UNIVERSITY OF NOTTINGHAM

Department of Classics & Archaeology

‘The Baskets and the Basket-makers of Prehistoric South-east Europe. A Palaeoethnobotanical Approach’

By

Mila Valentinova Andonova

Thesis submitted to the University of Nottingham for the degree of Doctor of Philosophy

June 2019

I certify that:

a) The following dissertation is my own original work.

b) The source of all non-original material is clearly indicated.

c) All material presented by me for other modules is clearly indicated.

d) All assistance received has been acknowledged.

(Mila Andonova)

To my loving Grandparents,

Some of whom were weaving baskets.

ABSTRACT

Archaeological basketry is one of the 'invisible' types of material culture, which in South-east Europe are rarely preserved, and hence rarely properly recorded. Nevertheless, in the cases, where basketry remains are retrieved, they are often considered not very informative, as other vegetal remains, such as seeds or charcoal. In addition, this type of material is very challenging when botanically identified, mainly due to its high fragility, demanding preservation and not adequate conservation. This thesis will attempt to reveal the 'invisibility' of archaeological basketry in the study region of South-east Europe, via an integrated approach, including established and novel techniques for the assessment and identification of botanical remains, in combination with field ethnographic work, access to museum archive material and reference no supportive proxies as palaeoenvironmental data, iconography and aspects of materiality. This multi-proxy approach highlights the high informative potential of archaeological basketry and perhaps, it will encourage future studies on the subject.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

CT – Computed Tomography

EN – Early Neolithic

Epi. – Epi-illuminated light

FN – Final Neolithic

LN – late Neolithic

MN – Middle Neolithic

PPL – Plain polarised light

Q– Qestionaires

R – Radial plane

SEM- Scanning Electron Microscopy

T – Transversal plane. Also called cross-section.

TA – Tangential plane, also called longitudinal section.

XPL – Cross polarised light

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

CD attached here:

ACKNOWLEDGEMENTS

The completion of this thesis was made possible with the support of great many people, beginning with my supervisors, Alexandra Livarda, Chrysanthi Gallou and Julian Henderson, who supported my idea from the beginning. I am grateful to Alexandra Livarda for the many hours spent in fruitful discussions on plants, people, and of course baskets and for her ultimate support before and during my PhD research. Chrysanthi Gallou answered numerous questions on Mediterranean archaeology and provided support during the process of obtaining official study permits from the Greek government. Julian Henderson supported my laboratory work – a core element of my research.

Since this doctoral research combined several techniques, while sculpturing a novel approach to archaeological and ethnographic evidence for baskets, the list with brilliant laboratory facilities I accessed and their scientific staff is rather long. To begin with I am grateful to Beth Steer and Martin Roe from the Nanoscale and Microscale Research Center of the University of Nottingham, who supported me into the imaging of several decades of SEM (scanning electron microscope) scans. Beth Steer assisted me with trying different techniques and was always welcoming for experimenting with new material. I am also thankful to Craig Sturrock from the Hounsfield Facility for Rhizosphere Research at the University of Nottingham, who agreed and aided the CT (computed tomography) scans conducted for the purposes of this thesis. He was very supportive in the experimentation with the visualisation of the data and allowed myself to spend long hours in their state-of-art facility obtaining the best possible images.

The preparation of my ethnographic samples would have not been possible without the invaluable help of the wood anatomists from the Swiss Federal Institute for Forest, Snow and Landscape Research, WSL: Fritz Schweingruber, Holger Gartner and Allen Crivellaro. With their help and excellent equipment – such as the new GSL-1® microtome – was accessed and used in this research. By the end of my doctoral research several questions had already emerged and I am thankful to the scientists of the Royal Botanic Garden KEW, whom I consulted and they helped me with my botanical identifications: David Cutler, Peter Gasson and Chryssie Prychid.

My ethnographic work would have not been possible without the agreement of the interviewed basket-makers: Kolyo Baev, Neno Lalov, Hristo Iliev, Georgi Georgiev, Tsolka Metodieva, Metodi Metodiev, Stefan Mihov, Sonja Mihova, Elka Velkovska, Julieta Georgieva, Dimitar Atanasov, Sasho Angelov, Emel Balakchi, Mehmet Sehir, Dimcho Zanev, Vencislav Damyanov and Snejana Damyanova. They all responded to my request for an interview and spent long hours discussing and showing me their craft. Some of them even welcomed me in their workshops and kindly invited me at their homes. The ethnographic part of this thesis would also have not been possible without the support of the museum directors: Svetla Dimitrova (Ethnographic Museum Etar), Angel Yankov (Regional Ethnographic Museum of Plovdiv), Nikolay Todorov (Regional Historic Museum of Silistra), Petko Hristov (Institute for Ethnology and Folklore with Museum, Bulgarian Academy of Sciences). The study of the archaeological material for the purposes of this thesis was made possible by the archaeological site directors and their teams. Starting from the North to the South, along the studied sites in this thesis, I express my gratitude to: Vasil Nikolov (National Archaeological Museum, Bulgarian Academy of Sciences), Elena Marinova (Catholic University of Leuven, Belgium), Ivan Vajsov (National Archaeological Museum, Bulgarian Academy of Sciences), Malgoszata Grebska-Kulow (Regional Historic Museum of Blagoevgrad, Bulgaria), Vanya Petrova (National Archaeological Museum, Bulgarian Academy of Sciences), Krasimir Leshtakov (University of Sofia, Bulgaria), Dimitra Malamidou (Ephorate of Antiquities, Serres, Greece), Chaido Koukouli-Chrysanthaki (archaeologist, retired), Stratis Papadopoulos (Ephorate of Antiquities, Drama, Greece), Stella Katsarou-Tzeveleki (Ephorate of Palaeanthropology-Speleology, Athens, Greece), Christos Doumas (The Thera Foundation), Maia Pomadere (French School at Athens), Carl Knappett (University of Toronto), Nikos Zacharias (University of Peloponese).

I am also thankful to Maria Beloyanni, whose PhD thesis was also dedicated to the craft of basketry. She has provided me with valuable data and useful advice. Thank you to Rayna Nacheva (Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences) for the support with the creation of the dedicated to this research maps and to Matt Davies (Digital Humanities Hub, University of Nottingham) for providing a photographic equipment for the purposes of this study. I am grateful to my friends and colleagues, who assisted me with numerous favours in support of my thesis: Bela Dimova, Marco Panato, Fabio

Saccocio, Paz Ramirez, Llorenc Picornell-Gelabert, Julie Daujat, Julie-Anne Bouchard-Perron, Robert Francis, Mariele Valci, Giulia Grisot, Fabio Gentile, Elsa Fergadiothou and Leslie Bode.

I am grateful to Juliana Andonova, Valentin Andonov, Nikolay Andonov, my extended Family and to Dimitar Katsarski, for being always there, wherever I go and whatever path I choose to take.

CHAPTER I. INTRODUCTION

1.1. Research questions

If basketry remains have been studied ethnographically for decades, the study of archaeological basketry is still quite a new direction within the discipline of archaeobotany. The main reason for that is the scarcity of the evidence, which is largely due to the perishability of this type of material. Being made out of processed plants, basketry objects are highly depended on the taphonomic conditions present at each archaeological site. This means they could be preserved in a charred, mineralised, desiccated or waterlogged environment, but only if their plant anatomy allows it. Since during the processing preceding the basket-weaving activities the plant material is being split, dried, and re-moistured, the chances of preservation of the intact plant tissue are very low.

However, this type of archaeobotanical remains do exist, even if the taphonomic conditions in South-east Europe do not always favour that as, for example, waterlogged or desiccated basketry material is a rare find. Even in the cases when basketry remains are present, they can be easily overlooked when botanical material is retrieved, because they do not fall precisely within the two major divisions of archaeobotany, the study of seeds and the study of wood charcoal (anthracology). In addition, when basketry remains are not overlooked, but retrieved, they are conserved in order to protect their completeness, while botanical analysis is usually not conducted because they are considered 'unidentifiable' (due to their fragility and conservation). In the course of this study it was surprising to notice that even sites with extensive archaebotanical and anthracological sampling did not include any study of their basketry remains. This thesis endeavours to rectify this and introduce basketry as a dynamic and important line of evidence that will hopefully stimulate further studies and consideration of this type of archaeological material.

The main research questions of this thesis can be summarised as follows:

1. Is prehistoric archaeological basketry in South-east Europe botanically identifiable?

2. Can archaeological basketry remains be assessed non-destructively, given their quality?

3. Is the indirect evidence for basketry, such as the mat-impressions on pottery, informative on basketry plants and technologies?

4. What lessons can still be learnt from any existing basket-makers within the study area and what insights can they allow into basketry technology and plant choices?

5. What were and are the social aspects of basketry crafts and its practitioners?

6. What are the potential links between basketry plants, basket-makers and basket-users?

7. Can ethnography and archaeology be combined together in order to provide more in-depth knowledge on basket-making?

1.2. Geographical and chronological scope of the research

Geographically and according to the modern political borders this thesis focuses on the South Balkans and the Eastern Mediterranean, and particularly on Bulgaria and Greece. Biogeographically and according to the regional division of Europe the chosen study area can be positioned within two major zones, South Continental and East Mediterranean, generally situated between the 20° - 30° parallel and 35° – 45° meridian. Nevertheless, the different cultural processes in the prehistory of the region were not framed within the modern countries' political borders. This was the major element causing complexity in the chosen study area: the presence of non-geographical, but traditional borders which have interacted in different time periods. This is why for example Egyptian or Turkish basketry is discussed in the context of the Eastern Mediterranean, while still focusing on South-east Europe. Nevertheless, these rather flexible borders between the different regions of the study area of this thesis were studied separately, in order to achieve a better resolution for the analysis developed in this thesis.

The two parts of the study area are different from an ecological point of view because the north part (Bulgaria and North Greece) is mainly occupied by temperate Continental forest, while the south area (Central and southern Aegean Greece) is populated by subtropical dry forest and subtropical humid forest (Davis and Holmgren, 2000). The two ecological zones differ in terms of biodiversity too and this is well recorded and visualised by the *Atlas of Flora Europea* (Jalas et al. 1999), where the Continental zone is dominated by 300-400 plant species per gridded area with the exception of west Bulgaria, where the species concentration is higher (400 – 500 species per grid), while the Mediterranean zone is dominated by 100 – 200 plant species per grid, with several exceptions in the west Greek Ionian coast, the islands in the Aegean sea and east Crete, where the vegetation concentration is lower (0 – 100 species per grid). This floristic diversity had to be taken into account when botanical identifications were attempted for the purposes of this research.

Despite the geography and the ecology of the north and south regions of the study area, the cultural chronology during the prehistory of South-east Europe slightly differs. This is why there are several proposed chronologies adapted to each micro-region within this part of Europe: there is one for the Balkans (including North Greece), and one for the southern Aegean Greece. For the Neolithic period the two time-scales are almost parallel, with the exception of the late Neolithic, which is later in the Balkans (e.g. the Middle Neolithic for some Balkan sites corresponds to the late Neolithic for some southern Aegean sites). The transition period between the end of the Neolithic and the beginning of the Bronze Age also differs: the last phase of the late Neolithic and Final Neolithic in the southern Aegean corresponds to the Early, Middle and Late Chalcolithic in the Balkans. The cultural periods become even more diverse when the Bronze Age begins: the Early Bronze Age for the Balkans corresponds to the Early Helladic for the Aegean, while in the Cyclades this is the early Cycladic and in Crete the Early Minoan. These last three cultural periods continue almost parallel until the end of the Bronze Age in the Aegean (Tsirtsoni, 2016; Table 1.1.).

The studied in this thesis chronological time span falls within the Late Neolithic of both the Balkans and the Aegean and the Late Bronze Age of the Aegean. The studied archaeological sites, where direct and indirect evidence for basketry originates from, are located across the whole geographical surface of the study area, including the Black sea coast to the North, west and central Bulgaria, South-east and South-west Bulgaria, Greek Macedonia, Thrace, the Greek Mainland, the Cyclades and Crete. This is the reason why not a single cultural chronology is used, but instead, the ones assigned by the excavators and researchers of each site were taken into consideration in this thesis.

BC	EUROPEAN PERIODS	AEGEAN PERIODS	BALKAN PERIODS
6800-6500	PRECERAMIC (PPN)		
6500-5800	EARLY NEOLITHIC (EN)		
5800-5300	MIDDLE NEOLITHIC (MN)	MN	
5300-4800	MIDDLE NEOLITHIC	LN Ia	MN (-5200) LN (-4800)
4800-4500	LATE NEOLITHIC (LN)	LN Ib	EC MC
4500-3200	EERLY CHALCOLITHIC (EC)	FN/C LN IIa LN IIb	LC FC Proto BA
3000-2000	MIDDLE CHALCOLITHIC (MC)	EBA I EARLY HELLADIC (I-III)	EBA
2000-1625	MIDDLE BRONZE AGE (MBA)	MIDDLE HELLADIC (I-III)	MBA
1625-1200	LATE BRONZE AGE (LBA)	LATE HELLADIC (I, IIA,B-IIIA,B)	LBA

Table 1.1. Relative chronologies for the Mediterranean and the Balkan regions, when compared with the European periodisation (after Tsirtsoni, 2016).

1.3. Strands of evidence and limitations

In order to achieve a better understanding of modern and archaeological basketry two major strands of evidence were combined into an integrated approach towards the study of basket-making in South-east Europe. The first line of evidence was ethnographic research that included documents, actual basketry samples and field interviews with basket-makers. The archaeological analysis consisted of the study of both direct and indirect evidence for ancient basketry, i.e. plant remains from ancient basketry objects and impressions on pottery.

This way, two separate datasets were created, one including the ethnographic data, and the other the archaeological ones. The study of each element was secured by the official permits for access to museum archives and collections. Sampling of both archaeological and ethnographic botanical specimens was conducted *in situ*, where the basketry objects were kept, while transportation and laboratory analysis followed this. Since transportation was not possible for the mat-impressed pottery assemblages (with the exception of one site), an adapted to this restriction approach was applied: the analysis was performed in situ within the archives where the material was kept, and specially designed for this study casts of the impressed surfaces were taken away for further analysis.

The diverse sources of information on basketry were analysed separately but interpreted together, aiming at securing a better understanding of this ancient and contemporary craft.

1.4. Thesis structure

To respond to the multi-proxy approach to ancient and contemporary basketry, this thesis was built in four main chapters. Each of them follows a dedicated methodological set, presented in each chapter, but they all aim at obtaining an in-depth view of the ancient and contemporary basketry of South-east Europe.

The first chapter (Chapter 2) discusses the basketry weaving techniques and investigates the different approaches to the study of this craft, including its relation or not to the textile craft. It also reviews the existing scholarship related to ancient and contemporary basketry plants within the study area. Finally, Chapter 2 defines the set of terms regarding the weaving techniques, which are applied to the rest of the thesis. The choice of standardised terminology to be used when describing ethnographical and archaeological basketry is important because it unifies the evidence. This chapter also discusses the two types of approaches within the literature dedicated to basketry: the first, including non-botanical observations, and the second, including botanical identifications of the weaving plant material. The two types of data are united together and a table with all proposed basketry species was created in order to be used as an initial guide of botanical information.

The ethnographic evidence for basketry was collected via a two-levelled approach, discussed in Chapter 3. The first level consisted of the assessment and analysis of museum material, including archive documentary sources, such as photographs, and sampling basketry specimens from the museums' collections. The second level of this approach focused on primary field work, conducted within all ethnographic regions of Bulgaria. The field methodology consisted of identifying basket-makers and interviewing them via tailored for the purposes of this thesis questionnaires, which were approved by the Ethics Officer in

Faculty of Arts in 2016, prior to my fieldwork. The dataset, built on the basis of this information, was then discussed, and included the profile of the basket-makers, the types of basket-products that were recorded, the plants' choices the craftsmen made, the economic aspects of the basketry craft and the social dimensions and traditions of basketry. Further, the relation between the basketry products and the basket plants, along with the one between baskets and their makers and users was investigated in order to gain further insights into this endangered by disappearance craft.

Archaeological basketry, including both direct (plant remains) and indirect (mat-impressed pottery) evidence, was analysed and discussed in Chapter 4. A combination of a novel approach to the archaeobotanical material and an in-depth observation and analysis of the impressed pottery aimed at proposing an integrated approach towards the identification of archaeological basketry. The featured examples included actual botanical remains in different modes of preservation from Neolithic and Bronze Age sites located on the border between Bulgaria and Greece and in Greece, while the studied pottery, consisted of samples from both countries and time periods. The set of techniques applied to the basketry plant remains consisted of two levels of a non-destructive assessment and a destructive botanical identification technique. The approach to the mat-impressed pottery included a microscopic analysis of the impressions and the creation of casts in order to obtain a better image of the weaving technique and the possible plant material. Types of plant material were then suggested and different patterns were explored, such as the tradition and localism of particular plant choices and weaving techniques, along with the relationship between the basketry and pottery products. Chapter 4 concludes that the applied integrated approach, using both direct and indirect evidence for archaeological basketry, is necessary in order to inform on all aspects of the ancient basketry craft.

The two data sets, compiled in the Chapters 3 and 4, the contemporary (ethnographic) and the ancient (archaeological), are brought together in Chapter 5. This chapter attempts to reconstruct the palaeo-environments of the studied in Chapter 4 archaeological sites via a combination of archaeobotanical, anthracological and palynological data. Then this information is compared with the already suggested botanical identifications of the archaeological basketry material conducted in Chapter 4 and informed by those in Chapter 3.

In order to obtain further insights into the uses of archaeological basketry, a brief review of the available archaeological iconographic evidence depicting baskets is also conducted. The different aspects of basketry usages and their materiality are then discussed.

In the Conclusion section of this thesis (Chapter 6) the main outcomes of this research are highlighted as well as its limitations alongside suggestions for improving their future application, related to the contemporary and ancient basket-making. Future directions of this research are also outlined, building upon the applicability of this approach to different time periods and regions. In addition, Appendices (1-4) were added only for referral purposes, see CD attached to this thesis.

CHAPTER II. APPROACHING BASKETRY: TECHNIQUES AND RAW MATERIAL

2.1. Introduction

The current chapter aims to systematise the existing technological classifications, to review the previously suggested plant species for contemporary and ancient basketry in South-east Europe, and to summarise the existing in the scholarship approaches to ancient and contemporary basketry craft. There have been two types of approaching basketry and basketry plans, including non-botanical studies, where no botanical identifications were held, but valuable suggestions and observations on the possible basketry plants were provided; and botanical studies, where plant identifications were conducted. This literature review was designed as a basis of the structure of the field interviews and the approach to the archaeological material. The identified plant families and species were also used as a guide when performing the ethnobotanical and archaeobotanical identifications (Chapters 3 and 4 respectively).

