Christopher Britsch

ÇUKURİÇİ HÖYÜK 6

PREHISTORIC TEXTILE PRODUCTION IN THE CONTEXT OF WESTERN ANATOLIA, THE AEGEAN AND BULGARIA



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Austrian Archaeological Institute

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Çukuriçi Höyük 6

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Christopher Britsch

Çukuriçi Höyük 6

Prehistoric Textile Production in the Context of Western Anatolia, the Aegean and Bulgaria

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Contents

Preface by the Series Editor 9

Acknowledgements 11

I. Introduction 13

II. Terminology 19
II.1. Chronological Terminology 19
II.2. Technical Terminology 22

III. State of Research 27
III.1. Studies on Textile Technologies 27
III.2. General Publications on Textile Tools in the Research Area 31

IV. Theory and Methods 35
IV.1. Practice Theory 35
IV.2. Agency Theory 40
IV.3 Craft Specialisation Theories 43
IV.4. Adapted and Extended Models 49
IV.5. Metrical Analyses 55
IV.5.1. Indirect Data Collecting and the Weight from Density 57
IV.6. Stylistic Analyses 61
IV.7. Moment of Inertia 61
IV.8. Statistical Analyses 63
IV.9. Typologies 66
IV.9.1. Spindle Whorls 66
IV.9.2. Loom Weights 69

V. Data 73

VI. Results – Commonalities, Changes and Continuities 83
VI.1. Analysis of Categorical Data (Shapes and Decorations) 84
VI.2. Statistical Analyses 97
VI.2.1. Two-Step Cluster Analysis 97
VI.2.2. Non-parametric Tests of Variance 100

VII. Case Study – Çukuriçi Höyük 115
VII.1. Artefact Analyses 119
VII.2. Spatial Analysis 130
VII.3. Conclusion – Çukuriçi Höyük 136

VIII. Discussion 143
VIII.1. Developments through Time – Discussion of the Descriptive Evaluation . . . 145
VIII.1.1. Loom Weight Shapes 145
VIII.1.2. Spindle Whorl Shapes 157
VIII.1.3. Spindle Whorl Decorations 161
VIII.2. Connectivity, Commonalities and Differences – Discussion of the Analytical Evaluation 163
VIII.2.1. Limitations of the Statistical Methods 164
VIII.2.2. Understanding the Merging of Groups – Interpretation of the Results of the Two-Step Cluster Analyses 166
VIII.2.3. Understanding Patterns among the Groups – Interpretation of the Results of the Non-parametric Analyses of Variance 168
VIII.3. Observing the Big Picture – A Comprehensive Discussion 174
VIII.3.1. Connecting the Detailss – Integrative Multimethod Discussion . . 174
VIII.3.2. Observing the Threads and Seams – Discussion According to the Information-based Model 179
VIII.3.3. Extending the Weave and Patterns – The Final Conclusion 184

IX. Summary 191

X. Abstract – Zusammenfassung – Özet 197

XI. Bibliography 199

XII. Catalogue 225
XII.1. Greek Mainland 225
XII.1.1. Pefkakia Magoula 225
XII.1.2. Platia Magoula Zarkou 245
XII.2. Northern Greece 250
XII.2.1. Dikili Tash 250
XII.3. Turkish Thrace 260
XII.3.1. Aşağı Pınar 260
XII.3.2. Kanlıgeçit 271
XII.4. Bulgaria 273
XII.4.1. Dubene-Sarovka 273
XII.4.2. Nova Nadezhda 275
XII.4.3. Tell Golyamo Delchevo 277
XII.4.4. Tell Lipnik 280
XII.4.5. Tell Sava 280
XII.4.6. Varna 281
XII.5. Aegean Islands 282
XII.5.1. Ayio Gala 282
XII.5.2. Dhaskalio 282
XII.5.3. Emporio 282
XII.5.4. Heraion 283
XII.5.5. Markiani 284
XII.6. Western Anatolian Coast 287
XII.6.1. Çukuriçi Höyük 287
XII.6.2. Hanay Tepe 302

XII.6.3. Kumtepe 302
XII.6.4. Troy 302
XII.7. Northwestern Anatolia 327
XII.7.1. Demircihüyük 327
XII.7.2. Ilıpınar 334
XII.7.3. Kaklık Mevkii 334
XII.7.4. Karaoğlan Mevkii 335
XII.8. Southwestern Anatolia 336
XII.8.1. Aphrodisias 336
XII.8.2. Bademağacı 337
XII.8.3. Beycesultan 349
XII.8.4. Çine Tepecik 354
XII.8.5. Karataş 355
XII.8.6. Hacılar Höyük 358
XII.8.7. Kuruçay Höyük 358

XIII. Plates 361

Preface by the Series Editor

The 34th volume of the OREA series also marks the 6th volume dedicated specifically to the results and specialists' studies emerging from the excavations at Çukuriçi Höyük. Starting with the 33rd volume, the series appears for the first time in its new visual design, introduced across all OREA volumes and Austrian Archaeological Institute publications with the Austrian Academy of Sciences Press from 2025 onward.

Çukuriçi Höyük, located in western Anatolia, was excavated between 2007 and 2014 directed by this series editor. Our investigations yielded an enormous amount of primary data from well-preserved archaeological layers and associated materials dating from the early Neolithic pioneers (c. 6700 BC) to the Early Bronze Age (c. 2750 BC). Since the outset of the project, it has been a central goal to make this material available through systematic, high-quality publications. To date, six monographs and approximately one hundred articles have been produced, collected and are accessible through the Academy's online repository via https://epub.oeaw.ac.at/ERC-Prehistoric-Anatolia.

The present volume by Christopher Britsch turns to the textile production, one of the key technological and social innovations in prehistory. By examining the emergence, development, and wider cultural implications of textile technologies, this study provides a comprehensive, cross-regional overview spanning the 7th to the end of the 3rd millennium BC. Its geographical scope encompasses Greece and the Aegean, Bulgaria, Turkish Thrace, and western Anatolia, where around 2000 tools from 31 sites have been incorporated in this study. Through a multi-scalar methodological approach including large-scale statistical procedures, the study evaluates both the technological characteristics of spindle whorls and loom weights and their broader cultural and social impact. The author pairs these methods with theoretical perspectives grounded in practice theory and agency studies, allowing for a nuanced interpretation of the social roles, decision-making structures, and craft traditions associated with textile production. His results demonstrate that textile technologies evolved in a strikingly parallel manner across the research regions over several millennia, with chronological developments serving as the most influential factor. Nevertheless, regional and local particularities remain discernible, pointing to flexible and context-driven craft practices. The introduction of wool during the Chalcolithic period (5th–4th mill. BC) most likely marks the turning point, accompanied by changes in tool design, production routines, and the increasing role of textile workers in societies.

Çukuriçi Höyük forms a core component of this volume. Through detailed spatial, contextual, technological, and chronological investigation, the case study demonstrates that textile production was already a specialised craft by the Early Bronze Age in the early 3rd millennium. The author's multi-level analytical framework offers new insights into the organisation of labour, technological choices, and the practices and agencies that shaped textile production at the site from the Late Neolithic around 6500 calBC onward. More broadly, the study contributes to the growing recognition of prehistoric textile production as a critical field of archaeological research. Long underrepresented in scholarship, textile studies have seen significant expansion over the past two decades. This volume adds an essential, data-rich synthesis to that body of work and will hopefully serve as a valuable reference for future investigations.

I extend my sincere gratitude and congratulations to the author Christopher Britsch for producing this exemplary contribution to the OREA and Çukuriçi series and to prehistoric research more generally. I also gratefully acknowledge the Austrian Science Fund (FWF) for supporting the production of this volume. My thanks go as well to our dedicated publishing team with Ulrike

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Barbara Horejs
Scientific Director, Austrian Archaeological Institute
Vienna, 17 November 2025

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I. Introduction

The present study analyses the emergence and distribution of prehistoric textile production technologies via prehistoric textile tools. The aim is to provide an insight of chronological and geographical appearance, as well as the spatial distribution. Both, the aspect of intercultural connection (transfer of technology and tools) as well as the social aspect of textile workers (social standing, autonomy, economical influence) are core elements of this study. To allow tracking developments and progression, a rather broad chronological frame was chosen from the beginning of the 7th to the end of the 3rd millennium BC. From these periods 2026 artefacts from 31 different sites from Turkey, Greece and Bulgaria were analysed. The sites were chosen due to known connections within their material culture. However, due to the different state of prehistoric records and excavations, as well as the accessibility to archaeological records, the distribution among regions and periods is very heterogenic. The problems and solutions regarding this matter are addressed in the study as well.

For the analysis and the subsequent interpretation of the material different statistical methods and theoretical archaeological and sociological models were chosen. The study also critically discusses the possibilities and limits of this approach.

The manufacturing of textiles plays a vital role in any society, be it prehistoric or modern, due to the need for clothes and other practical uses of fabrics. Furthermore, the possibility of representing and projecting cultural and social aspects charges clothing, tapestry or other decorative textiles with additional potential and significance. In modern societies this relevance can be seen in different aspects of daily life such as social status (fashion, brand display, etc.), cultural (folkloric dress, etc.) or religious representation (a nun's or priest's garment, hijabs, burkas, etc.), or the combination of practicability and display of affiliation to a certain craft (overalls, white gowns, etc.). Further evidence for the important role of textiles is that social restrictions in clothing can already be seen in ancient times. The most famous example known stems from ancient Mesopotamia, where linen was restricted to kings and divine images.[1] During these times wool had already become the most dominant raw material in textile production due to its higher practicability compared to plant fibres. However, the limited availability of linen textiles gave it higher prestige.

Especially when considering wool, crucial influences of the textile industry on economies, trade and exchange can be found throughout human history. At Kültepe in central Anatolia several thousand inscribed objects were found that demonstrate the importance of wool and textiles for Assyrian trade.[2] During the Old Assyrian period wool and textiles made up two of the three main commodities for Assyrian traders within Anatolia.[3] Another example is societies in ancient Mesopotamia, where wool functioned as a driving force in economic and social change. Reformations in the organisation and execution of textile production fuelled shifts from a kinship-based society to a control system mainly based on class.[4] Since in ancient Mesopotamia the textile production was mainly performed by women, the increasing significance of the craft also had an influence on the social standing of genders. The new empowerment of the craft was, however, used for a

1 See, for example: Edens 1992; Zettler 1992; McCorriston 1997.
2 See: Wisti-Lassen 2014.
3 See, for example: Dercksen 2004; Lassen 2010; Barjamovic 2011.
4 McCorriston 1997.

subordination of women to men.[5] Women were often pushed into labouring in textile production while men were employed in the organisation of the craft. In ancient Athens, by contrast, it was found that during the 5th and 4th centuries BC, the organisation of textile production was also conducted by women.[6] Here a steadily growing importance of textile production and well-trained textile workers allowed an empowering of women through training textile workers and organising the craft in home workshops.

These written sources demonstrate the relevance of textile production as a craft loaded with social and cultural connotations, the importance of textiles as a commodity for trade and exchange, as well as the subsequent potential influence on social, cultural and economic structures.[7] It is probable that such meanings were also embedded in Neolithic, Chalcolithic and Early Bronze Age societies. However, the absence of written documents reduces the sources of information to archaeological artefacts. In many cases, evaluating or proving such circumstances can be a challenge.

The main reason for this difficulty is that prehistoric textiles are unlikely to be preserved. Since all textiles were made from organic material, preservation is only possible under specific circumstances. The main limiting factor is the condition of the soil. Generally plant fibres need very alkaline soils, while for animal fibres, acidic conditions increase the likelihood of preservation.[8] The same also applies for extreme wet conditions, such as a textile sunken in water, a bog or a swamp. Bogs and swamps have an acidic pH level and can therefore preserve animal fibres, while water has an alkaline pH level and can better preserve plant fibres.[9] What happens is that the low levels of oxygen slow down the oxidation processes and prevent bacteria from decomposing the material. As well as extreme wet conditions, extreme dryness can also preserve textiles, as examples from the deserts of the Nile Valley show.[10] Further preserving conditions can occur when the textile is frozen, attached to metal or surrounded by salts.[11] If, for example, a textile is buried around a metal object, the corrosion can lead to a mineralisation of the fabric.[12] A famous example for the preservation of textiles through salts is the salt mines of Hallstatt in Austria.[13] The textile can be preserved since the salty environment is toxic to bacteria that would otherwise destroy the organic material. Another possibility is that the textile was burned and got charred. The resulting alteration of the fibres allows them to be preserved in a carbonised state.[14] An analysis of the fibres is still possible, even though the structure is altered in this process.

Though this list shows several possibilities for the preservation of prehistoric textiles, all of these situations occur only rarely. These occasions often require certain environmental circumstances, such as deserts, swamps or permafrost. Consequently, prehistoric textile finds often derive from distinct regions, for example from Scandinavia,[15] Switzerland,[16] Austria,[17] Egypt,[18] Mexico[19] or Russia.[20] In many other parts of the world, for example the Anatolian or Aegean world, no rich account of direct textile finds is available.

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5 See: Rapp 1977; Gailey 1985.
6 Spantidaki 2017.
7 See, for example: Nosch 2019; Balatti 2019; Droß-Krüpe 2019.
8 Cybulska – Maik 2007.
9 Farke 1986; Wild 1988; Gillis – Nosch 2007; Rast-Eicher 2012; Grömer 2016.
10 Wild 1988.
11 See, for example: Chen et al. 1998; Mitschke 2001; Gengler 2005.
12 See: Mitschke 2001; Wild 1988.
13 See, for example: Gengler 2005; Grömer et al. 2013.
14 See: Farke 1986; Rast-Eicher 2003.
15 See, for example: Walton 1988; Mannering 2007; Andersson Strand – Mannering 2014; Mannering 2015.
16 See, for example: Leuzinger 2002; Benguerel 2010; Rast-Eicher 2017.
17 See, for example: von Kurzinksy 1998; Gengler 2005; Grömer et al. 2013; Preinfalk – Preinfalk 2014.
18 See, for example: Cartland 1918; Hodak 1996; Wild – Wild 2008; Cardon 2011.
19 See, for example: King 1979; Brumfiel 1991; Joyce 1993; Asturias de Barrios 1998; Hendon 2006.
20 See, for example: Mikhailov 2008; Zubkova et al. 2010; Kuzmin et al. 2012.

Therefore, in these regions textile production needs to be analysed by using proxies, such as preserved tools used during the production process. In the prehistoric context, these tools include spindle whorls and loom weights, as well as bone needles and awls. Since the assignment of bone tools to certain tasks in the processing of woven fabrics is problematic,[21] the current study concentrates on spindle whorls and loom weights. The artefact analyses will serve to reconstruct the development of textile production, with its local and regional developments, on the basis of material culture. The aim is not only to evaluate the craft with regard to its technical aspects, but also to interpret the social, cultural and economic impact of its changes and continuities.

Geographically, the study is based in western Anatolia with the prehistoric tell settlement of Çukuriçi Höyük as a case study (see Chapter VII). For far-reaching comparisons and analogies, sites from not only western Anatolia, but also from the Aegean Islands, the Greek mainland and northern Greece, as well as Turkish Thrace and Bulgaria were included. The study thus roughly encompasses the Aegean and neighbouring regions. The research area is divided into eight parts, namely Bulgaria, the Greek mainland, northern Greece, the Aegean Islands, Turkish Thrace, the western Anatolian coast, northwestern Anatolia and southwestern Anatolia (see Fig. 1). Since these are all regions which yield few or no preserved textiles, the just-mentioned need to focus on the tools used in textile production arises.

Within this geographical and contextual focus, the study will concentrate on the time from the 7th to the 3rd millennium BC. In the core region of this study – western Anatolia – this encompasses the Neolithic, Chalcolithic and Early Bronze Age. A further description of the chronological terminology applied in this study will be given in the next subchapter.

The broad chronological and geographical frame was chosen to make it possible to gain a deeper understanding of the different phases in the development of textile production technologies. The time frame begins with the earliest evidence of textile production in the studied region, which almost coincides with the earliest settlings. It further encompasses the introduction of milk, wool, copper and, later, bronze. These newly found resources changed societal development in many ways – economically, culturally, hierarchically and so on. Although, except for wool, none of these resources are directly connected with textile production, the just-mentioned general changes initiated by them will still have had an influence on it. Unfortunately, textile production, like some other crafts, is often seen as purely domestic work and not considered as a vital element to study. However, just as changes in prestigious crafts like metal production could influence social structures, developments in domestic crafts could have similar effects. Changes in textile production could, for example, initiate or at least reflect changes in trade (new goods, textiles as packaging, etc.) or social and cultural norms (representation, fashion, etc.). To understand fully social and cultural developments, the insight into domestic crafts is therefore as important as insight into prestigious ones. To be able to see differences in local and regional changes, as well as autonomous developments and transferred technologies, the geographical frame of the study also had to be large enough to contain all aspects investigated.

The Aegean, together with the surrounding regions west, east and north of it, is not only a sufficiently large area, but it also displays other ideal conditions. The Aegean can be seen as a zone for transferring innovations from Asia to Europe. From the Neolithic on, new resources and technologies, as well as social and cultural influences, spread from the Near East to Anatolia and from western Anatolia through the Aegean and Turkish Thrace to Europe.[22] Examples of such

[21] Bone awls in particular are known to be used for multiple functions, such as the piercing of woven fabrics, leather or hide, up to the perforation of bark. If at all possible, a reliable determination of the use of a bone tool would thus always need intensive microscopic use-wear analysis (see, for example: Christidou 2008; Sidera et al. 2010). This procedure exceeded the time available for this work, so that these artefact types were not included.

[22] See, for example: Cherry 1981; Rahmstorf 2006; Greenberg – Goren 2009; Rosenstock 2009; Özdoğan 2011; Çilingiroğlu – Çakırlar 2013; Brami 2015; Horejs et al. 2015.



Fig. 1 Subdivision of the research area (ERC Prehistoric Anatolia/C. Britsch)

distributions can be found in lithic technology,[23] pottery types,[24] metallurgy[25] and architecture,[26] as well as other technological advancements such as the weight systems.[27] The research region is therefore a vital area for investigating and understanding the transfer of knowledge, techniques and resources into Europe. Textile production addresses all three of these transfers: knowledge – e.g. the function of the weight and shapes of tools and the behaviour of different fibres; techniques – spinning and weaving (as well as finishing) techniques; and resources – changes of plant fibres and the introduction of wool. Considering the potential economic as well as social and cultural impact of prehistoric textile production, the study in the chosen research region will thus provide an important contribution to the general understanding of the innovation transfers to Europe.

[23] See, for example: Gatsov – Nedelcheva 2011; Horejs et al. 2015.
[24] See, for example: Schoop 2005; Rahmstorf 2006; Çilingiroğlu 2009b; Greenberg – Goren 2009.
[25] See, for example: Muhly et al. 1991; Bartelheim – Pernicka 1999; Mehofer 2014; Pernicka 2014.
[26] See, for example: Rosenstock 2006; Rosenstock 2009; Özdoğan 2010; Brami 2017.
[27] See: Rahmstorf 2006; Horejs 2016b.

To be able to get a clear and valid picture of the broad chronological and geographical frame, a large amount of data was collected. A total of 1511 artefacts from 14 different sites were recorded in museums and excavation depots. The recording was performed in three different countries, in Turkey, Greece and Bulgaria. The time spent in recording and travelling added up to a period of around six months. Additionally, for each country, differing organisational efforts were necessary, including, for example, contacting current and/or former excavators, museum directors and curators as well as governmental institutions for permits. Especially for Greece and Turkey, drawn-out processes for permission to work on archaeological material were necessary. This also included mandatory reports, partially in the respective national language, after analysing the artefacts. These processes additionally took about four months of time for the organisation, preparation and reworking. Moreover, metrical data for 515 spindle whorls from 17 sites were collected via literature.

Unfortunately, not all data recorded could eventually be used for the analyses of the current study. This could be due to several reasons, for example missing information or problems in dating or with the respective stratigraphy. This limited the data suitable for the analyses to 1279 artefacts (1091 spindle whorls and 188 loom weights). The elaborate discussion about the exclusion of certain data is given in Chapter VI and partially in Chapter IV.

The acquired data consists mainly of metrical details of the tools, but also of information about the design and potential decoration. Stylistic factors (shape and decoration) will not be discussed for every individual object, but for typologically connected groups, with a few exceptions for extraordinary pieces. For the metrical data, different statistical methods will be used to gain proper insight into the meaning of the metrics. The results will be interpreted and discussed applying common archaeological and sociological approaches, such as craft specialisation theories, practice theory and agency theory.

The aim of this approach is to describe the technological development of prehistoric textile production in the research area as well as to give an interpretation of the potential social, cultural and economic significance of the craft. Ultimately, however, the results of the analyses, interpretations and discussions should function as a foundation to further discuss the potential applicability of the methods and theories used for the study of prehistoric crafts and craftsmanship in general.

The first and foremost research question therefore has to be whether technological developments are noticeable in the spindle whorl and loom weight assemblages of the studied sites. As previous studies, preliminary results and research in other regions show, it is highly likely that this question will be answered positively.[28] Thus, the following research questions regarding textile technologies arise: when are changes or new technologies noticeable (chronological appearance)? Where do changes first appear or new technologies emerge from (geographical appearance)? From and to where do which techniques spread (spatial distribution)? Are differences and/or commonalities between different sites noticeable (regional connectivity)?

The last question addresses the possibility of connectivity in technology between different sites, potentially even between distant regions. The likely existence of such connections and flows of information has been shown in a test study regarding the 4th and 3rd millennia BC in the research region.[29] The current study is now supposed to investigate how far such connectivity is still noticeable with a broader geographical and chronological reach and, most importantly, with a larger database. The connected questions are therefore: are developments in textile production shared among certain sites and/or regions (contacts/exchange) or are developments mainly homogeneous throughout the research area (general chronological developments)?

As mentioned above, the study not only aims to reconstruct the emergence and spread of textile production technologies but also to explore the further implications. The answers to the questions regarding technological developments will therefore be used to address issues about the

[28] See, for example: Andersson 2003; Schade-Lindig – Schmitt 2003; Mårtensson 2007; Andersson et al. 2008; Andersson Strand 2012; Mårtensson et al. 2009; Andersson et al. 2010; Chmielewski – Gardyński 2010; Verhecken 2010; Gleba 2011.

[29] Britsch – Horejs 2017.

social and cultural relevance of textile production, such as: what degree of freedom did textile workers have in controlling developments? Can the social standing of textile workers be extrapolated via the textile tool analyses? Is it possible to discern any expression of cultural identity from the artefacts?

The examples of textile production in different societies described in the first paragraphs of this chapter show that the craft could have had not only a social and cultural impact, but it could also have influenced economic processes. The main questions in this regard would thus be: is an influence of textile production on economic structures noticeable in the research area? This question is, however, very complex and rather unlikely to be answered via the artefact analyses. It is therefore better to address a core aspect of the economical relevance of textile production: wool.

The examples described above clearly show a strong significance of wool as an economic impact factor in textile production. This is also postulated in the Secondary Products Revolution concept of Sherratt.[30] Sherratt described the great economic influence of secondary animal products – such as, for example, animal labour, milk or wool – on both economic and technological developments in directly as well as indirectly connected traits. Wool could, for example, have had an influence on certain agricultural aspects, since it suppressed the demand for plant fibres. In turn, labour divisions, the social standing of different professions as well as current and future exchange goods and trade commodities could have changed. When aiming to address the economic influence of textile production, focusing on the introduction and implementation of wool is therefore promising. The consequential research questions are thus: can it be determined from the textile tool inventories when wool was present? Are (stronger) changes visible around the time wool is supposed to have spread in the research area? Is a potential spread of wool connected with a change in the social and/or cultural significance of textile production?

The aim of these research questions is to analyse and discuss prehistoric textile production with regard to all accessible aspects – technical, social, cultural and economic – and to develop methods and approaches for the general study of prehistoric crafts. The final research questions will therefore be: is it possible to trace craft development via large-scale statistical analyses? Is it possible to interpret the results of such statistical analyses via common sociological and archaeological theories regarding social, cultural and economic structures? And to what extent is it possible to gain insight into prehistoric life via this approach?

The last section of research questions is supposed to critically analyse the procedures of the current study in order to assess the further applicability of the methods and theories as well as the general approach.

The following chapter will first address the definition of certain terminologies used in this study. Since there is no consistent periodical terminology across the research area, it is necessary to settle for one terminology. The discussion and definition of this is given in Subchapter II.1. The same applies for certain technical terminologies. For example, some researchers would designate certain artefacts as spindle whorls or loom weights, which others would consider to have a different function. The technical terminological definitions will be given in Subchapter II.2. Both subchapters will provide guidance on how the terms are applied in the current study.

After the terminological framework is given, the current state of research for prehistoric textile production studies will be elucidated in Chapter III. Chapter IV will give information on the applied theories and methods of this study and feature the typologies developed and applied in this book in Subchapter IV.9. In Chapter V detailed accounts regarding the data that were collected and used are given. Chapter VI will feature the results of the analyses of that complete database. The discussion of these results forms the final chapter of this volume, Chapter VIII. Beforehand, a detailed ‘in-depth’ analysis of the Çukuriçi Höyük textile tools, which provided the impulse for the current study, will be presented and discussed in Chapter VII. Additionally, Chapters X–XII include the bibliography, plates and the complete find catalogue.

[30] Sherrat 1981; Sherrat 1997a; Sherrat 1997b.

II. Terminology

The following chapters will provide information on the chronology used in the current study, as well as giving the definition for technical terms used throughout the volume. In no case is the aim to enter into a discussion on the different terminologies and definitions, but only to inform about how they are applied.

II.1. Chronological Terminology

The current study analyses finds from regions that do not share a common chronological terminology. This is not only due to traditions in research, but mainly due to the different cultural areas. A simple solution to this problem could be always to refer to absolute dates when making comparisons. However, especially for certain older excavations, such exact dates are not available. If using absolute dates on the one hand and relative dating on the other, no valid comparisons could be made due to different levels of measurement and it would, additionally, be very confusing due to the lack of uniform chronological terminology. For easier writing, reading and understanding of the different comparative data, it is necessary to compromise and settle on one chronology and its terms. However, the geographical expanse of the current study not only makes it impossible to use a chronological terminology fitting to every region, it also makes it unworkable to pin down general aspects that define a certain period. Factors that define the Late Neolithic in western Anatolia are, for example, not the same as those that define the Late Neolithic in Greece or Bulgaria.[31] Even when concentrating on western Anatolia as the core region of the study, discussions about what defines the Early, Middle or Late Chalcolithic, for instance, are very recent and partially still ongoing.[32] The same also applies for the Neolithic and Early Bronze Age periods.[33] Problems will also arise as soon as one tries to match periods of time with absolute dates. Therefore, the chronological terms used in this study have to be seen merely as labels for the simultaneous existence of different settlements in a large geographical area.

Since the study is based on Çukuriçi Höyük as a case study and therefore based in western Anatolia, the chronological terminology of western Anatolia will be used as a reference. The dates connected with the respective terms are displayed in Table 1. However, to understand the inevitable chronological mixture this approach produces, it is necessary to consider the different chronological systems to demonstrate the differently used chronological terms in reference to absolute dates. The aim is not to provide a full discussion of the different systems, but to offer a basis for chronological reference for the different sites and regions included in the current study. A graphical presentation of the different systems is given in Figure 2.

This means that in the current study, assemblages of sites are not compared based on cultural periods (for example the Greek Neolithic with the western Anatolian Neolithic) but based upon absolute dates. These are, however, subsumed under the above-mentioned chronological terminology of western Anatolia and the connected chronological divisions. This approach was chosen

[31] See, for example: Demoule – Perlès 1993; Bailey 2000; Steadman – McMahon 2011.

[32] See, for example: Hauptmann 1986; Maran 2000; Schoop 2005; Schoop 2011; Bartelheim – Krauß 2012; especially Schwall 2018.

[33] See, for example: Lichter 2005; Şahoğlu 2005; Özdoğan et al. 2012; Kouka 2013; Fidan et al. 2015; Horejs et al. 2015; Horejs 2016b; Horejs – Weninger 2016.

Period	Date	References
Early Neolithic	7000–6500 BC	Özdoğan 2011
Late Neolithic	6500–6000/5900BC	
Early Chalcolithic	6000/5900–5500 BC	Schoop 2005 Schwall 2018
Middle Chalcolithic	5500–4250 BC	
Late Chalcolithic	4250–3000 BC	
Early Bronze Age 1	3000–2750 BC	Efe 1988 Pernicka et al. 2014 Weninger – Easton 2014 Jung – Weninger 2015
Early Bronze Age 2	2750–2440 BC	
Early Bronze Age 3	2440–2000 BC	

Tab. 1 Applied chronology of the current study

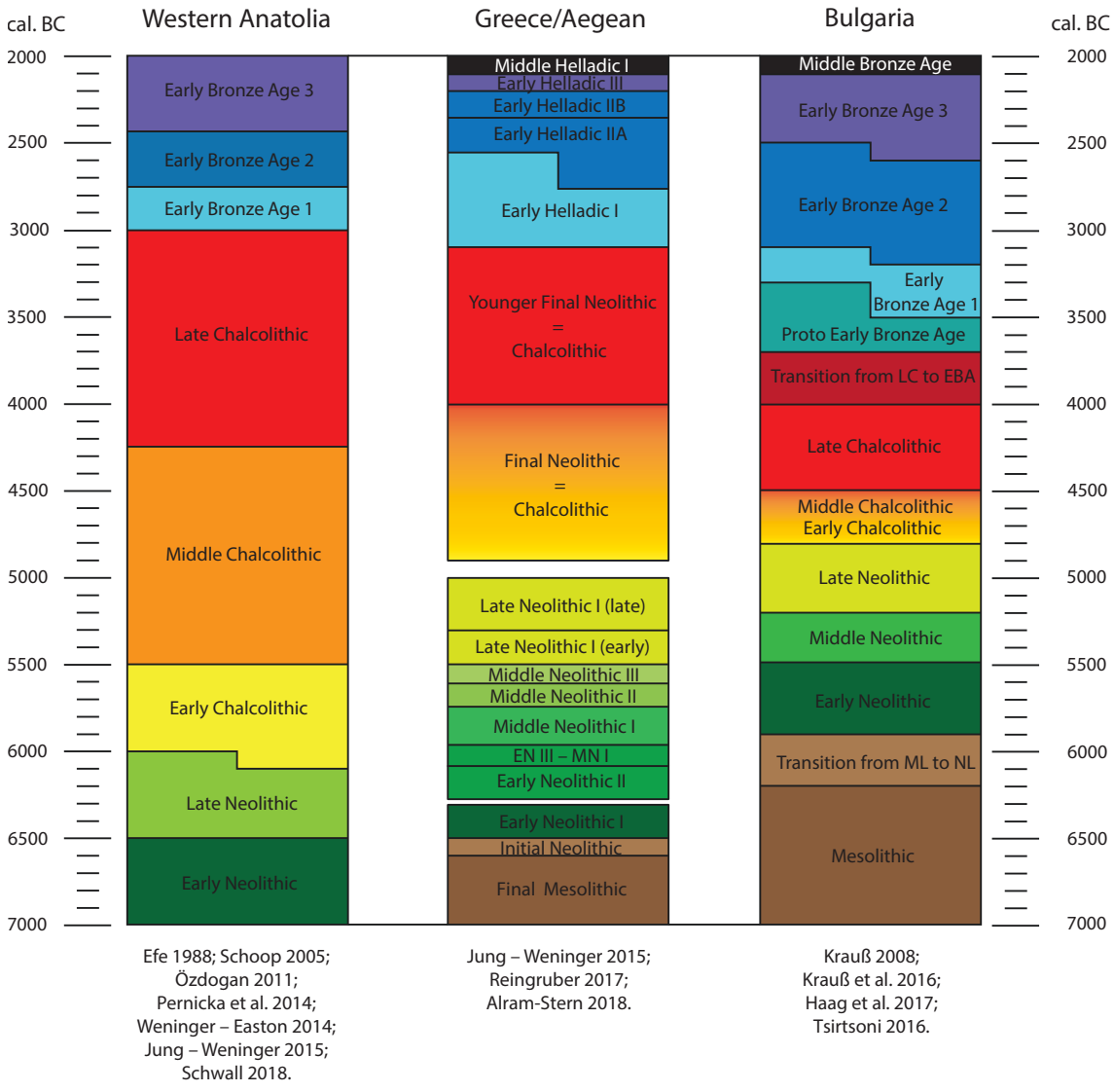

Fig. 2 Comparison of the different chronologies present in the research region of the current study (C. Britsch)

in order to be able to compare (relatively) simultaneously existing sites and people with each other. The main shortcoming of this method is, of course, the fact that, inevitably, sites from culturally and technologically different surroundings will be compared (for example Neolithic Greek or Bulgarian sites with Chalcolithic western Anatolian sites). However, where sites differ in textile technology due to a dependence on other technological advancements (for example the introduction of copper), the statistical analyses will unveil the discrepancies clearly. More importantly, however, the comparison of simultaneously existing sites and people allows the observation of commonalities and differences, as well as developments, independent of other traits. This, in turn, allows us to judge in which regions textile production developed in similar or different patterns, without pre-assuming a connection by only comparing Neolithic with Neolithic, Chalcolithic with Chalcolithic and so on. In the famous book by Elizabeth J. W. Barber, she compares similarly labelled periods from the different regions, resulting in several inaccuracies. These include atypical uses of certain terms (such as Chalcolithic or Mesolithic for different regions), as well as deviations from the actual dating.[34] In part this is also due to the available knowledge of the absolute dates for certain periods at the time of publication. However, the main problem is the fact that this approach forces Barber to compare artefacts and sites that are dated up to 3000 years apart. It is my opinion that this time discrepancy – as well as the connected possibilities of different progressions in technology – is far more critical for a large comparative view. Consequently this volume will adopt the procedure described above and will not follow Barber's approach in this matter.

The research in the current study starts at the beginning of the 7th millennium and the Early Neolithic in western Anatolia. The western Anatolian Early Neolithic is defined as between 7000 and 6500 BC.[35] During this time, Bulgaria, as well as Greece and the Aegean, still remain in the Mesolithic. The initial Neolithic in Greece, however, already begins at around 6400 BC.[36]No textile tools from this earliest period could be found in the research region. Thus, the analyses in the current study actually begin at around 6500 BC, the beginning of the Late Neolithic in western Anatolia and the Early Neolithic in Greece. In Bulgaria this time is still to be labelled Mesolithic. The transition to the Neolithic in this region occurs not earlier than 6200 BC and the transitional phase lasts until about 5900 BC.[37]

Already two centuries earlier, cultures in western Anatolia started to convert into the Early Chalcolithic and in Greece and the Aegean into the Middle Neolithic. In 5500 BC a major change is noticeable in all main regions. In western Anatolia this marks the transition to the Middle Chalcolithic; in Greece, to the Late Neolithic; and in Bulgaria, to the Middle Neolithic.[38] The Middle Chalcolithic in western Anatolia encompasses the time from 5500 to 4250 BC and thus several periods in both Greece and Bulgaria. In Greece the shift from the Late to the Final Neolithic (also sometimes labelled Chalcolithic) occurs at around 5000/5100 BC. The Final Neolithic then lasts until 4000 BC, when it descends into the Younger Final Neolithic. During the same interval, in Bulgaria the transition to the Late Neolithic (5200 BC), the Early/Middle Chalcolithic (4800 BC) and the Late Chalcolithic (4500 BC) occurs. Like the Final Neolithic in Greece, the Late Chalcolithic in Bulgaria ends around 4000 BC.[39]

The Late Chalcolithic in western Anatolia, as already mentioned, begins around 4250 BC and then lasts until the beginning of the Early Bronze Age in c. 3000 BC.[40] The Younger Final Neolithic in Greece lasts from 4000 until 3100 BC and by 3100 BC a transition to the Early Helladic I period can already be seen.[41] In Bulgaria the transition to the Early Bronze Age is a bit more

34 See: Barber 1991, xxx–xxxi.
35 Özdoğan 2011.
36 Krauß 2016; Reingruber 2017.
37 Krauß 2008; Krauß 2016.
38 Schoop 2005; Krauß 2008; Tsirtsoni 2016; Reingruber 2017; Schwall 2018.
39 Schoop 2005; Tsirtsoni 2016; Haag et al. 2017; Reingruber 2017; Schwall 2018.
40 Jung – Weninger 2015; Tsirtsoni 2016; Haag et al. 2017.
41 Maran 2000; Jung – Weninger 2015; Tsirtsoni 2016.

complex. It includes two transitional phases which start as early as 4000 BC.[42] The transition from the Late Chalcolithic to the proto-Early Bronze Age lasts three centuries, until 3700 BC. The proto-Early Bronze Age then lasts until about 3500/3300 BC. From then on, Early Bronze Age 1 in Bulgaria lasts until 3100 BC, when the Early Helladic periods in Greece start and one century before the Early Bronze Age periods in western Anatolia begin.

The Early Bronze Age (or Early Helladic) periods of the different regions only align exactly in one case, the end of Early Bronze Age 3 in Bulgaria and Early Helladic III in Greece/the Aegean (2100 BC). Otherwise the comparisons have to be observed individually. The periods of the 3rd millennium align as follows in the different regions: western Anatolia – EBA 1 (3000–2750 BC), EBA 2 (2750–2440 BC) and EBA 3 (2440–2000 BC); Greece/Aegean – EH I (3100–2700/2500 BC), EH II (2700/2500–2200 BC) and EH III (2200–2100 BC); Bulgaria – EBA 2 (3200/3100–2600/2500 BC) and EBA 3 (2600/2500–2100 BC).[43]

II.2. Technical Terminology

The production of textiles is a time-consuming process including several tasks. The first step is the procurement and preparation of the raw material. Depending on the chosen material, this takes up a different amount time and separate tasks. The preparation of plant fibres, generally, take more steps than that of wool.[44] In both cases the aim is to obtain cleaned, brushed and sorted fibres. Since the procurement and preparation steps will not be discussed in this volume, no further detail will be given at this point. All necessary explanations can be found in detail in a recent publication by Eva Andersson Strand.[45]

The next step is the creation of yarn/thread by spinning the raw fibres. Through the twisting and spinning motion, the fibres get entwined with each other and a yarn is produced. Depending on the method, the tool used and the spinner's skill, the thickness and strength of the yarn can vary. It is possible to spin a yarn on one's thigh without any tools. Since in the current study, however, tools are focused on in the analyses, this method will not be discussed further. The spinning methods discussed in the current study are those which employ a spindle (mostly made of wood, sometimes of bone) and a spindle whorl (mostly made of clay, sometimes of bone or stone). These can also be practised by twisting the spindle on the thigh.[46] For the research area and the chronological frame of the study, the method with low whorl and suspended spinning is typically assumed.[47] This method uses the torque of the spun spindle with attached spindle whorl as well as the gravity acting on the dropped spindle and whorl. In this study a further description of the technical details and the resulting focus on technical aspects of spindle whorls is given in Subchapter IV.5.

The next task is to form a textile out of the spun thread. While methods like knitting are also possible for this task, the current study focuses on weaving as a method to efficiently produce large amounts of textile. Generally a loom is used for weaving. The job of the loom is to keep a set of threads – the so-called warp threads – straight, to make it possible to interweave the weft threads. Typically one of three types of looms is used: a horizontal ground loom, a vertical two-beam loom or a warp-weighted loom.[48] The main component used in building such looms

42 See: Tsirtsoni 2016.

43 Pernicka et al. 2014; Weninger – Easton 2014; Alram-Stern 2014; Reingruber 2008; Jung – Weninger 2015; Alexandrov 2017; Dimitrov – Stojčev 2017.

44 See, for example: Barber 1991; Andersson Strand 2012.

45 Andersson Strand 2012.

46 See, for example: Barber 1991; Keith 1998; Tiedemann – Jakes 2006; Andersson Strand 2012; Mazăre 2010; Mazăre 2012.

47 See, for example: Crowfoot 1937; Balfanz 1995.

48 See, for example: Crowfoot 1937; Hoffmann 1964; Andersson Strand 2012.

is wood. It is therefore unsurprising, due to the organic nature of wood, that most prehistoric looms are decomposed and therefore very problematic to prove in an archaeological context. One exception is the warp-weighted loom. The loom uses the gravitational force of loom weights to pull the warp threads straight.[49] Such loom weights can technically be made from any material; in the studied region and time frame they are, however, always made from clay. Furthermore, the rather frequent appearance of loom weights in all studied areas allows us to focus solely on warp-weighted looms. The detailed description of the technical function and the explanation for focusing on the weight of loom weights are given in Subchapter IV.5.

Concluding the general description of the analysed production processes, the following paragraphs will include the definition of the technical terms used throughout this book. One of the most frequently used words in the current study is the term textile. This term can include several types of objects. It is therefore vital to define what exactly is meant when referring to a textile. For example, in Karina Grömer's definition, '(t)he term textile encompasses not only woven fabrics, but all products which consist of interconnected basic components. These include mats made in plying and basketry techniques, objects of fabrics made in coiling techniques, nets, wickerwork and twined objects'.[50] The focus on spindle whorls and loom weights in the current study however allows no statements about most of these textile types. Thus, the term textile will only refer to woven fabrics.

To follow the procedure of the production of such a fabric or textile described above, the next important technical term is spinning. Spinning describes the twisting or conversion of natural fibres into a thread/yarn by using the force of rotational motion.[51] The thus-produced yarn can be defined as a spun thread made by spinning natural fibres,[52] unlike the potentially confusing term string, which consists of several such spun threads.[53] It was already stated that the study focuses on a spinning technique which employs spindle whorls (or whorls for short). Technically speaking, a spindle whorl functions as a flywheel, which means that by storing rotational energy it influences the rotational speed and torque of the spindle. Though this sounds rather defining, a spindle whorl could be any pierced symmetrical object. Even the weight cannot give any further clue, since, even for very heavy or light whorls, techniques exist to use them to spin yarn. However, not too many artefacts falling into this category exist in a prehistoric context. Therefore, to be able to define a pierced symmetrical object as a spindle whorl, other options (such as use as beads or net-sinkers) need to be excluded. With this in mind, those two possibilities need to be described in the following, both concerning the distinction between beads and spindle whorls, as well as the potential use of reused rounded and pierced pottery sherds as whorls.

The best method for distinguishing between a bead and a whorl is to search for abrasions on the object. This is only possible if the artefact can be observed directly (meaning not via drawings or photos), but is then rather simple. Spindle whorls normally show abrasions around their holes, beads normally do not. It can, however, not be excluded that a whorl that was not used frequently and therefore shows no abrasions could be falsely identified as a bead. The only other, less reliable, way is to compare clusters of weight and diameter or the general shape of different objects. This method is, however, also not fail-safe, because one cannot rule out the possibility that beads with similar shapes and weights existed. In the current study both methods were used to be able to identify beads and only include actual spindle whorls into the study.

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49 See: Mårtensson et al. 2009.

50 Grömer 2016, 32.

51 Cf. "spinning" <https://www.oxfordlearnersdictionaries.com/definition/english/spinning>; <https://www.merriam-webster.com/dictionary/spin>.

52 Cf. "yarn" <https://www.oxfordlearnersdictionaries.com/definition/english/yarn>; <https://www.merriam-webster.com/dictionary/yarn>.

53 Cf. "string" <https://www.oxfordlearnersdictionaries.com/definition/english/string_1>; <https://www.merriam-webster.com/dictionary/string>.

The question of the use of reused pierced sherds as spindle whorls is a more problematic one and has caused a lot of discussion in the research community.[54] In this study pierced sherds are not defined as spindle whorls due to the following reasons:

In a case study on the Early Bronze Age Çukuriçi Höyük tools, it could be shown that spindle whorls and pierced sherds differ in weight classes.[55] The pierced sherds seemed to fall into clearer weight clusters than the spindle whorls, which shows that they were even more strictly classified by weight. Moreover, many of the pierced sherds from EBA Çukuriçi Höyük were lighter than even the smallest spindle whorl from the same settlement.[56] The meaning of the weight for the spinning process will be discussed in detail in Chapter IV. For now it must be stated that spinning experiments proved that a lighter whorl produces a finer and thinner yarn.[57] This would mean that if the pierced discs were spindle whorls, at Çukuriçi Höyük the finest yarn would not have been produced with specially constructed whorls, but with recycled, slightly asymmetric pottery sherds. This was deemed as highly unlikely for this particular case since, moreover, spindle whorls were present in rather large numbers.[58]

For Çukuriçi Höyük this tool category was interpreted as net sinkers, understanding the weight clusters as tool sets for different types of fishing nets. This interpretation is not uncommon: other researchers have also suggested this identification, though often only for larger/heavier pieces.[59] For Çukuriçi Höyük it could be argued that the relatively light objects were very useful as net sinkers for the muddy seabed in fishing close to a coast.[60] It cannot be stated for sure if this interpretation is applicable to other prehistoric settlements. It would be too daring to assume that pierced and rounded sherds were used as net sinkers as a general conclusion. However, to address the potential interpretation as spindle whorls, the pierced sherds also have technical disadvantages.

Pierced sherds often have an irregular shape and nearly always have a biconical hole, which results from drilling from both sides of the sherd. The irregular shape makes them less ideal as a flywheel. Furthermore, the biconical hole means that a pierced sherd will only be stuck on the spindle with a minimal mass. This, in turn, can lead to the basic problem of the sherd falling off the spindle during the spinning process. It is, in my opinion, very unlikely that craftspeople, who are perfectly able to construct and use ideal tools, will voluntarily use tools that are less fitted for their labour. Additionally, it has to be mentioned that for a person with knowledge of how to treat and bake clay, the production of a spindle whorl requires minimal effort. In comparison, chipping, smoothing and piercing an already burned sherd is an ordeal. That would mean that a less suited tool is produced with more effort and time consumption than a tool perfectly fitting the task. Therefore, in my opinion, too few arguments speak in favour of the use of pierced sherds as spindle whorls. Consequently, in the current study the term spindle whorl will only be used for tools that are produced for this precise purpose.

The next step addressed was the weaving, which can be defined as the action of creating a textile by interlacing threads/yarn on a loom.[61] As described above, three main types of looms exist, which all share the function of pulling warp threads straight to allow the interweaving of weft threads. It was also stated that (and why) the current study focuses only on the warp-weighted loom. This loom type can be described as an upright loom, placed in a vertical position, consisting

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54 See, for example: Blegen et al. 1950; Sharp Joukowsky 1986; Hochstetter 1987; Obladen-Kauder 1996; Rahmstorf 2008; Strommenger – Miglus 2010; Britsch 2022.

55 Britsch – Horejs 2014; Horejs – Britsch 2021.

56 Britsch – Horejs 2014, 234.

57 Andersson et al. 2008, 173; Mårtensson et al. 2009, 378.

58 See: Britsch – Horejs 2014; Horejs – Britsch 2021; as well as Chapter V of this study.

59 See, for example: Hochstetter 1987; Obladen-Kauder 1996; Strommenger – Miglus 2010.

60 See: Britsch – Horejs 2014; Horejs – Britsch 2021.

61 Cf. “weaving” <https://www.oxfordlearnersdictionaries.com/definition/english/weaving>; <https://www.merriam-webster.com/dictionary/weaving>.

of a main wooden beam, which is placed upon posts and two thin beams or sticks, used for separating and changing two sets of yarns.[62] This type of loom is named after its mechanics: the warp threads (vertically hanging threads) are weighed down by loom weights.

The definition of a loom weight is critical in itself. Since the only technical function of a loom weight is being a weight that pulls down a thread, it is rather difficult to say if the observed object was actually used on a loom. Some objects considered as loom weights could certainly also function as net sinkers, or smaller versions as balance weights. The only distinctive proof, in a prehistoric context, is when a cluster of loom weights is found in a position that allows the reconstruction of a loom. The other – still very reliable – way is via comparison. If an artefact from a certain site is of the same design as those from a site with such a cluster find, the artefact can also be considered a loom weight. To be defined as a loom weight in the current study, an artefact needed either to be found in such ideal conditions or at least to share most characteristics with such finds. This also means that a loom weight in the current study is an object that is attached to a warp-weighted loom for which we have archaeological (or at least correlative) proof of its function. A criticism of this definition is the exclusion of the potential multi-functionality of loom weights. However, no determining use-wear analysis is possible on them, since it would again only show that they hung on something.

[62] See, for example: Crowfoot 1937.

III. State of Research

As described in the introductory chapter, textiles and textile production form a vital part of social and cultural life. Even though this can be assumed for prehistoric times as well – maybe to a slightly smaller extent – archaeological research does not reflect this relevance. While in certain regions[63] an already well-established and still growing knowledge of prehistoric textiles exists, in other parts of the world the topic has been neglected and information is lacking. This imbalance can largely be blamed on the accessibility of prehistoric textiles, that is to say the preservative conditions and therefore the particular natural environment. The study of prehistoric textile production is unfortunately – for most parts of the world – based on indirect evidence, namely, the tools used in manufacture. In regions where no direct evidence can be found, only a few sites have been analysed by indirect findings. In this chapter an overview of the present state of research of the geographical area and chronological frame of the current study will be given (Fig. 3). References to more general approaches will be added if necessary. The portrayal will be separated into two sections: studies on textile technologies and general publications on textile tools. The first part will address publications that were used as a basis and frame of reference for methods and theories used in the current study, while the second will include all publications on textile tools (descriptions, photos, drawings etc.) relating to the research region.

III.1. Studies on Textile Technologies

The summary of loom types published in 1913 by Henry Ling Roth marks the first detailed analysis of ancient and prehistoric textile production techniques in Egypt and Greece.[64] In the paper, artefacts and pictorial sources, as well as written accounts from historic times, are included. The study focused on looms and weaving techniques; however, spindles, whorls and spinning techniques were also addressed. The next systematic approaches were published by Grace M. Crowfoot in the 1930s, with one paper addressing the spinning and another the weaving process.[65] Both papers contain a large summary and discussion of different tool types, technological change and pictorial sources, as well as a linguistic approach to terminological change in the ancient textile craft. Since Crowfoot's interest was mostly in technical aspects, the geographical settings played a minor role in her studies. However, the examples used in her studies show a similar tendency to Roth's review – coming mostly from the Near East, Egypt and Greece. In 1964 the first monograph solely on the history of looms and weaving techniques was published by Marta Hoffmann. It encompasses the then-known technological aspects of looms and weaving from prehistoric to contemporary times.[66]

In 1965 two papers were published regarding the sensational finds of preserved textiles in the settlement of Çatal Hüyük. Due to a fire, pieces of unwoven strings, as well as of woven textiles

[63] As already described in Chapter I, depending on the individual circumstances and conditions, textiles can be preserved. Since certain countries and regions provide such special conditions like wetlands, swamps or permafrost and so on more often, these regions have been favoured for studying prehistoric textiles. This includes, for example, Russia, Mexico, Egypt, Scandinavia, Switzerland and Austria. Further references are given in Chapter I.

[64] Roth 1913.

[65] Crowfoot 1931; Crowfoot 1937.

[66] Hoffmann 1964.

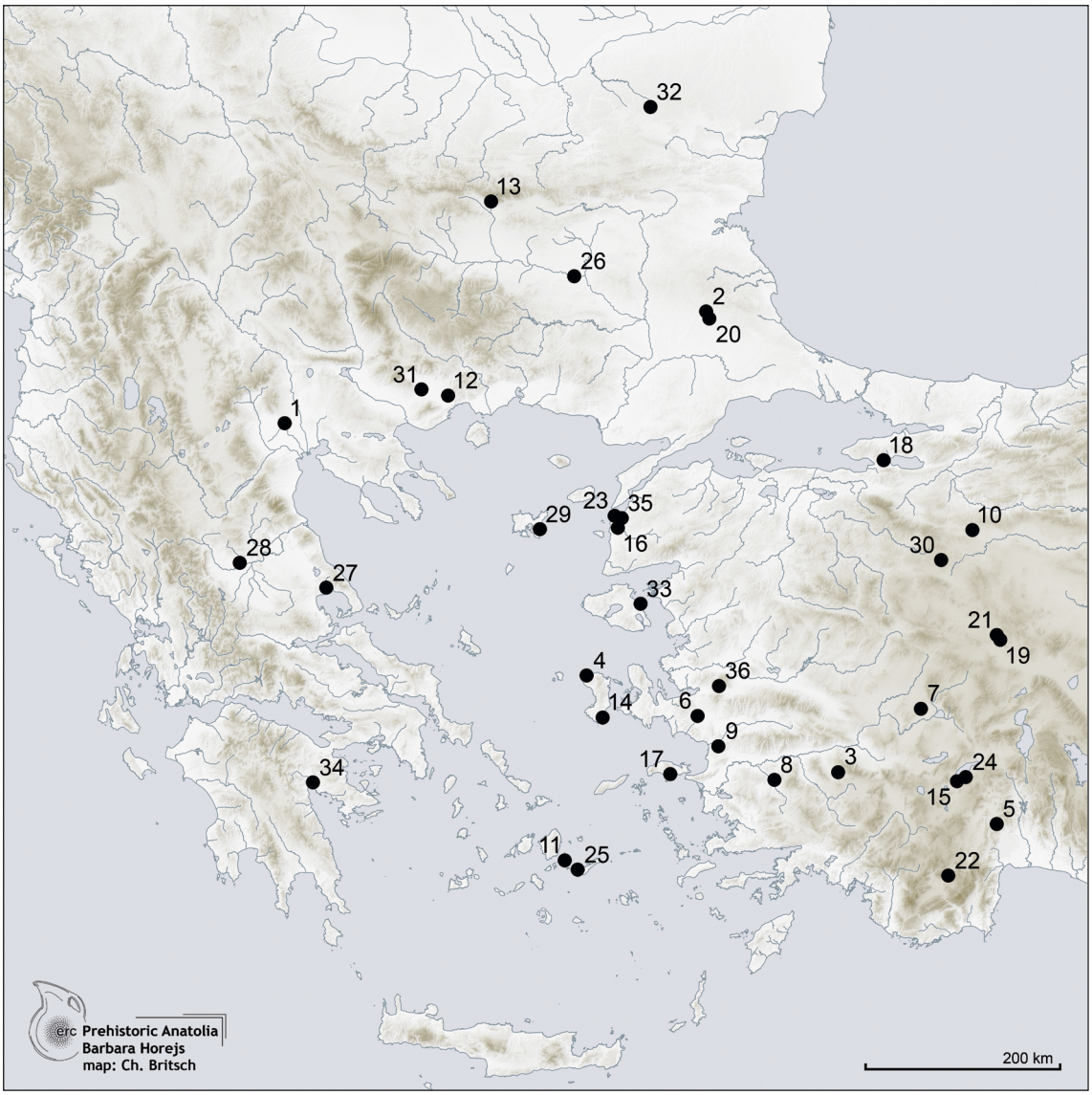

Fig. 3 Sites mentioned in the current chapter. 1 – Archontiko, 2 – Aşağı Pınar, 3 – Aphrodisias, 4 – Ayio Gala, 5 – Bademağacı, 6 – Bakla Tepe, 7 – Beycesultan, 8 – Çine Tepecik, 9 – Çukuriçi Höyük, 10 – Demircihüyük, 11 – Dhaskalio, 12 – Dikili Tash, 13 – Dubene-Sarovka, 14 – Emporio, 15 – Hacılar Höyük, 16 – Hanay Tepe, 17 – Heraion, 18 – Ilıpınar, 19 – Kaklık Mevkii, 20 – Kanlıgeçit, 21 – Karaoğlan Mevkii, 22 – Karataş, 23 – Kumtepe, 24 – Kuruçay Höyük, 25 – Markiani, 26 – Nova Nadezhda, 27 – Pefkakia Magoula, 28 – Platia Magoula Zarkou, 29 – Poliochni, 30 – Seyitömer Höyük, 31 – Sitagroi, 32 – Tell Golyamo Delchevo, 33 – Thermi, 34 – Tiryns, 35 – Troy, 36 – Ulucak (ERC Prehistoric Anatolia/C. Britsch)

were preserved. Several examples were found, which are all supposed to be made of bast or flax fibres.[67] The finds sparked greater interest in the textile production of prehistoric Anatolia. Unfortunately several pieces of textile were lost during the excavation and another large amount was destroyed due to a lack of knowledge about the treatment of these delicate finds. Nonetheless, the finds shed a little light on a long-invisible craft and surely played a part in the growing interest in this particular region since then. The same development can be seen in Bulgarian prehistoric research induced by textile finds near Sofia.[68]

67 Burnham 1965; Ryder 1965.
68 See: Petkov 1965.

A detailed account of older phases, starting with the Greek Neolithic, was presented by Jill Carington Smith in the form of a PhD thesis.[69] Unlike Hoffmann, she explicitly focuses on prehistoric times, thus giving the first monographic account of prehistoric textile production. Once more, the geographical focus of the research remains in Greece. However, due to the lack of pictorial sources in prehistory, Carington Smith concentrates strongly on archaeological features and artefacts. Her work therefore provided the impulse for the currently strong focus on textile tools as a primary source of information.

In the 1980s two important papers were published by Barbara Kelley McLauchlin and Avigail Sheffer.[70] Though both are rather short papers, they address a critical point still contained in the current study: the question of what impact tools have on the textile production process. While former studies mainly analysed tools in a more descriptive manner, those two papers analyse individual tools to discuss their possible use and influence based on their metrics and physics. This development marks a vital change in the archaeological study of textile production. Furthermore, at the start of the 1980s, the North European Symposium for Archaeological Textiles (NESAT) was founded. Starting in 1981, NESAT has held a conference on archaeological textiles every three years.[71] While having a certain focus on central and northern Europe and textiles themselves, the conferences – as well as the resulting publications – also contain contributions regarding the analysis of textile tools from the Aegean, Anatolia and the Balkans.[72] NESAT has therefore created the first international platform for sharing knowledge and ideas on research into prehistoric textile production.

The book that probably had the strongest influence on the current discussions in this field was published in 1991 by Barber.[73] It encompasses a rich collection of archaeological evidence as well as a technical analysis. Especially for the Neolithic, Chalcolithic and Bronze Age in the Aegean and Anatolia, as well as parts of the Balkans, the book is the most complete standard reference. Barber managed to demonstrate many different developments as well as a certain uniformity in the artefact development. The two most important parts of her publication for the current study are the large collection of references she created for prehistoric textiles and tools and the idea of linking technological development and distribution with the tools used in manufacture in order to reconstruct prehistoric techniques and their diffusion.

Later in the 1990s both Barber and others directed their research interest more to the organisation of textile production.[74] Topics like the general social organisation as well as the discussion of gender roles in textile production were central to these approaches. Due to the richer archaeological sources, these discussions were, however, mostly concerned with the Near East. The availability of written sources also led to a focus on the Late Bronze Age and onwards. However, earlier periods were always at least addressed via analogies.

In the last two decades, research on prehistoric textile production intensified significantly. To a large degree this development can be associated with the founding of the Centre for Textile Research in Copenhagen (CTR) in 2005. But even before this, a tendency toward more technically and less aesthetically focused studies is noticeable in the textile research in different parts of the world.[75] All of these approaches – to differing extents –follow the trend from the 1990s of analysing tools in reference to their technical aspects. This led to discussions about the impact of spindle whorl and

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69 Carington Smith 1977

70 McLauchlin 1981; Sheffer 1981.

71 For a list of previous NESAT symposia, see: <http://www.nesat.org/main/history_en.html> (last accessed 12 Feb. 2025).

72 Jørgensen – Tidow 1982; Jørgensen et al. 1988; Walton – Wild 1990; Jørgensen – Munksgaard 1992; Jaacks – Tidow 1994; Jørgensen – Rinaldo 1998; Pritchard – Wild 2005; Maik 2004; Rast-Eicher – Windler 2007; Andersson Strand et al. 2010b; Banck-Burgess – Nübold 2013; Grömer – Pritchard 2015; Nosch 2015; Bravermanová et al. 2017; Laurito 2018; Vakirtzi 2018; Sarri – Mokdad 2019; Quillien – Sarri 2020.

73 Barber 1991.

74 Barber 1994; McCorriston 1997; Crewe 1998; Keith 1998.

75 See, for example: Web 2002; Petrova 2004; Chohadzhiev 2003; Chohadzhiev 2004; Schade-Lindig – Schmitt 2003; Andersson 2003; Becks – Guzowska 2004; Bichler et al. 2005; Burke 2005; Guzowska – Becks 2005; Richmond 2006.

loom weight properties on the textile production process, an aspect that formed a vital part in the subsequent studies of the CTR.

The most important insights into the technical aspects of textile production were gained by the CTR's spinning and weaving experiments.[76] The experiments were able to demonstrate a definite connection between the metrics of textile tools and the manufactured products (namely the yarn and the weave). The exact details of this connection will be highlighted in Subchapter IV.5. The vital knowledge acquired at this point was the confirmation that it is possible to analyse and partially reconstruct the textile production process via the metrical data of the tools. This allowed subsequent studies to investigate textile production with a deeper technical focus. At around the same time as the CTR experiments, another fundamental monograph was published by Grömer.[77] The book encompasses prehistoric and historic textile production techniques and especially their terminology. This includes all manufacturing steps from gaining the raw material up to finishing and mending textiles. It is, to date, the most comprehensive literature for textile production technology and terminology, and was also translated into English.[78] Likewise, other scholars enlarged such knowledge with further technological analyses.[79] One direction of such approaches was the consideration of the moment of inertia of spindle whorls.

The idea to calculate the moment of inertia of spindle whorls and include it in the analysis was first introduced by Isa Loughran-Delahunt, but was sadly never published.[80] In a later attempt, Tomasz Chmielewski and Leszek Gardyński tested the impact of the spindle whorl's moment of inertia by experimenting with a pendulum.[81] The tests were able to clearly demonstrate that a change in rotational movement could be deduced from the shape and size of the spindle whorl. However no follow-up research was undertaken in this respect by the authors. The topic was then pursued again by André Verhecken, who emphasised the potential of calculating the physical properties of spindle whorls.[82] He, however, subsequently retracted the statement, calling the process too problematic since prehistoric spindle whorls are, in his opinion, too asymmetric and the moment of inertia would exclude too many important factors (initial energy, individuality of the spinner, spindle size, curled-up yarn, etc.).[83] The moment of inertia and its significance for the analysis of the spinning process, as well as the reason for its inclusion in this study, will be discussed in detail in Subchapter IV.7.

The growing interest in the mechanics of textile production seems to have also led to an increased focus on the general topic. This resulted, for one, in the collective volumes of the CTR,[84] but also in an increase in studies about prehistoric Anatolia, the Aegean and Bulgaria.[85] This, in turn, led to a growing data pool on textile tools, which had seldom been addressed in those specific regions and had rarely been published. At the same time, the Textile Revolution research group was included into the TOPOI excellence cluster of the Freie Universität Berlin.[86] The research group focuses strongly on early wool processing and generally has a very technical point of view.[87]

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76 See: Mårtensson 2007; Andersson et al. 2010; Andersson Strand et al. 2010a.

77 Grömer 2010.

78 Grömer 2016.

79 See, for example: Gleba 2011.

80 Loughran-Delahunt 1996.

81 Chmielewski – Gardyński 2010.

82 Verhecken 2010.

83 Verhecken 2013.

84 See, for example: Gillis – Nosch 2007; Nosch – Laffineur 2012; Gleba – Mannering 2012; Andersson Strand – Nosch 2015; Siennicka et al. 2018.

85 See, for example: Chohadzhiev 2007; Andersson et al. 2008; Petrova 2008; Çilingiroğlu 2009a; Frangipane et al. 2009; Burke 2010; Laurito 2010; Petrova 2011; Andersson Strand 2012; Gleba 2012; Siennicka 2012; Schoop 2014; Rahmstorf 2015.

86 See the research group's website: <https://www.topoi.org/group/a-4/> (last accessed 21 Nov. 2024).

87 See, for example: Becker et al. 2016; Grabundžija et al. 2016; Grabundžija – Russo 2017; Schier 2017; Conrad et al. 2018.

Summarising the technical methodology accrued from the described developments, one finds a strong commonality within the different approaches: the concept of reconstructing information about production techniques, efficiency and the properties of the end product via the tools used in textile production. For both the spindle whorls and the loom weights, it is commonly agreed upon that the weight and dimensions of the tools have the strongest influence on the end product. For spindle whorls, these measures influence the yarn thickness and thereby the yarn strength and the material and time consumption per metre produced. For loom weights, they determine how many threads are fixed on each weight and how close these threads hang next to each other on the loom.[88] Therefore, the basis for all analyses in the current study is the metrics and the weight obtained by undertaking direct measurement on the objects.

As described above, very few researchers tried to take the analysis of such metrics to a next level, considering, for example, the moment of inertia of spindle whorls, which would additionally take the geometrical shape into account. This might be due to the fact that most researchers in the field strongly reject this hypothesis. The main argument against the influence of the moment of inertia is the problem that many other factors of influence are not taken into account when predicting the end product. This argument, as already described above, has only been published by Verhecken.[89] Though the reservations that other factors possibly also have an influence are understandable in a way, one must argue that it is better to be able to predict an outcome more precisely by figuring out as many influencing factors as possible. Since the moment of inertia uses the weight as a variable in its calculation, it could also be seen as 'building upon' the weight. This means that it is an extension of the already observed influence of the weight. That leads to my hypothesis that results from experiments related to the weight could also be transferable to the moment of inertia. Therefore, the current study will, contrary to common procedures, further test the possibility of an impact due to the moment of inertia and include it in the statistical evaluations.

Another difference of the approach in the current study is the use of indirectly collected metrical data. To be precise, this means that if no value for the weight is given in publications, but information on the remaining measurements can be obtained, the weight is calculated based on the volume and density.[90]

To conclude, the study will follow the current methodological developments and approaches as a basis (metrical analysis), but will also try to include and develop further-reaching concepts, especially for its statistical analyses (moment of inertia, indirectly collected data).

This first part of the presentation of the state of research only included publications regarding the technological aspects of textile production, as well as the methodological and theoretical possibilities of analysing, evaluating and interpreting prehistoric textile production processes by studying spindle whorls and loom weights. Publications which solely or mainly present information on textile tools in varying degrees of detail will be featured in the following part.

III.2. General Publications on Textile Tools in the Research Area

Though the core part of the current study is the personally recorded spindle whorls and loom weights, still a substantial share derived from publications. The studies which the methodological frame of this book was built upon were already presented in the previous section. Yet, in most excavation reports, textile tools are not published in detail. Their presence or absence is merely outlined and, with the exception of a few photographs or technical drawings, the information given is too unspecific to be used in the present study. Only a few publications refer to textile tools in a way that makes them a useful data source for the following research. The details of the recording

88 For a more detailed description of the impact of tool metrics and the exact calculations see: Subchapter IV.5.

89 Verhecken 2013.

90 The critique and problems connected with this approach are discussed in detail in Subchapter IV.5.1.

method from publications are given in Subchapter IV.5.1. In addition to providing data for the current study, such publications also provided a basis for how to properly describe and display the tools. The history of research and the publications that found their way into the study will be described in the following paragraphs.

The earliest detailed records of textile tools, especially spindle whorls, are Heinrich Schliemann's publications of finds from Troy in the late 19th century.[91] The publications included a plethora of drawings of the extremely large numbers of spindle whorls found during the early excavations in Troy. Unfortunately for the current study, Schliemann focused on the spindle whorl decorations. This means that no technical details were published and, moreover, the drawings were given in a fashion that does not allow the secondary recording of metrical information. Nonetheless, Schliemann's early work on the tools created a reference for many later publications and at least aroused some interest for prehistoric textile tools from Anatolia and the Aegean. In the 1950s the textile tools from the American excavations in Troy were published by Carl W. Blegen and his team.[92] Though the volumes contained far fewer individual finds than the earlier Schliemann publications, Blegen's records included some technical data on the spindle whorls and loom weights, as well as spatial information for specific examples. One such example is the loom weights found in two rows in a room in Troy IIg (EBA 2).[93] The position of the loom weights between a wall and two wooden beams was preserved in situ due to a burned layer. This allowed interpretation as an immobile loom, fixed in place, which allowed further assumptions about the dimensions of the loom and the potential weaves produced on it.[94]

Meanwhile, in 1936, Winifred Lamb published the results of the excavations at Thermi on Lesbos (EBA). Though only marginally presented, that publication also included a few written and some pictorial references to spindle whorls and loom weights from the site.[95]

In the 1960s several publications including excavation results from the research region were published, which also contained information on textile tools. For the Aegean Islands, this included the excavations under the Heraion on Samos[96] (EBA) and those at Poliochni on Lemnos[97] (LC–EBA). At approximately the same time, publications of the results from two western Anatolian sites were published: Hacılar Höyük[98] (EBA 1) and Beycesultan[99] (LC–EBA). None of these publications included detailed technical information on the textile tools. However, in varying degrees, they offered metrical information, as well as drawings and photos that allowed the deduction of metrics which could be used in the current study. Especially from Beycesultan, a large number of spindle whorls were published (N = 54). The publications for Heraion and Hacılar Höyük only presented small numbers of spindle whorls ($N_{Heraion} = 8$; $N_{Hacılar\ Höyük} = 5$). Otherwise they only offered drawings and photos, which did not allow the deduction of metrical information due to the low quality. The same applies for all pictorial data from Poliochni.

The publications of Tell Golyamo Delchevo[100] (LN–LC) and of Kumtepe[101] (LC) are the only ones from the 1970s which could be used in the current study. The Tell Golyamo Delchevo publication contains all spindle whorls and loom weights from the site. The Kumtepe publication contains photos of the spindle whorls found and of a loom weight; unfortunately, however, the photo of the loom weight was not of a quality that allowed inclusion into the database.

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91 See: Schliemann 1874; Schliemann 1881; Schliemann 1884.
92 Blegen et al. 1950; Blegen et al. 1951.
93 Blegen 1963, 71–72.
94 Britsch – Horejs 2014.
95 Lamb 1936.
96 Milojčić 1961.
97 Bernabò-Brea 1964.
98 Mellaart 1961.
99 Lloyd – Mellaart 1962.
100 Todorova et al. 1975.
101 Sperling 1976.

In the beginning of the 1980s, Sinclair Hood and his team published two volumes on excavations on Chios.[102] Though a limited number of textile tools were featured in these volumes (fewer than ten per site), at least an impression of the assemblage was given with a few notices about the exact find locations within the sites. It was possible to include data from Emporio (EBA 1) and Ayio Gala (LC) on Chios in the database through these publications. For the excavations at both Aphrodisias in southwestern Anatolia and Pefkakia Magoula on the Greek mainland, results were published later in the same decade.[103] The publication of Aphrodisias (LC–EBA 1) presented a considerable number of spindle whorls (N = 15) with technical information that could be used in the current study. The volume on Pefkakia Magoula (LC–EBA 3), however, only contained very marginal information about textile tools. Further research on the site and its textile tools was not published until nearly a decade later, via a monograph and microfiche by Elmar Christmann.[104]

Generally, in the 1990s the number of publications including drawings, photos or details of prehistoric textile tools increased significantly. In addition to the already mentioned volume by Christmann, relevant information about eight more sites was published in this decade. All of the publications present excavation results and all of them include at least small amounts of information about the respective textile tools. The pertinent sites are Karataş[105] (LC–EBA), Ilıpınar[106] (EBA 1), Kumtepe[107] (LC), Kaklık Mevkii[108] (EBA 1), Kuruçay Höyük[109] (LC–EBA 1), Demircihüyük[110] (EBA), Karaoğlan Mevkii[111] (EBA 2) and Bakla Tepe[112] (LC). The publication by Manfred Korfmann and colleagues presented four spindle whorls from the Kumtepe excavations that also allowed an inclusion into the database. However, the publications on Karataş and Demircihüyük in particular were important for the current study. Both offered considerable quantities of drawings and photos, as well as technical data on their textile tools ($N_{Karataş}$ = 28; $N_{Demircihüyük}$ = 71). Both volumes mark a turning point for the research region. From then on, more detailed records and analyses on spindle whorls and loom weights were included in the excavation reports and publications.

With the 21st century the number of publications also containing technical information on prehistoric textile tools constantly increased significantly for the research region. In the first decade of the year 2000 alone, 16 volumes and papers regarding new excavations or summaries of material from older excavations were published. One important example of a comprehensive revision is the volume by Ourania Kouka which included textile tools from all phases of Poliochni, Thermi, Emporio, and Heraion.[113] The volume presented not only textile tools but also the settlement architecture of the respective sites, as well as information about pottery, metallurgy and all small finds. Most importantly, the volume included the spatial distribution of the artefacts and a technical interpretation of the buildings and features they were connected with. Another important revision of older excavation tools published during this decade is the analysis of the pierced clay objects in the Schliemann collection by Elisabeth Völling.[114] The paper discusses spindle whorls and loom weights in great detail and offers technical information.

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102 Hood et al. 1981; Hood et al. 1982.
103 Sharp Joukowsky 1986; Weisshaar 1989.
104 Christmann 1996.
105 Eslick 1992; Warner 1994.
106 Roodenberg 1995.
107 Korfmann et al. 1995.
108 Efe et al. 1995; Topbaş et al. 1998.
109 Duru 1996.
110 Obladen-Kauder 1996.
111 Topbaş et al. 1998.
112 Erkanal – Özkan 1999.
113 Kouka 2002.
114 Völling 2008.

Volumes and papers on newer excavations included the results from Bademağacı[115] (EBA 1–2), Sitagroi[116] (MC–EBA), Çine Tepecik[117] (EBA), Markiani[118] (EBA 3) and Ulucak[119] (LN–EBA).

Furthermore, the continued excavations and analyses at Ilıpınar led to a subsequent publication regarding settlement structures, burials and the connected finds.[120] The volume offered both written and pictorial information about spindle whorls, which could be added into the database.

Ultimately, in the current decade the consideration of and interest in textile tools in volumes regarding excavation results in the research region increased even more. Several volumes and papers regarding more than ten different sites have been published with information on or even special consideration of prehistoric textile tools. This includes sites in western Anatolia: Hanay Tepe[121] (LC), Bakla Tepe[122] (LC), Çukuriçi Höyük[123] (LN–EBA 1) and Seyitömer Höyük[124] (EBA 3); in Turkish Thrace: Kanlıgeçit[125] (EBA); in eastern and northern Greece: Platia Magoula Zarkou[126] (LN), Tiryns[127] (EBA) and Archontiko[128] (EBA 3) and on the Aegean Islands: Dhaskalio[129] (EBA). Furthermore, through continuous excavations and/or revisions of older material, more information was published on Çine Tepecik[130] (EBA) and Sitagroi[131] (MC–EBA), in the case of Sitagroi, with a special focus on textile tools. While most of these publications present the results of excavations and mention and describe textile tools with a varying degree of detail, some focused especially on the prehistoric textile production of the respective settlement. These are the papers by Małgorzata Siennicka, Christopher Britsch and Barbara Horejs, Ernestine S. Elster, Lorenz Rahmstorf and Evi Papadopoulou and colleagues.

Another volume that deserves special regard is the unpublished PhD thesis by Vanya Petrova.[132] In her thesis Petrova analysed a plethora of prehistoric textile tools from different Bulgarian sites.

It must be clarified that this part of the review of the current state of research only contained publications that gave information about textile tools in the investigated area and time frame. Publications of sites like Aşağı Pinar (EC–MC), Dikili Tash (MC–EBA), Dubene-Sarovka (EBA 2), Platia Magoula Zarkou (MC–EBA 3), or Nova Nadezhda (MC–EBA 2) exist and were also consulted in this study for references, for example on stratigraphies. Since, however, those publications did not contain usable information on textile tools for the current study, they are not described here. Also important to mention is that for Nova Nadezhda, a publication of the textile tools by Vanya Petrova and Krum Bacvarov is forthcoming.

115 Duru 2001; Duru 2003; Duru 2004; Duru – Umurtak 2006; Duru – Umurtak 2007; Duru – Umurtak 2009.
116 Elster 2003.
117 Günel 2003; Günel 2008.
118 Marangou et al. 2006.
119 Çilingiroğlu 2009a.
120 Roodenberg – Alpaslan-Roodenberg 2008.
121 Blum et al. 2011.
122 Şahoğlu – Tuncel 2014.
123 Britsch – Horejs 2014; Britsch – Horejs 2017; Schwall 2018; Horejs – Britsch 2021.
124 Bilgen 2015.
125 Özdoğan – Parzinger 2012.
126 Alram-Stern et al. 2022.
127 Siennicka 2012; Rahmstorf et al. 2015.
128 Papadopoulou et al. 2015.
129 Renfrew et al. 2013.
130 Günel 2014.
131 Elster et al. 2015.
132 Petrova 2011.

IV. Theory and Methods

This chapter encompasses all methods, models and theoretical approaches used in the acquisition and interpretation of the data in this study. The first four subchapters are dedicated to theories that allow us to move from a mere technical analysis up to a social evaluation of the studied material. In my opinion, Carl Knappett states absolutely accurately that '[…] the archaeologist need not be reduced to the unhappy state of being a frustrated mentalist condemned to materialism'.[133] Clinging to this optimism, different sociological and economic theories, as well as their archaeological adaptations, were incorporated in this study. The main construct on which to build analyses of the social and cultural impact of material culture is the diverse field of practice theory. The details of each theory will be discussed in their respective subchapters. Only a few introductory thoughts should be mentioned here. Anyone who takes a glimpse at the complex discussions revolving around practice theory will surely notice the sheer impossibility of stating one definition or even one definite trait of it. Rummaging around in the extensive ideas of minds like Theodore Schatzki, Hilmar Schäfer or Bjørnar Olsen, will mainly demonstrate the vastness within theories of practice. When it comes to the other theories addressed in this chapter – agency theory or theories on craft specialisation – this statement applies as well, although to a lesser extent. The aim of this chapter can thus not be to cover all discussions and developments of each theory or even to outdo this and build up a new construct in these dense structures. On the contrary, the hope is to be able to go cherry-picking within common conceptions. The following four subchapters therefore depict merely the examination of those parts that I deemed to be crucial or at least helpful for analysing and interpreting the social and cultural dimension of textile production. In Chapter IV.4 the discussions of the preceding subchapters are concluded and the actually used models will be depicted and – in certain cases – extended or changed to be able to work on the given material. The remainder of this chapter is of a descriptive nature. It will only give an insight into how exactly the data were obtained and evaluated and, regarding the statistics, which exact calculations were used for further analyses.

IV.1. Practice Theory

As already described in the introductory part of this chapter, practice theory is an immensely diverse field of different concepts, ideas and models. The basic aim is to explain what influences, shapes, changes and determines human behaviour; how and why we perceive our natural, social and cultural surroundings; and how and why we perform practices in a certain way. Most known approaches encompass colossal networks of hypotheses.[134] The common thread within practice theory is, however, the basic concepts on which most constructs are built: structure, practice and the dialectic relationship between those two.[135] The intriguing difference from other sociological concepts is that neither the social setting, nor the human beings are the centre of interest, but rather the action or practice performed by an agent within a certain structure. This focus on

[133] Knappett 2005, 169.

[134] See, for example: de Certeau 1984; Schatzki 1996; Schatzki 2002; Olsen 2003; Schäfer 2013; Schäfer 2016; Schatzki 2016.

[135] See, for example: Ortner 1984; Ortner 1989, or, for a variety of examples, Dougherty 2004; Knappett 2005; Rouse 2007.

practices as primary objects of study has strongly increased in fields like sociology, anthropology and history. For archaeology, however, this development is mostly noticeable within Anglo-American research, and even there not in a comparable degree.[136] This might be due to an archaeo-typical focus on artefacts (objects) as the centre of studies. Therefore, especially for an archaeological context, the definition might be extended by the action of an agent within a certain setting using a certain object leading to potential alterations. Analysing the different approaches to practice, even within this framework, the aforementioned diversity prevails. Thus, before further describing the exact notion of terms like agent, actor, practice and so on, it might be useful to discuss different common approaches which assess the impact of the individual components. I will begin in chronological order. Searching for the beginning or foundation of practice theory, one will always be led to Pierre Bourdieu and Anthony Giddens. One will notice that the terminology used in most theories concerning practice is mostly related to Giddens,[137] he having coined terms like structure and agent. This notwithstanding, with regard to the content, most theorists typically refer to Bourdieu's concepts of habitus and doxa. However, from a 'practice-theoretical' point of view this makes sense. Giddens, pushing the human actor to the fore, ascribes far more power to the individual agent and action than most practice theorists do. This gave way to another theoretical development that will be discussed in the next subchapter, agency theory. Admittedly this distinction between practice theory and agency theory is a fuzzy one – depending only on the intensity of emphasis placed on certain aspects.

An examination of practice theory has to start with a review of the basic concepts of Bourdieu, who, to put it in Jennifer L. Dornan's fitting words, 'has made practice theory popular'.[138] Doxa describes all the rules and norms that encompass social life in a given society. Such rules do not have to be written down or even publicly stated, as they are common knowledge (from a certain perspective, common sense). This concept is comparable with Ludwig Wittgenstein's concept of rule-following and is taken up again in later outlines.[139] A greater impact on general theoretical developments is induced by the habitus concept. I will therefore first discuss this part and come back to rules and norms later.

Bourdieu describes habitus as the overarching structure that includes the environment as well as the human actor within the system.[140] The habitus is therefore structured as well as structuring and reflects the dispositions and determinations the human actor perceives.[141] The actor can thus only act and react within the frame of the habitus, or to put it more drastically, mainly act unconsciously. Bourdieu explains that the habitus is an individual construct determined by unique impressions on each actor. Such impressions can be contacts to certain social groups, social situations and general circumstances like social class and standing.[142] He points out that the habitus defines the agents' interests – their perception and actions – consequently leaving the actors without an autonomous will or even consciousness.[143] Bourdieu is thus extreme in his conception of the role of the human actor, almost completely omitting intentionality from his considerations. In fact, he stresses that changes of a social system by a human actor can only occur by 'accident'.[144] This postulate of the unintentional consequences was part of the discussions following Bourdieu's concepts. This can, for example, be seen in Sherry B. Ortner's outline of practice theory. Unlike Bourdieu, she states that the unintentional consequences of an action are bigger and have a higher

136 Rouse 2007, 499.
137 See: Giddens 1979; Giddens 1984; Giddens 1993.
138 Dornan 2002, 305.
139 See, for example: Wittgenstein 1953; Taylor 1985; Taylor 1995.
140 Bourdieu 1977.
141 See: Dornan 2002; Bourdieu 1977.
142 Bourdieu 1977; Bourdieu 1990.
143 See: Bourdieu 1977, 76; Bourdieu 1990, 56; for a deeper analysis on this part see: Searle 1983; Dornan 2002, 305–306.
144 See: Bourdieu 1977, 164; Garnham 1993, 182.

impact, but does not deny the general influence of intentionality.[145] Ortner also displays a far less deterministic view. She believes that when studying a society, one will perceive its characteristics in two steps. The first step is compatible with Bourdieu's habitus. It is a first sketchy view that gives the impression that the main influential component is the system or structure revolving around everything. The actor is shaped and confronted by and within this structure. In the second step, however, one will recognise the actor potential to exert an influence. According to Ortner, groups and individuals can shape and change their world by giving meaning and value to certain things, events and circumstances or by bringing order to a social system. This would mean that the actors have a strong influence on their actions – by socialising and giving their world a symbolic framework. This phenomenon is what Ortner terms 'culture'. However, she does not define the second view as more advanced than the first one or vice-versa; rather, she describes the ideal utilisation of practice theory as the serious implementation of both aspects. What is more, it is the interface between those two views – how they react to one another and how they shape, limit and advance each other – that is the primary interest in Ortner's theory.[146] Another such dialectic interpretation is Charles Taylor's two strategies. Taylor's interpretation is comparable to Ortner's in its distinction between exogenous and endogenous impacts.[147] When developing the two strategies Taylor referred to Wittgenstein's assertion of rule-following (*Regelfolgen*).[148] Wittgenstein claimed that human practice always reflects the rule-following that is embedded by the social system, an even more deterministic approach than Bourdieu's.[149] In Taylor's conception of Wittgenstein's claim, he describes how human action and self-awareness happen in two different stages. One depicts actors as being influenced and led by their background, meaning, for example, acts are performed mainly due to being imposed by society (Wittgenstein's rule-following!). The second stage follows the idea that actors will be able to incorporate their background into their ideas and have a reflective relationship, allowing them to find individual ideas, reasons and explanations.[150] This part agrees with Ortner's previously mentioned notion that the essence of practice theory is the interaction between the actor and the structure. Accordingly, Taylor stated in an earlier publication that he sees 'man as a self-interpreting animal',[151] meaning that '[a]lready to be a living agent is to experience one's situation in terms of certain meanings; and this in a sense can be thought of as a sort of proto-'interpretation''.[152] This clearly emphasises that for Taylor, too, neither the structure nor the agent should be the sole focus, but the interrelation between both. This hybrid combination can be detected in many later and current approaches to practice theory.[153]

These conceptions share yet another important aspect: recognition of 'the' agent as potentially consisting of multiple actors. Fundamentally an action is always an individual act undertaken by a single individual. However, it would be impossible – and moreover hermeneutically wrong – to view an action as detached from its surrounding structure, meaning that it is influenced and structured by its background, as well as that it is part of it. And the background of an individual, in most cases, in part consists of other people. A performance must therefore also be seen as an interaction between several actors that are both structured by and structuring their social playground. Thus, to understand the mechanism of an action, one has to connect activities and actors. Rouse even claims that such connectivity can encompass several generations of actors forming an

145 Ortner 1984.
146 Ortner 1984, 18.
147 See: Taylor 1985; Taylor 1995.
148 Wittgenstein 1953.
149 Of course there is far more to it; however, explaining Wittgenstein's theories here would take the discussion too far off track.
150 Taylor 1995.
151 Taylor 1985, 26.
152 Taylor 1985, 27.
153 See, for example: Brandom 1994; Rabinow 1996; Schatzki 1996; Schatzki 2002; Rouse 2007; Wartenberg 2009.

act, also pointing to the resulting difficulty of analysing impacts.[154] Thomas E. Wartenberg establishes another form of connection between several actors. According to Wartenberg, connections between social agents occur within a 'social alignment'. This alignment emerges due to (co-) dependencies on actions or materials that are in the control of others, resulting in a 'power relationship' between social agents. Wartenberg defines the concept of a social alignment as a method to understand and comprehend the interaction of social agents and their performances.[155] Even though the term 'power relationship' creates a rather negative impression, the interrelationships between agents must primarily be seen as unbiased. Teaching and learning, for example, is an example of such an alignment between two social bodies.[156] Even though skills can be obtained autodidactically, the process still needs the interrelation, meaning the observation or knowledge, of an existing action. Even innovative performances will develop with reference to an existing action. An exception to Wartenberg's theory can be stated for training or advancing a certain skill. The progression of body and mind and potential alteration of movements need not rely on others. Hubert L. Dreyfus describes this progress as a change of patterns that can go against certain rules or even violate them.[157]

The acquisition of skills and the progression, change and advancement of techniques is, of course, a vital aspect for the archaeological analysis of craftsmanship. The questions on why and how we adapt and spread technology, change and evolve or sometimes decline it are the fundamentals to understanding past developments. Fuller points out that 'knowledge exists only through its embodiment in linguistic and other social practices. These practices, in turn, exist only by being reproduced from context, which occurs only by the continual adaptation of knowledge to social circumstances'.[158] This reproduction of practices functions to a large extent via linguistic conceptions, which are not accessible for the greater part of prehistory. However, the context is 'accessed not solely through words, but in mimesis, imitation, and most definitely in the day-to-day actions, the repetitious engraving of practices and dispositions into the body'.[159] Thus the structure humans are confronted with in daily life consists largely of the actions, interactions and relations between social agents. Therefore, the existence of structure has to be seen both within a sole human mind as well as in the outside, the surrounding.[160] The structure is constantly reproduced and created, but also altered and changed in a continuous progression. This leads to two integral assumptions: (1) structure consists of the individual actions and performances of groups as well as of superordinate organisms like social institutions and political systems and thus (2) structure cannot be a universal reality, but is acquired, and therefore varies between people and societies.[161] Richard Handler and Jocelyn Linnekin assume that tradition, too, is thus an essential part of structure, and therefore part of the determination of agents and their actions.[162] To express it more blatantly, politics, institutions, traditions and ideologies, as well as smaller social groups (relatives, acquaintances, peers and so on), can construct limitations or boundaries for actions of any kind. Bourdieu reinforces this by saying that it is not only the habitus or structure but the perception of the agents themselves that also sets boundaries. Because of the correspondence between the objective, the social or the internalised structures, limitations are imposed on an agent that are mainly bound to a sense of reality.[163] However, I would argue that these 'self-inflicted' limitations are the exact reason why an agent can transcend the imposed structures, boundaries

154 Rouse 2007, 507.
155 Wartenberg 1990, 150.
156 See: Taylor 1991; Rouse 2007.
157 Dreyfus 1979; Dreyfus – Dreyfus 1986; also Foucault 1977; Foucault 1978.
158 Fuller 1989, 4.
159 Dougherty 2004.
160 See, for example: Haugeland 1999.
161 See: Bourdieu 1977; Mauss 1992; Dougherty 2004.
162 See: Handler – Linnekin 1984.
163 Bourdieu 1977, 164.

and limitation in favour of the urge for improvement. Through the perception of surrounding systems, introspection and self-awareness, a human agent will therefore be able to wilfully overcome said boundaries.

Nonetheless, one important question for this study remains: how is it possible to detect practices, agents, intentional and unintentional changes and their impact within the archaeological record? Doubtless there are several opinions on the question as to which parts of the mentioned constructs can be detected, many stating that practice can only be gathered via structure or habitus and that agency is archaeologically not recognisable.[164] Whichever position one might adopt in this discussion, one obvious limitation prevails: the underlying data. In prehistoric times we can refer to neither written nor – in most cases – pictorial sources. Therefore, the only direct source is the material culture, namely the finds and features. While this is a drawback for a holistic practice analysis, it does not constrict archaeologists from applying practice theory to their studies. On the contrary, objects or tools are often cited as strong conductors of social, cultural and ideological expression.[165] It is assumed that every object can function as a sign, meaning it represents and depicts something that goes beyond its mere technicalities. An object can therefore reflect social and cultural meaning; it also possesses the power of ideological and personal representation as well as alteration. One can go so far as to state that every sign carries ideology and therefore every object carries the potential expression of such ideology.[166] James J. Gibson points to another important aspect of tools within this construct, saying that 'a tool is a sort of extension of the hand, almost an attachment to it or a part of the user's own body'.[167] A tool can therefore become something far beyond a simple mobile object; it can gain properties or even a personality – one only has to listen to a car enthusiast talking about a car and its components. Knappett refers to such objects as giving a person a 'second skin', including not only cars but clothing, tools, houses or cosmetics. He also proposes the example of a blind man using his cane as an extension of his body, even as a substitute and amplification of certain senses.[168] According to Gibson, the 'capacity to attach something to the body suggests that the boundary between the animal and the environment is not fixed at the surface of the skin but can shift'.[169] Thus any tool can represent a plethora of aspects of meaning for the initial producer and user as well as their surrounding society and ideologies. The task of any archaeologist analysing material culture should therefore – in my opinion – include the evaluation of the practices of production and usage, embedding it in the social and cultural sphere of its respective society. To achieve this, any object has to be reviewed from multiple angles: first, the resemblances it shared with other items and secondly, the practical use and potential ideological message it carried in the society/structure (a) in which it was created, (b) it derived from or (c) it was used in. One of the best descriptions of analytical steps is probably the outline from Knappett.[170] This model, as well as others, will be discussed in Subchapter IV.4.

After setting out the most important ideas and developments in practice theory, criticism and doubts also have to be discussed. One elementary criticism when applying practice theory is the notion that the comprehension of a practice – especially when referring to a craft – requires the insight of a trained and skilled practitioner rather than the outside view of an analyst.[171] This criticism is elementary insofar as it is applicable to nearly all archaeological, as well as ethnological or most sociological research.[172] In hardly any case will a study be undertaken by people who can call themselves expert practitioners in their object of study. However, especially in fields like

164 See, for various examples: Dornan 2002; see also Mitchell 1986; Hodder – Cessford 2004; Brami 2017.
165 See, for example: Gosden 2005; Knappett 2005.
166 See: Sartre 1963; Voloshinov 1973; Dougherty 2004.
167 Gibson 1979, 42.
168 Knappett 2005, 17.
169 Gibson 1979, 42.
170 Knappett 2005.
171 See: Polanyi 1958; Rouse 2007.
172 See, for example: David – Kramer 2001.

sociology, ethnology or psychology, an extrinsic view of someone, following scientific methods, can offer a more informative insight, since it will be more objective. Nobody would claim that a sociologist studying the life of homeless people would have had to be homeless too, or that a psychologist treating a patient with depression had to have depression too. Just to carry it to the extremes, consider a biologist studying the behaviour of insects. The criticism as such is therefore a criticism of science itself. Nonetheless, we have to keep in mind that through a lack of expertise in the practice, the validity of the analysis is certainly reduced. Stephen Turner claims that practice theory promises more than it can deliver. He writes that by referring to practice theory one already assumes that there is more meaning within a practice than the simple act or performance. Therefore, a potential non-existent meaning will be interpreted as an actively performed, or at least a sub-conscious, meaning, again more related to the view of the observer than the practitioners:[173] 'Unless we can proceed as if a practice were real, a cause that persisted, we would have no basis for using our past understandings or interpretations to warrant future interpretations.'[174] A comparable criticism was formulated by Alisdair MacIntyre, who called social practices unpredictable. If one assumes that both the intentional and unintentional consequences can shape and change a structure in a lasting way, one has to admit that the shaping or changing depends to a certain degree on chance. MacIntyre points out this problem of identifying such 'change by chance' and especially the difficulty of observing all facets.[175] This is, of course, a fundamental concern, especially for archaeology, since we are missing many pieces of the puzzle anyhow. However, if we assumed that to grasp the vital aspects of practices one has to consciously perceive, know and understand all facets of the practice or, better still, be a (or the) practitioner oneself, we would deny any influence of the sub-conscious within practices.[176] Thus we would declare the action as a pure enactment of the agent's will to perform, which, again, would contradict the main concept of practice theory. Following the multiple outlines described in this subchapter, we can therefore declare that it should generally be possible to obtain an understanding of a structure, its norms and ideologies as well as to gain knowledge about associated practices, agents and objects, without having the whole picture laid out in front of us. In prehistoric archaeology, with its restrictions to material culture as a source, we have, of course, additional limitations. However, I think that due to the relevance of objects in practice theoretical outlines, archaeologists can nevertheless apply practice theory. Furthermore, archaeologists should even be able to contribute to the framework of practice theory due to their chronologically and geographically widespread view on social and cultural development.

IV.2. Agency Theory

As mentioned before, the line between agency theory and practice theory is a fuzzy one, relying mostly on the emphasis placed on the actor or agent. Just like practice theory, agency theory takes its roots from Bourdieu's work. With the new conceptions by Giddens, the general outline changed and took on a different perspective. Since most current approaches on agency theory build on those concepts, I will begin my recollection with the principles of Giddens. The most distinct difference between Bourdieu's and Giddens' view on the explanation of what determines human actions is certainly the impact of the agent within the system. Giddens, too, sticks to a construct consisting of structure, agent and action.[177] However, Giddens does not believe in Bourdieu's conductorless orchestration of human practice, but in a 'practical consciousness'. This means that an agent would act via a 'non-discursive, but not unconscious, knowledge of social

[173] See Turner 1994.
[174] Turner 1994, 37–38.
[175] MacIntyre 1981.
[176] See: Rouse 2007, 509–510.
[177] See, for example: Giddens 1979; Giddens 1984; Giddens 1993.

institutions'.[178] This leaves the agent far less determinate than in a classical practice theory outline. Still, Giddens does not consider the agent as completely free, since most enactments derive from tacit knowledge. In his opinion, an enactment can, however, be goal-directed and can be shaped in certain ways by the agent's will.[179] Especially interesting for archaeological research is that Giddens introduced the factors creativity and innovation to the model of how action is determined. In his conception these two factors are the leading human influences for action and in the mutation of social structures.[180] Thus, even though Giddens also puts his actor in a predetermined setting of cultural and social norms, he credits the human agent with the possibility of consciously perceiving habituated actions. According to his theory, the agent is on top of the structure: 'structure only exists as the reproduced conduct of situated actors with definite intentions and interests.'[181] The strongest limitation for human action – in Giddens' perspective – is not social, cultural or ideological bindings, but knowledge and skills, more precisely the agent's 'capacity of doing […] things'.[182] It can therefore be said that Giddens' theory tends to show the social world as a stable construct built on shared knowledge and advancement, rather than constant constraints and conflicts between actors and the structure.[183] This concept of social contact and exchange of ideas and knowledge fits perfectly into an archaeologist's mindset. However, as mentioned in Subchapter IV.1, the criticism regarding the detectability of agents and agency in the archaeological record has to be kept in mind.[184] Nevertheless, one must consider whether this difficulty (some might even state impossibility) of observation is a reason to exclude the variable from the calculation. In my opinion, if we consider the human factor as an influence within the system, we have to include it, even if only as an unknown variable. Furthermore, if we accept the practice theory assumption that a practice can be reflected in material culture, we can state that an echo or imprint of the human agent should – however slightly – also be visible.[185] Therefore, artefacts should be able to give us information about the human actors as well.

Before searching for the agency in archaeology we need to define the term. This, however, proves to be problematic, since the definition of the term, especially in archaeology, seems to be indistinct. Chris Barker, as a sociologist, defines agency as 'the capacity of individuals to act independently and to make their own free choices'.[186] This definition limits the agent to being human and the agency to consisting of the action of said humans, more precisely individual humans. While being one of the most recognised definitions in sociology, it cannot be adapted to archaeology in the same way. The main problem in archaeology is to find individuality aside from famous and therefore historically recorded personae. Thus, in prehistoric times individual life histories are restricted to burials, and even those have strong limitations.[187] As Dornan demonstrated in her summary of attempts to apply agency theory in archaeology, the search for an individual is mainly in vain and ends, at best, in a strict top-down analysis.[188] It is therefore not surprising that agency in archaeology is often seen as a collective action and capacity, or sometimes even as a metastructure comprising the social and the psychological.[189] Knappett, for example, splits up the metastructure, referring to the social component as 'personhood' and limiting the term 'agency' to the psychological.[190] The most important difference, however, in referring to agency as a

178 Giddens 1979, 24.
179 See: Giddens 1979.
180 See: Giddens 1993.
181 Giddens 1993, 134.
182 Giddens 1984, 9.
183 See: Dornan 2002.
184 See, for various examples: Dornan 2002 or see also: Hodder – Cessford 2004; Brami 2017.
185 Cf. also Warnier 1999.
186 Barker 2005.
187 See, for example: Bernbeck 1997, 251–270; Eggert 2008, 55–71; Renfrew – Bahn 2012, 421–461.
188 See: Dornan 2002.
189 See, for example: Dobres – Robb 2000; Wobst 2000.
190 Knappett 2005, 23.

metastructure is not the distinction within, but the retreat from an individualistic view to a more encompassing one. Furthermore, several archaeologists state the inseparability of human and object, leading to a discussion on an agency of humans and objects.[191] Chris Gosden, for example, notes that agency is both enacted and perceived (by the archaeologist) via objects. He therefore points to a concept of agency that almost exclusively takes objects and materiality into account, an agency of objects. Of course, when referring to agency as a metastructure of psychological enactment, not all human aspects can be converted to objects. John Pickering claims,for example, that intentionality is always a human trait and 'appears to have no counterpart in the material realm'.[192] On the other hand, he argues that intentionality will always be partially 'predisciplined' by the exterior world – one might say structure – within which a human agent exists.[193] This leads back to the beginning of this subchapter and the ongoing discussion about how freely an agent can act within a surrounding system.

One important question results from this discussion for archaeologists: how can we trace a fracture of self-determined action within an otherwise co-dependent, interrelated and interacting system in the archaeological record? Knappett names the link between mind, agent and object the 'cognition'.[194] If this term fits, we have to ask ourselves, how we can recognise past cultural and social action other than through the conglomeration of all three.[195] As Knappett puts it: 'Indeed, so inseparable are mind, action, and matter that, at times, to say that humans 'think through' material culture runs far deeper than trite wordplay.'[196] Therefore, if we accept that human actions can be portrayed by their material culture, and if we, as archaeologists, perceive them through material culture, the most important aspect for the present study of agency theory is the agent-object interrelation as a reflection of agency. In the previous subchapter I already discussed Gibson's notion regarding the attachment of objects as tools to one's body and Knappett's example of a blind man's cane.[197] These examples clearly demonstrate the entanglement between actors and objects. The term 'entanglement' was embedded in archaeology most strongly by Ian Hodder.[198] In his theory, entanglement encompasses four different types of relationship between humans and things.[199] These relationships are based on the assumption that humans depend on things and other humans, as things depend on humans and on other things. These 'dependency relationships' lastly also demonstrate the structuring of mindsets via objects, but also the potential reflection of human thought via objects. A premise for this study will therefore be that researching human practice through an object always contains impressions of the actor. J. Scott Turner demonstrates that this impression could also reach an agent–structure interrelation by referring to biological cases – earthworms and soil or termites and their nest – showing that an agent's influence not only shapes the agent's structure but can convert it to something novel and unique.[200] He further leads to the point that by such modification an agent 'confers a degree of livingness to its apparently inanimate surroundings'.[201] Surely this concept is even more plausible when referring to human-made objects, or, as Pickering wrote, 'humanized technological artifacts'.[202] This would

191 See: Gosden 2005; Knappett 2005, 134.
192 Pickering 1995, 17–18.
193 Pickering 1995, 19.
194 See: Knappett 2005, 62–63.
195 For an even more differentiated view, in my opinion it would be important to add social and cultural – maybe even environmental – structures into that bunch. Precisely therein lies the problem in my opinion. If we explore this detailed collection of influences further, we will end up including all factors that describe structure. Therefore we ultimately return once more to a trichotomy of agent, object and structure.
196 Knappett 2005, 133.
197 See: Subchapter IV.1 in this volume or Gibson 1979, 42; Knappett 2005, 17–18.
198 Hodder 2012; Hodder 2014.
199 Hodder 2014, 13–14.
200 See: Turner 2000.
201 Turner 2000, 6.
202 Pickering 1995.

mean that almost all objects will entail a human agent's will, ideas and ideologies. It is therefore necessary to perceive an artefact from different angles – the functional as well as the symbolic.[203] This takes us back to the question on the impact of an object as a sign, as discussed in the previous subchapter. The important take-away is – as before – that through material culture it should be possible to detect the mindset of the relating agents. Thus a separation of human agents and objects as forming variables of agency is, in my opinion, impossible in archaeological research.

Another important aspect of agency theory not tackled in this chapter so far, is linguistics and semiotics. Since, however, the data we can find about prehistoric societies do not contain linguistic or semiotic information, it is, in my opinion, impossible to adapt these aspects of agency theory to this study. For the societies referred to in this volume we do not know what language they spoke, with which gestures they enhanced it, or which other bodily signals they used in communication, nor do we have written information.[204] Consequently these aspects will not be discussed further here.

IV.3. Craft Specialisation Theories

We live in a time of intense craft specialisation: if our car breaks down, we take it to a mechanic; if a window does not lock perfectly, we call the glazier; if the light won't turn on, we call an electrician, and so on. The demand for specialisation is at an all-time high and therefore so too the general pressure to specialise. A 'Jack of all trades, master of none' does not fit in a modern-day picture anymore and the famous ideal of polymaths is mostly unwanted nowadays. Though it feels like a rather current development, thinking back to stories of parents and grandparents who could 'build a house with their own hands' and fix almost anything that dared to break, the development of specialised craftsmanship started far earlier.

One of the most well-known discussions was surely set off by Vere Gordon Childe.[205] I will not go into detail about his discussion of the Neolithic Revolution nor about his exact notions on craft specialisation; however, I think it is vital to outline the most intriguing points that definitely influenced later theories. Before metal was introduced to societies, Childe does not see any craft specialisation, 'at most a division of work between the sexes'.[206] In a way he proclaims the smith as the embodiment of specialisation, and in his opinion, only with the emergence of blacksmithing did a need for specialisation and organisation arise for the first time. This also includes the whole concept of labour division, meaning in this case mainly surplus food procurement to 'support bodies of specialist miners, smelters, and smiths withdrawn from direct food-production'.[207] He thus built his definition of specialisation mainly based on the 'type of craft' rather than on analysing developments in different crafts in connection with their social and cultural background. Of course, it has to be mentioned that Childe's concept is outdated in many respects, especially the fact that craft specialisation most certainly did not begin with the processing of metals. Nonetheless, he already included important factors for operationalising specialisation that were taken up in later concepts as well, such as the skill needed for the craft, time exposure, the organisation of labour within a big chaîne opératoire, and the need for access to and supervision of special resources.[208] To illustrate the advancements of Childe's concept, we will here focus on the concepts and summaries of Cathy Lynne Costin[209] and Reinhard Bernbeck[210], because in my opinion,

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203 See Knappett 2005, 85; also compare to Deacon 1997.
204 I am only referring to spoken or bodily language here, not signs or signals embedded in material culture.
205 See: Childe 1951; Childe 1952; Childe 1956a; Childe 1956b.
206 Childe 1951, 95.
207 Childe 1951, 35.
208 See: Childe 1951; Childe 1952; Childe 1956b.
209 See: Costin 1991.
210 See especially: Bernbeck 1994; Bernbeck 1997.

most past as well as current discussions on craft specialisation are outlined in these conceptions. Costin's work is mainly based on the Anglophone discussions focusing strongly on Meso- and Latin-American prehistoric cultures. The beginning of those discussions, however, was probably Robert K. Evans' paper on craft specialisation in the Balkan Chalcolithic.[211] At least, this paper introduced the idea of a 'measurability' of specialisation, which constitutes the fundamental intention of Costin's approach. In this she also took up the concept of spatial analysis of artefact accumulations by Gary M. Feinman.[212] The difference is that Feinman restricted the method to analysis between whole settlements and only took direct evidence as a reference, while Costin proclaimed the possibility of intra-site studies and the analysis of indirect evidence of crafts.[213] In her theory she also considers the objections by John E. Clark, considering the potential problematic distinction between the place of production and the place of use of a tool.[214] However, she counters this criticism by referring to different ratios between finished products and waste material.[215] In my opinion, by doing so she relies too much on ideal conditions of preservation, not considering the problem of qualitatively different sources. Furthermore, when referring to comparisons of sites not on a (inter-)regional scale but from an intra-site perspective, she ignores the limitations proclaimed in the Pompeii premise.[216] This means that we have to question the validity of the models she introduced, at least on a local, if not also on a regional scale. Before rushing into more detailed aspects of Costin's work, a review of the terminology is vital for any further discussion. Evans defined a specialised craft as any production that is limited to a certain percentage of the whole community and forces those to withdraw (some of) their time from basic subsistence activities. This withdrawal in turn causes the need for support in subsistence from the remaining society, creating a mutual exchange system.[217] A similar definition was given by Clark and Parry, naming any kind of production that produces for 'non-producers' a specialised craft.[218] This leads to a very weak definition including nearly every producing craft. Following this definition we could dub someone who collected sticks and stones and shared them with his community a specialist. Of course, this is reducing the matter to absurdity. One main criticism is that Clark and William J. Parry did not include the need for an exchange system or the need for certain skills, knowledge or other exclusivities in their definition. Not surprisingly, other conceptions included far more conditions for a craft to be specialised.[219] Those requirements contain mainly factors of specialised knowledge, training and advancement (systems of knowledge transfer, skillsets), labour intensity (efficiency, scale of production) and the retraction of certain individuals or groups from basic subsistence activities and the consequently needed exchange. For this work I adopted the following definition: a specialist should possess special knowledge which enables her or him to obtain and advance a skillset to work efficiently on a possibly large scale of production to ensure her or his standing in society and enable an exchange with other substantial goods. This definition tries to include several opinions on specialisation, still reducing the possibilities to a logical amount. Costin would add the recognition of a title, name or office for the craft and/or craftspeople and the necessity of a clear payment to this definition.[220] In the prehistoric context, however, it is impossible to detect any entitlements. Also, I would definitely prefer the term exchange to payment, because the term payment implies the presence of a kind of currency, of which we are nescient as regards the prehistoric Aegean and Anatolia.

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211 Evans 1978.
212 See: Feinman 1980; Feinman 1985; Feinman 1986; also see Feinman et al. 1981.
213 Costin 1991, 18–20.
214 See: Clark 1986.
215 Costin 1991, 21–23, figs. 1.5a–c.
216 See: Binford 1981; Schiffer 1985; Bernbeck 1997, 66.
217 Evans 1978, 115.
218 Clark – Parry 1990.
219 See, for example: Rice 1981; Tosi 1984; Muller 1984; Kerner 2010.
220 Costin 1991, 3.

But how do we identify the indicators that give us information about the conditions suggested in the definition? In other words, how do we find a feasible way to gain information on specialisation? Costin demonstrates four possible predictors, partially summarised and extended from earlier concepts. These include concentration, scale, context and intensity.[221] Each category makes it possible to distinguish between two poles of specialisation and thus implies measurability. Concentration and scale give information about the kind of workshop, for example a nucleated or dispersed one (concentration), or a kin-based or 'factory'-like organisation (scale). Context and intensity refer to the specialists themselves and describe conditions that have not been discussed here so far: the distinction between attached and independent specialists as well as between part-time and full-time specialists.[222] The terms part-time and full-time specialist are rather self-explanatory. Though those terms are sometimes referred to as an evolutionary progress, it cannot be securely stated that a part-time specialisation is needed for a full-time specialist to subsequently arise. If, for example, someone is trained as an apprentice in a certain field, he most likely starts with nearly no skills and finishes as a potential full-time specialist. However the distinction and the recognition of the possibility that a specialist did not necessarily devote all his working time to one certain craft is important when discussing matters like efficiency and technological advancements. The higher time investment typically allows a full-time specialist's work to become more of a routine and therefore more efficient. One might argue here that certain products did not need to be made in sufficient quantities to make efficiency a major concern. However, one must consider that 'spare time' within a craft certainly could lead to advancement and improvement both in tool construction as well as in technology. Therefore Costin argues correctly when writing that 'technologically more expensive industries will require more full-time specialization in order to be cost-effective'.[223] This being said, it would still be a mistake to assume a natural pathway from part-time to full-time specialism, since one would ignore a free will for decision-making by societies and individuals.[224] A society that does not feel the need to improve certain objects and/or does not long for higher quantities in certain goods, might simply not need certain full-time specialists and will thus not support them. A consideration of the individual circumstances of each society in question is therefore necessary. This certainly also accounts for the distinction between attached and independent specialists. The simple difference between an independent and an attached specialist is the motivation for specialisation. While an independent specialist is mainly motivated by economic reasons – namely the demand – an attached specialist is subject to the demands and potential supervision of an external individual or group.[225]

These four predictors take us a step closer to identifying specialists, but still do not offer information on how to gain information through the archaeological record. For this, Costin displays several graphical models that show how to detect specialisation, how to locate and pinpoint it and how to identify different aspects of specialisation, leading, ultimately, to a categorisation of specialisation. All these models are inherently consistent, but actually give no clear operationalisation on how the knowledge and data are obtained within the models. For example, the models indicate that a scale can be set to see if a workshop or specialist is independent or attached, nucleated or dispersed and so on.[226] Costin refers to eight aspects that can define each of the four predictors of specialisation. However, little information is given on how to measure, count or rank these aspects on a scale objectively. For example, how do we rate whether something is a 'dispersed workshop' to judge the context of a tool? There is mostly no other possibility than recording the

[221] Costin 1991, 13–18.
[222] Costin 1991, 8–9.
[223] Costin 1991, 17.
[224] See, for example: Johnson 1978.
[225] By 'external individual or group' I mean any kind of people in command. This can include any kind of elite, aristocracy, chief or 'political' leader, etc. For the general terminology, it is unimportant to whom exactly I am referring. All that matters is that a craft is controlled in its output and development under command from the outside.
[226] See: Costin 1991, fig. 1.4 and tab. 1.1.

presence or absence of certain features. This makes the result not as differentiated as it could be. Problematic in this is that the aspects Costin postulates as representing the predictors would themselves need a methodological guideline. More information would be needed on how to study material in a way that allows local as well as regional and large-scale comparison. In addition to this criticism, Costin raises valid points with her predictors and, furthermore, gives first ideas on methods of analysis that can be used in this study, such as artefact accumulations and distribution, as well as the standardisation of tools and end products.

For the localisation of a specialised craft Costin distinguishes between direct and indirect evidence. The direct evidence is the tools used in performing the craft, while the finished end products are only indirect evidence, since they can be found with consumers as well. The simple logic is that we should find accumulations of tools in houses or areas where they were used. However, in some cases there might not be a need for a high number of tools to perform a craft, or the tools could have been made of perishable material. Costin therefore also refers to production waste as a direct indicator for a production locus.[227] The new aspect Costin adds to this simple logic is the 'ratio' as a method of analysis. She exemplifies this method with three different examples: the waster-to-sherds ratio, the waster blades-to-used blades ratio and the spindle whorls-to-sherds ratio.[228] The general assumption for all ratios is the higher the number, the stronger the probability that the picture represents a workshop. Technically this is mainly an attempt to reinforce the assumptions with numbers. Generally this is an interesting addition, since it would allow intra-site as well as inter-site analyses and, furthermore, seems to provide for small- and large-scale comparability of data. The main problem, however, is the applicability. Costin demonstrates examples in ideal conditions and therefore limited in their generalisability or external validity. As mentioned above, calculating such ratios on an intra-site level would, in many cases, prove problematic in light of the Pompeii premise. The comparison of such ratios on a larger scale will most probably prove problematic too, since one will encounter different quality of data. What if, for example, we have a few well- and large-scale excavated sites, some only partially small-scale excavated sites and a lot of survey finds? Such a great heterogeneity can obscure true relationships and therefore affect the validity. This limitation has to be kept in mind. Since one of this study's main focuses will be the spindle whorls, the spindle whorls-to-sherds ratio is of interest and this alone will be discussed. While the other ratios refer to clearly connected objects, one must ask oneself what connects spindle whorls with sherds. Costin does not give any clear explanation about why she chose to depict this ratio, so it is up to the reader to interpret it. In my opinion the reference to sherds reflects an attempt to create a measurement of population without needing to refer to actual inhabitants. The simple equation would therefore be: many sherds equals many people. One has to seriously doubt whether the number of sherds found can actually indicate the size of a population or even the number of inhabitants of a building. This assumption contains a plethora of problems: different handling of vessels in different societies; the properties of different kinds of vessels (a fine vase will break more easily and into more sherds than a thick-walled storage vessel); waste disposal outside of working areas, and many more aspects. These possible differences would be ignored. Due to these problems I will not apply this ratio in the analysis of the current study, but will revert to the basic foundation of the method, meaning the simple spatial relation of artefacts within clearly recognisable use horizons.

Costin mentions standardisation as another criteria for specialisation, which should prove very useful for the current study. In its outline it is a pretty simple and straightforward idea: a strong standardisation of artefacts indicates a high degree of specialisation, while a high variety of artefacts indicates a low degree of specialisation.[229] It is necessary to note again Costin's distinction between direct and indirect evidence to understand the following. Standardisation does not resemble

[227] Costin 1991, 18–19.
[228] See: Costin 1991, fig. 1.5a–c. In these figures Costin uses data from Costin 1986, Russel 1988; Brumfiel 1991.
[229] Costin 1991, 33–36.

mass production. Mass production would be noticeable via finished products and would therefore only be detectable through indirect evidence. Standardisation, however, can be recognised through direct evidence, namely the tools, as well. This is especially important when analysing the production of objects made from perishable materials, for example woodworking, basketry or textile production. However, as simple as it may seem, these general assumptions mainly fit a certain kind of specialism where one type of an object is favoured. Another scenario could, for example, be specialists that prove themselves by producing a huge variety of objects with a corresponding variety of tools. Depending on the conditions of discovery – for example, if the tools are partially destroyed due to formation processes, recollected or scattered – they might be wrongly interpreted as a totally unfocused domestic production throughout a whole settlement and not as the tool kit of one professional. Costin also notes that an attached specialist could be 'forced' to produce objects in a very unique way to fulfil the wishes of their patron.[230] Such a production could easily be misinterpreted as a small-scale and rather private production, while it could be highly specialised craftspeople working full-time on demand. It can therefore be reasoned that the equation cannot be that simple and has its limitations. However, if the conditions are good and we can observe a high standardisation in tools or goods, we can most probably confirm craft specialisation. As already described above, the concentration on Costin's outline is not only justified by her personal contribution to the topic, but also by her review of the most important Anglophone discussions. Due to a visible focus on Mesoamerican archaeological topics the Anglophone approaches are, however, often biased. It is therefore also important to include other discussions.

Bernbeck gives another general view on the topic. He separates the production of goods into two major categories: domestic production and tributary production. Domestic production, in his definition, is organised in several Haushalt[231] units and production, consumption and knowledge is only shared within and between those units.[232] Tributary production includes a superordinate structure which receives the produced goods (tributes) and organises redistribution. This system is always connected with a clearly present authority.[233] Bernbeck defines specialisation as the 'dauerhafte Bindung der Herstellung eines bestimmten Produktes an Produktionseinheiten oder -untereinheiten'.[234] He further proclaims that with this definition, specialisation cannot occur during the time of domestic production, since in a Haushalt unit no activity is performed year-round and activities are not necessarily bound to certain individuals.[235] On the other hand, he states that specialisation of production is mandatory in a tributary production system.[236] Therefore, one has to assume that the process of specialisation happens during the shift from domestic production systems to tributary ones. Following Bernbeck it is therefore mainly conditioned by developments of economic and cultural systems of a society rather than individual influence and motivation. Like the theorists discussed above, he also sees the difference between attached and economically motivated specialisation and states that in Mesopotamia at least, the latter developed first.[237] However, in his conception all specialisation processes depend on general developments in society. Therefore the focal point of analysis lies primarily on economic conditions and processes through which information about specialisation can be gained. This difference in focus seems to be the significant distinction between the approaches outlined here. Bernbeck describes

230 Costin 1991, 34.

231 The German term Haushalt is used here in preference to the English term "household" to distance it from current household definition discussions in archaeology. Bernbeck defines the term as a unit where people (1) share a joint physical living space, (2) organise a division of tasks and (3) have a frame for social reproduction (see Bernbeck 1994, 28).

232 Bernbeck 1994, 28–29.

233 Bernbeck 1994, 50–52.

234 The permanent linking of the production of one distinct product to a production unit or subunit (translation by the author, Bernbeck 1994, 31).

235 Bernbeck 1994, 34.

236 Bernbeck 1994, 71.

237 See: Bernbeck 1994, 342.

two concepts that are important to consider when trying to analyse craft specialisation: work processes (*Arbeitsprozesse*) and production conditions (*Produktionsverhältnisse*). Work processes are operationalised via the factors working appliances, time exposure, type of product and the organisation of labour. Working appliances, or tools, are mainly studied by their local distribution and frequency but also judged by the skill needed to operate them. Time exposure simply means the time needed from obtaining the raw material up to the product being finished. The factor 'type of product' distinguishes between whether the aim is an end product or an appliance in a chaîne opératoire. The organisation of labour in the sense intended by Bernbeck means the number of workers needed for the whole process to acquire the product, and the intensity of hierarchy involved.[238] Thus, evaluating the work processes with the aid of these factors mainly provides descriptive information on a craft and its value while depending heavily on the quality of the pertinent excavation, the state of preservation and, moreover, on the possibility of referring to ethnographical and historical analogies. The production conditions comprise all information on who produced how much, if it was only consumed by the producers or redistributed, and if the latter, how the redistribution was managed. The question that arises is once again, how this information can be gathered from the archaeological record. In his study of Mesopotamian cultures Bernbeck analysed settlements of the Hassuna and Samarra cultures. He demonstrated that for a valid analysis of production – including the study of specialisation – a big picture is needed first. That means that one needs first to analyse the settlement situation, including the layout of the settlement, the spatial distance between buildings, and the separation between private and public spaces. The next step aims at deciphering the interaction between humans and space. Bernbeck refers to objects used in basic subsistence activities, for example grinding stones, to localise living areas within a settlement. Finally, to detect workshops, or at least activity zones, Bernbeck suggests the methods of spatial distribution of tools and raw materials.[239] Two major differences to Costin's approach are apparent: first, Bernbeck again strives for a more comprehensive understanding of the whole system and second, he has a far less optimistic view about the overall applicability of the analysis. He clearly states that for a meaningful study of production, a lot of information on a society and its settlement is needed. Thus he seems to confine his approach to research on material that derives from well- and extensively excavated sites. Bernbeck also warns that assertions about production conditions and systems are only possible through the comparison of several, similar units (between two Haushalt units or two villages, etc.). He further states: '[d]ie Analyse der Produktionsverhältnisse muß daher auf einem sehr allgemeinen Niveau erfolgen'.[240]

Summarising the portrayed approaches, we find a very optimistic and promising view with the perception of an all-round applicability on the one hand, and a rather pessimistic opinion on the possibility of analysing craft specialisation – or rather production – on the other. As for practice theory, those ideas and methods were presented that seem most likely to be applicable for the material examined in this study. It is not my intention to proclaim a new, let alone an advanced, theory. The aim is rather to find a middle course between the most common existing attempts. The focal points that can be extracted from this chapter are the standardisation of tools and their spatial distribution within a settlement. These are far from being uncommon or surprising factors, but with the help of the theoretical background provided in this subchapter, it should be possible to use them as reference points.

238 See: Bernbeck 1994, 73.

239 See: Bernbeck 1994, 237–329; Bernbeck 1997, 297–301.

240 The analysis of production conditions has to take place on a very general level (translation by the author, Bernbeck 1997, 300).

IV.4. Adapted and Extended Models

As promised in the previous three subchapters, the methods – more precisely models – that could be extracted from the theoretical background will be presented here. The description chosen here – adapted and extended models – is deliberate. The term 'extended' is not used as a synonym for advanced. Most theories adduced in this study did not develop in archaeology and therefore might need a little honing to fit the underlying data. The aim is therefore to find models that provide logical steps that can be used on archaeological material. However, they will inevitably be adjusted to the current study and material. My intention is not to devise general models that will fit to any practice-, agency- or specialisation-based question in archaeology. The aim is rather to create logical, consistent and, most importantly, reproducible guidance for myself and the readers to follow the steps of analysis presented later.

To begin with, I will discuss my models for the processes of practice and agency theory that were presented in the earlier subchapters (see Figs. 4–5). The models represent the most important factors that will later be used in the analysis. For the practice theory model, the most relevant components are structure, practice and the dialectic interrelation between them. Due to the background of prehistoric archaeology, the object, as a display of human interaction and reflection of practices, also represents a vital part of the construct. The social agents themselves take on a minor, albeit non-negligible, role in the system. The strongest influences are impeded by the reciprocity of structure as a structuring mechanism and practice as a structured as well as a structuring action. Any object in the system reflects practices, as well as ideals of the structure, while, at the same time, it can influence these components. For example, a new innovation might change former practices, which could likewise reshape the structure. The social agents have no direct influence on any of the named factors. The link between social agents and practice should just represent the active performance of the agents needed for the existence of a practice. However, we were able to argue in Subchapter IV.1 that the agents do have an impact via certain intermediate steps. The most important might be the influence they can have on the social system by imposing order on it. The social system itself is, of course, mainly influenced by the structure; however, by giving meaning to certain social circumstances, ranks or relations, the agents can have an impact. In a similar way, the interaction between social agents can lead to the emergence of power relationships, which can become a completely new variable.[241] Another indirect way of agents influencing the structure is via special events. The idea is quite simple; random unforeseen events – ecological changes, the discovery of new raw materials, and confrontation with other cultures – can subvert current systems.

The crucial factor within this is, however, in my opinion, the reaction of the human agents. Changes can be confronted with a different attitude and innovations can be adopted as well as ignored; what changes, is simply the outcome. Certainly the agents are partly predestined in their actions, but this is already strongly displayed in the model. Important to note is that the human agents can – at least slightly – influence the structure based on certain events. One especially noteworthy impact of events and social agents is the acquisition of new skills or the advancement of present technologies. Normally this should occur in dependence on the social agents (being willing to advance or adapt), a certain event (teaching from the outside or the need for progress) and the object or tool (possibility of/need for advancement). This happening is so important because, even within a strict practice theory-based outline, this results in a breaking of structured rules mainly led by human agents. Furthermore, this kind of advancement and progression of technologies is one strong focal point of prehistoric archaeology, as well as of the current study. The final important part of this model to mention is the reflective relationship between social

[241] I have not assigned any further relations of power relationship to the remaining parts (see Fig. 1). The reason is simply that I find it difficult, if not impossible, to separate the development of dependencies in a social context from the general social system. The term was, however, still included separately in the model since it was discussed in Subchapter IV.1 within Wartenberg's concepts.

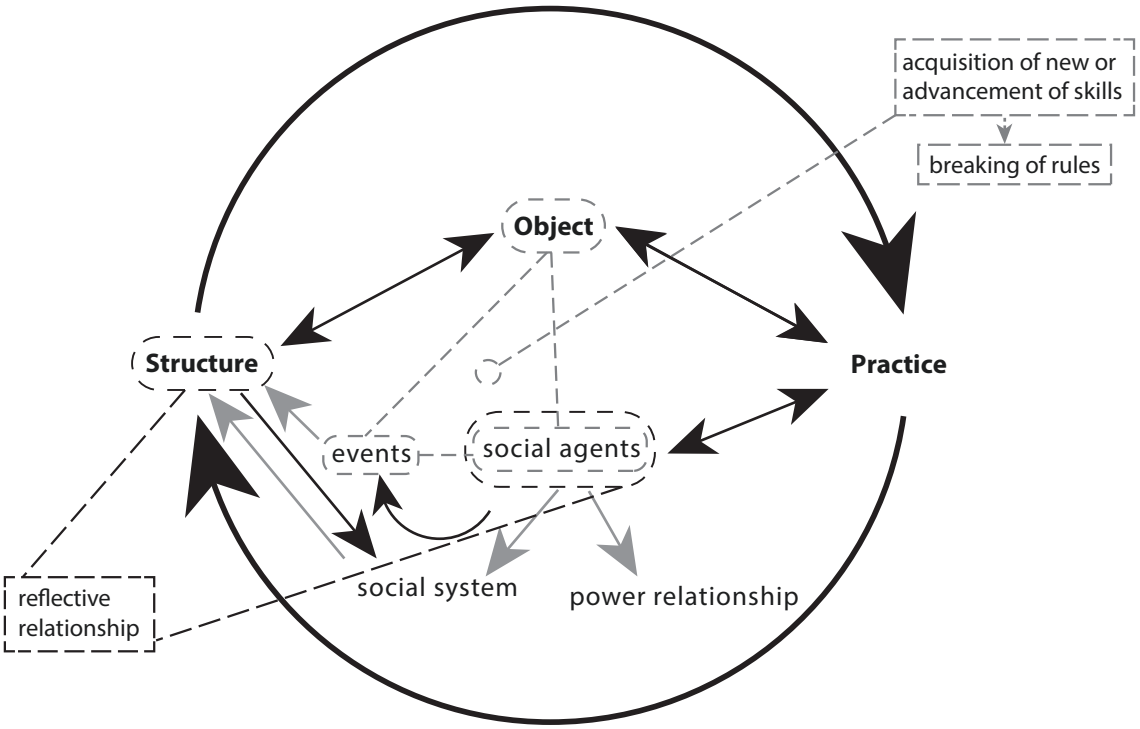

Fig. 4 Model of the discussed processes of practice theory (C. Britsch)

agents and the structure. This concept was introduced by Ortner and was included in this model because of its substantial meaning for the whole system. Like Ortner, I would attribute to social agents the ability to reflect upon their surrounding structures. This does not mean that they wield power over them, but this certain degree of awareness is the basis for any of the opportunities to exert an influence by the human actors described above. This discussion already leads to the next model I will present here: the model of processes is agency theory (see Fig. 7).

