12	–	–	Ruttkay 1988–1989
Hainburg	ornament	76	24	–	–	Ruttkay 1988–1989
Hainburg	ornament	74	26	–	–	Ruttkay 1988–1989
Kiskundo-rozsma Grave 56	*Noppenring*	78.6	23.3	–	–	Fischl – Kulcsár 2011
Óbéba/Beba Veche, Grave A	*Noppenring*	75.82	24.18	–	–	Fischl – Kulcsár 2011
Óbéba/Beba Veche, Grave A	*Lockenring*	85.81	14.19	–	–	Fischl – Kulcsár 2011
Óbéba/Beba Veche, Grave A	disc	77.43	21. 67	1.25	–	Fischl – Kulcsár 2011
Óbéba/Beba Veche, Grave B	disc	79. 61	20.39	–	–	Fischl – Kulcsár 2011
Pécs	*Lockenring*	77.05	22.95	–	–	Hänsel – Weihermann 2000
Pipea	arm ring	69.701	30	0.009	0.29	Hartmann 1968
Szigetszent-miklós-Üdülősor, Grave 863	head ornament	83.25	14.84	–	0.48	Endrődi 2012
Szőreg-Szív utca Grave 40	*Lockenring*	77.05	22.95	–	–	Fischl – Kulcsár 2011
Velem	ornament	80	17	–	3	Ilon 2015
Vinča	*Lockenring*	74.828	25	0.012	0.16	Hartmann 1968
Vinča	*Lockenring*	72.895	26	0.055	1.05	Hartmann 1968
Zsennye, Grave 15	*Noppenring*	75.82	21.7	–	0.88	Nagy 2013
Zsennye, Grave 15	*Noppenring*	75.82	18.2	–	0.67	Nagy 2013

András Uzsoki summarized documents regarding gold panning in western Hungary based on evidence from either the Roman or the modern period. According to his data, panned gold from the Danube (at the Csallóköz area, between modern-day northwestern Hungary and southwestern Slovakia) had a very high, 95wt%, gold content, while gold from the Dráva river (southwestern Hungary) contained 92.5wt% gold.[78] Scholars also suggest the use of panned gold in the area of the western Slovakian Jelšovce cemetery, referring to site names (Zlaté Moravce, Zlatníky na Ostrove) as evidence of gold panning, presumably already from the Bronze Age.[79]

In the last decade, European prehistoric gold raw material analysis was given a fresh impetus by several neutron based (e.g. PIXE) and isotope investigation methods. According to the first results of the analyses of the Nebra hoard's gold ornaments, the first summary suggested the Transylvanian A3-type gold origin of their raw material with more than 20wt% silver.[80] Later, the research project led by Ernst Pernicka analysed raw material deposits all over Europe, through

78 Uzsoki 1959, 75.
79 Bátora – Pernicka 2000, 579–592; Nagy 2013, 104–105.
80 Pernicka 2004.

which it became clear that testing only for components such as silver, copper and tin is not sufficient for the precise provenancing of raw materials, as gold with a high silver content is known from a number of different European regions (beside modern Romania) like the Czech Republic and Bulgaria.[81] Scholars proposed more precise characterization of the raw material based on other components, such as tellurium, or the platina group elements.[82] Gregor Borg was able to subdivide Hartmann's A3 group into A3 and A3D. The gold artefacts of the subgroup A3D occur particularly in northern central Europe and Cornwall. The remaining artefacts of the group A3 occur mainly in the Carpathians Basin.[83] Lead isotope analysis proves that the gold of the sun ornament of the Nebra Sky within the A3D group may have originated from Cornwall, England, in agreement with the geochemical analysis of the tin component in the disc's bronze material.[84]

A good example of tracing the provenance of raw materials more precisely in the case of Hungarian gold artefacts is the PIXE analysis of the Copper Age hoard from Hencida. Here, beside 89–93wt% gold and 5.2–8.5wt% silver content, the results have shown the presence of other trace elements, like copper (3wt% in two items), iron, arsenic and platinum. Based on these, László Csedreki, János Dani and their colleagues ascribe the raw material to Hartmann's B type *Berggold*, contrary to former suggestions of the Rosia Montana region (Hartmann's A3 type).[85] Further, more detailed analyses of the group A3 is an important direction for studying gold raw material used in the prehistoric Carpathian Basin. The complex analyses of native gold samples from the 'Golden Quadrangle' as well as Dacian gold finds prove utilization of raw material coming from both primary and secondary sources in later prehistory.[86] Due to the small number of radiocarbon and lead isotope results, gold mining activity in the already mentioned Transylvanian region can be proven only from the Iron Age, so it is still difficult to determine Bronze Age gold sources.[87] Moreover, results for the gold from the Varna cemetery suggest the deliberate alloying of the raw material (see above). This means that we can expect more precise answers for the question of gold provenance from geochemical characterization.

Conclusions

The XRF compositional analyses carried out on the 15 Bronze Age gold hair-rings presented here were not sufficient to identify an exact provenance for the raw materials. However, the tin content of less than 0.1wt% component implies that the raw material may have been native gold, either Hartmann's A3 or B groups, depending on the silver content.

Our new data, however, are sufficient to suggest that the raw material components of gold objects vary even within a single hoard. This also implies that the metal deposits in question consisted of artefacts made at different times or at different workshops, and that pieces of the Biia, Pincehely, and Komárom-Szőny assemblages were collected throughout a prolonged period. The ornaments made of wire were probably easy to make; however, the cast hair-rings would have required significant technical skill and knowledge and were created by using the lost-wax casting technique. Following the casting process, the surface of the objects was polished and buffed, and given the visible traces of use wear, it is clear that some of these ornaments were worn before their deposition.

81 Czajlik 2012, 38.
82 Makkay 1995; Junk – Pernicka 2003; Bugoi et al. 2008; Constantinescu et al. 2008.
83 Borg 2010.
84 Ehser et al. 2011; Lockhoff – Pernicka 2014.
85 Csedreki – Dani 2011; Csedreki et al. 2011; Török et al. 2015.
86 Constantinescu et al. 2012.
87 Ioane – Bedelean 2010; Baron et al. 2011; Ciugudean 2012.

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The Valchitran Hoard: Production Technology and Chemical Analyses

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Abstract: During the last decades, the Valchitran hoard was in the focus of numerous archaeological studies which intensively discussed the typology, the date and the cultural relations of each single gold object. A recently finished research project on the Bronze Age gold mining of Ada Tepe provided the possibility to re-evaluate these interpretations with the help of archaeometric methods. The tool mark analyses revealed that the artefacts can be divided into three technological groups: the mono- and bimetallic vessels as well as one polymetallic vessel. The results of the chemical analyses confirm this classification. This allows us to conclude that the producers of these objects were able to cast a huge amount of gold within one event. Furthermore, we can point out that the casting of the inner construction as well as the conception of the inlays provide evidence that the craftsmen had very good knowledge and practical skills in metalworking as well as a sense of proportion, design and aesthetics.

Keywords: Valchitran, archaeometallurgy, Bronze Age, gold analyses tool mark analyses

Introduction

The famous Valchitran hoard has already been the subject of many typological and analytical studies in earlier publications.[4] Within a research project[5] on the Late Bronze Age gold mining activities at Ada Tepe, it was possible for the first time to systematically examine all of the gold objects for tool marks resulting from the production process and regarding the chemical composition of their metal and the alloys. The research project focused on the following questions: Which production techniques have been used (e.g. casting, hammering, use of rivets, specific shape of the punches, etc.)? Was the gold from the Ada Tepe mine used to produce the Valchitran artefacts? Is it possible to define and/or confirm the technological groups described in previous publications? Furthermore the documentation of traces and damage caused by 'excavation' and 'first use' should be analysed.

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[4] Mikov 1958; Bonev 1984; Matthäus 1989; Sherratt – Taylor 1989; Penkova – Mehofer 2017; Chukalev – Dimitrova 2018; Penkova – Mehofer 2018; Stefanova 2018.

[5] The analyses were carried out in the framework of an Austrian Science Fund (FWF) project (P28451, "Bronze Age Gold Road of the Balkans. Ada Tepe Mining"), directed by Barbara Horejs, Institute for Oriental and European Archaeology (now: Austrian Archaeological Institute), Austrian Academy of Sciences, and conducted in cooperation with Hristo Popov, National Institute of Archaeology with Museum, Bulgarian Academy of Sciences.

Toolmark Analyses and Production Technology

The triple vessel no. 3203 stands out as a unique object within the Valchitran hoard.[6] It is the most mysterious object of the treasure. Three chased bowls are connected by means of hollow tubes. Three further tubes were attached to form the handle. Only the central one of these is hollow. Its utilitarian function still remains unknown. Some researchers hypothesize that this object was used for mixing liquids, while the decoration of the chased bowls would represent measurement lines.[7] The chased bowls were produced by using the technique of sinking; the observable lines of the decoration were made by using a punch with a rectangular cross-section. The tubes of the handle give the appearance of being soldered to the chased bowls, which, however, does not explain the presence of the golden rivets. According to Mikov, the black-coloured material, which was possibly added for decorative purposes, has a composition of 54.3% gold, 31.1% copper, 3% silver and 1.3% sulfur.[8] He interpreted it as niello.[9] The construction and composition of various metals as well as the applied techniques – especially soldering – makes this triple vessel a singular object within the ensemble. The traces of this metal-joining technology can be observed several times on this vessel; first, at the junction between the handle and the body of the chased bowls, and second, at the junctions of the chased bowls with the electrum tubes connecting them (Fig. 1). Soldering is a technique used to combine two components with each other.[10] Characteristically, the soldering metal, which was produced separately, has a lower melting temperature than the carrier constituents. The soldering metal then forms a permanent joint between the components (fusion or melted solder, diffusion soldering). For the Bronze Age, the technique of soldering is known from Mesopotamia (Ur), Iran (Susa) and the Aegean, so far.[11] As an example, the finds from Troy – treasure A – may be mentioned as evidence from the second half of the 3rd millennium BC.[12] In the metallurgical tradition of the (northern and central) European Bronze Age, soldering is unknown. Barbara Armbruster discussed the joining of a decorative element on a gold bowl found at Eilby Lunde (Denmark)[13] and dated to the Nordic Bronze Age Period IV as a possible example of soldering, but discarded this possibility because there is no other case of soldering known from the Late Bronze Age. Indeed, she suggested an alternative explanation for the observed feature, i.e. casting on. At the beginning of the Early Iron Age, the golden bangles from Torre Vã, Beja (Portugal)[14] seem to provide the first evidence for soldering in Iberia. The observation of such features on (northern and central) European Bronze Age gold work that suggest soldering raises the question of whether it could be a modern repair from the time when such an artefact was found.

Coming back to the triple vessel no. 3203 of the Valchitran hoard, it is especially interesting that the areas inside the chased bowls where the crescent-shaped tubes are attached by soldering are slightly arched upwards and do not show any traces of working e.g. grinding and polishing. Furthermore, these regions exhibit dark surfaces, which may be due to the composition of the solder, its corrosion, or the oxidation of the solder during heating. Usually, soldered parts are cleaned after joining, which did not happen in this case. It is also very interesting that the surfaces of the crescent-shaped tubes have a dark-grey to blackish colour. Whether this is caused by corrosion or an intentional darkening of the surface must remain unsolved.

In contrast to the bowl interiors, the soldered parts connecting the chased bowls with the handles are mostly ground and polished and do not show soldering residues. Bearing in mind the

6 Alexandrov et al. 2018, 507, cat. no. 311.
7 Dimitrova – Čukalev 2017.
8 Mikov 1958, 23.
9 Pacini 2004, 7.
10 Bühler 1998–1999.
11 Konstantinidi-Syvridi et al. 2014, 10, fig. 15.
12 Tolstikow et al. 1996, 33–35, 55, cat. nos. 18–20; 56, cat. nos. 21–23; Born et al. 2009.
13 Armbruster 2012a, 414.
14 Armbruster 2012b, 199, fig. 4.

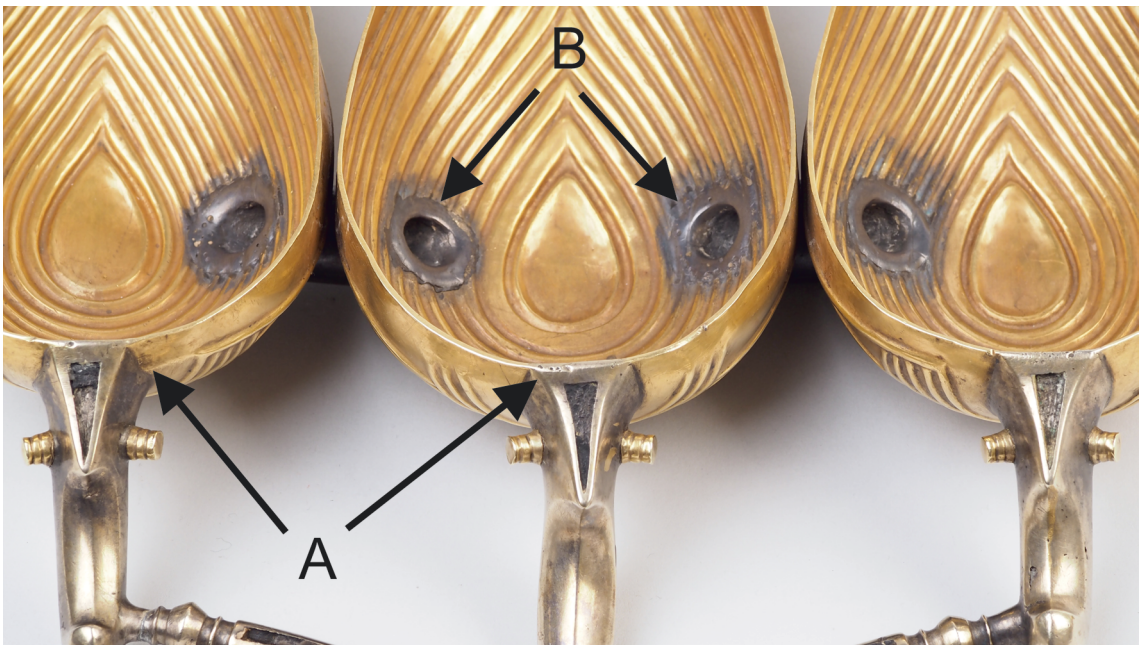

Fig. 1 Triple vessel, mus. no. 3203: the arrows (A) mark the junction of the handle and the body of the chased bowls; the other arrows (B) mark the joints of the tubes with the chased bowls. The different colour of these two junctions, which is caused by the different degree of cleaning/grinding/polishing, is clearly visible (photos: G. Georgiev, NAIM)

excellent metalworking skills of the craftsmen who produced these artefacts, it is surprising that the soldered parts inside the chased bowls were not ultimately cleaned. Therefore, a certain time span between the two soldering 'events' may be assumed. Even though we cannot name a specific time period for this action, we can hypothesize that the (re)soldering of the chased bowls with the crescent-shaped tubes happened in modern times, after the Valchitran gold hoard was unearthed in 1924 and was in private hands for some time. Such repairs were not uncommon during the 18th and 19th centuries AD, when many gold treasures were found. As an example, one can name the gold hoard of Sânnicolau Mare (Nagyszentmiklós), which shows several such modern repairs.[15]

Kantharos

The kantharos (no. 3192)[16] was, according to our technological observations, cast in one piece together with its handles. Vassil Mikov, on the contrary, thinks that the bottom was soldered with silver, but during our analyses, no evidence for the use of this particular technique was detected. The casting method was possibly the so-called 'lost-wax' technique.[17] There are much older dated attestations for the use of this technique, but it requires good knowledge and skills to cast an object as big as this kantharos. Probably the cast blank was thicker in the beginning. The visible traces of hammering inside the body of the vessel allow the conclusion that a plastic deformation was performed to shape the artefact. The decorative ornaments on the handles were made by using a punch with a rectangular cross-section.[18] Traces of these instruments are visible on the outside of the body of the vessel[19] as well as on the inner side of the handle. Generally speaking

15 Bühler – Freiberger 2018, 23–198.
16 Penkova – Mehofer 2018, 216, fig. 1.
17 Hunt 1980, 1–17; Davey 2009, 147–154.
18 Steines 2001, 38.
19 Penkova – Mehofer 2017, 83, fig. 2.

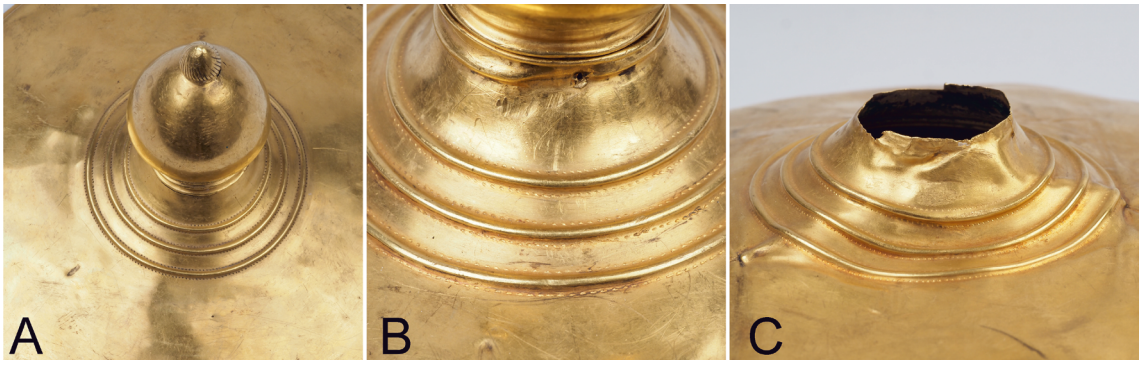

Fig. 2 The small *phalerae* mus. no. 3198 (A), 3199 (B) and 3200 (C) have dotted lines along the circular bulges (photos: G. Georgiev, NAIM)

it seems logical that the diagonal lines are made before fixing the handles at their lower ends, but a close examination of these lines show that they were made subsequently. In the area where the uprising handle is bent down towards the body of the vessel, it can be seen that they are irregularly orientated and show changing directions. A similar phenomenon can be observed on the *kyathos* (cup) no. 3193.[20] As a final touch, three rivets were placed in the lower ends of the handles, in order to close them and fix them to the vessel.

The examination of the tool marks on each single gold artefact allowed further conclusions concerning their production, which are also relevant for other similar objects made of precious metals. The technological features observed on the kantharos (no. 3192)[21] and its possible production techniques can, for instance, be compared with the golden vessels of Rădeni, Romania, and Kryzovlin, Ukraine,[22] which have similar shapes.[23] The lid-shaped artefacts (nos. 3196–3202, Fig. 2) offer additional insights into the Bronze Age gold-working techniques. A find of another lid from Călărași, Romania,[24] can be compared with the small Valchitran lids (nos. 3198–3202). Two further pairs of silver lid-shaped objects, one purportedly found in the vicinity of Cherven Bryag (Pleven district), and one stored in the private Vassil Bojkov collection, are known.[25]

Lid-Shaped Objects (*phalerae*)

Concerning the technical skills and the concept of the decorative scheme, the two big lids (nos. 3196–3197)[26] can be identified as the most elaborated pieces. Combining the gold and the silver elements in such an elegant manner, knowing their properties and how to join them together mechanically, implies a high degree of knowledge. The lids are made of two parts – an upper and a lower one – combined by a mechanical joint. The lids are quite heavy. Therefore, they needed constructive elements added on the interior. The latter are made out of bronze with 83% copper and 16% tin.[27] An interesting fact to note here is that in the centre of the interior two-part cross-shaped

20 Haag et al. 2017, 86; Penkova – Mehofer 2017, 81, 83, fig. 2; Penkova – Mehofer 2018, 216, fig. 2.
21 Mikov 1958, 9, fig. 2; Penkova – Mehofer 2017, 81, 83, fig. 2.
22 Dzis-Rayko – Chernyakov 1981, 153, fig. 3; Vulpe – Mihăilescu-Bîrliba 1985, 50, fig. 1.
23 In the Pobit Kamak hoard, numerous moulds were found. One of these bivalve moulds can be used to produce a miniature vessel with a shape comparable to the kantharos (Hänsel 1976, 39, pls. 1–3; Haag et al. 2017, 175, fig. 91).
24 Bondoc 2006.
25 Shalganova 2003, 77, fig. 1; Marazov 2011, 20; Stefanova 2018, 224, fig. 2.
26 Haag et al. 2017, 176, cat. nos. 105–106.
27 The recent analyses of a sample of the copper-based inner construction of the lid no. 3197 by Pernicka showed that it was heavily corroded. This led to a higher tin concentration than in uncorroded bronze. This fact also has to be taken into account for these older analyses (Mikov 1958, 23).



Fig. 3 The photo shows the amber inlay in the bronze construction of the lid mus. no. 3197 (photo: G. Georgiev, NAIM)

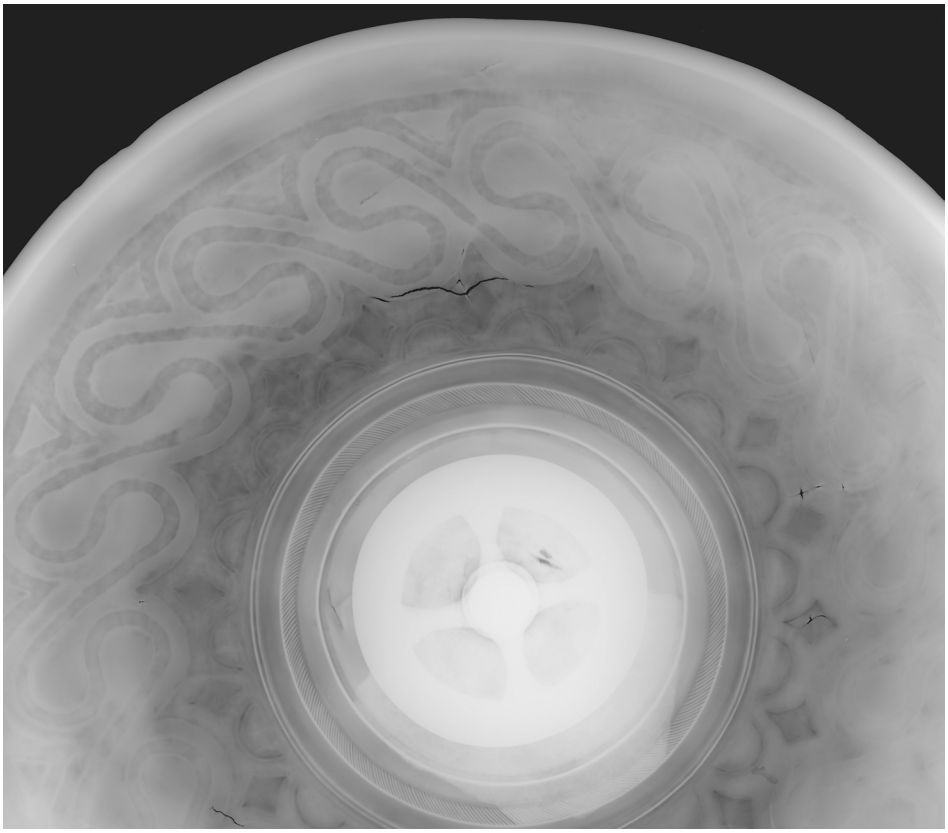

Fig. 4 X-ray image of the big lid mus. no. 3196 (X-ray image Controltest Ltd)

construction, a depression incrusted with amber is visible (Fig. 3).[28] The observable thickness of the metal of the lower part of the lid allows us to hypothesize that this part of the lid was cast and subsequently worked with various techniques e.g. for the inlaying of the silver sheets.[29] The upper part was obviously hammered around the constructive inner bronze element and then joined to the lower part. From the X-ray image it can be seen that prior to the attachment of the silver inlays,[30] some 'grooves' had been prepared (Fig. 4).

It seems that these small 'grooves' were made by working from both sides. Once completed, a sheet of silver metal, cut or previously cast in the shape of the ornament, was placed inside. Afterwards a punch and a hammer were used to join the two metals together. By this operation, some of the gold metal from the rims of the grooves overlapped the silver and fixed it in place – a technique known as damascening.[31] In the places where fragments are missing, one can see that sheet metal was used. A lighter line around the ornament can be discerned. Finally, small dots were made with a punch of spherical shape in order to emphasize and additionally fix the silver sheet metal.

It is interesting to note that the golden lid-shaped pieces from Valchitran are composed, as described previously, of an upper and a lower element[32] whereas the lid from Călărași is made of four different components. It is obvious that its upper knob and the central part consist of gold, while the upper conical section and the lower disc-shaped section consist of silver. In the interior, one can observe a copper-based element that is designed to support the construction and stability of the artefact. This inner element also differs from those of the two large lid-shaped objects from the Valchitran hoard (nos. 3196–3197).[33] While these have a two-part cross-shaped construction[34] with a depression to fix an amber bead, the Călărași copper-based element has just one beam without indentation. This feature at least relates the two large lid-shaped objects from Valchitran with the silver lids from Cherven Bryag, whose inner copper-based structural elements also show such a hole or depression,[35] even though they do not have a cross-shaped construction.

It is also recognizable that the circular bulges of the small lid-shaped objects (no. 3198–3202) are decorated in a different way than those of the Călărași lid. Each of the bulges of the objects nos. 3198–3200 has dotted lines on either side (Fig. 2), whereas the bulges of lids nos. 3201–3202 do not have such lines (Fig. 5). In addition, it can be pointed out that certain bulges of the central golden part and the lower silver part of the Călărași lid have oblique incisions, which can also be observed on the large (nos. 3196–3197) but not on the small Valchitran lid-shaped objects (*phalerae*).

These bevelled decorations can also be observed on the Valchitran vessels, but there is a significant difference in that the decorations on the kantharos and the cups are much more irregular than those observable on the two large lids nos. 3196 and 3197. Their decorations are placed very accurately and regularly. This observation clearly separates them from a technological point of view.

Chemical Analyses

The analysis of archaeological gold artefacts is not easy because except for silver, other elements are only contained in very small concentrations. Therefore, mass spectrometry is predominantly applied for the chemical analysis of gold. However, the disadvantage is that the sample must be

28 In lid no. 3197 the amber is still present, while it was lost in lid no. 3196 (Penkova – Mehofer 2017, 83, fig. 4).
29 Penkova – Mehofer 2017, 83, fig. 5B.
30 Forbes 1966, 143.
31 Penkova – Mehofer 2017, 83, fig. 5.
32 Penkova – Mehofer 2017, 82, 83, figs. 3–5.
33 Unfortunately none of the inner copper-based constructions of the small lids are preserved or visible today. Therefore the two large lids are used for comparison (Haag et al. 2017; Penkova – Mehofer 2017, 83, fig. 4; Alexandrov et al. 2018, 507, cat. nos. 308–310).
34 Haag et al. 2017, 174, fig. 83; 175, fig. 85.
35 Stefanova 2018, 224, fig. 2b, d.

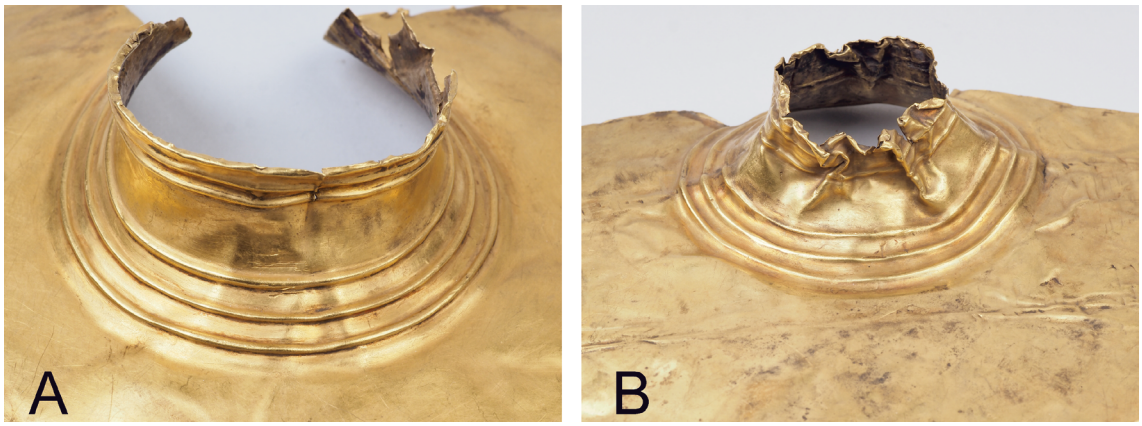

Fig. 5 The photos show that the ribs of the small lid-shaped objects (*phalerae*) mus. no. 3201 (A) and no. 3202 (B) are not accompanied by dotted lines (photos: G. Georgiev, NAIM)

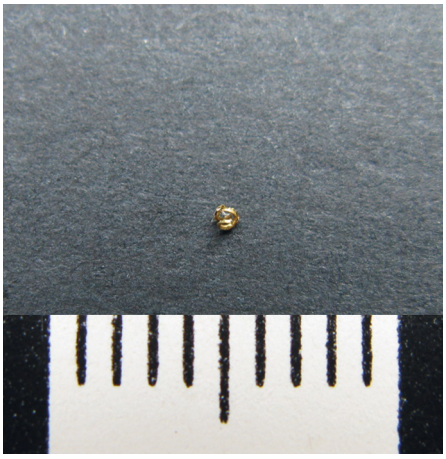

Fig. 6 Typical size of a sample required for LA-ICP-MS (E. Pernicka)

supplied as a liquid. This means that a sample must be taken that will be used up. For about 20 years, this method has been linked with implementation of sampling by laser ablation. A laser beam is directed at the surface of the sample, where through the high energy density, low amounts of the sample material evaporate or flake off (ablate). The now volatile sample material is guided by a stream of gas into a mass spectrometer and element concentrations and isotopic signatures can be measured. This has the advantage that only very small damage is inflicted on the object, which is hardly visible to the naked eye. The disadvantage is that the object must be taken to the laboratory, a process that is often not possible. A compromise between both requirements is the extraction of a very small sample of about 1mg (Fig. 6) that is then analysed by a laser beam, which is usually focused on a small area of 0.05mm. Through this sensitive method of laser ablation, further elements in addition to the concentrations of the main elements gold, silver and copper can be determined – such as the platinum metals rhodium, palladium, iridium and platinum (in all samples ruthenium and osmium fall below the detection limit) as well as manganese, iron, cobalt, nickel, zinc, cadmium, tin, antimony, tellurium, lead and bismuth.

The objects of the Valchitran treasure were analysed using this method. For comparison, four samples of the gold artefacts from the large tumulus near Izvorovo were analysed.[36] Unfortunately, this site was partly plundered and it is not possible to provide an exact date,[37] but stylistic parallels of more than 300 gold beads in a necklace with Mycenaean gold beads suggest that they may be related to the early phases of the Aegean Late Bronze Age, i.e. the 16th to the 14th century BC.[38] The samples are listed in Table 1 together with the sampling locations (Fig. 7). The instrumentation used for major and trace element analysis was a Thermo iCAP Q inductively-coupled plasma mass spectrometer coupled with a Resonetics laser ablation system (ArF, 193nm). The parameters of the ICP-MS are optimized to ensure a stable signal with a maximum intensity over the full range of masses of the elements and to minimize the formation of oxides and double-ionized

36 Alexandrov et al. 2018, 43, cat. nos. 235–237.
37 Borislavov 2017.
38 Horejs – Jung 2017, 100–101.



Fig. 7 Sampling locations on the investigated object of the Valchitran hoard (E. Pernicka)

Tab. 1 List of samples taken from objects of the Valchitran hoard and from tumulus 1 at Izvorovo (Bulgaria) with sampling locations

Lab no.	Object	ID1	ID2	Sampling location
MA-163568	*phalera*	VAL 3199	3199	edge
MA-163570	*phalera*	VAL 3201	3201	edge
MA-163571	*phalera*	VAL 3202	3202	torn rim of the shaft
MA-163572	*phalera*	VAL 3200	3200	torn rim of the shaft
MA-163573	*phalera*	VAL 3198a	3198	fracture on top of the dome
MA-163575	cup with handle	VAL 3195	3195	crack beside the handle
MA-163576	cup with handle	VAL 3194	3194	small defect on the rim
MA-163577	cup with handle	VAL 3204	3204	small crack on the lower part of the handle
MA-163578	triple vessel	VAL 3203a	3203	rim of the left vessel
MA-163584	jug with handle	VAL 3193	3193	rim of the handle
MA-163585	kantharos	VAL 3192	3192	rim of the vessel
MA-163587	large bimetallic *phalera*	VAL 3197a	3197a	bottom interior of the rim
MA-163588	large bimetallic *phalera*	VAL 3196a	3196a	black material besides a fracture
MA-163589	large bimetallic *phalera*	VAL 3196b	3196b	torn rim of the fracture
MA-163617	large bead	Izvorovo, tumulus 1	55779	small fragment from extruding foil
MA-163618	large bead	Izvorovo, tumulus 1	55778	small fragment from fracture
MA-163619	small bead	Izvorovo, tumulus 1	55777.2	small fragment from the orifice
MA-163620	bead	Izvorovo, tumulus 1	55777.1	small fragment from the orifice

Tab. 2 Major and trace element concentrations of the samples of the Valchitran hoard and from tumulus 1 at Izvorovo

Lab no.	Major elements [%]			Platinum group metals [mg/kg]						Trace elements [mg/kg]												
	Au	Ag	Cu	Ru	Rh	Pd	Os	Ir	Pt	Mn	Fe	Co	Ni	Zn	As	Se	Cd	Sn	Sb	Te	Pb	Bi
MA-163568	89	10.3	0.32	<3	0.42	14.8	<0.1	0.43	59	6.2	430	1.0	<4	9	<2	<20	0.5	500	9.0	2.8	24.9	7.5
MA-163570	85	14.6	0.33	<3	0.17	2.34	<0.1	0.047	19.9	7.0	490	<0.8	<4	49	<2	<20	<0.4	260	4.5	<0.9	23.9	33
MA-163571	81	18.3	0.78	<3	0.17	9.0	<0.1	0.078	15	4.8	189	<0.8	<4	14	<2	<20	<0.4	1730	5.5	4.8	49	25
MA-163572	91	8.9	0.26	<3	0.33	11.7	<0.1	0.33	46	7.0	570	0.9	<4	29	<2	<20	0.7	350	5.4	2.5	18.6	4.4
MA-163573	91	8.7	0.33	<3	0.36	12.1	<0.1	0.34	47	6.9	510	0.8	<15	44	<2	<20	0.8	310	3.5	3.8	25.5	1.4
MA-163575	92	8.1	0.045	<3	0.28	15.0	<0.1	0.34	39	5.9	630	0.80	<15	9	2.2	<20	0.7	540	14.7	6.4	20.9	11.5
MA-163576	93	7.2	0.058	<3	0.41	17.7	<0.1	0.44	53	4.1	470	<0.8	<15	25	<2	<20	0.6	430	6.6	0.9	13.5	2.3
MA-163577	93	7.0	0.034	<3	0.83	29.8	<0.1	0.82	91	3.8	540	0.9	<15	<5	<2	<20	0.4	400	6.3	1.5	8.3	3.5
MA-163578	72	26.5	1.18	<3	0.48	4.7	<0.1	0.36	33	4.2	198	<0.8	<15	15	<2	<20	<0.4	820	10.6	<0.9	38	28
MA-163584	92	7.5	0.041	<3	0.60	19.6	<0.1	0.57	63	8.9	470	<0.8	<15	<5	<2	<20	<0.4	390	9.0	3.3	17.1	2.5
MA-163585	91	9.3	0.058	<3	0.35	15.6	<0.1	0.38	43	5.9	370	<0.8	<15	6	<2	<20	0.8	176	8.0	1.4	24.8	4.7
MA-163587	89	10.8	0.33	<3	<0.1	6.7	<0.1	0.17	22.8	5.1	278	<0.8	<15	10	<2	<20	<0.4	251	12.4	4.2	50	30
MA-163588	29	66	5.5	<3	0.280	2.09	<0.1	0.044	6.8	3.3	109	0.9	<15	13	2.6	<20	<0.4	107	6.9	<0.9	1090	184
MA-163589	88	11.9	0.4	<3	<0.1	1.93	<0.1	0.064	14.3	5.7	275	0.8	38	12	<2	<20	<0.4	229	9.1	3.1	52	64
MA-163617	89	10.5	0.43	3.7	1.5	5.4	<0.1	1.85	142	10.8	390	<0.8	<15	25	2.6	<20	<0.4	17.1	0.85	<0.9	15.7	5.2
MA-163618	91	8.9	0.19	<3	2.2	8.3	<0.1	0.63	201	1.93	133	<0.8	<15	16	<2	<20	<0.4	<2	0.74	<0.9	5.1	2.39
MA-163619	93	6.8	0.40	7.7	3.0	7.6	0.1	4.8	300	6.2	283	<0.8	<15	23	3.6	<20	<0.4	18.3	0.64	<0.9	4.6	0.90
MA-163620	96	4.0	0.27	<3	0.6	1.73	<0.1	0.42	50	4.0	140	<0.8	<15	11	<2	<20	<0.4	6.9	<0.3	<0.9	0.93	5.2

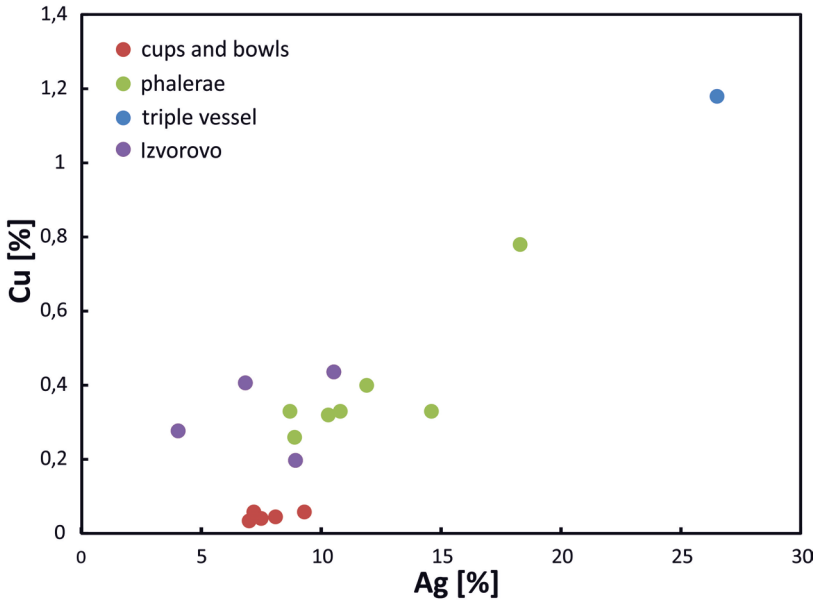

Fig. 8 Silver and copper contents of the investigated objects of the Valchitran hoard and of gold beads from tumulus 1 at Izvorovo. The category 'cups' also includes the kantharos and the cup (E. Pernicka)

species.[39] Quantification was carried out using ablation yield correction factors with normalization of Cu, Ag and Au to 100%. Two different external standards (NA1 and NA2) were used to quantify major, minor and trace elements. A third standard (FAU7) was analysed to check the reproducibility and accuracy of the results. The results shown in Table 2 represent average concentrations of 3 to 4 lines (each with a length of 300–400µm). The results are summarized in Table 2.

By looking at the major element concentrations (Fig. 8), it is obvious that the Valchitran objects do not have a uniform composition and therefore were not produced from the same batch of gold. It turns out that the cups (*kyathoi*) and *phalerae* are made of different gold with different compositions and, furthermore, that the unusual object with the three leaf-shaped vessels, the function of which is unclear, is made of a distinctly different gold than these two groups. One of the smaller *phalerae* plots between these two gold types. The diagram also suggests that all objects were made of naturally occurring gold, which always contains a few percent silver and usually less than 0.1% copper. In particular, the gold vessels of the Valchitran hoard and the beads from Izvorovo are perfectly compatible with this general composition. The three combined leaf-shaped vessels have the highest copper content, but it is still rather low at 1.2%, which is too low to induce any recognizable change in colour but would increase the hardness of the metal. The question arises of whether this was an intentional addition or not.

There are two types of gold deposits occurring in nature: primary gold deposits have commonly formed as veins, lodes, or massive (sulphide) ore lenses by chemical precipitation from hot fluids, whereas secondary gold deposits originate from the deep weathering and oxidation of pre-existing primary gold ores. The erosion of such primary (micro) gold particles and the fluviatile transport in creeks and rivers lead to the accumulation of heavy minerals and gold nuggets in trap sites, where they form placer deposits of alluvial gold. It is well known that, generally, placer gold contains less silver than primary gold due to the leaching of silver by riverine water. It has long been recognized that most prehistoric gold artefacts contain more copper than the natural gold, which has mostly been explained by contamination, mainly during production of the

[39] Details of the procedure are described in Kovacs et al. 2009.

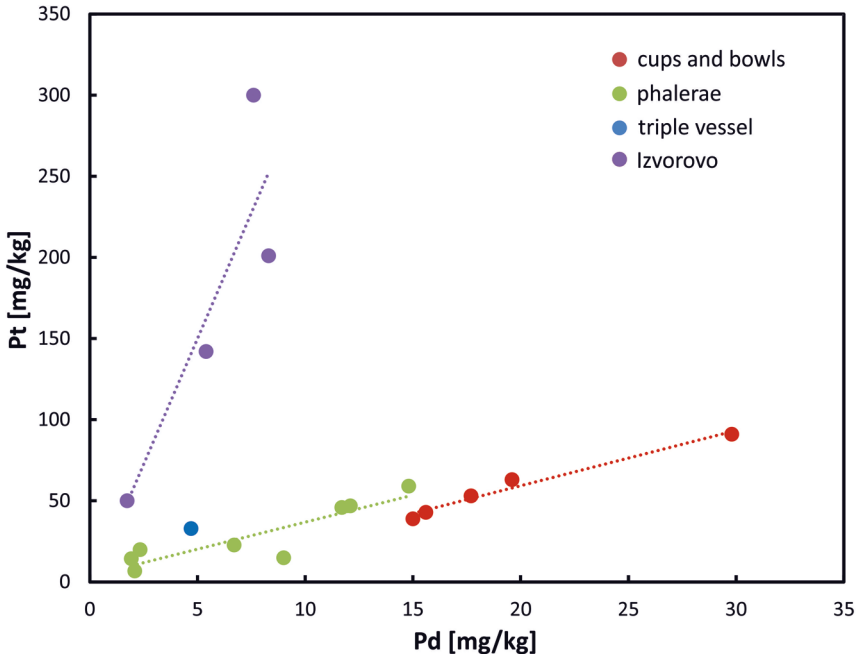

Fig. 9 Palladium and platinum contents of the investigated objects of the Valchitran hoard and of gold beads from tumulus 1 at Izvorovo. The category 'cups' also includes the kantharos and the large cup. The trend lines mark objects with similar Pd/Pt-ratios (E. Pernicka)

object.[40] It is also possible that copper entered the gold in artefacts on melting alluvial gold that may have been contaminated with copper minerals.[41] Finally, one has to consider the possibility of recycling of gold that may have been alloyed with copper.

The three compositional groups of the Valchitran samples are also mirrored in the trace element concentrations, especially of the platinum group elements palladium and platinum (Fig. 9). The two elements are correlated in nature, so that their ratios are more significant than their absolute concentrations. The dotted lines mark the samples that have similar Pd/Pt ratios, and again, the three compositional types of gold are recognizable. The presence of platinum group elements suggests that all objects consist of alluvial gold, since they occur in different geochemical environments and rocks than gold. Consequently, primary or vein gold rarely contains platinum group elements. However, all these metals are chemically very stable and survive the natural decomposition of the host rocks. The same is true for tin, which mainly occurs in the mineral cassiterite (SnO_2) and, together with platinum group minerals, can be collected together with gold on panning. It is assumed that melting of such gold mostly consisting of very small particles ('gold dust') under charcoal cover can reduce tin to the metal, which is taken up by the gold. Of the platinum group elements, only palladium and platinum are soluble in gold and can be identified on analysis. It is also obvious from Figure 9 that the gold beads from the tumulus near Izvorovo are distinctly different in that they contain much more palladium and platinum. Interestingly, they contain much less tin than the samples from the Valchitran hoard, which suggests a source in a geologically different region.

Originally it was tempting to relate the gold of the Valchitran treasure to the recently discovered and explored ancient gold mine of Ada Tepe that was exploited in the Late Bronze Age.[42] For a long time, the belief prevailed that due to the easier extraction, mainly stream gold was

40 E.g. Pingel 1992; Vavelidis – Andreou 2008.
41 E.g. Hauptmann – Gambaschidze 2006.
42 Popov et al. 2015; Popov et al. this volume.

obtained in prehistoric cultures. It came as a big surprise when a few years ago, a prehistoric gold mine was discovered in Georgia which was probably already in use in the 4th millennium BC, and gold was without doubt extracted there.[43] Nevertheless, just as important for the history of gold mining is the discovery of the gold mine on Ada Tepe in the Bulgarian Rhodopes, dating to the 2nd millennium BC. However, with the conclusion that the gold of the Valchitran hoard and from the tumulus near Izvorovo is of alluvial origin, it is unlikely that it derived from the Ada Tepe mine.