2.2. Defining basketry and basketry techniques

2.2.1. Defining basketry

A basketry technique is the method in which a basket or a mat is being produced. This is the way of linking the elements composing the body of the product. Often in the English literature the word 'weaving' is used when describing basket-making. The verb *to weave* relates also to textile production: 'weaving a basket', but also 'weaving cloth'. For British English, the first three definitions of the verb in the Oxford Dictionary (Simpson and Weiner 1989) are: "*to form a fabric (a stuff or material) by interlacing*", "*to practice weaving; to work with loom*", "*to spin (a web, a cocoon)*", "*to form a texture with (threads, filaments, strips of some material)*". For American English, the first three definitions given by the Merriam-Webster's New International Dictionary of English Language (Babcock, 1971) are: "*to form (cloth) by interlacing strands (…)*", "*to interlace (as threads) into cloth*" and "*to make (as a basket) by intertwining*". In the languages of the two main study areas in this thesis, Greek and Bulgarian, the picture looks similar. The Ancient Greek 'ὑφαίνω' [hyfèno] relates mostly to 'weaving cloth' (Montaniari, 2015), while the Modern Greek 'πλέκω' [plèko] refers to both 'weaving a basket', but it also means *knitting, plaiting* (Georgakas and Kazazis, 2005). In Old Bulgarian ('плести' [plèsti]) and Modern Bulgarian ('плета' [pletá]) the verb means both 'to knit', but also 'to weave a basket' (Radeva, 2012).

As seen even linguistically, basketry and textile production are two different but related to each other crafts. Thus, when describing a certain manufacturing technique, this may be addressed to both basketry and textile items. This is unavoidable as the technological proximity of the way of interlinking elements when producing baskets or fabrics uses similar or identical terminology. And if the earliest attempts (Mason, 1904; Lechmann, 1907; Vogt, 1937; Clark, 1952; Crowfoot, 1954) aimed in describing and grouping the variety of interlinking elements (i.e. the techniques), often placing basketry and textile production in genealogical relationship, the later ones focused on separating basketry from textiles and developing specifically basketry-related terminology (Adovasio, 1977; Wendrich, 1999; Bichard, 2008).

Mason (1904), whose study focused on American Indian basketry, introduced some of the earliest approaches to basketry, grouped different weaving techniques and identified the different sources of their production. For Mason, basketry as a craft was the ancestor of textile production and, at the same time, basketry *per se* was defined as 'textile art' (ibid.). Lechmann (1907) aimed at the creation of a universal classification according to the geographical distribution of the different types and techniques. He codified numerous categories, classes and subclasses, but his classification was rejected by the later scholarship, mainly because of its complexity. A few years later, Okey (1912) wrote one of the first instructional books for basket-making learners, used as a basis by Wright (1977) whose work was also instructional, although accompanied by a few historic aspects. Vogt (1937) published the first attempt to deal with archaeological basketry and textiles, focusing on the Swiss Neolithic Lake Villages, which is still widely cited in the scholarship. He studied the technical differences between the different types of baskets and developed a descriptive system, which positioned the different types of *Geflechtsarten* (plaiting arts) within their geographical distribution. In Lechmann's classification, basketry was discussed as 'plaiting' craft, separately from *Gewebe* (fabric).

Several instructional books, dealing with contemporary basketry techniques and material for basket-making, were published during the second half of the 20th century, but none of them focused on establishing technological classifications or referred to historical or archaeological evidence: Butcher (1986), Johnson (1986), Maynard (1989), Harvey (1975), and Garbiel and Goymer (1991). Nevertheless, several classification systems related specifically to basketry products were proposed. Most of them (Clark, 1952; Crowfoot, 1954; Emery, 1966-1994; Smith, 1975; Adovasio, 1977; Beloyanni, 1996; Wendrich, 1999, and Bichard, 2008) even had historical, archaeological or ethnographic references. The technological classification systems of these authors are reviewed in this chapter, followed by a discussion on the adoption of particular elements of these systems for the purposes of this thesis.

2.2.2. Reviewing technological classifications & approaches to the study of basketry

In his "*Prehistoric Europe: The Economic Basis*", Clark (1952) referred to the different types of basket/mat-making, using the word *plaiting*, whereas for textile production he used the term *weaving*. The author briefly systematised the techniques based on the earliest known evidence at that time: either direct (i.e. preserved basketry remains) or indirect (impressions on pottery). Even if *plaiting* was grouped together with the textiles, he defined several techniques related to basketry and matting (even though some of them are shared with the textiles): *netting*, *coiled work*, *twinned plaits*, *plaited matting*, *various rare plaits* and *wicker-work* (Clark, 1952, see Table 2.1).

Netting was described as a single-element plaiting (knotted and knotless) mainly of fishing nets and sprang bonnets with early origins in the Mesolithic Finland, Estonia and in the Neolithic French Riviera and the Swiss Alps (Clark, 1952) and later during the Bronze Age it was identified in Northern Europe, in Denmark and Norway. According to Clark (ibid.), netting specimens encountered archaeologically were considered to be made of willow bast or other bast plants, but it is not clear what the evidence was for these plant identifications. *Coiled-work* was described as a two-element technique (the previous described are one-element, as the construction is formed by one thread/cord/yarn) and, according to Clark's review, it was extremely widespread in pre-dynastic Egypt and Chalcolithic Palestine and also known in Neolithic Denmark, Switzerland, Germany, Orkney, Spain and Greece. *Twinned plaiting* was known in Switzerland, Denmark, Britain and Italy since the Neolithic. Based mostly on the known archaeological finds at his time (such as the Neolithic Swiss Lake Villages), Clark hypothesised netting and plaiting as having a pre-Neolithic origin, and together with twined plaiting he classified them as the oldest techniques (Clark, 1952).

The category of *plaited matting* (*plain* and *twill*) was considered of uncertain origin and the earliest example was presumed to have originated in Roman Egypt (Clark, 1952). Some of the information here is not clear because the examples provided were *plain* matted floors from Jarmo in Iraq, described as being "*occupied by extremely primitive farmers to whom the pottery was apparently unknown*" (Clark, 1952, p. 230), i.e. the author provides a Neolithic example. Clark (ibid.) then provided examples of *twill* matting from Chalcolithic Palestine, Bulgaria, Romania, Hungary and Poland. The category of *rare plaits* consisted of the "pig-tail plaits" found in Spain, although unknown to the rest of Europe, while the earliest occurrence of 'wicker-work' was attested, according to Clark at the time of his review, at the Swiss Neolithic Lake Villages. A point should be made here: Clark was mixing together two separate basketry and mat techniques: the plain weave (which he called *plain plaited matting*) and the twill weave (called *twill plaited matting*); by 'pig-tail' technique he may have meant the diagonal twill weave, which resembles pig-tails plaits.

The chronological positioning of Clark's earliest evidence is no longer valid, although it is acknowledged that it was proposed solely on the data available in the early 1950s. Clark's work should therefore be considered as an early successful attempt to systematise the published archaeological data for perishable materials, such as basketry, mats, nets and textiles, at the first half of the 20th century. At that time, the excavations at Jericho, Fayum and the Swiss Lake Villages were extremely popular, along with the first excavations in Post-war East Europe like Hungary, Poland, Greece and Bulgaria. There was a tendency to deal with the 'earliest' textiles or basketry, identified as imports from the Southeast (e.g. Clark, 1952), but this could be interpreted in the general spirit of the archaeology of that time, focusing on the very first origins of historical phenomena, although this tendency became more evident by the 1970s (Smith, 1975; Adovasio, 1977).

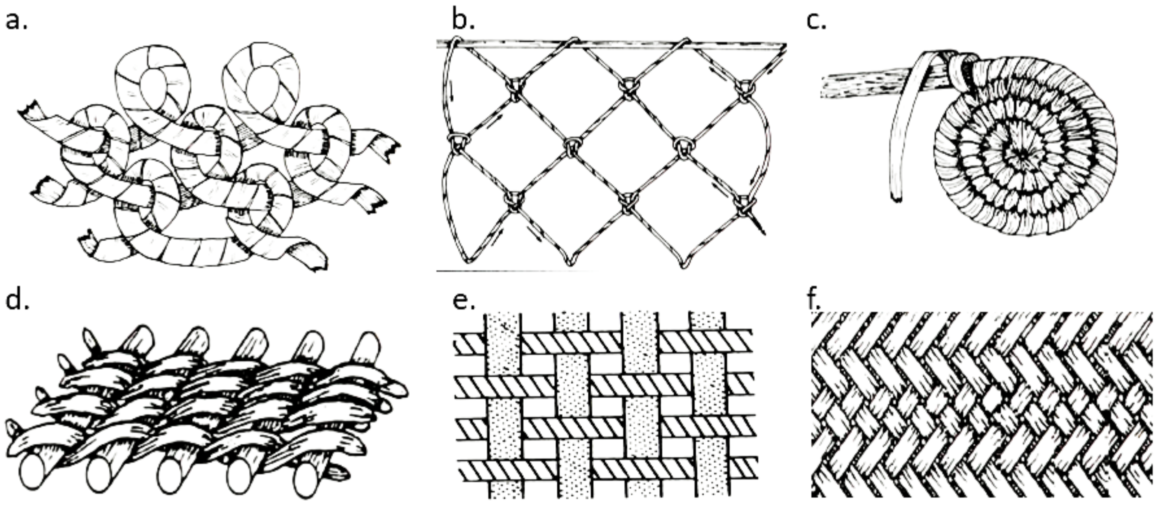


Figure 2.1. Graphic representation of the techniques described by Clark (1952): a. Knottless netting (Image: Wendrich, 2012: 155); b. Knotted netting (Image: ibid., 156); c. Coiling (Image: ibid., 160); d. twinning (Image: ibid., 266); e. Plain weave (Image: ibid., 36) and f. Twilling (Image: ibid., 212).

Contemporary to Clark's work is that of Crowfoot (1954), who first acknowledged that the boundary between basketry and textiles is difficult to be drawn: "*Basketry and mats are commonly distinguished from weaving, but it is often difficult to know where to make the division*" (Crowfoot, 1954, p. 414). The first difference she pointed at was related to the essence of labour, by hand or mechanised: baskets are made by hand, mats can be made by hand but also as 'true weaves' with machinery, whereas textiles (commonly called 'weaving') are produced with specific equipment. The second aspect considered by Crowfoot was evolution: she perceived basketry as a conservative craft, less subject to change than weaving, which has been developing through time since the invention of the loom. A third major difference, according to Crowfoot, were the raw materials' characteristics: while in basketry, the vegetable fibres were usually unspun, for textiles, animal fibres were chosen and the processing sequence included spinning.

In terms of the evolution of the basketry craft, Crowfoot's approach was similar to Clark's: there was a major attempt to classify basketry and weaving techniques from the earliest to the latest and according to their geographical occurrence. For her, coiled basketry was the earliest, but perhaps contemporary to the plain, twined and twilled types. She distinguished between six different basketry techniques (ibid.): *coiled, twined, wrapped* (which technologically is coiled work; Fig. 2.1. c-d.), *matting work* (that includes diagonal and perpendicular twills, variations of plain weave and radial basket twill; Fig. 2.1. e-f), *plaited* and *wicker or stake-frame* basketry (which are basketry twilling, see also Table 2.1; Fig. 2.1.f.).

Chronologically, Crowfoot (1954) defined the examples from the Neolithic and Bronze Age South-east (Palestine, Iran, Iraq, Egypt, Sudan, Cyprus) as being the earliest and she tracked the diffusion of the basketry technology in Bronze Age Europe (Switzerland, Spain, Hungary, the Balkans and Britain) from the South-east. Regarding the spinning activity, she considered eastern examples from Egypt, Mesopotamia and Palestine as being the earliest, and referred to Egypt when describing the origins of weaving and the appearance of the looms (ibid.). Since Crowfoot's work was based mainly on the evidence from Egypt and Palestine, the interpretation of an early eastern origin of techniques and items might be expected. This tendency, however, was maintained until much later in scholarship: the earliest twill plate examples were considered deriving from the Middle and Near East (Smith, 2000).

After Clark's and Crowfoot's original research on basketry technology (conducted in the 1950s) a new approach on the mode of manufacture appeared with Emery's "*Primary Structure of Fabrics*" (1980). This book formed a fully illustrated descriptive guide to textile fabrics, but also peripheral products, such as netting, matting and basketry. In Emery's major division of interworked elements four categories were distinguished*: single element*, *two single elements*, *one set of elements,* and *two or more sets of elements*. A *single element* meant that a fabric was created by interlacing a single element with itself. In the *Two single elements* two single elements works were joint together. *One set of elements* was a number of elements, which did not change and usually followed the same direction, in general vertically. *Two or more sets of elements* represented two directions of the elements, longitudinal and parallel, which were interworking in right angles (Emery, 1980; also see *Table 1*).

Within the *single element* works Emery positioned all kinds of looping (Fig. 2.2. a), knotting (Fig. 2.2. b), knitting (Fig. 2.2. c) and croushet (Fig. 2.2. d), whereby a single element acted by a sort of looping (i.e. needle knitting). Lace and basket-work were described as *two elements* works; their grouping together was based on the primary classification of their structures as both of them technically could be either a kind of sewing (one or two single elements) or weaving (one or more sets of elements). *One set of elements* included plaiting (Fig. 2.2.e), braiding (Fig. 2.2.f), twill plaiting, (Fig. 2.2. g) plain plaiting (Fig. 2.2.h), twinning (Fig. 2.2.i), macramé (Fig. 2.2. j) and sprang (Fig. 2.2.k), whereby the elements were interlinked between themselves only and the set remained the same; all plaited products were applicable to this category.

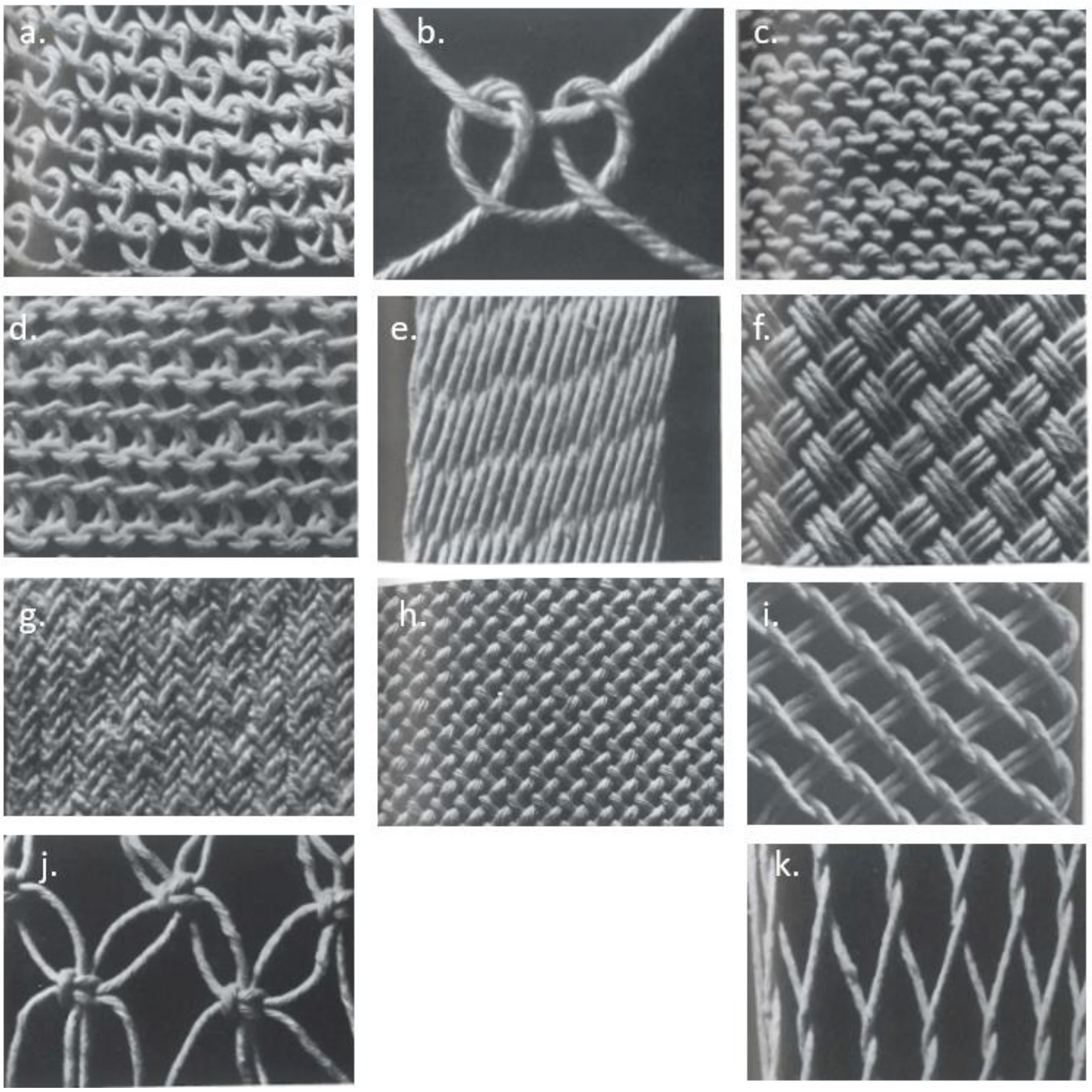


Figure 2.2. Single element works, according to Emmery (1980): a. looping (Image: Emery, 1980: 31); b. knotting (Image: ibid., 36); c. knitting (Image: ibid., 41); d. croushet (Image: ibid., 43); e. plaiting (Image: ibid., 61); f. braiding (Image: ibid., 63); g. twill plaiting (Image: ibid., 63); h. plain plaiting (Image: ibid., 63); i. twinning Image: ibid., 64; j. macramé Image: ibid., 61); k. sprang (Image: ibid., 61).

Two or more sets of elements were works whereby vertical (warps) and horizontal (wefts) elements were interlinked between the different sets. The term 'weaving' applied to this group. Depending on the orientation, the weaves are warp- (vertically) or weft- (horizontally) faced (Fig. 2.3.a-b). Emery (1980) described two main technologies: a. *interlacing warps and wefts* and b. *interlacing elements* (see Table 2.1.). The technique of plain weave was the first major one that featured in the first category and may include different numbers of warps or wefts. For example, the technique of pairing the warps and wefts, or the 3/3 plain weave was described as "*basket/mat weave*" (Emery, 1980: 77; Fig. 2.3. c). Tabby weave or cloth weave appeared as another synonym to plain weave. The so-called 'tapestry' weave featured here as interlocked or joint weave, whereby many elements may interlink between each other, creating decorative patterns, as in some types of matting (ibid.; Fig. 2.3. d).