The model for agency theory is somewhat simpler since the interrelations are more direct and therefore easier to observe and understand. Basically, there are three components: structure, agent and object. Technically it would be possible to reduce it to two – structure and agency – which would, however, make it impossible to address the relevance of interaction between agent and object. Since the object is already displayed separately in the model, the term agent stands as a synonym for human agent or actor. The model demonstrates that in agency theory all three major components are both structured and structuring. Between the agent and the object we observe this process as material culture, or, more precisely, as the manifestation of human enactment in the physical world, which is likewise influenced by the already existing material world. In this model the agent has a direct influence on the structure via the creativity and innovation humans can exert in their actions. Equally – if not more intensely – the agent is influenced by the structure through social and cultural norms, laws and ethics. While such norms also slightly determine the variability of objects, the stronger effect is conveyed by tradition. Traditions can, of course, be a part of cultural norms, but are often treated on a different level of (sub-)consciousness. Of course, traditions also influence human action; the distinction in the model was mainly chosen for the recognisability in the record. Traditions are often far more strongly detectable in the material record since they persist for longer, because compared to cultural norms they are more often associated with positive connotations. At the same time, the objects contain the expression of a sense of community as well as that of individuality. Under certain circumstances these two meanings can become increasingly relevant for a society and thus undermine norms and influence the general structure.

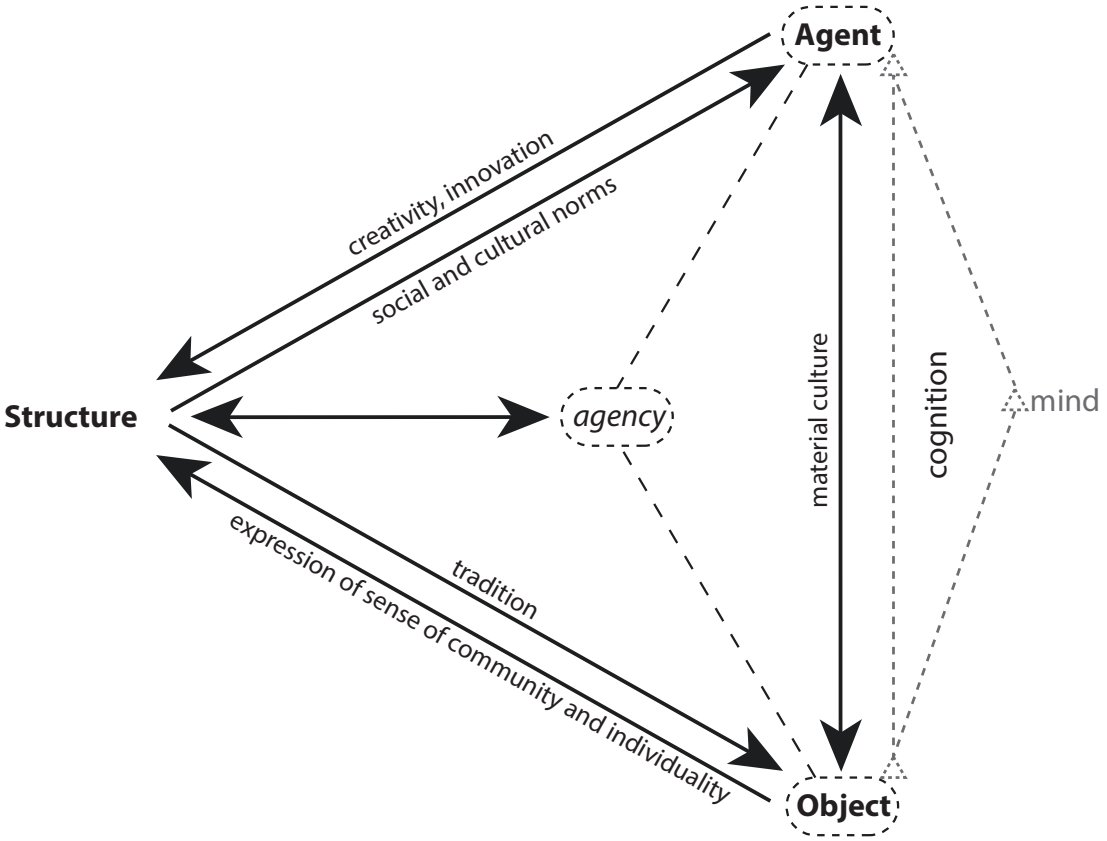

Fig. 5 Model of the discussed processes of agency theory (C. Britsch)

Finally, a notion introduced by Knappett was added to the model: the concept of cognition. This concept concerns the interrelation between agent, object and mind. In light of the conceptualisation thus far this seems contradictory, since we already endowed the agent not only with the ability to cognise, but even to actively influence, shape and change things. Knappett's idea of cognition is thus mainly included to address the difficulty of separating object and actor, demonstrating that the actors perceive their world through their material culture and at the same time give meaning to it. It is thus that only through human action, material substantiality and an individual and collective mindset that a true cognition is established. This demonstrates the strong impact and relevance of material culture and thereby indicates how it can be recognised in the archaeological record.

But how can these models be adapted for archaeological artefact analysis? To answer this question I will first discuss the steps of analysis introduced by Knappett and will then proceed to a model of material analysis based on the information drawn from the theoretical background.

Knappett postulates four steps in the analysis of an artefact that should lead to an interpretation according to the principles of practice and agency theory (Fig. 6). The initial step is called affordance. For example, on seeing a pot, one should not immediately assume it is a cooking or storage vessel and so on, but try to perceive it as an alien object. Anything that comes to mind would suffice. For the example of the pot, it could be guessed that it was used as a helmet, a bath tub for children or a flowerpot (depending on the dimensions). The handles of a pot could indicate that it should not be carried directly, meaning that the contents might be very hot or cold.[242] These examples give an impression of how many associations one can have even with a commonly known object. Of course, certain guesses might simply seem like nonsense, but this will mainly be

[242] For a detailed step-by-step analysis see: Knappett 2005.

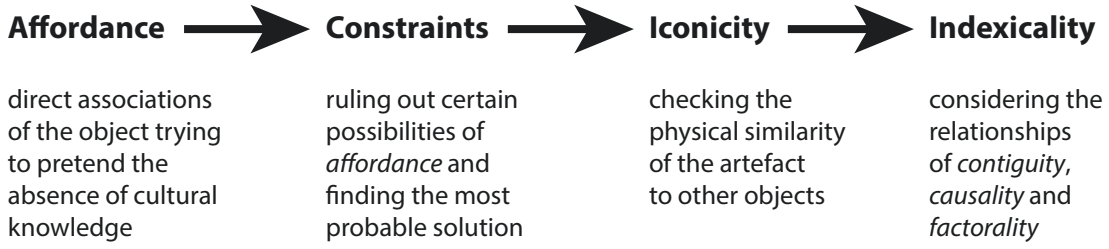

Fig. 6 Steps for the analysis of artefacts (after Knappett 2005)

due to the fact that is quite arduous to completely ignore ethnocentric knowledge. The next step is called constraints, which is a deeper analysis of the guesses made in the first step. In this step the researcher is supposed to apply logical thinking and background knowledge. Iconicity – the third step – is a different attempt to find information on the function of an object. This comparative approach can be conducted with other contemporaneous artefacts, as well as with older, younger or even modern objects. As the final step, indexicality, three aspects of an object are observed, contiguity, causality and factorality. Contiguity describes the accumulation of a mass of things or the state of such connection. From an archaeological point of view this refers to artefacts found together in the same context.[243] The method used here is the typical analysis of association between different artefacts found in the same feature or layer. The idea is to gain information about the use of an object within a practice, which can range from daily work processes to important rituals. To understand the causality of an object, one has to consider the process of producing said object. This encompasses the energy, time and skill invested in production, as well as the raw material it was made of. In prehistoric times, it is, for example, important to consider the raw material, as well as its availability and the distance to the resource. If an object was made of stone, metal or clay from a faraway resource it can indicate exchange connected with the production of this particular object. Finally, factorality represents the concept of pars pro toto, a model typically applied in reference to burials. Yet factorality can be seen in different situations and representations of an object. Referring to rituals, for example, an object can represent an enactment or a deeper meaning (the famous 'burying of the hatchet'), a complete craft (grave goods as symbols) or a bigger construction since the rest decomposed (loom weights of a wooden loom).[244]

The aim of Knappett's model is to provide a guideline by which the observer is forced to reflect on the object both by itself, as well as with regard to its archaeological and former surroundings. By following the four steps, one should be able to evaluate unknown aspects of an artefact or even re-evaluate common interpretations. The focus of the model is – as can be seen especially in the steps iconicity and indexicality – the analysis of an object within its social and cultural context, to recognise its function and meaning in a consideration of practice and agency theory. The only criticism I would level against Knappett's model would be the unilinear approach of the analysis. During every step, information is supposed to be gathered only in reference to the object. Both practice and agency theory, however, tell us that many interpretations only make sense in respect of the structure or even the actor. My aim, therefore, is to construct an applicable model for prehistoric archaeology, especially for my current study.

The models presented in Figures 4 and 5 cannot be applied directly, since too much information needed in those systems is not available in the archaeological record. I therefore tried to build a model based on the transfer of information between observable and unobservable factors in the archaeological record (Fig. 7).[245] The information-based model will include both practice and agency theory concepts, as well as Knappett's straightforward method of analysis. As already

[243] Knappett 2005, 90, 133, 147–152.
[244] See: Knappett 2005, 100–101; also see: Sonesson 1989.
[245] The term for the model will henceforth be shortened to 'information-based model'.

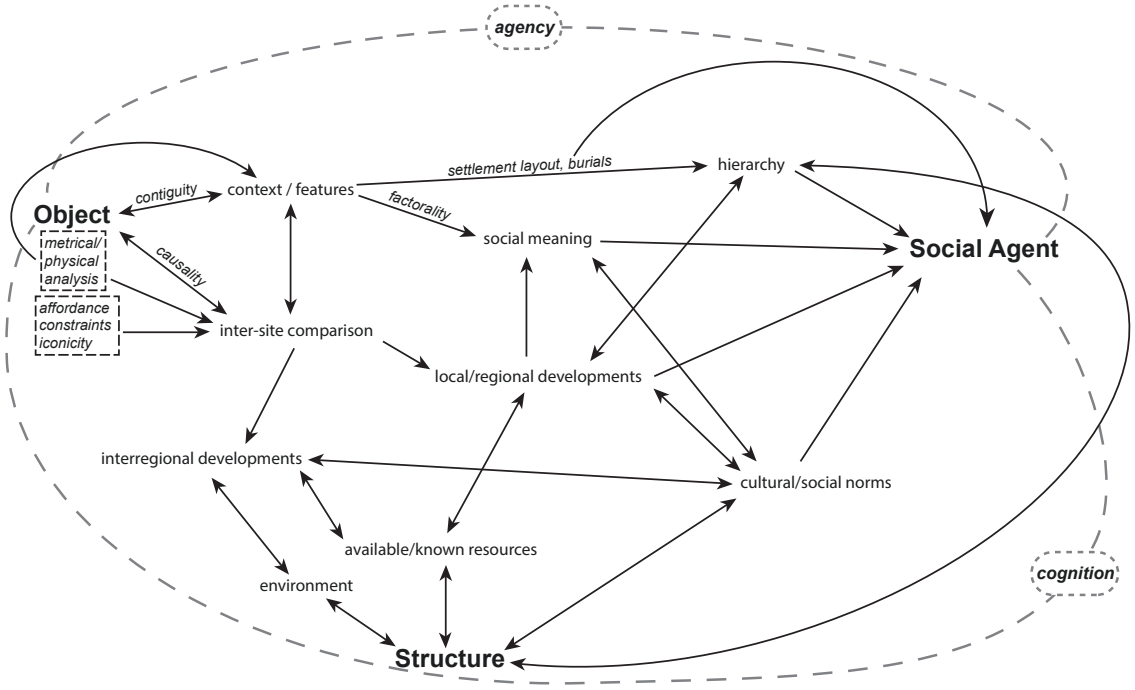

Fig. 7 Information-based model for practice and agency theory-based material analysis (C. Britsch)

mentioned above, the aim of the model is not to be universally applicable to any archaeological study. The model is built on the basis of the current study, meaning an analysis of knowledge transfer, craft developments and specialisation, as well as the social and cultural impact of such developments. The model will thus certainly be suitable for other comparable approaches, but might have to be revised or extended for differing problems.

The alignment of the main aspects of the model – object, structure and social agent – should not imply any hierarchy, since they are seen as coequal in their impact on the system. The analysis of the social agent will, however, fall rather short in both the model and my approach. There are two main reasons for this. First, I built the model on my current study, which is a material-based analysis and thus most of the information obtained is about artefacts. Second, since the study is performed on prehistoric material, the human agent is neither directly observable nor can it be observed through pictorial or written sources. Information can therefore not be deduced from them. This does not, however, mean that social agents have no impact on the system. In contrast to Bourdieu, I would clearly state that the human actor has the ability to actively reflect and react to its surroundings. If the model was to show connections of impact rather than information transfer there would be several arrows running from social agent to other aspects. Likewise, there would be direct connections between the object, the structure and the social agent. The absence of these links is to be blamed on the fact that one cannot obtain information about their users or their structure directly via objects or vice versa. Instead, the information gathering follows the subsequent necessary steps. Since my own focal point is artefacts themselves, I will start with the object. The information obtained directly from the object is acquired from a simple metrical and physical analysis of the artefact, as well as by applying Knappett's concepts of affordance, constraints and iconicity. Via information, insight into certain features and contexts within a settlement can be gained, which is also useful for the comparison between different sites. The other possibility for gaining information about the context and features of a site is contiguity, and for the inter-site comparison, causality, as defined by Knappett. In addition to Knappett's concepts, I would state that the acquisition of information with these two factors is reciprocal. An object can give meaning to a feature, as well as the other way round. Likewise, a comparison between different sites can profit from as well as contribute to detailed information about the nature of an

artefact. A comparable interrelation can be deduced between context/features and inter-site comparison, since information on contexts and features can give insight on a comparable level, as well as be enlightened by it. Continuing the analysis, Knappett's factorality can lead, via knowledge on its context, to an understanding of the social meaning of an object. Furthermore, via information about the context (especially data from settlement layouts and burials) conclusions about the social organisation or hierarchy of a society can be drawn. The definition of the term hierarchy in this model is: the social, cultural and potentially political organisation, as well as lines of command, independency and individuality of a certain society. Therefore, hierarchy could here also stand for a heterarchy or even anarchical structures. Both the social meaning of artefacts as well as the hierarchy of a society, and especially data from burials, in turn give information about the social agent. A main issue of the current study is local, regional and interregional developments. Information on such comparative data can, of course, only be gained by inter-site comparisons on a local, regional and interregional level. Both interregional as well as local and regional developments can give information about the available and used resources in a craft. Likewise, if information on the resources is available, this, in return, can yield information on a craft's development, since it can strongly influence several processes (time exposure, value of the end product, etc.). The aspect here labelled environment, on the other hand, only exerts an influence and is only accessible through interregional developments. When referring to environment in this context I am referring only to far-ranging effects, such as climatic change, which might also have an influence on crafts. The last aspect I added to the model, which helps create a clearer picture of the main factors, is the cultural and social norms of a society. These are intrinsically very complex, both highly structured and structuring, as well as possibly deeply established, but at the same time bendable. Likewise, information about them should be widely accessible but is hard to pin down. Cultural and social norms are a vital part of the structure and thus give information about it and are revealed by it. The same reciprocity accounts for the different types of craft developments. Although the social meaning of an object is possibly most strongly reflected in the cultural and social norms and both can only be completely understood with the support of the other. Finally, these norms certainly provide a lot of information about the social agent.

Ultimately, I want to highlight the two so far unheeded concepts of the model – agency and cognition. Both concepts mainly result from the agency theory model discussed above. In this model, agency describes a conglomeration between object and social agent, together forming both structured and structuring parts within the all-surrounding structure. The cognition, comparable to Knappett's concept, here refers to the reflexive interrelation between object, structure and social agent. I have left out the concept of mind in this model introduced by Knappett since I find it problematic to observe the psychological separately from the actor and the structure. Both concepts are conceptualisations trying to underline the inseparability of the key aspects. As can clearly be seen in the model worked out here, the strings of information are deeply interwoven and entwined with each other. The applicability of the model will be tested in the current study and will surely be limited in certain respects. For future studies, the model and its concepts most probably need to be extended. I think, however, that the presented outline represents a chance of gaining comparable and structured information that will facilitate easier future extension and applicability.

One might observe the absence of craft specialisation theories within these models at this point. There is a simple reason for this. The models depicted here will either function as a worksheet for analysis or as an explanation in support of the same. In Subchapter IV.3 it was, however, possible to demonstrate that the possibilities of analysis are rather limited. In fact, I concluded that only artefact accumulations and tool standardisation form a possible working basis for this study. Aspects of craft specialisation theories were therefore not included, since it is – in my opinion – more practical to directly analyse the material in regard of the two named aspects.

IV.5. Metrical Analyses

The data analysed in this study consists mainly of metrical data and data from calculations based on these metrics. Other macroscopically observed features are shapes and decorations, which will be discussed later in this chapter. The metrics collected involve measurements of different sections depending on the type of object and its weight. Some of the data were acquired via publications, which sometimes led to the need to calculate the weight via the volume and density of the objects. The validity of this method will be discussed in Subchapter IV.5.1. The lion's share of the data was attained directly through the analysed artefacts themselves. The measurements were taken with a calliper (length, width, thickness and diameter) and the weight was determined using a micro scale (e = 0.05g, max. 1000g; e = 0.1g, max. 2000g). At the current state of research the most promising source of information is the weight of spindle whorls and loom weights. Consequently, the weight was always collected. If possible, all measurements necessary to calculate the approximate volume were recorded. As mentioned above, this depended on the complexion of the object. For a spheroid spindle whorl, for example, this included the semi-major axis (a) and the symmetrical axis (z) (volume: $\frac{4\pi}{3} * 2a^2c$; with c = $\frac{z}{2}$). For a biconical whorl – with two equally sized truncated cones – on the other hand, the height (h), as well as the radius of the width (R) and the top (r) have to be included (volume: $2*(\frac{h}{2}*\frac{\pi}{3}*(R)^2 + R*r + (r)^2)$). The reason for recording the tools in such detail is that the information on the volume will be used for the calculation of the moment of inertia of the spindle whorls. The analyses in Subchapter IV.7 will show the usefulness of the moment of inertia of spindle whorls, which has so far only been marginally discussed.[246]

The assumption that the weight of each tool has an influence on the spinning and weaving processes was arrived at an early date.[247] The definite proof however derives from the experimental studies of the Centre for Textile Research in Copenhagen (CTR).[248] In the experiments, spindle whorls of three to four different weights (4g, 8g, 18g and 44g) and two different types of loom weights of 275g (Type 1 with a thickness of 4cm and Type 2 with a thickness of 2cm) were used.[249] All tasks were performed by at least two individuals – trained spinners and weavers – to observe the significance of individual skill. Three experiments will be reviewed here for better understanding; testing of (1) the power (P) of the process (in other words, the time needed to spin a certain amount of wool ($P = \frac{w}{t}$, [W = work, t = time]), (2) the thickness of yarn spun with each whorl and (3) the impact of the interrelation between loom weight size and yarn thickness on the weaving process. The test regarding the power of spinning was conducted with only three sizes of whorls, 4g, 8g and 18g whorls (Tab. 2). With each whorl 100g raw wool was spun. The test yielded average spinning speeds for each whorl, meaning the metres of yarn (m) spun in one hour (h).[250] The experiment demonstrated that a higher spindle whorl weight lead to higher efficiency.

The same correlation was found between the whorl weight and the thickness of the yarn produced (Tab. 3). While varying slightly depending on the individual spinner, the test produced an overall clear picture showing that the lighter the whorl is, the thinner the yarn produced will be. Logically more metres of yarn could be produced from 100g raw wool with a lighter whorl.[251]

246 See, for example: Verhecken 2010; Firth 2015.
247 See, for example: Carington Smith 1977; Barber 1991.
248 See the institute's website: <https://ctr.hum.ku.dk/> (last accessed 21 Nov. 2024).
249 Mårtensson 2007; Mårtensson et al. 2009; Andersson et al. 2010.
250 Mårtensson 2007; Andersson et al. 2008; Andersson et al. 2010.
251 Andersson et al. 2008, 173; Mårtensson et al. 2009, 378.

Spindle whorl (g)	m/h
4	35
8	40
18	50

Tab. 2 P of different spindle whorls

Spindle whorl (g)	Yarn thickness (mm)	m/100g raw wool
4	< 0.3	1700
8	0.3–0.4	1000
18	0.4–0.6	625
44	0.8–1.0	n.a.

Tab. 3 Impact of spindle whorl weight on yarn thickness and length

Yarn thickness (mm)	Warp tension (g/thread)
< 0.3	10
0.3–0.4	15–20
0.4–0.6	25–30
0.8–1.0	~ 40

Tab. 4 Impact of yarn thickness on warp tension

Aim	Calculation
# of ths per lw	$\frac{w(lw)}{t(ths)}$
# of ths per cm	$\frac{2(\#(ths\ per\ lw))}{wd(lw)}$
# of lw in set-up	$\frac{wd(sb)}{2(wd(lw))}$
# of th_{warp}	$\#(lw)*\#(ths\ per\ lw)$
y for th_{warp}	$\#(ths_{warp})*l$
y for th_{weft}	$\#(ths_{weft})*wd(sb)$
y per weave	$y(ths_{warp}) + y(ths_{weft}) + 2* \frac{y(ths_{warp})+y(ths_{weft})}{100}$

Tab. 5 Calculations for aspects of a loom set-up (abbreviations: # = amount, l = required length, lw = loom weight, sb = starting border [short hand-woven part of the textile, which is tied up on the loom and on which the weaving starts; thus this starting border defines the width of the whole textile], t = warp tension, th = thread, th_{warp} = warp thread, th_{weft} = weft thread, w = weight, wd = width, y = needed yarn)

The relevance of the yarn thickness becomes apparent in the final experiment, addressing the different loom weight dimensions (Tab. 4). The first step is to acknowledge the fact that the thicker the yarn, the stronger it is. In the CTR experiments this is described as the warp tension.[252] The term is named after the warp threads, the threads that are fixed vertically on a warp-weighted loom and on which the loom weights are attached. Warp tension denotes the strength that is needed to pull a thread as straight as possible without breaking it.

Knowing the warp tension of a yarn and the weight of a loom weight thus allows us to estimate to how many such yarns the loom weight needed to be attached. For example, if we had a yarn with a warp-tension of 40g/thread and a loom weight of 400g, the loom weight would need to be tied to ten threads to give optimal conditions. Using more such threads per weight would result in the yarns being too loose and fewer could cause them to break. Additionally it has to be mentioned that the ideal number of threads per loom weight lies between 5 and 30.[253] Too few will make the whole weave too open and too many will make it impossible to weave comfortably, since the spaces between the threads become too small. Thus our fictional loom weight of 400g could be used for threads with a warp tension between ~13 and 80g/thread. Therefore, if we know the weight of spindle whorls and loom weights from a site, we can deduce information on the yarn thickness, the warp tension and, through that, practical loom set-ups. The final information needed is the width of the loom weights. This provides two insights; (1) how big the gaps in between the warp threads might have been and (2) how many threads could be included in one weave. The latter insight depends also on the general size of the loom; however, even if it is unknown, there certainly is a practical limitation on a loom size and therefore a presumable maximum size.

A calculation of all aspects of a loom set-up in seven steps is given by the CTR experiments.[254] The calculations are demonstrated in Table 5.

The calculations shown in Tables 2–5 demonstrate what detailed insight can be gained simply from the metrical data of the tools. Obviously it is not possible to reconstruct the appearance of the potential weave in all its details. For this we would need to know which exact method (for example tabby, twill, broken twill or diamond twill)[255] was used, or if, for example, yarns of different thicknesses were used for the warp and weft threads. Nonetheless, the calculations give an impression of the possibilities prehistoric weavers had and a better understanding of what impact metrics and therefore metrical standardisations had.

IV.5.1. Indirect Data Collecting and the Weight from Density

The aim of the study is to analyse the development of textile production as comprehensively as possible. Therefore, already published data cannot simply be ignored. Unfortunately, published data often have three limitations in regard to textile tools: (1) it is rare that all recovered tools, especially very fragmented objects, are included, thus creating a bias in favour of the preservative condition. Further, the information provided on metrics can be (2) fragmentary, sometimes resulting in omission of the weight or (3), worse still, in a total absence of metrical data. The first limitation is a bias that cannot be changed but should – as shown in in Subchapter IV.8. Statistical Methods – not affect the data pool too much. The second and third limitations can be compensated for by calculating the weight from the density. In cases where only the weight data is missing this is a simple task. If, however, all metrical data is missing, well-executed drawings with a scale are needed. The metrics can then be deduced from the drawing.

For the calculation of the weight or the mass (m), the volume (V) and the density (ρ) of the object are needed ($m = V * \rho$). Therefore, for most objects more than just the height and diameter

[252] Mårtensson et al. 2009, 378.
[253] Mårtensson et al. 2009, 392.
[254] Mårtensson et al. 2009, 392–395.
[255] See: Grömer 2016 for further explanation and depiction or Ulanowksa 2018.

are needed, limiting the data collection via publications even further. Calculating this for prehistoric tools, we encounter two inaccuracies; (1) no prehistoric handmade object is perfectly symmetrical, any calculation of the volume thus only gives an approximate value and (2) the density of baked clay depends on the inclusions and can therefore vary.

The variation of clay density, however, becomes noticeably less when the clay is fired, as can be seen by a test study conducted on three different types of clay.[256] In this study 31 clays were tested (11 surface-weathered [A], six hypothermally altered clays [B] and 15 flint clays [C]) in a dried (110°C, N = 31) and a fired (1510°C, N = 28) state. To observe the different behaviour of dried and fired clay, I calculated the mean density (M) and its standard deviation (SD). These calculations show that for groups A and B the standard deviation of the mean is slightly larger for the dried than for the fired state, while for group C it is the other way round (Tab. 6).

Clay group	M (dried)	SD (dried)	M (fired)	SD (fired)
A	1.46	0.28	2.46	0.21
B	2.19	0.28	2.41	0.23
C	2.38	0.21	2.42	0.25

Tab. 6 Mean density and standard deviation of the different clay groups in a dried or a fired state

Considering, however, all samples together as one sample gives a significantly larger standard deviation for the dried samples (M_{dried} = 2.03, SD_{dried} = 0.49; M_{fired} = 2.43, SD_{fired} = 0.22). The last result is the most important one in my opinion. It demonstrates that within a variety of clay types, the range of densities is rather narrow. It should therefore be possible for prehistoric assemblages to work with a standardised density for baked clay. The remaining question would then be what value to use as a standardised density. Since the objects referred to in the current study are made of fired clay, the number shown above would suggest 2.43g/cm³ as a standardised density, since it is the mean value of all fired clays in the test study by David Baumann and Walter D. Keller. To ensure, however, that a density value is used that fits prehistorically fired clay objects, a customised standard density was calculated by estimating the density of the objects newly analysed for this study.

Data from 393 spindle whorls for which a measured weight was available and for which calculation of the volume was possible could be used. A sample of ~20% of the original data was randomly chosen. The data set was selected randomly via SPSS with no further presets. The random sampling was performed three times, resulting in samples a (N = 68), b (N = 72) and c (N = 88). For all spindle whorls in samples a, b and c, the density was calculated through mass and volume ($\rho = \frac{m}{v}$). For the calculated densities, the mean and standard deviation were calculated, resulting in only slightly differing numbers between the three samples (M_a = 2.17, SD_a = 0.37; M_b = 2.12, SD_b = 0.39; M_c = 2.23, SD_c = 0.43). I will therefore use the mean value for the means of the three samples, which is 2.17g/cm³. Interestingly it can be seen that this number is not far from the mean of the fired clays described above (2.43g/cm³), which again demonstrates how small the variability is (Tab. 7).

[256] Baumann – Keller 1975.

Sample no.	Clay type	Clay density (g/cm³) [dried at 110°C]	Clay density (g/cm³) [fired at 1510°C]
2	A	1.28	1.93
3	A	1.46	2.54
4	A	0.82	2.52
5	A	1.52	2.52
6	A	1.39	2.39
10	A	1.78	2.67
12	A	1.85	2.57
13	A	1.40	2.39
14	A	1.57	2.63
16	A	1.67	2.42
17	A	1.27	–
1	B	2.50	2.32
11	B	2.26	2.02
15	B	1.89	2.66
18	B	2.20	2.38
19	B	2.47	2.53
22	B	1.83	2.57
7	C	2.36	2.67
8	C	2.34	2.70
9	C	2.45	2.63
19	C	2.47	2.53
20	C	2.40	–
21	C	2.20	2.60
23	C	1.75	2.18
24	C	2.56	2.32
25	C	2.53	2.54
26	C	2.57	1.97
27	C	2.60	?
28	C	2.44	2.25
29	C	2.51	1.99
30	C	2.24	2.58
31	C	2.25	2.48

Tab. 7 Density of different clay samples in a dried and a fired state (A = surface-weathered and sedimentary kaolin clays, B = hypothermally altered clays, C = flint clays; after Baumann – Keller 1975)

Another critical problem was addressed by Richard Firth concerning the extent of the potential error resulting from a calculation with only approximate measurements and a standardised density.[257] He points out that these errors are even more critical when calculating the moment of inertia, since, for example, 'the moment of inertia of a sphere is proportional to the fifth power of its diameter and so any error in the diameter is approximately magnified fivefold'.[258] Theoretically, Firth is absolutely correct in this criticism. In practice, however, we have to consider that with spindle whorls we are dealing with rather small objects. Measuring errors and errors deriving from a standardised density should therefore result in only marginal changes. On a modern

[257] Firth 2015.
[258] Firth 2015, 155.

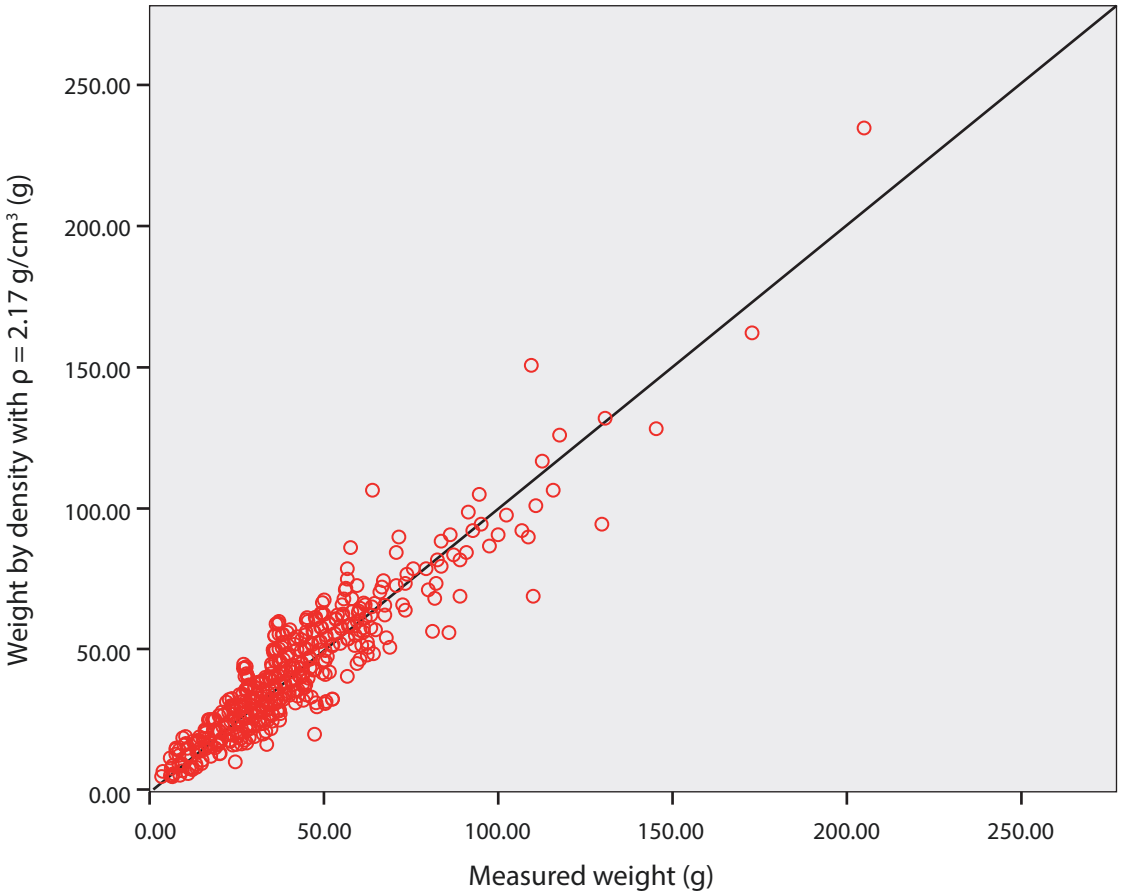

Fig. 8 Scatter plot of weight correlations (N = 393) (C. Britsch)

technical scale this could, of course, still be crucial, but in a prehistoric context we have to ask if such a small difference would have been noticeable for spinners or the providers of spindle whorls at all. To observe the deviation of the calculated weight by density with the actually measured weight I calculated a bivariate correlation. If the calculated weights did not deviate at all from the measured ones, a scatter plot should form a straight line where Y = X. The scatter plot does not show exact fits; the residuals are, however, rather small (Fig. 8).

The calculations further showed a very strong correlation with a very high significance between the measured weight (X) and the weight calculated by density (Y) ($r = 0.956$, $p < 0.0005$, Y = X). Since $r^2 = 0.914$, the calculated weights correlate to 91.4% with the measured ones. Thus it should be safe to use calculated weights when necessary. It has to be noted that this statement addresses only spindle whorls. Loom weights generally have a more irregular shape, which makes the volume calculation more difficult and problematic. Furthermore, the greater size of loom weights in comparison to spindle whorls enlarges the error mentioned by Firth. An estimation of the mass of a loom weight should, therefore, in my opinion, only be deduced by the correlation with objects of similar sizes from the same sample. More precisely, this means that if we have several intact (or at least nearly intact) loom weights from one site that clearly plot into different weight groups, it can be possible to assign other (e.g. less intact) loom weights from the same site into said groups. However, the mass of individual loom weights or loom weights from sites where no weight data is given at all, should not be calculated by density.

Nonetheless, it was possible to demonstrate in this subchapter that the calculations work well enough for spindle whorls, thus allowing a significant expansion of the database used in this study.

IV.6. Stylistic Analyses

Since the current study is mainly dedicated to the emergence, development and diffusion of technological aspects, the stylistic analyses make up a minor part in it. Nevertheless, the discussed artefacts have features that cannot be connected with functional aspects, but seem to be of a decorative nature. Decoration in general can always be used as a sign or a transmitter of a message. Thus, since the study aims to explore the geographical and chronological transfer of knowledge, stylistic features have to be included as mediators of cultural and social aspects. The two attributes of spindle whorls and loom weights that have to be addressed from this point of view are the shapes of loom weights and incised decorations (mainly present on spindle whorls).

As described in Subchapter IV.5 the relevant technical features of a loom weight are its weight and its width (or thickness). Other dimensions should not influence the weaving process and all shapes could be produced in different sizes, making the weight customisable. Therefore, aside from the width, the shape is irrelevant from a technical perspective. The analyses in Subchapter VI.2 will address the emergence and spread of loom weight shapes both chronologically and spatially. Considering practice and agency theory, it is possible that the emergence and distribution of certain shapes within a structure or mindset are connected with the spread of certain techniques in textile production. The 'decorative' character of loom weight shapes will therefore be discussed bearing these aspects in mind.

More obvious non-technical features are incised decorations. Such decoration is mostly found on spindle whorls, very rarely on loom weights. The conspicuous characteristic is the large variety in which these incised decorations appear. Schliemann already noticed the greatly differing styles when analysing the spindle whorls of Troy.[259] To see if patterns are recurring and/or individual, several tools from multiple sites will be considered. Just as for the loom weight shapes, the points of interest are whether certain patterns are chronologically or geographically restricted and/or whether a diffusion is observable. Furthermore, the decorations could be a marker of technical features. They could, for example, be labelling the spindle whorls with regard to their weight or intended specialised purpose (for example spinning wool or plant fibres, finer or coarser yarn, etc.). The decorations will therefore be statistically analysed, treated primarily as a stylistic aspect used in connection with technical intention (see Subchapter IV.8).

Finally, I want to specify that the stylistic analyses in this study will not be art-historical analyses of styles throughout the studied millennia. The aim is rather to separate a technical character from stylistic attributes which display cultural or social representation.

IV.7. Moment of Inertia

The moment of inertia (I) describes the resistance of a rigid body towards a change of rotary movement around a certain axis. The inertia therefore depends on the rotational axis, the body's mass and its mass distribution. The value calculated by the moment of inertia can be defined as the torque needed for an angular acceleration around a rotational axis.

The spinning of a spindle whorl is, physically speaking, best described by the moment of inertia. Ideally the spindle whorl spins around the rotational axis determined by the spindle, which is the axis of rotational symmetry of the whorl. Depending on the shape of the whorl, the moment of inertia calculations differ (Tab. 8). Assuming that the moment of inertia has a noticeable influence on the spinning process (e. g. different rotational speeds), a development in whorl shapes could indicate a deliberate fitting of tools to a certain task. The shapes of the spindle whorls could thus contain information about the applied technological knowledge and process. Of course, such knowledge was not built on physical calculations, but rather experience and simple trial-and-error

[259] See, for example: Schliemann 1874.

principles. Nonetheless, calculating and comparing the moment of inertia for a large number of spindle whorls could give information on preferences and the transfer of techniques.

Until now only very few studies have addressed the topic of the moment of inertia of spindle whorls.[260] Furthermore, the few existing studies mainly concentrated on simple shapes, such as, for example, globular or discoid whorls. The two most common shapes in the prehistoric Aegean and Anatolia, the conical and biconical shapes, however, have only been considered in one single study so far.[261] As can be seen in Table 8, the calculations can be broken down into three different formulas considering spheroid, conical and biconical shapes. The typological categories presented in Subchapter IV.9 can be assigned as follows: types I and II are spheroid, type III is conical and types IV and V are biconical. The calculations for all other types are not so simple, but in any case, these occur only rarely.

Shape	Moment of inertia (I)
Spheroid	$I = \frac{1}{2} m * r^2$
Conical	$I = \frac{3}{10} m * \frac{(r_1^5 - r_2^5)}{(r_1^5 - r_2^5)}$
Biconical	$I = \frac{3}{5} m * \frac{(r_1^5 - r_2^5)}{(r_1^3 - r_2^3)}$

Tab. 8 Moment of inertia formulae for different spindle whorl shapes (I = moment of inertia, m = mass, r_1 = maximal radius of whorl, r_2 = radius at top/bottom of whorl)

To provide an example, a calculation of the moment of inertia is demonstrated on three spindle whorls studied in this work. These three spindle whorls were chosen because they have nearly the same weight and a similar diameter, but have three different shapes and derive from three different sites (Tab. 9). The results demonstrate that while the weight and diameter are almost the same, the moment of inertia can differ noticeably.

Site	Cat.no.	Shape	Weight (g)	Diameter (cm)	I (g*cm²)
Bademağacı	1227	Spheroid	35.65	4	57.04
Markiani	588	Conical	35.49	4.4	53.79
Troy	870	Biconical	35.34	3.8	78.79

Tab. 9 Moment of inertia of three different spindle whorls

As mentioned above, the moment of inertia describes the energy needed to change the rotary movement of a physical body. This means that a whorl with a larger moment of inertia needs more energy to set it in motion, but will, at the same time, keep up this motion longer in relation to the energy invested. For the three spindle whorls presented in Table 8, this implies that the biconical whorl offers prolonged spinning.

With a similar aim, Chmielewski and Gardyński tested a series of spindle whorls by fixing them on a pendulum and measuring the impact on its rotational movement.[262] The spindle whorls all originated from the Funnel Beaker site 1C in Gródek, Poland. They found that different-shaped whorls had a noticeably different moment of inertia. Especially between flat and biconical shapes, they found a big difference. Since, in that particular region, biconical shapes appear later than flat ones, they interpreted the change in shapes as a change in functionality due to imported technology.

260 See: Loughran-Delahunt 1996; Verhecken 2010; Verhecken 2013.
261 See: Chmielewski – Gardyński 2010.
262 Chmielewski – Gardyński 2010.

Moreover, they considered the possibility of the biconical whorls being an adaptation for the spinning of wool, since the short woollen fibres would need faster prolonged spinning than that needed for plant fibres.[263]

While the question of the role of wool in this matter has to be discussed, we can assume with a degree of certainty, that the biconical whorls made it possible for the spindle to rotate more quickly. Moreover, the shape allows an increase of the moment of inertia without increasing the weight or diameter of the whorl, which would break a thin yarn (see Tab. 9). Since in this way the weight can be kept low and the rotation accelerated, the biconical whorls should be the better tool for spinning tightly spun and fine yarn.[264] However, as can be seen in Table 9, the differences are noticeable, but not immense. The question would therefore be to what extent the differences were apparent for spinners in prehistoric societies. To pursue this question on a large scale, the moment of inertia will be analysed alongside the weight of the spindle whorls to comprehend technical features as thoroughly as possible, since it is possible to yield important information on the technical aspects of spindle whorls, especially their shapes.

IV.8. Statistical Analyses

The statistical data analysis was conducted with the software SPSS. The aim of the statistical analysis was to observe potential patterns within the studied artefacts which would allow statements about developments in and the diffusion of textile production technology. This search for patterns was approached using two different methods: (1) a cluster analysis to detect whether certain variables can arrange the samples into groups and if so, which are most important and (2) an analysis of variance between the different sites to detect potential connectivity in technologies.

(1) Cluster Analysis

Generally a cluster analysis will show which objects from different data sets are alike by measuring distances between them. The simplest display of this function is a two-dimensional scatter plot. The distance on the x and y axis from one particular point to another is used as a basis for measuring likeness. Cluster analyses are most often displayed as two- or three-dimensional scatter plots but are theoretically applicable in X dimensions. It is possible to calculate cluster analyses for large databases with multiple variables if a fitting method is chosen.[265] For the current study, the two-step cluster analysis in SPSS was chosen.

The two-step cluster analysis has the ability to create clusters based on both categorical and interval-scaled variables. Furthermore, the analysis automatically selects the most suitable number of clusters, and, most importantly, proves very sustainable with large and unevenly distributed data collections.[266] The two-step cluster analysis will show whether the spindle whorls and loom weights cluster depending on nominal and/or metrical variables and, if so, will inform about the relevance of the respective clustering variables.

(2) Analysis of Variance

The analysis of variance explores the difference in variance of a dependent variable between the samples of two or more independent samples. In doing so, the null hypothesis (H0) is: ‘There is no difference between the samples regarding the dependent variable.’ To analyse this hypothesis, the analysis of variance calculates whether the variance of the dependent variable is attributable

263 See: Chmielewski – Gardyński 2010, 878.
264 For the impact of the weight on the yarn thickness see: Subchapter IV.5.
265 See, for example: Drennan 2009.
266 Rezankova et al. 2006.

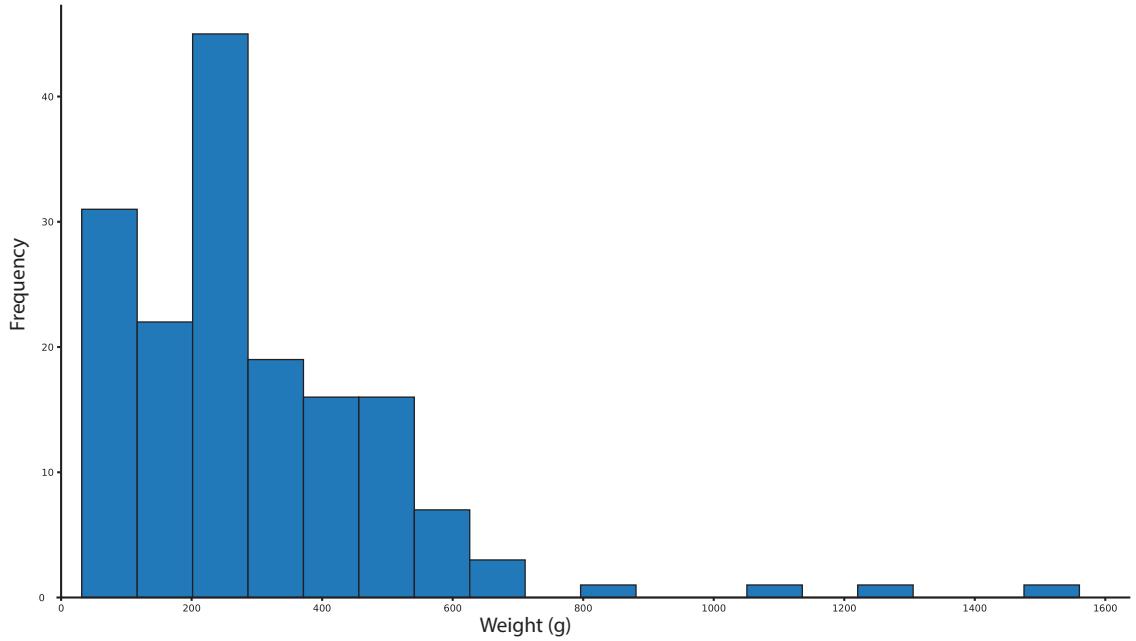

Fig. 9 Distribution of weight among the loom weights in the database (M = 290.01g, SD = 208.45g, N = 165) (C. Britsch)

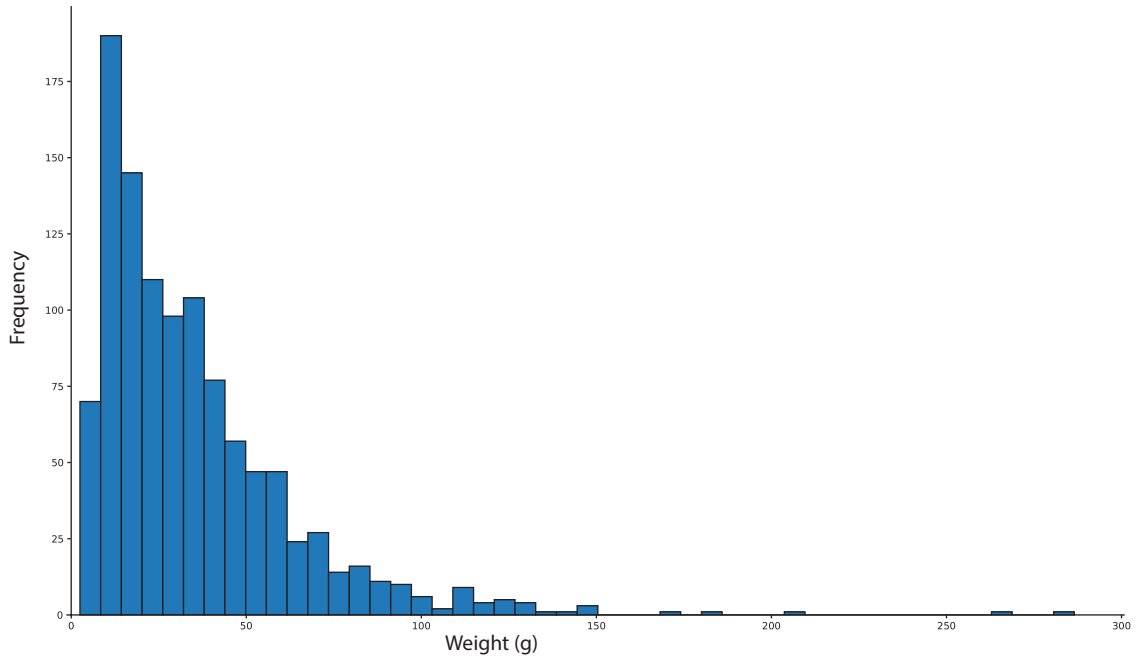

Fig. 10 Distribution of weight among the spindle whorls in the database (M = 35.35g, SD = 28.85g, N = 1106) (C. Britsch)

to the samples or whether they derive from the same distribution. If the H0 has to be rejected, that means that at least one sample or group is different from one other group (H1). However the analysis of variance for several groups does not indicate which groups are different and therefore post-hoc tests are performed to identify the exact interactions between each pair of groups.

In the current study the difference between different sites was of interest. Do they differ in the way their textile tools were produced? Do they have different technologies? In the database of the current study the technologically most strongly influencing factor measured on the textile

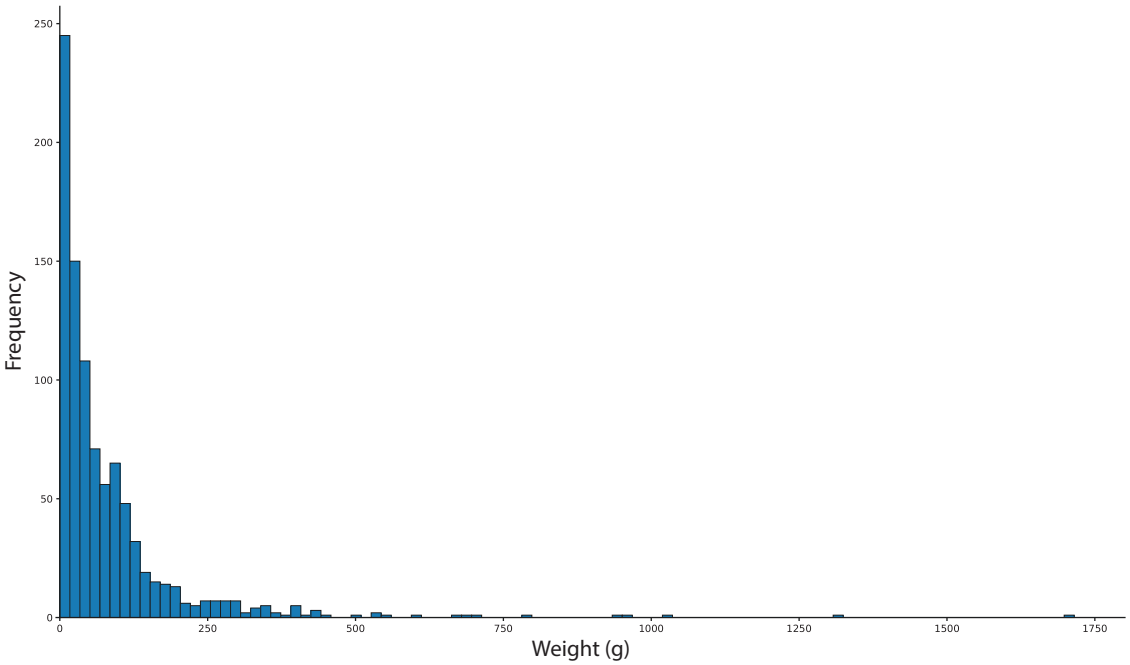

Fig. 11 Distribution of the moment of inertia among the spindle whorls in the database (M = 94.10g*cm², SD = 151.94g*cm², N = 962) (C. Britsch)

tools was their weight, an interval-scaled variable (see Subchapter IV.5). For the spindle whorls, the physical impact of the shape, best expressed through the moment of inertia, can also be of influence (see Subchapter IV.7). The moment of inertia is also an interval-scaled variable. These variables therefore form the basis for the testing for differences among groups and are used as dependent variables. For each period, three analyses were performed, comparing the variances of the different sites (samples or independent variables) within the dependent variables weight of loom weights as well as the weight of spindle whorls and the moment of inertia of spindle whorls.

To choose the correct analysis of variance, the data has to be tested for violations of normality via the Shapiro-Wilk test ($p \leq 0.05$) and of variance homogeneity via the Levene test ($p \leq 0.05$). For the weight of loom weights as well as for the weight of spindle whorls and the moment of inertia of spindle whorls, the Shapiro-Wilk test displayed a strong violation of normality ($p = 0.00$) with positive skewed distributions in all cases (Figs. 9–11). Furthermore, in all cases the Levene test shows that for the tools from the different sites recorded. no variance homogeneity is given ($p = 0.00$). In addition the number of tools in each sample differs a lot (between N = 0 and N = 151).

Therefore, only univariate and non-parametric tests can be executed to test for differences in variances between the samples. Non-parametric tests, unlike parametric tests like ANOVA or the t-test, do not require the assumption of normal distribution or variance homogeneity. The Mann-Whitney U test will be used for testing variance differences between two samples (equivalent to the parametric t-test) and the Kruskal-Wallis test for differences between three or more samples (equivalent to the parametric one-way ANOVA).[267] In the case of a significant result ($p \leq 0.05$) for the Kruskal-Wallis test, a post-hoc test with Bonferroni corrections to counteract the multiple comparisons problem[268] was performed.

[267] Barabási – Albert 1999; Amaral et al. 2000; Albert – Barabási 2002; Barabási 2002; Bonnini et al. 2014.
[268] See: Westfall – Young 1993.

IV.9. Typologies

All objects analysed in the current study are handmade and were mostly made of clay. In several steps during the production certain 'imperfections' in the shape and appearance could – and most likely did – occur. Furthermore, the shapes of the objects will always have been influenced by the hand of their maker. This means that while two people might have had the same shape in mind, the outcome could still look different, since neither machines nor templates were used. The idea of the typologies presented in this chapter is not to find perfect matches, but rather to connect objects that seem to have shared a similar intended shaping. Thus the question arises at what degree of appearance deviation a new type or subtype needed to be created. Instead of only trying to find an equation or measurable difference that could be laid out on a scale and be quantified, the (subjective) perception of the shape was set as the main category.

Though a subjective distinction and labelling of the shape is certainly an assailable criterion, I am convinced that it comes closest to properly reconstructing past intentions. As mentioned, a shape might diverge for several reasons, while the manufacturers still had the same or a similar style in mind. The typologies presented in this chapter try to refer to these similarities in mindsets. In my opinion the qualitative approach can give an openness to the process of categorisation that is necessary to find so far unknown phenomena in this field. Furthermore, the subjective perspective will help to put oneself in the position of the manufacturers. But, of course, quantitative differences can also help in subdividing types, as can be seen in the spindle whorl typology.

Generally, the strategy for organising and classifying the artefacts in the typologies of this study follows the rules described in detail by Manfred K. H. Eggert.[269]

IV.9.1. Spindle Whorls

Probably the most well-known typology for spindle whorls for western Anatolian prehistory is the typology introduced by Blegen.[270] The typology simply lists different spindle whorl shapes without a clear order or any regard to differences in sizes or weight. Therefore, the only reference seems to be a schematic depiction of shapes. A comparable typology with regard to sizes and weight and a comprehensible order was suggested by Britsch and Horejs in reference to the finds from Çukuriçi Höyük.[271] Such typologies, however, are mainly useful when categorising an assemblage of a specific site and when comparing finds from other sites with this specific site. However, as stated in the introduction of this chapter, since spindle whorls are handmade objects, slight divergences in shape will be inevitable. Therefore a tolerance of imperfection in the comparison is required. Working with new artefacts from other sites, usually two options are given: either one always refers the new artefacts to one certain site/typology (for example 'Troy/Blegen') or one will always refer to any well-matching site/typology.

The first option has the problem that one site will inadvertently become some kind of metasite which all comparisons are based on. This, in turn, can potentially lead to an incorrect clustering.

To give an example: we have five spindle whorls, each from a different site. Every single one of these five whorls resembles certain aspects (colour, surface treatment, height, width, rounded edges, etc.) of a type from such a metasite's typology. This would eventually lead to the assignment of the same type for all five whorls. However, if one also considered the five spindle

269 Eggert 2008, 123–146.
270 Blegen et al. 1950.
271 Britsch – Horejs 2014.

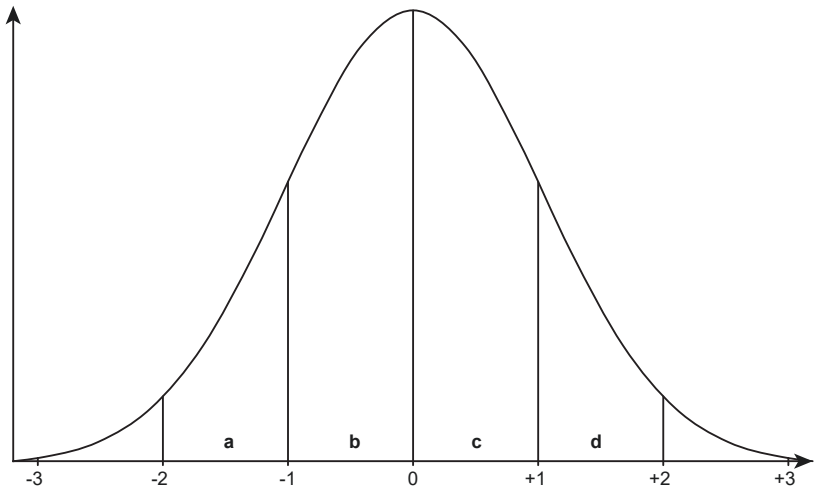

Fig. 12 Determination of subtypes via standard deviations on a normal distribution (applicable for Types I, II, V, VI and VII) (C. Britsch)

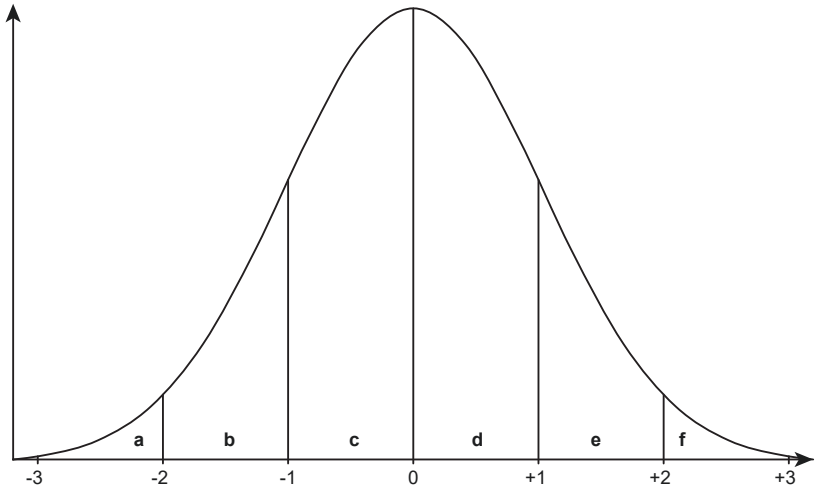

Fig. 13 Determination of subtypes via standard deviations on a normal distribution (applicable for Types III and IV) (C. Britsch)

whorls in regard to each other, their differences could be more prominent than their commonalities. Thus, in the latter case, one would create subtypes, grouping together only those which resemble a common type. In the first case however, all five objects might have been labelled as one similar type, potentially leading to further assumptions of diffusion and connectivity which might not resemble past intentions or reality. The second option, however, also carries a potential bias. For example, one might want to find a comparison for an assemblage from a site X and the closest resemblance can be found in the ensemble from site C. The determination of a typology for site C, however, was made in reference to that of site B, which, in turn, was based on the typology of site A, and so on. In that case this option would lead to a similar problem as the first one.

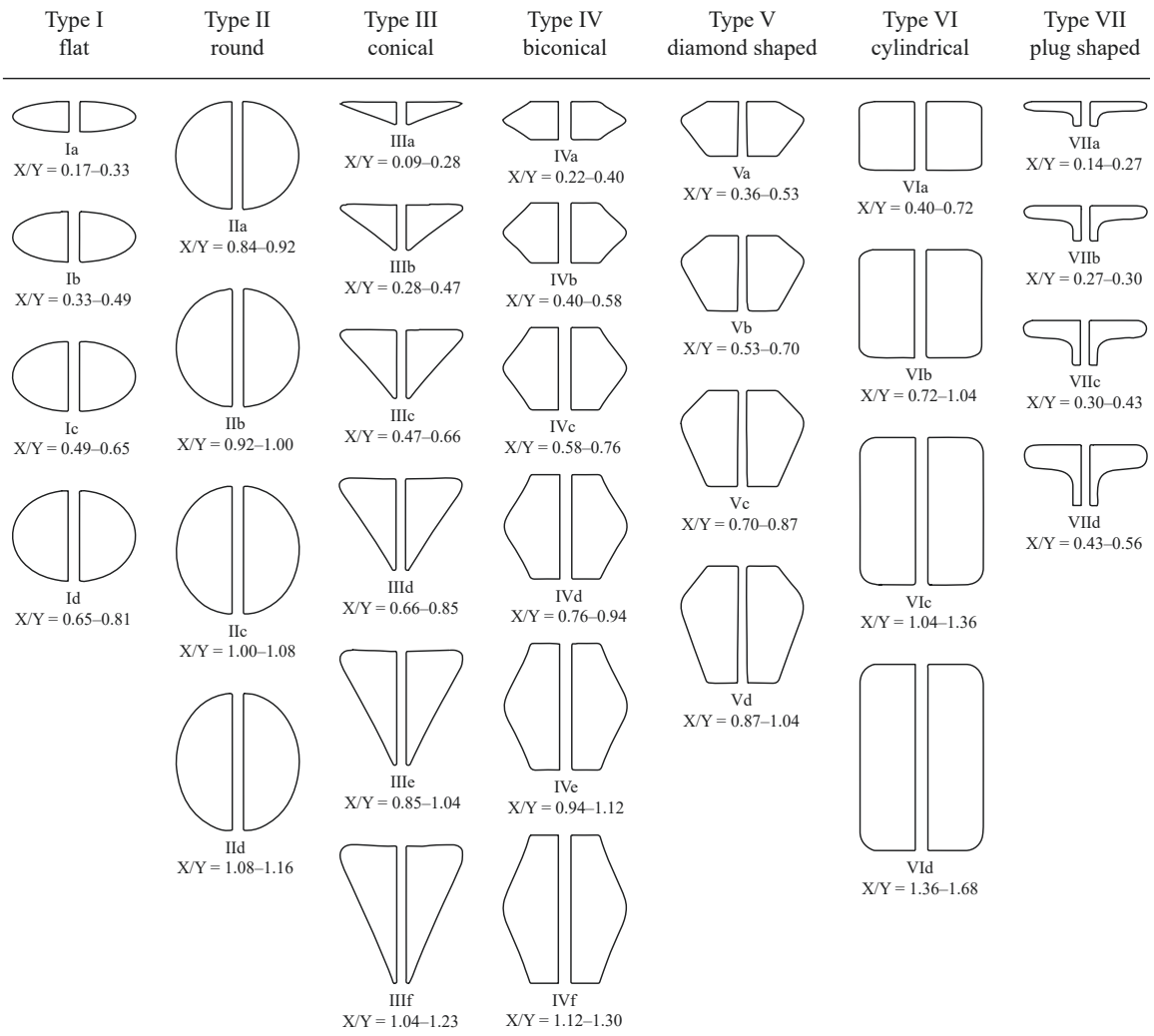

Fig. 14 Spindle whorl typology based on the ratio between height (X) and diameter (Y) with X/Y, based on 1091 finds from 31 different sites (C. Britsch)

As a possible solution to this problem, a different approach to spindle whorl typologies is suggested in the current study. As a foundation of the typology, all spindle whorls in this volume's database were used. That means 1107 spindle whorls from 32 different sites dating from the Late Neolithic until the end of the Early Bronze Age.[272] The spindle whorls are first divided into main types (types I–VII) determined by their general shape, creating the types flat, round, conical, biconical, diamond shaped, cylindrical and plug shaped. An assignment to a more precise subcategorisation can be performed later on with only a little additional work. The subtypes (labelled with lower case letters) are categorised by their ratio of height (X) to maximal diameter (Y). The mean (M) and the standard deviation (SD) of the ratios of one type were calculated. The subtypes were then created by taking the values between M and M-SD, M and M+SD, M-SD and M-(2×SD), M+SD and M+(2×SD) and so on, until all spindle whorls (except for strong outliers) were included (Figs. 12–13). Depending on the shape, this created four to six subtypes (Fig. 14, as well as Plates 1–3).

[272] For a more detailed account on the included spindle whorls see: Chapters V and VI.

One main aim of the typology is to enable a quick categorisation when recording archaeological material. The idea behind this approach is to categorise spindle whorls by their technical aspects. The theoretical background comes from the experiments of the CTR (see Chapter IV.5) and the thoughts on the moment of inertia (see Chapter IV.7), indicating that the important factors of a spindle whorl's technical function and versatility are its height, diameter and weight. The given typology directly assesses two of these important factors, height and diameter. One disadvantage of the typology is the missing categorisation via weight, leaving out one very relevant aspect. Consequently, it is possible that two different spindle whorls from the same subtype differ so strongly in weight, that they could not have been used for the same task. However, a typology that took weight into account as an additional criterion when creating subtypes would end up with so many subtypes (common shape, height, diameter and weight), that a comparative approach would not be interpretable. Therefore the typology presented here compromised, giving a clear definition of the shape from both an aesthetic and a technical point of view. When comparing different spindle whorls with this typology only two aspects of information are needed: type and weight.

The ratios used for categorisation in Figure 12 were calculated using the whole database of this study. Due to the large number of finds included in the study from many different sites of the study's region, I hope that I have collected a representative sample size. Since the forming of subtypes derived from mathematical calculations, the method can easily be adapted to bigger or other data pools.

The main advantage of this kind of typology is the easy assignment of individual objects to the respective subtype. Instead of considering whether a given whorl is rather a Type IVc or IVd whorl, the ratio is calculated and thus automatically assigned to the appropriate subtype. Since any database or spread-sheet program will be able to automatically calculate this ratio, the work is minimised.

IV.9.2. Loom Weights

As already mentioned in the introduction of this chapter, the objects dealt with here were handmade. It will therefore be nearly impossible to find two artefacts that are exactly similar in every detail. This is even more obvious among loom weights. For one, they are generally larger objects, allowing more variations, and, apart from that, the only necessity is a comparable weight; the symmetry of the shape plays only a secondary role. Thus it is very important to take into account the intent of the shaping rather than just the actual final shape. It is not necessary to subdivide the loom weight typology into differently sized versions of the same type. In contrast to spindle whorls, the variation of sizes of a certain type, even between different sites and regions, is not considerable.

The loom weight typology used in the current study uses main types (types I–IX) referring to their general geometrical appearance, and subtypes (marked with capital letters) based on variations within the general geometrical shape (Fig. 15). Altogether nine main types were identified: cylindrical, drop shaped, pyramidal, cuboid, domed, discoid, spool shaped and crescent shaped, as well as special cases. Depending on the main type, between two and eight subtypes were created. For examples on the actual appearance of the different types and subtypes see Plates 4–7. A description for the main type and the subtypes is given in Table 10.

Type I	**Elongated tubular shape with the perforation through the long axis.**	
Cylindrical	A	Round cross section; length to width at least 2:1; slightly curved ends.
	B	Round cross section; length to width c. 1:1; slightly curved ends.
	C	Similar to Type IA, but with two perforations through the long axis.
	D	Oval shaped cross section; length to width c. 1.5:1; curved ends.
	E	Round cross section; length to width between 1.5:1–2:1; clean cut ends.
	F	Miniature form of Type IA
Type II	**Flat shape with curved top clear-cut or curved bottom; perforation at top, through the shortest axis.**	
Drop shaped	A	Oval, but nearly round cross section.
	B	Very flat; strongly bulging width; sharp ending top.
	C	Straight edges; wide curved top.
	D	Curved bottom; relatively wide, but evenly bulging width.
	E	Very wide; strongly bulging width; sharp ending top; two perforations.
Type III	**Square base and top; basic pyramidal form; perforations close to top along a broad axis.**	
Pyramidal	A	Square cross section; sharp edges; flat top and bottom.
	B	Slightly rectangular cross section; rather thin; curved bottom and flat top.
	C	Slightly roundish cross section; strongly curved bottom, clean cut top.
	D	Rectangular cross section; rather straight edges; very flat.
	E	Rectangular cross section; very steep edges; rather short; curved top.
	F	Long rectangular cross section; perforated through long axis, additional – probably decorative – perforation through the top.
	G	Similar to Type IIIA, but with two perforations.
	H	Rectangular cross section; very wide; two perforations.
Type IV	**Rectangular/“angular” front; straight edges; perforation near top.**	
Cuboid	A	Strongly curved top and bottom; square, roundish angular cross section.
	B	Slightly curved top and bottom; rectangular cross section.
	C	Slightly curved top and bottom; square cross section.
	D	Flat top and bottom; wide bulging bottom; rectangular cross section; perforated through longer width axis.
	E	Slightly curved top and bottom; rectangular cross section; perforated through longer width axis.
Type V	**Roundish, slightly ovoid shape with large hole in the centre.**	
Domed	A	Strongly elongated width; very large hole; rather crudely made.
	B	Nearly round cross section; top ending more sharply than bottom.
Type VI	**Flat, round shape; generally nearly symmetrical.**	
Discoid	A	Flat cross section; perforation near top; sometimes clean cut top.
	B	Sphendonoid cross section; two perforations through centre.
	C	“Doughnut” shaped; large perforation through centre.
	D	Sometimes slightly conical cross section; small perforation through centre.
Type VII	**Two broad sides narrowing to the middle; round cross section.**	
Spool shaped	A	Short and thick; perforation through long axis.
	B	Short and thick; no perforation.
	C	Short and thick; small perforation through broad axis.
	D	Long and thin; no perforation.
Type VIII	**Objects shaped like a crescent with two opposing perforations at top.**	
Crescent shaped	A	Strongly bent shape; round cross section; perforations at each end.
	B	“Half-oval” shape; ovoid cross section; perforations at widest points.

Type IX	**Special shapes with no clear connection to other shapes.**	
Special cases	A	Long conical shape set on a bent foot; perforation through conical part.
	B	Nearly completely round shape with one perforation.
	C	Pyramidal shape with strongly curved and slightly bulging top; perforation through the bottom.
	D	Very long object; slightly pyramidal cross section; multiple holes along the top through the broad axis.

Tab. 10 Description of the different loom weight types and subtypes

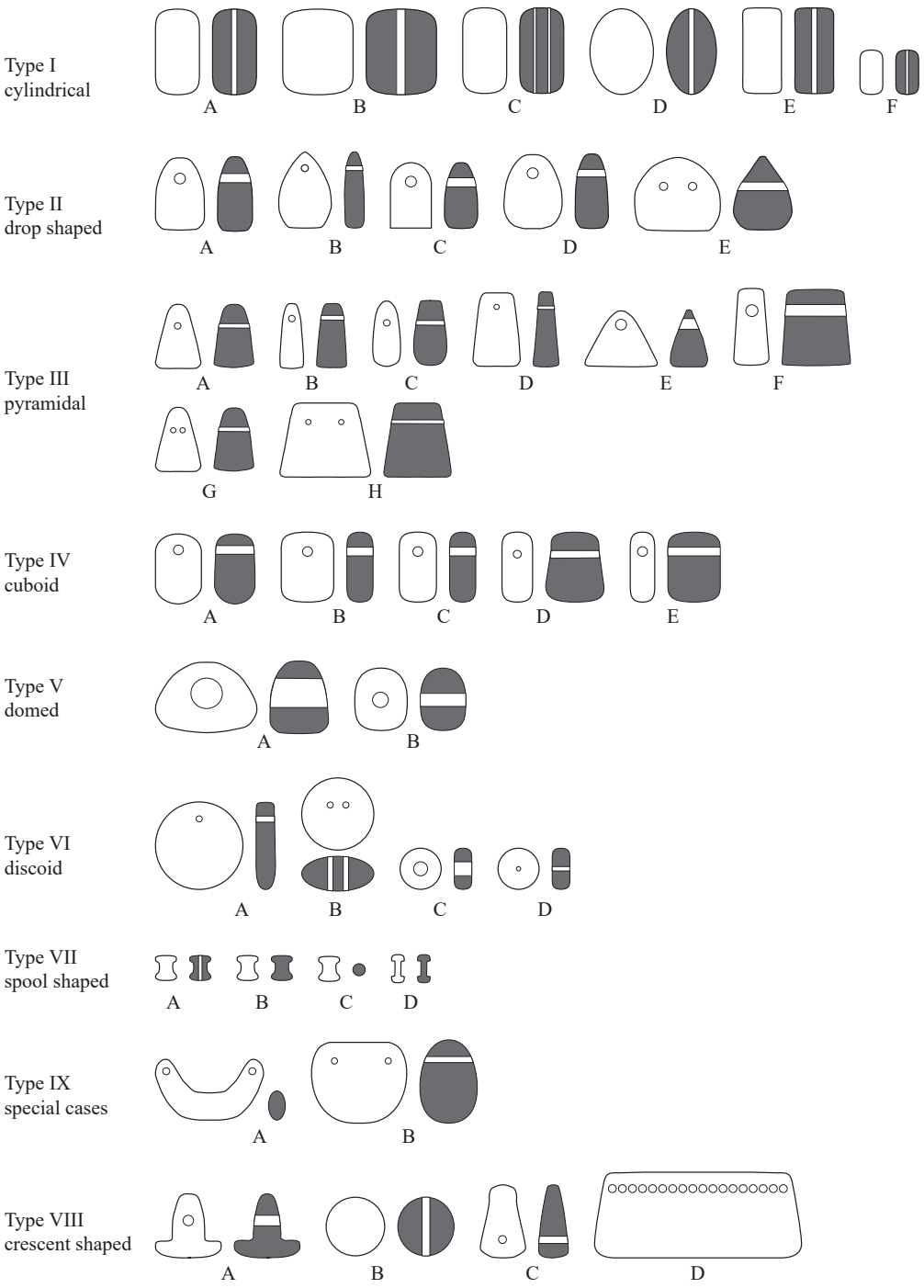

Fig. 15 Loom weight typology used in the current study (C. Britsch)

V. Data

A short summary of the data sources and collection was given in the introduction. The current subchapter will serve to give a clear overview of the data collected for this study.

The absolute majority of spindle whorls and all loom weights in the current database were recorded personally by the author. This originally encompassed 1511 artefacts from 14 different sites. Unfortunately, a large number of finds had to be excluded due to different reasons. To summarise the selection process: the main reasons to exclude finds from the database were if the tools were afterwards deemed too fragmented for (statistical) evaluation, the assignment to settlement layers and thereby chronological periods was unclear, or the object could not be clearly identified as either a loom weight or spindle whorl.

This process excluded a total of 485 finds, leaving only 1026 artefacts that consisted of 838 spindle whorls and 188 loom weights. The sites included were Aşağı Pınar, Bademağacı, Çukuriçi Höyük, Dikili Tash, Dubene-Sarovka, Kanlıgeçit, Nova Nadezhda, Pefkakia Magoula, Platia Magoula Zarkou, Tell Golyamo Delchevo, Tell Lipnik, Tell Sava, Troy and Varna (Fig. 16). These were all recorded according to the process described in Subchapter IV.5. The exact numbers of spindle whorls and loom weights from each site are displayed in Tables 11–16.

Additionally to those finds, 253 spindle whorls could be recorded via literature. The process, as well as the reason for only recording spindle whorls in this way, is described in detail in Subchapter IV.5.1.

These selection processes led to a total number of 1279 artefacts, including data of 1091 spindle whorls and 188 loom weights. 11.34% of the total material (145 artefacts, consisting of 109 spindle whorls and 36 loom weights) derived from the site Çukuriçi Höyük, which was used as a case study and studied in greater depth than the remaining sites.

The details about the respective publications were given in Chapter III.2. The publications mentioned in this part were used for the recording of spindle whorls. Exceptions are the sites Bademağacı, Pefkakia Magoula, Tell Golyamo Delchevo, Troy and Varna, for which – as described above – the artefacts could be recorded at their respective place of deposit. This means that the following sites' spindle whorls were recorded via publications: Aphrodisias,[273] Ayio Gala,[274] Beycesultan,[275] Çine Tepecik,[276] Demircihüyük,[277] Dhaskalio,[278] Emporio,[279] Hanay Tepe,[280] Hacılar Höyük,[281] Heraion,[282] Ilıpınar,[283] Kaklık Mevkii,[284] Karaoğlan Mevkii,[285]

[273] Sharp Joukowsky 1986.
[274] Hood et al. 1981; Hood et al. 1982.
[275] Lloyd – Mellaart 1962.
[276] Günel 2003; Günel 2008; Günel 2014.
[277] Obladen-Kauder 1996.
[278] Renfrew et al. 2013.
[279] Hood et al. 1981; Hood et al. 1982.
[280] Blum et al. 2011.
[281] Mellaart 1961.
[282] Milojčić 1961.
[283] Roodenberg 1995; Roodenberg – Alpaslan-Roodenberg 2008.
[284] Efe et al. 1995; Topbaş et al. 1998.
[285] Topbaş et al. 1998.

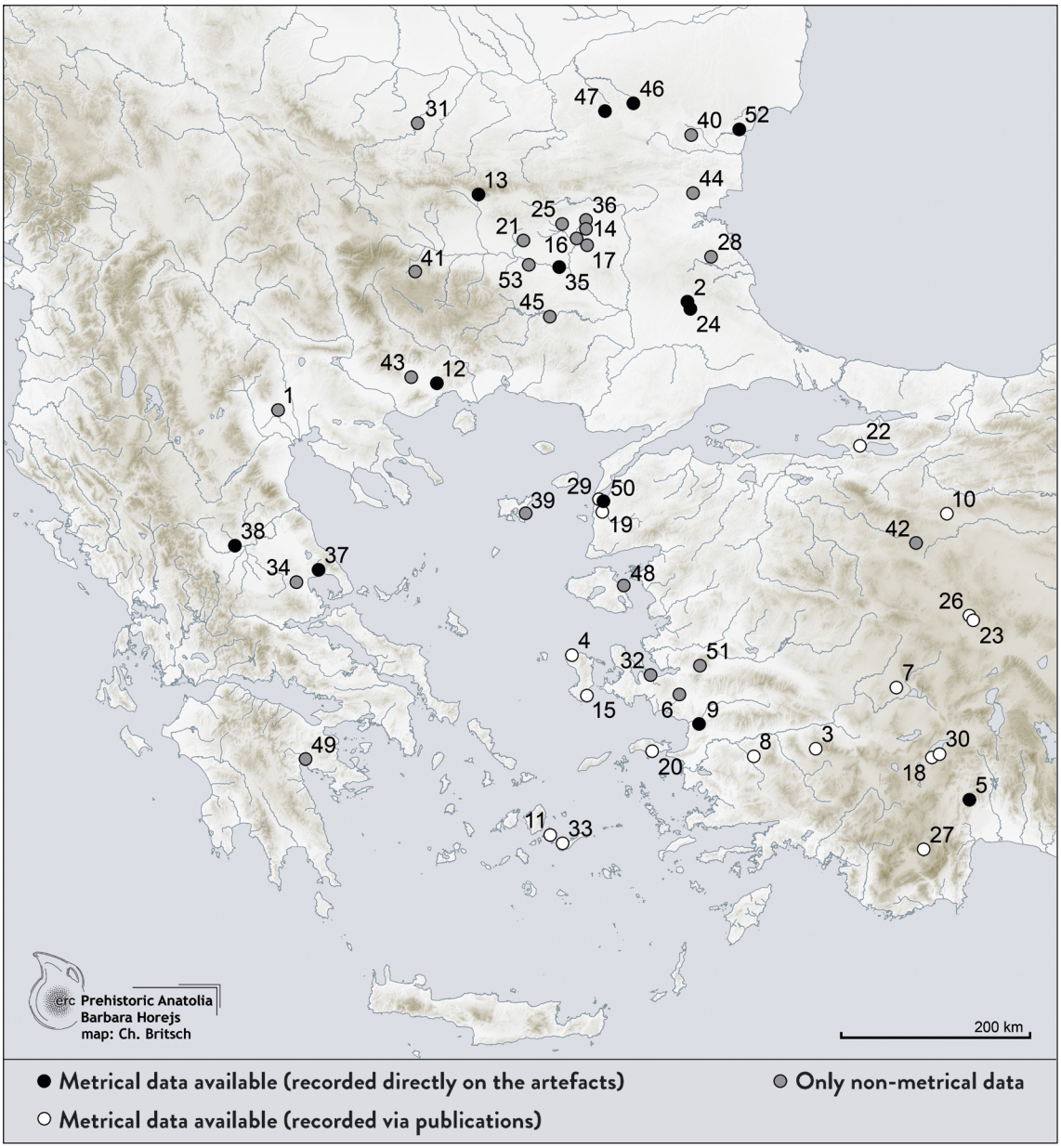

Fig. 16 Sites analysed and presented in the current study. 1 – Archontiko, 2 – Aşağı Pinar, 3 – Aphrodisias, 4 – Ayio Gala, 5 – Bademağacı, 6 – Bakla Tepe, 7 – Beycesultan, 8 – Çine Tepecik, 9 – Çukuriçi Höyük, 10 – Demircihüyük, 11 – Dhaskalio, 12 – Dikili Tash, 13 – Dubene-Sarovka, 14 – Dyadovo, 15 – Emporio, 16 – Ezero, 17 – Golyama Detelina, 18 – Hacılar Höyük, 19 – Hanay Tepe, 20 – Heraion, 21 – Hotnitsa, 22 – Ilıpınar, 23 – Kaklık Mevkii, 24 – Kanlıgeçit, 25 – Karanovo, 26 – Karaoğlan Mevkii, 27 – Karataş, 28 – Krushka, 29 – Kumtepe, 30 – Kuruçay Höyük, 31 – Lepitsa, 32 – Liman Tepe, 33 – Markiani, 34 – Mikrothiva, 35 – Nova Nadezhda, 36 – Nova Zagora, 37 – Pefkakia Magoula, 38 – Platia Magoula Zarkou, 39 – Poliochni, 40 – Provadia, 41 – Rakitovo, 42 – Seyitömer Höyük, 43 – Sitagroi, 44 – Sadievo, 45 – Tatul, 46 – Tell Golyamo Delchevo, 47 – Tell Lipnik, 48 – Thermi, 49 – Tiryns, 50 – Troy, 51 – Ulucak, 52 – Varna, 53 – Yabalkovo (ERC Prehistoric Anatolia/C. Britsch)

Karataş,[286] Kumtepe,[287] Kuruçay Höyük[288] and Markiani[289] (see Fig. 16). As for the personally recorded finds, detailed information is given in Tables 11–16.

286 Eslick 1992; Warner 1994.
287 Sperling 1976; Korfmann et al. 1995.
288 Duru 1996.
289 Marangou et al. 2006.

Region	Site	LN	EC	MC	MC/ LC	LC	LC/ EBA 1	EBA 1	EBA 2	EBA 2–3	EBA 3	Σ
Greek Mainland	Pefkakia Magoula					99		8	2	46	14	*169*
	Platia Magoula Zarkou			3						32		*35*
	Σ			*3*		*99*		*8*	*2*	*78*	*14*	*204*
Northern Greece	Dikili Tash			81		1	1	3				*86*
	Σ			*81*		*1*	*1*	*3*				*86*
Turkish Thrace	Aşağı Pınar		15	49								*64*
	Kanlıgeçit			1				3	2	3	8	*17*
	Σ		*15*	*50*				*3*	*2*	*3*	*8*	*81*
Bulgaria	Dubene-Sarovka							25				*25*
	Nova Nadezhda			8	1				2			*11*
	Tell Golyamo Delchevo	3		4	2							*9*
	Tell Lipnik			2								*2*
	Tell Sava			4								*4*
	Varna			3								*3*
	Σ	*3*		*21*	*3*			*25*	*2*			*54*
Aegean Islands	Ayio Gala					3						*3*
	Dhasklaio							1			2	*3*
	Emporio							9				*9*
	Heraion										8	*8*
	Markiani							14	11			*25*
	Σ					*3*		*24*	*11*		*10*	*48*
Western Anatolian Coast	Çukuriçi Höyük	10				3		93				*106*
	Troy							9	18	19	151	*197*
	Hanay Tepe					2						*2*
	Kumtepe					4						*4*
	Σ	*10*				*9*		*102*	*18*	*19*	*151*	*309*
North-western Anatolia	Demircihüyük							50	21			*71*
	Ilıpınar							4				*4*
	Kaklık Mevkii							11				*11*
	Karaoğlan Mevkii								2			*2*
	Σ							*65*	*23*			*88*
South-western Anatolia	Bademağacı							21	89			*110*
	Aphrodisias					15						*15*
	Beycesultan					3		6	29		16	*54*
	Çine Tepecik							3				*3*
	Karataş					10		2	13		3	*28*
	Hacılar Höyük							5				*5*
	Kuruçay Höyük					3		3				*6*
	Σ					*31*		*40*	*131*		*19*	*221*
	Σ (total)	13	15	155	3	143	1	270	189	100	202	*1091*

Tab. 11 Amounts of spindle whorls in different regions/sites in different periods in the database

Finally, further information from different publications was used for the analysis of the spreading of loom weight shapes. For this part only the shapes were recorded as present or absent at the respective sites, no numbers or metrics were recorded. This included information on the following sites: Aphrodisias,[290] Archontiko,[291] Bakla Tepe,[292] Beycesultan,[293] Demircihüyük,[294] Emporio,[295] Karataş,[296] Kumtepe,[297] Poliochni,[298] Seyitömer Höyük,[299] Ulucak,[300] Sitagroi,[301] Thermi[302] and Tiryns.[303] Furthermore, the unpublished PhD thesis of Petrova – which we were kindly permitted to use in this volume – offered information for 13 different sites from Bulgaria: Dyadovo, Ezero, Golyama Detelina, Hotnitsa, Karanovo, Krushaka, Lepitsa, Nova Zagora, Provadia, Rakitovo, Sadievo, Tatul and Yabalkovo.[304] The results of these comparisons are presented in Subchapter VI.1.

Shape	**Shape type**	**LN**	**EC**	**MC**	**MC/ LC**	**LC**	**LC/ EBA 1**	**EBA 1**	**EBA 2**	**EBA 2–3**	**EBA 3**	**Σ**
Flat	Type I					1		1	3	1	1	*7*
	Type Ia	2	1	25		53		6	3	2		*92*
	Type Ib		2	8		5		6	4			*25*
	Type Ic		2	14	1	2		5	6	4	3	*37*
	Type Id	2	1	5		1		3	3		3	*18*
	Σ	*4*	*6*	*52*	*1*	*62*		*21*	*19*	*7*	*7*	*179*
Round	Type II							6	3			*9*
	Type IIa	2				3		10	4	1		*20*
	Type IIb	2				2		2	6	1		*13*
	Type IIc	1						3	1		2	*7*
	Type IId	1				1		1				*3*
	Σ	*6*				*6*		*22*	*14*	*2*	*2*	*52*
Conical	Type III					1		6	1	4	2	*14*
	Type IIIa			21	1	6		3	1			*32*
	Type IIIb	1		15	1	22		15	4	11	5	*74*
	Type IIIc		2	9		7	1	6	4	25	11	*65*
	Type IIId			4		2		6		9	1	*22*
	Type IIIe			1				1		3	3	*8*
	Type IIIf			2				1		1	1	*5*
	Σ	*1*	*2*	*52*	*2*	*38*	*1*	*38*	*10*	*53*	*23*	*220*

290 Sharp Joukowsky 1986.
291 Papadopoulou et al. 2015.
292 Erkanal – Özkan 1999; Şahoğlu – Tuncel 2014.
293 Lloyd – Mellaart 1962.
294 Obladen-Kauder 1996.
295 Hood et al. 1981; Hood et al. 1982.
296 Eslick 1992; Warner 1994.
297 Sperling 1976; Korfmann et al. 1995.
298 Bernabò-Brea 1964.
299 Bilgen 2015.
300 Çilingiroğlu 2009a.
301 Elster 2003; Elster et al. 2015.
302 Lamb 1936.
303 Rahmstorf et al. 2015; Siennicka 2012.
304 Petrova 2011.

Shape	Shape type	LN	EC	MC	MC/ LC	LC	LC/ EBA 1	EBA 1	EBA 2	EBA 2–3	EBA 3	Σ
Biconical	Type IV							30	14	1	15	*60*
	Type IVa		1	2		6		1	2		1	*13*
	Type IVb		1	7		5		8	6	5	11	*43*
	Type IVc		3	18		10		32	38	15	41	*157*
	Type IVd	2	2	10		10		77	52	2	25	*180*
	Type IVe			2		2		26	23	1	9	*63*
	Type IVf							7	2		2	*11*
	Σ	*2*	*7*	*39*		*33*		*181*	*137*	*24*	*104*	*527*
Diamond shaped	Type V								1		5	*6*
	Type Va			1						2	16	*19*
	Type Vb			1		2		3	2	7	23	*38*
	Type Vc			3				1	3	2	8	*17*
	Type Vd							2			12	*14*
	Σ			*5*		*2*		*6*	*6*	*11*	*64*	*94*
Cylindrical	Type VI							2				*2*
	Type VIa									1		*1*
	Type VIb								2	1	2	*5*
	Type VId					1						*1*
	Σ					1		2	2	2	2	*9*
Plug shaped	Type VII									1		*1*
	Type VIIa			5				1				*6*
	Type VIIc			1								*1*
	Type VIId			1		1						*2*
	Σ			*7*		*1*		*1*		*1*		*10*
	Σ (total)	13	15	155	3	143	1	271	188	100	202	*1091*

Tab. 12 Amounts of spindle whorls of different shapes/shape types from different periods in the database

Region	Site	Flat	Round	Conical	Biconical	Diamond shaped	Cylin-drical	Plug shaped	Σ
Greek Mainland	Pefkakia Magoula	60	3	70	25	6	3	2	*169*
	Platia Magoula Zarkou	5		23	4	2	1		*35*
	Σ	*65*	*3*	*93*	*29*	*8*	*4*	*2*	*204*
Northern Greece	Dikili Tash	20		46	7	4		9	*86*
	Σ	*20*		*46*	*7*	*4*		*9*	*86*
Turkish Thrace	Aşağı Pınar	31		5	28				*64*
	Kanlıgeçit	1			16				*17*
	Σ	*32*		*5*	*44*				*81*
Bulgaria	Dubene-Sarovka			2	19	4			*25*
	Nova Nadezhda	2			9				*11*
	Tell Golyamo Delchevo	2		6	1				*9*
	Tell Lipnik	1			1				*2*
	Tell Sava	3			1				*4*
	Varna	2			1				*3*
	Σ	*10*		*8*	*32*	*4*			*54*
Aegean Islands	Ayio Gala			2	1				*3*
	Dhasklaio	1			2				*3*
	Emporio				9				*9*
	Heraion				6	2			*8*
	Markiani	10		12	2		1		*25*
	Σ	*11*		*14*	*20*	*2*	*1*		*48*
Western Anatolian Coast	Çukuriçi Höyük	12	21	5	68				*106*
	Troy	3	2	17	112	62	1		*197*
	Hanay Tepe			1	1				*2*
	Kumtepe				3	1			*4*
	Σ	*15*	*23*	*23*	*184*	*63*	*1*		*309*
North-western Anatolia	Demircihüyük	4	8	9	49		1		*71*
	Ilıpınar			1	3				*4*
	Kaklık Mevkii	1	1		9				*11*
	Karaoğlan Mevkii	1			1				*2*
	Σ	*6*	*9*	*10*	*62*		*1*		*88*
South-western Anatolia	Bademağacı	9	12	4	79	5	1		*110*
	Aphrodisias	4	2	4	5				*15*
	Beycesultan	3		3	41	7			*54*
	Çine Tepecik			1	1	1			*3*
	Karataş	2	2	3	20		1		*28*
	Hacılar Höyük	1		4					*5*
	Kuruçay Höyük		1		5				*6*
	Σ	*19*	*17*	*19*	*151*	*13*	*2*		*221*
	Σ (total)	178	52	218	529	94	9	11	*1091*

Tab. 13 Amounts of spindle whorls of a certain shape from different regions/sites in the database

Region	Site	LN	EC	MC	MC/ LC	LC	LC/ EBA 1	EBA 1	EBA 2	EBA 2–3	EBA 3	Σ
Greek Mainland	Pefkakia Magoula									27	2	*29*
	Platia Magoula Zarkou			3						8		*11*
	Σ			*3*						*35*	*2*	*40*
Northern Greece	Dikili Tash			2			1	1				*4*
	Σ			*2*			*1*	*1*				*4*
Turkish Thrace	Aşağı Pınar		23	22								*45*
	Kanlıgeçit											
	Σ		*23*	*22*								*45*
Bulgaria	Dubene-Sarovka							1				*1*
	Nova Nadezhda											
	Tell Golyamo Delchevo	7		15								*22*
	Tell Lipnik			2								*2*
	Tell Sava											
	Varna			2								*2*
	Σ	*7*		*19*				*1*				*27*
Aegean Islands	Ayio Gala											
	Dhasklaio											
	Emporio											
	Heraion											
	Markiani											
	Σ											
Western Anatolian Coast	Çukuriçi Höyük	1				1	2	27				*31*
	Troy									6	34	*40*
	Hanay Tepe											
	Kumtepe											
	Σ	*1*				*1*	*2*	*27*		*6*	*34*	*71*
North-western Anatolia	Demircihüyük											
	Ilıpınar											
	Kaklık Mevkii											
	Karaoğlan Mevkii											
	Σ											
South-western Anatolia	Bademağacı								1			*1*
	Aphrodisias											
	Beycesultan											
	Çine Tepecik											
	Karataş											
	Hacılar Höyük											
	Kuruçay Höyük											
	Σ								*1*			*1*
	Σ (total)	8	23	46		1	3	29	1	41	36	*188*

Tab. 14 Amounts of loom weights in different regions/sites in different periods in the database

Shape	Shape type	LN	EC	MC	MC/ LC	LC	LC/ EBA 1	EBA 1	EBA 2	EBA 2–3	EBA 3	Σ
Cylindrical	Type IA	1				1	1	9		1	3	*16*
	Type IC									1		*1*
	Type ID							16				*16*
	Type IE							1			1	*2*
	Type IF						1	1				*2*
	Σ	*1*				*1*	*2*	*27*		*2*	*4*	*37*
Drop shaped	Type IIA										1	*1*
	Type IIB		2	1								*3*
	Type IIC		5	5								*10*
	Type IID		3	5						4	13	*25*
	Type IIE										3	*3*
	Σ		*10*	*11*						*4*	*17*	*42*
Pyramidal	Type IIIA		4	3					1	6	3	*17*
	Type IIIB							1			1	*2*
	Type IIIC		1									*1*
	Type IIID			1							1	*2*
	Type IIIE		1									*1*
	Type IIIG			1								*1*
	Σ		*6*	*5*				*1*	*1*	*6*	*5*	*24*
Cuboid	Type IVA		6	11								*17*
	Type IVB			1							1	*2*
	Type IVC			1								*1*
	Type IVD									2		*2*
	Type IVE									24	5	*29*
	Σ		*6*	*14*						*26*	*6*	*52*
Domed	Type VB		1									*1*
	Σ		*1*									*1*
Discoid	Type VIA										1	*1*
	Type VIB										2	*2*
	Type VIC			1			1					*2*
	Type VID	7		15								*22*
	Σ	*7*		*15*			*1*				*3*	*26*
Spool shaped	Type VIIA							1		2		*3*
	Type VIIB									1		*1*
	Type VIIC			1								*1*
	Σ			*1*				*1*		*3*		*5*
Crescent shaped	Type VIIIA										1	*1*
	Σ										*1*	*1*
	Σ (total)	8	23	46		1	3	29	1	41	36	*188*

Tab. 15 Amounts of loom weights of different shapes/shape types from different periods in the database

Region	Site	Shape types								Σ
		I	II	III	IV	V	VI	VII	VIII	
Greek Mainland	Pefkakia Magoula	1		1	26		0	1		*29*
	Platia Magoula Zarkou	1		5			2	3		*11*
	Σ	*2*		*6*	*26*		*2*	*4*		*40*
Northern Greece	Dikili Tash		1				2	1		*4*
	Σ		*1*				*2*	*1*		*4*
Turkish Thrace	Aşağı Pınar		19	6	19	1				*45*
	Kanlıgeçit									
	Σ		*19*	*6*	*19*	*1*				*45*
Bulgaria	Dubene-Sarovka			1						*1*
	Nova Nadezhda									
	Tell Golyamo Delchevo			2			20			*22*
	Tell Lipnik		1	1						*2*
	Tell Sava									
	Varna			2						*2*
	Σ		*1*	*6*			*20*			*27*
Aegean Islands	Ayio Gala									
	Dhasklaio									
	Emporio									
	Heraion									
	Markiani									
	Σ									
Western Anatolian Coast	Çukuriçi Höyük	31								*31*
	Troy	4	21	5	6		3	0	1	*40*
	Hanay Tepe									
	Kumtepe									
	Σ	*35*	*21*	*5*	*6*		*3*		*1*	*71*
North-western Anatolia	Demircihüyük									
	Ilıpınar									
	Kaklık Mevkii									
	Karaoğlan Mevkii									
	Σ									
South-western Anatolia	Bademağacı			1						*1*
	Aphrodisias									
	Beycesultan									
	Çine Tepecik									
	Karataş									
	Hacılar Höyük									
	Kuruçay Höyük									
	Σ			*1*						*1*
	Σ (total)	37	42	24	51	1	27	5	1	*188*

Tab. 16 Amounts of loom weights of a certain shape from different regions/sites in the database

VI. Results – Commonalities, Changes and Continuities

The database of textile tools for the current study consists of a total of 1279 artefact data sets from 31 different sites (see Fig. 16) that contain statistically evaluable continuous variables, such as weight or diameter. 1091 of these are spindle whorls and 188 are loom weights. All important descriptive statistical information on the artefacts is given in Tables 11 to 16. Additionally, the categorical information of artefacts from a further 22 sites, for example their shape, was included for the comparative analyses (see Fig. 16).

As described in detail in Chapter IV, information on multiple variables was collected for each artefact. These include nominal variables (e.g. region or shape) and metrical variables (e.g. weight or diameter). A list of these variables and their definitions is given in Table 17. The variables diameter$_2$ and moment of inertia are only relevant for spindle whorls.

Variable	Definition	Level of Measurement
Region	Regional origin of artefact, following the division given in Chapter I and Fig. 1	Nominal
Site	Archaeological site the artefact was found at	Nominal
Period	Chronological period the artefact derived from, following the division in Chapter II.1 and Tab. 1	Nominal
Type	Identification of tool type, either SW (spindle whorl) or LW (loom weight)	Nominal
Shape	Shape type of the artefact, following the divisions from Chapter IV.9 and Figs. 14–15	Nominal
Decoration	Non-technical, decorative alterations on the artefact	Nominal
Material	Raw material the artefact was made from	Nominal
Weight	Measured and/or reconstructed weight	Interval
Height	Measurement of longest vertical axis of artefact	Interval
Diameter$_1$	Measurement of longest horizontal axis of artefact	Interval
Diameter$_2$	Measurement of horizontal axis of top and/or bottom of a spindle whorl	Interval
Hole diameter	Measurement of longest interior axis of the artefacts perforation	Interval
Moment of inertia	Calculated value of the moment of inertia of a spindle whorl, following the calculations given in Tab. 8	Interval

Tab. 17 Description of the recorded variables of the artefacts in the database

It has to be noted, however, that a complete collection of metrical data for each artefact was not always possible. This depended mainly on two circumstances: the state of preservation or the state of publication. For example, the artefact could have been broken in a way that allowed the measurement of weight but not that of height, diameter$_1$, diameter$_2$ or hole diameter. When the data was collected via publication, sometimes certain metrical data (e.g. diameter) was unavailable. This means that it is possible that the total amount (N) for different analyses can change.

An artefact could also not be included in the database for the statistical analyses if certain non-metrical data that the statistical analyses are based on was missing including (a) information about the geographical or chronological origin (region, site and period) or (b) information about the type or shape of the tool (type and shape).

However, in addition to the statistical analyses based on continuous variables, descriptive observations based on the spread of certain types of shapes or decorations on a geographical and chronological scale are also included in the study. Such a distribution based on only categorical data can also yield important and interesting information on cultural connectivity and chronological development. The results of these observations will be presented in the following subchapter.

VI.1. Analysis of Categorical Data (Shapes and Decorations)

In this subchapter the chronological occurrence of the different types and shapes of loom weights and spindle whorls, as well as decorations of spindle whorls will be reported. The data pool used for these descriptive analyses is different for the spindle whorls than for the loom weights. For the spindle whorls only data from the database with information on all continuous variables (from 31 sites) was included. This allows more precise analyses regarding their distribution since exact numbers can be calculated. Furthermore, the large number of spindle whorls in the database allows the assumption that it constitutes a representative sample for the respective regions and periods. For the loom weights, in addition to the data from the database, information from the further 22 sites with only categorical data was included. The disadvantage of this additional data is that not all publications it derived from yield information on the number of loom weights found, but, for example, only state whether a certain loom weight type could be found or not or only display the most intact or presentable objects. However, due to the fact that far fewer loom weights from the analysed time frame could be recorded in the database, this additional data is necessary to offset the loss of data accuracy.

These circumstances led to slightly different approaches in the reflection on and discussion of the two tool categories, which also makes different approaches and styles for the presentation of the results necessary.

As can be seen in Table 12 and in the introduction to the current chapter, the spindle whorl shapes and types appear, with a few exceptions, in no clear chronological pattern. However, the individual spindle whorl shapes appear in changing proportions in the different periods. A comparison between each of the 31 sites would, however, be difficult or even impossible to evaluate. To simplify this matter, the proportional amounts in which the spindle whorls appear in each period are displayed only for the respective region. Figures 17 to 21 display the different spindle whorl shapes[305] for the following periods: Figure 17 – the Late Neolithic; Figure 18 – the Early to Middle Chalcolithic; Figure 19 – the Middle to Late Chalcolithic; Figure 20– Early Bronze Age 1; and Figure 21 – Early Bronze Age 2–3. Since, for the Early Chalcolithic period, data from only one site is available in the database, it is displayed together with the Middle Chalcolithic tools. Also, the Early Bronze Age 2–3 periods are displayed together. Because of the data provided by the respective excavators and/or publications, the dating could not be more precise.

Since, as mentioned above, for the loom weights a lot of data without accurate amounts needed to be added, a presentation in pie charts does not make sense. Instead, two different kinds of presentation were chosen, each only indicating whether a shape/type was present during a certain period or not. Figures 22–28 show the geographical distribution of the different shapes by presenting them next to the site they were found at. Figures 29–38 show which shape types were present in the different regions studied. It has to be kept in mind that the markings do not imply any amounts of or proportion between loom weight shapes. Instead, both graphic types are intended to convey at which time, in which region/site, the different shapes appeared, were present, and disappeared.

[305] For representation of the spindle whorl shapes see: Chapter IV.9, Fig. 14.

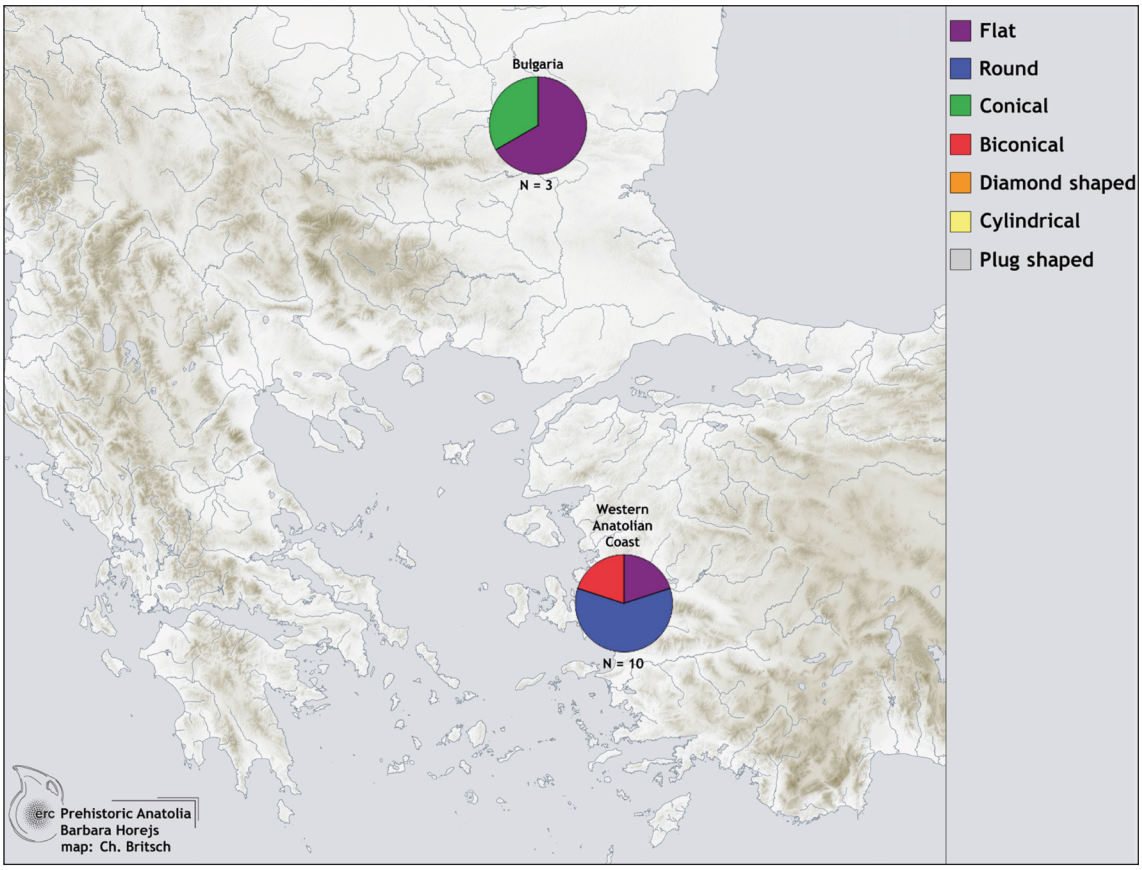

Fig. 17 Late Neolithic spindle whorl shapes present in data base by region (ERC Prehistoric Anatolia/C. Britsch)

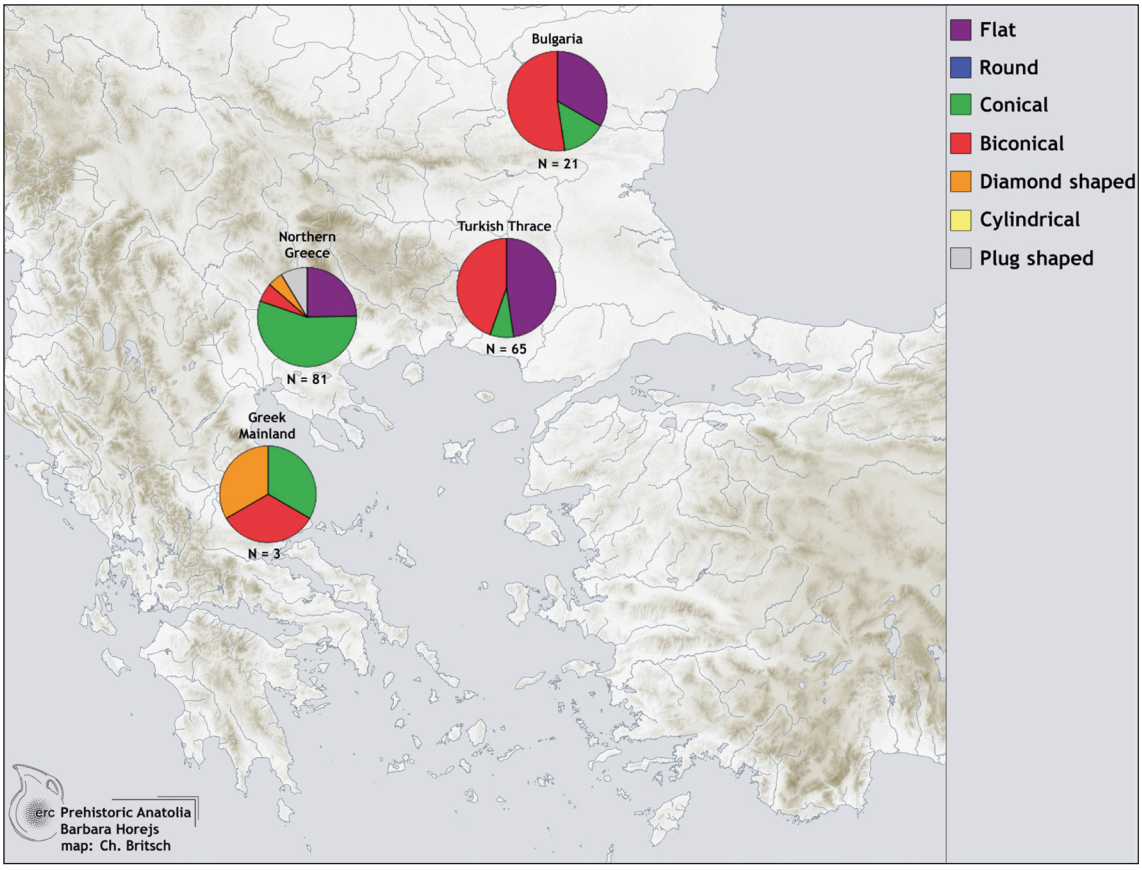

Fig. 18 Early and Middle Chalcolithic spindle whorl shapes present in data base by region (ERC Prehistoric Anatolia/C. Britsch)

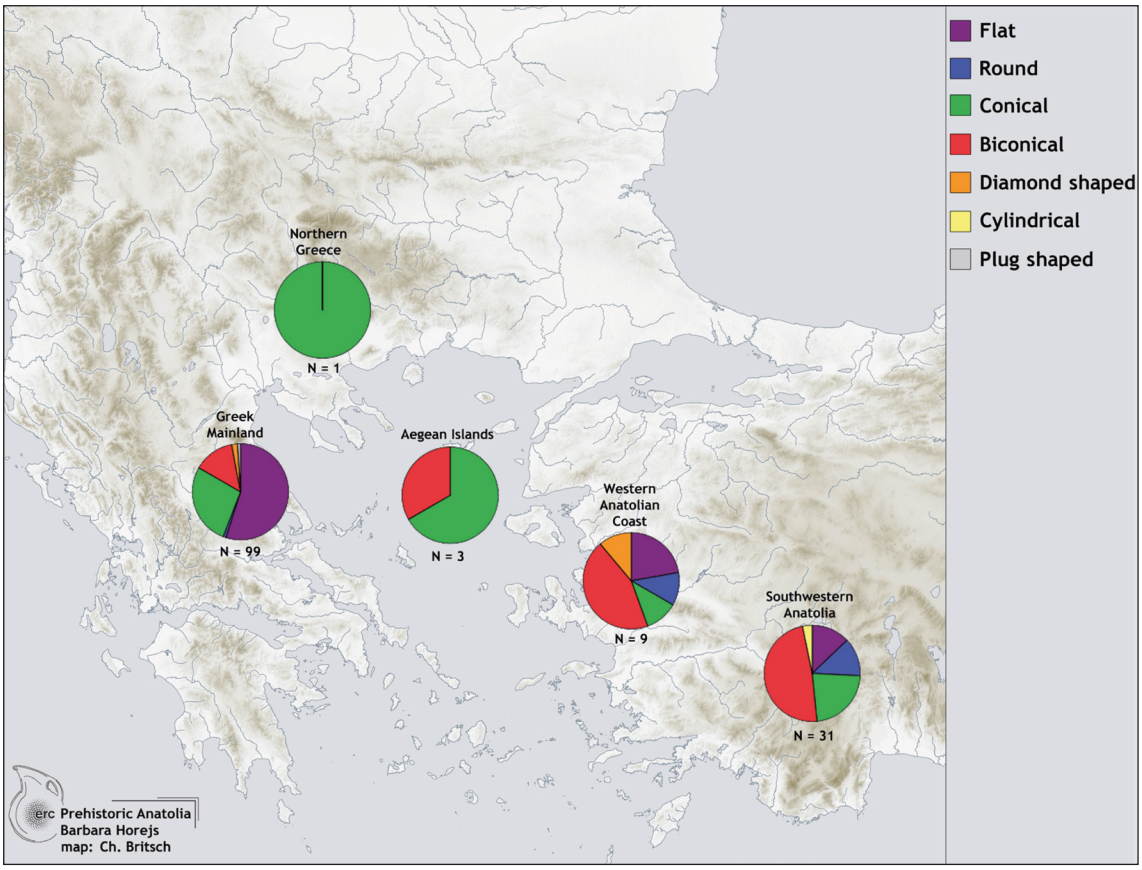

Fig. 19 Late Chalcolithic spindle whorl shapes present in data base by region (ERC Prehistoric Anatolia/C. Britsch)

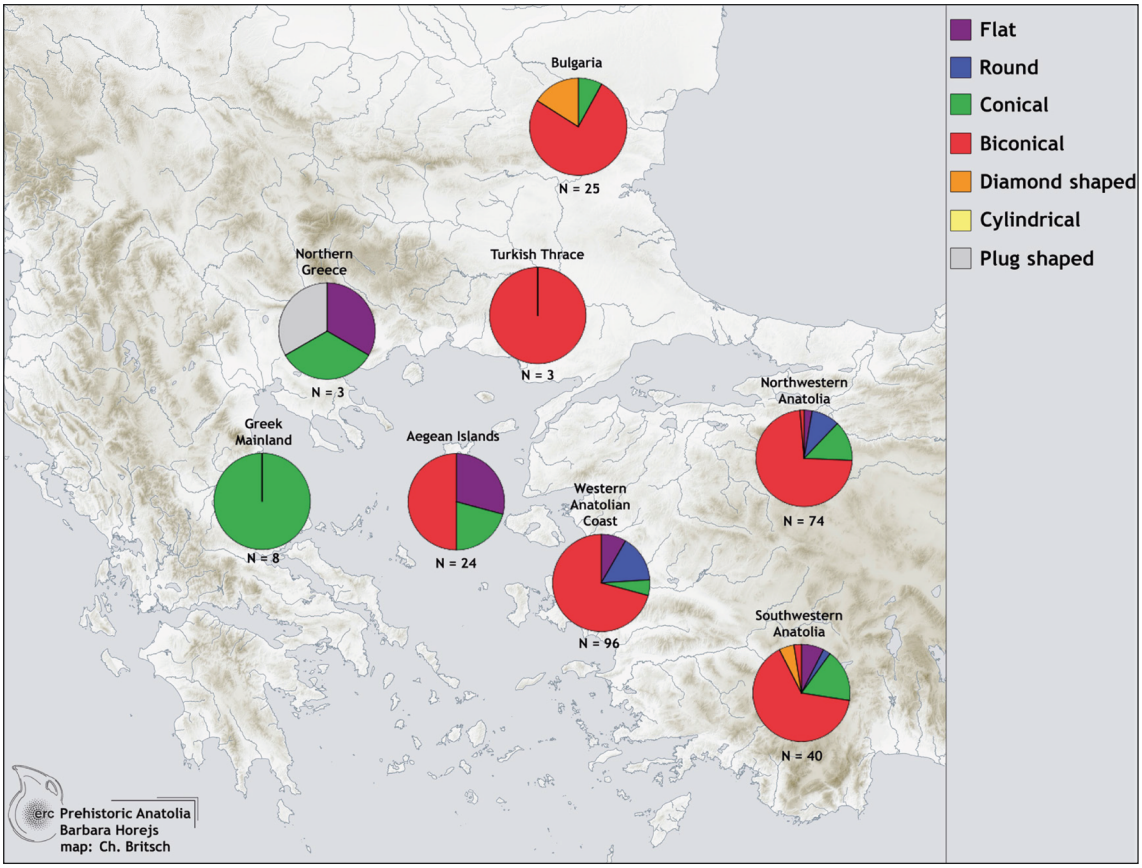

Fig. 20 Early Bronze Age 1 spindle whorl shapes present in data base by region (ERC Prehistoric Anatolia/C. Britsch)

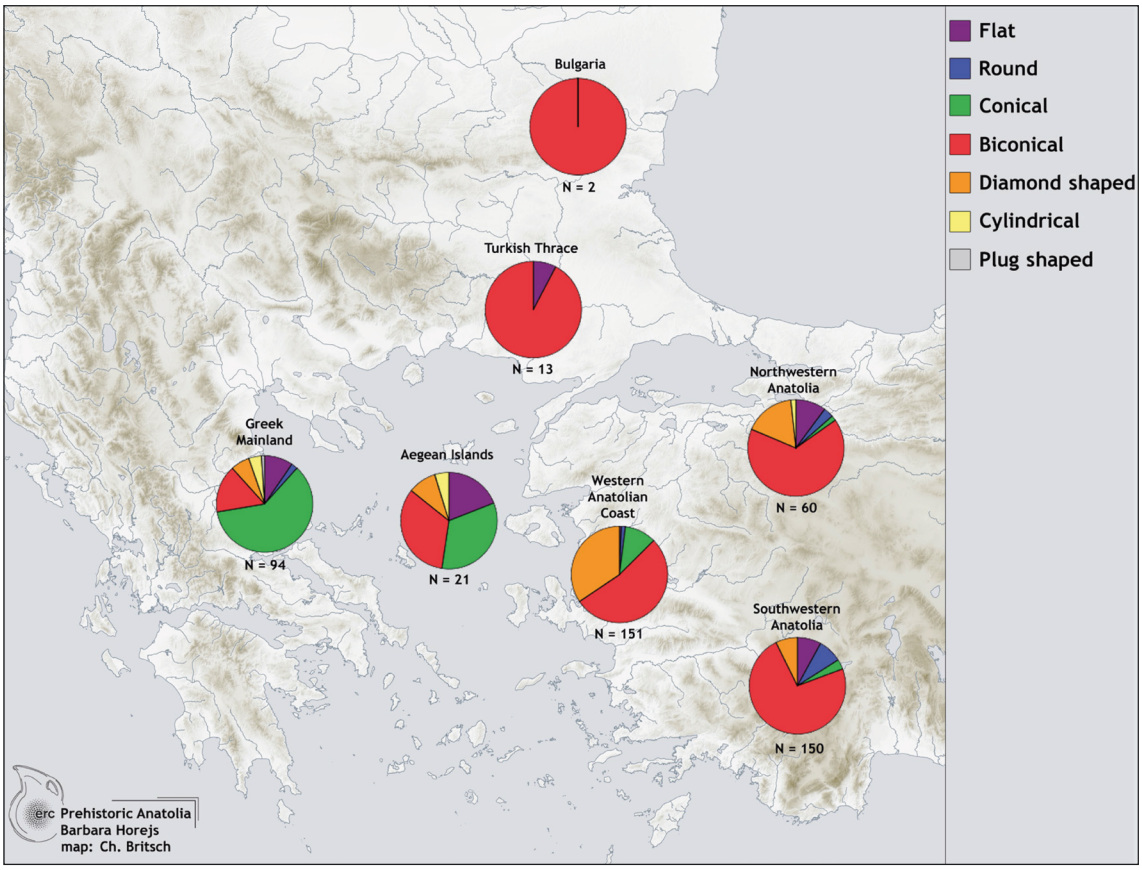

Fig. 21 Early Bronze Age 2–3 spindle whorl shapes present in data base by region (ERC Prehistoric Anatolia/ C. Britsch)



Fig. 22 Late Neolithic loom weight shapes distribution by site (ERC Prehistoric Anatolia/C. Britsch)

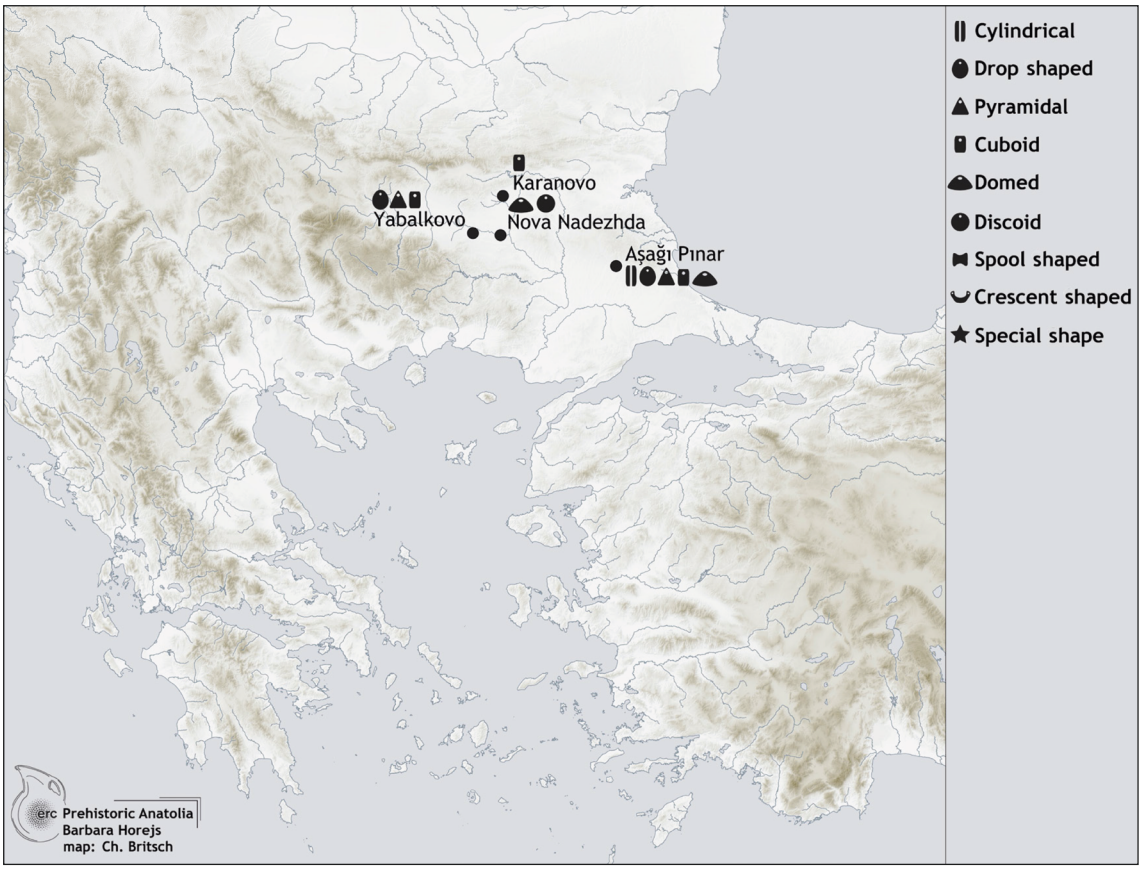

Fig. 23 Early Chalcolithic loom weight shapes distribution by site (ERC Prehistoric Anatolia/C. Britsch)

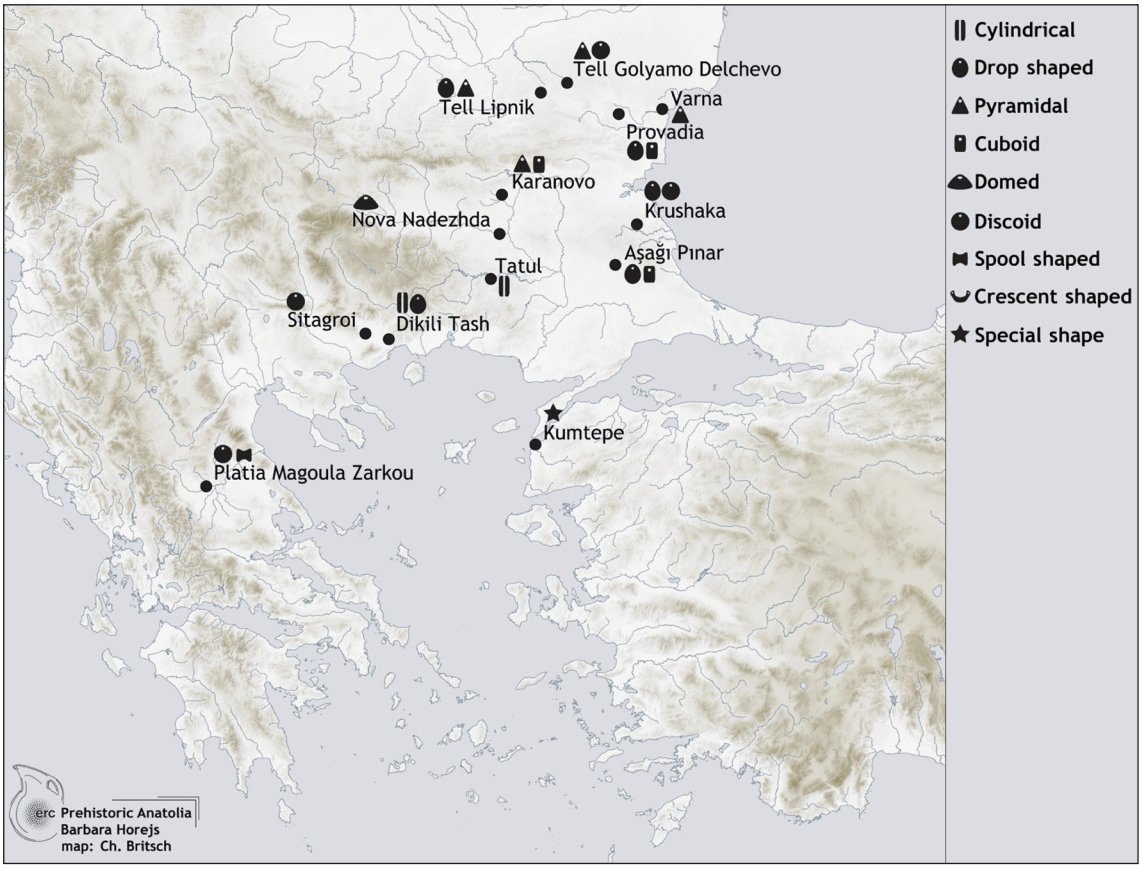

Fig. 24 Middle Chalcolithic loom weight shapes distribution by site (ERC Prehistoric Anatolia/C. Britsch)