This is confirmed by the chemical composition of some ore samples[44] from this site that were extracted by Zdravko Tsintsov and homogenized by melting the gold dust into small globules in the laboratory, which mimics the most likely procedure in antiquity (Tabs. 3–4). All samples have much lower copper contents than the artefact samples but, interestingly, the golden melt bead from the archaeological excavations on Ada Tepe, possibly a spill from the melting process, has the highest copper content of 0.32% and is thus comparable with the gold of Valchitran but not with the gold from Izvorovo. This melt bead shows – in the main components as well as in the trace elements – a very similar composition to the gold of the *phalerae*. This suggests that gold of this composition was at least processed on Ada Tepe. One sample of purportedly primary gold contains an unusually high concentration of platinum, which is difficult to explain. It could be contamination from the preparation of the globules, but the exact conditions were not recorded. Most significant is the difference in the tin concentration between artefacts and primary and even alluvial gold. In this respect it has to be added that alluvial gold can, and indeed often does, contain tin, but it does not necessarily do so, especially in small rivers and creeks. This seems to be the case with the small samples of alluvial gold from the surroundings of Ada Tepe.

Tab. 3 List of samples taken of natural gold obtained by enrichment of ore samples from quartz veins on Ada Tepe (Bulgaria) and by panning alluvial gold in riverines nearby. a and b samples are different measurements on the same melt globule

Lab no.	Object	ID1
MA-163567	Melt globule from the archaeological excavations on Ada Tepe.	Ada Tepe 206/2011
MA-166245a	Quartz vein sample extracted from the area of the archaeological enrichment experiment	ER-1
MA-166245b	Quartz vein sample extracted from the area of the archaeological enrichment experiment	ER-1
MA-166246	Primary gold from Ada Tepe	ER-2
MA-166247	Primary gold from Ada Tepe, zone no. 8	ER-3
MA-166248	Quartz vein sample extracted from the area of ancient exploitation on Ada Tepe	ER-4
MA-166249	Alluvial gold from the river near the old exploitation	ER-5
MA-166250a	Primary gold from the top of the Ada Tepe hill, Sector G-11, open cast mine, layer below the Hellenistic sanctuary	ER-7m
MA-166250b	Primary gold from the top of the Ada Tepe hill, Sector G-11, open cast mine, layer below the Hellenistic sanctuary	ER-7m
MA-166251	Alluvial gold from the Kesibir River, at the foot of the Ada Tepe hill	ER-8m
MA-166252	Alluvial gold from the Kesibir River, at the foot of the Ada Tepe hill	ER-9m
MA-166253a	Alluvial gold from the Prava reke River near Dabovets village	ER-10m
MA-166253b	Alluvial gold from the Prava reke River near Dabovets village	ER-10m

43 Stöllner et al. 2010.
44 Tsintsov et al. 2016.

Tab. 4 Major and trace element concentrations of the primary gold from Ada Tepe of alluvial gold in the vicinity of Ada Tepe

Lab no.	Major elements [%]			Platinum group metals [mg/kg]						Trace elements [mg/kg]												
	Au	Ag	Cu	Ru	Rh	Pd	Os	Ir	Pt	Mn	Fe	Co	Ni	Zn	As	Se	Cd	Sn	Sb	Te	Pb	Bi
MA-163567	89	10.3	0.32	<8	<0.2	14.8	<0.4	0.4	59	6.2	430	0.95	<4	9	<2	<20	0.5	7.5	9.0	2.8	0.43	24.9
MA-166245a	71	29	0.0077	<8	<0.2	<1	<0.4	<0.02	1.8	<5	<30	<0.9	<15	<3	<3	<20	<0.7	<2	<3	<3	<0.3	<0.1
MA-166245b	71	29	0.107	<8	<0.2	<1	<0.4	<0.02	4.7	<5	1080	<0.9	<15	610	<3	<20	<0.7	<2	<3	<3	8.9	1.5
MA-166246	90	10.0	0.0147	<8	2.4	1.6	<0.4	0.03	280	<5	<30	<0.9	<15	1.0	<3	<20	<0.7	<2	<3	<3	9.1	29.8
MA-166247	80	19.9	0.0122	<8	<0.2	<1	<0.4	<0.02	3.5	<5	50	<0.9	<15	<3	<3	<20	<0.7	3.1	<3	<3	1.2	2.03
MA-166248	70	30	0.0046	<8	<0.2	<1	<0.4	<0.02	4.9	26.5	3700	6	<15	76	6.1	<20	<0.7	0.92	8.6	<3	41	9.6
MA-166249	74	26	0.00145	<8	<0.2	<1	<0.4	<0.02	3.1	<5	<30	<0.9	<15	<3	<3	<20	<0.7	3.6	<3	<3	<0.3	<0.1
MA-166250a	71	29	0.0076	<8	<0.2	<1	<0.4	<0.02	4	6.9	1110	<0.9	<15	10.9	<3	<20	5.8	<2	<3	<3	135	71
MA-166250b	72	28	0.0062	<8	<0.2	<1	<0.4	<0.02	3.9	<5	276	<0.9	<15	1,9	<3	<20	<0.7	<2	<3	<3	13.6	8.4
MA-166251	83	16.9	0.0047	<8	<0.2	<1	<0.4	<0.02	4.8	<5	<30	<0.9	<15	<3	<3	<20	<0.7	<2	<3	<3	<0.3	0.2
MA-166252	84	15.7	0.161	<8	<0.2	1.6	<0.4	<0,02	8.6	5.3	480	<0.9	<15	4.4	5.7	<20	<0.7	<2	10.3	<3	4.3	0.9
MA-166253a	86	13.9	0.036	<8	0.2	1.7	<0.4	<0.02	13.7	82	35000	5.7	18.6	82	<3	<20	10.1	5.8	1310	<3	183	91
MA-166253b	88	12.3	0.0156	<8	<0.2	2.0	<0.4	<0.02	3.4	17.3	7600	1.13	<15	14.5	<3	<20	1.9	1.5	500	<3	31	18

Conclusion

The chemical analyses of the Valchitran artefacts allow the definition of three groups with varying silver and copper concentrations.[45] The accompanying technological analyses correlate very well with this classification.[46] The first group comprises the monometallic vessels, thus the kantharos, the large cup and the small cups. During their production they were cast, hammered, formed into their final shape and finally decorated. The second group comprises the bimetallic vessels, the lids with silver inlays (nos. 3196–3197),[47] and the small lids. The common construction features of the lids are the two parts made of gold, the silver inlays, the copper-based subconstructions and the amber inlays. Differences are describable in the decoration and the chemical composition. The triple vessel (no. 3203), as the only and unique member of the third group, is composed of many parts, has an elaborated construction scheme, and is the only artefact showing evidence for soldering.

The final review of the results allows us to conclude that the craftsmen were capable of producing artefacts with sophisticated decorative elements with a wide range of techniques. They were not only able to cast a huge amount of gold (4.5–5kg) within one event but also to cast the gold into objects with a relatively thin wall thickness. Additionally, we can point out that the casting of the inner construction as well as the conception of the inlays provide evidence that the craftsmen had good knowledge and practical skills as well as a sense of proportion, design and aesthetics.

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[45] Pernicka 2017, 91.

[46] This subdivision falls in line with the groups defined by Andrew Sherratt and Timothy Taylor, who divided the vessels into Valchitran A (kantharos, large cup, cups, dating to the Bronze Age, 16th–14th century BC) and Valchitran B comprising the lids and the triple vessel, dated later than Valchitran A, till the Early Iron Age (Mikov 1958; Sherratt – Taylor 1989).

[47] Berger et al. 2010; Penkova – Mehofer 2017, 83, figs. 3 and 5.

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New Absolute Dates for the Middle and Late Bronze Ages in the Central Balkans and Some Indications of the Local Bronze Metallurgy and Workshops

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Abstract: This article presents a more detailed discussion of new absolute dates for the Middle Bronze Age and Late Bronze Age in the central Balkans. The dates are significant for two reasons. Firstly, they provide general information about a chronological frame of the Middle and Late Bronze Age cultures in Serbia, and secondly, they indicate certain corrections in the dating of the one specific type of socketed axe that appears to be somewhat older than previously considered. What is important to underline for the period of the Middle and Late Bronze Age is also evidence of the existence of a local metallurgy, including the detection of tin ore in western Serbia on the south slopes of Cer Mountain, remnants of the copper smelting activities at the Ružana site in eastern Serbia and numerous finds of stone moulds for casting different bronze objects.

Keywords: Absolute chronology, Brnjica Group, central Balkans, metallurgy, Paraćin Culture, socketed axe

Introduction

The term central Balkans, which is not an official geographical term, usually refers to the territory of Serbia south of the Sava and the Danube rivers, with the Morava River valley in the central part, dividing the territory of the central Balkans into two almost equal parts - eastern and western Serbia (Fig. 1).[4]

According to the results of archaeological investigations in the last six decades, and especially in the last 20 years, it was noted that in the Middle Bronze Age this territory was occupied by populations described as the Protovatin Culture[5], the Ljuljaci Culture[6] or the Bubanj-Hum IV-Ljuljaci Culture.[7] The definition of these groups is based on a stylistic and typological distinction of the pottery from several indicative sites such as Milića brdo in Ljuljaci, Bubanj, Mediana and Velika humska čuka.[8] Besides the central Balkans, pottery associated with the aforementioned groups also appears in the neighbouring region north of the Danube River (Banat). However, a more precise chronological and territorial distinction of the Middle Bronze Age in Serbia is still lacking. The date presented here from the Ružana site, near Bor in eastern Serbia,[9] suggests an occupation between the 19th and 18th centuries BC or at the start of Middle Bronze Age. Similar

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4 Cvijić 1922.
5 Bogdanović 1986, 71–72; Stojić 1992, 216–219.
6 Tasić – Tasić 2003, 96.
7 Bulatović – Stankovski 2012, 343–347.
8 Garašanin – Đurić 1983; Bogdanović 1986; Bulatović – Stankovski 2012.
9 Kapuran et al. 2016. Pottery from this site had elements of the Bubanj-Hum IV-Ljuljaci Group (see Bulatović – Stankovski 2012, pls. 2.16; 3.21, 25; 5.1–6; 7.28–30) or Protovatin Culture (see Bogdanović 1986), as well as of the early Verbicoara Culture (see Crăciunescu 2004, pls. 1.7; 15.1; 16.2).

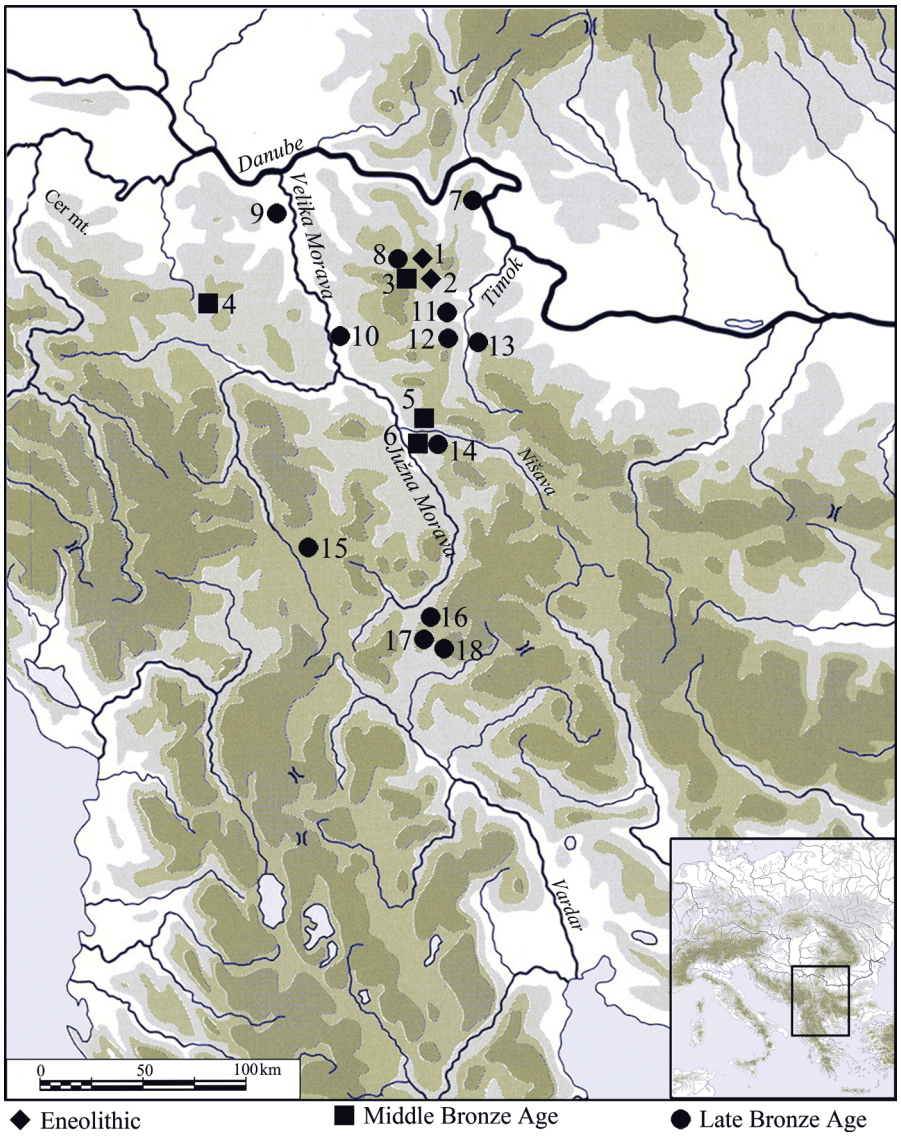

Fig. 1 Map with the mentioned sites in the central Balkans: 1. Kmpije; 2. Čoka lu Balaš; 3. Ružana; 4. Ljuljaci; 5. Velika humska čuka; 6. Bubanj; 7. Brza Palanka; 8. Trnjane; 9. Novačka ćuprija; 10 Paraćin; 11. Mali Izvor; 12. Magura; 13. Gornja bela Reka; 14. Mediana; 15. Donja Brnjica; 16. Klinovac; 17. Svinjište; 18. Kokino (graphics: A. Bulatović)

dates are also obtained from other sites in eastern Serbia such as Trnjane or Hajdučka Česma, all indicating the time between the 20th and the 17th century BC.[10]

Characteristic for the Late Bronze Age of the central Balkan area are two archaeological phenomena defined as the Paraćin and the Brnjica cultural groups. While the Paraćin Group existed in the territory of central Serbia, sites of the Brnjica Group spread over the area of today's southeastern and southern Serbia and northern Macedonia. The pottery of these two groups shows similar stylistic and typological features, in particular in the contact area in the lower course of the South Morava River. The two groups also share the same burial custom with cremations in urns and comparable funerary constructions (stone enclosures). In terms of cultural-chronological relations, both groups are considered to be very close and connected with each other, with some minor regional differences in the material culture.

[10] Kapuran et al. 2020; Mehofer et al. 2021.

Until recently, chronological determination of the Paraćin and Brnjica groups was based mainly on the relative chronology and on two absolute dates from several decades ago and showing a broad chronological range. The first date is from the Novačka ćuprija site in central Serbia, assigned to the Paraćin Culture, and it ranges from 1365 to 860 calBC.[11] The second date belongs to the Brnjica Culture and originates from the Mediana site in southeastern Serbia, with a span between 1280 ± 90 calBC.[12] Nearly four decades after these results, new absolute calibrated dates from the sites of the Brnjica Group Mediana near Niš and Gradina near Svinjište enabled a more precise absolute determination of the Brnjica Culture between the 14th and the 12th century BC,[13] but also raised a question regarding the possible existence of local bronze workshops in the Late Bronze Age, which will be discussed later in this article. The recently presented dates from the urn cemeteries Gložđak and Rajkinac in central Serbia also provided the first solid evidence about the chronological span of the Paraćin Culture, placing it between the 15th and the 13th century BC, and thus indicating a somewhat higher age than most of the sites associated with the Brnjica Culture.[14]

Southeastern Serbia

As stated above, the dominant archaeological manifestation of the Late Bronze Age in the territory of southeastern Serbia is the Brnjica Group. In the following, we will give a brief description of the settlement sites Mediana and Gradina, as well as of the archaeological contexts from which the ^{14}C-dated samples presented here originate.

The site of Mediana is located about 5km east of Niš, on the broad terrace of the Nišava River within the famous Late Roman city with the palace, which is considered as the residence of Emperor Constantine (Fig. 1.14). Investigations of the prehistoric settlement were conducted on several occasions, and the last excavations in 2008 revealed parts of a semi-dug rectangular dwelling structure from the Late Bronze Age.[15] The width of the building is 2.5m, but the length is undetermined since the northern part of the structure extended in the trench profile, outside of the expropriation area (Fig. 2).

The house walls were made of wattle-and-daub construction and covered on the outside with some sort of coating, which was occasionally ornamented with wide arched and straight grooves, while the floor was made of rammed earth. In the middle of the southern end of the building, a posthole of a large diameter was documented. Inside the building, several fragmented vessels and a large number of potsherds have been found, as well as the remains of carbonized timber, wall plaster and other artefacts.

Stylistic and typological characteristics of the pottery from the house fully correspond to the Brnjica Culture and include hemispherical bowls and s-profiled bowls, cone-shaped cups with a handle which extends significantly beyond the rim, pear-shaped amphorae with a distinctive inner side of the rim, and ornaments such as incised lines, rows of pricks and plastic extensions on the top of the handles (Fig. 3).

A piece of carbonized wood from the house, which most probably comes from its wooden structure, was used as a sample for dating (cf. Fig. 13). Radiocarbon analysis was carried out in Mannheim, Germany (MAMS 27601) and the absolute date is 3046 ± 25 BP. The calibrated age is 1395–1224 calBC (95.4%) or 1383–1261 calBC (68.2%), using OxCal version 4.4.4.[16] This time span approximately corresponds to the period Bronze C and the first half of Bronze D, according

[11] Krstić et al. 1986, 20. Other data (absolute age BP or laboratory) are not available.
[12] Coles – Harding 1979, 452, lab. no. BC-6.
[13] Bulatović et al. 2021.
[14] Kapuran et al. 2022.
[15] Bulatović 2008.
[16] Reimer et al. 2020. See also Bulatović et al. 2018, 124.



Fig. 2 Mediana, remains of the rectangular Bronze Age house (photo and drawings: A. Bulatović)

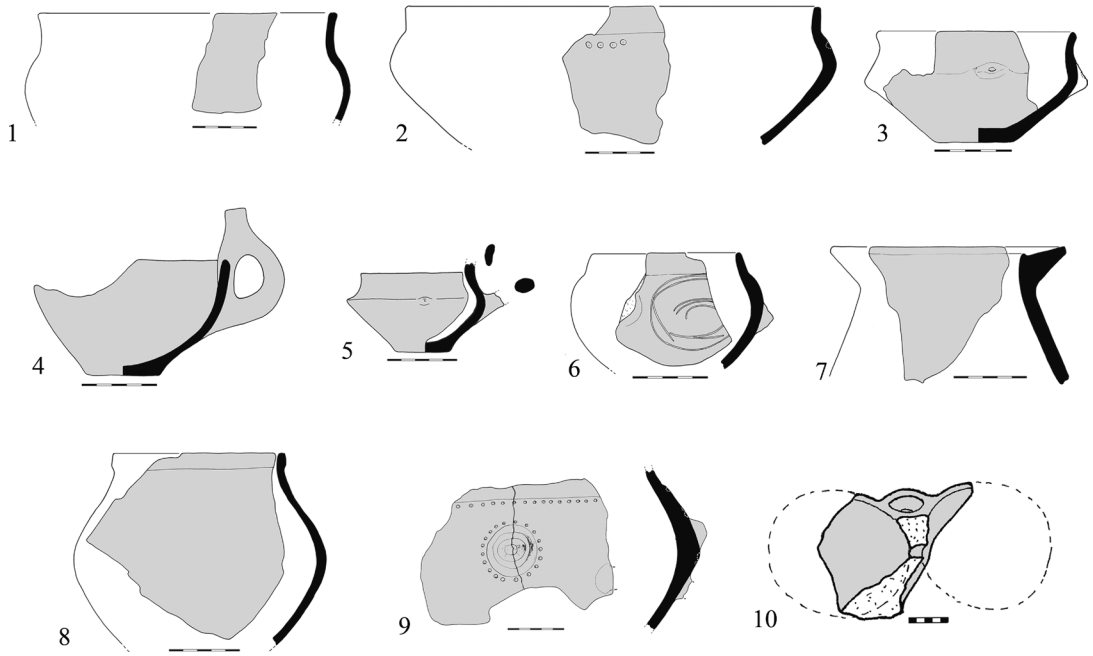

Fig. 3 Mediana, pottery repertoire of the Brnjica cultural group (after Bulatović 2008)

to the chronology of central Europe.[17] It is worth underlining that during the decade-long research at Mediana, several stone moulds for pins and a bronze socketed axe were found, pointing to the existence of a metallurgical casting workshop within the settlement.

The second site in southeastern Serbia with recently obtained absolute dates from the Late Bronze Age is Gradina near Svinjište, near the border with North Macedonia (Fig. 1.17). The

[17] Harding 2000, pl. 1.1.

Svinjište village is situated about 7km to the east of the main communication line – the Morava valley, which today represents the route of the Niš–Skopje highway.[18] The site of Gradina is positioned on a dominant hill with steep slopes. The excavations and geo-electric prospection revealed that the prehistoric settlement with dimensions of about 65 × 50m was enclosed by a wooden structure placed on a low stone wall. Two cultural horizons were defined at the site: the earlier one, which belongs to the Late Bronze Age Brnjica Culture, and a more recent one dating at the beginning of the Early Iron Age according to the chronology of metal ages in Serbia (stage Hallstatt A2–B1 in central Europe).[19]

Although the terrain is very steep, on the northern slope of the site the excavations uncovered remains of a dwelling structure with a well-preserved part of the floor made of rammed earth on a levelled bedrock, as well as several postholes dug into the bedrock, sometimes flanked by stone slabs (Fig. 4). The remains of the floor, about 0.5m² in extent, were situated about 4m to the west of the surrounding exterior wooden structure ('walls' or a fence) and included a conical cup placed on it (Figs. 4.1; 5.3). The remains of the floor and the cup can both stratigraphically be linked with an older horizon of the settlement (Brnjica Culture). Typical pottery shapes from the older phase also included s-profiled bowls (Fig. 5.1–2), conical cups with one handle (Fig. 5.3), globular kantharoi (Fig. 5.4), pear-shaped vessels with a characteristic profile on the inner side of the rim (Fig. 5.5), and pyranoi with rare decorations, mostly in the form of finger imprints or grooves (Fig. 5.6). About 0.7m west of the floor patch, a bronze socketed axe was discovered (Fig. 4.2), with remains of the wooden (oak) handle in the socket and on the axe (Fig. 5.7). The axe, parts of the floor and some pieces of wall plaster found in the area of the dwelling structure all show obvious traces of burning. More than 40kg of clay plaster with imprints from this particular zone clearly testifies to the fact that the walls of the building were made of this material.

A group of vessels found at about 1.1m to the northwest from the patch of floor (Fig. 4.3) contained fragments decorated with a series of rectangular imprints made with a serrated tool (so-called false cord) and series of notches (Fig. 6.4–5), which is typical of the pottery repertoire from the younger horizon at the Svinjište site. Other distinctive shapes from the younger settlement phase include bowls with an inverted rim (Fig. 6.1–2), jugs with a high handle (Fig. 6.3), urn-like vessels with a channelled neck (Fig. 6.4) and kantharoi with a short cylindrical neck and typical T-shaped handles (Fig. 6.5). The repertoire of ornaments involved incised horizontal and vertical lines, hatched triangles and channels,

The position of the younger finds close to the floor from the older horizon is probably a result of the erosion. Hence, the stratigraphical and chronological attribution of the discovered finds was made considerably more difficult by the steep terrain and the impact of erosion (Fig. 4).

Thirteen years ago, when the results of this research were first published,[20] the dwelling structure from Svinjište was dated to the younger horizon of the settlement, namely to a period corresponding to the stages Hallstatt A2–B1 in terms of central Europe.[21] In the absence of absolute dates, the uncovered object was dated using the stylistic and typological characteristics of the pottery, such as bowls with an inverted rim and ornaments in the form of a false cord. The same age was also assumed for the socketed axe of a local type, with the few analogies dating in a wide range between Hallstatt A1 and Hallstatt B1.[22]

However, the recent radiocarbon dating of a piece of the wooden handle from the axe's socket, which was carried out in the US, and then of another piece of the handle from the external surface of the axe, conducted in Germany, indicated that the axe, and thus also the dwelling structure, both belong to the older, Late Bronze Age settlement horizon. This is corroborated by the fact that

[18] Bulatović 1999; Bulatović – Kapuran 2007.
[19] Garašanin 1973; Vasić 1982a; Vasić 1982b.
[20] Bulatović – Kapuran 2007, 13.
[21] See Vasić 1982b for a comparative chronology between Serbia and central Europe.
[22] Gavranović – Kapuran 2014, 34.



Fig. 4 Gradina in Svinjište, part of the floor with a conical cup and position of the socketed axe (photo and drawings: A. Bulatović)

both the dwelling structure and the axe were affected by fire, whereas the pottery found northwest of the floor (Fig. 4.3), which certainly originated from the younger horizon, has no traces of burning and is thus presumably in a secondary position due to the erosion process.

In any case, both the absolute and mutually close dates from Svinjište indicate the age of the oak wood used for the manufacturing of the axe handle as falling in the period from the 14th to the middle of the 13th century BC. According to the date from Mannheim (MAMS 2760), the absolute age of the wooden sample is 3015 ± 25 BP (Fig. 13), or when calibrated 1385–1192 calBC (95.4%) and 1289–1216 calBC (68.2%). Based on the date from Miami (Beta 433117), the

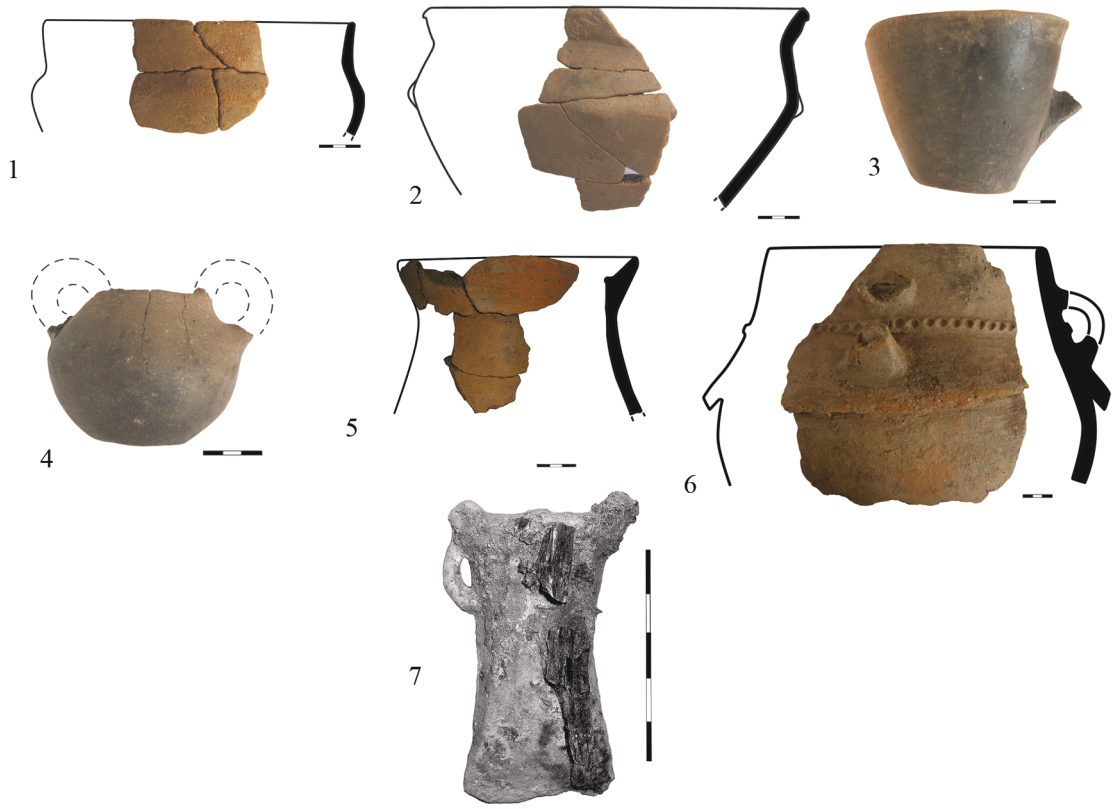

Fig. 5 Gradina in Svinjište, finds from the older horizon (Brnjica Culture). 1–6. Pottery; 7. Bronze socketed axe with remains of a wooden handle (photo and drawings: A. Bulatović)

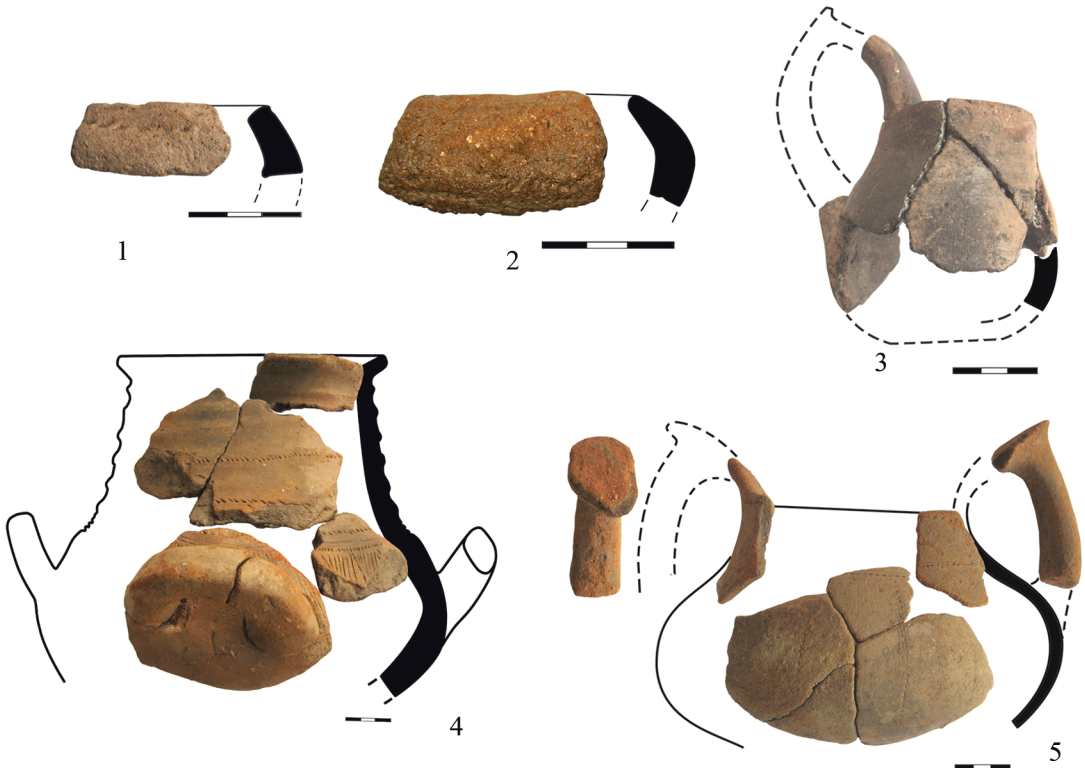

Fig. 6 Gradina in Svinjište, pottery finds from the younger horizon (photo and drawings: A. Bulatović)

absolute age of the wooden sample is 3030 ± 30 BP (Fig. 13) or 1396–1195 calBC (95.4%) and 1364–1258 calBC (68.2%). Both dates were calibrated using OxCal 4.4.4.[23]

With regard to a possible 'old wood' effect, it is certainly not to be excluded that the finds from the lower, older horizon in Svinjšte are somewhat younger than the two radiocarbon results suggest, but the association of the socketed axe with the stage Hallstatt A2–B1, as previously estimated by using typological analogies and a relative chronology, appears at least questionable.[24] The probability that the timber used for the handle was made from much older heartwood or from reused wood which had fallen centuries ago undoubtedly exists; however, there is also some other evidence that this type of socketed axe emerged as early as in the late 14th and in the course of the 13th century BC. Similar axes from Bulgarian hoards such as Ovcha Mogila[25] and Vărbitsa I and II[26] in the Lower Danube region with a similar decoration (arcade field with vertical ribs) are to be pointed out, yet, unlike most of the Serbian finds, these regularly lack a lateral loop.[27] Decisive for the chronological determination of the two Bulgarian hoards are the associated swords of a supraregional distribution, the Mycenaean rapier of type C according to Nancy Sandars[28] or Type 1a3 after Imma Kilian-Dirlmeier[29] dating to the time of LH IIB/IIIA1[30] or the 14th century BC (Bronze C2) at Ovcha Mogila, and a fragment of a Naue II sword from Vărbitsa II, dating in the time between Bronze D and Hallstatt A1. In terms of the overall composition, both hoard finds can be assigned to the stage Lesura-Vărbitsa, following the chronology of Bulgarian hoards after Bernhard Hänsel.[31] In Hänsel's study the Lesura-Vărbitsa horizon was more or less correlated with Bronze D–Hallstatt A1 or with the time between the late 14th and the late 13th century BC. The suggested early dating of the Ovcha Mogila hoard based on the Mycenaean type C would expand the estimated duration of this stage and locate its start already in the later Bronze C. [32] However, it is to be emphasized that the collection of hoarded metals could also include some objects with a longer period of circulation that date significantly earlier than the deposition act itself.

Taking into account the chronology of Bulgarian hoards with similar socketed axes, the absolute dates from Svinjište turn out to be not as contradictory as initially thought. Other finds of this particular axe type with a latterally placed loop are registered at several other sites in Serbia, but mostly as chance finds without a clear context. The one exception is a small hoard from Mali Izvor near Zaječar in eastern Serbia with only four socketed axes overall.[33] Apart from the axe of the same type as in Svinjšte, the Mali Izvor hoard also contained one axe without a loop and with an almond-like decoration within an arcade field, with the best analogies precisely in the above-mentioned hoards Ovcha Mogila and Vărbitsa II in northern Bulgaria.[34] Thus, the find from Mali Izvor most probably belongs in the same period between the late 14th and the late 13th century BC or in the second horizon of the Serbian hoards after Rastko Vasić's chronology.[35]

The fact that socketed axes with a lateral loop of the same type as in Svinjšita occurred predominantly in southern and eastern Serbia, whereas the similar finds from Bulgaria are without a loop, demonstrates different regional and local technological preferences and workshop traditions. Regarding the surrounding area of Svinjište, the existence of the local casting workshops can be assumed for the nearby site of Kokino in North Macedonia (Fig. 1.18), less than 15km to

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23 Reimer et al. 2020. See also Bulatović et al. 2018, 124.
24 Dergačev 2011, 89.
25 Krauß 2005, fig. 6.1–2.
26 Chernykh 1978, 198; Dergačev 2011, 81.
27 Gavranović – Kapuran 2014, pl. 1.
28 Sandars 1963, 119.
29 Kilian-Dirlmeier 1993, 44.
30 Bozhinova et al. 2013, 81–82.
31 Hänsel 1976, 30
32 Krauß 2005, 209.
33 Vasić 1982b, fig. 3.
34 Krauß 2005, fig. 4.2, 5, 8; Dergačev 2011, 79.
35 Vasić 1982b, 286.

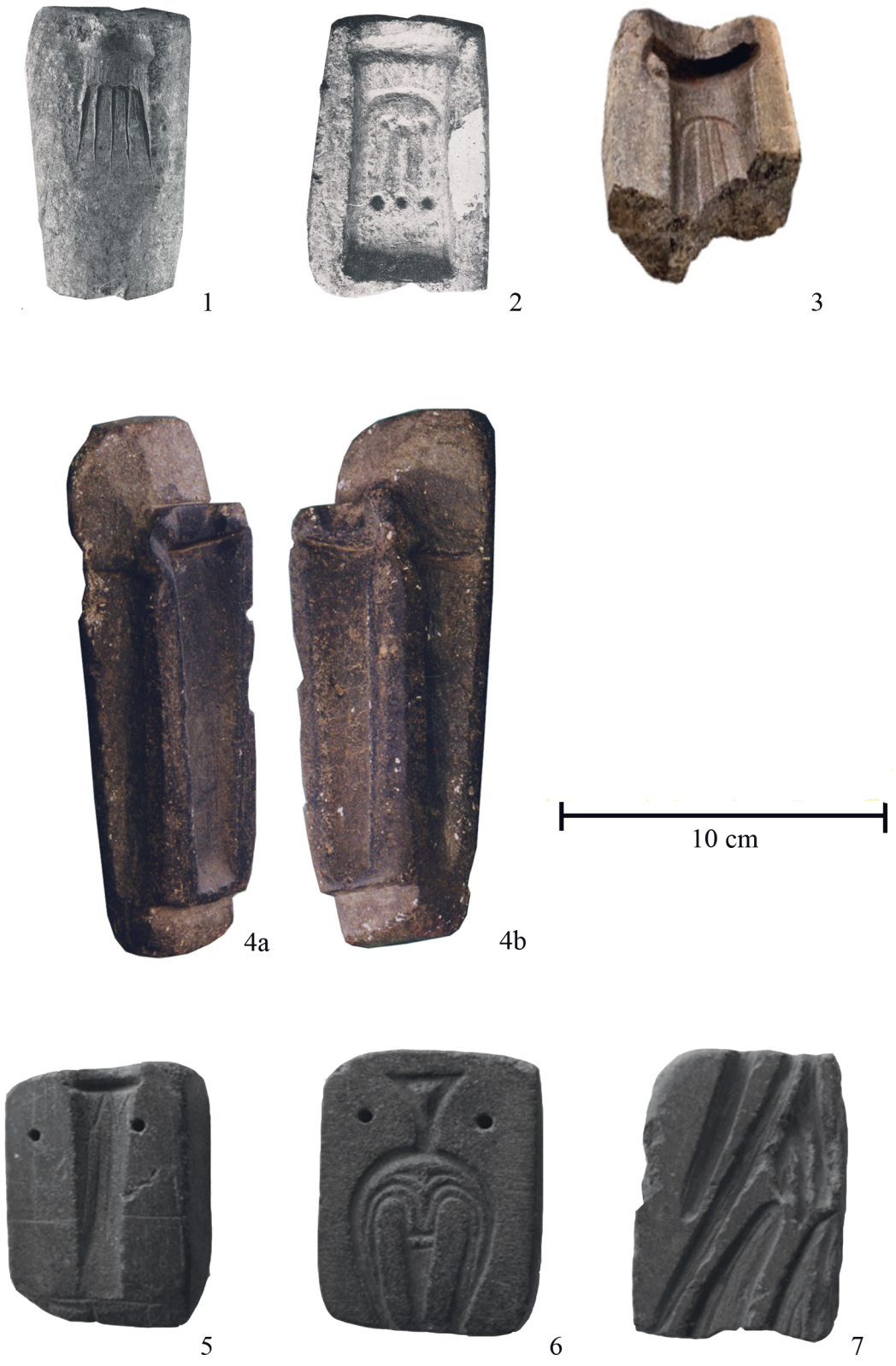

Fig. 7 Stone casting moulds from southern Serbia. 1–2. Mediana (after Garašanin 1973); 3. Hisar (photo: N. Borić); 4. Klinovac (photo: A. Bulatović); 5–7. Kokino (after Bulatović – Stankovski 2012)

the south, where several stone moulds for the production of chisels, pins, spearheads and pendants were discovered (Fig. 7.5–7),[36] as well as in Klinovac, about 12km to the northeast (Fig. 1.16), with a two-sided mould for the casting of different types of chisels (Fig. 7.4a–4b).[37] Stone moulds for the casting of axes of the same type as in Svinjšte with and without a lateral loop were found in the nearby sites Mediana (Fig. 7.1–2) and Hisar (Fig. 7.3),[38] which is a further indication that the axes are a local form, mostly produced and used in southern and southeastern Serbia.

The new absolute dates from the Svinjište site, as well as the slightly older absolute date from the Mediana site, allow us to conclude that the Late Bronze Age communities interpreted as the Brnjica cultural group inhabited the territory of southeast Serbia in the period from the beginning of the 14th century until the third quarter of the 13th century BC, which does not mean that they did not live in this area before and after this period. The published absolute dates from the Svinjište and Mediana settlements are a step toward a better chronological understanding of this specific cultural phenomena in the central Balkans.[39]

Eastern Serbia

The area between the Danube and Crni Timok rivers represents one of the richest copper fields in southeastern Europe, with the earliest traces of exploitation dating to the middle of the 6th millennium BC or during the Vinča Culture.[40] Interestingly, apart from a relatively small number of copper axes and awls, the number of finds that can be connected to copper metallurgy in the time between the Late Neolithic and the 2nd millennium BC is surprisingly small in this territory.[41] Scarce indications of metallurgical activity include traces of metallic slag on pottery and a clay nozzle discovered at the Late Copper Age sites of Kmpije[42] and Čoka lu Balaš[43] in the vicinity of the city of Bor (Fig. 8.1–2). A small triangular clay object from Ružana that could represent a core, used in the casting of socketed objects (Fig. 8.3) is most probably to be added to this.

Clear evidence of bronze metallurgy prior to the Late Bronze Age has also been uncovered at the multilayered site of Feudvar in Vojvodina, where extensive excavations confirmed the existence of a metal workshop in an Early Bronze Age stratum including several moulds made for the casting of spearheads, axes and jewellery.[44]

The archaeological survey[45] on the territory of eastern Serbia or in the hinterland of the Iron Gates (surroundings of the cities Bor and Zaječar) yielded an updated image about the distribution of the Bronze Age settlements and necropolises (Fig. 9).[46] The surveys and later targeted excavations pointed to the existence of a specific group of settlements with a particular concentration around the sulfidic copper ore deposits.[47] It is important to stress that the settlement sites are located in an area with soils of a very poor quality, unsuitable for any kind of intensive agriculture apart from livestock farming, and that all of them show no traces of fortification. Judging by the altitude and current vegetation, it is to be presumed that the sites were surrounded by a dense forest, though paleo-botanic dates are still lacking. Another noteworthy clustering of Bronze Age

36 Bulatović – Stankovski 2012, fig. 24.5.
37 Bulatović 2002, figs. 3–4.
38 Garašanin 1973, fig. 164; Kolarić 1972, nos. 153, 154, 171; Stojić 2011, fig. 25.
39 Bulatović et al. 2021.
40 Jovanović 1971, 60; Borić 2009, 206.
41 Pernicka et al. 1993, 29.
42 Kapuran et al. 2014, 78–81.
43 Tasić 1990, 9–11.
44 Hänsel – Medović 1991, 82–83, pls. 11–12; Falkenstein et al. 2016, 17.
45 Conducted by the Archaeological Institute in Belgrade.
46 Kapuran – Jovanović 2013, 832–833, map. 1.
47 Kapuran 2014, 287, map 3; Kapuran et al. 2020; Mehofer et al. 2021.

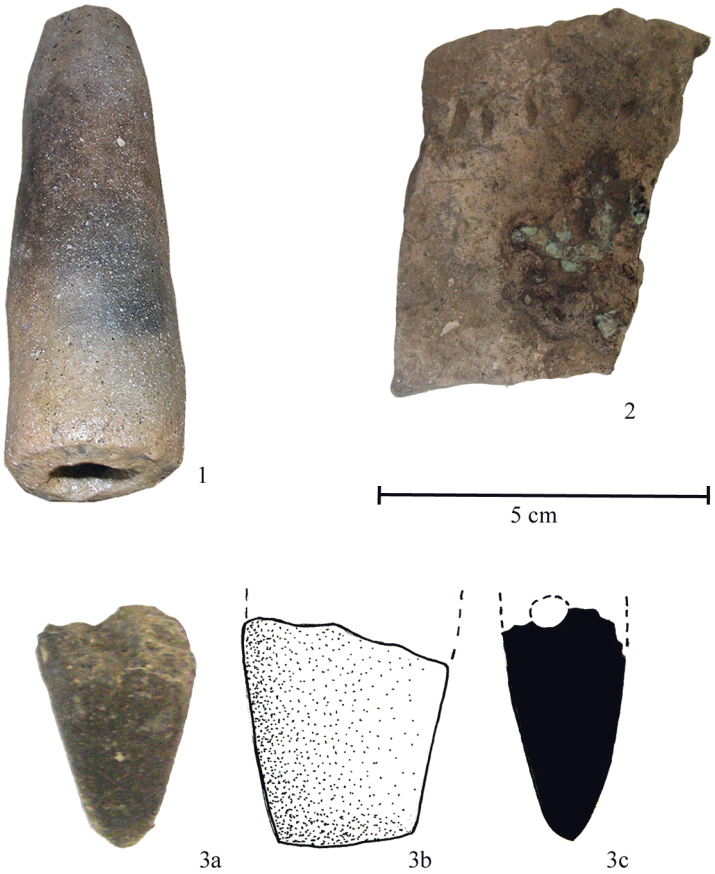

Fig. 8 1. Čoka lu Balaš, clay nozzle (photo: I. Jovanović, Museum Bor); 2. Kmpija, pottery fragment with traces of bronze (photo: A. Bulatović); 3. Ružana, fragment of a clay core (photo and drawing: A. Kapuran)

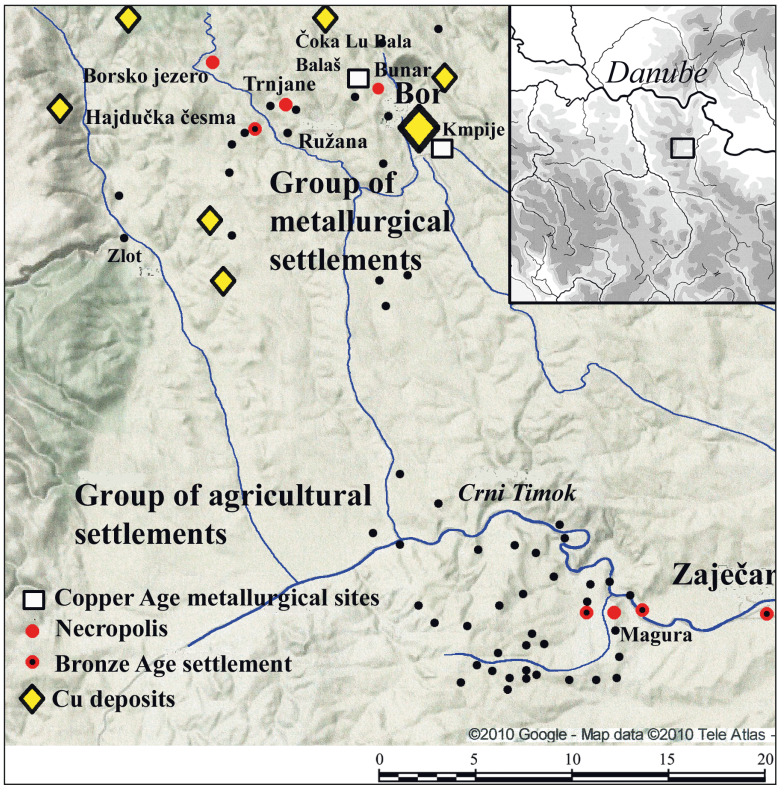

Fig. 9 Map of sites and main copper ore deposits in northeastern Serbia (graphics: A. Kapuran)

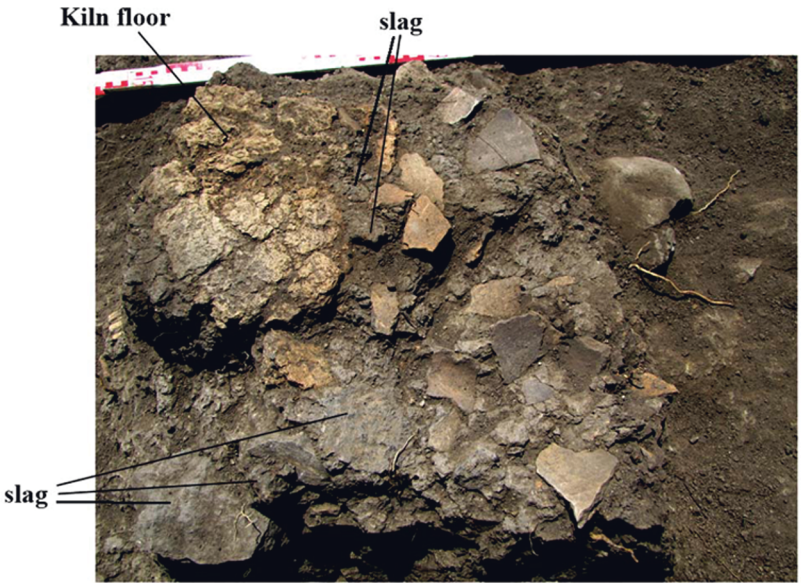

Fig. 10 Ružana 2, remains of the furnace with copper slag (photo: A. Kapuran)

settlements in northeastern Serbia was registered in an area of fertile soils around the Crni Timok River that offered more favourable conditions for intensive farming. Both sites near copper deposits and settlements located in the fertile zone of the river valley are accompanied by cemeteries with cremation urn graves, usually located in the immediate vicinity.