The technique of 'float weave', the second one in the first category, referred to the twill weave and was also thought to be produced by more than two sets of elements, whereby one of the elements freely passes above or under another one ('floats'). Here the diversity of the twill weaves was described as: *even* (equal ratio between warps and wefts), *simple* (plain twill without variation) or *diagonal* (diagonal direction of the twill; Fig. 2.3. e), *horizontal or vertical herringbone* (Fig. 2.3. f-g), *broken* (diagonal twill, whereby the diagonal lines are interrupted by change of the direction of the twill), or *half twills* (Fig. 2.3. h). The next category of *interlacing elements* included the *crossed gauze* weave, which was called 'split twine' when referring to basketry and matting and which could be simple or complex depending on the single or multiple elements (Fig. 2. 4). The next technique in this category was the *weft-wrapping*, whereby the wefts were wrapped via turns of an element around them, which was known as the coiled technique when referred to basketry (Fig. 2. 4).

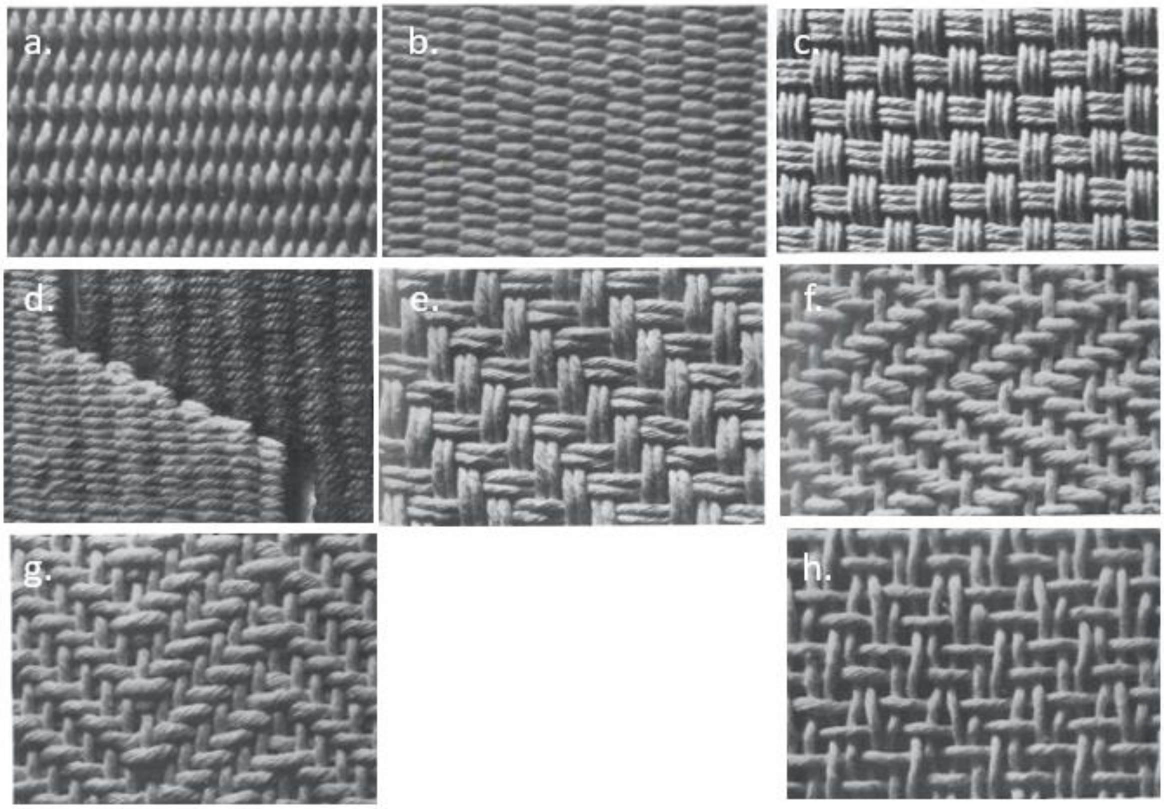


Figure 2.3. Two or more sets of elements' techniques, after Emery (1980): a. warp-faced (Image: Emery, 1980: 76); b. weft-faced (Image: ibid., 76); c. basket/mat weave (Image: ibid., 77); d. tapestry (Image: ibid., 79); e. even, simple, diagonal (Image: ibid., 98); f. horizontal herringbone (Image: ibid., 95), g. vertical heringbone (Image: ibid., 95); h. broken, half twill (Image: ibid., 95).

Emery's analysis to fabric techniques was not fully adopted by the scholarship when considering basketry. Nevertheless, elements of her structural approach were borrowed by Adovasio (1977) and were further extended by Wendrich (1999). In his "*Basketry Technology*", Adovasio (1977) applied, similarly to Emery, almost mathematical precision when describing and cataloguing American Indian basketry objects. He did not propose new technological categories; he retained the three main types of *twined*, *coiled*, and *plaited*, and added the 'miscellaneous techniques' category (see Table 2.1; Fig. 2.4). The novelty in his approach is that each particular basketry technique required different parameters to be measured and described, and this is why Adovasio established different protocols for each type of basketry. He also added qualitative criteria to the description: the twining/coiling/twilling or plaiting could be *close*, *open* or *open and close,* and was based on the spacing of the weft rows. He observed these elements at the three major structural parts of the baskets: base, body and selvage.

For twinning, he identified five variations of completing the same technique: *simple, diagonal, simple and diagonal, cross warp, wrapped* (Adovasio, 1977, see Table 2.1.). For coiling, he described the elements of the foundation (rod, bundle, welt), which were applied in the construction of either *single element foundation*, *horizontal*, *stacked* or *bunched one* (ibid.). A second major feature of the coiling technique according to Adovasio were the *stitches*, which could be *simple, interlocking*, *splitting* or *wrapping.* For plaiting, the focus was on the centres and the selvages (self-finishing, multiple or coiled; ibid.).

Beyond the technological aspect, Adovasio (1977) followed two types of analysis, which he called 'internal and external correlations' in all his studies, from the Pueblo site at the Antelope cave in Northwest Arizona, US, to the Neolithic settlement of Sitagroi in Northern Greece (Adovasio, 1977; 2003). This attempt implied inclusion of evidence from other artefact categories, such as textile production, in search of parallels and comparative features. The external correlations analysis, or the extensive comparison with other archaeological sites, was further extended by Smith (1975; 1977), who studied archaeological material from prehistoric Greece related to spinning, weaving and textile manufacture, and in that way, he conducted the first regionally based approach in South-east Europe.

Smith employed a wide range of finds categories, including spindle whorls and loom weights, pottery impressions, bone, lithic, clay and metal tools. She drew the difference between basket/matting and textile production according to mechanization as "*the invention of the shed stick and heddle*" in textile-weaving, and the hand-made basketry (ibid., p. 110). Despite that, in her continuous work on the subject there is a continuous attempt to discuss the two crafts together or one in the context of the other (e.g. Smith, 1977; 2000).

In Smith's description of techniques, the tabby *plain weave* was closer to cloth production and like in textiles could be warp or weft-faced, but suitable for weaving baskets of stiffer material (see Table 2.1). Within the category of *twined weaves*, Smith defined *simple* and *split* twines based on the earliest examples in Anatolia. The *twill weave* was also common with the cloth weaves, but mentioned as one of the earliest basketry and matting techniques with Clark's earlier examples from Hungary, Poland, Egypt, Palestine, Anatolia and the Balkans (Bulgaria and Greece). The different types of twilling were defined here as *half twill* (1/2; Fig. 2.3. h), *two to two strands* (2/2; Fig. 2.3.e) and *multiple* warp to weft combinations as 3/2 or 6/4 (Smith, 1975; Figs. 2.2.f; 2.3.c). Smith followed Clark's concept for the twill technique as deriving from the South-east and remaining characteristic for Eastern Europe (Smith, 1975; 2000). *Coiled* and *wrapped* work were grouped together and classified as no true weave because their elements were sewn together.

Smith facilitated modern research regarding the different cases of basketry or archaeological evidence for textiles by putting together and classifying the finds extracted from the published data until the 1980s within their technique category in the Aegean and circum-Aegean region. Focusing on interpreting the basketry/mat techniques impressed on pottery fragments in different prehistoric sites in Greece, she grouped the findings according to their precedence from one of two major regions, mainland Greece and the Greek islands (Smith 1977), a model, which has been followed and enriched later by Beloyanni (2008; 2003; 1996).

In the mid-1990s, Beloyanni (1996) studied the prehistoric evidence of basketry in Greece starting from the Early Neolithic (EN) data and reaching the Middle Bronze Age (MBA). Her approach was a combination of the descriptive method of Crowfoot (1954) and Smith (2000; 1977; 1975) and her technological analysis followed Adovasio (1977). In Beloyanni's approach to basketry techniques a novel element in grouping the previous categories was added. The different weaves were organised according to their set-up: circular, such as the coiled technique, and rectangular, such as the plain weave, twilling or twinning (see Table 2.1). This division applied to the shape of the final product, e.g. rectangular mat or spherical basket, but is probably incomplete because the properties of a product of circular set-up may be expressed in a rectangular one, i.e. a rectangular mat may be woven in coiled technique.

Nevertheless, Beloyanni's and Smith's work in Greece formed the richest list of evidence of prehistoric basketry in South-east Europe. For instance, one of the most instructive sites that Beloyanni studied was the Late Cycladic (LBA) settlement at Akrotiri Thera. A unique assemblage of 29 basketry objects were preserved in the volcanic ash that covered the settlement in c. 1625 BC (Beloyanni, 2008; 2007). Another one was the LN cave dwelling Skoteini (Euboea) with perhaps the highest concentration of mat-impressed pottery in the region, including more than 70 fragments (Beloyanni, 1993). The site that produced the earliest evidence for mat-impressed pottery in South-east Europe is possibly the EN settlement Servia, studied by Smith (2000).

It should be noted that both the work of Beloyanni and Smith focused on the technological and functional level of interpretation, but also with some limited discussion on the possible plant material used for weaving baskets. The latter was done only on the basis of macroscopic observation and the available ethnographical data as the authors did not conduct systematic ethnographic studies. Smith referred to modern plants used nowadays for weaving hats in northern Greece (Smith, 2000), while Beloyanni included several observations on modern basketry at Akrotiri (Beloyanni, 2008) and cited existing ethnographic studies for Crete (e.g. Leontidis, 1986). Both Smith and Beloyanni compiled multiple evidence, direct and indirect, such as impressions, sealings and iconography. This approach marks the work of the two authors as highly original and provides a wide regionally based data corpus, inherited for the next decades of research.

Relatively recently, an attempt to review all previous approaches to ancient basketry from the end of the 19th century to the late 1990s was undertaken in "*The World According to Basketry. An Ethno-Archaeological Interpretation of Basketry Production in Egypt*" by Wendrich (1999). Her own approach, based on archaeological and ethnographical material from Amarna and Qasr Ibrim in Egypt and at Catalhöyük in Anatolia (Wendrich, 2005; 1999; 1991), provided a new re-structuring of the different basketry techniques by grouping them according to the function of each element in the basketry composition.

Wendrich's classification criteria were based on two main characteristics: the activity of the systems (i.e. the complexity of constructional elements as wefts, warps) and the number of directions involved during the weaving process. Based on these two parameters she developed a guide for recording basketry and cordage products, specifically addressed to archaeologists and ethnographers and considering preservation issues, *in situ* stabilisation, sampling and future restoration and conservation (Wendrich, 1991).

According to her guide, the *one-system techniques* were represented by one active technique (i.e. strand or a group of strands) in one direction (i.e. yarn in a net going up and down but, in a line; Fig. 2.1.a-b); such techniques were knotless netting, grommets and knotted netting. The *two-system techniques* were in one or two orientations (i.e. the plaits with sewing, whereby the plait is passive, but the strand which fastens the plait is active; Fig. 2.3.g). Two–system techniques in *one direction* included coiling and wrapping (Fig. 2.1.c), whereby there is a passive bundle and an active winder, oriented in one direction. Two-system techniques oriented in *two directions* included weaving, twining, waling and piercing, whereby the two directions are perpendicular to each other (example for twining - Fig. 2.1. d). *Three–system techniques* consisted of either two passive and one active as in the coiled inlay, or one passive and two active ones as in looping and binding; in both cases there were variations with one or two orientations of the mobile elements (see Table 2.1).

The second significant element in Wendrich's work was her ethnographic approach to basketry and basket-makers in Egypt (Amarna, Qasr Ibrim and New Nubia). She applied her own functional approach in terms of the technology of baskets and mats, but she also involved utilitarian observations, such as the active or static use of a basketry item (i.e. active involved, for instance, carrying a content, while static meant covering or storing; Wendrich, 1999). She discussed the preparation and production time related to the raw material and the process of basket-making, along with the workshop space, the body-language, the gender of the basket-makers and the economic aspects of basket-making, and the meaning of the baskets in a social context (ibid.).

Finally, Wendrich approached the challenge of the raw plant material more comprehensively by creating a list of the most common species used for weaving baskets and mats. Her team also applied plant fibre analysis on some of the recorded species. A brief description of plant tissues involved when processing the plant itself and weaving the basket were proposed as a basic key to Egyptian basketry (Brinkkemper and Hejden, 1999). This type of ethno(or)-archaeological studies are discussed in section 3 of this chapter. Gathered together, these elements of her ethno-archaeological study represented the first systematic ethno-archaeological approach to basketry: the craft and its crafts(wo)men.

Almost a decade after Wendrich's ethno-archaeological research, Bichard (2008) wrote his "*Baskets in Europe*" on contemporary basketry in Europe and, similar to Wendrich, aimed at the creation of a multiple catalogue, covering evidence of origin, raw material, tools, geographical diffusion, regional characteristics and usage, and also including the whole of Europe and focusing on modern examples. His main methodology was personal observation, as he travelled through European countries and collected information and items of traditional basket-making. His work and the rich illustrative material included in his study is of major importance as it provides regionally based information about contemporary techniques, preferences in plant use and existing basket-making communities.

Bichard (2008) identified six main types of basketry techniques: *coil*, *plait*, *strake and strand*, *loop*, *net* and *assemble* (see Table 2.1; Fig. 2.4.). The coiled work was described as a combination of a passive (called 'core') element and an active one (called "stitching"). The 'core' consisted of a single plant element or a bundle of plants. Bichard pointed out that coiled work produced typically oval or circular items, but he suggested square angles are to be found in Scandinavia and Turkey; the author mentioned that sometimes complex patterns were achieved with a combination of different stitching methods (ibid: 41). The usages he mentioned for this type of basketry are mainly 'to contain', for instance in households for storage of dry goods, sometimes with lids or skeps for keeping bees and for catching swarms (ibid.)

According to Bichard, plaited baskets were made of two active elements, flat or round strips. The simplest variation of this technique, called also checquer-weave, was the equal checquering in right angles of both the strips and strands. The plaited technique could be used for both the base and the sides of a basket, and could be organised in producing several pieces, which were further sawn together with the same or other raw material. The products of this technique could be hats, bags, bed mattresses and floor mats.

What was called 'stake and strand' by Bichard (2008) actually covered several techniques and basket shapes. He distinguished five 'methods' in this category: plank base, round work, scuttle work, square work, twinning and frame work. The plank base type was when the base was formed by a flat wooden piece and the stakes were inserted in it through holes. This kind of basket was a solid one, whereby skills of both the woodworker and the basket-maker were required, as Bichard stated. In the category of 'round work', Bichard grouped items woven in circular or oval shape and mainly of willow. With 'scuttle work', he meant baskets aimed to retain grain, meal or liquids, thus these items had waterproof characteristics due to their very tight weave. Regarding appearance, there was no space seen between the warps in this weave. Because of the compression applied to the stakes with a metal tool used when weaving, this work was also known as 'beaten work' (ibid, p. 46). Large items, such as the winnowing fan, were produced by this technique. With the terms 'square' and 'frame' work, Bichard referred to baskets with mainly rectangular shape, which actually may be woven in different techniques. The group of 'twinned baskets' included baskets either of soft or hard plant material, whereby twinning strokes are woven together by-passing successive stakes. Bichard (ibid.) pointed at the fact that there were only a few tools needed when weaving in this technique. The last two categories mentioned were 'netting' and 'looping'. In looping, there was only one active element, forming a network via loops around itself, e.g. for fish traps. Similar items were created via netting, whereby thin and rigid material, such as rushes, were crossed vertically and horizontally, shaping diamond patterns and a rigid structure (ibid.).

More recently, Harris (2014) has taken a slightly different and strongly theoretical approach to the technological aspects of basketry. She proposed three basketry techniques according to their affordance to cloth, cover or contain, and included coiling, *twinning* and *twilling* (see Table 2.1.). The first one mentioned was the coiled technique, which produces stiff and flat products impossible to fold or wrap. This was followed by the close twinning and the open twinning techniques whereby the close twinning is stiffer than the open one, but more flexible than the coiled products and the open twinning is much more flexible than the other two. The last category included the twill-plaited products which are situated closer to the textiles, but made of interwoven strips, and not of spun thread as fabrics. According to Harris (ibid.), twill plaiting produces the most flexible type of basketry, allowing it to be wrapped, folded, shaped and to cover, i.e. shares the affordance to cloth and hence is a phenomenon that belongs to the cloth culture(ibid.).

Harris's (2014) approach is of particular interest in terms of archaeological basketry, as she developed her theory on the basis of archaeological mat-impressed pottery in Neolithic

Italy (*bocca quadrata*, ibid.). Her qualitative interpretation of basketry techniques remains unparalleled and could definitely feed into the discussion of textile-related crafts. This special aspect of the materiality of basketry, i.e. their shared affordance with fabrics, refers to both the physical aspects of the products of this craft and to the social perception of the uses and application of these products. In this way, this approach bridged the widely discussed (see above, also Table 2.1.) relationship between fabrics (textiles) and basketry with the social aspects of the crafts. It also proposed a classification, which along with the multiple layers of interpretation it contained, it also referred to techniques for weaving baskets.

After reviewing the different concepts regarding basketry techniques (see also Table 2.1 for their comparison and Fig. 2.4. for their visualisation), a decision about the preferred terminology needed to be made for the purposes of this study. Therefore, four techniques were chosen as the most appropriate to be used for the categorisation of basketry for the purposes of this thesis: coiling (stitched and simple), plain weave, twinning (simple and split) and twilling. These four techniques of weaving baskets emerged as the principal ones from the literature review. Although many more variations and sub-divisions of each technique, based on the specific regional or cultural factors or the adopted descriptive approach, could be also employed, these will not be considered here in order to achieve a standardisation of the descriptive sections. In support of this choice, it should also be mentioned that the four main adopted techniques fully reflect the functional elements of the process of weaving baskets, including both vertical and horizontal elements, which could potentially implement different plant choices and techniques with which their weaving is performed (Fig. 2.4.).