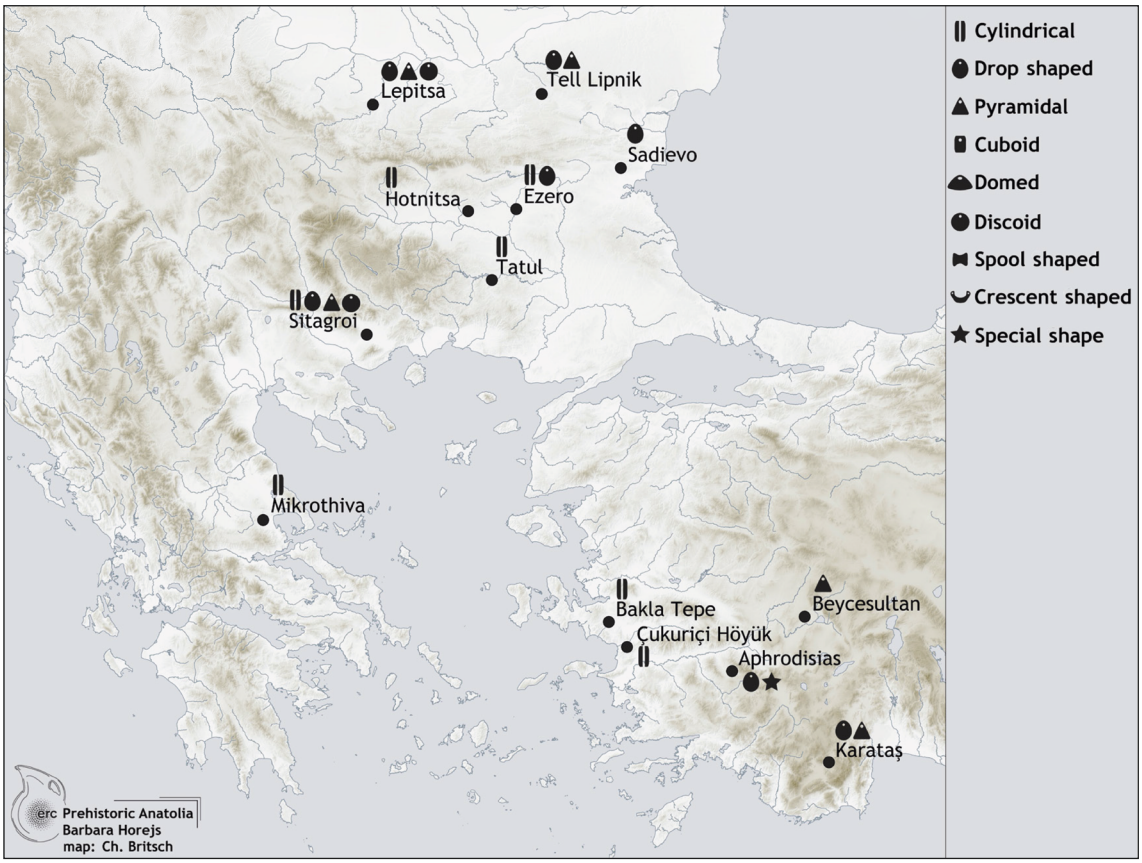

Fig. 25 Late Chalcolithic loom weight shapes distribution by site (ERC Prehistoric Anatolia/C. Britsch)

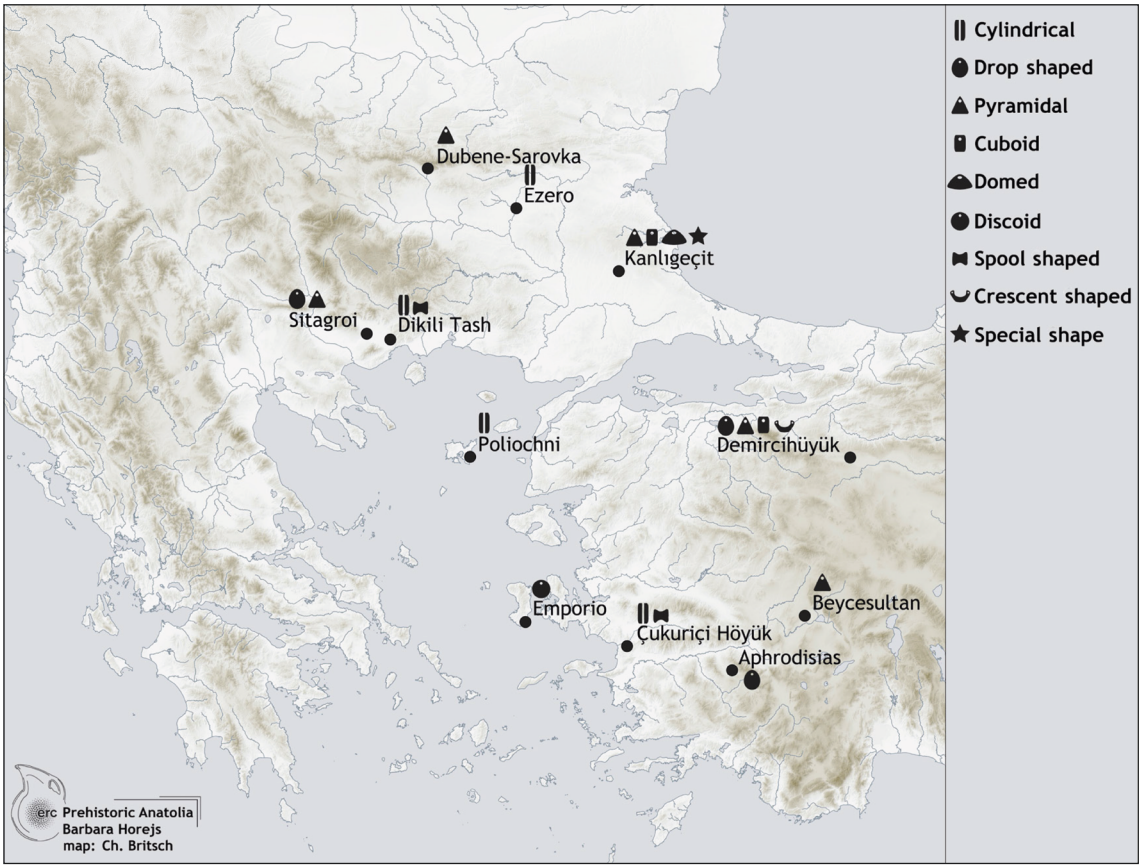

Fig. 26 Early Bronze Age 1 loom weight shapes distribution by site (ERC Prehistoric Anatolia/C. Britsch)

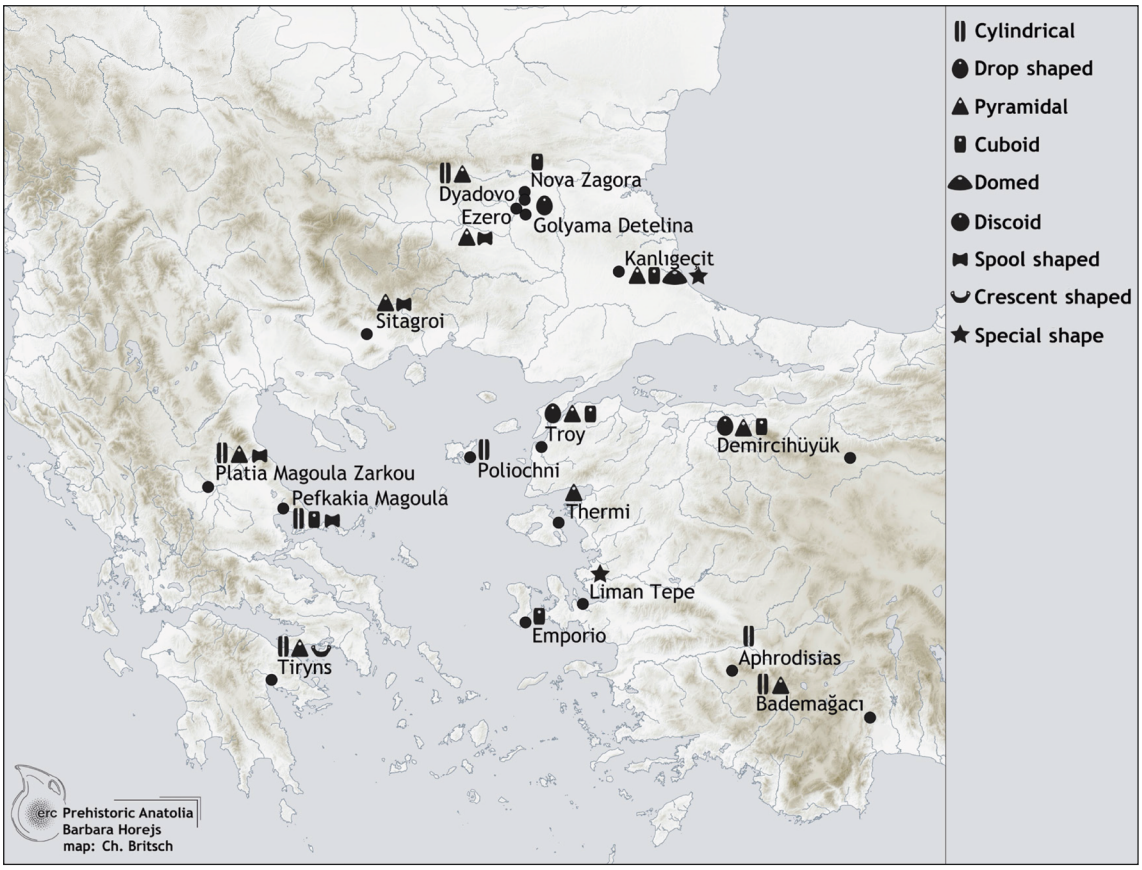

Fig. 27 Early Bronze Age 2 loom weight shapes distribution by site (ERC Prehistoric Anatolia/C. Britsch)

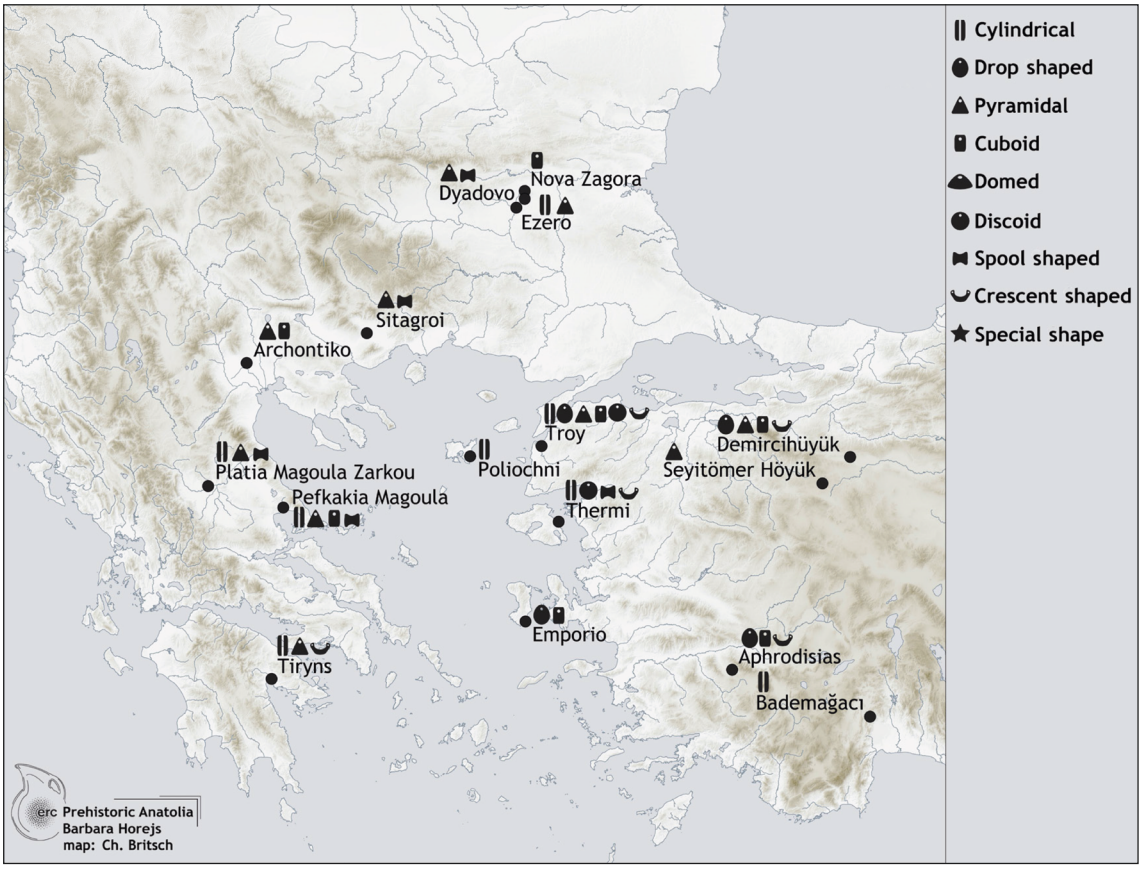

Fig. 28 Early Bronze Age 3 loom weight shapes distribution by site (ERC Prehistoric Anatolia/C. Britsch)

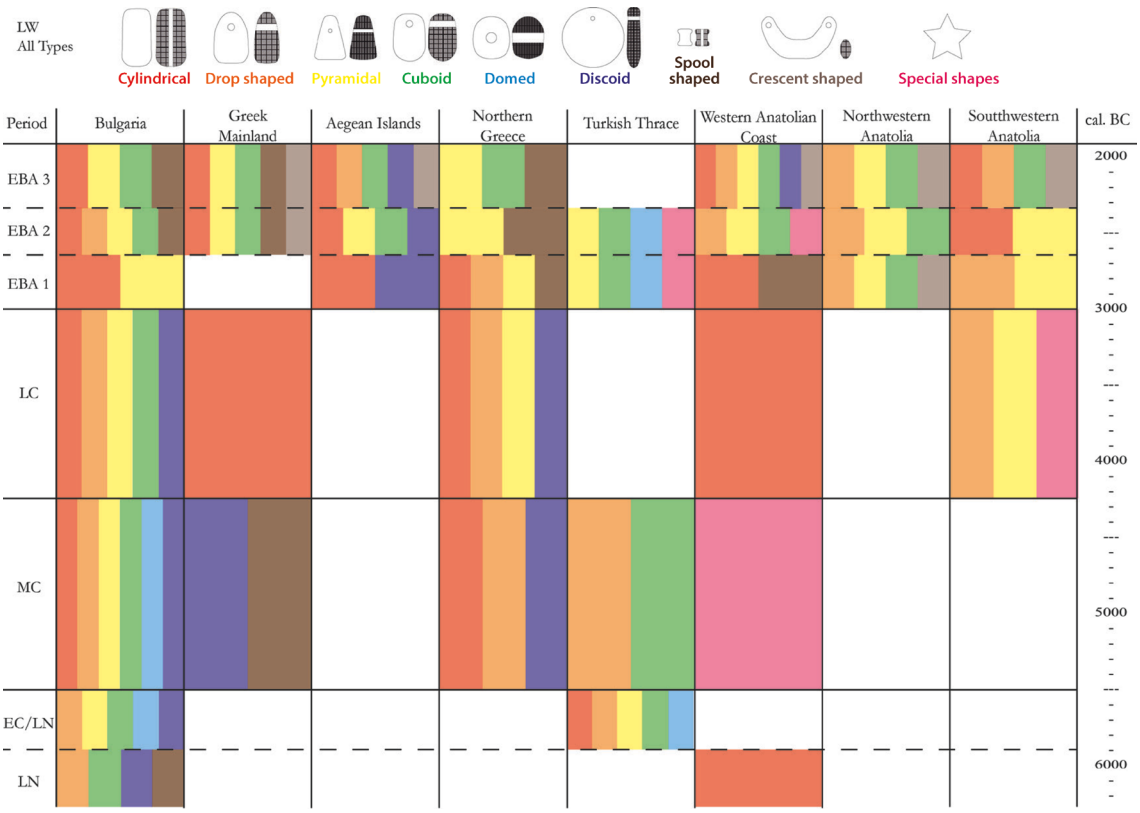

Fig. 29 Loom weight shapes occurrences by region (C. Britsch)

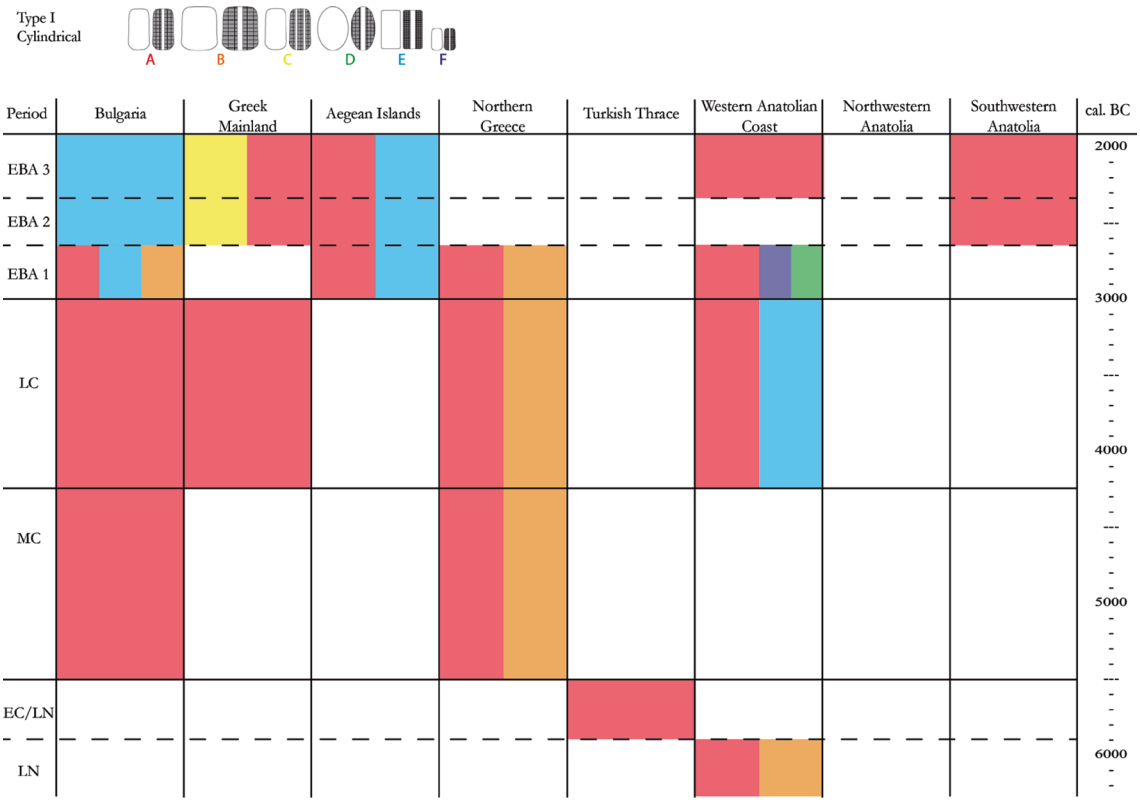

Fig. 30 Cylindrical loom weight type occurrences by region (C. Britsch)

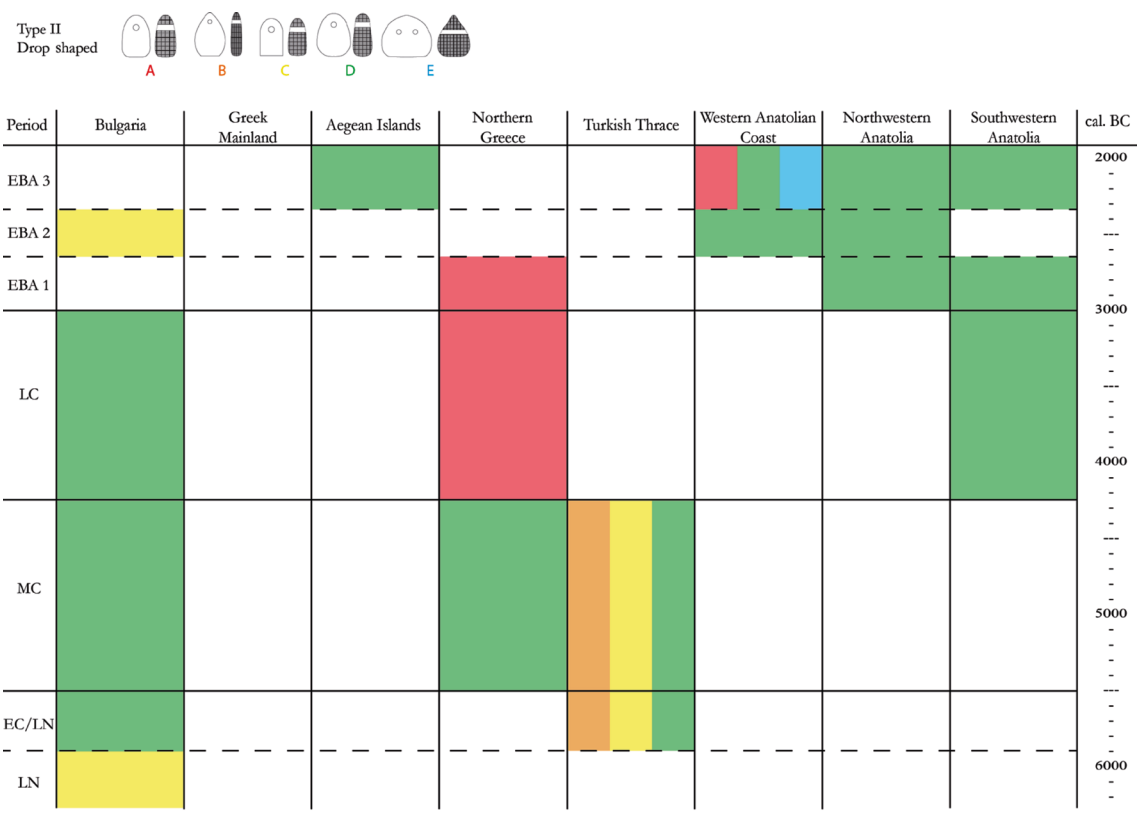

Fig. 31 Drop shaped loom weight type occurrences by region (C. Britsch)

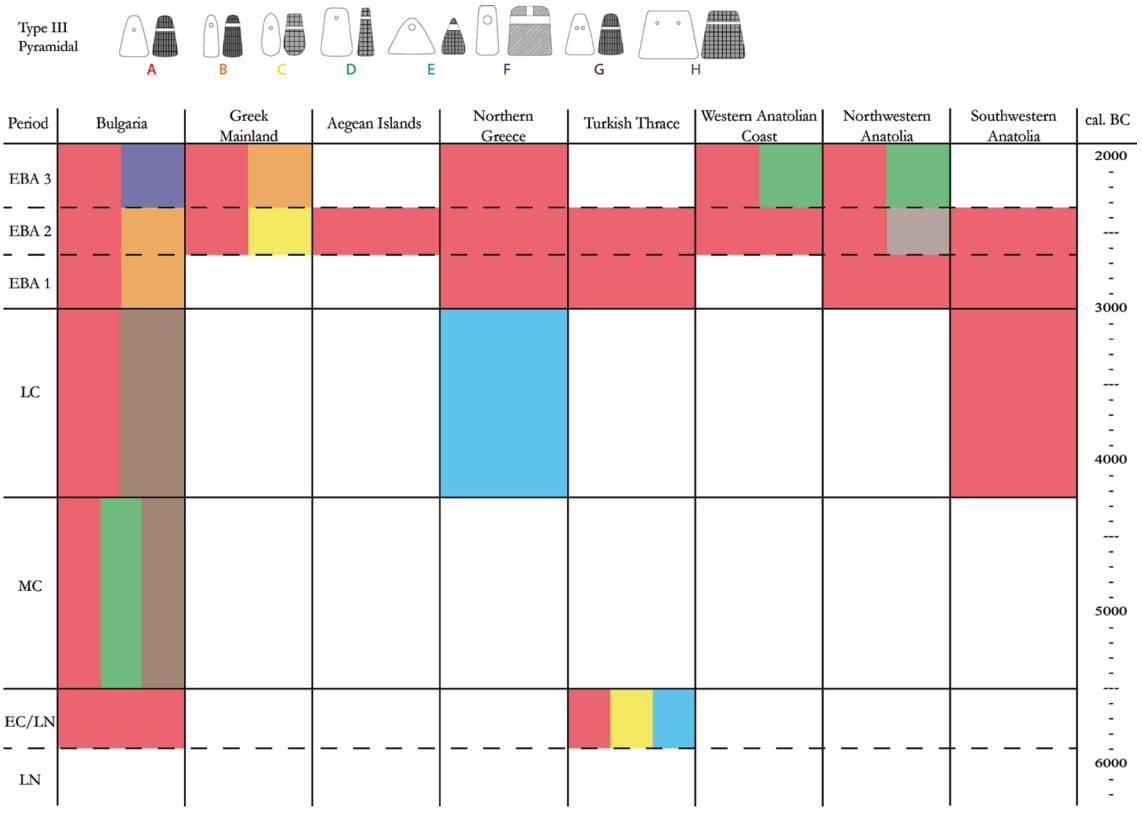

Fig. 32 Pyramidal loom weight type occurrences by region (C. Britsch)

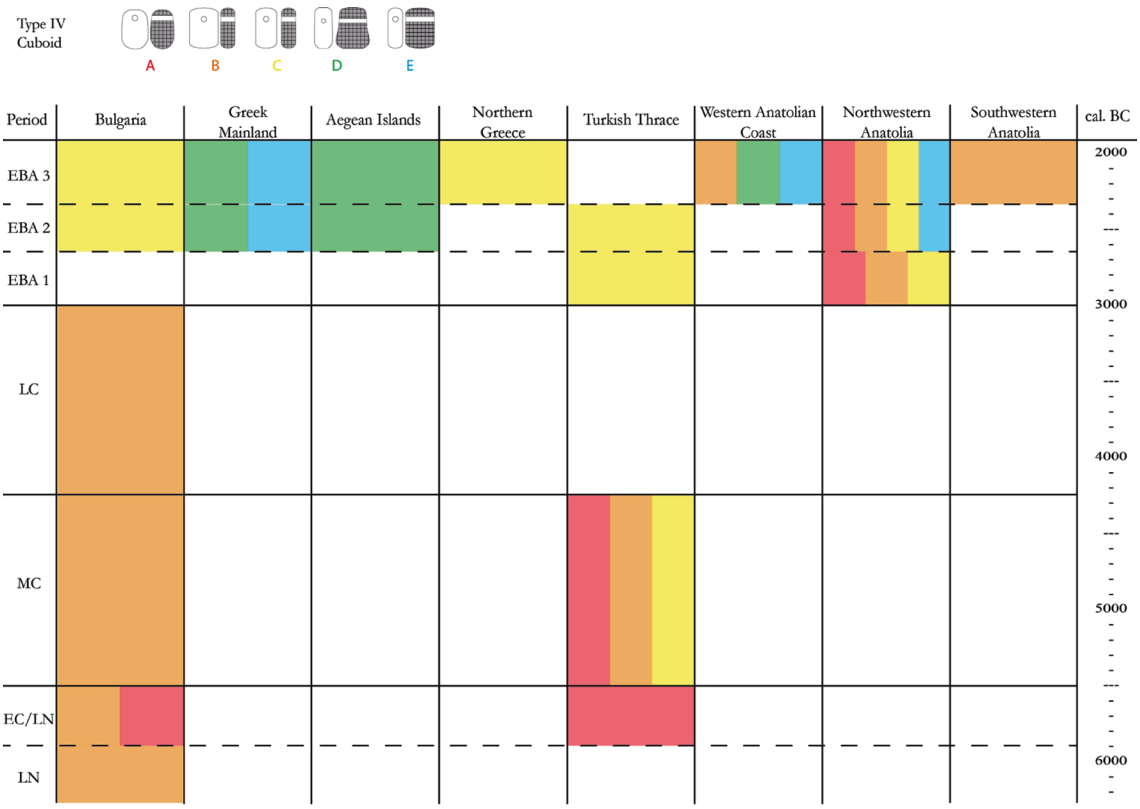

Fig. 33 Cuboid loom weight type occurrences by region (C. Britsch)



Fig. 34 Domed loom weight type occurrences by region (C. Britsch)



Fig. 35 Discoid loom weight type occurrences by region (C. Britsch)

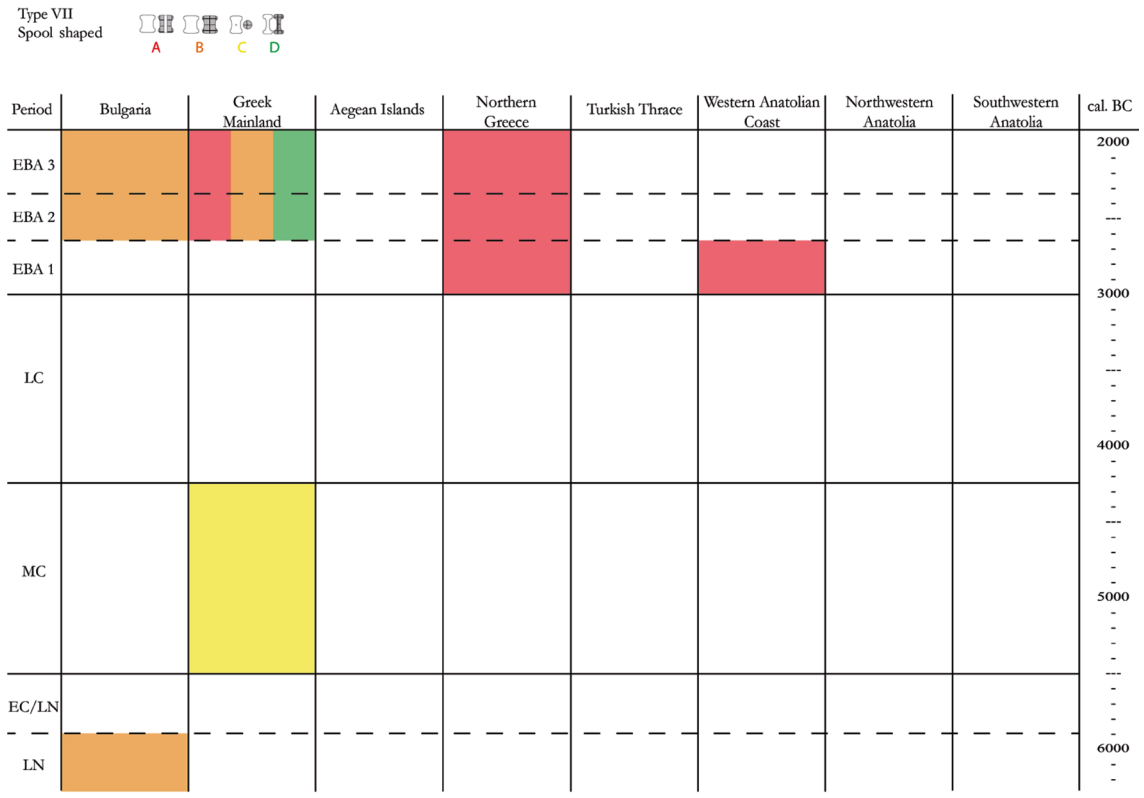

Fig. 36 Spool-shape loom weight type occurrences by region (C. Britsch)

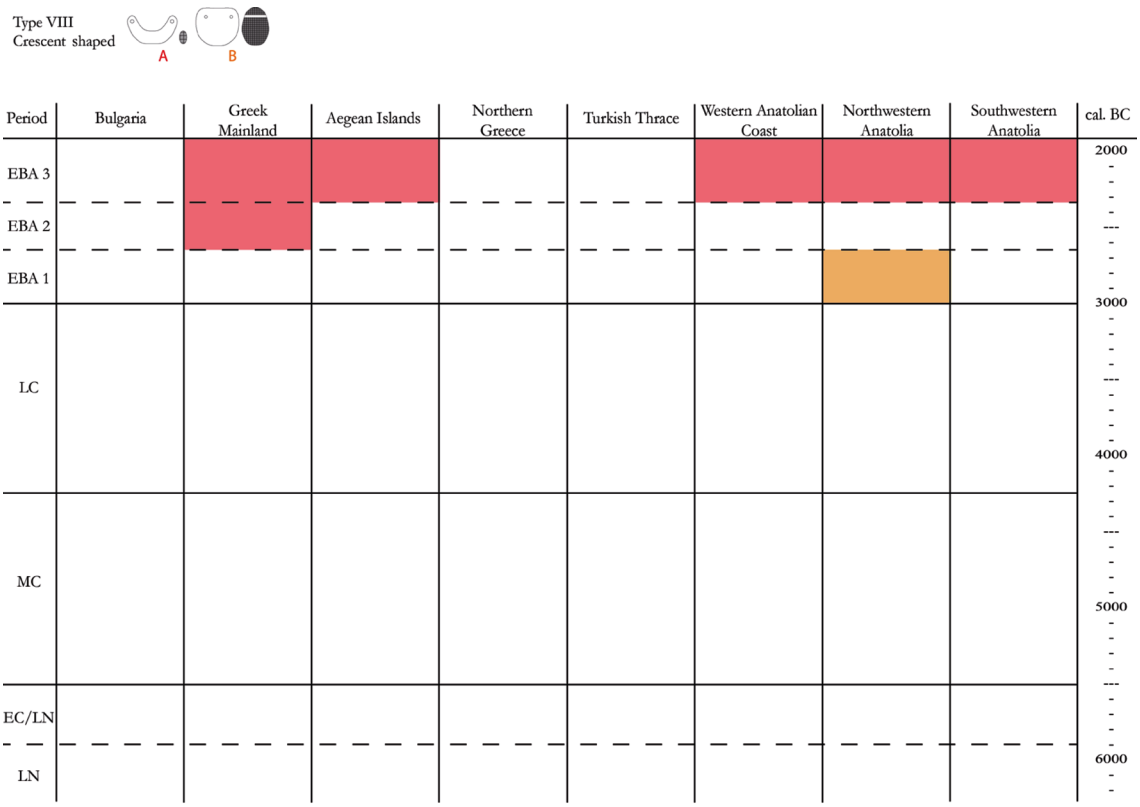

Fig. 37 Crescent-shape loom weight type occurrences by region (C. Britsch)

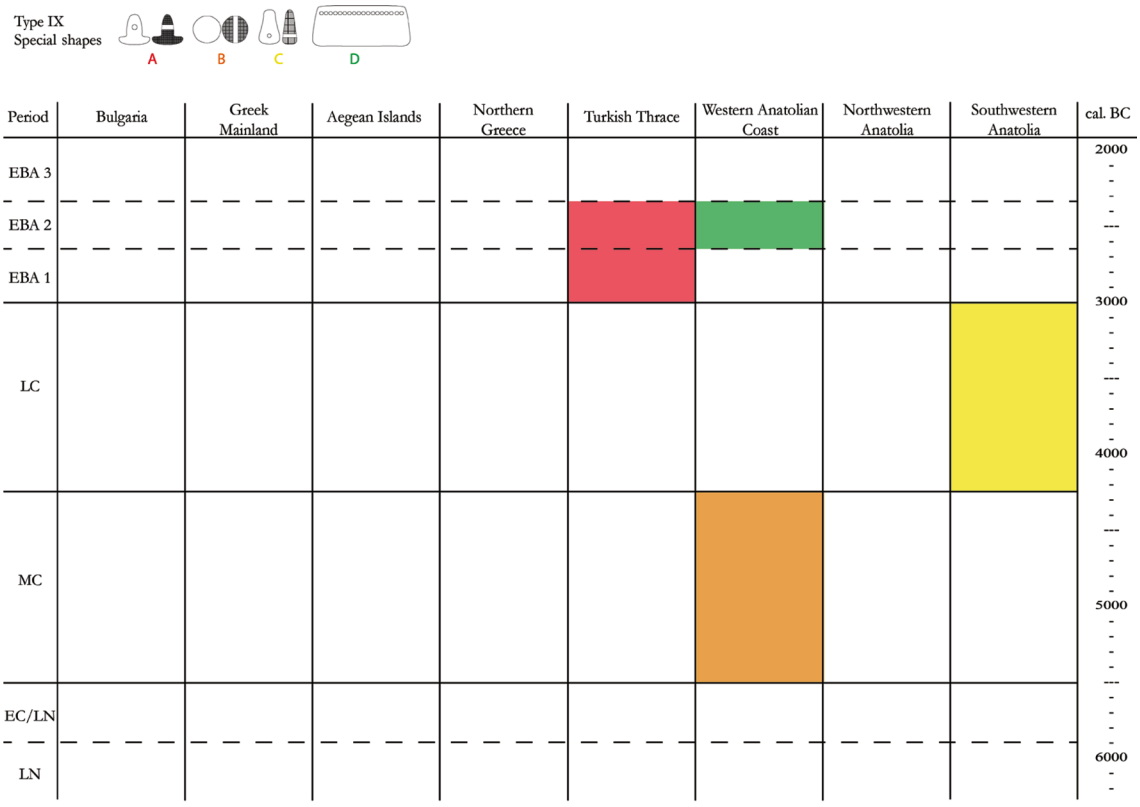

Fig. 38 Special shape loom weight type occurrences by region (C. Britsch)

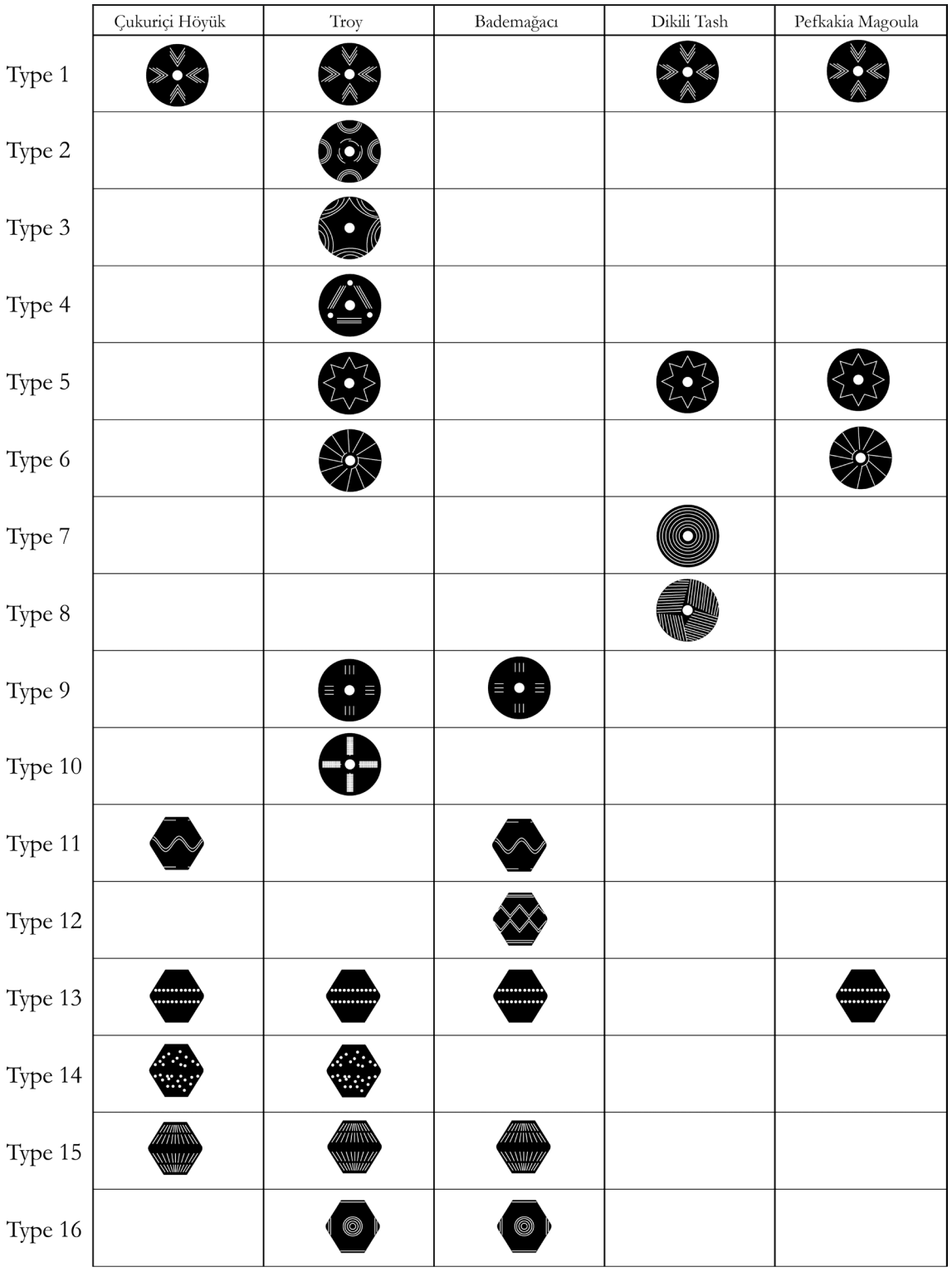

Fig. 39 Schematic display of spindle whorl decoration types appearing on more than one individual object (C. Britsch)

Another piece of information about the spindle whorls that has not been presented so far is whether they are decorated or not. From the 1091 spindle whorls, only 169 were decorated. These will be discussed in further detail in Subchapter VIII.1. Of these decorations, most are completely individual and cannot be condensed into groups in any way. Only 16 types of decorations seem to be repetitive. As presented in Figure 39, out of these 16 types, nine of them appear at several sites throughout the investigated regions. The significance of these distributions will also be discussed in Chapter VIII.

All other information of a descriptive nature for the textile tools of specific sites is given at the pertinent position in the catalogue (see Chapter XII).

VI.2. Statistical Analyses

With 1279 data sets from 31 different archaeological sites, observations drawn by eye would not only be prone to creating mistakes; the danger that any such observation would be tainted by subconscious expectations and one's structured mindset would be too strong. Therefore objective tools, in this case statistical calculations, were chosen for the analysis.

As explained in Subchapter IV.8, two statistical methods were chosen for analysis: a two-step cluster analysis and non-parametric analyses of variance (Mann-Whitney U and Kruskal-Wallis tests). The results will be presented in this subchapter and discussed in Chapter VIII. Before any statistical analysis was performed, extreme outliers of both spindle whorls and loom weights (meaning all values beyond three or more interquartile ranges (IQR)) were eliminated from the data. This left 1082 spindle whorls and 185 loom weights to analyse.

VI.2.1. Two-Step Cluster Analysis

The two-step cluster analysis was calculated on three different bases: (1) containing all artefacts, (2) containing only loom weights and (3) containing only spindle whorls. The variables included for each two-step cluster are displayed in Table 18. It has to be mentioned however, that in no case were all 1082 spindle whorls and 185 loom weights included in each cluster analysis. This is due to the fact that a cluster analysis can only include a data set if information on all the variables used is available. This means that if, for example, the moment of inertia of a spindle whorl was not available, it could not be included in the two-step cluster (3). The total number of data sets used in the different calculations are given in the respective captions.

Two-step cluster	**(1)**	**(2)**	**(3)**
Variables	Site	Site	Site
	Period	Period	Period
	Shape	Shape	Shape
	Weight	Weight	Weight
	Diameter	Diameter	Diameter
	Type		Moment of inertia

Tab. 18 Contained variables and components of two-step clusters (1), (2) and (3)

Two-step clusters (1) and (2) were not readily interpretable for different reasons. Two-step cluster (1) separated mainly by shape, period and site (Fig. 40) and with an importance of 0.86 also by type. However, all loom weights, independent of their geographical or chronological origin, were put into one cluster, thereby demonstrating that combining both artefact categories in one cluster cannot lead to combined clusters (Fig. 41). This means that it would most probably be better to calculate the two-step cluster analysis separately for the loom weights and spindle whorls.

Two-step cluster (2) separated mainly by site and secondly by period (Fig. 42). The main problem for this two-step cluster is that only two clusters were created (Fig. 43). Moreover, the two clusters that were created share many similarities, which most certainly demonstrates the difficulty of the analysis in creating clusters in the first place. The necessary steps for discussing the clusters – judging, labelling and interpreting – therefore seem impossible. Since the typology (see Subchapter IV.9), as well as the descriptive analyses in Subchapter VI.1, however, clearly show distinguishable developments, it has to be assumed that the problem derived from insufficient data. Two-step cluster (2) therefore has to be dismissed.

The final two-step cluster (3), however, produced interesting results. The clusters were mainly separated by period and site (Fig. 44), which created four clusters (Fig. 45). Figure 46 shows the main attributes of each cluster for the respective variables. The percentage of the main components for the categorical variables within their respective cluster is given in Table 19.

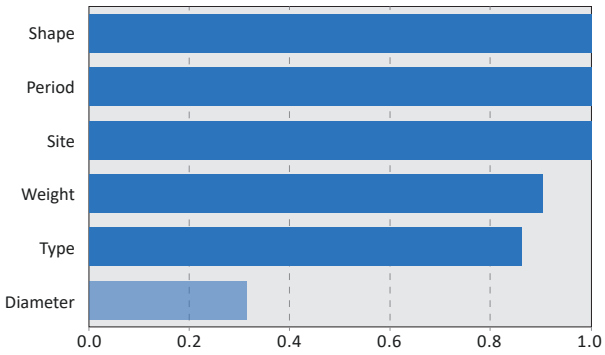

Fig. 40 Predictor importance for the two-step cluster (1) [N = 1237; $N_{Loom\ weights}$ = 156, $N_{Spindle\ whorls}$ = 1081] (C. Britsch)

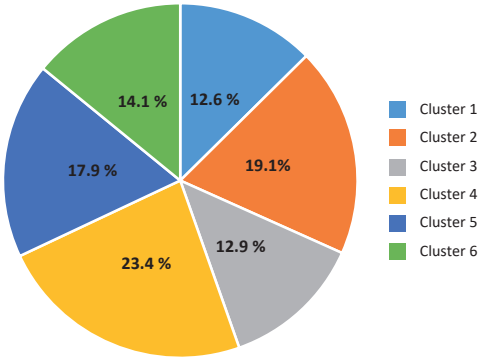

Fig. 41 Cluster sizes of the two-step cluster (1) [N = 1237; $N_{Loom\ weights}$ = 156, $N_{Spindle\ whorls}$ = 1081] (C. Britsch)

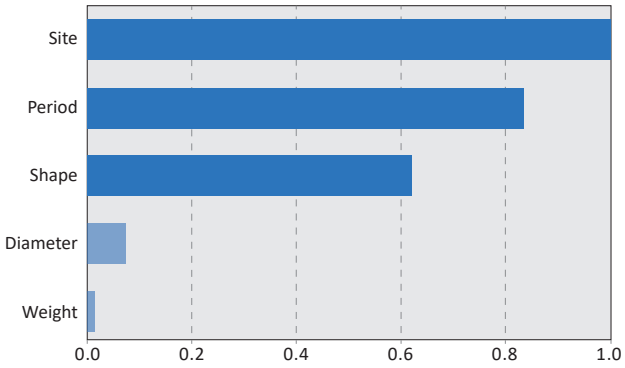

Fig. 42 Predictor importance for the two-step cluster (2) [N = 156] (C. Britsch)

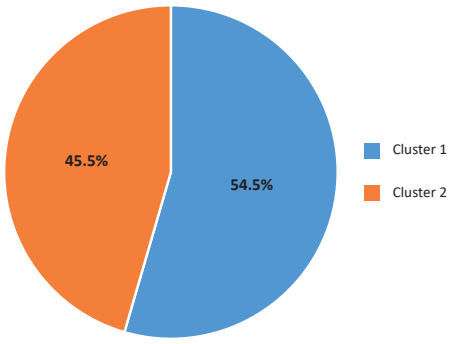

Fig. 43 Cluster sizes of the two-step cluster (2) [N = 156] (C. Britsch)

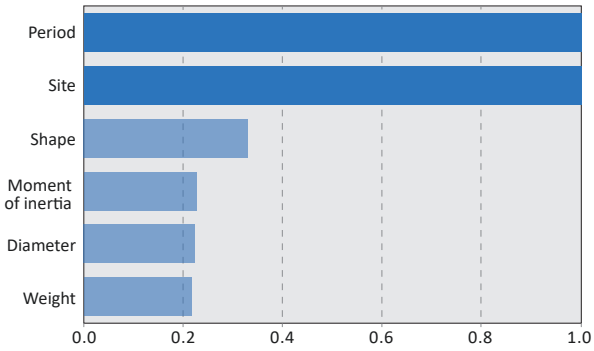

Fig. 44 Predictor importance for the two-step cluster (3) [N = 939] (C. Britsch)

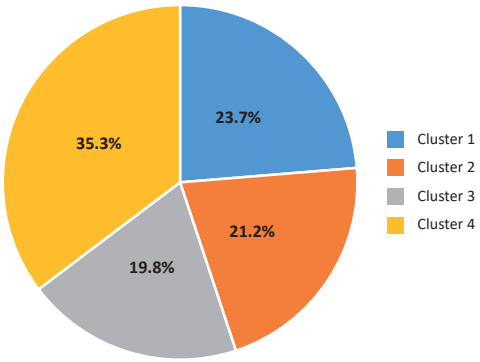

Fig. 45 Cluster sizes of the two-step cluster (3) [N = 939] (C. Britsch)

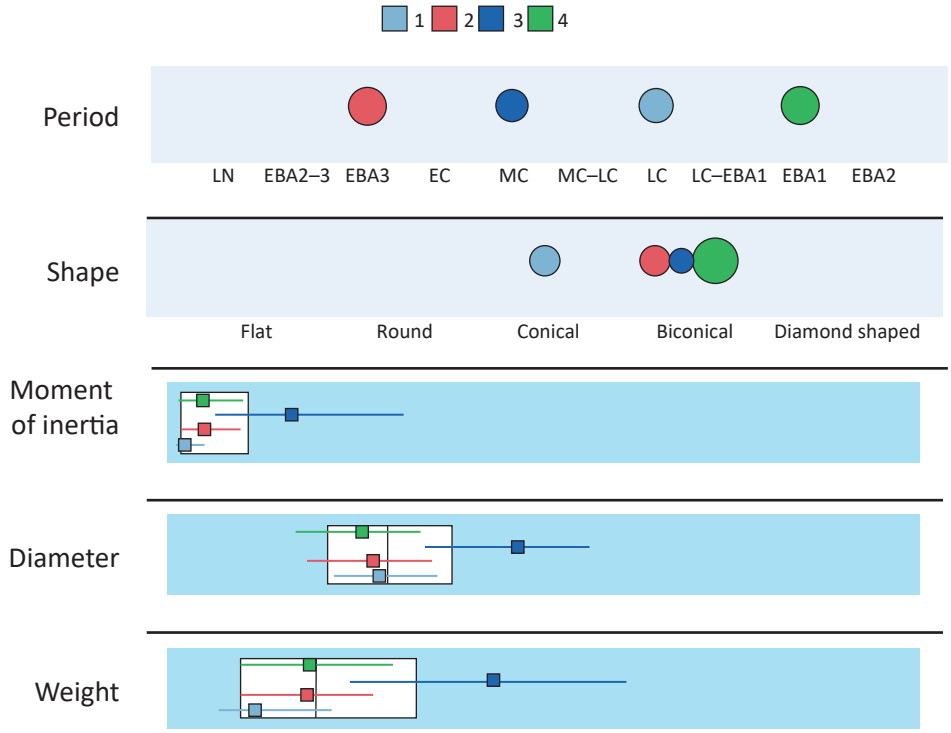

Fig. 46 Cluster comparison for the two-step cluster (3); markings show the strongest represented factor of each variable within the clusters [N = 939] (C. Britsch)

	Period	% in cluster	Site	% in cluster	Shape	% in cluster
Cluster 1	LC	98.6	Pefkakia Magoula	90.6	Flat	40.7
	EBA 2–3	73.0	Platia Magoula Zarkou	89.7	Conical	53.3
			Aphrodisias	100		
			Ayio Gala	66.7		
			Hacılar Höyük	60.0		
			Hanay Tepe	100		
			Kumtepe	100		
			Kurucay Höyük	50.0		
Cluster 2	EBA 3	100	Troy	89.1	Diamond shaped	81.4
			Heraion	100		
			Kanlıgeçit	64.7		
Cluster 3	EC	100	Dikili Tash	100		
	MC	100	Dubene-Sarovka	78.3		
			Nova Nadezhda	100		
			Tell Golyamo Delchevo	100		
			Tell Lipnik	100		
			Tell Sava	100		
			Varna	100		
			Emporio	55.6		
			Aşağı Pınar	100		
Cluster 4	LN	76.9	Çukuriçi Höyük	96.9	Round	76.7
	EBA 1	77.1	Bademağacı	100	Biconical	53.8
	EBA 2	96.9	Beycesultan	64.8		
			Çine Tepecik	100		
			Demircihüyük	78.6		
			Karataş	55.6		
			Ilıpınar	75.0		
			Kaklık Mevkii	100		
			Karaoğlan Mevkii	100		
			Markiani	75.0		

Tab. 19 Main components of the clusters in two-step cluster (3); "% in cluster" represents the percentage of the total of the respective data present in the database [N=939]

VI.2.2. Non-parametric Tests of Variance

Three non-parametric analyses of variance were calculated separately for each period with the weight (1) of loom weights as well as the weight (2) and moment of inertia (3) of spindle whorls as dependent and sites as independent variables. One exception for both loom weights and spindle whorls was the Early Chalcolithic, for which only finds from one site (Aşağı Pınar) are available in the database, rendering the analysis useless in this case. As described in Subchapter IV.8, if only two sites were available, a Mann-Whitney U test was performed; if more than two were available, a Kruskal-Wallis test was conducted. In the case of a significant result ($p \leq 0.05$) for the Kruskal-Wallis test, a post-hoc test with Bonferroni corrections was performed.

Dependent variable = weight(loom weights) and independent variable = sites

A non-parametric analysis of variance for the weight of loom weights could not be conducted separately for EBA 2, since only data from one site (Bademağacı) was available, only for the time frame EBA 2–3 was a significant result obtained (Tab. 20). However, the post-hoc tests with Bonferroni correction displayed no significant result between the different sites. The significant result of the Kruskal-Wallis test therefore has to be dismissed.

For the weight of loom weights the null hypothesis therefore has to be retained for all periods.

Period	N (sites)	Test used	N (loom weights)	p
Late Neolithic	2	Mann-Whitney U	8	1.000
Middle Chalcolithic	5	Kruskal-Wallis	24	0.079
Late Chalcolithic	2	Mann-Whitney U	4	1.000
Early Bronze Age 1	2	Mann-Whitney U	28	0.071
Early Bronze Age 2–3	4	Kruskal-Wallis	78	0.050
Early Bronze Age 3	2	Mann-Whitney U	36	0.384

Tab. 20 Details and results of analyses of variance with dependent variable = weight(loom weights) and independent variable = sites

Dependent variable = weight(spindle whorls) and independent variable = sites

The non-parametric tests for the weight of spindle whorls displayed significant results for all periods except for the Late Neolithic and EBA 3 (Tab. 21). In reference to Cluster 4 of the two-step cluster analysis (3) in Subchapter VI.2.1 (see Tab. 19), an additional test was performed for EBA 1–2. For the Middle Chalcolithic, however, the post-hoc test showed no significant result between the different sites. The significant result of the Kruskal-Wallis test therefore has to be dismissed.

For the weight of Late Neolithic, Middle Chalcolithic and EBA 3 spindle whorls, the null hypothesis therefore has to be retained.

Period	N (sites)	Test used	N (spindle whorls)	p
Late Neolithic	2	Mann-Whitney U	13	0.692
Middle Chalcolithic	9	Kruskal-Wallis	149	0.000
Late Chalcolithic	10	Kruskal-Wallis	143	0.000
Early Bronze Age 1	18	Kruskal-Wallis	268	0.000
Early Bronze Age 1–2	20	Kruskal-Wallis	457	0.000
Early Bronze Age 2	10	Kruskal-Wallis	189	0.000
Early Bronze Age 2–3	13	Kruskal-Wallis	490	0.000
Early Bronze Age 3	7	Kruskal-Wallis	202	0.548

Tab. 21 Details and results of analyses of variance with dependent variable = weight(spindle whorls) and independent variable = sites

The results of the post-hoc test for the Late Chalcolithic with significance values (p) are shown in Table 22. Since the post-hoc tests yield information about which sites differ significantly from each other, the results allow the construction of homogenous subgroups.

The homogenous subgroups are displayed in Table 23 and Figure 47.

Site (a)	Site (b)	p
Beycesultan	Aphrodisias	0.008
	Kumtepe	0.012
Karataş	Aphrodisias	0.002
	Kumtepe	0.018
Pefkakia Magoula	Aphrodisias	0.000
	Kumtepe	0.036

Tab. 22 Significant results of post-hoc tests on weight for Late Chalcolithic spindle whorls

Homogenous Subgroup 1	Homogenous Subgroup 2
Beycesultan	
Karataş	
Pefkakia Magoula	
Çukuriçi Höyük	Çukuriçi Höyük
Kuruçay Höyük	Kuruçay Höyük
Ayio Gala	Ayio Gala
Hanay Tepe	Hanay Tepe
Dikili Tash	Dikili Tash
	Aphrodisias
	Kumtepe

Tab. 23 Homogenous subgroups created following the results of the post-hoc analyses for the Late Chalcolithic



Fig. 47 Projection of the homogenous subgroups for Late Chalcolithic spindle whorls (after the Kruskal-Wallis test on the weight) (ERC Prehistoric Anatolia/C. Britsch)

The results of the post-hoc tests for Early Bronze Age 1 with significance values (p) are shown in Table 24. The analyses allowed the construction of homogenous subgroups (Tab. 25 and Fig. 48).

Site (a)	Site (b)	p
Ilıpınar	Dubene-Sarovka	0.018
Kaklık Mevkii	Çukuriçi Höyük	0.018
	Emporio	0.026
	Dubene-Sarovka	0.000
Demircihöyük	Çukuriçi Höyük	0.000
	Emporio	0.005
	Dubene-Sarovka	0.000
Beycesultan	Dubene-Sarovka	0.024
Troy	Dubene-Sarovka	0.013
Bademağacı	Dubene-Sarovka	0.005

Tab. 24 Significant results of post-hoc tests on weight for EBA 1 spindle whorls

Homogenous Subgroup 1	Homogenous Subgroup 2	Homogenous Subgroup 3
Demircihüyük		
Kaklık Mevkii		
Ilıpınar	Ilıpınar	
Bademağacı	Bademağacı	
Beycesultan	Beycesultan	
Troy	Troy	
Dikili Tash	Dikili Tash	Dikili Tash
Pefkakia Magoula	Pefkakia Magoula	Pefkakia Magoula
Çine Tepecik	Çine Tepecik	Çine Tepecik
Karataş	Karataş	Karataş
Hacılar Höyük	Hacılar Höyük	Hacılar Höyük
Kuruçay Höyük	Kuruçay Höyük	Kuruçay Höyük
Markiani	Markiani	Markiani
Kanlıgeçit	Kanlıgeçit	Kanlıgeçit
Dhaskalio	Dhaskalio	Dhaskalio
	Emporio	Emporio
	Çukuriçi Höyük	Çukuriçi Höyük
		Dubene-Sarovka

Tab. 25 Homogenous subgroups created following the results of the post-hoc analyses for EBA 1



Fig. 48 Projection of the homogenous subgroups for EBA 1 spindle whorls (after the Kruskal-Wallis test on the weight) (ERC Prehistoric Anatolia/C. Britsch)

The results of the post-hoc test for Early Bronze Age 1–2 with significance values (p) are shown in Table 26. The analysis allowed the construction of homogenous subgroups (Tab. 27 and Fig. 49).

Site (a)	Site (b)	p
Ilıpınar	Dubene-Sarovka	0.010
Kaklık Mevkii	Çukuriçi Höyük	0.006
	Emporio	0.013
	Dubene-Sarovka	0.000
Demircihüyük	Bademağacı	0.000
	Beycesultan	0.001
	Markiani	0.005
	Çukuriçi Höyük	0.000
	Emporio	0.001
	Dubene-Sarovka	0.000
Troy	Çukuriçi Höyük	0.000
	Emporio	0.013
	Dubene-Sarovka	0.000
Karataş	Dubene-Sarovka	0.017
Bademağacı	Dubene-Sarovka	0.000

Tab. 26 Significant results of post-hoc tests on weight for EBA 1–2 spindle whorls

Homogenous Subgroup 1	Homogenous Subgroup 2	Homogenous Subgroup 3	Homogenous Subgroup 4
Demircihüyük			
Troy	Troy		
Kaklık Mevkii	Kaklık Mevkii		
Ilıpınar	Ilıpınar	Ilıpınar	
Karataş	Karataş	Karataş	
Dikili Tash	Dikili Tash	Dikili Tash	Dikili Tash
Nova Nadezhda	Nova Nadezhda	Nova Nadezhda	Nova Nadezhda
Pefkakia Magoula	Pefkakia Magoula	Pefkakia Magoula	Pefkakia Magoula
Çine Tepecik	Çine Tepecik	Çine Tepecik	Çine Tepecik
Dhaskalio	Dhaskalio	Dhaskalio	Dhaskalio
Hacılar Höyük	Hacılar Höyük	Hacılar Höyük	Hacılar Höyük
Karaoğlan Mevkii	Karaoğlan Mevkii	Karaoğlan Mevkii	Karaoğlan Mevkii
Kuruçay Höyük	Kuruçay Höyük	Kuruçay Höyük	Kuruçay Höyük
Kanlıgeçit	Kanlıgeçit	Kanlıgeçit	Kanlıgeçit
	Beycesultan	Beycesultan	
	Markiani	Markiani	Markiani
	Bademağacı	Bademağacı	Bademağacı
		Çukuriçi Höyük	Çukuriçi Höyük
		Emporio	Emporio
			Dubene-Sarovka

Tab. 27 Homogenous subgroups created following the results of the post-hoc analyses for EBA 1–2



Fig. 49 Projection of the homogenous subgroups for EBA 1–2 spindle whorls (after the Kruskal-Wallis test on the weight) (ERC Prehistoric Anatolia/C. Britsch)

The results of the post-hoc test for Early Bronze Age 2 with significance values (p) are shown in Table 28. The analysis allowed the construction of homogenous subgroups (Tab. 29 and Fig. 50).

Site (a)	Site (b)	p
Troy	Bademağacı	0.007
	Beycesultan	0.000
	Nova Nadezhda	0.040
Demircihüyük	Bademağacı	0.011
	Beycesultan	0.001

Tab. 28 Significant results of post-hoc tests on weight for EBA 2 spindle whorls

Homogenous Subgroup 1	Homogenous Subgroup 2	Homogenous Subgroup 3
Troy		
Demircihüyük	Demircihüyük	
Pefkakia Magoula	Pefkakia Magoula	Pefkakia Magoula
Karataş	Karataş	Karataş
Karaoğlan	Karaoğlan	Karaoğlan
Markiani	Markiani	Markiani
Kanlıgeçit	Kanlıgeçit	Kanlıgeçit
	Nova Nadezhda	Nova Nadezhda
		Bademağacı
		Beycesultan

Tab. 29 Homogenous subgroups created following the results of the post-hoc analyses for EBA 2



Fig. 50 Projection of the homogenous subgroups for EBA 2 spindle whorls (after the Kruskal-Wallis test on the weight) (ERC Prehistoric Anatolia/C. Britsch)

The results of the post-hoc test for Early Bronze Age 2–3 with significance values (p) are shown in Table 30. The analysis allowed the construction of homogenous subgroups (Tab. 31 and Fig. 51).

Site (a)	Site (b)	p
Demircihüyük	Bademagaci	0.024
	Pefkakia Magoula	0.005
	Beycesultan	0.002
	Platia Magoula Zarkou	0.000

Tab. 30 Significant results of post-hoc tests on weight for EBA 2 spindle whorls

Homogenous Subgroup 1	Homogenous Subgroup 2
Demircihüyük	
Nova Nadezhda	Nova Nadezhda
Troy	Troy
Dhaskalio	Dhaskalio
Karataş	Karataş
Heraion	Heraion
Karaoğlan Mevkii	Karaoğlan Mevkii
Markiani	Markiani
Kanlıgeçit	Kanlıgeçit
	Bademağacı
	Pefkakia Magoula
	Beycesultan
	Platia Magoula Zarkou

Tab. 31 Homogenous subgroups created following the results of the post-hoc analyses for EBA 2

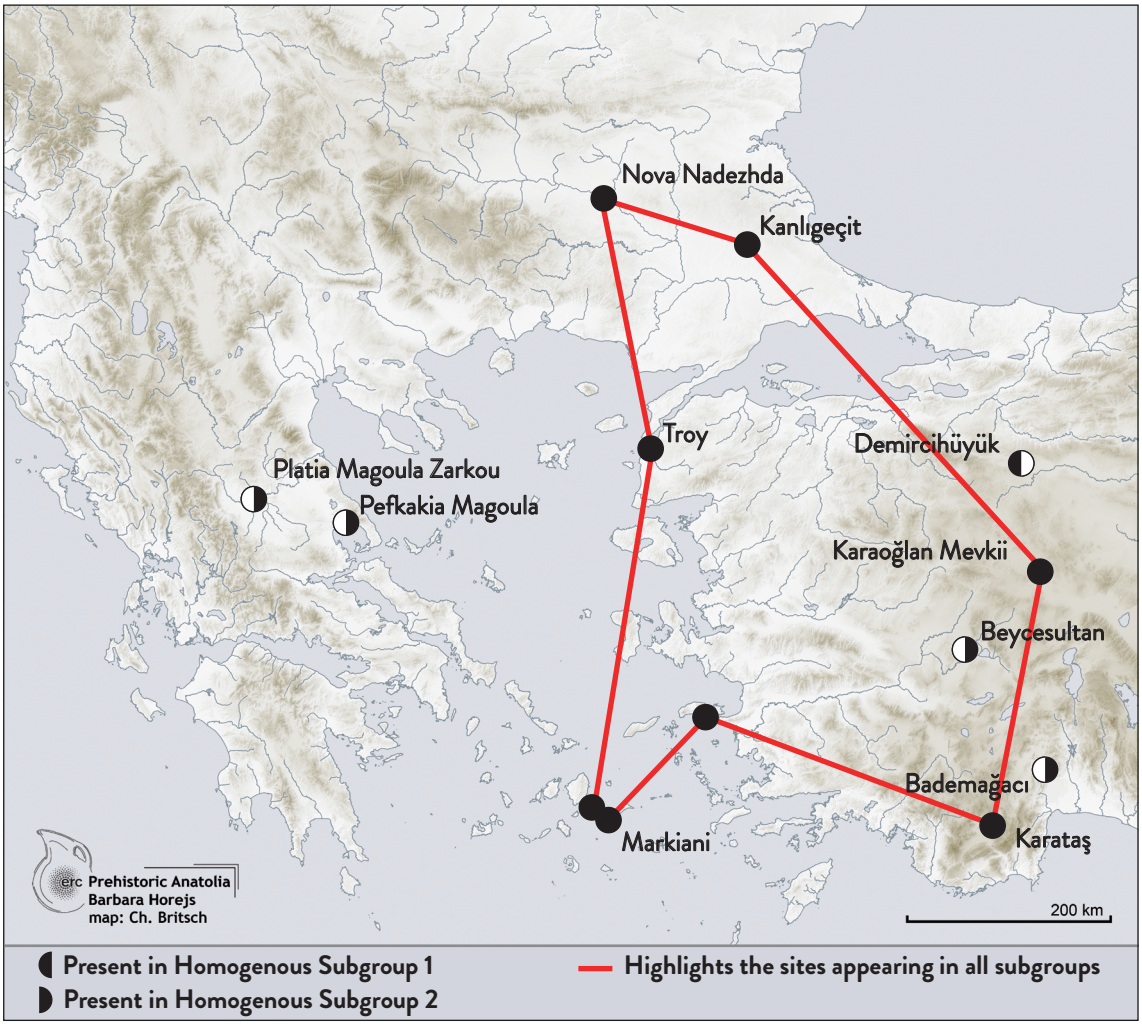

Fig. 51 Projection of the homogenous subgroups for EBA 2–3 spindle whorls (after the Kruskal-Wallis test on the weight) (ERC Prehistoric Anatolia/C. Britsch)

Dependent variable = moment of inertia(spindle whorls) and independent variable = sites

The non-parametric tests for the moment of inertia of spindle whorls displayed significant results for all periods except for the Late Neolithic, EBA 2–3 and EBA 3 (Tab. 32). In reference to Cluster 4 of the two-step cluster analysis (3) in Subchapter VI.2.1 (see Tab. 19), an additional test was performed for EBA 1–2. For the Middle Chalcolithic and EBA 2, however, the post-hoc test showed no significant result between the different sites. The significant result of the Kruskal-Wallis test therefore has to be dismissed.

For the moment of inertia of Late Neolithic, Middle Chalcolithic, EBA 2, EBA 2–3 and EBA 3 spindle whorls, the null hypothesis therefore has to be retained.

Period	N (sites)	Test used	N (spindle whorls)	p
Late Neolithic	2	Mann-Whitney U	13	0.112
Middle Chalcolithic	9	Kruskal-Wallis	129	0.002
Late Chalcolithic	10	Kruskal-Wallis	139	0.000
Early Bronze Age 1	17	Kruskal-Wallis	214	0.000
Early Bronze Age 1–2	19	Kruskal-Wallis	375	0.000
Early Bronze Age 2	10	Kruskal-Wallis	161	0.006
Early Bronze Age 2–3	12	Kruskal-Wallis	426	0.084
Early Bronze Age 3	6	Kruskal-Wallis	176	0.854

Tab. 32 Details and results of analyses of variance with dependent variable = moment of inertia (spindle whorls) and independent variable = sites

The results of the post-hoc test for the Late Chalcolithic with significance values (p) are shown in Table 33. The analysis allowed the construction of homogenous subgroups (Tab. 34 and Fig. 52).

Site (a)	Site (b)	p
Karataş	Aphrodisias	0.003
	Kumtepe	0.011
Pefkakia Magoula	Aphrodisias	0.001
	Kumtepe	0.032

Tab. 33 Significant results of post-hoc tests on the moment of inertia for Late Chalcolithic spindle whorls

Homogenous Subgroup 1	Homogenous Subgroup 2
Pefkakia Magoula	
Karataş	
Çukuriçi Höyük	Çukuriçi Höyük
Kuruçay Höyük	Kuruçay Höyük
Ayio Gala	Ayio Gala
Hanay Tepe	Hanay Tepe
Dikili Tash	Dikili Tash
Beycesultan	Beycesultan
	Kumtepe
	Aphrodisias

Tab. 34 Homogenous subgroups created following the results of the post-hoc analyses for the Late Chalcolithic



Fig. 52 Projection of the homogenous subgroups for Late Chalcolithic spindle whorls (after the Kruskal-Wallis test on the moment of inertia) (ERC Prehistoric Anatolia/C. Britsch)

The results of the post-hoc test for the Early Bronze Age 1 with significance values (p) are shown in Table 35. The analysis allowed the construction of homogenous subgroups (Tab. 36 and Fig. 53).

Site (a)	Site (b)	p
Ilıpınar	Dubene-Sarovka	0.004
Kaklık Mevkii	Emporio	0.012
	Dubene-Sarovka	0.000
Demircihüyük	Dubene-Sarovka	0.000
Beycesultan	Dubene-Sarovka	0.012
Bademağacı	Dubene-Sarovka	0.004
Çukuriçi Höyük	Dubene-Sarovka	0.003

Tab. 35 Significant results of post-hoc tests on the moment of inertia for EBA 1 spindle whorls

Homogenous Subgroup 1	Homogenous Subgroup 2	Homogenous Subgroup 3
Kaklık Mevkii		
Ilıpınar	Ilıpınar	
Demircihüyük	Demircihüyük	
Bademağacı	Bademağacı	
Beycesultan	Beycesultan	
Çukuriçi Höyük	Çukuriçi Höyük	
Troy	Troy	Troy
Dikili Tash	Dikili Tash	Dikili Tash
Pefkakia Magoula	Pefkakia Magoula	Pefkakia Magoula
Çine Tepecik	Çine Tepecik	Çine Tepecik
Karataş	Karataş	Karataş
Hacılar Höyük	Hacılar Höyük	Hacılar Höyük
Kuruçay Höyük	Kuruçay Höyük	Kurucay Höyük
Markiani	Markiani	Markiani
Kanlıgeçit	Kanlıgeçit	Kanlıgeçit
	Emporio	Emporio
		Dubene-Sarovka

Tab. 36 Homogenous subgroups created following the results of the post-hoc analyses for EBA 1

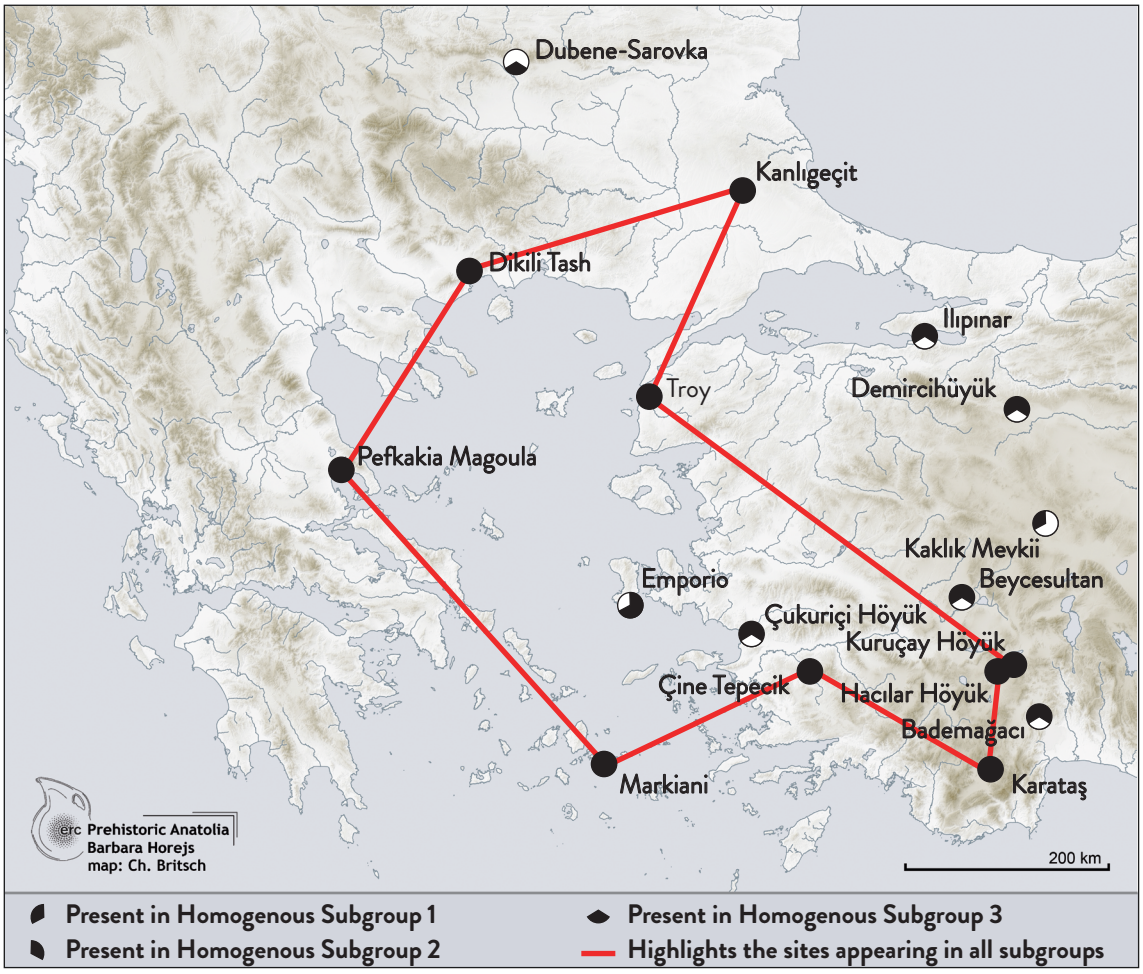

Fig. 53 Projection of the homogenous subgroups for EBA 1 spindle whorls (after the Kruskal-Wallis test on the moment of inertia) (ERC Prehistoric Anatolia/C. Britsch)

The results of the post-hoc test for Early Bronze Age 1–2 with significance values (p) are shown in Table 37. The analysis allowed the construction of homogenous subgroups (Tab. 38 and Fig. 54).

Site (a)	Site (b)	p
Ilıpınar	Dubene-Sarovka	0.002
Kaklık Mevkii	Emporio	0.036
	Çukuriçi Höyük	0.005
	Dubene-Sarovka	0.000
Demircihüyük	Emporio	0.012
	Dubene-Sarovka	0.000
Troy	Dubene-Sarovka	0.000
Karataş	Dubene-Sarovka	0.003
Bademağacı	Dubene-Sarovka	0.000
Çukuriçi Höyük	Dubene-Sarovka	0.003

Tab. 37 Significant results of post-hoc tests on the moment of inertia for EBA 1–2 spindle whorls

Homogenous Subgroup 1	Homogenous Subgroup 2	Homogenous Subgroup 3	Homogenous Subgroup 4
Kaklık Mevkii			
Demircihüyük	Demircihüyük		
Troy	Troy	Troy	
Karataş	Karataş	Karataş	
Bademağacı	Bademağacı	Bademağacı	
Ilıpınar	Ilıpınar	Ilıpınar	
Dikili Tash	Dikili Tash	Dikili Tash	Dikili Tash
Nova Nadezhda	Nova Nadezhda	Nova Nadezhda	Nova Nadezhda
Pefkakia Magoula	Pefkakia Magoula	Pefkakia Magoula	Pefkakia Magoula
Çine Tepecik	Çine Tepecik	Çine Tepecik	Çine Tepecik
Hacılar Höyük	Hacılar Höyük	Hacılar Höyük	Hacılar Höyük
Karaoğlan Mevkii	Karaoğlan Mevkii	Karaoğlan Mevkii	Karaoğlan Mevkii
Kuruçay Höyük	Kuruçay Höyük	Kuruçay Höyük	Kuruçay Höyük
Kanlıgeçit	Kanlıgeçit	Kanlıgeçit	Kanlıgeçit
Beycesultan	Beycesultan	Beycesultan	Beycesultan
Markiani	Markiani	Markiani	Markiani
	Çukuriçi Höyük	Çukuriçi Höyük	
		Emporio	Emporio
			Dubene-Sarovka

Tab. 38 Homogenous subgroups created following the results of the post-hoc analyses for EBA 1–2



Fig. 54 Projection of the homogenous subgroups for EBA 1–2 spindle whorls (after the Kruskal-Wallis test on the moment of inertia) (ERC Prehistoric Anatolia/C. Britsch)

VII. Case Study – Çukuriçi Höyük

In the introduction it was mentioned that the current study is built upon the analysis of the material from Çukuriçi Höyük. Unlike the main data set of the study, a lot more detailed information was available for the finds from Çukuriçi Höyük for the current analyses. This included information on other archaeological fields, for example pottery, lithics, architecture, zoology or botany, but also, most importantly, three-dimensional measurements of the tools within the settlement. The case study thus allows a more in-depth evaluation of textile tools, especially regarding their spatial distribution, as well as the social and economic standing of textile production within the society. The main part of the study relies on large-scale statistical analyses, for which data has to be unified to its smallest denominator. Consequently, it would not have been possible to include such strong details of one particular site into the discussion of all data. However, the simple neglect of well-documented and structured data was seen as too great a loss for the current study. It was therefore deemed as the best solution to detach the 'in-depth' analyses of Çukuriçi Höyük from the main discussion. This does not mean that the Çukuriçi Höyük textile tools are excluded from the main statistical analyses. Comparable categorical and interval-scaled data from the finds are still included in those statistics. However, the results of the more detailed aspects (e.g. individual settlement layers, intra-site spatial distributions) are presented and discussed in the current chapter. This chapter iterates a vital point, not only because it is the foundation for the whole study but, furthermore, because it demonstrates how much insight can be gained on technological, as well as social and cultural aspects of textile production, if sufficient information is available.



Fig. 55 Panoramic view of Çukuriçi Höyük tell settlement in the vicinity of Ephesos near the modern city of Selçuk (OeAW-OeAI/N. Gail)



Fig. 56 Situation of Çukuriçi Höyük amid modern plantations (OeAW-OeAI/N. Gail)



Fig. 57 Aerial view of excavation trenches including Neolithic (left) and Late Chalcolithic/Early Bronze Age (right) settlement structures of Çukuriçi Höyük (OeAW-OeAI/N. Gail)

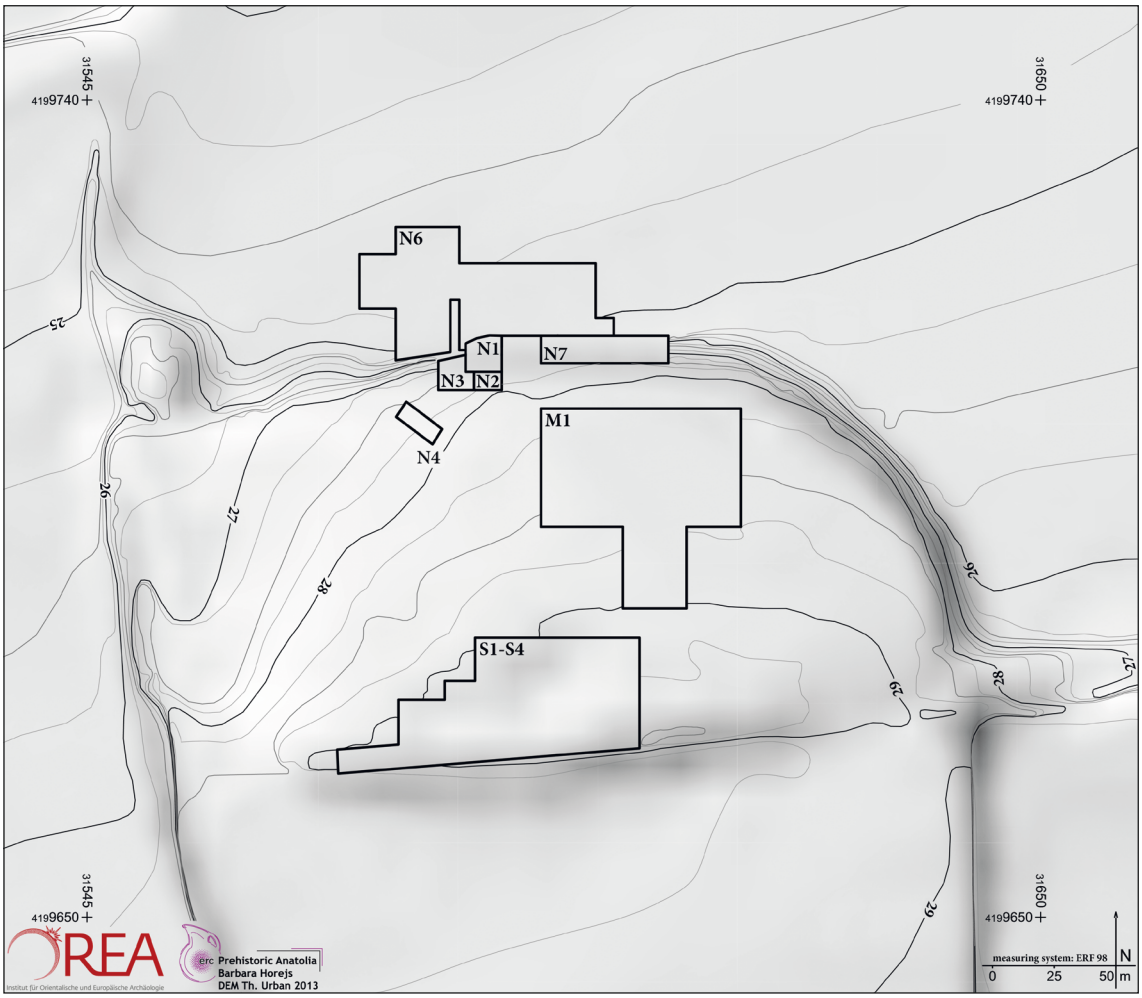

Fig. 58 Location of the different excavation trenches on the modern tell structure of Çukuriçi Höyük (after Horejs 2017, fig. 1.4)

Finally, the case study analyses can demonstrate the applicability of the methods and models adopted and created in this volume to an individual site.

Çukuriçi Höyük is a tell settlement on the central Aegean coast in western Anatolia in the direct vicinity of the ancient city of Ephesos (Fig. 55–56). The settlement layers range from the Early Neolithic in the 7th millennium up to Early Bronze Age 1 at the beginning of the 3rd millennium BC. From 2006 to 2014, the tell was excavated by Barbara Horejs and her team (Fig. 57–58). Detailed studies concerning the pottery, lithics, metallurgy, architecture and small finds, as well as zoological and botanical remains, have already been conducted and published to a large extent.[306] Furthermore, studies for several of these fields are still ongoing.[307]

Çukuriçi Höyük was partially destroyed by modern agriculture, which led to the complete removal of a large part of the former tell. This circumstance, however, led to the advantage of being

[306] Horejs 2008a; Horejs 2008b; Bergner et al. 2009; Horejs 2009; Horejs 2010; Horejs et al. 2010; Galik – Horejs 2011; Horejs 2011; Horejs et al. 2011; Horejs 2012; Horejs 2014; Britsch – Horejs 2014; Horejs et al. 2015; Horejs – Mehofer 2015; Horejs – Schwall 2015; Horejs 2016a; Horejs 2016b; Horejs – Galik 2016; Bosch 2017; Britsch – Horejs 2017; Horejs 2017b; Horejs et al. 2017; Milić – Horejs 2017; Peloschek 2017; Schwall – Horejs 2017; Horejs – Schwall 2018; Schwall 2018; Horejs – Britsch 2021; Burke – Horejs 2022; Mehofer 2022; Galik et al. 2023; Grasböck et al. 2023; Schwall et al. 2023.

[307] Milić 2018; Bochatz 2019; Emra 2020; Röcklinger forthcoming.

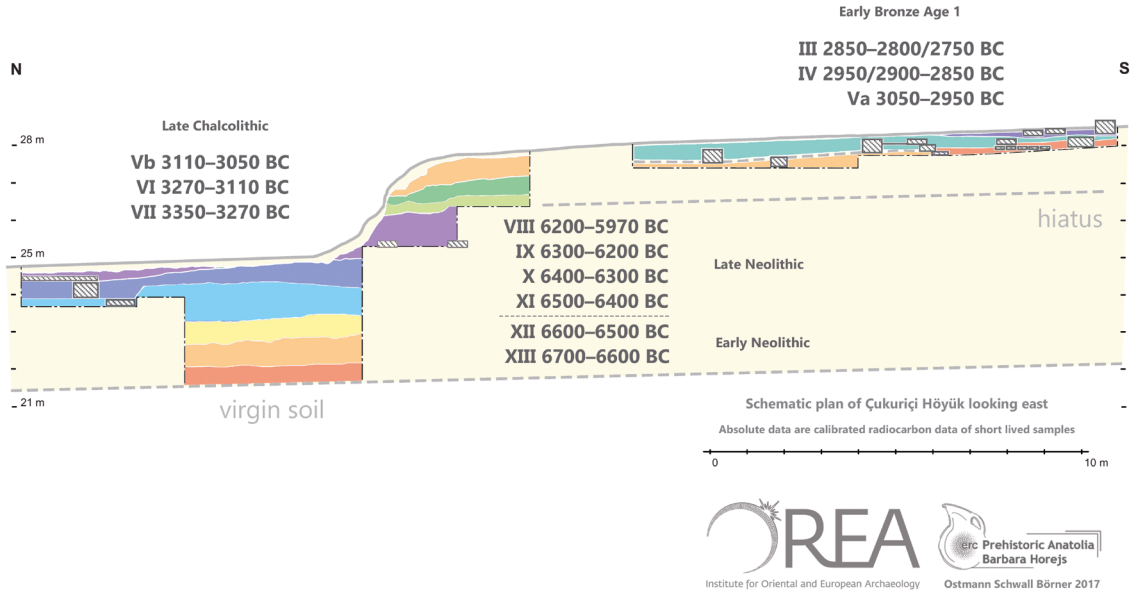

Fig. 59 Çukuriçi Höyük, tell cross section and settlement phases with absolute dating (after Horejs 2017, fig. 1.6)

able to access the Neolithic settlement layers, which would otherwise have been covered by the strata from several millennia. The topmost disturbed layers above all parts of the tell were labelled as ÇuHö I, a phase with modern disturbances. The layers below this phase could be associated with twelve separate settlement phases of Çukuriçi Höyük (Fig. 59).

Neolithic Çukuriçi Höyük is separated into six settlement phases (ÇuHö XIII–VIII). Detailed studies concerning the lithic industry, pottery and architecture, as well as the faunal and floral records have been published. The studies reveal a picture of an already organised and complex society living in the first settlements of Çukuriçi Höyük. In particular, a certain superimposed building structure that was erected in three different phases (ÇuHö X–VIII) is of special interest. The consecutive use of the same spot with a roughly similar architectural outline could demonstrate the important influence of social practices and identity in the cultural behaviour of prehistoric societies.[308]

The Chalcolithic consists of three settlement phases (ÇuHö VII–Vb). These settlements of Çukuriçi Höyük were the focus of the PhD thesis of Christoph Schwall.[309] The settlement structure, architecture, pottery and small finds of the Chalcolithic phases in particular have been very thoroughly evaluated. Circular structures, as well as stone structures used for storage purposes, were uncovered. The Chalcolithic societies of Çukuriçi Höyük seemed to have clear organisational structures in their settlement and labour. Rather than a loose custom in which everyone produced for themselves, a clear affinity for craft specialisation was visible. According to Schwall, this specialisation process can already be traced in the Middle Chalcolithic in western Anatolia and intensified in the Late Chalcolithic, clearly recognisable at Çukuriçi Höyük.[310]

This intensification of specialisation and craft organisation can be followed into the Early Bronze Age at Çukuriçi Höyük. The period consists of three phases at the tell (ÇuHö Va–III). The Early Bronze Age layers were excavated in two separate trenches (S1–4 and M1). Stone structures and several buildings consisting of multiple rooms were uncovered from phases Va to III. Detailed studies of all of the initially mentioned fields have been or are still being conducted on the Early Bronze Age material. The most impressive results derived from the metallurgical analyses. The studies were able to show that Çukuriçi Höyük was a metallurgical centre in EBA 1. With

308 Brami et al. 2016.
309 Schwall 2018.
310 Schwall 2018, 246–247.

over 150 metal tools, objects and fragments and a plethora of ovens, the EBA 1 settlements at Çukuriçi Höyük show a clear specialisation, which is, as yet, greater than at any other contemporary settlement in western Anatolia.[311] However, this specialisation and organisation of labour is also visible in other areas. The deliberate placement of animal husbandry outside the settlement, for example, demonstrates spatial organisation. Likewise, recent analyses have shown that the settlements were separated into homogenously organised household communities.[312] These examples highlight how deeply structured the settlements were, both economically as well as socially.

The aim of this chapter is to analyse the social, cultural and economic relevance of textile production at Çukuriçi Höyük. Especially important for this study in this regard is the possibility to focus on a far more detailed perspective of one specific site, to see the potential extent of accessible information. The discussion on the textile tools of Çukuriçi Höyük will therefore be included in all detail, in regard to all theories and theoretical models presented in Chapter IV. The discussion should function as a prelude to the final discussion in Chapter VIII, but also offer all relevant primary data from Çukuriçi Höyük.

VII.1. Artefact Analyses

A total of 145 clay textile tools were found at Çukuriçi Höyük, of which 25% were loom weights and 75% spindle whorls. Furthermore a total of 214 bone tools that were potentially used in textile production (including needles, awls, potential weaving shuttles and scrapers) were found at the site. However, to be absolutely sure that the tools were used in textile production, a use-wear analysis would have been necessary, since, especially in the case of awls, they could also have been used for drilling or piercing other materials, such as, for example, bark. Unfortunately, these analyses would have taken up too much time and would have been beyond the scope of the current study. Consequently, only the clay textile tools could be included. 137 of these 145 clay tools could be assigned to an exact settlement phase. Only five loom weights and three spindle whorls from phase I could not be securely correlated to a specific period. The distribution is shown in Table 39. This subchapter serves for the detailed description of the artefacts found. A further discussion will be given in Subchapter VII.3 or, referring to regional and superregional comparisons and distributions, in Chapters VI and VIII. All spatial references are displayed in Subchapter VII.2.

Period	**Late Neolithic**				**Late Chalcolithic**			**EBA 1**				**?**	
Phase	**XI**	**X**	**IX**	**VIII**	**VII**	**VI**	**Vb**	**Va**	**IV**	**III**	**I**	**I**	Σ_{total}
LW	0	0	0	1	1	0	2	5	12	1	9	5	36
SW	2	3	4	1	0	3	0	0	38	15	40	3	109
Σ_{phase}	2	3	4	2	1	3	2	5	50	16	49	8	145
Σ_{period}	11 (1 LW, 10 SW)				6 (3 LW, 3 SW)			120 (27 LW, 93 SW)					

Tab. 39 Chronological distribution of the number of loom weights (LW) and spindle whorls (SW) at Çukuriçi Höyük

Late Neolithic (ÇuHö XI–VIII)

All metrical and descriptive details on the Neolithic textile tools are given in Table 40. Additionally, the diameters and weights of the individual objects are depicted in the scatter plot of Figure 60. Only one loom weight was found in a Neolithic context in settlement phase VIII (Cat.no. 590). The loom weight was found in a pit that has been connected to ritual acts.[313] Together with the

311 Horejs 2009; Horejs et al. 2010; Horejs et al. 2011; Mehofer 2014; Mehofer 2016; Horejs 2016a; Mehofer 2022.
312 Horejs 2016a. On socio-cultural aspects see also Cveček 2022.
313 Galik et al. 2012, 261.

loom weight, a pierced ceramic disc, a slingshot bullet, a fragment of a stone axe, a clay bead, a clay spoon and a polishing stone, as well as the femur of a leopard, were found in the pit. The loom weight is of cylindrical shape (for a description of types see Subchapter IV.9). The confusing part about the object is that it is made from a ware that is otherwise only known from the Late Chalcolithic context at Çukuriçi Höyük, arousing the suspicion that the loom weight could have been relocated. However, the pit it derived from was undisturbed and the finds located in situ.[314] Assuming that the artefact is Late Neolithic, it would be one of the earliest finds of this loom weight type. Comparable contemporaneous finds of such loom weights in the close vicinity could only be found in Ulucak.[315] Even though, with only one individual object, no statement about weight classes etc. can be made, this loom weight could represent the beginning of a tradition in textile production that can be followed until the end of the Early Bronze Age in western Anatolia and the Aegean (see Chapter VI).

Çukuriçi Höyük – Late Neolithic				
Cat.no.	**Type**	**Shape**	**Weight (g)**	**Phase**
590	LW	Type IA	211.47	VIII
598	SW	Type IId	44.13	IX
599	SW	Type IVd	40.31	IX
596	SW	Type IIb	20.92	IX
600	SW	Type IVd	20.20	IX
592	SW	Type Id	34.46	X
593	SW	Type IIa	32.75	X
594	SW	Type IIa	33.33	X
597	SW	Type IIc	45.97	IX
595	SW	Type IIb	17.59	XI
591	SW	Type Id	18.28	XI

Tab. 40 Attributes of textile tools from different Neolithic phases of Çukuriçi Höyük (shapes based on the typology in Subchapter IV.9)

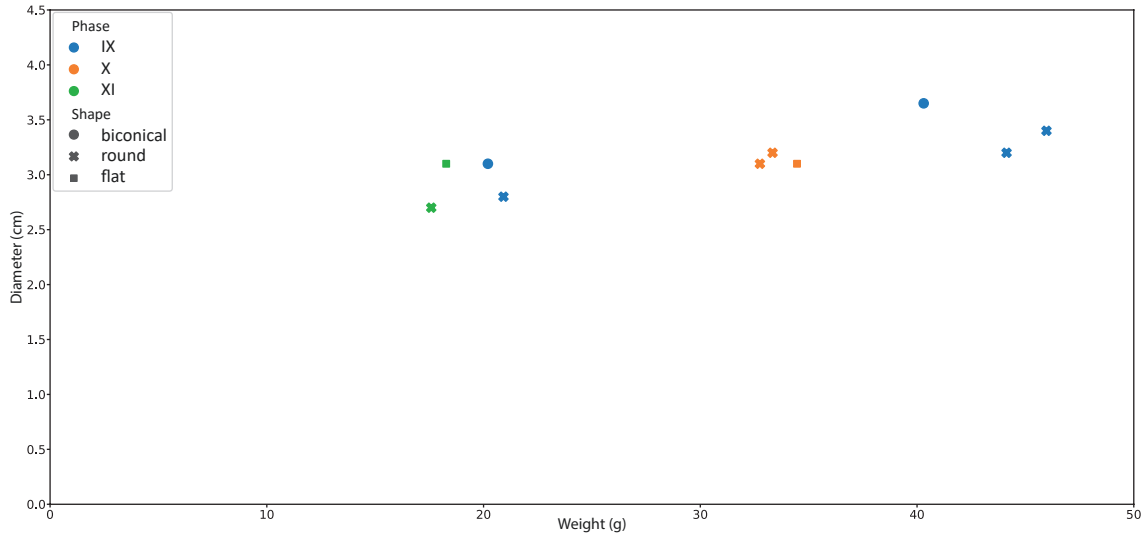

Fig. 60 Scatter plot of Neolithic spindle whorls (N = 10) from Çukuriçi Höyük according to the respective shape and phase (C. Britsch)

[314] See: Galik et al. 2012.
[315] Çilingiroğlu 2009a, also thanks to a personal note by Özlem Cevik.

Generally textiles appear already as early as 17000 BC in the Near East, for example at Ohalo II in Israel.[316] However, tools like spindle whorls and loom weights only appear during the Neolithic, when the fabrication of clay-made tools became a common custom. In the Near East first appearances are recognised during the end of the 8th and the beginning of the 7th millennium,[317] while in Anatolia spindle whorls appear in very small numbers during the second half of the 7th millennium.[318] This means that the production of textiles clearly predated the presence of textile tools, at least from an archaeological perspective. Therefore, the earliest textiles were either produced using methods without tools[319] or the tools were made from perishable materials. In either case, it can be expected that with the earliest manufacturing of textile tools the functional custom of plying and twisting yarn as well as the general mechanics of weaving were already long-implemented knowledge. Nonetheless, the appearance of such clay tools pinpoints an important change in the textile craft, underlining the chronological significance of these very early finds from Çukuriçi Höyük.

The oldest spindle whorls at Çukuriçi Höyük were found in a far earlier phase, in ÇuHö XI, in the beginning of the Late Neolithic (Cat.nos. 591 and 595). Both spindle whorls were found in the same layer of the Deep Trench in N6. One is flat in shape (Cat.no. 591) and the other round (Cat. no. 595). Both whorls were made from unbaked clay and were thus difficult to recover and impossible to restore. These circumstances could, of course, be one main reason that spindle whorls are, in general, a rare find in such early periods. Nonetheless, it was possible to reconstruct the weight of the whorls, showing that they were of very comparable weight, with 0.69g difference.

In phase X three spindle whorls were found. One derived from the Deep Trench (Cat.no. 592), one from Complex 11 (Cat.no. 594) and one from Complex 13 (Cat.no. 593). Though each was made from a different clay ware, all three have a comparable weight, with a range starting at just 1.71g.

Another five spindle whorls originated from phase IX. One was found in the Deep Trench (Cat.no. 600), one in Complex 21 (Cat.no. 599) and three in Complex 6 (Cat.nos. 596, 597 and 598). The whorl from the Deep Trench and that from Complex 21 are of a slightly biconical shape, the other three are all round in shape. Though, again, it is not a large number, the weights of the spindle whorls do cluster into two lighter and three heavier whorls (difference Cat.nos. 596 and 600: 0.72g, range of Cat.nos. 597, 598 and 599: 5.66g).

Overall a dominance of flat and roundish spindle whorls (80%) is observable in the Neolithic material.

Late Chalcolithic (ÇuHö VII–Vb)

All metrical and descriptive details on the Late Neolithic textile tools are given in Table 41. Additionally, the diameters and weights of the individual objects are depicted in the scatter plot of Figures 61 and 62. In the earliest Late Chalcolithic level of Çukuriçi Höyük – phase VII – one cylindrical loom weight was found (Cat.no. 601). The loom weight has the typical thin cylindrical shape of Type IA. The remaining two Late Chalcolithic loom weights were found in phase Vb.

316 Nadel et al. 1994.
317 See, for example: Orrelle et al. 2012.
318 See, for example: Çilingiroğlu 2009a as well as the artefact presentations in this volume.
319 See: Crowfoot 1931.

Çukuriçi Höyük – Late Chalcolithic				
Cat.no.	**Type**	**Shape**	**Weight (g)**	**Phase**
601	LW	Type IA	335.79	VII
603	SW	Type Id	27.52	VI
606	LW	Type IF	78.50	Vb
605	LW	Type IA	190.76	Vb
604	SW	Type IIb	22.30	VI
602	SW	Type Ic	9.54	VI

Tab. 41 Attributes of textile tools from different Late Chalcolithic phases of Çukuriçi Höyük (shapes based on the typology in Subchapter IV.9)

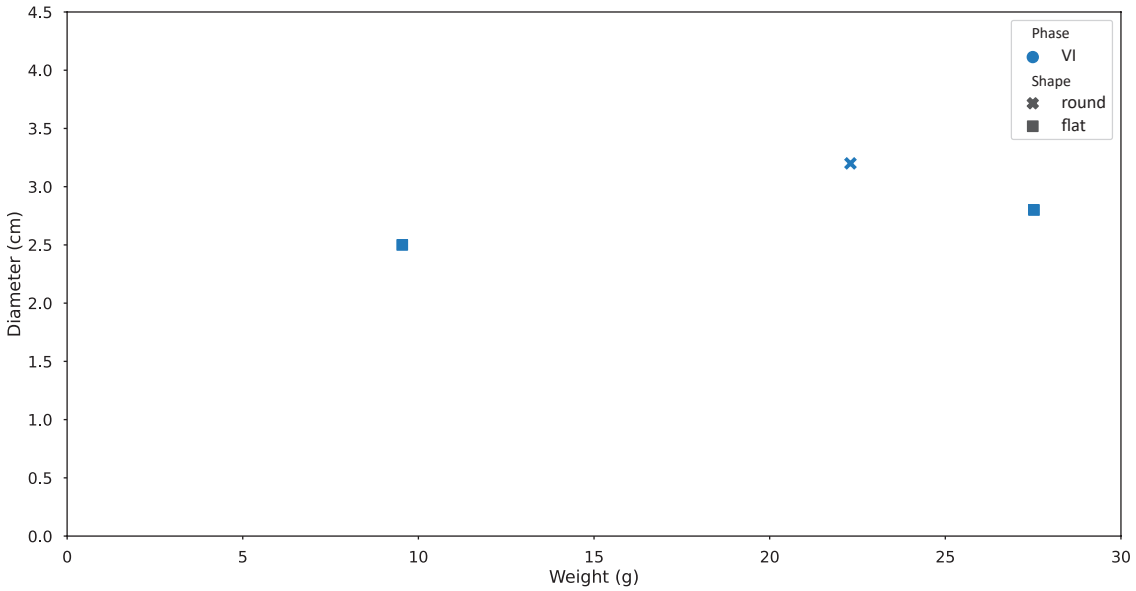

Fig. 61 Scatter plot of Late Chalcolithic spindle whorls from Çukuriçi Höyük (N = 3) (C. Britsch)

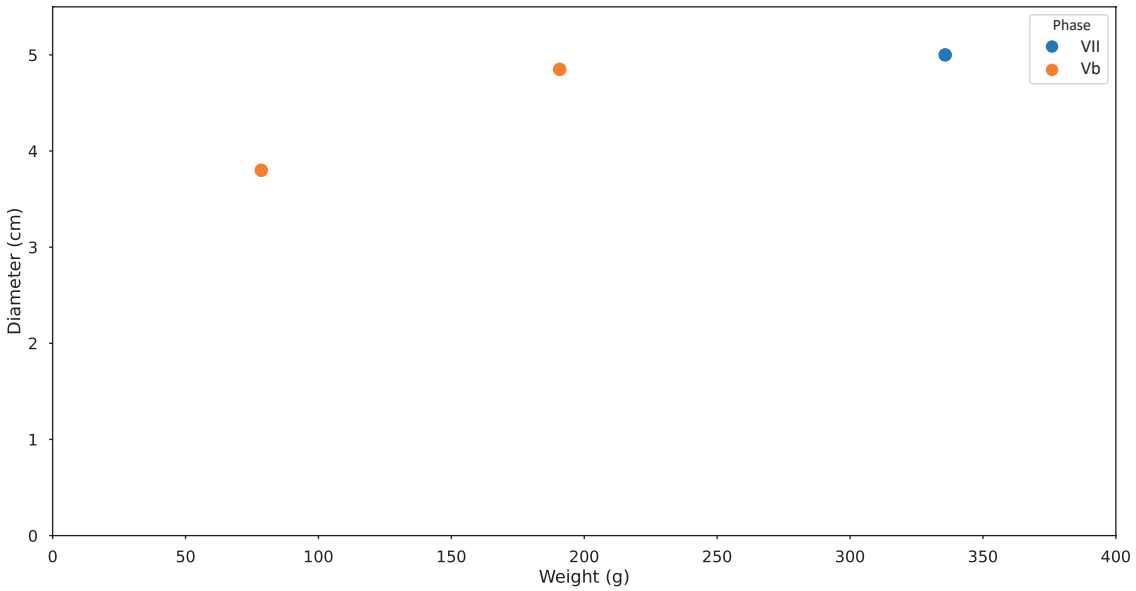

Fig. 62 Scatter plot of Late Chalcolithic loom weights from Çukuriçi Höyük (N = 3) (C. Britsch)

One of the two loom weights from phase Vb was found under Room 38 (Cat.no. 606) and one in an open area (Cat.no. 605). Cat.no. 605 has the typical shape of Type IA and weighs 190.76g, while Cat.no. 606 is of the miniature shape Type IF and weighs only 78.5g. Both objects were fully preserved.

Other than these loom weights, only three Late Chalcolithic spindle whorls were found, all from phase VI. One was found in a levelling layer of Trench N7 (Cat.no. 603) and the two others under Room 41 (Cat.nos. 602 and 604). Cat.nos. 602 and 603 are flat in shape and Cat.no. 604 is round. The weights of the three whorls differ quite a lot (range 17.98g).

Early Bronze Age 1 (ÇuHö Va–III and I)

Due to the total amount of 120 textile tools that could be associated with the Early Bronze Age 1 layers at Çukuriçi Höyük, a description as detailed as that for the Neolithic and Late Chalcolithic tools will not be given. Instead the information will be broken down into the most important factors: shape, weight and find location (in a room/outside area).

All metrical and descriptive details on the EBA 1 textile tools of ÇuHö Va are given in Table 42. Additionally, the diameters and weights of the individual objects are depicted in the scatter plot in Figure 63 of the five loom weights from phase Va, two derived from under Room 48 (Cat. nos. 614 and 617), two from under Room 36 (Cat.nos. 615 and 636) and one from an outside area (Cat.no. 616). Four are shaped as Type IA and one has the cut ends and compact shape of Type IE. The reconstructed weights of the different objects are not exactly the same, but are within a comparable range of 109.95g.

Çukuriçi Höyük – Phase Va				
Cat.no.	**Type**	**Shape**	**Weight (g)**	**Find location**
617	LW	Type IA	161.71	Under Room 48
614	LW	Type IA	191.75	Under Room 48
615	LW	Type IA	271.66	Under Room 36
636	LW	Type IE	228.10	Under Room 36
616	LW	Type IA	251.87	Outside

Tab. 42 Attributes of textile tools from EBA 1 Phase Va of Çukuriçi Höyük (shapes based on the typology in Subchapter IV.9)

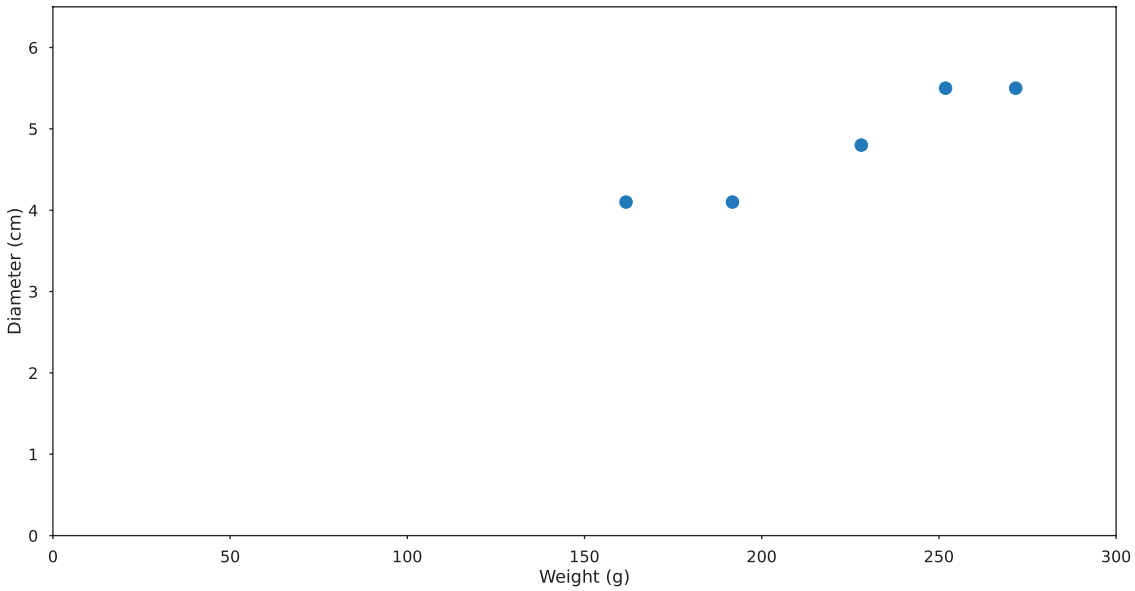

Fig. 63 Scatter plot of EBA 1 Phase Va loom weights from Çukuriçi Höyük (N = 5) (C. Britsch)

Descriptive and metrical details on the EBA 1 textile tools of ÇuHö IV are given in Table 43. Additionally, the diameters and weights of the individual objects are depicted in the scatter plots in Figures 64–65. In phase IV twelve loom weights were found. Ten loom weights were found in rooms – six of them in Room 41, the other two in outside areas. The most represented shape is Type ID with ten weights, their average weight is about 489g (SD = 63.55g).

Furthermore, a total of 38 spindle whorls were found in phase IV. The most common shape, with 31 examples, is biconical, followed by the round shape, with five examples and conical, with only two whorls.

Çukuriçi Höyük – Phase IV				
Cat.no.	**Type**	**Shape**	**Weight (g)**	**Find location**
687	SW	Type IVd	53.67	Rooms (West)
659	SW	Type IIc	50.00	Room 15
665	SW	Type IIIc	17.00	Room 18
689	SW	Type IVd	30.00	Room 19
611	LW	Type IA	62.86	Room 11
696	SW	Type IVd	11.10	Room 11
624	LW	Type ID	453.00	Room 11
671	SW	Type IVc	65.45	Rooms (West)
694	SW	Type IVd	21.40	Room 48
662	SW	Type IIIb	37.37	Room 48
622	LW	Type ID	441.20	Room 41
628	LW	Type ID	484.22	Room 41
652	SW	Type IIa	8.30	Room 41
707	SW	Type IVd	37.40	Room 41
645	SW	Type Id	79.56	Room 47
731	SW	Type IVf	27.50	Room 47
632	LW	Type ID	552.80	Room 41
623	LW	Type ID	452.40	Room 41
626	LW	Type ID	575.75	Room 41
620	LW	Type ID	473.50	Room 41
711	SW	Type IVd	5.90	Room 48
634	LW	Type ID	369.33	Room 43
635	LW	Type ID	584.00	Room 43
681	SW	Type IVd	17.55	Room 43
653	SW	Type IIa	20.10	Outside
705	SW	Type IVd	51.90	Room 41
724	SW	Type IVe	32.70	Room 41
674	SW	Type IVc	56.80	Room 54
698	SW	Type IVd	65.50	Room 54
706	SW	Type IVd	40.80	Room 38
675	SW	Type IVc	44.29	Room 38
727	SW	Type IVe	58.70	Room 38
654	SW	Type IIa	14.70	Room 41
700	SW	Type IVd	59.18	Room 53
679	SW	Type IVd	47.84	Room 53
701	SW	Type IVd	45.92	Room 53
708	SW	Type IVd	33.65	Room 54

Çukuriçi Höyük – Phase IV				
Cat.no.	**Type**	**Shape**	**Weight (g)**	**Find location**
637	LW	Type IF	98.00	Outside
723	SW	Type IVe	45.79	Room 38
703	SW	Type IVd	41.20	Outside
697	SW	Type IVd	43.84	Outside
633	LW	Type ID	505.30	Outside
709	SW	Type IVd	23.60	Room 53
712	SW	Type IVd	14.21	Room 53
702	SW	Type IVd	53.20	Room 53
699	SW	Type IVd	58.90	Room 53
704	SW	Type IVd	18.10	Room 38
710	SW	Type IVd	38.63	Room 38
682	SW	Type IVd	15.10	Room 43
678	SW	Type IVd	5.89	Room 43

Tab. 43 Attributes of textile tools from EBA 1 Phase IV of Çukuriçi Höyük (shapes based on the typology in Subchapter IV.9)

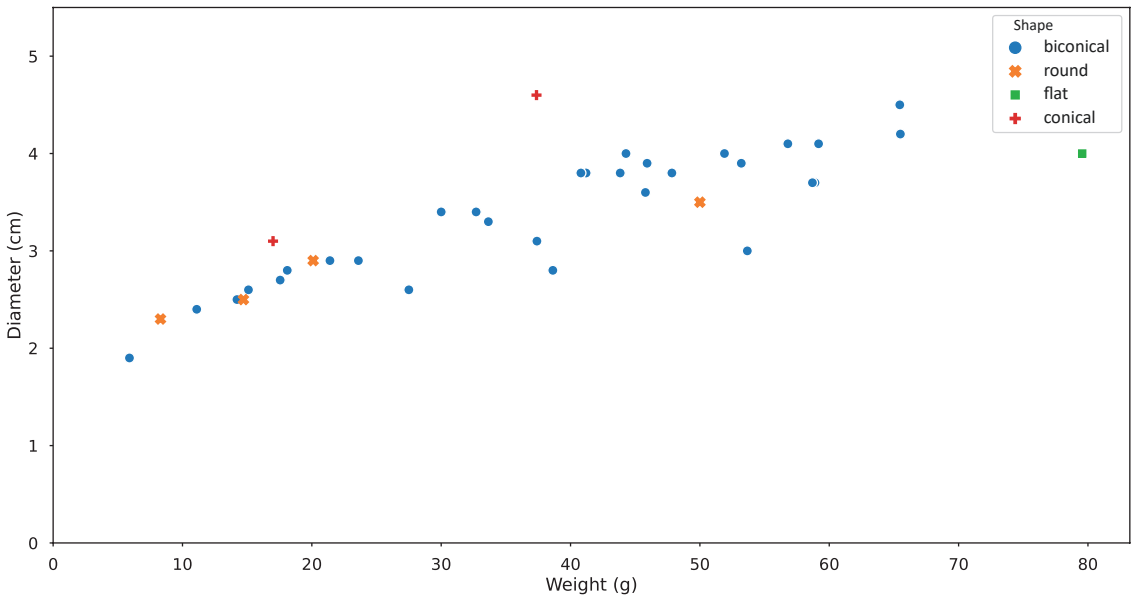

Fig. 64 Scatter plot of EBA 1 Phase IV spindle whorls from Çukuriçi Höyük (N = 38) (C. Britsch)

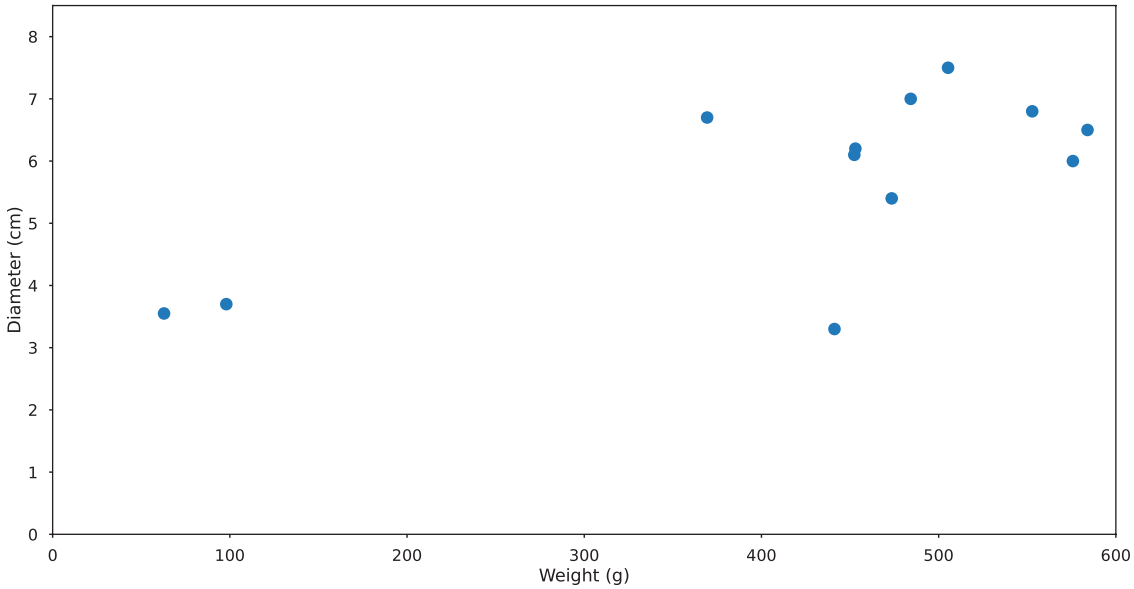

Fig. 65 Scatter plot of EBA 1 Phase IV loom weights from Çukuriçi Höyük (N = 12) (C. Britsch)

The metrical and descriptive details of ÇuHö III are given in Table 44. Additionally, the diameters and weights of the individual objects are depicted in the scatter plot in Figure 66. In phase III only one loom weight and 15 spindle whorls were found. Like the majority of those from phase IV, the loom weight is of Type ID, but is lighter than the average weight in this phase (-120.24g). For the spindle whorls, again, the most common shape is biconical, with nine examples, followed by the round shape, with four examples, and flat, with two whorls.

Çukuriçi Höyük – Phase Va				
Cat.no.	**Type**	**Shape**	**Weight (g)**	**Find location**
650	SW	Type IIa	19.71	Outside
677	SW	Type IVd	7.46	Outside
644	SW	Type Id	11.50	Room 2
655	SW	Type IIb	45.00	Room 1
649	SW	Type IIa	57.70	Rooms (East)
728	SW	Type IVf	30.80	Rooms (East)
717	SW	Type IVe	60.60	Room 5
693	SW	Type IVd	19.88	Room 5
670	SW	Type IVc	40.00	Outside
695	SW	Type IVd	15.00	Outside
641	SW	Type Ib	28.20	Room 6
718	SW	Type IVe	43.70	Outside
676	SW	Type IVd	4.17	Room 20/21
690	SW	Type IVd	37.88	Outside
657	SW	Type IIc	41.49	Room 20/21
621	LW	Type ID	358.76	Outside

Tab. 44 Attributes of textile tools from EBA 1 Phase III of Çukuriçi Höyük

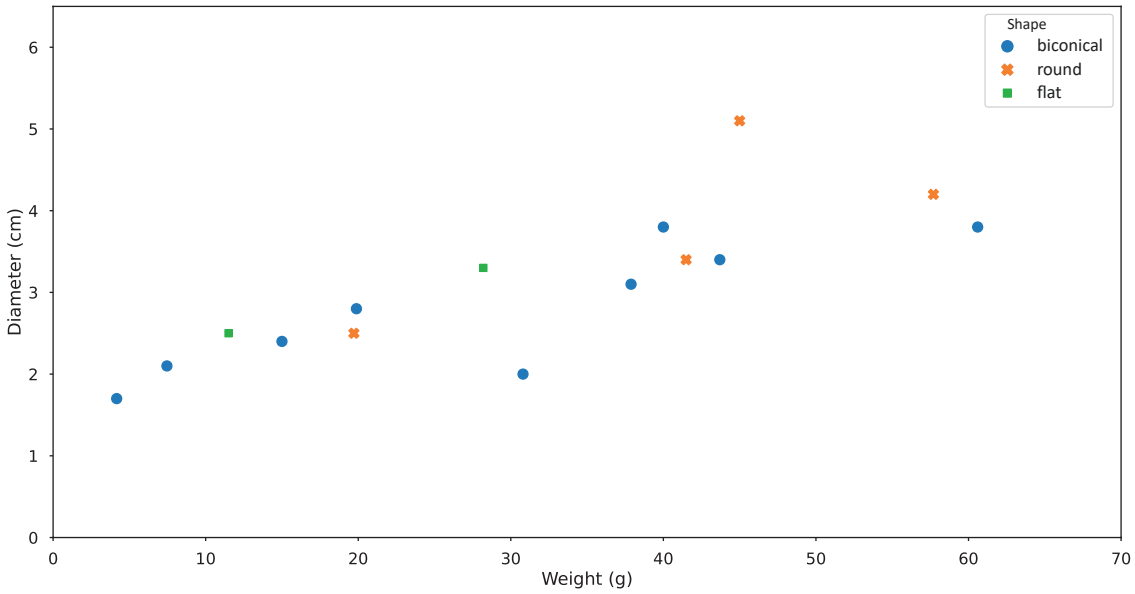

Fig. 66 Scatter plot of EBA 1 Phase III spindle whorls from Çukuriçi Höyük (N = 15) (C. Britsch)

A total of 14 loom weights and 43 spindle whorls are associated with the phase ÇuHö I. The descriptive and metrical details on all textile tools of ÇuHö I are given in Table 45. Additionally, the diameters and weights of the individual objects are depicted in the scatter plots in Figures 67 and 68 This phase was basically used to label finds from disturbed layers close to the modern surface. The finds from trenches S1–4 and M1 (9 loom weights and 40 spindle whorls) could, however, be associated with the Early Bronze Age 1. Since for the remaining five loom weights and three spindle whorls no chronological assignment was possible, they cannot be included in the evaluation and will therefore not be discussed here.

Çukuriçi Höyük – Phase I				
Cat.no.	**Type**	**Shape**	**Weight (g)**	**Trench**
658	SW	Type IIc	37.14	S1
646	SW	Type Id	38.40	S1
730	SW	Type IVf	17.60	S1
666	SW	Type IVb	20.00	S1
612	LW	Type IA	269.40	S1–4
613	LW	Type IA	236.25	S1–4
685	SW	Type IVd	49.29	S2
714	SW	Type IVe	37.60	S1–4
638	LW	Type IF	33.33	N4
716	SW	Type IVe	51.20	S4
720	SW	Type IVe	47.71	S4
680	SW	Type IVd	16.82	S3
667	SW	Type IVc	33.05	S3
668	SW	Type IVc	16.90	S3
619	LW	Type IA	197.37	N4
639	SW	Type Ib	14.90	S1–4
608	LW	Type IA	229.90	N6
618	LW	Type IA	250.23	N6

Çukuriçi Höyük – Phase I				
Cat.no.	**Type**	**Shape**	**Weight (g)**	**Trench**
607	LW	Type IA	281.71	N6
669	SW	Type IVc	55.67	M1
684	SW	Type IVd	45.13	M1
686	SW	Type IVd	58.53	M1
609	LW	Type IA	195.33	M1
715	SW	Type IVe	42.40	M1
673	SW	Type IVc	12.60	M1
721	SW	Type IVe	24.40	M1
643	SW	Type Ic	16.00	M1
640	SW	Type Ib	36,02	M1
719	SW	Type IVe	44.80	M1
648	SW	Type IIa	42.60	M1
656	SW	Type IIb	18.10	M1
629	LW	Type ID	387.67	M1
642	SW	Type Ic	59.00	M1
729	SW	Type IVf	55.17	M1
691	SW	Type IVd	31.50	M1
688	SW	Type IVd	73.67	M1
664	SW	Type IIIc	62.96	M1
692	SW	Type IVd	36.12	M1
672	SW	Type IVc	69.69	M1
661	SW	Type IIIb	74.42	M1
647	SW	Type IIa	67.43	M1
630	LW	Type ID	433.57	M1
625	LW	Type ID	414.29	M1
660	SW	Type IId	63.00	M1
722	SW	Type IVe	9.59	M1
627	LW	Type ID	436.22	M1
631	LW	Type ID	464.27	M1
610	LW	Type IA	250.50	M1
683	SW	Type IVd	69.50	M1
651	SW	Type IIa	69.33	M1
663	SW	Type IIIb	21.85	M1
726	SW	Type IVe	15.70	M1
713	SW	Type IVd	19.71	M1
725	SW	Type IVe	27.78	M1

Tab. 45 Attributes of textile tools from disturbed layers of Phase I of Çukuriçi Höyük (shapes based on the typology in Subchapter IV.9)

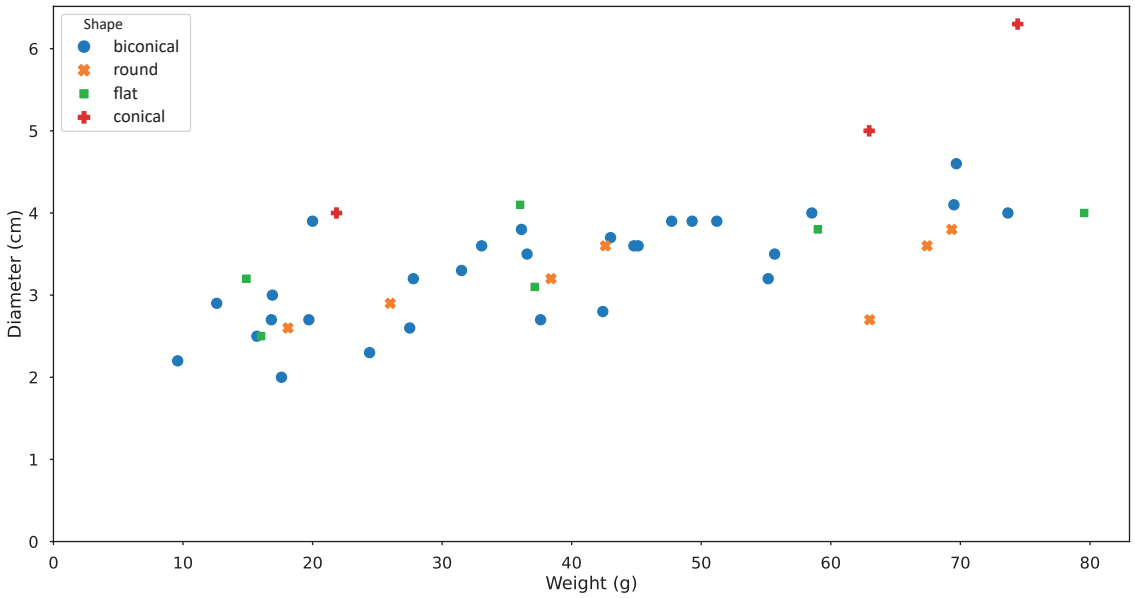

Fig. 67 Scatter plot of EBA 1 Phase I spindle whorls from Çukuriçi Höyük (N = 45) (C. Britsch)

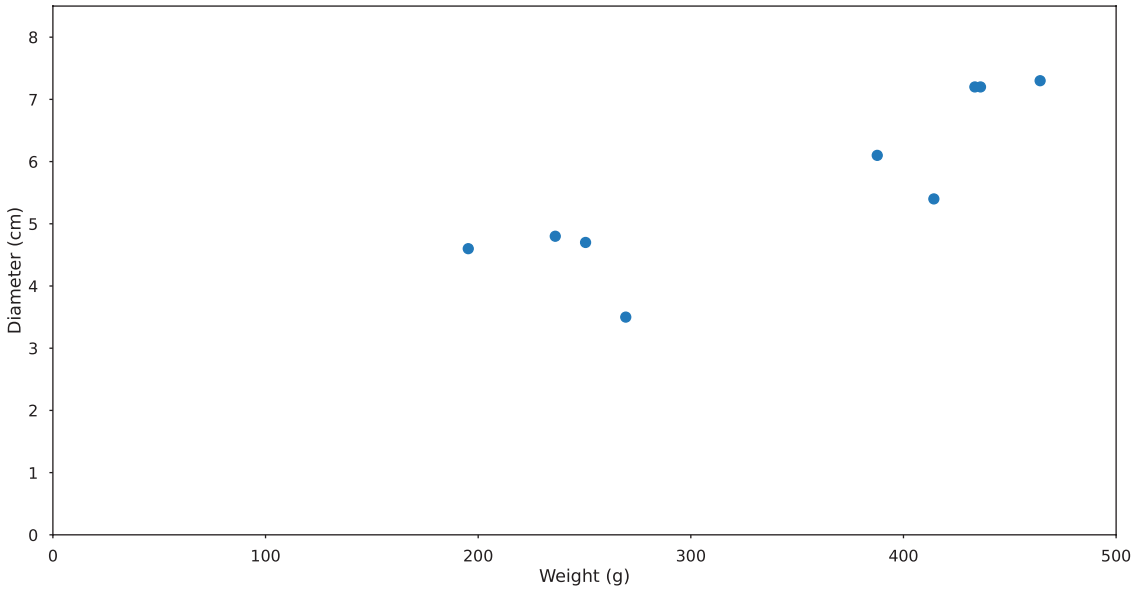

Fig. 68 Scatter plot of EBA 1 Phase I loom weights from Çukuriçi Höyük (N = 9) (C. Britsch)

The majority of EBA 1 loom weights from phase I, like in phases IV and III, are of Type ID. However, with five weights of Type ID and four of Type IA, the dominance is not as pronounced. The average weight of the Type ID loom weights is about 427g (SD = 25.40g) and that of the Type IA examples about 238g (SD = 27.23g).