In the course of excavations at the sites of Ružana 1 and 2 in the surroundings of the present-day industrial-metallurgic centre of Bor, the remains of two prehistoric metallurgic furnaces have been discovered.[48] They are located at a distance of about 100m from each other, on the foothill of a smaller hilltop settlement and above the steep banks of a creek (which has dried out in the meantime) near today's village of Banjsko Polje. The close proximity of the two furnaces and numerous finds of metallic slag, especially in the pit of the Ružana 1 site, speaks for an increased metallurgical activity on the slope area above the creek. Apart from the slag, the pit discovered at Ružana 1 also contained a large number of animal bones, ashes and a significant quantity of pottery sherds. The remains of the furnace, approximately corresponding to the form of a horseshoe, were placed directly above the pit. The well-preserved bottom of the furnace at the Ružana 2 site also included a large lump of the metallic slag, stuck on the floor structure (Fig. 10).[49]

The pottery from the pit at the Ružana 1 site can typologically be associated with the early Vatin (Protovatin or Bubanj-Hum IV-Ljuljaci Group) (Fig. 11.1–4) and Verbicioara Culture (Fig. 11.5). Comparable pottery of the Protovatin type also occurred at the site Ružana 2 (Fig. 11.6–7), some 100m to the west, where another furnace structure was discovered.

The first chemical analysis of metallic slag uncovered at Ružana 1 points at the prehistoric copper ore smelting process.[50] Based on the presence of iron oxide and silicon dioxide, the slag can be classified as fayalite or iron-silicate slag, which was also discovered at Bronze Age metallurgical sites in the Alps, in the Iberian Peninsula and in Cyprus.[51] One further piece of evidence of the non-modern provenance of the slags from Ružana is the lack of flux (e.g. limestone). The low amount of oxygen and sulfur and other inclusions suggests advanced technological methods for

48 Kapuran et al. 2016, 176, 179, fig. 1.
49 Kapuran et al. 2016, 180, fig 8.
50 Kapuran et al. 2016, 181; Mehofer et al. 2021.
51 Tylecote 1987, pl. 8.6.

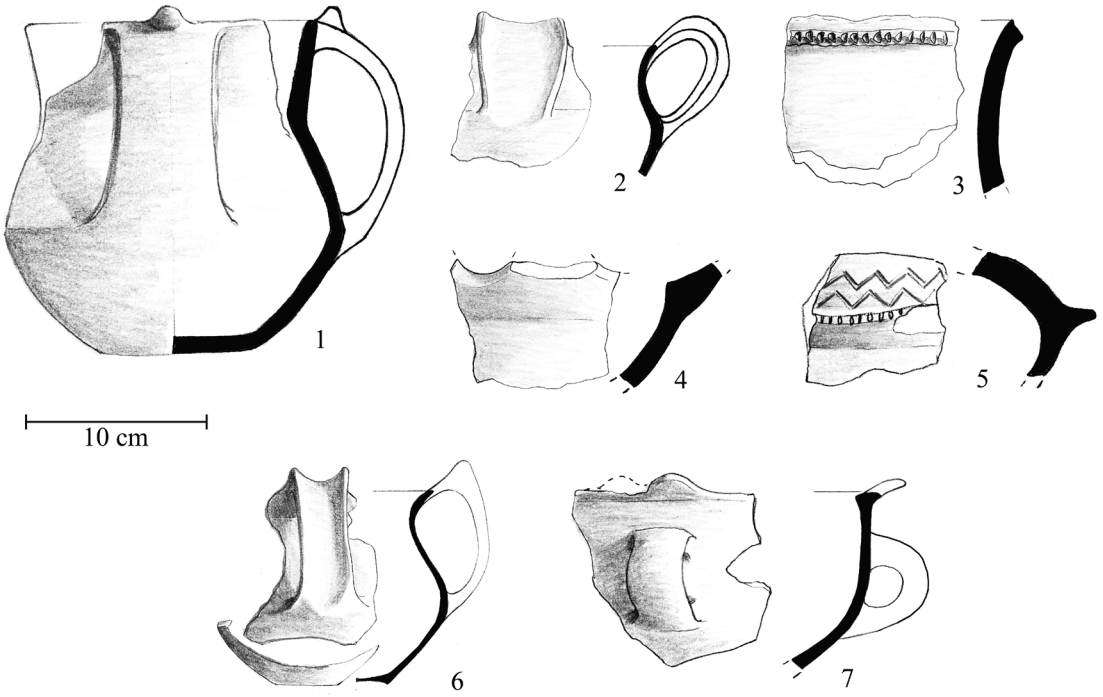

Fig. 11 Ružana, Early and Middle Bronze Age pottery (drawing: A. Kapuran)

improving the quality of copper. Very similar slag shapes also occur in a number of sites around the city of Bor, with settlements at Trnjane and Čoka Njica being the best investigated thus far.[52]

Radiocarbon absolute dating analysis of the bone sample from the slag pit at the Ružana 1 site was carried out at the Centre de Datation par le Radiocarbon, Lyon, France (no. Lyon 13386). According to the obtained results, the absolute age of the sample is 3480 ± 35 BP (Fig. 13) and after the calibration with OxCal 4.4.4., the age is 1882–1691 calBC (95.4%) or 1867–1762 calBC (68.2%).

This date would characterize Ružana as one of the early sites with early Vatin (or Protovatin) pottery in the central Balkans and emphasize the intermediary role of eastern Serbia in the possible mutual relations between the Carpathian Basin and the Aegean world during the Early Bronze Age.[53] The absolute dates from the nearby sites Trnjane and Čoka Njica with traces of copper production and associated urn cemeteries also point to the same period.[54] One evidence of these supraregional, long-distance contacts is a vessel of Vatin type from Agios Mamas in northern Greece, found in Layer 13.[55] According to radiocarbon dates, this settlement phase belongs to the time between the late 18th and the early 16th century BC,[56] which is in accordance with the new radiocarbon dates from eastern Serbia.

The excavations in Ružana also yielded a number of typologically significantly younger pottery finds from the Middle and Late Bronze Ages (Paraćin Group), Early Iron Age (Kalakača and Basarabi phase) and even traces of Roman presence.[57] Further radiocarbon dates and detailed analysis of the pottery will certainly clarify whether the metallurgical activity at the

52 Mehofer et al. 2021.
53 Bóna 1975; Garašanin 1983; Tasić 1984; Stojić 1998.
54 Mehofer et al. 2021.
55 Horejs 2007, pl. 16.10376.
56 Hänsel et al. 2010, 305.
57 Kapuran et al. 2016.

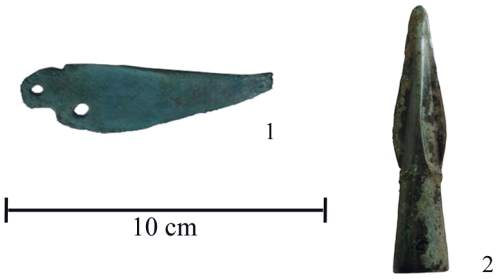

Fig. 12 Bronze knife from Trnjane (photo: A. Kapuran); 2. Bronze spearhead from Magura (photo: A. Bulatović)

Ružana site continued to be present and of the same intensity throughout all settlement phases.

An interesting aspect regarding eastern Serbia is the fact that the metal slags from the copper smelting process were found at a number of sites around the city of Bor,[58] but a very limited number of bronze objects actually originate from the Bronze Age. Other indications of developed local casting activity in the settlements (workshops, casting moulds, ingots) are also scarce. At the associated cemeteries, the deceased were exclusively cremated and buried in urns encircled with stone structures.[59] Grave goods are almost completely absent; occasionally a pottery beaker was placed in the grave. Bronze objects were found only at the necropolises in Trnjane, represented by a single bronze knife (Fig. 12.1), and in Magura, with one spearhead (Fig. 12.2) and one fragmented bronze pin.[60]

The bronze knife[61] from Trnjane belongs to the group of knives with a curved edge (type IIa after Bernhard Hänsel and Biba Teržan[62]) that appear in a long period between the advanced stage of the Early Bronze Age and the beginning of the Late Bronze Age. The absolute date for the grave with the knife from Trnjane clearly suggests the 18th century BC,[63] meaning that this particular piece is among the earliest examples. According to several authors, the appearance of such knives with two or three rivets in the western and central Balkans is a result of the contacts with the Aegean world.[64] Also indicative of this hypothesis are distant analogies for the knives from Troy, Epirus and the Aegean Islands.[65] Conversely, the spearhead from the Magura necropolis (type H XII according to Ljuben Leshtakov)[66] is significantly younger (Bronze D) and has its best parallels among the finds from the southern part of the Carpathian Basin.[67]

The fact that the sporadic bronzes from graves in eastern Serbia were not placed in the funeral pyre (no traces of fire) and thus not deliberately destroyed, underlines their significance as grave goods, most probably connected with the status of the deceased in life. It is further interesting that the two examples (a knife and a spearhead) are not only of different age but also point to two opposite regions (the Aegean and the Carpathian Basin). Hence, their occurrence might mirror different directions of possible exchange network routes that were established at the beginning of the Middle Bronze Age (knife) and at the start of the Late Bronze Age (spearhead).

Also particularly puzzling is the fact that very few casting moulds have been discovered in the wider area of eastern Serbia, with a mould for the casting of socketed chisels coming from the village of Planinica being closest to Ružana.[68] Judging by the typological resemblance with the axes from nearby small hoards from Mali Izvor and Gornja Bela Reka, each containing four socketed axes of different types, the casting mould from Planinica could be from the Hallstatt A1 period.[69] Another stone mould for the casting of axes and sewing needles was found in the depot

58 Pernicka et al. 1993, 39.
59 Jovanović 1999, 70–71.
60 Lazić 2016, fig. 3.6.
61 Jovanović – Janković 1990, 9.
62 Hänsel – Teržan 2001, 88, fig. 20.
63 Kapuran et al. 2020.
64 Parović-Pešikan 1995, 16; Hänsel – Teržan 2000, 171.
65 Sandars 1955, 183; Branigan 1974, 27, pls. 13–14.
66 Srejović – Lazić 1997, fig. 35; Leshtakov 2015, 106, pl. 157, map 16.
67 Hansen 1994, 62.
68 The mould is kept at the museum in Zaječar and is still unpublished.
69 Lalović 1975.

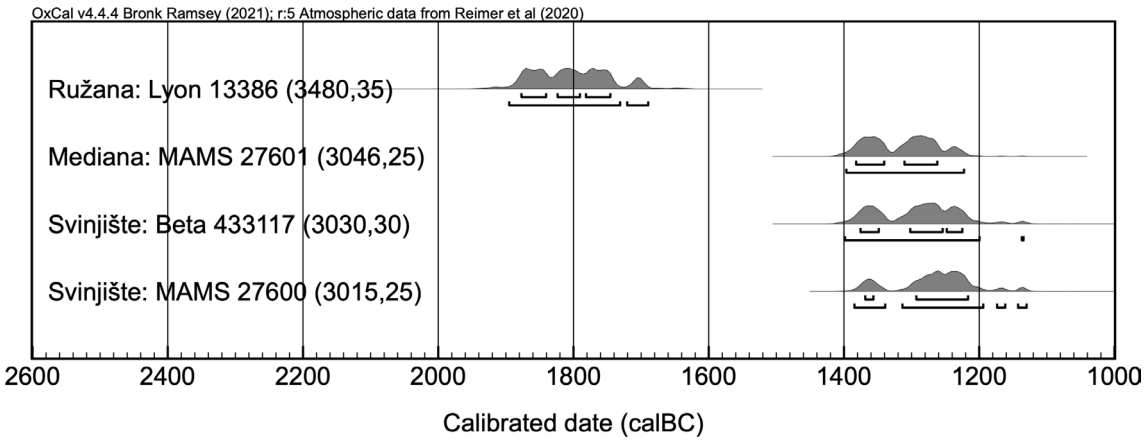

Fig. 13 Calibrated radiocarbon dates from Ružana, Mediana and Svinjište (graphics: L. Webster)

of the Hallstatt A2–B1 period from Brza Palanka.[70] Older traces of casting activities that would chronologically correspond to the period of intensive copper production (19th–16th century BC) are thus far missing in the area. Hence, we can assume that from the early stages of the Middle Bronze Age, the local population was primarily engaged in the extraction and production of copper but not in the production of finished metal objects.

Conclusion

The funerary ritual at the cemeteries of the Brnjica Culture in southern Serbia and in the urn cemeteries in eastern Serbia at first glance appears to be similar, with cremations and deposition of the cremated human remains in urns buried in the centre of a stone circle.[71] However, as the recently published absolute dates suggest, the urn cemeteries in eastern Serbia are significantly older, with most dates falling between the 20th and the 17th century BC and thus belonging to the end of the Early and the beginning of the Middle Bronze Age.[72] In contrast to the paucity of bronzes in eastern Serbia, the much younger graves assigned to the Brnjica Culture in the Južna Morava Valley contained various metal objects. The disparity between the two regions has also been documented with regard to casting moulds as an essential indicator of local bronze production.

One of the specific products crafted in local casting workshops of the Late Bronze Age was socketed axes with a reinforced collar bellow the mouth and an arcade-shaped field. Across the territory of the central Balkans, this type occurs in several different variants.[73] The axe from Svinjšte clearly belongs to this group, while the casting moulds from the nearby sites of Mediana and Hisar near Leskovac indicate possible workshops where objects of this type could have been made (Fig. 7.1–3). Further casting moulds for other tools and weapons as well as jewellery were also found at some other Brnjica Group sites in the Južna Morava Basin like Klinovac, and further to south at the site of Kokino in North Macedonia (Fig. 7.4–7).

As the new results of the chemical analysis of trace elements and copper isotopes on metal objects and absolute dates clearly demonstrate, the copper production in eastern Serbia ceased around 1600 BC and the copper from the Trentino region in North Italy entered most of the

70 Srejović 1975, 101, pl. 84.5.
71 Jovanović 1999, 70–71.
72 Kapuran et al. 2020; Mehofer et al. 2021.
73 Gavranović – Kapuran 2014, 45.

western and central Balkans.[74] The hitherto conducted analytic studies on ores, slags and artefacts from Serbia have shown that copper from the local deposits in eastern Serbia circulated not later than the Middle Bronze Age.[75] Hence, a developed craft production of different bronze objects during the Late Bronze Age in southern Serbia obviously used some other sources for the copper raw material.

The recently proven existence of the tin ore cassiterite in the streams on the southern slopes of the Cer Mountain in western Serbia and the analyses of tin isotopes of numerous bronze objects from the central Balkans suggest that the Cer Mountain was an important source of tin for Bronze Age communities in the central Balkans.[76] However, the first tin isotope analyses of bronze objects from southern Serbia revealed that tin from western Serbia was apparently not used for the bronze alloy of which these objects were made. In the context of the site Gradina in Svinjšte, it is worth mentioning that certain tin ore deposits are also located in the immediate vicinity,[77] in an area with several documented Bronze Age sites,[78] which opens up the possibility that some of these local tin sources were also exploited in prehistoric times.

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Trade Networks

First Golden Times: The 'Treasures' of Troy as an Indicator for Long-Distance Trade Networks in the 3rd Millennium BC

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Abstract: The number of gold objects in the Aegean and Anatolia steadily increased from 3000 BC onwards and the use of gold became common after 2500 BC. In addition to this development, fortified settlements emerged in western Anatolia and on the East Aegean islands. This development indicates socio-cultural changes leading to proto-urban centres around 2500 BC. Besides the settlements, the practice of hoarding and, thus, the intentional removal of gold also appears in this region, impressively displayed by the gold 'treasures' of Troy in northwestern Anatolia. Particular gold items of this collection indicate far-ranging trade networks from the Aegean via Mesopotamia and the Iranian Plateau to the Indus region, revealing interactions between emerging elites in the Early Bronze Age. These new gold symbols, used to display social status, represent a new connectivity in the Early Bronze Age, which can also be described as the 'first golden times'.

Keywords: Early Bronze Age, Aegean, Anatolia, gold jewellery, trade networks, elites

Introduction

In general, gold has been attracting people and communities for thousands of years and, basically, the value of gold has not changed drastically throughout this time. The significance of gold is strongly connected with cultural functions, representing a symbol of divinity, royalty, power, sun, light, and purity.[5] Therefore, the appearance and distribution of gold objects within prehistoric societies allows us to recognize the possibility of connectivity and the degree of social dynamics within these societies.

Besides sporadic gold finds from the 5th and 4th millennia BC in the Aegean and Anatolia, evidence of gold increases during the Early Bronze Age 1 (3000–2700 BC). Together with gold objects, the appearance of fortified settlements in this period indicates socio-cultural changes in western Anatolia and on the East Aegean islands. This development seems to lead to the emergence of early hierarchical structures, eventually resulting in the first proto-urban centres in the developed Early Bronze Age 2 (around 2500 BC). In addition, this is accompanied by the first evidence of the practice of hoarding prestigious objects in the Aegean and in western Anatolia. Taking this into account, unavoidable questions arise: why do gold finds appear and increase in number during the 3rd millennium BC? Can the accumulation of precious gold objects be seen as an indicator for the emergence of elites, initiating the 'first golden times'?

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[5] Cf. Bernstein 2000.

Early Gold Finds during the 5th and 4th Millennia BC

To gain a deeper insight into the advent of gold finds and their socio-cultural relevance, it is worth taking a brief look at the socio-cultural developments since the 5th millennium BC in the Aegean and Anatolia in general. In this context, the eastern Balkans especially are of interest when considering the high number of exceptionally elaborated gold objects found in the necropolis of Varna I (Bulgaria) in the coastal region of the Black Sea, which are dated between 4600–4400 calBC.[6] Despite the lack of comparable numbers of gold objects from settlements during this time, these finds clearly show that already during the 5th millennium BC, societies are traceable which were able to produce gold objects in a specialized and developed way. The technologically and technically advanced stage of metallurgical skills is proven by the use of the lost-wax casting technique and deliberate alloying.[7] In this context, chemical analyses of the gold objects revealed that placer deposits were most likely used for their production.[8] Hence, the gold objects from the Varna necropolis indicate the first, albeit short-term and unstable appearance of social inequality and are evidence of early elites.[9]

Subsequently, this development was not without impact on the neighbouring regions, as shown by the recently conducted studies regarding early metallurgy in the Aegean and Anatolia.[10] Generally, in the late 5th and the 4th millennium BC, an intensification of metallurgy can be traced in the Aegean and western Anatolia which can be connected with the earlier development in the Balkans. This is clearly shown by genuine Balkan metal objects, so-called 'ring idols' made of gold, which were produced in this region especially in the 5th millennium BC.[11] In southern Greece, the Aegean and Anatolia, these idols are also well-known in the 4th and 3rd millennia, but the majority consist of different materials such as silver and lead. Nevertheless, a local production of 'ring idols' in Anatolia is attested by a casting mould found at Çamlıbel Tarlası III in northern Central Anatolia dating between 3590–3470 calBC.[12] Therefore, already during this period, it can be shown that there was extended contact between the Balkans, the Aegean and Anatolia. Although societies with permanent settlements can be traced during this time,[13] except for the metal objects known from the Ilıpınar[14] cemetery, no clear indications, such as exceptionally-equipped buildings and prestigious objects, for the formations of elites can be detected within the settlements.

Make Gold Great Again: The Significance of Early Bronze Age Gold Jewellery

From 3000 BC onwards, the number of recorded gold objects in Anatolia increased, with only a few scattered finds in the Aegean in settlement, burial or cave contexts. In Anatolia, jewellery such as gold beads, bracelets, necklaces, spiral rings, and earplugs are already known from Early Bronze Age 1 contexts.[15] In addition to this, fortified settlements appear in the East Aegean and western Anatolia. Besides a presumable increasing need for protection, such labour-intensive building constructions show that the settlement was well organized; moreover, the increasing number of gold finds indicates socio-cultural changes. Hence, during the early 3rd millennium BC, societies of regional influence and power appear and they provided the essential requirements

6 Krauß et al. 2014a; Krauß et al. 2014b.
7 Leusch et al. 2014, 174–177.
8 Leusch et al. 2014; Leusch et al. 2015.
9 Cf. Renfrew 1978; Hansen 2018, 223–224.
10 Mehofer 2014.
11 Alram-Stern 2014, 317–319; Mehofer 2014, 470, 488–490.
12 Schoop 2009, 65–67; Schoop et al. 2009.
13 Cf. Schwall 2018, 277–284.
14 Roodenberg 2008; cf. Horejs 2014, 35.
15 Cf. Schwall – Horejs 2020; Horejs – Schwall 2023.

for a gradual formation of elites. Nevertheless, the abandonment of settlements within the Early Bronze Age 1 period clearly shows that these structures were not at all stable.

With the formation of extended proto-urban centres surrounded by impressive fortification systems in the Aegean and Anatolia around 2500 BC, such as Troy,[16] substantial changes become recognizable in the structural basis of the settlements.[17] Together with the emergence of these centres showing a clear inner organization, as indicated by the communal buildings and sophisticated defence systems with bastions, a significantly higher number of gold finds in settlements and burials is recorded and seems to correlate with a changing socio-cultural organization.[18] Likewise, it is notable that a new habit of hoarding precious objects emerges in the Aegean and Anatolia. Due to the lack of clearly related destruction horizons for the majority of the hoards, it is unlikely that the motive was simply to hide items. Instead, this custom shows that there was an intentional removal of accumulated precious metal within the settlement. The question is whether there is any relationship between the changing settlement structure and the appearance of gold finds, and whether these objects can be taken as an indicator for an emerging social inequality?

For this purpose, the famous gold accumulations – so-called 'treasures' – of Troy discovered by Heinrich Schliemann in the second half of the 19th century offer a good opportunity to analyse the gold objects in detail.[19] The locations and, thus, the exact allocation of each 'treasure' to a specific settlement phase were difficult to determine from the available information. The studies conducted by Donald Easton and his precise review and assessment of Schliemann's publications and notes allow us to assign the majority of the find complexes to the settlements Troy II and III, dated to the second half of the 3rd millennium BC.[20] The 'treasures' themselves consist of various groups of objects such as vessels, weapons, raw material, and semi-finished products made of different materials. However, gold jewellery in particular, such as necklaces, diadems, earrings, pins, and bracelets, represents a large quantity among the finds that have partially fine filigree applications.[21] By looking more closely at the individual items of the gold accumulations, it is noticeable that particular pieces of jewellery, such as hair-rings, so-called *Lockenringe*, basket-shaped earrings with pendant chains, quadruple spiral beads, and flat-winged disc beads,[22] are included in several accumulations – a fact that is important for the relationship between the 'treasures' themselves as well as with external finds. Regarding the astonishing wealth of the gold objects, it is conspicuous that all gold accumulations have been found within or close to the citadel of Troy. Consequently, the gold accumulations of Troy seem to be connected with the community living or practising within this area and to indicate a possible social differentiation. The question therefore arises as to whether the finds could presumably be seen as an indicator for the formation and consolidation of hierarchical structures in Troy?

That this development of a social stratification was not only restricted to Troy is underlined by further gold hoards showing remarkable similarities with the objects of Troy which were found in Anatolian and East Aegean settlements. At Poliochni on Lemnos, a hoard containing more than 300 gold objects placed in a ceramic vessel was discovered in a storage room and dates to the second half of the 3rd millennium BC.[23] Interestingly, the items found at Poliochni offer almost perfect parallels with several gold objects from Troy, such as quadruple spiral beads, flat-winged disc beads, and *Lockenringe*.[24] Also striking are the similarities between the basket-shaped

16 Cf. Ünlüsoy 2006, 136–142.
17 Cf. Renfrew 1972, 225–264; Kouka 2008, 276–279.
18 Cf. Reinholdt 2008; for a compilation of increasing gold finds in the southern Aegean during the EBA see also Legarra Herrero 2014.
19 Schliemann 1881; cf. Trejster 1996; Treister 2013; Sazcı 2007.
20 Easton 1997; Easton 2014, 79–89.
21 E.g. Sazcı 2007, 243, 297.
22 E.g. Sazcı 2007, 181, 184, 193–194, 227.
23 Bernabò-Brea 1976, pls. 240–252.
24 Bernabò-Brea 1976, pls. 246–247; 250.17.

earrings with pendant chains,[25] whereby the question was raised as to whether these objects were possibly produced in the same workshop.[26] In addition to Poliochni, comparable objects are also known from the Eskiyapar 'treasure' in central Anatolia.[27] This hoard was also placed in a ceramic vessel, and the inventory includes comparable finds of basket-shaped earrings (however, without pendant chains), quadruple spiral beads, and flat-winged disc beads as well as *Lockenringe* of the Troy type.[28] In general, taking a closer look at the components of the hoards, it becomes obvious that the majority of the gold objects represent personal adornments. This fact is striking, and not all of the settlements' inhabitants can be expected to have been wearing gold jewellery. Hence, the jewellery gives us a strong indication that a kind of vertical social stratification within the society must have existed. Moreover, the commonalities of specific adornments found in all three hoards show specific types of jewellery that were used by the rising elites from the Early Bronze Age 2. Taking this into account, the connection ranging from the East Aegean via western to central Anatolia gives a brief insight into the important nodes of an extended interaction sphere during the second half of the 3rd millennium BC.

From the Aegean to the Indus: Gold Jewellery as an Indicator of a Far-reaching Trade Network

Focusing on further interrelations based on jewellery from Troy, additional evidence is provided from the western and the more eastern regions by taking a look at ring disc beads, quadruple spiral motifs, and flat-winged disc beads.

Ring Disc Beads

Interaction between the Greek mainland ('Thyreatis' hoard,[29] Kolonna on Aegina[30]), Crete (Archanes[31]), and western Anatolia (Troy,[32] Seyitömer Höyük[33]) during the second half of the 3rd millennium BC is attested by so-called 'ring disc beads' made of gold.[34] The shape of the beads is unique and it seems to be unlikely that this bead type originated independently in three different regions.

Quadruple Spiral Motifs

Aside from ring disc beads, extensive, far-reaching connections are indicated by adornments with quadruple spiral motifs. Besides beads of this type from Troy, four gold pendants with attached quadruple spirals have been assigned to the Troad, most probably from Troy.[35] Remarkably, nearly identical gold objects were found in the royal tombs of Ur, Iraq.[36] Due to the similarities of the motifs and the pendants' composition, it is assumed that the objects assigned to the Troad represent imitations of the Middle Eastern motifs or even imports.[37] More evidence for contact between the Troad and the Middle East is attested by gold quadruple spiral beads discovered in the tombs

25 Bernabò-Brea 1976, pls. 241–244.
26 Cf. Trejster 1996, 231.
27 Özgüç – Temizer 1993.
28 Özgüç – Temizer 1993, pls. 106.2–5; 107.1–8; 112.1c; 115.2b.
29 Reinholdt 1993, 6–7, figs. 5–7.
30 Reinholdt 2008, 125, pl. 11.3.
31 Sakellarakis – Sapouna-Sakellaraki 1997, 619, fig. 656.
32 Sazcı 2007, 194.
33 Bilgen et al. 2015, 145, fig. 159.
34 Reinholdt 2008, 26–27.
35 Bass 1966, 37; Bass 1970, pl. 86.20–23.
36 Woolley 1934, pls. 134.U.9656; 220; cf. Armbruster 2016, 130, fig. 14.
37 Bass 1966, 37; cf, Maxwell-Hyslop 1971, 35; Hauptmann et al. 2018, 101.

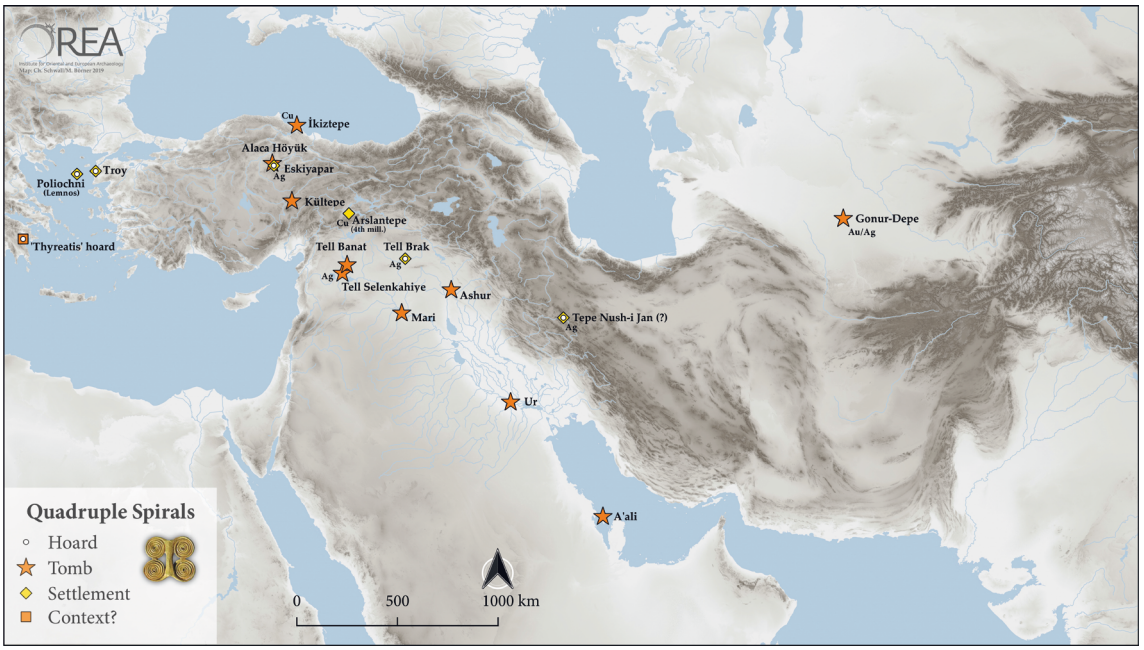

Fig. 1 Distribution of quadruple spiral motifs made of gold (Cu=copper, Ag=silver, Au/Ag=gold & silver; map: M. Börner, Ch. Schwall/OREA; quadruple spiral: after Højlund 2007, 75, fig. 131)

of Tell Banat in Syria.[38] Besides rod-shaped objects with perforations and pendants – quite similar to the pendants of the basket-shaped earrings from Troy – the occurrence of quadruple spiral beads is striking. Taking a closer look at metal objects with a quadruple spiral motif, it is apparent that they are quite common in Anatolia (Alaca Höyük, Eskiyapar, İkiztepe, Kültepe, Troy) in the 3rd millennium BC but also known from the Aegean as well as the Greek mainland, as shown by the examples from the Poliochni 'treasure' and the 'Thyreatis' hoard (Fig. 1; for references see Tab. 1). Moreover, the exceptional quadruple spiral plaque made of arsenical bronze from Arslantepe level VI A (Late Chalcolithic) indicates an occurrence in Anatolia from as early as the late 4th millennium BC.[39] The significance of the quadruple spiral motif has already been discussed.[40] Nevertheless, it is worth highlighting the far-reaching distribution in detail. Comparable quadruple spiral motifs made of precious metal are widely distributed in the Middle East, as seen in examples from Syria (Mari, Tell Banat, Tell Brak, Tell Selenkahiye), Iraq (Ashur, Ur), Iran (Tepe Nush-i Jan), Bahrain (Aʿali), and Turkmenistan (Gonur-Depe).

The distribution of quadruple spiral motifs clearly emphasizes the appearance of such objects at sites of supra-regional relevance which are situated at important junctions of routes on water or land. However, the archaeological contexts in which the quadruple spiral motifs were discovered seem to differ. In the Aegean region, these items derived exclusively from hoards, whereas the Middle Eastern objects are assigned to tombs. This fact seems to indicate that the hoarding practice within the settlement context in the Aegean can be seen as a counterpart to the graves in central Anatolia and Mesopotamia, thus expressing different regional customs. Regarding the quadruple spirals from Turkmenistan, the occurrence of these remote finds in Central Asia seems to be unusual.

38 Porter – McClellan 2003, 185.
39 Cf. Maxwell-Hyslop 1989, 216.
40 Cf. Maxwell-Hyslop 1971, 34–37; Maxwell-Hyslop 1989; Huot et al. 1980; Aruz 2003b; Rahmstorf 2011, 147.

Tab. 1 Early Bronze Age metal quadruple spiral objects (cf. Fig. 1)

Site	Object – Material (Reference)	Dating (Reference)
Aʿali (BH)	bead – gold (Højlund 2007, 75, fig. 131)	c. 2000–1750 BC (Højlund 2007, 120–121)
Alaca Höyük (TR)	beads – gold (Arık 1937, pl. 249)	c. 2300–2000 BC (Zimmermann 2009, 14; Yalçın – Yalçın 2018, 93–94)
Arslantepe (TR)	plaque – arsenical bronze (Palmieri 1981, 107, fig. 3.5)	Arslantepe VI A – late 4th millennium BC (Palmieri 1981, 102, tab. 1)
Ashur (IQ)	beads – gold (Aruz 1995, 50–51)	late 3rd/early 2nd millennium BC (Aruz 1995, 51)
Eskiyapar (TR)	beads – silver (Özgüç – Temizer 1993, pl. 115.2b)	c. 2200–2000 BC (Özgüç – Temizer 1993, 628)
Gonur-Depe (TM)	pendants – gold & lazurite (Sarianidi 2007, 97); rings with attached quadruple spiral – gold & silver (Sarianidi 2007, 98, figs. 143, 146)	c. 2400–1600 calBC (Jungner 2007)
İkiztepe (TR)	plaques – bronze (Bilgi 1990, 218, figs. 19.439–445; cf. Aruz 2003a)	EBA III – late 3rd millennium BC (Bilgi 1990, 164; Aruz 2003a)
Kültepe (TR)	bead – gold (Özgüç – Akok 1958, pl. 19.8)	Kanish Karum II – late 3rd/early 2nd millennium BC (Özgüç – Akok 1958, 58)
Mari (SY)	beads – gold (Nicolini 2010, 302, pls. 480–481)	presumably second half of the 3rd millennium BC; found in a Middle Assyrian tomb (Nicolini 2010, 249–250)
Poliochni (GR)	bead – gold (Bernabò-Brea 1976, pl. 250.17)	Poliochni yellow – second half of the 3rd millennium BC (Alram-Stern 2014, 306, fig. 1)
Tell Banat (SY)	beads – gold (Porter – McClellan 2003, 185)	mid- to late 3rd millennium BC (Porter – McClellan 2003, 185)
Tell Brak (SY)	beads – silver (Mallowan 1947, pl. 32.8; Collins 2003c)	c. 2300–2160 BC (Mallowan 1947, 73–74, 171; Collins 2003c)
Tell Selenkahiye (SY)	bead – silver (van Loon 2001a, pl. 8.11c)	Selenkahiye IV – second half of the 3rd millennium BC (Huot et al. 1980, 124; van Loon 1979, 101; van Loon 2001b, 17.604–17.606)
Tepe Nush-i Jan (IR)	beads – silver (Stronach 1969, pl. 9a)	possibly late 3rd/early 2nd millennium BC; belonging to a later hoard (Stronach 1969, 15–16; Curtis 1984, 6)
'Thyreatis' hoard (GR)	pendant – gold (Reinholdt 1993, 9, fig. 12.B4)	second half of the 3rd millennium BC (Reinholdt 1993, 33)
Troy (TR)	beads – gold (Sazcı 2007, 227, 269); pendants assigned to Troy (Bass 1966, 37; 1970, pl. 86.20–23; cf. Born 2016, 467, fig. 13)	Troy II–III – c. 2550–2200 BC (Easton 2014, 79–89; Weninger – Easton 2014, 183)
Ur (IQ)	pendants with attached quadruple spiral – gold (Woolley 1934, pls. 134.U.9656; 220; cf. Armbruster 2016, 130, fig. 14)	ED IIIA – c. 2550–2400 BC (Woolley 1934, 227; Collins 2003a)

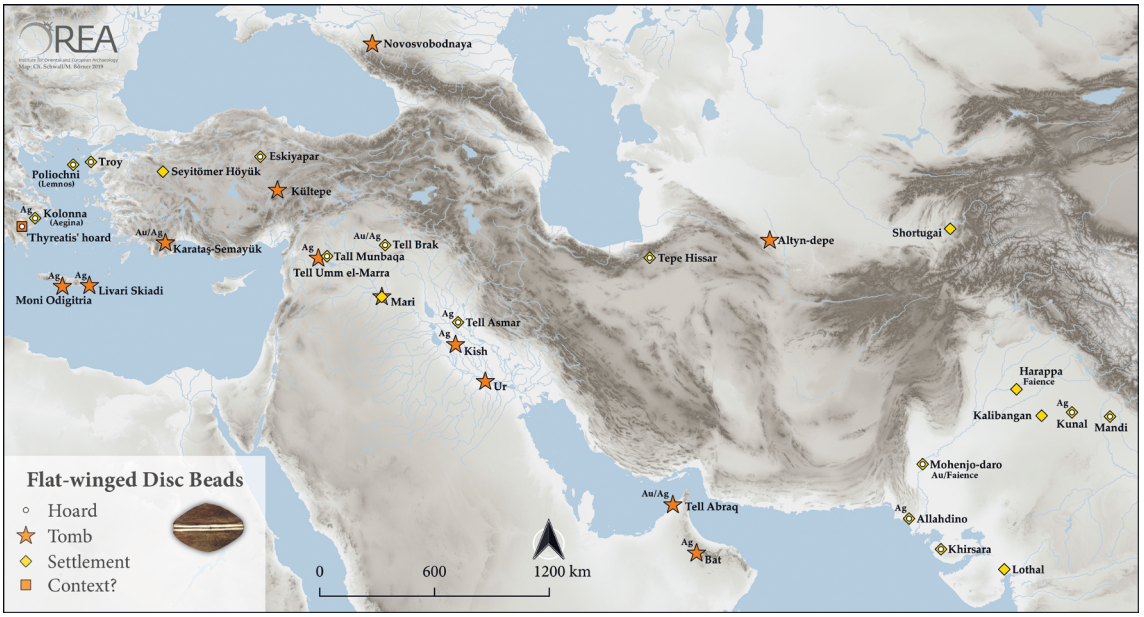

Fig. 2 Distribution of flat-winged disc beads made of gold (Ag=silver, Au/Ag=gold & silver; map: M. Börner, Ch. Schwall/OREA; flat-winged disc bead: after Collins 2003b, 232, fig. 158d)

Flat-Winged Disc Beads

To understand the objects found in Turkmenistan, it is necessary to add another category of precious metal beads which also has a far-reaching distribution, as has already been noticed by several authors.[41]

Flat-winged disc beads also clearly show these relations between west and east (Fig. 2; for references see Tab. 2). They are known from the Greek mainland ('Thyreatis' hoard), the Saronic Gulf (Kolonna on Aegina), the Aegean (Livari Skiadi and Moni Odigitria on Crete, Poliochni on Lemnos), and Anatolia (Eskiyapar, Karataş-Semayük, Külтepe, Seyitömer Höyük, Troy). In this region, the beads are mainly round and oval-shaped. Only a few objects have a different shape, such as the rhombic examples from Troy or the double-axe-shaped beads from Eskiyapar. With regard to the Middle East, flat-winged disc beads were found at different sites in Mesopotamia (Mari, Tall Munbaqa, Tell Asmar, Tell Brak, Tell Umm el-Marra, Kish, Ur), Iran (Tepe Hissar), the Gulf region (Tell Abraq), and in Oman (Bat). Their shape is mainly oval and rhombic, with unusual rectangular and elongated oval gold beads found at Mari. Additionally, finds that were discovered in more northerly areas than the Middle East and have a round to oval shape are known from a kurgan in Russia (Novosvobodnaya) as well as sites in Turkmenistan (Altyn-Depe) and Afghanistan (Shortugai) in southern Asia. Likewise, in the case of the quadruple spiral from Gonur-Depe, and especially the more distant objects found in northern Iran, Turkmenistan, and Afghanistan, the distribution seems unusual at first glance. However, the distribution becomes comprehensible when the Indus region is looked at in detail. In the Harappa Culture of India, flat-winged disc beads made of gold and silver are known from several sites close to the sea (Allahdino, Khirsara, Lothal) as well as in the catchment area (Kalibangan, Kunal, Mandi, Mohenjo-daro) of the Indus River.[42] The majority of these beads have a large round form, date to the Mature

41 Cf. Maxwell-Hyslop 1971, 34–37; Aruz 2003b; Rahmstorf 2011, 149; Döpper – Schmidt 2013, 33.
42 Cf. Ray 2013, 541.

Tab. 2 Early Bronze Age flat-winged disc beads (cf. Fig. 2)

Site	Object – Material (Reference)	Dating (Reference)
Allahdino (PK)	beads – silver – large round, rhombic (Fairservis 1982, 109; Kenoyer 1998, 138, fig. 7.30; Law 2011, 438, fig. 12.40)	Harappa Culture – second half of the 3rd millennium BC (Kenoyer 1991a, tab. 3)
Altyn-Depe (TM)	bead – gold – oval (Masson 1988, pl. 22.2)	Namazga V – c. 2300–1850 BC (Masson 1988, 96)
Eskiyapar (TR)	beads – gold – double-axe-shaped (Özgüç – Temizer 1993, pl. 112)	c. 2200–2000 BC (Özgüç – Temizer 1993, 628)
Bat (OM)	bead – silver – rhombic (Döpper – Schmidt 2013, 32, fig. 8c; Schmidt – Döpper 2014, 209, fig. 11h)	Umm an-Nar period – c. 2800–2000 BC (Schmidt – Döpper 2014, 205)
Harappa (IN)	beads – faience – (large) round, oval & rhombic (Beck 1940, pls. 130; 133.3; Vats 1940, pl. 128.13)	Mound F, Stratum I, III–IV (Beck 1940, 416–417; Vats 1940, 435); Period 3A–C – c. 2600–1900 BC (Kenoyer 1991b, 38–40)
Kalibangan (IN)	bead – gold – large round (Bala 2003, 230, pl. 39.4; Bala 2004, 37, fig. 8)	Period I – c. 3000–2700 BC (Bala 2003, 229; Lal 2003)
Karataş-Semayük (TR)	beads – gold & silver – round & oval (Mellink 1969, pl. 74.15, 17)	EBA III (Mellink 1969, 322)
Khirsara (IN)	beads – gold – large round (Nath et al. 2013, 433, fig. 9A; Nath – Kumaran 2017, 553, fig. 6; Pokharia et al. 2017, 5, fig. 2c)	Mature Harappa Culture – c. 2600–1900 BC (Nath – Kumaran 2017, 554; Pokharia et al. 2017, 14)
Kish (IQ)	bead – silver – rectangular (Mackay 1929, pl. 60.44)	ED III – c. 2400–2300 BC (Moorey 1970, 104)
Kolonna (GR)	beads – silver – oval (Reinholdt 2008, 126, pl. 12.4)	Kolonna V – EH III (Reinholdt 2008, 71); for a late EH III/early MH context (Gauss 2010, 743)
Kültepe (TR)	beads – gold – oval (Özgüç 1986, 43, fig. 3.39c–d)	Kültepe level 13.1 – EBA III (Özgüç 1986, 31)
Kunal (IN)	beads – silver – large round (Khatri – Acharya 1994/95, 86)	Phase IC – transition early/mature Harappan Culture (Khatri – Acharya 1994/95, 85–86)
Livari Skiadi (GR)	bead – silver – round (Papadatos 2015, pl. 35.J72)	EM I–III (Papadatos 2015, 105)
Lothal (IN)	beads – gold – large round (Rao 1973, pl. 29b)	Period A – c. 2500–1900 BC (Rao 1973, fig. 40)
Mandi (IN)	beads – gold – bell-shaped (Sharma et al. 2000, pl. 5; Tewari 2004, 61, fig. 7)	around 2000 BC (Sharma et al. 2000, 37; Tewari 2004, 62)
Mari (SY)	beads – gold – rectangular (late Mari I), rhombic (Mari II), elongated oval (Mari III) (Nicolini 2010, 254, pls. 314–315; 257–258, pls. 324–330; 281, pls. 405–406)	late Mari I – c. 2700 BC; Mari II – c. 2500 BC; Mari III – c. 2300–2000 BC (Nicolini 2010, 224–225)
Mohenjo-daro (IN)	beads – gold – round to oval (Mackay 1931, pls. 146.34; 149.5, 7; Aruz 2003c); bead – faience – rhombic (Mackay 1931, pl. 146.38)	Intermediate period – c. 2600–1900 BC (cf. Mackay 1931, 515; Aruz 2003c)
Moni Odigitria (GR)	bead – silver – round (Michelaki – Vasilakis 2010, fig. 78.J41)	EM II–MM IIA (Michelaki – Vasilakis 2010, 198)
Novosvobodnaya (RU)	beads – gold – approx. oval (Collins 2003d)	mid-3rd millennium BC (Collins 2003d)
Poliochni (GR)	beads – gold – round to oval (Bernabò-Brea 1976, pl. 247c)	Poliochni yellow – second half of the 3rd millennium BC (Kouka 2009, 142, tab. 9)
Seyitömer Höyük (TR)	beads – gold – round to oval (Bilgen et al. 2015, 145, fig. 159)	Phase V-B (EBA III) – c. 2300–2220 calBC (Harrison 2017; Harrison 2021, 166, fig. 12.1B)

Site	Object – Material (Reference)	Dating (Reference)
Shortugai (AF)	beads – gold & terracotta – round (Francfort 1989, pl. 34.5)	Period II – c. 2200–1700 BC (Francfort 1989, 242)
Tall Munbaqa (SY)	'pendant' – gold – oval (Karras 1998, pl. 128.1894)	IV-Ku-1 – c. 2400–2100 BC (Karras 1998, 180–181; Werner 1998, 37)
Tell Abraq (AE)	beads – gold & silver – oval (Potts 2000, 54; Potts 2003)	late 3rd millennium BC (Potts 2003)
Tell Asmar (IQ)	bead – silver – rhombic (Frankfort 1933, 49, fig. 31)	Akkadian period – c. 2350–2150 BC (Frankfort 1933, 56–57)
Tell Brak (SY)	beads – gold & silver – oval & rhombic (Mallowan 1947, pl. 33.14; Collins 2003b; 2003c)	c. 2300–2160 BC (Mallowan 1947, 73–74, 171; Collins 2003b; Collins 2003c)
Tell Umm el-Marra (SY)	beads – silver – rhombic (Dunham 2003)	c. 2300 BC (Dunham 2003)
Tepe Hissar (IR)	beads – gold – round to oval (Schmidt 1937, fig 138; Gürsan-Salzmann 2016, 262, fig. 5.36)	Hissar IIIC – c. 2200–1800 BC (Gürsan-Salzmann 2016, 261)
'Thyreatis' hoard (GR)	bead – gold – round (Reinholdt 1993, 4, fig. 3a)	second half of the 3rd millennium BC (Reinholdt 1993, 33)
Troy (TR)	beads – gold – oval & rhombic (Sazcı 2007, 174–175, 193)	Troy II–III – c. 2550–2200 BC (Easton 2014, 79–89; Weninger – Easton 2014, 183)
Ur (IQ)	beads – gold – round & rhombic (Woolley 1934, 366, fig. 70.16, 19; cf. Maxwell-Hyslop 1971, pls. 6a, 17a, 19a; Armbruster 2016, 122, fig. 7)	Starting in the ED period; common in the Akkadian and Ur III dynasty – c. 2300–2000 BC (Woolley 1934, 371; Maxwell-Hyslop 1971, 10)

Harappan Culture (c. 2600–1900/1800 BC[43]) and derive from hoards found within the settlements.[44] Thus, these are contemporary with the beads found in the more western regions. Besides beads made of gold and silver, (large) round, oval and rhombic faience beads from Mohenjo-daro and Harappa most likely resemble the metal objects.