The adopted and standardised descriptive approach would be of particular importance when describing ethnographic and archaeological evidence for basketry. The main reason for this is that if amongst the ethnographic examples the weaving technique chosen for particular objects would be easily identifiable (usually on the single basis of optical examination; Chapter 3), then for the archaeological ones, both direct and indirect, this would not be a straight-forward conclusion. In the cases where archaeobotanical material was examined (Chapter 4), the techniques were sometimes indeterminable, due to the lack of functional elements and/or insufficient preservation. In most cases, the weaving technique was easier to determine for mat-impressed pottery specimens (Chapter 4) where sufficient details were preserved in the impression. All these challenges of the analysis of evidence for archaeological basketry represent the main reason for the adoption of a terminology that uses only main basketry techniques instead of their variations.

Describing the technological aspects of baskets, i.e. the technique they were woven with, means the studied basketry objects will be first identified at their basics, allowing further interpretation and discussion on the possible plant choices for weaving. This way, the link between the chosen techniques and the chosen plant material for weaving can be fully investigated and discussed (Section 3.5.1.). This is why the classification of techniques can be a good guide for the extended analysis, where an attempt is made to identify the possible plant resources for weaving and their relation to social practices of the prehistoric and contemporary societies of South-east Europe.

AUTHOR YEAR	TERM	# or X	TECHNIQUES					
CLARK (1952)	PLAITING	#	1. COILING	2. TWINNED PLAITS	3. PLAITED MATTING	4. NETTING	5. WICKER WORK	6. VARIOUS
CROWFOOT (1954)	BASKETRY	X	1. COILING	2. TWINED	3. PLAITED	4. MATTING WORK	5. WRAPPED	6. WICKER/STAKE-FRAME
EMERY (1966)	FABRIC	#	1. TWO+ SETS ELEMENTS 1.1. INTERLACING WARPS AND WEFTS 1.2. INTERLACING ELEMENTS	2. ONE SET ELEMENTS: PLAIN PLAITING=TABBY, TWINNING, SPRANG, MACRAMÉ, TWILL=FLOAT: 2.1. EVEN 2.2. SIMPLE 2.3. DIAGONAL 2.4. HERRINGBONE 2.5. BROKEN 3.5. HALF	3. TWO SINGLE ELEMENTS: LACE, BASKET WEAVE=PLAIN WEAVE	4. SINGLE ELEMENTS: KNOTTINING, NETTING, LOOPING		
SMITH (1975)	WEAVING	#	1. COILING = WRAPPING "IS NO TRUE WEAVE"	2. TWIN WEAVE 2.1. SIMPLE TWINE 2.2. SPLIT TIWINE	3.TWILL WEAVE 3.1. HALF TWILL (1/2) 3.2. TWO TO TWO (2/2) 3.3. MULTIPLE(3/2, 6/4)	4. PLAIN/TABBY WEAVE 4.1. WARP-FACED 4.2. WEFT-FACED		
ADOVASIO (1976)	BASKETRY	X	1. COILED (OPEN, CLOSE, OPEN-CLOSE) 1.1. ON FOUNDATION (F): SINGLE ELEMENT F, STACKED f, BUNCHED F 1.2. ON STITCHES: SIMPLE, INTERLOCKING, SPLITTING, WRAPPING	2. TWINED (OPEN, CLOSE, OPEN-CLOSE) 2.1. SIMPLE 2.2. DIAGONAL 2.3. SIMPLE-DIAGONAL 2.4. CROSS 2.5. WRAP	3. PLAITING = TWILLING (OPEN, CLOSE, OPEN-CLOSE)	4. VARIOUS (OPEN, CLOSE, OPEN-CLOSE)		
BELOYANNI (1996)	BASKETRY	X	1. CIRCULAR SET-UP	2. RECTANGULAR SET-UP				
WENDRICH (1999)	BASKETRY	X	1. ONE SYSTEM, ONE ACTIVE ELEMENT, ONE DIRECTION	2. TWO-SYSTEM; ACTIVE+PASSIVE ELEMENTS 2.1. DIRECTION 2.2. DIRECTIONS	3. THREE-SYSTEM 3.1. TWO PASSIVE+ONE ACTIVE 3.1. ONE PASSIVE+TWO ACTIVE			
BICHARD (2008)	BASKETRY	X	1. COILING	2. PLAITING	3. STAKE AND STRAND 3.1. PLANK BASE 3.2. ROUND WORK 3.3. SCUTTLE WORK 3.4. SQUARE WORK 3.5. TWINNING 3.6. FRAME	4. LOOPING	5. NETTING	6. ASSEMBLE
HARRIS (2014)	BASKETRY (CLOTH CULTURE)	#	1. COILING (RIGID)	2.TWINNING (INTERMEDIATE) 2.1. CLOSE TWINE (STIFFER) 2.2. OPEN TWINE (SOFTER)	3.TWILLING (FLEXIBLE)			
Table 2.1. Basketry techniques					**KEY: (#) Basketry related to Fabric; (X) Basketry not related to fabric; (=) Even terms**			

Table 2.1. Comparative table of basketry techniques, according to the existing scholarship

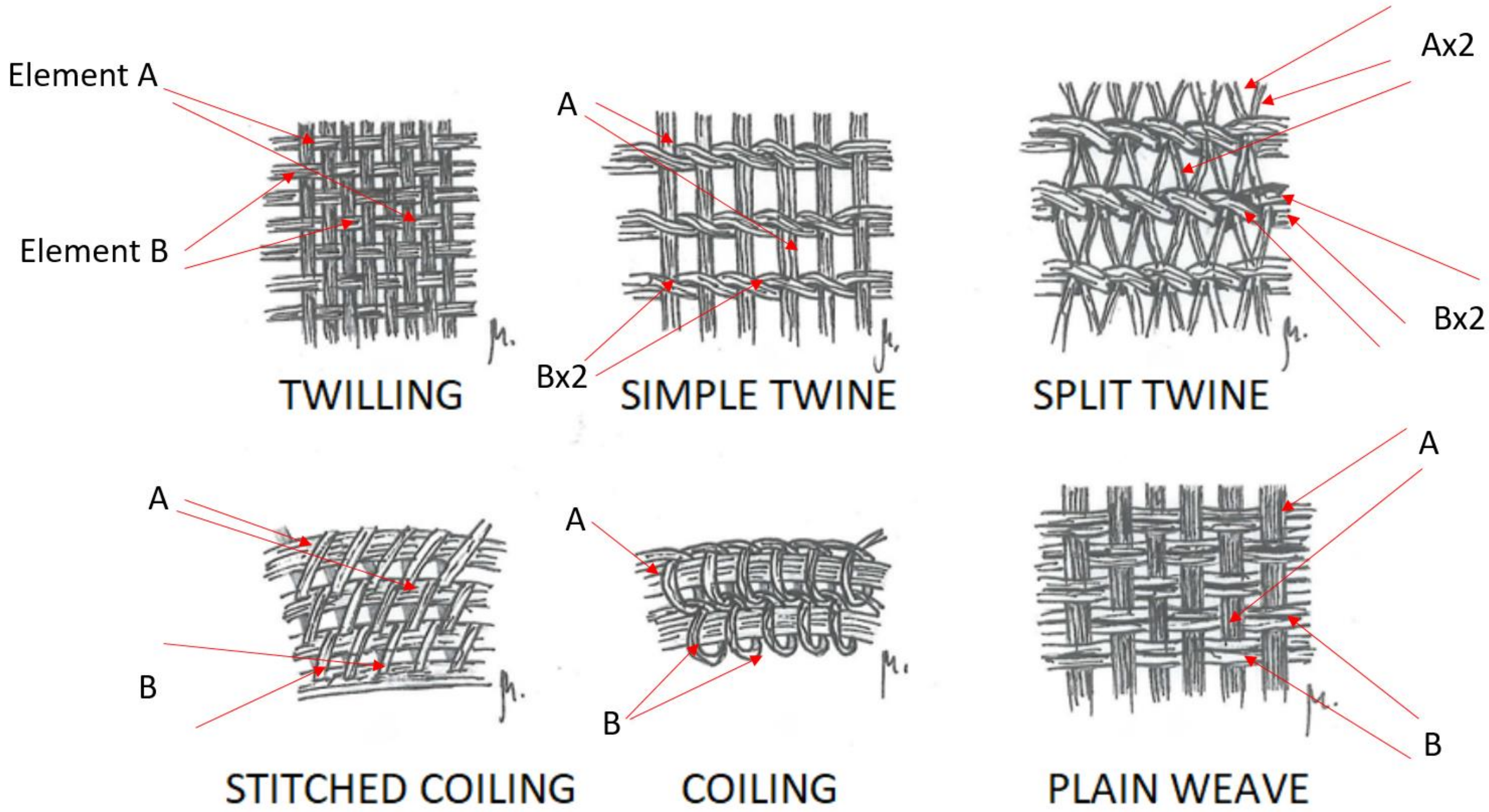


Figure 2.4. The four main basketry techniques adopted in this thesis, including twilling, twinning (simple and split twine), coiling (simple and stitched) and plain weaving and displaying the active elements of each technique (A and B). Schematic adaptation after Emery (1980), Adovasio (1977) and Wendrich (1999).

2.3. Plant material for basketry

Several studies have dealt with the plant material used or preferred for basketry, mostly in modern times. Most have an instructional character for craft-learners. Possibly the richest in this aspect is the scholarship related to the United Kingdom, facilitated by the existence of the Basketmakers' Association (e.g. Okey, 1912; Legg, 1960; Harvey, 1975; Wight, 1977; Butcher, 1986; Johnson, 1986; Maynard, 1989; Garbiel and Goymer, 1991; Crawford, 1993; Vaughan, 1994). Bichard (2008) compiled the existing information and added data from his own research for European basketry material but more detailed information was given about the plants preferred by the British basket-makers. For South-east Europe there are several publications, also with a regional focus, and they can be classified into non-botanical and botanical approaches (Fig. 2.2).

The first group of non-botanical studies are ethnographic, such as the work of Leontidis (1986), who travelled in Crete and described the traditional basketry types and raw material on the island, and Beloyanni (2008) who studied the archaeological evidence of basketry from the Bronze Age settlement of Akrotiri and observed the contemporary basketry on the island of Thera. To these ethnographic studies the work of Ertug (1997; 1999; 2006) can be added, who studied contemporary 'plaited crafts' in Turkey, both in the European and Asian part, and whose approach fits the botanical studies too, because botanical identifications were carried out on the modern plant material. Wendrich's research (1991; 1999) can be positioned here too. Her work focused on the South Aegean, Egypt and Asia Minor and was supported by botanical identifications by Brinkkemper and van der Heijden (1999).

In addition, short notes on the possible plant material used in basketry were produced by archaeologists studying basketry impressions on pottery from prehistoric South-east Europe, such as Crowfoot (1954), Petkov (1965), Smith (2000), Adovasio & Illingworth (2003), Martinez (2004) and Beloyanni (2008). However, systematic botanical identifications of archaeological material deriving from South-east Europe have not yet been published. There is only one relative identification of date or doom palm species that has been reported for the basketry object from the Late Minoan Cemetery at Armenoi in Crete that derived in the context of its conservation (Paterakis, 1996). Full botanical identifications of desiccated basketry products from the circum-Aegean region (deriving from Egypt) have been conducted by Brinkkemper and van der Heijden (1999) and Borojevic and Mountain (2014).

The plant species discussed in the studies dedicated to plant material employed in basketry are summarised below. The combination of non-botanical and botanical approaches by different authors are reviewed first, while the botanical approaches are reviewed last, as they include a particular narrow range of species (Table 2.2).

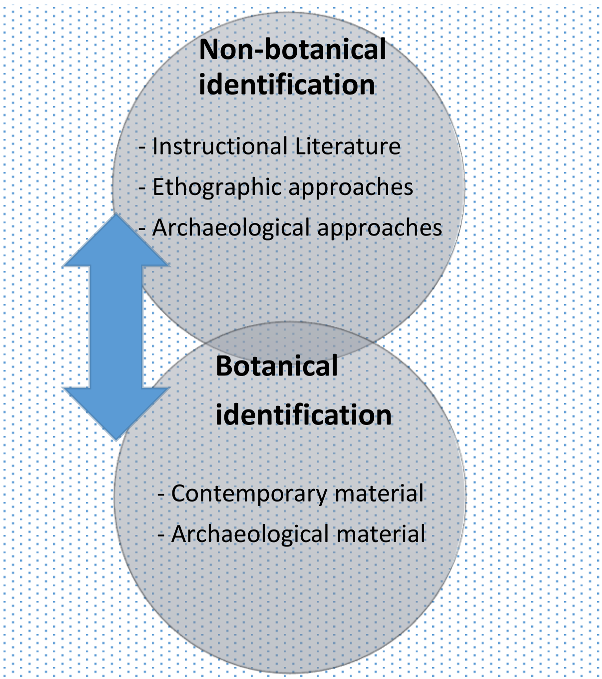


Figure 2.2. Approaches to plant material for basketry in the reviewed bibliography.

2.3.1. Archaeological and ethnographic (non-botanical) approaches to raw material for basketry

The archaeological and ethnographic approaches to basketry include mainly non-botanical analyses of the objects, but still provide valuable information on technological aspects of basket-making and often also put forward suggestions for plant species possibly chosen for the weaves. In most cases these studies are dedicated to ethnographic or secondary (indirect) archaeological evidence for basketry, such as the mat-impressed pottery. In addition, they sometimes prove the basis for the interpretation of basketry objects that were botanically analysed, and serve as a strand of evidence which has the potential to elucidate the choice of plant material for weaving.

Bichard (2008) systematised the plant species he identified while observing European basketry in five categories: deciduous trees, conifers, other trees and shrubs, creepers and climbers, and cereal straw (see Table 2.2). Deciduous trees were widely used as material for both warps and wefts in the countries with larger woodlands, but were generally popular across Europe. Certain trees, notably chestnut, ash, hazel, were classified as suitable only for the formation of the rigid elements of a basket, such as the handle, rim or ribs. The young stems (“shoots”) of many species, such as elm, acacia, dogwood, buckthorn, myrtle, olive, and privet, could be utilised as material for baskets (see Table 2.2) and in some cases even without coppicing (ash, ibid.). Sometimes roots of some species (e.g. birch) were used as flexible material in coiling or stitching. In other cases, thin splints from oak, chestnut, poplar and willow were produced and used as wefts in all techniques. In the case of willow, further processing would be involved, such as boiling (so-called “buff” willow) and cutting into thinner ‘skeins’. The bark of some species was used directly for shaping the body of a basket in plain weave or as flexible joining material in coiling: willow, birch. The bast, or the fibrous layer under the bark of lime wood, was also used in coiling and production of cords and nets (ibid.).

In regards to the coniferous trees the main species were pine, spruce and juniper, which could be used in splints in plain weave or as warps. The spruce roots were used in coiling and stitching. Generally, however, conifers were more popular as basketry material in the northern European countries and Scandinavia (Bichard, 2008). Bichard also added one mixed group of deciduous trees and shrubs, which were specific and locally important in different European regions, and included species such as clematis, hop, and honeysuckle (ibid.).

The next main group of plants, according to Bichard (2008), were cereals’ straws of which the leaves were utilised either fresh or dried in almost all kinds of basketry (but mainly coiling). These included rye, wheat, oat, barley and maize. Similar in terms of properties (such as flexibility) were other (non-cereal) grasses too (ibid., see also Table 2.2): Marram grass (*Amophila arenaria*), esparto grass (*Stipa tenacissima*), ropegrass (*Ampelodesmos mauritanicus*), purple moor grass (*Moliniaca erulea*), rushes (*Juncus* sp.), and reeds (*Phragmites communis, Arundo donax*).

For Crete, Leontidis (1986) described several plant species, which he identified through personal observations on traditional basket communities on the island in the 1970s.

The first species discussed by the author was the giant reed (Greek: [kalami], *Arundo donax*), which is very light and afforded large loads of material (ibid.). More often the giant reed was used as weft, but sometimes baskets were fully woven with it. Of importance for the collection of the plant was the time of the year and of the moon cycle as it had to be done after the summer and during the decreasing moon when the culms have less liquid content. Also, the culms chosen for collection had to be with large distance between the culm nodes, because if they were very close, then the culm was more fragile when dried and during weaving (Leontidis, 1986). The traditional processing consisted of splitting the culm in thinner splints (8 or 10 starting with 4 or 5 in the middle) and then peeling the outer skin. The splints were then stored in bundles and soaked in water until the next day when they were ready for weaving baskets (ibid.)

The second major group of plants chosen by the Cretan basket-makers of the 1970s were the 'vitses', which are the young and flexible rods of several trees or shrubs (Leontidis, 1986): *Pistacia* (Greek: [shoinos], *Pistacia lentiscus*), chaste tree/wicker (Greek: [lygariá], *Vitex agnus – castus*), wild olive (Greek [agrieliá], *Olea oleaster*), myrtle (Greek: [myrtiá], *Myrtus communis*), oleander (Greek: [sfáka/pikrodáfni], *Nerium oleander*), willow (Greek: [itiá], *Salix* sp.), holly (Greek: [prinári/lyóprino, *Illex aquifollium*), evergreen oak (Greek: [prinári/ágria belanidiá], *Quercus illex*), and mulberry (Greek:[mouriá], *Morus* sp.)

The rods were used as warps when weaving handles or rims and as wefts when weaving the base or sometimes for the entire basket (Leontidis, 1986). Interesting information was provided for the mastic tree, which was mostly found in the fields in the past: it was coppiced every year, so the next year when sawing the field, the owner could collect the new young rods for basket-making. A similar process was applied to the wild olive trees, which were growing new rods from their roots every year and these rods were coppiced for basketry (ibid.). The myrtle was coppiced every year too and this had to take place at the time of increasing moon because the liquid content in its branches was higher and so was its flexibility. The opposite recommendation was given for oleander, which had to be collected at decreasing moon. This plant was drying slowly for about one month (this was why lower liquid content in its branches is desirable when coppiced), and after the skin was peeled off, the rods were soaked in water for several days depending on the chosen wood (ibid.).

Other plants identified as being commonly used in Crete were some climbers, such as smilax (Greek: [akrèbastos], *Smilax aspera*), which had spikes to be removed when collected, and cattail (*Typha* sp.) the stem of which does not have any leaves and it is thus ready for weaving (Leontidis, 1986). When the stems were collected, they were tight in bundles to be dried, while just before use they were soaked in water. Other common plants for basket-weaving were cereal straw, wheat and barley leaves. Leontidis mentioned that in the past the leaves were gathered during the harvest but at the time of his observations they had to be collected earlier due to the mechanisation of the process in order to prevent breakage (ibid.). It is notable that during the weaving part of basket-making with cereal straw, the material (dried leaves) had to stay all the time soaked in water until the process was completed because, when dry, the wheat/barley leaves are highly fragile (ibid.).