Like for the other EBA 1 spindle whorls of Çukuriçi Höyük, the most common shape is biconical, with 26 examples, followed by the round shape with seven, conical with five and flat whorls with four examples.

Overall a dominance of biconical whorls (71 %) is noticeable in EBA 1 at Çukuriçi Höyük.

VII.2. Spatial Analysis

In many cases the location and circumstances of a find are as important as the artefacts themselves, if not even more so. Both the connection with certain features as well as with other artefacts, or simply the spatial situation, can give information about past practices. One basic, but certainly also one of the most important pieces of information given by tool distributions, is where the respective craft was carried out. Of course, the difficulty addressed by the Pompeii premise limits the validity of such local-causal connections strongly.[320] For spindle whorls and loom weights this limitation is especially true. From historical and ethnographical records we know that spindle whorls were often not used in one designated spot but throughout whole settlements, and sometimes even beyond.[321] Loom weights, on the other hand, are bound to a certain place (pun intended), namely a loom. However, a single loom weight by no means indicates a loom set-up. To securely locate a loom, at least a small cluster of loom weights is necessary. Nonetheless, the spatial data of textile tools has to be considered and analysed, especially if well-excavated and documented data is available. Though the associations with tool accumulations have to be careful, they cannot simply be ignored. It has to be checked whether tool accumulations exist and if so, they have to be discussed. For that reason the spatial distribution of spindle whorls and loom weights in the different phases of Çukuriçi Höyük will be presented here and discussed in Subchapter VII.3.

It is worth noting that the textile tools of phase ÇuHö Va will be displayed together with the Late Chalcolithic tools (see Fig. 70), even though the phase can already be dated to Early Bronze Age 1. This is due to the fact that in terms of spatial organisation this earliest Early Bronze Age phase is closer to the Late Chalcolithic phase ÇuHö Vb than to the subsequent phase ÇuHö IV.[322]

Neolithic (ÇuHö XI–VIII)

All Neolithic textile tools could be plotted on a map (Fig. 69). Only five out of 11 tools can be securely connected with a use horizon (Tab. 46). Probably due to the small number of objects, no

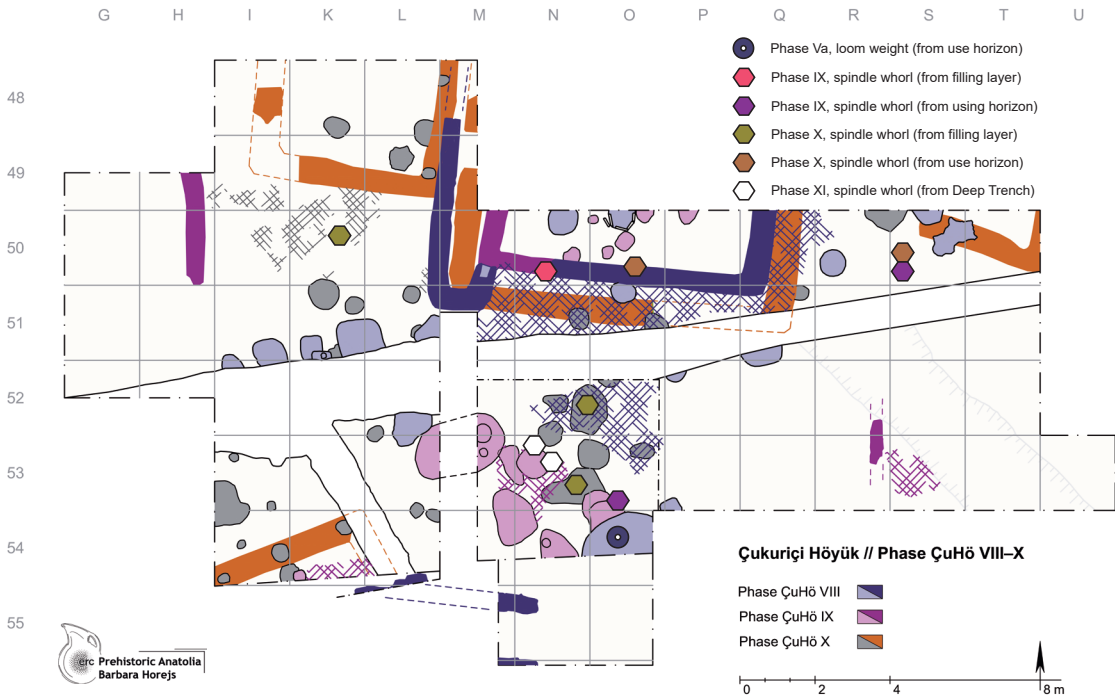

Fig. 69 Distribution map of Neolithic spindle whorls and loom weights (ERC Prehistoric Anatolia/C. Britsch)

320 See: Binford 1981; Schiffer 1985; Bernbeck 1997, 66; for Çukuriçi Höyük this topic was also discussed by Horejs et al. 2017 and is still being analysed in detail by Röcklinger forthcoming.

321 See, for a variety of examples: Barber 1991.

322 Schwall 2018.

Çukuriçi Höyük – Phase XI				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
595	SW	–	Deep trench	No
591	SW	–	Deep trench	No
Çukuriçi Höyük – Phase X				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
600	SW	–	Deep trench	No
592	SW	–	Deep trench	No
593	SW	Complex 13	Pit?	Yes
594	SW	Complex 11	Filling layer	No
597	SW	Complex 6	Floor	Yes
Çukuriçi Höyük – Phase IX				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
598	SW	Complex 6	Wall	No
599	SW	Complex 21	Court (outside)	Yes
596	SW	Complex 6	Floor	Yes
Çukuriçi Höyük – Phase VIII				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
590	LW	Complex 2	Pit	Yes

Tab. 46 Attributes of textile tools from different Neolithic phases of Çukuriçi Höyük

clear artefact accumulations could be found. The only spindle whorls that seem to cluster derive from phases XI and X, but could not be connected with a use horizon.

Late Chalcolithic (ÇuHö VII–Vb)

Of the six Late Chalcolithic textile tools, only four could be plotted on a map (Fig. 70); for the other two, sufficient data was not available. Only two out of six artefacts could be connected with a use horizon (Tab. 47). Probably due to the small number of tools, especially of those from use horizons, no artefact accumulations could be found.

Çukuriçi Höyük – Phase VII				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
601	LW	–	–	Yes
Çukuriçi Höyük – Phase VI				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
603	SW	–	Levelling layer	No
604	SW	–	Levelling layer	No
602	SW	Rect. House 1	Floor	Yes
Çukuriçi Höyük – Phase Vb				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
606	LW	–	Levelling layer	No
605	LW	–	Levelling layer	No

Tab. 47 Attributes of textile tools from different Late Chalcolithic phases of Çukuriçi Höyük



Fig. 70 Distribution map of Late Chalcolithic (ÇuHö VI–Vb) and EBA 1 (ÇuHö Va) spindle whorls and loom weights (ERC Prehistoric Anatolia/M. Börner)

Early Bronze Age 1 (ÇuHö Va–III and I)

Of the 115 textile tools from EBA 1 Çukuriçi Höyük, only 80 could be plotted on a map, this includes 38 (of 50) from phase IV, all 16 from phase III and 26 (of 49) artefacts from phase I that could securely be labelled EBA 1 (Fig. 71). Only about a third of all textile tools (34 tools from phase IV and three from phase III) could be connected with use horizons (Tab. 48). Nonetheless, artefact accumulations can be found, although mainly in trench M1 at the modern northern border of the tell. In phase Va an accumulation seems to be connected with the Circular Structure 2. However, four of the five phase Va loom weights derived from levelling layers and can thus not be securely associated. Accumulations in phase IV are mainly located in the northern rooms of trench M1, the vast majority (70.83% of all textile tools from phase IV use horizons) in two adjacent buildings. In phase III no peculiarities were noticeable. The potential meaning of these clusters will be discussed in the following subchapter.

Çukuriçi Höyük – Phase Va				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
617	LW	Circular Structure 2	Floor	Yes
614	LW	Circular Structure 2	Levelling layer	No
615	LW	Circular Structure 2	Levelling layer	No
636	LW	Circular Structure 2	Levelling layer	No
616	LW	Outside	Levelling layer	No
Çukuriçi Höyük – Phase IV				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
687	SW	Rooms (West)	Filling layer	No
659	SW	Room 15	Levelling layer	No
665	SW	Room 18	Filling layer	No
689	SW	Room 19	Floor	Yes
611	LW	Room 11	Floor	Yes
696	SW	Room 11	Destruction layer	No
624	LW	Room 11	Destruction layer	No
671	SW	Rooms (West)	Levelling layer	No
694	SW	Room 48	Floor	Yes
662	SW	Room 48	Floor	Yes
622	LW	Room 41	Find accumulation	Yes
628	LW	Room 41	Floor	Yes
652	SW	Room 41	Levelling layer	No
707	SW	Room 41	Levelling layer	No
645	SW	Room 47	Pit filling	Yes
731	SW	Room 47	Pit filling	Yes
632	LW	Room 41	Floor	Yes
623	LW	Room 41	Floor	Yes
626	LW	Room 41	Floor	Yes
620	LW	Room 41	Floor	Yes
711	SW	Room 48	Floor	Yes
634	LW	Room 43	Floor	Yes
635	LW	Room 43	Floor	Yes
681	SW	Room 43	Floor	Yes
653	SW	Outside	Levelling layer	No
705	SW	Room 41	Filling layer	No
724	SW	Room 41	Filling layer	No
674	SW	Room 54	Floor	Yes
698	SW	Room 54	Floor	Yes
706	SW	Room 38	Filling layer	No
675	SW	Room 38	Filling layer	No
727	SW	Room 38	Filling layer	No
654	SW	Room 41	Filling layer	No
700	SW	Room 53	Floor	Yes
679	SW	Room 53	Floor	Yes
701	SW	Room 53	Floor	Yes
708	SW	Room 54	Pit filling	Yes

Çukuriçi Höyük – Phase IV				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
637	LW	Outside	Floor	Yes
723	SW	Room 38	Find accumulation	Yes
703	SW	Outside	Floor	Yes
697	SW	Outside	Floor	Yes
633	LW	Outside	Floor	Yes
709	SW	Room 53	Filling layer	No
712	SW	Room 53	Floor	Yes
702	SW	Room 53	Floor	Yes
699	SW	Room 53	Floor	Yes
704	SW	Room 38	Find accumulation	Yes
710	SW	Room 38	Find accumulation	Yes
682	SW	Room 43	Floor	Yes
678	SW	Room 43	Floor	Yes
Çukuriçi Höyük – Phase III				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
650	SW	Outside	Levelling layer	No
677	SW	Outside	Levelling layer	No
644	SW	Room 2	Filling layer	No
655	SW	Room 1	Find accumulation	Yes
649	SW	Rooms (East)	Rubble	No
728	SW	Rooms (East)	Rubble	No
717	SW	Room 5	Filling layer	No
693	SW	Room 5	Levelling layer	No
670	SW	Outside	Levelling layer	No
695	SW	Outside	Levelling layer	No
641	SW	Room 6	Filling layer	No
718	SW	Outside	Levelling layer	No
676	SW	Room 20/21	Pit filling	Yes
690	SW	Outside	Levelling layer	No
657	SW	Room 20/21	Burned layer	Yes
621	LW	Outside	Levelling layer	No
Çukuriçi Höyük – Phase I (EBA 1 Part)				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
658	SW	–	Disturbed layer	No
646	SW	–	Disturbed layer	No
730	SW	–	Disturbed layer	No
666	SW	–	Disturbed layer	No
612	LW	–	Disturbed layer	No
613	LW	–	Disturbed layer	No
685	SW	–	Disturbed layer	No
714	SW	–	Disturbed layer	No
716	SW	–	Disturbed layer	No
720	SW	–	Disturbed layer	No
680	SW	–	Disturbed layer	No

Çukuriçi Höyük – Phase I (EBA 1 Part)				
Cat.no.	**Type**	**Find location**	**Feature**	**Use horizon**
667	SW	–	Disturbed layer	No
668	SW	–	Disturbed layer	No
639	SW	–	Disturbed layer	No
669	SW	–	Disturbed layer	No
684	SW	–	Disturbed layer	No
686	SW	–	Disturbed layer	No
609	LW	–	Disturbed layer	No
715	SW	–	Disturbed layer	No
673	SW	–	Disturbed layer	No
721	SW	–	Disturbed layer	No
643	SW	–	Disturbed layer	No
640	SW	–	Disturbed layer	No
719	SW	–	Disturbed layer	No
648	SW	–	Disturbed layer	No
656	SW	–	Disturbed layer	No
629	LW	–	Disturbed layer	No
642	SW	–	Disturbed layer	No
729	SW	–	Disturbed layer	No
691	SW	–	Disturbed layer	No
688	SW	–	Disturbed layer	No
664	SW	–	Disturbed layer	No
692	SW	–	Disturbed layer	No
672	SW	–	Disturbed layer	No
661	SW	–	Disturbed layer	No
647	SW	–	Disturbed layer	No
630	LW	–	Disturbed layer	No
625	LW	–	Disturbed layer	No
660	SW	–	Disturbed layer	No
722	SW	–	Disturbed layer	No
627	LW	–	Disturbed layer	No
631	LW	–	Disturbed layer	No
610	LW	–	Disturbed layer	No
683	SW	–	Disturbed layer	No
651	SW	–	Disturbed layer	No
663	SW	–	Disturbed layer	No
726	SW	–	Disturbed layer	No
713	SW	–	Disturbed layer	No
725	SW	–	Disturbed layer	No

Tab. 48 Attributes of textile tools from different Early Bronze Age phases of Çukuriçi Höyük



Fig. 71 Distribution map of EBA 1 (ÇuHö IV–III) spindle whorls and loom weights (ERC Prehistoric Anatolia/ C. Britsch)

VII.3. Conclusion – Çukuriçi Höyük

The two previous subchapters presented all the available descriptive information and results on the textile tools of Çukuriçi Höyük. As mentioned in the introductory part of this chapter, far more detailed information is available than for any other data used in this study. Additionally, the site is very well studied overall and therefore offers an ideal foundation for a detailed study of one aspect, such as textile production.

Different aspects will be discussed concerning the textile production at Çukuriçi Höyük:

- Does craft specialisation within the textile production tools exist?
- Which information can serve as an indicator of this?
- Loom weight shapes or weight classes?
- Spindle whorl shapes or weight classes?
- Can the practice of the craft be localised?
- Are patterns noticeable?
- How valid is the interpretation of such patterns?
- Are practices or agencies noticeable?
- Which indicators can be used?
- Can we speak of structured practises or agencies?

(1) Does craft specialisation within the textile production tools exist?

According to the discussion on craft specialisation theories in Subchapter IV.3, it could be shown that the main aspects that suggest craft specialisation are the standardisation of tools and spatial distribution. Standardisation can be operationalised through two aspects, standardisation of the shape and the metrics (including dimensions and weight) of a tool.

Regarding the shape of the different tools from Çukuriçi Höyük, three circumstances are most striking: the dominance of flat and roundish spindle whorls in the Neolithic (80%), the

dominance of biconical whorls in the EBA (71%) and the cylindrical-shaped loom weight as the sole loom weight shape (with one solitary exception in the EBA). Basically two options exist as reasons for a certain shape of a tool: either it is of an aesthetic or of a practical nature. It was already stated in Chapter IV that for spindle whorls the shape can have a slight impact on their performance; for loom weights, however, the shape has no practical function. Though it cannot be completely excluded that the spindle whorl shape was of an aesthetic nature (or both aesthetic and technical), the evidence shown in Subchapter IV.7 speaks strongly in favour of a technical nature. Even if the intention included an aesthetic aspect, a change in performance – even a slight one – would probably have been noticed by a craftsperson working with such tools every day. Therefore, it is very likely that a standardisation of spindle whorl shapes is attributable to their practical function, while standardisation in loom weight shapes is due to aesthetic reasons.

The intention of shaping an object according to aesthetic reasons can, however, be influenced by several factors, which are difficult (or even impossible) to distinguish. The factors can be personal preference, cultural norms, the adoption of foreign norms or traditions in crafts. However, none of these aspects have to be connected with artisanal reasons. A tool does not necessarily change its practicability with adjustments of a decorative nature. Aesthetic aspects will therefore be discussed later on.

The other factors of both spindle whorls and loom weights which can be standardised are their dimensions and weight. In Chapter IV the relevance of the weight and dimensions of textile tools on their performance and practicability was discussed. Since only one loom weight was assigned to Neolithic layers, logically no standardisation can be identified.

The ten spindle whorls from Neolithic Çukuriçi Höyük, however, show an interesting picture (see Fig. 60). In phases XI–IX, spindle whorls seem to cluster. In phase XI, the two whorls – though different in shape and diameter – are of nearly the same weight. The three whorls of phase X are close in diameter and in weight. For the five whorls of phase IX, two 'groups' seem to be visible, comprising three heavier whorls (c. 43g) and two lighter whorls (c. 20.5g). Within these two groups the whorls vary in diameter more than those of phase X, but less than those of phase XI. In the end, it has to be conceded that for each of those phases and groups, the number of spindle whorls is marginal. It is therefore problematic to securely deduce a standardisation of spindle whorl production from this record. However, at least a tendency is visible and a potential deliberate choice of weight in spindle whorls during the Neolithic can be assumed.

The Late Chalcolithic artefacts only include six textile tools: three spindle whorls and three loom weights. All loom weights differ greatly in weight and the spindle whorls also differ greatly, so for now it has to be assumed that no metrical standardisation of Late Chalcolithic textile tools from Çukuriçi Höyük took place.

Compared to the Neolithic and Late Chalcolithic, the EBA at Çukuriçi Höyük yielded a lot of spindle whorls and loom weights. For the loom weights, the scatter plots indicate a clustering into at least two groups by weight and slightly by diameter (see Figs. 63, 65 and 68). To ensure that these clusters are not shaped by subjective observation, a two-step cluster analysis with diameter and weight as continuous variables was conducted in SPSS. The two-step cluster analysis identified two clusters regarding the weight and diameter: Cluster 1, including 13 loom weights (48.1%) with a mean diameter of 4.33cm and a mean weight of 232.11g, and Cluster 2, including 14 loom weights (51.9%) with a mean diameter of 6.53cm and a mean weight of 470.45g. This analysis therefore shows the same groupings of EBA loom weights that was observed before via the scatter plots. It can therefore be assumed that loom weight production – and thus weaving – was standardised at EBA Çukuriçi Höyük.

The EBA spindle whorls of Çukuriçi Höyük seem so evenly spread on the scatter plots that a subjective separation into clusters is not possible (see Figs. 64, 66 and 67). Since, for the spindle whorls, the shape can also have a practical influence, two different two-step cluster analyses were conducted in SPSS, one (A) with only the diameter and weight as continuous variables and another (B) with the shape as an additional categorical variable. Both analyses resulted in two

clusters. For A, Cluster 1 included 34 spindle whorls (36.6%) with a mean diameter of 2.54cm and a mean weight of 16.96g and Cluster 2 included 59 spindle whorls (63.4%) with a mean diameter of 3.78cm and a mean weight of 48.84g. For B, Cluster 1 included 66 spindle whorls (71.0%), containing 100% of the biconical whorls, with a mean diameter of 3.24cm and a mean weight of 36.47g and Cluster 2 included 27 spindle whorls (29.0%), containing all flat, round and conical whorls, with a mean diameter of 3.53cm and a mean weight of 38.95g. This demonstrates two things: (A) the spindle whorls are clustering by diameter and weight and (B) the biconical shape stands out strongly from the other shapes. Though the analysis is not as clear as for the loom weights, it has to be assumed that the spindle whorls were also deliberately produced in reference to their weight, leading to a certain standardisation.

To conclude regarding the first question, the indicators for technical standardisation – and therefore potential craft specialisation – in textile production at Çukuriçi Höyük are the spindle whorl shapes (mostly in the EBA, potentially also in the NL), spindle whorl metrics (mostly in the EBA, potentially also in the NL) and loom weight metrics in the EBA. The follow-up question would therefore be whether these standardisations actually imply specialisation. In Chapter IV.3 I argued that standardisation can only be taken as an indicator of craft specialisation if it can be seen on a relatively large scale. The observations on the Neolithic tools therefore have to be dismissed as clear indicators of craft specialisation. The small scale makes it too risky that a small household production could be misinterpreted as a specialised craft. Note that this does not belittle the potential skill of Neolithic textile workers at Çukuriçi Höyük, nor diminish their ability to determine the practicability of their tools. It simply means that it is not possible to know whether textile production existed as a specialised and organised craft during the Neolithic at Çukuriçi Höyük, or not. The same applies for the Late Chalcolithic, for the very same reason: too few artefacts. The analyses by Schwall convincingly show that the Late Chalcolithic was a time of advanced craft specialisation.[323] However, it is not possible to prove or disprove this via the analyses of the textile tools. In the EBA this clearly changes. Not only does the number of finds increase significantly, all types of the above-mentioned standardisations are observable. Following the logic of the meaning of standardisation, it can be assumed that during the EBA textile production was a specialised craft carried out by at least semi-specialised craftspeople. The more obvious standardisation in loom weights in contrast to spindle whorls could demonstrate an even higher degree of specialisation for weaving than for spinning.

(2) Can the practice of the craft be localised?

The next question addresses the spatial distribution of textile tools within the settlement. Unfortunately, as Figures 69 and 70 demonstrate, the Neolithic and Late Chalcolithic tools have two major disadvantages for spatial analysis: only a few tools are available for mapping and, additionally, many of these derived from filling or levelling layers. Since it is impossible to say how far tools found in filling or levelling layers were transported from their original location of use or deposit, they cannot be used for spatial analysis.

For both the Neolithic and Late Chalcolithic this leaves one spindle whorl in each period that was found in a use horizon inside a building. For the Neolithic this is a spindle whorl in phase X found in Complex 12, the founding stage of the superimposed building mentioned previously. In the Late Chalcolithic a spindle whorl was found in the phase VI building. However, one single spindle whorl does not give much information and cannot be taken as an indicator.

[323] Schwall 2018.

The EBA produces a far more intriguing picture (see Fig. 71). What is most striking is the large number of finds from filling and levelling layers (66.25%) in comparison to finds from use horizons (34.75%) displayed on the map. This surely raises awareness of the lack in credibility of artefact distribution maps. It is to be noted that this crucial information is available only thanks to the very well-executed and -documented excavations at Çukuriçi Höyük. Most likely, this information is missing for many other, especially older, excavations. This rather devastating demonstration shows with how much care such distribution maps need to be regarded. Nonetheless, even if we exclude the tools from filling and levelling layers, the distribution still offers an interesting sight. In the southern trench (S1–4) only one spindle whorl and one loom weight from phase IV and three spindle whorls from use horizons of phase III can be found. In the trench further north (M1), however, 16 spindle whorls and six loom weights derived from use horizons of phase IV. All of these are situated in the northern row of rooms in the trench. Furthermore, the two buildings in the middle of this row contain the majority of the finds (17 textile tools). The more interesting of these two buildings is the one on the right. It consists of two rooms, the larger of which contains five loom weights and the smaller, six spindle whorls. The room with the loom weights furthermore contained a post structure that was interpreted as a potential loom built inside the room.[324] This clear accumulation of textile tools within two adjacent rooms can clearly be interpreted as potential workshops (or at least working areas) for textile production. This would mean that textile production, with both spinning and weaving, was conducted in designated places within the settlement. These places, as far as the current analyses go, were, however, also used for daily living activities.[325]

To answer the second question, it can be stated that not only the general existence of specialised textile craftspeople can be seen at EBA Çukuriçi Höyük, but also their potential living/working area can be traced. The relatively few buildings to which such activity areas for textile production can be assigned again highlights the strong degree of specialisation. Not just anyone performed the craft anywhere, but it was practised by trained and specialised people in designated work places.

However, this circumstance gives rise to an interesting discussion. From ethnographical records we know that spinning was an activity as mobile as its tools.[326] This means that one cannot confidently expect to find accumulations of spindle whorls in certain rooms. A recent paper was able to show that the same applies for other EBA 1 sites in western Anatolia and the Aegean.[327] Therefore, we can assume that the people at Çukuriçi Höyük and other EBA 1 sites in nearby regions chose distinct rooms for both spinning and weaving.

Another explanation could also be that these rooms were only used for storing the tools. It would, however, be a suspicious coincidence if both spindle whorls and loom weights were stored in the same rooms but were not used there. Another possibility would be that these tools were only manufactured in these rooms, which would make the rooms a specialised area for the production of textile tools rather than for the production of textiles. This is, however, unlikely, since current analyses of the clay wares of textile tools at Çukuriçi Höyük imply that the tools were produced by the settlement's potters.[328] In this case the tool manufacturing place should be connected with indicators of pottery production. At the current state of research, both these hypotheses can therefore be dismissed.

[324] Britsch 2012.
[325] See, for example: Horejs 2016a.
[326] See, for a variety of examples: Barber 1991.
[327] Britsch – Horejs 2020.
[328] Kind information by the projects petrographer Lisa Peloschek.

(3) Are practices or agencies noticeable?

This leaves us with the final question addressing the background of the craft specialisation at Çukuriçi Höyük. Craft specialisation can be induced and motivated by several aspects. Both economic need or a thriving economy can lead to labour division and in turn to specialisation; cultural and/or social traditions can dictate structures to which craft and labour handling are subdued; but even a striving by smaller groups and individuals can (re)direct the development of a craft (breaking of structures). All of these hypothetical actions happen within the frameworks set out in Chapter IV.

To analyse the material culture – namely textile tools – with regard to the models presented in Chapter IV.4 we can only consider developments. If the information only derives from one settlement during one fixed period of time, it does not offer sufficient data to fit into the model. A 'snapshot' of material culture without connection to any geographical or chronological movement can only be captured descriptively. Dynamics that would reveal aspects of the social/cultural/economic structure (for example social dictation, cultural norms, traditions, economic needs or also a breaking of rules, standards and so on), could not be defined, since these are all 'aspects of motion', which will not manifest in a static frame. For the current intra-site case study this means that nearly all of the analyses on the tools (spindle whorl and loom weight shapes and metrics) have to be treated with reserve, since in all cases only insufficient data for the Neolithic and (especially) Late Chalcolithic tools are available. Furthermore, the spatial component cannot be analysed at all, since interpretable data is only available for the EBA 1 phases (leading to the just-mentioned problem of one single 'snapshot'). Of course, this limitation can be overcome by including a broader geographical sphere, namely conducting an inter-site and/or interregional analysis. Such analyses were also performed in this study with data from artefact analyses. The discussion of the results of this comparative analysis can be found in Chapter VIII. For the intra-site spatial component such an interregional analysis was unfortunately not possible, since other than for the case study site, such detailed information was not available.

Nonetheless, the changes and continuities observable at Çukuriçi Höyük still give an interesting insight to discuss. For both tool types, two main categories have to be analysed: metrical ranges and shapes. For the spindle whorls, changing developments in both aspects can be observed. The development of the metrical aspect is, however, open to discussion, since it is not clear whether any progress or advancement actually took place as the respective sample sizes differ greatly. One can assume that, compared to the Neolithic and Late Chalcolithic tools, the EBA spindle whorls are more diverse, because Neolithic spindle whorls have a weight range between c. 17 and c. 46g (range: 29g); Late Chalcolithic, between c. 9 and c. 28g (range: 17g); and EBA whorls, between c. 4 and c. 80g (range: 74g). However, this development can be interpreted in several ways. It could show intensification in the craft and/or a higher degree of specialisation, since a more diverse metrical range of spindle whorls allows production of a larger diversity in yarn thicknesses. In the light of practice theory it could be understood as a breaking of rules induced by tradition in crafts (see Fig. 4). To be more precise, the production of yarn changed from a constrained range of possible outcomes (yarn thickness and woven end product) to a greater range of possibilities. The practice would thus change and, potentially, new skills could be acquired. Something similar could be assumed by the systematics of agency theory (see Fig. 5). As a result of the agent's ability to influence the structure through creativity and innovations, the structure (in this case the 'how-to' in spinning) could have been changed, leading to a change in material culture. The deeper background of this process could be seen in the cognition of the agent, seeing and adapting to a desired/necessary change in textile production. Looking at this from the perspective of the jointed model developed in this study (see Fig. 7), we recognise several connections: the interrelation of object and social agent (agency), the relevance of technical aspects of the object (causality), the potential social meaning of the change in material culture for the textile craftspeople (factorality as a demonstration of advancement and technological liberty) and the interaction of social agent and object as an influence on the structure (cognition).

Further components of the 'information-based model' in Subchapter IV.4 can be found in the developments in spindle whorl shapes. Both the Neolithic and the Late Chalcolithic are dominated by flat and round spindle whorls, while the EBA material mainly contained biconical whorls. Additionally, the diversity in shapes slightly increases in the EBA. This development, too, can be interpreted as a sign of higher craft specialisation. The change in dominant shapes can be explained as either an increase in knowledge and improvement in tool sets, or as an adaptation to potentially new or changed circumstances. The first hypothesis would include biconical whorls being generally better for spinning, regardless of the fibre and the spinner. Different analyses and experiments have shown that this cannot be the case.[329] The hypothesis can therefore be dismissed. The interpretation of changed shapes as an indicator for adaptation would include the hypothesis that an outside condition changed. It can therefore again be understood by applying the theoretical models of Chapter IV, since it could be seen as a change in structure that induced change in the object, the material culture and the behaviour of social agents. The typically regarded change thought about in this matter is the introduction of wool.[330] Though it is still unclear when wool was introduced in western Anatolia, it is very likely that at the beginning of the EBA it was a newly available resource. Since wool fibres are structurally very different from plant fibres,[331] a change in spindle whorls would be a logical way of adapting. If this was the case, referring again to the jointed 'information-based model', it would imply that following new components could be seen as an endogenous change of structure (environment, available/known resources) and a change in known customs through new innovation (local/regional developments, cultural/social norms). Additionally, the above-described impact of causality and cognition would apply in a similar manner.

It is vital to observe the developments in the metrics of loom weights. The main reason is the small number of loom weights from the Neolithic and Late Chalcolithic periods. Furthermore, even if those few weights are compared with the clusters of EBA loom weights, no difference is visible. Actually both the Neolithic example and all Late Chalcolithic loom weights fit into one of those clusters. Therefore, a change in loom weight metrics, which might follow the changes of spindle whorls, cannot be observed. This matter would maybe not be as intriguing if the same consistency were not observable in the loom weight shapes. However, just like the weight clusters, the shape stays the same during all phases at Çukuriçi Höyük. From the point of view of craft specialisation, this is difficult to analyse. The clear focus on a certain shape and certain weight classes could imply specialisation in certain weaves and textiles. However, the existence of this focus and specialisation for several thousand years is highly unlikely. From the perspective of practice and agency theory, this strong conservatism could be seen as traditions, cultural norms, or a sense of community. In all cases an interaction between the object and the structure is happening which exerts such power on the system that the social agent is either not able or not willing to change it. In the 'information-based model' this would highlight the components of influence by structure (cultural/social norms) and the force of the impression of objects in mindsets (constraints).

If all the mentioned aspects are considered, only a few of the components in the 'information-based model' are still missing. Before concluding these observations, however, it should be stated again that they have to be treated with care. For both tool types it is the case that very different sample sizes are being compared. This makes statements about ranges in metrics and diversity of shapes problematic. Furthermore, in both the Neolithic and the Late Chalcolithic settlements, we have good reason to believe that the records on textile tools are incomplete: many of the spindle whorls found from Neolithic layers were made from unbaked clay and were in a bad state of preservation. The possibility that the majority of Neolithic whorls did not survive the millennia is very likely. Additionally, the range of spindle whorl sizes during phase IX also implies

[329] See, for example: Schade-Lindig – Schmitt 2003; Andersson et al. 2010; Grömer 2016.
[330] See, for example: Greenfield 2010.
[331] See: Rast-Eicher – Bender Jørgensen 2013; Grömer 2016.

the possibility that a larger diversity of spindle whorls was available. For the Late Chalcolithic, Schwall was able to argue that the areas excavated were mainly used for storage purposes.[332] It would therefore be surprising to find a large number of textile tools in this area. This could, in turn, mean that the few tools found were located there more by accident and the majority of textile tools would have been located elsewhere.

Several insights are indicative of the textile production at Çukuriçi Höyük experiencing both an intensification and a stronger specialisation entering the EBA. Likewise, it could be shown that the craft was probably at no point completely dilettante, but was always performed by craftspeople who 'knew what to do'. To what extent this can be called semi- or fully specialised has to be considered on the basis of its economic implication. Since it is assumed that a specialist is either partially or fully freed from other subsistence activities, abilities and skills alone cannot be a sufficient argument for the presence of craft specialisation. The economic factor, however, is difficult to address in this matter, since the insufficient data available for the Neolithic and Late Chalcolithic textile production does not allow statements about its economic standing. Due to the large assemblage in the EBA settlements and especially the spatial analysis, it can be stated that the textile workers at EBA Çukuriçi Höyük were most likely at least semi-specialists. The work in designated areas and especially confinement to certain rooms shows that the craft was only entrusted to certain people. In combination with the high number of finds and the great spectrum of possibilities in spinning, plus the clearly directed focus of weaving, a high degree of specialisation is implied. However, this is all information missing for the Neolithic and Late Chalcolithic. Regarding this state of data, we can only assume that these earlier stages did not share such a high degree of textile craft specialisation. The next step would be to consider the 'how' and 'why' of the increase in specialisation in textile production.

Above, it was shown that several momenta of systemic change could have influenced the development of material culture. These included both potential conservatism through cultural norms and the impact of existing objects, as well as potential efforts towards innovation by social agents. In summary, however, it seems that an interpretation in favour of 'Bourdieusian' argumentation is the most plausible. We encounter a strong conservatism in the continuity of loom weight shapes and sizes. If the changes of spindle whorl sizes and shapes had been a development forced upon the system by the creative/innovative striving of textile workers, it would be surprising to not see this change in the other part of textile production, the weaving. It is therefore more likely that the changes in spindle whorl shapes and sizes were induced by developments of the structure (new resources – wool, pressure from outside – new trends [superregional matter]). Certainly, these changes were adopted willingly and could only be adapted via the mindset of skilled craftspeople. Inexperienced textile workers would not have had the cognitive ability to adapt their tools to changing circumstances. Nonetheless, the changes we can observe at Çukuriçi Höyük seem to have come from outside developments resulting in adjustments in the structure which led to induced changes for both agents and objects, but within the constraints of the objects.

The hypothesis of the stated 'change from outside' needs to be further defined and, not least, be proven in order to be able to rule out that the change was just endemic. The interregional and diachronic analyses in the following chapters will give more insights into the question of which factors exerted the power for the observed developments at Çukuriçi Höyük.

[332] Schwall 2018.

VIII. Discussion

In the beginning of this volume it was stated that the aim of this study was not only to reconstruct prehistoric textile technologies in the chosen research area, but also to learn about their social and cultural impact and, ultimately, to deduce general information on craft developments and knowledge transfer from the analyses.

To achieve these objectives, different approaches – theoretical and methodological – were employed. However, first of all, the fundamental part was the recording in a large database of textile tools from different sites, regions and periods. From other archaeological sources we know that people in and around the prehistoric Aegean were already very mobile and strongly connected. The distribution of obsidian, for example, perfectly demonstrates this far-reaching connectivity, already active even in the Neolithic.[333] Among such interconnected societies it would be futile trying to gain information about the network by only following the developments of a single region, tool or period.

Grasping the big picture in this case, however, creates both useful advantages as well as unavoidable disadvantages. One of the strongest drawbacks in this matter is the fragmentary record of data. The study was intended to cover a wide range, both geographically as well as chronologically. This, however, led to the problem that data are not available from all regions for all periods. Furthermore, even if data on a certain period are available throughout the whole studied region, the quantity and quality can differ greatly (see Chapter VI). These circumstances resulted in major limitations regarding primarily – though not only – the statistical evaluation of the data. This matter will be discussed in Subchapter VIII.2.1.

Another difficulty that derived from the widespread geographic focus of the study was the different chronologies within the research area. Even if one ignored certain inconsistencies in the discussions about the chronologies in the different regions, it would still leave the problem of choosing a terminology and defining the corresponding dates. In Chapter II this process was outlined, ultimately deciding in favour of the uniform use of the dating and chronological terminology of western Anatolia. Ultimately the chronological terms in this study are mainly used to supply a coherent framework for comparison. Since the case study site (Çukuriçi Höyük) of this volume is situated in western Anatolia, the western Anatolian chronological terminology was chosen as a point of reference. Therefore, any period labels mentioned in the following discussion find their reference in Subchapter II.1. The terminology given there is not a result of this study but of recent discussions and publications on the matter.[334]

As for the chronology, it was also possible to build the study on a strong methodological foundation. Though only little is known about prehistoric textile production in most parts of the research area, other regions of the world are rather well studied.[335] Moreover, many recent studies

[333] See, for example: Reingruber 2011; Horejs et al. 2015.

[334] See, for example: Efe 1988; Maran 2000; Lichter 2005; Şahoğlu 2005; Schoop 2005; Özdoğan 2011; Schoop 2011; Bartelheim – Krauß 2012; Özdoğan et al. 2012; Kouka 2013; Pernicka et al. 2014; Weninger – Easton 2014; Fidan et al. 2015; Horejs et al. 2015; Jung – Weninger 2015; Horejs 2016b; Horejs – Weninger 2016; Schwall 2018.

[335] See: Cartland 1918; King 1979; Walton 1988; Brumfiel 1991; Joyce 1993; Hodak 1996; Asturias de Barrios 1998; von Kurzinksy 1998; Leuzinger 2002; Hendon 2006; Mannering 2007; Mikhailov 2008; Wild – Wild 2008; Benguerel et al. 2010; Zubkova et al. 2010; Cardon 2011; Kuzmin et al. 2012; Andersson Strand – Mannering 2014, Preinfalk – Preinfalk 2014; Mannering 2015; Rast-Eicher 2017; Médard 2018.

and experiments gave detailed information about the functionality and technical aspects of loom weights and spindle whorls.[336]

The most relevant experiments for the current study were conducted by the Centre for Textile Research in Copenhagen (CTR). These experiments were able to demonstrate the impact of spindle whorl weight and loom weight sizes on textile production processes. Those are the factors that formed the basic variables on which the statistical analyses of this volume were built. However, one further addition to these factors was included: the moment of inertia of spindle whorls. This physical quantity as a basis for spindle whorl analyses has, until now, received only limited attention.[337] However, since it takes into account the whorl's shape in addition to the weight, it can yield important information. Moreover, in Subchapter IV.7 it was possible to demonstrate that spindle whorls of a similar weight but different shapes show slightly different values for the moment of inertia. To what extent this would have been noticed by a spinner needs to be discussed. Nevertheless, the variable was included in the study in order to encompass technical details as thoroughly as possible.

Another possible purpose of spindle whorl shapes, as for loom weight shapes or decoration on textile tools, is a solely decorative one. These stylistic attributes were also analysed and will therefore be discussed, albeit with a lesser focus. The priority in this volume is to consider technical features and the possible information deducible from them.

To evaluate the large record of interval-scaled data, different statistical methods were employed. For the comprehensive overview a two-step cluster analysis was undertaken (applicable for big data analyses), and for more detailed perspectives, non-parametric analyses of variance were employed. These analyses form the core of the results and likewise the following discussions. However, presenting and interpreting statistical data are two very different matters in this context. Ultimately the statistics only deliver hard facts about the behaviour and dependencies of the values entered into the tables. These results therefore still need to be interpreted according to fitting theory constructs for the respective topic.

For the interpretation of any results in this volume, two main theory constructs (practice theory and agency theory) and one theoretical discussion (on craft specialisation) were chosen. Based on the theories of, for example, Bourdieu, Giddens or Ortner, models were designed in order to be able to follow more easily the lines of reasoning applied to the results. The craft specialisation theories have to be seen as an extension or a further support for detailed aspects. In any case, what we are attempting is to understand the causality and modality of developments in prehistoric textile production. The theories and models presented in Chapter IV are thus the fundamental epistemic and ontological tools of this study. A first demonstration of their application was given in Chapter VII regarding the case study of the study, the prehistoric settlement Çukuriçi Höyük.

The case study of Çukuriçi Höyük served two important purposes. It demonstrated the depth of insight it is possible to obtain if well-excavated and -structured information is available and it gave an impression of the applicability of the theoretical models. Especially the latter, however, also proved the limitations present when referring to only one site. This shortcoming, as stated above, should be compensated for by the large database used in the current study. The evaluations showed that a broad view is necessary to fully understand the developments happening in a certain craft. That applies even more if this insight is meant to yield information about general developments and the standing of crafts and craftspeople in prehistory.

While the commonalities, changes and continuities of prehistoric textile production in the research area are certainly the core focus and foundation of the current study, the ultimate aim is to gather information on knowledge transfer that can be adapted to other crafts as well. To achieve this, the discussion will first refer to the results about categorical information (shapes

[336] See, for example: Mårtensson 2007; Mårtensson et al. 2009; Andersson et al. 2010; Verhecken 2010; Chmielewski – Gardyński 2010.

[337] Examples are: Loughran-Delahunt 1996; Chmielewski – Gardyński 2010; Verhecken 2010; Verhecken 2013.

and decoration) in Subchapter VIII.1. In particular, the development and distribution of loom weight shapes will be a focal point in this matter. The discussion of the analytical statistics results will follow in Subchapter VIII.2. The discussion, in this instance, will not only be about the results of this study, but also about the general applicability of the statistical methods, their potential and their limitations. Both were perceptible in the presented records. Nonetheless, Subchapter VI.2 has shown that – while not for all cases – significant results could be obtained. As for the descriptive analyses, the analytical statistics will be evaluated in the light of practice and agency theory, more precisely the acquired models.

The final subchapter of the discussion – and ultimately the study – will be the conclusion connecting the results of all analyses. The results of Chapter VI already indicate that the connections found in the different artefact categories are not congruent in all instances. Subchapter VIII.3 will discuss the causalities and modalities for aligned and opposed developments in prehistoric textile production. Gaining knowledge about the nature of changes and continuities within one distinct craft could provide insight into the general functioning of knowledge transfer within crafts. This includes the sharing of 'common' as well as the passing-on of special knowledge. These domains will ultimately be the most relevant insights this volume and its research will deliver.

VIII.1. Developments through Time – Discussion of the Descriptive Evaluation

The loom weight shapes and the spindle whorl decorations are two aspects that are difficult to quantify in this study. For the whorl decorations, too little homogeneity could be found among the different individual whorls to make a quantitative analysis possible. While the loom weight shapes present a far stronger homogeneity, the database was not comprehensive enough, for which reason unquantified data had to be added (see Chapter VI). This reduces the validity of quantitative methods enormously. Therefore, in both cases descriptive observations, deductive analyses and discussions will be more fruitful.

For spindle whorl shapes the situation is different. Since the moment of inertia has been recorded and analysed as a continuous variable, the whorl shapes can be analysed quantitatively. Nevertheless, additionally to the observations of the proportion in which they appear in distinctive regions and following potential changes, their spread and distribution is important additional information. The spindle whorl shapes will therefore be discussed both as a categorical and as a continuous variable.

This subchapter therefore covers three categories – loom weight shapes, spindle whorl shapes and spindle whorl decorations – and thus discusses the results presented in Subchapter VI.1.

VIII.1.1. Loom Weight Shapes

The developments of loom weight shapes will first be discussed for each period. Observable patterns throughout the different periods will subsequently be discussed for the respective loom weight shapes. For the domed, spool-shaped and crescent-shaped loom weights, no useful, interpretable distribution could be identified. These shapes will therefore not be additionally addressed. Finally, all observations will be conclusively discussed.

Late Neolithic (6500–6000/5900 BC)

For the Late Neolithic only information for two regions – the western Anatolian coast and Bulgaria – could be found, and in these regions only a few sites/objects could be recorded (see Figs. 22, 29–31, 33 and 35–36). The loom weights from the two western Anatolian sites are cylindrical in shape, showing a commonality and indicating a potential connection. However, it has to be

considered that the loom weight from Çukuriçi Höyük is only one individual object made from a peculiar ware for the Neolithic (see Chapter VII). The cylindrical loom weights of Ulucak were found in burned buildings from the phases Ulucak V and IV.[338] Following the dating provided by Çilingiroğlu, they were present at the end of the Late Neolithic. Although they are of a different subtype of cylindrical than the Çukuriçi Höyük example, they do belong to the same general shape. Therefore their presence at other Late Neolithic sites in the Izmir region would not be surprising.

Between the Bulgarian sites no commonalities could be found. Interestingly, however, already four different shapes of loom weights could be identified (drop shaped, cuboid, discoid and spool shaped), demonstrating diversity. The fact that none of these shapes appear at multiple sites does not necessarily mean that no connections or similarities in weaving techniques existed. The picture can easily be obscured by the only narrow view available. Nonetheless, at present it is not possible to assume any technological connectivity within Late Neolithic Bulgaria or between Bulgaria and the western Anatolian coast.

It can therefore be stated that in the Late Neolithic two opposing pictures are visible: commonalities on the western Anatolian coast and diversity in Bulgaria. The main conclusion that can be drawn is the seemingly first appearances of different shapes in different regions. However, since this information stems from severely limited data this hypothesis has to be considered with reservations. Further conclusions will be drawn in connection with the subsequent discussions of later periods.

Early Chalcolithic (6000/5900–5500 BC)

The records for the Early Chalcolithic are even more fragmentary than for the Late Neolithic (see Fig. 23). Only information on four sites, three from Bulgaria (Yabalkovo, Karanovo and Nova Nadezhda) and one from Turkish Thrace (Aşağı Pınar) is available. Moreover, all sites are spatially very close to each other. That means that we must abstain from making overly general comments.

However, for this small section we find multiple similarities between the two regions and the different sites. The cylindrical loom weight shape, which appeared on the western Anatolian coast in the Neolithic, can only be found at Aşağı Pınar. The discoid shape only appears at Nova Nadezhda. All other shapes present in the Early Chalcolithic (drop shaped, pyramidal, cuboid and domed), however, appear at several sites and in both regions (see Figs. 29–35). It can therefore be safely assumed that connections and commonalities were apparent in the weaving technology of the Early Chalcolithic, at least around the currently discussed area. A similar development in other regions is likely, but, as explained above, to state this as a fact would be too bold.

Middle Chalcolithic (5500–4250 BC)

With the Middle Chalcolithic the available records increase significantly (see Fig. 24). However, information from the Aegean Islands is completely lacking, and from western Anatolia almost completely lacking. In the regions with data available, multiple common loom weight shapes can be found. Except for the spool-shaped loom weight from Platia Magoula Zarkou and the special shape from Kumtepe, all other shapes appear at at least two different sites. With the exception of the pyramidal and domed shapes, they even appear in several regions (see Figs. 29–36, 38).

[338] Çilingiroğlu 2009a.

These multiple commonalities indicate far-reaching connections. In the case of the discoid loom weights, for example, the distribution seems to reach from Bulgaria, through northern Greece up to the Greek mainland. Comparably, the drop-shaped loom weights are spread through Bulgaria, Turkish Thrace and northern Greece. It is very likely that even further spread distributions could be found, if the picture were not limited by the available records. Nonetheless it can be seen that common ideas on how to produce a loom weight (or at least what it should look like) were present over a large area. The potential meaning of this commonality will be discussed in detail later on. For now the hypothesis can be stated that loom weight shapes were potentially transferred together with directly (weaving techniques) or indirectly (spinning, finishing techniques) connected technologies.

Late Chalcolithic (4250–3000 BC)

In the Late Chalcolithic less variety can be noticed than in the Middle Chalcolithic (five vs. eight types, see Fig. 25). However, the shapes present are spreading even further now. For example, the cylindrical loom weights are present on the western Anatolian coast, in Bulgaria, as well as in northern Greece and on the Greek mainland. The drop-shaped and pyramidal loom weights can be found in northern Greece, Bulgaria and in southwestern Anatolia.

The decrease in variation and the further-reaching distribution argue for an increasing degree of connectivity in regard to weaving technologies. It further indicates a greater willingness for adoption, possibly through cultural connections or a transfer of technology or practices. Interestingly, the adoptions seem to follow different patterns for the different loom weight shapes.

Cylindrical loom weights were recorded at six different sites and for four of them it is the only present loom weight shape during the Late Chalcolithic. By contrast, pyramidal shapes could be found at five different sites and only at Beycesultan is it the sole loom weight type found. Similarly, the drop-shaped weights are present at seven sites and there is also only one with no other shapes present.

This could mean that different flows of information or different kinds of connections existed between the different sites. This hypothesis currently has to be restricted to weaving. Certainly, the absence of shared loom weight shapes between two sites does not imply a complete absence of connectivity, since contacts on different levels regarding topics other than weaving cannot be excluded. Sites like Sitagroi (with four different loom weight types) or Lepitsa (with three different types) show that no clear restrictions in means of communication were present, since overlaps in different types are recognisable. On the whole it seems that certain far-reaching mindsets containing ideas and perceptions of a mode of production of textiles were crystallising in the Late Chalcolithic.

Early Bronze Age 1 (3000–2750 BC)

With the beginning of the Early Bronze Age the variety in loom weight shapes increases again (see Fig. 26). Each shape distinguished in the typology is present, though only a few shapes are represented by several types (see Figs. 29–38). Unlike in the Late Chalcolithic, sites more often feature only one solitary shape. Nevertheless, sites with four different shapes (Kanlıgeçit and Demircihüyük) exist.

The widest spread types are of cylindrical and pyramidal shape. Spatially the pyramidal loom weights are the furthest spread shape. However, at three of five sites they appear together with other shapes and they are also found at the two sites with multiple loom weights. The cylindrical-shaped weight, on the other hand, appears either alone or together with spool-shaped weights.

Referring to the Late Chalcolithic loom weights, the hypothesis was constructed that mindsets with different notions of a mode of production possibly resulted from different flows of information. The clearer solitary appearance of certain shapes and even further-reaching adoption could indicate that this is actually a process starting or emerging in the Late Chalcolithic and growing further in the Early Bronze Age.

Early Bronze Age 2 (2750–2440 BC)

Of the recorded sites from Early Bronze Age 2, the majority of sites (10 out of 17) feature two or more different loom weights (see Fig. 27). A pattern in the mixture of certain shapes is not observable. With two exceptions (Ezero and Sigatroi, both with pyramidal and spool-shaped weights and Dyadovo and Bademağacı both with cylindrical and pyramidal-shaped weights), it seems completely random. Moreover, the similarity between Dyadovo and Bademağacı should not be overstated. The sites are situated relatively far from each other and no other sites in between these two share this particular mixture of loom weight shapes.

The hypothesis of commonalities in mindsets that led to the adoption of certain shapes therefore seems problematic for EBA 2. However, one possibility is that through a higher degree of connectivity, exchange and communication, more information could flow in different areas and directions. This might have led to more individuality among the craftspeople of one distinct site. Different information on techniques and traditions could have given weavers the chance to choose more freely in their own development. This, in turn, could have led to a higher variety in mindsets, which could be reflected in the tools. If this was the case, the further-reaching connections should be visible through wider distributions of different shapes.

A stronger distribution of certain shapes is clearly visible for EBA 2 (see Figs. 29–38). Only seven out of 17 sites do not feature pyramidal loom weights, which makes the pyramidal shape the most strongly represented one. Furthermore cylindrical and cuboid shapes are also represented in almost all regions. Except for the special shape from Liman Tepe, all shapes are present in at least three different regions. This circumstance clearly indicates an increase in connectivity on a superregional scale, speaking in favour for the proposed concept of shared mindsets. However, since the majority of sites feature more than one loom weight shape, the aforementioned growth of individuality among weavers is also visible.

Early Bronze Age 3 (2440–2000 BC)

During the final phase of the Early Bronze Age the varieties of loom weight shapes per site increases further (see Fig. 28). Only four out of 16 sites feature just one solitary loom weight shape and nearly half of all sites have at least three different types. As for EBA 2, no typical shape mixtures can be found. One exception is the combination of pyramidal and spool-shaped loom weights appearing at Dyadovo and Sitagroi. The general far-reaching spread of pyramidal loom weight shapes, however, makes it unlikely that this had a deeper meaning.

The crescent-shaped loom weight (which first appeared in EBA 1) is now spread through the Greek mainland, the Aegean Islands and western Anatolia. Pyramidal and cylindrical loom weights are the most frequent shapes and also appear in nearly all regions. Interestingly, cylindrical loom weights are present in southwestern Anatolia, where pyramidal shapes are absent, and, in turn, cylindrical loom weights are absent in northern Greece and northwestern Anatolia. However, between those regions, several sites exist which have both shapes present (Platia Magoula Zarkou, Pefkakia Magoula, Tiryns, Ezero and Troy). In southwestern Anatolia, for example, pyramidal loom weights were present together with cylindrical ones during EBA 2. Therefore, no clear restrictions can be seen for these shapes.

Ultimately the developments described in EBA 2 are seemingly progressing in EBA 3: even wider distribution of certain loom weight types and even larger varieties of shapes per site. It was stated that these developments could be signs of more individuality among weavers. This raises the question of whether, in general, more weavers were active in EBA 3 than before. It can be argued that, potentially, an increase in population size occurred during the 3rd millennium,[339] which would have led to a higher demand in textiles and therefore also textile workers. However, even if that argument is set aside, one site clearly indicates a connection between many textile workers and a big variety of loom weight shapes: Troy.

Troy is known to have an incredibly high number of textile tools, both spindle whorls and loom weights.[340] Likewise, Troy exhibits the largest variety of loom weight shapes (six different shapes) at one site within the whole record of this study. This is another good indicator that the increase in loom weight varieties per site could derive from multiple textile workers that preferred different modes of production. These modes of production, in turn, were not only shared by different people at one site, but throughout several regions in and around the Aegean.

Cylindrical Loom Weights

The earliest examples for cylindrical loom weights were recorded in the Izmir region on the western Anatolian coast, at the sites Çukuriçi Höyük and Ulucak. The finds from both sites were found in layers dating to the end of the Late Neolithic (see Fig. 30). Shortly after this, in Early Chalcolithic layers, this shape appeared in Turkish Thrace and spread to Bulgaria and northern Greece in the Middle Chalcolithic. During the Late Chalcolithic the cylindrical loom weights could also be found further north in Bulgaria, as well as on the Greek mainland. Simultaneously the shape was still present in the Izmir region. During the Early Bronze Age the cylindrical loom weights spread further, especially into the Greek mainland (in EBA 2–3), the Aegean Islands (beginning in EBA 1, mostly in EBA 3) and southwestern Anatolia (in EBA 2–3).

The chronological distribution of the cylindrical loom weight is presented in Figure 72. On the map the earliest appearance of the cylindrical loom weight shapes at the respective sites is shown by colour-coded markings. These markings are shown as circles with the colour fading out. This depiction was chosen to indicate that the area which contained the loom weight shape was most probably larger than the record shows; however, we are only able to state with certainty which respective sites they were found at. The colours only indicate the earliest appearance of the shape in a certain area, meaning that, for example, the loom weights from the Late Chalcolithic and Early Bronze Age in the Izmir region are not depicted, since the shape was already present during the Late Neolithic.

The data suggest that the cylindrical shape has its origin on the western Anatolian coast, more precisely in the Izmir region. Since the shape does not appear in central Anatolia or northern Aegean Anatolia at all, it is very likely that this type of loom weight was distributed from the Izmir region to Turkish Thrace, from where it later spread to Bulgaria and northern Greece. The spread to the Greek mainland in the Late Chalcolithic could have come either from the opposite coast – western Anatolia – or from northern Greece. The fact that the earliest cylindrical loom weights on the Aegean Islands can be found in the Early Bronze Age could speak in favour of a distribution from northern Greece. Since it is, however, known from other archaeological sources that during the 4th millennium BC trans-Aegean contacts between western Anatolia and the Aegean Islands existed,[341] a possible distribution via the islands cannot be excluded. The origin of the earlier distribution on the Aegean Islands, during EBA 1, is difficult to pin down. The

339 See, for example: Wiencke 1989; MacSweeney 2004.
340 See, for example: Schliemann 1874; Schliemann 1881; Schliemann 1884; Blegen et al. 1950; Völling 2008.
341 See, for example: Schwall 2018.

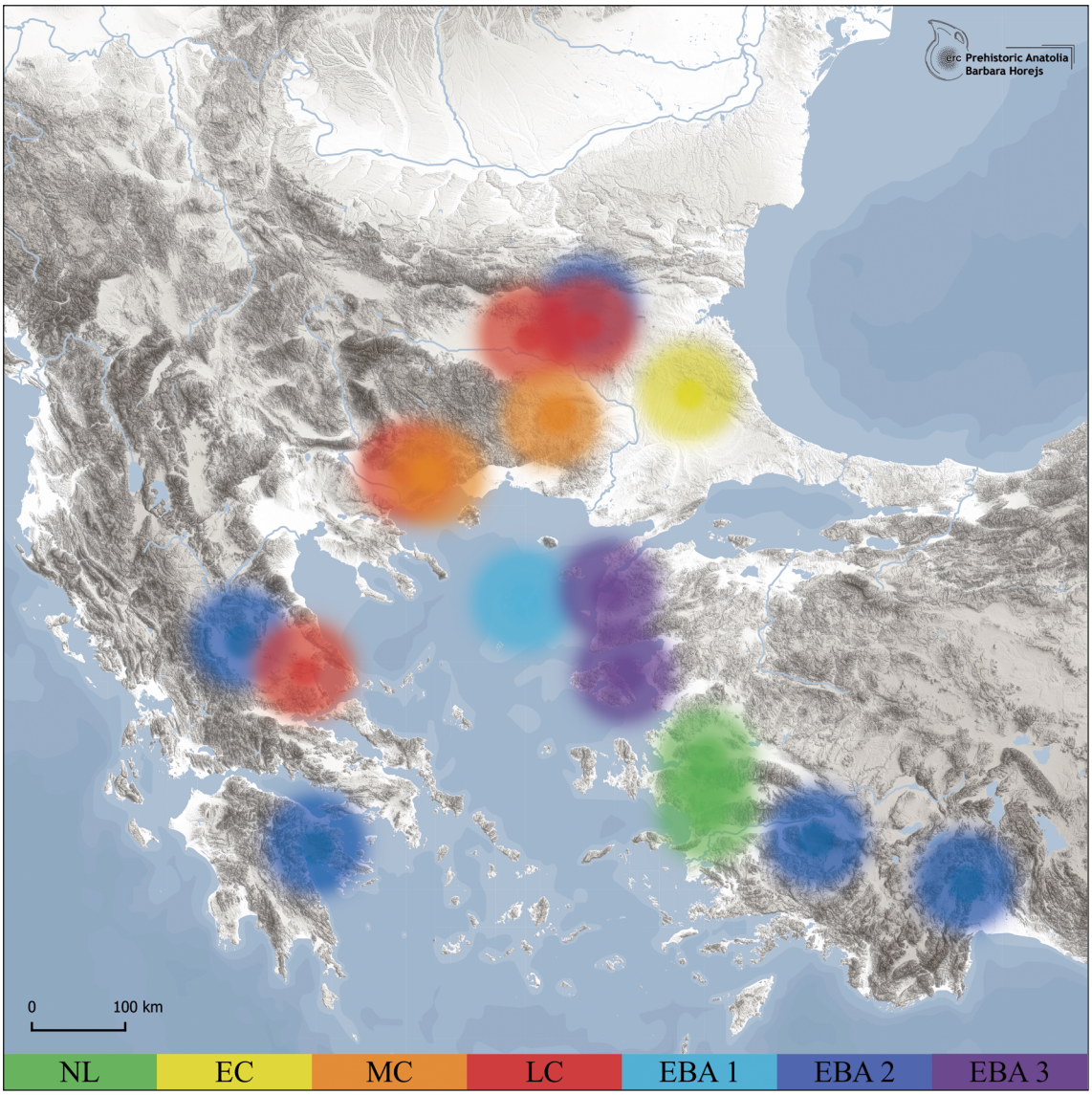

Fig. 72 Geographical/chronological distribution of cylindrical loom weights (C. Britsch)

site the information derived from is Poliochni, a settlement situated on Lemnos. With regard to the data in the current study, the influence could have come from eastern and northern Greece, as well as from the western Anatolian coast. The same applies for the spread of the shape in the Troad and on further Aegean islands during EBA 3. The developments during EBA 2 are simpler to assign. The spread in the Greek mainland and Bulgaria was most likely intrinsic, deriving from already existing knowledge, since the shape was already present in these regions during the Late Chalcolithic. The emergence in southwestern Anatolia was most likely influenced by the Izmir region.

Drop-shaped Loom Weights

The distribution of the drop-shaped loom weight is clearer in its picture than that of the cylindrical types (Fig. 73). The earliest appearance is in the Late Neolithic in the south of Bulgaria. During the Early Chalcolithic the shape appears in Turkish Thrace, and in the Middle Chalcolithic in further parts of Bulgaria, as well as in northern Greece. During the Late Chalcolithic the shape

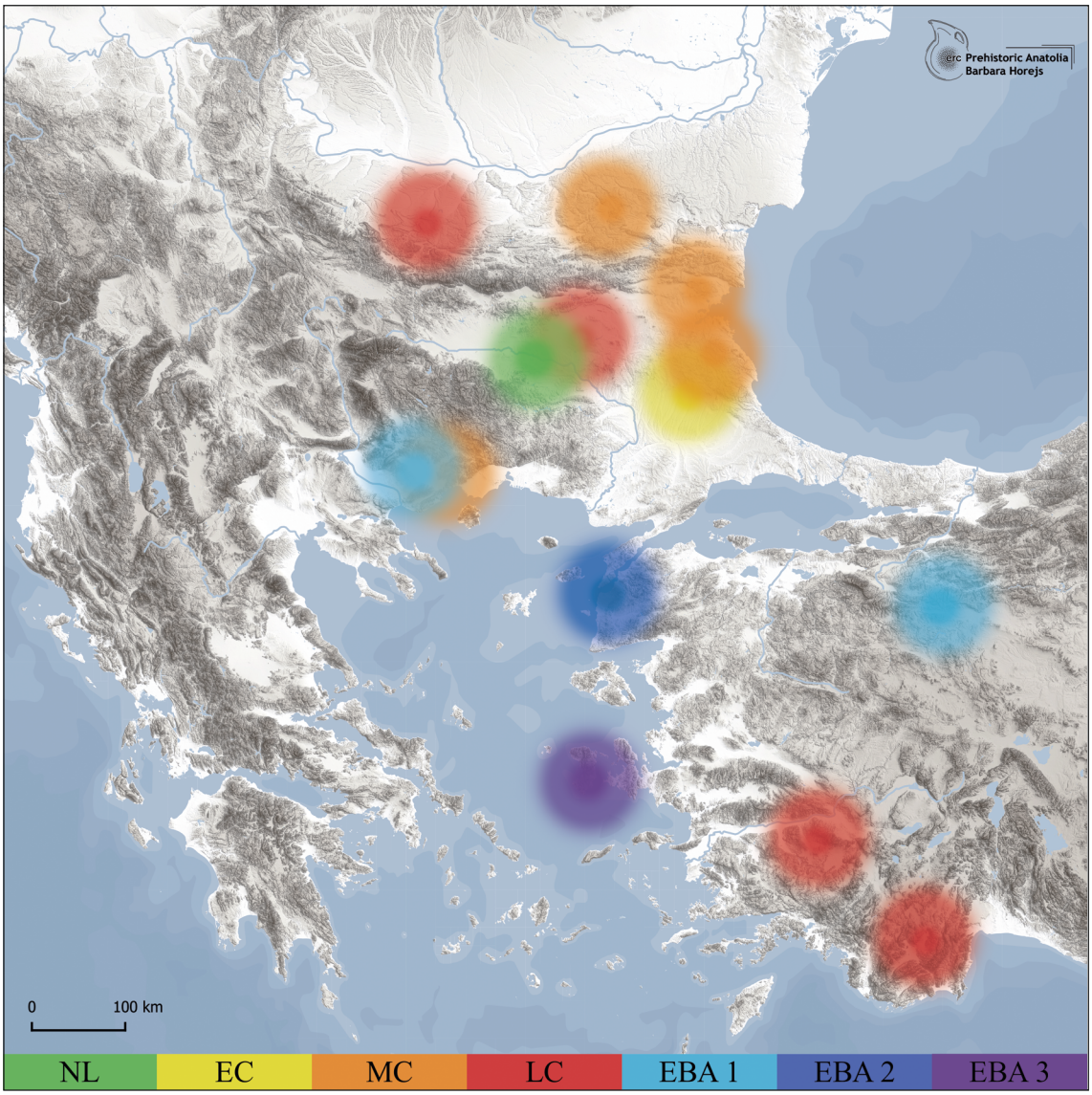

Fig. 73 Geographical/chronological distribution of drop-shaped loom weights (C. Britsch)

is then spread further north, in Bulgaria, and far south, in southwestern Anatolia. In the Early Bronze Age they also appear in other parts of western Anatolia (in EBA 1 in northwestern Anatolia and in EBA 2 also in the Troad), as well as on the Aegean Islands (in EBA 3).

The depiction presented in Figure 73 follows the same standards as for the cylindrical loom weights.

The distribution is mostly easy to interpret. The current state of data allows the assumption of an emergence in Bulgaria in the Late Neolithic, which was followed by a spread through Bulgaria, as well as to Turkish Thrace and northern Greece during the Chalcolithic. Most surprising is the big leap from the northern Aegean to southwestern Anatolia. The connection behind this is unclear. Information relating to sites in between those regions is potentially missing. However, it cannot be excluded that similar shapes emerged in southwestern Anatolia through an autarchic development. This circumstance must remain unclear until further research is undertaken in this region. The same applies for the influence on northwestern Anatolia and the western Anatolian coast. This distribution could derive from the south or from the north. For the late development on the islands it is, however, to be assumed, that the main influences came from the nearby mainland and therefore western Anatolia in general, since it is the closest point of contact.

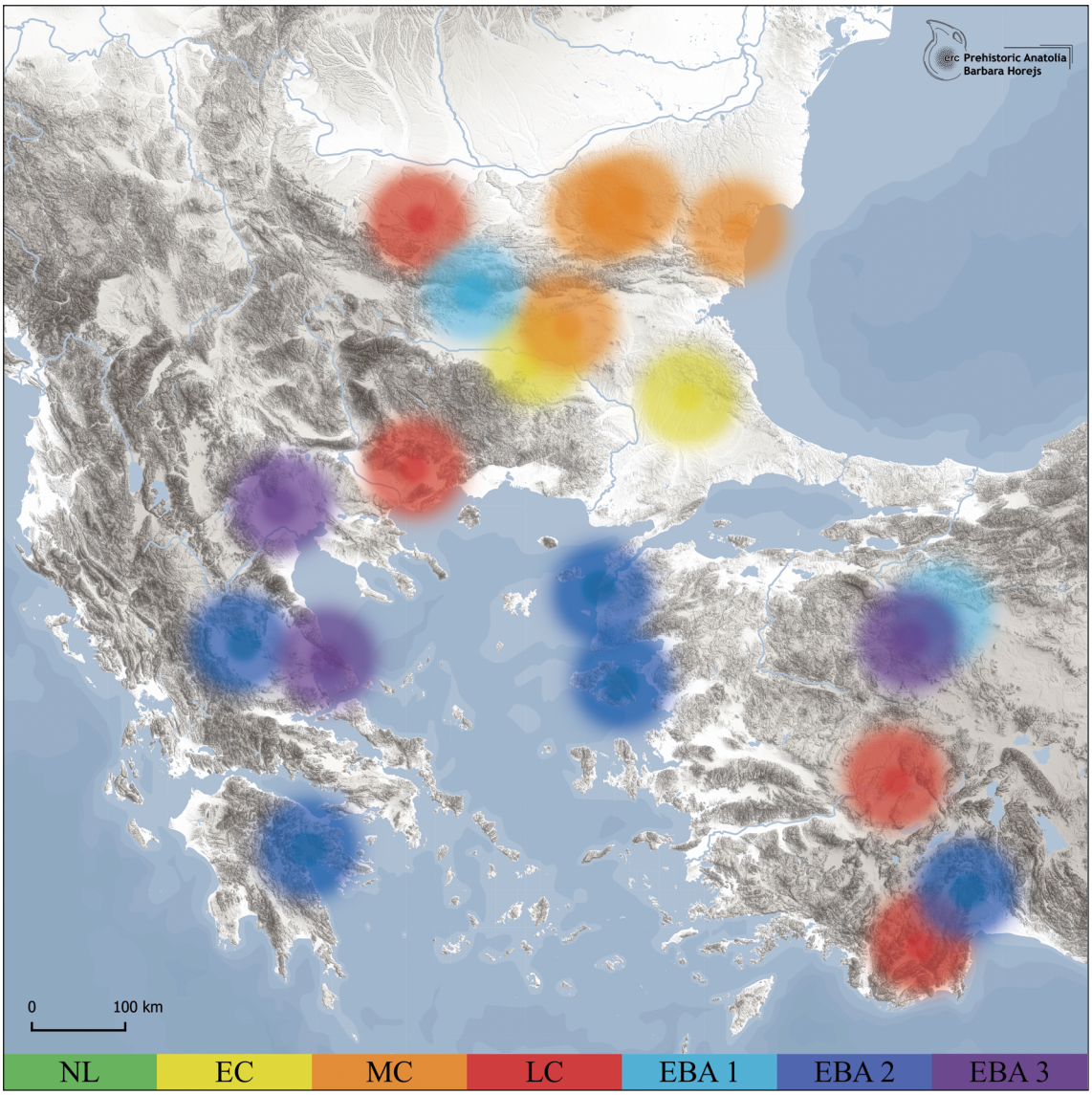

Fig. 74 Geographical/chronological distribution of pyramidal loom weights (C. Britsch)

Pyramidal Loom Weights

The pyramidal loom weight types are the most frequent types analysed in this study, and are present especially during the Early Bronze Age. Generally they have a comparable distribution to the drop-shaped weights, however wider and more extensively spread (Fig. 74). Their first appearance is during the Early Chalcolithic in Turkish Thrace and Bulgaria. In the Middle Chalcolithic the shape can be found in further parts of Bulgaria, and in the Late Chalcolithic, also in northern Greece and – like the drop-shaped types – in southwestern Anatolia. Also like the drop-shaped types, the pyramidal loom weight can be found in northern Aegean Anatolia during EBA 1. However, with EBA 2 a further distribution is noticeable, on the western Anatolian coast, the Aegean Islands and the Greek mainland. In northwestern Anatolia and eastern and northern Greece further appearances of pyramidal loom weights can be found in EBA 3.

The pyramidal loom weights are not present during the Late Neolithic. Other than that, the distribution has a similar peculiarity as that of the drop-shaped types. The shape appears first in Bulgaria and Turkish Thrace and seems to spread further north and south, to northern Greece, during the Chalcolithic. Interestingly, these types also appear in southern Aegean Anatolia in the Late Chalcolithic, without clear connections. Therefore, for this type too, the distribution must remain unclear.

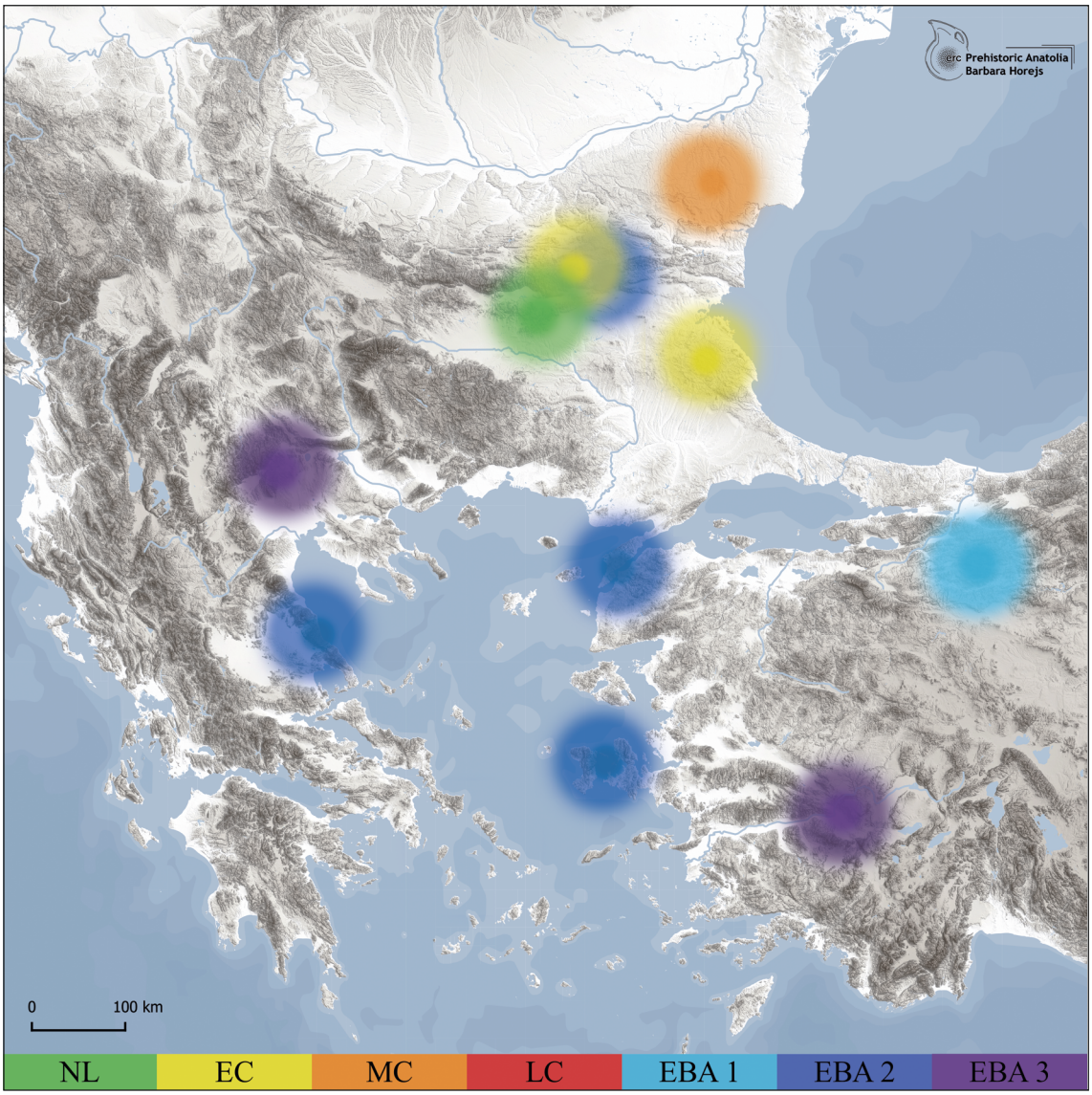

Fig. 75 Geographical/chronological distribution of cuboid loom weights (C. Britsch)

However, the strong similarity in the distribution of the two different loom weight types makes it less realistic that an autarchic development occurred. More likely, missing data is the reason for this picture. This would imply that during the Late Chalcolithic the pyramidal (and probably also the drop-shaped) loom weights spread immensely far, indicating far-reaching flows of contact and information. For the distribution in northwestern Anatolia and on the western Anatolian coast, the direction of influence is also unclear. It could be from either the north or the south (or both?). For the distribution to the Greek mainland it seems very likely that the influence came from further north, since it is the closest point of contact that contained this shape already during the Late Chalcolithic and EBA 1. Since the pyramidal shapes are already present in all regions during EBA 2, the appearances in EBA 3 are in all cases most likely through intrinsic developments.

Cuboid Loom Weights

The first cuboid loom weights can be found in Bulgaria in the Late Neolithic (Fig. 75). In the Early Chalcolithic they also appear in Turkish Thrace, and in the Middle Chalcolithic, in further parts of Bulgaria. No distribution could be traced in the Late Chalcolithic and only one, in northern

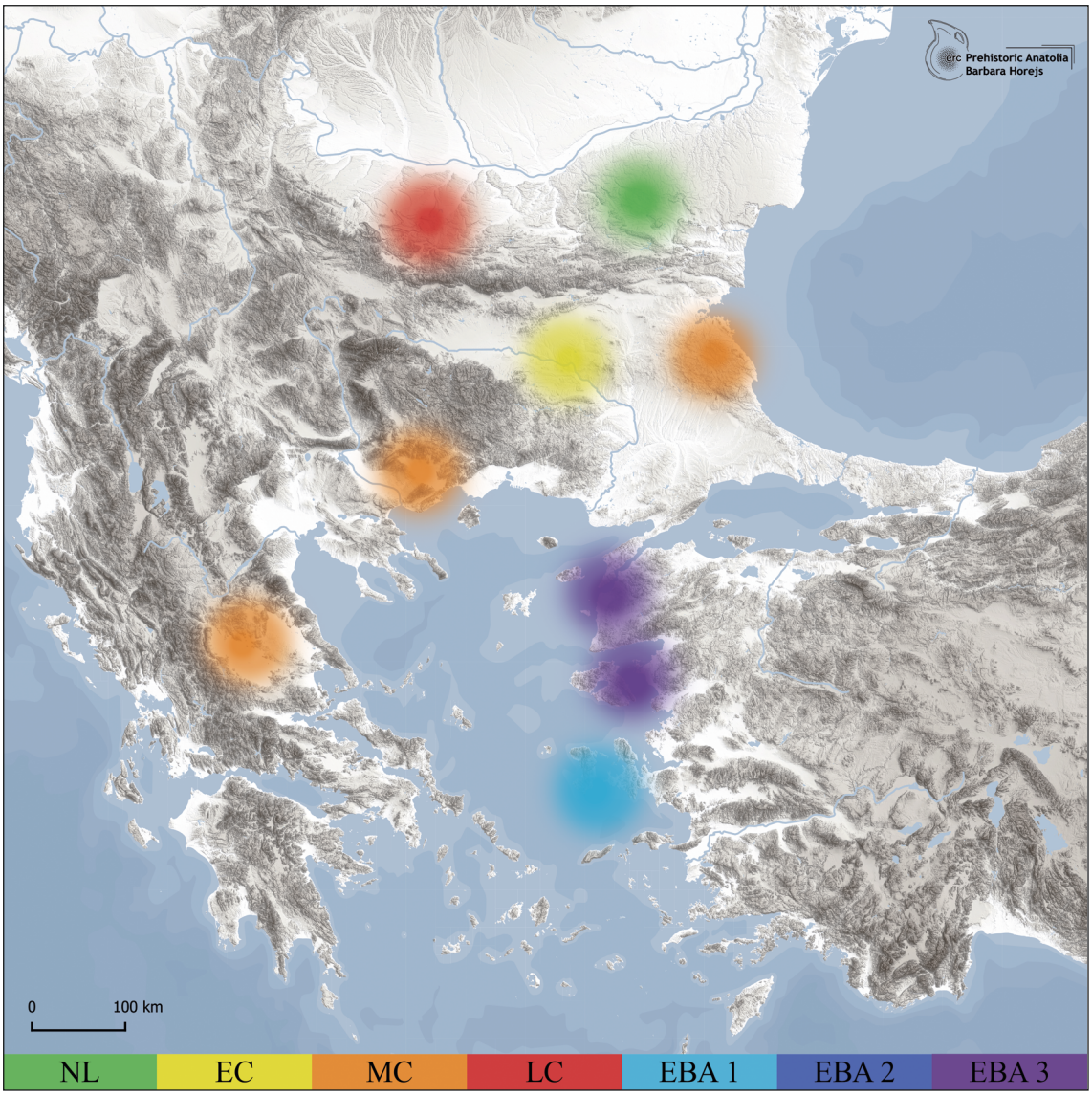

Fig. 76 Geographical/chronological distribution of discoid loom weights (C. Britsch)

Western Anatolia, in EBA 1. In EBA 2 and 3, however, the cuboid types can be found in five regions: eastern and northern Greece, the Aegean and southwestern Anatolia and the Aegean Islands.

The cuboid loom weights therefore seem to emerge in Bulgaria and initially mainly spread there and to directly connected areas. There are two possible logical reasons for the rather sudden high acceptance beginning with EBA 2. Either missing data obscures the picture, meaning that such loom weights actually existed during the Late Chalcolithic or EBA 1 but were never excavated or published, or they were not preserved. Alternatively, with the assumed increasing cultural influences, contacts and exchanges from EBA 2 on, the cuboid loom weights experienced a sudden high degree of acceptance.

Discoid Loom Weights

The discoid loom weight shape is the only one emerging from relatively far north in Bulgaria in the Late Neolithic (Fig. 76). In the Early Chalcolithic this shape still only appears in Bulgaria. In the Middle Chalcolithic it can also be found in northern Greece and on the Greek mainland. In the

Late Chalcolithic the only new appearance is in the northwest of Bulgaria, otherwise the distribution stays the same. In EBA 1 this shape arises on the Aegean Islands, more precisely on Samos, and not until EBA 3 on other Aegean islands and the western Anatolian coast.

The distribution of the discoid loom weights is – compared to the other shapes – limited and seems to spread gradually from the north to the south and, with a noticeable delay, to the east. Whether the developments on the Aegean Islands and western Anatolia were more influenced from east or north of the Aegean is difficult to say. Compared with the distribution of multiple other shapes, a stronger influence from the north is likely; however, it cannot be excluded that this particular shape spread from the east. Another very interesting question is why this rather simple and logical shape was the least common one. One interpretation could be its limited acceptance from weavers, meaning that weavers were either too 'stuck' in their current structures to change to a simpler shape, or that they simply preferred more complex shapes. The otherwise high degree of acceptance of new shapes, however, casts this interpretation into question. Ultimately this peculiarity cannot be explained at the current state of research.

Conclusion

The analysed, interpreted and presented records show several interesting results.

Firstly, the origin of most loom weight shapes seems to be Bulgaria. Only two exceptions can be found: the crescent-shaped loom weight, which first appears in northwestern Anatolia in EBA 1 (see Fig. 26) and the cylindrical loom weight which seems to emerge on the western Anatolian coast in the Late Neolithic (see above).

Secondly, most loom weight shapes are distributed from north to south. For most distributions, a delay is noticeable starting in and around the northern Aegean. In most cases it takes several millennia for shapes from Bulgaria to appear around the Greek mainland, the Aegean Islands or western Anatolia. One exception is southwestern Anatolia regarding the drop-shaped and pyramidal loom weight types. These shapes already appear there in the Late Chalcolithic.

And thirdly, a general increase in distribution can be seen during the Early Bronze Age for most types. This is especially noticeable in western Anatolia and the Greek mainland.

The general questions that have to be asked at this point are: why is there a development of different loom weight shapes? And why do the different shapes spread (differently) to different regions?

At several points in this study, most strongly in Subchapter IV.5, it was stated that the shape of the loom weight does not bear any technical significance. The developments and distributions can therefore not be connected directly to technological changes. The reason for the adoption and/or change of loom weight shapes therefore has to be connected with the impression they convey, either simply aesthetic or symbolic. Another possibility is connections to more general socio-cultural reasons that go beyond technological aspects.

When tools of any kind are being adopted or changed for aesthetic reasons, one would assume that the tools inevitably have a representative function. By changing tools to follow foreign perceptions of beauty/style, one implements something from another into one's own culture. Therefore, even if the reason for the adaptation was primarily a personal taste for aesthetics, the object automatically acquires a symbolic function since it represents a foreign culture.[342] It is therefore possible to define the development of loom weight shapes as a symbolic act of cultural transfer. This, however, only 'labels' the distribution and does not explain the causality for the cultural transfer.

[342] See, for example: Peirce 1932; Parmentier 1994; Parmentier 1997; Deledalle 2000.

When trying to find out more about the reasons behind distribution to answer the question of why development takes place, one can once again find answers by applying the theoretical models. First practice and agency theory will be consulted, demonstrating the ideas they convey on causality. They both emphasise the importance of objects in the interrelations between practice and structure, or agent and structure.

Regarding the model from Subchapter IV.4, the object – for example a cylindrical loom weight – is a link between practice and structure, which allows the social agent to influence the structure via certain events. The most typical example of an event is the acquisition or advancement of new skills (see Fig. 4). For example, a weaver (social agent) from one region receives information from another (for example through trade, exchange or migration) and gets to know a foreign style of weaving which uses certain loom weights (event) and by applying the new technology changes the loom weights (objects) he will use in the future. This process is called the breaking of rules, which, in turn, facilitates cultural and social change.[343] In our example the weaver will probably have an influence on fellow weavers and might change their perception and mode of production as well (structure).

It is important to notice that in the case of the loom weights, the 'acquisition of new skills' has to be seen as an indirect action within the system. This means that certain shapes can be part of a system in which the object is seen as a necessary part although it cannot be directly connected with a certain technology. To be more precise, any object – or tool – that is used in a given structure for an accustomed practice is part of a system and therefore part of the structure and practice themselves.[344] If parts of an existing structure, e.g. a certain weaving technology, are transferred to another structure – for example in the form of knowledge – it is possible that other, connected parts get transferred as well. Whether or not this transfer happens consciously depends on the individual situation. The outcome, however, does not necessarily depend on a conscious re-enactment. According to practice theory, it is actually far more likely for such additional transfers to happen subconsciously.[345] In the case of the adoption of loom weight shapes this would mean that by learning or picking up foreign techniques, one would also transfer the tools that were connected with that technology. The problem here is that the technology that was the initial aim of the transfer might not be directly recognisable in the archaeological record, or maybe even not at all. There can be several reasons for this. For one, the association can reach further than assumed, meaning that, for example, a technology transfer in a connected field within the craft could be the initial impulse. This could mean that via a change in spinning techniques or newly acquired raw materials, for example, the loom weight shape is included as a kind of technological 'by-catch'. This would postulate a potential indirectly recognisable transfer. Another possibility would be a change in weaving techniques that, while not being technically dependent on the loom weight shape, is still connected with this technique in the mindsets of its current and future operators. In this case, the unlikely event of preservation of the necessary evidence (meaning the actual textile) in the archaeological records will make it impossible to recognise the technological transfer.

In agency theory the object plays an even more important role. Together with the agent it forms what we refer to as agency and it has a direct influence on the structure as a mediator for expressions from individuals and groups within the structure (see Fig. 5). In many ways the adoption and development of loom weight types would follow similar procedures as in practice theory. The main difference is the recognition of more voluntary and directed actions by the agent. Instead of the subconscious transfer of unintended parts that are entangled within a foreign structure, it would be assumed that the agent, through creativity and innovation, willingly shapes the structure.[346] The ability to reflect upon the material culture and build up cognition among agent, object and mind, would negate a fully (and partially involuntary) transfer of objects. It would therefore

[343] See, for example: Wittgenstein 1953; Wartenberg 1990; Dreyfus 1979.
[344] See, for example: Gibson 1979; Gosden 2005; Knappett 2005.
[345] Bourdieu 1977; Bourdieu 1990.
[346] See: Giddens 1993; Turner 2000.

have to be assumed that, following agency theory, social agents recognised the foreign loom weight shapes and, while adopting connected technologies, also wanted to transfer these new forms. To give a modern example, it would be like eating Chinese food and wanting to use chopsticks or even Chinese dishes. It is not necessary, but in a way it can feel 'more right'. If deciding to eat in a restaurant, the choice of cutlery and dishes would at least partially be involuntary, but if the meal is eaten (or even made) at home, the choice can be made consciously.

As already stated in Chapter IV, both practice and agency theory, in my opinion, tend to an extreme. Most probably the adoption of new loom weight shapes was neither fully subconscious nor completely voluntary. The structure has an influence which cannot be denied. Yet, neglecting any conscious action by the agent, as well as underestimating the existing influence of the structure is problematic and most likely wrong. Therefore, in Subchapter IV.4 a combined model was suggested for the analysis of practices and agencies (see Fig. 7). The case study in Chapter VII showed that if it is applied to limited data, the results and interpretative possibilities are limited. To avoid this problem, the combined model analysis will not be conducted for the loom weights only but with the information available from this and all following discussions in the final conclusion in Subchapter VIII.3.

VIII.1.2. Spindle Whorl Shapes

The spindle whorl shapes will be discussed for each period. The basis for discussion will not be the simple presence or absence of shapes, but mainly the proportions in which they appear in the different regions. These ratios will help draw conclusions on potential contacts, developments, exchanges and adoptions. It should be recalled here again, that for the spindle whorl shapes, only the data in the database with metrical information will be discussed.

Late Neolithic

For the Late Neolithic only marginal information is available. Only data from two regions, Bulgaria and the western Anatolian coast, which are actually represented by only one site each (Bulgaria – Tell Golyamo Delchevo and the western Anatolian coast – Çukuriçi Höyük) are present (see Fig. 17). Within this limited data, differences are visible. In Bulgaria only flat and conical shapes are present, with a majority of flat shapes (66.6 %). On the western Anatolian coast round, flat and biconical shapes are present, with a majority of round shapes (60 %). Yet, in both cases the total amounts are very small (NBulgaria = 3 and Nwestern Anatolian coast = 10). A comparison is therefore difficult. The early presence of biconical shapes on the western Anatolian coast is, however, interesting, as is the absence of conical shapes in this region. The absence of any shapes in Bulgaria should not be overrated, since a total amount of three whorls cannot be taken as realistic representation.

Early and Middle Chalcolithic

As already stated in Chapter VI, for the Early Chalcolithic only information from one site (Aşağı Pınar in Turkish Thrace) was available. The data were therefore presented together with the Middle Chalcolithic spindle whorls (see Fig. 18). For the Middle Chalcolithic, data from three more regions and nine more sites were available.

The proportions of spindle whorl shapes in Bulgaria and Turkish Thrace are very similar: both contain mostly biconical (50% in Bulgaria; 47.5% in Turkish Thrace) and flat spindle whorls (35% in Bulgaria; 44.3% in Turkish Thrace) and small amounts of conical ones. The Bulgarian sites, however, contain more conical and biconical spindle whorls. Yet this is only a small

difference, which becomes apparent when comparing the two regions to northern Greece and the Greek mainland. In northern Greece a much clearer dominance of conical whorls is noticeable (56.3%). Furthermore, a larger variety of shapes can be found than in the other three regions. The Greek mainland is difficult to discuss, since published quantifiable data could only be found for three whorls. Potentially the presence of diamond-shaped spindle whorls indicates a connection between the Greek mainland and northern Greece. However, this has to be stated with reservations due to the small sample.

For the Early and Middle Chalcolithic it can therefore be stated that a connection between Bulgaria and Turkish Thrace is visible and another between the Greek mainland and northern Greece is possible. This could indicate mutual technologies between these respective regions, although information from too many regions is missing for a definite statement.

Late Chalcolithic

For the Late Chalcolithic, data from five different regions are available. Due to the small amounts of finds available, northern Greece and the Aegean Islands can – however – not be discussed (see Fig. 19).

Aegean and southwestern Anatolia show very similar proportions of spindle whorl shapes. Both have a dominance of biconical whorls (44.4% on the western Anatolian coast; 48.4% in southwestern Anatolia) and smaller shares of flat, round and conical types. The main difference is the appearance of diamond-shaped whorls on the western Anatolian coast in contrast to cylindrical spindle whorls in southwestern Anatolia. The strong dominance of flat spindle whorl types on the Greek mainland (56.6%) clearly separates the region from western Anatolia.

It can therefore be assumed that the two Anatolian regions presented share commonalities, while they are both different from the Greek mainland. Unfortunately, the minimal or missing data from the other two regions prevents statements being made regarding any further associations.

Early Bronze Age 1

For the beginning of the Early Bronze Age, sufficient data are available from most regions, except for Turkish Thrace, the Greek mainland and northern Greece (see Fig. 20). However, since all eight spindle whorls from the Greek mainland are of conical shape, it can at least be deduced that the dominant shape in this region was most likely conical.

In all western Anatolian regions, as well as in Bulgaria and the Aegean Islands, the vast majority of whorls are biconical (between 50 to 74%). This dominance is least pronounced on the Aegean Islands, but still visible, with the biconical shape constituting 50% of all whorls. The western Anatolian regions are also rather similar with respect to the other shapes. The main difference is that the diamond-shaped spindle whorls are only present in southwestern Anatolia, the proportions of biconical, conical, flat and round whorls are, however, largely similar. A connectivity of the western Anatolian regions is therefore visible through the spindle whorl shapes. The records for Bulgaria differ from the other regions mainly in the quantity of diamond-shaped whorls, which make up a relatively large part of the assemblage (17.4%), and the absence of flat and round whorl types. A possible general connectivity with minor local/regional particularities can therefore be assumed.

It is interesting that on the Aegean Islands the flat whorls are more strongly represented than in western Anatolia. This also applies, though to a significantly smaller degree, for the conical shape. One possible explanation is that the islands were influenced from both the east and the west (maybe also a Minoan influence from the south? Or a Levantine influence?). According to this, the dominance of biconical shapes could be an influence from western Anatolia, while the flat and conical shapes might represent influences from the Greek mainland and northern Greece.

Unfortunately the two latter regions are only marginally represented in the records for EBA 1. Therefore, the connection to the west has to remain only a hypothesis for now, while the contacts to the east are very likely.

Early Bronze Age 2–3

In Chapter VI it was already explained that the EBA 2 and 3 spindle whorls are depicted together since too many finds could not be dated precisely into one of the two periods based on the published data. For these combined periods no data from northern Greece are available, and for Bulgaria, only data from two spindle whorls could be used (see Fig. 21). The remaining regions are, however, rather well represented.

All western Anatolian regions, as well as Turkish Thrace show a clear dominance of biconical spindle whorl types (between 53 to 92.3%). This is most pronounced in Turkish Thrace (92.3%), where, however, only 13 spindle whorls make up the record. The data available from northern and southwestern Anatolia have very similar characteristics, with the main differences being the presence of more diamond-shaped whorls in northwestern Anatolia and a finding of a few cylindrical whorls which were absent in southwestern Anatolia.

The most peculiar region is the western Anatolian coast with its strong representation of diamond-shaped whorls (34.4%). This proportion of diamond-shaped spindle whorls finds no comparison among other regions or periods. It therefore has to be declared a particularity of the western Anatolian coast for now.

A further commonality is shared between the Aegean Islands and the Greek mainland. The proportions are similar, with one main difference: the higher proportion of biconical shapes on the Aegean Islands (33.3% vs. 16% in the Greek mainland). This stronger representation of biconical types could be an influence from the Anatolian mainland. Therefore the assumption would again – as for EBA 1 – be that the islands were influenced by both the east and west. The data for EBA 2 and 3 further suggest a stronger influence from the Greek mainland, because the characteristics from the Greek mainland (high proportions of conical and flat whorls, as well as the presence of cylindrical whorls) are more pronounced than those from the western Anatolian coast (high proportions of biconical and diamond-shaped whorls).

If the commonalities in spindle whorl shapes are the results of contacts and flows of information, the Aegean Islands could be an indicator for the contact between Greece and Anatolia via the Aegean Sea. The blend of both technologies and traditions would sprout in the region in between, the Aegean Islands. Furthermore, if contact between Greece and Anatolia led to changes and the adoption of different spindle whorl types, it is most likely that the impact is most strongly visible in the coastal areas. It could therefore be expected that the Greek mainland must be ‘more alike’ to the western Anatolian coast than to northern and southwestern Anatolia. The higher proportion of conical spindle whorls on the western Anatolian coast compared to northern and southwestern Anatolia reflects this predicted distribution. The conical whorls, or at least the higher proportion of them, could therefore be a trait from the Greek mainland. It can be concluded that during EBA 2 and 3, a direct line of communication and probably exchange was established through the Aegean Sea between the Greek mainland and Anatolia.

Conclusion

The irregular distribution of information throughout the different periods and regions makes it difficult to distinguish between developments and contact-based distributions.

The most obvious aspect in this regard is the overrepresentation of biconical spindle whorls in western Anatolia and Turkish Thrace during the Early Bronze Age in contrast to a dominance of conical whorls on the Greek mainland. However, this preference for biconical types is not new in

the Early Bronze Age, but was already present in Bulgaria and Turkish Thrace during the Early and Middle Chalcolithic. It is therefore a possibility that this preference is connected with spinning technology which spread towards the south from Bulgaria to western Anatolia. However, the lack of data during the Late Chalcolithic in both Bulgaria and Turkish Thrace makes it impossible to ensure the validity of this hypothesis.

Another striking characteristic is the increase in diamond-shaped spindle whorls in western Anatolia during the Early Bronze Age. While this shape appears in only small numbers and only in southwestern Anatolia during EBA 1, it is much more strongly represented during EBA 2–3, especially on the western Anatolian coast. The fact that this development finds no resemblance in other makes it possible to suggest – at least for the current state of research – that it has its origin in western Anatolia.

Probably the most meaningful observation that could be made is the existing connection between data from western Anatolia and the Greek mainland explained through findings from the Aegean Islands. It could be stated that the two large regions probably had contact which resulted in the exchange and adoption of foreign spindle whorl shapes and which was, moreover, condensed in the shape proportions present on the Aegean Islands.

These changes, developments and adoptions can be interpreted similarly to those of the loom weight shapes above. The shapes could have been, directly or indirectly, connected with a certain technology which was transferred and led to the concurrent adoption of the spindle whorl shapes. However, what makes the case more complicated for the spindle whorls than for the loom weights is that the changes are not as drastic. In most cases multiple shapes are present in each region and period and often also at each site (see, for example, Tables 11–13). This makes it difficult to distinguish whether a development was mainly intrinsic, led by the will and/or need of agents (textile workers) to advance or change techniques, or pushed by outside forces, for example by the desire to adopt foreign techniques. The development during the Early Bronze Age between the Greek mainland, the Aegean Islands and the western Anatolian coast however indicates clearly that the changing proportions of spindle whorl shapes were at least partially influenced by outside forces, most likely contacts and exchange.[347] Unfortunately this is still the only case that allows such direct deduction.

Independently of the question of whether the changing proportions of shapes derived from adaption or from autarchic advancement, the technical connection between different spindle whorls from different regions or periods is easier to observe and interpret than for the loom weights. There are two main approaches for interpreting technical connections. First, it has already been mentioned multiple times in this study that the spindle whorl shape can have an influence on its behaviour as a swinging weight which is expressed via its moment of inertia. Therefore, it can be concluded that the different shapes are directly connected with a technical aspect. That this was the primary reason for changes in and adoptions of shapes stands to reason. It was secondly suggested in several publications that the biconical shape might have been connected with the spread of wool as a raw material for textile production.[348] The spread of woolly sheep is often suggested to have happened around the 4th millennium BC. This would mean that during the 3rd millennium BC higher-quality wool could already have been widely available, which fits with the high numbers of biconical whorls during the Early Bronze Age.[349] The early dominance of biconical whorls during the Early and Middle Chalcolithic in Bulgaria and Turkish Thrace, on the other hand, calls this hypothesis into question.

However, when considering the changes in spindle whorl shapes with regard to the moment of inertia, it is not only the shape that is of relevance, but also the weight. The weight is currently the most reliable unit for giving information about the spindle whorl's functional properties. The

347 Compare, for example, ideas by Buchanan 2002.

348 See, for example: Schade-Lindig – Schmidt 2003; Chmielewski – Gardyński 2010; Britsch – Horejs 2014.

349 See, for example: Greenfield 1988; Greenfield 2005; Grabundžija – Russo 2017.

impact of the spindle whorl's weight on the yarn strength and thickness was explained in Subchapter IV.5. Since the weight is also included in the calculation of the moment of inertia, a similar shape does not necessarily lead to a similar value for the moment of inertia. This means that, hypothetically, it is still possible that the early appearance of biconical whorl shapes was mainly based on aesthetic perceptions, while later on the functional aspect was better understood. This could, in turn, have led to the wide adoption of biconical shapes due to their advantage in spinning wool fibres. To test this hypothesis, quantitative analyses focusing on the weight and the moment of inertia are necessary. Therefore, statistical methods were applied, which will be discussed in Subchapter VIII.2. For the sole observation of spindle whorl properties it can only be stated that changes were potentially influenced by technology transfer; the picture is, however, unclear.

VIII.1.3. Spindle Whorl Decorations

In Chapter VI the fact that most of the spindle whorl decorations are individual and thus do not function as indicators of contacts, communication or technical markings was addressed briefly. However, a few types (16) appear on several spindle whorls, some on different whorls at the same site and some even on whorls at multiple sites (see Fig. 39). These types can be seen as potentially connected due to their chronological matching and can be interpreted in the sense of commonalities between different sites and regions.

Ten of these 16 appear only during the 3rd millennium, seven of those only during EBA 2–3 and two more could only be recognised in a Middle Chalcolithic context. However, four of the recurring decoration types appear in several millennia. These include Type 1 (appearing in the Middle Chalcolithic and the Early Bronze Age), Type 5 (appearing in the Middle and Late Chalcolithic and EBA 3), Type 6 (appearing in the Late Chalcolithic and EBA 3) and Type 13 (appearing in the Late Chalcolithic and Early Bronze Age). These types challenge the general assumption of recognisable connectivity via recurring spindle whorl decorations. It is very unlikely that a decoration present during the Middle Chalcolithic at Dikili Tash in northern Greece influenced a spindle whorl made nearly 2000 years later in Troy on the western Anatolian coast during EBA 3. Certainly these similarities may simply be accidental – the ways of decorating a whorl are ultimately limited. However, if these commonalities were just a matter of chance, the validity of comparing concurrent decorations also decreases.

Nonetheless, the multiple appearances of distinct decoration types can still yield information that potentially gives insight into the conscious decisions involved in preparing tools for distinct tasks. Two important aspects could be connected with recurring decorations: the marking of spindle whorls according to technical aspects (e.g. weight) or as a representation of common cultural/aesthetic views between different sites/regions. The latter can only apply if a decoration type appears at more than one site in the same period. The spindle whorl decorations will therefore first be checked for potential technical markings, and those appearing at several sites during comparable time frames will be further analysed as potential signs of connectivity.

Spindle Whorl Decorations as Technical Markers

As mentioned several times in the current volume, the main technical aspects of spindle whorls that can be analysed are the weight and the moment of inertia. To see if the decorations were used as technical markers it is therefore necessary to check if a connection between certain decorations and certain values for the weight or the moment of inertia can be found. Unfortunately, some of the information on recurrently appearing spindle whorl decorations derived from drawings and/or photos of whorls from publications which neither provided metrical information nor (due to the quality of the drawings/photos) allowed the derivation of metrical information. The analysis of whether the weight is standardised or not can therefore only be performed on 13 of the 16 types,

since Type 4 is only represented by such whorls without information on the weight and for types 10 and 16 only the weight for one whorl each is available. These three types were therefore not included in the analysis.

Figures 77 and 78 show the range of weights and of the moments of inertia for the spindle whorls carrying the respective decoration type. These figures clearly demonstrate that within most types the spindle whorls vary both in weight and in respect of the moment of inertia. The only exception is two whorls decorated with Type 12 (Cat.nos. 1128 and 1182). Both whorls derived from EBA 2 layers of Bademağacı. A labelling of the whorl depending on the weight could, therefore,

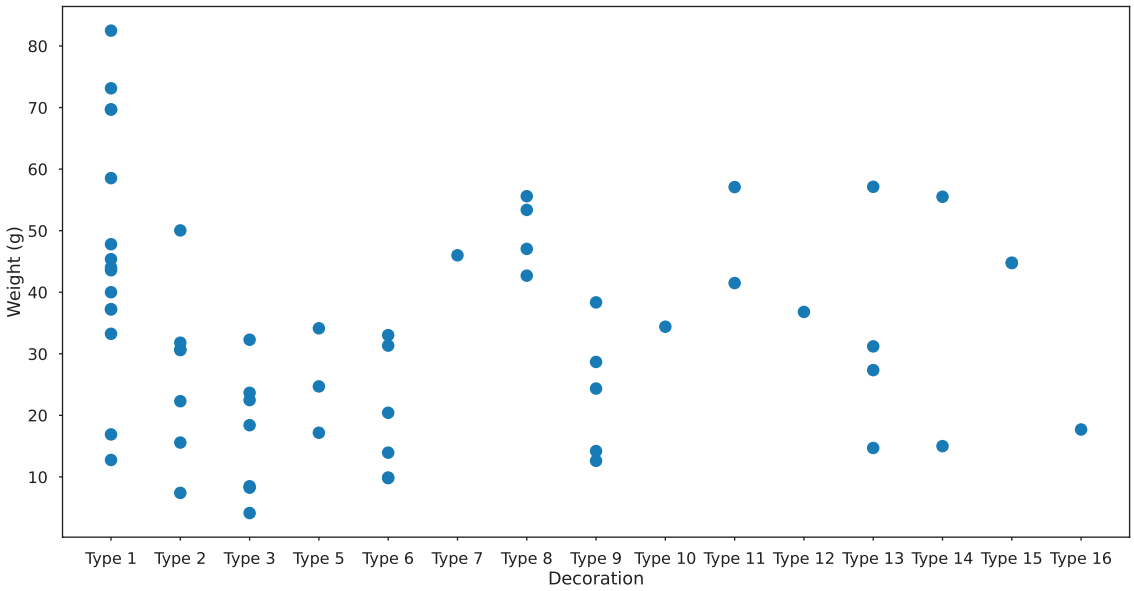

Fig. 77 Range of the weight of spindle whorls with regard to the different decoration types (C. Britsch)

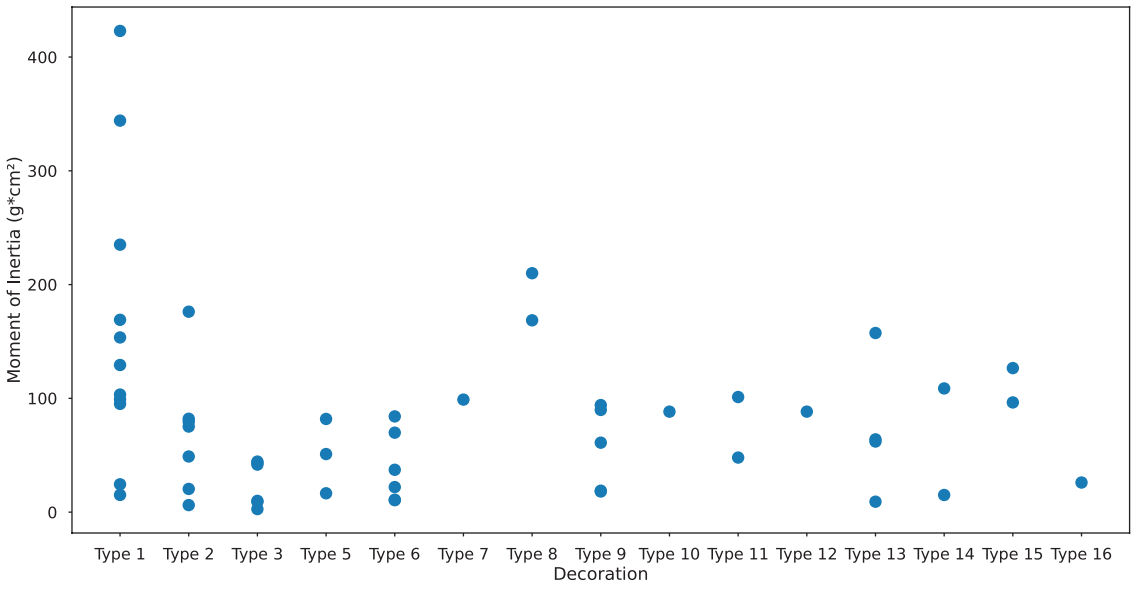

Fig. 78 Range of the moment of inertia of spindle whorls in regard to the different decoration types (C. Britsch)

be possible. It is, however, very unlikely, since such a manner of labelling spindle whorls should then be recognisable for other decorations as well. Yet at Bademağacı another three EBA 2 whorls carry the same decoration type, Type 9. These however differ significantly in weight (range = 24.15g).

It can therefore be stated that the decoration of spindle whorls had no technical background but was used for aesthetic/cultural reasons only.

Spindle Whorl Decorations as Indicators of Connectivity

As already stated, the decorations can only be counted as potential indicators of connectivity between sites and/or regions, if they are present at roughly the same time and at several sites. This only accounts for types 9, 11 and 14 to 16. The related whorls all derived from western Anatolian Early Bronze Age settlements (Çukuriçi Höyük, Bademağacı and Troy). The appearances are presented in Table 49.

	Çukuriçi Höyük	**Bademağacı**	**Troy**
Type 9		X	X
Type 11	X	X	
Type 14	X		X
Type 15	X	X	X
Type 16		X	X

Tab. 49 Appearances of the five recurring spindle whorl decorations at Çukuriçi Höyük, Bademağacı and Troy

The recurrence of types to this extent can be interpreted as a connection between these three sites. A set-back for this hypothesis is that all Çukuriçi Höyük whorls derived from EBA 1 layers, the Bademağacı whorls from EBA 2 and those from Troy from EBA 3 layers. Thus there is still a chronological discrepancy, yet not a whole millennium and they are therefore roughly the same. Furthermore, while the spatial proximity makes the commonality more realistic, it does not offer insight into far-reaching contacts.

Nevertheless, even if it is only a minor contribution, the information that derived from this analysis will be used in the combined analysis in the final conclusion in Subchapter VIII.3.

VIII.2. Connectivity, Commonalities and Differences – Discussion of the Analytical Evaluation

The previous subchapter demonstrated the possible insight into craft development and the behaviour of craftspeople that can be achieved by analysing the qualitative data of the tools used in production. It was also possible to show the limitation of statements when referring only to categorical information (like shape and decoration). We were able to derive potential interpretations of technical information. In this chapter the results of the analyses performed on quantitative data will be discussed in a similar way by stating possible interpretations as well as limitations. The technical variables that were recorded and analysed for further insight into technological aspects were the weight and diameter of loom weights and the weight, diameter and moment of inertia for spindle whorls.

To be able to properly analyse such quantitative data in a way that is both tangible and interpretable, two main requirements need to be fulfilled: enough available data and the choice of a fitting statistical method.

The methods of choice for the statistical analyses of data in this study were two-step cluster analyses and non-parametric analyses of variance. The justification for the choice of statistical methods was given in Subchapter IV.8 and Chapter VI. It was argued that these methods are the most fitting ones for the database of this study. Nonetheless, they still have limitations and can be criticised as a method in general. To examine these limitations, the methodological critique is featured in Subchapter VIII.2.1. The results of the cluster analyses and the analyses of variance will be discussed in Subchapters VIII.2.2 and VIII.2.3.

Other than the limitations of the methods themselves, the results featured one undeniably severe limitation. Interpretable results for the loom weights could not be gained from any of the statistical analyses. This is mainly due to the fact that similarly shaped loom weights from different sites, regions and periods are also too similar in their dimensions and weight. Therefore, no other interpretation can be given for the loom weights than that they were most likely created within a logical/practical framework which did not differ greatly throughout the different regions and periods. This means that the discussion in the current subchapter is limited to the results of the spindle whorl analyses. Though the spindle whorl, as an initial tool in the textile chaîne opératoire, can yield a lot of information on the possibilities and limitations of textile production, the evaluation of loom weight data might have completed the picture.

Fortunately, thanks to the discussion based on categorical data from the previous subchapter, a lot of information is available on the loom weights. These interpretations and discussions will be merged together with those of the current subchapter in the final discussion in Subchapter VIII.3.

VIII.2.1. Limitations of the Statistical Methods

Every method has its limitations, problems and shortcomings and therefore needs to be examined critically. Statistical methods, just because they produce strict numbers, are no exception to this rule. The results often leave room for discussion, but more importantly, ultimately they have to be interpreted. This interpretation can be more or less specific and difficult depending on the method, the underlying data and the final result. The different limitations will be listed in this subchapter.

General Limitations of Statistical Analyses on Archaeological Material

Analytical statistics are not the most commonly applied tools in archaeology and in most cases for a good reason. The most obvious reason is the problem of sampling in archaeology, or more precisely, the problem of ‘not sampling’.

When an archaeological site is excavated, it is almost never completely uncovered. Even if large parts of a settlement were excavated, it is always difficult to tell whether the actual borders of the settlement were reached or whether further people living outside it were also socially and economically connected with the settlement. Therefore, statistically speaking, nearly every excavation is only a sample of a site, with its total volume being difficult to estimate or know, which, in turn, could decrease general validity. There is another major problem with the kind of a sample one gains from typical archaeological sites. These samples are never completely random. The choice of where to place the trenches on an excavation is (for very good reasons!) never arbitrary, but is guided by prospection results, natural outlines, the archaeologists’ experience, the research question and so on. Thus the sampling in archaeology is always reduced in its internal validity by the selection bias.

This problem continues when the meaning of the sampling gets ‘extended’, as is the case when a few sites in a certain region are taken as representing this region. Therefore it is once again important to include as many sites in the study as possible. Due to the limited archaeological sources, a sample size of 29 sites could be achieved for this study. While a higher number would have been necessary to imbue the statistical results with maximum power, this already constitutes the foundation for meaningful calculation and interpretation.

Following Drennan's explanation about the possibilities of working statistically with biases in archaeology, the aforementioned biases should not be too problematic for the current study. Drennan explained in detail why and how analytical statistics work in archaeology despite potential biases in sampling.[350] He mentions that, as long as the bias does not directly affect the research questions, it is still possible to apply statistics. To give an example of a bias that does directly affect the research question: if, in a survey, only lithics above a certain size were collected as an assemblage, correct statistical analysis of the size categories of the said lithics afterwards would not be possible. The current study is not affected by a comparable bias. Nonetheless, it has to be kept in mind that potential distortions of data and results could still derive from the problem of biased sampling.

Limitations of the Current Database

In addition to the general limitations for analytical statistics in archaeology, the current study, or more precisely its database, has one major shortcoming: gaps in the data. The aim of the study was to cover a wide range both geographically, as well as chronologically. Due to the finite time available for the study and the limited accessibility of finds from certain sites, regions and areas, gaps in the database for certain periods and regions could not be avoided (see Tabs. 11, 15). This reduces the all-round validity of the different interpretations. However, this approach was the only way to follow developments to such a broad extent that they could yield completely new insights.

Another problem, aside from the sample size, is unevenly distributed data. The numbers of spindle whorls and loom weights can differ immensely between the different sites and periods. In some cases this might reflect past reality in a way. Certainly settlements with more or fewer spinners and weavers existed. However, it is very unlikely that in any given settlement only four or five spindle whorls were in use. The statistical methods used in the current study tried to adjust for this problem, for example by applying non-parametric tests. However, this gave rise to disadvantages such as possibly having less statistical power in the results and it not being possible to calculate multivariate statistics.

Criticism of the Applied Statistical Methods

Though a cluster analysis often seems the most logical choice to work with, the standard methods have one major limitation: the possible number of variables. Furthermore, the level of measurement of the variables (categorical or interval-scaled) can also be a limitation. Most methods do not permit a diverse level of measurements for the analysed variables and many even only permit the analysis of interval-scaled variables. This has already been explained in more detail in Chapter VI. For the current study the two-step cluster analysis in SPSS was chosen since it does operate with high numbers of variables, as well as with both categorical and interval-scaled variables in the same calculation.

However, another general problem of cluster analyses, which also applies to the two-step cluster analysis, is the evaluation of the resulting clusters. After the cluster analysis has calculated the different clusters it is up to the operators themselves to evaluate and interpret the composition of the clusters. No objective parameters or algorithms exist that guide one through this process. A 'manual evaluation' was performed in this study, meaning that the results were evaluated by a human. This implies that subjective ideas, tendencies or mindsets may have influenced the way the results were interpreted. Yet it is necessary to use human evaluation to judge the quality of a cluster and to answer the question of how useful the results are.

[350] Drennan 2010, 92–93.

While this human bias is not present in the analyses of variance applied in the current study, the methods have one major limitation: their statistical power. In the best case, parametric analyses (e.g. ANOVA) should always be preferred to non-parametric ones, since they carry more statistical power. Put simply, parametric analyses will deliver better/'more correct' results. Yet, as also explained in Chapter VI, due to the fact that the current database was not normally distributed in the dependent variables (weight and moment of inertia) and that the sample sizes in parts differed greatly, a non-parametric method was the only correct choice and might, therefore, have resulted in higher statistical power after all.

VIII.2.2. Understanding the Merging of Groups – Interpretation of the Results of the Two-step Cluster Analyses

In Subchapter VI.2.1 the results of three differently compiled two-step cluster analyses were reported. It could be revealed that only one of them (two-step cluster (3)) produced interpretable results. This was to a large extent related to the loom weight data. As mentioned above, no significant differences could be detected among similarly shaped loom weights from different sites, regions and periods. Since the clusters are based on similarities as well as on differences between individuals and groups, no easily interpretable clusters could be created if loom weights were included. Therefore only two-step cluster (3), which was created without loom weights, could be interpreted. This two-step cluster analysis will therefore be the only one that will be discussed in the current subchapter and will, for easier reading in this chapter, be simply referred to as the cluster analysis.

The cluster analysis, as already indicated above, included only the spindle whorls from the database (N = 1279 with extreme outliers; N = 1082 without extreme outliers). Furthermore, only certain of the spindle whorls in the database could be included: those with information on the moment of inertia (N = 939). Since it was generally assumed in this study that the variable moment of inertia can have a noticeable influence on the spinning process, it was seen as less of a problem to exclude spindle whorls with missing information than not to test the importance of this variable (a total of 340 spindle whorls in the database had to be excluded from the cluster analysis).

The cluster analysis created four different clusters, mainly arranged by the variables period and site, and to a lesser extent by the variable shape of the spindle whorls. The interval-scaled variables (weight, diameter and moment of inertia) were only of little importance.

The first step for the evaluation of the clusters was labelling them according to their components from the predictors with the most importance. Since the main predictor for sorting the clusters was the variable period, the following labels can be given:

Cluster 1 – 4th millennium (Late Chalcolithic, but also EBA 2–3)

Cluster 2 – Second half of 3rd millennium (EBA 3)

Cluster 3 – 6th to 5th millennium (Early and Middle Chalcolithic)

Cluster 4 – First half of 3rd millennium (EBA 1–2, but also Late Neolithic)

Clusters 2 and 3 are easy to label according to the periods. Cluster 2 only contains EBA 3 and Cluster 3 only Early and Middle Chalcolithic spindle whorls. Clusters 1 and 4 are less distinct, since they contain periods with large chronological distances. Cluster 4 contains – in addition to the EBA 1 and 2 whorls – the majority of Late Neolithic whorls. Due to the generally small number of Late Neolithic whorls in the whole database (N = 13), the cluster was nonetheless labelled as EBA 1 and 2. Cluster 1 contains both the majority of Late Chalcolithic spindle whorls, as well as 73% of those whorls which date around EBA 2–3. Since the majority of the cluster is made up by Late Chalcolithic whorls (N = 137) and EBA 2–3 whorls only represented approximately one third of the cluster (N = 65), Cluster 4 was labelled in reference to the Late Chalcolithic. The chronological mixture will be discussed in detail later on.

The second most important predictor for the sorting of the clusters was the variable site. Most of the sites, however, appear in the clusters according to the respective period. To give

an example: the Late Chalcolithic spindle whorls of Çukuriçi Höyük appear in Cluster 1, while the Late Neolithic and EBA 1 whorls of the same site appear in Cluster 4. This, and many other examples, demonstrate that while both of the variables period and site were labelled as highly important predictors for the cluster analysis (see Fig. 44), the data sets were still sorted mainly by period. Nonetheless, there are some exceptions to this rule. Spindle whorls from several sites were sorted into groups with mainly chronologically older whorls. This includes whorls from the 30 sites included in the cluster analysis: Dikili Tash, Dubene-Sarovka, Nova Nadezhda, Tell Golyamo Delchevo, Ayio Gala, Demircihüyük, Emporio, Hacılar Höyük, Ilıpınar, Kuruçay Höyük, Markiani, Troy and Kanlıgeçit. When examining this in more detail, for more than half of these sites only a small portion (≤ 25%) of the spindle whorls was sorted into clusters with incongruous periods. Two sites have a sizeable portion of 'wrongly' assigned whorls: Tell Golyamo Delchevo and Ayio Gala, both with 33.3%. Additionally, at three sites the majority of the spindle whorls were clustered together with older whorls: Dubene-Sarovka (82.61%), Emporio (55.56%) and Hacılar Höyük (100%). Interestingly, in almost no case were whorls put into clusters with mainly younger examples. The only two sites for which this occurred are Troy and Kanlıgeçit, and in both cases only individual objects were incongruously assigned in this manner.

Therefore, for most sites the spindle whorls were not sorted into clusters according to their site, but according to the dating of the respective layers they derived from, except for the few examples listed above. Since sorting by sites is actually a sorting by the (dating of the) layers of a site, the information is mostly covered by the periods. A labelling of the clusters according to the sites they contain is therefore not useful.

The third, but by far less important predictor was the shape of the spindle whorls (see Fig. 44). Table 19 lists in which cluster(s) the majority of each shape appears. This clearly shows that only diamond-shaped and round whorls appear to a large extent in only one distinct cluster (diamond-shaped whorls: 81.4% in Cluster 2; round whorls: 76.7% in Cluster 4). A labelling of the clusters according to the spindle whorls' shapes would therefore be misleading for most cases.

The interval-scaled variables (weight, diameter and moment of inertia) also failed to yield any further insight. Cluster 3, as can be seen in Figure 46, does fall outside the standard perimeter for all cases; however, the remaining clusters are not very different. It has to be mentioned that this does not mean that the interval-scaled variables were not used at all in the cluster analysis; they just function less well as predictors than period or site. That means that it is not possible to distinguish between the clusters by metrical information alone. Consequently, it can be concluded that the most important predictor for sorting the clusters is the period and the best label for the created clusters of spindle whorls are the labels given above following the chronology.

Two main questions arise regarding the further evaluation of the clusters: (1) what might it mean if spindle whorls of certain sites are clustered together with mainly chronological older (or younger) whorls? And (2), why did 73% of the EBA 2–3 spindle whorls cluster together with the Late Chalcolithic whorls (rather than with the other EBA 1–2 or 3 whorls)?

To find an answer to the first question the non-parametric analyses of variance were conducted. These specifically aimed at comparing variances in the tools from different sites during a certain period to find out whether or not one can assume that these different sites originate from the same distribution (see Subchapter VI.2.2). The discussion of this question will therefore be presented in the following subchapter, together with the evaluation of the further information drawn from the non-parametric analyses of variance.

To find possible reasons for the peculiarities addressed in the second question, the respective sites whose spindle whorls date to EBA 2–3 were looked at more thoroughly. It should here be recalled that the finds that were labelled as EBA 2–3 derived from layers which could not be securely dated to either EBA 2 or 3. Nonetheless, they cannot be older than 2750 BC or younger than 2000 BC. These include spindle whorls from Pefkakia Magoula, Platia Magoula Zarkou,

Troy and Kanlıgeçit. For Troy and Kanlıgeçit, the finds from this period were sorted into either Cluster 4 with other EBA 2 whorls, or into Cluster 2 with other EBA 3 whorls, meaning that practically no chronological discrepancy is included. The Pefkakia Magoula and Platia Magoula Zarkou EBA 2–3 whorls, however, all clustered together with other Late Chalcolithic whorls. Since the Pefkakia Magoula and Platia Magoula Zarkou spindle whorls make up 77.52% of the EBA 2–3 whorls, it is obvious that the clustering of those two sites' whorls is responsible for the combination of Late Chalcolithic and EBA 2–3 in Cluster 1. When looking into the two sites more closely, it is interesting that 26.24% of the finds from Pefkakia Magoula and even 93.1 % of the Platia Magoula Zarkou finds cluster together with older artefacts.

It can therefore be safely concluded that it is not EBA 2–3 in general that is clustering together with the Late Chalcolithic for some reason, but that it is a peculiarity of two specific sites (Pefkakia Magoula and Platia Magoula Zarkou). This seems to be the same phenomenon as the chronologically 'wrongly' sorted finds mentioned above. Therefore, as for the other sites, to what extent this could be connected to local and regional specific developments or traditions will be discussed on the basis of the results of the analyses of variance in the following subchapter.