Regarding the shape in general, distinct forms seem to be predominant in certain regions. Whereas the oval and round shapes prevail in the Aegean and Anatolia, oval and rhombic beads are more frequently found in Mesopotamia, and the large round beads are common in the Indus region. The regional differentiation by shape is to some extent also seen in the deposition custom in hoards or burials. As in the case of the quadruple spiral motifs, flat-winged disc beads derive more frequently from hoards in the Aegean and, furthermore, in the Indus region. In central Anatolia and Mesopotamia, the number of objects found in burial contexts is still large and supports the assumption of different regional customs. Moreover, exceptions such as rhombic shapes are known from western and eastern regions and have been found at Troy and Harappa. The appearance of 'foreign' types in this region indicates an interaction sphere and possible trade routes by sea or land. In the case of the rhombic types, a distribution via seaways is more likely. Evidence for possible caravan routes is presented by the round to oval bead shapes found in northern Iran, Turkmenistan, and Afghanistan. Despite the influence of the Harappa Culture, especially in the case of Shortugai in Afghanistan, these finds suggest a stronger relation to the shapes found in Anatolia possibly triggered by contacts via caravan transport routes.

43 Cf. Kenoyer 1991a, 334; McIntosh 2008, 83.

44 McIntosh 2008, 319–320; Manuel 2010; Mahapatra – Ansari 2016, 745–746.

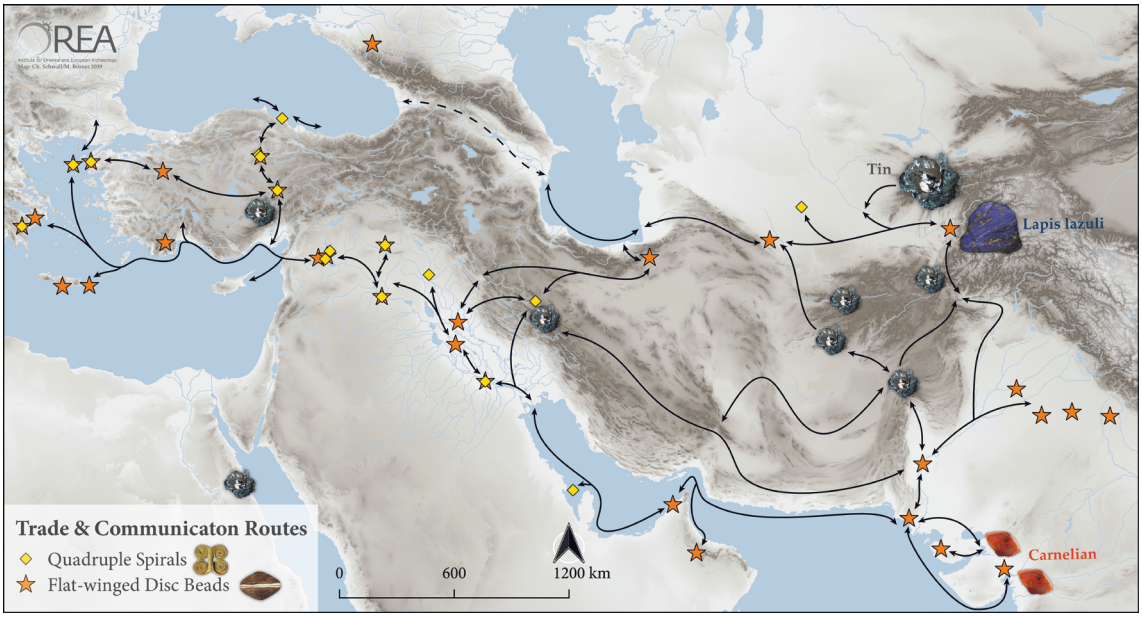

Fig. 3 Assumed routes of the far-reaching trade network based on the distribution of quadruple spiral objects and flat-winged disc beads made mainly of gold and silver, together with lapis lazuli, tin, and major carnelian raw material sources (map: M. Börner, Ch. Schwall/OREA; quadruple spiral and flat-winged disc bead: see Figs. 1–2)

Conclusion

The distribution of quadruple spiral motifs and flat-winged disc beads clearly shows that these objects are attested in different regions from the Aegean to the Indus Valley and mainly date to the second half of the 3rd millennium BC. Together with the flat-winged disc beads, even though the shape of the beads varies in the different regions, the quadruple spiral motifs indicate a 'specific type of jewellery' as code used only by elites and a far-reaching communication network by which prestige objects were also distributed. But what is the motivation for these far-reaching contacts within the 'first golden times' in the 3rd millennium BC? To answer this question, the gold 'treasures' of Troy provide a possible explanation for the motivation: axes made of jadeite and lapis lazuli.[45] The decorated axes especially, made of the rare mineral lapis lazuli, clearly have to be interpreted as prestige objects and are evidence of the procurement of finished goods or raw material from regions that are more distant. The closest lapis lazuli sources are situated in northern Afghanistan (Badakhshan) and more than 3500km away from Troy.[46] Recently compiled geological analyses revealed that the Harappa Culture already had access to the rare blue mineral from Afghanistan and possibly exchanged it with the western regions.[47] Beside lapis lazuli, tin sources from central Asia (Afghanistan, Tajikistan, and Uzbekistan[48]), which are important for the production of bronze, could have been a trigger for the development of a far-reaching trading network in the 3rd millennium BC.[49] In this context especially, recently conducted analyses of gold artefacts from the royal tombs at Ur are interesting, claiming the use of placer deposits from Iran and Afghanistan, based on calculated ages from the isotope ratios of osmium in platinum group inclusions in the gold objects and relating them to known geological ages of gold deposits. However, the observed isotope ratios are largely similar in platinum group

45 Sazcı 2007, 279, 283.
46 Cf. Zöldföldi et al. 2006.
47 Law 2011, 80, 528–543.
48 Cf. Berger et al. 2014, 76, 80.
49 Cf. Muhly 1973, 337–338.

minerals from many different occurrences worldwide,[50] which is interpreted as indicative of a mantle origin, with little influence of crustal material,[51] and can thus not be related to crustal ore deposits. Accordingly, the provenance of the gold from the Royal Cemetry of Ur must as yet be considered as unknown.[52]

Moreover, the importance of precious and exotic materials as symbols of social status becomes obvious with regard to carnelian beads. Elongated and etched carnelian beads are typical in the Indus region and have also been found at numerous sites in Mesopotamia.[53] The main carnelian sources are situated in the province of Gujarat in northwestern India; additional sources are, moreover, known from Iran, the Arabian Peninsula, and southern Egypt.[54] Interestingly, the carnelian beads show a comparable distribution pattern to the flat-winged disc beads from the Aegean to the Indus region. In general, the appearance of precious objects such as carnelian or gold beads in different regions must be seen within the context of the development of a far-reaching trading network during the 3rd millennium BC. Mapping the evidence of flat-winged disc beads and quadruple spiral objects together with the raw material sources of lapis lazuli, tin, and carnelian, the distribution clearly shows that these objects occur at sites close to raw material sources or important junctions of assumed routes by land or sea (Fig. 3).[55] Therefore, the gold treasures from Troy and related finds dating to the second half of the 3rd millennium BC can presumably be seen within the context of the emergence and consolidation of elites situated close to important sections of the trading routes.

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50 E.g. Junk – Pernicka 2003.
51 Cabri et al. 2022.
52 Jansen et al. 2016a; Jansen et al. 2016b; Jansen et al. 2018, 131–135.
53 Cf. Rahmstorf 2015, 162–163, figs. 9–10.
54 E.g. de Waele – Haerinck 2006, 32; Harrell – Storemyr 2009, 42, fig. 30; Law 2011, 266–278.
55 Cf. routes: Kenoyer 1998, 91–98; Şahoğlu 2005, 342–343, fig. 1; Singh 2008, 164–169; Law 2011, 462–499, fig. 13.12; Chakrabarti 2014.

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Making the Difference – Crafting Jewellery in the Early Bronze Age Eastern Balkans: The Role and the Place of the Eastern Balkans as a Crossroad between the Balkans, the Aegean, Anatolia and the World Beyond

Zheni Vasileva[1]

Abstract: This paper aims to present a synthetic overview of the jewellery production in present-day Bulgaria during the 3rd millennium BC. By highlighting diverse aspects connected with metal ornaments, the present paper also intends to integrate the eastern Balkans into the wider cultural context. The beginning of the Early Bronze Age brought many changes among the prehistoric societies – new burial practices, technological innovations and new styles in the jewellery fashion. No doubt jewellery must have had far-reaching social implications for the prehistoric societies. A new kind of adornment is often associated with a new custom expressing particular social identities. The analyses of the jewellery production underline that the Early Bronze Age eastern Balkans do not have to be regarded only as a receptive path of foreign knowledge, but should also be seen as a centre of local and regional artistic activities and a place of influence for the Balkans and the world beyond.

Keywords: jewellery, Early Bronze Age, eastern Balkans, Aegean, gold, silver

Introduction

Gold and silver jewellery has been one of the most vivid expressions of the 3rd-millennium BC societies in the Aegean and the Near East. As well-known benchmarks of this dynamic period, the items of jewellery display the creativity and the innovative potential of the Early Bronze Age (EBA) societies. For a long time, the eastern Balkan region has been considered as a periphery of the developed 3rd-millennium BC centre. The intensive archaeological excavations during the last decades provide new evidence about the EBA period in the eastern Balkans – regarding new burial customs, metallurgical innovations, trade and cultural contacts. The growth of goods exchange and contacts of the EBA eastern Balkans with different regions supported the appearance of new cultural trends. The artistic development was greatly influenced by new concepts in the jewellery production. Especially important are the abundant appearance of silver ornaments and the occurrence of new types of metal ornaments. Silver, gold and arsenical bronze become among the most preferred materials for crafting jewellery in the eastern Balkans. Geographically, the eastern Balkans connect different regions by means of important communication routes, i.e. the Aegean, Anatolia and the Mediterranean, the Lower Danube area and the northern Black Sea region, as well as the central Balkans and the Middle Danube region.

EBA jewellery production in the eastern Balkans has rarely been addressed in dedicated studies. The present paper aims to review and enhance the current knowledge regarding EBA jewellery fashion in this area. By highlighting diverse aspects connected with metal ornaments, the present paper also intends to integrate the eastern Balkans into the wider cultural context and

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reconsider its place among the developed 3rd-millennium BC jewellery centres. We begin with a brief overview of the development of jewellery production in the 3rd millennium BC.

The 3rd-Millennium BC Jewellery Production

Interregional interactions seem to have expanded considerably during the 3rd millennium BC, and new networks were built in new directions that contributed significantly to the development of the EBA communities. Very often, metal ornaments have been considered as a visual language through which personal and social messages have been sent to the society, and jewellery also contributes to creating and maintaining social networks.

Rachel Maxwell-Hyslop, a pioneer in the study of Bronze Age jewellery production, described the extraordinary diversity of jewellery during the 3rd millennium BC as evidence for the intensive capacity of jewellery artisans in different centres. According to her, the western Asiatic jewellery can be divided into several distinct schools, linked together by common types, techniques and motifs.[2] In the 1970s, George Bass used the term 'Early Gold Age' to describe the jewellery innovations in the 3rd millennium BC in the Aegean and the Near East.[3] The numerous collections from these regions represent evidence for reconstructing technologies and typologies, as well as cross-cultural influences (Mesopotamian, Anatolian, and Aegean) between distant regions. The corpus of the Aegean EBA jewellery production examined in the last decades shows close affinities between the various areas of the expansion of the Aegean cultures, the Greek mainland, the Cyclades, Crete and west coastal Anatolia. These close affinities are defined as evidence of a *jewellery koiné*, in which centres of production were located in different regions and mutually influence each other, without any of them being dominant. Each of these centres implies the existence of local craftsmanship.[4]

The rich grave assemblages and treasures found in the zones between the Adriatic and the Near East demonstrate the rise of elite groups and consumption of metal ornaments, weapons, tools and luxury goods. Recent intensive archaeological excavations show that the custom of depositing metal weapons and gold and silver jewellery was also practised in the Balkan regions. The most representative examples are the necropolis at Velika Gruda and Mala Gruda in the western Balkans[5] and the cemetery with ritual structures at Dabene in the Upper Thracian Plain[6]. In its region, Dabene is an outstanding example in terms of the quantity and quality of metal ornaments, but it is not the only case in question. A striking degree of local variability can be seen in the jewellery production.

The Jewellery Repertoire of the EBA Eastern Balkans

In the eastern Balkans, a wide variety of jewellery forms was created by the EBA masters, using different techniques. Metal ornaments were designed to adorn the head, the neck, the hands and the clothes. They appear in graves as a part of the deceased's costume, but there are also ornaments found in settlements or as accidental finds (Fig. 1). The development of the EBA jewellery production in the eastern Balkans can be traced through the appearance of the first adornments made of precious metals in the first phase of the EBA to its flourishing in the EBA III – the results of which are the gold ornaments from the cemetery with ritual structures at Dabene.

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2 Maxwell-Hyslop 1960, 106.
3 Bass 1970, 340.
4 Laffineur 2008, 323.
5 Primas 1996.
6 Hristov 2015.

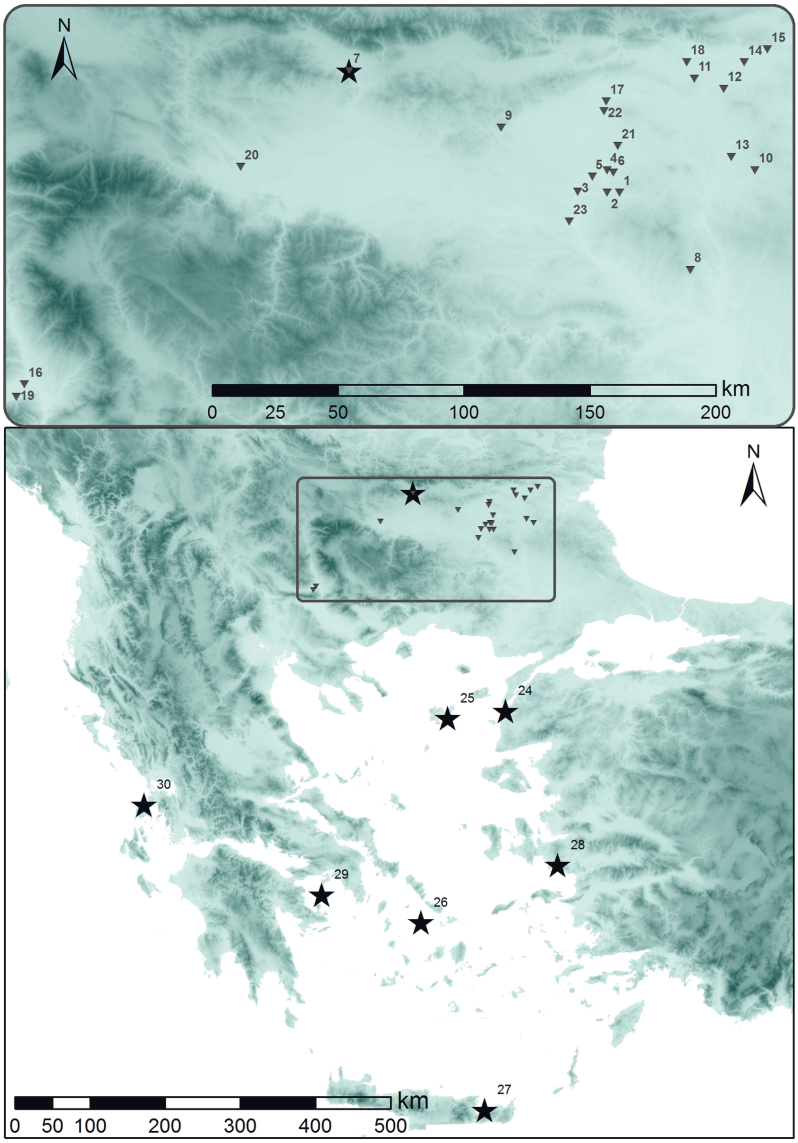

Fig. 1 Distribution of jewellery items during the 3rd millennium BC in Thrace and main centres of jewellery production in the Aegean region. 1. Tell Mudrets; 2. Necropolis Mednikarevo-Iskritsa; 3. Tell Galabovo; 4. Necropolis Goliama Detelina; 5. Necropolis Troyanovo; 6. Settlement Ovchartsi; 7. Necropolis with ritual structures, Dabene; 8. Settlement Mihalich; 9. Tell Sveti Kirilovo; 10. Necropolis Popovo; 11. Necropolis Drazhevo; 12. Necropolis Mogila; 13. Necropolis Boyanovo; 14. Necropolis Straldzha; 15. Necropolis Venets; 16. Treasure Rupite; 17. Tell Ezero; 18. Necropolis Gabrova mogila; 19. Treasure Petrich; 20. Tell Yunatsite; 21. Necropolis Pet mogili; 22. Tell Dyadovo; 23. Tell Konstantsia; 24. Troy; 25. Poliochni; 26. Syros; 27. Mochlos; 28. Baklatepe; 29. Kolonna; 30. Leukas (map: Z. Vasileva, M. Anchev)

Each category of ornaments produced in the eastern Balkan regions during the EBA has its peculiarities and offers different regularities in its occurrence. The present research does not pretend to give a detailed review of the jewellery production, but aims to present the most important characteristics. The majority of the metal adornments pertain to kinds and types previously unknown in the eastern Balkans. For this reason, the EBA jewellery demonstrates changes in the aesthetic conceptions of the local societies, as well as the many-faceted affinities and local innovations.

The head seems to have been the primary locus for the display of gold and silver jewels, in the form of hair-rings and earrings. These types of adornments were among the first jewels that occurred at the beginning of the EBA. With the passage of time during the phase of EBA II–III, the number of metal ornaments increased and new classes of jewellery appeared – pins,

applications, necklaces with beads, different types of earrings and hair-rings. Among them there are also unique jewels, characterized by the unusual choice of shape, as well as the absence of parallels in the contemporary cultures.

The Phenomenon of the Metal Hair Ornaments

Hair ornaments made up from small differently shaped metal rings appeared in the very beginning of the 3rd millennium BC. The distributional grounds of the metal hair-rings form an arch spreading in a large geographical and cultural area – Middle to Lower Danube and northern Caucasus, the Balkans, the northeast Aegean, Anatolia, Syria and Mesopotamia. Early graves with spiral hair ornaments date back to Usatovo Culture contexts of the second half of the 4th millennium BC. At the cemetery Usatovo barrow I-13, grave 4, four spiral hair-rings made of silver wire twisted spirally in 1.5 coils are found.[7] Find sites of hair ornaments from the late 4th millennium BC and 3rd millennium BC range from the southern Caucasus to the western Carpathian Basin, but their main area of distribution lies in the North Pontic region. Considering the development of the hair-rings in the Northwest Pontic region, Svetlana Ivanova described the 3rd millennium BC as a 'silver age'.[8] The fashion of metal hair ornaments continued its development during the 3rd millennium BC. Bianca Preda considers the hair ornaments as prestige goods of a small elite class.[9] Spiral hair ornaments made of precious metals were also fashioned in the eastern Aegean, Anatolia and the world beyond. Similar ornaments appeared in burial contexts at the EBA cemeteries Karataş-Semayük[10], Demircihöyük-Sarıket[11] and Küçükhöyük[12] or rich burial complexes such as Arslantepe[13], Alaca Höyük[14] and Ur[15]. Spiral hair rings are also known from the famous treasures of Troy[16]. Spiral hair ornaments circulated in vast geographic and cultural regions. As demonstrated by the examples above, they represent a supraregional piece of jewellery. During the second half of the 3rd millennium BC, in central Europe gold spiral hair ornaments appeared in both female and male burials as evidence of social stratification. Harald Meller suggests that this form of adornment was associated with braided hairstyles and served as a sign of distinction for a social elite.[17]

Especially interesting is the striking alignment of hair ornaments in the territory of the Balkans and especially the Upper Thracian Plain. In the Danube-Carpathian region, metal hair-rings are frequently found in barrow graves,[18] and hair ornaments are also found in barrow graves south of the Danube (Fig. 2). It is suggested that the local population accepted and adapted the hair ornaments as a result of interactions with the bearers of the so-called Pit-Grave Culture at the very beginning of the 3rd millennium BC.[19] The rings were primarily manufactured in gold and silver, but there are also many examples produced from copper or arsenical bronze. Based upon their formal design, the hair-rings found in the eastern Balkans can be divided into several types: spiral hair rings with 1.5 coils, spiral rings with 2.5 coils and rings with one full coil and backwards curves. The most frequent variation is the spiral form with 1.5 coils, made of metal wire with a circular cross-section (Fig. 3). Usually found near the head of the skeleton, it is assumed

7 Patokova 1979, 109.
8 Ivanova 2007, 87.
9 Preda 2015, 22.
10 Mellink – Angel 1970, 245.
11 Seeher 1991, 63–64.
12 Gürkan – Seeher 1991, 90.
13 Nocera et al. 2001, 108.
14 Maxwell-Hyslop 1971, 45, fig. 31b.
15 Pittman 1998, 108.
16 Antonova et al. 1996, 120, nos. 133–134.
17 Meller 2014, 611; Meller 2019, 285.
18 Motzoi-Chicideanu – Olteanu 2000.
19 Alexandrov 2009, 10–11.

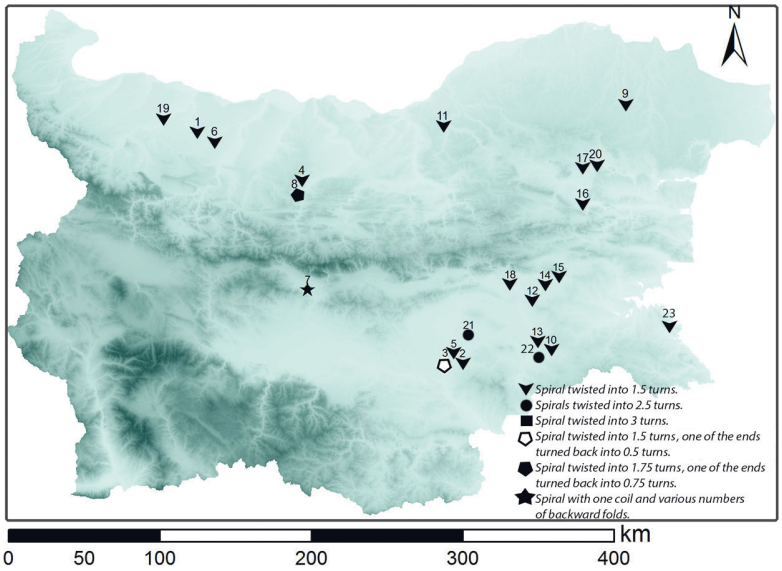

Fig. 2 Distribution of metal hair-rings during the Early Bronze Age in the territory of Bulgaria. 1. Turnava; 2. Mednikarevo-Iskritsa; 3. Galabovo; 4. Goran-Slatina; 5. Troyanovo; 6. Turnak; 7. Dabene; 8. Lovech; 9. Zhegliartsi-Orliak; 10. Popovo; 11. Plachidol; 12. Mogila; 13. Boyanovo; 14. Stralzdha; 15. Venets; 16. Smiadovo; 17. Madara; 18. Gabrovo mogila; 19. Mihailovo; 20. Kalugeritsa; 21. Pet mogili; 22 Malomirovo; 23. Silihlyar (map: Z. Vasileva, M. Anchev)



Fig. 3 Silver spiral hair-ring from the Early Bronze Age necropolis Troyanovo (photo: F. Ostmann/OeAW-OeAI)

that strands of hair were threaded through the hair-rings.[20] The distribution map shows the concentration of hair-rings with 1.5 coils in an area framed by the Maritsa and Tundzha rivers in the modern districts of Stara Zagora, Sliven, and Yambol. Actually the production of metal hair-rings with 1.5 coils represented a superregional phenomenon that was spread over a wide geographical range – the Balkan-Carpathian region, the eastern Aegean, central Anatolia, Syria and Mesopotamia.

[20] Vasileva 2016a.

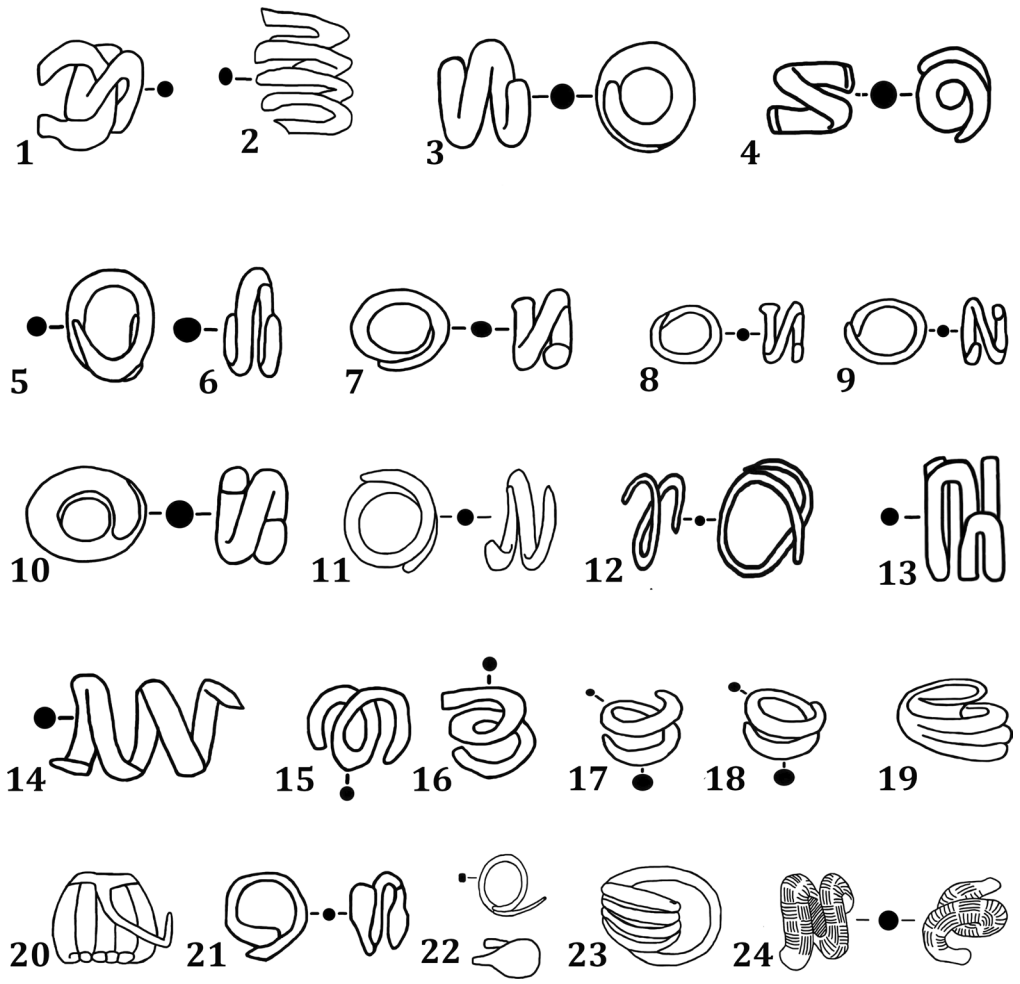

Fig. 4 Different types of metal hair-rings from the 3rd millennium BC. 1. Usatovo, barrow I-13 (Patokova 1979, fig. 30.10); 2. Usatovo, barrow I-13 (Patokova 1979, fig. 30.11); 3. Celei (Nica 1982); 4. Zimnicae, grave 11 (Alexandrescu 1974, pl. 8); 5. Goran-Slatina, barrow 3, grave 8 (Kitov et al. 1991, fig. 72); 6. Goran-Slatina, barrow 3, grave 8 (Kitov et al. 1991, fig. 72); 7. Turnava, barrow 3, grave 1 (Alexandrov 2009, fig. 1.7); 8. Turnava, barrow 3, grave 1 (Alexandrov 2009, fig. 1.13); 9. Mihailovo (Alexandrov 2009, fig. 1.8); 10. Turnak, grave 1 (Alexandrov 2009, fig. 1.11); 11. Straldzha, barrow 1, grave 1 (Alexandrov 2017c, fig. 6.1); 12. Mednikarevo-Iskritsa, barrow 3, grave 8 (Panayotov, Alexandrov 1995, fig. 10); 13. Galabovo (Leshtakov 2002, 179); 14. Pet mogili, grave 3 (Kuncheva-Ruseva 1994, fig. 5); 15. Troyanovo, barrow 1, grave 1 (Panayotov 1989, fig. 30); 16. Troyanovo, barrow 1, grave 3 (Panayotov 1989, fig. 32); 17. Troy, treasure F (Maxwell-Hyslop 1971, fig. 33.a); 18. Troy, treasure F (Maxwell-Hyslop 1971, fig. 33b); 19. Troy, treasure D (Maxwell-Hyslop 1971, 51); 20. Troy, treasure D (Maxwell-Hyslop 1971, 51); 21. Küçükhöyük, grave 84 (Gürkan – Seeher 1991); 22. Demircihöyük, grave 372 (Seeher 2000, fig. 43); 23. Eskiyapar treasure (Özgüç – Temizer 1993, pl. 110); 24. Alaca Höyük (Maxwell-Hyslop 1971, fig. 31)

The wide geographical distribution of superregional forms, such as the hair-rings with 1.5 coils, demonstrates clearly how this type of hair adornment was already understood and probably used symbolically in the 3rd millennium BC (Fig. 4). It seems that the development of these small ornaments can be taken as an indicator for similar socio-cultural trends over large geographical and cultural regions. Their significance may be better understood from the perspective of the role these rings played in the visual expression of social messages. The anthropological and ethnological studies have demonstrated that jewellery usually represents a means of social communication contributing to visual expression.[21]

[21] Eicher 1995.

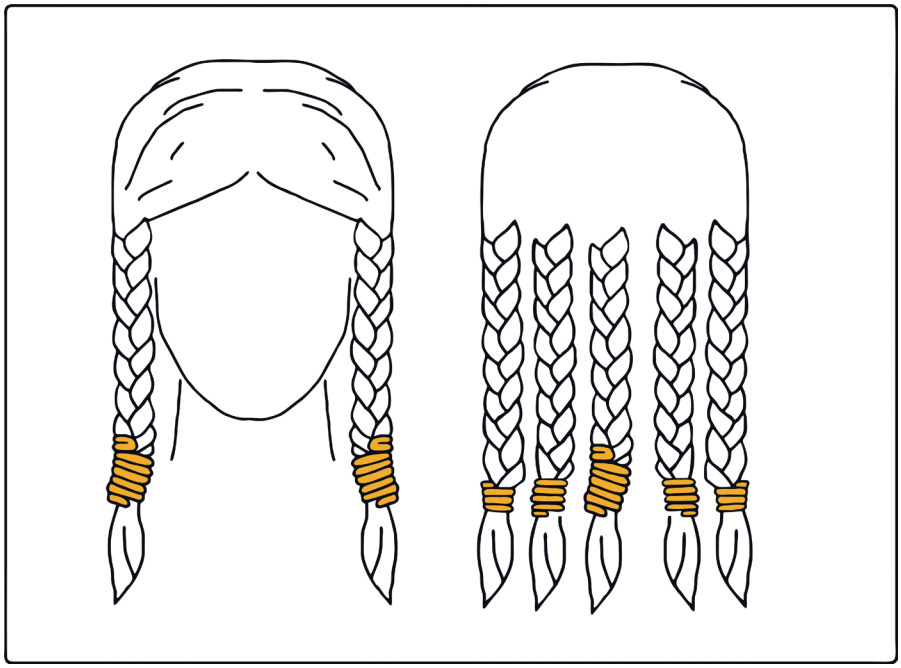

Fig. 5 Reconstruction of a braided hairstyle with gold Dabene-type rings, Early Bronze Age III (after Vassileva – Minkov 2017, fig. 2)

A new kind of adornment is often associated with a new custom expressing particular social identities. For the purpose of this research, the appearance of a new local type of hair ornament which would become one of the emblems of emerging social groups in the EBA societies of the eastern Balkans (Fig. 5) is especially interesting. In the cemetery with ritual structures at Dabene, dated to the EBA III period, a type of gold ring with one full coil followed by different numbers of backward folds is attested. More than 50 spiral hair-rings of this type were found at the so-called ritual structures during the archaeological excavation conducted by Martin Hristov. Here ritual structure no. 5, where more than 5470 gold items were discovered, should be mentioned. Among the gold jewels were various beads, spacers and hair-rings. The structure has an absolute date MAMS-23529 measured on charcoal: 3963 ± 23 BP, 2569–2353 calBC (95% confidence).[22] Comparable hair adornments had been found along the upper and middle courses of the Danube in complexes that date to the Middle and Late Bronze Age. Bearing in mind the later parallels, Hristov suggests that the earliest hair-rings with one full coil and backward folds so far came from the area of the eastern Balkans.[23] The appearance of a new local type of hair adornment is probably due to an innovating tendency among the local population and illustrates the artistic development of the local population.

The hair-rings form a special group of adornments with a particular significance not only due to their precious material, but also because of their symbolic meaning. It can be assumed that this form of adornment was associated with a specific braided hairstyle or that the rings were sewn onto a head scarf. Hair ornaments could be easily dismantled and rearranged for different occasions. The occurrence of different types of metal hair-rings in the EBA eastern Balkan regions is likely no coincidence, but it actually reflects the trends in the development of metal jewellery, as well as technological innovations. The art of adorning oneself was probably a powerful cultural symbol and ornaments were modified according to cultural norms and personal preferences. So

[22] Hristov 2015, 486, 492, figs. 4–5, tab.2.
[23] Christov 2008, 223.

far, we can suggest that hair adornments were among the most popular and important ornaments in these areas during the EBA.

Earrings

The second category of head ornaments includes metal earrings. During the EBA, earrings were most probably ornaments that were suspended from the ear by a ring, wire or a hoop, or stuck directly through or into the ear. There is no definite evidence that EBA people pierced their ears, and for this reason we can suggest that the earrings could also be sewn onto a headscarf, close to the area of the ears[24].

In the eastern Balkans, earrings of EBA date can be made of arsenical bronze, copper, gold and silver. They were most probably worn individually or in pairs. The most common types are simple open earrings or earrings in a crescent shape (the so-called Zimnicea type). In terms of skills and design these ornaments are simple, made of metal wire. However, the crescent earrings are of interest because they belong to a northern tradition accepted and adopted by the local population in the eastern Balkans.[25] An association between crescent rings and spiral hair-rings with 1.5 coils is documented in several cemeteries in present-day Bulgaria and Romania[26]. In the southern part of this area, these ornaments were most probably reproduced under northern influence by the local masters starting at the beginning of the EBA I and became common adornments during the EBA II and III periods.

Among the metal ornaments of the EBA eastern Balkan repertoire, the rings of type Leukas – characterized by a drop-shaped form with narrow and pointed ends – deserve special attention. It is suggested that this type of metal adornment was used as a hair-ring or earring. The territorial framework of the Leukas type includes the territory of the West Aegean, the Balkans and the Carpathian Basin. Recent research by the author has demonstrated that it is possible that the drop-shaped design of the Leukas-type ornaments has a Balkan origin and that the type represents a Balkan influence in the Aegean EBA jewellery.[27] The existence of similar ornaments crafted from precious metals should not come as a surprise; it rather confirms the idea of contacts between distant regions. The rings of the Leukas type were probably introduced in the eastern Balkans as a result of contacts. Here the type is attested at Tell Yunatsite in one gold ring;[28] one gold ring is known from the Venets cemetery, dated in EBA III;[29] and a silver ring is known from the so-called Petrich treasure, dated to EBA III.[30] Here one of the most recent finds coming from barrow 4 in Silihlyar locality near Primorsko, where silver spiral hair-rings were found attached to gold rings of the Leukas type, should also be mentioned. The burial belongs to a young woman. The ornaments were found close to the skull[31] and were probably embedded in the hairstyle of the young woman. There are different reconstructions regarding how the rings were worn – as earrings or as hair ornaments. It can be suggested that the rings were worn in different manners according to the style and the practice of the local societies. It seems that during the EBA, the manner in which metal ornaments were worn had a different meaning from one community to another. The distribution of Leukas-type rings serves as an excellent example of how common codes were developed, accepted and adopted in a broad geographical area.

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24 Iconographical evidence comes from Late Bronze Age frescoes on Thera and from the jewel fresco from Knossos (Higgins 1980, fig. 9).

25 Vasileva 2016a, 12–13.

26 Cf. the Zimnicea necropolis (Alexandrescu 1974) and the Goran-Slatina necropolis (Kitov et al. 1991).

27 Vasileva 2017, 10.

28 Mikov 1940, fig. 18.

29 Vasileva 2017, 4, fig. 3.3.

30 Alexandrov 2017b, 124; Alexandrov – Chukalev 2018, 468, cat. no. 105.

31 Balabanov – Pantov 2019, 108, fig. 3.



Fig. 6 Necklace of silver beads, silver and gold spiral hair-rings, Troyanovo, Chernyova barrow, second quarter of the 3rd millennium BC (photo: F. Ostmann/OeAW-OeAI)

Neck Ornaments

Strings or necklaces with metal beads were also quite popular in the eastern Balkans (Fig. 6). Beads are among the most popular ornaments in the prehistoric societies. They are often described as small symmetrical ornaments, perforated in order to be strung together. The variety of metal beads in the eastern Balkan regions is represented by various shapes – spherical, oval, cylindrical, biconical, ring-shaped beads, etc.[32] Metal beads were fashioned from gold, silver or arsenical bronze. A great diversity of gold beads is found in the cemetery with ritual structures at Dabene – small flat beads (some of them decorated with notches along the periphery), spherical, biconical, ring-shaped, pyramidal and long tube-shaped beads.[33] During the EBA in the Aegean-Anatolian world, beads similar to those in the eastern Balkans were quite popular and common. The most representative collection comes from the treasures of Troy,[34] but there are also many parallels in mainland Greece, on the Cyclades and on Crete.[35] Regarding the typology of the EBA beads from the eastern Balkans, it is important to note the presence of beads in pyramidal shapes, which are missing from other contemporary regions. They appear to be one of the local innovations.[36]

Apart from small beads used as components of necklaces, pendants were most probably also used in the eastern Balkan regions. A unique artefact belonging to this category is a miniature bronze jug, found in the EBA settlement Ovcharitsa II.[37] The jug has a round bottom and it was probably threaded through the handle. A comparison can be made with a similar pendant from

32 Vasileva 2016a, 17–20.
33 Hristov 2015, 486.
34 Antonova et al. 1996, 79–99, cat. nos. 78–101.
35 Branigan 1974, 39–40.
36 Hristov 2015.
37 Kančev – Kančeva-Ruseva 1996, 227–238.



Fig. 7 Necklace with gold beads and spacers from the necropolis with ritual structures Dabene, Early Bronze Age III (Alexandrov 2018, 39)

the Thyreatis treasure, Peloponnese, dated to the Early Helladic III period. The Thyreatis pendant is interpreted as a component of a necklace and it was also probably threaded through the handle.[38] Actually during the 3rd millennium BC in the Aegean, the form of the pendants represented different objects (weapons, pottery, etc.)[39]. Jewellery probably played an important role in the visual expression of the identity, rank or social function of the wearer. A similar suggestion can be proposed for the pendants found in the EBA eastern Balkans. Very important examples that deserve attention are the gold adze-shaped pendants known from the cemetery with ritual structures at Dabene. [40] Similar pendants are also known from Treasure A[41] at Troy and Tell Banat [42] in Syria. These pendants were probably symbols of power and had special social symbolism.

Among the components of the EBA necklaces, there are also artefacts known in the archaeological literature as spacers. So far, the only site in the eastern Balkans that has yielded this type of necklace components is the cemetery with ritual structures at Dabene. Two types of separators are represented here: oblong rectangular bars with rounded ends and longitudinally oriented holes (3 to 11 holes) and rectangular spacers made of tubes wrapped in gold foil (3 or 6 tubes) (Fig. 7). [43] The number and the variety of the spacers and beads found in Dabene are more than impressive. How exactly the spacers and the beads were arranged is not clear, but several reconstructions are proposed. It is suggested that spacers are objects used to arrange beads and pendants in simple or compound strings – several rows of different or identical types of beads, separated in rows by spacers.[44] Similar reconstructions are also proposed for gold spacers found in the treasures of Troy.[45] Another interesting observation is that only a few EBA sites yielded gold spacers: Troy,[46] Poliochni,[47] Velika Vrbitsa,[48] Tell Banat,[49] Tepe Hissar and Ur.[50] Similar objects made from bone are known from central Europe and Romania.[51] The separators form a special group of a necklace's components. The gold examples are found in only a few sites, but in a wide geographical range. In this sense, they make an important contribution to our knowledge of jewellery impulses and the presence of supraregional ornaments. On the other hand, the rarity of golden examples in such a wide geographical area illustrates the special meaning of such luxury goods among the EBA communities.