One more locally focused publication was dedicated to the contemporary basket-making at the island of Santorini (Thera) by Beloyanni (2007), who listed several plant species which were characteristic for the island's baskets. Her method of identification was macroscopic observation of archaeological material and ethnographic study of modern baskets. She provided only the common names within the suggested five groups of plant species and not the scientific ones, and this may be described as relative identification.

The first group of plants according to Beloyanni (2007) consisted of hydrophilic plants, such as rush, straw, bulrush, common reed, rye grass, Timothy grass (but it is not clear whether this referred to *Phleum* sp. or *Typha* sp.), and the Agrosideae tribe of the Poaceae family (ibid.). The second group was represented by straw of wheat and barley, while the third group was formed by palm leaves (Arecaceae). The fourth category included stalks and fibres of gorse, flax, hemp, and sedge. Finally, the fifth category consisted of thin rods of wood and bushes, such as wicker, osier, lentisk and oleaster. Beloyanni added that the preferred combination for modern basket-makers was wicker and reed (again, it is not clear whether this was *Arundo* sp., *Phragmites* sp. or *Typha* sp. or any other species), due to their abundance on the island (ibid.). She also cited an interesting local proverbial expression, which could be in support of the above: "*Bring me wicker and I'll weave you a basket*" (ibid.).

Last but not least, as mentioned above, there were several notes on plant material for basket-making produced by archaeologists studying basketry/mat impressions on pottery and observing contemporary examples. Based on limited ethnographic observations, several plant species were proposed by Crowfoot (1954) as being the main plants for weaving baskets in Palestine, including *Typha angustata, Juncus acutus, Scirpus lacutris,* and *Scirpus littoralis* and *Stipa tenacissima* in Spain (ibid.). Studying impressions from the Neolithic site of Servia (North Greece), Smith (2000) suggested that the impressions in twill technique were similar to the Near Eastern examples woven with the same technique using rushes (*Sarpus/schoenoplectus tabernaemontari*). When discussing the basketry impressions from the Bronze Age site at Sitagroi (Northern Greece), Adovasio and Illingworth (2003) proposed that the twill plate fragments were related to mats made of reeds like split *Yucca* sp., *Scirpus* sp. or *Typha* sp., while one coiled impression was described as probably woven with a split on both surfaces bundle of grass stiches (ibid.). Studying basketry impressions on pottery from several Chalcolithic sites in West Bulgaria and on the basis only of macroscopical examination, Petkov (1965) suggested the use of wheat straw (einkorn and bread wheat – *Triticum monococcum* and *Triticum aestivum* respectively) in twill mat impressions, and also of *Typha latifolia* and *Typha angustifolia* for other fragments in the same technique (ibid.). For impressions from nets, Petkov suggested *Juncus acutus* (ibid.).

An interesting approach bridging archaeology and the technology of basket-making while adding a new dimension, the experimental one, was conducted by Hurcombe (2008). Instead of focusing on a single region only, she assessed examples from all around Europe through the application of a review of fibre plants, stone tool wear traces resulting from the processing of plants for crafts, impressions from cordage, fabrics and basketry and a theoretical overview of the phenomenon of the skeuomorphism (ibid.).

Hurcombe (2008) discussed four aspects of fabric, cordage and basketry as perishable crafts, starting with the physical properties of plants suited for cordage or textile production. She called this aspect the 'plants chaîne opératoire' and she discussed plant sources including flax (*Linum usitatissimum*), nettle (*Urtica doica*), hemp (*Canabis sativa*) and esparto grass (*Stipa tenatissima*) for the production of fabric, while Bulrush (*Scirpus lacustris*) was associated with cordage and basketry. In order to better understand the processing of these plants and their transformation into fibres, she incorporated the experimental work with these plants done by a professional basket-maker (ibid.). She then discussed the use ware on experimental stone tools while cutting Cattail (*Typha* sp.), reeds (*Phragmites* sp.) and Bulrush. Hurcombe also studied experimentally created collections of plant species woven according to different basketry technologies (including cordage and textile production with its decorative aspects, such as embroidery). No conclusions were drawn in terms of plants except for the confirmation of the relevance of cattails and Bulrush, when compared to archaeological specimens from Britain. In addition, Hurcombe reviewed several examples of mat-impressed pottery deriving from prehistoric Britain as examples for skeuomorphism and she validated their normativity in terms of the organic material, which left its impression upon the inorganic one (ibid.).

2.3.2. Ethno-botanical and archaeobotanical approaches to raw material for basketry

If in other parts of northern Europe (as in the Low Countries: Brinkkemper and Joosten, 2012; Deforce, 2014), or the Mediterranean (Spain: Pique, R. *et al*., 2018; Romero-Brugues *et al*., 2018), exceptional conditions have favoured the excellent preservation of basketry remains, this type of evidence is rather scarce within the studied area of South-east Europe. This is the reason why ethnographic or archaeological approaches involving botanical identifications of basketry are not numerous, but they do exist and will be summarised in this section, along with the plant families or species they propose for the specimens subject to their analysis.

In the Balkans, the ethno-botanical studies by the team of Nedelcheva and Dogan (Nedelcheva *et al*., 2011; Dogan et al., 2008) have dealt with plant-based crafts in Romania, Serbia, Bulgaria and Turkey. Nedelcheva *et al*. (2011) presented four groups of combinations between plant parts and plant properties: use of wood, fibrous plants, plants or vegetative parts because of special properties (form, strength, ornamental character) and plants or vegetative parts because of their symbolic meaning (ibid.). Within their group of fibrous plants for plaiting, weaving and cordage the authors documented 71 species employed in knitting and weaving mats and rugs, mainly from the families of Poaceae, Cyperaceae, Juncaceae, Typhaceae (see Table 2.1).

Based on the available bibliography, several plants have been listed as designated to basketry and especially related to Bulgaria (Nedelcheva *et al*., 2011). The authors mention both woody (including climbers and bushes) and non-woody plants. From the hard woods, those listed are: *Cornus mas*, *Corylus avellana*, *Populus nigra*, *Populus tremula*, *Salix alba, Salix* *fragilis*, *Salix rosmarinofolia*, *Tilia cordata*, *Tilia platyphyllos*, *Tilia tomentosa*, *Ulmus minor*, *Viburnum lantana*, and *Vitex agnus-castus* (ibid.). Climbers and bushes employed in Bulgarian basketry according to the authors are: *Abutilon theophrastii*, *Althaea cannabina* from the Mallows family (Malvacae); from the grass family (Poaceae): *Arundo donax*, *Hordeum vulgare*, *Sorghum halepense*; and some sedges and reeds of the Cyperaceae family: *Typha latifolia*, *Scirpus lacustris* and *Scirpus sylvatica*.

In her ethnobotanical approach, Ertug (1997; 1999) presented several plant species and the products that they were used for, employed in "plaiting" mats and baskets in Anatolia in the 1990s (ibid.). Her research combined ethnographic observations and interviews with the collection of about 600 plant specimens chosen for basketry and matting, which were botanically identified (Ertug, 1999). In her later work, in collaboration with other colleagues, Ertug identified about 90 species (from 40 families), whereby 13 were recorded as used for matting, 38 for basketry, 14 for cordage and about 23 with multiple uses (ibid.).

Ertug (1999) noted that at the time of her research mat plaiting had higher importance than basket plaiting, which was endangered by disappearance by losing its importance. She acknowledged the significance of the plaiting tradition for the Neolithic society of Asikli on the Melendiz River, where plenty of raw material, such as grass, rushes and reeds, were available for plaiting (ibid.). The four species Ertug identified as related to mats and basket work in the Mendeliz valley were: graceful cattail (*Typha laxmannii*), reed (*Phragmites autralis*), blue rush (*Juncus inflexus*) and white willow (*Salix alba*). In addition to the woody plants she added chestnut (*C. sativa*), hazelnut (*C. avellana*) and chaste tree (*Vitex* sp.)

The described cattail products included both mats and containers. The mats ('Yatak Hasiri or Taban Hasiri') were floor covers placed over the mud-plastered or wooden floor (Ertug, 1999). Ertug gave information on processing the rush leaves before plaiting: if not used while fresh but dried (after storage), the leaves had to be soaked (ibid.). Then they could be wrapped one around another forming a twined rope. An interesting observation was that while wet, these rush leaves were also used in loom weaving as wefts (Ertug 1997). The described containers ('Selevir') were meant for carrying foodstuff mainly on donkeys. This type of container was bag alike as it was plaited as a mat, but folded lengthwise and sewn with leather cords, and then fixed with two pieces of wood on the back of the animal (ibid.; Ertug, 1999). The weaving of the round basket-like container ('Ot Sele') for storing flat round bread ('Yufka'), crops, bulgur, home-made macaroni, fruits and eggs was mentioned as 'women's work' (Ertug 1999; 1997). The locals of the village of Demirgi informed the author that when stored in these baskets, the foodstuff kept longer because the air passed through the basket (Ertug 1997).

The reed ('Kamis', *Phragmites australis*) was described as mainly used in ceiling construction ('Tavan Hasiri') in the area of Akhisar, where a marsh was available. This reed could be collected in November – December but it could not be plaited green because it was too fragile. After the reeds were dried, they were ready for matting in April throughout all summer until November (Ertug, 1997). Before plaiting, the reeds had to be split and then flattened under a heavy stone. Ertug noted that the flattening was usually men's work, while the plaiting was women's work (ibid.). When used as ceiling, the shiny (outer) part of the reed had to face the room, but when sometimes it was used for flooring – the shiny part faced downwards (ibid.; Ertug, 1999).

The rushes (*Juncus inflexus)* were employed in weaving tray-like baskets (Yag Selesi) used in the linseed oil production process. The substance extracted from the grounded *Linum* sp. or *Erica* sp. seeds was placed in that containers. Then they were piled on top of each other and put in the pressing pit. As these containers were woven with a hole in the bottom, the oil was drained out of them that way. The residue was then emptied and used as fodder (Ertug 1999; 1997).

Willow branches (*Salix alba*) were employed in weaving large baskets for carrying mainly grapes in eastern Turkey (Kazilkaya), but also other fruits or vegetables, or dung cakes (Ertug, 1999). Ertug noted that the wickerwork was no longer popular in the observed area, but was replaced by plastic barrels or buckets (ibid.). Nevertheless, she mentioned that sometimes older wickerwork baskets were repaired with ropes or leather bands so they could be still used. Ertug (1999; 1997) also observed plant species chosen for other crafts, such as broom making. For example, she concluded the pigweed (*Chenopodium album)* was preferred for brooms for cleaning threshing floors (ibid.).

In Ertug's (2006) later attempt to review the research on plated crafts in Anatolia and Thrace in Turkey, more than 50 species were described with their local name and usage and type of product in basketry, matting, cordage or broom making (Table 2). The species she listed for Turkey's basketry included both woody and non-woody plants. From the woody plants she recorded: mastic (*Pistacia lentiscus*), oleander (*Nerium oleander*), cornel (*Cornus mas*), hazelnut family (*Corylus avellana*, *Corylus colurna*, *Corylus maxima*), tamarisk (*Tamarix* sp.), chestnut (*Castanea sativa*), myrtle (*Myrtus communis*), olive tree (*Olea europea*) and wild olive tree (*Olea europea* L. var. *sylvestris*), green olive tree (*Phyllirea latifolia*), pine tree (*Pinus sylvestris*), pomegranate (*Punica granatum*), poplar (*Polulus nigra*), willow family (*Salix alba*, *Salix amplexicaulis*, *Salix triandra, Salix viminalis*), elm tree (*Ulmus minor*), chaste tree (*Vitex agnus-castus*), beech (*Fagus orientalis*), oak family (*Quercus* sp.), and rhododendron family (*Rhododendron* sp.). From the non-woody plants those referred to as being used in basketry were: rushes (*Juncus inflexus*, *Juncus heldreichianus*), giant reed (*Arundo donax*), oat (*Avena sativa*) straw, bread wheat (*Triticum aestivum*), barley straw (*Hordeum vulgare*), rice straw (*Oryza sativa*), and cattail (*Typha laxmanii*). The plants chosen for matting were mainly non-woody and according to Ertug (ibid.) were: sedges (*Carex divisa* Hudson, *Carex nigra*, *Carex pendula*, *Carex longus*), rushes (*Juncus* subulatus, *Juncus heldreichianus*), cane (*Phragmites australis*), maize (*Zea mays*) and cattail (ibid.).

Focusing on the southern Mediterranean, Brinkkemper and Heijden (1999) identified five plant species, which were most commonly used in contemporary Egypt based on their ethno-archaeological work. Two palm species were identified by them, the doom palm (*Hyphaene thebaica*) and the date palm (*Phoenix dactylifera*), as being used in basket-making in Egypt (Amarna and Qasr Ibrim), of which the complete leaves or strips were employed (ibid.).

The second group of plant species proposed for the Egyptian basketry belonged to the grass family (Poaceae) and included grasses, reeds and cereal straw (Brinkkemper and Heijden, 1999). The first in the list was the halfa grass, which was represented by two different species with the same Arabic name: *Desmostachya bipinnata = Eragrostis cynosuroides* and *Imperata cylindrical*. Both leaves and culms of the two halfa grasses were used for basketry and cordage (ibid.). Within the reeds, common reed (*Phragmites australis = Phragmites communis*) and giant reed (*Arundo donax*) were used. Wendrich pointed that the two species had the same name in Arabic (ghaab), which was facilitated by their similar appearance (ibid.). Other tall grasses used for weaving baskets included sugar cane (*Saccharum spontaneum*), sorghum (*Sorghum bicolor*), and wheat (*Triticum* sp.). Again here, mostly the leaves and the culms were used in basket-making (ibid.).

Sedges represented the third large group chosen in Egyptian basketry, mainly *Cyperus* sp. species, such as *Cyperus schimperanus*, *Cyperus papyrus*, *Cyperus rotundus*, and *Cyperus alopecuroides*; the culms of these plants were used along with their leaves (Wendrich, 1999). Apart from basketry these species were also used in cordage. Rushes, such as *Juncus rigidis* and *Juncus acutus,* were preferred for making fish traps and twine and plaited baskets (ibid.). In addition to these plants, Wendrich identified flax (*Linum usitatissimum*) as material for cordage and nets and cotton (*Gossypium arboretum*) as a resource for textiles and fine string (ibid.)

Six plant species from archaeological desiccated basketry and cordage products were botanically identified by Borojevic and Mountain (2013) as used in Mersa/Wadi Gawasis and other sites, from the Egyptian collection of the Museum of Fine Arts in Boston (Deir el-Bersha and unknown sites). These species included culms of *Cyperus papyrus* and *Phragmites communis*, *Linum usitatissimum*, and leaves of *Desmostachya bipinnata, Imperata cylindrica* and *Hyphaene thebaica* (ibid.). The site of Mersa was a complex of rock-cut galleries (caves) where rare organic desiccated material was preserved. The findings included coils of ropes made of *C. papyrus* culms, a mat plaited with *D. bipinnata*, and a leaf sandal sole woven in coiled technique whereby the coils were made of *C. papyrus* and the stitches of *L. usitatissimum* (ibid.). Interesting was also the evidence classified by the authors as raw material, or three plant species which were unwoven in a basketry/cordage product: leaf sheaths of halfragrasses (*D. bipinnata* and *I. cylindrica*) and culms of reed (*Phragmites communis*, ibid.).

The museum examples that Borojevic and Mountain (2013) studied included samples of baskets, cordage, bags and one sandal. Some of the identified objects of unknown provenance included a round basket in coiled technique, whereby *H. thebaica* leaves were chosen as wefts and *D. bipinnata* culms as strings stitching the coils; a twined bag of *Hyphaene* leaf; a sole of a sandal in coiled technique; and a brush of *D. bipinnata* leaves (ibid.). The studied items from the Deir el-Bersha tomb included rope made of *C. papyrus*, and a basket woven with leaf sheath of *I. cylindrica* with linen knotted cloth (“gauze”) in it (ibid.). To summarise, the assemblage included grasses, sedges, palm leaves and flax, all relevant to the flora of the studied region of South-east Europe.

Another study of an early-middle Holocene rock shelter at Takarkori in Saharan Lybia, analysed more than 50 basketry and cordage vegetal remains, preserved desiccated, due to the favourable desert conditions (di Lernia et al., 2012). The authors studied twisted, plaited (braided) and twinned fragments the majority of which displayed preserved plant anatomy. Their identifications were assigned to the panicoid grasses (Panicoideae) and particularly to foxtail millet (*Setaria* sp.), which was also the major crop recorded as being the content of some of the baskets. A specific conclusion was drawn for this early site at Sahara, according to which containers meant to store a particular crop were also made from the same material (ibid.).

The non-botanical and botanical approaches to basketry reviewed in this section are summarised in Table 2.2., which was designed to compare the various proposed plant species used in basketry. Some of them are grouped on the basis of shared regional parameters related to the basketry they dealt with. For example, Leontidis' (1986) and Beloyanni's (2007) are grouped together as their works represent the non-botanical ethnographic evidence for Crete; Crowfoot (1954), Petkov (1965), Smith (2000) and Adovasio and Illingworth (2003) are considered as advancing an archaeological approach towards mat-impressions in Northern Greece and Bulgaria; Wendrich (1999) and Brinkkemper and van der Heijden (1999) are grouped together as presenting a mixed non-botanical and botanical approach on Egyptian sites, while Borojevic and Mountain (2014) and di Lernia et al. (2012) focus on the same region but from a botanical perspective; Nedelcheva et al.' (2011) and Dogan et al.' (2008) work are examples of studies concerning the extended Balkan area, while Ilieva (2012), Dencheva (2012), Bineva (2012), Yordanova (2009), Lilova (2011), Semerdjieva (2014) are grouped together as related to Bulgaria.

The existing suggestions of basketry plants were then used to inform when approaching the primary material studied in this thesis, both the ethnographic samples and the archaeological material. The combination of these botanical approaches with the scholarship related to the technical aspects of basketry formed the necessary foundation for the analysis and the interpretation of contemporary and ancient basketry products, as discussed in Chapters 3-5.