VIII.2.3. Understanding Patterns among the Groups – Interpretation of the Results of the Non-parametric Analyses of Variance

The cluster analysis showed that chronological depth – in the sense of periods – and geographical distribution – in the sense of sites – were the most relevant predictors for sorting clusters. The factor periods proved to be the most important variable which – in most cases – clustered very clearly. This raised the question of whether further analyses within the respective periods could yield more detailed information. For this purpose, non-parametric analyses of variance and subsequent post-hoc tests were conducted for each relevant period to see which sites are significantly different from each other with regard to their tool inventories.

Again, as can be seen in Subchapter VI.2.2, the analyses on loom weights did not yield any significant results in the post-hoc tests with Bonferroni correction. This is again due to the fact that loom weights were rather standardised in their production, even throughout regions and periods, as was already explained above. Therefore, as for the cluster analysis, only the results for the spindle whorls will be discussed.

Since the question for these analyses was whether there are any differences between the performance of spindle whorls from different sites, it was necessary to analyse technical and quantifiable data. This means the analyses needed to focus on the weight and the moment of inertia as independent variables. Since only non-parametric tests could be used, it was necessary to conduct the analyses for weight and moment of inertia separately. The analyses on weight produced more significant and clearer results. Of the eight analyses performed on weight, for three the null hypothesis had to be retained; for all other analyses significant results could be obtained. Of the eight analyses performed in respect of the moment of inertia, for five the null hypothesis had to be retained; for three analyses significant results could be obtained. The basis of the discussions will be the homogenous subgroups created via the non-parametric analyses of variance that were presented in the respective figures in Subchapter VI.2.2. The three periods for which analyses on both the weight and the moment of inertia are available showed only slightly different results from each other. They will therefore not be discussed separately. The discussion will follow the same periods/chronological units that were chosen for the analyses. Afterwards a conclusion across all periods will follow, additionally observing and analysing the results of the discussions taking account of practice and agency theory perspectives.

Late Chalcolithic (4250–3000 BC)

For the Late Chalcolithic significant differences between five different sites could be found regarding the weight of the spindle whorls, and four different sites showed differences regarding the moment of inertia. This allowed the creation of two homogenous subgroups for each variable (see Tabs. 22–23, 33–34).

The sites that are represented in both homogenous subgroups are seen as a core group (see Figs. 47, 52). All sites in this core group are rather similar to each other with regard to the technical properties of their spindle whorls and also share commonalities with the sites outside the core group. Significant differences can only be found outside of this core group.

For the Late Chalcolithic this means the main differences in spindle whorl weight are found between the sites Kumtepe/Aphrodisas and Pefkakia Magoula, Beycesultan and Karataş. The main differences for the moment of inertia are between the sites Kumtepe/Aphrodisias each with Pefkakia Magoula and Karataş.

However, neither the connections nor the differences make much sense in this case. It seems unlikely that a site from the Troad is connected with only one site from southwestern Anatolia but differs significantly from the others. It is also unlikely that sites from southwestern Anatolia are very like a site from the Greek mainland, but differ strongly from another southern Anatolian site. Though it is definitely possible that certain sites maintained strong, far-reaching contacts, it seems unlikely in this case because of the many inconsistencies. More likely, the measured and calculated connections are due to the partially small sample sizes of certain sites, for example Kumtepe is only represented by four and Beycesultan by only three spindle whorls in the Late Chalcolithic (see also Tab. 11).

The information will therefore be kept in mind for the final discussion, where it will be reflected together with the information from the loom weights, but will not be discussed further at this point.

Early Bronze Age 1 (3000–2750 BC)

Since data on the moment of inertia was not available for any EBA 1 spindle whorls, the results automatically differ between the analysis on weight and that on the moment of inertia. This can also be seen in the depiction of the homogenous subgroups in Figures 48 and 53. Nonetheless, in both cases three homogenous subgroups were created based on the significant results of the post-hoc Kruskal-Wallis analysis.

For the weight, significant differences between nine sites and for the moment of inertia, differences between eight sites could be found. Again, for each variable a core group exists in which no differences in spindle whorl properties could be found. Moreover, since we are dealing with three homogenous subgroups in this case, there are sites that appear in two of the three groups.

For weight as well as for the moment of inertia, the site Dubene-Sarovka diverges strongly from the other sites. This is especially interesting, since in the cluster analysis Dubene-Sarovka clustered together with Early and Middle Chalcolithic sites, even though it dates to EBA 1. The result of the Kruskal-Wallis analysis again underlines the different technology (at least in respect of spinning) present in Dubene-Sarovka compared to other EBA 1 sites.

Interestingly, in both cases sites from the western Anatolian coast, from northwestern Anatolia and partially from southwestern Anatolia and the Aegean Islands contrast with other sites and groups. It therefore seems possible that these particular regions developed differently than the rest. Either they acclimatised to structural changes more quickly or, by contrast, they stuck more rigidly to traditions. The details of this interpretation will be discussed in Subchapter VIII.3.

The core group, for weight as well as for the moment of inertia, spans from southwestern Anatolia through Turkish Thrace and northern Greece to the Greek mainland and even the southern parts of the Aegean Islands. Whether this strong connectivity is the result of actual contacts is

questionable because of the large spatial extent and the multiple sites which do not fit the pattern in between. An alternative interpretation for this phenomenon is that similarities are generated due to logical developments in spindle whorl sizes. Certainly there are logical dimensions to spindle whorls that provide good 'all-round' applicability for spinning.[351] The large connection could, therefore, be due to a more general dealing with the task that is not deeply specialised. This would, in turn, make sites differing from others even more interesting.

If far-stretched commonalities were the sign of general chronological developments in spindle whorls (and therefore textile technologies), the exception to the rule could indicate expert understanding and specialised technology. This means that groups with common significant differences to other sites could show mutual developments of their textile technologies.

Such mutuality, as can be seen on the maps, is also spatially related, for example in the case of the weight of whorls from Emporio and Çukuriçi Höyük, or Kaklık Mevkii and Demircihüyük (see Fig. 48).

As was discussed for the adoption of loom weight shapes in Subchapter VIII.1, the groups with common differences could display flows and centres of communication and exchange. In the light of practice or agency theory this could also be the reflection of some deeply embedded structures which did not bend to general developments as quickly as others.

Early Bronze Age 1–2 (3000–2440 BC)

As described in Subchapter VI.2.2, an additional Kruskal-Wallis analysis was performed together for the periods EBA 1 and 2 since they were assigned to the same cluster in the cluster analysis (see Subchapter VI.2.1). The analysis of the spindle whorl weight yielded significant differences between eleven and that of the moment of inertia between nine different sites.

Both results allowed the creation of four different homogenous subgroups. Other than this difference of four rather than three subgroups, the resulting pictures of these two analyses are very comparable to the results for the two EBA 1 analyses (see Figs. 49, 54). Again, the different regions of western Anatolia show the strongest variances. For the Aegean Islands, Emporio once more shows significant differences to multiple groups, but in this instance Markiani also varies with regard to the spindle whorl weight (not for the moment of inertia). The most obvious difference relative to the core group seems to be found in the more eastern part of western Anatolia. However, the group affiliations of the different sites in the homogenous subgroups are so unevenly distributed that it is difficult to assign directly spatial connections to the different subgroups. Though it is possible that different flows of information produced the spread of different technologies, it is not feasible to trace exact processes with only this information. The discussion on different flows of information will therefore be picked up again in the final discussion, when the development of loom weights is connected with the spindle whorl development.

Early Bronze Age 2 (2750–2440 BC)

The analyses on EBA 2 spindle whorls produced significant results only for weight. Significant differences could be found between five sites, which allowed the creation of three homogenous subgroups (see Tabs. 28–29). The resulting presentation of the homogenous subgroups is comparable with the EBA 1 distribution. The core group stretches across nearly all regions and most of the exceptions can be found in the eastern part of western Anatolia.

Moreover, the repeated seclusion of western Anatolian regions is very striking. Especially since this development can be seen from the Late Chalcolithic on, it needs to be comprehensively reflected on and discussed in the conclusion of this subchapter.

[351] Mårtensson 2007; Andersson et al. 2008; Andersson et al. 2010.

Early Bronze Age 2–3 (2750–2000 BC)

As described in Subchapter VI.2.2, the EBA 2 and 3 spindle whorls were evaluated separately, as well as together, since multiple finds in the database could not be dated precisely to either one of the two periods. For EBA 3, as mentioned above, no significant results which could be discussed here were calculated. For EBA 2–3, as for EBA 2, only for the weight of the spindle whorls could significant results be gained. The analyses showed differences between five sites, which allowed the creation of two homogenous subgroups (see Tabs. 30–31 and Fig. 51).

Two aspects are most striking for the analyses of this time frame: the eastern part of western Anatolia still shows multiple divergences and the sites on the Greek mainland (especially Pefkakia Magoula) are, for the first time since the Late Chalcolithic, separated from the core group.

The significant differences in western Anatolia are not too surprising, since they not only appeared since the Late Chalcolithic, but also since they were already visible in the EBA 2 material, which was also included in this analysis.

The divergences of the two eastern Aegean Greek sites (Platia Magoula Zarkou and Pefkakia Magoula), on the other hand, promise new insights. It could imply two things: either the time between/around EBA 2 and 3 marks the time when special developments occur in this region which separate it from other sites, or, since sufficient data from multiple sites and a larger amount of spindle whorls is available for the first time, the differences can be seen more clearly, but were present in earlier time periods as well. However, strictly speaking, the two homogenous subgroups mainly show that Demircihüyük is significantly different from Platia Magoula Zarkou, Pefkakia Magoula, Beycesultan and Bademağacı in respect of the weight of their spindle whorls. That means that the main difference is between one northwestern Anatolian site and a group of two eastern Aegean Greek and two southwestern Anatolian sites. Consequently, the difference needs to be noted, but should not be overestimated.

Conclusion

The different non-parametric analyses of variance have shown that significant differences are observable and partly change throughout the millennia. These observable differences show that spinning was not practised everywhere with the exact same intent. In Subchapter IV.5 the strong influence the spindle whorl weight can have on the whole textile production process, for example by influencing the thickness and strength of the yarn, was described. Therefore, the differences in spinning processes – proven through the analyses of variance and the subsequent post-hoc tests – can have a very strong impact on the textile production of the respective sites in general. It was also shown that different results are obtained when regarding the weight and the moment of inertia of spindle whorls, showing the importance of including this variable into observations of spindle whorls.

The cluster analysis was able to show that the most important predictor for clustering the spindle whorls is the chronology. To further attest potential differences during the different periods, the non-parametric analyses of variance were performed. Since the main influencing factor seemed to be the chronology, it was to be expected that not too many significant differences should be found among the sites. Nonetheless, in several periods significant differences were visible. More importantly, these differences seemed to develop in certain areas throughout the millennia.

The most obvious of these areas is the eastern part of western Anatolia, to be more precise, the sites Beycesultan, Karataş, Ilıpınar, Demircihüyük and Kaklık Mevkii. Spatially close sites that do, however, fit into the core groups formed in the different periods are Kuruçay Höyük, Hacılar Höyük and Karaoğlan Mevkii. These are, however, sites with only a few spindle whorls in the database (between two and six whorls). It is therefore possible that, if the record on these sites were more complete, differences could become visible. However, it cannot be said that this area marks

a region with strict commonalities throughout time. In several periods sites of this area did share commonalities, while others did not. The only constant seems to be a general 'non-conformity' of this area.

Another such area, though not as explicit, is the western Anatolian coast. Except for the analysis on the Late Chalcolithic and that on EBA 2–3, the sites of this area are also always separated from the core group. Interestingly this also includes Emporio on Chios, an island which is very close to the coast of the Izmir region. Again, this does not necessarily indicate an area of shared knowledge. If it were such an area however, the Troad – or at least Troy – seemed not to fit into this connectivity, since, for example, it differed significantly from Emporio and Çukuriçi Höyük during EBA 1. Nonetheless, the coastal region of western Anatolia also seems to develop differently from other areas.

The final interesting observation could be made for the Greek mainland. Unfortunately the region is mainly only represented via one site (Pefkakia Magoula), which reduced the validity of the comparison. However, it is still conspicuous that during the Late Chalcolithic and EBA 2–3 the region is separate from the core region, but for all other analyses showed no significant differences. It was already stated above that this could either be due to changing local and regional behaviour, or due to gaps in the data. To find out which explanation is more likely, the results will be analysed and discussed together with the results of the discussion on loom weights in the next chapter.

The significant differences found in the analyses occurred only between a small number of the investigated sites. The way this was dealt with and interpreted will be shown in the following example: for instance, during the Late Chalcolithic, a significant difference was found between Kumtepe/Aphrodisias and Beycesultan/Karataş/Pefkakia Magoula, not between Kumtepe/Aphrodisias and all other sites of the period. However, the fact that Kumtepe and Aphrodisias are significantly different from Beycesultan, Karataş and Pefkakia Magoula, while all other sites are similar to those three sites, in my opinion shows that a general difference between the 'core sites' and Kumtepe and Aphrodisias does exist. Therefore it was stated that the sites with significant differences to others display a general 'non-conformity', which could be the indicator for specialised developments in a craft in a certain region or for an area in which a general change did not take place or had a different impact.

Following this logic, assumptions on the emergence of specialised craftsmanship can be made. Prior to that, one recurring result has to be discussed. In all cases, the number of sites for which no significant differences were found is rather large and spatially far spread. For certain periods (Late Neolithic, Middle Chalcolithic, Early Bronze Age 3) significant differences were not detected either in regard to weight or to the moment of inertia. Two possible interpretations will be given: either it is due to a methodological problem, meaning that the record on spindle whorls of the currently used database is not comprehensive enough, or it is actually true that sites existing in the same period in general do not differ much. The second interpretation would once more highlight the significance of chronological developments for changes in prehistoric textile production, rather than local or regional specialities.

As seen before, certain sites and regions stand out from this general finding. If we interpret those sites which form a new homogenous subgroup as sites with technology differing from the main developments, we can assume two things: (1) different craftspeople from different sites had different knowledge and skills available for their work and (2), though the main criteria for craft development seems to be 'time' in general, in some regions the factor 'site' does play an important role, too.

This means that the saliences in different regions described above describe developments that were not only influenced by chronological changes but also by social and cultural structures existing within these societies. Following the schematics drawn for practice theory (see Fig. 4), it can be assumed that the acquisition of new skills can be seen as a breaking of the rules of the existing structure. Outside developments, like general developments throughout time, can influence the structure, but do not necessarily have to.

There are two possible explanations for a divergence from outside developments. Firstly, if the social agents within the system do not accept the new developments, no acquisition of new technology appears and therefore no breaking of rules takes place. This would mean that the respective society remains within older structures. From the point of view of agency theory (see Fig. 5), such conservatism would exactly describe the influence of structure on the objects via tradition and the binding between object and agent through material culture. The best example for this is Dubene-Sarovka. In the cluster analysis the site was paired together with much older sites (from the Early and Middle Chalcolithic). Furthermore, in the comparison with other EBA 1 and EBA 2 sites it stands out significantly in the pairwise comparisons. It is therefore very likely that older imbedded structures had a stronger influence on the behaviour than simultaneous developments in different regions. Furthermore, it has to be stated that Dubene-Sarovka did not exist as a settlement during the Early or Middle Chalcolithic.[352] Therefore, the influencing structure did not derive from the settlement and its tradition themselves, but most likely primarily from a generally existing structure in the particular region. Since no comparable sites in the direct vicinity are included in the database, further research is needed to support this hypothesis.

Another way to interpret the results of the non-parametric analyses of variance is to see the sites differing from the mass not as unprogressive and traditional, but as sites with even more evolved technologies. Not only the acquisition of new skills, but also the advancement of existing skills can be seen as breaking the rules of the structure. It could, therefore, very well be that some of the sites actually progressed more quickly than others, leading to the picture of sites not fitting into the general chronological scheme. The only examples according to the cluster analysis would, however, be Troy and Kanlıgeçit and even those only moderately, because while some spindle whorls from those sites were put together with chronologically younger examples, these constituted only minor parts of their assemblages (10% Troy; 17.7% Kanlıgeçit). Nonetheless, it is still possible, and in that case, the main influencing factors of the system would, in practice-theoretical terms, thus be the reflective relationship between the social agent and the structure (consciously perceiving the chronological developments) and the power of the social agents to shape the structure through certain events (using the chronological developments and therefore extrinsic change of the structure to further change and development in technology). In agency-theoretical terms this would describe the agent's ability to consciously form a meta-structure through itself, object and mind (cognition) and to then influence the structure via enactment with the object (agency). Additionally, the influential link between the agent and the structure (creativity and innovation) gives the agent more scope in shaping the structure.

In summary, it can be stated that while the main predictor for influences in the textile craft seems to be time (meaning the periods/chronology), some specific local and regional developments can be found. Such developments can either be seen as held back by traditions or as sparks for further progression. The final discussion and the comprehensive view of all aspects analysed in this study will serve to judge whether the nature of these both specific and general developments can be distinguished, interpreted and maybe even labelled in their function of general craft developments in the periods and regions studied.

VIII.3. Observing the Big Picture – A Comprehensive Discussion

In the previous two subchapters the emergence, developments and distribution of different aspects of prehistoric textile tools were discussed. This included the analysis of categorical data (loom weight and spindle whorl shapes and spindle whorl decorations) and of interval-scaled data (such as spindle whorl weight and the moment of inertia). The discussions were followed by interpretations according to practice and agency theory. In all cases the influences of chronological

[352] Nikolova 2002.

progression as an outside force on the structure could be recognised as a strong predictor for technological development. However, the enactment of traditions through the interrelation between agents and the structure as a conserving power for existing structures could also be detected. Likewise, the agent's ability (an interpretation more in favour of agency theory) to change and shape the structure through creativity, innovations and the need for individual and communal representation was a fitting theory for several results. All these observations were, however, mostly made for individual aspects, detached from other aspects and variables and their developments. Though it is possible, it is certainly not likely that changes and continuities in individual aspects of textile production (or any craft for that matter) developed in isolation from all other aspects. It is rather more likely that, for example, developments in spinning technology were accompanied by developments in weaving technology, maybe not simultaneously, but certainly changes in one trait of a craft will be noticed and reflected in other parts. Therefore, the results of the discussions from Subchapters VIII.1 and VIII.2 with their information on both spinning and weaving technology need to be brought together and their results should be reflected comprehensively in order to acquire a better understanding of developments in textile production. This understanding will also help us to gain further insights into developments in prehistoric crafts in general.

The comprehensive discussion will be predicated on the information-based model presented in Subchapter IV.4 (see Fig. 7). The model represents a connection between the approaches of practice and agency theory that were discussed in the current volume. The model was further adapted to be applicable to archaeological artefacts. The model was tested for its utility in the case study in Chapter VII. The main problem in that case was the limited material included in the analysis. The integrative contemplation of the model, taking into account the results of all analyses and discussions of the current study, should thus overcome these difficulties. To allow such a comprehensive study that 'brings together' the results of the different discussions, the first question needs to be, if they 'go together'.

The first part of the final discussion will therefore focus on the similarities and discrepancies in the developments of loom weights and spindle whorls, integrating the outcomes from the multimethod approach. Following this approach, the results will be analysed and interpreted step by step by means of the information-based model. The last subchapter will then sum up the conclusions of the final discussion and further elaborate the contributions of this volume to a better understanding of the general functions of prehistoric craft developments and transfer of knowledge.

VIII.3.1. Connecting the Details – Integrative Multimethod Discussion

As described in the introductory section above, the current subchapter will discuss the interpretations of the different tool categories as well as the different analyses (categorical and analytical statistics) together. The aim is to analyse to what extent different developments progressed homogenously and/or simultaneously. As was already stated at several points, it is highly unlikely that several aspects of the same craft could develop in complete isolation from one another. It is therefore important to observe and discuss changes and continuities comprehensively for the different parts (spinning and weaving) as well as for the different aspects (types, stylistics, metrics etc.). Unfortunately, the data does not always allow the inclusion of all aspects, since the statistical analyses for some periods did not yield significant results. For example, for the Late Neolithic, Early and Middle Chalcolithic and Early Bronze Age 3, no significant results for the statistical analyses (non-parametric analyses of variance) could be obtained. This could either mean that the data was too limited (especially for the Late Neolithic and Early Chalcolithic) or that technologies did not differ too much. The discussions about these periods will therefore be based mainly on the different discussions on categorical data. For all other periods the analytical statistics will be included.

Late Neolithic (6500–6000/5900 BC)

For the loom weight shapes superregional connections could not be detected during the Late Neolithic. The regional connectivity seemed more present on the western Anatolian coast than in Bulgaria. The spindle whorl shapes did not yield further information, since only data from two different sites with only small numbers of spindle whorls were available. The statistical analyses revealed that technologies did not differ significantly between the Neolithic sites. Summing up, the results argue against existing connectivity, contacts and clear structures. The main insight here is the early presence of the different loom weight and spindle whorl shapes. It has to be kept in mind though, that for this period only a few sites with partially very few examples of loom weights and spindle whorls could be integrated in the analyses, which could reduce the validity of the deductions.

Early and Middle Chalcolithic (6000/5900–4250 BC)

The Early and Middle Chalcolithic are best discussed together for the current record, because the records, especially for the Early Chalcolithic, do not allow an individual discussion and, furthermore, the two periods proved to be rather similar in the different analyses. For the Early Chalcolithic, data on loom weight shapes is only available from Bulgaria and Turkish Thrace and for spindle whorl shapes only from Turkish Thrace. Moreover, the loom weight shapes present in Bulgaria during the Early Chalcolithic are also present during the Middle Chalcolithic. However, for Turkish Thrace a strong reduction in loom weight shape variability can be seen.

Nonetheless, for both the Early and Middle Chalcolithic the loom weight shapes present in Turkish Thrace and Bulgaria are very similar, which was interpreted as superregional contacts. The same could be seen for the spindle whorl shape proportions. It can therefore be assumed that ‘shape-wise’ the developments happened simultaneously for both tool categories on a superregional level.

For northern Greece the case is a bit more complicated. It was stated that the similar proportions of spindle whorl shapes could indicate a connection with the Greek mainland, rather than Turkish Thrace or Bulgaria. The very low number of spindle whorls present from the Greek mainland during these periods might, however, reduce the validity of this statement. Furthermore, the loom weight shapes appearing in northern Greece in the Middle Chalcolithic are all also present in Bulgaria and/or Turkish Thrace. The cylindrical loom weight shape in particular most likely spread from Turkish Thrace to northern Greece. A connection between northern Greece and Turkish Thrace and Bulgaria can therefore not be denied. Most likely the region was influenced from both sites (southwest and east/northeast). The spindle whorl shapes could, however, either indicate a stronger influence from the Greek mainland, or possibly an autarchic development. Based on the current data, however, it is not possible to state with certainty which option is more likely. The main conclusion drawn from this is that the developments of spindle whorl and loom weight shapes in this region were probably not fully parallel.

As for the Late Neolithic, the statistical analyses revealed that technologies did not differ significantly between the early or the Middle Chalcolithic sites. This means that during this time too the applied technologies were more or less similar. Most likely tools were constructed by simple conceptions and no intensive specialisations are to be expected.

The shape developments of the different textile tools during the Early and Middle Chalcolithic yield two main insights. Firstly, it shows that different regions are connected differently. Bulgaria and Turkish Thrace, for example, seem very deeply connected. Secondly, it demonstrates that the adoption of loom weight shapes was most likely not only connected with aesthetic perceptions but also with the acquisition of technologies. However, since, as just described, technologically the sites and regions did not differ strongly during these periods, a detailed observation of the connected distribution of technological and aesthetical aspects is difficult to make.

The fact that both the loom weight and spindle whorl shapes in Bulgaria and Turkish Thrace are so closely related indicates that the shapes are based on the same underlying structure. It was assumed in Subchapter VIII.1 that the adoption of shapes could have been the by-product of adopting technologies. These technologies would be so entangled in existing structures that either the social agents could not adopt isolated parts of the structure, or the agents willingly adopted the connected norms of a structure, even if parts of it were technically not bound to the foreign technology. For example, the developments in northern Greece (adopting loom weight shapes but not spindle whorl shapes) argue for a degree of autonomy on the part of the agents in the adoption of shapes/technologies/structures. Another explanation would be co-occurring structures – an existing structure that embedded the spindle whorl shapes and a foreign structure that brought new loom weight shapes.

Late Chalcolithic (4250–3000 BC)

The developments in the Late Chalcolithic are difficult to grasp for different reasons. Firstly, while much information on the loom weight shapes in Bulgaria is available, no information for the spindle whorls is present in the database for that region. Similarly, the state of information for northern Greece is also much more limited for the spindle whorls than for loom weights. These limitations are not the result of an actual absence of spindle whorls, but of the inaccessibility of recordable data, which nonetheless makes it problematic. The second problem is that for this period the results from the different methods are very contrasting and therefore difficult to integrate.

For example, the loom weight shapes indicate variation between Aegean and southwestern Anatolia. The spindle whorl shape proportions on the other hand are very similar. The analysis of spindle whorl metrics in turn speaks in favour of a difference, which would also mean that the loom weight shapes are more closely connected to technical aspects of spindle whorls than the shapes of the spindle whorls themselves.

Likewise, the spindle whorl shape proportions show clear differences between the Greek mainland and western Anatolia. The results of the statistical analyses, however, only partially confirm these differences and prove that other sites in the two regions bear strong similarities. The only information about loom weight shapes on the Greek mainland during the Late Chalcolithic is the presence of cylindrical loom weights in Mikrothiva. This particular shape can be found in nearly all other recorded regions for this period. This again argues against a differentiation of the Greek mainland from other regions.

Thus the assumption that can be made for the Late Chalcolithic is that connectivity was present and reflected in the textile tools, but seems to have worked on several different levels. The development of spindle whorls and loom weights is not connected for most sites. One striking peculiarity in this regard can, however, be found: southwestern Anatolia.

This region shows significant differences regarding measurable technical aspects of spindle whorls from the western Anatolian coast in the statistical analyses. The same sites showed differences in their loom weight shapes. This indicates differences in textile technologies in between southwestern Anatolia and the western Anatolian coast, which could be based on differing structural developments.

It was stated in Subchapter VIII.1.1 that the cylindrical loom weight shapes could be connected with a higher degree of conservatism of structure and therefore serve as an indicator of a distinct structural development. In this sense, the similar loom weight shapes in southwestern Anatolia and northern Bulgaria in the Late Chalcolithic could indicate concurrently progressing developments in textile production technologies. However, sites like Ezero and Sitagroi, which feature both cylindrical and differently shaped loom weights, show that the loom weight shapes cannot be taken as the sole indicators of technological development. However, insufficient data on spindle whorls from Bulgaria and northern Greece precludes further investigations of this hypothesis at this point.

Early Bronze Age 1 (3000–2750 BC)

For Early Bronze Age 1 the quantity/quality of available data for the two tool categories is very similar, the only major exception being northern Greece with significantly less information on spindle whorls compared to loom weights.

In the discussion on loom weight shapes it was mentioned that a decrease in variety per site is noticeable, which allows us to separate the use of certain types in certain areas more clearly. At the same time, for the spindle whorls in western Anatolia, Bulgaria, Turkish Thrace and the Aegean Islands, a strong unity is visible through the prevalent biconical shapes. It is thus difficult to connect the shape developments of the different tool types, since they seem strongly related regarding the spindle whorl shapes, but different according to the loom weight shapes. It seems that, as in the Late Chalcolithic, they are not bound to the same developments and transfers.

The analysis of the weight and moment of inertia of the spindle whorls showed distinct developments in the most eastern parts of western Anatolia and the western Anatolian coast. Interestingly, these peculiarities cannot be found for the spindle whorl shapes, but can be seen for the loom weight shapes. The more eastern parts of western Anatolia seem to be interconnected via loom weight shapes but seem to be also linked with Turkish Thrace. For the loom weight shapes the western Anatolian coast is more connected with the Aegean Islands and not with the eastern parts of western Anatolia. Even more interesting in this case is that the regions Bulgaria and northern Greece are split with regard to these two developments. In both regions sites exist that rather resemble the western Anatolian coast and others that can be associated with northwestern and southwestern Anatolia. Unfortunately, for the spindle whorls there is insufficient data to conduct a comparison.

Nonetheless, it was argued that at the beginning of the Early Bronze Age higher individuality among textile craftspeople can be found. This is, for example, reflected in the choice of which technological structure is adopted, best visible in the far-reaching spread of individual loom weight shapes. Furthermore, it was argued that these different developments of structures and adoption might be the result of different flows of information. This means that through exchange, trade or other contacts, information of new/other developments or techniques were also shared, leading to unequal possibilities of adoption depending on contact zones. To be precise, depending on which sites were in contact with each other, information was available or not. If this was the case, the different analyses of EBA 1 yield two new main insights: (1) the exchange of knowledge and technologies was not unidirectional and depended strongly on the people and individuals and (2) the distribution of technical aspects of spindle whorls seems to be more closely connected with that of loom weight shapes than with that of spindle whorl shapes.

These two premises deliver hypotheses that need to be further discussed in the final conclusion. If they proved true, it would mean that, at least from the Early Bronze Age on, craftspeople acted consciously in adapting, developing and changing their connected structure. It would also be possible to deduce that loom weight shapes were structurally connected with textile production techniques in the mindsets of its craftspeople, while spindle whorl shapes were actually characterised more by aesthetic perceptions. This would not exclude that the craftspeople understood the influence of the whorl shape on the spinning process; it would just mean that when the spindle whorl was changed in size it was to fit the outcome rather than the shape.

Early Bronze Age 2 (2750–2440 BC)

In Early Bronze Age 2 the variety of loom weight shapes per sites increases again. In Subchapter VIII.1.1 this was interpreted as a result of the increasing individuality of textile workers in different settlements. It was stated that such a development began in EBA 1; there the result was a wide spread of individual objects. It was argued that this marked the rise of different flows of knowledge and technologies. The hypothesis would now be that an increase in these contacts led,

in turn, to an increasing variety of shapes. Since a generally stronger connectivity could be argued for EBA 2 (see Subchapters VIII.1.1 and VIII.1.2), it is likely that not only the increasing individuality but also the increase in new and foreign impressions led to different craftspeople adopting different methods, in turn leading to a higher variety.

Both Bernbeck and Costin argue that normally standardisation, and therefore a reduction in varieties, indicates an increase in craft specialisation. However, both also state that the ability of a 'market' or craft to produce in higher variability can also be a sign of increasing craft specialisation.[353] It is therefore possible that the developments in EBA 2 are the result of a growing number of craftspeople influenced by stronger connectivity leading to an increase in craft specialisation.

Unfortunately, the other record can hardly prove or disprove this hypothesis. For the spindle whorl shapes, the main insight was that the western Anatolian regions were most likely well connected and a connection between western Anatolia and the Greek mainland through the Aegean Islands existed. The analytical statistics of the spindle whorls only indicated a potential separation of parts of northern and southwestern Anatolia, Aegean Anatolia and Bulgaria. This is a notion that cannot be supported either through the loom weight or the spindle whorl shapes.

Early Bronze Age 3 (2440–2000 BC)

Since the spindle whorl shapes could only be analysed comprehensively for the periods EBA 2–3, the picture does not change here. However, since the statistical analyses produced no significant results for EBA 3 alone, analyses were also carried out for EBA 2–3 and those results show a very comparable picture to the distribution of the whorl shapes. In both cases the Greek mainland is different from the rest. Furthermore, the differences in spindle whorl metrics in northern and southwestern Anatolia from the core group are reflected in the differences in shapes between the two regions and the western Anatolian coast. However, Turkish Thrace shows a slightly deviating development of spindle whorl shapes that is not reflected in the metrics, where the area is in the core group together with sites from the western Anatolian coast and the Aegean Islands.

For the loom weight shapes, the hypothesis was stated that the process seen in EBA 2 (more individuality among textile craftspeople resulting in higher variety per site) continues in EBA 3. This higher degree of variety as a result of strong connections, contacts and exchange is, however, again difficult to confirm with the spindle whorl data. It is possible that the still growing proportions of biconical spindle whorls are also a result of this development, since the growing contacts might have spread information on the advantages of the biconical shape. But since this phenomenon could already be observed in EBA 1, this is questionable.

One possibility is that the shapes of the tools change their meaning during the Early Bronze Age. It was stated before that the loom weights were possibly (at least in the mindsets of craftspeople) more closely connected with technological factors than the spindle whorl shapes. This was suggested because the distribution of technical aspects of spindle whorls was very similar to that of loom weight shapes, while, at the same time, spindle whorl shape distributions differed from both. This seems to change during EBA 2–3, because the distribution of technical aspects of spindle whorl shapes is more similar to spindle whorl shapes in these periods than to loom weight shapes. It can therefore be assumed that the technical relevance of the shapes also changes. It is possible that during EBA 2 and, at the latest in EBA 3, loom weight shapes progressively became more a representation of cultural and social aspects than of technical attributes. Concurrently, the shape of spindle whorls might have increasingly lost its aesthetic function and it instead became more important that it was a well-functioning tool.

If this proved true, a change in the comprehension of material culture, objects, tools and the structure itself occurred during the Early Bronze Age. The following subchapter will therefore

[353] See Costin 1991; Bernbeck 1994.

analyse the potential impact and relevance of the different aspects of the tools according to practice and agency theory.

VIII.3.2. Observing the Threads and Seams – Discussion According to the Information-based Model

The discussion in this subchapter will completely follow the combined model of practice and agency theory presented in Subchapter IV.4 (see Fig. 7).

The three main aspects of the model are the object, the social agent and the structure. The model is based on the transfer of information between observable and unobservable factors in the archaeological record. Since the current study is based on artefacts (objects), most information about impacts on the system will be gained in relation to objects. The factor structure is more complicated to grasp; the multiple discussions previous to this chapter have, however, hopefully given a plentiful insight into its nature. As stated in Subchapter IV.4, the model does not assign any transfer of information to the social agent. This is not meant to neglect the influence of the social agent on the system, but to demonstrate how problematic access to the human factor in archaeological records is. Even if information on small groups or individuals is available via burials or the interior and equipment of rooms, for example, the source of information is actually the objects and their features, not the humans themselves.

The discussion regarding the information-based model will therefore consider the information deriving from the structure and then from the objects. The results, as well as the interrelations between the different aspects, will afterwards be discussed conclusively.

Structure

The most direct information obtainable from the structure relates to three factors: cultural and social norms, available resources and environmental issues (e.g. climate, geology, etc.). These components of the structure are also the aspects that limit human behaviour most strongly.

Cultural and social norms, as could be seen in the discussions in the previous subchapters, often have to be seen as rather abstract. This means, it is easier to imagine and demonstrate the fact that cultural and social norms were intact and did influence craft developments, than to actually attest what exactly the norms dictated. Nonetheless, the discussions showed that a varying degree of limitation via structured cultural and social norms could be detected for the different regions and periods. This could, for example, be seen in sites that changed more quickly to newer techniques or recent developments, which showed that cultural and social norms did not represent the same obstacle in connection with technological progression for all sites/groups/individuals. Furthermore, on several occasions a willingness of the social agents to preserve these structures rather than adopt new ones was assumed. It was further assumed that both preservation and changes in structure are visible in the material culture. One important part of this is, for example, the connectivity of technically less relevant factors (e.g. loom weight shapes) with technically relevant aspects (e.g. spindle whorl dimensions). This shows that parts of a structure could be preserved in spite of technological advancement or were adopted together with new technologies, even though they were not necessary. However, these are still rather abstract assumptions about the influence of structure and the information obtainable on cultural and social norms. In fact, the unidirectional view from one craft is too limited and too prone to obscure potentially important parameters. This means that in order to state detailed assumptions on the strength and nature of the cultural and social norms, more information of the structure would be needed, gained through insights from other aspects of the life of prehistoric societies.

Available resources, as well as environmental aspects should logically differ more or less through time and space. Whether or not such changes influenced textile production needs to be

discussed. If natural or economic changes that occurred during the researched millennia did not influence textile production, logically they will not be visible in the current study. This most certainly does not deny their existence, it just makes it impossible to discuss based on the analysed materials. The statistical analyses of said materials have shown that the main variable connected with differences in textile tools is chronology (period). This means that if natural or economic developments influenced the behaviour in producing textiles, these had to be events that influenced all regions, otherwise more differences between the regions should be visible.

The next question is which environmental or resource-related developments could have had an influence on textile production. For resources this is reducible to one distinct innovation: wool. Certainly the choice of certain plant fibres should differ between regions and periods. However, the botanical record on fibrous plants can be problematic, since their remains do not necessarily appear in the records. For example, at Çukuriçi Höyük, even in periods when most certainly no wool was present, fibrous plants are absent in the botanical records.[354] One reason for this could be the treatment of fibrous plants. Flax for example, if harvested for its fibres, is collected before the seeds are ripe and is often already prepared directly in the field.[355] It would therefore not be surprising if use of flax does not show in the botanical record. The still much bigger problem is that for many sites sufficient botanical records are not available at all. General assumptions on regional or local preferences are therefore to be made with caution. Another way of resources having an influence on textile production would be superregional changes in plant fibres through time. Such a development would, however, most likely be due to changing climates and would therefore be included in the environmental influences. The environmental influences that could have had an impact on textile production can also be reduced to one major aspect: climate. Next to plant growth and plant variability, climatic changes could have simply altered the demand for different types of textile (thicker/thinner, more/less). It has to be mentioned in this regard that climatic changes can, but do not only, occur on a superregional level. Various events can result in changes in the microclimate (e.g. deforestation). Since, however, it was excluded above that regional changes (and therefore changes in microclimates) influenced textile production, these aspects are negligible.

In their study of the Pannonian Plain, Grabundžija and Russo even assume that the spread of wool, too, was connected with climatic changes.[356] The changing environmental conditions could have made areas more or less suitable for the spread of woolly sheep and therefore the adoption of wool. Likewise, changing environments, as mentioned above, could have influenced the availability of native plants, in turn making the adoption of wool more attractive. Grabundžija and Russo concluded that shifting climates probably influenced fibre treatment and spinning techniques (mainly in regard to spindle whorl sizes), yet they stated that it was a 'slow and gradual accommodation to the world around them'.[357] This would fit with the – in this volume repeatedly assumed – conservatism of prehistoric textile workers. Nonetheless, the introduction and subsequent increase in wool usage most certainly had an influence on textile production, politico-economically as well as individually for the respective textile workers. The fact that the spread of the wool-bearing sheep probably depended on environmental issues highlights the function of the structure as an influential element in this change.

The oldest spindle whorls analysed in the study on climatic influence and wool of Grabundžija and Russo derived from the final 5th millennium BC.[358] The authors however state that it is very likely that wool was already present on the Pannonian Plain at this time and spindle whorls were already adapted to the task. The study was therefore not able to capture the potential moment of change deriving from the introduction of wool. Nonetheless, the study showed, similarly to the

354 See: Horejs et al. 2011.
355 See: Beugnier – Crombé 2007.
356 See: Grabundžija – Russo 2016.
357 Grabundžija – Russo 2016, 319.
358 Grabundžija – Russo 2016, 305.

analyses in this volume, differences between the different periods from the close of the 5th to the end of the 3rd millennium. These changes mainly depended on the period the finds derived from and less on their geographical origin. Therefore, the developments were associated with changing tasks influenced by climatic events. These tasks were supposedly either related to plant fibres varying through climatic changes and/or through the increasing use of wool as a textile fibre. Following the study of Grabundžija and Russo, it has to be assumed that both processes had an impact on the developments of spindle whorls and the connected technologies.

It can therefore be hypothesised that both new and changing raw materials (available/known resources), as well as changing climates (environment) had an influence on developments for prehistoric textile tools. These two factors constitute strong impacts on the structure that can be recognised through the information paths given in the information-based model (see Fig. 7). The free will of sheep herders should, however, not be neglected in this matter. A potential reluctance to adopting new breeds is very likely. It is possible that the fear of a possible greater proneness to illness or higher demands in care of a new breed might have threatened potential economic disadvantages. On the other hand, the possibility of accessing a new and promising market via wool as a fibre source might also have been a compelling argument. Therefore, the change to wool-bearing sheep could also have been intrinsically motivated via the economic thinking of herders, as well as extrinsically through adapting to the climate.

The most intriguing follow-up question would be whether it is possible to determine a moment in time when these influences were strongest. A logical moment would be the spread of wool-bearing sheep and the introduction of wool as a fibre. A recent paper by Nataša Djurdjevac Conrad et al. performed a simulation model analysis for the spread of woolly sheep from the Near East through Anatolia, the Aegean, the Balkans and Greece.[359] The simulation suggests a spread of wool-bearing sheep in the regions studied in this volume between 5763 to 5167 BC with standard deviations between 182 to 231 years (both depending on the respective region).[360] If the simulation was correct, wool would be present far earlier than normally expected. Most studies until now argued for a spread around the 4th millennium BC.[361] The authors of the paper also state however, that the dates have to be re-evaluated via the archaeological record. The information will therefore be discussed further in Subchapter VIII.3.3 in relation to all analyses and information from the current study.

Object

As already stated above, as an artefact-based study, this volume focuses strongly on objects. Thus, the main source of information for the analysis of structure and agency logically derives from said objects. For the analysis via the information-based model, technically two levels of artefact analysis exist. The first concerns direct physical observations on the individual artefact, as well as on groups of artefacts. These are the metrical/physical analysis (e.g. weight, diameter, moment of inertia, etc.) and Knappett's affordance, constraints and iconicity (associations and considerations of the function and meaning of the object with sole regard to the object itself). The second level encompasses the information obtainable on aspects of the system via the objects. The aspects that are most closely connected to the objects are information on the context and features and information from inter-site comparisons.

The first level of information was already acquired and presented for the studied tools. The metrical and physical details are displayed in the catalogue and, additionally, in the pertinent sections of this volume. Knappett's steps of analysis presented in Figure 6 were the basic principles

[359] See: Conrad et al. 2018.

[360] Conrad et al. 2018, tab. 1.

[361] See, for example: Ryder 1974; Greenfield 1988; Barber 1991; Greenfield 2005; Rast-Eicher – Bender Jørgensen 2013.

according to which the inclusion and exclusion of tools was decided (see, for example, the exclusion of perforated discs in Subchapter II.2) and on which the typologies were built in Subchapter IV.9. All tools or types were excluded that could not withstand the process of Knappett's steps of analysis. If affordance offered too many possibilities that could not be ruled out via constraints, tool types could not be included, since the risk of misinterpretation would have been too high. Also, if objects appeared too individual and could not be connected with other comparable objects via iconicity, they were also excluded. Since, therefore, all tools that were labelled either spindle whorls or loom weights in the current study already followed the lines of Knappett's argumentation, it is redundant to discuss the tools again in regard to Knappett's concepts. Logically the argumentation would lead to the assumption that the respective tools are either loom weights or spindle whorls, since otherwise they would not have been added to the current database (as, for example, in the case of the perforated discs).

For the factor context/features only very little information could be found. For most of the tools in the current study no data on their connected surroundings is available. The case study of Çukuriçi Höyük demonstrated that it is possible to assign textile tools to distinct rooms and connect them with features (e.g. a loom). However, this kind of deduction is limited to very well-executed and -documented excavations with high numbers of textile tools and information on the settlement layout that allow the formation of artefact clusters. In multiple cases data added in this study derived from excavations which could not fulfil these requirements. Therefore, the currently used database did not include intra-site spatial information on the tools. A recent study presented by Britsch and Horejs furthermore demonstrated the problematic validity of assigning tools to buildings, rooms and features with data from older excavations, compared to data from recent excavations.[362] Due to these limitations, no information on context and/or features can be gained.

The inter-site comparisons formed the most integral part of the current study. All aspects of the aforementioned first level of object analysis were compared, including interval-scaled data (weight, diameter and moment of inertia) as well as categorical data (shape, type and decoration). The data was compared via simple observations, as well as descriptive and analytical statistics. The results of these analyses have been discussed in the previous and the current subchapters. I will therefore restrict myself to highlighting the relevant insights gained through artefact information.

The discussions were able to show that connections on different levels and regarding different aspects existed between individual sites, as well as regions. Connections of this kind could especially be noticed for loom weight shapes, spindle whorl weight and the moment of inertia as well as, to a lesser degree, for spindle whorl shapes and decorations.

For the loom weight shapes, wide superregional distributions of different types could be attested. Especially before EBA 2, the distribution of loom weight shapes was partially concurrent with the spread of technical aspects of spindle whorls. The distribution, or the adoption of new shapes, was therefore interpreted as potentially accompanying new technology (even though not directly related to it).

The analyses of spindle whorl weights and moments of inertia showed that the majority of sites in each period shared rather similar spindle whorl characteristics. Nevertheless, sites that seemed to stick out from the mass existed in each period. These results were interpreted as potential different flows of information and/or different degrees of acceptance of new technology or, on the contrary, as conservatism.

Spindle whorl shapes and decorations delivered only minor insights. Links in decoration were only present for three western Anatolian EBA sites in this study (see Subchapter VIII.1.3). Although for the shapes of spindle whorls better comparative data is available, significant results were still limited. Since the spindle whorl shape distribution did not fit the distributions of the weight and moment of inertia before the Early Bronze Age, it was suggested that the choice of

[362] Britsch – Horejs 2020.

shape during the earlier periods was mainly based on aesthetic views. During the Early Bronze Age, spindle whorl shapes – like loom weight shapes before them – could be interpreted as potentially accompanying changing technologies.

It can therefore be concluded for the inter-site comparisons that information about the connectivity of different sites and regions could be gained in relation to several aspects of the object analyses. Sites were connected through technology, but also through their views on aesthetics. Most interestingly, the two aspects do not necessarily overlap. This means that when prehistoric textile workers adopted new and foreign technology or materials, a consequential adoption of foreign concepts of aesthetics was strongly ambivalent. While, for example, loom weight shapes were adopted, even though they were not directly related to technical aspects, spindle whorl shapes were retained in traditions (even though they could have had a technical impact). The interconnectivity of certain sites and regions in contrast to significantly different sites and regions does, as in the information-based model, directly lead to assumptions and information about general local and regional developments. As for social meaning, hierarchy and cultural/social norms, as well as, lastly, the social agent itself, the information that can be gathered from local/regional developments is multidirectional (see Fig. 7). The reflection of information transfer between the just-listed aspects must therefore be seen from an angle of interrelated information sources in the cognitive process of the current study's discussion.

Interrelated Aspects

Unfortunately, two important interrelated aspects in the information-based model cannot be addressed via the data and analyses of the current study: hierarchy and social meaning.

The main reason why no statement can be made concerning the social standing of textile workers in any kind of hierarchy is the absence of spatial information relating to the finds within settlements and the general absence of data from burial sites. However, as already addressed above, even if data of this kind are available, it has to be taken into account that the validity of locating textile tools within settlements is questionable, especially for older excavations.[363] The cited paper, as well as the case study in this volume, were only able to show clear results for Çukuriçi Höyük. There it could be seen that the textile workers were embedded in the general heterarchical structures of their society.[364] A special (high or low) social status could not be determined. The paper by Britsch and Horejs also showed that no clear conclusive result about the social standing of textile workers could be gained from the analysis of burial data. Therefore, even though a hierarchy must certainly have had an influence on how strongly and freely textile workers could have moulded social and cultural structures, no information can be discussed in this regard.

Similarly, to grasp the social meaning of objects is beyond the possibilities of the current study. According to the proposed model, the analysis of the social meaning follows Knappett's proposed factorality. This means that it is assumed that the objects have a potential deeper meaning conveyed by the social agent, since they are employed in a certain enactment of, for example, rituals or traditions, or are bound to a distinct place endowed with social meaning. The first aspect can – with the current data – only be addressed via assumptions about the cultural and social norms, meaning mainly via the analysis of structure. Necessary information that would be based on the artefacts themselves is not accessible, since social implications (position within settlements, role as burial objects, special treatment, etc.) could not be analysed due to the above-mentioned limitations of available and applicable spatial information in the database. As mentioned above, the exception for the availability of spatial data in the current study is the site Çukuriçi Höyük. However, the hierarchically flat or respectively heterarchical organisation of the settlement, with

363 See: Britsch – Horejs 2020.
364 Britsch – Horejs 2020.

no obvious differences in social classes visible through building structures, makes it difficult to project social meaning onto the artefacts from spatial appearance. To be able to make such inferences, a study of a more hierarchically organised society would be necessary.

Regarding the aspect cultural and social norms, it was already stated that to acquire any insight via the structure, an already existing multidirectional insight of the structure is needed. This means that by only regarding one small part of human activity, in the current case meaning regarding textile production as a part of craft production, the factor structure alone cannot deliver enough information. Nonetheless, conservatism in some cases opposed to a striving for innovation in others, detectable via changes in and continuities of aesthetic and technical aspects of textile tools, does allow at least assumptions about the importance and impact of social and cultural norms within the studied prehistoric societies. The most important contribution of the current study to analysing and validating such assumptions derives from the aspect local and regional developments that is discussed in the following paragraph.

Information on the local and regional developments derives from the structure, as well as from the object. The information from the structure mainly includes the natural changes discussed above (climatic changes, wool as a new resource). These are changes that will have had an influence on the craft structures of the different societies. How fast and how strong and in what exact way such changes started and evolved can only be answered via the objects. Thus the inter-site comparative analyses described above are the key in the current study for addressing these questions. Only by observing diachronic changes and continuities of technical and aesthetic factors of tools in a large enough geographic area is it possible to distinguish local, regional and interregional or general developments. Ascertaining what changes occurred and on which natural (climate, wool) or social and cultural (contacts, exchange, etc.) developments they depended will be the key element for the final conclusion in Subchapter VIII.3.3.

Several aspects of the information-based model could only be recorded through rather abstract and theoretical considerations rather than the direct analysis of archaeological remains. The assumptions made by analysing textile production nonetheless need to be stated in detail, so they can add to the mosaic for fully understanding craft developments in general. Likewise, the outstanding overlying aspects of agency and cognition still need to be discussed as they, too, form general concepts which can be adopted for the study of other archaeological categories. The discussion of these only theoretically approachable concepts, as well as the final statement on the social, cultural and economic standing of prehistoric textile production in the research area will be the content of the final conclusion in Subchapter VIII.3.3.

VIII.3.3. Extending the Weave and Patterns – The Final Conclusion

The multi-layered discussions demonstrated that various insights on the prehistoric textile production and technology in the research area could be gained through the different approaches applied. The foremost important insight was that developments through time and space were noticeable and that these – at least from the Early and Middle Chalcolithic on – never appeared restricted to individual sites but always in connection to others. This accounts for the development of loom weight shapes, as well as for spindle whorl shapes and metrics. This showed that developments were not advanced only in isolation by individuals, but progressed through contact and shared knowledge. Connecting the development of the different aspects and finding parallelisms was, however, difficult or even impossible. Partly this was due to the state of the current data, more precisely the lack of research and publications. However, also in cases when sufficient data were available, concurrent developments of different tool shapes and metrics were – if present at all – restricted to specific areas.

In Subchapter VIII.3.1 the similarities and dissimilarities in the development of shapes and metrics were discussed. Besides the already addressed spatial limitation of similar developments in most cases, the discussion was able to show that one major switch in these developments is

noticeable on an interregional level: while before the 3rd millennium developments in the weight and moment of inertia of spindle whorls were often concurrent with loom weigh shape developments, from the 3rd millennium on they bore more similarities to spindle whorl shape developments.

The discussions on the cluster analysis and the non-parametric analyses of variance were able to demonstrate that the picture one will perceive depends on the perspective. To clarify, if the developments of all tools are seen from an overarching perspective, above everything a chronological progression of changes can be perceived. However, when looking more closely, inconsistencies will appear. This was discussed for sites in the cluster analysis whose spindle whorls were sorted together with otherwise older or younger finds. It was hypothesised that such inconsistencies are the result of a stronger propensity to traditions or, conversely, a stronger striving for innovation on a local or regional scale. Looking into the details of this possibility, it could be noted that only some of the sites (though often the majority) seemed to follow the basic chronological developments. These were depicted in Figures 47–54 as a 'core-group' containing all sites that share similarities to every single site analysed and no significant differences to any other site during that period. It depended on the respective period whether more sites were within or outside of this core group. Unfortunately, it was not possible to detect clearly spatially separated homogenous subgroups that would have permitted us to distinguish areas with different technological backgrounds. For this, the groups shared too many similarities after all, which most likely resulted from the basic chronological developments. Nonetheless, it can be stated that developments were not exactly homogeneous for all sites and regions. Local and regional structures, the individuality of agents, contacts and exchange, as well as different flows of information most likely had an influence – even if only to a smaller extent than general developments.

The underlying reasons for the chronological, local and regional changes, as well as for the switch from previously concurrent developments have been discussed with regard to practice and agency theory. Furthermore, the possible information transfer from structure- and object-related sources has been described according to the conjoined information-based model presented in the current volume. It could be demonstrated that many of the developments can either be assigned to structural changes, occurring in the different millennia studied or to the impact of social agents employing their will and cognition to alter existing structures for the sake of innovation. The structural and individual reasons of craftspeople, as well as their potential meaning and impact, were debated in the previous parts of the current subchapter. All the discussions recapitulated so far were intended to provide an overview of the different possibilities of interpretation. The focus of the following discussion will be to evaluate the different possibilities of interpretation, to draw conclusions and then to reflect critically on the validity of the current study's analyses. The goal is thus to state finalised hypotheses about the procedure, as well as the social, cultural and economic meaning and standing of prehistoric craft production in the research area. Finally, general conclusions about prehistoric craft production and analytical possibilities will be drawn.

Early Textile Technologies in the Anatolian-Aegean World

Textile production, in modern times, is a craft tainted with social and cultural prejudices. In most countries of the world textile production as a common profession on a large scale is absent nowadays. The huge demand from Western countries in particular is typically met by big companies outsourcing the task to those countries with the cheapest manual labourers (and often the least regard for human rights). Even Fair-Trade production is usually, though with better conditions, produced outside of the Western world. The only part of the textile craft that can be found regularly in all countries is alteration shops doing small repairs. Therefore, the craft is mostly reduced to a hobby. As such, it is mostly seen as strongly feminine, often associated with elderly people and with the middle or lower classes. Of course, this represents stereotypical images that might be frequent but do not represent the absolute truth. What is interesting for the current study, however, is the question of whether and to what extent similar images were present in prehistoric societies.

Gender, as well as age-related topics can be difficult to address with archaeological records. However, without written or pictorial sources or finds, exact settlement layouts and features from burial sites, this is nearly impossible. A recent paper by Britsch and Horejs included the western Anatolian Early Bronze Age burial site Demircihüyük-Sarıket for the analysis of agents of textile production.[365] The study revealed that no significant result for the connection of spindle whorls as burial gifts and a certain age or sex was obtainable. The paper also critically discussed the validity of directly assigning grave goods to a deceased person's past profession(s) (or hobbies). Nonetheless, if trying to find a potential connection between grave goods and professions, no specific age or sex restrictions could be noticed.

Since the current study did not include information about the exact find location or surrounding features for the artefact data, the topics of age or sex (or even gender) could not be addressed. This also proved a problem for addressing the social standing of the textile workers. Except for the case study of Çukuriçi Höyük, the spatial distribution of textile tools within the sites could not be taken into account due to the lack of data on the matter. Thus, assigning the social standing of textile workers by the buildings/rooms/areas they lived/worked in is also not possible. However, the social standing within a society is not only reflected in the working and living accommodation or collected riches. In fact it can be far more abstract. One important aspect is the degree of freedom for collective and individual development and innovation. To be able to grasp this complex construct, the current study followed the aesthetic and functional developments of textile tools and interpreted the results through practice and agency theory.

It was argued that aesthetic attributes of tools could have been transferred together with technological aspects. For the current study, this was mainly true for the loom weight shapes. Only in the later EBA did spindle whorl shape distributions show similarities to the distribution of technical aspects. Another aesthetic aspect of spindle whorls that was studied was their decoration. However, in regard to questions of development and connectivity, this was only a minor contribution. The following paragraphs therefore refer to the aesthetic nature of loom weights and spindle whorls, as well as the technical aspects of spindle whorls.

For the Late Neolithic, little can be stated. Connectivity through shapes was present and most likely more common than the archaeological remains allow us to detect. However, to what degree different developments were connected is not possible to judge from the rather small record.

During the Early and Middle Chalcolithic at least some developments and distributions seemed to proceed in parallel. For example, in Turkish Thrace and Bulgaria both loom weight shapes and spindle whorl shape proportions were rather similar. Northern Greece, on the other hand, was only comparable with these regions by the loom weight shapes, not via the spindle whorls. From a technical point of view (spindle whorl weight/moment of inertia), no significant differences between any sites could be found. The different levels of connectivity were interpreted as a sign of a certain autonomy of textile workers in the development of their tools. The most likely situation is that during these early times technical aspects were mostly dictated through general, structural developments, depending on the environment and available resources. However, with regard to aesthetics, a certain degree of freedom was apparent. This led to different adaptive developments for the different tool types.

The connection between spindle whorl and loom weight shapes from the Early and Middle Chalcolithic is not present during the Late Chalcolithic anymore. In fact, while connectivity on different levels between individual sites could be noted, correlations between the developments of different tool categories and aspects are difficult to make for the Late Chalcolithic. In some cases the distribution of spindle whorl shapes fits quite well with technical factors, in others the loom weight shapes fit better. It seems as if the Late Chalcolithic in the studied regions is a 'time of upheaval' for textile production. It is quite possible that the initial impulse for such an upheaval derived from the introduction of wool. Furthermore, it is likely that craftspeople, groups and

[365] Britsch – Horejs 2020.

societies reacted very differently to a new resource that is obtained in an entirely different way and behaves differently in the spinning and weaving process. It was argued that the cylindrical loom weights might be an indicator for a stronger conservatism of structures. Supposedly, such settlements also reacted more reluctantly to the introduction of a new resource. However, the results on loom weight shape distribution and the distribution of technical aspects was not able to substantiate this. The most likely assumption for the Late Chalcolithic is that due to strong structural changes in the research area, a disorder in the previously noticeable connectivity occurred, which also influenced the way techniques were adopted. Regarding the model reconstruction by Conrad et al., we could assume that the introduction of wool-bearing sheep happened during the Middle Chalcolithic.[366] Thus wool would certainly already have been implanted in the textile production of many settlements, enabling the necessary impact for the just-presented hypothesis. This would imply that the Late Chalcolithic marks a time of change in the social and economic significance of textile workers. The strong connection with recent events and changes will have given textile craftspeople more influence. Through the introduction of wool, sheep herders, as well as farmers and other workers responsible for fibrous plants, will have experienced intense changes in the demand for their products and work. This also means that a potential growing demand for wool and shrinking demand for plant fibres led to a stronger relevance of wool-bearing sheep and their suppliers and a decrease in importance for other sheep races and fibrous plants. This will have allowed the textile workers a more active role as social agents in altering the structure.

It was already suggested in Subchapter VIII.3.1 that from the beginning of the Early Bronze Age on, textile craftspeople acted more consciously and had a stronger influence and impact on the structure, resulting, for example, in a broader spectrum of loom weight types per site. These results very much support the hypothesis of changes in development of the social and economic significance of textile craftspeople in the Late Chalcolithic. The developments in EBA 1 show, comparably to the Late Chalcolithic, heterogeneity in the adoption of different aspects of textile production. This heterogeneity was interpreted as a result of stronger individuality among textile craftspeople. To put it more concretely, textile workers were able to choose more freely which technical and aesthetical aspects they wanted to adopt. While this would clarify the 'mix-up' between different developments, it could not have freed agents' actions completely from structural influences. It thus explains why the distribution of loom weight shapes seems to be still strongly connected to the adoption of technological developments. Nevertheless, the growing independence and accompanying higher social and economic standing of textile workers seems to further increase with the beginning of the Early Bronze Age.

This independence and self-regulation of textile workers seems to increasingly progress during the Early Bronze Age. From EBA 2 on, two main events occur for loom weight shapes: the variety per site increases and the shapes are less and less connected with technical aspects. Simultaneously, the spindle whorl shapes are more connected with technological developments. The loom weight shapes therefore seem to become detached from the structured mindset as 'carry-on' of technological change and become a voluntary portrayal of cultural and social representation. This demonstrates a strong impact of the will of textile workers and a decrease in influence from the structure. The same can be said about the changes in spindle whorl shapes. Instead of still adapting to norms and having to adjust technical properties in order to fit the artisanal needs, the shapes themselves are adapted. The shapes therefore lose their representational functions and are adjusted to the practical necessities of a tool. This shows that a growing autonomy regarding the craft development and the actual performance of the craft can be detected for prehistoric textile workers during the 3rd millennium. Most certainly an increase in social, cultural and economic significance was connected with these changes. Apparently, from the Neolithic on, textile production gradually became a more important craft, with the biggest advance probably occurring at the end of the Middle Chalcolithic, but at the latest in the Late Chalcolithic in the research area.

366 See: Conrad et al. 2018 as well as the discussion in Subchapter VIII.3.2.

This leads to the question of to what extent textile production was performed as a simple household activity or by specialised craftspeople. Following the results and discussions of the current study it can be suggested that, starting in the Middle Chalcolithic, textile production was increasingly carried out by people who dedicated a lot of time and energy to it. From the Late Chalcolithic on it is possible to talk about at least semi-specialised craftspeople. The strong influence of textile workers – which was discussed above – could certainly not have been achieved without the agency of people that represent themselves with the craft. Beginning in the Early Bronze Age, when this influence became continually stronger, for a certain proportion of the settlements, fully specialised craftspeople can be assumed. If and to what extent the craft was performed only as a household activity before the Middle Chalcolithic is hard to tell from the fragmentary data available. However, based on the current study, it is not likely that in the Neolithic or Early Chalcolithic textile workers were already specialised. Since the records do not offer the in-depth insight necessary for a clear statement about textile craft specialisation in the Neolithic and Early Chalcolithic, it has to be argued by 'elimination' of the possibility. To be more precise, it would have to be expected that if textile production was already a specialised craft during the Neolithic and Early Chalcolithic, these developments would have been carried on into the Middle Chalcolithic and further. Since, as described above, such a development can, however, not be detected, it is unlikely that textile craft specialists existed in these very early periods.

Looking at the previous discussions, it seems more than just a coincidence that the increase in the social and economic significance of textile workers co-occurs with the potential introduction of wool. Regardless of looking at older suggestions or recent approaches on the introduction of wool, the time around the end of the Middle and beginning of the Late Chalcolithic seems most likely for the studied regions.[367] If we follow the concept of the Secondary Products Revolution presented by Sherratt, the introduction of any secondary product had several repercussions for different crafts and traits of economy.[368] Thus, textile production was most likely not only part of a change, but on the verge of influencing several progressions. Depending on how strongly wool was adopted as a resource, the importance of sheep herding could increase, while that of collecting and retting or otherwise preparing plant fibres decreased. Likewise woollen fabrics surely changed exchange routines, as they appeared as a new and advanced commodity. Wool has several advantages, like flexibility or the insulation against cold and water it provides.[369] This probably made the product interesting and attractive, and, in turn, could have led to both a quick adoption and a high demand for woollen textiles. Textile workers were therefore engaged in a process that gave their craft new aspects of interest and demand. Moreover, other traits depended to different degrees on the decisions, behaviour and willingness of textile workers to adapt and advance in these newly created structures.

The results and discussions of this volume demonstrate that textile workers (at least in the research area) actively exploited the new developments. To refer to the information-based model (see Fig. 7), the social agents (in the form of the textile workers) used, via cognition, their standing as agency to influence not only the structure, but also to shape their standing as social agents. To be more precise, the social agents consciously observed occurring changes in the structure and recognised the connected necessary changes in objects. Through the influence via objects/material culture, they used this to advance their own position and significance, as well as that of their craft. We can therefore perceive the prehistoric textile craftspeople as a perfect example for an agency of people and objects rising in status by reflecting and acting upon changes. The result was a gradual increase in the social, cultural and economic standing of the textile craft and its workers over at least two to three millennia.

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367 See: Ryder 1974; Greenfield 1988; Barber 1991; Greenfield 2005; Grabundžija – Russo 2016; Conrad et al. 2018.

368 See, for example: Sherratt 1981; Sherratt 1983; Arbuckle et al. 2009; Arbuckle 2012.

369 See, for example: Gilligan 2007; Grömer 2016, 432.

This clearly demonstrates the great insight and understanding of the functioning of a craft that it is possible to gain via large-scale statistical analyses of technically relevant data. The further potential of this approach will therefore be discussed in the following and final subchapter.

Analysis of Prehistoric Crafts – Statements, Possibilities and Prospects

The greatest limitation of the current study, as declared at several points in this study, is the both geographically and chronologically unevenly distributed data. However, this limitation actually resulted from one of the strongest and most important aspects of the study, the large diachronic and interregional scale. Technological advancement is a huge part of human life. In order to achieve it, knowledge and influences are transferred on a large geographical scale. Nonetheless, certain advantages or changes take time. This can result from conservative thought patterns like traditions or ideologies, or from natural limitations, like the wrong climate for certain plants or breeds or the inaccessibility of certain raw material sources. However, it can also simply be a process that takes time: for example understanding new technology, changing work environments or shifting positions in an established network structure. In prehistoric times it is even more likely that changes took a large amount of time. Observing developments of prehistoric crafts diachronically and on a large geographical scale is therefore absolutely vital for understanding the different influencing factors within the system.

The other most important strengths of the current study were the large database, with a lot of personally recorded artefacts, and the analytical statistics. As for the time frame and geographical scale chosen, it is almost impossible to expect deep insights into changes and continuities if the artefact database is too small. Consequently, it is necessary to analyse and evaluate a large data collection. Archaeologists, at least in many cases, are reluctant to use analytical statistics. The possible reasons for and problems with this fact, have already been discussed in Subchapter VIII.2.1. The current study was, however, able to demonstrate that the inclusion of analytical statistics proves one major advantage: it allows the large-scale analysis of quantifiable data. Any given tool – be it prehistoric, historic or modern – has quantifiable aspects that give information about its area of application. Nobody would use a sledgehammer for a simple nail and no one would try to break down a wall with a geologist's hammer, and for a good reason. While this example is rather obvious, the large-scale statistical analysis of technical properties is not only very efficient and objective, it also allows us to notice more subtle changes and differences in tools in different periods, regions or even between two or more sites.

In this respect, a statement on the importance of considering the moment of inertia when studying spindle whorls is also necessary. The exemplary calculations in Subchapter IV.7 have shown that a difference in the moment of inertia between whorls of a similar size and weight could be noticed. However, in the large scale statistical analyses, the calculations regarding the moment of inertia and weight resulted in only marginal differences (in many cases in no differences at all). This means, at least for the studied regions, the moment of inertia of spindle whorls could not supply more information than the study of the weight produced. Considering that obtaining metrical information from spindle whorls can prove difficult anyhow (due to fragmentation or missing information in publications), studying the moment of inertia instead of the weight is far more complicated and problematic. This can also be seen in the current database, in which information on the weight is available for 1031 spindle whorls, but the moment of inertia could be calculated for only 939 whorls . Therefore, based on the results of the current study, a preference for analysing spindle whorl weight instead of the moment of inertia has to be strongly recommended for future studies.

While the most important input of this volume for prehistoric archaeology is certainly the insight into prehistoric textile production, it should also give an idea of the possibilities of the methodological approaches applied. If comparable studies for other crafts were available, it would be possible to see if certain crafts developed homogeneously in certain periods and/or regions. This

would give a great general insight into the social and economic standing and development of prehistoric craftspeople. Therefore, one prospect that can be stated is the possibility of transferring the methods applied in the current study to future ones to gain detailed knowledge of other crafts as well.

Furthermore, as also stated at several points, the results of any statistics still need to be interpreted. The multiple discussions in this volume have shown the potential of employing practice and agency theory for further analysing statistical results and interpreting technological change and transfer of knowledge. The models presented in this study, especially the information-based model created for it, can only grow in validity if information from various aspects of human life are included. Hence, if comparable data would be studied with the same concepts and models, the comprehensiveness of the models grows immensely. The other prospect of the study is therefore a constantly growing understanding of prehistoric agencies and practices as a result of receiving input from several different archaeological fields.

To sum up, it is hoped that through further studies examining the technical details of different tools on large scales, manifold insights can be gained into prehistoric crafts – but also into human past life in general. By observing the big and small changes, the traditions and innovations and the relentless advancement of technology, we can gain understanding about the ‘what’ and the ‘how’ and – maybe most importantly – the ‘why’ of human practices and actions.

IX. Summary

This volume aimed to analyse, portray and understand the emergence, development and distribution of prehistoric textile technologies. To achieve this, a broad framework was chosen, both geographically, as well as chronologically. Geographically the research region reaches from western Anatolia, through the Aegean to the Greek mainland and through Turkish Thrace to Bulgaria. Chronologically the study covers a period from the beginning of the 7th millennium until the end of the 3rd millennium BC. The geographical setting was chosen for two reasons: firstly, the investigations for this volume originally started with the analysis of the tools from Çukuriçi Höyük, a tell settlement on the western Anatolian Aegean coast, in the direct vicinity of the ancient city of Ephesos. Secondly, the area is ideal for observing influences and changes coming from the Near East to Europe, thus giving optimal insight into technological transfer. The time frame, including the Neolithic, Chalcolithic and Early Bronze Age periods of said regions, was additionally intended to allow a better grasp of the development of textile production among ground-breaking innovations. The research periods include the earliest sedentariness, as well as the introduction of copper, bronze and metallurgy in general. These epochs therefore mark crucial times of change in the human history of the research region.

As stated in Chapter II, to ensure an intelligible and straight-forward description and understanding of the comparative analyses in the current study, the chronological terminology of the case study's region – western Anatolia – was chosen as a common terminology. Generally, in the current study, sites and their artefact ensembles are compared following absolute dates not similar period terms, thus leading to the fact that on certain occasions a Chalcolithic settlement on one end can be compared with a Neolithic one on the other. This approach was chosen since it offers the possibility to compare approximately simultaneously existing sites (and tools), resulting in a growing recognition of differences and commonalities in the tool and technology developments.

Prehistoric textile production in general, but especially in the research region, was a completely neglected topic in archaeological research for a long time. Compared to other fields of the discipline, it is still an underrepresented area of interest. The state of research portrayed in this volume was, however, able to show that in the last two decades a significant increase in studies and publications regarding prehistoric textile production is visible (Chapter III). Particularly since the founding of the Centre of Textile Research in Copenhagen (CTR) in 2005, more and more contributions to the understanding of the functionality of textile tools and the associated methodology have emerged. Consequently, most of the methods used in this volume could be built upon those recent developments in particular (Chapter IV).

The data collection could be separated into three categories: (1) data collected by direct study of the specific artefact; (2) metrical data obtained from publications, partially with weight calculations via the density of the objects; and (3) categorical data (shapes, decoration) collected from publications. Methods (1) and (2) ideally comprised measurements of the height, mid-, top- and bottom-width, as well as the weight of each tool. The reason for this approach is the recent experimental studies of the CTR which demonstrated the relevance of the weight and size of textile tools in the textile production processes.[370] In addition to these metrical variables, the moment of inertia of spindle whorls was included in the analyses. This physical unit has only rarely been

[370] See, for example: Mårtensson 2007; Mårtensson et al. 2009; Andersson et al. 2010.

taken into account by textile archaeologists; however, the informative potential was discussed in a few instances.[371]

The current study employed statistical analyses of large data sets, with analytical methods incorporating both categorical and interval-scaled data. The inclusion of the moment of inertia as a further variable therefore involved only a minor effort. The aim was to test whether or not different results will be gained if the moment of inertia is analysed instead of the weight of spindle whorls.

For the statistical analyses, two main approaches were chosen: cluster analyses and analyses for variance (Subchapter IV.7). To be able to include both categorical and interval-scaled variables into the same cluster analysis, the two-step cluster analysis was selected, since it is capable of handling different levels of measurement and applicable to big data. For the analyses of variance, non-parametric tests had to be chosen, since too many of the assumptions for parametric analyses were violated.

Another innovative approach of the current study, regarding textile tools, was the attempt to interpret the developments of textile technologies by employing practice and agency theory (Subchapters IV.1–IV.2). Both concepts were favoured since they do not use material culture as a particular focus, but emphasise reflecting information about the actor and the action. The aim was to gain an insight into the development of textile production by relating to the actions and actors behind the tools. In order to give a well-structured analysis and to provide a clear understanding of the conclusions drawn, graphic models for both practice and agency theory were created. Additionally, a linking model was conceptualised including aspects from both practice and agency theory. The model was, moreover, extended with structures for artefact analysis as introduced by Knappett (Subchapter IV.4).[372] The aim is to offer an integrated, holistic view on actors and tools and the practices they are involved in.

Furthermore, common archaeological theories on the development of craft specialisation were also discussed, serving as a supporting foundation for the interpretation of the results of this study. The main focus in this was on the theoretical outlines of Bernbeck and Costin (Subchapter IV.3).[373]

The data collected and analysed in the just-described manners included information from 1279 artefacts, of which data was collected via direct study of the tools for 1026 objects and via publications for 253 objects (Chapter V). Of the 1026 directly recorded artefacts, 838 were spindle whorls and 188 loom weights. The 253 tools recorded via publications were all spindle whorls. Due to the complexity of the geometrical shape of many loom weights, the recording via drawings and photos was deemed too error-prone.

As mentioned above, different statistical methods were used to compare and analyse the large number of artefacts and the different variables. For the two-step cluster analysis, different compositions were tested, of which, however, only one yielded easily interpretable results. In this analysis the variable period was found to be the single main predictor for differences among textile tools (Chapter VI). This indicates that changes depended primarily on chronological progress and less on regional differences. To further analyse potential differences and changes among the different periods, non-parametric analyses of variance were conducted. For the Late Chalcolithic (4250–3000 BC), Early Bronze Age 1 (3000–2750 BC) and Early Bronze Age 2 (2750–2440 BC), differences between certain sites could be noticed. However, none were found for the Late Neolithic (6500–6000/5900 BC), the Early Chalcolithic (6000/5900–5500 BC) and Middle Chalcolithic (5500–4250 BC) and Early Bronze Age 3 (2440–2000 BC). Moreover, it was difficult to create clear homogenous subgroups, since significant differences occurred mostly between individual sites and not groups. Nonetheless, especially in the EBA periods, it was possible to find

371 See: Loughran-Delahunt 1996; Chmielewski – Gardyński 2010; Verhecken 2010; Verhecken 2013.
372 Knappett 2005.
373 See: Costin 1991; Bernbeck 1994; Bernbeck 1997.

clusters of similarities and differences between sites which were also spatially separated. It can therefore be assumed for all periods, that, while chronological developments had the main influence on textile production, a certain impact of regional or local particularities was also noticeable.

As a next step, the statistical results needed to be analysed and interpreted in detail (Chapter VI). For this, the theoretical outlines described above, especially the constructed concepts and models, were used. However, before the final discussion, a small intermezzo was included: the 'in-depth case study' of Çukuriçi Höyük (Chapter VII). The reason for this was mainly because for Çukuriçi Höyük – being the initial springboard for this volume – a far higher level of data existed. For example, information on all other archaeological fields (pottery, lithics, zoology, botany etc.) was available, but also three-dimensional measuring of the tools inside the settlement, which enabled a spatial analysis. It was therefore deemed the better approach to exclude these detailed analyses from the main results and discussion, to provide the necessary room for discussing and understanding the detailed features. It further served to find out how the models and other approaches work on a small-scale study of only one site, rather than a big data analysis. The analyses showed that, starting in the Neolithic (c. 6500 BC), a certain degree of specialisation in tool variety was noticeable. However, the small number of finds from both Neolithic and Chalcolithic layers made secure statements difficult. The EBA (3rd millennium BC) tools, however, clearly showed that the craft was performed by specialised craftspeople and was most certainly conducted in designated areas. The spatial data of the EBA settlements further indicated the existence of workshops, or at least of a mixture of workshop and living area. Therefore it could be assumed that distinct agents were entrusted with the task of producing textiles at Çukuriçi Höyük, at least from the Early Bronze Age on. In reflecting on practice and agency theory, as well as the proposed models, it was suggested that a high degree of conservatism in textile production at Çukuriçi Höyük was noticeable. The main indicator was the consistent use of the same cylindrical loom weight type for over three millennia. However, it had to be stated that further conclusions could only be drawn carefully, since similar developments at other contemporary sites are not demonstrated in this detailed study. Summarising, it could clearly be shown that the models created in this study were highly applicable. Additionally, the chapter demonstrated the strengths and weaknesses of a detailed individual study. The possibilities of a multi-level analysis, including measured information on the tools, as well as spatial data and information from other traits of the settlement, constituted a huge advantage in the discussion of potential practices and agencies. Missing information from other sites of the same kind, however, made the validity of final statements problematic.

Building on this, in the final discussion in Chapter VIII, the data from all 1279 finds was observed, analysed and interpreted. Additionally, information from publications regarding loom weight shapes was added to this discussion. While this approach included information from all 31 sites, providing a high generalisability, the level of data was far lower than for the Çukuriçi Höyük case study. Nonetheless, this far more comprehensive perspective on textile tools offered deep insights into their developments, as well as the connected practices, agents and structures. To be precise, it could be detected that developments in textile tools and textile production evolved in a strongly homogenous manner across the research region and the social standing of textile workers grew progressively in importance. The geographically and chronologically broad frame, however, also led to the methodological problem that for certain regions and periods the data was unevenly distributed. This made the analyses problematic in some cases. For the most part, however, the advantages outweighed the disadvantages.

The discussion was divided into four parts, regarding the development and distribution of loom weight shapes, spindle whorl shapes, spindle whorl decorations and spindle whorl metrics. These aspects were then analysed based on the theoretical models of the study and a final statement on the development of prehistoric textile production in the research region was given. The following paragraphs include the results of the discussions of these evaluations, as well as the final statement.

In the current study it seemed that most loom weight shapes originated from Bulgaria and spread from north to south into the Aegean, the Greek mainland and western Anatolia. This includes drop-shaped, pyramidal, cuboid and discoid loom weights. Exceptions are the cylindrical and crescent-shaped loom weights, both initially appearing in western Anatolia. Especially interesting, however, was the general exchange and far-spread distribution of most types. The hypothesis was stated that loom weights might have been adopted alongside (in)directly connected technologies. The assumption was, further, that even if the shape of a tool (or any object) was not vital to the execution of a task, it was still adopted, because the social agent perceived it as 'fitting' for the modus operandi.

The spindle whorl shapes were a bit more difficult to approach, simply because in most cases a broad variety of shapes is present at each site and region. However, certain general observations could be made. A dominance of biconical shapes seemed mostly representative for Bulgaria, Turkish Thrace and western Anatolian regions. A characteristic of the Greek mainland and northern Greece on the other hand was large proportions of conical spindle whorls. This difference is especially interesting when looking at the Aegean Islands. In the Early Bronze Age (3000–2000 BC), the islands seemed to have a mixture of the typical spindle whorl shape proportions of the western Anatolian coast and of the Greek mainland. This was seen as an indicator of intense contact and, more importantly, as a sign that spindle whorl shapes (or at least the know-how and aesthetic perception) were transferred via exchange and contact between different regions. Another interesting aspect of the spindle whorl shapes was the general increase in biconical shapes around the 4th millennium BC. Since different researchers argue that before and around the 4th millennium the woolly sheep, as well as wool itself, was spread throughout the research region, this change in shapes was interpreted as a potential indicator that tools were adapted for that new resource.

The study of spindle whorl decorations primarily yielded the insight that such decorations were highly individual, which makes the observation of distribution problematic. However, five different decoration types were detected, which appeared at at least two different contemporary sites. The sites these 'uniform' decoration types derived from were all western Anatolian sites – Çukuriçi Höyük, Troy and Bademağacı – and all dated to the Early Bronze Age. Whether this reoccurring appearance is connected with a transfer through exchange (similarly to the loom weight shapes) is difficult to say. However, it can be assumed that even such small details were transferred alongside changing technologies.

As already mentioned above, regarding the results of the statistical analyses, it was observable through the spindle whorls' metrics, that the most important predictor for the development of textile tools was the chronology (period). Nevertheless, significant differences between certain sites in the respective periods were also noticeable. Therefore it was supposed that the choices and influences leading the development of textile production, in practice/agency theory terms, mainly derived from the structure and structural changes. However, the visible differences within a period showed that the agents/actors, namely the textile workers, could actively influence these developments. This impact by the social agents was assumed to have mainly worked in two ways: either (1) agents tended to stick to the known or traditions, or (2) agents of textile production in certain settlements progressed faster than others. In the first case, this could again be interpreted as an influence from the structure, since traditions are part of cultural and social norms. It thus remained difficult to distinguish how much voluntary choice is involved in the action, meaning how much influence derived from the actors. For the second case, the progress can either be autarchic development, meaning the initial change, or indicate a stronger readiness to adopt new foreign technologies.

Interesting with regard to these adoptions is the question of which of the tested and observed aspects got adopted together or at around the same time. As mentioned above, the loom weight shapes, spindle whorl metrics and spindle whorl shapes were analysed in this regard. For the metrics, the weight as well as the moment of inertia were statistically analysed. The non-parametric analyses for variance in most cases yielded almost the same results for both the weight and the moment of inertia. Since the moment of inertia depends (among other factors) on the geometrical

shape of the whorl, it could be assumed that spindle whorl shapes were distributed at the same time as spindle whorl metrics. However, before Early Bronze Age 2 (c. from 2750 BC), no clear connection between the distribution of spindle whorl shapes and metrics was observable. By contrast, the distribution of loom weight shapes and that of spindle whorl metrics are very similar.

It was argued that aesthetic attributes of tools could have been transferred together with technological aspects. Thus, through the observation of which aspects were adopted alongside technical developments, hypotheses can be arrived at regarding to what extent the developments were influenced from outside or by the agents themselves. If certain aspects are connected throughout most of the region within one period, a stronger impact of the structure can be assumed. A stronger influence of the social agents could be expected if more variation in the adoption or distinct changes in the way of adoption are visible.

Due to these observations, it was deemed most likely that during the Early and Middle Chalcolithic developments and choices were mostly influenced by structural developments, the environment and available resources. A clear impact of the agents' will could not be securely attested. This changed, however, in the Late Chalcolithic. The connection between loom weight and spindle whorl developments ceases in most cases. The analyses of this study suggested a 'time of upheaval' in the textile production of the research region. The reason for this was seen in strong structural changes, which led to a disruption of the previously exiting connectivity. Most likely, the background of this change is the introduction of wool. As indicated earlier, the spread of the wool-bearing sheep and thereby wool as a raw material is supposed to have happened around the end of the 5th and beginning of the 4th millennium BC.[374] A simulation model analysis by Conrad and colleagues suggests a spread of the woolly sheep at around 5763 to 5167 BC with standard deviations between 182 to 231 years (both depending on the respective area of the research region).[375] Some additional time has to be taken into account until an acceptance of wool as a textile raw material had taken place to such a degree that it is noticeable through the tool assemblages. It was therefore judged most likely that, following the suggested time frames of the cited papers, wool became predominant by or during the Late Chalcolithic. In the discussion in this volume it was further suggested that this new raw material gave more impact and power to textile workers in the economy and therefore allowed them to take up a more active role in the developments of their craft. Therefore the 'upheaval' or changes noticed during the Late Chalcolithic would be the result of structural changes, as well as the empowerment of textile workers and thus the active influence of the workers' will.

This process of more autonomy with greater freedom of choice for textile workers seems to have progressed steadily in the Early Bronze Age. At the beginning of the Early Bronze Age a great mixture of different distributions is noticeable, indicating a vivid network of contact and exchange. Interestingly, as before, in the Late Chalcolithic, the distribution of technical aspects of spindle whorls is rather similar to that of loom weight shapes. However, as suggested above, during EBA 2 and especially EBA 3, this changed visibly. In the second half of the 3rd millennium, technical aspects of spindle whorls show a similar distribution to spindle whorl shapes. At the same time, loom weight shapes were distributed differently from spindle whorls. It was thus assumed that the technical relevance of both objects' shapes changed. This would mean that the functionality of the spindle whorl shape was considered more as a technical and less as an aesthetic factor. Presumably, also before the Early Bronze Age, textile workers noticed the technical relevance of the spindle whorl shape, but were led to stick to 'typical' shapes due to the influence of social structures. Thus, a change in the use of spindle whorl shapes would demonstrate a developing comprehension of material culture, objects and tools. Furthermore, this, in turn, would imply an increasing autonomy and impact of textile workers on their craft's development. Loom

[374] See, for example: Ryder 1974; Greenfield 1988; Barber 1991; Greenfield 2005; Rast-Eicher – Bender Jørgensen 2013.

[375] Conrad et al. 2018, tab. 1.

weight shapes seem to have become detached from the structured mindset as 'carry-on' of technological change and became a deliberate portrayal of cultural and social representation. Spindle whorl shapes, on the other hand, were no longer adapted to norms, but made to fit artisanal needs. Therefore, in the current volume, it was suggested that, in the research region, Early Bronze Age textile workers were acting more consciously and had a stronger influence and impact on the structure than their ancestors. This growing independence and accompanying higher social and economic standing, led to greater craft specialisation and more autonomy and freedom in carrying out their craft. This resulted, for example, in spindle whorls becoming mere tools, but also in the use of loom weights as representative objects, as well as a broader spectrum of loom weight types per site.

In summary, it can be said that from the Neolithic (c. from 6500 BC) on, textile craftspeople and their craft gradually became more relevant so that the workers gained more power over the development of their own craft. The biggest advance happened just before or during the Late Chalcolithic (4250–3000 BC) with the introduction of wool. Textile workers actively exploited these new developments, which resulted in a steady increase in the social, cultural and economic standing of the textile craft and its workers. Thus it could also be deduced that, from the Late Chalcolithic on, textile workers were at least semi-specialised and that they developed into fully specialised craftspeople during the Early Bronze Age (3rd millennium BC).

In addition to these new understandings of the development of a lesser researched prehistoric craft, the study was also able to demonstrate the usefulness of its methods. The insights would not have been possible without the inclusion of analytical statistics that allowed the analysis of large-scale quantifiable data. Furthermore, the applicability and structured logics of the (theoretical) models presented in this study to follow a complex development throughout a large chronological and geographical span were proven. Thus, it could be shown that from Early Bronze Age 1 (c. from 2750 BC on) at Çukuriçi Höyük, as well as other contemporary settlements in the research region, textile production and textile workers became economically more relevant and were accorded a higher social importance. Moreover, it could be shown that these developments were initiated around the beginning of the Late Chalcolithic (c. from 4250 BC) and progressed steadily from this point onwards.

X. Abstract – Zusammenfassung – Özet

Abstract

Clothes make the man. While a lot of other crafts of historical times have vanished or changed, textile production has retained its vital role as a supplier of day-to-day necessities and representational objects. The question arises, when textile production gained this importance and how the craft developed beforehand. The present book aims to observe and analyse these early stages of textile production to gain information about its emergence, as well as its technological and social/cultural development throughout prehistoric times. The study analyses spindle whorls and loom weights from the 7th till the end of the 3rd millennium BC in Greece, the Aegean, Bulgaria, Turkish Thrace and western Anatolia. The initial impulse for this project derived from the analyses of the textile tools from Çukuriçi Höyük, a tell settlement on the western Anatolian-Aegean coast. These analyses already demonstrated both the potential insight to be gained from the study of prehistoric textile tools from said region, as well as the connection of western Anatolian technologies with those of Bulgaria and Greece. To gain a deeper understanding of the transfer of innovation and the connected social and cultural aspects in the whole Anatolian-Aegean world, tools from 31 sites in the research region were recorded. The data obtained were analysed using analytical statistical methods, such as two-step cluster analyses and non-parametric analyses of variance. These showed that textile production had strongly parallel developments in the different regions throughout the millennia, with minor differences between distinct sites and areas. The results are discussed against the background of specially constructed models, based on concepts of practice and agency theory. This approach was able to reveal that textile production increasingly grew in importance, especially from the introduction of wool onwards. These developments were accompanied by a more emancipated and self-determined role of textile workers at that time.

Zusammenfassung

Kleider machen Leute. Während der Großteil historischer Handwerke sich verändert hat oder verschwunden ist, hat die Textilproduktion ihre Rolle als Quelle ganz alltäglicher Notwendigkeiten wie Kleidung sowie besonderer repräsentativer Objekte erhalten. Es stellt sich dabei die Frage, wann die Textilproduktion diese wichtige Bedeutung gewonnen hat und wie sich das Handwerk zu dem entwickelt hat, was es bis heute ist. Das Ziel der vorliegenden Arbeit ist es, die anfänglichen Stadien der Textilproduktion zu untersuchen und zu analysieren, um so Informationen über deren Entstehung, sowie deren technologische und soziale/kulturelle Entwicklung zu erlangen. Die Studie widmet sich dabei der Analyse von Spinnwirteln und Webgewichten des 7. bis zum Ende des 3. Jahrtausends v. Chr. aus Griechenland, der Ägäis, Bulgarien, Türkisch-Thrakien und Westanatolien. Den ursprünglichen Anstoß für dieses Projekt gaben die Untersuchungen der Textilgeräte des Çukuriçi Höyük, eines prähistorischen Tells, gelegen an der westanatolischen Ägäisküste. Die dort durchgeführten Forschungen konnten den potenziellen Erkenntnisgewinn von Analysen in dieser Region aufzeigen und wiesen bereits die Verbindung westanatolischer, griechischer und bulgarischer Technologien nach. Um ein tiefergehendes Verständnis von Innovationstransfer sowie von der Verbreitung sozialer und kultureller Aspekte im gesamten anatolisch-ägäischen Raum zu erlangen, wurden Textilwerkzeuge von 31 Fundorten der Forschungsregion aufgenommen. Die dadurch erhobenen Daten wurden mittels analytisch-

statistischer Methoden, wie der TwoStep Cluster Analyse und non-parametrischen Varianzanalysen, untersucht. Durch diese Analysen ließen sich einerseits stark parallel ablaufende Entwicklungsprozesse in den verschiedenen Regionen feststellen, wobei auch andererseits einige interessante Unterschiede zwischen bestimmten Siedlungen und Regionen erkannt wurden. Die Ergebnisse wurden anhand von in dieser Arbeit erstellten theoretischen Modellen diskutiert, welche auf Prinzipien der Praxistheorie und Agency Theory aufbauen. Es zeigt sich, dass die prähistorische Textilproduktion stetig an Bedeutung gewann, insbesondere ab der Einführung von Wolle. Dies ging wiederum mit einer wachsenden Selbstbestimmtheit und einer bedeutenderen sozialen Rolle von TextilhandwerkerInnen einher.

Özet

İnsanları gösteren giydikleri kıyafetleridir. Tarihsel dönemlerin diğer birçok zanaatı ortadan kalkmış veya değişmiş olsa da, tekstil üretimi, günlük ihtiyaçların ve temsili nesnelerin tedarikçisi olarak hayati rolünü günümüze kadar korumuştur. Tekstil üretiminin bu önemi ne zaman kazandığı ve bu zanaatın daha önceleri nasıl bir gelişim gösterdiği sorusu ortaya çıkıyor. Bu tez, tekstil üretiminin erken aşamalarını gözlemleyip analiz ederek, tarih öncesi çağlar boyunca ortaya çıkışının yanı sıra teknolojik ve sosyal/kültürel gelişimi hakkında da bilgi edinmeyi amaçlamaktadır. Bu çalışma, Yunanistan, Ege, Bulgaristan, Türk Trakyası ve Batı Anadolu'da MÖ 7. binyıldan MÖ 3. binyılın sonuna kadar olan dönemdeki ağırşakları ve dokuma ağırlıklarını analiz etmektedir. Bu proje için ilk itici güç, Batı Anadolu-Ege kıyısındaki bir tepe yerleşim alanı olan Çukuriçi Höyük'teki tekstil araçlarının analizlerinden elde edildi. Bu analizler, hem sözü geçen bölgenin tarih öncesi tekstil araçlarının incelenmesinden elde edilecek potansiyel kavrayışı hem de Batı Anadolu teknolojilerinin Bulgaristan ve Yunanistan'ınkilerle olan bağlantısını zaten göstermiştir. Tüm Anadolu-Ege dünyasındaki yeniliklerin aktarımı ve ilintili sosyal ve kültürel yönler hakkında daha derin bir anlayış elde etmek için araştırma bölgesindeki 31 alandan aletler kaydedildi. Elde edilen veriler, iki aşamalı küme analizleri ve parametrik olmayan varyans analizleri gibi analitik istatistiksel metodlar kullanılarak analiz edildi. Bunlar, tekstil üretiminin bin yıl boyunca farklı bölgelerde güçlü paralel gelişmelere sahip olduğunu, alanlar ve bölgeler arasında küçük farklılıklar olduğunu gösterdi. Sonuçlar, uygulama ve vekalet teorisi kavramlarına dayalı olarak özel oluşturulmuş modellerin arka planı mukabilinde tartışılmaktadır. Bu yaklaşım, bilhassa yünün ortaya çıkışından itibaren tekstil üretiminin öneminin giderek arttığını ortaya koyabildi. Bu gelişmelere, o dönem içindeki tekstil işçilerinin daha özgür ve kendi kaderini tayin eden rolü eşlik etmiştir.

Translation: Aynur Uysal

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XII. Catalogue

XII.1. Greek Mainland

XII.1.1. Pefkakia Magoula

Late Chalcolithic

Cat.no. 1
Type: spindle whorl
Shape: Type I
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 5.40
Reconstructed weight (g): 12.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.30
I (g*cm²): –

Cat.no. 2
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 19.45
Reconstructed weight (g): 19.85
Height (cm): 1.04
Diameter (cm): 3.87
Hole diameter (cm): 0.50
I (g*cm²): 29.72

Cat.no. 3
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 16.90
Height (cm): 0.86
Diameter (cm): 3.77
Hole diameter (cm): 0.50
I (g*cm²): 24.02

Cat.no. 4
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 10.10
Reconstructed weight (g): 10.31
Height (cm): 0.81
Diameter (cm): 3.42
Hole diameter (cm): 0.50
I (g*cm²): 12.05

Cat.no. 5
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 12.85
Reconstructed weight (g): 13.11
Height (cm): 0.78
Diameter (cm): 3.83
Hole diameter (cm): 0.50
I (g*cm²): 19.23

Cat.no. 6
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 13.65
Reconstructed weight (g): 13.93

Plate 8

Height (cm): 1.00
Diameter (cm): 3.27
Hole diameter (cm): 0.40
I (g*cm²): 14.89

Cat.no. 7
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 16.45
Height (cm): 0.83
Diameter (cm): 3.82
Hole diameter (cm): 0.40
I (g*cm²): 24.00

Cat.no. 8
Type: spindle whorl
Shape: Type Ia

Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 9.90
Reconstructed weight (g): 19.80
Height (cm): 0.90
Diameter (cm): 4.24
Hole diameter (cm): 0.40
I (g*cm²): 35.60

Cat.no. 9
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 11.00
Height (cm): 0.80
Diameter (cm): 3.27
Hole diameter (cm): 0.50
I (g*cm²): 11.76

Cat.no. 10 **Plate 8**
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 11.95
Reconstructed weight (g): 13.28
Height (cm): 0.86
Diameter (cm): 3.31
Hole diameter (cm): 0.40
I (g*cm²): 14.55

Cat.no. 11 **Plate 8**
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 14.40
Reconstructed weight (g): 14.55
Height (cm): 0.84
Diameter (cm): 3.74
Hole diameter (cm): 0.50
I (g*cm²): 20.35

Cat.no. 12
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 9.50
Reconstructed weight (g): 9.60
Height (cm): 0.84
Diameter (cm): 3.01
Hole diameter (cm): 0.50
I (g*cm²): 8.69

Cat.no. 13
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 10.80
Reconstructed weight (g): 12.00
Height (cm): 0.80
Diameter (cm): 3.30
Hole diameter (cm): 0.50
I (g*cm²): 13.07

Cat.no. 14
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 10.90
Reconstructed weight (g): 11.01
Height (cm): 0.85
Diameter (cm): 3.24
Hole diameter (cm): 0.40
I (g*cm²): 11.56

Cat.no. 15
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 13.60
Reconstructed weight (g): 14.32
Height (cm): 0.99
Diameter (cm): 3.31
Hole diameter (cm): 0.50
I (g*cm²): 15.68

Cat.no. 16
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 7.35
Reconstructed weight (g): 14.70
Height (cm): 0.88
Diameter (cm): 3.86
Hole diameter (cm): 0.40
I (g*cm²): 21.90

Cat.no. 17
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 10.70
Height (cm): 0.98
Diameter (cm): 3.17

Hole diameter (cm): 0.40
I (g*cm²): 10.75

Cat.no. 18
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 55
Weight: measured, reconstructed
Original weight (g): 4.65
Reconstructed weight (g): 8.45
Height (cm): 0.74
Diameter (cm): 3.08
Hole diameter (cm): 0.40
I (g*cm²): 8.02

Cat.no. 19
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 17.60
Reconstructed weight (g): 17.78
Height (cm): 1.10
Diameter (cm): 3.55
Hole diameter (cm): 0.50
I (g*cm²): 22.40

Cat.no. 20
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 16.25
Reconstructed weight (g): 16.41
Height (cm): 0.73
Diameter (cm): 4.39
Hole diameter (cm): 0.50
I (g*cm²): 31.63

Cat.no. 21
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 9.70
Reconstructed weight (g): 10.21
Height (cm): 0.89
Diameter (cm): 2.98
Hole diameter (cm): 0.40
I (g*cm²): 9.07

Cat.no. 22
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 10.60
Height (cm): 0.70
Diameter (cm): 3.45
Hole diameter (cm): 0.40
I (g*cm²): 12.62

Cat.no. 23
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 5.45
Reconstructed weight (g): 10.90
Height (cm): 0.84
Diameter (cm): 3.00
Hole diameter (cm): 0.40
I (g*cm²): 9.81

Cat.no. 24
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 10.75
Height (cm): 0.92
Diameter (cm): 3.18
Hole diameter (cm): 0.50
I (g*cm²): 10.87

Cat.no. 25
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 8.30
Reconstructed weight (g): 8.74
Height (cm): 0.71
Diameter (cm): 3.14
Hole diameter (cm): 0.50
I (g*cm²): 8.61

Cat.no. 26
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 18.65
Reconstructed weight (g): 18.84
Height (cm): 0.75
Diameter (cm): 4.50
Hole diameter (cm): 0.50
I (g*cm²): 38.15

Cat.no. 27
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed

Original weight (g): 13.25
Reconstructed weight (g): 22.08
Height (cm): 0.70
Diameter (cm): 4.07
Hole diameter (cm): 0.40
I (g*cm²): 36.58

Cat.no. 28
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 12.80
Reconstructed weight (g): 12.93
Height (cm): 0.95
Diameter (cm): 3.41
Hole diameter (cm): 0.40
I (g*cm²): 15.03

Cat.no. 29
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 11.40
Reconstructed weight (g): 11.52
Height (cm): 0.83
Diameter (cm): 3.30
Hole diameter (cm): 0.40
I (g*cm²): 12.54

Cat.no. 30
Type: spindle whorl
Shape: Type Ia
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 12.15
Height (cm): 0.77
Diameter (cm): 3.47
Hole diameter (cm): 0.40
I (g*cm²): 14.63

Cat.no. 31
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 10.75
Reconstructed weight (g): 11.08
Height (cm): 0.82
Diameter (cm): 3.22
Hole diameter (cm): 0.40
I (g*cm²): 11.49

Cat.no. 32
Type: spindle whorl
Shape: Type Ia

Plate 8

Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 18.40
Reconstructed weight (g): 18.59
Height (cm): 1.02
Diameter (cm): 3.89
Hole diameter (cm): 0.50
I (g*cm²): 28.12

Cat.no. 33
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 10.30
Reconstructed weight (g): 10.40
Height (cm): 0.74
Diameter (cm): 3.28
Hole diameter (cm): 0.40
I (g*cm²): 11.19

Cat.no. 34
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 10.40
Reconstructed weight (g): 13.00
Height (cm): 0.94
Diameter (cm): 3.51
Hole diameter (cm): 0.40
I (g*cm²): 16.02

Cat.no. 35
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 4.55
Reconstructed weight (g): 9.10
Height (cm): 0.75
Diameter (cm): 2.98
Hole diameter (cm): 0.40
I (g*cm²): 8.08

Cat.no. 36
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 12.60
Reconstructed weight (g): 13.26
Height (cm): 0.87
Diameter (cm): 3.74
Hole diameter (cm): 0.40
I (g*cm²): 18.55

Cat.no. 37
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 6.45
Reconstructed weight (g): 12.90
Height (cm): 0.82
Diameter (cm): 3.61
Hole diameter (cm): 0.40
I (g*cm²): 16.81

Cat.no. 38
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 12.70
Height (cm): 0.83
Diameter (cm): 3.37
Hole diameter (cm): 0.40
I (g*cm²): 14.42

Cat.no. 39
Type: spindle whorl
Shape: Type Ia
Decoration: Type 6
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 9.90
Height (cm): 0.91
Diameter (cm): 3.26
Hole diameter (cm): 0.40
I (g*cm²): 10.52

Cat.no. 40
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 10.45
Reconstructed weight (g): 10.66
Height (cm): 0.75
Diameter (cm): 3.22
Hole diameter (cm): 0.50
I (g*cm²): 11.06

Cat.no. 41
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 13.05
Reconstructed weight (g): 20.08
Height (cm): 0.81
Diameter (cm): 3.93
Hole diameter (cm): 0.50
I (g*cm²): 31.01

Cat.no. 42
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 14.75
Height (cm): 0.88
Diameter (cm): 3.83
Hole diameter (cm): 0.60
I (g*cm²): 21.64

Cat.no. 43
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 13.30
Reconstructed weight (g): 13.57
Height (cm): 0.96
Diameter (cm): 3.44

Plate 8

Hole diameter (cm): 0.50
I (g*cm²): 16.06

Cat.no. 44
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 12.15
Height (cm): 0.94
Diameter (cm): 3.15
Hole diameter (cm): 0.40
I (g*cm²): 12.06

Cat.no. 45
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 7.55
Reconstructed weight (g): 8.88
Height (cm): 0.75
Diameter (cm): 3.03
Hole diameter (cm): 0.40
I (g*cm²): 8.15

Cat.no. 46
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 7.80
Height (cm): 0.64

Diameter (cm): 3.40
Hole diameter (cm): 0.40
I (g*cm²): 9.02

Cat.no. 47
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 11.55
Reconstructed weight (g): 11.67
Height (cm): 0.74
Diameter (cm): 3.42
Hole diameter (cm): 0.40
I (g*cm²): 13.65

Cat.no. 48
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 11.60
Height (cm): 0.88
Diameter (cm): 3.21
Hole diameter (cm): 0.50
I (g*cm²): 11.95

Cat.no. 49
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 11.80
Reconstructed weight (g): 11.92
Height (cm): 0.93
Diameter (cm): 3.29
Hole diameter (cm): 0.40
I (g*cm²): 12.90

Cat.no. 50
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 11.20
Reconstructed weight (g): 17.23
Height (cm): 1.05
Diameter (cm): 3.20
Hole diameter (cm): 0.50
I (g*cm²): 17.64

Cat.no. 51
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 11.35
Reconstructed weight (g): 11.58
Height (cm): 0.81
Diameter (cm): 3.33
Hole diameter (cm): 0.50
I (g*cm²): 12.84

Cat.no. 52
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 6.55
Reconstructed weight (g): 13.10
Height (cm): 0.81
Diameter (cm): 3.52
Hole diameter (cm): –
I (g*cm²): 16.23

Cat.no. 53
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 12.70
Reconstructed weight (g): 12.83
Height (cm): 0.78
Diameter (cm): 3.65
Hole diameter (cm): 0.40
I (g*cm²): 17.09

Cat.no. 54
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 10.90
Reconstructed weight (g): 11.12
Height (cm): 0.96
Diameter (cm): 2.02
Hole diameter (cm): 0.50
I (g*cm²): 4.54

Cat.no. 55
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 13.85
Reconstructed weight (g): 15.39
Height (cm): 1.14
Diameter (cm): 3.17
Hole diameter (cm): 0.40
I (g*cm²): 15.46

Cat.no. 56
Type: spindle whorl
Shape: Type Ib
Material: clay

Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 4.30
Reconstructed weight (g): 9.56
Height (cm): 0.75
Diameter (cm): 2.03
Hole diameter (cm): –
I (g*cm²): 3.94

Cat.no. 57
Type: spindle whorl
Shape: Type Iid
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 11.10
Reconstructed weight (g): 11.68
Height (cm): 9.30
Diameter (cm): 3.11
Hole diameter (cm): 0.50
I (g*cm²): 11.30

Cat.no. 58
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 9.70
Reconstructed weight (g): 38.80
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 59
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 19.85
Reconstructed weight (g): 24.81
Height (cm): 1.08
Diameter (cm): 4.92
Hole diameter (cm): 0.60
I (g*cm²): 45.60

Cat.no. 60
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 9.70
Height (cm): 0.90
Diameter (cm): 3.45
Hole diameter (cm): 0.40
I (g*cm²): 9.15

Cat.no. 61 **Plate 8**
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 24.55
Reconstructed weight (g): 24.80
Height (cm): 1.02
Diameter (cm): 4.84
Hole diameter (cm): 0.60
I (g*cm²): 43.87

Cat.no. 62 **Plate 8**
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 18.20
Reconstructed weight (g): 19.16
Height (cm): 1.17
Diameter (cm): 4.18
Hole diameter (cm): 0.60
I (g*cm²): 26.14

Cat.no. 63
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 6.75
Reconstructed weight (g): 13.50
Height (cm): 0.92
Diameter (cm): 4.07
Hole diameter (cm): 0.50
I (g*cm²): 17.05

Cat.no. 64
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 16.35
Reconstructed weight (g): 17.21
Height (cm): 1.00
Diameter (cm): 3.92
Hole diameter (cm): 0.50
I (g*cm²): 20.33

Cat.no. 65 **Plate 8**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 29.90
Reconstructed weight (g): 30.51
Height (cm): 1.66
Diameter (cm): 4.48
Hole diameter (cm): 0.60
I (g*cm²): 46.15

Cat.no. 66
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 27.50
Reconstructed weight (g): 27.78
Height (cm): 1.51
Diameter (cm): 4.29
Hole diameter (cm): 0.60
I (g*cm²): 39.23

Cat.no. 67 **Plate 8**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 10.20
Reconstructed weight (g): 10.74
Height (cm): 1.28
Diameter (cm): 3.04
Hole diameter (cm): 0.40
I (g*cm²): 7.53

Cat.no. 68 **Plate 8**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 26.40
Reconstructed weight (g): 29.33
Height (cm): 1.35
Diameter (cm): 4.68
Hole diameter (cm): 0.50
I (g*cm²): 49.32

Cat.no. 69 **Plate 8**
Type: spindle whorl
Shape: Type IIIb
Decoration: Type 5
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 17.00
Reconstructed weight (g): 17.17
Height (cm): 1.37
Diameter (cm): 3.56
Hole diameter (cm): 0.40
I (g*cm²): 16.56

Cat.no. 70
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 12.30
Reconstructed weight (g): 12.55
Height (cm): 1.12
Diameter (cm): 3.31
Hole diameter (cm): 0.50
I (g*cm²): 10.71

Cat.no. 71
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 11.65
Reconstructed weight (g): 11.77
Height (cm): 1.25
Diameter (cm): 3.27
Hole diameter (cm): 0.40
I (g*cm²): 9.67

Cat.no. 72 **Plate 8**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 12.55
Reconstructed weight (g): 13.21
Height (cm): 1.40
Diameter (cm): 3.20
Hole diameter (cm): 0.40
I (g*cm²): 10.26

Cat.no. 73
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 18.35
Height (cm): 1.29
Diameter (cm): 3.96
Hole diameter (cm): 0.40
I (g*cm²): 21.74

Cat.no. 74
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 23.20
Reconstructed weight (g): 23.92
Height (cm): 1.68
Diameter (cm): 4.09
Hole diameter (cm): 0.40
I (g*cm²): 30.30

Cat.no. 75
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 21.30

Reconstructed weight (g): 21.96
Height (cm): 1.26
Diameter (cm): 4.31
Hole diameter (cm): 0.50
I (g*cm²): 31.06

Cat.no. 76
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 11.15
Reconstructed weight (g): 11.49
Height (cm): 1.29
Diameter (cm): 3.10
Hole diameter (cm): 0.40
I (g*cm²): 8.43

Cat.no. 77
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 21.00
Reconstructed weight (g): 21.65
Height (cm): 1.24
Diameter (cm): 3.82
Hole diameter (cm): 0.40
I (g*cm²): 25.72

Cat.no. 78
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 10.35
Reconstructed weight (g): 11.50
Height (cm): 1.31
Diameter (cm): 3.04
Hole diameter (cm): 0.40
I (g*cm²): 8.08

Cat.no. 79
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 14.55
Reconstructed weight (g): 19.40
Height (cm): 1.15
Diameter (cm): 3.68
Hole diameter (cm): 0.50
I (g*cm²): 20.28

Cat.no. 80
Type: spindle whorl
Shape: Type IIIb
Material: clay

Plate 8

Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 15.75
Reconstructed weight (g): 15.91
Height (cm): 1.08
Diameter (cm): 3.67
Hole diameter (cm): 0.50
I (g*cm²): 16.80

Cat.no. 81
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 22.10
Reconstructed weight (g): 26.00
Height (cm): 1.47
Diameter (cm): 4.47
Hole diameter (cm): 0.60
I (g*cm²): 39.43

Cat.no. 82
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 4.30
Reconstructed weight (g): 8.60
Height (cm): 1.15
Diameter (cm): 2.71
Hole diameter (cm): 0.40
I (g*cm²): 4.88

Cat.no. 83
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 10.80
Reconstructed weight (g): 11.13
Height (cm): 1.03
Diameter (cm): 3.25
Hole diameter (cm): 0.40
I (g*cm²): 9.20

Cat.no. 84
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 15.65
Reconstructed weight (g): 15.81
Height (cm): 1.68
Diameter (cm): 3.48
Hole diameter (cm): 0.50
I (g*cm²): 14.73

Cat.no. 85
Type: spindle whorl
Shape: Type IVa
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 8.55
Reconstructed weight (g): 9.50
Height (cm): 1.00
Diameter (cm): 3.15
Hole diameter (cm): 0.50
I (g*cm²): 14.49

Cat.no. 86 **Plate 8**
Type: spindle whorl
Shape: Type IVa
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 16.60
Reconstructed weight (g): 16.77
Height (cm): 1.25
Diameter (cm): 3.59
Hole diameter (cm): 0.40
I (g*cm²): 34.37

Cat.no. 87
Type: spindle whorl
Shape: Type IVa
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 11.25
Reconstructed weight (g): 11.60
Height (cm): 1.17
Diameter (cm): 3.12
Hole diameter (cm): 0.40
I (g*cm²): 17.38

Cat.no. 88
Type: spindle whorl
Shape: Type IVa
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 8.30
Reconstructed weight (g): 16.60
Height (cm): 1.29
Diameter (cm): 3.46
Hole diameter (cm): 0.40
I (g*cm²): 30.26

Cat.no. 89
Type: spindle whorl
Shape: Type IVa
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 7.45
Reconstructed weight (g): 7.53
Height (cm): 0.95
Diameter (cm): 2.91
Hole diameter (cm): 0.40
I (g*cm²): 9.77

Cat.no. 90
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 15.70
Reconstructed weight (g): 17.44
Height (cm): 1.73
Diameter (cm): 3.17
Hole diameter (cm): 0.70
I (g*cm²): 27.91

Cat.no. 91 **Plate 8**
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 12.20
Height (cm): 1.40
Diameter (cm): 3.29
Hole diameter (cm): 0.40
I (g*cm²): 20.09

Cat.no. 92
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 12.25
Height (cm): 1.56
Diameter (cm): 2.86
Hole diameter (cm): 0.50
I (g*cm²): 15.36

Cat.no. 93
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 21.55
Reconstructed weight (g): 21.77
Height (cm): 1.62
Diameter (cm): 3.73
Hole diameter (cm): 0.40
I (g*cm²): 46.21

Cat.no. 94 **Plate 8**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 5.35
Reconstructed weight (g): 5.52
Height (cm): 1.27

Diameter (cm): 2.08
Hole diameter (cm): 0.50
I (g*cm²): 4.28

Cat.no. 95 **Plate 8**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 7.20
Reconstructed weight (g): 14.40
Height (cm): 1.99
Diameter (cm): 2.70
Hole diameter (cm): 0.50
I (g*cm²): 15.98

Cat.no. 96 **Plate 8**
Type: spindle whorl
Shape: Type IVd
Decoration: Type 13
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 15.60
Reconstructed weight (g): 31.20
Height (cm): 2.93
Diameter (cm): 3.58
Hole diameter (cm): 0.80
I (g*cm²): 62.06

Cat.no. 97 **Plate 8**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 9.95
Reconstructed weight (g): 19.90
Height (cm): 2.57
Diameter (cm): 3.04
Hole diameter (cm): 0.40
I (g*cm²): 28.60

Cat.no. 98 **Plate 8**
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 18.50
Reconstructed weight (g): 19.07
Height (cm): 1.92
Diameter (cm): 3.29
Hole diameter (cm): 0.50
I (g*cm²): 32.01

Cat.no. 99 **Plate 8**
Type: spindle whorl
Shape: Type VIId
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 14.00
Reconstructed weight (g): 14.74
Height (cm): 1.76
Diameter (cm): 3.33
Hole diameter (cm): 0.50
I (g*cm²): –

Early Bronze Age 1

Cat.no. 100
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 30.65
Reconstructed weight (g): 87.57
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.80
I (g*cm²): –

Cat.no. 101 **Plate 9.a**
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 5.75
Reconstructed weight (g): 11.50
Height (cm): 0.83
Diameter (cm): 3.64
Hole diameter (cm): 0.40
I (g*cm²): 11.59

Cat.no. 102
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 28.85
Reconstructed weight (g): 72.13
Height (cm): 1.75
Diameter (cm): 5.07
Hole diameter (cm): 0.80
I (g*cm²): 141.93

Cat.no. 103
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed

Original weight (g): 10.50
Reconstructed weight (g): 10.82
Height (cm): 1.15
Diameter (cm): 3.36
Hole diameter (cm): 0.50
I (g*cm²): 9.37

Cat.no. 104 **Plate 9.a**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 16.95
Reconstructed weight (g): 17.84
Height (cm): 1.80
Diameter (cm): 3.87
Hole diameter (cm): 0.60
I (g*cm²): 20.35

Cat.no. 105 **Plate 9.a**
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 52.30
Reconstructed weight (g): 65.38
Height (cm): 3.15
Diameter (cm): 4.14
Hole diameter (cm): 0.90
I (g*cm²): 88.26

Cat.no. 106 **Plate 9.a**
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 48.50
Reconstructed weight (g): 60.63
Height (cm): 3.37
Diameter (cm): 4.67
Hole diameter (cm): 0.80
I (g*cm²): 102.27

Cat.no. 107 **Plate 9.a**
Type: spindle whorl
Shape: Type IIIe
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 71.65
Reconstructed weight (g): 79.61
Height (cm): 3.94
Diameter (cm): 4.11
Hole diameter (cm): 0.90
I (g*cm²): 104.53

Early Bronze Age 2

Cat.no. 108 **Plate 9.b**
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 9.40
Height (cm): 0.64
Diameter (cm): 3.24
Hole diameter (cm): 0.40
I (g*cm²): 9.87

Cat.no. 109 **Plate 9.b**
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 19.80
Reconstructed weight (g): 20.84
Height (cm): 1.65
Diameter (cm): 3.53
Hole diameter (cm): 0.60
I (g*cm²): 25.97

Early Bronze Age 2–3

Cat.no. 110 **Plate 9.c**
Type: loom weight
Shape: Type IC
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 130.30
Reconstructed weight (g): 134.33
Height (cm): 5.14
Diameter (cm): 4.91
Hole diameter (cm): 0.55

Cat.no. 111 **Plate 9.c**
Type: loom weight
Shape: Type IVD
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 194.25
Reconstructed weight (g): 200.26
Height (cm): 6.25
Diameter (cm): 5.43 × 5.17 (base)
Hole diameter (cm): 0.60

Cat.no. 112 **Plate 9.c**
Type: loom weight
Shape: Type IVD
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 232.75
Reconstructed weight (g): 235.10
Height (cm): 7.71
Diameter (cm): 5.95 × 4.07 (base)
Hole diameter (cm): 0.50

Cat.no. 113
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 311.75
Reconstructed weight (g): 314.90
Height (cm): 7.57
Diameter (cm): 6.43 × 4.47 (base)
Hole diameter (cm): 0.80

Cat.no. 114 **Plate 10.a**
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 244.60
Height (cm): 7.60
Diameter (cm): 6.26 × 3.53 (base)
Hole diameter (cm): 0.60

Cat.no. 115
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 296.10
Reconstructed weight (g): 305.26
Height (cm): 7.52
Diameter (cm): 6.41 × 4.41 (base)
Hole diameter (cm): 0.60

Cat.no. 116
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 208.30
Reconstructed weight (g): 210.40
Height (cm): 6.16
Diameter (cm): 5.25 × 4.32 (base)
Hole diameter (cm): 0.70

Cat.no. 117
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 312.45
Reconstructed weight (g): 328.89
Height (cm): 7.32
Diameter (cm): 6.36 × 6.28 (base)
Hole diameter (cm): 0.90

Cat.no. 118 **Plate 10.a**
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 249.15
Height (cm): 7.14
Diameter (cm): 5.82 × 4.06 (base)
Hole diameter (cm): 0.70

Cat.no. 119 **Plate 10.a**
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 312.30
Height (cm): 7.25
Diameter (cm): 6.08 × 4.81 (base)
Hole diameter (cm): 0.70

Cat.no. 120
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 204.65
Height (cm): 7.08
Diameter (cm): 5.45 × 3.75 (base)
Hole diameter (cm): 0.90

Cat.no. 121
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 335.85
Height (cm): 7.45
Diameter (cm): 6.27 × 4.65 (base)
Hole diameter (cm): 0.70

Cat.no. 122
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 311.45
Reconstructed weight (g): 317.81
Height (cm): 9.78

Diameter (cm): 5.85 × 3.32 (base)
Hole diameter (cm): 0.60

Cat.no. 123
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 262.60
Reconstructed weight (g): 276.42
Height (cm): 8.37
Diameter (cm): 6.56 × 4.26 (base)
Hole diameter (cm): 0.40

Cat.no. 124
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 349.60
Reconstructed weight (g): 353.13
Height (cm): 8.35
Diameter (cm): 7.72 × 3.43 (base)
Hole diameter (cm): 0.60

Cat.no. 125
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 191.80
Reconstructed weight (g): 213.11
Height (cm): 6.68
Diameter (cm): 5.30 × 4.20 (base)
Hole diameter (cm): 0.50

Cat.no. 126 **Plate 10.a**
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 251.10
Reconstructed weight (g): 279.00
Height (cm): 8.24
Diameter (cm): 6.37 × 4.39 (base)
Hole diameter (cm): 0.50

Cat.no. 127
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 211.05
Reconstructed weight (g): 222.16
Height (cm): 7.39
Diameter (cm): 5.35 × 3.78 (base)
Hole diameter (cm): 0.60

Cat.no. 128
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 207.60
Reconstructed weight (g): 209.70
Height (cm): 6.83
Diameter (cm): 5.23 × 3.70 (base)
Hole diameter (cm): 0.60

Cat.no. 129
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 221.60
Height (cm): 7.22
Diameter (cm): 5.76 × 3.15 (base)
Hole diameter (cm): 0.60

Cat.no. 130
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 342.45
Reconstructed weight (g): 345.91
Height (cm): 9.72
Diameter (cm): 6.38 × 4.08 (base)
Hole diameter (cm): 0.60

Cat.no. 131
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 220.00
Reconstructed weight (g): 222.22
Height (cm): 7.20
Diameter (cm): 6.11 × 4.00 (base)
Hole diameter (cm): 0.60

Cat.no. 132
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 223.80
Reconstructed weight (g): 248.67
Height (cm): 8.22
Diameter (cm): 5.34 × 4.31 (base)
Hole diameter (cm): 0.50

Cat.no. 133 **Plate 10.a**
Type: loom weight
Shape: Type IVE

Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 215.65
Height (cm): 7.14
Diameter (cm): 5.78 × 4.27 (base)
Hole diameter (cm): 0.60

Cat.no. 134
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 214.00
Reconstructed weight (g): 218.37
Height (cm): 7.05
Diameter (cm): 5.96 × 3.90 (base)
Hole diameter (cm): 0.60

Cat.no. 135
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 199.85
Reconstructed weight (g): 285.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.60

Cat.no. 136 **Plate 10.a**
Type: loom weight
Shape: Type VIIA
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 65.55
Reconstructed weight (g): 81.94
Height (cm): 3.50
Diameter (cm): 3.76
Hole diameter (cm): 1.00

Cat.no. 137
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 8.20
Reconstructed weight (g): 8.28
Height (cm): 1.31
Diameter (cm): 2.30
Hole diameter (cm): 0.50
I (g*cm²): 4.38

Cat.no. 138
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 16.15
Height (cm): 2.38
Diameter (cm): 2.60
Hole diameter (cm): 0.50
I (g*cm²): 10.92

Cat.no. 139
Type: spindle whorl
Shape: Type IIb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 13.75
Height (cm): 2.34
Diameter (cm): 2.40
Hole diameter (cm): 0.30
I (g*cm²): 7.92

Cat.no. 140 **Plate 10.b**
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 22.90
Reconstructed weight (g): 91.60
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 141
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 18.35
Reconstructed weight (g): 73.40
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 142
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 7.90
Reconstructed weight (g): 15.80
Height (cm): 1.19
Diameter (cm): 3.85
Hole diameter (cm): 0.60
I (g*cm²): 17.74

Cat.no. 143
Type: spindle whorl
Shape: Type IIIb
Material: clay

Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 36.50
Reconstructed weight (g): 73.00
Height (cm): 2.40
Diameter (cm): 5.40
Hole diameter (cm): 1.00
I (g*cm²): 161.78

Cat.no. 144
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 55.10
Reconstructed weight (g): 58.00
Height (cm): 2.28
Diameter (cm): 5.00
Hole diameter (cm): 1.00
I (g*cm²): 113.91

Cat.no. 145
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 9.65
Reconstructed weight (g): 9.75
Height (cm): 1.25
Diameter (cm): 3.08
Hole diameter (cm): 0.50
I (g*cm²): 7.22

Cat.no. 146
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 11.95
Reconstructed weight (g): 12.58
Height (cm): 1.29
Diameter (cm): 3.37
Hole diameter (cm): 0.40
I (g*cm²): 10.83

Cat.no. 147
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 37.85
Reconstructed weight (g): 94.63
Height (cm): 2.53
Diameter (cm): 5.55
Hole diameter (cm): 0.80
I (g*cm²): 239.87

Cat.no. 148
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 29.05
Reconstructed weight (g): 29.95
Height (cm): 2.12
Diameter (cm): 3.68
Hole diameter (cm): 0.70
I (g*cm²): 33.44

Cat.no. 149
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 20.55
Reconstructed weight (g): 20.76
Height (cm): 2.08
Diameter (cm): 3.17
Hole diameter (cm): 0.50
I (g*cm²): 19.29

Cat.no. 150
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 27.45
Reconstructed weight (g): 34.31
Height (cm): 2.07
Diameter (cm): 4.11
Hole diameter (cm): 1.00
I (g*cm²): 46.21

Cat.no. 151
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 43.05
Reconstructed weight (g): 61.50
Height (cm): 2.90
Diameter (cm): 4.44
Hole diameter (cm): 1.00
I (g*cm²): 94.28

Cat.no. 152
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 32.70
Reconstructed weight (g): 40.88
Height (cm): 2.23
Diameter (cm): 4.12

Hole diameter (cm): 1.00
I (g*cm²): 55.04

Cat.no. 153
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 31.25
Reconstructed weight (g): 31.57
Height (cm): 1.98
Diameter (cm): 4.18
Hole diameter (cm): 1.10
I (g*cm²): 44.77

Cat.no. 154 **Plate 10.b**
Type: spindle whorl
Shape: Type IIIc
Decoration: individual
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 14.85
Reconstructed weight (g): 16.50
Height (cm): 1.88
Diameter (cm): 3.11
Hole diameter (cm): 0.40
I (g*cm²): 12.02

Cat.no. 155
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 46.30
Reconstructed weight (g): 54.47
Height (cm): 2.50
Diameter (cm): 4.32
Hole diameter (cm): 0.90
I (g*cm²): 82.22

Cat.no. 156
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 68.75
Reconstructed weight (g): 69.44
Height (cm): 3.39
Diameter (cm): 5.26
Hole diameter (cm): 1.20
I (g*cm²): 149.85

Cat.no. 157
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 20.10
Reconstructed weight (g): 20.51
Height (cm): 2.09
Diameter (cm): 3.66
Hole diameter (cm): 0.90
I (g*cm²): 21.85

Cat.no. 158
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 52.40
Reconstructed weight (g): 53.47
Height (cm): 2.95
Diameter (cm): 4.61
Hole diameter (cm): 0.80
I (g*cm²): 88.98

Cat.no. 159
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 25.05
Reconstructed weight (g): 25.82
Height (cm): 2.08
Diameter (cm): 3.60
Hole diameter (cm): 0.90
I (g*cm²): 26.02

Cat.no. 160 **Plate 10.b**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 34.25
Reconstructed weight (g): 38.06
Height (cm): 2.13
Diameter (cm): 4.07
Hole diameter (cm): 0.80
I (g*cm²): 51.59

Cat.no. 161
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 7.20
Reconstructed weight (g): 7.35
Height (cm): 1.47
Diameter (cm): 2.29
Hole diameter (cm): 0.40
I (g*cm²): 3.95

Cat.no. 162
Type: spindle whorl
Shape: Type IIId

Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 47.95
Reconstructed weight (g): 79.92
Height (cm): 3.06
Diameter (cm): 4.57
Hole diameter (cm): 1.00
I (g*cm²): 129.84

Cat.no. 163 **Plate 10.b**
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 82.75
Reconstructed weight (g): 87.11
Height (cm): 4.04
Diameter (cm): 4.94
Hole diameter (cm): 1.00
I (g*cm²): 188.47

Cat.no. 164
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 33.00
Reconstructed weight (g): 33.33
Height (cm): 2.70
Diameter (cm): 3.95
Hole diameter (cm): 1.00
I (g*cm²): 41.54

Cat.no. 165
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 9.35
Height (cm): 1.81
Diameter (cm): 2.29
Hole diameter (cm): 0.50
I (g*cm²): 4.56

Cat.no. 166 **Plate 10.b**
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 50.10
Reconstructed weight (g): 52.74
Height (cm): 3.07
Diameter (cm): 3.97
Hole diameter (cm): 0.70
I (g*cm²): 77.41