38 Reinholdt 1993, 9, fig. 10.B.3.
39 Konstantinidi 2001, 23.
40 Hristov 2005, 130–133.
41 Antonova et al. 1996, 79–99, cat. nos. 78–101.
42 Porter 2002, 18–21, figs. 7–10.
43 Tsintsov et al. 2009, 7.
44 Hristov 2005, figs. 4–5.
45 Treister 1996, 214–215.
46 Antonova et al. 1996, 99, cat. no. 101.
47 Bernabò-Brea 1976, pl. CCL. 41, CCLI. 11.
48 Hartmann 1970, pl. 28, Au 1573.
49 Porter 2002, 18–20, figs. 7–10.
50 Müller-Karpe 1974, pl. 173.8–21.
51 Popescu 2003.

Hand Ornaments

During the EBA, arm/ankle jewellery was not common in the eastern Balkans. However, arm bracelets do exist in the local repertoire. A bronze bracelet from Mihalich deserves special attention. The bracelet was produced from a wire with a circular cross-section. The ends were formed as circular plates, decorated with incised decoration.[52] The item does not show close similarities with other examples from contemporary jewellery centres, and so far we can interpret it as a unique product of the local artisans[53].

Metal bracelets, made of silver, are known from the stray finds at Rupite[54] and Petrich.[55] The preserved examples show us that the use of bracelets in the eastern Balkans seems random, in contrast to the Aegean and Anatolia, where metal arm bracelets were frequently manufactured.[56]

Accessories for Clothes

Metal dress pins also appear in the Early Bronze Age eastern Balkans. The preserved examples, produced from bronze, are found at settlements, and the exact way they were used is not clear. The number of metal pins in the eastern Balkan regions is small, but they show a considerable variety in the shape of the head – pins without a head; roll-headed pins; and pins with spherical, pyramidal or biconical heads. Although we are currently lacking evidence demonstrating how they were used on garments, they probably performed similar functions in the eastern Balkan regions as they did in the Aegean-Anatolian world.[57]

Of special interest is the appearance and distribution of the metal pins with spherical and hemispherical heads in the Aegean. According to Lorenz Rahmstorf, these pins, frequently made of tin bronze, seem to be related to people in the Aegean wearing Anatolian-style clothes. He suggests that the pins were distributed as trade goods by small groups of traders/metallurgists/specialists, reaching the Aegean from the east.[58] We can make the same suggestion for the occurrence of metal pins in the EBA eastern Balkans. As an argument here, we can point out the exact parallels in the Aegean and the archaeological context: settlements with indications for trade relations with the Aegean-Anatolian world. The spread of metal pins in the eastern Balkans shed new light on the relations between the eastern Balkans and the surrounding lands, especially the Aegean and Anatolia during the Early Bronze Age.

Gold, silver or bronze applications, pierced with holes for sewing, also appeared in the EBA. The most representative examples are the gold items from Dabene[59] and the silver applications from Rupite[60] and Petrich (Fig. 8).[61] Comparable applications were found in the Aegean-Anatolian world.[62] The silver applications decorated with *repoussé* from Petrich and Rupite show links between the production centres in the Aegean and the Banat at the end of the EBA.[63]

The production and use of jewellery in the eastern Balkans flourished during the EBA III period. The emergence of certain types of ornaments is most likely due to influences from the

52 Van der Meijden – Nikolov 2007, 114.
53 Vasileva 2016a, 21.
54 Katincharov – Avramova 1994.
55 Alexandrov 2017b, 125.
56 Branigan 1974, 43–44.
57 Vasileva 2016a, 22–26.
58 Rahmstorf 2015, 157–159.
59 Hristov 2015, 487.
60 Katincharov – Avramova 1994.
61 Alexandrov 2017b, 124, fig. 1.
62 Vasileva 2016a, 26–27.
63 Alexandrov 2017b, 125.



Fig. 8 Silver applications from the region of Petrich, Early Bronze Age III (photo: F. Ostmann/OeAW-OeAI)

southeast and direct contacts with the Aegean and Anatolia. The new imported products, styles and technological innovations were sometimes changed within the context of interactions and adapted to meet the local needs. At the same time, there are new types, which are probably local innovations and can be seen as further developments of gold jewellery-manufacturing traditions.[64] The gold items find parallels in the Aegean-Anatolian world, but also in central Europe. In this sense, the eastern Balkans were most probably part of a common circle of production and usage of metal ornaments in the 3rd millennium BC.

The EBA eastern Balkan repertoire is represented by various ornaments – hair-rings, earrings, necklaces with beads, pendants and separators, bracelets, pins and applications for clothes. The analysis of the main types of jewellery items indicates that the local societies were familiar with the main jewellery fashion trends, but at the same time, were able to produce and provide new types of metal ornaments. While discussing the jewellery phenomenon, we have to bear in mind that there are several defining components. On the one hand, these are the specific raw materials used for crafting jewellery, i.e. the different metals. On the other hand, there are some other specifics such as the technological level of the artisans, the needs of the users, the cultural norms. However, it needs to be emphasized that jewellery combines different economic and social aspects.

Craft Specialization

Evidence for craft specialization is still scarce in the eastern Balkans, but some attempt must be made to identify the masters if we are to understand the nature of craft specialism. The best model for such research is the model proposed by Keith Branigan for Minoan Crete. According to the author, the development of craft specialization in the 3rd millennium BC was a complex phenomenon in which many interacting factors were at work. Branigan proposed three categories of craft specialists: 1) full-time travelling (or itinerant) craftsmen; 2) full-time resident masters; and 3) part-time resident masters, who in addition did other kinds of work, e.g. in agriculture.[65]

In order to understand the crafting logic of the local artisans, first we need to discuss the choice of raw materials. Gold, silver, arsenical bronze and copper were employed in the EBA for producing items of jewellery. The techniques used by the local masters have never been the subject of a detailed study, but the already published studies on this subject allowed us to suggest that hammering, casting and sintering were practised by the local masters. The disposal shows us that along with the average craftsmen in the eastern Balkans, work was done by jewellers and goldsmiths, who made a valuable contribution to the EBA jewellery[66]. One of the greatest challenges in the study of prehistoric jewellery production is identifying the artisans behind the adornments

64 Hristov 2010, 309; Vasileva 2016b, 229.
65 Branigan 1983, 24–26.
66 Tsintsov et al. 2009, 13; Tsintsov 2018, 65.



Fig. 9 Hoard of gold, silver and bronze objects, Rupite, Early Bronze Age III (after Alexandrov 2018, 39)

they created. The choices of the masters can be limited by the state of technological advancement, the raw materials and the preferences of the customers. Each ornament poses its own technological challenges. The exact organization of production in the eastern Balkan area is unknown, but based on the relevant information, we can discuss whether Branigan's model is applicable to these regions in the EBA.

The idea of travelling craftsmen during the EBA is not new,[67] but evidence to support the hypothesis has been slow to accumulate. However there are some indications for the presence of masters. An excellent example is provided by a hoard found in the region of Rupite (Fig. 9).[68] It is suggested that the hoard was found in a tumulus grave which was destroyed by treasure hunters. Judging from the rich inventory, it could be interpreted as the grave of a smith or jeweller. The grave gifts consist of gold, silver and bronze jewellery, a dagger, awls, chisels and nails, produced from arsenical bronze and thin sheet metal made of electrum. There are also silver and bronze wire fragments that may constitute the raw materials on which the artisan laboured. [69] Of special interest are both the inventory of the grave and its location. The area of Rupite is located close to the river Strymon, which was probably a link between the Aegean and the Balkans. Another example is the treasure of silver applications and bangles found in the region of Petrich. The silver applications from Petrich resemble the fine forging typical for the Aegean and the Near East. The finds from Rupite and Petrich show links between production centres in the north Aegean and Balkans at the end of the EBA.[70]

The emergence of unique single jewels may have derived from the taste and the artistic sensibility of the patrons and the artisans who worked and lived in the eastern Balkans. These unique finds shed new light on the EBA jewellers, who made a valuable contribution to the development of the local manufacture. However, people, especially craftsmen, probably travelled from one centre to another, bringing with them their tools, knowledge and experience.

67 Leshtakov 2011, 569.
68 Katincharov – Avramova 1994, 4–5.
69 Leshtakov 2011, 569; Vasileva 2016b, 229; Hristov 2018a, 467, cat. nos. 92–96.
70 Alexandrov 2017b, 125.

Whether there were full-time artisans in the eastern Balkans is still a tricky question. As Hristov has suggested, if we accept the hypothesis that gold ornaments from Dabene were manufactured locally, this would provide evidence for organized production and activity practised by specialized artisans. The pieces of gold jewellery found at Dabene demonstrate skilled know-how in crafting gold ornaments. The artisans successfully used the technique of sintering and were able to produce hundreds of similar objects such as beads, hair-rings, spacers for necklaces, etc.[71] The scale of precision in the manufacture points to very experienced and skilful masters and 'know-how' in crafting pieces of jewellery. It seems that jewellers did not work in isolation and were thoroughly familiar with the contemporary fashion and technologies. In any case, as fine pieces of art, the Dabene artefacts represent one of the pinnacles of EBA workmanship in the eastern Balkans, and provide another much-needed glimpse into the EBA metalworking traditions, which are still not fully understood.

Concerning the third category, we can suggest that the simple ornaments found in the eastern Balkans were produced by artisans or masters, also manufacturing tools and weapons and working with different raw materials – copper, bronze and precious metals. Unfortunately, so far no workshops for metal weapons, tools or ornaments have been examined in these regions, and we can only make suggestions about how the local masters were organized. Nevertheless, with regard to the craft development of that period, it is also worth noticing the leap taken in the artistic manufacturing of metal objects – both in the balance of shapes, as well as in the variety of raw materials used.

Conclusion: 'Making the difference': Crafting jewellery in the Eastern Balkans during the EBA

The analyses above show clearly that the quantity and the quality of the eastern Balkan jewellery can be compared with the developed EBA jewellery centres. The fact that some of the ornaments appeared due to influence from the Aegean-Anatolian world can be used as one of the arguments that the eastern Balkans were an integral part of the EBA exchange networks (cf. the models of the Anatolian Trade Network and the Great Caravan Route).[72]

The presence of developed jewellery production brings into discussion the possible presence of certain ranked individuals in well-organized communities, capable of obtaining items of jewellery through exchange or ordering their manufacture locally. Some ornaments were adopted from neighbours or by wide-ranging goods exchange and cultural contacts; other ornaments represent the local EBA society itself. The synthesis of these elements creates the aspect of the local jewellery fashion. From the point of view of the jewellery, the eastern Balkans can be considered as a region of local artistic creativity and a place of influence for the Balkans. The creativity and originality of the Thracian craftsmen manifests itself in the way they assimilated ideas from other cultures which they adapted to their traditions or how they created their own unique shapes. The analysis shows that impulses were received from different directions as a result of intensive interactions.

The analysis of the jewellery production underlines the fact that the EBA eastern Balkans do not have to be regarded only as being receptive of foreign knowledge, but also as a region with its own artistic activities, possibly influencing other parts of southeastern Europe as well. With the exploitation of local resources and the flourishing of jewellery production during EBA III, the eastern Balkans played an important part in the overall 3rd-millennium BC *jewellery koiné*.

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71 Hristov 2010, 310; Hristov 2018b, 340.

72 Şahoğlu 2005, fig. 1; Efe 2007, fig. 17a.

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Contacts between Anatolia, the Aegean, Southeast and Central Europe: The Significance of Four Middle Bronze Age Bone Objects from Shekerdzha Tumulus

Petar P. Minkov[1]

Abstract: The main purpose of this article is to comment and study the Middle Bronze Age engraved bone objects from the Shekerdzha mound, Kamen, Sliven District. These objects were recovered during the rescue excavations of the mound. They represent grave gifts. The finds most likely belong to artefacts such as sceptres and/or other regalia. This hypothesis was suggested in the first published paper about investigation of the mound.[2] The objects at the Shekerdzha mound are presented as evidence showing the cultural contacts between distant areas like Anatolia and the Aegean with central Europe and the western Balkans during the Middle Bronze Age. These finds are so far unknown in the territory of Bulgaria, but are very well represented in Anatolia, southern Greece and central Europe (in the region of Hungary, parts of Romania, Slovenia and Slovakia). Consequently, the study is focused on the reasons for the presence of these finds in the eastern Balkans. An attempt has been made to explain the origin, routes of penetration and distribution and cultural determination and to refine the chronology of the artefacts.

Keywords: Middle Bronze Age, bone artefacts, contacts, central Europe, Anatolia, the Aegean, Upper Thrace

Recently during rescue excavations of the Shekerdzha tumulus, Sliven District, Bulgaria, three extraordinary bone objects were detected. They have rich engraved decoration. In the initial publication, they were treated as sceptres or amulets. The aim of this article is to clearly document their cultural origin, chronology, function and interpretation.

Previous Research: Archaeological Context

The finds were detected during archaeological excavations of the Shekerdzha tumulus[3] (Fig. 1). It is located 1km north of Kamen, Sliven District.[4] The original dimensions of the tumulus were 5m high, with a diameter at the base of c. 43–47m. The tumulus consists of a few distinct embankments relating to different periods. Several graves from the Early and Middle Bronze Age periods have been excavated, as well as one grave dated to the 4th century BC.[5]

The bone finds were discovered in grave no. 1 (Fig. 2). This is a rectangular grave pit (east-west orientation). Its dimensions are: length: 1.55m (E–W); width: 0.75m (N–E). In the grave, the skeleton of a 25–30-year-old man was found.[6] The position of the skeleton is on its back with flexed legs – semi-hocker. The fill of the grave pit consisted of a dark-brown soil, including organic remains.[7] The first bone object was discovered around the neck, while the other two were

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2 Dimitrova 2014, 78.

3 The excavations were conducted by Diana Dimitrova, Department of Thracian Archaeology, National Archaeological Institute with Museum, Bulgarian Academy of Sciences (NAIM-BAS).

4 Dimitrova et al. 2012, 109.

5 Dimitrova et al. 2012, 109–111; Dimitrova 2014, 76.

6 Dimitrova 2014, 78.

7 Dimitrova 2014, 78.

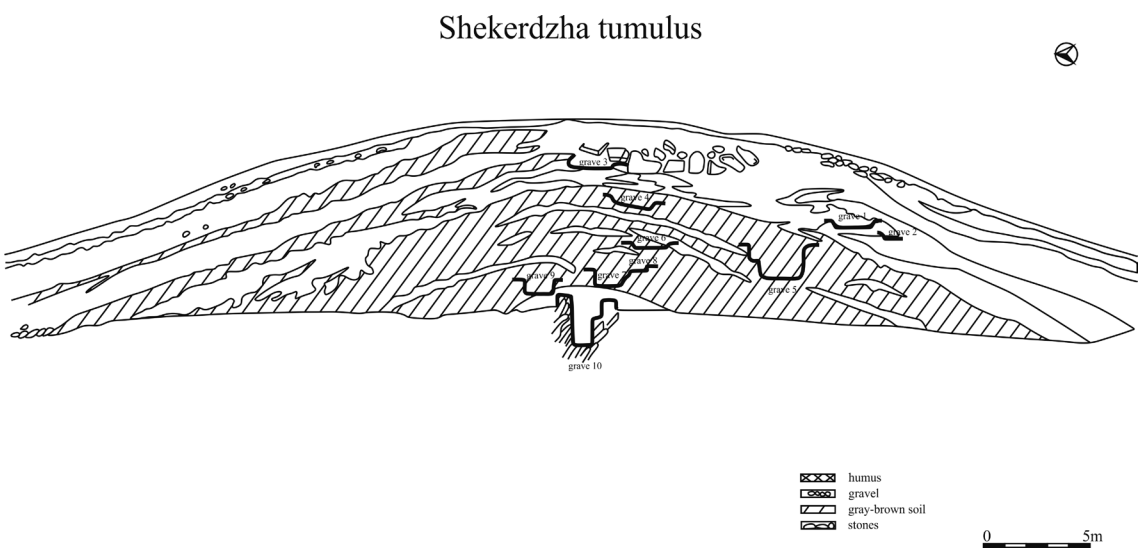

Fig. 1 Shekerdzha tumulus, cross-section (adapted by the author after Dimitrova et al. 2012, 109, fig. 1)

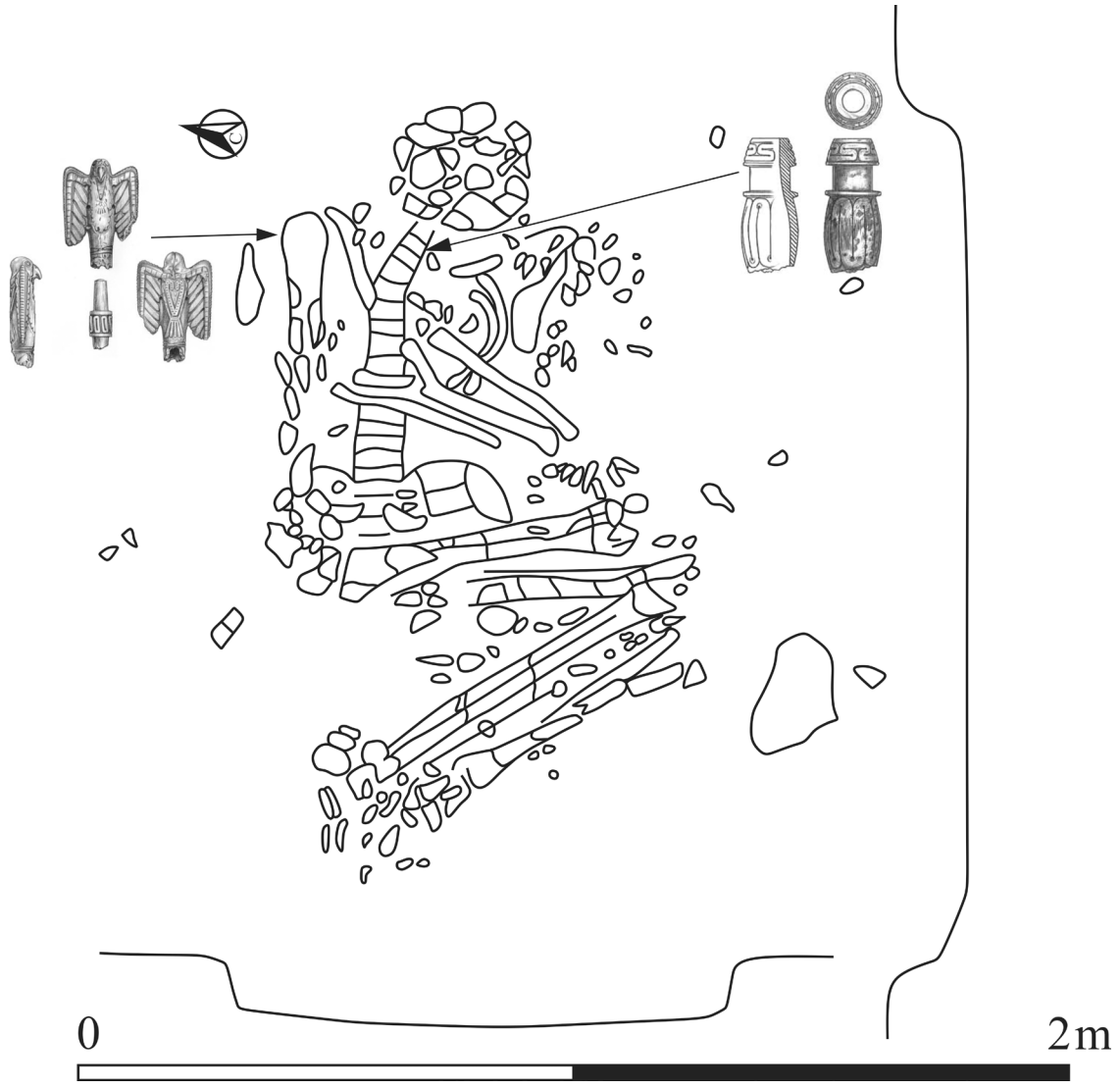

Fig. 2 Shekerdzha tumulus, grave 1; localization of the bone artefacts (adapted by the author after Dimitrova 2014, 77 fig. 9.5, grave 1 – bottom left)

found in the shoulder area (Fig. 2).[8] Bronze rivets were detected near the right shoulder. There is no mention of any other object in this grave, nor any evidence for later intrusions.

The Finds

Four bone objects were unearthed (Fig. 3.I–II). They consist of two eagle-shaped figurines[9] and two cylindrical/ovoid objects. All artefacts are fragmented. They are probably made of bone or antler.

The eagles are rendered in great detail. Each of the anatomical details of the body is depicted perfectly (Fig. 3.I).[10] The dimensions of the well-preserved one are: height: 3.65cm; width: 2.45cm (measurement at the level of the wings); thickness: 1.05cm; length: 2.2cm.

The better preserved figurine is the upper part of an object which was hollow inside. The figurine represents a bird of prey (probably an eagle or a falcon?) with folded wings (untied wings) with a height almost equal to that of the head of the bird. The head has an oval shape. To make the eyes, copper rivets were inserted. The beak was added later. The plumage of the body was rendered in relief below the beak. Two to three horizontal lines were incised below the body (just above the break). The feathers were rendered in relief by deep incisions and modelling of each individual wing. There is a 'V'-shaped symbol on the back of the bird, with edges curved inwards like volutes. At the lower end of this ornament, five feathers of the tail were embossed. The lateral edges of the wings were covered in short incisions – evenly spaced from one another.

The third artefact is more fragmented. It has a cylindrical/conical shape and a circular cross-section (Fig. 3.I). According to the scale, its height is c. 2–2.5cm, and its maximal thickness 1cm. The middle part of the body has a cylindrical profile. This part is decorated in relief with recurrent engraved motifs, namely vertical ellipses. They terminate above and below with horizontal edges in relief.

The fourth object is also fragmented. It has an oval/cylindrical profile and circular cross-section (Fig. 3.II). A hole is drilled through its centre. The dimensions of the artefact are: preserved height: c. 3.95cm; maximal diameter: c. 1.5cm; diameter of the hole: c. 0.5cm. The uppermost section of the artefact has a conical shape. This part was decorated with a spiral or meander motif, which was engraved with deep incisions. In Wolfgang David's typology, these decorative elements belong to the motifs constituting his type V, 'flattened wave meander'. The cylindrical part below this motif has a smooth and undecorated surface. It is separated from the ovoid (lower) part of the body by a protruding disc with an evenly cut edge. The surface of this part of the body is ornamented with dense vertical 'S'-shaped lines. At each individual curve, a circle with a central dot was engraved. This motif is described as type III, 'steep wave band ('pulley' motif)', according to the above-mentioned typology.[11]

The workmanship of the objects and their decoration is very impressive and suggests the use of different tools. These might be bronze or copper chisels, awl/stiletto, needles, and maybe leather for smoothing off the surface. The finds were most likely made of long tube bones or antler(?). The last suggestion is well known and documented from the literature, particularly deer antler.[12]

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8 Dimitrova 2014, 78–79, fig. 10.1–3.

9 The eagle-shaped sculptures are almost the same and have similar details, features and dimensions. One of them (the better-preserved one) has a defect on the middle of the left wing. The worse-preserved figurine is not described here because of its condition. The dimensions of the worse-preserved eagle are: height: 3.60cm; width; 2.60cm (measurement at the level of the wings); thickness: 0.85cm; length: 1.65cm. Two fragments of an undecorated cylindrical shaft – together longer than the bird sculpture – may have been part of this second figurine (Alexandrov et al. 2018, 494 cat. no. 241).

10 Alexandrov et al. 2018, 494 cat. nos. 239–241.

11 David 2007, 412.

12 David 2007, 412.

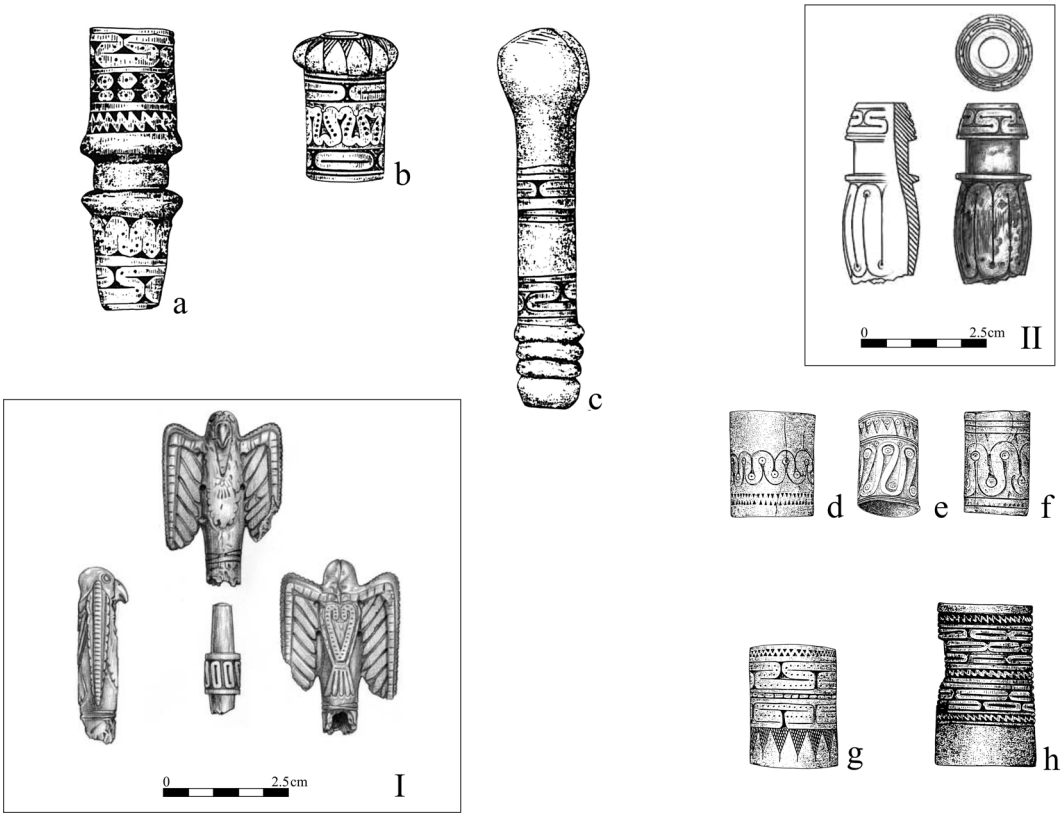

Fig. 3 Artefacts from the Shekerdzha tumulus and their parallels: I–II. Shekerdzha tumulus grave 1, scale 1:3 (Dimitrova 2014, 79, fig. 10.1–3); a. Kültepe/Kārum Kaniš (David 1997, 299, pls. 7–8; David 2007, pl. 104b1); b. Tószeg (David 1997, 299, pl. 7.1; David 2007, pl. 103j1); c. Vatin (David 1997, 299, pl. 7.9; David 2007, pl. CIVd1); d. Tiszafüred-Ásotthalom (David 1997, 302, pl. 10.2; David 2007, pl. 103v9); e. Otomani (David 1997, 302, pl. 10.3; David 2007, pl. CIIIv2); f. Pecica (David 1997, 302, pl. 10.1; David 2007, pl. 103v8); g. Tiszafüred-Ásotthalom (David 1997, 298, pl. 6.2; David 2007, pl. 104c1); h. Boğazköy (David 1997, 301, pl. 9.3; David 2007, pl. 103j3)

Parallels and Chronology

Parallels

There is no parallel in Bulgaria for the objects described here. Objects made of bone from the Early and the Middle Bronze Age in Upper Thrace and north of the Stara Planina Mountains are significantly different from the objects described here.

In the literature dedicated to these artefacts, only cylindrical objects and objects with an ovoid/cylindrical shape provide a relevant (if distant) analogy. It is the only published eagle-shaped bone object at the moment. In addition, one can mention some relief/plastic and sealed depictions of single-headed eagles from Mesopotamia. The appearance and distribution of this motif goes back to the 3rd millennium BC.[13] This iconography was accepted and widely distributed later on in the Hittite Kingdom.[14]

In neighbouring regions of eastern and southeastern Europe, there are some parallels for the two cylindrical objects from the Shekerdzha tumulus, especially regarding similarities in the decoration (Fig. 4). These are finds from: Kültepe, Anatolia (Fig. 3.a); Tószeg-Laposhalom,

[13] Chariton 2011, 10, fig. 12.

[14] The idea for a possible link between the Shekerdzha eagle and Hittite depictions of eagles was brought to my attention by Stefan Alexandrov.

Hungary (Fig. 3.b); Vatin, Serbia (Fig. 3.c); Tiszafüred-Ásotthalom, Hungary (Fig. 3.d); Otomani, Romania (Fig. 3.e); Pecica, Romania (Fig. 3.f); Tiszafüred-Ásotthalom, Hungary (Fig. 3.g); and Boğazköy, Turkey (Fig. 3.h).[15]

These similarities are related to the decoration of the artefacts. Concerning the shape, no similarities can be noticed except in the case of specimens with a cylindrical or cylindrical-ovoid central part. Partial similarities in shape are noted between one of the finds from Shekerdzha (Fig. 3.II) and the one from Kültepe (Fig. 3.a). These are the marked cylindrical-shaped transitions that are not decorated.

Analogies in the decoration concern objects with steep wave bands (Fig. 3.d–f) and others with flattened wave-meander bands (Fig. 3.a, c, g–h), while there is one analogous case for a V-shaped motif covered with negative dots (Fig. 3.b, I). Furthermore, one can mention that the 'flattened wave meander' present on the larger cylinder is found on several objects from the shaft graves at Mycenae and also on the stone stelae placed on the top of the graves.[16]

Differences from the quoted artefacts relate to the shape and type of the objects. Central European finds are cylindrical in shape or have a cylindrical body and profiled end parts of spherical/ovoid shape. On the examples from the eastern Balkans, there are no zigzag decorations, hanging or standing triangles, nor concentric circles with a dot. However, there are a number of elements that clearly show the direct similarity between the objects analysed from Upper Thrace and the neighbouring regions.

As is evident from their distribution, those objects are mainly concentrated alongside the Middle Danube, while two finds come from Anatolia.[17] The cited examples are cylindrical objects with a circular cross-section. Their dimensions usually vary from 1.8 to 7.2cm in height and 1.7 to 4.0/4.2cm in width.[18] Their surfaces are covered with engraved decoration. Several motifs can be organized in a linear composition. From the most common to the rarer, these include: spiral lines; spiral-meandered lines; zigzag lines; ellipsoidal ornaments; concentric circles with dot; hanging shaded triangles; and single incised lines. David proposes the following typology of motifs: III 'steep wave band ('pulley' motif)'; IV 'flattened pseudo-meander'; V 'flattened wave meander'; and X 'zigzag bands'.[19] According to him, these motifs are most widespread, a fact which can be explained in terms of interregional contacts.[20]

The archaeological contexts of the finds from central Europe are different settlement sites. Mycenaean Greece is a different case. Here, objects of this class were deposited in tombs (shaft graves and tholos tombs).[21] An exception to that is the case of Mitrou, were a horse-bridle toggle piece was found in a Late Helladic (LH) I context in elite Building H.[22]

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15 A large number of bone tube finds with incised decoration from the Aegean world have been published. They are significantly different from the objects described here and are excluded from the discussion. They have been investigated by Konstantina Saliari and Erich Draganits (Saliari – Draganits 2013).

16 David 2007, pl. 104.a1–a3, h1–h5.

17 These artefacts were published in many catalogues and publications alongside similar objects; see: Vladar 1974; Stuchlík 1993, 272–286; Harding 2000, 170–172; Šefčáková et al. 2010, 143–151. The publications regarding finds with engraved decoration from southern Greece are concerned with similarities between single motifs such as spirals, meander bands, etc. The development of different types of motifs and ornaments – spirals, meanders, 'S'-shaped motifs, concentric circles, as well as combinations of them, are described in detail in the monograph by Wolfgang David (David 2002). Nevertheless, the objects analysed in the quoted monograph are connected to the Apa-Hajdúsámson style. David sets out the differences between these styles (David 1997, 248–249).

18 David 1997, 284–287.

19 David 2007, 412.

20 David 2007, 412.

21 David 2007, 412.

22 Maran – van de Moortel 2014, 529–548. In the article, the find is dated at 17th–16th century BC.

This is shown by David, who presents a long list with sites and the find contexts of the relevant objects.[23]

The materials from the Carpathian-Danube region and Anatolia consist of a combination of motifs, some of which occur in Southern Greece.[24] David points out that the bone objects under consideration are widespread in the territory between eastern Bavaria/southern Moravia and the southeastern part of the Carpathian Basin.[25] According to him, these finds cannot be related to (a) specific cultural group(s). On the one hand, these objects were not imported from the North and/or the Near East in Mycenae (and the territories around it). On the other hand, they were not transported from southern and southeastern regions to the areas of the Carpathians and the Middle Danube either. However, the similarities in the decorative compositions and schemes are so prominent that they would not have been possible without the existence of direct contacts between these three areas.[26] Yet, it is difficult to determine where these objects came from and who were the bearers of the idea behind these kinds of objects and decorations. A conceivable route for the distribution of the artefacts from Anatolia towards the Carpathians and the Danube, as suggested by David, is to be sought somewhere in the Black Sea region.[27] This route passes by the region of the Shekerdzha tumulus. Thus, Upper Thrace, which remained as a gap in the distribution of the analysed artefacts, ceases to be a significant gap, as is clearly shown in Figure 4. Thus, the Shekerdzha finds give the answer regarding the distribution route via which either the knowledge and/or the objects themselves spread.

In his analysis, David formulates the idea that the finds under review were initially created in local cultures amidst different cultural groups/populations, while this process was originally influenced by elites. They had, likewise, the capacity to realize superregional relationships across considerable distances.

Valeriu Cavruc is broadly in agreement with David's ideas.[28] In his work, he mapped the distribution of the types of these finds. The highest concentration is located in the south of the Urals, the Middle Danube region and the Aegean.[29]

Kristian Kristiansen and Thomas Larsson are of the opinion that the engraved bone artefacts originally belonged to horse-harnesses. According to David, however, in Mycenaean Greece these ornaments are not restricted to the sphere of horse-riding etc., but they appear on many other object classes.[30]

Kristiansen and Larsson documented three regional trajectories of distribution of cheekpieces (depending on the type of object).[31] These geographical zones are: the space between the Urals and the Carpathians – with an influence from the Steppe tradition of crafting the bone elements for the harnessing of horses. The second zone includes the Near East and the eastern Mediterranean – in the mentioned territories, the finds were produced of bronze, but they are very close to others typologically. The third area includes eastern and central Europe, where these finds were made of antler.[32] The authors pointed out that the elements of the horse-harness are part of the

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23 David 1997, 277–289. According to some authors, these artefacts were primarily found in the tumulus graves in the Carpathian region and along the Middle Danube. This statement is not proven by substantial evidence. The circumstances of their discovery are not clear enough (Cavruc 1998, 96; Kristiansen – Larsson 2007, 28–29; Diaconu 2014, 179).

24 David 2007, 414.

25 David 2007, 413.

26 David 2007, 414.

27 David 2007, 413–414.

28 Cavruc 1998, 97–98.

29 According to this author, the distribution of these finds coincides with serious political and demographic changes in continental Greece related to the invasion of the Hyksos in Egypt and Palestine in around 1649–1541 BC (Cavruc 1998, 97–98).

30 David 2007, 412.

31 Kristiansen – Larsson 2007, 29.

32 Kristiansen – Larsson 2007, pl. 6c.

so-called ‘warrior/chariot package’, which contains a new version of the long sword, the bow, the arrow and the lance, with almost the same spatial distribution. The crafting traditions of these objects (in the aforementioned regions) are typical for the Aegean and Carpathian Basins. New contacts and interactions were thus established between the eastern Mediterranean and northern Europe.[33]

The data suggest that the best parallel for the artefacts from the Shekerdzha tumulus (in terms of the decorations) lay in the Carpathian Basin and, with some exceptions, in Anatolia. The finds from modern-day eastern and central Europe are part of the broader territorial context of the distribution of these artefacts. The appearance of such objects in the southeastern part of the eastern Balkans is logically conditioned by the availability of such materials in the closest distribution area – today Hungary and Romania – and they are also an element of the wider territorial range of their distribution. The appearance of such objects in contemporary Bulgaria attests to a new and unknown point (route) of penetration and transfer in the Old World.

Chronology

The dating of the finds from the Shekerdzha tumulus depends on two criteria: (1) the archaeological context; and (2) the relative and absolute chronology of analogous finds, as described above.

In the preliminary publication it was stated that these objects most likely dated to the Thracian/‘central Balkan’ Middle Bronze Age.[34]

In Bulgarian historiography there are several opinions about the beginning and the duration of the Middle Bronze Age in Upper Thrace. According to Yavor Bojadzhiev, this is the time between 2200/2000–1600/1550 BC – based on analyses of radiocarbon dates.[35] In Krassimir Leshtakov’s opinion there are no absolute dates based on radiocarbon samples for the Middle Bronze Age.[36] In recent years some absolute dates have been published (Tab. 1). These are three absolute dates from Dabene, which fall at the end of the second and beginning of the third phase of the Early Bronze Age, end of the third phase of the Early Bronze Age III and the beginning of the Middle Bronze Age. The dates are: MAMS-23529 (on charcoal): 3963 ± 23 BP (2558–2465 calBC [1σ]/2569–2353 calBC [2σ]); MAMS-23531 (on bone): 3414 ± 35 BP (1752–1645 calBC [1σ]/1873–1621 calBC [2σ]); MAMS-23532 (on bone): 3676 ± 37 BP (2134–1982 calBC [1σ]/2194–1948 calBC [2σ]).[37]

The author points out that the third date from structure 14, falling into the first half of the 2nd millennium BC (MAMS-23531), ‘… is well synchronised with the dates from the round enclosure near Bikovo, Sliven region’.[38]

Recently, Leshtakov and Zoï Tsirtsoni published new absolute dates from the Middle Bronze Age in Upper Thrace: (1) Cherna Gora, Bln-5368, with a calibrated age of 2290/2190–2180/2140 BC, and Bln-5346, with a calibrated age of 2140–2030 BC; (2) Bikovo enclosure (six samples), with calibrated ages between 2030–1900 and 1750–1620 BC;[39] (3) Radnevo, with a calibrated age of 1870–1680 BC; (4) Chokoba, two samples with calibrated ages between 2190 and 1980 BC; and (5) Tatul, with a calibrated age of 1930–1650 BC.[40] The authors pointed out three occupation periods of the Bronze Age, one of which – the time of the Middle Bronze Age in Bulgaria – should be set ‘between 2200/2000 and 1600/1500 cal BC, attested in at least three sites

33 Kristiansen – Larsson 2007, 29.
34 Dimitrova 2014, 80.
35 Boyadzhiev 2003, 25.
36 Leshtakov 2009, 58.
37 Hristov 2015, 492, tab. 2.
38 Hristov 2015, 490.
39 From Bikovo six ^{14}C dates are available, and they fall within the period in question (Leshtakov – Tsirtsoni 2016, 484–485, fig. 4).
40 The period stated derives from a summarizing of the available ^{14}C dates: Leshtakov – Tsirtsoni 2016, 482, 485–487.

Tab. 1 ^{14}C dates from Dabene, Cherna Gora, Bikovo, Randevo, Chokoba and Tatul (P. Minkov)

Site	Sample ID	Material	BP	calBC
Dabene	MAMS-23529	Charcoal	3963 ± 23 BP	2558–2465 calBC [1σ] / 2569–2353 calBC [2σ]
Dabene	MAMS-23531	Bone	3414 ± 35 BP	1752–1645 calBC [1σ] / 1873–1621 calBC [2σ]
Dabene	MAMS-23532	Bone	3676 ± 37 BP	2134–1982 calBC [1σ] / 2194–1948 calBC [2σ]
Cherna Gora	Bln-5368	No data	No data	2290/2190–2180/2140 BC
Cherna Gora	Bln-5346	No data	No data	2140–2030 calBC
Bikovo	No data	No data	No data	2030–1900 calBC
Bikovo	No data	No data	No data	1750–1620 calBC
Radnevo	No data	No data	No data	1870–1680 calBC
Chokoba	No data	No data	No data	2190 calBC
Chokoba	No data	No data	No data	1980 calBC
Tatul	No data	No data	No data	1930–1650 calBC

(Bikovo, Radnevo, Chokoba 18A). These dates coincide with those obtained from Tell Galabovo and the developed phase of Cherna Gora 1 enclosure …'[41]

The presented information can be summarized as follows: until recently, studies on Bronze Age chronology have been missing data on the start and duration of its middle stage. Absolute dates from several sites have recently been published, and they fall in a relatively similar period, extending from 2290 BC (at the earliest) to 1680/1650 BC (at the latest). Despite the limited number of absolute dates, it may be said that the Middle Bronze Age began in about the 22nd/21st century BC and continued until the end of the 16th century BC. This conclusion coincides with the opinion of the authors of the aforementioned study.[42]

Based on their archaeological context, it is hard to determine the precise dating of the Shekerdzha bone artefacts. According to the relative dating of materials detected in the other graves of the tumulus (presented below), the most likely date for the graves from the time when the Middle Bronze Age layer was deposited could be the end of the Early Bronze Age (phase III) and the beginning of the Middle Bronze Age.

The investigator determined two chronological periods for the erection of the mound.[43] The first of them is the Early Bronze Age. The embankment of the mound consists of dark-brown clay.[44] It includes six graves: nos. 10 (primary), 5, 6, 7, 8 and 9. The stratigraphic sequence from the bottom to the top is as follows: nos. 10, 9, 7 and nos. 8, 5, 6 (Fig. 1). The grave pits have a rectangular, oval or trapezoidal shape. Inventory has been found inside nos. 10 (flint arrowhead), 5 (four silver spiral rings of type IA2 according to Stefan Aleksandrov[45]), 7 (two silver spiral rings) and 9 (a silver spiral ring).

The second part of the chronological sequence belongs to the Middle Bronze Age. The 'later' mound consists of light-yellow clay[46]. There are three graves in it: nos. 1, 2 and 4. Stratigraphically,

41 Leshtakov – Tsirtsoni 2016, 488.

42 Leshtakov – Tsirtsoni 2016, 488: 'Taken altogether, and with the dates already available from other sites in Bulgaria, the new dates cover the whole third and second millennium BC. They fill, in particular, in a definite manner the presumed gap of the early second millennium BC, bridging the interval that separated the last dates of the Ezero-Nova Zagora-Yunatsite horizon, around 2200–2000 cal BC, from the earliest admitted date for the start of the LBA, around 1600/1500 cal BC.' Cf. also Krauß this volume.

43 Dimitrova 2014, 76.

44 Dimitrova 2014, 76.

45 Aleksandrov 2009.

46 Dimitrova et al. 2012, 110.

grave 4 is the highest situated in the primary mound and does not belong to the 'later tumulus'. Thus, it offers a terminus post quem for the graves of the Middle Bronze Age.

Graves nos. 1 and 2 are located in the southern part of the mound and their position is above the early graves and underneath grave no. 4. In grave no. 2 a cup characteristic of the Early Bronze Age was discovered. A pitcher with a vertical handle, positioned below the mouth of the handle, with an emphasized transition between the neck and the body of the pot and vertical relief strips was found in grave no. 4.[47]

The silver pendants of type IA2 are indicative for the relative chronology of these finds. They have a very wide chronological range between the first and third phases of the Early Bronze Age (3000–2200/2100 BC).[48] The golden pendant from grave no. 4 belongs to type IA1. According to Aleksandrov's typology, this type dates to the Early Bronze Age, and more precisely to Early Bronze Age 1b, and the author does not have enough evidence for a later date for this specific type.[49]

The ceramic jug of grave no. 4 is a popular ceramic shape for the third phase of the Early Bronze Age and there are a large number of analogies in Upper Thrace, e.g. Tell Ezero, Tell Nova Zagora, Tell Dyadovo, and so on.[50] Such a jug was discovered in a grave mound in the excavations of the Lozianska mogila.[51] The pot comes from grave no. 18 (inhumation), which is dated to the Early Bronze Age based on the parallels for the vessel.[52]

Based on the data presented for the stratigraphy and inventory of the mound, some observations can be made. As noted above, the primary grave is no. 10. Graves nos. 9–4 can be dated to approximately the same period, while it can be assumed that no. 4 is the uppermost and still belongs to the primary phase of the mound embankment, i.e. to the first group of graves. To the later part of the 'mound' of yellow clay belong graves 1 and 2, which are the southernmost. In the profile of the mound, it looks as if grave 2 is the lower one and may therefore possibly be the earlier of the two (?). Grave no. 3 dates to the Hellenistic period and is unrelated to the others. Thus, it can be assumed that grave no. 1 is the latest grave (or one of the two latest graves) of the Bronze Age. If we accept that grave no. 4 marks the period between the first and third phases of the Early Bronze Age or just the time of the third phase of the latter period, then the occurrence of graves nos. 1 and 2 could be the earliest to belong to a time immediately after that – the end of the third phase of the early Bronze Age and/or the Middle Bronze Age.

The second chronological anchor for the Shekerdzha bone objects is offered by the relative dates of the mentioned parallels belonging to the 'Carpathian-East Mediterranean Wave Band Decoration'. According to David, the chronological horizons which include all of them are the second and the third phases of the Hungarian Middle Bronze Age.[53] The concrete periodization that he suggests is the classical and probably the latest phases of Füzesabony-Otomani, Vatya and Mad'arovce. These periods at least partially overlap with the phases LH I and IIA on the Greek mainland and with Kārum Kaniš Ib in Anatolia.[54] In central Europe, this equates to synchronisms with the phases Bronze A2b–A2c and the beginning of Bronze B in the modified Reinecke system.[55] Nevertheless, they offer only a very coarse chronological scheme.

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47 Dimitrova 2014, 79, fig. 10.4.