FAMILY	SPECIES	COMMON NAME	AUTHORS							
			1	2	3	4	5	6	7	8
DICOTYLEDONOUS PLANTS										
ANACARDIACEAE	*Pistacia lentiscus*	Mastic								
APOCYNACEAE	*Vinca major*	Periwinkle								
APOCYNACEAE	*Nerium oleander*	Oleander								
AQUIFOLIACAEAE	*Illex aquifollium*	Holly								
BETULACEAE	*Alnus* sp.	Alder								
BETULACEAE	*Betula* sp.	Birch								
BETULACAE	*Corylus avelliana*	Common hazel								
BETULACAE	*Corylus colurna*	Turkish hazel								
BETULACAE	*Corylus maxima*	Filbert								
CANABINACEAE	*Cannabis sativa*	Hemp								
CANABINACEAE	*Humulus lupulus*	Hop								
CAPRIFOLIACEAE	*Lonicera sp.*	Honeysuckle								
CAPRIFOLIACEAE	*Viburnum lantana*	Wayfarer								
CAPRIFOLIACEAE	*Viburnum opulus*	Guelder-rose								
CORNACEAE	*Cornus mas*	Cornel								
CORNACEAE	*Cornus sanguineus*	Dogwood								
CUPRESSACEAE	*Juniperus communis*	Juniper								
ERICACEAE	*Rhododendron* sp.	Rhododendron								
ERICACEAE	*Calluna vulgaris*	Heather								
FABACEAE	*Acacia sp.*	Acacia, mimosa								
FABACEAE	*Spartus junceum*	Spanish broom								
FABACEAE	*Ulex europeus*	Gorse								
FAGACEAE	*Castanea sativa*	Sweet chestnut								
FAGACEAE	*Fagus orientalis*	Beech								
FAGACEAE	*Quercus* sp.	Oak								
FAGACEAE	*Quercus alba*	White oak								
FAGACEAE	*Quercus illex*	Evegreen oak								
FAGACEAE	*Quercus michauxii*	Swamp chestnut oak								
GOSSYPIEAE	*Gossypyim arboretum*	Cotton								
LINACEAE	*Linum sp.*	Flax								
LINACEAE	*Linum usitatissimum*	Flax								
LYCOPODIACEAE	*Lycopodium annotinum*	Club moss								
LYTHRACAEAE	*Punica granatum*	Pomegranate tree								
MALVACEAE	*Abutilon theophrastii*	Velvetleaf, Cinese jute								
MALVACEAE	*Althaea cannabina*	Hemp-leaved holyhock								
MALVACEAE	*Lavatera thuringiaca*	Garden tree-mallow								
MORACEAE	*Morus sp.*	Mullberry								
MYRTACEAE	*Myrtus communis*	Common myrtle								
OLEACEAE	*Fraxinus excelsior*	Ash								
OLEACEAE	*Ligustrum vulgare*	Privet								
OLEACEAE	*Olea europea*	Olive tree								
OLEACEAE	*Olea oleaster*	Wild olive, oleaster								
OLEACEAE	*Phyllirea latifolia*	Green olive, Mock privet								
PINACEAE	*Picea abies*	Spruce								
PINACEAE	*Pinus sp.*	Pine								
PINACEAE	*Pinus sylvestris*	Pine tree								
RANUNCOLACEAE	*Clematis vitalba*	Wild clematis								
ROSACEAE	*Prunus avium*	Bird cherry								
ROSACEAE	*Sorbus aucuparia*	Rowan tree								
ROSACEAE	*Rubus sp.*	Blackberry								
SALICACEAE	*Populus nigra*	Black poplar								
SALICACEAE	*Populus tremula*	Aspen								
SALICACEAE	*Salix.* sp.	Willow								
SALICACEAE	*Salix eleagnos* Scop.	Olive willow								
SALICACEAE	*Salix viminalis*	Osier								
SALICACEAE	*Salix purpurea/ amplexicaulis*	Purple willow								
SALICACEAE	*Salix rosmarinifolia*	Hoary willow								
SALICACEAE	*Salix triandra*	Almond-leaved willow								
SALICACEAE	*Salix alba*	White willow								
SALICACEAE	*Salix fragilis*	Crack willow								
SMILACACEAE	*Smylax aspera*	Smilax								
STYRACACEAE	Styrax sp.	Snowbell								
TAMARICACEAE	*Tamarix* sp.	Tamarisk, salt cedar								
TAMARICACEAE	*Myricaria germanica*	German tamarisk								

TILIACEAE	*Tilia* sp.	Linden, lime								
TILIACEAE	*Tilia cordata*	Linden								
TILIACEAE	*Tilia platyphyllos*	Large-leaved linden								
TILIACEAE	*Tilia tomentosa*	Silver linden								
ULMACEAE	*Celtis caucasica*	Caucasian hackberry								
ULMACEAE	*Ulmus* sp.	Elm								
ULMACEAE	*Ulmus minor*	Field elm								
URTICACEAE	*Urtica doica*	Nettle								
VERBENACEAE	*Vitex agnus-castus*	Chaste tree, wicker								
VITACEAE (S)	*Vitis* sp.	Wild grapes								
MONOCOTYLEDONOUS PLANTS										
ARECACEAE	Arecaceae sp.	Palm tree								
ARECACEAE	*Hyphenae thebaica*	Doum palm								
ARECACEAE	*Chamaerops humilis*	Fan palm								
ARECACEAE	*Phoenix dactylifera*	Date palm								
ARECACEAE	*Raphia sp.*	Raffia palm								
ASPARAGACEAE	*Yucca sp.*	Yucca								
ASPHODELACEAE	*Asphodelus microcarpus*	Asphodel								
CYPERACEAE	*Cyperus* sp.	Sedges								
CYPERACEAE	*Carex* sp.	True sedge								
CYPERACEAE	*Carex divisa*	Divided, separated sedge								
CYPERACEAE	*Carex nigra*	Common, black sedge								
CYPERACEAE	*Carex pendula*	Pendulous, Weeping sedge								
CYPERACEAE	*Carex longus*	Long sedge								
CYPERACEAE	*Cyperus alopecuroides*	Foxtail sedge								
CYPERACEAE	*Cyperus schimperianus*	Schimper flatsedge								
CYPERACEAE	*Cyperus papyrus*	Papyrus grass								
CYPERACEAE	*Cyperus rotundus*	Nut grass								
CYPERACEAE	*Eriophorum latifolium*	Broad-leaved cottongrass								
CYPERACEAE	*Schoenoplectus/Scirpus*	Fresh water rush								
CYPERACEAE	*Scirpus lacutris*	Bulrush								
CYPERACEAE	*Scirpus littoralis*	Club rush								
CYPERACEAE	*Scirpus sylvaticus*	Wood club rush								
ERICACEAE	*Calluna vulgaris*	Heather								
JUNCACEAE	*Juncus acutus*	Spiny rush								
JUNCACEAE	*Juncus maritimus*	Sea rush								
JUNCACEAE	*Juncus bufonius*	Toad rush								
JUNCACEAE	*Juncus effusus*	Soft rush								
JUNCACEAE	*Juncus heldreihianus*	Heldreich's rush								
JUNCACEAE	*Juncus inflexus*	Blue rush								
JUNCACEAE	*Juncus rigidis*	Sea rush								
JUNCACEAE	*Juncus subalutus*	Somerset rush								
POACEAE	*Andropogon/* Chrysopogon *gryllus*	Bunchgrass								
POACEAE	*Arundo donax*	Giant reed								
POACEAE-Pooideae	*Agrostis* sp.	Bent								
POACEAE	*Avena* sp.	Oat								
POACEAE	*Avena sativa*	Oat								
POACEAE	*Ammophila arenaria*	Marram grass								
POACEAE-Pooideae	*Ampelodesmos mauritanicus*	Ropegrass. Mauritania grass								
POACEAE-Chloridoideae	*Desmostachya bipinnata*	Halfa grass								
POACEAE-Pooideae	*Glyceria maxima*	Great Manna grass								
POACEAE	*Hoprdeum* sp.	Barley								
POACEAE	*Hordeum sativum*	Wild barley								
POACEAE	*Hordeum vulgare*	Domesticated barley								
POACEAE-Arundoideae	*Imperata cylindrica*	Halfa grass								
POACEAE-Pooideae	*Lygeum spartum*	Esparto grass, spartum								
POACEAE-Arundoideae	*Mollinia caerulea*	Purple moor grass								
POACEAE	*Oryza sativa*	Rice								
POACEAE-Pooideae	*Phalaris arundinacea*	Reed Canary grass								
POACEAE-Pooideae	*Phleum pratense*	Timothy grass								
POACEAE-Arundonideae	*Phragmites australis/communis*	Reed, cane								
POACEAE	*Saccharum spontaneum*	Wild sugar cane								
POACEAE	*Secale* sp.	Rye								
POACEAE	*Sorghum bicolor*	Sorghum								
POACEAE	*Sorghum halepense*	Johnson grass								
POACEAE - Pooideae	*Stipa* sp.	Esparto grass								
POACEAE	*Triticum* sp.	Wheat								

POACEAE	*Triticum aestivum*	Bread wheat								
POACEAE	*Zea mays*	Maize								
POLYGONACEAE	*Rumex acetosa*	Common sorrel								
TYPHACEAE	*Typha* sp.	Cattail								
TYPHACEAE	*Typha latifolia*	Reedmace								
TYPHACEAE	*Typha angustifolia*	Cattail								
TYPHACEAE	*Typha laxmanii*	Graceful cattail								

Table 2.2. Dicotyledonous (woody) and monocotyledonous (non-woody) plant species used in basketry and matting, according to the reviewed authors: 1. General ethnographic non-botanical approach for the Balkans after Bichard (2008), 2. Ethnohraphic non-botanical approach for Crete after Leontidis (1986) and for Santorini after Beloyanni (2007), 3. Observations on archaeological mat-impressed pottery conducted non-botanically for North Greece by Crowfoot (1954), Smith (2000), Adovasio and Illingworth (2003) and about West Bulgaria by Petkov (1965), 4. Ethno-botanical approach for Turkey by Ertug (1997, 1999, 2006), 5. Ethno-botanical and archaeobotanical approach for Egypt by Wendrich (1999) and Brinkkemper and van der Heijden (1999), 6. Archaeobotanical approach for Egypt by Borojevic and Mountain (2014) and di Lernia et al. (2012), 7. Ethno-botanical approach for Bulgaria and the Balkans by Nedelcheva et al. (2011), Dogan et al. (2008), 8. Ethnographic non-botanical approach for Bulgaria by Ilieva (2012), Dencheva (2012), Bineva (2012), Yordanova (2009), Lilova (2011), Semerdjieva (2014).

2.4. Conclusion

Both contemporary and ancient, the craft of basketry has attracted more than a century-long interest within the research community. This perishable item has been widely discussed either in relation to textile production or as a separate and autonomous activity. The technological similarities in the way fabrics and baskets are woven resulted in shared descriptive approaches and terminologies. Nevertheless, numerous studies have focused specifically on basket-making, and therefore, have produced basketry-specific terminology. This chapter undertook the task to review and summarise the various existing in the scholarship approaches in order to make an informed decision on the appropriate terminology that should be adopted in terms of basketry techniques for the purposes of this study.

Furthermore, in addition to the study of the technological aspects of basketry, the existing scholarship on the plant choices made by past and present basket-makers was addressed. Within the non-botanical category of studies, morphological observations on mat-impressions were attempted, but the basketry plant material have not been examined to check or verify their botanical identification. So, in a way earlier scholarship has succeeded in providing some botanical suggestions, which although incomplete, they were an important starting point for the systematic analysis of basketry plants. Both botanical and non-botanical approaches were used as a guide for the primary ethnographical fieldwork conducted for the purposes of this thesis (Chapter 3), and for the laboratory identification of archaeological basketry remains also undertaken in the context of this research (Chapter 4).

In conclusion, this concise review of scholarship on basketry techniques and raw materials had a number of useful outcomes: a) the setting up of a comprehensive background on the various relevant approaches and advancements; b) the identification of the appropriate basketry techniques that will be discussed with respect to the technological aspect of this thesis (chapter 3 and 4); and c) the positioning and contextualisation of the study of basketry techniques and raw materials in prehistoric South-East Europe, which is the focus of this project, within existing scholarly approaches and advancements (Chapter 5).

CHAPTER III. ETHNOGRAPHY OF BASKETS AND BASKET-MAKERS IN BULGARIA

The developed in this thesis combined approach of field interviews, basketry plant samples obtained during the field work and from museum specimens, supported by bibliographical and documental research, aims at investigating the plant choice for basketry in the recent past and present day within their specific cultural and environmental context, giving insights into the current stage of basketry crafts, its practitioners and exploitation patterns which could be used to critically assess the documented ancient basketry practices (see Chapters 4 and 5).

3.1. Introduction

Ethnographic studies emerged in Bulgaria with the establishment of the Public Ethnographic Museum (*Naroden Ethnographski Muzej*) at Sofia in 1902, where traditional material and non-material culture meant to be preserved and displayed for the public (Vakarelski, 1977). Before that, several ethnographic accounts regarding Bulgaria and the Bulgarians were published by Austrian (Felix Kanitz, 1882) and French travellers (e.g. Alphonse de Lamartine, 1832; Ami Boué, 1854; Jérome Blanqui, 1842; Cyprien Robert, 1851 et al.). The following four decades of war conflicts (The Balkan War, WWI and WWII) posed obstacles for the new-born discipline, but soon, at the beginning of the new Socialist period in Bulgaria (1950s), a vast effort towards ethnographic studies was made and more ethnographic museums were founded at Plovdiv (1951), Koprivshtitsa (1956), Etar (1964), and Varna (1974) (Georgiev *et al.* 1983, Novakov, 2000). This included extensive ethnographic field work, documenting the traditional culture of the Bulgarian ethnos, compiled in several encyclopaedic issues under the general title "Ethnography of Bulgaria", starting with Vakarelski (1977) and Georgiev *et al*. (1983). A photographic trend appeared and developed at the end of the 19th century (with emphasis during the post–WWI period) and was fit into the vivid interest of Bulgarian traditional culture (to name but a few photographers: Stoyanov, 1930; Savov, 2017; Karastoyanov, 1882; Katsev, 2017a-c). The descriptive process of the

Bulgarian traditional culture was aided by the division system of the ethnographic regions, based on their specific folklore, traditional garments and calendar. This division aimed to define population groups based on their differences and unique characteristics, and also to assist the on-going documentation; as a consequence, these regions were introduced into the literature. The ethnographic division of Bulgaria includes six traditional folklore regions, and two groups, which were never determined as separate regions (Vakarelski, 1977). This ethnographic division will be adopted in this chapter as a template for description, but also to better understand the cultural context of the observed crafts and craftsmen.

It should be pointed out, that if the discrepancies between the populations belonging to different regions are no longer that evident, i.e. people do not wear their traditional costumes on an everyday basis but only at heritage-dedicated events, they are still present, for example in the traditional dialects or folklore songs of each region. It may be concluded, that the ethnographic regionality is still valid now-a-days, because the borders of the regions were artificially drawn upon a naturally existing ground of differences amongst the population and its traditional culture.

3.2. Presentation of regions: ethnographic division & ecological description

This section presents the studied ethnographic regions of Bulgaria, along with their geographical, ecological and economic background. These factors will be reviewed side by side because they all played an important role into the cultural history of each region and were often discussed in the dedicated scholarship. Taken all together, these factors do influence the cultural and/or economic aspects of traditional crafts which are an important element of the historical record of each region.

A simplified plotting of the boundaries of the six ethnographic regions in Bulgaria will look as follows: To the North-east is the region of Dobrudja, including the north Black Sea coast and the Danube delta. To the North-central and west is the Severnyashki region, covering the whole Lower Danube Plain and bordering the Balkan Mountain to the south. The Balkan Mountain itself is characterised by the Bakaldjii cultural group. South-east of the Balkan Mountain is the region of Thrace, including the south Black sea coast and the Strandja mountain shared between Bulgaria and Turkey. The south-east bottom end of Thrace includes the Strandja cultural group. West of Thrace is the region of Rhodope, named after the mountain which is shared between Bulgaria and Greece. To the West is the Shopski region, which includes the Sofian Plain and borders Serbia, sharing the west-most parts of the Balkan Mountain. Between the Shopski region and the region of Rhodope is the Pirinski region, known also as Macedonia; this region is dominated by the mountain of Pirin and its rivers are shared between Bulgaria, Greece and North Macedonia (*Figure 1*).

3.2.1. Severnyashki

The **Severnyashki** *(literary: The Northern)* region is the most northern ethnographic region of Bulgaria. Geographically, it corresponds to the Lower Danube Plain and sits between the river Danube to the north and the Balkan Mountains (Stara Planina) to the south; to the east it borders the ethnographic region of Dobrudja and to the south-west the Shopski region (Fig. 3.1.). Being the largest plain on Bulgarian territory, the Danube Plain, including the regions of Severnyashki and Dobrudja, is often termed "the fertile plain" due to the extensive agriculture being the main occupation in this area. Both regions are situated on the Danube banks – a reason why they have always played a key economic role: here in 1866, even before the collapse of the Ottoman Empire, the first railway line linked its major city, Russe, with Varna – an important centre on the northern Black Sea coast, contributing to the trade market and the development of industry (Kosev *et al.* 1987).

In ecological terms, the numerous river tributaries of the Danube and the type of soils (loess, black and grey forest soils) are determining the current type of Eurasian steppe and steppe forest vegetation in the Lower Danube Plain with the broadleaved vegetation to the west, and steppe-like to the east (Georgiev, 1979). At the Danube islands (op. cit.) the largest area consists of wetland forests, including willows (*Salix* sp.) and poplars (*Populus* sp.), together with other woody species, such as Turkey oak (*Quercus cerris*), Hungarian oak (*Quercus franietto*), elms (*Ulmus* sp.), lime (*Tilia* sp.), hornbeam (*Carpinus* sp.) and hazel (*Corylus avellana*). In addition, a few steppe taxa are extremely common in the vegetation of the Danube Plain: bunchgrass (*Chrysopogon gryllus*), feather grass (*Stipa* sp.), and grass – leaved iris (*Iris graminea*).

According to the ethnographic division of Bulgaria, the Severnyashki region also incorporates the **Balkandjii** group (*literary: the people from the Balkan mountain*), who are the inhabitants or the people who have their origin in the northern slopes of Stara Planina (The Balkan, in Ottoman Turkish language) in Bulgaria (Vakarelski, 1977). The Balkandjii ethnic group was never determined as forming an ethnographic region, because they never settled permanently and exclusively in the Balkan region (Map 3.1). Instead, mainly due to economic struggles as a result of the arduous mountain conditions, this ethnic group became scattered within different geographic and ethnographic areas of Bulgaria. They often migrated from the highlands to the lowlands due to economic opportunities and this high-lowland migration has been intensively studied by ethnographers and historians, because of the multiple cultural implications that were brought along. The Balkandjii mountain people brought to the plains, where they settled, their knowledge of wood crafts, their animal husbandry practises, their folklore and dialect (Ilieva 2012; Angelova, 2007; Popova, 2007). Regardless of whether the Balkadjii settled in another mountainous or in a plain region, there is something particular they always brought with them: the knowledge of how to make their living out of the mountain (Ilieva, 2012). For the Balkadjii, the mountain is synonymous with the forest, which governs their unbreakable relationship with wood-based crafts, even when they are about to settle in a lowland fertile region, where woodland vegetation is scarce.