Cat.no. 167
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 37.60
Reconstructed weight (g): 38.76
Height (cm): 2.67
Diameter (cm): 3.98
Hole diameter (cm): 0.80
I (g*cm²): 53.39

Cat.no. 168 **Plate 11.a**
Type: spindle whorl
Shape: Type IIIe
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 39.10
Reconstructed weight (g): 48.88
Height (cm): 3.42
Diameter (cm): 3.50
Hole diameter (cm): 0.90
I (g*cm²): 47.81

Cat.no. 169 **Plate 11.a**
Type: spindle whorl
Shape: Type IIIe
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 48.10
Reconstructed weight (g): 49.08
Height (cm): 3.35
Diameter (cm): 3.83
Hole diameter (cm): 1.00
I (g*cm²): 58.02

Cat.no. 170
Type: spindle whorl
Shape: Type IIIe
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 25.85
Reconstructed weight (g): 43.08
Height (cm): 3.27
Diameter (cm): 3.81
Hole diameter (cm): 0.90
I (g*cm²): 49.58

Cat.no. 171
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 22.50
Reconstructed weight (g): 32.14
Height (cm): 1.84
Diameter (cm): 4.29
Hole diameter (cm): 0.70
I (g*cm²): 93.14

Cat.no. 172 **Plate 11.a**
Type: spindle whorl
Shape: Type IVb
Decoration: Type 1
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 32.25
Reconstructed weight (g): 33.25
Height (cm): 1.89
Diameter (cm): 4.23
Hole diameter (cm): 0.70
I (g*cm²): 95.15

Cat.no. 173 **Plate 11.a**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 75.70
Reconstructed weight (g): 126.17
Height (cm): 3.61
Diameter (cm): 6.00
Hole diameter (cm): 1.00
I (g*cm²): 699.63

Cat.no. 174
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 7.05
Reconstructed weight (g): 14.10
Height (cm): 1.72
Diameter (cm): 2.85
Hole diameter (cm): 0.50
I (g*cm²): 17.56

Cat.no. 175
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 41.80
Reconstructed weight (g): 46.44
Height (cm): 3.08
Diameter (cm): 4.27
Hole diameter (cm): 0.80
I (g*cm²): 128.25

Cat.no. 176
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 13.75
Reconstructed weight (g): 14.03
Height (cm): 1.95
Diameter (cm): 2.85
Hole diameter (cm): 0.50
I (g*cm²): 18.45

Cat.no. 177
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 24.45
Reconstructed weight (g): 25.74
Height (cm): 2.40
Diameter (cm): 3.65
Hole diameter (cm): 0.60
I (g*cm²): 52.49

Cat.no. 178
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 21.75
Reconstructed weight (g): 27.19
Height (cm): 2.31
Diameter (cm): 3.57
Hole diameter (cm): 0.60
I (g*cm²): 54.07

Cat.no. 179 **Plate 11.a**
Type: spindle whorl
Shape: Type Va
Decoration: Type 1
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 29.80
Reconstructed weight (g): 37.25
Height (cm): 2.18
Diameter (cm): 4.14
Hole diameter (cm): 0.50
I (g*cm²): 99.32

Cat.no. 180
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 10.95
Height (cm): 1.85
Diameter (cm): 2.45
Hole diameter (cm): 0.50
I (g*cm²): 10.24

Cat.no. 181 **Plate 11.a**
Type: spindle whorl
Shape: Type VIa
Material: clay
Preservation condition (%): 100
Weight: measured, complete

Original weight (g): 10.95
Height (cm): 1.59
Diameter (cm): 2.35
Hole diameter (cm): 0.50
I (g*cm²): –

Cat.no. 182
Type: spindle whorl
Shape: Type VII
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 19.35
Reconstructed weight (g): 77.40
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 183
Type: loom weight
Plate 11.a
Shape: Type IIIB
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 183.95
Reconstructed weight (g): 193.63
Height (cm): 9.64
Diameter (cm): 5.04 × 3.94 (base)
Hole diameter (cm): 0.70

Early Bronze Age 3

Cat.no. 184
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 208.85
Height (cm): 7.08
Diameter (cm): 5.73 × 3.77 (base)
Hole diameter (cm): 0.60

Cat.no. 185
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 7.75
Reconstructed weight (g): 7.83
Height (cm): 1.61
Diameter (cm): 2.08
Hole diameter (cm): 0.50
I (g*cm²): 3.39

Cat.no. 186
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 32.10
Reconstructed weight (g): 64.20
Height (cm): 1.99
Diameter (cm): 5.89
Hole diameter (cm): 1.00
I (g*cm²): 169.93

Cat.no. 187
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 49.70
Reconstructed weight (g): 99.40
Height (cm): 3.24
Diameter (cm): 5.84
Hole diameter (cm): 0.80
I (g*cm²): 256.19

Cat.no. 188
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 10.25
Reconstructed weight (g): 10.35
Height (cm): 1.98
Diameter (cm): 3.08
Hole diameter (cm): 0.50
I (g*cm²): 7.57

Cat.no. 189
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 6.65
Reconstructed weight (g): 6.86
Height (cm): 1.59
Diameter (cm): 1.88
Hole diameter (cm): 0.40
I (g*cm²): 2.61

Cat.no. 190
Type: spindle whorl
Shape: Type IVa
Material: clay
Plate 11.b
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 33.45
Reconstructed weight (g): 44.60
Height (cm): 1.67
Diameter (cm): 5.11

Hole diameter (cm): 0.70
I (g*cm²): 181.14

Cat.no. 191
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 11.55
Height (cm): 1.81
Diameter (cm): 2.71
Hole diameter (cm): 0.50
I (g*cm²): 13.50

Cat.no. 192
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 21.45
Reconstructed weight (g): 22.11
Height (cm): 2.69
Diameter (cm): 3.23
Hole diameter (cm): 0.70
I (g*cm²): 35.43

Cat.no. 193
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 23.00
Reconstructed weight (g): 57.50
Height (cm): 3.07
Diameter (cm): 3.88
Hole diameter (cm): 0.80
I (g*cm²): 133.01

Cat.no. 194
Type: spindle whorl
Shape: Type Va
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 8.55
Reconstructed weight (g): 17.10
Height (cm): 1.69
Diameter (cm): 3.47
Hole diameter (cm): 0.50
I (g*cm²): 31.29

Cat.no. 195
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 35.00
Reconstructed weight (g): 38.89
Height (cm): 2.61
Diameter (cm): 3.73
Hole diameter (cm): 0.50
I (g*cm²): 84.82

Cat.no. 196
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 14.25
Reconstructed weight (g): 14.54
Height (cm): 1.76
Diameter (cm): 2.85
Hole diameter (cm): 0.30
I (g*cm²): 17.95

Cat.no. 197
Type: spindle whorl
Shape: Type VIb
Material: clay
Preservation condition (%): 55
Weight: measured, reconstructed
Original weight (g): 10.35
Reconstructed weight (g): 18.82
Height (cm): 2.47
Diameter (cm): 2.78
Hole diameter (cm): 0.50
I (g*cm²): –

Cat.no. 198 **Plate 11.b**
Type: spindle whorl
Shape: Type VIb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 8.75
Height (cm): 2.03
Diameter (cm): 1.99
Hole diameter (cm): 0.60
I (g*cm²): –

XII.1.2. Platia Magoula Zarkou

Late Neolithic

Cat.no. 199 **Plate 12**
Type: loom weight
Shape: Type VIC
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 74.50
Reconstructed weight (g): 87.65

Height (cm): 1.42
Diameter (cm): 7.83
Hole diameter (cm): 1.92

Cat.no. 200 **Plate 12**
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 128.00
Height (cm): 2.68
Diameter (cm): 6.56
Hole diameter (cm): 0.41

Cat.no. 201 **Plate 12**
Type: loom weight
Shape: Type VIIC
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 32.10
Reconstructed weight (g): 32.76
Height (cm): 4.07
Diameter (cm): 1.86
Hole diameter (cm): 0.29

Cat.no. 202 **Plate 13**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 55.60
Reconstructed weight (g): 56.73
Height (cm): 2.98
Diameter (cm): 4.93
Hole diameter (cm): 0.79
I (g*cm²): 108.08

Cat.no. 203 **Plate 13**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 74.00
Reconstructed weight (g): 75.51
Height (cm): 3.69
Diameter (cm): 5.13
Hole diameter (cm): 1.06
I (g*cm²): 305.34

Cat.no. 204 **Plate 13**
Type: spindle whorl
Shape: Type Va
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 96.90
Reconstructed weight (g): 98.88
Height (cm): 2.77
Diameter (cm): 5.66
Hole diameter (cm): 1.01
I (g*cm²): –

Early Bronze Age 2–3

Cat.no. 205 **Plate 14**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): –
Weight: measured
Original weight (g): 167.60
Height (cm): 5.30
Diameter (cm): 6.92
Hole diameter (cm): 1.00

Cat.no. 206 **Plate 14**
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 539.00
Reconstructed weight (g): 634.12
Height (cm): 11.60
Diameter (cm): 7.57 × 6.99
Hole diameter (cm): 0.94

Cat.no. 207 **Plate 14**
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 421.00
Reconstructed weight (g): 495.29
Height (cm): 12.22
Diameter (cm): 5.57 × 5.41
Hole diameter (cm): 0.88

Cat.no. 208 **Plate 14**
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 205.90
Reconstructed weight (g): 686.33
Height (cm): 7.12
Diameter (cm): 5.83
Hole diameter (cm): –

Cat.no. 209 **Plate 14**
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): –

Weight: measured
Original weight (g): 357.60
Height (cm): 8.03
Diameter (cm): 7.68
Hole diameter (cm): –

Cat.no. 210
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): –
Weight: measured
Original weight (g): 79.95
Height (cm): 4.60
Diameter (cm): 4.27
Hole diameter (cm): 0.80

Cat.no. 211 **Plate 15.a**
Type: loom weight
Shape: Type VIIA
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 30.20
Reconstructed weight (g): 30.51
Height (cm): 2.57
Diameter (cm): 2.86
Hole diameter (cm): 0.82

Cat.no. 212 **Plate 15.a**
Type: loom weight
Shape: Type VIIB
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 88.50
Height (cm): 4.66
Diameter (cm): 3.24
Hole diameter (cm): –

Cat.no. 213 **Plate 15.b**
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 16.60
Reconstructed weight (g): 22.13
Height (cm): 1.08
Diameter (cm): 4.56
Hole diameter (cm): 0.44
I (g*cm²): 46.02

Cat.no. 214 **Plate 15.b**
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 31.40
Height (cm): 1.37
Diameter (cm): 4.28
Hole diameter (cm): 0.73
I (g*cm²): 57.52

Cat.no. 215 **Plate 15.b**
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 11.60
Height (cm): 1.21
Diameter (cm): 3.38
Hole diameter (cm): 0.46
I (g*cm²): 13.25

Cat.no. 216 **Plate 16**
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 19.30
Reconstructed weight (g): 19.69
Height (cm): 1.73
Diameter (cm): 3.33
Hole diameter (cm): 0.64
I (g*cm²): 21.84

Cat.no. 217 **Plate 16**
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 16.60
Reconstructed weight (g): 16.94
Height (cm): 1.78
Diameter (cm): 3.00
Hole diameter (cm): 0.45
I (g*cm²): 15.24

Cat.no. 218 **Plate 16**
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 50.20
Height (cm): 2.84
Diameter (cm): 4.17
Hole diameter (cm): 0.74
I (g*cm²): 87.29

Cat.no. 219 **Plate 16**
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 12.30
Reconstructed weight (g): 30.75

Height (cm): 2.23
Diameter (cm): –
Hole diameter (cm): 0.60
I (g*cm²): –

Cat.no. 220 **Plate 16**
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 15.85
Reconstructed weight (g): 52.83
Height (cm): 3.41
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 221 **Plate 17**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 15.50
Reconstructed weight (g): 19.38
Height (cm): 1.57
Diameter (cm): 3.78
Hole diameter (cm): 0.59
I (g*cm²): 21.61

Cat.no. 222 **Plate 17**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 13.30
Reconstructed weight (g): 13.57
Height (cm): 1.35
Diameter (cm): 3.36
Hole diameter (cm): 0.40
I (g*cm²): 11.58

Cat.no. 223 **Plate 17**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 52.90
Height (cm): 2.32
Diameter (cm): 4.98
Hole diameter (cm): 0.87
I (g*cm²): 103.56

Cat.no. 224 **Plate 17**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 19.60
Height (cm): 1.42
Diameter (cm): 4.60
Hole diameter (cm): 0.71
I (g*cm²): 31.38

Cat.no. 225 **Plate 18**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 37.40
Reconstructed weight (g): 37.78
Height (cm): 1.75
Diameter (cm): 4.58
Hole diameter (cm): 0.72
I (g*cm²): 63.80

Cat.no. 226 **Plate 18**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 34.40
Reconstructed weight (g): 35.46
Height (cm): 2.56
Diameter (cm): 4.11
Hole diameter (cm): 0.94
I (g*cm²): 49.33

Cat.no. 227 **Plate 18**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 36.70
Reconstructed weight (g): 38.63
Height (cm): 2.25
Diameter (cm): 4.10
Hole diameter (cm): 0.61
I (g*cm²): 54.28

Cat.no. 228 **Plate 18**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 59.60
Height (cm): 2.73
Diameter (cm): 4.22
Hole diameter (cm): 0.92
I (g*cm²): 109.07

Cat.no. 229 **Plate 19**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 85

Weight: measured, reconstructed
Original weight (g): 42.60
Reconstructed weight (g): 50.12
Height (cm): 2.60
Diameter (cm): 4.60
Hole diameter (cm): 1.18
I (g*cm²): 87.26

Cat.no. 230 **Plate 19**
Type: spindle whorl
Shape: Type IIIc
Material: bone, epiphyse, spongiosa visible onflat surface (and brakes)
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 23.10
Reconstructed weight (g): 27.18
Height (cm): 2.55
Diameter (cm): 4.44
Hole diameter (cm): 0.55
I (g*cm²): 41.30

Cat.no. 231 **Plate 19**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 59.50
Reconstructed weight (g): 60.71
Height (cm): 2.94
Diameter (cm): 4.87
Hole diameter (cm): 0.86
I (g*cm²): 111.87

Cat.no. 232 **Plate 20**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 18.20
Reconstructed weight (g): 18.76
Height (cm): 2.04
Diameter (cm): 3.39
Hole diameter (cm): 0.59
I (g*cm²): 18.41

Cat.no. 233 **Plate 20**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 57.30
Reconstructed weight (g): 58.47
Height (cm): 2.66
Diameter (cm): 4.78
Hole diameter (cm): 1.06
I (g*cm²): 107.29

Cat.no. 234 **Plate 20**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 31.70
Reconstructed weight (g): 32.02
Height (cm): 2.20
Diameter (cm): 3.86
Hole diameter (cm): 0.73
I (g*cm²): 41.69

Cat.no. 235 **Plate 20**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 47.30
Height (cm): 2.35
Diameter (cm): 4.25
Hole diameter (cm): 0.75
I (g*cm²): 75.50

Cat.no. 236 **Plate 21**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 47.80
Reconstructed weight (g): 48.28
Height (cm): 2.42
Diameter (cm): 5.14
Hole diameter (cm): 0.87
I (g*cm²): 100.54

Cat.no. 237 **Plate 21**
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 43.40
Reconstructed weight (g): 44.74
Height (cm): 3.27
Diameter (cm): 4.10
Hole diameter (cm): 0.94
I (g*cm²): 60.11

Cat.no. 238 **Plate 21**
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 24.50
Height (cm): 2.32
Diameter (cm): 3.27
Hole diameter (cm): 0.59
I (g*cm²): 21.01

Cat.no. 239 **Plate 21**
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 7.60
Reconstructed weight (g): 7.68
Height (cm): 1.79
Diameter (cm): 2.52
Hole diameter (cm): 0.61
I (g*cm²): 4.07

Cat.no. 240 **Plate 22**
Type: spindle whorl
Shape: Type IIIf
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 20.60
Reconstructed weight (g): 51.50
Height (cm): 3.82
Diameter (cm): 3.40
Hole diameter (cm): 1.07
I (g*cm²): 44.65

Cat.no. 241 **Plate 22**
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 28.20
Reconstructed weight (g): 28.78
Height (cm): 1.94
Diameter (cm): 4.60
Hole diameter (cm): 0.83
I (g*cm²): 93.99

Cat.no. 242
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 54.75
Reconstructed weight (g): 84.23
Height (cm): 2.65
Diameter (cm): 5.37
Hole diameter (cm): 0.90
I (g*cm²): 396.73

Cat.no. 243 **Plate 22**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 40.10
Reconstructed weight (g): 41.34
Height (cm): 2.54
Diameter (cm): 4.27
Hole diameter (cm): 0.77
I (g*cm²): 119.47

Cat.no. 244 **Plate 22**
Type: spindle whorl
Shape: Type VIb
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 10.05
Reconstructed weight (g): 28.71
Height (cm): 2.93
Diameter (cm): 2.90
Hole diameter (cm): –
I (g*cm²): –

XII.2. Northern Greece

XII.2.1. Dikili Tash

Middle Chalcolithic

Cat.no. 245 **Plate 23.a**
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 400.20
Reconstructed weight (g): 444.67
Height (cm): 9.55
Diameter (cm): 8.77
Hole diameter (cm):

Cat.no. 246
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): –
Weight: measured
Original weight (g): 53.40
Height (cm): 3.20
Diameter (cm): 4.92
Hole diameter (cm): 1.90

Cat.no. 247
Type: spindle whorl
Shape: Type Ia
Decoration: individual
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed

Original weight (g): 92.80
Reconstructed weight (g): 94.69
Height (cm): 1.28
Diameter (cm): 8.50
Hole diameter (cm): 0.70
I (g*cm²): 684.16

Cat.no. 248
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 53.60
Reconstructed weight (g): 268.00
Height (cm): 1.95
Diameter (cm): 5.92
Hole diameter (cm): –
I (g*cm²): 939.24

Cat.no. 249
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 7.50
Reconstructed weight (g): 30.00
Height (cm): 0.71
Diameter (cm): 3.91
Hole diameter (cm): –
I (g*cm²): 45.86

Cat.no. 250
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 15
Weight: measured, reconstructed
Original weight (g): 8.90
Reconstructed weight (g): 59.33
Height (cm): 0.90
Diameter (cm): 4.30
Hole diameter (cm): –
I (g*cm²): 109.71

Cat.no. 251
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 129.80
Height (cm): 1.13
Diameter (cm): 8.57
Hole diameter (cm): 0.70
I (g*cm²): 953.31

Cat.no. 252
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 50.10
Reconstructed weight (g): 50.61
Height (cm): 1.34
Diameter (cm): 6.13
Hole diameter (cm): 0.60
I (g*cm²): 190.16

Cat.no. 253 **Plate 23.b**
Type: spindle whorl
Shape: Type Ia
Decoration: Type 1
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 82.50
Height (cm): 1.40
Diameter (cm): 7.16
Hole diameter (cm): 0.70
I (g*cm²): 422.94

Cat.no. 254
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 33.40
Reconstructed weight (g): 33.74
Height (cm): 0.90
Diameter (cm): 5.44
Hole diameter (cm): 0.60
I (g*cm²): 99.84

Cat.no. 255 **Plate 23.b**
Type: spindle whorl
Shape: Type Ia
Decoration: individual
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 11.30
Reconstructed weight (g): 56.50
Height (cm): 1.04
Diameter (cm): 4.49
Hole diameter (cm): –
I (g*cm²): 113.90

Cat.no. 256
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 20.00
Reconstructed weight (g): 50.00
Height (cm): 1.17
Diameter (cm): 6.05
Hole diameter (cm): –
I (g*cm²): 183.01

Cat.no. 257
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 7.80
Reconstructed weight (g): 31.20
Height (cm): 0.76
Diameter (cm): 4.15
Hole diameter (cm): –
I (g*cm²): 53.73

Cat.no. 258 **Plate 23.b**
Type: spindle whorl
Shape: Type Ia
Decoration: Type 1
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 58.50
Reconstructed weight (g): 73.13
Height (cm): 1.20
Diameter (cm): 6.86
Hole diameter (cm): 0.60
I (g*cm²): 344.12

Cat.no. 259
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 70.40
Height (cm): 1.45
Diameter (cm): 7.15
Hole diameter (cm): 1.00
I (g*cm²): 359.90

Cat.no. 260 **Plate 23.b**
Type: spindle whorl
Shape: Type Ia
Decoration: individual
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 35.50
Reconstructed weight (g): 71.00
Height (cm): 1.25
Diameter (cm): 7.15
Hole diameter (cm): 0.60
I (g*cm²): 362.97

Cat.no. 261
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 66.20
Height (cm): 1.24
Diameter (cm): 6.75
Hole diameter (cm): 0.70
I (g*cm²): 301.62

Cat.no. 262
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 28.70
Reconstructed weight (g): 114.80
Height (cm): 1.32
Diameter (cm): 6.18
Hole diameter (cm): –
I (g*cm²): 438.45

Cat.no. 263
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 23.60
Height (cm): 1.24
Diameter (cm): 4.09
Hole diameter (cm): 0.60
I (g*cm²): 39.48

Cat.no. 264
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 23
Weight: measured, reconstructed
Original weight (g): 10.55
Reconstructed weight (g): 45.87
Height (cm): 0.84
Diameter (cm): 4.74
Hole diameter (cm): –
I (g*cm²): 103.06

Cat.no. 265
Type: spindle whorl
Shape: Type Ia
Decoration: individual
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 9.10
Reconstructed weight (g): 45.50
Height (cm): 0.89
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): 65.70

Cat.no. 266
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 8.25

Reconstructed weight (g): 16.50
Height (cm): 1.71
Diameter (cm): 3.55
Hole diameter (cm): 0.40
I (g*cm²): 20.79

Cat.no. 267
Type: spindle whorl
Shape: Type IIIa
Decoration: individual
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 21.70
Reconstructed weight (g): 54.25
Height (cm): 0.92
Diameter (cm): 5.14
Hole diameter (cm): –
I (g*cm²): 110.62

Cat.no. 268
Type: spindle whorl
Shape: Type IIIa
Decoration: Type 8
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 46.10
Reconstructed weight (g): 47.04
Height (cm): 0.82
Diameter (cm): 6.80
Hole diameter (cm): 0.55
I (g*cm²): 168.60

Cat.no. 269
Type: spindle whorl
Shape: Type IIIa
Decoration: Type 5
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 33.80
Reconstructed weight (g): 34.14
Height (cm): 1.13
Diameter (cm): 5.62
Hole diameter (cm): 0.50
I (g*cm²): 81.90

Cat.no. 270 **Plate 23.b**
Type: spindle whorl
Shape: Type IIIa
Decoration: individual
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 17.90
Reconstructed weight (g): 44.75
Height (cm): 0.94
Diameter (cm): 5.95
Hole diameter (cm): 0.60
I (g*cm²): 135.46

Cat.no. 271
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 55
Weight: measured, reconstructed
Original weight (g): 32.70
Reconstructed weight (g): 59.45
Height (cm): 1.20
Diameter (cm): 7.10
Hole diameter (cm): 0.60
I (g*cm²): 228.16

Cat.no. 272
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 28.40
Reconstructed weight (g): 71.00
Height (cm): 1.35
Diameter (cm): 6.90
Hole diameter (cm): 0.70
I (g*cm²): 261.25

Cat.no. 273 **Plate 23.b**
Type: spindle whorl
Shape: Type IIIa
Decoration: individual
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 20.90
Reconstructed weight (g): 52.25
Height (cm): 1.52
Diameter (cm): 5.50
Hole diameter (cm): 0.60
I (g*cm²): 119.46

Cat.no. 274
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 22.40
Reconstructed weight (g): 34.46
Height (cm): 1.45
Diameter (cm): 5.70
Hole diameter (cm): 0.60
I (g*cm²): 84.93

Cat.no. 275 **Plate 24.a**
Type: spindle whorl
Shape: Type IIIa
Decoration: individual
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 30.20
Reconstructed weight (g): 43.14

Height (cm): 1.52
Diameter (cm): 6.02
Hole diameter (cm): 0.70
I (g*cm²): 119.79

Cat.no. 276
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 45.00
Reconstructed weight (g): 64.29
Height (cm): 1.17
Diameter (cm): 7.83
Hole diameter (cm): 0.50
I (g*cm²): 297.01

Cat.no. 277
Type: spindle whorl
Shape: Type IIIa
Decoration: Type 8
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 13.90
Reconstructed weight (g): 55.60
Height (cm): 1.21
Diameter (cm): 6.80
Hole diameter (cm): 0.50
I (g*cm²): 193.31

Cat.no. 278
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 23.50
Reconstructed weight (g): 94.00
Height (cm): 1.49
Diameter (cm): 5.55
Hole diameter (cm): 0.50
I (g*cm²): –

Cat.no. 279
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 20.30
Reconstructed weight (g): 81.20
Height (cm): 1.23
Diameter (cm): 5.42
Hole diameter (cm): –
I (g*cm²): 180.16

Cat.no. 280
Type: spindle whorl
Shape: Type IIIa
Decoration: individual

Plate 24.a

Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 21.55
Reconstructed weight (g): 61.57
Height (cm): 1.15
Diameter (cm): 5.53
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 281
Type: spindle whorl
Shape: Type IIIa
Decoration: Type 8
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 21.35
Reconstructed weight (g): 53.38
Height (cm): 1.39
Diameter (cm): 7.20
Hole diameter (cm): –
I (g*cm²): 210.00

Cat.no. 282
Type: spindle whorl
Shape: Type IIIa
Decoration: individual
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 24.30
Reconstructed weight (g): 97.20
Height (cm): 1.24
Diameter (cm): 6.02
Hole diameter (cm): 0.50
I (g*cm²): 275.94

Cat.no. 283
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 31.00
Reconstructed weight (g): 44.29
Height (cm): 1.43
Diameter (cm): 5.36
Hole diameter (cm): 0.50
I (g*cm²): 96.58

Cat.no. 284
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 13.15
Reconstructed weight (g): 29.22
Height (cm): 1.18
Diameter (cm): 4.72

Hole diameter (cm): 0.60
I (g*cm²): 50.64

Cat.no. 285
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 12.50
Reconstructed weight (g): 31.25
Height (cm): 1.35
Diameter (cm): 5.00
Hole diameter (cm): 0.60
I (g*cm²): –

Cat.no. 286
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 22.45
Reconstructed weight (g): 37.42
Height (cm): 1.31
Diameter (cm): 5.28
Hole diameter (cm): 0.60
I (g*cm²): 79.95

Cat.no. 287
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 10.70
Reconstructed weight (g): 21.40
Height (cm): 1.47
Diameter (cm): 4.08
Hole diameter (cm): 0.70
I (g*cm²): 28.04

Cat.no. 288
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 28.20
Reconstructed weight (g): 56.40
Height (cm): 1.91
Diameter (cm): 6.19
Hole diameter (cm): 0.50
I (g*cm²): 163.53

Cat.no. 289
Type: spindle whorl
Shape: Type IIIb
Decoration: Type 7
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 27.50
Reconstructed weight (g): 91.67
Height (cm): 1.76
Diameter (cm): 5.86
Hole diameter (cm): 0.70
I (g*cm²): 237.33

Cat.no. 290
Type: spindle whorl
Shape: Type IIIb
Decoration: Type 7
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 27.60
Reconstructed weight (g): 46.00
Height (cm): 2.47
Diameter (cm): 5.32
Hole diameter (cm): 0.60
I (g*cm²): 98.91

Cat.no. 291
Type: spindle whorl
Shape: Type IIIb
Decoration: individual
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 15.10
Reconstructed weight (g): 50.33
Height (cm): 1.90
Diameter (cm): 4.72
Hole diameter (cm): 0.40
I (g*cm²): 85.42

Cat.no. 292 **Plate 24.a**
Type: spindle whorl
Shape: Type IIIb
Decoration: individual
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 14.40
Reconstructed weight (g): 72.00
Height (cm): 1.38
Diameter (cm): 4.01
Hole diameter (cm): –
I (g*cm²): 88.76

Cat.no. 293 **Plate 24.a**
Type: spindle whorl
Shape: Type IIIb
Decoration: individual
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 10.00
Reconstructed weight (g): 22.22
Height (cm): 1.05
Diameter (cm): 3.65
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 294 **Plate 24.a**
Type: spindle whorl
Shape: Type IIIb
Decoration: individual
Material: clay
Preservation condition (%): 10
Weight: measured, reconstructed
Original weight (g): 8.20
Reconstructed weight (g): 82.00
Height (cm): 1.30
Diameter (cm): 3.64
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 295 **Plate 24.a**
Type: spindle whorl
Shape: Type IIIb
Decoration: individual
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 18.60
Reconstructed weight (g): 93.00
Height (cm): 1.57
Diameter (cm): 4.64
Hole diameter (cm): 0.40
I (g*cm²): 153.87

Cat.no. 296
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 29.90
Reconstructed weight (g): 119.60
Height (cm): 1.87
Diameter (cm): 4.21
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 297 **Plate 24.a**
Type: spindle whorl
Shape: Type IIIb
Decoration: individual
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 14.50
Reconstructed weight (g): 72.50
Height (cm): 1.31
Diameter (cm): 3.51
Hole diameter (cm): 0.50
I (g*cm²): 74.22

Cat.no. 298
Type: spindle whorl
Shape: Type IIIb
Decoration: Type 1
Material: clay
Preservation condition (%): 15
Weight: measured, reconstructed
Original weight (g): 11.30
Reconstructed weight (g): 75.33
Height (cm): 1.14
Diameter (cm): 3.30
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 299
Type: spindle whorl
Shape: Type IIIb
Decoration: Type 1
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 16.35
Reconstructed weight (g): 65.40
Height (cm): 1.41
Diameter (cm): 4.99
Hole diameter (cm): –
I (g*cm²): 123.03

Cat.no. 300
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 10.00
Reconstructed weight (g): 28.57
Height (cm): 1.68
Diameter (cm): 3.47
Hole diameter (cm): –
I (g*cm²): 26.07

Cat.no. 301
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 12.60
Reconstructed weight (g): 28.00
Height (cm): 2.18
Diameter (cm): 4.26
Hole diameter (cm): 0.40
I (g*cm²): 39.26

Cat.no. 302
Type: spindle whorl
Shape: Type IIIc
Decoration: individual
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 44.20
Reconstructed weight (g): 55.25
Height (cm): 2.58
Diameter (cm): 5.38
Hole diameter (cm): 0.50
I (g*cm²): 121.25

Cat.no. 303
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 89.90
Reconstructed weight (g): 92.68
Height (cm): 3.30
Diameter (cm): 5.84
Hole diameter (cm): 0.70
I (g*cm²): 244.86

Cat.no. 304 **Plate 24.a**
Type: spindle whorl
Shape: Type IIIc
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 7.10
Height (cm): 1.23
Diameter (cm): 2.54
Hole diameter (cm): 0.40
I (g*cm²): 4.48

Cat.no. 305
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 61.70
Reconstructed weight (g): 62.96
Height (cm): 2.84
Diameter (cm): 4.70
Hole diameter (cm): 1.00
I (g*cm²): 109.36

Cat.no. 306
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 29.10
Reconstructed weight (g): 116.40
Height (cm): 4.13
Diameter (cm): 6.30
Hole diameter (cm): –
I (g*cm²): 347.30

Cat.no. 307
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 52.10
Reconstructed weight (g): 115.78
Height (cm): 4.19
Diameter (cm): 5.09
Hole diameter (cm): 0.70
I (g*cm²): 247.16

Cat.no. 308
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 31.90
Reconstructed weight (g): 79.75
Height (cm): 3.49
Diameter (cm): 4.80
Hole diameter (cm): –
I (g*cm²): 145.49

Cat.no. 309
Type: spindle whorl
Shape: Type IIIe
Decoration: individual
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 42.60
Reconstructed weight (g): 47.33
Height (cm): 2.70
Diameter (cm): 2.86
Hole diameter (cm): 0.50
I (g*cm²): 30.81

Cat.no. 310
Type: spindle whorl
Shape: Type IIIf
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 28.20
Reconstructed weight (g): 112.80
Height (cm): 6.50
Diameter (cm): 2.30
Hole diameter (cm): –
I (g*cm²): 44.75

Cat.no. 311
Type: spindle whorl
Shape: Type IIIf
Decoration: individual
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 19.45
Reconstructed weight (g): 77.80
Height (cm): 10.50
Diameter (cm): 5.39
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 312
Type: spindle whorl
Shape: Type IVb
Decoration: individual
Material: clay

Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 67.60
Height (cm): 2.49
Diameter (cm): 5.42
Hole diameter (cm): 0.60
I (g*cm²): 310.73

Cat.no. 313 **Plate 24.a**
Type: spindle whorl
Shape: Type IVb
Decoration: individual
Material: clay
Preservation condition (%): 5
Weight: measured, reconstructed
Original weight (g): 6.80
Reconstructed weight (g): 136.00
Height (cm): 1.16
Diameter (cm): 2.03
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 314
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 23.20
Height (cm): 2.41
Diameter (cm): 3.28
Hole diameter (cm): 0.40
I (g*cm²): 37.96

Cat.no. 315
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 58.70
Reconstructed weight (g): 117.40
Height (cm): 4.24
Diameter (cm): 6.03
Hole diameter (cm): 0.90
I (g*cm²): 666.50

Cat.no. 316
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 20.10
Reconstructed weight (g): 40.20
Height (cm): 3.75
Diameter (cm): 3.50
Hole diameter (cm): 0.60
I (g*cm²): 78.46

Cat.no. 317
Type: spindle whorl
Shape: Type Vb
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 66.60
Height (cm): 3.30
Diameter (cm): 4.80
Hole diameter (cm): 0.50
I (g*cm²): 237.76

Cat.no. 318
Type: spindle whorl
Shape: Type Vc
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 45.80
Height (cm): 3.24
Diameter (cm): 4.40
Hole diameter (cm): 0.50
I (g*cm²): 134.37

Cat.no. 319
Type: spindle whorl
Shape: Type Vc
Decoration: individual
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 11.70
Reconstructed weight (g): 29.25
Height (cm): 2.61
Diameter (cm): 3.48
Hole diameter (cm): 0.40
I (g*cm²): 53.90

Cat.no. 320
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 54.80
Reconstructed weight (g): 109.60
Height (cm): 4.11
Diameter (cm): 5.00
Hole diameter (cm): 1.00
I (g*cm²): 442.65

Cat.no. 321 **Plate 24.a**
Type: spindle whorl
Shape: Type VIIa
Decoration: individual
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 32.10
Reconstructed weight (g): 64.20

Height (cm): 1.57
Diameter (cm): 6.86
Hole diameter (cm): 0.60
I (g*cm²): –

Cat.no. 322 **Plate 24.a**
Type: spindle whorl
Shape: Type VIIa
Decoration: Type 1
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 22.00
Reconstructed weight (g): 44.00
Height (cm): 1.15
Diameter (cm): 6.26
Hole diameter (cm): 0.60
I (g*cm²): –

Cat.no. 323 **Plate 24.a**
Type: spindle whorl
Shape: Type VIIa
Decoration: Type 1
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 43.10
Reconstructed weight (g): 45.37
Height (cm): 1.44
Diameter (cm): 7.09
Hole diameter (cm): 0.70
I (g*cm²): –

Cat.no. 324
Type: spindle whorl
Shape: Type VIIa
Decoration: Type 1
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 66.20
Reconstructed weight (g): 69.68
Height (cm): 1.51
Diameter (cm): 7.11
Hole diameter (cm): 0.70
I (g*cm²): –

Cat.no. 325
Type: spindle whorl
Shape: Type VIIa
Decoration: Type 8
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 27.75
Reconstructed weight (g): 42.69
Height (cm): 1.25
Diameter (cm): 7.05
Hole diameter (cm): 0.70
I (g*cm²): –

Cat.no. 326
Type: spindle whorl
Shape: Type VIIc
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 14.75
Reconstructed weight (g): 36.88
Height (cm): 2.11
Diameter (cm): 4.97
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 327
Type: spindle whorl
Shape: Type VIId
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 17.30
Reconstructed weight (g): 34.60
Height (cm): 2.51
Diameter (cm): 4.70
Hole diameter (cm): –
I (g*cm²): –

Late Chalcolithic

Cat.no. 328
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 27.30
Reconstructed weight (g): 91.00
Height (cm): 1.92
Diameter (cm): 4.92
Hole diameter (cm): –
I (g*cm²): 169.09

Late Chalcolithic – Early Bronze Age 1

Cat.no. 329
Type: loom weight
Shape: Type VIC
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 48.10
Reconstructed weight (g): 120.25
Height (cm): 2.57
Diameter (cm): 6.59
Hole diameter (cm): 1.60

Cat.no. 330
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 47.50
Reconstructed weight (g): 95.00
Height (cm): 3.52
Diameter (cm): 5.82
Hole diameter (cm): 0.70
I (g*cm²): 247.37

Early Bronze Age 1

Cat.no. 331
Type: loom weight
Shape: Type VIIA
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 45.70
Reconstructed weight (g): 50.78
Height (cm): 3.16
Diameter (cm): 4.30
Hole diameter (cm): 0.60

Cat.no. 332
Type: spindle whorl
Shape: Type Ia
Material: stone
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 71.50
Reconstructed weight (g): 110.00
Height (cm): 1.10
Diameter (cm): 7.40
Hole diameter (cm): 0.50
I (g*cm²): 602.36

Cat.no. 333
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): 55
Weight: measured, reconstructed
Original weight (g): 6.00
Reconstructed weight (g): 10.91
Height (cm): 0.79
Diameter (cm): 3.65
Hole diameter (cm): 0.70
I (g*cm²): 11.18

Cat.no. 334 **Plate 24.b**
Type: spindle whorl
Shape: Type VIIa
Decoration: individual
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 21.70
Reconstructed weight (g): 54.25
Height (cm): 1.35
Diameter (cm): 5.73
Hole diameter (cm): –
I (g*cm²): –

XII.3. Turkish Thrace

XII.3.1. Aşağı Pınar

Early Chalcolithic

Cat.no. 335 **Plate 25**
Type: loom weight
Shape: Type IIB
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 507.65
Reconstructed weight (g): 534.37
Height (cm): 11.48
Diameter (cm): 8.12 × 5.13 (base)
Hole diameter (cm): 1.50

Cat.no. 336
Type: loom weight
Shape: Type IIB
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 518.95
Reconstructed weight (g): 529.54
Height (cm): 9.22
Diameter (cm): 7.63 × 6.36 (base)
Hole diameter (cm): 1.10

Cat.no. 337
Type: loom weight
Shape: Type IIC
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 205.90
Reconstructed weight (g): 242.24

Height (cm): 8.25
Diameter (cm): 5.19 × 5.11 (base)
Hole diameter (cm): 1.30

Cat.no. 338 **Plate 25**
Type: loom weight
Shape: Type IIC
Decoration: individual
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 354.00
Reconstructed weight (g): 472.00
Height (cm): 9.00
Diameter (cm): 7.28
Hole diameter (cm): 0.90

Cat.no. 339
Type: loom weight
Shape: Type IIC
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 452.85
Height (cm): 9.32
Diameter (cm): 7.51 × 6.93 (base)
Hole diameter (cm): 1.20

Cat.no. 340
Type: loom weight
Shape: Type IIC
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 419.10
Reconstructed weight (g): 423.33
Height (cm): 8.24
Diameter (cm): 6.32 × 5.95 (base)
Hole diameter (cm): 1.10

Cat.no. 341
Type: loom weight
Shape: Type IIC
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 9.55
Diameter (cm): 8.35
Hole diameter (cm): 0.90

Cat.no. 342
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 201.45
Reconstructed weight (g): 503.63
Height (cm): 5.82
Diameter (cm): 6.48
Hole diameter (cm): 1.00

Cat.no. 343
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 301.00
Reconstructed weight (g): 376.25
Height (cm): 9.25
Diameter (cm): 7.15
Hole diameter (cm): 1.20

Cat.no. 344
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 436.95
Reconstructed weight (g): 582.60
Height (cm): 10.29
Diameter (cm): 7.54
Hole diameter (cm): 1.10

Cat.no. 345
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 462.10
Reconstructed weight (g): 543.65
Height (cm): 9.88
Diameter (cm): 7.16
Hole diameter (cm): 1.20

Cat.no. 346 **Plate 25**
Type: loom weight
Shape: Type IIIA
Decoration: individual
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 9.11
Diameter (cm): 7.10
Hole diameter (cm): 1.20

Cat.no. 347
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 10.08
Diameter (cm): 8.01
Hole diameter (cm): 1.20

Cat.no. 348 **Plate 25**
Type: loom weight
Shape: Type IIIA
Decoration: individual
Material: clay

Preservation condition (%): –
Weight: –
Height (cm): 9.58
Diameter (cm): 7.23
Hole diameter (cm): 1.20

Cat.no. 349
Type: loom weight
Shape: Type IIIC
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 479.90
Height (cm): 8.46
Diameter (cm): 7.03 × 6.95 (base)
Hole diameter (cm): 1.00

Cat.no. 350
Type: loom weight
Shape: Type IIIE
Decoration: individual
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 1206.70
Reconstructed weight (g): 1244.02
Height (cm): 11.19
Diameter (cm): 10.77 × 10.25 (base)
Hole diameter (cm): 1.50

Cat.no. 351 **Plate 25**
Type: loom weight
Shape: Type IVA
Decoration: individual
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 432.65
Reconstructed weight (g): 441.48
Height (cm): 9.07
Diameter (cm): 6.28 × 5.86 (base)
Hole diameter (cm): 1.20

Cat.no. 352
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 464.85
Reconstructed weight (g): 479.23
Height (cm): 9.12
Diameter (cm): 6.48 × 5.94 (base)
Hole diameter (cm): 1.50

Cat.no. 353
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 415.80
Reconstructed weight (g): 420.00
Height (cm): 8.99
Diameter (cm): 6.62 × 5.87 (base)
Hole diameter (cm): 1.10

Cat.no. 354
Type: loom weight
Shape: Type IVA
Decoration: individual
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 9.15
Diameter (cm): 6.46
Hole diameter (cm): 1.10

Cat.no. 355
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 9.28
Diameter (cm): 6.75
Hole diameter (cm): 1.30

Cat.no. 356
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 10.17
Diameter (cm): 7.93
Hole diameter (cm): 1.30

Cat.no. 357 **Plate 25**
Type: loom weight
Shape: Type VB
Decoration: individual
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 508.05
Reconstructed weight (g): 597.71
Height (cm): 9.68
Diameter (cm): 7.48
Hole diameter (cm): 1.20

Cat.no. 358
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 30.06
Height (cm): 0.82
Diameter (cm): 5.68
Hole diameter (cm): –
I (g*cm²): 96.98

Cat.no. 359 **Plate 26.a**
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 63.40
Height (cm): 2.19
Diameter (cm): 5.27
Hole diameter (cm): 1.10
I (g*cm²): 176.08

Cat.no. 360
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 19.60
Reconstructed weight (g): 56.00
Height (cm): 1.43
Diameter (cm): 3.02
Hole diameter (cm): –
I (g*cm²): 51.07

Cat.no. 361 **Plate 26.a**
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 52.35
Reconstructed weight (g): 61.59
Height (cm): 2.39
Diameter (cm): 4.72
Hole diameter (cm): 1.30
I (g*cm²): 137.21

Cat.no. 362
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 71.30
Height (cm): 2.69
Diameter (cm): 4.83
Hole diameter (cm): 1.00
I (g*cm²): 166.34

Cat.no. 363
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 38.10
Reconstructed weight (g): 38.48
Height (cm): 2.53
Diameter (cm): 3.63
Hole diameter (cm): 0.80
I (g*cm²): 50.71

Cat.no. 364
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 17.50
Reconstructed weight (g): 17.86
Height (cm): 1.86
Diameter (cm): 3.32
Hole diameter (cm): 0.80
I (g*cm²): 15.26

Cat.no. 365 **Plate 26.a**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 48.50
Reconstructed weight (g): 50.00
Height (cm): 2.24
Diameter (cm): 4.58
Hole diameter (cm): 0.90
I (g*cm²): 83.52

Cat.no. 366
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 85.25
Reconstructed weight (g): 113.67
Height (cm): 2.90
Diameter (cm): 6.29
Hole diameter (cm): 1.50
I (g*cm²): 724.83

Cat.no. 367 **Plate 26.a**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 52.35
Height (cm): 2.85
Diameter (cm): 4.39
Hole diameter (cm): 1.10
I (g*cm²): 165.12

Cat.no. 368
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 25.25
Reconstructed weight (g): 72.14
Height (cm): 2.92
Diameter (cm): 4.10
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 369
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 55.85
Reconstructed weight (g): 111.70
Height (cm): 3.58
Diameter (cm): 5.47
Hole diameter (cm): 1.40
I (g*cm²): 531.32

Cat.no. 370
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 52.75
Reconstructed weight (g): 105.50
Height (cm): 4.12
Diameter (cm): 5.45
Hole diameter (cm): 0.80
I (g*cm²): 499.56

Cat.no. 371 **Plate 26.a**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 33.60
Reconstructed weight (g): 33.94
Height (cm): 3.24
Diameter (cm): 3.67
Hole diameter (cm): 0.70
I (g*cm²): 72.75

Cat.no. 372
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 32.30
Reconstructed weight (g): 35.89
Height (cm): 3.14
Diameter (cm): 3.69
Hole diameter (cm): 0.50
I (g*cm²): 75.63

Middle Chalcolithic

Cat.no. 373
Type: loom weight
Shape: Type IIB
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 10.18
Diameter (cm): 9.19
Hole diameter (cm): 1.30

Cat.no. 374
Type: loom weight
Shape: Type IIC
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 10.99
Diameter (cm): 8.28
Hole diameter (cm): 1.40

Cat.no. 375
Type: loom weight
Shape: Type IIC
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 10.30
Diameter (cm): 9.74
Hole diameter (cm): 1.50

Cat.no. 376
Type: loom weight
Shape: Type IIC
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 8.67
Diameter (cm): 6.36
Hole diameter (cm): 0.80

Cat.no. 377
Type: loom weight
Shape: Type IIC
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 8.79
Diameter (cm): 6.60
Hole diameter (cm): 0.80

Cat.no. 378
Type: loom weight
Shape: Type IIC
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 8.82
Diameter (cm): 7.69
Hole diameter (cm): 1.10

Cat.no. 379
Type: loom weight
Shape: Type IID
Material: clay

Preservation condition (%): –
Weight: –
Height (cm): 10.27
Diameter (cm): 10.44
Hole diameter (cm): 1.40

Cat.no. 380
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 11.01
Diameter (cm): 9.61
Hole diameter (cm): 1.30

Cat.no. 381
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 10.93
Diameter (cm): 10.01
Hole diameter (cm): 2.10

Cat.no. 382
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 11.85
Diameter (cm): 7.97
Hole diameter (cm): 0.80

Cat.no. 383
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 10.69
Diameter (cm): 9.09
Hole diameter (cm): 1.00

Cat.no. 384
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 11.10
Diameter (cm): 8.24
Hole diameter (cm): 0.80

Cat.no. 385
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 11.50
Diameter (cm): 8.20
Hole diameter (cm): 0.90

Cat.no. 386
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 11.52
Diameter (cm): 8.69
Hole diameter (cm): 0.80

Cat.no. 387
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 11.43
Diameter (cm): 8.68
Hole diameter (cm): 0.90

Cat.no. 388
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 10.48
Diameter (cm): 7.71
Hole diameter (cm): 0.90

Cat.no. 389
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 11.14
Diameter (cm): 8.30
Hole diameter (cm): 0.90

Cat.no. 390
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 9.98
Diameter (cm): 8.47
Hole diameter (cm): 0.60

Cat.no. 391
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 10.96
Diameter (cm): 7.67
Hole diameter (cm): 1.00

Cat.no. 392
Type: loom weight
Shape: Type IVA
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 7.88
Diameter (cm): 6.67
Hole diameter (cm): 0.70

Cat.no. 393 **Plate 26.b**
Type: loom weight
Shape: Type IVB
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 11.32
Diameter (cm): 8.63
Hole diameter (cm): 0.70

Cat.no. 394 **Plate 26.b**
Type: loom weight
Shape: Type IVC
Material: clay
Preservation condition (%): –
Weight: –
Height (cm): 11.86
Diameter (cm): 8.34
Hole diameter (cm): 0.90

Cat.no. 395
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 71.86
Height (cm): 1.88
Diameter (cm): 5.80
Hole diameter (cm): 1.40
I (g*cm²): 241.73

Cat.no. 396
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 42.43
Height (cm): 1.92
Diameter (cm): 4.41
Hole diameter (cm): 1.10
I (g*cm²): 82.51

Cat.no. 397
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 126.15
Height (cm): 2.58
Diameter (cm): 6.56
Hole diameter (cm): –
I (g*cm²): 542.87

Cat.no. 398
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 123.05
Height (cm): 2.92
Diameter (cm): 6.09
Hole diameter (cm): –
I (g*cm²): 456.36

Cat.no. 399
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 57.75
Height (cm): 2.23
Diameter (cm): 4.77
Hole diameter (cm): 0.80
I (g*cm²): 131.41

Cat.no. 400
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 140.33
Height (cm): 2.87
Diameter (cm): 6.56
Hole diameter (cm): 1.40
I (g*cm²): 603.89

Cat.no. 401
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 181.54
Height (cm): 3.27
Diameter (cm): 6.99
Hole diameter (cm): 1.50
I (g*cm²): 886.98

Cat.no. 402
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 88.14
Height (cm): 2.70
Diameter (cm): 5.36
Hole diameter (cm): 1.60
I (g*cm²): 253.21

Cat.no. 403
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 126.28
Height (cm): 3.15
Diameter (cm): 5.94
Hole diameter (cm): 1.20
I (g*cm²): 445.57

Cat.no. 404 **Plate 27**
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 93.82
Height (cm): 2.71
Diameter (cm): 5.52
Hole diameter (cm): 1.10
I (g*cm²): 285.88

Cat.no. 405
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 131.14
Height (cm): 3.54
Diameter (cm): 5.71
Hole diameter (cm): 1.30
I (g*cm²): 427.57

Cat.no. 406
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 93.98
Height (cm): 3.18
Diameter (cm): 5.10
Hole diameter (cm): 1.30
I (g*cm²): 244.44

Cat.no. 407 **Plate 27**
Type: spindle whorl
Shape: Type Ic
Decoration: individual
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 17.63
Height (cm): 1.82
Diameter (cm): 2.92
Hole diameter (cm): 0.60
I (g*cm²): 15.03

Cat.no. 408
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 24.75
Height (cm): 2.05
Diameter (cm): 3.26
Hole diameter (cm): 0.60
I (g*cm²): 26.31

Cat.no. 409
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 41.94
Height (cm): 2.39
Diameter (cm): 3.93
Hole diameter (cm): 1.00
I (g*cm²): 64.78

Cat.no. 410
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 171.37
Height (cm): 3.38
Diameter (cm): 6.68
Hole diameter (cm): 1.40
I (g*cm²): 764.68

Cat.no. 411
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 286.52
Height (cm): 4.00
Diameter (cm): 7.94
Hole diameter (cm): 1.60
I (g*cm²): 1806.34

Cat.no. 412
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 109.95
Height (cm): 3.01
Diameter (cm): 5.67
Hole diameter (cm): 0.70
I (g*cm²): 353.47

Cat.no. 413 **Plate 27**
Type: spindle whorl

Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 83.29
Height (cm): 2.68
Diameter (cm): 5.23
Hole diameter (cm): 1.10
I (g*cm²): 227.82

Cat.no. 414
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 35.23
Height (cm): 2.34
Diameter (cm): 3.64
Hole diameter (cm): 0.80
I (g*cm²): 46.67

Cat.no. 415
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.83
Height (cm): 2.33
Diameter (cm): 3.00
Hole diameter (cm): 0.60
I (g*cm²): 21.44

Cat.no. 416 **Plate 27**
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 34.60
Height (cm): 2.50
Diameter (cm): 3.49
Hole diameter (cm): 0.80
I (g*cm²): 42.14

Cat.no. 417
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 37.24
Height (cm): 2.46
Diameter (cm): 3.65
Hole diameter (cm): 0.80
I (g*cm²): 49.61

Cat.no. 418
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 76.30
Height (cm): 3.16
Diameter (cm): 4.61
Hole diameter (cm): 1.00
I (g*cm²): 162.16

Cat.no. 419
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 85.96
Height (cm): 3.19
Diameter (cm): 4.87
Hole diameter (cm): 0.80
I (g*cm²): 203.88

Cat.no. 420
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 42.96
Height (cm): 2.09
Diameter (cm): 4.55
Hole diameter (cm): 0.50
I (g*cm²): 73.81

Cat.no. 421 **Plate 27**
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 32.13
Height (cm): 2.51
Diameter (cm): 3.15
Hole diameter (cm): 0.70
I (g*cm²): 31.11

Cat.no. 422 **Plate 28**
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 38.39
Height (cm): 2.93
Diameter (cm): 3.57
Hole diameter (cm): 0.70
I (g*cm²): 41.30

Cat.no. 423 **Plate 28**
Type: spindle whorl
Shape: Type IVb
Material: clay

Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 53.92
Height (cm): 2.46
Diameter (cm): 4.58
Hole diameter (cm): 1.10
I (g*cm²): 192.53

Cat.no. 424
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 121.14
Height (cm): 3.10
Diameter (cm): 6.02
Hole diameter (cm): 1.39
I (g*cm²): 760.23

Cat.no. 425
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 74.64
Height (cm): 2.39
Diameter (cm): 5.67
Hole diameter (cm): 1.50
I (g*cm²): 394.31

Cat.no. 426
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 44.95
Height (cm): 2.28
Diameter (cm): 4.49
Hole diameter (cm): 0.80
I (g*cm²): 149.35

Cat.no. 427 **Plate 28**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.70
Height (cm): 2.21
Diameter (cm): 2.97
Hole diameter (cm): 0.50
I (g*cm²): 23.11

Cat.no. 428
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 72.03
Height (cm): 3.26
Diameter (cm): 5.16
Hole diameter (cm): 0.70
I (g*cm²): 298.34

Cat.no. 429 **Plate 28**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 114.09
Height (cm): 3.95
Diameter (cm): 5.37
Hole diameter (cm): 0.90
I (g*cm²): 548.30

Cat.no. 430
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 29.98
Height (cm): 2.26
Diameter (cm): 3.69
Hole diameter (cm): 0.50
I (g*cm²): 67.18

Cat.no. 431
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 22.38
Height (cm): 2.16
Diameter (cm): 3.38
Hole diameter (cm): 0.60
I (g*cm²): 40.89

Cat.no. 432
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 86.05
Height (cm): 3.31
Diameter (cm): 5.33
Hole diameter (cm): 0.90
I (g*cm²): 392.12

Cat.no. 433
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –

Weight: calculated via density
Reconstructed weight (g): 64.45
Height (cm): 3.33
Diameter (cm): 4.87
Hole diameter (cm): 0.70
I (g*cm²): 236.81

Cat.no. 434
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 44.38
Height (cm): 2.77
Diameter (cm): 4.29
Hole diameter (cm): 1.00
I (g*cm²): 128.83

Cat.no. 435
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 76.47
Height (cm): 3.50
Diameter (cm): 5.16
Hole diameter (cm): 1.00
I (g*cm²): 315.85

Cat.no. 436
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 53.28
Height (cm): 2.93
Diameter (cm): 4.44
Hole diameter (cm): 0.90
I (g*cm²): 168.98

Cat.no. 437
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 30.11
Height (cm): 2.58
Diameter (cm): 3.60
Hole diameter (cm): 0.50
I (g*cm²): 62.24

Cat.no. 438
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 19.33
Height (cm): 2.40
Diameter (cm): 3.36
Hole diameter (cm): 0.50
I (g*cm²): 33.04

Cat.no. 439
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 17.04
Height (cm): 2.32
Diameter (cm): 2.85
Hole diameter (cm): 0.60
I (g*cm²): 22.11

Cat.no. 440 **Plate 28**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 29.36
Height (cm): 2.78
Diameter (cm): 3.33
Hole diameter (cm): 0.50
I (g*cm²): 53.05

Cat.no. 441
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 129.13
Height (cm): 3.95
Diameter (cm): 5.16
Hole diameter (cm): 1.20
I (g*cm²): 646.91

Cat.no. 442
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 27.71
Height (cm): 2.77
Diameter (cm): 3.34
Hole diameter (cm): 0.90
I (g*cm²): 49.23

Cat.no. 443
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –

Weight: calculated via density
Reconstructed weight (g): 20.72
Height (cm): 2.47
Diameter (cm): 2.97
Hole diameter (cm): 0.60
I (g*cm²): 29.77

XII.3.2. Kanlıgeçit

Early Bronze Age 1

Cat.no. 444
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 13.33
Height (cm): 2.09
Diameter (cm): 2.73
Hole diameter (cm): 0.40
I (g*cm²): 15.59

Cat.no. 445 **Plate 29.a**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 30.20
Height (cm): 2.59
Diameter (cm): 3.59
Hole diameter (cm): 0.50
I (g*cm²): 62.17

Cat.no. 446
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 25.02
Height (cm): 2.34
Diameter (cm): 3.35
Hole diameter (cm): 0.70
I (g*cm²): 45.75

Cat.no. 447 **Plate 29.a**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 27.20
Height (cm): 3.15
Diameter (cm): 3.18
Hole diameter (cm): 0.50
I (g*cm²): 43.14

Early Bronze Age 2

Cat.no. 448
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.52
Height (cm): 2.54
Diameter (cm): 3.33
Hole diameter (cm): 0.50
I (g*cm²): 40.63

Cat.no. 449 **Plate 29.b**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 14.86
Height (cm): 2.18
Diameter (cm): 2.78
Hole diameter (cm): 0.40
I (g*cm²): 18.18

Early Bronze Age 2–3

Cat.no. 450 **Plate 29.c**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 51.84
Height (cm): 3.39
Diameter (cm): 4.55
Hole diameter (cm): 0.70
I (g*cm²): 163.15

Cat.no. 451
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density

Reconstructed weight (g): 17.75
Height (cm): 2.44
Diameter (cm): 2.87
Hole diameter (cm): 0.40
I (g*cm²): 23.17

Cat.no. 452 **Plate 29.c**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.63
Height (cm): 2.69
Diameter (cm): 2.77
Hole diameter (cm): 0.50
I (g*cm²): 19.72

Early Bronze Age 3

Cat.no. 453 **Plate 30**
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 32.66
Height (cm): 2.32
Diameter (cm): 3.52
Hole diameter (cm): 0.50
I (g*cm²): 40.47

Cat.no. 454 **Plate 30**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.76
Height (cm): 2.58
Diameter (cm): 3.17
Hole diameter (cm): 0.60
I (g*cm²): 38.32

Cat.no. 455
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 26.10
Height (cm): 2.66
Diameter (cm): 3.46
Hole diameter (cm): 0.60
I (g*cm²): 48.46

Cat.no. 456 **Plate 30**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 52.15
Height (cm): 3.56
Diameter (cm): 4.35
Hole diameter (cm): 0.60
I (g*cm²): 151.17

Cat.no. 457 **Plate 30**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 15.26
Height (cm): 2.21
Diameter (cm): 2.87
Hole diameter (cm): 0.50
I (g*cm²): 19.61

Cat.no. 458 **Plate 30**
Type: spindle whorl
Shape: Type IVe
Decoration: individual
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 27.84
Height (cm): 3.29
Diameter (cm): 3.33
Hole diameter (cm): 0.60
I (g*cm²): 47.17

Cat.no. 459 **Plate 30**
Type: spindle whorl
Shape: Type IVe
Decoration: individual
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.91
Height (cm): 2.73
Diameter (cm): 2.73
Hole diameter (cm): 0.50
I (g*cm²): 19.61

Cat.no. 460
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 28.63
Height (cm): 3.24
Diameter (cm): 3.27
Hole diameter (cm): 0.70
I (g*cm²): 47.58

XII.4. Bulgaria

XII.4.1. Dubene-Sarovka

Early Bronze Age 2

Cat.no. 461
Type: loom weight
Shape: Type IIIB
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 1528.00
Reconstructed weight (g): 1559.18
Height (cm): 16.61
Diameter (cm): 9.62 × 6.97 (base)
Hole diameter (cm): 1.00

Cat.no. 462
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 36.90
Reconstructed weight (g): 38.84
Height (cm): 2.68
Diameter (cm): 3.69
Hole diameter (cm): 0.50
I (g*cm²): 50.09

Cat.no. 463
Type: spindle whorl
Shape: Type IIIf
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 23.25
Reconstructed weight (g): 24.47
Height (cm): 2.86
Diameter (cm): 2.71
Hole diameter (cm): 0.50
I (g*cm²): 18.65

Cat.no. 464
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 12.60
Height (cm): 1.36
Diameter (cm): 3.19
Hole diameter (cm): 0.50
I (g*cm²): 20.35

Cat.no. 465
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed

Plate 31.a

Original weight (g): 72.45
Reconstructed weight (g): 73.93
Height (cm): 3.05
Diameter (cm): 5.87
Hole diameter (cm): 0.70
I (g*cm²): 386.56

Cat.no. 466
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 64.20
Reconstructed weight (g): 66.19
Height (cm): 2.86
Diameter (cm): 5.44
Hole diameter (cm): 1.00
I (g*cm²): 299.61

Cat.no. 467
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 95

Plate 31.b

Weight: measured, reconstructed
Original weight (g): 137.90
Reconstructed weight (g): 145.16
Height (cm): 3.98
Diameter (cm): 6.86
Hole diameter (cm): 0.80
I (g*cm²): 1030.01

Cat.no. 468
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 96
Weight: measured, reconstructed
Original weight (g): 55.45
Reconstructed weight (g): 57.76
Height (cm): 2.64
Diameter (cm): 5.44
Hole diameter (cm): 0.80
I (g*cm²): 265.40

Cat.no. 469
Type: spindle whorl
Shape: Type IVc
Material: clay

Plate 31.b

Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 106.30
Reconstructed weight (g): 108.47
Height (cm): 3.93
Diameter (cm): 5.50

Hole diameter (cm): 0.70
I (g*cm²): 502.17

Cat.no. 470
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 51.30
Reconstructed weight (g): 102.60
Height (cm): 3.71
Diameter (cm): 5.81
Hole diameter (cm): 0.90
I (g*cm²): 530.51

Cat.no. 471 **Plate 31.b**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 65.30
Height (cm): 3.10
Diameter (cm): 5.18
Hole diameter (cm): 0.80
I (g*cm²): 270.04

Cat.no. 472
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 79.10
Reconstructed weight (g): 81.55
Height (cm): 3.49
Diameter (cm): 5.18
Hole diameter (cm): 0.80
I (g*cm²): 333.97

Cat.no. 473
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 87.75
Reconstructed weight (g): 90.46
Height (cm): 3.68
Diameter (cm): 5.66
Hole diameter (cm): 0.60
I (g*cm²): 436.98

Cat.no. 474
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 64.75
Reconstructed weight (g): 66.75
Height (cm): 3.62
Diameter (cm): 5.18
Hole diameter (cm): 0.80
I (g*cm²): 274.45

Cat.no. 475
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 70.70
Reconstructed weight (g): 72.14
Height (cm): 3.50
Diameter (cm): 4.70
Hole diameter (cm): 0.80
I (g*cm²): 249.72

Cat.no. 476
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 17.25
Reconstructed weight (g): 17.60
Height (cm): 2.00
Diameter (cm): 2.79
Hole diameter (cm): 0.70
I (g*cm²): 27.01

Cat.no. 477
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 85.45
Reconstructed weight (g): 87.19
Height (cm): 3.60
Diameter (cm): 5.41
Hole diameter (cm): 0.80
I (g*cm²): 395.21

Cat.no. 478
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 109.90
Reconstructed weight (g): 111.01
Height (cm): 3.97
Diameter (cm): 5.54
Hole diameter (cm): 0.90
I (g*cm²): 532.08

Cat.no. 479 **Plate 31.b**
Type: spindle whorl
Shape: Type IVd

Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 16.05
Reconstructed weight (g): 16.89
Height (cm): 2.30
Diameter (cm): 2.67
Hole diameter (cm): 0.50
I (g*cm²): 19.14

Cat.no. 480
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 96
Weight: measured, reconstructed
Original weight (g): 76.30
Reconstructed weight (g): 79.48
Height (cm): 4.15
Diameter (cm): 4.98
Hole diameter (cm): 0.80
I (g*cm²): 302.38

Cat.no. 481 **Plate 31.b**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 198.70
Reconstructed weight (g): 204.85
Height (cm): 5.94
Diameter (cm): 7.44
Hole diameter (cm): 0.80
I (g*cm²): 1715.13

Cat.no. 482
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 22.40
Reconstructed weight (g): 49.78
Height (cm): 3.39
Diameter (cm): 3.91
Hole diameter (cm): 0.60
I (g*cm²): 117.46

Cat.no. 483
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 45.55
Reconstructed weight (g): 46.01
Height (cm): 2.81
Diameter (cm): 4.42
Hole diameter (cm): 0.80
I (g*cm²): 140.16

Cat.no. 484 **Plate 31.b**
Type: spindle whorl
Shape: Type Vb
Decoration: individual
Material: clay
Preservation condition (%): 92
Weight: measured, reconstructed
Original weight (g): 74.60
Reconstructed weight (g): 81.09
Height (cm): 3.48
Diameter (cm): 5.37
Hole diameter (cm): 0.90
I (g*cm²): 356.40

Cat.no. 485
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 79.15
Height (cm): 3.94
Diameter (cm): 5.14
Hole diameter (cm): 0.60
I (g*cm²): 315.01

Cat.no. 486
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 79.85
Reconstructed weight (g): 88.72
Height (cm): 4.36
Diameter (cm): 4.84
Hole diameter (cm): 1.10
I (g*cm²): 323.32

XII.4.2. Nova Nadezhda

Middle Chalcolithic

Cat.no. 487 **Plate 32**
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 51.80
Reconstructed weight (g): 129.50
Height (cm): 1.63
Diameter (cm): 6.50
Hole diameter (cm): 0.90
I (g*cm²): 547.14

Cat.no. 488 **Plate 32**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 43.90
Height (cm): 2.42
Diameter (cm): 4.10
Hole diameter (cm): 0.70
I (g*cm²): 117.96

Cat.no. 489 **Plate 32**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 57.00
Reconstructed weight (g): 58.16
Height (cm): 2.90
Diameter (cm): 4.75
Hole diameter (cm): 0.70
I (g*cm²): 201.67

Cat.no. 490 **Plate 32**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 45.25
Height (cm): 2.83
Diameter (cm): 4.16
Hole diameter (cm): 0.70
I (g*cm²): 121.26

Cat.no. 491
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 40.90
Reconstructed weight (g): 81.80
Height (cm): 3.72
Diameter (cm): 4.53
Hole diameter (cm): 1.00
I (g*cm²): 274.84

Cat.no. 492 **Plate 32**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 55
Weight: measured, reconstructed
Original weight (g): 35.50
Reconstructed weight (g): 64.55
Height (cm): 3.69
Diameter (cm): 4.41
Hole diameter (cm): 0.80
I (g*cm²): 194.86

Cat.no. 493
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 48
Weight: measured, reconstructed
Original weight (g): 30.10
Reconstructed weight (g): 62.71
Height (cm): 3.50
Diameter (cm): 4.07
Hole diameter (cm): 0.90
I (g*cm²): 162.91

Cat.no. 494 **Plate 33.a**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 36.10
Reconstructed weight (g): 37.22
Height (cm): 3.62
Diameter (cm): 3.49
Hole diameter (cm): 0.80
I (g*cm²): 72.26

Middle – Late Chalcolithic

Cat.no. 495 **Plate 33.b**
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 10.55
Height (cm): 1.34
Diameter (cm): 2.62
Hole diameter (cm): 0.90
I (g*cm²): 7.24

Early Bronze Age 2

Cat.no. 496 **Plate 33.c**
Type: spindle whorl
Shape: Type IVa
Decoration: individual
Material: clay
Preservation condition (%): 80

Weight: measured, reconstructed
Original weight (g): 48.00
Reconstructed weight (g): 60.00
Height (cm): 2.18
Diameter (cm): 6.11
Hole diameter (cm): 0.60
I (g*cm²): 343.41

Cat.no. 497 **Plate 33.c**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 50.30
Reconstructed weight (g): 59.18
Height (cm): 3.15
Diameter (cm): 5.34
Hole diameter (cm): 0.50
I (g*cm²): 261.23

XII.4.3. Tell Golyamo Delchevo

Late Neolithic

Cat.no. 498 **Plate 34.a**
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 185.20
Height (cm): 3.69
Diameter (cm): 6.63
Hole diameter (cm): 0.70

Cat.no. 499 **Plate 34.a**
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 202.30
Reconstructed weight (g): 212.95
Height (cm): 3.59
Diameter (cm): 7.00
Hole diameter (cm): 0.70

Cat.no. 500 **Plate 34.a**
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 197.45
Height (cm): 3.76
Diameter (cm): 6.68
Hole diameter (cm): 0.70

Cat.no. 501 **Plate 34.a**
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 205.85
Height (cm): 3.83
Diameter (cm): 7.34
Hole diameter (cm): 0.60

Cat.no. 502 **Plate 34.a**
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 191.65
Reconstructed weight (g): 197.58
Height (cm): 3.60
Diameter (cm): 7.86
Hole diameter (cm): 0.90

Cat.no. 503 **Plate 34.a**
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 181.80
Reconstructed weight (g): 227.25
Height (cm): 3.74
Diameter (cm): 6.70
Hole diameter (cm): 0.70

Cat.no. 504 **Plate 34.a**
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 182.45
Reconstructed weight (g): 214.65
Height (cm): 3.47
Diameter (cm): 7.59
Hole diameter (cm): 0.90

Cat.no. 505 **Plate 34.b**
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 28.80
Height (cm): 0.95
Diameter (cm): 4.97

Hole diameter (cm): 0.60
I (g*cm²): 71.14

Cat.no. 506 **Plate 34.b**
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 28.10
Height (cm): 1.41
Diameter (cm): 4.58
Hole diameter (cm): 1.10
I (g*cm²): 58.94

Cat.no. 507 **Plate 34.b**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 29.20
Reconstructed weight (g): 29.80
Height (cm): 1.88
Diameter (cm): 4.45
Hole diameter (cm): 0.50
I (g*cm²): 44.57

Middle Chalcolithic

Cat.no. 508 **Plate 35.a**
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 191.90
Reconstructed weight (g): 225.76
Height (cm): 8.90
Diameter (cm): 5.48 × 2.79 (base)
Hole diameter (cm): 0.40

Cat.no. 509
Type: loom weight
Shape: Type IIID
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 223.55
Reconstructed weight (g): 235.32
Height (cm): 9.04
Diameter (cm): 5.19 × 3.34 (base)
Hole diameter (cm): 0.40

Cat.no. 510
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 228.60
Height (cm): 4.40
Diameter (cm): 6.88
Hole diameter (cm): 0.80

Cat.no. 511
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 214.45
Height (cm): 3.03
Diameter (cm): 7.56
Hole diameter (cm): 0.90

Cat.no. 512
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 197.95
Reconstructed weight (g): 282.79
Height (cm): 3.19
Diameter (cm): 7.90
Hole diameter (cm): 0.80

Cat.no. 513
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 218.95
Reconstructed weight (g): 336.85
Height (cm): 3.95
Diameter (cm): 8.97
Hole diameter (cm): 0.80

Cat.no. 514
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 221.75
Reconstructed weight (g): 295.67
Height (cm): 3.66
Diameter (cm): 7.96
Hole diameter (cm): 0.80

Cat.no. 515
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 232.95

Reconstructed weight (g): 310.60
Height (cm): 4.61
Diameter (cm): 7.25
Hole diameter (cm): 0.50

Cat.no. 516
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 267.25
Reconstructed weight (g): 272.70
Height (cm): 3.51
Diameter (cm): 8.45
Hole diameter (cm): 0.70

Cat.no. 517
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 260.35
Reconstructed weight (g): 274.05
Height (cm): 3.56
Diameter (cm): 8.35
Hole diameter (cm): 0.80

Cat.no. 518 **Plate 35.a**
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 257.75
Height (cm): 3.48
Diameter (cm): 8.07
Hole diameter (cm): 0.60

Cat.no. 519
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 281.30
Height (cm): 3.41
Diameter (cm): 8.92
Hole diameter (cm): 0.60

Cat.no. 520 **Plate 35.a**
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 242.10
Height (cm): 4.30
Diameter (cm): 7.40
Hole diameter (cm): 0.70

Cat.no. 521
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 263.60
Reconstructed weight (g): 310.12
Height (cm): 5.03
Diameter (cm): 7.47
Hole diameter (cm): 0.70

Cat.no. 522 **Plate 35.a**
Type: loom weight
Shape: Type VID
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 160.80
Reconstructed weight (g): 164.08
Height (cm): 2.58
Diameter (cm): 7.54
Hole diameter (cm): 0.70

Cat.no. 523
Type: spindle whorl
Shape: Type IIIa
Material: bone
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 8.65
Height (cm): 0.60
Diameter (cm): 3.82
Hole diameter (cm): 0.50
I (g*cm²): 9.96

Cat.no. 524 **Plate 35.b**
Type: spindle whorl
Shape: Type IIIb
Material: bone
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 20.10
Reconstructed weight (g): 20.51
Height (cm): 1.82
Diameter (cm): 4.10
Hole diameter (cm): 0.80
I (g*cm²): 26.42

Cat.no. 525 **Plate 35.b**
Type: spindle whorl
Shape: Type IIIc
Material: bone
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 23.65
Reconstructed weight (g): 31.53
Height (cm): 2.54
Diameter (cm): 4.18
Hole diameter (cm): 1.00
I (g*cm²): 43.24

Cat.no. 526 **Plate 35.b**
Type: spindle whorl
Shape: Type IVa
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 25.60
Height (cm): 1.43
Diameter (cm): 4.65
Hole diameter (cm): 0.80
I (g*cm²): 84.39

Middle – Late Chalcolithic

Cat.no. 527 **Plate 35.c**
Type: spindle whorl
Shape: Type IIIa
Material: bone
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 28.70
Height (cm): 1.40
Diameter (cm): 5.27
Hole diameter (cm): 0.50
I (g*cm²): 61.00

Cat.no. 528 **Plate 35.c**
Type: spindle whorl
Shape: Type IIIb
Material: bone
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 19.35
Reconstructed weight (g): 20.37
Height (cm): 1.76
Diameter (cm): 4.25
Hole diameter (cm): 1.00
I (g*cm²): 33.67

XII.4.4. Tell Lipnik

Middle Chalcolithic

Cat.no. 529 **Plate 36.a**
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 533.50
Reconstructed weight (g): 561.58
Height (cm): 10.48
Diameter (cm): 5.98 × 8.94
Hole diameter (cm): 0.60

Cat.no. 530 **Plate 36.a**
Type: loom weight
Shape: Type IIIG
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 146.10
Reconstructed weight (g): 162.33
Height (cm): 8.40
Diameter (cm): 4.80 × 4.20 (base)
Hole diameter (cm): 0.40

Cat.no. 531
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 75.15
Reconstructed weight (g): 100.20
Height (cm): 2.35
Diameter (cm): 5.94
Hole diameter (cm): 1.00
I (g*cm²): 353.54

Cat.no. 532 **Plate 36.a**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 65.70
Reconstructed weight (g): 146.00
Height (cm): 5.10
Diameter (cm): 5.88
Hole diameter (cm): –
I (g*cm²): 784.22

XII.4.5. Tell Sava

Middle Chalcolithic

Cat.no. 533 **Plate 36.b**
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 10.45
Height (cm): 0.76

Diameter (cm): 3.36
Hole diameter (cm): 0.40
I (g*cm²): 11.80

Cat.no. 534 **Plate 36.b**
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 7.45
Height (cm): 0.65
Diameter (cm): 3.15
Hole diameter (cm): 0.40
I (g*cm²): 7.39

Cat.no. 535
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 21.30
Height (cm): 1.63
Diameter (cm): 3.20
Hole diameter (cm): 0.80
I (g*cm²): 21.81

Cat.no. 536 **Plate 36.b**
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 35.55
Height (cm): 2.15
Diameter (cm): 4.33
Hole diameter (cm): 1.00
I (g*cm²): 114.85

XII.4.6. Varna

Middle Chalcolithic

Cat.no. 537 **Plate 36.c**
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 118.70
Reconstructed weight (g): 131.89
Height (cm): 7.72
Diameter (cm): 4.78
Hole diameter (cm): 0.40

Cat.no. 538 **Plate 36.c**
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 218.75
Reconstructed weight (g): 230.26
Height (cm): 8.91
Diameter (cm): 5.30
Hole diameter (cm): 0.60

Cat.no. 539 **Plate 36.c**
Type: spindle whorl
Shape: Type Ia
Material: spondylus?
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 13.25
Reconstructed weight (g): 13.66
Height (cm): 0.61
Diameter (cm): 3.73
Hole diameter (cm): 0.70
I (g*cm²): 19.00

Cat.no. 540 **Plate 36.c**
Type: spindle whorl
Shape: Type Ia
Material: spondylus?
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 6.90
Reconstructed weight (g): 7.11
Height (cm): 0.47
Diameter (cm): 3.13
Hole diameter (cm): 0.70
I (g*cm²): 6.97

Cat.no. 541 **Plate 36.c**
Type: spindle whorl
Shape: Type IVa
Material: bone
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 9.60
Reconstructed weight (g): 9.80
Height (cm): 0.77
Diameter (cm): 3.23
Hole diameter (cm): 0.60
I (g*cm²): 15.86

XII.5. Aegean Islands

XII.5.1. Ayio Gala

Late Chalcolithic

Cat.no. 542
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 21.53
Height (cm): 2.00
Diameter (cm): 3.60
Hole diameter (cm): –
I (g*cm²): 21.83

Cat.no. 543
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 25.41
Height (cm): 2.10
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): 28.77

Cat.no. 544
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 78.48
Height (cm): 3.40
Diameter (cm): 5.20
Hole diameter (cm): –
I (g*cm²): 334.69

XII.5.2. Dhaskalio

Early Bronze Age 1

Cat.no. 545
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 14.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Early Bronze Age 3

Cat.no. 546
Type: spindle whorl
Shape: Type I
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 19.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 547
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 9.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

XII.5.3. Emporio

Early Bronze Age 1

Cat.no. 548
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 75.96
Height (cm): 4.00
Diameter (cm): 4.80
Hole diameter (cm): –
I (g*cm²): 273.17

Cat.no. 549
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 30.23
Height (cm): 3.00
Diameter (cm): 3.30
Hole diameter (cm): –
I (g*cm²): 53.44

Cat.no. 550
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 40.68
Height (cm): 3.10
Diameter (cm): 4.00
Hole diameter (cm): –
I (g*cm²): 101.48

Cat.no. 551
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 71.37
Height (cm): 3.70
Diameter (cm): 4.70
Hole diameter (cm): –
I (g*cm²): 250.48

Cat.no. 552
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 7.23
Height (cm): 1.70
Diameter (cm): 2.20
Hole diameter (cm): –
I (g*cm²): 5.57

Cat.no. 553
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 66.86
Height (cm): 4.00
Diameter (cm): 4.50
Hole diameter (cm): –
I (g*cm²): 211.45

Cat.no. 554
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 95.04
Height (cm): 4.60
Diameter (cm): 5.20
Hole diameter (cm): –
I (g*cm²): 394.15

Cat.no. 555
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 63.54
Height (cm): 3.90
Diameter (cm): 4.50
Hole diameter (cm): –
I (g*cm²): 199.61

Cat.no. 556
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 32.35
Height (cm): 3.40
Diameter (cm): 3.40
Hole diameter (cm): –
I (g*cm²): 58.35

XII.5.4. Heraion

Early Bronze Age 3

Cat.no. 557
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 43.75
Height (cm): 2.80
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 123.23

Cat.no. 558
Type: spindle whorl
Shape: Type IVc
Material: clay

Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 33.08
Height (cm): 2.60
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 88.65

Cat.no. 559
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 5.86
Height (cm): 1.40
Diameter (cm): 2.10
Hole diameter (cm): –
I (g*cm²): 4.24

Cat.no. 560
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 5.86
Height (cm): 1.40
Diameter (cm): 2.10
Hole diameter (cm): –
I (g*cm²): 4.24

Cat.no. 561
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 37.83
Height (cm): 2.80
Diameter (cm): 3.85
Hole diameter (cm): –
I (g*cm²): 90.50

Cat.no. 562
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 7.32
Height (cm): 1.75
Diameter (cm): 2.10
Hole diameter (cm): –
I (g*cm²): 5.30

Cat.no. 563
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 34.41
Height (cm): 2.75
Diameter (cm): 3.85
Hole diameter (cm): –
I (g*cm²): 92.30

Cat.no. 564
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 24.02
Height (cm): 2.75
Diameter (cm): 3.15
Hole diameter (cm): –
I (g*cm²): 40.87

XII.5.5. Markiani

Early Bronze Age 1

Cat.no. 565
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 34.94
Height (cm): 1.00
Diameter (cm): 5.60
Hole diameter (cm): –
I (g*cm²): 109.56

Cat.no. 566
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 33.42
Height (cm): 1.20
Diameter (cm): 5.00
Hole diameter (cm): –
I (g*cm²): 83.55

Cat.no. 567
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 45.48
Height (cm): 1.40

Diameter (cm): 5.40
Hole diameter (cm): –
I (g*cm²): 132.62

Cat.no. 568
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 21.39
Height (cm): 1.20
Diameter (cm): 4.00
Hole diameter (cm): –
I (g*cm²): 34.22

Cat.no. 569
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 5.39
Height (cm): 1.00
Diameter (cm): 2.20
Hole diameter (cm): –
I (g*cm²): 2.61

Cat.no. 570
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 27.51
Height (cm): 1.40
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 48.53

Cat.no. 571
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 58.47
Height (cm): 1.80
Diameter (cm): 5.40
Hole diameter (cm): –
I (g*cm²): 170.51

Cat.no. 572
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 24.24
Height (cm): 1.40
Diameter (cm): 4.60
Hole diameter (cm): –
I (g*cm²): 39.95

Cat.no. 573
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 30.27
Height (cm): 1.60
Diameter (cm): 5.00
Hole diameter (cm): –
I (g*cm²): 57.92

Cat.no. 574
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 8.98
Height (cm): 1.20
Diameter (cm): 3.20
Hole diameter (cm): –
I (g*cm²): 7.00

Cat.no. 575
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.24
Height (cm): 1.60
Diameter (cm): 4.40
Hole diameter (cm): –
I (g*cm²): 34.40

Cat.no. 576
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 87.72
Height (cm): 3.80
Diameter (cm): 5.20
Hole diameter (cm): –
I (g*cm²): 187.03

Cat.no. 577
Type: spindle whorl
Shape: Type IVa
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 54.75
Height (cm): 2.20
Diameter (cm): 5.60
Hole diameter (cm): –
I (g*cm²): 265.49

Cat.no. 578
Type: spindle whorl

Shape: Type IVb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 29.81
Height (cm): 2.00
Diameter (cm): 4.60
Hole diameter (cm): –
I (g*cm²): 95.56

Early Bronze Age 2

Cat.no. 579
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.58
Height (cm): 1.20
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 41.60

Cat.no. 580
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 20.21
Height (cm): 1.40
Diameter (cm): 3.60
Hole diameter (cm): –
I (g*cm²): 26.20

Cat.no. 581
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 27.43
Height (cm): 1.90
Diameter (cm): 3.60
Hole diameter (cm): –
I (g*cm²): 35.55

Cat.no. 582
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 53.51
Height (cm): 1.60
Diameter (cm): 5.80
Hole diameter (cm): –
I (g*cm²): 150.89

Cat.no. 583
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 60.80
Height (cm): 1.80
Diameter (cm): 6.00
Hole diameter (cm): –
I (g*cm²): 178.69

Cat.no. 584
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.85
Height (cm): 1.60
Diameter (cm): 4.60
Hole diameter (cm): –
I (g*cm²): 38.22

Cat.no. 585
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 52.72
Height (cm): 2.00
Diameter (cm): 5.20
Hole diameter (cm): –
I (g*cm²): 118.36

Cat.no. 586
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.38
Height (cm): 1.20
Diameter (cm): 4.10
Hole diameter (cm): –
I (g*cm²): 21.41

Cat.no. 587
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 32.99
Height (cm): 2.20
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 45.83

Cat.no. 588
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 35.49
Height (cm): 2.20
Diameter (cm): 4.40
Hole diameter (cm): –
I (g*cm²): 53.79

Cat.no. 589
Type: spindle whorl
Shape: Type VIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 10.78
Height (cm): 2.00
Diameter (cm): 2.20
Hole diameter (cm): –
I (g*cm²): –

XII.6. Western Anatolian Coast

XII.6.1. Çukuriçi Höyük

Late Neolithic

Cat.no. 590 **Plate 37.a**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 158.60
Reconstructed weight (g): 211.47
Height (cm): 8.60
Diameter (cm): 4.70
Hole diameter (cm): –

Cat.no. 591 **Plate 37.b**
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): 87
Weight: measured, reconstructed
Original weight (g): 15.90
Reconstructed weight (g): 18.28
Height (cm): 2.10
Diameter (cm): 3.10
Hole diameter (cm): 0.40
I (g*cm²): 17.56

Cat.no. 592 **Plate 37.b**
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 22.40
Reconstructed weight (g): 34.46
Height (cm): 2.50
Diameter (cm): 3.10
Hole diameter (cm): 0.40
I (g*cm²): 33.12

Cat.no. 593 **Plate 37.b**
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 13.10
Reconstructed weight (g): 32.75
Height (cm): 2.60
Diameter (cm): 3.10
Hole diameter (cm): 0.40
I (g*cm²): 31.47

Cat.no. 594 **Plate 37.b**
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 25.00
Reconstructed weight (g): 33.33
Height (cm): 2.70
Diameter (cm): 3.20
Hole diameter (cm): 0.50
I (g*cm²): 34.13

Cat.no. 595 **Plate 37.b**
Type: spindle whorl
Shape: Type IIb
Material: clay
Preservation condition (%): 58
Weight: measured, reconstructed
Original weight (g): 10.20
Reconstructed weight (g): 17.59
Height (cm): 2.50
Diameter (cm): 2.70
Hole diameter (cm): 0.40
I (g*cm²): 12.82

Cat.no. 596 **Plate 37.b**
Type: spindle whorl
Shape: Type IIb
Material: clay
Preservation condition (%): 98

Weight: measured, reconstructed
Original weight (g): 20.50
Reconstructed weight (g): 20.92
Height (cm): 2.70
Diameter (cm): 2.80
Hole diameter (cm): 0.40
I (g*cm²): 16.40

Cat.no. 597 **Plate 37.b**
Type: spindle whorl
Shape: Type IIc
Material: clay
Preservation condition (%): 45
Weight: calculated via density
Reconstructed weight (g): 45.97
Height (cm): 3.50
Diameter (cm): 3.40
Hole diameter (cm): 0.80
I (g*cm²): 53.14

Cat.no. 598 **Plate 37.b**
Type: spindle whorl
Shape: Type IId
Material: clay
Preservation condition (%): 92
Weight: measured, reconstructed
Original weight (g): 40.60
Reconstructed weight (g): 44.13
Height (cm): 3.60
Diameter (cm): 3.20
Hole diameter (cm): –
I (g*cm²): 45.19

Cat.no. 599 **Plate 38.a**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 39.50
Reconstructed weight (g): 40.31
Height (cm): 2.85
Diameter (cm): 3.65
Hole diameter (cm): 0.70
I (g*cm²): 82.61

Cat.no. 600 **Plate 38.a**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 20.20
Height (cm): 2.40
Diameter (cm): 3.10
Hole diameter (cm): 0.50
I (g*cm²): 30.31

Late Chalcolithic

Cat.no. 601 **Plate 38.b**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 319.00
Reconstructed weight (g): 335.79
Height (cm): 10.00
Diameter (cm): 5.00
Hole diameter (cm): 1.00

Cat.no. 602 **Plate 38.c**
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 9.54
Height (cm): 1.60
Diameter (cm): 2.50
Hole diameter (cm): 0.80
I (g*cm²): 5.96

Cat.no. 603 **Plate 38.c**
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 13.76
Reconstructed weight (g): 27.52
Height (cm): 2.20
Diameter (cm): 2.80
Hole diameter (cm): 0.70
I (g*cm²): 21.58

Cat.no. 604 **Plate 38.c**
Type: spindle whorl
Shape: Type IIb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 11.15
Reconstructed weight (g): 22.30
Height (cm): 3.00
Diameter (cm): 3.20
Hole diameter (cm): 1.00
I (g*cm²): 22.84

Late Chalcolithic – Early Bronze Age 1

Cat.no. 605 **Plate 39.a**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 190.76
Height (cm): 9.20
Diameter (cm): 4.85
Hole diameter (cm): 0.90

Cat.no. 606 **Plate 39.a**
Type: loom weight
Shape: Type IF
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 78.50
Height (cm): 6.20
Diameter (cm): 3.80
Hole diameter (cm): 0.70

Early Bronze Age 1

Cat.no. 607 **Plate 39.b**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 98.60
Reconstructed weight (g): 281.71
Height (cm): 6.30
Diameter (cm): 5.50
Hole diameter (cm): 1.00

Cat.no. 608 **Plate 39.b**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 92
Weight: measured, reconstructed
Original weight (g): 211.51
Reconstructed weight (g): 229.90
Height (cm): 8.80
Diameter (cm): 4.80
Hole diameter (cm): 0.90

Cat.no. 609 **Plate 39.b**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 15
Weight: measured, reconstructed
Original weight (g): 29.30
Reconstructed weight (g): 195.33
Height (cm): 1.90
Diameter (cm): 4.60
Hole diameter (cm): 0.90

Cat.no. 610 **Plate 39.b**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 50.10
Reconstructed weight (g): 250.50
Height (cm): 2.80
Diameter (cm): 4.70
Hole diameter (cm): 0.90

Cat.no. 611 **Plate 39.b**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 22.00
Reconstructed weight (g): 62.86
Height (cm): 3.85
Diameter (cm): 3.55
Hole diameter (cm): –

Cat.no. 612 **Plate 39.b**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 134.70
Reconstructed weight (g): 269.40
Height (cm): 7.20
Diameter (cm): 3.50
Hole diameter (cm): 0.80

Cat.no. 613 **Plate 39.b**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 189.00
Reconstructed weight (g): 236.25
Height (cm): 10.15
Diameter (cm): 4.80
Hole diameter (cm): 0.90

Cat.no. 614
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed

Original weight (g): 76.70
Reconstructed weight (g): 191.75
Height (cm): 7.70
Diameter (cm): 4.10
Hole diameter (cm): 0.80

Cat.no. 615
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 176.58
Reconstructed weight (g): 271.66
Height (cm): 10.20
Diameter (cm): 5.50
Hole diameter (cm): 0.80

Cat.no. 616
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 251.87
Height (cm): 10.00
Diameter (cm): 5.50
Hole diameter (cm): 0.80

Cat.no. 617
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 56.60
Reconstructed weight (g): 161.71
Height (cm): 5.70
Diameter (cm): 4.10
Hole diameter (cm): –

Cat.no. 618 **Plate 39.b**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 77
Weight: measured, reconstructed
Original weight (g): 192.68
Reconstructed weight (g): 250.23
Height (cm): 8.60
Diameter (cm): 5.40
Hole diameter (cm): 0.90

Cat.no. 619 **Plate 39.b**
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 177.63
Reconstructed weight (g): 197.37
Height (cm): 9.00
Diameter (cm): 4.30
Hole diameter (cm): 1.20

Cat.no. 620
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 94.70
Reconstructed weight (g): 473.50
Height (cm): 6.60
Diameter (cm): 5.40
Hole diameter (cm): –

Cat.no. 621 **Plate 39.b**
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 89.69
Reconstructed weight (g): 358.76
Height (cm): 5.80
Diameter (cm): 4.10
Hole diameter (cm): 0.50

Cat.no. 622 **Plate 40**
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 110.30
Reconstructed weight (g): 441.20
Height (cm): 6.20
Diameter (cm): 3.30
Hole diameter (cm): –

Cat.no. 623
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 113.10
Reconstructed weight (g): 452.40
Height (cm): 5.10
Diameter (cm): 6.10
Hole diameter (cm): 1.00

Cat.no. 624 **Plate 39.b**
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 135.90
Reconstructed weight (g): 453.00
Height (cm): 5.90
Diameter (cm): 6.20
Hole diameter (cm): 1.00

Cat.no. 625 **Plate 40**
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 145.00
Reconstructed weight (g): 414.29
Height (cm): 7.10
Diameter (cm): 5.40
Hole diameter (cm): –

Cat.no. 626
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 230.30
Reconstructed weight (g): 575.75
Height (cm): 10.70
Diameter (cm): 6.00
Hole diameter (cm): –

Cat.no. 627 **Plate 40**
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 196.30
Reconstructed weight (g): 436.22
Height (cm): 9.60
Diameter (cm): 7.20
Hole diameter (cm): 0.80

Cat.no. 628
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 217.90
Reconstructed weight (g): 484.22
Height (cm): 6.80
Diameter (cm): 7.00
Hole diameter (cm): 1.10

Cat.no. 629 **Plate 40**
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 232.60
Reconstructed weight (g): 387.67
Height (cm): 10.10
Diameter (cm): 6.10
Hole diameter (cm): –

Cat.no. 630 **Plate 40**
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 303.50
Reconstructed weight (g): 433.57
Height (cm): 8.10
Diameter (cm): 7.20
Hole diameter (cm): 0.70

Cat.no. 631 **Plate 40**
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 348.20
Reconstructed weight (g): 464.27
Height (cm): 9.90
Diameter (cm): 7.30
Hole diameter (cm): –

Cat.no. 632
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 552.80
Height (cm): 10.50
Diameter (cm): 6.80
Hole diameter (cm): 0.90

Cat.no. 633 **Plate 41.a**
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 505.30
Height (cm): 10.10
Diameter (cm): 7.50
Hole diameter (cm): 0.80

Cat.no. 634 **Plate 41.a**
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 166.20
Reconstructed weight (g): 369.33
Height (cm): 9.10
Diameter (cm): 6.70
Hole diameter (cm): 0.90

Cat.no. 635 **Plate 41.a**
Type: loom weight
Shape: Type ID
Material: clay
Preservation condition (%): 15
Weight: measured, reconstructed

Original weight (g): 87.60
Reconstructed weight (g): 584.00
Height (cm): 5.30
Diameter (cm): 6.50
Hole diameter (cm): 1.00

Cat.no. 636 **Plate 41.a**
Type: loom weight
Shape: Type IE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 228.10
Height (cm): 8.50
Diameter (cm): 4.80
Hole diameter (cm): 1.00

Cat.no. 637 **Plate 41.a**
Type: loom weight
Shape: Type IF
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 73.50
Reconstructed weight (g): 98.00
Height (cm): 6.30
Diameter (cm): 3.70
Hole diameter (cm): 0.60

Cat.no. 638 **Plate 41.a**
Type: loom weight
Shape: Type IF
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 30.00
Reconstructed weight (g): 33.33
Height (cm): 5.30
Diameter (cm): 2.50
Hole diameter (cm): 0.40

Cat.no. 639
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 14.90
Height (cm): 1.30
Diameter (cm): 3.20
Hole diameter (cm): 0.80
I (g*cm²): 15.26

Cat.no. 640 **Plate 41.b**
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 35.30
Reconstructed weight (g): 36.02
Height (cm): 2.00
Diameter (cm): 4.10
Hole diameter (cm): 0.50
I (g*cm²): 60.55

Cat.no. 641 **Plate 41.b**
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 14.10
Reconstructed weight (g): 28.20
Height (cm): 1.40
Diameter (cm): 3.30
Hole diameter (cm): –
I (g*cm²): 30.71

Cat.no. 642 **Plate 41.b**
Type: spindle whorl
Shape: Type Ic
Decoration: individual
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 11.80
Reconstructed weight (g): 59.00
Height (cm): 1.90
Diameter (cm): 3.80
Hole diameter (cm): 0.40
I (g*cm²): 85.20

Cat.no. 643 **Plate 41.b**
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 5.60
Reconstructed weight (g): 16.00
Height (cm): 1.50
Diameter (cm): 2.50
Hole diameter (cm): 0.40
I (g*cm²): 10.00

Cat.no. 644
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 11.50
Height (cm): 1.80
Diameter (cm): 2.50
Hole diameter (cm): 0.40
I (g*cm²): 7.19

Cat.no. 645 **Plate 42**
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed

Original weight (g): 35.80
Reconstructed weight (g): 79.56
Height (cm): 3.30
Diameter (cm): 4.00
Hole diameter (cm): 0.50
I (g*cm²): 127.29

Cat.no. 646 **Plate 42**
Type: spindle whorl
Shape: Type Id
Decoration: individual
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 13.00
Reconstructed weight (g): 37.14
Height (cm): 2.50
Diameter (cm): 3.10
Hole diameter (cm): 0.40
I (g*cm²): 35.69

Cat.no. 647 **Plate 42**
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 23.60
Reconstructed weight (g): 67.43
Height (cm): 3.20
Diameter (cm): 3.60
Hole diameter (cm): –
I (g*cm²): 87.39

Cat.no. 648 **Plate 42**
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 42.60
Height (cm): 3.00
Diameter (cm): 3.60
Hole diameter (cm): 0.60
I (g*cm²): 55.21

Cat.no. 649
Type: spindle whorl
Shape: Type IIa
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 57.70
Height (cm): 3.50
Diameter (cm): 4.20
Hole diameter (cm): 0.60
I (g*cm²): 101.78

Cat.no. 650 **Plate 42**
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 6.90
Reconstructed weight (g): 19.71
Height (cm): 2.10
Diameter (cm): 2.50
Hole diameter (cm): –
I (g*cm²): 12.32

Cat.no. 651 **Plate 42**
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 20.80
Reconstructed weight (g): 69.33
Height (cm): 3.20
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): 100.12

Cat.no. 652
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 8.30
Height (cm): 2.00
Diameter (cm): 2.30
Hole diameter (cm): 0.40
I (g*cm²): 4.39

Cat.no. 653 **Plate 42**
Type: spindle whorl
Shape: Type IIa
Decoration: individual
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 19.70
Reconstructed weight (g): 20.10
Height (cm): 2.50
Diameter (cm): 2.90
Hole diameter (cm): 0.60
I (g*cm²): 16.91

Cat.no. 654 **Plate 42**
Type: spindle whorl
Shape: Type IIa
Decoration: Type 13
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 14.70
Height (cm): 2.20
Diameter (cm): 2.50
Hole diameter (cm): 0.40
I (g*cm²): 9.19

Cat.no. 655
Type: spindle whorl
Shape: Type IIb
Material: stone
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 45.00
Height (cm): 4.90
Diameter (cm): 5.10
Hole diameter (cm): 1.00
I (g*cm²): 117.05

Cat.no. 656 **Plate 42**
Type: spindle whorl
Shape: Type IIb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 18.10
Height (cm): 2.40
Diameter (cm): 2.60
Hole diameter (cm): 0.50
I (g*cm²): 12.24

Cat.no. 657 **Plate 43**
Type: spindle whorl
Shape: Type IIc
Decoration: Type 11
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 41.49
Height (cm): 3.50
Diameter (cm): 3.40
Hole diameter (cm): 0.60
I (g*cm²): 47.96

Cat.no. 658 **Plate 43**
Type: spindle whorl
Shape: Type IIc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 19.20
Reconstructed weight (g): 38.40
Height (cm): 3.30
Diameter (cm): 3.20
Hole diameter (cm): –
I (g*cm²): 39.32

Cat.no. 659 **Plate 43**
Type: spindle whorl
Shape: Type IIc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 25.00
Reconstructed weight (g): 50.00
Height (cm): 3.50
Diameter (cm): 3.50
Hole diameter (cm): 0.40
I (g*cm²): 61.25

Cat.no. 660 **Plate 43**
Type: spindle whorl
Shape: Type Iid
Decoration: individual
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 12.60
Reconstructed weight (g): 63.00
Height (cm): 3.10
Diameter (cm): 2.70
Hole diameter (cm): 0.40
I (g*cm²): 45.93

Cat.no. 661 **Plate 43**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 70.70
Reconstructed weight (g): 74.42
Height (cm): 2.90
Diameter (cm): 6.30
Hole diameter (cm): 0.70
I (g*cm²): 221.53

Cat.no. 662 **Plate 43**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 35.50
Reconstructed weight (g): 37.37
Height (cm): 1.80
Diameter (cm): 4.60
Hole diameter (cm): 0.60
I (g*cm²): 60.30

Cat.no. 663 **Plate 44**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 14.20
Reconstructed weight (g): 21.85
Height (cm): 1.60
Diameter (cm): 4.00
Hole diameter (cm): 0.80
I (g*cm²): 27.25

Cat.no. 664 **Plate 44**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 61.70
Reconstructed weight (g): 62.96
Height (cm): 3.20

Diameter (cm): 5.00
Hole diameter (cm): 0.60
I (g*cm²): 118.05

Cat.no. 665 **Plate 44**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 17.00
Height (cm): 1.70
Diameter (cm): 3.10
Hole diameter (cm): 0.50
I (g*cm²): 12.75

Cat.no. 666
Type: spindle whorl
Shape: Type IVb
Material: stone
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 20.00
Height (cm): 2.10
Diameter (cm): 3.90
Hole diameter (cm): 0.60
I (g*cm²): 47.56

Cat.no. 667
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 33.05
Height (cm): 2.70
Diameter (cm): 3.60
Hole diameter (cm): 0.80
I (g*cm²): 71.13

Cat.no. 668
Type: spindle whorl
Shape: Type IVc
Decoration: Type 1
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 16.90
Height (cm): 2.10
Diameter (cm): 3.00
Hole diameter (cm): 0.40
I (g*cm²): 24.46

Cat.no. 669 **Plate 44**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 16.70
Reconstructed weight (g): 55.67
Height (cm): 2.10
Diameter (cm): 3.50
Hole diameter (cm): –
I (g*cm²): 102.29

Cat.no. 670 **Plate 44**
Type: spindle whorl
Shape: Type IVc
Decoration: Type 1
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 16.00
Reconstructed weight (g): 40.00
Height (cm): 2.75
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 671 **Plate 44**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 55
Weight: measured, reconstructed
Original weight (g): 36.00
Reconstructed weight (g): 65.45
Height (cm): 3.30
Diameter (cm): 4.50
Hole diameter (cm): 0.40
I (g*cm²): 227.26

Cat.no. 672 **Plate 45**
Type: spindle whorl
Shape: Type IVc
Decoration: Type 1
Material: clay
Preservation condition (%): 96
Weight: measured, reconstructed
Original weight (g): 66.90
Reconstructed weight (g): 69.69
Height (cm): 3.30
Diameter (cm): 4.60
Hole diameter (cm): 0.60
I (g*cm²): 235.10

Cat.no. 673 **Plate 45**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 12.60
Height (cm): 1.80
Diameter (cm): 2.90
Hole diameter (cm): 0.50
I (g*cm²): 16.49

Cat.no. 674 **Plate 45**
Type: spindle whorl
Shape: Type IVc

Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 28.40
Reconstructed weight (g): 56.80
Height (cm): 3.10
Diameter (cm): 4.10
Hole diameter (cm): 0.60
I (g*cm²): 150.89

Cat.no. 675 **Plate 45**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 43.40
Reconstructed weight (g): 44.29
Height (cm): 3.00
Diameter (cm): 4.00
Hole diameter (cm): –
I (g*cm²): 113.53

Cat.no. 676 **Plate 46**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 4.17
Height (cm): 1.50
Diameter (cm): 1.70
Hole diameter (cm): 0.40
I (g*cm²): 1.97

Cat.no. 677 **Plate 46**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 7.46
Height (cm): 1.70
Diameter (cm): 2.10
Hole diameter (cm): 0.30
I (g*cm²): 5.61

Cat.no. 678 **Plate 46**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 5.60
Reconstructed weight (g): 5.89
Height (cm): 1.50
Diameter (cm): 1.90
Hole diameter (cm): 0.20
I (g*cm²): 3.49

Cat.no. 679 **Plate 46**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 46.40
Reconstructed weight (g): 47.84
Height (cm): 3.10
Diameter (cm): 3.80
Hole diameter (cm): 0.40
I (g*cm²): 110.49

Cat.no. 680
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 16.82
Height (cm): 2.20
Diameter (cm): 2.70
Hole diameter (cm): 0.50
I (g*cm²): 19.81

Cat.no. 681 **Plate 46**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 17.20
Reconstructed weight (g): 17.55
Height (cm): 2.30
Diameter (cm): 2.70
Hole diameter (cm): 0.40
I (g*cm²): 21.04

Cat.no. 682 **Plate 46**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 15.10
Height (cm): 2.29
Diameter (cm): 2.60
Hole diameter (cm): 0.40
I (g*cm²): 16.95

Cat.no. 683 **Plate 46**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 13.90
Reconstructed weight (g): 69.50
Height (cm): 3.50
Diameter (cm): 4.10
Hole diameter (cm): –
I (g*cm²): 200.99

Cat.no. 684 **Plate 46**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 36.10
Reconstructed weight (g): 45.13
Height (cm): 3.00
Diameter (cm): 3.60
Hole diameter (cm): 0.50
I (g*cm²): 95.75

Cat.no. 685 **Plate 46**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 41.90
Reconstructed weight (g): 49.29
Height (cm): 3.40
Diameter (cm): 3.90
Hole diameter (cm): 0.40
I (g*cm²): 119.40

Cat.no. 686 **Plate 46**
Type: spindle whorl
Shape: Type IVd
Decoration: Type 1
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 43.90
Reconstructed weight (g): 58.53
Height (cm): 3.20
Diameter (cm): 4.00
Hole diameter (cm): 0.40
I (g*cm²): 153.54

Cat.no. 687 **Plate 47**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 16.10
Reconstructed weight (g): 53.67
Height (cm): 2.70
Diameter (cm): 3.00
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 688 **Plate 47**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 44.20
Reconstructed weight (g): 73.67
Height (cm): 3.10
Diameter (cm): 4.00
Hole diameter (cm): 0.40
I (g*cm²): 198.47

Cat.no. 689 **Plate 47**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 15.00
Reconstructed weight (g): 30.00
Height (cm): 2.70
Diameter (cm): 3.40
Hole diameter (cm): 0.30
I (g*cm²): –

Cat.no. 690
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 32.20
Reconstructed weight (g): 37.88
Height (cm): 2.50
Diameter (cm): 3.10
Hole diameter (cm): 0.40
I (g*cm²): 62.15

Cat.no. 691 **Plate 47**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 31.50
Height (cm): 3.10
Diameter (cm): 3.30
Hole diameter (cm): 0.40
I (g*cm²): 56.52

Cat.no. 692 **Plate 47**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 35.40
Reconstructed weight (g): 36.12
Height (cm): 3.00
Diameter (cm): 3.80
Hole diameter (cm): 0.40
I (g*cm²): 81.80

Cat.no. 693
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed

Original weight (g): 16.90
Reconstructed weight (g): 19.88
Height (cm): 2.60
Diameter (cm): 2.80
Hole diameter (cm): 0.50
I (g*cm²): 25.01

Cat.no. 694 **Plate 47**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 21.40
Height (cm): 2.40
Diameter (cm): 2.90
Hole diameter (cm): 0.40
I (g*cm²): 30.79

Cat.no. 695 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Decoration: Type 14
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 15.00
Height (cm): 2.20
Diameter (cm): 2.40
Hole diameter (cm): 0.40
I (g*cm²): 15.08

Cat.no. 696 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 11.10
Height (cm): 1.90
Diameter (cm): 2.40
Hole diameter (cm): 0.60
I (g*cm²): 9.92

Cat.no. 697 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 43.40
Reconstructed weight (g): 43.84
Height (cm): 2.90
Diameter (cm): 3.80
Hole diameter (cm): 0.40
I (g*cm²): 102.42

Cat.no. 698 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 65.50
Height (cm): 3.70
Diameter (cm): 4.20
Hole diameter (cm): 0.50
I (g*cm²): 191.88

Cat.no. 699 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 58.90
Height (cm): 3.40
Diameter (cm): 3.70
Hole diameter (cm): 0.40
I (g*cm²): 137.01

Cat.no. 700 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 57.40
Reconstructed weight (g): 59.18
Height (cm): 3.50
Diameter (cm): 4.10
Hole diameter (cm): 0.40
I (g*cm²): 164.14

Cat.no. 701 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 45.00
Reconstructed weight (g): 45.92
Height (cm): 3.00
Diameter (cm): 3.90
Hole diameter (cm): 0.40
I (g*cm²): 112.43

Cat.no. 702 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 53.20
Height (cm): 3.30
Diameter (cm): 3.90
Hole diameter (cm): 0.40
I (g*cm²): 141.80

Cat.no. 703
Type: spindle whorl
Shape: Type IVd
Material: clay

Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 20.60
Reconstructed weight (g): 41.20
Height (cm): 2.90
Diameter (cm): 3.80
Hole diameter (cm): 0.40
I (g*cm²): 98.80

Cat.no. 704 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 36.70
Reconstructed weight (g): 38.63
Height (cm): 2.30
Diameter (cm): 2.80
Hole diameter (cm): 0.40
I (g*cm²): 50.30

Cat.no. 705 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 51.90
Height (cm): 3.70
Diameter (cm): 4.00
Hole diameter (cm): 0.40
I (g*cm²): 127.71

Cat.no. 706 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 40.80
Height (cm): 3.00
Diameter (cm): 3.80
Hole diameter (cm): 0.50
I (g*cm²): 95.32

Cat.no. 707 **Plate 48**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 18.70
Reconstructed weight (g): 37.40
Height (cm): 2.60
Diameter (cm): 3.10
Hole diameter (cm): 0.40
I (g*cm²): 56.73

Cat.no. 708 **Plate 49**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 28.60
Reconstructed weight (g): 33.65
Height (cm): 3.00
Diameter (cm): 3.30
Hole diameter (cm): –
I (g*cm²): 60.37

Cat.no. 709 **Plate 49**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 23.60
Height (cm): 2.70
Diameter (cm): 2.90
Hole diameter (cm): –
I (g*cm²): 30.60

Cat.no. 710 **Plate 49**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 18.10
Height (cm): 2.30
Diameter (cm): 2.80
Hole diameter (cm): 0.40
I (g*cm²): 23.57

Cat.no. 711 **Plate 49**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 5.90
Height (cm): 1.50
Diameter (cm): 1.90
Hole diameter (cm): 0.40
I (g*cm²): 3.59

Cat.no. 712 **Plate 49**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 13.50
Reconstructed weight (g): 14.21
Height (cm): 2.10
Diameter (cm): 2.50
Hole diameter (cm): 0.40
I (g*cm²): 15.67

Cat.no. 713 **Plate 49**
Type: spindle whorl

Shape: Type IVd
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 6.90
Reconstructed weight (g): 19.71
Height (cm): 2.10
Diameter (cm): 2.70
Hole diameter (cm): 0.40
I (g*cm²): 22.29

Cat.no. 714 **Plate 49**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 9.40
Reconstructed weight (g): 37.60
Height (cm): 2.60
Diameter (cm): 2.70
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 715 **Plate 49**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 10.60
Reconstructed weight (g): 42.40
Height (cm): 2.90
Diameter (cm): 2.80
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 716 **Plate 49**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 25.60
Reconstructed weight (g): 51.20
Height (cm): 4.00
Diameter (cm): 3.90
Hole diameter (cm): 0.50
I (g*cm²): 119.28

Cat.no. 717 **Plate 49**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 30.30
Reconstructed weight (g): 60.60
Height (cm): 3.90
Diameter (cm): 3.80
Hole diameter (cm): 0.50
I (g*cm²): 134.25

Cat.no. 718
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 43.70
Height (cm): 3.30
Diameter (cm): 3.40
Hole diameter (cm): 0.60
I (g*cm²): 82.64

Cat.no. 719 **Plate 49**
Type: spindle whorl
Shape: Type IVe
Decoration: Type 15
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 44.80
Height (cm): 3.90
Diameter (cm): 3.60
Hole diameter (cm): 0.50
I (g*cm²): 96.42

Cat.no. 720 **Plate 49**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 16.70
Reconstructed weight (g): 47.71
Height (cm): 4.00
Diameter (cm): 3.90
Hole diameter (cm): 0.50
I (g*cm²): 111.16

Cat.no. 721 **Plate 49**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 6.10
Reconstructed weight (g): 24.40
Height (cm): 2.50
Diameter (cm): 2.30
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 722 **Plate 49**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 9.30
Reconstructed weight (g): 9.59
Height (cm): 2.10
Diameter (cm): 2.20
Hole diameter (cm): 0.30
I (g*cm²): 7.53

Cat.no. 723 **Plate 50**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 43.50
Reconstructed weight (g): 45.79
Height (cm): 3.60
Diameter (cm): 3.60
Hole diameter (cm): –
I (g*cm²): 98.55

Cat.no. 724 **Plate 50**
Type: spindle whorl
Shape: Type IVe
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 32.70
Height (cm): 3.30
Diameter (cm): 3.40
Hole diameter (cm): 0.40
I (g*cm²): 60.99

Cat.no. 725 **Plate 50**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 27.50
Reconstructed weight (g): 27.78
Height (cm): 3.10
Diameter (cm): 3.20
Hole diameter (cm): 0.40
I (g*cm²): 46.49

Cat.no. 726 **Plate 50**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 15.70
Height (cm): 2.40
Diameter (cm): 2.50
Hole diameter (cm): 0.40
I (g*cm²): 16.87

Cat.no. 727 **Plate 50**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 58.70
Height (cm): 3.60
Diameter (cm): 3.70
Hole diameter (cm): 0.50
I (g*cm²): 146.75

Cat.no. 728 **Plate 50**
Type: spindle whorl
Shape: Type IVf
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 7.70
Reconstructed weight (g): 30.80
Height (cm): 2.60
Diameter (cm): 2.00
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 729 **Plate 50**
Type: spindle whorl
Shape: Type IVf
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 33.10
Reconstructed weight (g): 55.17
Height (cm): 3.90
Diameter (cm): 3.20
Hole diameter (cm): 0.40
I (g*cm²): 101.41

Cat.no. 730 **Plate 50**
Type: spindle whorl
Shape: Type IVf
Decoration: individual
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 4.40
Reconstructed weight (g): 17.60
Height (cm): 2.40
Diameter (cm): 2.00
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 731 **Plate 50**
Type: spindle whorl
Shape: Type IVf
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 27.50
Height (cm): 3.30
Diameter (cm): 2.60
Hole diameter (cm): 0.40
I (g*cm²): 33.15

XII.6.2. Hanay Tepe

Late Chalcolithic

Cat.no. 732
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 41.88
Height (cm): 2.40
Diameter (cm): 4.40
Hole diameter (cm): –
I (g*cm²): 65.15

Cat.no. 733
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 33.81
Height (cm): 3.20
Diameter (cm): 3.90
Hole diameter (cm): –
I (g*cm²): 77.79

XII.6.3. Kumtepe

Late Chalcolithic

Cat.no. 734
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 40.25
Height (cm): 3.10
Diameter (cm): 3.90
Hole diameter (cm): –
I (g*cm²): 96.55

Cat.no. 735
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 58.57
Height (cm): 3.50
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 169.47

Cat.no. 736
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.93
Height (cm): 2.70
Diameter (cm): 3.10
Hole diameter (cm): –
I (g*cm²): 37.28

Cat.no. 737
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 51.49
Height (cm): 2.70
Diameter (cm): 4.50
Hole diameter (cm): –
I (g*cm²): 219.80

XII.6.4. Troy

Early Bronze Age 1

Cat.no. 738
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 30.13
Reconstructed weight (g): 37.66
Height (cm): 2.20
Diameter (cm): 4.10
Hole diameter (cm): 0.70

Plate 51
I (g*cm²): 49.22

Cat.no. 739
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 2.47
Reconstructed weight (g): 6.17
Height (cm): –

Diameter (cm): –
Hole diameter (cm): 0.50
I (g*cm²): –

Cat.no. 740
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 1.73
Reconstructed weight (g): 5.77
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 741 **Plate 51**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 9.44
Reconstructed weight (g): 10.49
Height (cm): 1.90
Diameter (cm): 2.60
Hole diameter (cm): 0.40
I (g*cm²): 10.83

Cat.no. 742 **Plate 51**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 9.47
Reconstructed weight (g): 18.94
Height (cm): 2.60
Diameter (cm): 3.80
Hole diameter (cm): 0.50
I (g*cm²): 43.29

Cat.no. 743 **Plate 51**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 21.80
Height (cm): 2.70
Diameter (cm): 3.30
Hole diameter (cm): 0.60
I (g*cm²): 51.89

Cat.no. 744 **Plate 51**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 23.22
Reconstructed weight (g): 23.69
Height (cm): 2.50
Diameter (cm): 3.10
Hole diameter (cm): 0.60
I (g*cm²): 37.49

Cat.no. 745 **Plate 51**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 14.18
Reconstructed weight (g): 28.35
Height (cm): 3.50
Diameter (cm): 4.30
Hole diameter (cm): 0.60
I (g*cm²): 82.31

Cat.no. 746 **Plate 51**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 13.30
Height (cm): 2.70
Diameter (cm): 2.60
Hole diameter (cm): 0.60
I (g*cm²): 14.18

Early Bronze Age 2

Cat.no. 747
Type: spindle whorl
Shape: –
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 3.02
Reconstructed weight (g): 8.64
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 748 **Plate 52.a**
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 15.71
Reconstructed weight (g): 15.87
Height (cm): 0.70
Diameter (cm): 4.30
Hole diameter (cm): 0.40
I (g*cm²): 29.34

Cat.no. 749
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 2.68
Reconstructed weight (g): 7.65
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 750
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 1.24
Reconstructed weight (g): 3.10
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 751
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 12.02
Reconstructed weight (g): 24.03
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.60
I (g*cm²): –

Cat.no. 752 **Plate 52.a**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 7.41
Reconstructed weight (g): 14.82
Height (cm): 2.80
Diameter (cm): 3.70
Hole diameter (cm): 0.50
I (g*cm²): 31.00

Cat.no. 753
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 18.14
Reconstructed weight (g): 22.67
Height (cm): 2.20
Diameter (cm): 3.50
Hole diameter (cm): 0.50
I (g*cm²): 43.60

Cat.no. 754
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 6.34
Reconstructed weight (g): 12.69
Height (cm): 2.60
Diameter (cm): 3.50
Hole diameter (cm): –
I (g*cm²): 24.94

Cat.no. 755
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 6.04
Reconstructed weight (g): 12.08
Height (cm): 2.60
Diameter (cm): 3.50
Hole diameter (cm): –
I (g*cm²): 23.02

Cat.no. 756 **Plate 52.a**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 14.10
Height (cm): 2.10
Diameter (cm): 3.00
Hole diameter (cm): 0.50
I (g*cm²): 19.89

Cat.no. 757 **Plate 52.a**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 11.80
Height (cm): 2.00
Diameter (cm): 2.80
Hole diameter (cm): 0.40
I (g*cm²): 14.45

Cat.no. 758 **Plate 52.a**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 55
Weight: measured, reconstructed
Original weight (g): 7.63
Reconstructed weight (g): 13.87
Height (cm): 2.30
Diameter (cm): 2.60

Hole diameter (cm): 0.50
I (g*cm²): 14.60

Cat.no. 759
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 6.89
Reconstructed weight (g): 15.30
Height (cm): 3.00
Diameter (cm): 3.60
Hole diameter (cm): 0.60
I (g*cm²): 31.02

Cat.no. 760
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 55
Weight: measured, reconstructed
Original weight (g): 11.19
Reconstructed weight (g): 20.34
Height (cm): 3.30
Diameter (cm): 3.50
Hole diameter (cm): 0.60
I (g*cm²): 38.76

Cat.no. 761
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 3.15
Reconstructed weight (g): 7.87
Height (cm): 2.90
Diameter (cm): 2.90
Hole diameter (cm): 0.50
I (g*cm²): 10.12

Plate 52.a

Cat.no. 762
Type: spindle whorl
Shape: Type V
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 5.65
Reconstructed weight (g): 14.12
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 763
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 4.26
Reconstructed weight (g): 10.66
Height (cm): 2.30
Diameter (cm): 3.40
Hole diameter (cm): –
I (g*cm²): 22.01

Cat.no. 764
Type: spindle whorl
Shape: Type VIb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 9.22
Reconstructed weight (g): 18.44
Height (cm): 2.50
Diameter (cm): 3.20
Hole diameter (cm): 0.50
I (g*cm²): –

Early Bronze Age 3

Cat.no. 765
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 460.00
Height (cm): 9.80
Diameter (cm): 7.40
Hole diameter (cm): –

Cat.no. 766
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed

Plate 52.b

Original weight (g): 437.00
Reconstructed weight (g): 460.00
Height (cm): 7.80
Diameter (cm): 4.60
Hole diameter (cm): 0.70

Cat.no. 767
Type: loom weight
Shape: Type IA
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 636.60
Reconstructed weight (g): 670.11
Height (cm): 8.70
Diameter (cm): 5.30
Hole diameter (cm): 0.70

Cat.no. 768 **Plate 52.b**
Type: loom weight
Shape: Type IE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 104.53
Height (cm): 5.30
Diameter (cm): 4.00
Hole diameter (cm): 0.80

Cat.no. 769 **Plate 52.b**
Type: loom weight
Shape: Type IIA
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 466.90
Height (cm): 7.90
Diameter (cm): 5.10
Hole diameter (cm): 0.70

Cat.no. 770
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 77.04
Reconstructed weight (g): 85.60
Height (cm): 7.10
Diameter (cm): 5.60
Hole diameter (cm): 0.60

Cat.no. 771
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): –
Weight: measured
Original weight (g): 89.51
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.60

Cat.no. 772
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 56.63
Reconstructed weight (g): 80.90
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –

Cat.no. 773 **Plate 53**
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 112.95
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.80

Cat.no. 774
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 86.02
Reconstructed weight (g): 143.37
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –

Cat.no. 775 **Plate 53**
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 98.17
Height (cm): 7.10
Diameter (cm): 5.70
Hole diameter (cm): 1.00

Cat.no. 776
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 92.85
Reconstructed weight (g): 103.17
Height (cm): 7.30
Diameter (cm): 5.70
Hole diameter (cm): 0.90

Cat.no. 777
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 87.94
Reconstructed weight (g): 97.71
Height (cm): 7.80
Diameter (cm): 5.90
Hole diameter (cm): 1.10

Cat.no. 778
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 115.51
Reconstructed weight (g): 119.08
Height (cm): 7.50

Diameter (cm): 5.40
Hole diameter (cm): 1.00

Cat.no. 779
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 103.56
Reconstructed weight (g): 115.07
Height (cm): 7.50
Diameter (cm): 5.60
Hole diameter (cm): 0.80

Cat.no. 780
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 96.39
Reconstructed weight (g): 107.10
Height (cm): 7.70
Diameter (cm): 5.10
Hole diameter (cm): 0.80

Cat.no. 781
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 81.80
Reconstructed weight (g): 90.89
Height (cm): 6.90
Diameter (cm): 5.40
Hole diameter (cm): 0.70

Cat.no. 782
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 43.15
Reconstructed weight (g): 50.76
Height (cm): 5.60
Diameter (cm): 4.20
Hole diameter (cm): 0.50

Cat.no. 783
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 55
Weight: measured, reconstructed
Original weight (g): 40.73
Reconstructed weight (g): 74.05
Height (cm): 7.70
Diameter (cm): 4.00
Hole diameter (cm): –

Cat.no. 784
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 194.40
Reconstructed weight (g): 388.80
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 1.80

Cat.no. 785
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 86.00
Reconstructed weight (g): 215.01
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.70

Cat.no. 786
Type: loom weight
Shape: Type IID
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 271.76
Reconstructed weight (g): 339.70
Height (cm): 7.10
Diameter (cm): 6.60
Hole diameter (cm): 0.60

Cat.no. 787 **Plate 53**
Type: loom weight
Shape: Type IIE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 117.90
Height (cm): 5.30
Diameter (cm): 4.20
Hole diameter (cm): 0.60

Cat.no. 788
Type: loom weight
Shape: Type IIE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 101.66
Height (cm): 5.30
Diameter (cm): 3.90
Hole diameter (cm): 0.40

Cat.no. 789
Type: loom weight
Shape: Type IIE
Material: clay

Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 51.23
Height (cm): 3.10
Diameter (cm): 4.90
Hole diameter (cm): 0.30

Cat.no. 790 **Plate 53**
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 83.00
Height (cm): 5.70
Diameter (cm): 4.10
Hole diameter (cm): 0.40

Cat.no. 791 **Plate 53**
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 134.60
Height (cm): 7.40
Diameter (cm): 4.90
Hole diameter (cm): 0.50

Cat.no. 792
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 54.76
Reconstructed weight (g): 56.45
Height (cm): 6.00
Diameter (cm): 4.40 × 2.40 (base)
Hole diameter (cm): 0.50

Cat.no. 793
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 54.20
Reconstructed weight (g): 83.38
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –

Cat.no. 794 **Plate 53**
Type: loom weight
Shape: Type IIID
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 460.00
Height (cm): 8.70
Diameter (cm): 5.60
Hole diameter (cm): 0.40

Cat.no. 795 **Plate 53**
Type: loom weight
Shape: Type IVB
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 252.35
Reconstructed weight (g): 388.23
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.60

Cat.no. 796
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 440.00
Reconstructed weight (g): 517.65
Height (cm): 7.10
Diameter (cm): 3.20
Hole diameter (cm): 0.60

Cat.no. 797 **Plate 53**
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 305.20
Height (cm): 10.70
Diameter (cm): 6.30
Hole diameter (cm): 1.30

Cat.no. 798
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 221.36
Reconstructed weight (g): 233.01
Height (cm): 8.80
Diameter (cm): 6.50
Hole diameter (cm): 1.00

Cat.no. 799 **Plate 53**
Type: loom weight
Shape: Type IVE
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 182.85
Height (cm): 8.40
Diameter (cm): 5.80
Hole diameter (cm): 1.00

Cat.no. 800
Type: loom weight
Shape: Type IVE
Material: clay

Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 231.79
Height (cm): 8.50
Diameter (cm): 6.20
Hole diameter (cm): 0.90

Cat.no. 801 **Plate 53**
Type: loom weight
Shape: Type VIA
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 276.02
Reconstructed weight (g): 281.65
Height (cm): 7.30
Diameter (cm): 7.50
Hole diameter (cm): 0.50

Cat.no. 802
Type: loom weight
Shape: Type VIB
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 40.10
Reconstructed weight (g): 80.20
Height (cm): 4.80
Diameter (cm): 4.80
Hole diameter (cm): 0.50

Cat.no. 803 **Plate 53**
Type: loom weight
Shape: Type VIB
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 75.80
Height (cm): 2.70
Diameter (cm): 5.50
Hole diameter (cm): 0.60