48 Aleksandrov 2009, 12.

49 Aleksandrov 2009, 11.

50 Leshtakov 1992, 19, figs. 7.30, 12.86; Leshtakov 1997, 70, fig. 2.38; 75; 87, fig. 4.1.

51 Agre 2015, 1–31.

52 Agre 2015, 5–7.

53 David 2007, 415.

54 However, Kārum Kaniš Ib (7th Citadel level) dates to the 18th century BC (Michel 2011, 314). Thus, this phase antedates LH I (for the radiocarbon-based high chronology of LH I see, e.g., Manning 2010, 23, tab. 2.2), which suggests that its chronological overlap with the Early Mycenaean phases as suggested by David is only partial (cf. David 1997, 272; David 2007, 415).

55 David 2007, 415; cf. David et al. 2017, 594, fig. 19. For the synchronisms see: Harding 2000, 13, fig. 1.3; 18, tab. 1.1; Boroffka 2013, 879, fig. 47.2.

Recently, some new evidence for the absolutely chronology of Bronze A2b–A2c was published. According to a study by Victória Kiss, Klára Pusztainé Fischl and others, the beginning of the Middle Bronze Age in Hungary (MBA 1–2) is contemporary with Bronze A2a–b, while the MBA 3 corresponds to the Bronze A2c/Bronze B phases. The absolute dates which they present are 2000/1900–1700/1600 BC for Bronze A2a–A2b and 1700/1600–1500/1450 BC for Bronze A2c–B.[56]

David and others suggested the following absolute dates for Bronze A2b–A2c: 1700–1500 BC.[57]

In conclusion, one might estimate a duration from 1700/1600 to 1500/1450 BC for the phases Bronze A2b–A2c.

Finally, I would like to comment on the chronology of the bone cylinder from Kültepe/Kārum Kaniš, because it is actually the best parallel for the larger cylindrical fragment from Shekerdzha. According to Tahsin Özgüç most of those bone artefacts originate from Kārum Level II.[58] They have long handles which vary between 10.3 and 10.6cm in length and measure 1.6cm in diameter.[59] The author also described 'shorter' artefacts, but has not mentioned their exact find level. Nevertheless, Level II (with the Assyrian archives) of Kārum is the most acceptable stratigraphic position. If this is true, the chronology of the best parallel for the Shekerdzha artefacts is earlier than the others (Fig. 3) and could be fixed at the middle of the 20th–19th century BC following the last overview on the chronology of the site.[60] Thus the chronological frame for the Bulgarian finds is extended by at least one century.

Based on the available information for the dating of the finds (parallels of the Shekerdzha objects), one may state that their absolute date might fall between c. 1950(?)/1800 and 1600 BC.[61] One cannot exclude that the use-life of these artefacts continued until the end of the Middle Bronze Age and the beginning of the Late Bronze Age.

The evidence raises the very important question about the chronological position of the artefacts from the eastern Balkans. If we accept that they can be dated to the beginning of the Middle Bronze Age in Upper Thrace (indirectly hinted at by their archaeological context and by materials from other Middle Bronze Age graves inside the tumulus), they may end up being earlier than other examples of the relevant typological group by more than two hundred years. At present, it is difficult to say this for certain.[62] A future ^{14}C date might clarify the absolute chronology of the finds from the Shekerdzha tumulus.

Interpretation

The detection of engraved bone artefacts from Thrace allows us a suggestion for solving the problem of their function and interpretation. With the publication of graves and finds from the Shekerdzha tumulus, the author accepts that the finds under review were probably (parts of) amulets or sceptres.[63]

According to David, the purpose of this kind of object (with a cylindrical body and wave-meander band decoration) is not fully understood. He points out that they could well be pieces of

56 Kiss et al. 2015, 28 fig. 5; Fischl et al. 2015, 504, tab. 1b.
57 David et al. 2017, 594, fig. 19.
58 Özgüç 1986, 70, pl. 121.1–4.
59 Özgüç 1986, 70.
60 Michel 2011, 314.
61 In a personal conversation, David suggested the 17th–16th century BC for the finds from Shekerdzha, which is close to the dating of the horse-bridle piece from Mitrou (Maran – van de Moortel 2014, 533).
62 The determination of the absolute chronology of the finds would be decisive for their origin, i.e. Anatolia or central Europe.
63 Dimitrova 2014, 78.

different objects – sceptres, horse-harnesses, pieces decorating a bow, bone handles and so on.[64] David has studied in detail the decoration of the bone finds. The finds with cylindrical shape or in the shape of a pyxis include a wide spectrum of objects distributed in the Middle Danube region and in western Anatolia. The disc-shaped finds covered with spiral motifs are typical for the Carpathian-Danube area and the Peloponnese. Based on this information, it is difficult to determine any connection between the finds from Anatolia on the one hand and those from the Aegean on the other.[65]

The above-mentioned author accepts that these objects – with cylindrical shape and engraved decoration of wave-shaped spirals and concentric circles – were elements of the horse-harness and there is evidence for this explanation and the reconstruction of very important related processes during the 2nd millennium BC.[66]

Similar thoughts were expressed by Cavruc, Kristiansen and Larsson. Cavruc thinks that they were elements of the equipment of the chariot warriors. According to him, they marked the introduction of chariots in Europe at the beginning of the Middle Bronze Age. The significant processes connected with the development of bronze metallurgy contributed to the intensification of the relationships between the populations of the Carpathian and North Pontic areas.[67] This, according to the author, required cultural adaptation to possibly new conditions in the contacts around an approved type, as well as expected cultural changes.[68]

Wider considerations in terms of the ownership and significance of these objects are given by Kristiansen and Larsson.[69] According to the authors of the quoted studies, the first half of the 2nd millennium BC is a period of significant changes affecting a wide range of people's spheres of life. First of all, there are innovations in the military, which led to the formation of a new class of soldiers.[70] One of the manifestations of this new army is the introduction and production of the chariot (alongside an array of weapons – a composite bow, a long sword, a spear, etc.), which adds new social, economic ideological meanings and a new meaning to the military tradition.[71] This is one of a number of factors that affect funeral rites in which the most characteristic features are the burial mounds.[72]

The presented data indicate that scholarly opinions relate to different types of objects. David mentions objects with a cylindrical shape or complex objects embellished with a wave-meander band.

A second group of authors focuses on objects that are very reminiscent of horse-harness implements. They do not look like the Shekerdzha finds, and the latter can hardly be interpreted as parts of horse munition. The similarities in their decoration indicate that they may have

64 David 2007, 412.
65 David 2007, 412.
66 David 2007, 412–414.
67 Cavruc 1998, 94.
68 Cavruc 1998, 94.
69 Kristiansen 2007, 254–257; Kristiansen – Larsson 2007, 26–33.
70 Kristiansen – Larsson 2007, 28.
71 Kristiansen – Larsson 2007, 28.
72 This is the reason for the authors to speak of the emergence of a new institution, which is characterized by the construction of chariots, horse breeding and training, production of new weapons and training for use thereof (Kristiansen – Larsson 2007, 28). Following their analysis, the authors note that the distribution of the so-called 'package' of this new institution is the criterion for its adaptation to local traditions. This adaptation has been accomplished by aligning a large number of characteristic features such as the distribution (among a large number of objects) of the waveband or meander band motif, as well as the increased reliance on and marketing of horses, which is well documented later on at Dendra. The aforementioned transfers and communications were carried out by small groups of permanently migrating soldiers, craftsmen, and horse breeders. The presence of identical or almost identical objects (or similar motifs) in the Carpathian Basin, Mycenae and Anatolia is one of the reasons to suppose direct contacts between these regions, some of which the authors assume happened at a personal level. The observations outlined here represent one of the ways of spreading the so-called '(new) institutional set' in the territories under review (Kristiansen – Larsson 2007, 29).



Fig. 4 Distribution map of the closest parallels for the cylindrical objects from Shekerdzha (P. Minkov)

appeared synchronously or belong to the same cultural range of the distribution of bone objects with wave-meander decoration.

The overview to date sketches the outlines for a possible explanation of the finds from the Shekerdzha tumulus. They are the only representatives of this type of bone find from the eastern Balkans. Most likely, they are the work of a craftsman of considerable skill, judging by the precise workmanship of the items, and probably renowned for this type of product. In my opinion, the most likely interpretation of these finds is that they were part of a sceptre. The structure of the objects suggests that they were possibly part of an object – a multi-component sceptre –, whose supposed reconstruction included two or three parts (Fig. 3). Its discovery in a tumulus among other Middle Bronze Age graves does not necessarily imply that it belonged to any members of the higher strata of the community, but that it fit into a system of intensive contacts of transmission and reception, as well as free migration flows.

In conclusion, during this period, Upper Thrace and the eastern Balkans in general were actively engaging with Anatolia, which can also be observed via other object categories: *depata amphikypella*, imports, etc. (Fig. 4). Thus, at the same time, it became the driving force of the relations between the Carpathian zone and the south and southeast. These relations reflect events happening at the beginning of the Middle Bronze Age. In general, they can be described as follows: a crisis in the provision of raw metal (caused by the invasion of a new population?), the activation of individual networks of people seeking new resources, this in turn leading to new relationships with different population groups, through whose lands the 'search agents' had to pass. By the time the 'ultimate goal' was reached, the Carpathian[73] Basin, rich in natural resources, a backflow of ideas and objects had been received through Thrace and Anatolia.

[73] The interest of populations from more remote territories and societies in the natural resources of the Carpathians is presumed for the earliest stages of the Bronze Age (Hood 1973).

Conclusion

The data presented in this study can be summarized as follows: recently, in the rescue study of the tumulus near Kamen, Sliven District, three fragmented bone objects were found in a grave. These are a figure of an eagle, as well as two cylindrical objects, the decoration of which is performed very skilfully and in detail. The finds have no corresponding parallels in the eastern Balkans. However, finds discovered in the Carpathian Basin and partly in Anatolia show strong similarities in shape and decoration to two of the objects. Although the eagle figure is without precise parallel at this stage, the author has included it in the analysis because of the general archaeological context with the other two artefacts due to the fact that all are made from the same material. The motifs with which the artefacts are engraved are meanders, circles and ellipses. These decorative elements are characteristic of cylindrical artefacts with a circular cross-section.

On the basis of their morphological features, it is suggested that all pieces were probably part of a sceptre that was probably made of several prefabricated parts (Figs. 5–6). Its location in southeastern Bulgaria is likely to mark one of the routes where the connections between Anatolia and the Carpathians took place during the Middle Bronze Age.

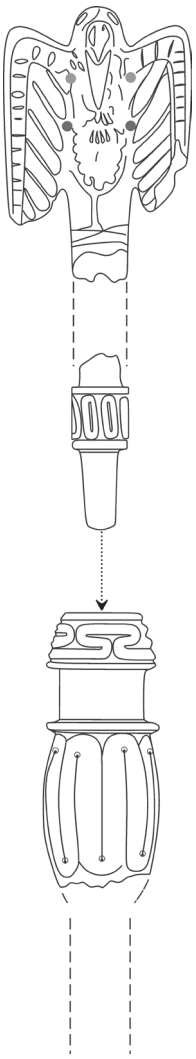

Fig. 5 Conceivable reconstruction of the artefacts from Shekerdzha tumulus, grave 1 (version I, P. Minkov)

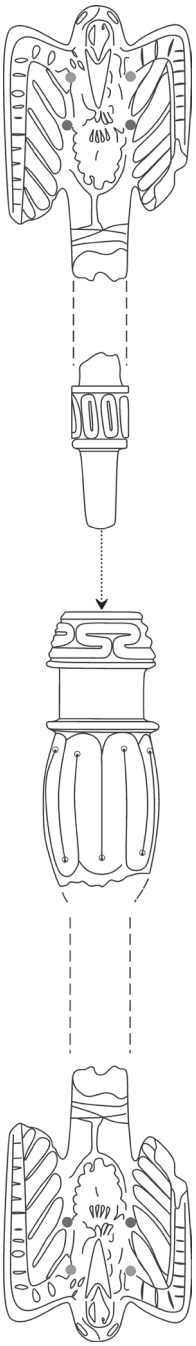

Fig. 6 Conceivable reconstruction of the artefacts from Shekerdzha tumulus, grave 1 (version II, P. Minkov)

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Thrace beyond the Gold: Some Questions on the Unequal Exchange during the Late Bronze Age

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Abstract: The question about the cultural contacts and interchange has always provoked interest among those attempting to elucidate them from different perspectives. The answers suggest a general picture of the trade or economic life, and allow inferences to be drawn regarding the political relations in the specific period. The possibilities of such reconstructions for Late Bronze Age Thrace are limited and based mainly on material evidence. Several imported finds – pottery, weapons and oxhide ingots – are already well known and integrated in the analysis of the Thraco-Mycenaean connections. Other small finds – marble pommels of Mycenaean swords – add some new aspects to the picture of these contacts. Two such finds originate from excavations of LBA sites in the Eastern Rhodopes – Ada Tepe near Krumovgrad and Aul kaya near Dolno Cherkovishte (Haskovo region). Their presence at particular sites in the mountainous region once more poses questions about the type of contacts and the role of Thrace within the entire Mycenaean network in the eastern Mediterranean and the Balkans. The stereotypical picture of Thrace provided by written sources emphasizes its pastoralism. However, recent archaeological research into LBA gold mining in Bulgaria suggests that gold was the most wanted natural resource here. Such an assumption is possible as long as we accept the existence of (market?) specialization within the Mycenaean world. The consequent question is what Thrace received in return for its gold. The find types listed above, as well as their quantity do not demonstrate wide variety or luxury, leaving the impression of an unequal exchange relationship between Thrace and Mycenae.

Keywords: Thrace, Mycenaean *koine*, import finds, sword pommels, archaeometric analysis

The World of Today

The modern world with its political background or social and economic conditions affects – intentionally or not – our understanding of the past and the concepts we create for extinct societies. Our individual attitudes define the subjects we study and influence the reconstructions we build when describing ancient political or trade relations, market systems or communities. Nevertheless, we should always be aware and very 'careful for imposing current biases and world-views back on the ancient world',[4] since this might be misleading, and not all modern theories can be applied unambiguously to past societies.

The title of the present study is derived from the modern economic concept in the neo-Marxist theory which involves the definition of the 'unequal exchange', coined in the 1960s/1970s by Arghiri Emmanuel.[5] Despite being formulated only now, reflecting our current background, it could also be valid for the past. As pointed out in the literature, it includes several basic elements: imperialism; 'buy cheap, sell dear'; trade may benefit parties unevenly; and everything leads to

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[4] Cline 2015, 209.

[5] Emmanuel 1972.

exploitation. Apart from the title, the aim of the present paper is, of course, not to trace mechanically whether we could speak of such practices of unequal exchange during the Late Bronze Age, nor does it offer any moralistic suggestions. It has been arrived at because some of our knowledge about the behaviour of the Mycenaean political authorities leaves such an impression.

The Mycenaean *koine*

The notion of 'globalization' is another contemporary term, traceable in various aspects – political, social, economic or cultural – of the modern world. In recent years, scholars have attempted to study its origin, or at least to detect similar processes in the past.[6] During the Bronze Age, when the first societies emerged, globalization is conflated with 'Bronzization'[7] or 'cultural hybridization'.[8] The generally accepted opinion is that the Late Bronze Age could be described for the eastern Mediterranean region as 'a period of pronounced 'globalization', characterized by strong trade relations that created a cultural koine',[9] where the political entities of Egyptians, Hittites and Mycenaeans created their hyper-regional networks and interacted simultaneously.

Speaking of Mycenaean Greece, the often referred-to notion of *koine*, sometimes defined as the 'cultural *koine*', needs an explanation: the term is borrowed from linguistics, where it refers to the common language, like the spoken Greek of the Hellenistic period, implying a more or less voluntary aspect of belonging. In Mycenaean archaeology, it is rather used for describing the diffusion of common cultural features observed in the Aegean through the Late Helladic III A–B period.[10] This perception is naturally connected with the idea of the centre/core-periphery relationships[11] arising as a result of an expansion – trade, military or cultural. By a further conceptualization, we could expect inequalities in the development of the individual parts of the political/cultural entities or associated members, as shown, for example, for the Peloponnese, where Achaia demonstrates a different and less articulated society than the neighbouring palatial states, despite possibly not being subjugated or dependent.[12] In such a wide-ranging and structured network, a special role was played by the so called 'gateway communities' like Dimini, spreading the Mycenaean influence further to the northern Balkans.[13]

The marked differences and regional specifics cast the uniformity of the Mycenaean *koine* into doubt. Regarding the geographical scope of the Aegean and the Balkans, it seems much better to think about a Mycenaean economic zone or network.

The presence of a dominant centre, or centres, as major consumers and redistributors of goods also assumes the existence of organized economic behaviour within the Mycenaean sphere of influence, where the leading authorities dictated the rules, exploiting to some degree the other regions.[14] The organized trade and exchange practices also assume the presence of local specialization, where each region was known for or provided specific goods or resources. For prehistoric economies which could be defined as 'natural resource-based', such a scenario is highly acceptable, or at least our understanding is such: the stereotypical picture associates Cyprus with the copper ingots, the Mycenaean world with the ceramic vessels and the coast of the Levant with resin.[15] The question

6 Cf. Moore – Lewis 2009.
7 Cf. Vandkilde 2016.
8 Cf. Stockhammer 2012.
9 I.e. Meiri et al. 2017.
10 Petrakis 2009, 13.
11 For core-periphery theory cf. Harding 2013.
12 Arena 2015.
13 Jung 2005, 53 n. 48.
14 For the specifics of the Mycenaean economy, with pros and cons for the existence of a market economy, see the discussion most recently in Jung 2016, 563–566, but also Burns 2010, 118–119; Pullen 2013.
15 Cf. Meiri et al. 2017 with ref. 2.

remains whether we could expect such a specialization within the micro-regional Mycenaean zone, particularly for ancient Thrace.

Thrace in the Mycenaean Network

Already in 1920, Bogdan Filov pointed to the Thraco-Mycenaean relationships as a topic for study.[16] According to the then-accepted theory, he considered Minoan Crete and Mycenae as two cores of one cultural entity and compared it with Thrace from the Neolithic period onwards. As evidence for the contacts, Filov referred to three types of artefacts, represented in his time only through single finds – weaponry (the specimen from Dolno Levski), as well as tombs and golden diadems from the much later period of the 6th–4th century BC. The last two were regarded as surviving elements from the Mycenaean period, and their preservation in Thrace, while the rest of the world had changed with the coming of iron, has been pointed out as an argument for the autochthonous origin of the Thracians, who retained their cultural traditions.

Since then, the connections between Thrace and Mycaenae have provoked interest from various scholars. With the increasing LBA weaponry finds from the region, it was possible to suggest that it occupied a transitional position, where the central European and Greek traditions communicated.[17] The growing knowledge allowed Alexander Fol to generalize the picture from a socio-political point of view in 1972, introducing the concept of 'Mycenaean Thrace' for describing the supposed similar processes of proto-state formation in LBA Thrace, parallel to the Mycenaean Greek states.[18] The main arguments for such a parallelism could be assumed from historical sources – Homeric epics and mythographic tradition, where Thracians were introduced in a similar manner to the great Mycenaean heroes. Despite the vague criticism from an archaeological point of view,[19] since no clear material evidence for a distinct Thracian monarchy, aristocracy or social stratification in the LBA had been discovered – no citadels, no rich graves, no striking wealth of luxury goods comparable to the Greek mainland –, the term determined the subsequent studies on Thrace, all emphasizing the close mutual influences of Mycenaean Greeks and Thracians and suggesting a common cultural legacy. A response to this trend was the 4th International Congress of Thracology in Rotterdam in 1984, dedicated to the topic of "Thracians and Mycenaeans".[20]

The present text is not questioning whether the Mycenaeans and their contemporary Thracians co-existed and knew each other, but the intensity of the contacts, the degree of influence and the significance of Thrace for Mycenae requires a fresh and unbiased look, in accordance with our current state of knowledge.

Mycenaean Imports in Thrace

Archaeological excavations in the last decades have accumulated new data for developing Filov's initial hypothesis. Of course, the Thracian tombs or golden diadems are no longer regarded as direct Mycenaean survivals and have received an adequate interpretation within the Thracian culture of the 1st millennium BC.[21] Nowadays, researchers have recognized several main types of LBA artefacts from Thrace of probable Mycenaean/Aegean origin: weaponry, esp.

16 Filov 1920.
17 Hänsel 1970.
18 Fol 1972, 39–42.
19 Athanassov – Krauß 2015, 72.
20 Best – de Vries 1989.
21 Cf. Stoyanova 2015; Tonkova 2015.

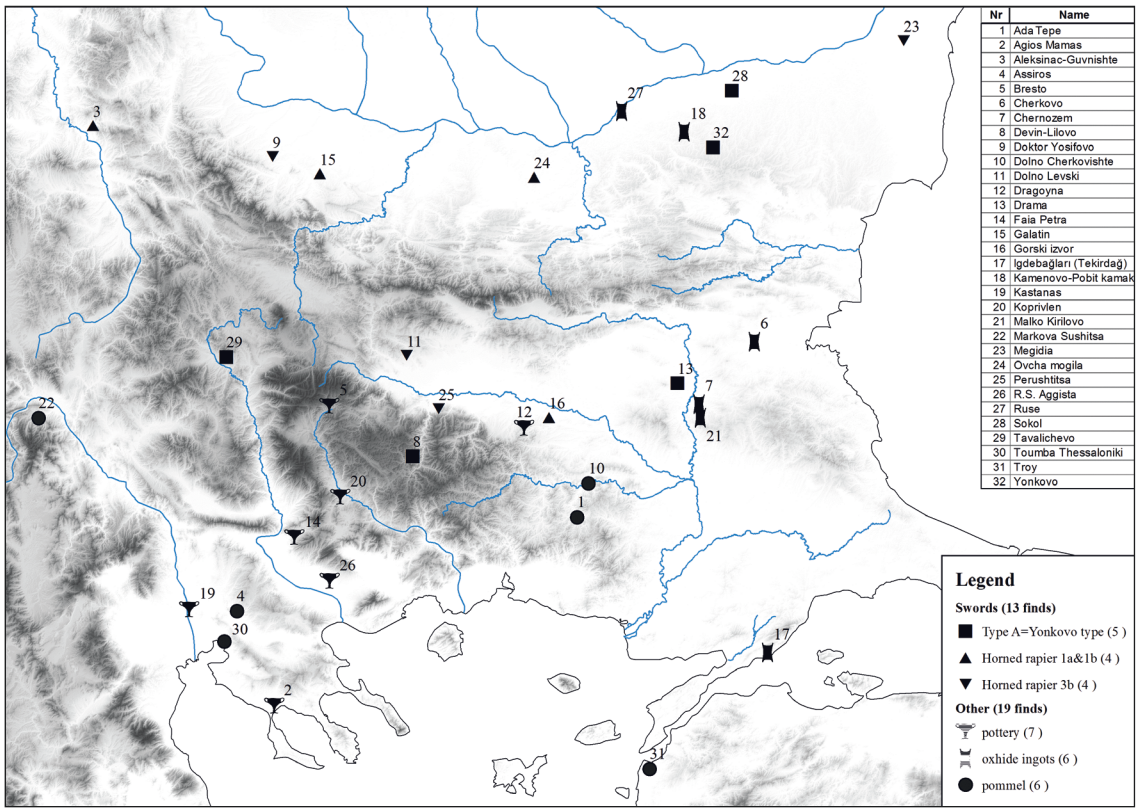

Fig. 1 Distribution of the Mycenaean imports in Thrace and the adjacent region. 1. Ada Tepe (excavations by the authors); 2. Agios Mamas (Hänsel et al. 2010, 319, n. 81; Bozhinova et al. 2013, 78, nn. 94–95); 3. Aleksinac-Guvnishte (Filipovic et al. 2015); 4. Assiros (Wardle et al. 1980, 253; Kilian-Dirlmeier 1993, no. 171; Wardle – Wardle 2001, 31, fig. 1.3; 34); 5. Bresto (Athanassov et al. 2017); 6. Cherkovo (Leshtakov 2007, 449); 7. Chernozem (Leshtakov 2007, 449); 8. Devin-Lilovo (Borislavov – Ivanova 2007, 89); 9. Doktor Yosifovo (Panayotov 1980, 179, fig. 1.5; Kilian-Dirlmeier 1993, 50, no. 106); 10. Dolno Cherkovishte (excavations by the authors); 11. Dolno Levski (Panayotov 1980, 179, fig. 1.3; Kilian-Dirlmeier 1993, 50, no. 108); 12. Dragoyna (Bozhinova et al. 2013, 72–73); 13. Drama (Kănčev – Kănčeva 1993); 14. Faia Petra (Valla 2007); 15. Galatin (Panayotov 1980, 179; Kilian-Dirlmeier 1993, 44, no. 58; Jung 2005, 56 – for the date); 16. Gorski izvor (Petrov 2007, 33); 17. Igdebağları (Tekirdağ) (Leshtakov 2007, 450); 18. Kamenovo-Pobit kamak (Leshtakov 2007, 449); 19. Kastanas (Jung et al. 2017, 279); 20. Koprivlen (Alexandrov 2002); 21. Malko Kirilovo (Leshtakov 2007, 449); 22. Markova Sushitsa (Kolishtrkova-Nasetva – Videski 1996); 23. Megidia (Bader 1991, 34, cat. no. 22, pl. 5.22); 24. Ovcha mogila (Krauß 2005); 25. Perushtitsa (Panayotov 1980, 179, fig. 1.4; Kilian-Dirlmeier 1993, 50, no. 107); 26. R. S. Aggista (Jung et al. 2017, 278, n. 37); 27. Ruse (Leshtakov 2007, 450); 28. Sokol (Panayotov 1980, 178, fig 2:2; Kilian-Dirlmeier 1993, 19, no. 43); 29. Tavalichevo (Panayotov 1980, 175); 30. Toumba Thessaloniki (Andreou – Kotsakis 1996, 382, n. 27, no. 4381; Mavroidi et al. 2004, 319, Σχ. 4, KE 961); 31. Troy (Götze 1902, 385 fig. 357; 398, fig. 385; 417, fig. 443c; Trejster 1996, 224 with nos. 170–175); 32. Yonkovo (Panayotov 1980, 176, figs. 1.1; 2.1; Kilian-Dirlmeier 1993, 9, no. 6) (© J. Tzvetkova, G. Nekhrizov)

swords;[22] pottery;[23] and oxhide ingots.[24] When discovered, they provoke great enthusiasm among the excavators and the scholarly community. The subsequent interpretations traditionally mainly attest (once again) the Mycenaean influence in Thrace and sketch out its scope in order to trace the transfers of goods or ideas, for reconstruction of possible (trade) routes, and for the cross-dating of sites and synchronization of the Thracian LBA with the LH, which is definitely very important.

[22] Hänsel 1970; Panayotov 1980; Kilian-Dirlmeier 1993, passim; Jung 2017. Other weaponry categories, like spearheads and axes, have also been involved in the discussion (see Panayotov 1980, 187–190 [for axes]; Bouzek 1985, 41–43; Leshtakov 2015, esp. 180), but testifying contacts in the other direction – to the north of Thrace – and hence are not evaluated in the current discourse.

[23] Cf. most recently Jung et al. 2017.

[24] Leshtakov 2007.

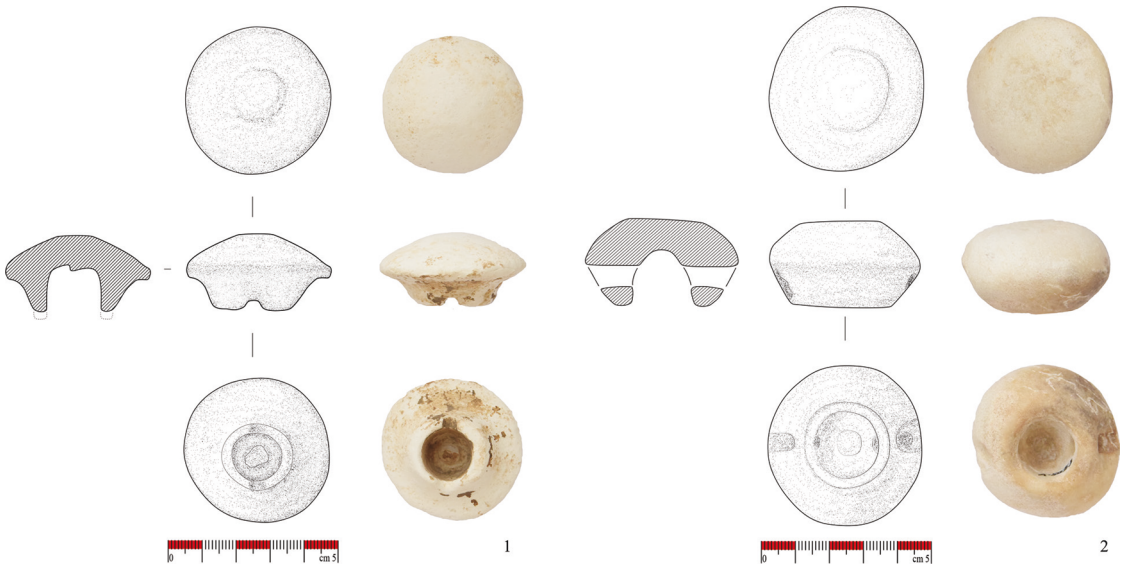

Fig. 2 Pommels from Thrace: 1. Ada Tepe; 2. Dolno Cherkovishte (© J. Tzvetkova, G. Nekhrizov)

The present database, including the broader area of the Lower Axios Valley and Troy, comprises c. 30 finds (see Fig. 1).[25] It cannot be compared with the solid database of c. 600 imported objects in the Aegean illustrating the contacts with the Near East or Egypt for the same period of the 14th–12th century BC,[26] as well as analogous evaluations for earlier periods of the EBA–MBA in the Anatolian-Mesopotamian region.[27] Neither can we fully utilize it for a detailed sketch of local social processes, as shown for Mycenaean Greece.[28] Moreover, it is questionable whether some of the sword types should not be regarded as local products related to some extent to Mycenaean types.[29] Nevertheless, whether imitations or not, their presence in inland Thrace demonstrates the adoption of Mycenaean know-how and design for their production, and speaks for the same process of infiltration of Mycenaean influence.

Mapping the discussed finds will show a picture of a not very dense distribution (Fig. 1). Considering they cover a chronological span of c. 200–350 years, within the period c. 1550/1400–1200 BC, this suggests less intensive contacts. Besides, some of them probably entered Thrace through the local North Aegean centres in the Lower Axios Valley and did not originate from the genuine Mycenaean territory. That being said, they illustrate only a fraction of what once arrived in Thrace and what has succeeded in surviving through the centuries.

Despite the limited number of imported artefacts, the accumulated data forces us to ask new and more complex questions: what is the place of Thrace within the entire network? What role did the Thracian lands play in the Mycenaean policy? What type of relations existed between these parts of the eastern Mediterranean?

Mycenaean Sword Pommels from Thrace

Recently one more artefact type – marble pommels from the sword hilt – was added to the picture of Mycenaean imports in Thrace. They originate from two sites in the Eastern Rhodopes.

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25 One more find of a bronze rapier was published from the collection of the National Historical Museum-Sofia. It belongs to the type A or Yonkovo-type swords (Hristova – Hristov 2008). Since no circumstances about its provenance are available, it is not included in the present map and analysis at this point.

26 Cline 2015, 210.

27 Massa – Palmisano 2018.

28 Burns 2010.

29 Bouzek 1985, 31, 37, fig. 8; Jockenhövel 2017, 77; Jung 2017, 71.

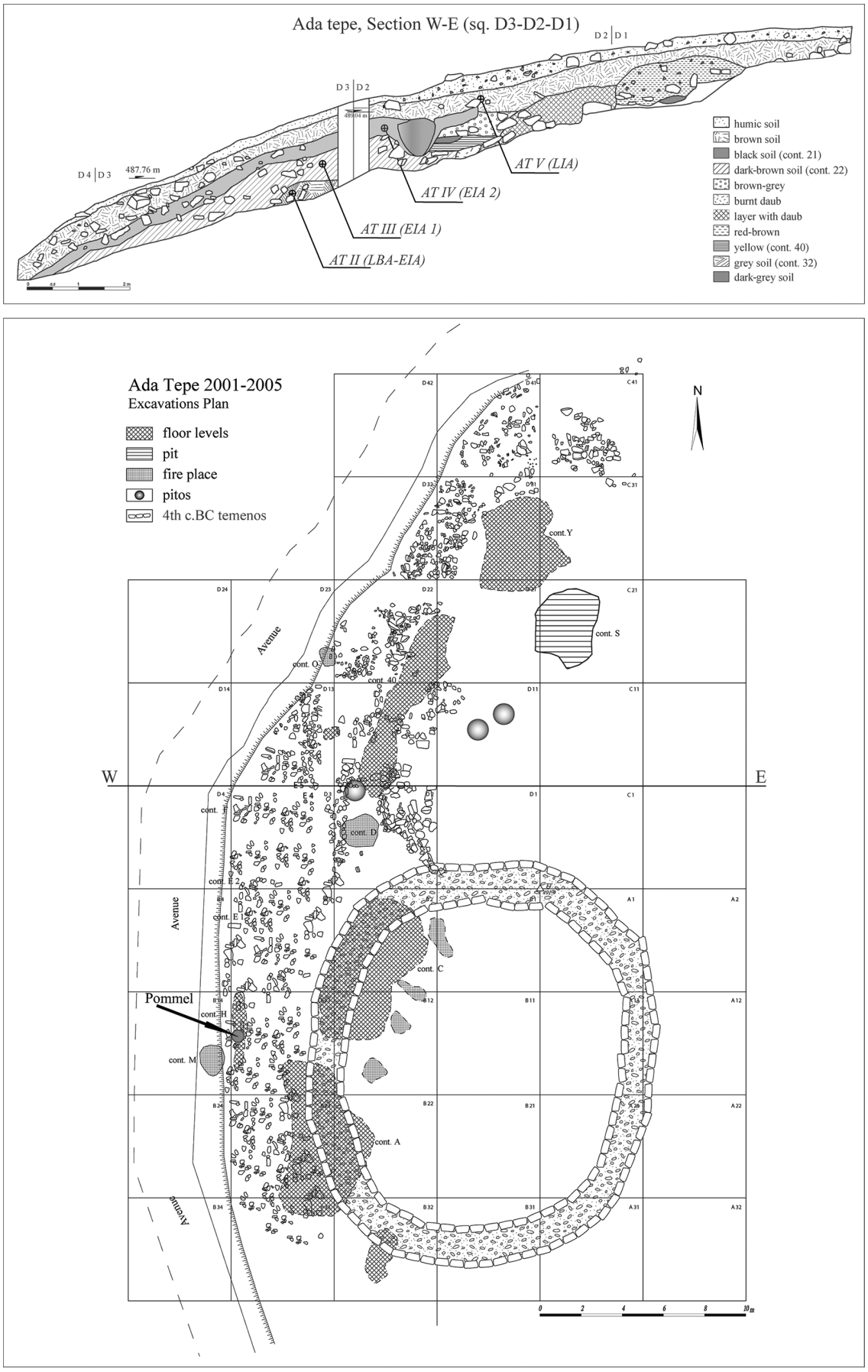

Fig. 3 Ada Tepe 2001–2005 campaign: stratigraphic profile and general plan of the excavated area of the Thracian sanctuary, with the place of provenance of the pommel (© J. Tzvetkova, G. Nekhrizov)

Ada Tepe Pommel

The find came to light during the excavations in 2002 of the Thracian sanctuary at Ada Tepe, Krumovgrad, located on the top part of the hill.[30] The pommel has a mushroom-like shape with protruding hollowed stem, and rivet holes for attachment on both sides. The lower part is broken, so only the upper half of the rivet holes is preserved. The dimensions of the piece are 4.5cm in diameter, and it has a height of 2.3cm; the inside diameter of the stem is 1.5cm, and its depth c 1.20cm. The pommel is made of fine white marble with a powdery surface – perhaps due to exposure to fire or because of the soil environment (Fig. 2.1 and Appendix).

The find was uncovered in Square B13 underneath the 4th-century BC temenos, in the lowest spits of the stratigraphic level of brown soil (Cont. 22 according to the site nomenclature for the 2001–2006 excavations), and not related to the revealed structures there. The established stratigraphy has shown several consecutive stages of site functioning on the hill top, covering the time span between the transitional period LBA–EIA (AT II) and the Late Iron Age (AT V). The find location belongs to the stage AT II, and according to the modelled radiocarbon chronology of the site,[31] it could be tentatively dated within 1190–1120 1σ calBC.[32] The pommel itself represents an earlier product in a 12th-century BC context.

The Pommel from Dolno Cherkovishte-Aul kaya

The pommel from Dolno Cherkovishte-Aul kaya was found during the excavations on the site in 2007. It has a less pronounced biconical shape and is hollowed, with symmetrically placed rivet holes in the lower part. Its dimensions are: diameter: 4.7 × 4.5cm; height: 2.4cm; inside diameter: 1.9cm, with a depth of c. 1.6cm; and the diameter of the rivet holes is 0.6cm. The pommel is well preserved, made of fine white marble, with well-defined grains with angular to straight boundaries (Fig. 2.2 and Appendix).

The site Aul kaya is located near the village of Dolno Cherkovishte, c. 10km westwards from the town of Madzharovo in the Eastern Rhodopes, in the valley of the Arda River. It occupies a prominent rock, rising some 8–10m above the surrounding terrain. In the 1950s, part of it was destroyed and used as stone quarry for the reconstruction of a local road. To the west of the rock, on the lower terraces, occupation from the EIA was attested, while on the top part of the rock, the uncovered materials are only from the LBA. On the rock platform there, within an area of c. 6 × 5m, traces of a structure with floor levelling and two consecutive fireplaces were revealed, indicating at least two phases of occupation. Its north and west parts extend as far as the rock, natural splits and niches in which were used for depositing ceramic vessels and small household objects. Despite the considerable altitude difference, the accumulated cultural layer comprises c. 1m to the north, thinning to the south towards the rock edge, where a small treasure-hunter dig has also violated the archaeological deposits. According to the pottery complex and the richly decorated vessels showing *Furchenstich*, *Kerbschnitt* and incised techniques, the functioning of the site on the top rock could be dated to the developed stage of the Thracian LBA.[33] There are no radiocarbon data from the site available, since no suitable samples were uncovered during the excavations. The pommel originates from the structure on the top rock but not in an in situ context, as it was uncovered in the first spits at the platform edge, where the cultural layer was thin and partially disturbed by the treasure-hunter dig.

30 Cf. Nekhrizov 2003.

31 Cf. Nekhrizov – Tzvetkova 2018, tab. 5–6.

32 The suggested date is a modelled age of the stratum Ada Tepe II based on a series of eight samples. The sample from the same layer as the pommel gives a date of 2955 ± 30 BP/1216–1122 1σ cal. (AT01 = SUERC-37394 [GU25473], cf. Nekhrizov – Tzvetkova 2018, tab. 5).

33 Nekhrizov 2008.

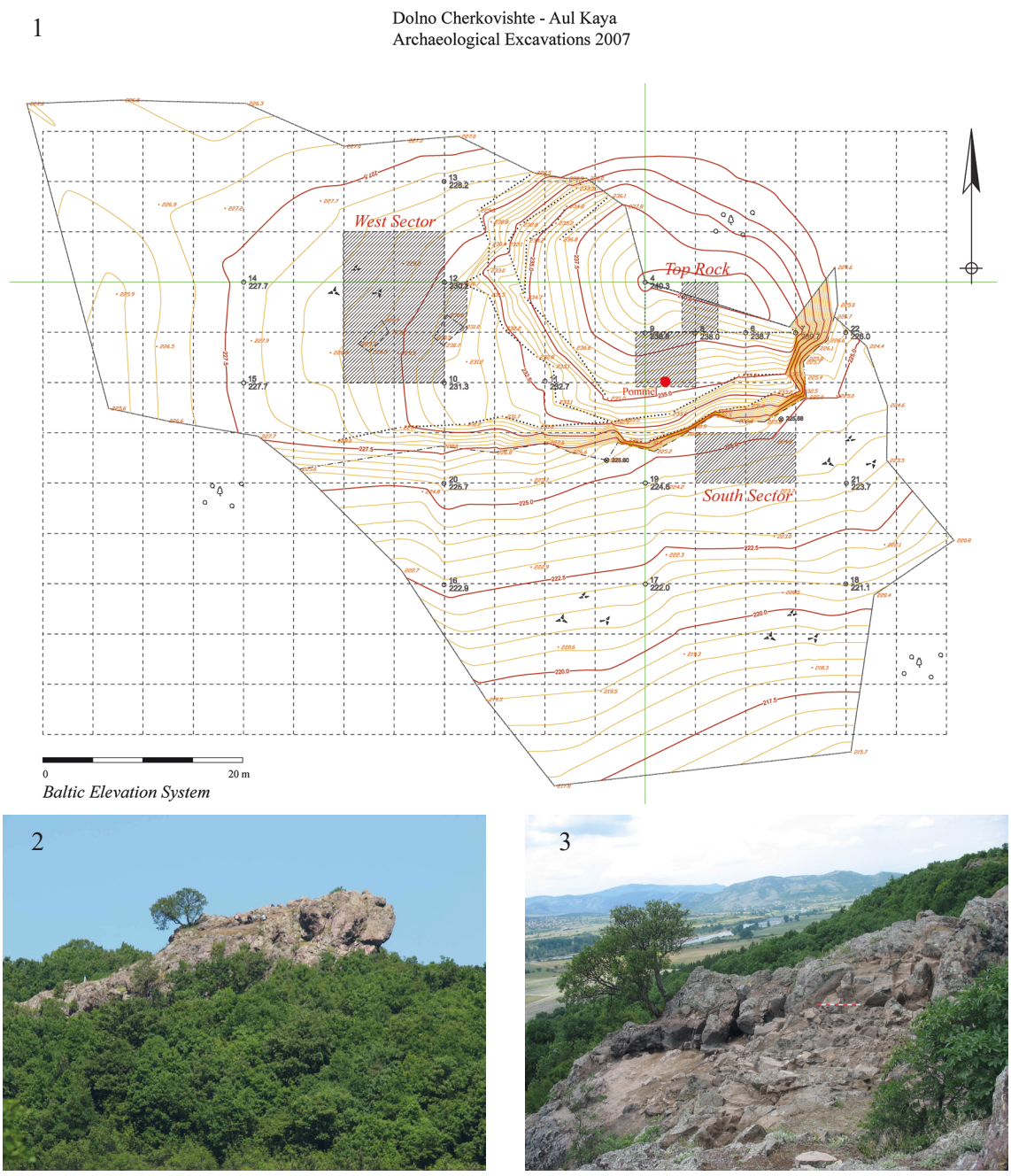

Fig. 4 Dolno Cherkovishte site: 1. Plan of the excavated area with the place of provenance of the pommel; 2. Overview to the top rock (view from the south); 3. Situation on the rock platform with LBA occupation area (view from the east) (© J. Tzvetkova, G. Nekhrizov)

Generally, the pommels from Thrace should be and are regarded in connection with the attested sword types, as a part of such items,[34] although the situation of their discovery shows them as lone pieces. This, on the other hand, raises the question whether they might have entered Thrace as such, and if not – what has happened to the blade of the sword. In the second case, it is easy to assume the blade has been recycled, while the other option provides multiple variants for the

[34] Jung 2017 with map 2.

pommel's solo deposition: as garbage from a broken sword; a kind of souvenir; a special gift as *pars pro toto* regarding the context of discovery on i.e. cult places; or as a prepared item for the production of a sword.

Modern investigations of LBA Aegean warfare pay less attention to the pommels as a humble part of the weapons, usually only noting their presence. Imma Kilian-Dirlmeier lists a total of five swords with pommels and 18 other single pieces in her study of Mycenaean swords from Greece, Bulgaria and Albania.[35] Subsequent finds should add more items to the picture, though no recent systematizing study is available for the Balkans.[36] From the adjacent region of Thrace, several new pommels were uncovered in the last years: two from Toumba Thessaloniki,[37] one from Assiros,[38] and another from Markova Sushitsa.[39] The excavations of Troy have also yielded several finds – three marble pommels from different strata[40] and six further specimens made from rock crystal from the so called Treasure L.[41]

As an inseparable part of the hilt, pommels could be made of different materials: wood, ivory, bone, semiprecious stones or marble. Functionally, all swords are expected to have a sort of hilt ending,[42] though some types such as the cross-swords (type Dii after Sandars) are not supposed to have pommels like the ones discussed here. When made from perishable materials, only some parts of the sword's hand-grip may indicate the presence of a pommel – preserved revetment, conical casts, specific (gold) strips, rivets, etc. Sometimes the whole hilt including the knob was covered with gold sheet. Commonly, those decorated elements attract more attention than the pommel itself. Kilian-Dirlmeier briefly discusses the knobs, distinguishing several forms: spheroid, calotte-shaped, biconical, and mushroom-shaped. She assumes an attribution of the big spheroid and calotte-shaped pommels to the swords of type A, and the calotte-shaped and biconical ones to the swords of type B. For the horned and cross-swords,[43] she suggests mushroom-shaped pommels, known already from the sword type A from the shaft graves in Mycenae without any considerable form changes.[44] The observations based on the attested examples of entirely preserved swords do not allow regularities between the length of the sword and the knob dimensions to be traced.[45] We should also consider that some of the pommels might have belonged to daggers.

Parallels

As the closest parallels of the Ada Tepe pommel we can point to the Ialysos horned sword (type Ia after Kilian-Dirlmeier) with a marble knob dated in LH IIIA1[46] as well as the pommel find from Toumba Thessaloniki,[47] at the same time staying geographically closer. If we follow the suggestion of Kilian-Dirlmeier, it is highly acceptable that the Ada Tepe find could have belonged to a horned or cross-sword.