The slopes of the Stara Planina (Balkan) are characterised by their vertical forest zonality, where up to 800 m.a.s.l. deciduous forests dominate (Assyov *et al*., 2006). Above this level, in some locations, coniferous forests can be found. The deciduous forests of Stara Planina are formed of lower and higher zones, according to altitude: different climbers, such as the old man's beard (*Clematis vitalba*), often co-form the lower layer with some tree species, such as ash (*Fraxinus excelsior*), while oaks (*Quercus* sp.), hornbeam (*Carpinus betulus*) and maple (*Acer* sp.) are to be seen higher (ibid.). The upper zone is formed of beech trees (*Fagus sylvatica*): this layer of the forest is very often the highest border of the forest itself, and above are the green pastures and meadows populated with shrub species, such as Cornelian cherry. Almost all the species of the Balkan forest were employed in various wood-related crafts, such as house exterior and interior building, furniture-making, tools and equipment-making, traditional for this area and its population (ibid.).

3.2.2. Dobrudja

The ethnographic region of **Dobrudja** borders to the west the Severnyashki region and is situated at the lower Danube River, including the Danube Delta and expanding to the northern Black sea coast (Fig. 3.1.). Here again, as in the Severnyashki region, the Danube always played a key economic role, in combination with the access to the northern Black sea coast. These factors determined the recent historical events, sharing Dobrudja between Bulgaria and Romania, depending on the 20th century's wars' outcomes: after the collapse of the Ottoman Empire, with the Treaty of San Stefano (1878), Dobrudja was awarded to Russia, which then annexed the northern part it to Romania and the southern – to Bulgaria; with the Second Balkan War (1913) Bulgaria lost southern Dobrudja to Romania, but then after the Treaty of Bucharest (1918) a portion of northern Dobrudja was awarded to Bulgaria – a process which terminated with the Treaty of Neuilly (1919), when Romania regained the northern parts and Danube remained the current border between the two countries (Bojinov, *et al*., 1991; Vachkov, *et al.* 2012). This complicated political background inevitably resulted in a mixed population, consisting of Romanians, Bulgarians, Turks and Tatars (who settled in Dobrudja during the Ottoman rule), which governed the diverse cultural heritage of the region (op. cit).

Ecologically Dobrudja lies within the Eurasian steppe and steppe forest vegetation zone, but there the ancient xerothermic forests are now replaced by steppe-like vegetation of mainly oak and grassland populations, determined by the human impact with the centuries-old tradition for grain cultivation in the region (Kolev *et al.* 2002). Here on lime-rich edaphic conditions, the secondary steppe-like vegetation replaces the ancient steppe forest and the black soils are slowly converted into grey forest soils (ibid.). The current vegetation is characterised by recent xerothermic forests with steppe elements, including wood species: pubescent oak, oak of Virgil (*Quercus virgilliana*), Turkey oak, sometimes Hungarian oak, oriental hornbeam (*Carpinus orientalis*) and manna ash (*Fraxinus ornus*). Rarely in the western part of the region lime trees grow in mixed secondary forests with sessile oak (*Q. patraea*) and hornbeam (*Carpinus betullus*). In the eastern areas, extensively exploited by cereal agriculture and situated closer to the Black sea coast, degraded mixed forests include: Grayish oak (*Q. pedunculiflora*), Turkey oak and Oriental hornbeam but with no lime trees. Secondary shrub communities are present in the whole region, formed as a result of the forests degradation, and include Jerusalem thorn (*Paliurus spina-christi*), smoke tree (*Cotynus coggyria*) and grassland vegetation with steppe elements, such as bunchgrass (*Chrysopogon gryllus),* bluestem *(Dichanthium ischaemum),* and bulbous bluegrass (*Poa bulbosa*). Even as part of the Danube plain, the relatively level region of Dobrudja is eventually hilly reaching 200–300 m.a.s.l., which combined with the high percentage of windy days, the extremely low-precipitated southern areas and the extensive cereal cultivation, made the region known for its wind mills (ibid.).

3.2.3. Thrace

The ethnographic region of **Thrace** is situated south of the Balkan mountain. It starts from the southern slopes of the Stara Planina (Balkan), expanding into the Thracian plain and bordering the southern Black sea coast (Fig. 3.1.). Culturally, historically and politically, Thrace is shared between three countries, Bulgaria, Greece and Turkey, the main reason for the region shaping itself as a conflict zone in the recent Eastern Balkan history. Just before the collapse of the Ottoman Empire, Northern Thrace was incorporated into the semi-autonomous Ottoman province of Eastern Rumelia (after the Berlin Congress in 1878), but later was united with Bulgaria in 1885 (Kosev, *et al*., 1987). Soon after the Balkan Wars (1912 – 1913), the Greco – Turkish Wars (1919 – 1922) erupted in Eastern Thrace (Markov et al. 1999). This part of Eastern Thrace (Asia Minor) stayed within the borders of the newly recognized Republic of Turkey (secured by the Treaty of Lausanne in 1922).

Ecologically, Thrace consists of low and high grasslands with steppe elements (where anthropogenic deforestation occurs), covering the large Maritsa river banks and the Black sea coast and moderately hilly inland areas (Georgiev, 1979). The hydrophilic vegetation nearby the river zones includes giant reeds (*Phragmites* sp.), willows, poplars and alders (*Alnus* sp., Kolev et al. 2002). The level areas in the inward parts of the Thracian plain are nowadays extensively exploited for agriculture and within the hilly parts of the plain degraded mesophilic and hydro mesophilic forest communities survive, including Grayish oak, field elm (*Ulmus minor*), field ash (*Acer campestre)*, Jerusalem thorn (*Pariarus spina-christi*), and hornbeam. The mild climatic conditions favoured the rose-growing industry and even attributed to Thrace a synonymous name – the Rose Valley, where local hybrids of the Damask rose (*Rosa damascene* var. *trignitipetala)* were produced after the 1950s and named after the centre of the rose industry - Kazanlak rose. The rose-growing industry was one of the main ones in the years before the WWI, which declined between the two wars; at the post-WWII years it was renewed and is still important for the current country's economy. Other agricultural industries included maize, cotton, linen, whereas grape and tobacco cultivation are concentrated in the east part of the region.

In terms of ethnographic division Thrace is also a complex region and includes the **Strandja** ethnic group. Strandja is the name of the border mountain, shared between Bulgaria and Turkey, and enclosed by the Black sea to the east (Fig. 3.1.). Similar to the Balkadjii people, this group was not recognised into a separate region but was included in Thrace. The ethnic diversity of this area was determined by the presence of Greek immigrants until the Balkan Wars (1913), which bore an interesting summer ritual, performed at the days of St. Elena and St. Constantine – the *Nestinari*/*Anastenaria*, dancing on fire. This ritual, remained performed by the Bulgarians too, after the Greek community was expelled to Greece as a result of the Graeco-Turkish Wars, and is now-a-days one of the most famous summer festivals in the region.

Ecologically, the vegetation of Strandja includes Euxinus (Black sea), Mediterranean and steppe elements with a great number of endemic species. The current vegetation consists of relict forests of oriental beech (*Fagus orientalis*) and oriental durmast (*Q. polycarpa*), where often the oriental durmast forms mesoxerothermic forests with the Turkey oak, the Hungarian oak and the Strandja oak (*Q. hartwissiana*) and the oriental hornbeam (Kolev et al., 2002). The forest shrub layer is very diverse, consisting of rhododendron (*Rhododendron ponticum*), Cherry laurel (*Laurocerasus officinalis*), common holly (*Ilex aquifolium*), Black-sea holly (*Ilex coclchica*), and Pontic daphne (*Daphne pontica*). Nearby the rivers, the longose forests occur (being temporarily flooded) and include communities of field ash (*Fraxinus oxycarpa*), field elm, common alder (*Alnus glutinosa*), English oak (*Q. robur*) and Grayish oak, Stradja oak, hornbeam and abele (*Populus alba*). The longose forests are also abundant with evergreen climbers, such as smilax (*Smilax excelsa*), silkvine (*Periploca graeca*), Old Man's beard (*Clematis vitalba, C. vitivella, C. flamula*), wild vine (*Vitis vinifera* ssp. *sylvestris*), and common hop (*Humulus lupulus*).

3.2.4. Rhodope

The ethnographic region of **Rhodope** is a mountainous region which identifies itself with the Rhodope Mountain massif (Fig. 3.1.). It borders Thrace to the north and is shared between Bulgaria (West and East Rhodope) and Greece (South Rhodope). This region is another one with rich cultural diversity, owing to historical events, the most recent of which are the Balkan Wars (1912 – 1913), during which the region first remained on Bulgarian territory, but later was annexed to Greece and the Bulgarian population was expelled. The mixed Bulgarian and Greek Orthodox population, together with the Muslim communities of the Pomaks (Slavic muslims) and Bulgarian Turks (descenders of the Ottoman settlers), and the K/sarakatsani nomadic group (who migrated between Thrace and the Aegean) outline the diverse and rich cultural profile of the Rhodope ethnographic region (Andreev, *et al.* 1999).

The Rhodope Mountain massif is part of the Rhodope montane mixed forests ecoregion, which includes both the Balkan mountain and the Rhodope massif (Kolev et al., 2002). The region is characterised by vertical forest zonality, with a large conifer forest layer - very distinct in the West and central parts of the mountain and dominated by Scots pine (*Pinus sylvestris*) and Norway spruce (*Picea abies*), but also including: Silver fir (*Abies alba*), Bulgarian fir (*Abies borisii-regis*), Bosnian pine (*Pinus heldreichii*), Macedonian pine (*Pinus peuce*), and Austrian pine (*Pinus nigra)*. Above the conifers are the alpine grasslands and heaths, populated by numerous endemic species from the Pleistocene glaciation. The mixed deciduous forests of central European character, occupying the lower zones at the northern and eastern parts of the Rhodope, are composed of species, such as European beech (*Fagus sylvatica*), and a local variety, the Moesian beech (*Fagus sylvatica* var. *moesiaca).* The deciduous forests to the East are also co-formed by sessile oak, Oriental hornbeam (*Carpinus orientalis*), European hornbeam (*Carpinus betulus),* Norway maple (*Acer platanoides*), Sycamore maple (*Acer pseudoplatanus*) and sometimes the relict hop-hornbeam (*Ostrya carpinifolia*). Often at the deep valleys the deciduous forests are mixed with coniferous species, such as Austrian black pine. At the south parts of the mountain xerothermic forests grow formed of Hungarian and Turkey oak, adding diversity to the local vegetation, including European, Alpine and Mediterranean floristic elements (ibid.).

3.2.5. Pirin

The **Pirinski** ethnographic region is identified with the mountain range of Pirin, expanding to the area south of Rila Mountain (Fig. 3.1.). Often the region referred to as Macedonia or Macedonia of Pirin and indeed, the region borders the Republic of North Macedonia to the west and Greece to the south. Politically, the region was annexed to Bulgaria after the Balkan Wars (1912) and amendments to its western territories were applied by the end of the war, when they were delegated to former Yugoslavia (Vachkov, *et al.* 2012). Since the Communist period was established in Bulgaria, a pro-Macedonian propaganda within the inhabitants of the region took place for over a decade (1944 – 1958) and resulted in high proportion of the local population recognising themselves as "ethnic Macedonians" and Macedonian language speakers. This government-forced process was later abandoned but the contemporary population still preserves traces of it, such as the spoken distinct western dialect and/or Macedonian language (op.cit.).

Ecologically, the vegetation of Pirin is vertically zoned with the deciduous forests with Mediterranean elements at the bottom including wood species, such as pubescent oak, Oriental hornbeam, European oak, European beech (Kolev et al., 2002). The higher coniferous zone is formed of Norway spruce, Scots pine, Macedonian pine (*Pinus peuce*), less Bosnian pine (*Pinus heldreichii*) and Austrian pine when silicate soils are present. The subalpine zone has abundant dwarf mountain pine (*Pinus nugo*) and juniper (*Juniperus communis*). As the mountain range of Pirin governs the vegetation diversity here there are two major regions. The north part of the area is dominated by the high alpine ecological zone with its adjacent arctic-alpine vegetation (grasslands, moss and lichens) on karstic edaphic conditions. In the lower zones endemic Boreal flora is represented by conifers, such as the Macedonian and Bosnian pine. To the south, the Pirinski region looks quite different, with the absence of the alpine and sub-alpine zones and with the abundance of deciduous forests at a lower altitude, including beech species and sessile oak, which are sometimes mixed with Scots and Macedonian pine (op.cit.). The ecological conditions of the south slopes of Rila Mountain and the territories south of it and north of Pirin are almost identical with the southern slopes of Pirin: the alpine zone is absent and the conifer forests of Macedonian pine are dominant, while the south-facing slopes are populated by xeromesophytic forests dominated by sessile oak (op. cit.).

3.2.6. Shopski

The **Shopski** region (*literary the Shops' – the local population call themselves Shops)* is the west-most ethnographic area of Bulgaria, located between the north-west part of the Severnyashki region and the north parts of the Pirinski region, the Balkadjii group to the east and it borders Serbia to the east-west (Fig. 3.1.). This is the region with the highest population concentration in Bulgaria, as the capital of Sofia is situated here. During the last century, this major urban centre had an important role in the internal migration of population oriented from the countryside to the big cities. As opposed to other border regions, after the Liberation of the Ottoman regime (1978) the inner part of the Shopski region (including the city of Sofia) always remained within the territory of Bulgaria. Nevertheless, the western territory of the region was subject to the Serbo-Bulgarian War in 1885, when, since after the Union of Eastern Rumelia (South Bulgaria, after the Liberation in 1878) with the Principality of Bulgaria (North Bulgaria, Vachkov, *et al.* 1999 this area was annexed to Bulgaria, and was then claimed back by Serbia. The collision of the Serbian and Bulgarian armies resulted in a victory for Bulgaria, which kept the western flank of the Shopksi region, but this conflict is still alive in the local population's memory and often cause tension between settlements at the opposite sides of the current border (ibid.).

The Shopski region covers the whole Sofian plain, framed between the Vitosha Mountain to the east, the western-most part of the Balkan mountain to the west and the northern and north-eastern slopes of Rila Mounatin to the south; one of the major rivers on the territory of Bulgaria – Iskar - also flows here, adding to the diverse regional ecological conditions with the mesophytic grasslands along the river banks (Kolev et al., 2002). This type of vegetation is the dominant in the territories occupied by agricultural activities, which represent the majority of the non-mountainous areas of the region. Apart from this, the dominant vegetation in the region is steppe-like with xerothermic oak forests of Hungarian, sessile and Turkey oak mainly in the south aspects of the region and the areas with less annual precipitation. The dominant modern state of the vegetation consists of extensive grasslands, exploited for agricultural needs. The Moeasian relict forests are more actively present in the northern area of the region, where it borders the Severnyashki region, where along the rivers also Grayish oak and hop-hornbeam are also growing (op. cit.). The area, defined by the mountain range of Vitosha, presents all the aspects of the vertical zonality, including the alpine, arctic-alpine and sub-alpine vegetation, then the coniferous forests of fur, which transition into forests of beach, sessile oak and hornbeam. Mixed forests are found lower, including sessile oak with Turkey oak, sessile oak with hornbeam, Greek maple (*Acer heldreichii*) and Balkan maple (*Acer hyrcanum*). At the south-facing parts there are xerothermic forests of Hungarian oak, birches (*Betula* sp.) and the relict downy willow (*Salix lapponum*).

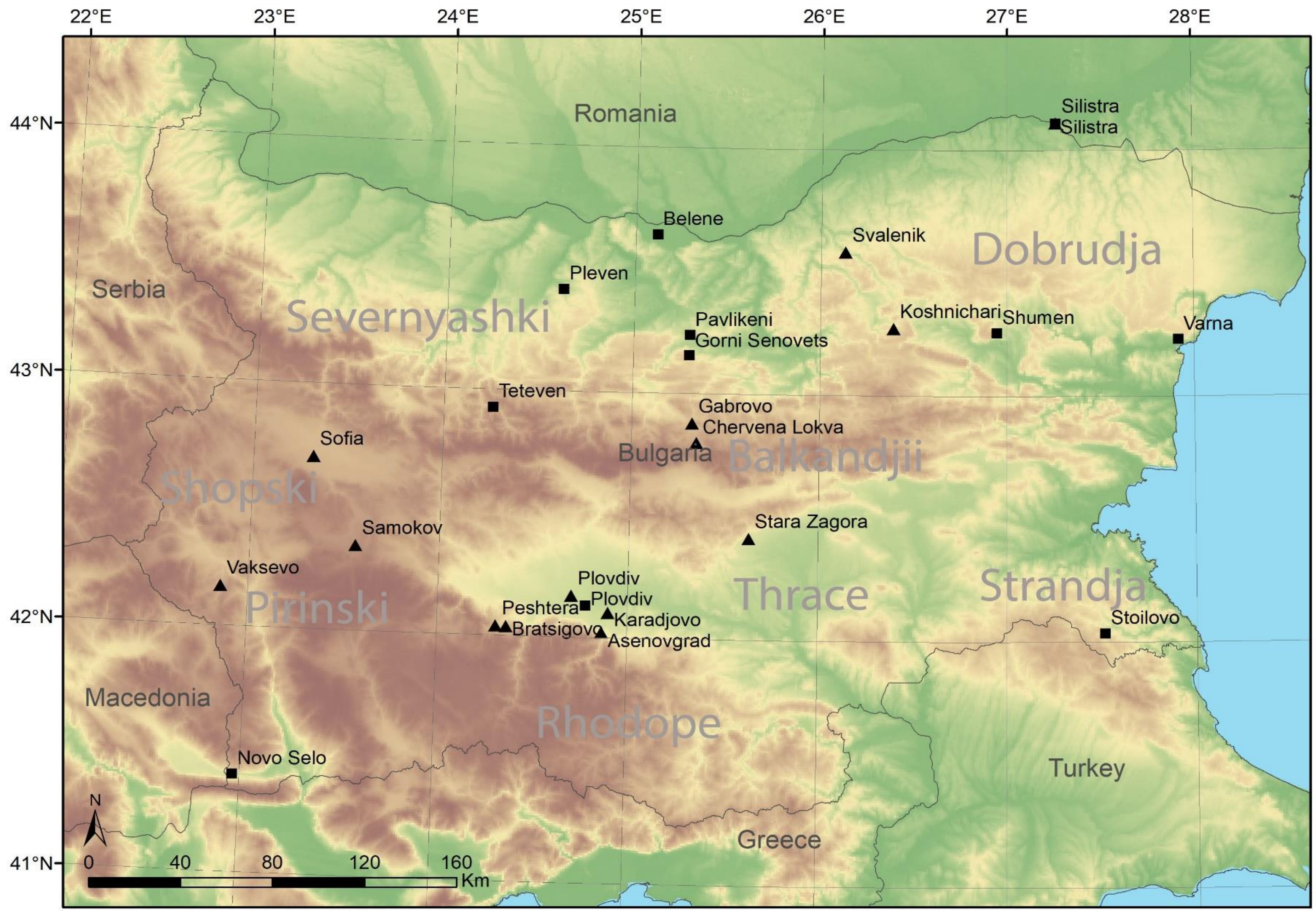


Figure 3.1. Ethnographic regions of Bulgaria (grey), locations with evidence for historical commersialisation of basketry (square) and locations of primary interviews (triangle), transcribed in Appendix 1. Map design: ArcGIS® (2019).