Cat.no. 804 **Plate 53**
Type: loom weight
Shape: Type VIIIA
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 89.65
Reconstructed weight (g): 92.42
Height (cm): 5.40
Diameter (cm): 7.10
Hole diameter (cm): 0.50

Cat.no. 805 **Plate 54**
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 8.20
Height (cm): 1.30
Diameter (cm): 2.50
Hole diameter (cm): 0.50
I (g*cm²): 5.13

Cat.no. 806 **Plate 54**
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 11.80
Height (cm): 2.20
Diameter (cm): 3.60
Hole diameter (cm): 0.60
I (g*cm²): 15.29

Cat.no. 807 **Plate 54**
Type: spindle whorl
Shape: Type IIc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 12.05
Height (cm): 2.30
Diameter (cm): 2.20
Hole diameter (cm): 0.30
I (g*cm²): 5.83

Cat.no. 808 **Plate 54**
Type: spindle whorl
Shape: Type IIc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 14.00
Height (cm): 2.40
Diameter (cm): 2.40
Hole diameter (cm): 0.40
I (g*cm²): 8.06

Cat.no. 809 **Plate 54**
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 32.05
Reconstructed weight (g): 40.06
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.80
I (g*cm²): –

Cat.no. 810
Type: spindle whorl
Shape: Type III
Decoration: individual
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 22.57
Reconstructed weight (g): 32.24

Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.70
I (g*cm²): –

Cat.no. 811
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 8.30
Reconstructed weight (g): 10.38
Height (cm): 1.40
Diameter (cm): 3.00
Hole diameter (cm): 0.40
I (g*cm²): 7.13

Cat.no. 812 **Plate 54**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 25.77
Height (cm): 1.60
Diameter (cm): 4.10
Hole diameter (cm): 0.90
I (g*cm²): 33.25

Cat.no. 813
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 18.78
Reconstructed weight (g): 20.87
Height (cm): 1.50
Diameter (cm): 3.20
Hole diameter (cm): 0.50
I (g*cm²): 18.77

Cat.no. 814 **Plate 54**
Type: spindle whorl
Shape: Type IIIb
Decoration: Type 14
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 55.51
Height (cm): 2.00
Diameter (cm): 4.80
Hole diameter (cm): 0.80
I (g*cm²): 108.73

Cat.no. 815
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 15.50
Reconstructed weight (g): 44.29
Height (cm): 2.30
Diameter (cm): 4.60
Hole diameter (cm): 0.90
I (g*cm²): 74.07

Cat.no. 816
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 14.80
Reconstructed weight (g): 15.58
Height (cm): 1.90
Diameter (cm): 2.90
Hole diameter (cm): 0.70
I (g*cm²): 10.20

Cat.no. 817
Type: spindle whorl
Shape: Type IIIc
Decoration: Type 3
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 11.30
Reconstructed weight (g): 32.29
Height (cm): 2.10
Diameter (cm): 4.10
Hole diameter (cm): 0.70
I (g*cm²): 43.29

Cat.no. 818
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 39.40
Reconstructed weight (g): 41.47
Height (cm): 2.50
Diameter (cm): 4.10
Hole diameter (cm): 0.90
I (g*cm²): 54.62

Cat.no. 819 **Plate 54**
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 19.86
Reconstructed weight (g): 20.47
Height (cm): 2.10
Diameter (cm): 3.30
Hole diameter (cm): 0.50
I (g*cm²): 17.64

Cat.no. 820 **Plate 54**
Type: spindle whorl
Shape: Type IIIc

Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 29.02
Height (cm): 1.90
Diameter (cm): 4.00
Hole diameter (cm): 0.60
I (g*cm²): 36.19

Cat.no. 821 **Plate 54**
Type: spindle whorl
Shape: Type IIIe
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 30.36
Height (cm): 3.00
Diameter (cm): 3.20
Hole diameter (cm): 0.40
I (g*cm²): 26.77

Cat.no. 822
Type: spindle whorl
Shape: Type IIIe
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 17.61
Height (cm): 2.40
Diameter (cm): 2.60
Hole diameter (cm): 0.50
I (g*cm²): 10.91

Cat.no. 823 **Plate 54**
Type: spindle whorl
Shape: Type IIIe
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 25.27
Height (cm): 2.60
Diameter (cm): 2.90
Hole diameter (cm): 0.40
I (g*cm²): 18.58

Cat.no. 824 **Plate 54**
Type: spindle whorl
Shape: Type IIIf
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 35.40
Reconstructed weight (g): 36.12
Height (cm): 3.70
Diameter (cm): 3.20
Hole diameter (cm): 0.60
I (g*cm²): 30.23

Cat.no. 825
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 30.70
Reconstructed weight (g): 87.71
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 826
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 32.53
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 827
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 15.70
Reconstructed weight (g): 62.80
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 828
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 20
Weight: measured, reconstructed
Original weight (g): 16.90
Reconstructed weight (g): 84.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 829
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 15
Weight: measured, reconstructed
Original weight (g): 7.40
Reconstructed weight (g): 49.33
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 830
Type: spindle whorl
Shape: Type IV

Decoration: individual
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 15.44
Reconstructed weight (g): 44.11
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 831
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 35.61
Reconstructed weight (g): 47.48
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 832
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 15.23
Reconstructed weight (g): 38.08
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 833
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 12.00
Reconstructed weight (g): 26.67
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.60
I (g*cm²): –

Cat.no. 834
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 42.00
Reconstructed weight (g): 52.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.70
I (g*cm²): –

Cat.no. 835
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 22.72
Reconstructed weight (g): 32.46
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.50
I (g*cm²): –

Cat.no. 836
Type: spindle whorl
Shape: Type IV
Decoration: Type 15
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 25.37
Reconstructed weight (g): 63.43
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 837
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 39.32
Reconstructed weight (g): 52.43
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.80
I (g*cm²): –

Cat.no. 838
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 33.04
Reconstructed weight (g): 82.60
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.70
I (g*cm²): –

Cat.no. 839
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 4.36
Reconstructed weight (g): 12.46
Height (cm): –

Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 840 **Plate 55**
Type: spindle whorl
Shape: Type IVb
Decoration: Type 6
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 9.80
Height (cm): 1.40
Diameter (cm): 2.70
Hole diameter (cm): 0.60
I (g*cm²): 10.89

Cat.no. 841
Type: spindle whorl
Shape: Type IVb
Decoration: Type 6
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 13.80
Reconstructed weight (g): 13.94
Height (cm): 1.70
Diameter (cm): 3.20
Hole diameter (cm): 0.60
I (g*cm²): 22.02

Cat.no. 842
Type: spindle whorl
Shape: Type IVb
Decoration: Type 3
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 18.40
Height (cm): 1.90
Diameter (cm): 3.30
Hole diameter (cm): 0.50
I (g*cm²): –

Cat.no. 843 **Plate 55**
Type: spindle whorl
Shape: Type IVb
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 4.70
Height (cm): 1.20
Diameter (cm): 2.20
Hole diameter (cm): 0.40
I (g*cm²): 3.52

Cat.no. 844 **Plate 55**
Type: spindle whorl
Shape: Type IVb
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 8.96
Height (cm): 1.50
Diameter (cm): 2.80
Hole diameter (cm): 0.40
I (g*cm²): 11.27

Cat.no. 845
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 8.05
Height (cm): 1.30
Diameter (cm): 2.60
Hole diameter (cm): 0.40
I (g*cm²): 8.22

Cat.no. 846 **Plate 55**
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 28.49
Height (cm): 2.00
Diameter (cm): 3.60
Hole diameter (cm): 0.50
I (g*cm²): 66.95

Cat.no. 847
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 24.17
Height (cm): 1.70
Diameter (cm): 3.50
Hole diameter (cm): 0.80
I (g*cm²): 47.51

Cat.no. 848
Type: spindle whorl
Shape: Type IVb
Decoration: Type 1
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 31.63
Reconstructed weight (g): 37.21
Height (cm): 2.30
Diameter (cm): 4.00
Hole diameter (cm): 0.70
I (g*cm²): 103.34

Cat.no. 849 **Plate 55**
Type: spindle whorl
Shape: Type IVb
Decoration: Type 9

Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 9.30
Height (cm): 1.50
Diameter (cm): 2.90
Hole diameter (cm): 0.60
I (g*cm²): 13.38

Cat.no. 850
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 22.50
Reconstructed weight (g): 56.25
Height (cm): 3.00
Diameter (cm): 4.50
Hole diameter (cm): 0.70
I (g*cm²): 192.72

Cat.no. 851
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 40.50
Reconstructed weight (g): 41.33
Height (cm): 2.90
Diameter (cm): 4.10
Hole diameter (cm): 0.90
I (g*cm²): 108.02

Cat.no. 852
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 17.20
Reconstructed weight (g): 21.50
Height (cm): 1.90
Diameter (cm): 3.10
Hole diameter (cm): 0.60
I (g*cm²): 33.50

Cat.no. 853
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 33.40
Reconstructed weight (g): 34.43
Height (cm): 2.70
Diameter (cm): 4.00
Hole diameter (cm): 0.70
I (g*cm²): 84.83

Cat.no. 854
Type: spindle whorl
Shape: Type IVc
Decoration: Type 18
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 17.70
Height (cm): 2.10
Diameter (cm): 2.90
Hole diameter (cm): 0.80
I (g*cm²): 26.03

Cat.no. 855
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 12.20
Reconstructed weight (g): 12.84
Height (cm): 2.00
Diameter (cm): 3.40
Hole diameter (cm): 0.50
I (g*cm²): 23.39

Cat.no. 856
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 21.80
Reconstructed weight (g): 22.24
Height (cm): 2.50
Diameter (cm): 3.30
Hole diameter (cm): 0.60
I (g*cm²): 37.58

Cat.no. 857
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 31.20
Height (cm): 2.40
Diameter (cm): 3.70
Hole diameter (cm): 0.50
I (g*cm²): 66.62

Cat.no. 858 **Plate 55**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 43.70
Height (cm): 2.80
Diameter (cm): 4.10

Hole diameter (cm): 0.50
I (g*cm²): 114.23

Cat.no. 859
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 38.50
Height (cm): 2.70
Diameter (cm): 3.70
Hole diameter (cm): 0.70
I (g*cm²): 81.56

Cat.no. 860
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 12.60
Reconstructed weight (g): 31.50
Height (cm): 2.60
Diameter (cm): 3.50
Hole diameter (cm): 0.70
I (g*cm²): 61.92

Cat.no. 861
Type: spindle whorl
Shape: Type IVc
Decoration: Type 13
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 55.41
Reconstructed weight (g): 57.12
Height (cm): 3.00
Diameter (cm): 4.20
Hole diameter (cm): 0.50
I (g*cm²): 157.44

Cat.no. 862
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 32.98
Height (cm): 2.40
Diameter (cm): 3.80
Hole diameter (cm): 0.60
I (g*cm²): 78.02

Cat.no. 863
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 27.44
Height (cm): 2.50
Diameter (cm): 3.60
Hole diameter (cm): 0.50
I (g*cm²): 55.17

Cat.no. 864
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 59.64
Height (cm): 3.30
Diameter (cm): 4.80
Hole diameter (cm): 0.70
I (g*cm²): 215.98

Cat.no. 865 **Plate 55**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 39.59
Height (cm): 2.50
Diameter (cm): 4.00
Hole diameter (cm): 0.80
I (g*cm²): 101.49

Cat.no. 866
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 58.86
Height (cm): 3.20
Diameter (cm): 4.60
Hole diameter (cm): 0.60
I (g*cm²): 196.91

Cat.no. 867
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 27.84
Reconstructed weight (g): 34.80
Height (cm): 2.70
Diameter (cm): 3.80
Hole diameter (cm): 0.80
I (g*cm²): 84.68

Cat.no. 868
Type: spindle whorl
Shape: Type IVc
Decoration: Type 2
Material: clay
Preservation condition (%): 100
Weight: measured, complete

Original weight (g): 7.40
Height (cm): 1.40
Diameter (cm): 2.30
Hole diameter (cm): 0.50
I (g*cm²): 6.19

Cat.no. 869
Type: spindle whorl
Shape: Type IVc
Decoration: Type 2
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 15.58
Height (cm): 1.80
Diameter (cm): 2.90
Hole diameter (cm): 0.60
I (g*cm²): 20.39

Cat.no. 870
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 35.34
Height (cm): 2.40
Diameter (cm): 3.80
Hole diameter (cm): 0.50
I (g*cm²): 78.79

Cat.no. 871
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 33.72
Height (cm): 2.80
Diameter (cm): 3.90
Hole diameter (cm): 0.80
I (g*cm²): 79.02

Cat.no. 872
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 43.42
Reconstructed weight (g): 54.28
Height (cm): 2.40
Diameter (cm): 3.90
Hole diameter (cm): 0.60
I (g*cm²): 159.08

Cat.no. 873
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 30.68
Height (cm): 2.40
Diameter (cm): 3.40
Hole diameter (cm): 0.50
I (g*cm²): 56.51

Cat.no. 874
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 49.05
Height (cm): 3.10
Diameter (cm): 4.40
Hole diameter (cm): 1.10
I (g*cm²): 149.26

Cat.no. 875
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 61.03
Reconstructed weight (g): 67.81
Height (cm): 2.70
Diameter (cm): 4.30
Hole diameter (cm): 0.90
I (g*cm²): 206.96

Cat.no. 876
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 6.40
Reconstructed weight (g): 7.53
Height (cm): 1.50
Diameter (cm): 2.10
Hole diameter (cm): 0.50
I (g*cm²): 5.94

Cat.no. 877
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 33.03
Height (cm): 2.60
Diameter (cm): 4.10
Hole diameter (cm): 0.50
I (g*cm²): 83.88

Cat.no. 878
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 90

Weight: measured, reconstructed
Original weight (g): 17.34
Reconstructed weight (g): 19.27
Height (cm): 2.10
Diameter (cm): 3.00
Hole diameter (cm): 0.60
I (g*cm²): 29.34

Cat.no. 879
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 15.63
Height (cm): 1.80
Diameter (cm): 2.80
Hole diameter (cm): 0.50
I (g*cm²): 19.98

Cat.no. 880
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 39.01
Height (cm): 2.90
Diameter (cm): 3.90
Hole diameter (cm): 0.60
I (g*cm²): 90.88

Cat.no. 881
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 20.68
Reconstructed weight (g): 22.98
Height (cm): 2.40
Diameter (cm): 3.40
Hole diameter (cm): 0.50
I (g*cm²): 292.82

Cat.no. 882
Type: spindle whorl
Shape: Type IVc
Decoration: Type 1
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 12.75
Height (cm): 2.00
Diameter (cm): 2.80
Hole diameter (cm): 0.50
I (g*cm²): 15.14

Cat.no. 883
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 13.60
Height (cm): 1.90
Diameter (cm): 3.10
Hole diameter (cm): 0.50
I (g*cm²): 20.89

Cat.no. 884
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 11.90
Height (cm): 1.80
Diameter (cm): 3.00
Hole diameter (cm): 0.60
I (g*cm²): 18.49

Cat.no. 885
Type: spindle whorl
Shape: Type IVc
Decoration: Type 3
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 4.00
Height (cm): 1.40
Diameter (cm): 2.00
Hole diameter (cm): 0.50
I (g*cm²): 2.59

Cat.no. 886
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 26.49
Reconstructed weight (g): 27.03
Height (cm): 2.30
Diameter (cm): 3.70
Hole diameter (cm): 0.50
I (g*cm²): 60.21

Cat.no. 887
Type: spindle whorl
Shape: Type IVc
Decoration: Type 1
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 41.39
Reconstructed weight (g): 43.57
Height (cm): 3.10
Diameter (cm): 4.20
Hole diameter (cm): 0.60
I (g*cm²): 129.33

Cat.no. 888 **Plate 55**
Type: spindle whorl
Shape: Type IVc
Decoration: Type 3
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 29.70
Height (cm): 2.50
Diameter (cm): 4.00
Hole diameter (cm): 0.70
I (g*cm²): 76.14

Cat.no. 889 **Plate 55**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 6.60
Height (cm): 1.60
Diameter (cm): 2.40
Hole diameter (cm): 0.60
I (g*cm²): 8.54

Cat.no. 890
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 12.00
Reconstructed weight (g): 40.00
Height (cm): 2.80
Diameter (cm): 3.60
Hole diameter (cm): 0.70
I (g*cm²): 95.95

Cat.no. 891
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 16.10
Reconstructed weight (g): 32.20
Height (cm): 3.20
Diameter (cm): 3.70
Hole diameter (cm): 0.70
I (g*cm²): 67.75

Cat.no. 892
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 11.20
Reconstructed weight (g): 22.40
Height (cm): 2.70
Diameter (cm): 3.50
Hole diameter (cm): 0.60
I (g*cm²): 41.36

Cat.no. 893 **Plate 55**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 7.40
Height (cm): 1.70
Diameter (cm): 2.00
Hole diameter (cm): 0.30
I (g*cm²): 4.55

Cat.no. 894
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 17.25
Reconstructed weight (g): 21.56
Height (cm): 2.60
Diameter (cm): 2.80
Hole diameter (cm): 0.70
I (g*cm²): 26.74

Cat.no. 895
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 28.66
Reconstructed weight (g): 31.84
Height (cm): 2.90
Diameter (cm): 3.60
Hole diameter (cm): 0.70
I (g*cm²): 67.57

Cat.no. 896
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 27.74
Reconstructed weight (g): 36.99
Height (cm): 3.00
Diameter (cm): 3.60
Hole diameter (cm): 0.50
I (g*cm²): 78.48

Cat.no. 897
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 30
Weight: measured, reconstructed
Original weight (g): 18.20
Reconstructed weight (g): 60.67

Height (cm): 3.30
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): 133.67

Cat.no. 898
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 7.20
Height (cm): 1.80
Diameter (cm): 2.00
Hole diameter (cm): 0.40
I (g*cm²): 4.57

Cat.no. 899
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 35
Weight: measured, reconstructed
Original weight (g): 25.90
Reconstructed weight (g): 74.00
Height (cm): 3.50
Diameter (cm): 4.20
Hole diameter (cm): 0.70
I (g*cm²): 219.65

Cat.no. 900
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 19.74
Reconstructed weight (g): 23.22
Height (cm): 2.50
Diameter (cm): 3.00
Hole diameter (cm): 0.50
I (g*cm²): 34.71

Cat.no. 901
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 27.92
Reconstructed weight (g): 28.49
Height (cm): 2.90
Diameter (cm): 3.30
Hole diameter (cm): 0.50
I (g*cm²): 46.70

Cat.no. 902
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 20.00
Height (cm): 2.40
Diameter (cm): 2.80
Hole diameter (cm): 0.40
I (g*cm²): 24.80

Cat.no. 903 **Plate 55**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 19.00
Height (cm): 2.80
Diameter (cm): 3.00
Hole diameter (cm): 0.60
I (g*cm²): 25.96

Cat.no. 904
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 18.20
Reconstructed weight (g): 19.16
Height (cm): 2.40
Diameter (cm): 3.00
Hole diameter (cm): 0.30
I (g*cm²): 26.75

Cat.no. 905
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 39.73
Reconstructed weight (g): 41.82
Height (cm): 3.00
Diameter (cm): 3.90
Hole diameter (cm): 0.70
I (g*cm²): 102.39

Cat.no. 906
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 15.82
Reconstructed weight (g): 15.98
Height (cm): 2.30
Diameter (cm): 2.60
Hole diameter (cm): 0.30
I (g*cm²): 16.32

Cat.no. 907
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 65

Weight: measured, reconstructed
Original weight (g): 7.96
Reconstructed weight (g): 12.25
Height (cm): 2.10
Diameter (cm): 2.10
Hole diameter (cm): 0.50
I (g*cm²): 8.38

Cat.no. 908
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 21.59
Reconstructed weight (g): 43.18
Height (cm): 3.80
Diameter (cm): 3.90
Hole diameter (cm): 0.60
I (g*cm²): 102.68

Cat.no. 909
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 23.68
Reconstructed weight (g): 39.47
Height (cm): 3.50
Diameter (cm): 3.40
Hole diameter (cm): 0.60
I (g*cm²): 71.19

Cat.no. 910 **Plate 55**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 8.51
Height (cm): 2.00
Diameter (cm): 2.10
Hole diameter (cm): 0.50
I (g*cm²): 6.02

Cat.no. 911
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 26.86
Reconstructed weight (g): 53.72
Height (cm): 3.70
Diameter (cm): 3.60
Hole diameter (cm): 0.40
I (g*cm²): 107.21

Cat.no. 912 **Plate 55**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 40.59
Height (cm): 3.50
Diameter (cm): 3.70
Hole diameter (cm): 0.70
I (g*cm²): 86.66

Cat.no. 913
Type: spindle whorl
Shape: Type IVf
Decoration: Type 6
Material: clay
Preservation condition (%): 96
Weight: measured, reconstructed
Original weight (g): 19.60
Reconstructed weight (g): 20.42
Height (cm): 4.10
Diameter (cm): 3.30
Hole diameter (cm): 0.60
I (g*cm²): 37.23

Cat.no. 914 **Plate 56**
Type: spindle whorl
Shape: Type IVf
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 46.36
Height (cm): 4.20
Diameter (cm): 3.50
Hole diameter (cm): 0.50
I (g*cm²): 93.61

Cat.no. 915
Type: spindle whorl
Shape: Type V
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 12.37
Reconstructed weight (g): 16.49
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.40
I (g*cm²): –

Cat.no. 916
Type: spindle whorl
Shape: Type V
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 30.56
Reconstructed weight (g): 76.40
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 917
Type: spindle whorl
Shape: Type V
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 17.72
Reconstructed weight (g): 35.44
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.60
I (g*cm²): –

Cat.no. 918
Type: spindle whorl
Shape: Type V
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 39.60
Reconstructed weight (g): 44.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.70
I (g*cm²): –

Cat.no. 919
Type: spindle whorl
Shape: Type V
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 17.39
Reconstructed weight (g): 34.78
Height (cm): –
Diameter (cm): –
Hole diameter (cm): 0.70
I (g*cm²): –

Cat.no. 920 **Plate 56**
Type: spindle whorl
Shape: Type Va
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 22.40
Height (cm): 1.60
Diameter (cm): 3.70
Hole diameter (cm): 0.80
I (g*cm²): 47.13

Cat.no. 921
Type: spindle whorl
Shape: Type Va
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 31.20
Height (cm): 2.10
Diameter (cm): 4.10
Hole diameter (cm): 0.70
I (g*cm²): 79.76

Cat.no. 922
Type: spindle whorl
Shape: Type Va
Decoration: individual
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 28.94
Reconstructed weight (g): 32.16
Height (cm): 1.60
Diameter (cm): 3.80
Hole diameter (cm): 0.50
I (g*cm²): 70.53

Cat.no. 923
Type: spindle whorl
Shape: Type Va
Material: clay
Preservation condition (%): 55
Weight: measured, reconstructed
Original weight (g): 16.21
Reconstructed weight (g): 29.47
Height (cm): 1.90
Diameter (cm): 3.80
Hole diameter (cm): 0.60
I (g*cm²): 65.29

Cat.no. 924 **Plate 56**
Type: spindle whorl
Shape: Type Va
Decoration: Type 2
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 50.04
Height (cm): 2.50
Diameter (cm): 4.80
Hole diameter (cm): 0.70
I (g*cm²): 176.19

Cat.no. 925
Type: spindle whorl
Shape: Type Va
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 14.50
Height (cm): 1.70
Diameter (cm): 3.40
Hole diameter (cm): 0.40
I (g*cm²): 25.93

Cat.no. 926
Type: spindle whorl
Shape: Type Va
Decoration: Type 2
Material: clay
Preservation condition (%): 100

Weight: measured, complete
Original weight (g): 22.30
Height (cm): 1.90
Diameter (cm): 3.80
Hole diameter (cm): 0.40
I (g*cm²): 48.92

Cat.no. 927 **Plate 56**
Type: spindle whorl
Shape: Type Va
Decoration: Type 5
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 24.70
Height (cm): 1.80
Diameter (cm): 3.70
Hole diameter (cm): 0.60
I (g*cm²): 51.05

Cat.no. 928
Type: spindle whorl
Shape: Type Va
Decoration: Type 2
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 31.80
Height (cm): 1.90
Diameter (cm): 4.10
Hole diameter (cm): 0.80
I (g*cm²): 82.07

Cat.no. 929
Type: spindle whorl
Shape: Type Va
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 9.85
Reconstructed weight (g): 10.94
Height (cm): 1.40
Diameter (cm): 2.90
Hole diameter (cm): 0.60
I (g*cm²): 14.19

Cat.no. 930
Type: spindle whorl
Shape: Type Va
Decoration: Type 3
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 7.84
Reconstructed weight (g): 8.25
Height (cm): 1.40
Diameter (cm): 2.70
Hole diameter (cm): 0.60
I (g*cm²): 9.89

Cat.no. 931
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 6.60
Reconstructed weight (g): 13.20
Height (cm): 1.60
Diameter (cm): 2.90
Hole diameter (cm): 0.60
I (g*cm²): 17.97

Cat.no. 932
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 16.40
Reconstructed weight (g): 32.80
Height (cm): 2.50
Diameter (cm): 3.60
Hole diameter (cm): 0.70
I (g*cm²): 69.59

Cat.no. 933
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 9.60
Reconstructed weight (g): 24.00
Height (cm): 2.10
Diameter (cm): 3.30
Hole diameter (cm): 0.40
I (g*cm²): 39.96

Cat.no. 934
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 69.39
Reconstructed weight (g): 70.09
Height (cm): 3.10
Diameter (cm): 5.00
Hole diameter (cm): 0.90
I (g*cm²): 272.35

Cat.no. 935
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 20.88
Height (cm): 2.20
Diameter (cm): 3.20
Hole diameter (cm): 0.70
I (g*cm²): 34.44

Cat.no. 936
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 41.15
Height (cm): 2.50
Diameter (cm): 4.10
Hole diameter (cm): 0.70
I (g*cm²): 108.39

Cat.no. 937
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 22.18
Reconstructed weight (g): 44.36
Height (cm): 2.60
Diameter (cm): 4.30
Hole diameter (cm): 0.90
I (g*cm²): 128.79

Cat.no. 938
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 34.16
Height (cm): 2.40
Diameter (cm): 3.70
Hole diameter (cm): 0.70
I (g*cm²): 72.94

Cat.no. 939 **Plate 56**
Type: spindle whorl
Shape: Type Vb
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 33.29
Height (cm): 2.50
Diameter (cm): 4.10
Hole diameter (cm): 0.50
I (g*cm²): 85.47

Cat.no. 940
Type: spindle whorl
Shape: Type Vb
Decoration: Type 2
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 29.99
Reconstructed weight (g): 30.60
Height (cm): 2.20
Diameter (cm): 4.10
Hole diameter (cm): 0.70
I (g*cm²): 79.45

Cat.no. 941 **Plate 56**
Type: spindle whorl
Shape: Type Vb
Decoration: Type 1
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 47.80
Height (cm): 2.80
Diameter (cm): 4.80
Hole diameter (cm): 0.70
I (g*cm²): 169.04

Cat.no. 942
Type: spindle whorl
Shape: Type Vb
Decoration: Type 10
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 34.40
Height (cm): 2.50
Diameter (cm): 4.10
Hole diameter (cm): 0.80
I (g*cm²): 88.32

Cat.no. 943
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 13.21
Reconstructed weight (g): 26.42
Height (cm): 2.10
Diameter (cm): 3.90
Hole diameter (cm): 0.50
I (g*cm²): 61.91

Cat.no. 944
Type: spindle whorl
Shape: Type Vb
Decoration: Type 6
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 31.33
Height (cm): 2.60
Diameter (cm): 3.80
Hole diameter (cm): 0.80
I (g*cm²): 69.85

Cat.no. 945 **Plate 56**
Type: spindle whorl
Shape: Type Vb
Decoration: Type 3
Material: clay
Preservation condition (%): 100
Weight: measured, complete

Original weight (g): 22.48
Height (cm): 2.10
Diameter (cm): 3.50
Hole diameter (cm): 0.60
I (g*cm²): 41.78

Cat.no. 946
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 7.25
Reconstructed weight (g): 9.06
Height (cm): 1.70
Diameter (cm): 2.50
Hole diameter (cm): 0.40
I (g*cm²): 8.61

Cat.no. 947
Type: spindle whorl
Shape: Type Vb
Decoration: Type 6
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 33.03
Height (cm): 2.70
Diameter (cm): 4.10
Hole diameter (cm): 0.60
I (g*cm²): 84.13

Cat.no. 948
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 21.99
Reconstructed weight (g): 43.98
Height (cm): 2.90
Diameter (cm): 4.30
Hole diameter (cm): 0.60
I (g*cm²): 123.92

Cat.no. 949
Type: spindle whorl
Shape: Type Vb
Decoration: Type 3
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 22.48
Reconstructed weight (g): 23.66
Height (cm): 1.90
Diameter (cm): 3.50
Hole diameter (cm): 0.60
I (g*cm²): 44.43

Cat.no. 950
Type: spindle whorl
Shape: Type Vb
Decoration: Type 3
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 6.20
Height (cm): 1.40
Diameter (cm): 2.60
Hole diameter (cm): 0.50
I (g*cm²): 6.61

Cat.no. 951
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 9.50
Height (cm): 1.60
Diameter (cm): 3.00
Hole diameter (cm): 0.50
I (g*cm²): 13.26

Cat.no. 952
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 16.00
Height (cm): 2.10
Diameter (cm): 3.40
Hole diameter (cm): 0.60
I (g*cm²): 33.74

Cat.no. 953
Type: spindle whorl
Shape: Type Vb
Decoration: Type 9
Material: clay
Preservation condition (%): 40
Weight: measured, reconstructed
Original weight (g): 9.74
Reconstructed weight (g): 24.35
Height (cm): 3.00
Diameter (cm): 4.70
Hole diameter (cm): –
I (g*cm²): 89.85

Cat.no. 954
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 30.96
Reconstructed weight (g): 34.40
Height (cm): 2.50
Diameter (cm): 4.20
Hole diameter (cm): 0.60
I (g*cm²): 98.41

Cat.no. 955
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 32.79
Reconstructed weight (g): 33.80
Height (cm): 2.30
Diameter (cm): 3.90
Hole diameter (cm): 0.60
I (g*cm²): 95.15

Cat.no. 956
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 20.21
Height (cm): 2.30
Diameter (cm): 3.10
Hole diameter (cm): 0.60
I (g*cm²): 30.04

Cat.no. 957
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 18.21
Reconstructed weight (g): 19.17
Height (cm): 2.00
Diameter (cm): 2.30
Hole diameter (cm): 0.50
I (g*cm²): 15.36

Cat.no. 958 **Plate 56**
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 20.17
Reconstructed weight (g): 40.34
Height (cm): 3.20
Diameter (cm): 4.00
Hole diameter (cm): 0.50
I (g*cm²): 98.26

Cat.no. 959
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 8.28
Height (cm): 1.80
Diameter (cm): 2.10
Hole diameter (cm): 0.30
I (g*cm²): 6.32

Cat.no. 960
Type: spindle whorl
Shape: Type Vc
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 17.39
Height (cm): 2.40
Diameter (cm): 3.30
Hole diameter (cm): 0.50
I (g*cm²): 32.89

Cat.no. 961
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 29.26
Height (cm): 2.80
Diameter (cm): 3.50
Hole diameter (cm): 0.60
I (g*cm²): 56.27

Cat.no. 962
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 7.32
Height (cm): 1.70
Diameter (cm): 2.20
Hole diameter (cm): 0.20
I (g*cm²): 5.55

Cat.no. 963
Type: spindle whorl
Shape: Type Vc
Decoration: Type 2
Material: clay
Preservation condition (%): 100
Weight: calculated via density
Reconstructed weight (g): 28.10
Height (cm): 2.80
Diameter (cm): 3.90
Hole diameter (cm): 0.70
I (g*cm²): 68.80

Cat.no. 964 **Plate 56**
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 39.11
Height (cm): 3.40
Diameter (cm): 3.60
Hole diameter (cm): 0.60
I (g*cm²): 81.90

Cat.no. 965
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 26.28
Height (cm): 3.40
Diameter (cm): 3.30
Hole diameter (cm): 0.50
I (g*cm²): 45.29

Cat.no. 966
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 5.43
Height (cm): 1.90
Diameter (cm): 2.00
Hole diameter (cm): 0.50
I (g*cm²): 3.31

Cat.no. 967
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 66.10
Height (cm): 4.30
Diameter (cm): 4.30
Hole diameter (cm): 0.70
I (g*cm²): 190.47

Cat.no. 968
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 9.55
Height (cm): 3.00
Diameter (cm): 2.80
Hole diameter (cm): 0.50
I (g*cm²): 11.48

Cat.no. 969
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 29.56
Reconstructed weight (g): 32.84
Height (cm): 3.20
Diameter (cm): 3.20
Hole diameter (cm): 0.50
I (g*cm²): 52.86

Cat.no. 970
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 10.51
Reconstructed weight (g): 21.02
Height (cm): 2.80
Diameter (cm): 3.20
Hole diameter (cm): –
I (g*cm²): 33.49

Plate 56

Cat.no. 971
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 9.36
Reconstructed weight (g): 9.85
Height (cm): 2.50
Diameter (cm): 2.30
Hole diameter (cm): 0.30
I (g*cm²): 7.95

Cat.no. 972
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 7.21
Reconstructed weight (g): 14.42
Height (cm): 2.50
Diameter (cm): 2.60
Hole diameter (cm): 0.60
I (g*cm²): 15.61

Cat.no. 973
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 65
Weight: measured, reconstructed
Original weight (g): 10.91
Reconstructed weight (g): 16.78
Height (cm): 2.50
Diameter (cm): 2.70
Hole diameter (cm): 0.50
I (g*cm²): 18.80

Cat.no. 974
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 16.96
Reconstructed weight (g): 37.69
Height (cm): 2.90
Diameter (cm): 3.30
Hole diameter (cm): 0.60
I (g*cm²): 71.27

XII.7. Northwestern Anatolia

XII.7.1. Demircihüyük

Early Bronze Age 1

Cat.no. 975
Type: spindle whorl
Shape: Type I
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 30.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 976
Type: spindle whorl
Shape: Type II
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 977
Type: spindle whorl
Shape: Type II
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 4.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 978
Type: spindle whorl
Shape: Type II
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 11.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 979
Type: spindle whorl
Shape: Type II
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 980
Type: spindle whorl
Shape: Type II
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 11.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 981
Type: spindle whorl
Shape: Type II
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 13.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 982
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 15.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 983
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 64.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 984
Type: spindle whorl
Shape: Type III
Material: clay

Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 42.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 985
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 49.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 986
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 21.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 987
Type: spindle whorl
Shape: Type IIIa
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 14.82
Height (cm): 1.00
Diameter (cm): 3.65
Hole diameter (cm): –
I (g*cm²): 17.61

Cat.no. 988
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 17.08
Height (cm): 1.30
Diameter (cm): 3.70
Hole diameter (cm): –
I (g*cm²): 19.28

Cat.no. 989
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 9.47
Height (cm): 1.20
Diameter (cm): 3.30
Hole diameter (cm): –
I (g*cm²): 7.84

Cat.no. 990
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 13.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 991
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 9.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 992
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 993
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 994
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.00
Height (cm): –

Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 995
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 4.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 996
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 997
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 9.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 998
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 999
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 14.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1000
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 20.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1001
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 18.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1002
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 10.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1003
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1004
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 25.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1005
Type: spindle whorl

Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 46.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1006
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 11.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1007
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 9.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1008
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 2.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1009
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 11.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1010
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 15.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1011
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 35.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1012
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1013
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 8.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1014
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1015
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density

Reconstructed weight (g): 11.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1016
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 21.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1017
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.00
Height (cm): 2.10
Diameter (cm): 3.50
Hole diameter (cm): –
I (g*cm²): 14.81

Cat.no. 1018
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.00
Height (cm): 2.10
Diameter (cm): 3.50
Hole diameter (cm): –
I (g*cm²): 29.63

Cat.no. 1019
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 5.46
Height (cm): 1.75
Diameter (cm): 1.90
Hole diameter (cm): –
I (g*cm²): 3.12

Cat.no. 1020
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.87
Height (cm): 2.60
Diameter (cm): 2.50
Hole diameter (cm): –
I (g*cm²): 12.44

Cat.no. 1021
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 9.52
Height (cm): 2.20
Diameter (cm): 2.30
Hole diameter (cm): –
I (g*cm²): 7.85

Cat.no. 1022
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.46
Height (cm): 3.00
Diameter (cm): 3.00
Hole diameter (cm): –
I (g*cm²): 33.49

Cat.no. 1023
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.10
Height (cm): 2.50
Diameter (cm): 2.50
Hole diameter (cm): –
I (g*cm²): 11.63

Cat.no. 1024
Type: spindle whorl
Shape: Type VI
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 21.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Early Bronze Age 2

Cat.no. 1025
Type: spindle whorl
Shape: Type I
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 60.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1026
Type: spindle whorl
Shape: Type I
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1027
Type: spindle whorl
Shape: Type I
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1028
Type: spindle whorl
Shape: Type II
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 27.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1029
Type: spindle whorl
Shape: Type II
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 10.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1030
Type: spindle whorl
Shape: Type III
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1031
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 10.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1032
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 11.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1033
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 20.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1034
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 10.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1035
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 29.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1036
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 4.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1037
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 11.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1038
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 15.00
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1039
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 10.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1040
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 20.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1041
Type: spindle whorl
Shape: Type IV
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.50
Height (cm): –
Diameter (cm): –
Hole diameter (cm): –
I (g*cm²): –

Cat.no. 1042
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 33.76
Height (cm): 2.60
Diameter (cm): 3.90
Hole diameter (cm): –
I (g*cm²): 80.98

Cat.no. 1043
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 13.47
Height (cm): 2.00
Diameter (cm): 2.60
Hole diameter (cm): –
I (g*cm²): 15.28

Cat.no. 1044
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 7.61
Height (cm): 1.70
Diameter (cm): 2.20
Hole diameter (cm): –
I (g*cm²): 5.98

Cat.no. 1045
Type: spindle whorl
Shape: Type IVe
Material: clay

Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.51
Height (cm): 2.85
Diameter (cm): 2.75
Hole diameter (cm): –
I (g*cm²): 19.17

XII.7.2. Ilıpınar

Early Bronze Age 1

Cat.no. 1046
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 14.38
Height (cm): 2.00
Diameter (cm): 2.60
Hole diameter (cm): –
I (g*cm²): 8.45

Cat.no. 1047
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 9.18
Height (cm): 1.80
Diameter (cm): 2.40
Hole diameter (cm): –
I (g*cm²): 8.45

Cat.no. 1048
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.89
Height (cm): 1.80
Diameter (cm): 2.20
Hole diameter (cm): –
I (g*cm²): 5.15

Cat.no. 1049
Type: spindle whorl
Shape: Type IVf
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.37
Height (cm): 3.10
Diameter (cm): 2.60
Hole diameter (cm): –
I (g*cm²): 17.05

XII.7.3. Kaklık Mevkii

Early Bronze Age 1

Cat.no. 1050
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 7.11
Height (cm): 1.26
Diameter (cm): 2.25
Hole diameter (cm): –
I (g*cm²): 3.60

Cat.no. 1051
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 51.57
Height (cm): 3.24
Diameter (cm): 3.78
Hole diameter (cm): –
I (g*cm²): 73.69

Cat.no. 1052
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 9.05
Height (cm): 1.80
Diameter (cm): 2.30
Hole diameter (cm): –
I (g*cm²): 7.86

Cat.no. 1053
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 10.73
Height (cm): 2.07
Diameter (cm): 2.50
Hole diameter (cm): –
I (g*cm²): 10.49

Cat.no. 1054
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.34
Height (cm): 1.98
Diameter (cm): 2.50
Hole diameter (cm): –
I (g*cm²): 12.95

Cat.no. 1055
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 3.19
Height (cm): 1.35
Diameter (cm): 1.62
Hole diameter (cm): –
I (g*cm²): 1.35

Cat.no. 1056
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 19.30
Height (cm): 2.34
Diameter (cm): 3.06
Hole diameter (cm): –
I (g*cm²): 28.80

Cat.no. 1057
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.83
Height (cm): 2.16
Diameter (cm): 2.52
Hole diameter (cm): –
I (g*cm²): 13.29

Cat.no. 1058
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 3.68
Height (cm): 1.35
Diameter (cm): 1.62
Hole diameter (cm): –
I (g*cm²): 1.66

Cat.no. 1059
Type: spindle whorl
Shape: Type IVf
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 10.14
Height (cm): 2.70
Diameter (cm): 2.16
Hole diameter (cm): –
I (g*cm²): 7.34

Cat.no. 1060
Type: spindle whorl
Shape: Type IVf
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.42
Height (cm): 2.88
Diameter (cm): 2.52
Hole diameter (cm): –
I (g*cm²): 16.74

XII.7.4. Karaoğlan Mevkii

Early Bronze Age 2

Cat.no. 1061
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 21.06
Height (cm): 2.10
Diameter (cm): 3.00
Hole diameter (cm): –
I (g*cm²): 18.95

Cat.no. 1062
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 35.47
Height (cm): 2.50
Diameter (cm): 3.90
Hole diameter (cm): –
I (g*cm²): 87.86

XII.8. Southwestern Anatolia

XII.8.1. Aphrodisias

Late Chalcolithic

Cat.no. 1063
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 17.69
Height (cm): 0.90
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 31.20

Cat.no. 1064
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 33.87
Height (cm): 1.90
Diameter (cm): 4.00
Hole diameter (cm): –
I (g*cm²): 54.19

Cat.no. 1065
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 33.71
Height (cm): 1.80
Diameter (cm): 4.10
Hole diameter (cm): –
I (g*cm²): 56.66

Cat.no. 1066
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 28.98
Height (cm): 1.90
Diameter (cm): 3.70
Hole diameter (cm): –
I (g*cm²): 39.67

Cat.no. 1067
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 53.09
Height (cm): 3.30
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): 76.66

Cat.no. 1068
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 31.94
Height (cm): 2.80
Diameter (cm): 3.20
Hole diameter (cm): –
I (g*cm²): 32.71

Cat.no. 1069
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 13.34
Height (cm): 1.50
Diameter (cm): 3.60
Hole diameter (cm): –
I (g*cm²): 13.06

Cat.no. 1070
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 22.84
Height (cm): 1.70
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 30.88

Cat.no. 1071
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 19.86
Height (cm): 2.00
Diameter (cm): 3.70
Hole diameter (cm): –
I (g*cm²): 20.67

Cat.no. 1072
Type: spindle whorl
Shape: Type IIIc
Material: clay

Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 27.10
Height (cm): 2.10
Diameter (cm): 4.30
Hole diameter (cm): –
I (g*cm²): 37.92

Cat.no. 1073
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 36.56
Height (cm): 2.90
Diameter (cm): 3.90
Hole diameter (cm): –
I (g*cm²): 86.93

Cat.no. 1074
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 17.77
Height (cm): 2.30
Diameter (cm): 2.90
Hole diameter (cm): –
I (g*cm²): 24.19

Cat.no. 1075
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 32.77
Height (cm): 3.30
Diameter (cm): 3.70
Hole diameter (cm): –
I (g*cm²): 68.23

Cat.no. 1076
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 25.74
Height (cm): 3.20
Diameter (cm): 3.20
Hole diameter (cm): –
I (g*cm²): 40.66

Cat.no. 1077
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.46
Height (cm): 3.00
Diameter (cm): 3.00
Hole diameter (cm): –
I (g*cm²): 33.49

XII.8.2. Bademağacı

Early Bronze Age 1

Cat.no. 1078
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 17.45
Height (cm): 1.80
Diameter (cm): 3.21
Hole diameter (cm): 0.60
I (g*cm²): 17.98

Cat.no. 1079 **Plate 57.a**
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 20.75
Reconstructed weight (g): 20.96
Height (cm): 2.54
Diameter (cm): 2.95
Hole diameter (cm): 0.50
I (g*cm²): 18.24

Cat.no. 1080 **Plate 57.a**
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 9.20
Height (cm): 1.27
Diameter (cm): 2.75
Hole diameter (cm): 0.50
I (g*cm²): 5.57

Cat.no. 1081
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 11.95

Reconstructed weight (g): 12.19
Height (cm): 1.93
Diameter (cm): 2.87
Hole diameter (cm): 0.40
I (g*cm²): 7.64

Cat.no. 1082 **Plate 57.a**
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 30.10
Height (cm): 2.36
Diameter (cm): 4.13
Hole diameter (cm): 0.60
I (g*cm²): 78.83

Cat.no. 1083 **Plate 57.a**
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 14.15
Height (cm): 2.06
Diameter (cm): 2.89
Hole diameter (cm): 0.70
I (g*cm²): 18.57

Cat.no. 1084 **Plate 57.a**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 32.85
Reconstructed weight (g): 41.06
Height (cm): 2.97
Diameter (cm): 3.95
Hole diameter (cm): 0.70
I (g*cm²): 107.21

Cat.no. 1085
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 7.00
Reconstructed weight (g): 7.07
Height (cm): 1.62
Diameter (cm): 2.40
Hole diameter (cm): 0.80
I (g*cm²): 6.61

Cat.no. 1086 **Plate 57.a**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 60.50
Reconstructed weight (g): 86.43
Height (cm): 4.10
Diameter (cm): 4.97
Hole diameter (cm): 0.70
I (g*cm²): 342.86

Cat.no. 1087 **Plate 57.a**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 46.55
Reconstructed weight (g): 49.00
Height (cm): 4.03
Diameter (cm): 4.43
Hole diameter (cm): 0.50
I (g*cm²): 146.82

Cat.no. 1088 **Plate 57.a**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 23.50
Reconstructed weight (g): 23.98
Height (cm): 3.02
Diameter (cm): 3.41
Hole diameter (cm): 0.50
I (g*cm²): 43.92

Cat.no. 1089
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 43.65
Height (cm): 3.45
Diameter (cm): 4.16
Hole diameter (cm): 0.60
I (g*cm²): 120.81

Cat.no. 1090
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 25.10
Reconstructed weight (g): 31.38
Height (cm): 2.99
Diameter (cm): 3.42
Hole diameter (cm): 0.50
I (g*cm²): 59.30

Cat.no. 1091
Type: spindle whorl
Shape: Type IVd

Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 20.75
Reconstructed weight (g): 23.06
Height (cm): 2.93
Diameter (cm): 3.53
Hole diameter (cm): 0.40
I (g*cm²): 43.46

Cat.no. 1092
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 10.40
Reconstructed weight (g): 10.95
Height (cm): 2.38
Diameter (cm): 2.82
Hole diameter (cm): 0.80
I (g*cm²): 13.51

Cat.no. 1093
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 8.30
Reconstructed weight (g): 8.56
Height (cm): 1.93
Diameter (cm): 2.31
Hole diameter (cm): 0.30
I (g*cm²): 6.91

Cat.no. 1094 **Plate 57.a**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 20.15
Height (cm): 2.35
Diameter (cm): 3.07
Hole diameter (cm): 0.50
I (g*cm²): 30.80

Cat.no. 1095
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 9.60
Height (cm): 1.86
Diameter (cm): 2.30
Hole diameter (cm): 0.30
I (g*cm²): 7.78

Cat.no. 1096
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 54.25
Reconstructed weight (g): 55.36
Height (cm): 3.92
Diameter (cm): 4.17
Hole diameter (cm): 0.50
I (g*cm²): 147.25

Cat.no. 1097 **Plate 57.a**
Type: spindle whorl
Shape: Type Vd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 37.15
Height (cm): 3.45
Diameter (cm): 3.68
Hole diameter (cm): 0.50
I (g*cm²): 82.84

Cat.no. 1098 **Plate 57.a**
Type: spindle whorl
Shape: Type Vd
Decoration: individual
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 15.10
Reconstructed weight (g): 17.76
Height (cm): 2.53
Diameter (cm): 2.90
Hole diameter (cm): 0.60
I (g*cm²): 23.28

Early Bronze Age 2

Cat.no. 1099
Type: loom weight
Shape: Type IIIA
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 387.50
Height (cm): 10.65
Diameter (cm): 6.92 × 7.65 (base)
Hole diameter (cm): 0.70

Cat.no. 1100
Type: spindle whorl
Shape: Type Ib
Material: stone?clay?
Preservation condition (%): 100

Weight: measured, complete
Original weight (g): 4.80
Height (cm): 0.94
Diameter (cm): 2.07
Hole diameter (cm): 0.40
I (g*cm²): 2.06

Cat.no. 1101
Type: spindle whorl
Shape: Type Ib
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 7.05
Height (cm): 1.31
Diameter (cm): 2.88
Hole diameter (cm): 0.30
I (g*cm²): 5.85

Cat.no. 1102 **Plate 57.b**
Type: spindle whorl
Shape: Type Ic
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 57.50
Height (cm): 3.16
Diameter (cm): 4.89
Hole diameter (cm): 0.80
I (g*cm²): 137.49

Cat.no. 1103
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 38.35
Reconstructed weight (g): 51.13
Height (cm): 2.38
Diameter (cm): 4.41
Hole diameter (cm): 0.80
I (g*cm²): 99.44

Cat.no. 1104
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 37.20
Reconstructed weight (g): 49.60
Height (cm): 2.62
Diameter (cm): 4.72
Hole diameter (cm): 0.90
I (g*cm²): 110.50

Cat.no. 1105
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 35.00
Reconstructed weight (g): 35.35
Height (cm): 2.09
Diameter (cm): 4.08
Hole diameter (cm): 0.50
I (g*cm²): 58.85

Cat.no. 1106
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 11.40
Height (cm): 1.61
Diameter (cm): 2.99
Hole diameter (cm): 0.70
I (g*cm²): 10.19

Cat.no. 1107
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 6.85
Height (cm): 1.50
Diameter (cm): 2.21
Hole diameter (cm): 0.40
I (g*cm²): 3.35

Cat.no. 1108 **Plate 57.b**
Type: spindle whorl
Shape: Type II
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 37.85
Height (cm): 3.48
Diameter (cm): 3.20
Hole diameter (cm): 0.40
I (g*cm²): 38.76

Cat.no. 1109 **Plate 57.b**
Type: spindle whorl
Shape: Type IIa
Decoration: Type 11
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 34.25
Reconstructed weight (g): 57.08
Height (cm): 3.70
Diameter (cm): 4.21
Hole diameter (cm): 0.50
I (g*cm²): 101.18

Cat.no. 1110
Type: spindle whorl

Shape: Type IIa
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 9.85
Reconstructed weight (g): 9.95
Height (cm): 2.07
Diameter (cm): 2.26
Hole diameter (cm): 0.30
I (g*cm²): 5.08

Cat.no. 1111
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 13.30
Reconstructed weight (g): 16.63
Height (cm): 2.28
Diameter (cm): 2.69
Hole diameter (cm): 0.60
I (g*cm²): 12.03

Cat.no. 1112
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 28.30
Reconstructed weight (g): 29.18
Height (cm): 3.03
Diameter (cm): 3.33
Hole diameter (cm): 0.40
I (g*cm²): 32.35

Cat.no. 1113 **Plate 57.b**
Type: spindle whorl
Shape: Type IIb
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 15.35
Height (cm): 2.61
Diameter (cm): 2.64
Hole diameter (cm): 0.40
I (g*cm²): 10.70

Cat.no. 1114
Type: spindle whorl
Shape: Type IIb
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 40.20
Height (cm): 3.47
Diameter (cm): 3.73
Hole diameter (cm): 0.50
I (g*cm²): 55.93

Cat.no. 1115
Type: spindle whorl
Shape: Type IIb
Decoration: individual
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 37.00
Reconstructed weight (g): 41.11
Height (cm): 3.28
Diameter (cm): 3.45
Hole diameter (cm): 0.50
I (g*cm²): 48.93

Cat.no. 1116
Type: spindle whorl
Shape: Type IIb
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 20.30
Reconstructed weight (g): 40.60
Height (cm): 3.50
Diameter (cm): 3.72
Hole diameter (cm): 0.40
I (g*cm²): 56.18

Cat.no. 1117
Type: spindle whorl
Shape: Type IIb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 33.20
Height (cm): 3.10
Diameter (cm): 3.24
Hole diameter (cm): 0.50
I (g*cm²): 34.85

Cat.no. 1118 **Plate 57.b**
Type: spindle whorl
Shape: Type IIb
Decoration: individual
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 17.05
Reconstructed weight (g): 17.40
Height (cm): 2.55
Diameter (cm): 2.73
Hole diameter (cm): 0.50
I (g*cm²): 12.97

Cat.no. 1119
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 9.70
Reconstructed weight (g): 12.13
Height (cm): 1.77

Diameter (cm): 2.93
Hole diameter (cm): 0.50
I (g*cm²): 7.90

Cat.no. 1120
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 6.10
Reconstructed weight (g): 6.22
Height (cm): 1.35
Diameter (cm): 2.52
Hole diameter (cm): 0.30
I (g*cm²): 3.06

Cat.no. 1121 **Plate 57.b**
Type: spindle whorl
Shape: Type IVa
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 6.30
Height (cm): 1.07
Diameter (cm): 2.72
Hole diameter (cm): 0.50
I (g*cm²): 7.18

Cat.no. 1122
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 19.95
Reconstructed weight (g): 21.00
Height (cm): 2.10
Diameter (cm): 3.69
Hole diameter (cm): 0.80
I (g*cm²): 45.10

Cat.no. 1123 **Plate 57.b**
Type: spindle whorl
Shape: Type IVb
Decoration: Type 13
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 26.80
Reconstructed weight (g): 27.35
Height (cm): 1.97
Diameter (cm): 3.88
Hole diameter (cm): 0.60
I (g*cm²): 63.94

Cat.no. 1124 **Plate 58**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 22.00
Height (cm): 2.43
Diameter (cm): 3.37
Hole diameter (cm): 0.50
I (g*cm²): 42.82

Cat.no. 1125 **Plate 58**
Type: spindle whorl
Shape: Type IVc
Decoration: Type 9
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 14.20
Height (cm): 2.04
Diameter (cm): 2.87
Hole diameter (cm): 0.90
I (g*cm²): 18.82

Cat.no. 1126
Type: spindle whorl
Shape: Type IVc
Decoration: Type 9
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 37.20
Reconstructed weight (g): 38.35
Height (cm): 2.97
Diameter (cm): 4.01
Hole diameter (cm): 0.60
I (g*cm²): 94.08

Cat.no. 1127 **Plate 58**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 55
Weight: measured, reconstructed
Original weight (g): 20.25
Reconstructed weight (g): 36.82
Height (cm): 2.73
Diameter (cm): 4.42
Hole diameter (cm): 0.70
I (g*cm²): 115.15

Cat.no. 1128
Type: spindle whorl
Shape: Type IVc
Decoration: Type 12
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 18.40
Reconstructed weight (g): 36.80
Height (cm): 2.92
Diameter (cm): 3.85
Hole diameter (cm): 0.70
I (g*cm²): 88.34

Cat.no. 1129
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 85
Weight: measured, reconstructed
Original weight (g): 34.00
Reconstructed weight (g): 40.00
Height (cm): 2.83
Diameter (cm): 4.09
Hole diameter (cm): 0.70
I (g*cm²): 105.98

Cat.no. 1130
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 24.20
Reconstructed weight (g): 25.47
Height (cm): 2.81
Diameter (cm): 3.73
Hole diameter (cm): 0.40
I (g*cm²): 54.58

Cat.no. 1131
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 11.90
Height (cm): 2.00
Diameter (cm): 2.85
Hole diameter (cm): 0.80
I (g*cm²): 15.23

Cat.no. 1132
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 22.45
Height (cm): 2.29
Diameter (cm): 3.20
Hole diameter (cm): 0.50
I (g*cm²): 36.38

Cat.no. 1133
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 8.75
Reconstructed weight (g): 9.72
Height (cm): 1.88
Diameter (cm): 2.71
Hole diameter (cm): 0.40
I (g*cm²): 10.86

Plate 58

Cat.no. 1134
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 35.25
Reconstructed weight (g): 36.34
Height (cm): 2.55
Diameter (cm): 3.98
Hole diameter (cm): 0.60
I (g*cm²): 90.62

Cat.no. 1135
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 35.05
Reconstructed weight (g): 38.94
Height (cm): 3.15
Diameter (cm): 4.24
Hole diameter (cm): 0.50
I (g*cm²): 107.97

Cat.no. 1136
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 14.95
Reconstructed weight (g): 29.90
Height (cm): 2.78
Diameter (cm): 3.71
Hole diameter (cm): 0.50
I (g*cm²): 62.88

Cat.no. 1137
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 60
Weight: measured, reconstructed
Original weight (g): 15.30
Reconstructed weight (g): 25.50
Height (cm): 2.52
Diameter (cm): 3.59
Hole diameter (cm): 0.70
I (g*cm²): 54.78

Cat.no. 1138
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 23.50
Reconstructed weight (g): 23.74

Height (cm): 2.58
Diameter (cm): 3.43
Hole diameter (cm): 0.50
I (g*cm²): 43.38

Cat.no. 1139 **Plate 58**
Type: spindle whorl
Shape: Type IVc
Decoration: individual
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 10.65
Reconstructed weight (g): 10.98
Height (cm): 1.98
Diameter (cm): 2.82
Hole diameter (cm): 0.60
I (g*cm²): 14.17

Cat.no. 1140
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 23.40
Reconstructed weight (g): 23.88
Height (cm): 2.55
Diameter (cm): 3.55
Hole diameter (cm): 0.60
I (g*cm²): 46.49

Cat.no. 1141
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 5.05
Reconstructed weight (g): 5.10
Height (cm): 1.51
Diameter (cm): 2.07
Hole diameter (cm): 0.70
I (g*cm²): 3.46

Cat.no. 1142
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 36.55
Reconstructed weight (g): 36.92
Height (cm): 2.88
Diameter (cm): 4.31
Hole diameter (cm): 0.50
I (g*cm²): 104.37

Cat.no. 1143 **Plate 58**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 40.00
Height (cm): 3.23
Diameter (cm): 3.87
Hole diameter (cm): 0.60
I (g*cm²): 93.59

Cat.no. 1144 **Plate 58**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 11.35
Height (cm): 2.36
Diameter (cm): 2.53
Hole diameter (cm): 0.90
I (g*cm²): 12.47

Cat.no. 1145 **Plate 58**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 71.30
Height (cm): 4.11
Diameter (cm): 4.99
Hole diameter (cm): 0.60
I (g*cm²): 278.64

Cat.no. 1146 **Plate 58**
Type: spindle whorl
Shape: Type IVd
Decoration: Type 9
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 28.10
Reconstructed weight (g): 28.67
Height (cm): 2.97
Diameter (cm): 3.65
Hole diameter (cm): 0.60
I (g*cm²): 61.06

Cat.no. 1147
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 27.95
Reconstructed weight (g): 31.06
Height (cm): 3.20
Diameter (cm): 3.58
Hole diameter (cm): 0.60
I (g*cm²): 62.14

Cat.no. 1148
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 18.25
Height (cm): 2.43
Diameter (cm): 3.06
Hole diameter (cm): 0.50
I (g*cm²): 27.34

Cat.no. 1149 **Plate 58**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 14.70
Height (cm): 2.21
Diameter (cm): 2.67
Hole diameter (cm): 0.60
I (g*cm²): 16.65

Cat.no. 1150 **Plate 58**
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 51.80
Reconstructed weight (g): 57.56
Height (cm): 3.93
Diameter (cm): 4.32
Hole diameter (cm): 0.60
I (g*cm²): 165.99

Cat.no. 1151 **Plate 58**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 30.35
Reconstructed weight (g): 33.72
Height (cm): 3.30
Diameter (cm): 3.55
Hole diameter (cm): 0.50
I (g*cm²): –

Cat.no. 1152
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 55.00
Reconstructed weight (g): 55.56
Height (cm): 3.81
Diameter (cm): 4.62
Hole diameter (cm): 0.50
I (g*cm²): 183.40

Cat.no. 1153
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 52.90
Reconstructed weight (g): 53.98
Height (cm): 3.73
Diameter (cm): 4.52
Hole diameter (cm): 0.50
I (g*cm²): 172.02

Cat.no. 1154
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 50
Weight: measured, reconstructed
Original weight (g): 28.30
Reconstructed weight (g): 56.60
Height (cm): 4.16
Diameter (cm): 4.57
Hole diameter (cm): –
I (g*cm²): 182.89

Cat.no. 1155 **Plate 58**
Type: spindle whorl
Shape: Type IVd
Decoration: Type 15
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 33.55
Reconstructed weight (g): 44.73
Height (cm): 3.32
Diameter (cm): 4.15
Hole diameter (cm): 0.70
I (g*cm²): 126.59

Cat.no. 1156
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 25.20
Reconstructed weight (g): 36.00
Height (cm): 3.14
Diameter (cm): 3.55
Hole diameter (cm): 0.60
I (g*cm²): 72.04

Cat.no. 1157 **Plate 58**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 45
Weight: measured, reconstructed
Original weight (g): 22.80

Reconstructed weight (g): 50.67
Height (cm): 3.39
Diameter (cm): 4.11
Hole diameter (cm): 0.50
I (g*cm²): 132.59

Cat.no. 1158
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 20.80
Reconstructed weight (g): 21.22
Height (cm): 2.87
Diameter (cm): 3.16
Hole diameter (cm): 0.80
I (g*cm²): 33.99

Cat.no. 1159 **Plate 59**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 70
Weight: measured, reconstructed
Original weight (g): 23.60
Reconstructed weight (g): 33.71
Height (cm): 3.03
Diameter (cm): 3.65
Hole diameter (cm): 0.70
I (g*cm²): 70.95

Cat.no. 1160
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 45.75
Reconstructed weight (g): 47.16
Height (cm): 3.73
Diameter (cm): 4.31
Hole diameter (cm): 0.60
I (g*cm²): 137.21

Cat.no. 1161 **Plate 59**
Type: spindle whorl
Shape: Type IVd
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 42.10
Height (cm): 3.33
Diameter (cm): 4.13
Hole diameter (cm): 0.60
I (g*cm²): 111.66

Cat.no. 1162
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 43.70
Reconstructed weight (g): 48.56
Height (cm): 3.47
Diameter (cm): 4.46
Hole diameter (cm): 0.50
I (g*cm²): 146.54

Cat.no. 1163
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 80
Weight: measured, reconstructed
Original weight (g): 28.40
Reconstructed weight (g): 35.50
Height (cm): 3.30
Diameter (cm): 3.66
Hole diameter (cm): 0.50
I (g*cm²): 73.19

Cat.no. 1164
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 4.40
Height (cm): 1.69
Diameter (cm): 1.92
Hole diameter (cm): 0.30
I (g*cm²): 2.47

Cat.no. 1165
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 9.45
Height (cm): 2.07
Diameter (cm): 2.53
Hole diameter (cm): 0.70
I (g*cm²): 12.10

Cat.no. 1166
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 44.45
Reconstructed weight (g): 46.79
Height (cm): 3.49
Diameter (cm): 4.26
Hole diameter (cm): 0.50
I (g*cm²): 131.21

Cat.no. 1167
Type: spindle whorl

Shape: Type IVd
Material: clay
Preservation condition (%): 95
Weight: measured, reconstructed
Original weight (g): 16.10
Reconstructed weight (g): 16.95
Height (cm): 2.46
Diameter (cm): 3.05
Hole diameter (cm): 0.80
I (g*cm²): 24.83

Cat.no. 1168
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 24.50
Reconstructed weight (g): 25.00
Height (cm): 2.89
Diameter (cm): 3.20
Hole diameter (cm): 0.40
I (g*cm²): 39.55

Cat.no. 1169
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 11.85
Height (cm): 2.16
Diameter (cm): 2.52
Hole diameter (cm): 0.30
I (g*cm²): 11.61

Cat.no. 1170 **Plate 59**
Type: spindle whorl
Shape: Type IVe
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 42.05
Height (cm): 3.58
Diameter (cm): 3.80
Hole diameter (cm): 0.50
I (g*cm²): 93.75

Cat.no. 1171
Type: spindle whorl
Shape: Type IVe
Decoration: individual
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 37.30
Reconstructed weight (g): 41.44
Height (cm): 4.07
Diameter (cm): 4.07
Hole diameter (cm): 0.60
I (g*cm²): 105.45

Cat.no. 1172 **Plate 59**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 57.25
Height (cm): 4.15
Diameter (cm): 4.35
Hole diameter (cm): 0.50
I (g*cm²): 168.50

Cat.no. 1173 **Plate 59**
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 33.45
Reconstructed weight (g): 33.79
Height (cm): 3.30
Diameter (cm): 3.45
Hole diameter (cm): 0.50
I (g*cm²): 61.34

Cat.no. 1174
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 51.30
Reconstructed weight (g): 57.00
Height (cm): 4.26
Diameter (cm): 4.49
Hole diameter (cm): 0.70
I (g*cm²): 185.03

Cat.no. 1175
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed
Original weight (g): 50.05
Reconstructed weight (g): 51.60
Height (cm): 4.08
Diameter (cm): 4.09
Hole diameter (cm): 0.40
I (g*cm²): 132.18

Cat.no. 1176
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 90
Weight: measured, reconstructed
Original weight (g): 21.05
Reconstructed weight (g): 23.39
Height (cm): 3.02
Diameter (cm): 3.14
Hole diameter (cm): 0.60
I (g*cm²): 36.78

Cat.no. 1177
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 26.40
Reconstructed weight (g): 26.94
Height (cm): 3.10
Diameter (cm): 3.28
Hole diameter (cm): 0.50
I (g*cm²): 44.80

Cat.no. 1178 **Plate 59**
Type: spindle whorl
Shape: Type IVe
Decoration: individual
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 9.20
Height (cm): 2.15
Diameter (cm): 2.11
Hole diameter (cm): 0.40
I (g*cm²): 6.96

Cat.no. 1179
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 23.65
Height (cm): 3.19
Diameter (cm): 3.16
Hole diameter (cm): 0.40
I (g*cm²): 36.69

Cat.no. 1180
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): 99
Weight: measured, reconstructed
Original weight (g): 35.35
Reconstructed weight (g): 35.71
Height (cm): 3.84
Diameter (cm): 3.85
Hole diameter (cm): 0.60
I (g*cm²): 83.47

Cat.no. 1181 **Plate 59**
Type: spindle whorl
Shape: Type IVe
Decoration: individual
Material: clay
Preservation condition (%): 75
Weight: measured, reconstructed
Original weight (g): 44.35
Reconstructed weight (g): 59.13
Height (cm): 4.03
Diameter (cm): 4.10
Hole diameter (cm): 0.50
I (g*cm²): 152.36

Cat.no. 1182 **Plate 59**
Type: spindle whorl
Shape: Type IVe
Decoration: Type 12
Material: clay
Preservation condition (%): 25
Weight: measured, reconstructed
Original weight (g): 9.40
Reconstructed weight (g): 37.60
Height (cm): 3.00
Diameter (cm): 2.71
Hole diameter (cm): –
I (g*cm²): 41.42

Cat.no. 1183 **Plate 59**
Type: spindle whorl
Shape: Type IVf
Decoration: individual
Material: clay
Preservation condition (%): 92
Weight: measured, reconstructed
Original weight (g): 37.65
Reconstructed weight (g): 40.92
Height (cm): 4.51
Diameter (cm): 3.04
Hole diameter (cm): 0.50
I (g*cm²): 59.38

Cat.no. 1184
Type: spindle whorl
Shape: Type IVf
Material: clay
Preservation condition (%): 98
Weight: measured, reconstructed
Original weight (g): 9.00
Reconstructed weight (g): 9.18
Height (cm): 2.74
Diameter (cm): 2.02
Hole diameter (cm): 0.50
I (g*cm²): 5.62

Cat.no. 1185
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 7.90
Height (cm): 1.57
Diameter (cm): 2.84
Hole diameter (cm): 0.40
I (g*cm²): 9.67

Cat.no. 1186 **Plate 59**
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 97
Weight: measured, reconstructed

Original weight (g): 26.70
Reconstructed weight (g): 27.53
Height (cm): 2.93
Diameter (cm): 3.56
Hole diameter (cm): 0.50
I (g*cm²): 53.45

Cat.no. 1187
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 3.10
Height (cm): 1.33
Diameter (cm): 1.65
Hole diameter (cm): 0.50
I (g*cm²): 1.34

Cat.no. 1188
Type: spindle whorl
Shape: Type Vc
Material: clay
Preservation condition (%): 100
Weight: measured, complete
Original weight (g): 11.05
Height (cm): 2.10
Diameter (cm): 2.45
Hole diameter (cm): 0.40
I (g*cm²): 10.03

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Cat.no. 1189
Type: spindle whorl
Shape: Type IVa
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.57
Height (cm): 1.10
Diameter (cm): 2.80
Hole diameter (cm): –
I (g*cm²): 7.89

Cat.no. 1190
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 9.93
Height (cm): 1.30
Diameter (cm): 3.10
Hole diameter (cm): –
I (g*cm²): 14.76

Cat.no. 1191
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 10.96
Height (cm): 1.80
Diameter (cm): 2.90
Hole diameter (cm): –
I (g*cm²): 14.01

Early Bronze Age 1

Cat.no. 1192
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 10.61
Height (cm): 2.10
Diameter (cm): 2.60
Hole diameter (cm): –
I (g*cm²): 10.96

Cat.no. 1193
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 10.15
Height (cm): 2.10
Diameter (cm): 2.60
Hole diameter (cm): –
I (g*cm²): 10.42

Cat.no. 1194
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 24.93
Height (cm): 3.00
Diameter (cm): 3.40
Hole diameter (cm): –
I (g*cm²): 43.77

Cat.no. 1195
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 20.21
Height (cm): 2.90
Diameter (cm): 3.00
Hole diameter (cm): –
I (g*cm²): 27.97

Cat.no. 1196
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 13.94
Height (cm): 2.70
Diameter (cm): 2.70
Hole diameter (cm): –
I (g*cm²): 15.41

Cat.no. 1197
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 15.25
Height (cm): 2.60
Diameter (cm): 2.70
Hole diameter (cm): –
I (g*cm²): 17.25

Early Bronze Age 2

Cat.no. 1198
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 26.51
Height (cm): 1.80
Diameter (cm): 4.00
Hole diameter (cm): –
I (g*cm²): 68.71

Cat.no. 1199
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 35.79
Height (cm): 2.40
Diameter (cm): 4.40
Hole diameter (cm): –
I (g*cm²): 106.44

Cat.no. 1200
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 38.98
Height (cm): 2.90
Diameter (cm): 4.40
Hole diameter (cm): –
I (g*cm²): 114.13

Cat.no. 1201
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.62
Height (cm): 2.40
Diameter (cm): 3.40
Hole diameter (cm): –
I (g*cm²): 43.03

Cat.no. 1202
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 30.74
Height (cm): 2.70
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): 68.53

Cat.no. 1203
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 36.11
Height (cm): 3.00
Diameter (cm): 4.00
Hole diameter (cm): –
I (g*cm²): 88.37

Cat.no. 1204
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 44.77
Height (cm): 3.10

Diameter (cm): 4.10
Hole diameter (cm): –
I (g*cm²): 118.95

Cat.no. 1205
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 14.19
Height (cm): 2.10
Diameter (cm): 2.80
Hole diameter (cm): –
I (g*cm²): 17.60

Cat.no. 1206
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 38.57
Height (cm): 2.80
Diameter (cm): 3.90
Hole diameter (cm): –
I (g*cm²): 94.43

Cat.no. 1207
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 26.33
Height (cm): 2.20
Diameter (cm): 3.70
Hole diameter (cm): –
I (g*cm²): 57.30

Cat.no. 1208
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 40.86
Height (cm): 3.30
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 109.15

Cat.no. 1209
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 32.24
Height (cm): 3.10
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): 70.72

Cat.no. 1210
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 47.66
Height (cm): 3.30
Diameter (cm): 4.10
Hole diameter (cm): –
I (g*cm²): 126.62

Cat.no. 1211
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 26.91
Height (cm): 2.70
Diameter (cm): 3.50
Hole diameter (cm): –
I (g*cm²): 51.27

Cat.no. 1212
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 41.30
Height (cm): 3.20
Diameter (cm): 4.10
Hole diameter (cm): –
I (g*cm²): 106.59

Cat.no. 1213
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 41.87
Height (cm): 3.10
Diameter (cm): 4.00
Hole diameter (cm): –
I (g*cm²): 105.31

Cat.no. 1214
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 38.57
Height (cm): 3.00
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): 89.08

Cat.no. 1215
Type: spindle whorl
Shape: Type IVd

Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 39.45
Height (cm): 3.40
Diameter (cm): 3.70
Hole diameter (cm): –
I (g*cm²): 84.98

Cat.no. 1216
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 29.19
Height (cm): 3.00
Diameter (cm): 3.30
Hole diameter (cm): –
I (g*cm²): 50.92

Cat.no. 1217
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.06
Height (cm): 2.70
Diameter (cm): 3.10
Hole diameter (cm): –
I (g*cm²): 35.42

Cat.no. 1218
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 17.31
Height (cm): 2.30
Diameter (cm): 3.00
Hole diameter (cm): –
I (g*cm²): 24.41

Cat.no. 1219
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 47.28
Height (cm): 3.50
Diameter (cm): 4.00
Hole diameter (cm): –
I (g*cm²): 118.89

Cat.no. 1220
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 40.12
Height (cm): 3.00
Diameter (cm): 3.90
Hole diameter (cm): –
I (g*cm²): 97.19

Cat.no. 1221
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 36.74
Height (cm): 3.20
Diameter (cm): 3.60
Hole diameter (cm): –
I (g*cm²): 76.02

Cat.no. 1222
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 24.81
Height (cm): 2.80
Diameter (cm): 3.10
Hole diameter (cm): –
I (g*cm²): 38.66

Cat.no. 1223
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 27.08
Height (cm): 3.20
Diameter (cm): 3.30
Hole diameter (cm): –
I (g*cm²): 45.38

Cat.no. 1224
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 40.87
Height (cm): 3.70
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): 90.54

Cat.no. 1225
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 21.26

Height (cm): 3.10
Diameter (cm): 2.90
Hole diameter (cm): –
I (g*cm²): 27.83

Cat.no. 1226
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 26.95
Height (cm): 3.10
Diameter (cm): 2.90
Hole diameter (cm): –
I (g*cm²): 38.78

Early Bronze Age 3

Cat.no. 1227
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 35.65
Height (cm): 2.00
Diameter (cm): 4.00
Hole diameter (cm): –
I (g*cm²): 57.04

Cat.no. 1228
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.23
Height (cm): 1.40
Diameter (cm): 2.80
Hole diameter (cm): –
I (g*cm²): 9.59

Cat.no. 1229
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 17.80
Height (cm): 1.90
Diameter (cm): 2.90
Hole diameter (cm): –
I (g*cm²): 14.97

Cat.no. 1230
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 11.66
Height (cm): 1.70
Diameter (cm): 2.90
Hole diameter (cm): –
I (g*cm²): 7.63

Cat.no. 1231
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.62
Height (cm): 1.40
Diameter (cm): 2.50
Hole diameter (cm): –
I (g*cm²): 3.17

Cat.no. 1232
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 32.66
Height (cm): 2.40
Diameter (cm): 4.30
Hole diameter (cm): –
I (g*cm²): 46.01

Cat.no. 1233
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 8.45
Height (cm): 1.40
Diameter (cm): 2.60
Hole diameter (cm): –
I (g*cm²): 9.14

Cat.no. 1234
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 42.41
Height (cm): 2.80
Diameter (cm): 4.30
Hole diameter (cm): –
I (g*cm²): 122.20

Cat.no. 1235
Type: spindle whorl
Shape: Type IVd
Material: clay

Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 22.07
Height (cm): 2.40
Diameter (cm): 3.10
Hole diameter (cm): –
I (g*cm²): 34.93

Cat.no. 1236
Type: spindle whorl
Shape: Type Va
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 58.09
Height (cm): 2.50
Diameter (cm): 5.40
Hole diameter (cm): –
I (g*cm²): 278.62

Cat.no. 1237
Type: spindle whorl
Shape: Type Va
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 75.15
Height (cm): 2.90
Diameter (cm): 5.50
Hole diameter (cm): –
I (g*cm²): 401.12

Cat.no. 1238
Type: spindle whorl
Shape: Type Va
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 35.90
Height (cm): 2.10
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 119.38

Cat.no. 1239
Type: spindle whorl
Shape: Type Va
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 45.28
Height (cm): 2.40
Diameter (cm): 4.60
Hole diameter (cm): –
I (g*cm²): 181.37

Cat.no. 1240
Type: spindle whorl
Shape: Type Va
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 26.51
Height (cm): 2.10
Diameter (cm): 4.00
Hole diameter (cm): –
I (g*cm²): 83.94

Cat.no. 1241
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 47.64
Height (cm): 2.60
Diameter (cm): 4.40
Hole diameter (cm): –
I (g*cm²): 172.70

Cat.no. 1242
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 38.72
Height (cm): 2.70
Diameter (cm): 4.10
Hole diameter (cm): –
I (g*cm²): 107.42

XII.8.4. Çine Tepecik

Early Bronze Age 1

Cat.no. 1243
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 13.34
Height (cm): 1.60
Diameter (cm): 3.20
Hole diameter (cm): –
I (g*cm²): 10.63

Cat.no. 1244
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 14.97
Height (cm): 2.00

Diameter (cm): 3.20
Hole diameter (cm): –
I (g*cm²): 23.34

Cat.no. 1245
Type: spindle whorl
Shape: Type Vb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 22.80
Height (cm): 2.10
Diameter (cm): 3.50
Hole diameter (cm): –
I (g*cm²): 56.29

XII.8.5. Karataş

Late Chalcolithic

Cat.no. 1246
Type: spindle whorl
Shape: Type IIa
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.42
Height (cm): 2.50
Diameter (cm): 2.90
Hole diameter (cm): –
I (g*cm²): 19.70

Cat.no. 1247
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 7.00
Height (cm): 1.30
Diameter (cm): 2.70
Hole diameter (cm): –
I (g*cm²): 3.89

Cat.no. 1248
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.39
Height (cm): 1.80
Diameter (cm): 2.60
Hole diameter (cm): –
I (g*cm²): 7.11

Cat.no. 1249
Type: spindle whorl
Shape: Type IIId
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 7.93
Height (cm): 1.70
Diameter (cm): 2.10
Hole diameter (cm): –
I (g*cm²): 3.03

Cat.no. 1250
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 26.89
Height (cm): 2.10
Diameter (cm): 3.30
Hole diameter (cm): –
I (g*cm²): 54.20

Cat.no. 1251
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 16.22
Height (cm): 2.10
Diameter (cm): 2.90
Hole diameter (cm): –
I (g*cm²): 22.09

Cat.no. 1252
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 11.22
Height (cm): 1.80
Diameter (cm): 2.50
Hole diameter (cm): –
I (g*cm²): 11.77

Cat.no. 1253
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 11.73
Height (cm): 1.90
Diameter (cm): 2.40
Hole diameter (cm): –
I (g*cm²): 11.79

Cat.no. 1254
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.69
Height (cm): 1.60
Diameter (cm): 2.10
Hole diameter (cm): –
I (g*cm²): 4.84

Cat.no. 1255
Type: spindle whorl
Shape: Type VId
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 5.24
Height (cm): 2.40
Diameter (cm): 1.40
Hole diameter (cm): –
I (g*cm²): –

Early Bronze Age 1

Cat.no. 1256
Type: spindle whorl
Shape: Type Ic
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 49.13
Height (cm): 2.50
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 86.66

Cat.no. 1257
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 8.20
Height (cm): 1.90
Diameter (cm): 2.50
Hole diameter (cm): –
I (g*cm²): 7.75

Early Bronze Age 2

Cat.no. 1258
Type: spindle whorl
Shape: Type Id
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 15.81
Height (cm): 2.10
Diameter (cm): 2.60
Hole diameter (cm): –
I (g*cm²): 10.69

Cat.no. 1259
Type: spindle whorl
Shape: Type IIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 30.08
Height (cm): 3.00
Diameter (cm): 3.00
Hole diameter (cm): –
I (g*cm²): 27.07

Cat.no. 1260
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 26.19
Height (cm): 2.10
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): 59.87

Cat.no. 1261
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.18
Height (cm): 1.10
Diameter (cm): 2.70
Hole diameter (cm): –
I (g*cm²): 6.93

Cat.no. 1262
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 37.66
Height (cm): 2.70
Diameter (cm): 3.80
Hole diameter (cm): –
I (g*cm²): 89.94

Cat.no. 1263
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 19.50
Height (cm): 2.20
Diameter (cm): 3.10
Hole diameter (cm): –
I (g*cm²): 30.37

Cat.no. 1264
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 19.50
Height (cm): 2.40
Diameter (cm): 3.00
Hole diameter (cm): –
I (g*cm²): 28.23

Cat.no. 1265
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 59.91
Height (cm): 3.30
Diameter (cm): 4.20
Hole diameter (cm): –
I (g*cm²): 180.32

Cat.no. 1266
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 24.83
Height (cm): 2.70
Diameter (cm): 3.40
Hole diameter (cm): –
I (g*cm²): 44.41

Cat.no. 1267
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 24.08
Height (cm): 2.50
Diameter (cm): 3.20
Hole diameter (cm): –
I (g*cm²): 40.30

Cat.no. 1268
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 47.07
Height (cm): 3.80
Diameter (cm): 4.00
Hole diameter (cm): –
I (g*cm²): 115.83

Cat.no. 1269
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 12.16
Height (cm): 2.30
Diameter (cm): 2.30
Hole diameter (cm): –
I (g*cm²): 10.81

Cat.no. 1270
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 9.40
Height (cm): 2.10
Diameter (cm): 2.20
Hole diameter (cm): –
I (g*cm²): 7.39

Early Bronze Age 3

Cat.no. 1271
Type: spindle whorl
Shape: Type IVb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 19.46
Height (cm): 1.90
Diameter (cm): 3.70
Hole diameter (cm): –
I (g*cm²): 40.71

Cat.no. 1272
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 36.11
Height (cm): 2.70
Diameter (cm): 3.90
Hole diameter (cm): –
I (g*cm²): 87.47

Cat.no. 1273
Type: spindle whorl
Shape: Type IVd
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 41.66
Height (cm): 3.00
Diameter (cm): 3.60
Hole diameter (cm): –
I (g*cm²): 94.22

XII.8.6. Hacılar Höyük

Early Bronze Age 1

Cat.no. 1274
Type: spindle whorl
Shape: Type Ia
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 71.27
Height (cm): 1.40
Diameter (cm): 6.76
Hole diameter (cm): –
I (g*cm²): 325.70

Cat.no. 1275
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 7.13
Height (cm): 0.90
Diameter (cm): 3.10
Hole diameter (cm): –
I (g*cm²): 5.35

Cat.no. 1276
Type: spindle whorl
Shape: Type IIIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 6.42
Height (cm): 0.90
Diameter (cm): 2.90
Hole diameter (cm): –
I (g*cm²): 4.25

Cat.no. 1277
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 69.51
Height (cm): 2.90
Diameter (cm): 5.40
Hole diameter (cm): –
I (g*cm²): 158.08

Cat.no. 1278
Type: spindle whorl
Shape: Type IIIc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 68.30
Height (cm): 3.00
Diameter (cm): 5.30
Hole diameter (cm): –
I (g*cm²): 149.07

XII.8.7. Kuruçay Höyük

Late Chalcolithic

Cat.no. 1279
Type: spindle whorl
Shape: Type IIb
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 23.58
Height (cm): 2.70
Diameter (cm): 2.80
Hole diameter (cm): –
I (g*cm²): 18.49

Cat.no. 1280
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 18.79
Height (cm): 2.20
Diameter (cm): 3.10
Hole diameter (cm): –
I (g*cm²): 28.86

Cat.no. 1281
Type: spindle whorl
Shape: Type IVc
Material: clay

Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 17.93
Height (cm): 2.10
Diameter (cm): 3.10
Hole diameter (cm): –
I (g*cm²): 27.55

Early Bronze Age 1

Cat.no. 1282
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 13.62
Height (cm): 2.10
Diameter (cm): 2.80
Hole diameter (cm): –
I (g*cm²): 16.68

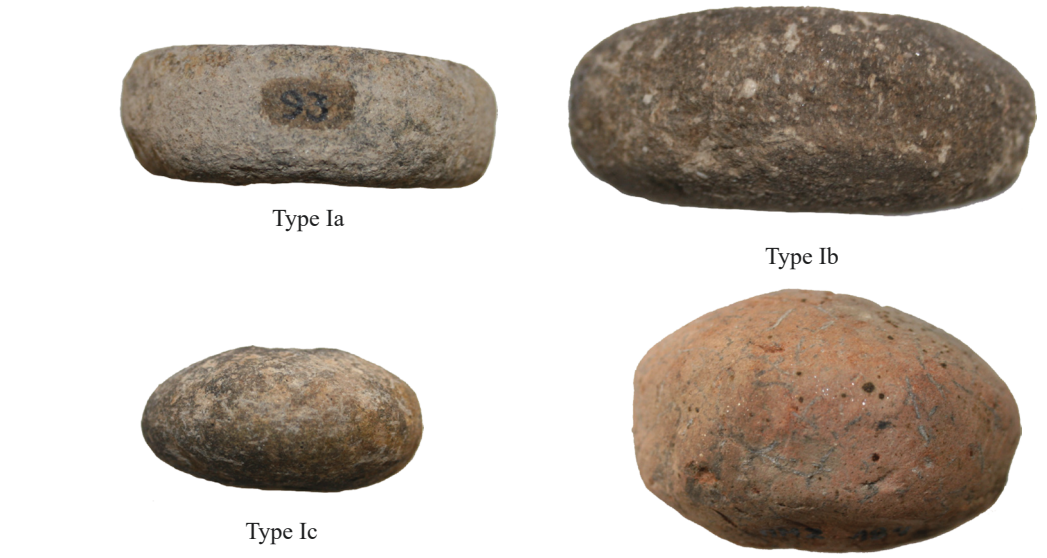
Cat.no. 1283
Type: spindle whorl
Shape: Type IVc
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 29.07
Height (cm): 2.70
Diameter (cm): 3.60
Hole diameter (cm): –
I (g*cm²): 58.94

Cat.no. 1284
Type: spindle whorl
Shape: Type IVe
Material: clay
Preservation condition (%): –
Weight: calculated via density
Reconstructed weight (g): 79.89
Height (cm): 4.50
Diameter (cm): 4.60
Hole diameter (cm): –
I (g*cm²): 265.19

XIII. Plates

A few notes have to be written for the following pages of plates. The finds for this study were recorded at different sites, museums and excavation storage facilities. This resulted in different circumstances regarding the photography. Furthermore, in some cases, it was possible to obtain photos taken by professional photographers, while, in most cases they had to be taken by me. The same applies for the drawings. While in all cases the digitisation was undertaken by me, a lot of the pencil drawings were produced by different students in the various excavation teams and in a few cases by professional artists. This has resulted in differences in style and especially in the quality of both the drawings and the photography.

My primary aim was to deliver a tangible comparative overview of the finds recorded for this volume. That means that for most sites a selection of the most representative objects, as well as of outstanding pieces, was included in the plates. Two exceptions are the sites Platia Magoula Zarkou and Çukuriçi Höyük. For each of these sites nearly all finds were included, since the current study constitutes the first examination of the textile tools of these sites. Furthermore, since Çukuriçi Höyük was chosen as the case study for this volume and the finds are therefore more thoroughly discussed, it was deemed necessary to offer as many pictorial references as possible.



a



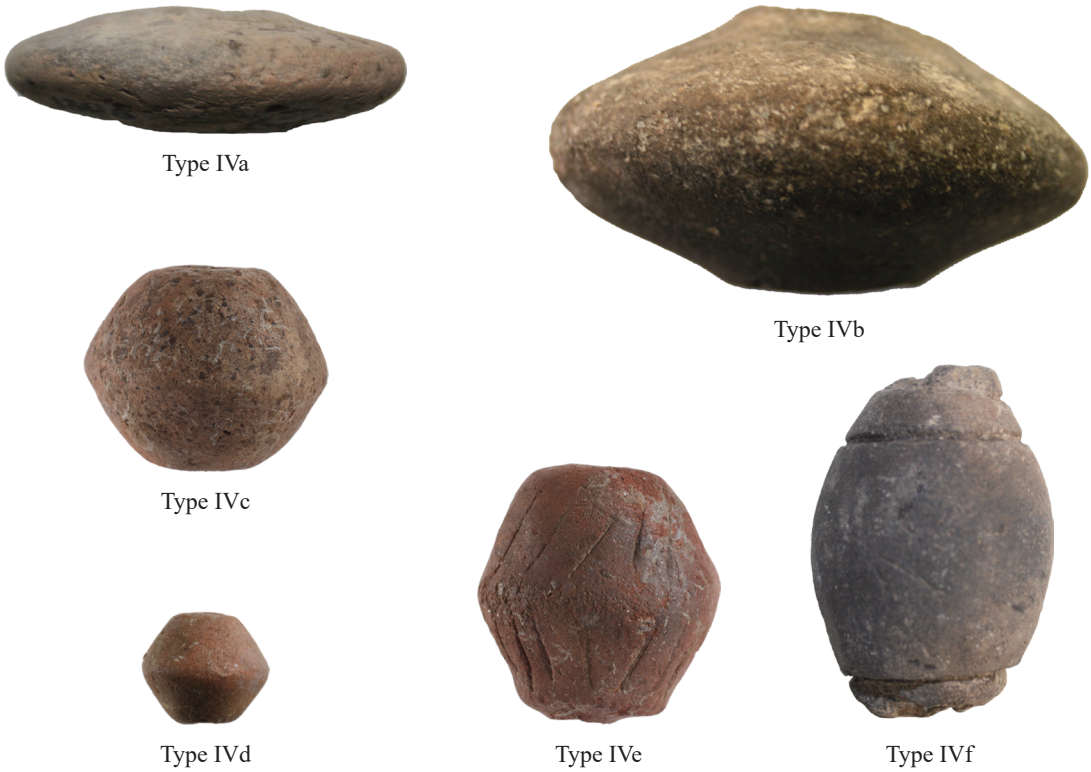
b



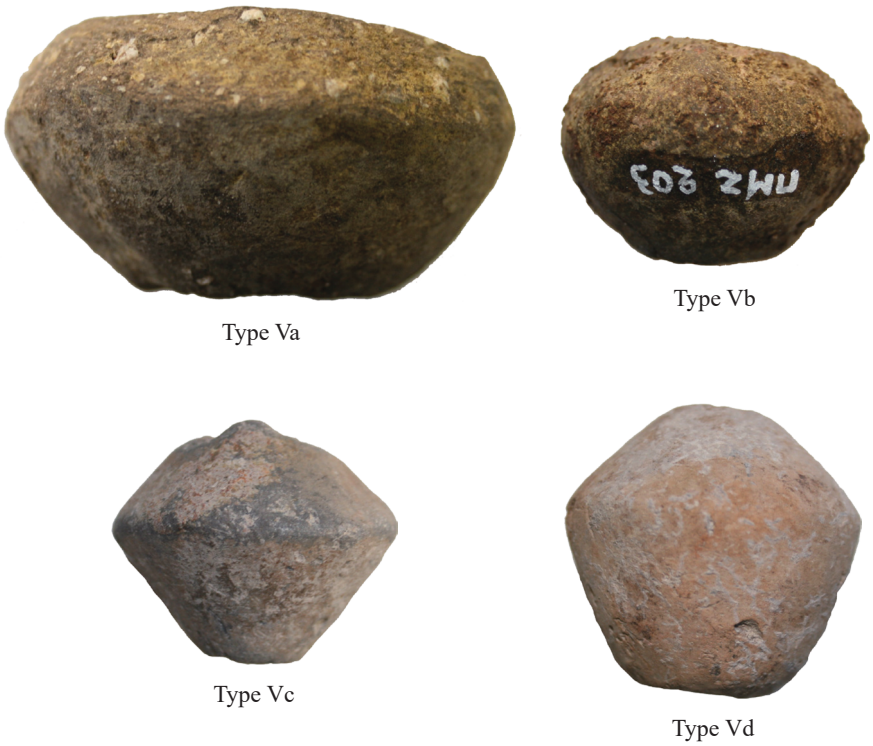
c

5 cm

Plate 1 Spindle whorls: a. Type I – flat spindle whorls; b. Type II – round spindle whorls; c. Type III – conical spindle whorls



a



b

5 cm

Plate 2 Spindle whorls: a. Type IV – biconical spindle whorls; b. Type V – diamond-shaped spindle whorls



a



b

5 cm

Plate 3 Spindle whorls: a. Type VI – cylindrical spindle whorls; b. Type VII – plug-shaped spindle whorls



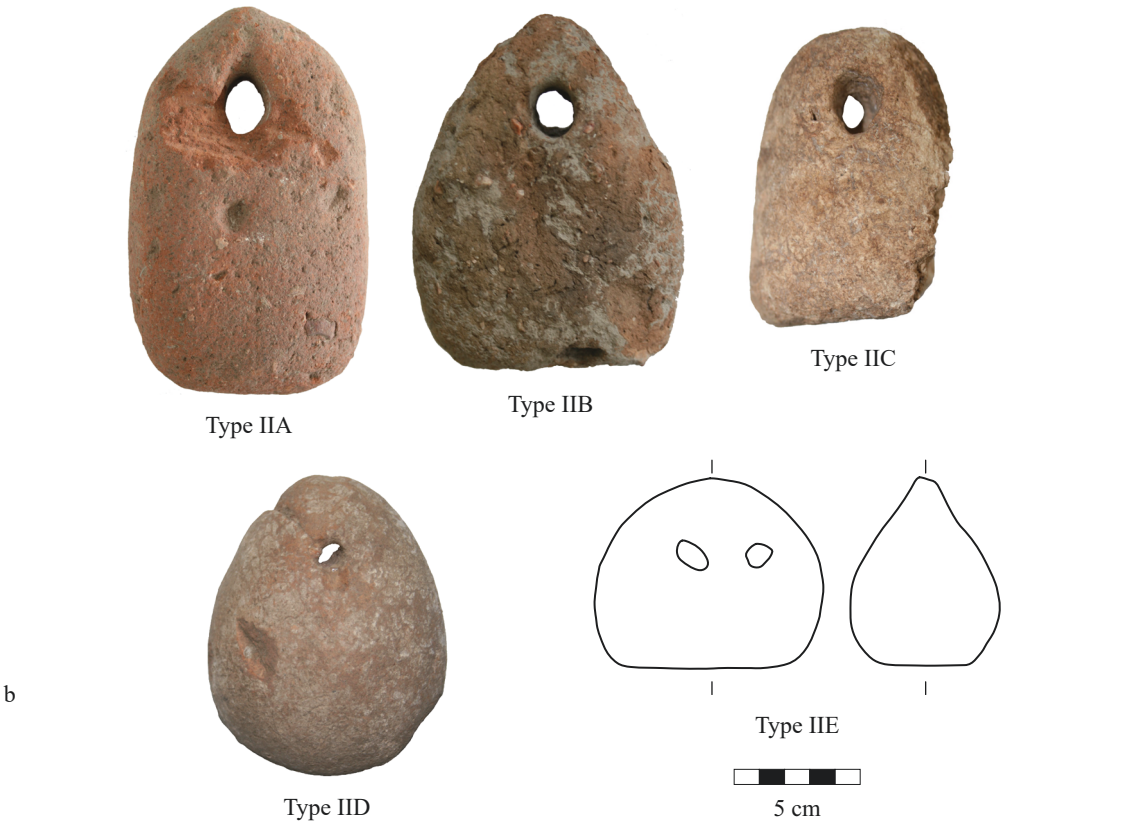


Plate 4 Loom weights: a. Type I – cylindrical loom weights; b. Type II – drop-shaped loom weights



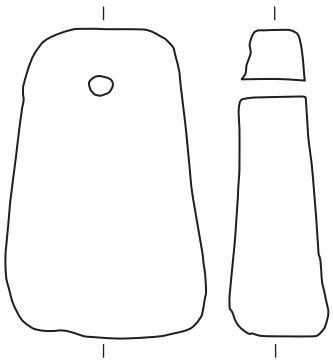
Type IIIA



Type IIIB



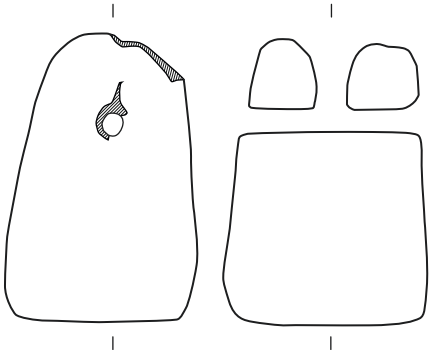
Type IIIC



Type IIID



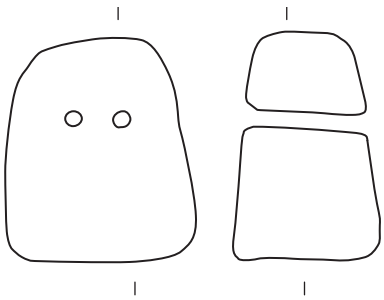
Type IIIE



Type IIIF



Type IIIG



Type IIIH

5 cm

Plate 5 Loom weights: Type III – pyramidal loom weights



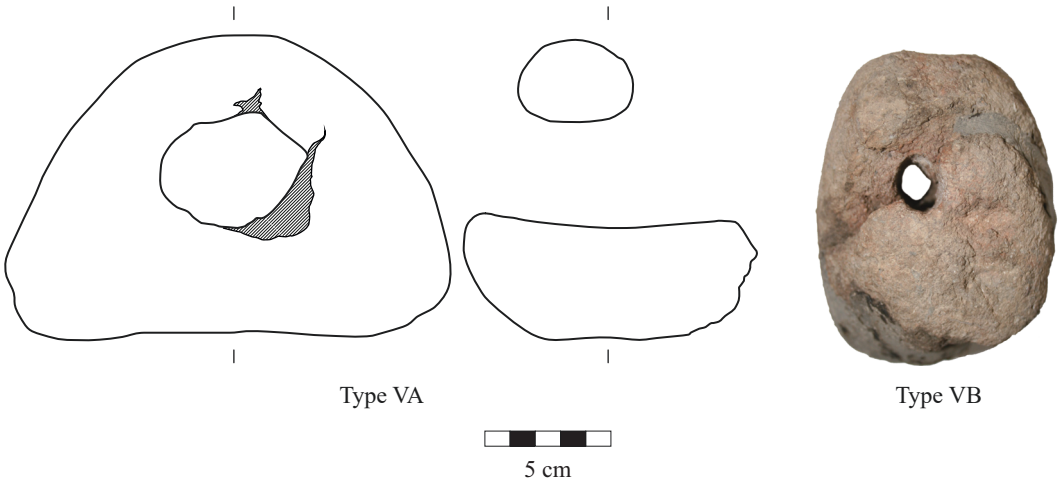
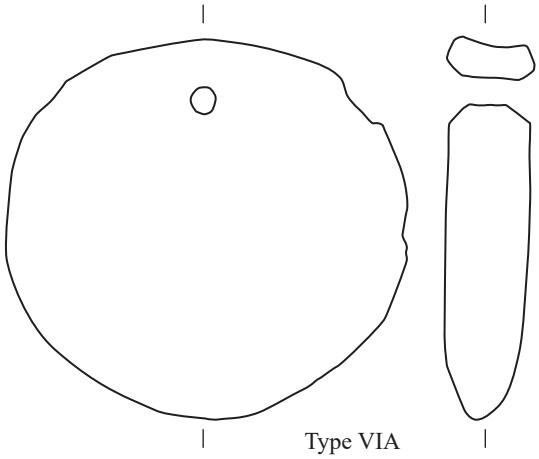
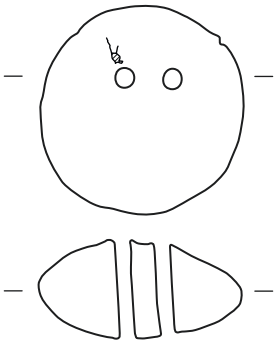


Plate 6 Loom weights: a. Type IV – cuboid loom weights; b. Type V – dome-shaped loom weights



Type VIA



Type VIB



Type VIC



Type VID

a



Type VIIA



Type VIIB

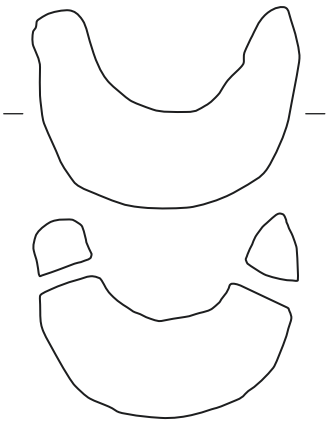


Type VIIC



Type VIID

b



Type VIIIA



Type VIIIB

c

5 cm

Plate 7 Loom weights: a. Type VI – discoid loom weights; b. Type VII – spool-shaped loom weights; c. Type VIII – crescent-shaped loom weights



Cat.no. 3



Cat.no. 10



Cat.no. 11





Cat.no. 30





Cat.no. 39



Cat.no. 61



Cat.no. 62



Cat.no. 65



Cat.no. 67



Cat.no. 68



Cat.no. 69



Cat.no. 72



Cat.no. 79



Cat.no. 86



Cat.no. 91



Cat.no. 94



Cat.no. 95



Cat.no. 96



Cat.no. 97



Cat.no. 98

5 cm



Cat.no. 99

Plate 8 Pefkakia Magoula: spindle whorls, Late Chalcolithic



Cat.no. 101

Cat.no. 104

Cat.no. 105

5 cm



Cat.no. 106

Cat.no.107

a



Cat.no. 108

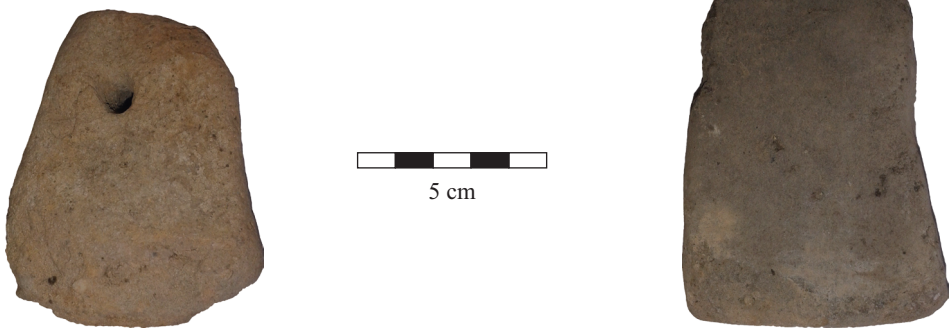
Cat.no. 109

5 cm

b



Cat.no. 110



5 cm

c

Cat.no. 111

Cat.no. 112

Plate 9 Pefkakia Magoula: a. Spindle whorls, EBA 1; b. Spindle whorls, EBA 2; c. Loom weights, EBA 2–3



a



b

Plate 10 Pefkakia Magoula: a. Loom weights, EBA 2–3; b. Spindle whorls, EBA 2–3



Cat.no. 168



Cat.no. 169



Cat.no. 172



Cat.no.173



Cat.no. 179



Cat.no. 181



Cat.no. 182

a



Cat.no. 187



Cat.no. 198

b

5 cm

Plate 11 Pefkakia Magoula: a. Spindle whorls, EBA 2–3; b. Spindle whorls, EBA 3

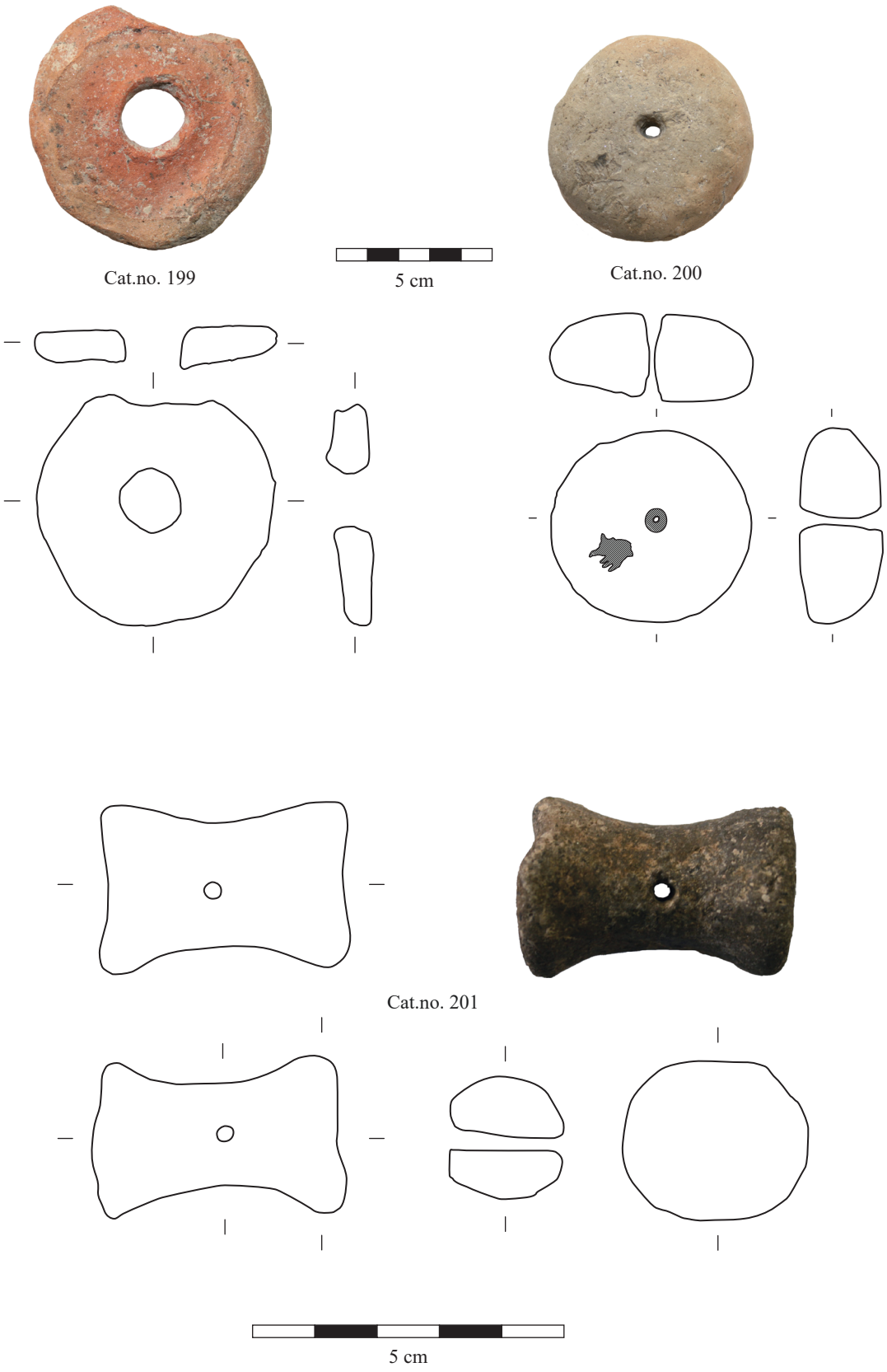


Plate 12 Platia Magoula Zarkou: loom weights, Late Neolithic

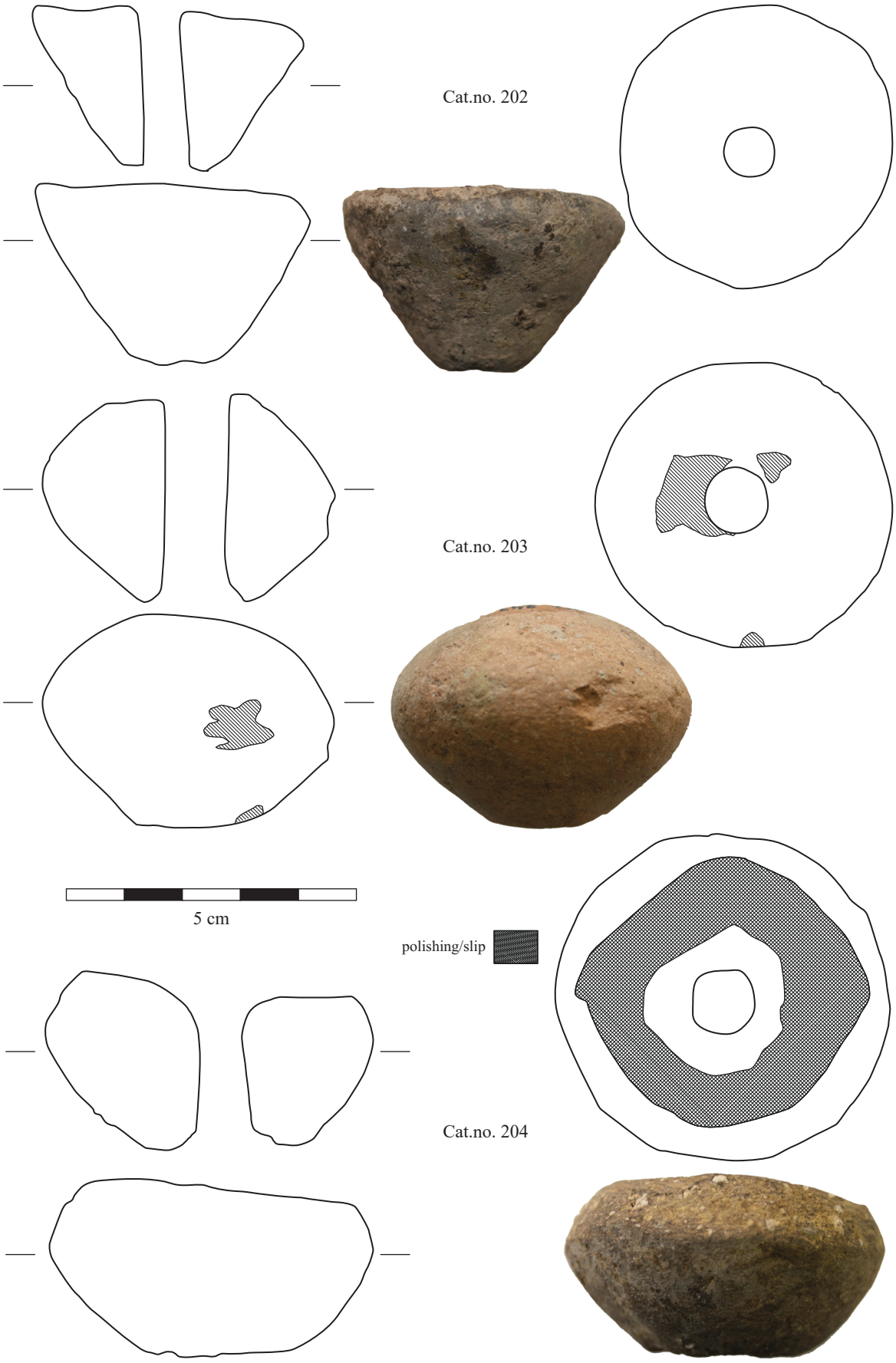


Plate 13 Platia Magoula Zarkou: spindle whorls, Late Neolithic



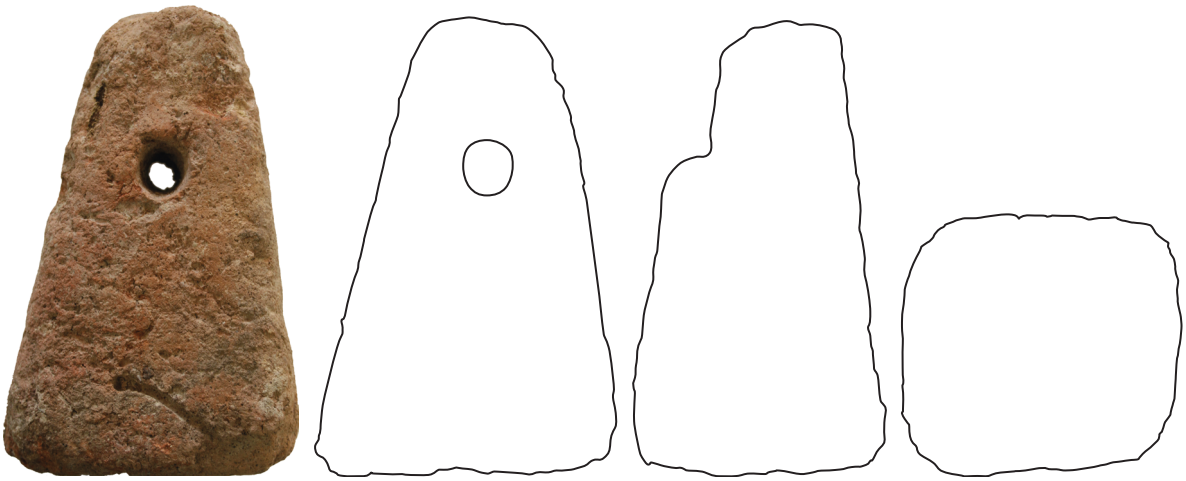
Cat.no. 205



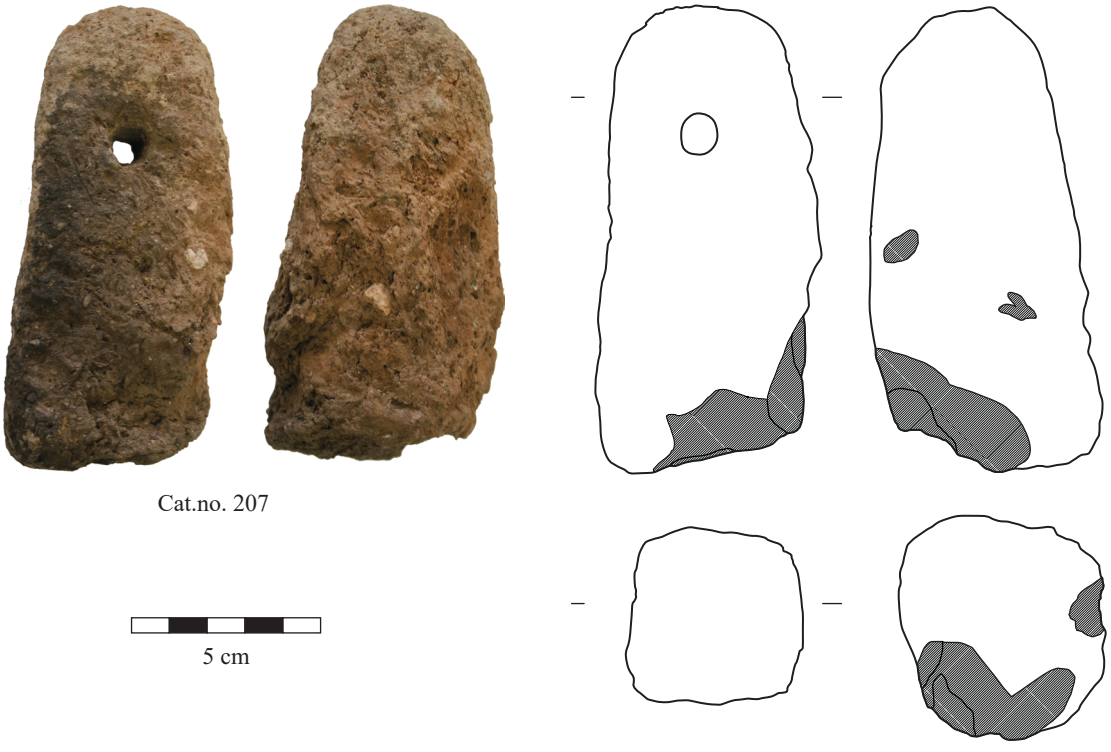
Cat.no. 208



Cat.no. 209



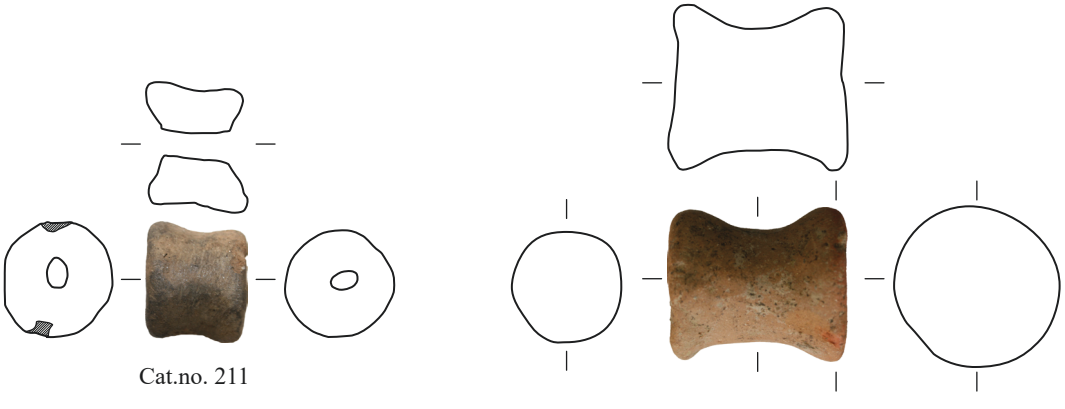
Cat.no. 206



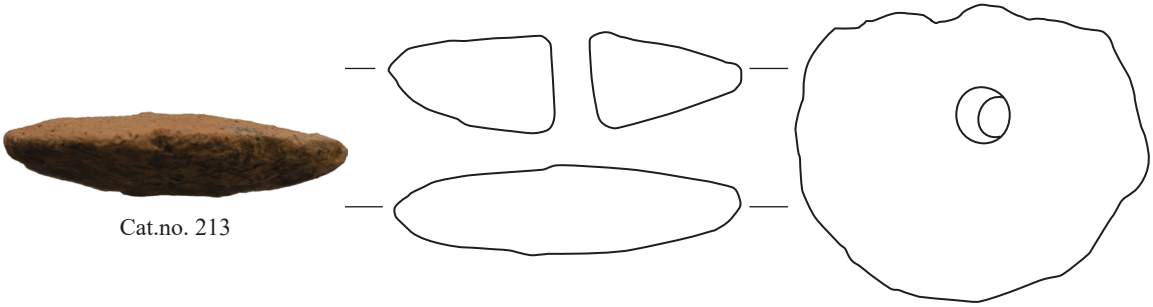
Cat.no. 207

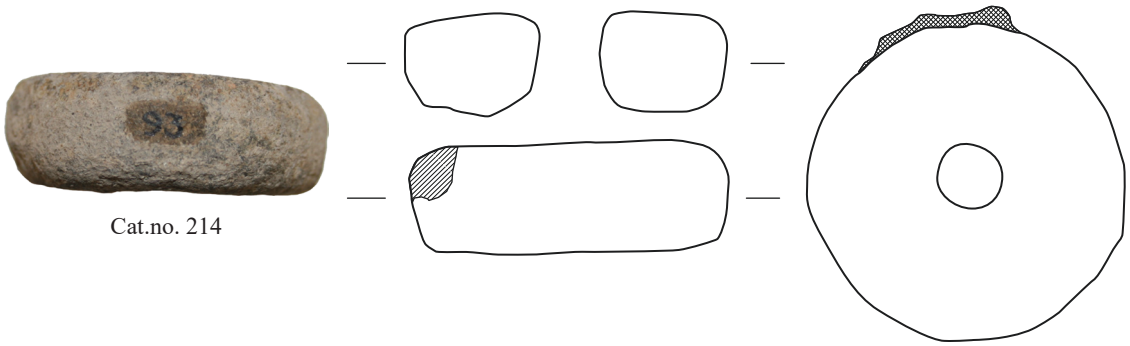
5 cm

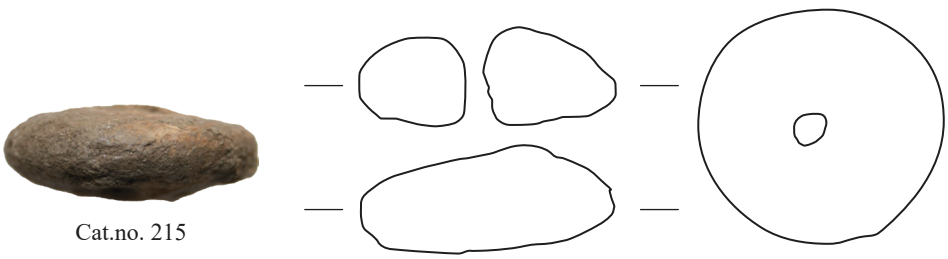
Plate 14 Platia Magoula Zarkou: loom weights, EBA 2–3



a

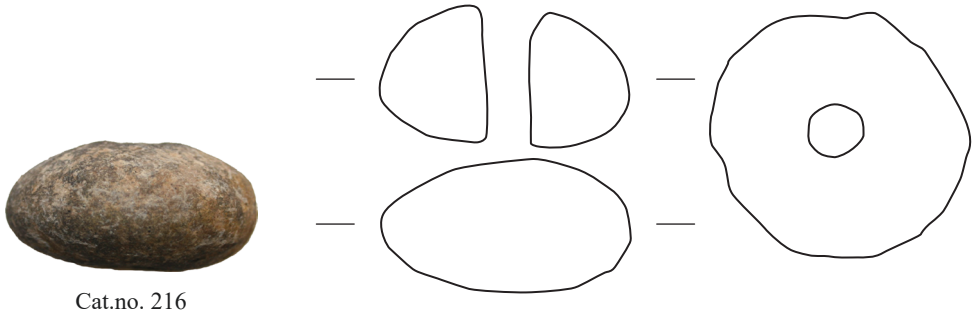






b

Plate 15 Platia Magoula Zarkou: a. Loom weights, EBA 2–3; b. Spindle whorls, EBA 2–3



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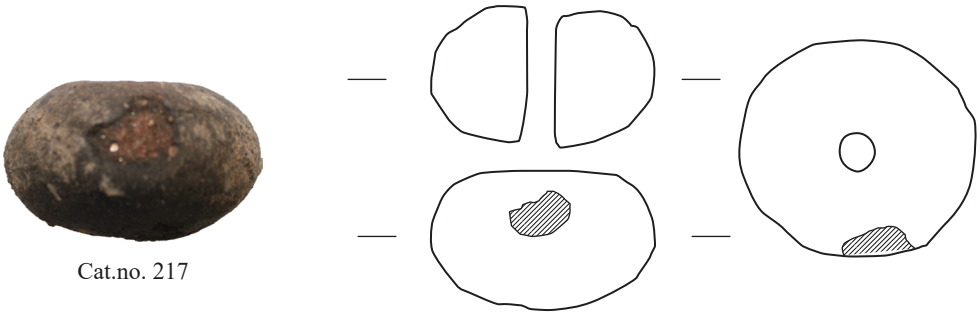

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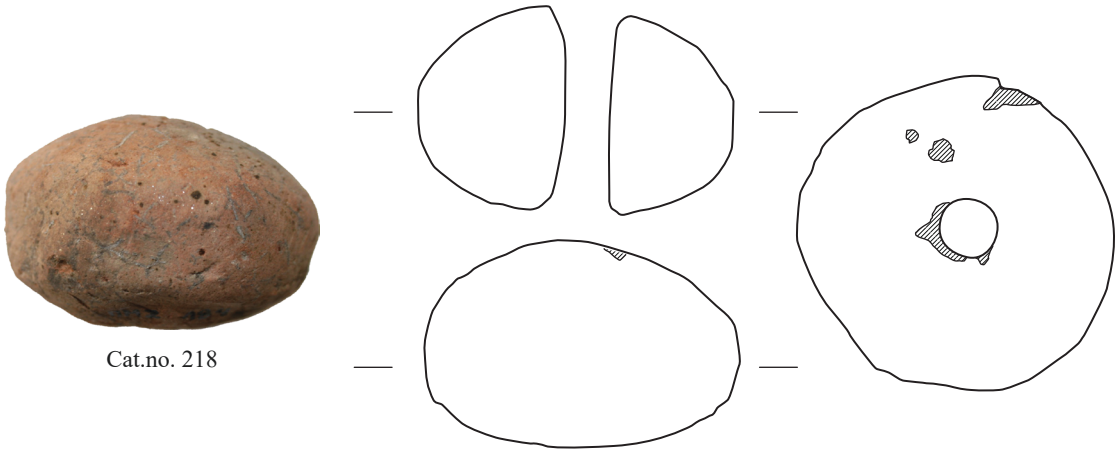


Cat.no. 218



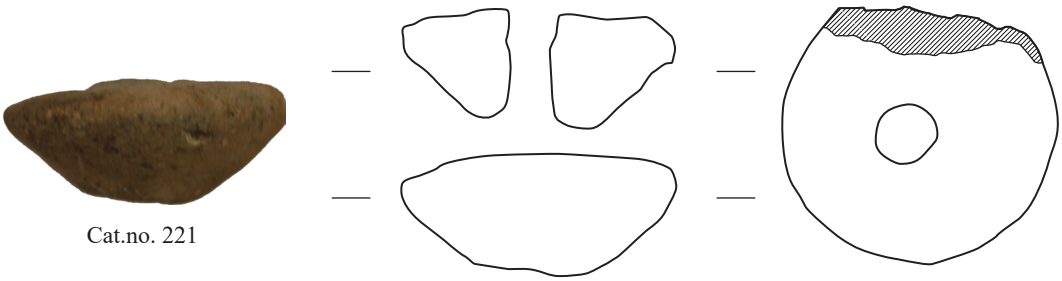
Cat.no. 219



Cat.no. 220

5 cm

Plate 16 Platia Magoula Zarkou: spindle whorls, EBA 2–3



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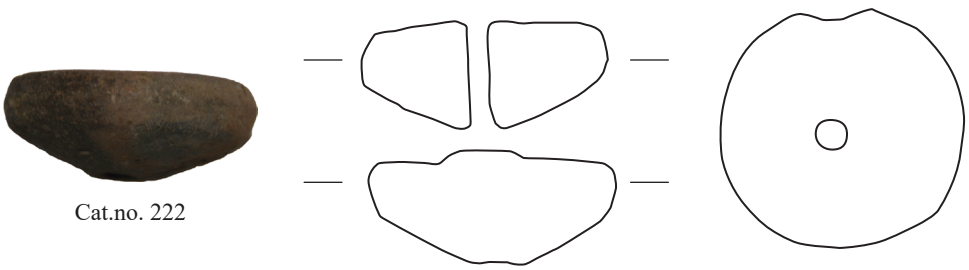