The geographically closest parallel to the Dolno Cherkovishte pommel is the second specimen from Toumba Thessaloniki.[48] The pommels of Hajdúsámson-Apa swords and daggers show some similarities, too. For them, a Mycenaean connection is also suggested: produced by local masters

35 Kilian-Dirlmeier 1993.
36 Molloy 2010, cf. cit. lit. For more finds see e.g.: Batziou-Efstathiou 1985, 41–42; Horejs – Jung 2017, 71, n. 11.
37 Andreou – Kotsakis 1996; Mavroidi et al. 2004.
38 Wardle – Wardle 2001.
39 Kolishtrkova-Nasteva – Videski 1993.
40 Götze 1902, 385 fig. 357; 398, fig. 385; 417, fig. 443c.
41 Trejster 1996, 224 with nos. 170–175.
42 Kilian-Dirlmeier 1993, 74–75.
43 Resp. type C and Di after Sandars 1963.
44 Kilian-Dirlmeier 1993, 75, n. 5.
45 Kilian-Dirlmeier 1993, 7.
46 Kilian-Dirlmeier 1993, 45, no. 63; cf. Jung 2017, 71, n. 11.
47 Mavroidi et al. 2004, 319, fig. 4, KE 961.
48 Andreou – Kotsakis 1996, 382, n. 27, no. 4381.

under Mycenaean influence.[49] The shape of the Dolno Cherkovishte pommel is simplified and lacks elegance, which allows us to draw parallels with the pommels attested on the earlier swords Type A and B.

For the Bulgarian lands, distribution of three sword types with assumed Mycenaean origin or influence can be seen: type A or the Yonkovo type, the horned swords of types 1a or b (Galatin type), and those of type 3b (Dolno Levski type).[50] Even with the recent finds from Drama,[51] Ovcha mogila,[52] Gorski Izvor,[53] and Devin-Lilovo,[54] there are no geographic concentrations or regularities traceable north or south of Haimos. The chronological position of the sword type A is set within the MH III–LH II, and of the horned swords from LH II onwards: type 1a in LH II–IIIA, type 1b a little bit later in LH IIIA,[55] narrowed down in recent studies to LH IIB–IIIA1.[56]

Searching for the Origin of the Pommel: Possibilities of the Archaeometric Analyses

No archaeometric analyses of the known marble pommels of Mycenaean swords have been performed so far. The expectation from such an investigation is at least to provide suggestions about the origin of the material from which they are made. Besides, while in archaeometric analyses of metal – bronze or gold – we are confronted with the possibility of dealing with reused and remelted metal from different metallurgical provinces, this could not happen with stones. On the other hand, compared with similar analyses of the metal part, one could offer further implications in relation to the very important question about the internal relations and circulation of materials in the Mycenaean world, to reconstruct the *chaîne opératoire*, and determine whether the founders also possessed skills for stone carving.

With the kind collaboration of our colleagues Reinhard Jung and Hristo Popov within the FWF-project "Bronze Age Gold Road of the Balkans – Ada Tepe Mining" (project number P28451), it was possible to submit samples from both pommels from Thrace to the Laboratory of Archaeometry of the National Centre for Scientific Research "Demokritos", Athens, and perform a series of analyses. The laboratory possesses an extensive database for ancient marble quarries – a good possibility for assessing the origin of marble artefacts.

According to the achieved results (cf. Appendix), both pommels show close relations to the Cycladic marble outcrops, especially those of Naxos. Of course, the suggestion is not that this unambiguously points to an origin from the island, since the database comprises marble quarries of the Aegean but does not include Thrace. Comparison to the Thracian outcrops will remain as a further issue. For now, the current results seem to support the Mycenaean origin of the pommels.

Conclusions

The overall assessment of the allocation and distributions of Mycenaean imports in Thrace involves several basic observations: from a quantitative point of view, we are dealing with few finds from three basic and relatively homogeneous categories – weaponry/swords, including pommels; pottery; and ingots, covering a wide time span between the 16th and the 12th century BC. Qualitatively, they have no marked prestige character, and in some cases might even be considered as

49 Kovács 1992, 338–339.
50 See Fig. 1; Panayotov 1980; Kilian-Dirlmeier 1993.
51 Kănčev – Kănčeva 1993.
52 Krauß 2005.
53 Petrov 2007.
54 Borislavov – Ivanova 2007; Borislavov 2017.
55 Kilian-Dirlmeier 1993, 53 fig. 13.
56 Bozhinova et al. 2013, 80–82.

garbage (i.e. pommels as part of a broken sword). In Thrace even the swords, usually regarded as indicators of a high social status,[57] are attested with single finds covering a large time-space, which diminishes their importance. The implications regarding the social status of consumers of imported wares speak rather for minimalistic requirements and suggest a very modest lifestyle with no need for fine commodities. From the discussed find groups, the ingots obviously embody the trade contacts and the transfer of the main metal of the Bronze Age, while the swords represent the most popular and practical weaponry in the region. All in all, luxury goods are lacking in Thrace, and only the few pottery sherds might be considered as such, though limited in number and restricted to the Rhodope region.[58]

If we are trying to figure out the local elite behind the imported finds, it is most likely not a pronounced one. The degree of social stratification and formation of a recognizable aristocracy are demonstrated to be very low in Thrace, hence we could not speak of a centralized and hierarchically organized social structure. The imports rather demonstrate that only a few people were attracted to the Mycenaean lifestyle, or at least accepted some of its external elements, but not the opulent ones. These observations – the lack of luxury and of distinct social stratification, revealing an egalitarian society of LBA Thrace – are also attested at the micro-regional level at the Ada Tepe site, where an early seasonal settling of the miners is revealed in the north area,[59] as well as on a macro-regional level for the whole of Thrace[60].

Considering the relatively high number of weapons of Mycenaean style among the imports, we could further speculate whether Thracians were not hired as mercenaries. The image of the warlike Thracians is already provided in the Homeric epic and continuously in the Classical tradition,[61] and if it is not just literary invention, it might lead back to processes started in the preceding ages of the Trojan war.

If there were rich people, an elite in Thrace – as demonstrated in the grave finds from Ovchartsi,[62] Izvorovo[63] and Devin-Lilovo[64] –, it was in the period before the rise of Mycenaean Greece, and if the buried persons were local, and not outlanders as suggested for the extraordinary burial of an old woman at Ovchartsi,[65] they were traders or similar.

An interesting observation about the lack of the later Mycenaean sword types D, F, and G (after Nancy Sandars) assigns it to the decline in contacts in LH IIIA late until LH IIIB.[66] It should be specified that this concerns the contacts which involved the introduction of weapons, since the Mycenaean imported pottery, though scarce, first appeared in LH IIIA1, continuing through LH IIIB, as the finds from Dragoyna, Koprivlen, and recently Bresto, attest.[67]

One natural question arises: since they acquired imports, what was exported in return from Thrace? If we accept that the region was one of the Mycenaean raw material sources, especially of gold,[68] its value was very low, considering the quantity and quality of the imported goods and whether those were the only ones involved in the barter trade. From the current perspective, the assumption leaves the impression of inequality in the exchange practices, demonstrating the exploitative nature of Mycenaean policy toward Thrace. But also, the Thracians had nothing against

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57 Cf. Bozhinova et al. 2013, 82.

58 The purportedly Mycenaean sherds from the excavations of Drama-Kayryaka site have recently been identified as belonging to the Archaic period (Jung et al. 2017, 270, n. 3 and the cited investigations of Stefanos Gimatzidis).

59 Popov et al. 2017, 193.

60 Athanassov – Krauß 2015, 68–70, 76.

61 Homer, Ilias V.461–462; Euripides, Hecuba 1088 ff; Aristophanes, Birds, 1369; Herodotus, Hist. 5.7.

62 Alexandrov 2009.

63 Borislavov 2010.

64 Borislavov 2017.

65 Alexandrov 2017.

66 Bozhinova et al. 2013, 84.

67 For Bresto see Athanassov et al. 2017; for Koprivlen and Dragoyna see most recently Jung et al. 2017 and cit. lit.

68 Popov et al. 2015, 57; Horejs – Jung 2017, 101.

contact of this type, maintaining it through the centuries of the LBA, obviously without any feeling of being exploited.

Appendix: Provenance Investigation of Two Marble Sword Pommels from Bulgaria

Yannis Maniatis – Dimitris Tambakopoulos

Samples and Techniques

The two objects – Ada Tepe (Museum no. 13315) and Dolno Cherkovishte (Museum no. A5053) – were examined and analysed at the Laboratory of Archaeometry of the National Centre for Scientific Research "Demokritos", Athens.

The objects were first examined non-destructively using a light source with standardized luminosity, optical microscopes and microscales. The translucency, the maximum grain size (MGS) and the most frequent grain size (MFS) were measured.

Following that, minute samples in the form of marble crystals weighing a few mg were received for further laboratory analysis from inner places of the objects so that no damage to the archaeological, typological information or the aesthetics of the objects resulted. The laboratory analysis typically involves the use of two analytical techniques: 1. electron paramagnetic resonance spectroscopy (EPR)[69] and 2. stable isotope analysis (IRMS), through which the isotopic ratio values of $^{13}C/^{12}C$ and $^{18}O/^{16}O$ expressed as ($\delta^{13}C‰PDB$) and (δ^{18} O‰PDB) are measured.[70] These, in combination with the maximum and most frequent marble grain sizes and the other physical parameters, lead to determination of the provenance of the marble.[71] However in this case, due to the small size of the objects, the sampled amount was very small, so it was not possible to apply the EPR technique, unavoidably reducing the accuracy of the final determination.

Results

Figure 5 shows the micromorphology of the samples in transmitted light from a light source under a digital microscope. As can be seen, pommel 13315 is characterized by an ultra-fine grain size distribution with a MGS of 0.6mm and MFS of 0.1mm, approaching a non-typical marble crystallization (Fig. 5.1–2). By contrast, pommel A5053 exhibits a much better crystallization and a more typical grain size for good quality marble (Fig. 5.3–4).

Tab. 1 Results of the measurements

Museum code	Description	Colour	MGS (mm)	MFS (mm)	$\delta^{18}O$ (‰)	$\delta^{13}C$ (‰)
13315	Very fine-grained marble, 1–2 grains up to 0.6mm, fairly well crystallized. Powdery surface, low translucency (due to weathering?), Calcitic marble according to acid test.	White	0.6	<0.1	-7.71	1.65
A5053	Fine- to medium-grained marble, homeoblastic, well-defined grains with angular to straight boundaries. Translucency = 1.0cm. Calcitic marble according to acid test.	White	0.8	0.5–0.8	-9.46	3.42

69 Maniatis et al. 1988; Mandi 1993; Polikreti 1999; Maniatis – Polikreti 2000; Polikreti – Maniatis 2002.
70 Herz 1985; Herz 1987; Herz 1988.
71 Maniatis 2004; Tambakopoulos 2007.

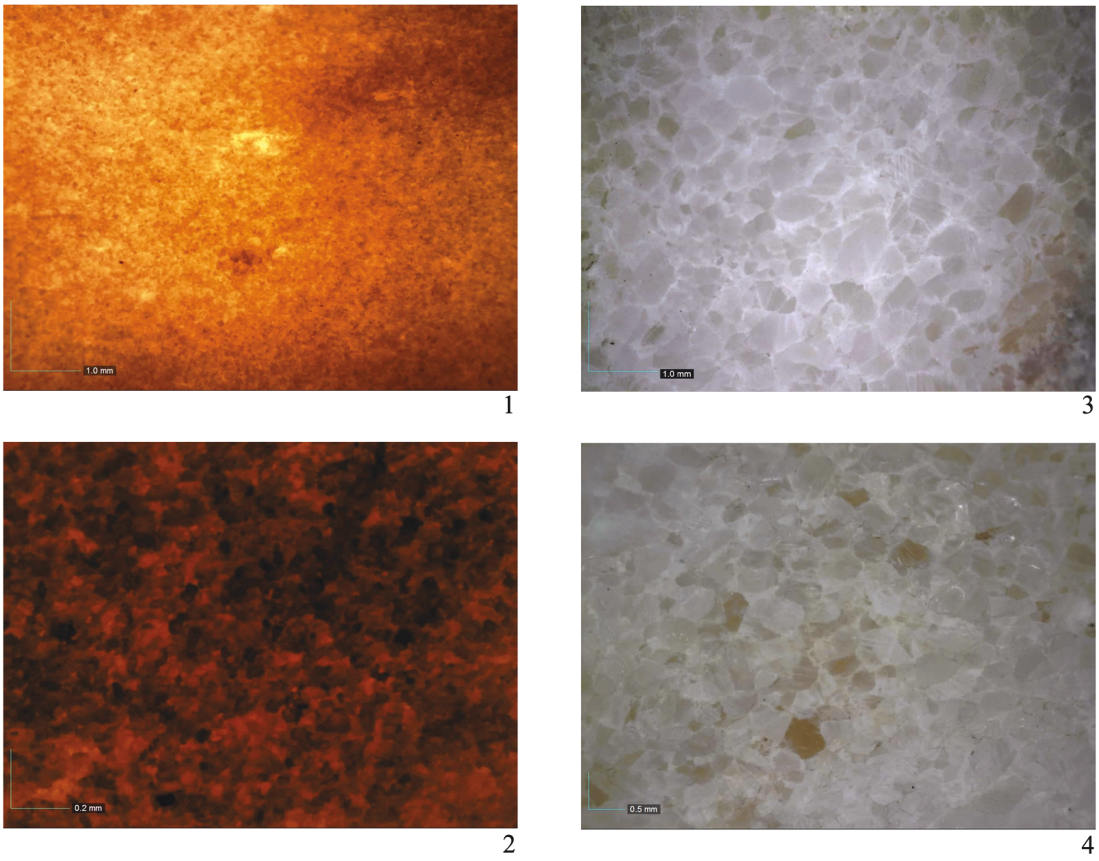

Fig. 5 Crystallinity observed in transmitted light under a microscope: 1. Ada Tepe n. 13315, scale = 1.0mm; 2. Ada Tepe n. 13315 at a higher magnification, scale = 0.2mm; 3. Dolno Cherkovishte n. A5053, scale = 1.0mm; 4. Dolno Cherkovishte n. A5053, at a higher magnification, scale = 0.5mm (© Y. Maniatis, D. Tambakopoulos)

Discussion

Pommel no. 13315 (Ada Tepe)

The diagram of Figure 6 shows the isotopic signature of the pommels against the isotopic fields of various Cycladic marble outcrops. The maximum grain size has been taken into account, so that only the fields with equivalent MGS are plotted. This diagram shows that sample 13315 falls in the overlapping region of Naxos-1 and 2, Ios, Tinos and Keros. However, its ultra-fine grain size distribution can be matched only with some EBA figurines excavated at Keros, Naxos, Syros, Paros and Crete. The source of the marble for these figurines has not been precisely located yet, but only southeastern Naxos (NX-1) has this kind of marble deposits. Keros may also be a candidate for this very fine marble, but the marble of Keros is not suitable for making objects of nice white marble like that in this pommel. Thus, based on these results and the database, southeastern Naxos is the most probable origin so far. In addition, on this part of the island, there are a lot of prehistoric settlements, and marble from this region was used extensively for making EBA figurines and vessels.

The diagram of Figure 7 shows the isotopic signatures of the pommels plotted against known ancient quarries with similar MGS opened at later times (Archaic-Roman). These quarries may be considered unlikely as origins for the prehistoric pommels, but nevertheless there is a remote chance that some small pieces of marble for making a few small objects could have been picked up from these regions in prehistory. However, this specific ultra-fine type of marble does not exist in these regions.

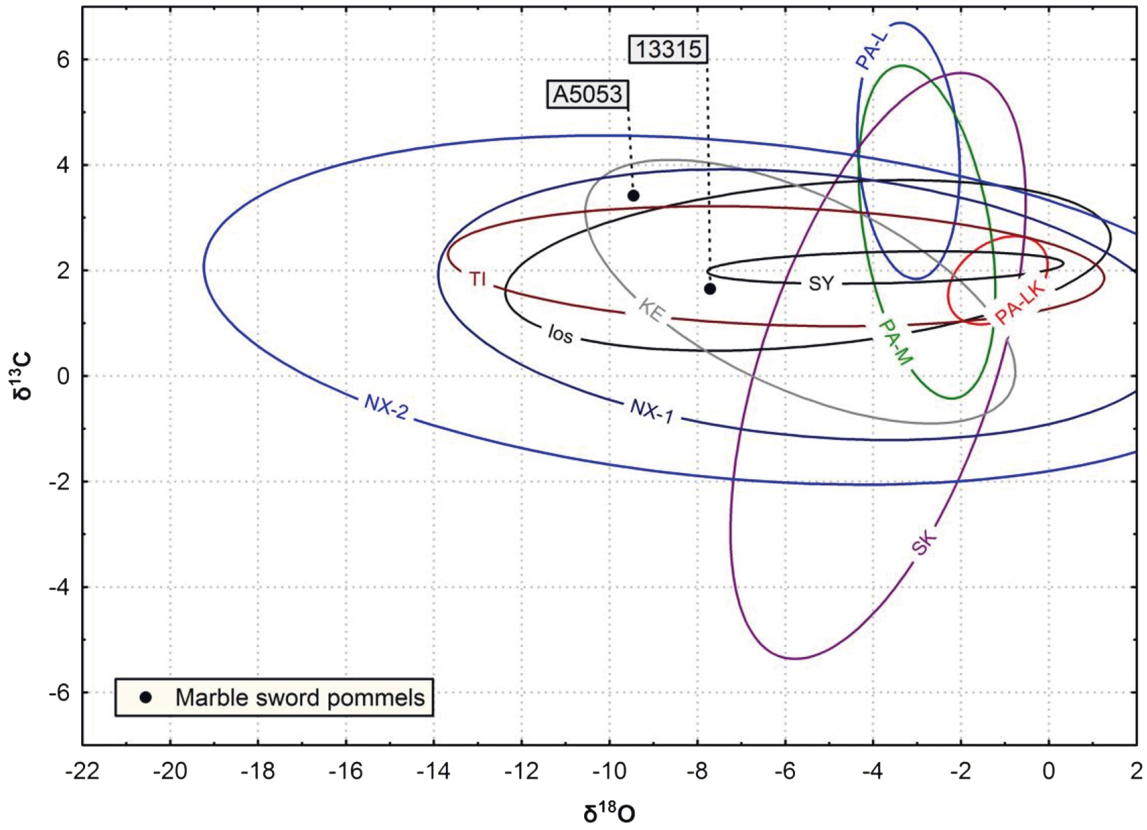

Fig. 6 Stable isotope analysis of the pommels plotted against the isotopic fields of various Cycladic marble outcrops and marble regions. Only the isotopic fields from locations with grain sizes corresponding to those of the pommels are plotted (NX-1 = Southeast Naxos, NX-2 = Central east Naxos, Ios = Ios, KE = Keros, SY = Syros, TI = Tinos, PA-M = Paros-Marathi, PA-L = Paros-Lychnites, PA-LK = Paros-Lakkoi, SK = Skyros). The data is taken from our own Laboratory of Archaeometry data and Attanasio et al. 2006.> (© Y. Maniatis, D. Tambakopoulos)

Pommel no. A5053 (Dolno Cherkovishte)

In the first diagram (Fig. 6), the isotopic signature of this sample also falls in the fields of NX-1, NX-2 and Keros, pointing again and more clearly at the region of central eastern and southeastern Naxos. The marble from these regions with the crystalline characteristics of this sample has been identified as being used in many prehistoric figurines and vessels.

In the diagram of Figure 7 with known ancient quarries, it falls only in the field of Pentelicon in Attica. Further precision in determining the origin is not possible because, as stated earlier, the amount of sample received from both pommels was not enough to run EPR spectroscopy measurements. If this had been possible, we would have been able to exclude – or not – the possibility of an origin from Penteli.

Conclusions

Based on the existing isotopic and grain size databases from marble outcrops and ancient quarries, an origin from Naxos is suggested for both pommels, but not necessarily from the same location. However, there are no traces of any quarries dating from prehistoric times. The objects made were small, so picking up a loose piece of marble to make a figurine, a vessel or a pommel from any region with a suitable marble outcrop having the preferred characteristics of that period (nice white marble like that of the pommels) was most probably the practice.

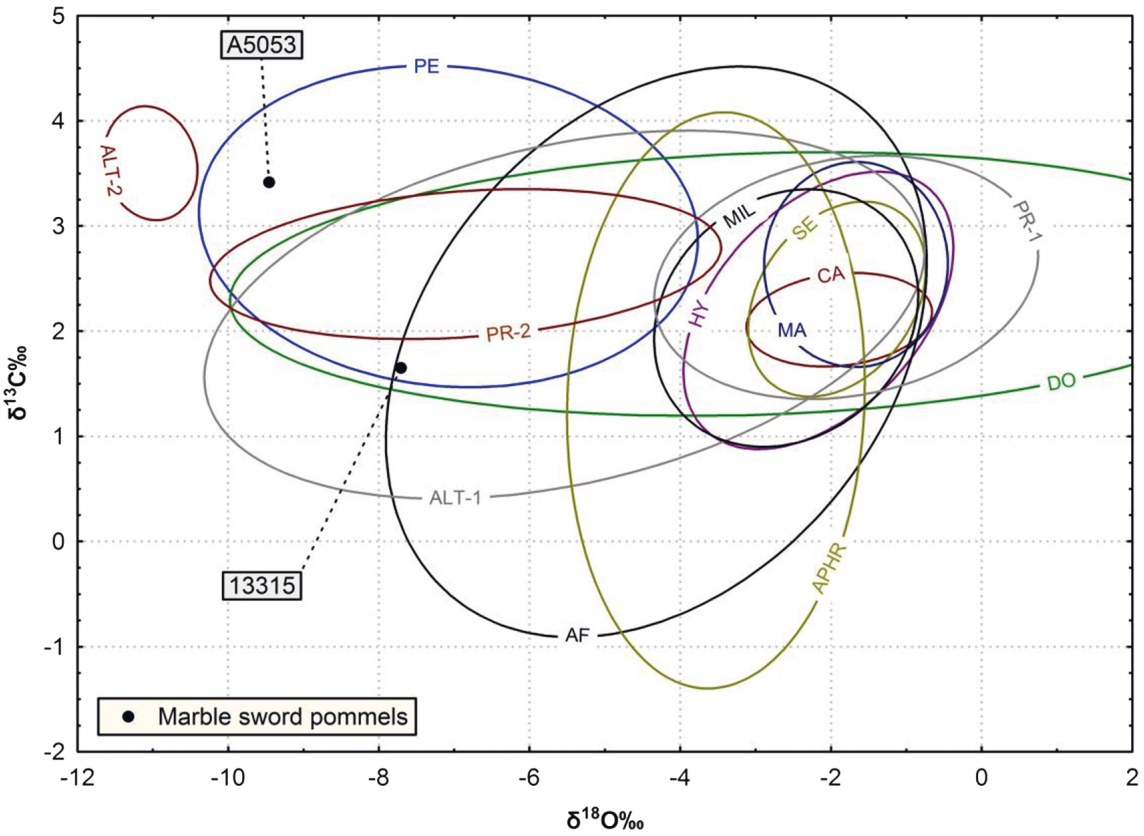

Fig. 7 Stable isotope analysis of the pommels, plotted against the isotopic fields of various known ancient quarries dating from the Archaic to the Roman period. Only the isotopic fields from locations with grain sizes corresponding to the pommels are plotted (PE = Penteli, ALT-1,2 = Altintas, AF = Afyon/Dokimeion, PR-1,2 = Proconnesos, DO = Doliana, MIL = Miletos, HY = Hymettos, APHR = Aphrodisias, CA = Carrara, SE = Seravezza, MA = Mani. The data is taken from our own Laboratory of Archaeometry data and Attanasio et al. 2006 (© Y. Maniatis, D. Tambakopoulos)

Apart from southeastern Naxos, marble with a fine grain size like that of pommel 13315 has been recorded in EBA figurines in Crete, but the fieldwork for locating marble outcrops of this quality on Crete is under way, and isotopic analysis of the figurines has not been performed so far. In addition, marble outcrops with very fine white marble were recently sampled in Paros and are currently being analysed.

We hope that in the future, after the databases have been expanded, we will be able to reassess the provenance of the pommels.

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Mycenaean Gold: Provenance, Technology and Trade

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Abstract: The provenance of Mycenaean gold, although extensively discussed over the last decades, still remains a puzzle for the scholars of the period; the lack of a sufficient number of archaeometric analyses on samples from Mycenaean sites has inevitably led to the suggestion of several 'candidates' as sources of their gold, among them, Egypt, northwestern Anatolia (Troad), the Caucasus region and Transylvania. A comparison of stylistic and technological features between certain types of Mycenaean gold artefacts and their counterparts from the above areas points more to the east than the north, although a trade route over land would be the most sensible choice. The ongoing research and publication of the preliminary results from the earliest European goldmine so far at Ada Tepe in the southern Balkans, is expected to enrich our knowledge and provide a basis for a reassessment of the evidence. The present paper aims to briefly present the existing evidence on the connecting links – and consequently the commercial routes – between the Mycenaean centres of the Peloponnese and their potential suppliers of gold.

Keywords: Mycenaeans, Balkans, provenance of gold, shaft graves, trade

The amazing wealth of finds discovered by Heinrich Schliemann and Panayotis Stamatakis at Mycenae Grave Circle A in November 1876 astonished the whole world.[2] A total of only 19 people[3] held, among other luxurious items, an extraordinarily large number of gold artefacts, including hundreds of foil roundels and cut-outs in various shapes, seals and signet rings (Fig. 1), necklaces, pins, ritual and drinking vessels, perfume containers, weapons with elaborate handles and, of course, the five, so far unique for the Aegean world, death masks.

The deceased were members of powerful families of Mycenaeans, who gradually expanded through trade throughout the whole Aegean during the Late Bronze Age; their influence reached from Asia Minor, the Middle East and Egypt to the western Mediterranean and northwestern Europe.[4] The discovery of such a huge number of valuable grave goods for only a handful of people, literally covered in gold from head to toe, is a phenomenon with no precedent in the Aegean; before that, during the Middle Helladic period, mainland Greece had only yielded sporadic finds of gold, consisting of simple pieces.[5] And since the southern Aegean has no significant ore-bearing sources, and the rich alluvial and reef sources of northern Greece were probably not exploited from that early period,[6] the question is, where did all this gold come from?

Due to the great archaeological and artistic value of Grave Circle A finds, microscopic analysis involving their transfer outside the museum was, until recently, only exceptionally allowed;[7] therefore any theories on the provenance of the early Mycenaean gold were mostly based on

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[2] For the chronicle of the excavations and finds of each grave see Demakopoulou 1990, 88–105.

[3] For the anthropological examination see Papazoglou-Manioudaki et al. 2010, esp. 219.

[4] For the expansion of the Mycenaeans see, among others, Castleden 2005, 183–186. For Asia Minor see Tartaron 2013, 272–275 (Miletus).

[5] For a typology of MH jewellery and discovery sites see: Higgins 1980, 51–52; Konstantinidi 2001.

[6] Stos-Gale 2014 (for a map of ore-bearing regions and discussion on northern Aegean sources); Georgakopoulou 2016.

[7] As part of a wider European programme, in the 1970s, Axel Hartman performed a series of sampling and ICP-AES (atomic emission spectrometry) analyses on a number of gold objects from NAM's Mycenaean collection; see Hartmann 1982.



Fig. 1 Gold signet ring with battle scene. Tomb IV, Grave Circle A, Mycenae, 16th century BC (by permission of the NAM Photographic Archive)

stylistic or technological similarities with other finds, mainly from Minoan Crete.[8] The same applied more or less for the rest of the Mycenaean finds in the National Archaeological Museum Athens (NAM), with only a few exceptions, where an in situ non-invasive analysis with portable equipment has been performed. The aim of the analysis was determination of the composition of the gold, silver or bronze alloy or details of manufacture, as in the cases of vessels,[9] daggers with inlaid decoration[10] or signet rings.[11] About a decade ago NAM, in collaboration with the Department of Chemical Engineering of the National Technical School of Athens, performed analyses aiming to determine the bulk chemical elemental composition of gold-alloy artefacts from Grave Circle A, as well as corrosion products and surface residues.[12] The results obtained so far identify the use of native gold alloy containing high concentrations of gold (varying between 65 and 90%), lower silver concentrations, while copper was detected as a minor element. It was further shown that the level of gold used in the alloys varied and that the precious metal mainly came from native sources.[13]

Stylistically, the majority of the early Mycenaean artefacts point to Minoan Crete as their place of origin.[14] Therefore it has traditionally been assumed that gold came from either Egypt

8 Dickinson 1997.
9 Stos-Gale 2014, esp. 188, 191.
10 Demakopoulou et al. 1995.
11 Müller 2003.
12 Saint et al. 2015.
13 Demakopoulou et al. 1995. The NAM co-organizes two international projects on gold artefacts of the Mycenaean period, one with Heidelberg University, the Curt-Engelhorn-Center for Archaeometry (CEZA) and the Institute of Oriental and European Archaeology (OREA) and the other with the Dimokritos Centre for Scientific Research (Athens), both seeking answers on the nature and provenance of the gold alloys.
14 Laffineur 1994.



Fig. 2 Gold finger ring with a griffin on the bezel decorated in the cloisonné technique (glass inlay still preserved). Kapakli tholos tomb, 15th century BC, NAM inv. no. P 5606 (by permission of the NAM Photographic Archive)

or Mesopotamia. Egypt in particular may have supplied the Aegean, at least from the 5th Dynasty (c. 2494–2345 BC[15]), along the Levantine coast, and via southern Anatolia or Crete.[16] This theory is not only based on the geographical position of Crete, between Egypt, Cyprus and the Levant, but also on the assumption that whoever the supplier or suppliers were, the importation of gold also involved transfer of technological know-how, symbols and ideas.[17]

Indeed, some of the most sophisticated techniques seen in Late Bronze Age Greece, like granulation and filigree, are attested in Mesopotamia and Syria as early as the mid-3rd millennium BC.[18] However, by the time both techniques reached the mainland through Minoan Crete, a little after 2000 BC,[19] when contacts with the eastern Mediterranean became stronger, a different know-how had been developed.[20] Similarly, the technique of cloisonné, already practised in Egypt from the 4th Dynasty (c. 2613–2498 BC[21]) with cut-to-shape pieces of glass or a variety of semi-precious stones set into metal cells,[22] was transformed by the Mycenaean craftsmen with the introduction of liquid glass that was then left to cool (Fig. 2).

The eastern origin of the early Mycenaean gold artefacts was seriously debated by Ellen Davis, who, following Georg Karo's and Bernhard Hänsel's arguments on the contacts with the

15 Shaw 2000, 480.
16 Andrews 1990, 52–54.
17 Laffineur 1994, 246–248.
18 Nicolini 2010, 70–71; Prévalet 2014, 428.
19 Higgins 1980, 57.
20 Morero – Prévalet 2015, 61–64.
21 Shaw 2000, 480.
22 Andrews 1990, 88–90.



Fig. 3 Rhomboid bone accessory with gold revetment decorated with wave band motif, Grave Circle A, Mycenae, NAM inv. no. P 344 (by permission of the NAM Photographic Archive)

North,[23] established the term 'Transylvanian connection'.[24] Although Davis was mainly referring to vessels made of precious metals, a recent study on the bone accessories with geometric patterns from Circle A confirms her theory, connecting them to the contemporary bone horse-harness accessories from central Europe.[25] Dozens of those accessories, most of them still preserving the gold foil covering them, were unearthed in Circle A, furnishing only male burials;[26] they were conventionally named buttons because of the vertical notch at the back, which would allow them to be sewn onto a cloth by means of a thread. Observations with a portable XRF on the core and the underside of one such accessory from Grave V, in which the gold sheet has been detached from the bone (Fig. 3), again suggested the use of native gold alloy.[27]

Items of the same date, made of bone or antler and decorated with similar wave band motifs, have been found in a wide area from the Carpatho-Danubian region to the Amuq Plain (southern Turkey), and north of the Black Sea.[28] The wave band motif is also known from gold ornaments, small vessels, bronze tools and weapons from the same areas. Although we are not in a position to know whether this is a case of importation, plain imitation of decorative motifs or technological transfer,[29] a northern link is further supported by the fact that the disc-shaped 'button', which is the most common object with such decoration, is known almost exclusively from the Carpatho-Danubian region and the Peloponnese.[30]

23 Karo 1930–33, 272; Hänsel 1982, 5–11.
24 Davis 1983.
25 Papadimitriou et al. 2016. For a comparison of patterns between artefacts from Mycenae and the Carpathian Basin see David 1997.
26 Karo 1930–33, pls. 59–66.
27 Papadimitriou et al. 2016, 249.
28 Maran – van de Moortel 2014 with a discussion and the various theories on the origin of such items. See also Minkov this volume.
29 Maran – van de Moortel 2014, 543–545.
30 David 2007, 412.



Fig. 4 Gold relief beads of various shapes. Prosymna, 15th century BC., NAM inv. no. P 8451 (by permission of the NAM Photographic Archive)

Affinities with the southeast Carpathians were also indicated by lead isotope analysis on silver artefacts from the shaft graves of Mycenae, among them the famous 'siege rhyton': similarities were documented with the Baia Mare district of Romania and the gold mining region of Rosia Montana (Apuseni) to the south, possibly exploited in the 2nd millennium BC. Samples from Kokla in the Argolid, Peristeria in Messenia and Perati in Attica also gave the same results.[31] The theory of Romanian ores as a possible source of Mycenaean gold has also been discussed in the past, in relation to another type of jewellery, the spiral earrings found mainly in Shaft Grave III of Mycenae Grave Circle A, a popular type in the Carpathian Basin.[32] Trade with the region seems to have been a continuous activity for more than 100 years, not restricted only to the 16th century BC.

At the turn of the 15th century BC, Mycenaean art acquired a local character, with fewer Minoan influences than before;[33] the gold relief bead which consists of two plates soldered together now becomes the trademark of the Mycenaean jeweller. The fact that several of the bead shapes, like the ivy, the rosette and the papyrus (Fig. 4), were reproduced for a period of two and a half centuries, indicates that relief beads, through their motifs, formed a kind of communicative code within the sphere of the Mycenaean world.[34]

31 Stos-Gale 2014, 192–195, fig. 9; 199–204, figs. 16–19.

32 This was first noticed by Arthur Evans (Evans 1929, 47–48: 'typical to Unetice culture centered on Transylvania'), while other scholars have emphasized the role of Romanian ore sources in Baia Mare; for discussion and selected bibliography see Stos-Gale 2014, 205.

33 For a recent overview of the period's art see Poursat 2014.

34 Eder 2015.



Fig. 5 Necklace of gold beads with a spherical granulated pendant in the middle. Prosymna, 15th century BC, NAM inv. no. P 8456 (by permission of the NAM Photographic Archive)

One of the earliest typical shapes of bead is the spherical granulated form, a type restricted geographically to southern Greece and Crete, and chronologically to the 15th and 14th centuries BC.[35] Each bead consists of two hemispheres soldered together, usually decorated with rows of granulation at the joint and around the decorative circlets destined for glass inlay (Fig. 5). The complexity of the type and the specific stages of manufacture show that it could be one of those – not so common – instances when we come across the product of a specialized workshop, most probably located in Crete; this hypothesis is further strengthened by the fact that the examples are, for the most part, found in the same context with Cretan signet rings that combine granulation and cloisonné.[36]

What makes this type of significant importance however, apart from its complicated method of manufacture, which indicates a particular *chaîne opératoire*, is the possible connection it suggests between the Aegean and the southern Caucasus: a group of gold beads – none of them identical to each other – found in the so-called Kurgan VIII burial in Trialeti,[37] although still given a problematic dating (late 3rd – mid-2nd millennium BC), may have served as the prototype of the Mycenaean granulated bead. Earlier examples of the type at Susa and Giyan suggest the region of Iran as the place of origin;[38] however, the Caucasus may have served as an intermediate station.

Since behind every myth lies some truth, it is tempting to link this hypothesis with the legend of Jason and the Golden Fleece,[39] as it may reflect the early trade contacts of the Mycenaeans with the Black Sea.[40] It was precisely this motivation, to confirm archaeologically the Argonauts' journey,

35 Konstantinidi 2005.
36 Konstantinidi 2005, 89–90.
37 See more recently Aruz et al. 2008, 93 with relevant bibliography.
38 Kushnareva 1997, 89–92, 114–116; See also Schwall et al. this volume.
39 The myth was first written by Apollonius of Rhodes in his epic poem "The Argonautica" (3rd century BC) (Seaton 1912).
40 Bouzek 1997, 169.

that led a Greek-French team of experts to perform comparative analysis between gold beads from ancient Colchis and the site of Kazanaki near Volos, where mythical Iolkus, the homeland of Jason should have been.[41] An undisturbed tholos tomb dated to 1350 BC was revealed, with the remains of seven persons, four adults and three children;[42] grave goods included around 1,000 gold beads of typical Mycenaean shapes (double spiral, rosette and lily), gold bands and roundels of very fine gold plate, suggesting that they were exclusively destined for burial use.

Analysis performed on 22 fragments of gold bands, 14 roundels and 13 relief beads showed a gold concentration lower than 89% and similarities with pieces from Mycenae, Grave Circle A, the tholos tomb from Kapakli, Volos and the settlement of Kastanas in Macedonia.[43] The presence of high amounts of trace elements suggests the use of alluvial gold in the manufacture of jewellery; similar analyses on gold artefacts from Colchis present feable analogies, indicating the use of natural gold-silver alloys.[44]

Before the rise of palatial administration in the Argolid, during the 14th century BC, Late Bronze Age art is distinguished by the combination of precious metals and alloys on luxurious vessels, with examples coming from tombs, mainly in the Argolid, Messenia and the region of Knossos on Crete.[45] Features like the gold-plated bronze rim and handle (Fig. 6), the wishbone handle terminating in a rosette-shaped button, the use of an inner lining, either of the same metal or of a different one, are typical for the period.[46] Some of those features have been adopted from the Minoan repertoire, while others evolved on the mainland;[47] none, however, survives in later periods. Behind this combination certainly lies something more than the desire to impress with polychromy: as contemporary evidence from Cyprus, Egypt and the Levant shows, precious metals were inexplicably linked to religious power, and they were given special values through their symbolism.[48]

Based on the evidence above, it becomes clear that although our current stage of knowledge does not allow us to draw any safe conclusions as to the provenance of Mycenaean gold, there are at least four candidates (one or more of whom prevailed in certain periods): Egypt, the Caucasus, Transylvania (Romania) and Bulgaria. One would assume that the easiest and more 'inexpensive' way for the Mycenaeans to acquire gold would be over land, considering also the time and risks taken by a sea voyage.[49] However, judging by the high social and economic significance gold had for the Mycenaeans, trade of the precious metal would certainly depend on other factors as well, like specific preferences – for example for the whitish Egyptian gold with the higher concentration of platinum[50] – or certain political and economic alliances between the regions involved.

A closer look at each of the possible gold 'suppliers' at this point would not offer much, as we are still far from understanding the nature of Late Bronze Age trade. It seems, however, that there were at least two different networks during the Late Bronze Age: one which also involved exchange of technology and ideas, and another one which focused mainly on the exchange of materials.[51] The former could correspond to the eastern network with the vital role of Cyprus as an intermediate station,[52] while the latter could involve the transport of raw materials and finished

41 Adrimi-Sismani et al. 2009.
42 Adrimi-Sismani – Alexandrou 2009.
43 Vavelidis – Andreou 2008.
44 For discussion and relevant bibliography see Adrimi-Sismani et al. 2009, 139–140.
45 Laffineur 1977; Konstantinidi-Syvridi 2021.
46 Davis 1977, 256 (Vapheio), 263–266 (Dendra).
47 Davis 1977.
48 Persson 1931, 57, mentions that in the Babylonian religion, silver is the symbol of the moon, copper of Venus, lead of Saturn and iron of Mars; cf. also Gillis 1999; Müller 2012, esp. 467.
49 For the presence of two Mycenaean emissaries or ambassadors equipped with bronze swords on the Uluburun ship (late 14th century BC), see Pulak 2008, esp. 302.
50 Ogden 1976.
51 Cosmopoulos 1991.
52 See, among others, Cluzan 2008; Jung 2015, 254 n. 80 (for the exportation of silver to the eastern Mediterranean).



Fig. 6 Silver cup with a gold-plated rim and handle, Vapheio, Laconia, 15th century BC, NAM inv. no. P 1875 (by permission of the NAM Photographic Archive)

products via a route that connected the northern Aegean with the central and eastern Balkans. It was actually the same route through which Baltic amber reached the elite of the Peloponnese, the Mediterranean and even the Black Sea.[53]

The significant role that the rivers Maritsa/Nestos, Strymon/Struma and Axios/Vardar played in the communication with the South, connecting the southern and central Balkans directly with the Aegean and the Mediterranean, is confirmed by Mycenaean/Aegean finds – possibly considered *exotica* – at several coastal sites, especially during the late 15th and 14th centuries BC:[54] pottery, double axes, spear- and arrow-heads, oxhide ingots and faience beads. Special importance has been given to the discovery of imported Mycenaean or locally made Mycenaean-type swords in the Balkans and the Carpathian basin.[55]

The typology of those finds alone does not clarify the focus of the Balkan-Aegean trade: bronze ingots may have been used as a form of 'currency' and the occurrence of swords may equally imply military expansionism or precautionary measures against aspiring burglars.[56] The only piece of evidence that could be interpreted as an indication of a Mycenaean political and economic expansion to the Balkans is the fine, painted pottery found in the eastern Balkans

53 De Boer 2010. An alternative route would be through the Adriatic coast, see Jung 2009, 72–73.

54 See, for example, Čenovo (bronze ingot), Tsarevo (Mycenaean sherd), Dolno Cherkovishte and Krumovgrad (marble sword pommels) (Alexandrov et al. 2018, 514 cat. no. 343; 518 cat. no. 355; Maran – van de Moortel 2014, 542).

55 Among others: Suckowska-Ducke 2016, esp. 68–69; Jung 2018, 242–244, maps 1 and 2.

56 See above n. 49.

(Dragoyna) which, based on analysis, was imported from the Thessalian coast towards the end of the 15th century BC.[57]

Furthermore, our insufficient knowledge on the structure of the society of the Balkans and the elite during that period makes it impossible to answer some vital questions on the role of the Mycenaeans in those trade contacts: were they imposing themselves by the force of weapons – as someone might argue based on the occurrence of the swords – in order to control the Balkans economically, or were they merely the participants in a wide interregional network? And what did they give in exchange for gold?

In view of the recent finds in the region of Bulgaria, it is evident that we cannot doubt the existence of a local elite or – more importantly – underestimate their role in the control and benefits from their trade with the Mycenaeans. The relatively few gold finds – in spite of the abundance of gold sources – like the Valchitran treasure[58] or the Aegean-type grain-of-wheat beads in Izvorovo Tumulus 1,[59] show influences or contacts with the south;[60] at the same time however, they display different aesthetics and attitudes towards goldwork's typology, circulation and deposition than in the Aegean and the eastern Mediterranean.[61] Furthermore, to our present knowledge, in the Mycenaean world and in the wider area of the eastern Mediterranean, the standardization of gold artefacts (i.e. relief beads and signet rings forms part of a communicative code between members of the elite and, in consequence, gold is consciously withdrawn to accompany the deceased in their graves. By contrast, the ore bearing regions in the north seem to use gold more as the means to acquire other goods in exchange than for its symbolic meaning as a material of prestige.

The discovery of so much gold in the Mycenaean graves, especially during the early period (15th century BC) clearly suggests its conscious withdrawal from circulation, partly in order to save it for future use. Although the picture could change dramatically in the light of new discoveries, for the moment, the situation in the Balkans seems to be different: what the elite of the Mycenaeans, the Egyptians, the Hittites and the Cypriots used as a powerful tool in order to establish and enforce their prestige inside and outside their administrative borders, in the Balkans seems to have served mainly as a trade product.

On the question 'gold in exchange for what?', again the scarce evidence does not allow us to draw any safe conclusions. Based on the Linear B archives, it looks like the economic activities on the Greek mainland focused on the trade of perishable goods[62]; we cannot depend on them, however, to understand the extent of that trade, as tablets were only temporary records, reflecting the situation over a short period, mainly in Pylos.[63] Wool – of major significance to the Mycenaean textile industry – could be one of those export commodities that has not left any trace in the archaeological record. The same actually applies to other products as well, such as perfumed oil from Knossos and Pylos, which was distributed via Cyprus to the eastern Mediterranean.[64]

Whether the recently excavated gold mine Ada Tepe, southeast Bulgaria[65] will change this picture, remains to be seen. In the light of new, published material in the Balkan Peninsula, perhaps we will soon be able to comprehend the relation of the two cultures in connection with gold. The contribution of new archaeometric analysis will certainly be very welcome, although there

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57 For the analysis of the pottery and relevant discussion see Jung et al. 2017. On the types of Mycenaean pottery see Bozhinova et al. 2013.

58 Penkova – Mehofer 2017.

59 Borislavov 2010, 17–19; Jung 2015, 258.

60 Horejs – Jung 2017, 100. Cf. also Borislavov 2018.

61 On the Valchitran and other treasures from the wider area see Paschalidis 2007, 440–441. More recently, Haag et al. 2017.

62 McMillan 2016, 53.

63 McMillan 2016, 52–53.

64 Among others, see Hamilakis 1996.

65 Popov et al. 2011; Horejs – Jung 2017.

are technical aspects that have proven to be misleading or inconclusive;[66] therefore a side by side evaluation of the evidence also provided from a technological comparison of the finds[67] could perhaps be a safer way to proceed.[68]

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[66] See, for example, Pernicka 2014, 159–160 for discussion on the oxidization and depletion of metal elements during the melting process.

[67] On the necessity of examining first the stages of production for each technique before attempting to compare between different regions and periods see Papadimitriou et al. 2016, 245–246.

[68] For the benefits of projects on Mycenaean gold work combining scientific and technological analysis, see Aulsebrook 2023, esp. 114–115.

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Social Interaction in Thrace: Rivers Shape Landscapes – Mountains Define History

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Abstract: Archaeological thought has traditionally perceived river valleys as places of intense human contact and mobility, exchange of ideas and commodities and thus loci of cultural innovation. This perception emerged in modernity after the major hydraulic works that dramatically changed river valleys from places of natural disasters and degradation to economically and demographically flourishing landscapes. In regions such as those of southern Thrace, which was regarded as a buffer zone between major cultures, rivers were always imagined as routes of migration, trade and communication of ideas that facilitated the circulation and exchange of technologically more advanced artefacts and ideas from the Aegean. From this more or less colonialist point of view, rivers were viewed as a contact network that gradually transformed the cultural landscape. Geomorphological analyses in some parts of the world have, however, shown a totally different picture of river valleys. This paper presents some glimpses of the material culture of southern Thrace and suggests that the most important innovations in this region did not take place within river valleys. By tracing the earliest contacts of the Balkan hinterland with the Aegean that took place during the early Archaic period following a long break after the Late Bronze Age, I argue that major rivers such as the Hebros, Nestos and Strymon did not define the cultural landscape as major water routes of contact as is usually thought.

Keywords: Early Iron Age, Hebros, Nestos, Strymon, cultural contact, exchange, migration

River valleys have a special place in the construction of narratives about human history since they are usually thought to have presented the highlights of human culture. The conceptualization of valleys as cradles of civilization originated in Near Eastern archaeology, which focused on the study of the major Neolithic and Bronze Age cultures along the valleys of the Tigris and Euphrates in Mesopotamia and the Nile in Egypt. Since then, river valleys have been a priori perceived not only as loci of culture but also as major routes for the diffusion of ideas and migration. They are expected to have hosted some of the major 'cultures', elaborate settlement systems, prosperous and complex societies; at the same time they appear in archaeological imagination as water routes that facilitated communication and trade between sea and hinterland. Nowhere else are these perceptions better illustrated than in the book by Peregrine Horden and Nicholas Purcell, and particularly in the chapter where they define their highly influential notion of 'connectivity': 'Moreover, to the sea in the literal sense we must add the very important case in which water-borne contacts extend the sea into the land. Navigable rivers – Ebro, Rhône and Tiber, Po, Adige and Narenta, Axios, Strymon and Hermus, Maeander, Pyramus, Orontes and Nile – and dozens of smaller but often partly navigable streams, with the coastal wetlands where land and sea mingle, together constitute another zone of communications.'[2] By contrast, mountains have usually been understood as barriers that do not offer opportunities for economic development. They have been thought instead to constrain economic growth due to alleged restricted resources and also hamper human mobility and communication. It is thus not incidental that mountains have usually been viewed as boundaries between different cultural landscapes or 'cultures'.[3]

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[2] Horden – Purcell 2000, 133.

[3] Only exceptionally were river valleys taken as cultural boundaries; see, e.g., Wardle 1997, 518.

The conceptualization of the major rivers as routes of communication and culture emerged in the context of earlier environmental deterministic approaches in European archaeology and particularly during a period when local historical and cultural phenomena used to be subsumed within general models that allegedly defined human behaviour. Such generalizations and their by-produced grand narratives could not have left unaffected the northern Aegean and central Balkans, which have been traditionally regarded as buffer zones between major cultures such as the Aegean and the Balkan ones. Traditionally the rivers that flowed from the North to the South have been regarded as the main routes for the diffusion of new ideologies and artefacts, as well as for human mobility. The Axios, Strymon, Nestos and Hebros rivers were thus traditionally considered as places of social and cultural contact between the northern Aegean and its Balkan hinterland.[4] By contrast, the mountain range of Rhodope has been treated in regional archaeology as a cultural frontier or archaeological boundary that restricted communication between the central Thracian and coastal Aegean plains.[5]

The first challenge to this more or less essentialist approach was voiced by Fernand Braudel in his study of the Mediterranean Sea, which is widely appreciated for its innovative diachronic perspective of 'longue durée'. According to the French historian, the sea connects but also separates, and the Mediterranean Sea in particular is a network of interconnected maritime and continental routes, a space in continuous motion.[6] In his monumental history, Braudel puts the mountains – not the sea or the rivers – first in his ecological, economic and cultural definition of the Mediterranean Sea. In this way he offers an alternative to the determinist view that previously dominated historical and archaeological interpretation about the primacy of rivers and valleys. According to Braudel, mountains offered refuge in periods of crisis and were full of resources for their population, which was not usually dense but could increase at times when plains were abandoned after having suffered ecological degradation.[7] Although plains are usually perceived as 'loci of culture', their environmental properties were not always favourable. Contrary to such modern perceptions, river valleys were usually considered in the premodern period as improper places for settlement due to unstable geological and unhealthy ecological conditions, although variations did exist.[8]

The essentialist view that rivers accommodated settlement and facilitated mobility among hostile mountains used to overemphasize the primacy of the natural environment against the human potential and will to cope with the forces of nature. Some societies were more resilient or persistent than others in similar environmental settings, while not all river valleys or mountains shared the same environmental properties and presented the same impediments for settlement and mobility at all times throughout human history.[9] Geomorphological analyses have shown certain deficiencies in such generalizations. A recent study on a very complex and extensive urban system

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4 Most characteristic are the following sentences by Milutin Garašanin in the Cambridge Ancient History: 'the valleys of the Struma (the Greek Strymon), Mesta and Marica rivers provided natural avenues of communication between the Thracian plain and the Aegean littoral…In the central part of the Balkan Peninsula a basic natural route is provided by the valleys of the Morava and the Vardar, the passage from one to the other being rendered easy by the low watershed at Preševo…when we consider links between the Balkan hinterland and the Aegean region we must pay particular attention to the valley of the Marica and even more to the valley of the Struma' (Garašanin 1982, 77). See also Archibald 1998, 13: '… the major river valleys form the most direct passage to the interior'. Some other scholars went further than that, assuming that 'the valleys of the Vardar, Ibar and Morava linked Corinth to the Balkan hinterland, and the route along the Danube was proposed to bridge the distance between the Black Sea colonies and Glasinac' (Babić 2002, 75). For a more recent, similar argumentation with a focus on the Strymon and Hebros rivers see de Boer 2010.

5 See, e.g., de Boer 2010, 181–182.

6 Braudel 1985.

7 Braudel 1972, 30–41.

8 Braudel 1972, 60–85.

9 For a study of the Nile Valley and a general discussion of geomorphological transformations in river valleys see: Macklin – Lewin 2015.

that was developed by the Indus Civilization has demonstrated – in contrast to earlier perceptions – that its numerous settlements did not flourish close to a Himalayan river, as used to be taken for granted, and that water was abundant only during the monsoon periods.[10]

The Physical and Cultural Landscape in Southern Thrace

The Nestos/Mesta, Strymon/Struma and the Hebros/Maritsa are the major rivers in Thrace. While for most of its length the Nestos flows through narrow and steep rocky valleys[11] and the Strymon was navigable only in its lower part, which formed the lake of Achinos until the 20th century,[12] the Hebros, the longest river that springs in the Balkans, was the only navigable one up to its upper course. There must have been several good reasons for the deification of the Hebros in Antiquity, the nicest of all rivers according to Alcaeus (frg. 109 Bergk: 'κάλλιστος ποταμών'). The fertility of the plain and navigability of the river that permitted the transport of grain were possibly the basis of the regional economy. Another reason must have been the propitiation of one of the largest and most dangerous rivers in the Balkans for the sake of the people who lived next to it.

The Rhodope Mountains are traditionally regarded as major barriers that restricted communication between the central Thracian and the coastal Aegean plains; the only possible way for contact was thought to have been through river valleys, mainly those of the Strymon and Hebros.[13] However, the study of the local material culture during the Late Bronze and Early Iron Age over the Rhodopes and adjacent areas transmits a different picture. There are barely any differences in the material culture – settlement patterns, burial architecture and mortuary practices, pottery and other artefact types – between the north and south sides of the Rhodope Mountains to account for restricted contacts; instead, differentiations are noticeable only in the material culture between the Western and Eastern Rhodopes that cannot be explained through an environmentally deterministic perspective.[14] In these early periods, the Rhodopes were definitely not a remote and desolate mountainous region, as used to be thought, but the place where a very complex network of hilltop settlements operated, bringing together the two adjacent plains: the coastal Aegean plain and the plain of central Thrace.[15]

The distribution pattern of goods of Aegean origin or type in Bulgaria may look quite bizarre, especially for those who are not familiar with the cultural complexity of the region. In an earlier period, regional archaeology used to imagine a Mycenaean exploration of the Black Sea or even a Mycenaean settlement on its western shores based on some random finds that included pottery, swords and lances of Mycenaean type or origin and other prestigious objects such as the much discussed assemblage of copper ingots of several different types and probably of variable origin.[16] Today it is widely acknowledged that the production, exchange and consumption of these commodities do not relate to maritime trade with the Aegean and that most of them were either acquired or produced locally on paths of exchange that were shaped through the millennia over the Rhodope Mountains and the large river valleys that cross them.[17] While some categories of Late Bronze Age goods such as pottery were found in the river valleys (Koprivlen), other commodities of Aegean type or origin, e.g. swords, are mostly known from the north side of the Rhodope

10 Singh et al. 2017, 1–14.
11 Casson 1926, 22.
12 Casson 1926, 21.
13 See above n. 4.
14 Baralis – Riapov 2007, 59–65; Gimatzidis 2023.
15 Gotzev 1997, 409–415; Popov 2015, 110–114.
16 Doncheva 2011; Doncheva 2012, 672–676, fig. 1.
17 De Boer 2008, 282–297.

Mountains, away from the so-called water routes, which does not conform to the traditional interpretation of river valleys as major trade routes.[18]

Pottery Making and Consumption: Evidence of Technology Transmission

Some of the few pots of Mycenaean type that were consumed in Bulgaria were found at Koprivlen, in the upper Nestos valley (LH IIIB–LH IIIC Early),[19] while the earliest ones come from Dragoyna (LH III A1),[20] a hilltop settlement on the northern Rhodope Mountains; finally, a few more came to light at Bresto and Ada Tepe.[21] After the end of Late Bronze Age, however, the populations in the Thracian hinterland and its Aegean coast neither consumed any archaeologically visible and datable goods from the Aegean nor did they appropriate any cultural phenomena of southern origin. The first major change in this long break in exchange, as we conceive it archaeologically, took place at the very same site of Koprivlen in the upper Nestos valley. Koprivlen is one of the few well-excavated and published settlement sites in southern Bulgaria dating to the 2nd and 1st millennium BC. From the Late Geometric period onwards, a very special painted pottery was produced and consumed at this settlement.[22] This pottery, called K-22 Ware after the macroscopical ware taxonomy at Sindos in central Macedonia, where its production probably began, is the hallmark of the Geometric pottery style of Macedonia in the Early Iron Age.[23] The upper Nestos valley, which was the most remote place where this ware was consumed, was also one of the less accessible places in the Balkan hinterland due to the steep gorges of that river in its lower course and was never seriously considered in historical and archaeological discourse as a proper route of communication.

K-22 is a ceramic ware produced with a very special technology, which comprises both handmade and wheelmade techniques and combines north and central Aegean pottery traditions in forms and types. This hybrid technology and shape repertoire thus make it a unique ceramic ware in the Aegean and the Balkans from the Late Geometric period onwards. This pottery was produced in the same way everywhere in Macedonia, with a remarkable adherence to a unique manufacturing recipe.[24] Nevertheless, there are several typological characteristics that reflect regional variabilities in the consumption of this pottery: for example, in Pirin and eastern Macedonia there is a special preference for neck-handled amphorae, jugs and pyxides, which are either absent or very rare in other assemblages of the same ware, such as those at Sindos and Kastanas in central Macedonia.[25] At the same time, *Leittypen* such as pithoi and pithoid amphorae appear in the same form and with the same decoration everywhere within the distribution area of the K-22 Ware.

The transmission of a very special technology for the making of this distinctive Macedonian Geometric pottery to such a remote place beyond its main area of production and consumption is of special interest. Argilos on the Strymonic Gulf and especially Koprivlen on the upper course of the Nestos were the only sites outside central Macedonia where the consumption of this pottery was particularly popular. Although the K-22 Ware probably originated in the lower course of the Axios River, it soon became more common in eastern and Pirin Macedonia than in any other region of Macedonia where it was consumed. This is what the statistical analyses of the ceramic assemblages at three different sites show: the K-22 Ware is represented by 8% of the total ceramic

18 Doncheva 2011, 88–91, 93–95, figs. 2–5; Bozhinova et al. 2013, 77–84, fig. 4.
19 Alexandrov 2002, 74–75, fig. 30; Jung et al. 2017, 276–281.
20 Bozhinova et al. 2013, 67–77.
21 Athanassov et al. 2017, 135–136, fig. 3; Jung et al. 2017, 67–77, pl. 14.1–6. For a few other possible sites with Mycenaean ceramic see also: Alexandrov 2005; Doncheva 2011, 88–89, 93, fig. 2.
22 Bozkova 2002, 133–144; Bozkova – Delev 2011, 16–23.
23 On this pottery see: Gimatzidis 2010, 226–252.
24 Analytically, on the technology of this ware see: Gimatzidis 2010, 101–105; Gimatzidis 2021.
25 More analytically, on the typology of this ware and its regional variabilities see Gimatzidis 2021.

assemblage of the Late Geometric period at Sindos; it forms 44% of the Early Iron Age and Early Archaic assemblage at Argilos; and surprisingly, it was even more common at Korpivlen. In fact, Koprivlen is the only site in the northern Aegean and its Balkan hinterland where the vast majority of the consumed crockery belongs to the K-22 Ware.[26] Recent neutron activation analyses (NAA) of a large number of samples from many different sites in Macedonia showed that this technologically and typologically highly standardized ware was produced in at least three microregions, with Sindos, Argilos and Koprivlen being the most visible sites for the time.[27]

This pottery was the most distinctive regional paint-decorated ceramic style in Macedonia during the Geometric period. As such, it is expected to have been mainly produced and consumed in the coastal zone of the northern Aegean. The most peculiar aspect of this ware's consumption pattern is, however, its total absence in the lower and middle Nestos valley and its overrepresentation at Koprivlen, which lies in the upper course of that river between the Pirin and Rhodope Mountains.[28] By contrast, the K-22 Ware was particularly common in the lower course of the Axios River and very rare in its middle course.[29]

The first question that arises is about the meaning of this inverse picture in the distribution of the K-22 Ware in the Macedonian and Thracian valleys, which says nothing about the origin of this pottery. The diffusion of its technology and its non-linear distributional pattern in the Axios, Strymon and Nestos valleys is not in accordance with the traditional perception of these terrains as routes for cultural diffusion and migration. This distribution pattern actually presents evidence against any unilinear and ecologically deterministic model of cultural diffusion; and of course, it does not reflect any ethnic or other social diversity. It also does not present evidence for any ceramic or other cultural *koine*, until recently a popular buzzword in ceramic studies, since these microregions barely share – with the exception of the K-22 Ware – any other common cultural feature. It highlights instead variation in human behaviour, and particularly in cultural choice, that resulted from different needs in the manipulation of cultural material towards forging certain social and cultural identities.

Settlement History and Patterns

During the Early Iron Age, the alluvial plain of Thrace at the Aegean coast hosted only a few sparse settlements that were mostly located on hills between the rivers Strymon and Hebros.[30] Some of them used to be well fortified and rose as markers of power and refuge in the middle of an ecologically hostile low plain. Although there is not much evidence from systematic surveys on the Rhodopes, it seems that these mountains were even more densely inhabited than the adjacent plains. Large settlements appear on the Thracian coast for the first time after colonization in the early Archaic period.[31]

Interesting data for the settlement history in Thrace is presented by the middle and lower Hebros valley, where there are only very few registered pre-Roman settlement sites such as the prehistoric settlement at Kavessos next to Pherai and the city of Ainos at the river's mouth, famous from the Archaic period onwards.[32] The first significant urban centres in the Hebros's lower valley emerge only during the Roman period, after the foundation of three major cities: Trajanopolis, Plotinopolis and Hadrianopolis.[33] The dearth of settlements in the Hebros valley during the

[26] A new analytical study of the pottery at Koprivlen is going to be published in cooperation with Anelia Bozkova.
[27] Gimatzidis 2024.
[28] Gimatzidis 2010, 251, fig. 75.
[29] Only one fragment of this ware was yielded at Vardarski Rid, close to Gevgelija (Papazovska 2005, 140, pl. 6.51).
[30] Triantafyllos 1990, 297–312.
[31] Triantafyllos 1990; Efstratiou 1993; Efstratiou 2002.
[32] Triantafyllos 1990, 298, 311, fig. 1.
[33] Avramea 1994, 138–141.

prehistoric and early historic period is not easy to explain since there are not any geomorphological studies available in the region: some settlements may have been permanently lost due to erosion or lay under a thick layer of alluvial sediments in the valley of this major river; at this stage, it is thus impossible to trace the environmental or other factors that restricted or defined in any other way habitation during those early periods.

The Perception of the Hebros River as a Major Water Route in the Balkans

Traditional reconstructions of regional exchange mechanisms in Thrace with a focus on the river Hebros, which is usually thought to have been navigable up to Philippopolis and is perceived as a major water route between the Balkans and the Aegean,[34] leave one wondering why the middle or lower valleys of that river seem to have been so sparsely inhabited in the pre-Roman and especially pre-Hellenistic periods.[35]

Some coins of the great Roman city Philippopolis, which lies on the upper course of the Hebros in the central Thracian plain, depict the god Isis Pelagia, who was the protector of sea travel and usually appeared on coins of harbour cities, or show the god Hebros himself lying on or next to a ship's bow. Ships are, however, also common on the coins of Hadrianopolis, which was located in the middle course of the river. The usual interpretation of this numismatic data is that the river was navigable from its mouth up to Philippopolis.[36] Nevertheless, it is hard to imagine that a ship could travel hundreds of miles from the Aegean to Philippopolis during the Roman or earlier periods. Instead, the numismatic data suggest the navigability of several parts of the Hebros River rather than implying that a ship could sail from the river's delta up to its upper course; this assumption would explain the information provided by Strabo (VII frg. 47), who claims at some point that the Hebros was navigable until Cypsela (today Ipsala) – that is, not very far from its mouth. The meaning is that the connection between the Aegean and the central Thracian plain was only indirect. What is certain is that at the beginning of the twentieth century, the river was directly navigable only as far as Adrianoupoulis (today Edirne).[37]

Contrary to earlier views that perceived the Hebros as a major water route for metal resources and other commodities during the Bronze and Early Iron Age – based mostly on evidence from the hinterland[38] – we now know that the earliest archaeologically visible indications that the river formed part of a Balkan communication network date from the Late Geometric period onwards, exactly like the upper Nestos valley. These are some small pottery sherds, this time found in pit complexes at Svilengrad and a few other sites on the Hebros and Tunza rivers. They belonged to the earliest Aegean vases that were imported and consumed in the Thracian hinterland many centuries after the break in the Late Bronze Age contacts with the Aegean.[39]

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34 De Boer 2010, 177.

35 Cf. de Boer 2002.

36 Peter 2005, 928–933.

37 Casson 1926, 23.

38 Cf. Lichardus et al. 2002, 168, about the cultural contacts between southeastern Bulgaria and the Aegean during the Late Bronze Age: 'Die Verbindung könnte über zwei mögliche Hauptwege hergestellt worden sein. Die erste Route kombiniert See- mit Landweg und verläuft von der ägäischen Nordküste über die untere Marica zur unteren Tundža, dann über die Balkanpässe nach Nordbulgarien, und von dort über die untere Donau ins Karpatenbecken. Der zweite Weg führt zu Schiff durch das Marmarameer ins Schwarze Meer …'; de Boer 2002, 452: 'all these contacts came through the Maritsa river and its tributaries'; Archibald 1998, 13: 'The distribution of archaeological material of Aegean origin makes it clear that the importance of the Maritsa for bulk transport inland has been greatly underestimated.'

39 Karadzhinov 2010, 158–180.

Gateway Settlements at River Mouths

The short overview of the archaeology of the major central Balkan rivers that have usually been perceived as routes of contact, trade and mobility between the Aegean and Thrace has demonstrated the complexity of the local cultural exchange patterns. It is thus probable that if there was ever any long-distance contact network in the southeastern Balkans during the prehistoric or early historic periods, this did not comprise any or at least only water-routes.

During the Late Bronze Age, goods of Aegean origin or type reached the Thracian hinterland through an exchange network operating among the numerous hilltop settlements in the Rhodope Mountains. Even Koprivlen in the upper Nestos valley, which appears as a significant knot in the Thracian exchange network, could be reached through the mountains but certainly not though the steep gorges in the middle course of the Nestos.[40] If the Aegean Geometric wares reached Svilengrad through the Hebros valley, which is a plausible assumption, we have still to wonder why there is nothing similar in the material culture of the middle and lower valleys of the same river, or even near its mouth in the Aegean.

The interpretation of river valleys as water routes is linked to their perception as fields of cultural innovation. Especially in the case of colonial landscapes, they have been teleologically conceived as places that attracted migration and thus hosted cultural transformations.[41] Colonial activity has been commonly understood as exchange between passive colonized communities and 'trading' colonizers; river valleys and their mouths were consequently regarded as ideal places for the establishment of ports of trade and later colonies.[42] According to the dominant narratives, such a location would facilitate contacts between the 'colonizers', who were usually perceived as sea-people, and the 'colonized', who were supposed to have inhabited continental sites, usually away from the sea.

In fact, the effect of the Greek migration on the settlement patterns of its target regions was highly variable. In some cases it indeed resulted in the foundation of new or the transformation of already existing settlements on geologically stable places near river mouths. Massalia (today Marseilles) was thus founded by Phocaeans from the eastern Aegean close to the mouth of the Rhône River in southern France. The spectacular finds of Greek origin or type that were yielded by sites such as Vix (La Garenne) and Hochdorf in the western Hallstatt region are thought to have circulated through the Rhône valley.[43] Similarly, at the other end of the Mediterranean Sea, the site with the most abundant Early Iron Age and early Archaic Greek ceramics ever found on the Syro-Palestinian coast was located next to the mouth of the Orontes, which in Antiquity used to be one of the largest rivers in the Levant. The foundation of Al-Mina, which was misinterpreted in the past as a Greek trade station or even colony, at the mouth of the Orontes can be better understood as a central knot in the Syrian exchange network with the rest of the Mediterranean world.[44] In the Black Sea, Miletus founded Histria near the mouth of the Danube[45] and Tanais at the Sea of Azov, close to the Don River delta.[46] Soon after its own foundation, Histria founded another settlement close to the delta of the Danube, Orgame.[47] In the northern Aegean, especially on the Thracian coast east of Chalkidiki, some of the most prosperous northern Aegean colonies were founded close to the deltas of the largest regional rivers. Argilos was

40 Cf. Delev – Popov 2002.
41 See, e.g., Morris 1992, 126.
42 De Boer 2010, 179–181.
43 Dietler 1998, 291–295.
44 For a most balanced appraisal of this site's history and interpretation of its material culture see Graham 1986, 67–81.
45 Avram 2003, 280–286.
46 Mikhaylovna Arsenyeva 2003, 1047–1054.
47 For a balanced interpretation of the reasons that led to the foundation of Orgame that are linked to the exploitation of the Danube delta's fishery resources see Bony et al. 2013, 151–152.

founded by Andrians next to the Strymon;[48] Abdera was initially founded by Klazomenai and later again by Teos next to the mouth of the Nestos;[49] and Ainos was established next to the mouth of the Hebros by Aeolians from Mytilene and Cumae.[50] Not only Greek but also some Phoenician colonies were situated next to river mouths. Gadir, which was founded at the mouth of the Guadalete River, close to the Guadalquivir, one of the largest rivers in Spain, is usually thought to have been located in a privileged place for the control of mineral resources in the Spanish hinterland.[51] Most, if not all, of these colonial settlements flourished on geologically stable sites that survived all geomorphological transformations over the millennia at the river deltas. Their foundation is thought to have been partly motivated by the opportunities for commodity exchange that their location at the mouth of major rivers offered. They were supposed to have taken advantage of their privileged location and took control of the trade with the 'natives' in their own region but also in the remote hinterland. According to the grand colonial narratives, the water routes facilitated the circulation of colonial and native commodities from the Mediterranean or Black Sea shores to the hinterland and vice versa.

However, ethnographic and archaeological evidence has demonstrated that river mouths did not always represent appropriate places for the establishment of gateway settlements. For example, in Sumatra, maritime trade did not define or affect the settlement pattern, as most communities settled far from river mouths. This settlement pattern remained consistent even during the period of European colonization, when trade was entirely maritime-based.[52]

Similarly, the founding of colonial settlements at river mouths and valleys was not the rule in Antiquity. On the contrary, a lot of the Greek colonies in Sicily, Campania, southern Italy[53] as well as some of the Phoenician establishments in northern Africa, Sicily and Sardinia[54] were founded in different landscapes with other criteria and for different purposes. This variability in the environmental setting of the colonial settlements shows, on the one hand, that human choice is rarely governed by universal – especially environmental – rules. On the other hand, it suggests that in the premodern period, river valleys were places of opportunity but also of major disasters: frequent floods, sedimentation, changes in the courses of rivers and consequently erosion[55] as well as unhealthy ecological conditions, mostly due to malaria from a certain period of time onwards that differed from place to place, made valleys hostile places for settlement.[56] The perception of river valleys as places of major historical developments in modern scholarship is thus biased by the transformations that they experienced during the last centuries after systematic hydraulic works.

Conclusions

A collapse of the Aegeo-Balkan contacts is archaeologically visible already before the end of the Late Bronze Age and their resumption dates several centuries afterwards. Ironically this happened in a period predating the colonization event. It is striking that these cultural changes are reflected not through the material culture of the Thracian coastal zone but at remote inland sites, such as Koprivlen, where there was only a minimal impact from the Greek migration. The latter began during the Late Geometric period in Chalkidike and during the Early Archaic period in coastal Thrace. The intensification of contacts between the northern Aegean and the central Balkans in

48 Perreault – Bonias 2015, 266–268.
49 Syrides – Psilovikos 2004, 351–359.
50 Isaac 1986, 138.
51 Aubet 2001, 262.
52 Miksic 2009, 78–85.
53 D'Agostino 2006; Domínguez 2006; Greco 2006.
54 Aubet 2001, 212–256.
55 For a useful review of various views of this issue see Bintliff 2002.
56 See, e.g., Sallares 2002, 7–22.

the pre-colonial period was probably not an Aegean but a Balkan initiative. The consumption of new wares of Aegeanizing type in the Balkan hinterland was a local choice. The reasons for the renewal of the Aegeobalkan contacts after so many centuries are not easy to explain. Archaeological reconstructions of past social relations are based on hard evidence that has survived past depositional processes and became part of what we call the archaeological record. We thus miss soft evidence that can, in the best cases, be derived by means of fine archaeometrical analysis, but most often is lost for ever. The available archaeological record shows that the renewal of contacts was – at least partly – the result of the reception of new habits of wine consumption in the Balkan hinterland. It was, after all, ceramic tableware of Aegean type or origin that marked the change in the regional archaeological record, and this speaks for the gradual introduction in Thrace of new ideologies in the ritual consumption of alcohol.[57] Although some of the inland Balkan sites with such cultural material lay next to rivers, it is most probable that these rites reached them not though river valleys but by means of a complex cultural network operating among the numerous Thracian hilltop sites in the Rhodope Mountains.

What we have seen is only a small part of some major transformations in the social and economic organization of the Balkan hinterland, where we have to look for the reasons that triggered the intensification of the contacts with the southern Aegean during the Early Iron Age and eventually took the form of a 'colonization' event. Although it was the Greeks from the central and southern Aegean who took the initiative to settle on the north Aegean shores, their settlement was motivated by social and economic transformations in the Balkans that proceeded this. These changes mostly took place on the hilly and mountainous terrain between the coastal and central Thracian plains, as well as in some remote alluvial plains in the Balkan hinterland, as the available archaeological record attests. In this sense, lower river valleys have not only been exaggerated but also misinterpreted as the scene of major cultural transformations.

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[57] Cf. Dietler 1998, 294, 301–308 for a similar cultural pattern in the Rhône valley.

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Index

Aʿali 351–352
Abdera 444
Ada Tepe 7, 9–13, 15–16, 19–126, 137–157, 181, 213–225, 252, 307, 317–319, 403, 306–409, 411, 413–415, 423, 431, 440
Agios Mamas *see* Olynthus (Toumba Ayios Mamas)
Ainos 441, 444
Al-Mina 443
Alaca Höyük 351–352, 370, 372
alluvial gold 13, 297, 316–319, 429
Altyn-Depe 353–354
amphora 57, 61, 63, 76, 88, 99, 125, 140–148, 150–153, 156, 196, 200, 216, 218–219, 223–224, 244, 247, 252, 325, 440
Apa-Hajdúsámson *see* sword
Apa-Hajdúsámson style 391
Apuseni Mountains 297, 427
Archanes 350
Argilos 31, 440–441, 443
Arslantepe 351–352, 370
Asenovets 30
Assiros 31, 145–147, 151, 224, 406, 411
Augusta Traiana (Stara Zagora) 249
Aul Kaya *see* Dolno Cherkovishte
Aunjetitz Culture 288
Axios 124, 407, 430, 437–438, 440–441
Bagachina 173
Bahrain 14, 351
baking tray 57, 87, 92, 99, 104, 107, 216, 224
Baley 12, 193–209
Basarabi phase 337
Bat 353–354
bead, golden 169, 283–284, 289–290, 313–314, 316–318, 348, 352–357, 373, 375–376, 427–428
Biia/Magyarbénye 281–282, 285–287, 290, 293–296, 299
Bikovo 31, 173, 177, 181, 185–186, 393–394
Bilje/Bellye 290, 297, 298
Boğazköy 390–391
Bonyhád 289
Bor 13, 325, 334–338
Bresto 31, 35, 119, 123, 406, 413, 440
Brnjica Group (Brnjica Culture) 13, 151–152, 325–329, 331, 334, 339
Brza Palanka 326, 339
^{14}C-dates *see* radiocarbon dates
Călăraşi 262–263, 275, 310, 312
Çamlıbel Tarlası 348
Câmpina-Slobozia 178, 185
Cârcea la Hanuri 177
Cârlomăneşti 178, 183
Carpathian-East Mediterranean wave band decoration 14, 389–391, 395–398, 426
cassiterite 297, 317, 340
Central Balkans 13, 325–326, 334, 337–340, 367, 430, 438, 444
Čerkovna (Cherkovna) Group 11, 125, 137, 145, 147, 152, 154, 156–157, 187
Chala 250
Chalkidike 444
chasing 294, 308–309
Chepintsi 30–31, 117
Cherkovna 31, 125, 145–147
Cherna Gora 31, 146, 154–155, 173, 181, 185–186, 393–394
Cherven Bryag 310, 312
Chokoba 31, 146, 154–155, 173, 181, 185–186
Chorkvata 181
Čoka lu Balaš 326, 334–335
copper 13, 15, 121, 123–124, 167, 170, 257, 261, 280, 288, 295, 297, 299, 308, 310, 312, 316–318, 320, 325, 334–336, 338–340, 351, 370, 374, 378, 380, 389, 404, 424, 429, 439
Crivăţ 173, 177, 262–263, 275
Crni Timok River 334, 336
cup
  ceramic cup 45, 61, 57–58, 61, 76, 86, 99, 104, 140–144, 148, 151, 154–156, 173–174, 181, 197, 200–201, 204, 206, 213, 216, 219, 221, 223–224, 283, 294, 327–330, 395
  gold cup 13, 295, 310, 312, 314, 316–317, 320
  silver cup 430
Cyprus 123, 336, 404, 425, 429, 431
Cypsela 442
Dabene 167, 173, 180–181, 185, 368–369, 371, 373, 375–376, 380, 393–394
Danube 12–13, 15, 122–123, 150–151, 153, 155–157, 167, 169, 171–174, 177, 181, 185–187, 193–194, 198, 224, 258–260, 263–264, 268, 271, 274
Demircihöyük-Sarıket 370, 372
Dendra 397, 429
depas amphikypellon 172, 398
Dimini 12, 231, 240, 404
Dobrudja 261, 265
Dolno Cherkovishte (Aul Kaya) 15, 31, 39, 124, 403, 406–407, 409–412, 414–416, 430
Donja Brnjica 152, 326
Dragoyna 12, 31, 39, 71–72, 120, 122, 124, 146–147, 149, 151–155, 213, 215, 217–218, 221, 231–252, 406, 413, 430, 440
Drama 121, 173, 177, 406, 412–413
Dunaújváros-Dunadűlő 289

Durankulak 179, 183, 185
eastern Balkans 10, 12–15, 37, 71, 120, 122–123, 125–126, 145, 147, 157, 216, 247, 252, 348, 367–370, 373–378, 380, 387, 391, 393, 396, 398, 430
Emen 146, 154–155, 168–175, 181, 187
Encrusted Pottery 12, 125, 155, 157, 198, 200, 288–289, 297
Eskiyapar 14, 350–354, 372
Essenitsa 125
Ezero 30–31, 173, 369, 394–395
fire-setting 47, 50, 55
Furchenstich (pottery decoration) 55, 58–59, 61, 76, 86, 93, 125, 216, 219, 223–224, 244, 409
Füzesabony Culture 289, 395
Füzesabony-Kettőshalom 289
Gadir 444
Galabovo 30–31, 146, 149, 173, 180–181, 185, 369, 371–372, 394
Gáta-Wieselburg Culture 288, 297
Gîrla Mare Group 155–156, 187
Gluhite Kamani 31, 34, 39, 181, 225
gold mining 9–10, 58, 63, 115–119, 123, 125, 137, 144–145, 299, 307, 318, 403, 427
Golden Quadrangle 297, 299
Gonur-Depe 351–353
Gornja Bela Reka 326, 338
Gorski Izvor 31, 124, 406, 412
Govora Group 152, 156
Gradina (near Svinjište) 13, 327–331, 340
Gradishte 30–31, 272, 275
Grey Ware (pottery category) 122, 231, 238, 240
Hajdúsámson-Apa *see* sword
Han Krum 114
Hangospuszta 282, 288–290
Harappa 353–356
Harc 289
Hatvan Culture 289
Hochdorf 443
Hebros *see* Maritsa
Hisar 333–334, 339
Histria 443
Ialysos 411
İkiztepe 351–352
Ilıpınar 348
Indus 14, 347, 350, 353, 355–356, 439
Isis 442
Izvorovo 13, 31, 39, 117, 121, 146, 149, 313–318, 413, 431
jadeite 356
Jászdózsa 289
Jelšovce 298
jug 55, 57, 59, 61, 67, 69, 76, 86, 99, 104, 150, 153–155, 172, 174–175, 198, 202, 206, 216, 219–220, 223, 314, 329, 375, 395, 440
K-22 pottery 15, 440–441
Kalakača phase 337
Kamenitsa 125
Kamenska Chuka 31, 146, 149–150, 152, 157
Kanlıgeçit 185–186
kantharos
  ceramic kanthros 57–58, 61, 76, 86, 99, 104, 125, 140–143, 151–154, 156–157, 172, 181, 197, 200–201, 213, 216, 219, 221, 223–224, 244, 329
  gold kantharos 13, 309–310, 312, 314, 316–317, 320
Kapakli 15, 425, 429
Kaposvár 289
Karataş-Semayük 353–354, 370
Kastanas 15, 31, 138, 146–152, 154, 186–187, 223–224, 406, 429, 440
Kastri 146, 150, 152–153
Kazanaki 15, 429
Kengyel 282, 289
Kerbschnitt (pottery decoration) 142, 216, 409
Keros 415–416
Klinovac 326, 333–334, 339
Kmpije 326, 334
Kokla 427
Kokino 326, 332–333, 339
Kolonna 350, 353–354, 369
Komárom-Szőny 281–284, 289–290, 292, 294–295, 299
Koprivlen 31, 35, 117, 123, 145–147, 149–150, 157, 219, 406, 413, 439–441, 443–444
Koszider period 197, 288–290
Kryzovlin 310
Küçükhöyük 370, 372
Kültepe (Kārum Kaniš) 351–354, 390–391, 395–396
Kush Kaya 12, 31, 35, 39, 120, 146–147, 151, 213–218, 220–222, 224
lapis lazuli
Lerna 149
Lesura-Vărbitsa stage 13, 332
Letnitsa 30–31
Lilovo 31, 121, 406, 412–413
Linear B 431
Livari Skiadi 353–354
Ljuljaci Culture (Bubanj-Hum IV-Ljuljaci Culture) 325–326, 336
Lockenring 13, 170–171, 281–283, 285–286, 288, 295, 298, 349–350
Locusteni 173, 177
lost-wax casting (technique) 13, 264, 268, 281, 292, 294, 299, 309, 348
Lovech 173, 257–258, 260, 275, 371
Mad'arovce 395
Magura 173, 197, 326, 338
Mala Gruda 368
Mali Izvor 326, 332, 338
Mari 351–354
Maritsa 15, 122–124, 371, 430, 437–439, 441–444
marble 15, 67, 71, 112, 117, 122, 403, 407, 409, 411–412, 414–417, 430
mass spectrometry 13, 312
Massalia (Marseilles) 443
Maydos-Kilisetepe 174
Maykop 274
Mechka River 1, 250
Mediana 13, 325–328, 333–334, 339
melting 308, 317–318, 432

Mesta *see* Nestos
Mezőberény 289
Mihalich 173, 185, 369, 377
Milića brdo 325
Mikro Vouni 31, 173, 180–181, 185
Mitkovi kamani 247, 249–251
Moni Odigitria 353–354
Morava 157, 219, 325–326, 329, 339, 438
mould, stone 60, 116, 169, 259–265, 267–271, 274–275, 286, 292, 294, 310, 325, 328, 333–334, 338–339, 348
Mycenae 14–15, 63, 391–392, 397, 405, 41, 423–424, 426–427, 429
  shaft graves 14, 391, 411, 427
  Mycenaean pottery 12, 70–71, 117–118, 122–123, 150, 157, 231, 406, 440
  Mycenaean sword type *see* sword
Năeni-Zănoaga 178, 183
Nagyberki-Kisberki 282, 289
Naxos 15, 412, 415–417
Nebra 170–171, 298–299
Nestos (Mesta) 30, 123–124, 219, 223, 430, 437–444
niello 308
Nile 437–438
Noppenring 13, 281, 283, 285–286, 288, 290–292, 294, 296–298
Nova Nadezhda 30
Nova Zagora 154, 173, 185, 394–395
Novgrad 146, 149–150, 173–174, 176–177
Novosvobodnaya 258, 274, 353–354
Odaia-Miciurin 185
Odaia Turcului 173, 177
Olynthus (Toumba Ayios Mamas) 31, 138, 146–147, 150–151, 186–187, 223, 247, 337, 406
Orbeasca de Sus 173, 177
Orlovets 30–31
Oryahovo 265, 275
Ostrovu Corbului 173, 260–261, 270, 273, 275
Otomani 390–391, 395
Ovcha Mogila 332, 406, 412
Ovcharovo 30–31
Ovchartsi 31, 63, 121, 369, 413
oxhide ingot 15, 123, 403, 406, 430
palladium 13, 313, 317
Paraćin Group 151, 197, 325–327, 337
Paros 415–417
Perati 427
Peristeria 427
Petrich 369, 374, 377–379
phalera 13, 310, 312–314, 316, 318
Pherai 441
Philippopolis (Plovdiv) 145–147, 149, 151, 154, 219, 231, 249, 442
Pietroasa Mică-Gruiu Dării 178, 183
Pincehely-Görbő 281–283, 285–286, 288–291, 295–296, 299
Pipea 297–298
Planinica 338
platinum 13, 299, 313, 315, 317–319, 356, 429
Plovdiv-Zimnicea-Čerkovna Group *see* Čerkovna Group
Poliochni 14, 263–264, 268, 275, 349–354, 369, 376
polishing 260, 264–265, 291, 293–294, 308–309
Polsko Kosovo 146, 150
Popești 146, 156
Protovatin Culture 325, 336–337
Pshenichevo 30–31
Rădeni 310
radiocarbon dates 12–13, 20–27, 32, 35, 38, 47, 58, 62, 67, 71–72, 80, 104, 107–108, 111–112, 114–115, 117–118, 123, 138, 145, 147, 149–150, 152, 154–156, 167, 177–187, 193, 198, 200–201, 213, 215, 219, 266, 337, 339, 393–394, 396
Radnevo 181, 185, 393–394
Radovanu 173, 177
Razkopanitsa 30–31, 145–146, 154–155, 173, 234
Rétközberencs 289
Rhodopes 9, 12, 15, 29–30, 35, 37, 39, 86, 114, 119–124, 137, 140, 145, 147, 149–153, 155–157, 224, 231, 249, 318, 403, 407, 409, 439, 441
Rhône 437, 443, 445
ring idol 348
Ropkite 12, 249–251
Rotbav 173, 185
Rupite 369, 377, 379
Ružana 13, 325–326, 334–339
Sakar 120–121, 225
Sambolovo 39
sand-casting 294
Sandanski 146, 149, 152
Sărata Monteoru 178, 183
Selishteto 146, 149
Semercheto 39
Seyitömer Höyük 350, 353–354
shaft-hole axe 169–171, 257–276
Shekerdzha 14, 387–400
Shortugai 353, 355
Sigriswil-Ringoldswil 170
silver 13–14, 110, 169–170, 250, 281–282, 288, 295, 297–299, 308–310, 312–313, 316, 320, 348, 351–356, 367–371, 374–375, 377–379, 394–395, 424, 427, 429–430
Sinaia 270, 275
Skaleto 146, 150
Șmig/Somogyom 282, 290
soldering 308–309, 320
spiral hair-ring 370–371, 373–375
spiral bead, quadruple 349–357
Sredna Gora 120–121
Stara Planina 219, 223–224, 260, 390
Strabo 442
Strandzha 120–121
Strymon/Struma 31, 124, 153, 157, 379, 430, 437–439, 441, 444
Susa 308, 428
Sveti Kirilovo 154, 173, 185, 266, 369
Svilengrad 442–443
Svishtov 125, 169, 171–172
sword 15, 67, 71, 117–118, 121–122, 157, 167, 169–171, 257, 332, 393, 397, 403, 406–407, 410–414, 429–431, 439
  type Apa-Hajdúsámson 169, 411
  type Dolno Levski (type 3b of horned swords according to Kilian Dirlmeier/type C3 according to Hänsel) 122, 412

Mycenaean, Karo/Sandars type A 112, 407, 411–412
Mycenaean, Karo/Sandars type B 411
Mycenaean, Sandars type C (types 1a, 1b of horned swords) 15, 122, 332, 412
Mycenaean, Sandars type D 411, 413
Mycenaean, Sandars type F 413
Mycenaean, Sandars type G 413
Naue II 332
Százhalombatta 282, 289
Szécsény-Benczúrfalva-Dolyán 289
Szelevény 282, 289
Szerencs 289
Tall Munbaqa 353, 355
Tanais 443
Tatul 31, 35, 39, 146–147, 149, 154–155, 173, 180–181, 185, 393–394
Tei-Monteoru Group 183, 185
Tell Abraq 353, 355
Tell Asmar 353, 355
Tell Banat 351–352, 376
Tell Brak 351–353, 355
Tell Selenkahiye 351–352
Tepe Nush-i Jan 351–352
Thebes 253, 275
Thyreatis 350–353, 355, 376
tin 167, 169, 171, 187, 268, 281, 295, 297, 299, 310, 313, 317–318, 325, 340, 356–357, 377
Tinos 415–416
Tiszafüred 288–290, 390–391
Tiszaug 289
Tószeg-Laposhalom 288, 390
Toumba Thessaloniki 146–147, 149–151, 406, 411
Trialeti 428
Trnjane 197, 326, 337–338
Troy 14, 31, 86, 110, 121–122, 170, 308, 338, 347, 349–353, 355–357, 36972, 375–376, 406–407, 411
Tsărkvishteto 146, 150, 152, 155
Ţufalău/Cófalva 171, 290
tumulus 13–14, 63, 149–150, 152, 155, 313–318, 379, 387–388, 390, 392–396, 398–400, 431
Tundzha River 121, 123–124, 371
Überfangguss 289
Ur 308, 350–353, 355–357, 376
Uzdborjád/Kölesd-Hangospuszta 282, 288–290
Valchitran 13, 307–320, 431
Vapheio 429–430
Vărbitsa 13, 146, 154, 173, 257, 268, 275, 332
Vardarophtsa (Axiochori) 146, 151
Varna 266, 275, 297, 299, 348
Vatin 197, 336, 390–391
Vatya period 288–289, 395
Velika Gruda 368
Velika humska čuka 325–326
Venets 369, 371, 374
Verbicioara 173, 177, 197
Verbicioara Culture 156, 172, 174, 197, 336
Veselinovo 258–263, 265, 267–268, 270–271, 275
vessel, golden 423–424, 426, 429
see also cup, kantharos
Vishegrad 31
Vix 443
Voditsa 30–31
Vratitsa 31, 121, 146–148, 173
Vučedol 263–265, 268
Wallachia 12, 178, 184, 261
XRF spectrometry 13, 281, 295–296, 299, 426
Yantra River 174, 177
Yunatsite 30–31, 172–174, 180–181, 185, 266, 275, 369, 374, 394
Zăbala 173, 177
Zheleznik 30–31, 39
Zsadány-Orosi-puszta 290

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