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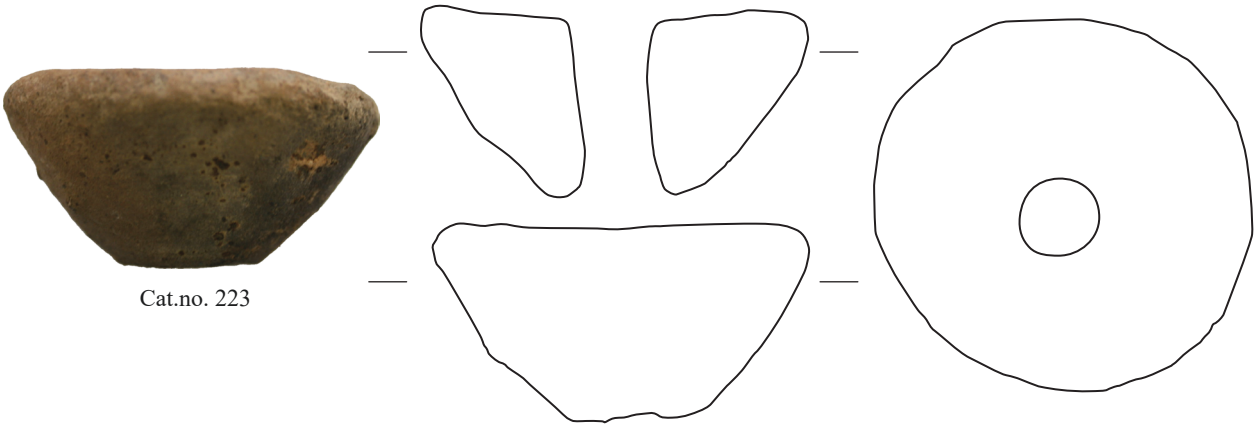

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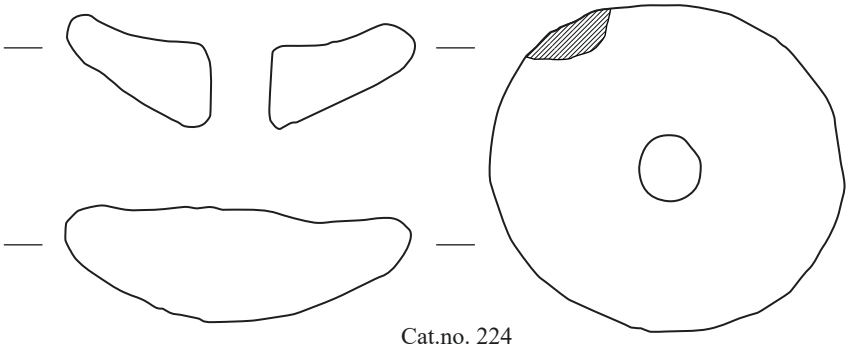


Cat.no. 224

5 cm

Plate 17 Platia Magoula Zarkou: spindle whorls, EBA 2–3

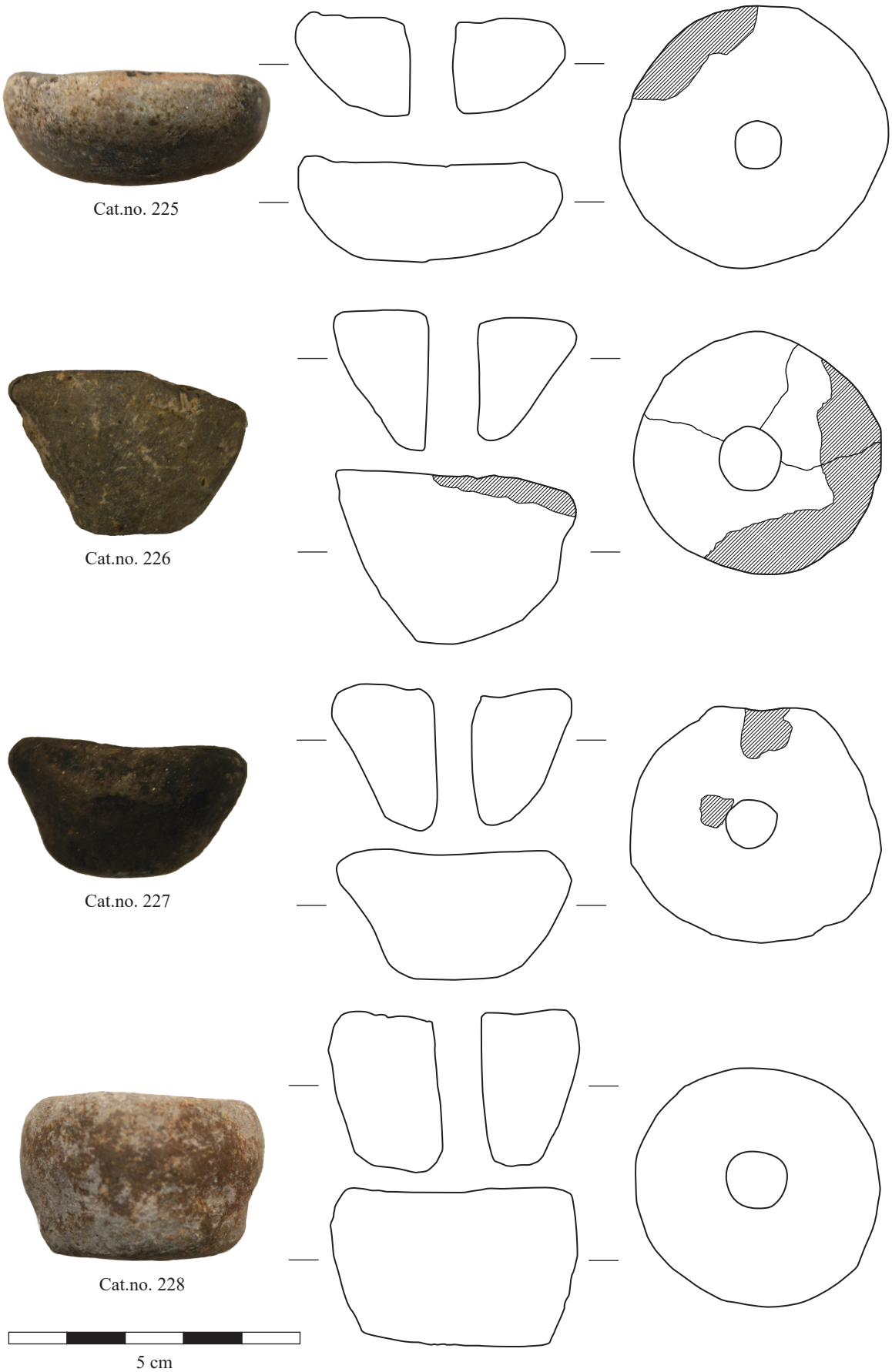


Plate 18 Platia Magoula Zarkou: spindle whorls, EBA 2–3

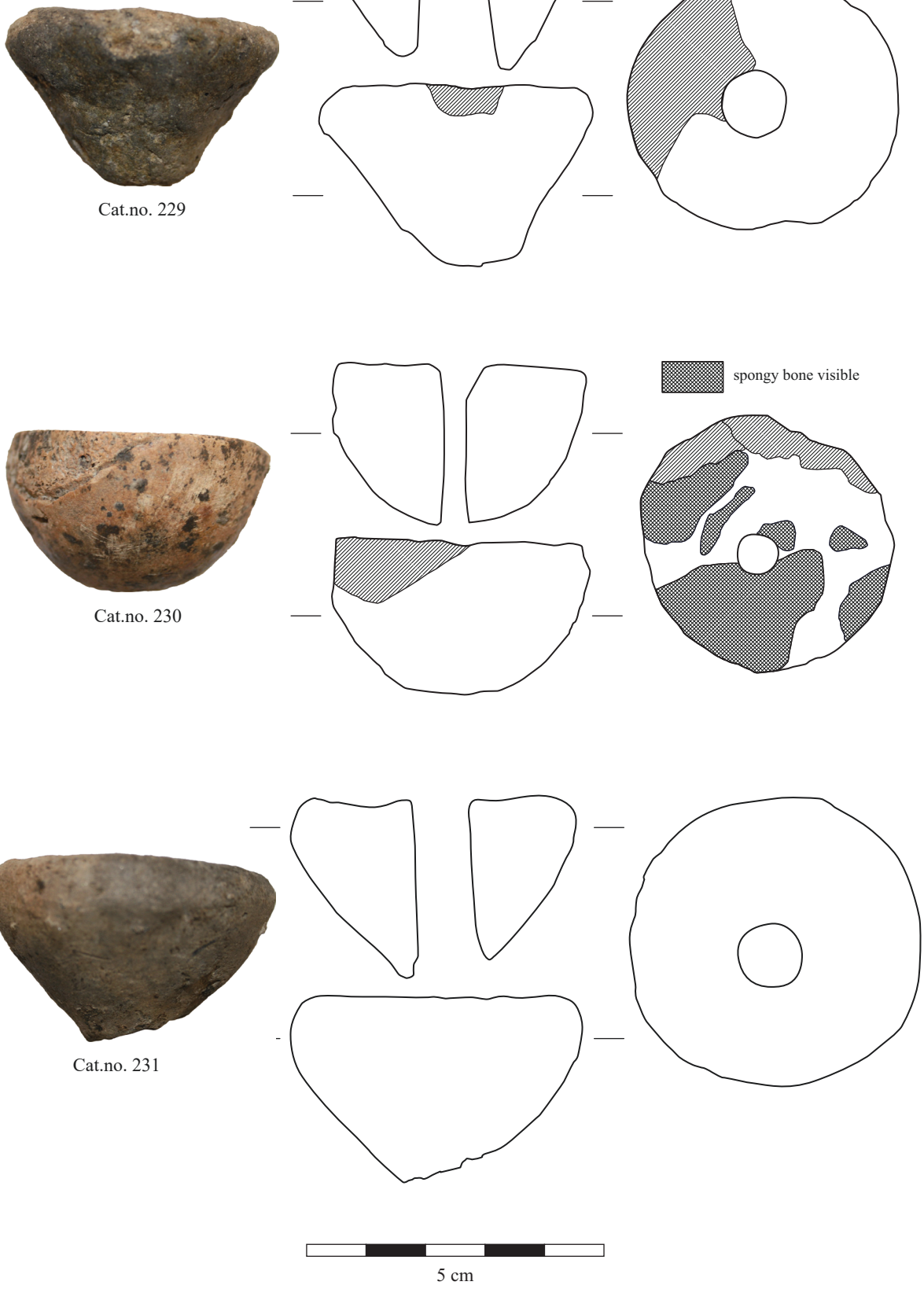


Plate 19 Platia Magoula Zarkou: spindle whorls, EBA 2–3

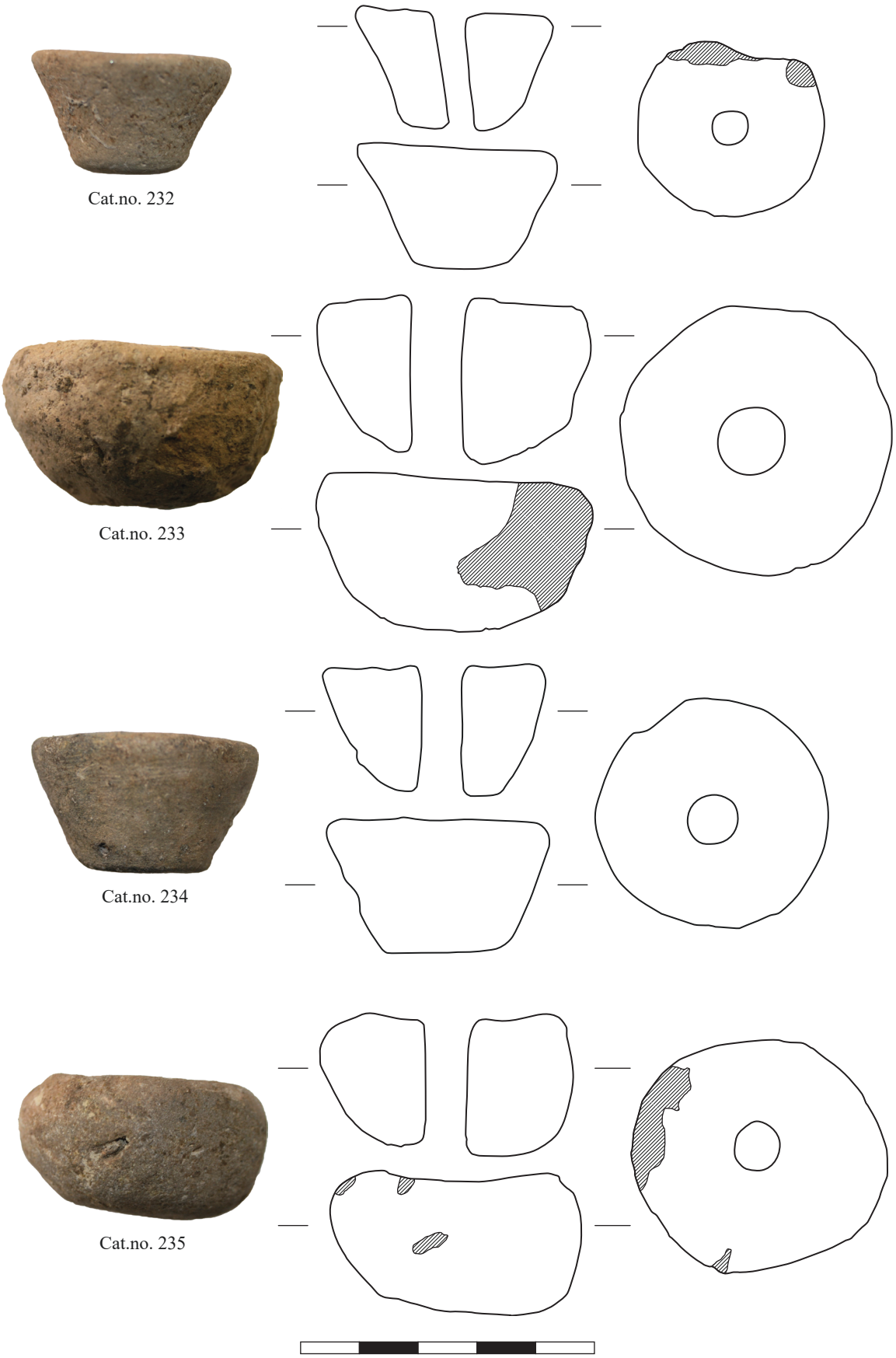


Plate 20 Platia Magoula Zarkou: spindle whorls, EBA 2–3

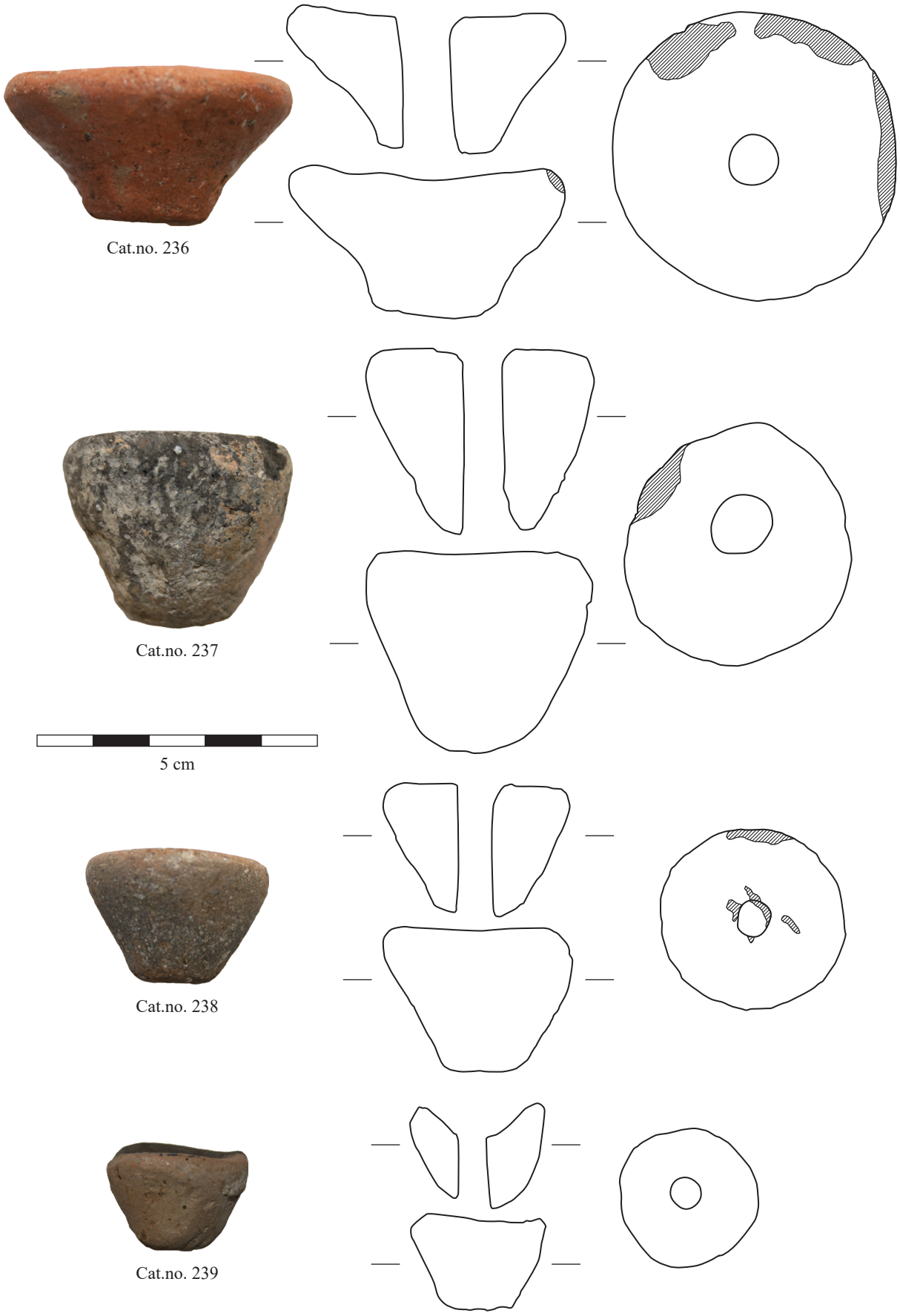
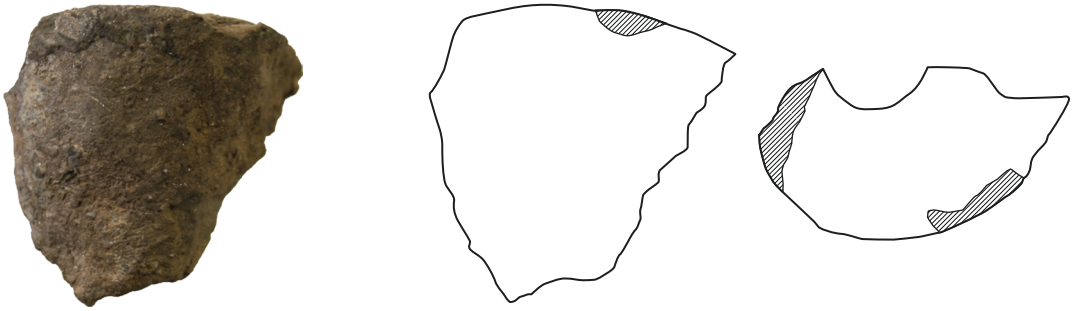


Plate 21 Platia Magoula Zarkou: spindle whorls, EBA 2–3



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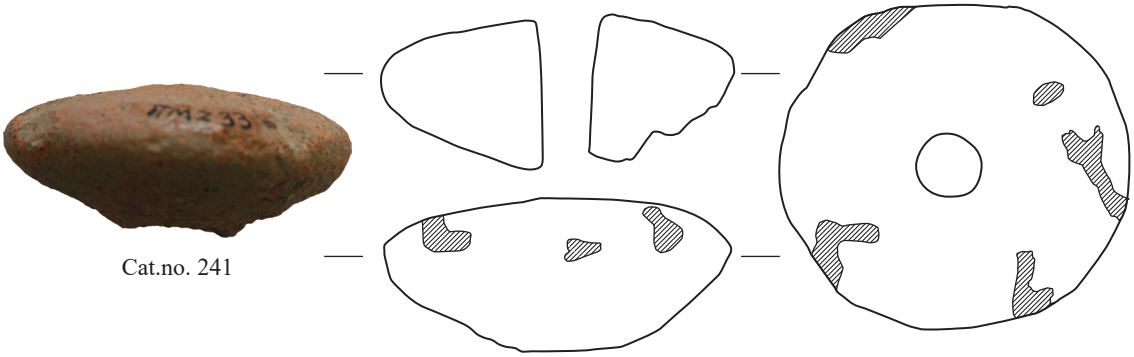

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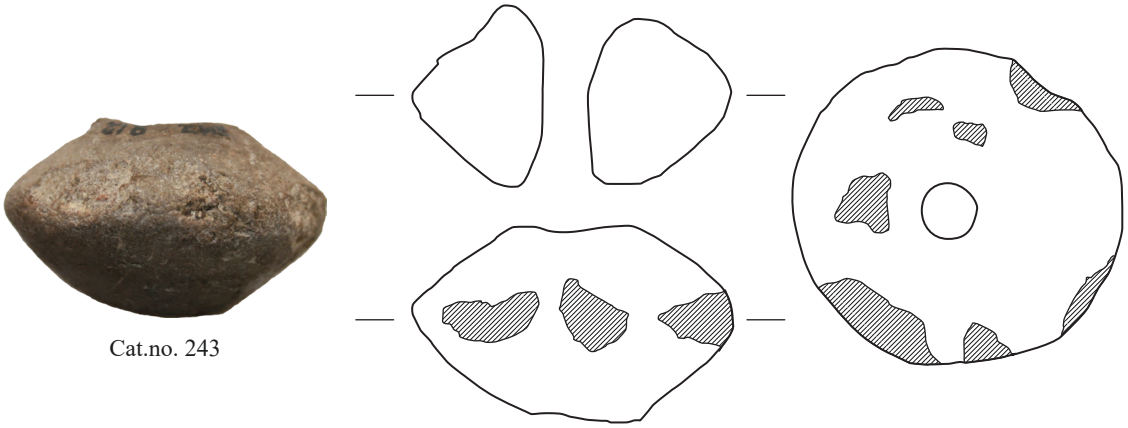


Cat.no. 243



Cat.no. 244

5 cm

Plate 22 Platia Magoula Zarkou: spindle whorls, EBA 2–3



Cat.no. 245

5 cm

a



Cat.no. 253



Cat.no. 255



Cat.no. 258



Cat.no. 260



Cat.no. 270



Cat.no. 273

5 cm

b

Plate 23 Dikili Tash: a. Loom weight, Middle Chalcolithic; b. Spindle whorls, Middle Chalcolithic



Cat.no. 275



Cat.no. 277



Cat.no. 292



Cat.no. 293



Cat.no. 294



Cat.no. 295



Cat.no. 297



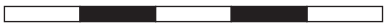
Cat.no. 304



Cat.no. 313



Cat.no. 321



5 cm



Cat.no. 322

a

b



Cat.no. 334



Cat.no. 323

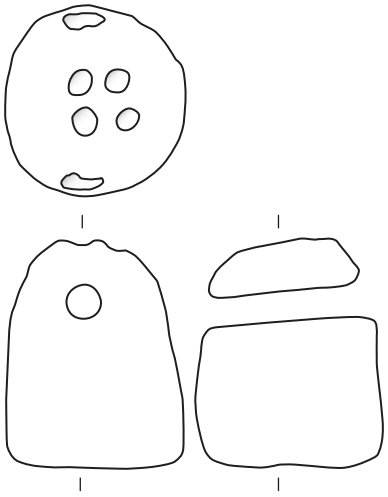
Plate 24 Dikili Tash: a. Spindle whorls, Middle Chalcolithic; b. Spindle whorl, EBA 1



Cat.no. 335

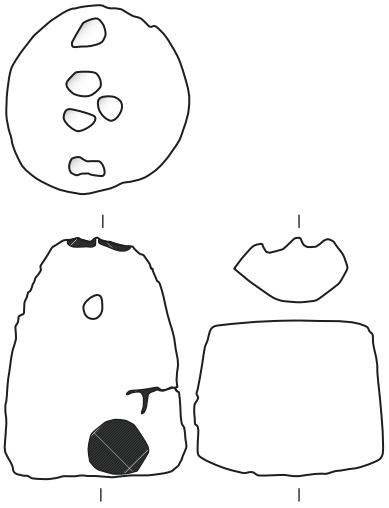


Cat.no. 338



Cat.no. 346

5 cm



Cat.no. 348



Cat.no. 350



Cat.no. 351



Cat.no. 357

Plate 25 Aşağı Pınar: loom weights, Early Chalcolithic



Cat.no. 359

Cat.no. 361

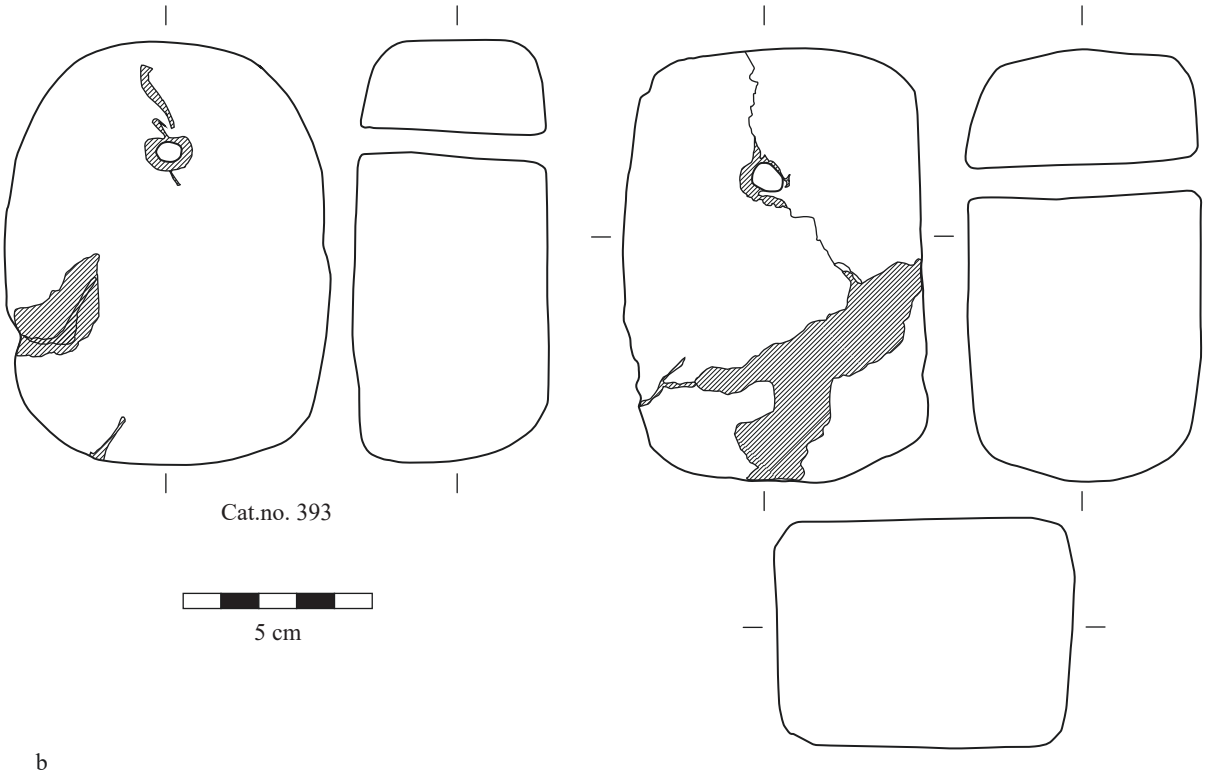
Cat.no. 365

Cat.no. 367

Cat.no. 371

a

5 cm



Cat.no. 393

5 cm

b

Cat.no. 394

Plate 26 Aşağı Pınar: a. Spindle whorls, Early Chalcolithic; b. Loom weights, Middle Chalcolithic

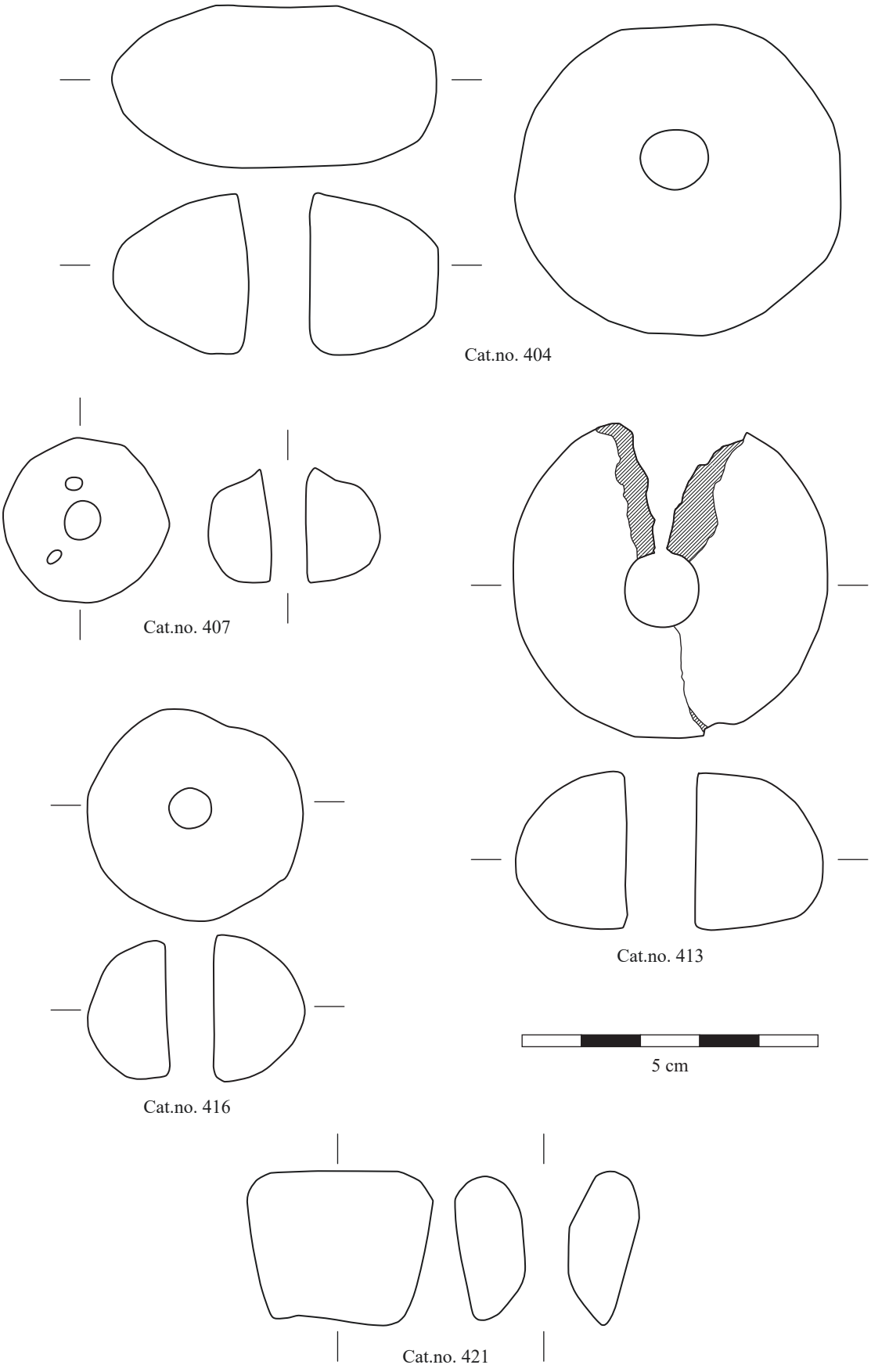
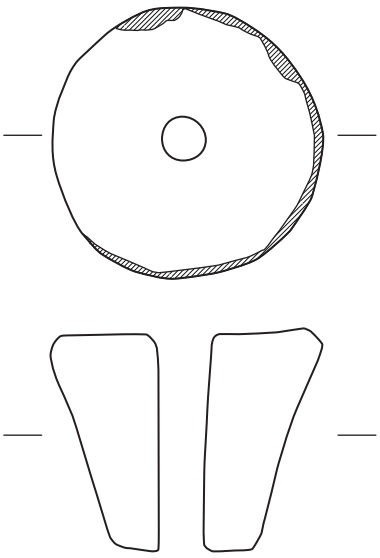


Plate 27 Aşağı Pınar: spindle whorls, Middle Chalcolithic



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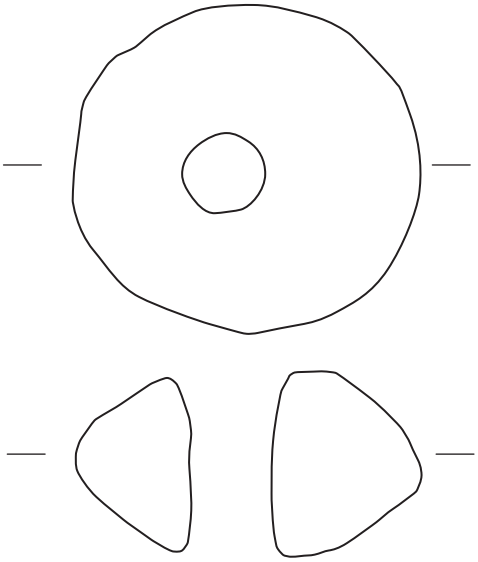

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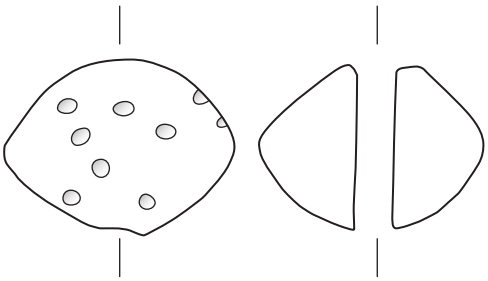

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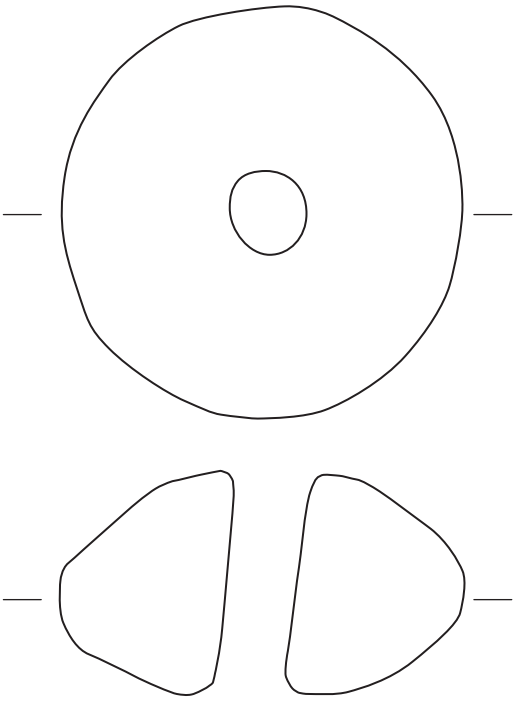
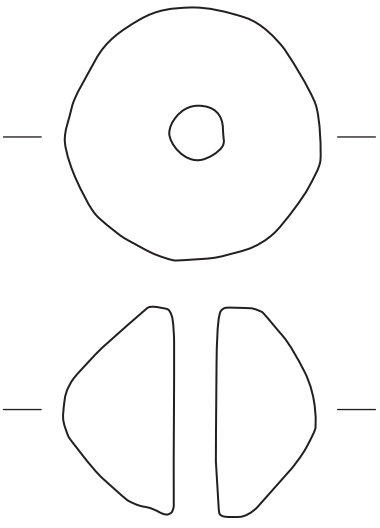


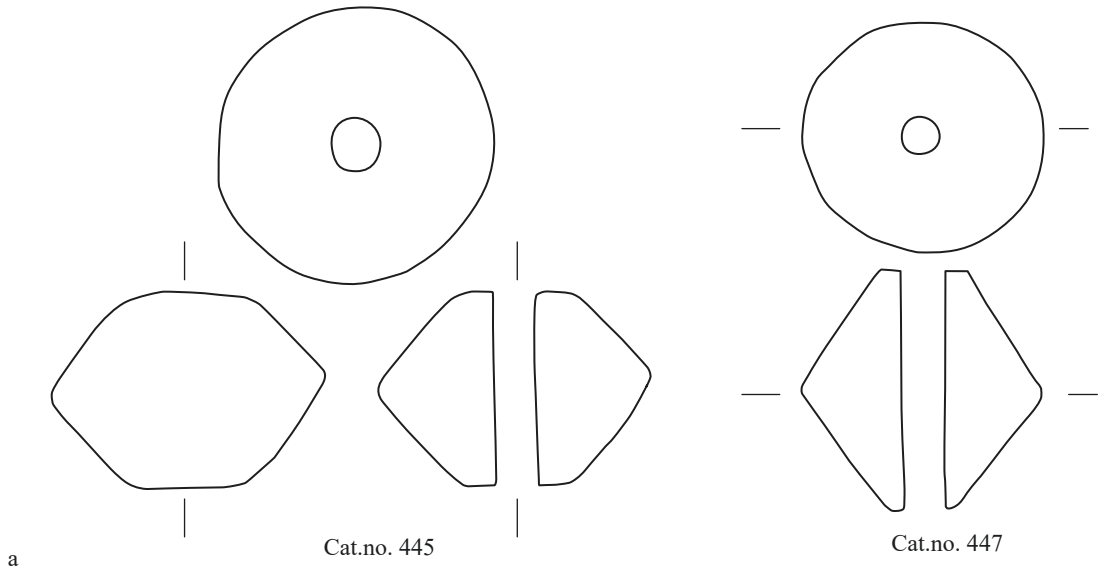
Cat.no. 429

5 cm

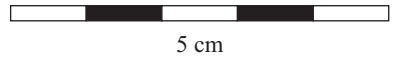


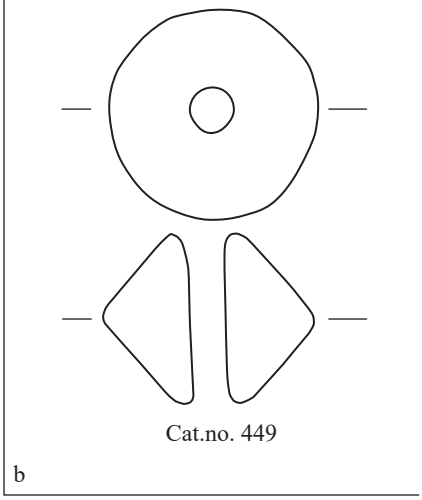
Cat.no. 440

Plate 28 Aşağı Pınar: spindle whorls, Middle Chalcolithic

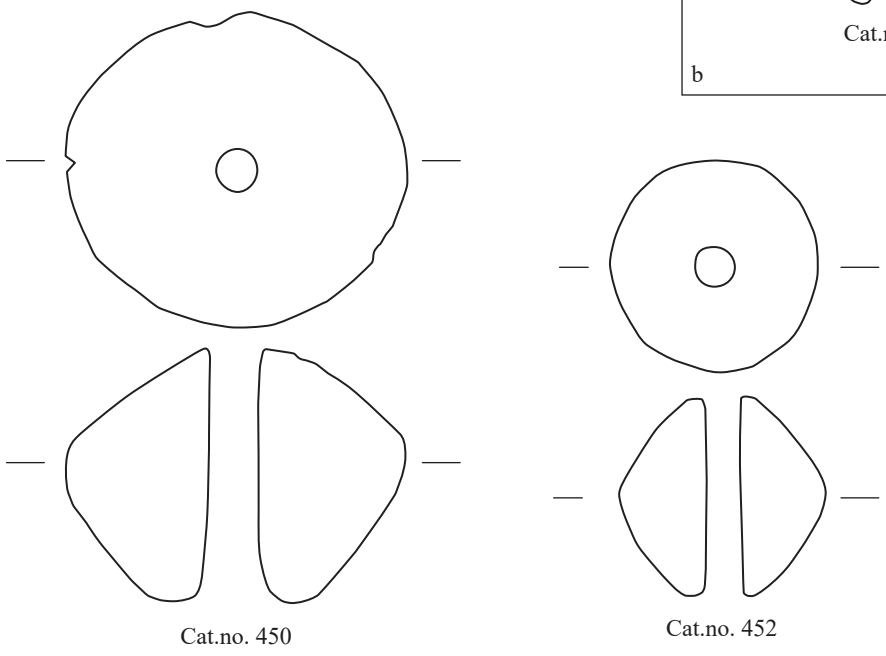


a



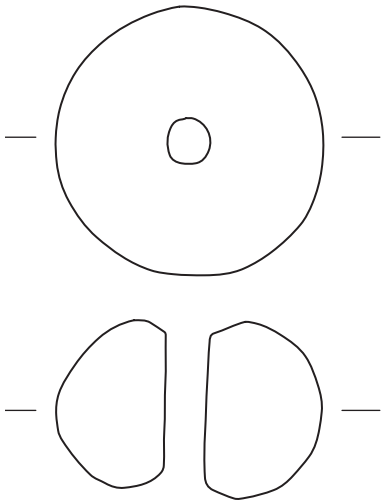


b



c

Plate 29 Kanlıgeçit: a. Spindle whorls, EBA 1; b. Spindle whorl, EBA 2; c. Spindle whorls, EBA 2–3



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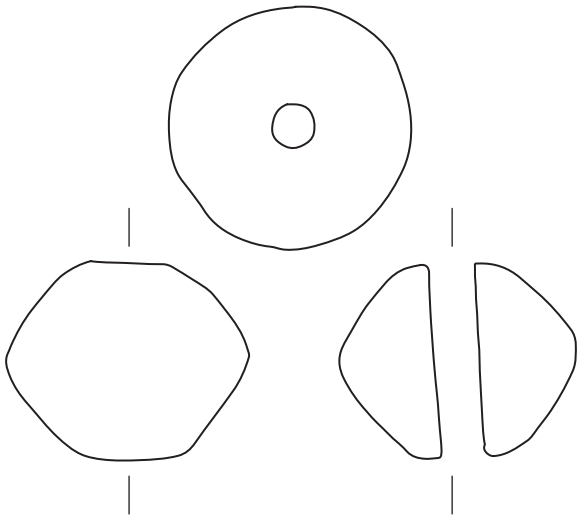
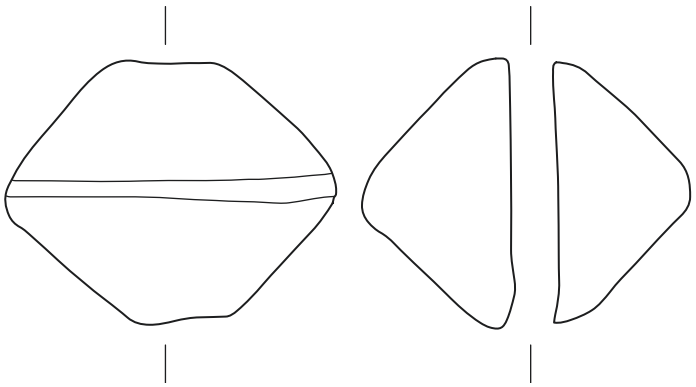
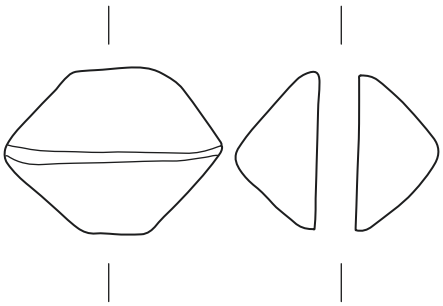


Cat.no. 454



Cat.no. 456



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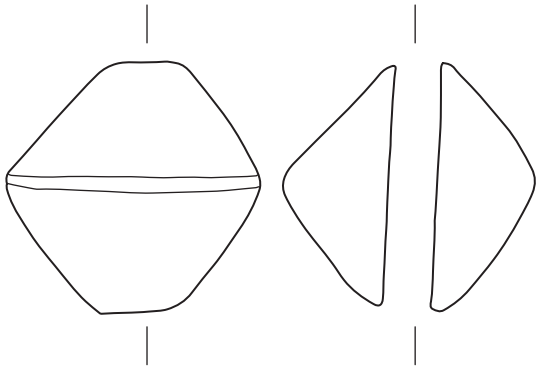

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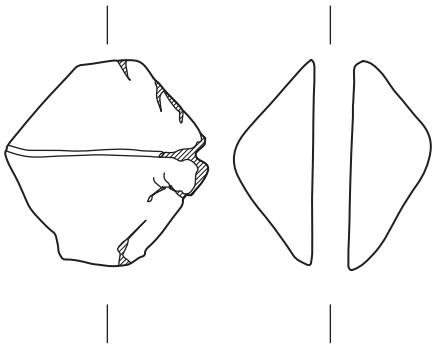

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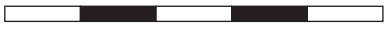


5 cm

Plate 30 Kanlıgeçit: spindle whorls, EBA 3

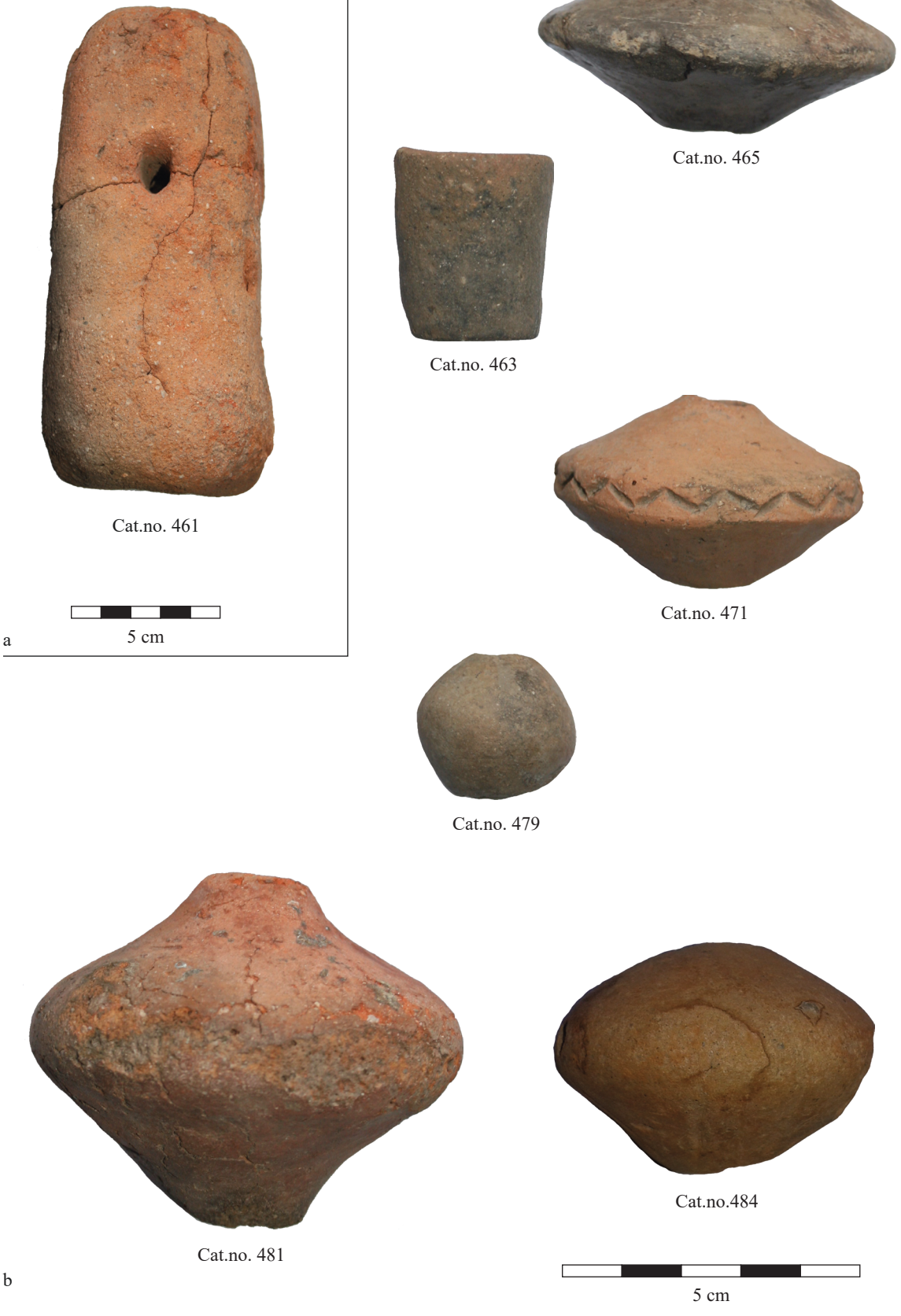


Plate 31 Dubene Sarovka: a. Loom weight, EBA 2; b. Spindle whorls, EBA 2



Cat.no. 487



Cat.no. 488



Cat.no. 489



Cat.no. 490



Cat.no.492



Cat.no. 493

5 cm

Plate 32 Nova Nadezhda: spindle whorls, Middle Chalcolithic



Cat.no. 494

5 cm

a



Cat.no. 495

5 cm

b



Cat.no. 496



Cat.no. 497

5 cm

c

Plate 33 Nova Nadezhda: a. Spindle whorl, Middle Chalcolithic; b. Spindle whorl, Middle – Late Chalcolithic; c. Spindle whorls, EBA 2



Cat.no. 498



Cat.no. 499



Cat.no. 500



Cat.no. 501



Cat.no. 502



Cat.no. 503

5 cm



Cat.no. 504

a



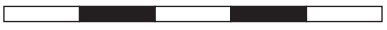
Cat.no. 505



Cat.no. 507



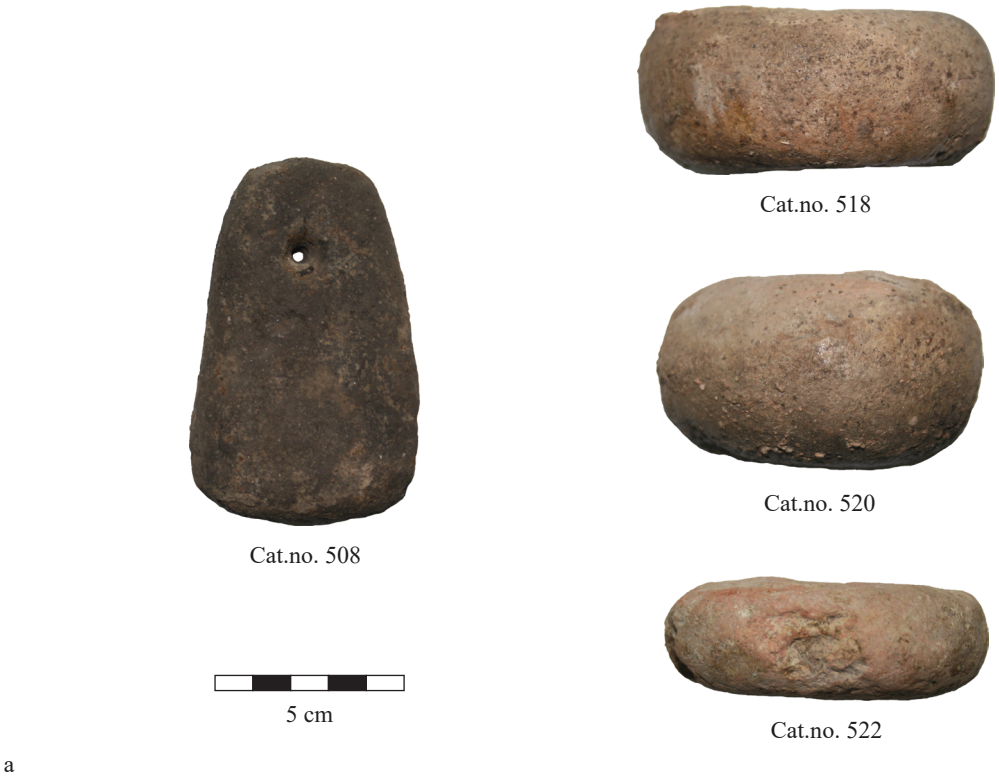
Cat.no. 506



5 cm

b

Plate 34 Tell Golyamo Delchevo: a. Loom Weights, Late Neolithic; b. Spindle whorls, Late Neolithic



a



b



c

Plate 35 Tell Golyamo Delchevo: a. Loom weights, Middle Chalcolithic;
b. Spindle whorls, Middle Chalcolithic; c. Spindle whorls, Middle – Late Chalcolithic







Plate 36 a. Tell Lipnik: loom weights and spindle whorls, Middle Chalcolithic;
b. Tell Sava: spindle whorls, Middle Chalcolithic; c. Varna: loom weights and spindle whorls, Middle Chalcolithic

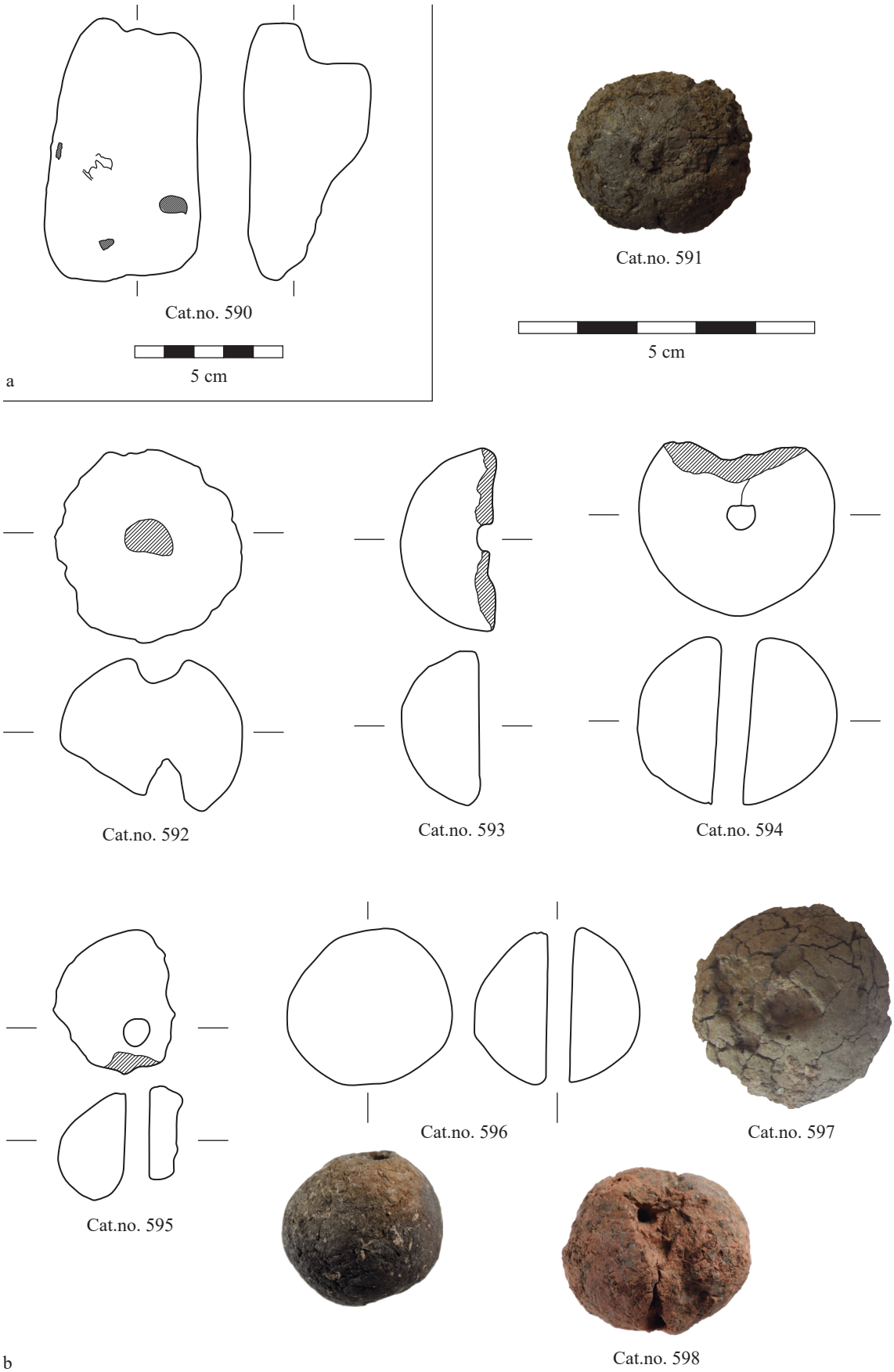
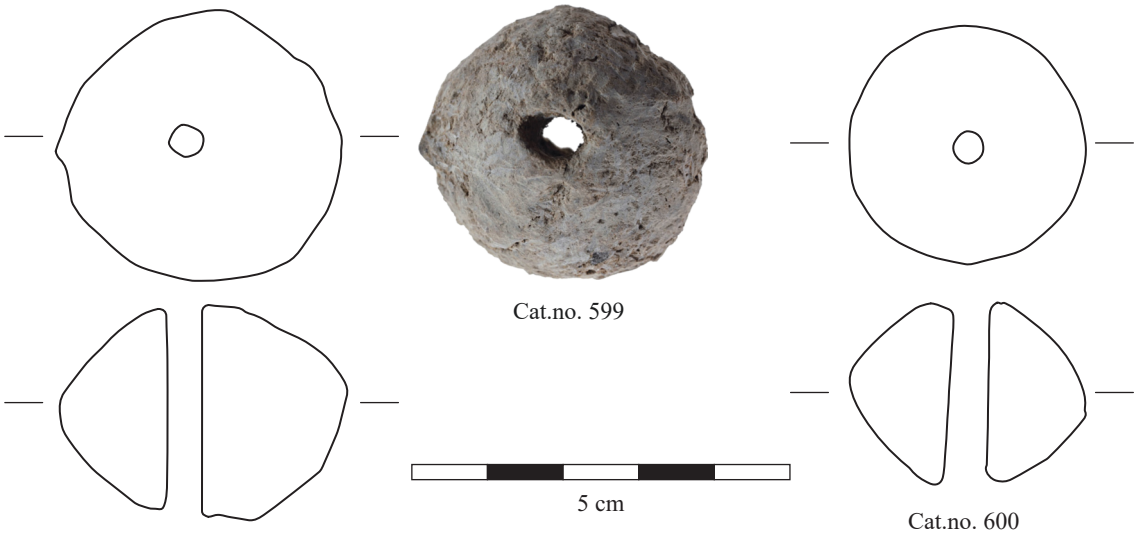


Plate 37 Çukuriçi Höyük: a. Loom weight, Late Neolithic; b. Spindle whorls, Late Neolithic



a

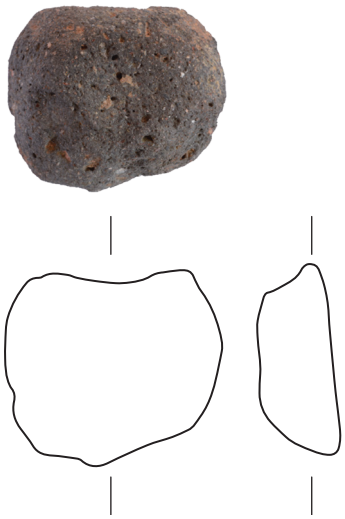


Cat.no. 601

b



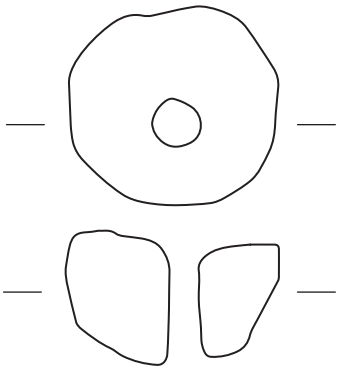
Cat.no. 602



Cat.no. 604



Cat.no. 603



c

5 cm

Plate 38 Çukuriçi Höyük: a. Spindle whorls, Late Neolithic;
b. Loom weight, Late Chalcolithic; c. Spindle whorls, Late Chalcolithic

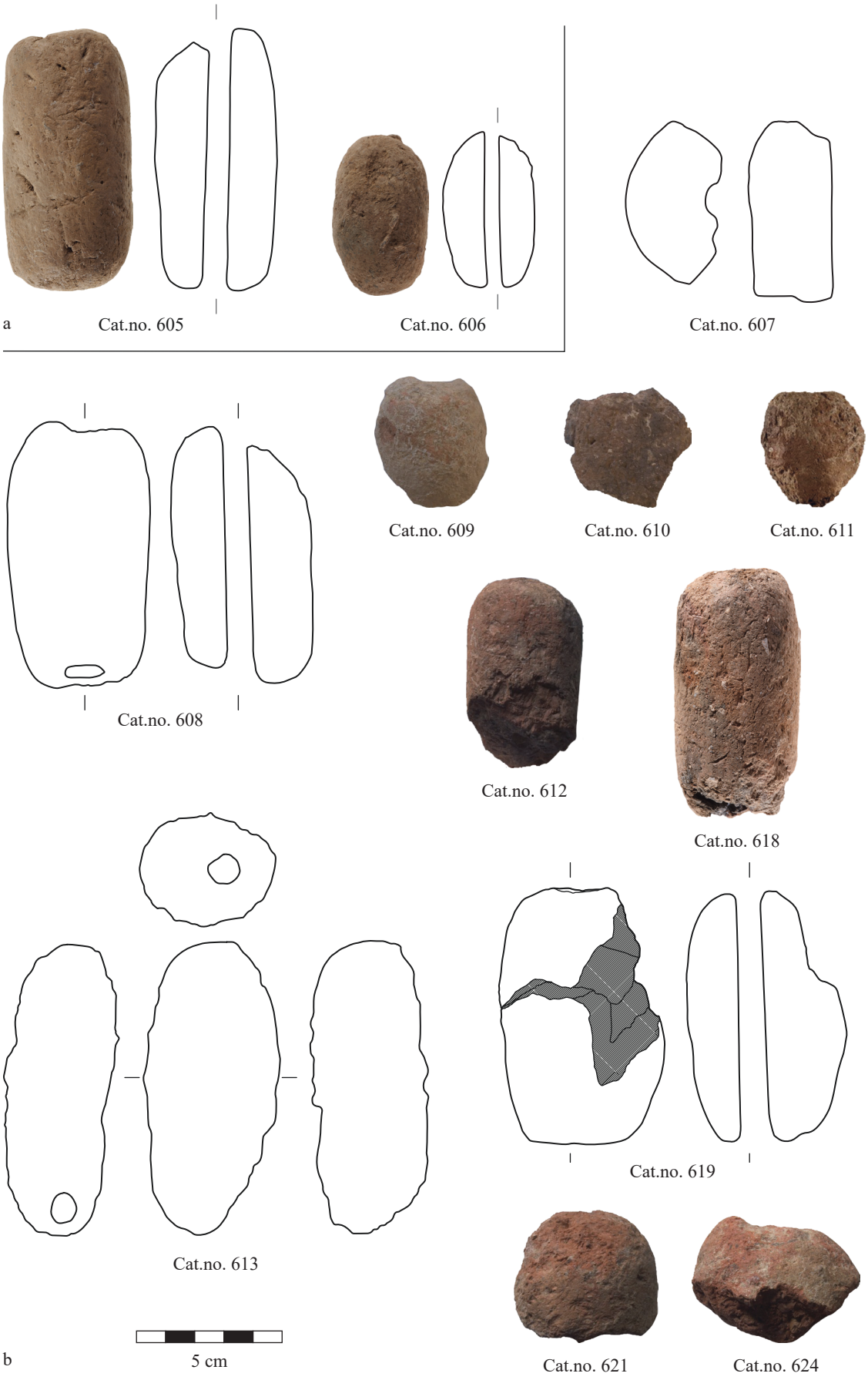


Plate 39 Çukuriçi Höyük: a. Loom weights, Late Chalcolithic – EBA 1; b. Loom weights, EBA 1

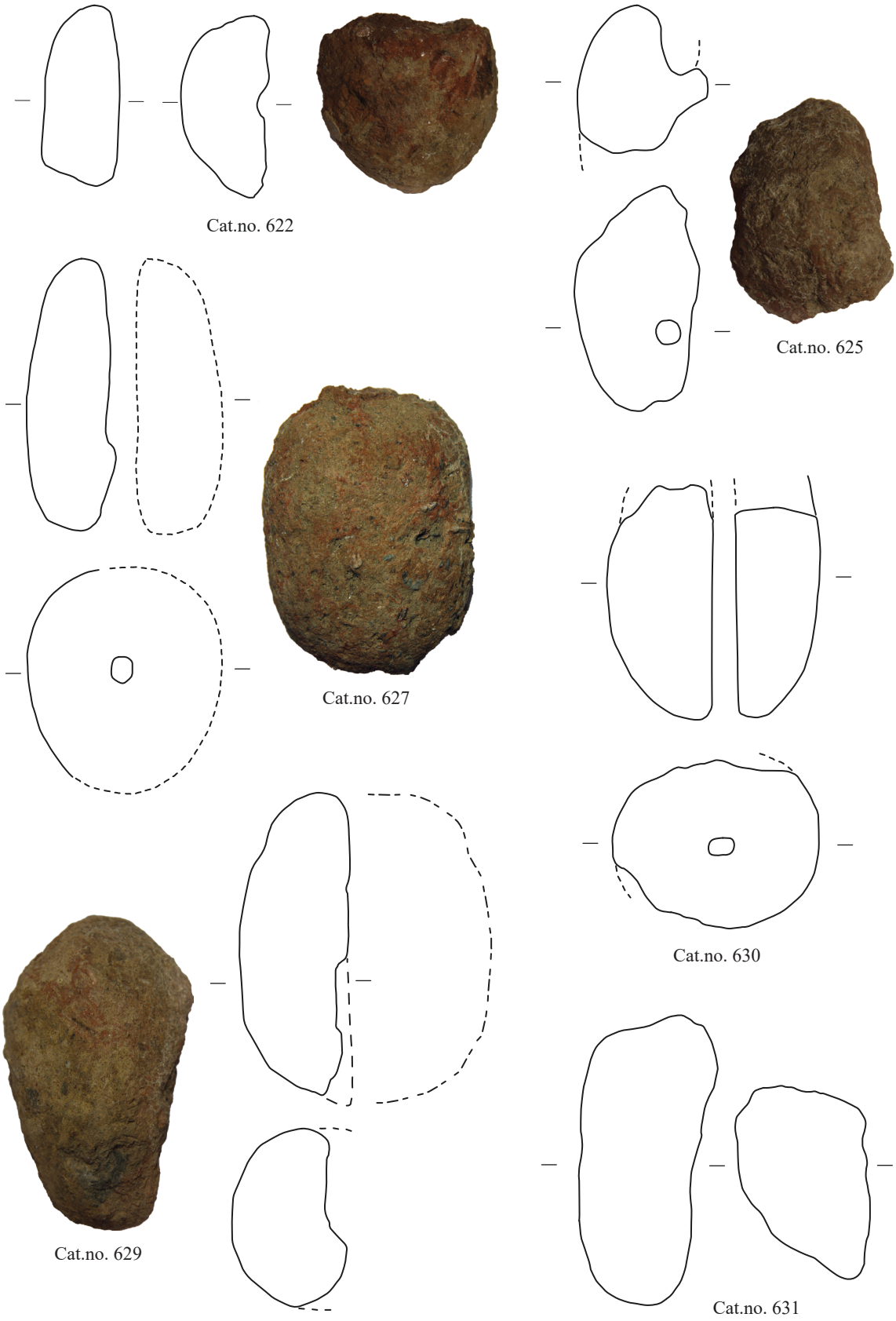
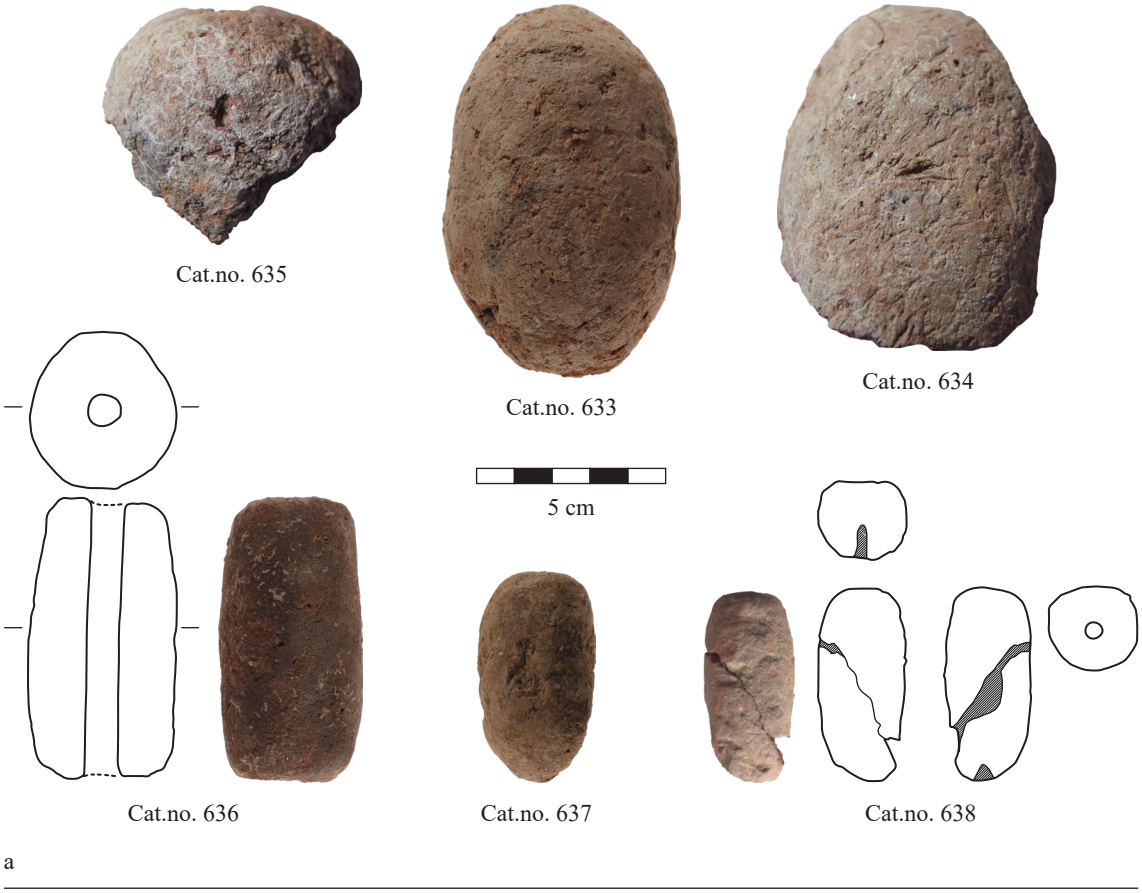
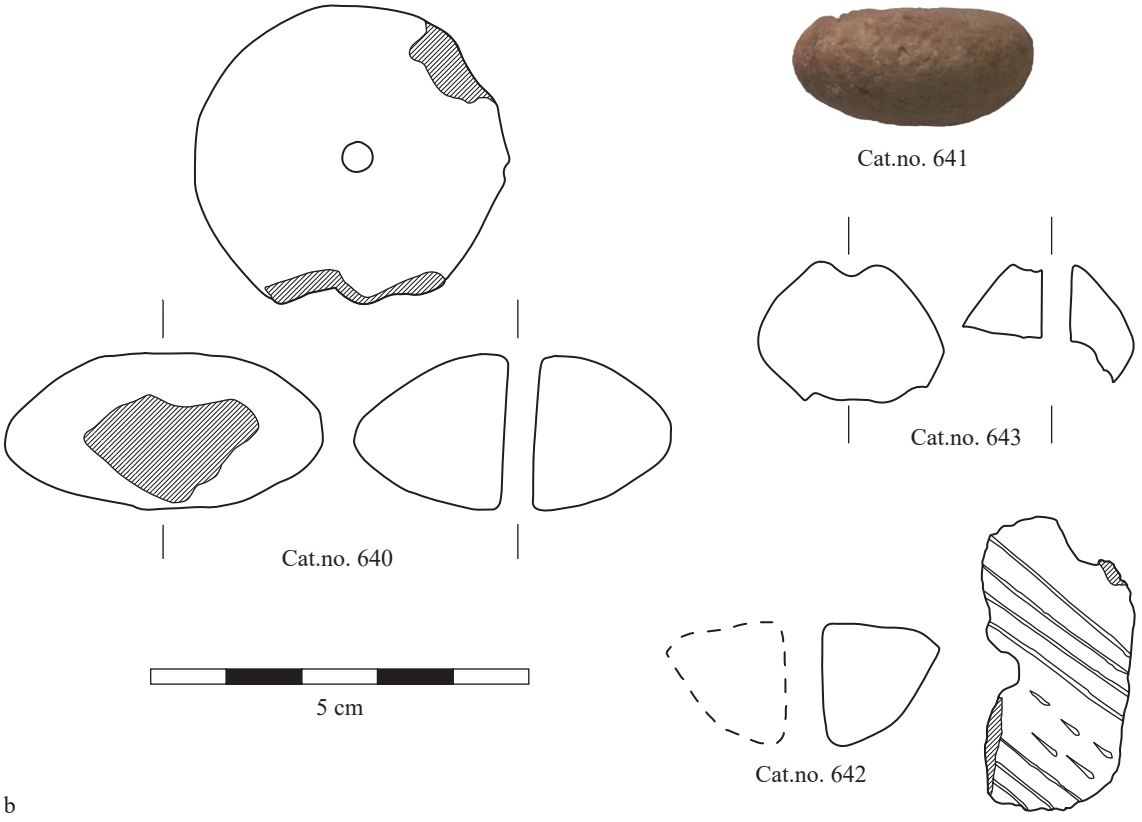


Plate 40 Çukuriçi Höyük: loom weights, EBA 1



a



b

Plate 41 Çukuriçi Höyük: a. Loom weights, EBA 1; b. Spindle whorls, EBA 1

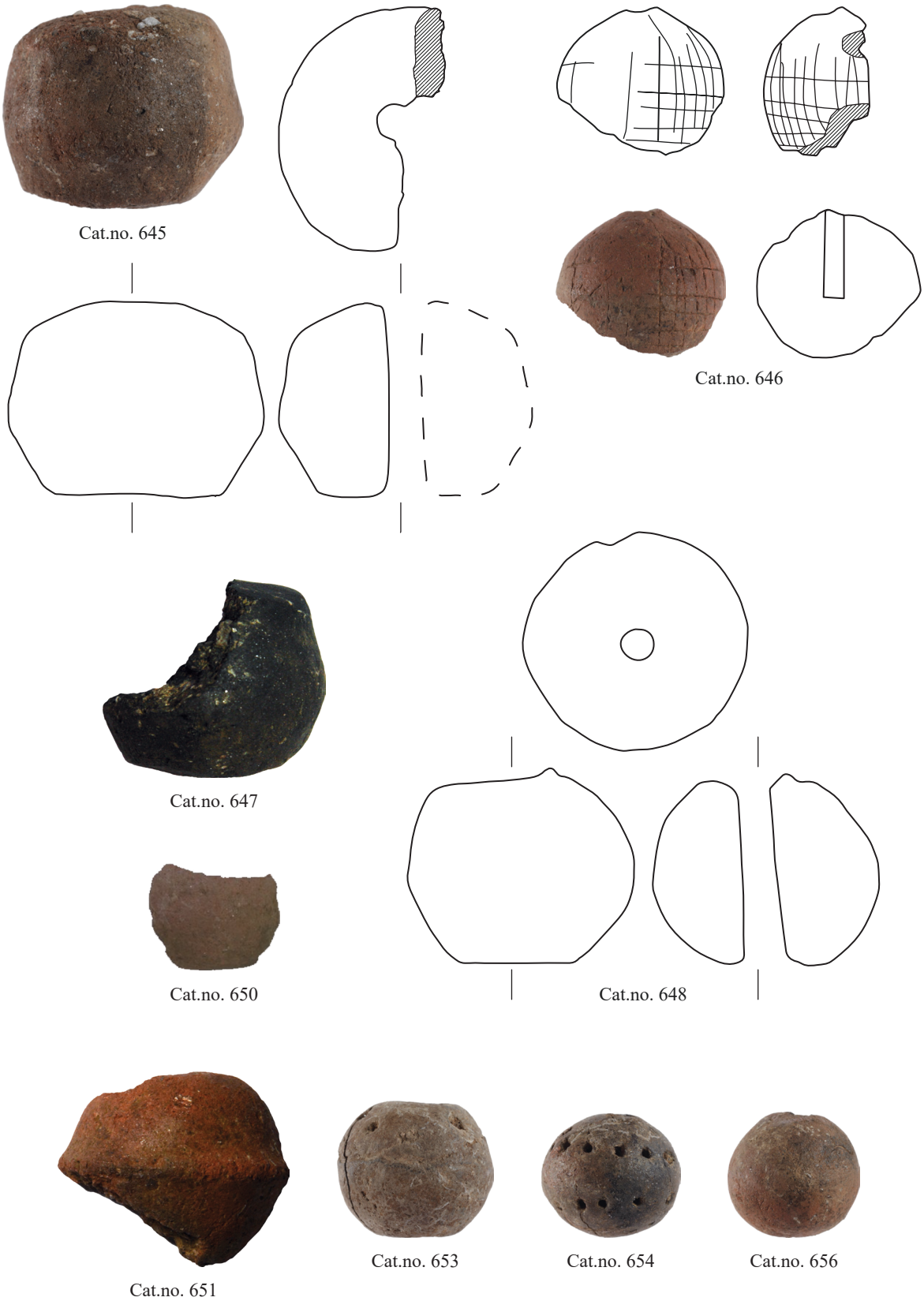


Plate 42 Çukuriçi Höyük: spindle whorls, EBA 1

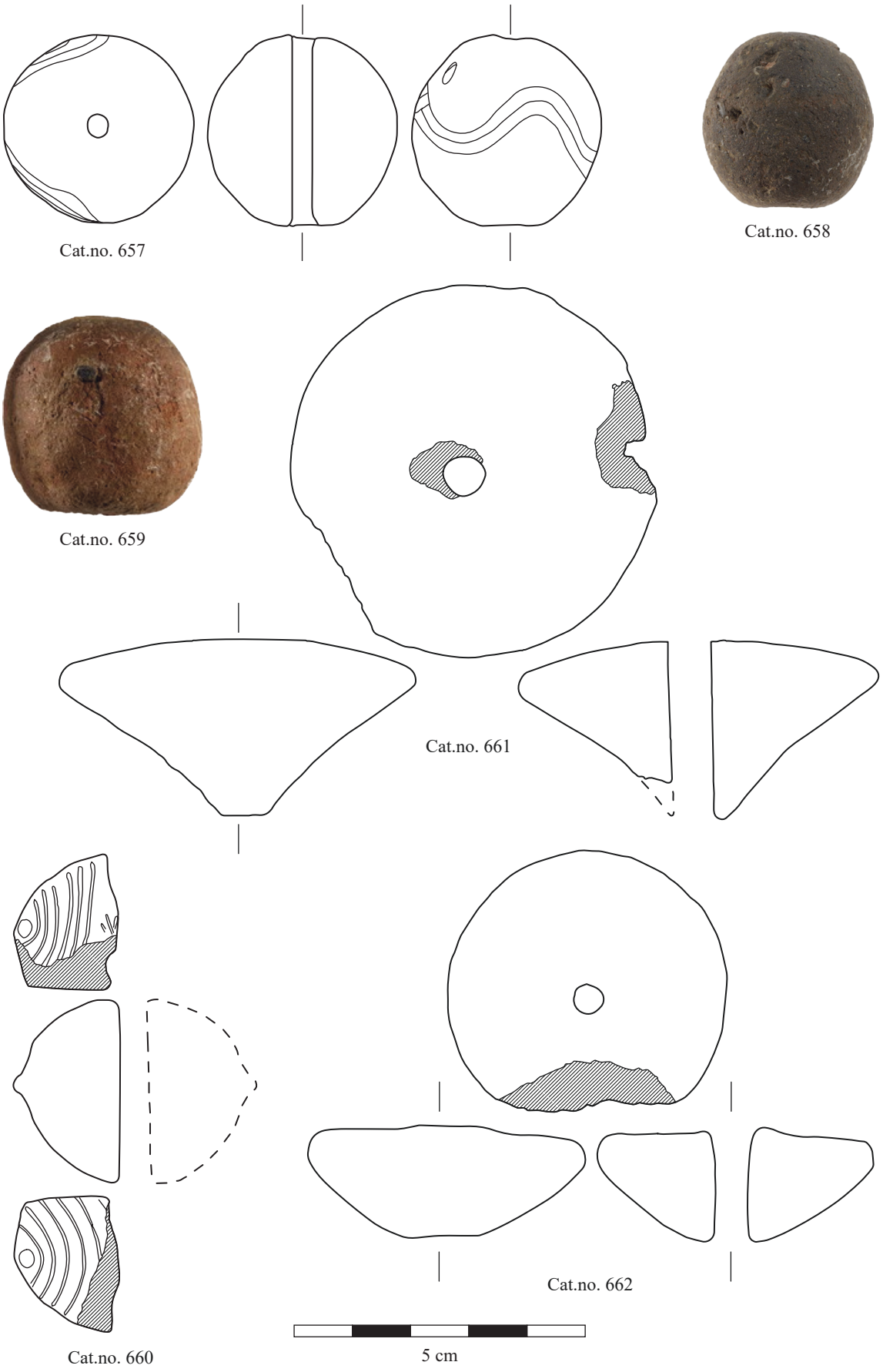
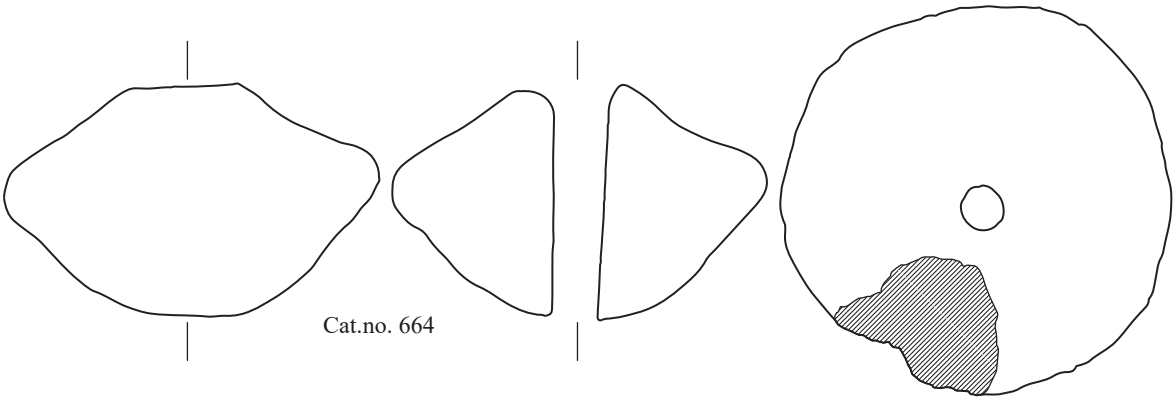


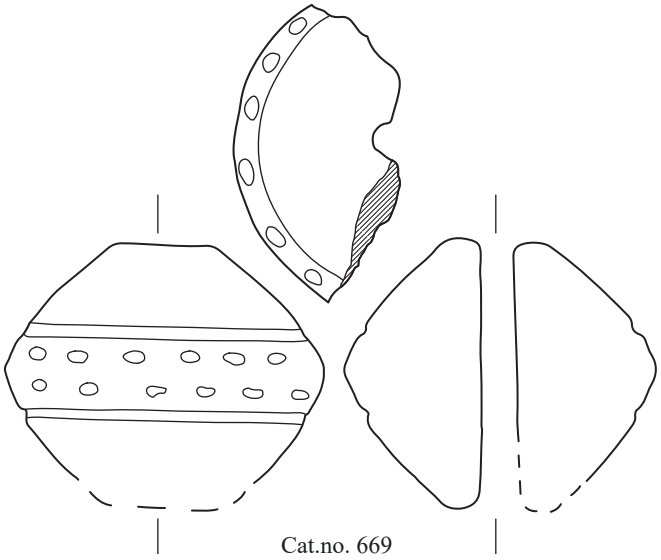
Plate 43 Çukuriçi Höyük: spindle whorls, EBA 1



Cat.no. 664



Cat.no. 663



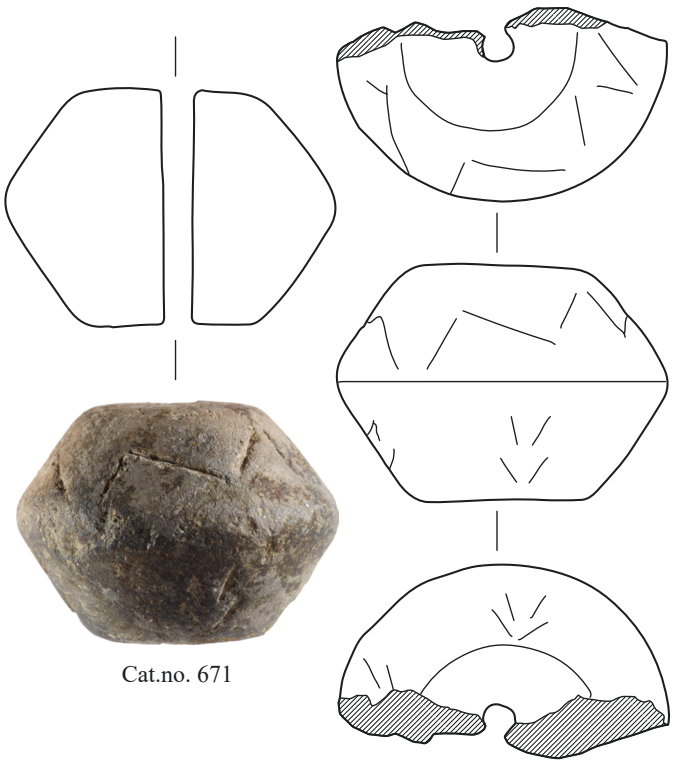
Cat.no. 669



Cat.no. 665



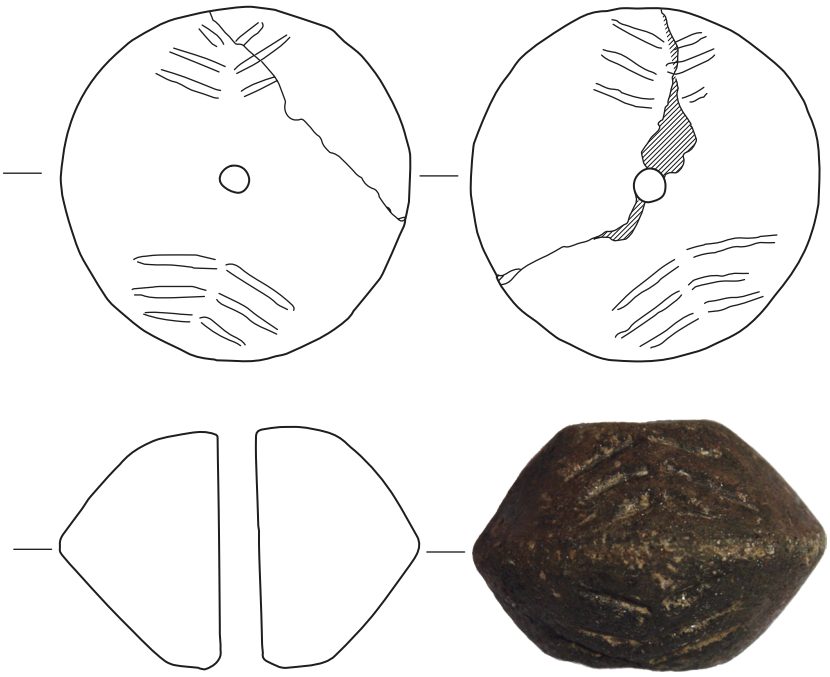
Cat.no. 670



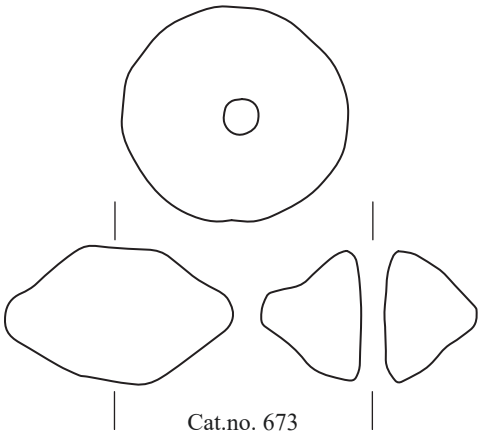
Cat.no. 671

5 cm

Plate 44 Çukuriçi Höyük: spindle whorls, EBA 1



Cat.no. 672



Cat.no. 673



Cat.no. 674



Cat.no. 675

5 cm

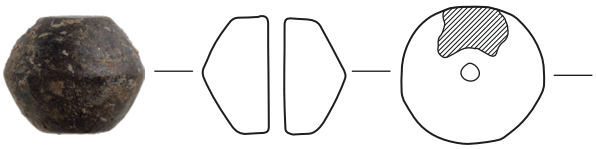
Plate 45 Çukuriçi Höyük: spindle whorls, EBA 1



Cat.no. 676



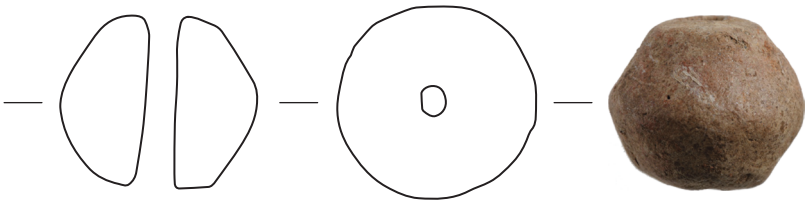
Cat.no. 677



Cat.no. 678



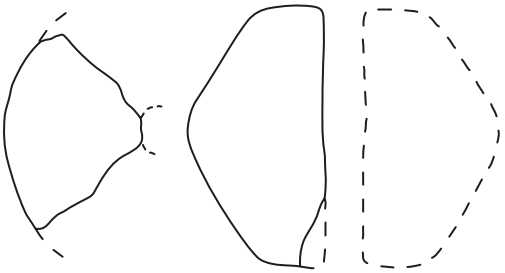
Cat.no. 679



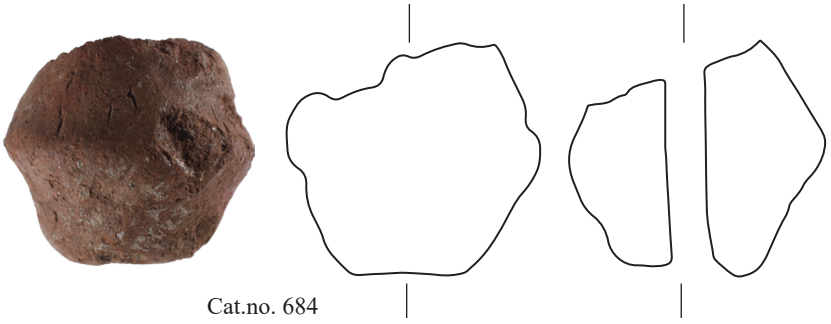
Cat.no. 682



Cat.no. 681



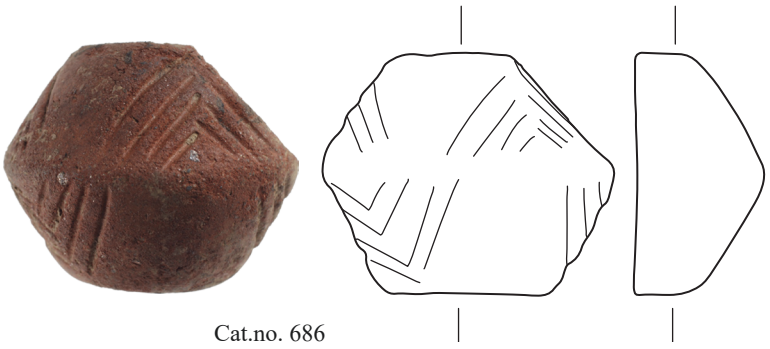
Cat.no. 683



Cat.no. 684



Cat.no. 685



Cat.no. 686

5 cm

Plate 46 Çukuriçi Höyük: spindle whorls, EBA 1

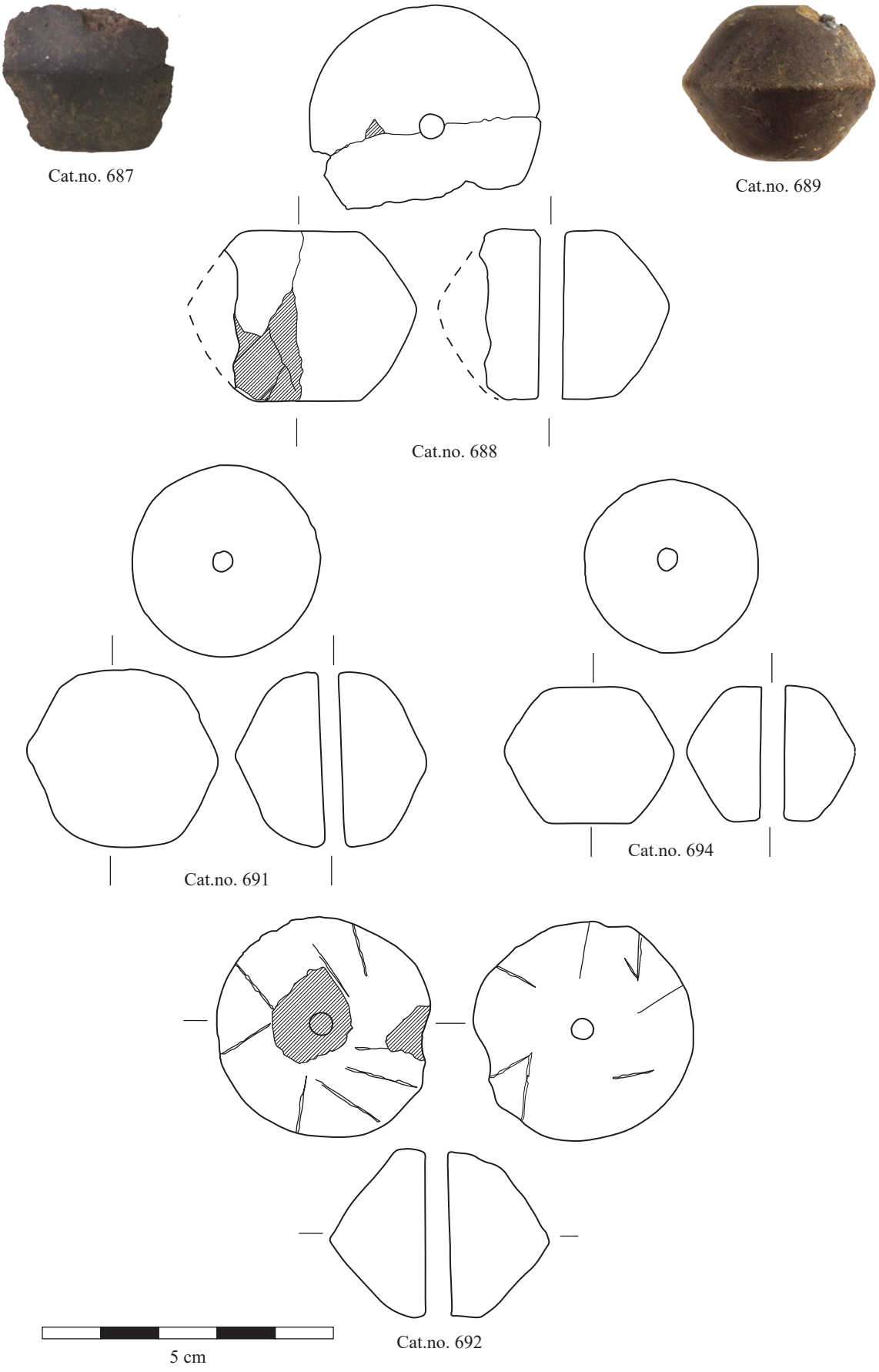


Plate 47 Çukuriçi Höyük: spindle whorls, EBA 1



Cat.no. 695



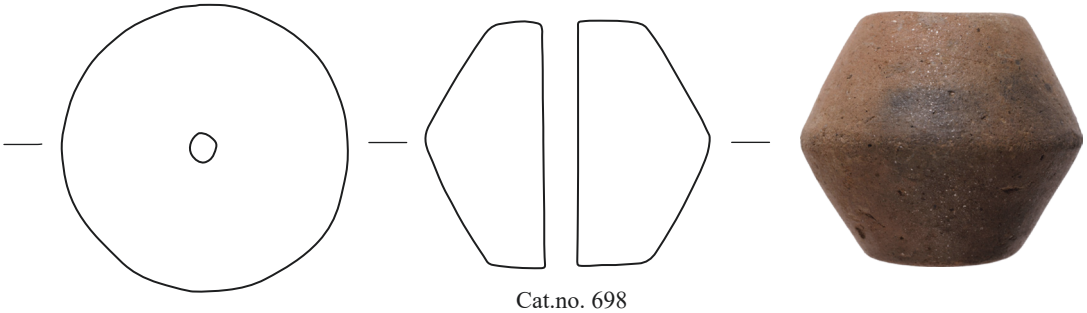
Cat.no. 696



Cat.no. 697



Cat.no. 699



Cat.no. 698



Cat.no. 700



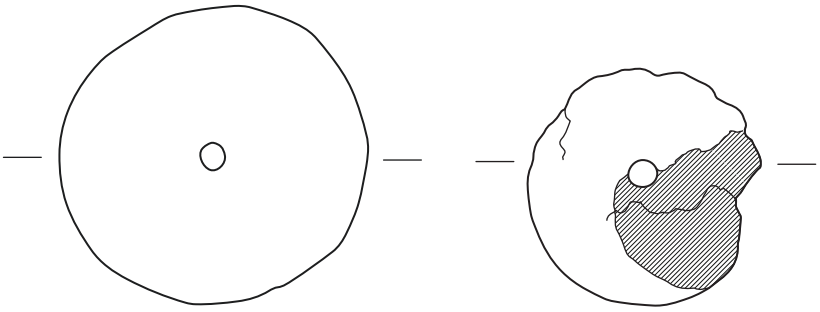
Cat.no. 701



Cat.no. 702



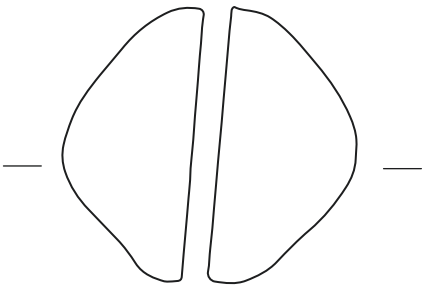
Cat.no. 704



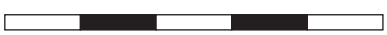
Cat.no. 707



Cat.no. 706



Cat.no. 705



5 cm

Plate 48 Çukuriçi Höyük: spindle whorls, EBA 1



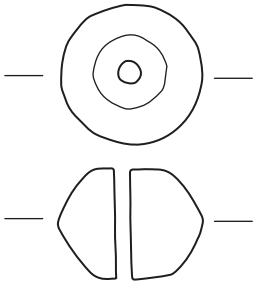
Cat.no. 708



Cat.no. 709



Cat.no. 710

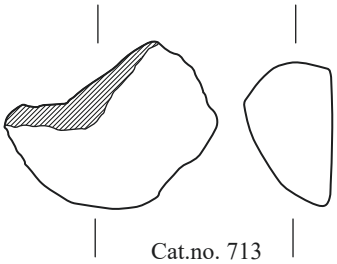




Cat.no. 711



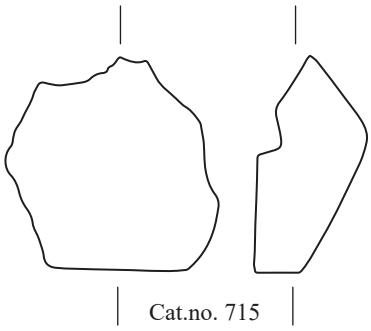
Cat.no. 712



Cat.no. 713



Cat.no. 714



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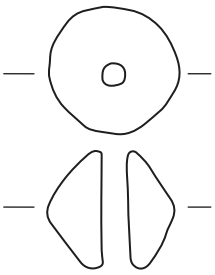
Cat.no. 716



Cat.no. 717



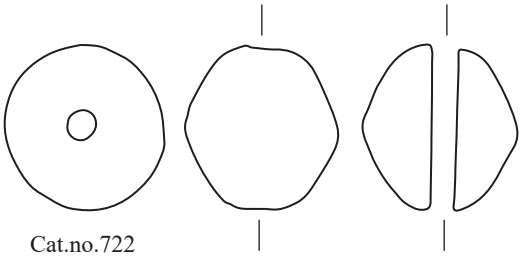
Cat.no. 719



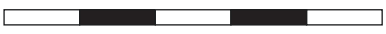
Cat.no. 720



Cat.no. 721



Cat.no.722



5 cm

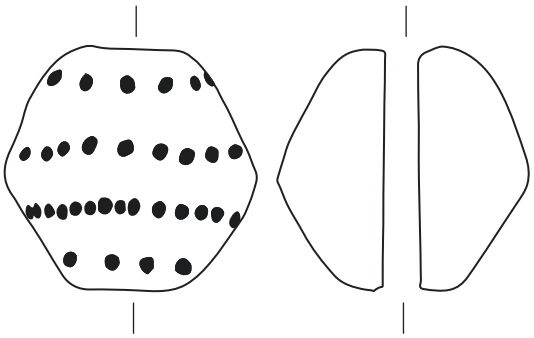
Plate 49 Çukuriçi Höyük: spindle whorls, EBA 1



Cat.no. 723

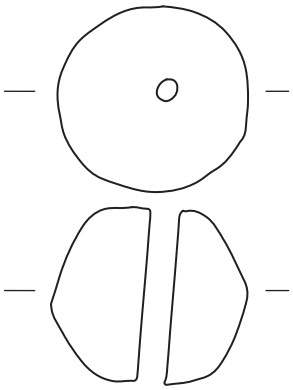


Cat.no. 724





Cat.no. 725



Cat.no. 726



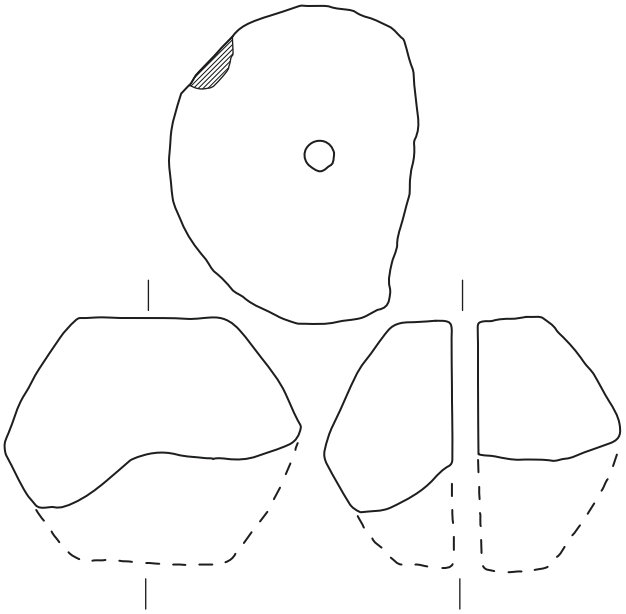
Cat.no. 727



Cat.no. 728



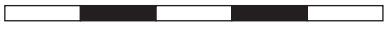
Cat.no. 730



Cat.no. 729

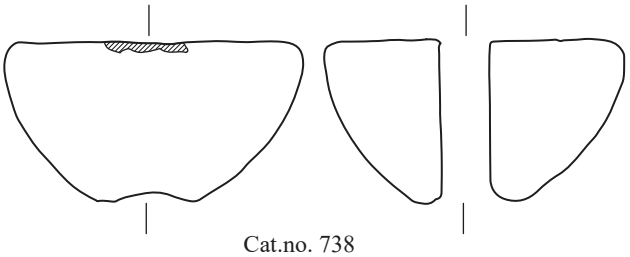


Cat.no. 731



5 cm

Plate 50 Çukuriçi Höyük: spindle whorls, EBA 1



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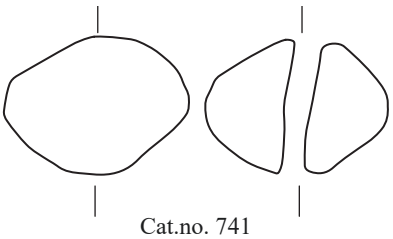

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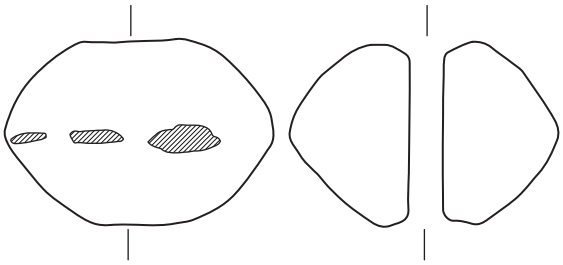

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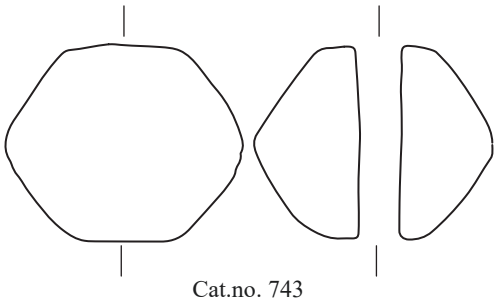

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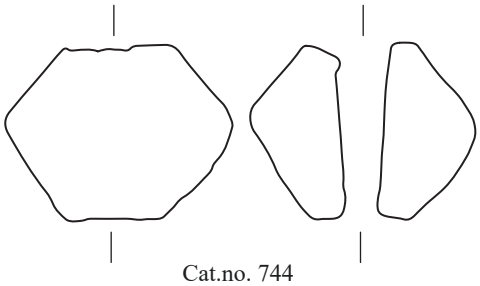

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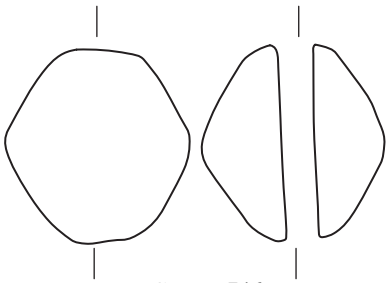

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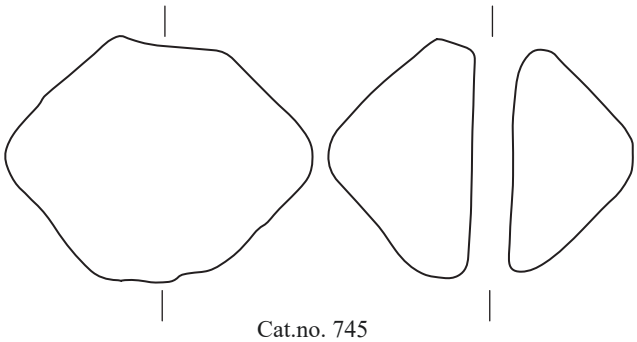


Cat.no. 745



5 cm

Plate 51 Troy: spindle whorls, EBA 1

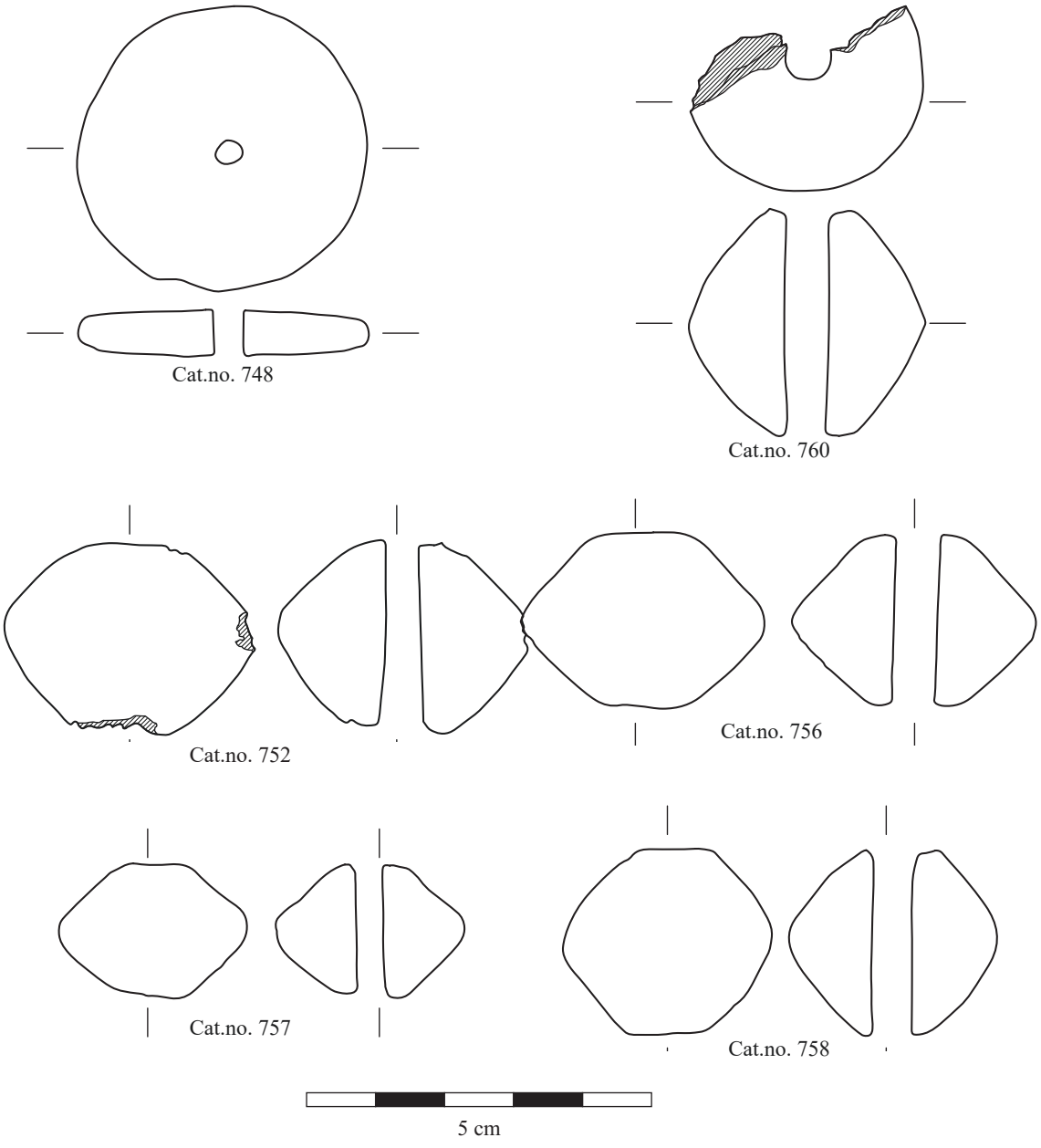


Plate 52 Troy: a. Spindle whorls, EBA 2; b. Loom weights, EBA 3

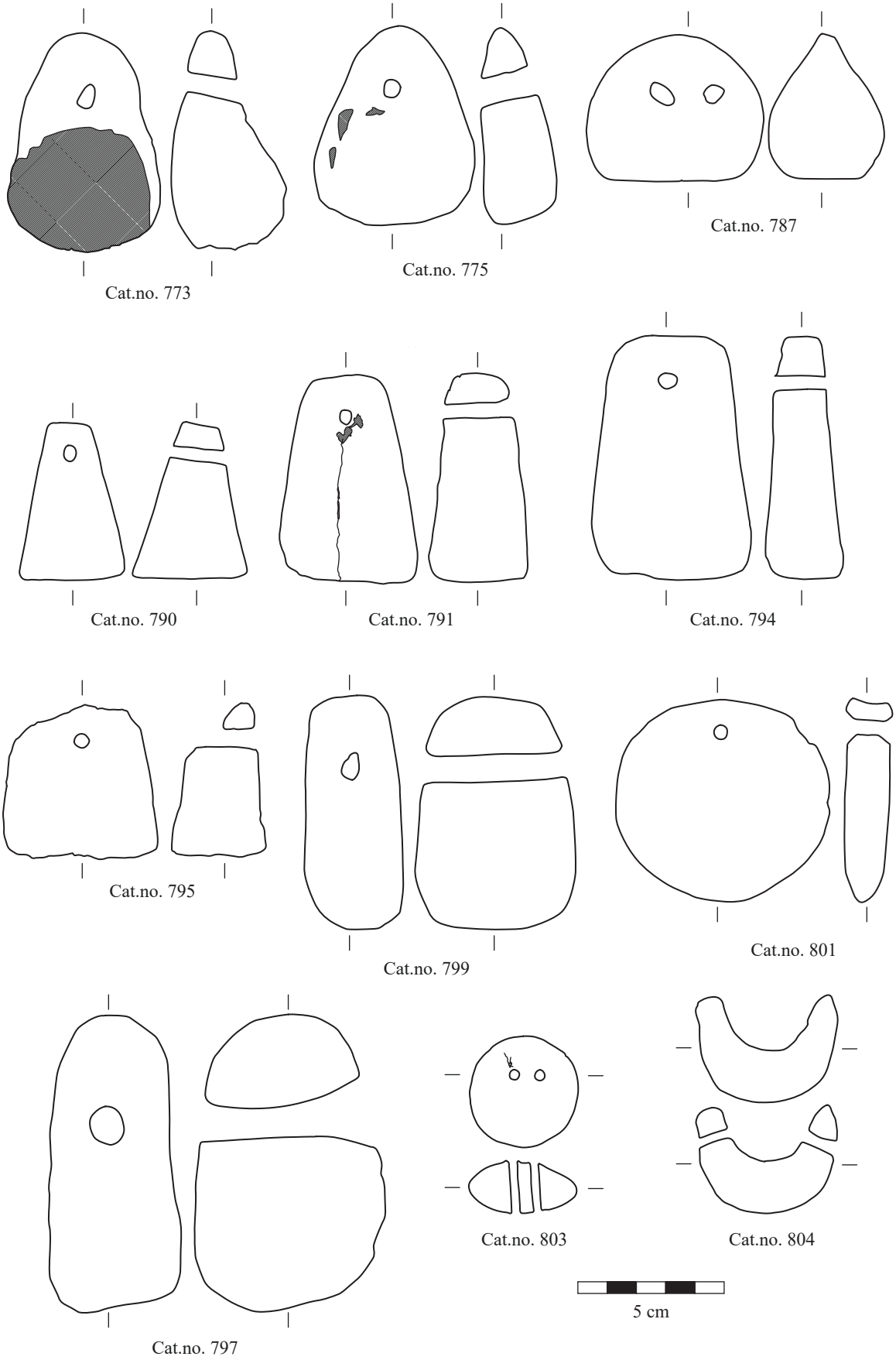


Plate 53 Troy: loom weights, EBA 3

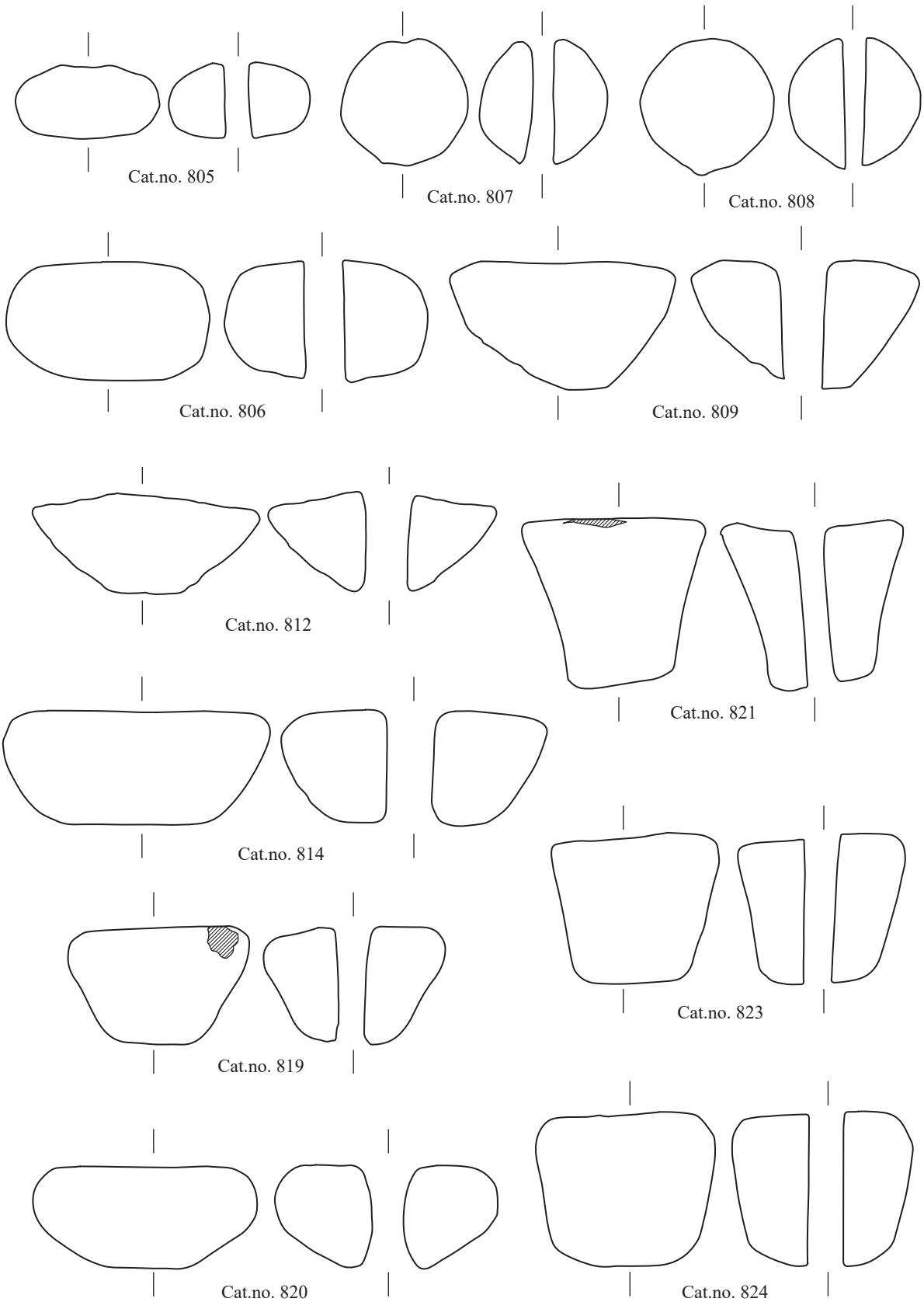


Plate 54 Troy: spindle whorls, EBA 3

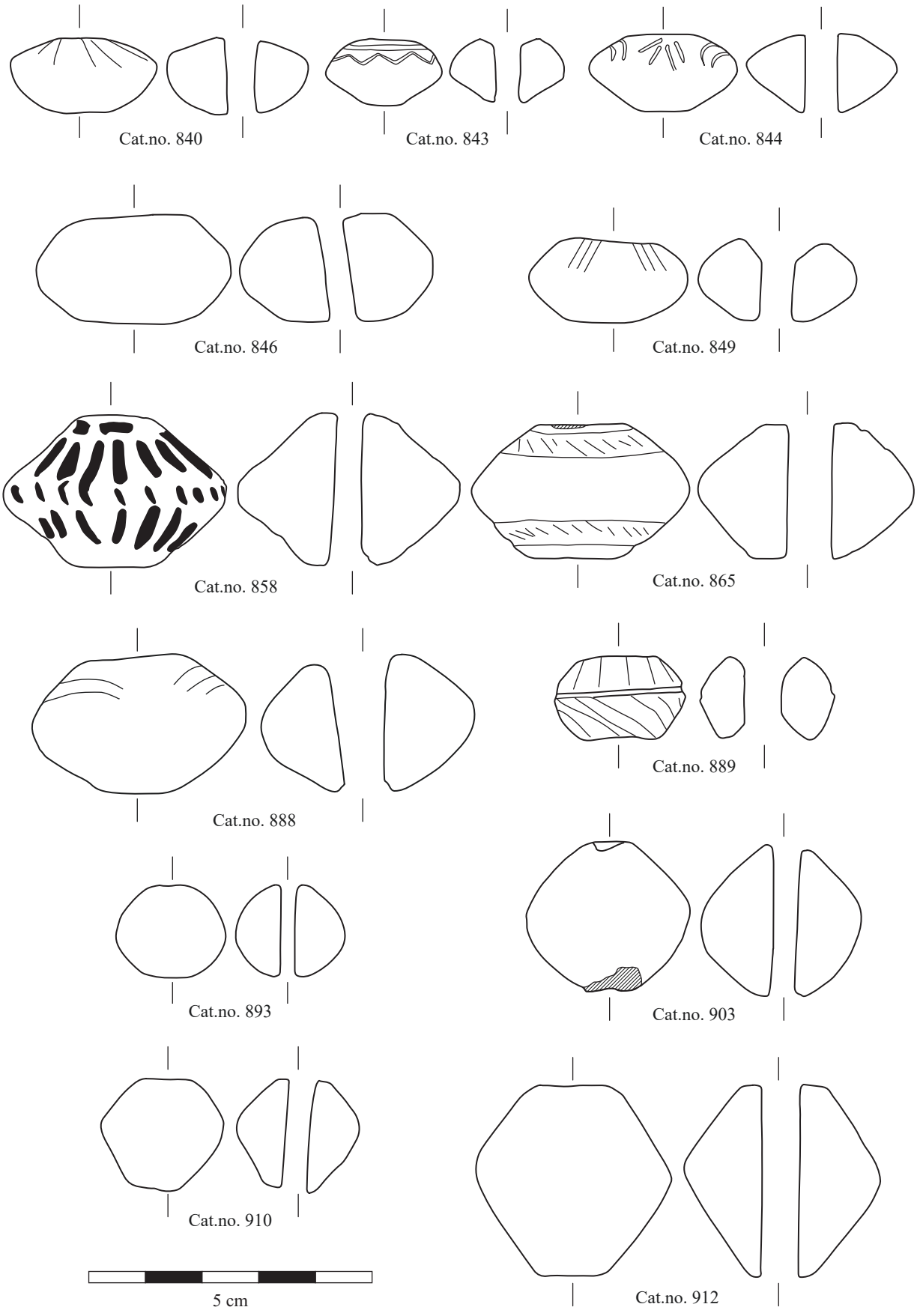


Plate 55 Troy: spindle whorls, EBA 3

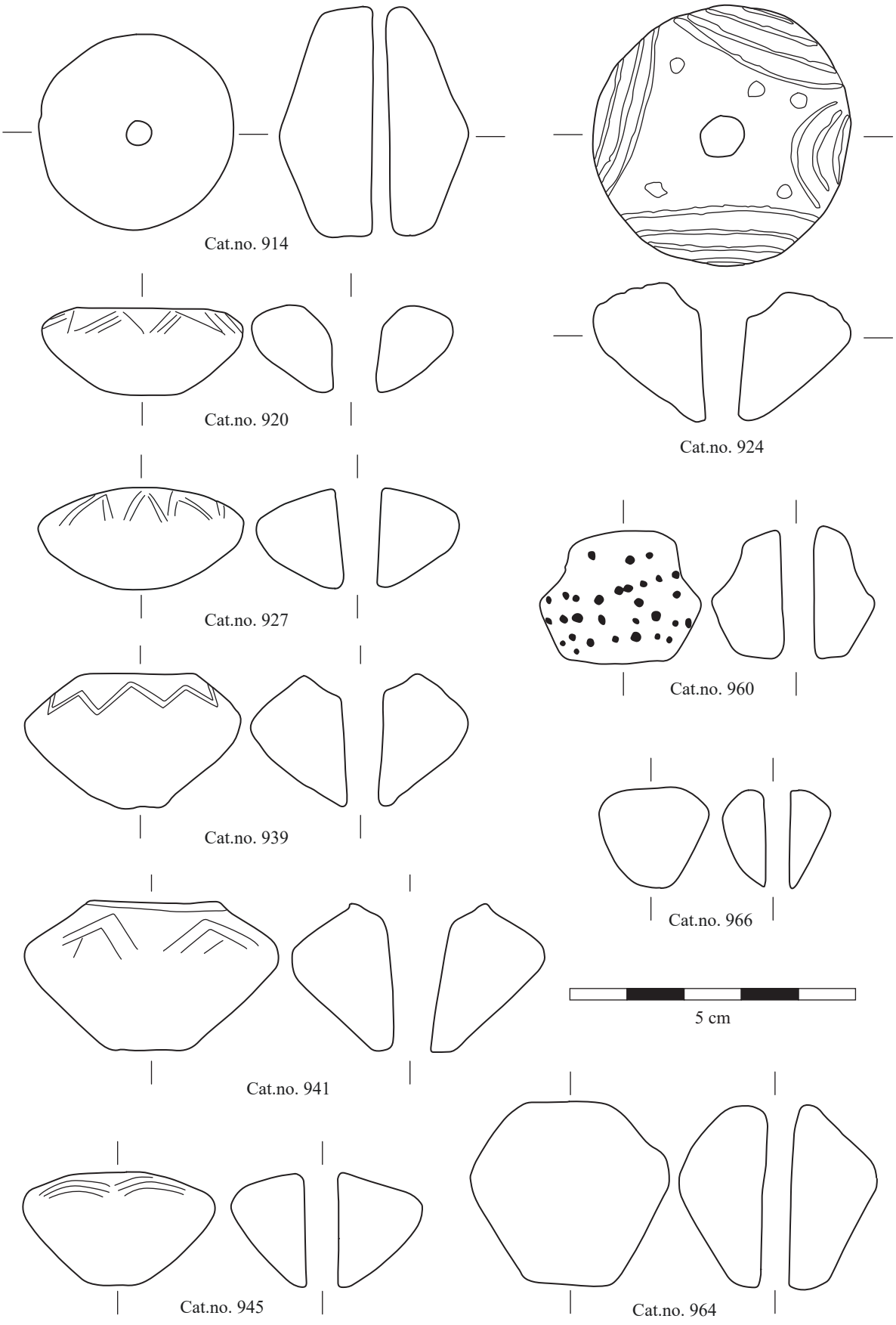


Plate 56 Troy: spindle whorls, EBA 3





Plate 57 Bademağacı: a. Spindle whorls, EBA 1; b. Spindle whorls, EBA 2



Cat.no. 1124



Cat.no. 1125



Cat.no. 1127



Cat.no. 1133



Cat.no. 1139



Cat.no. 1143



Cat.no. 1144



Cat.no. 1146



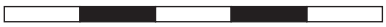
Cat.no. 1145



Cat.no. 1149



Cat.no. 1150



5 cm



Cat.no. 1151



Cat.no. 1155



Cat.no. 1157



Cat.no. 1156

Plate 58 Bademağacı: spindle whorls, EBA 2



Cat.no. 1159



Cat.no. 1161



Cat.no. 1172





Cat.no. 1170



Cat.no. 1173



Cat.no. 1178



Cat.no. 1181



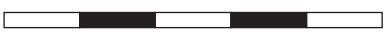
Cat.no. 1182



Cat.no. 1183



Cat.no. 1186



5 cm

Plate 59 Bademağacı: spindle whorls, EBA 2

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