3.3. Methods of ethno-botanical data collection

The data collection which was employed for the purposes of my ethno-botanical research on basketry involved information sourced from: bibliographical research, interviews, recording and sampling of plant material. These three types of information proxies belong to two big categories of data: primary (interviews and plant material obtained via field work and via museum collections), and secondary (scholarship, use of documents and photography). Often the primary data collection was guided by the already collected secondary data - for example a historic photographic archive, displaying basketry items or basket-makers pointed towards the identification of the functions of particular types of baskets in a particular region. The primary field work involved selecting informants, conducting interviews, observing the interviewees while performing their craft, recording information via memory-recall interviews, referring to past events, together with plant material collection, guided by the informants and sampling of plant material from basketry items from museum collections, where this was permitted. The work with the secondary sources included research of the existing scholarship and analysis of the different types of documents and their media (Fig. 3.2).

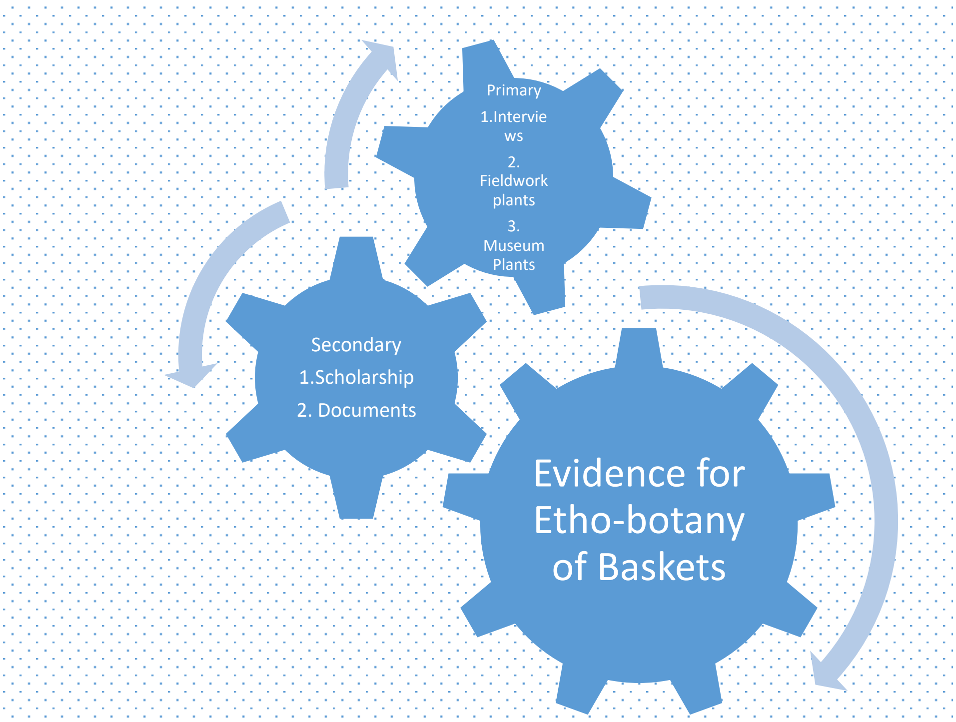


Figure 3.2. Strands of evidence for the ethno-botany of baskets, applied in this study.

3.3.1. Selection of informants, ethics, questionnaire and strategies

The number of interviews was limited by the extreme scarcity of modern practitioners of basket-making in Bulgaria. The process of identifying each particular informant and the specific circumstances and/or difficulties towards this were various. The methods used to identify interviewees included: the existing scholarship, information published or broadcasted on different media (web, newspapers, radio, and television), personal communication, and information obtained via other informants. This implied that I had already identified my informants on a judgemental sample basis – i.e. I searched for people who are/were specialists in basket-making and thus they knew more about it. This directly affects the representativeness of the sample because the number of interviews conducted on a judgemental basis is always lower than systematic non-judgemental interviews (i.e. of non-basket-makers, but retailers, or collectors). Some of the difficulties during the field interviews consisted of the age of some of the informants, preventing them of practicing basket-making anymore, hence their refusal to demonstrate weaving; the refusal of some of the informants to be photographed; and in some cases, the dubious information provided during the interview. All these background setting details are summarised in the beginning of each Questionaire in the *Diary* section (Appendix 1).

Ethics approval of my proposed questionnaire was granted by the School of Humanities Ethics Offices of the University of Nottingham in 2016. An Informed Consent Form was also signed by all of my informants, who positively gave their consent for their participation in this research. In two cases my interviewees refused to be recorded or photographed. I did treat this obstacle by undertaking field notes, and/or asking for and being granted permission to photograph the informants' baskets, but not the interviewees themselves. All the interviews were conducted in Bulgarian and then transcribed in translation in English by the author (Appendix 1). Supporting video and photographic material is also attached to each interview. In some cases, various types of documents, including private photographic archives or books, were accessed during my interviews; in these cases, these documents were also filed with the interviews they originated from, with permission by their owners, to be used in this study.

For the purposes of my research, I chose to conduct structured informal interviews, predominantly woven of open questions, grouped under a number of areas of interest:

personal information, typology of basketry, chosen raw material, working process and social aspects (Appendix 1). The open questioned interviews were used with the intention of creating a wider data base from which recourses for the design of closed-questioned interviews could be extracted in the future (Werner and Schoepfle, 1987). The nature of the interviews was structured, because they were previously prepared and standardised according to the areas of knowledge I wished to assess for the purposes of my study. The interviews were informal, because the questions could be negotiated, adjusted, criticised or changed by the informants in the process of a conversation. Each interview had an introducing section – a setting and participants' presentation, where the general context in which the interview was held was described along with the interviewees themselves.

The **first section** of questions aimed at a combination of personal/demographic data (age, origin, marital and occupational status) and general basket-making background (whether basket-making was the informant's main employment, when and where did they learn how to weave baskets, whether they learnt/were taught basket-making from/to family member, *Appendix 1, Section 1*). The personal questions were intended to first set the background of the conversation and then to obtain information, which would be combined with the questions addressing the social aspect of basketry. Some questions of this first group of questions were developed further in the ongoing interviews, providing a smooth link between the different sections.

The **second** cluster of questions addressed basketry products, but still at a general level, where I aimed in improving the ambience between myself and the interviewee and preparing the ground for my further and more detailed questions (*Appendix 1, Section 2)*. I performed that by demonstrating my pre-existing knowledge of the subject, the informant's craft, the local area and in some cases - their personality (if already previously interviewed). This strategy by means of leading the question-answer process when asking with obvious answers or implementing them into the question itself is known in ethnography as "baiting" or "presuming questions" (Agar, 1996, p. 142; Werner and Schoepfle, 1987). Examples for this method are my questions: "This type of basket is called XX, isn't it? /This basket is woven from XX, isn't it? /This basket is used for XX, isn't it? The application of this kind of questions was important to help me identify (and later disregard) if any informant was providing misleading and inaccurate data and study the content of any potentially falsified data. One of the main features characterising this type of informant is their tendency for generalisations, usually due to lack of detailed knowledge or desire to share – i.e. “all baskets are woven of willow”. This type of informants is not representative for the group they belong to or for the subject they inform us about, but the risk of relying on them is great, for example when there is time pressure.

The **third group** of questions represents the core of each interview, because here is where questions regarding the raw material chosen for weaving, its processing sequence and the actual weaving were addressed (*Appendix 1, Section 3*). In this section, the contrast strategy was applied successfully (Agar, 1996) by creating binary questions, such as ‘what is this plant good/bad for’ or ‘how do you dry/nourish the willow rods before/after the act of weaving’. Along with the contrast strategy, this group of questions fully engaged with the framing approach (ibid: 149), which consists of a statement/question with a gap, which was to be completed by the informant, such as “You grow your own osier in your own land at…./You trade these baskets at….”. The framework binds the general background together with further details of interest and is directed by the nature of the conversation; this is why I found this type of questions extremely informative and helpful as an approach. Questions, related to the particular working process of each plant or basket type were asked in combination with questions on the tools applied in each action. The three aspects of this group of queries, plant material, processing and actual basket-making, represent the largest volume in each of the transcribed interviews and provide the majority of the data employed in the ethnographic part of this thesis.

The **fourth** aspect addressed in the questionnaire include the economic value of the raw material and the actual baskets woven of it (*Appendix 1, Section 4*). For example, in *Section 1*, informants were queried to answer if basket-making is their main occupation. In addition, questions targeting the perception of value (i.e. cheap/expensive) were addressed in order to estimate existing economic patterns. The **fifth** part of the questionnaire set personalised questions aiming at a deeper layer of data collection, informing about the social aspects of basketry (*Appendix 1, Section 5*). Such aspects include the cultural value (e.g. Are there any special/dedicated baskets?), tradition and transmission of the craft and its knowledge (e.g. Would you like your son/daughter to become a basket-maker?). It also included challenging questions, such as: “Who makes the best baskets in here?” in combination with memory recall and description of past events. The data obtained from recalling past events have its biases too, such as (in)accuracy and hypothetical reconstructions of past events and objects, but the main benefit of this type of data is that they derive from the informant's personal experience and build upon the social context of which the informant is part.

3.3.2. The basket-makers

A total of sixteen (16) interviews were held with twenty (21) informants, aged 31 – 81, during the period between 2015 and 2017, representing all six ethnographic regions of Bulgaria (Table 3.1, Fig. 3.3). Six of these interviewees have been also previously interviewed in the scholarship or media (Q1, 3, 5, 11, 12and 13), while the remaining ten are primary interviews for the purposes of this study. As part of the interviewees' identification process was supported by preceding research, in combination with the scarcity of modern practitioners of the craft of basket-making in Bulgaria, the chance for interviewing non-informative informants (as described in the second cluster of interview questions in 3.3.1.) was minimised to a single case (Q15 from Shopski region) and hence it was removed from the analysis. From the Severnyashki region six informants were interviewed (5 male and 1 female), of which two represent the Balkadjii group (K.B., Q 1 and N.L., Q2). All, except of one were retired and were born in this region between 1930 and 1949. Basket-making was a side occupation for four of them (the last two and H.I., Q7 and G.G., Q8), while the other two were collectors or clients (bee-keepers who need skeps) for basketry goods (T.M., Q9 and M.M., Q10). Amongst the basket-makers two of them inherited the craft from their parents or relatives, while two were self-taught. In Dobrudja three informants were interviewed (1 male and 2 females) during a joined meeting, all of which were employed in a commercial private basket and furniture-weaving company: the owner (St.M., Q13), the manager (S.M., Q13) and a worker in the company (E.V., Q13). They were born in the region between 1987 and 1957 and two of them were father and daughter, whereby the latter learnt the craft from her father. All three currently live in the region and even if they gained an engineering, management and pedagogic university degrees respectively, now basket-making is their main occupation. In Thrace I interviewed three basket makers of whom one female informant was a needle work artist who did not weave but knitted baskets and other items (J.G., Q3); the other two male informants were a carpenter (D.A., Q5) and a Roma trader (S.A., Q4) who were weaving baskets. In the Rhodope region a family couple of Bulgarian Turks (see section 2.4.) were interviewed, whose main occupation was being primary school teachers but today being retired they are fully dedicated to basket-making (E.B. and M.S., Q11). In addition, a Roma baskets trader was accidentally interviewed in Sofia (while carrying and selling his baskets) but he and his products come from the Rhodope region (Q14). To this region is attributed one more interview of an antique collector, whose collection possessed basketry and matting objects (Q16). In the Pirinski region, a retired carpenter was interviewed, who was making baskets during all his life as a supplementary activity (D.Z., Q12). In the Shopski region I interviewed another family couple (V.D. and S.D., Q6), whose primary occupation was being a nurse and an engineer (born in the 1960s), but they also have their workshop and shop for basketry items, which represents a complementary family business. In addition, a Roma basketry items trader was interviewed at the Sofia Open Market, who also belongs to the Shopski region (Q15).

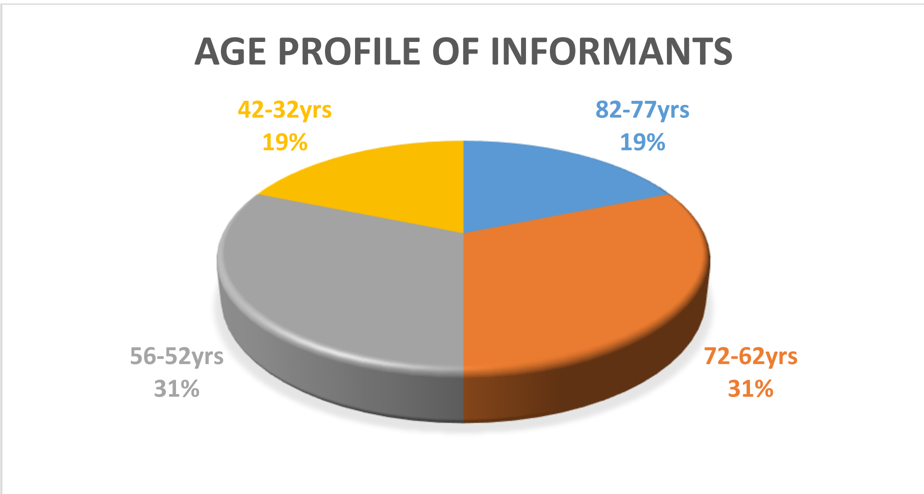


Figure 3.3. Age profile of Informants

№	Q Number	Informant	DOB	E Region	Location	Basket-maker	Collector/ Client	Principal? Profession	SHAPES	PLANTS	Inherited	Selling
1	7	H.I. (m)	1930	SEV	Koshnichari	yes	no	Carpenter, ret.	Big kosh, Frame baskets skeps	Hazel, old man's beard, Cornelian, metal wire	yes	no
2	8	G.G. (m)	1949	SEV	Koshnichari	yes	no	Engineer, ret.	Small baskets	Willows	yes	no
3	9	T.M. (f)	1947	SEV	Svalenik	no	yes	Journalist, ret.	Damijiana, Baskets, Pachnici	Willows, old man's beard	no	no
4	10	M.M. (m)	1952	SEV	Svalenik	no	yes	Bee-keeper	Skeps	Willows, old man's beard	no	no
5	1	K.B. (m)	1937	SEV (B)	Chervena Lokva	yes	no	Carpenter, ret.	Big kosh	Hazel	no, st	yes
6	2	N.L. (m)	1967	SEV (B)	Gabrovo	yes	no	Archery Coach	Decorative baskets	Willows, old man's beard, plastic	n, st	no
7	13	S.M. (f)	1987	DOB	Silistra	yes	no	Manager	Furniture	Willows, old man's beard, hazel, paper	yes	yes
8	13	St.M. (m)	1957	DOB	Silistra	yes	no	Director	Furniture	Willows, old man's beard, hazel, paper	no	yes
9	13	E.V. (f)	1977	DOB	Silistra	yes	n	Primary teacher	Furniture	Willows, old man's beard, hazel, paper	no, com	yes
10	3	J.G. (f)	1963	THR	Povdiv	no	yes	Artist	Varia, knit work	Corn leaves, raffia palm	yes	yes
11	5	D.A. (m)	1964	THR	Stara Zagora	yes	no	Carpenter	Baskets	Willows	yes	yes
12	4	S.A. (m)	n/a	THR	Karadjovo	yes	no	Trader	Medium baskets	Willows	yes	yes
13	11	E.B. (f)	1956	RHOD	Peshtera	yes	No	School teacher	Var. baskets	Cornelian, ash	yes	yes
14	11	M.S. (m)	1942	RHOD	Peshtera	yes	No	School teacher	Var. baskets	Cornelian, ash	no	yes
15	12	D.Z. (m)	1939	PIR	Vaksevo	yes	No	Carpenter, ret.	Var. baskets	Red willow, white willow, dwarf willow	yes	yes
16	6	V.D. (m)	1963	SHOP	Samokov	yes	No	Engineer	Damadjana	White willow	yes	yes
17	6	S.D. (f)	1967	SHOP	Samokov	yes	No	Nurse	Damadjana	White willow	yes	yes
18	14	G.A. (m)	1978	RHOD	Asenovgrad			Basketry trader	Hand baskets	Willow	yes	yes
19	15	Anonym. (m)	Circa 1990	SHOP	(Open Market)			Basketry trader	Hand baskets	Willow		yes
20	16	Anonym. (m)		RHOD	Bratsigovo	no	yes	Antiques collector	Hand baskets			no

Table 3.1. Profile of the interviewed informants

3.3.3. Documents and artefacts for the ethnobotany of baskets

Documentary sources and material artefacts, as two types of data, were used in favour of my ethnographic fieldwork to better understand the researched social activity because "the organisation of collective social activity involves the creation, use and circulation of material artefacts." (Hammersley and Atkinson, 2007, p. 121). In a way a document may be viewed as an artefact and the other way around – an artefact may be a document, and this mutual relationship benefits the outcomes of ethnographic field interviews. The main type of documental evidence which was employed and analysed along with the conducted field interviews consisted of photographs, along with basketry artefacts, held in museum collections

.

3.3.2.1. Photographs

The photographs accessed for the purposes of this study, were a combination of public (i.e. published in literature or catalogues) or private (i.e. personal archive) photographs. As a type of evidence, the photograph lies on the margin between the document and the artefact, being highly convertible in each of the two groups. According to Hammersley and Atkinson (2007) there are formal and informal types of documents, whereby the formal documents consist of published and/or publicly available data, whereas the informal documents mostly represent personal accounts. Again here, the photograph as a document may be produced out of both a formal and informal documentation. As Hammersley and Atkinson (2007) note, the autobiographical accounts are extremely rare to be identified with the people we actually study and caution should be applied because of their subjectivity. But this is why the scarcity of this type of photographs may be highly informative, such as in the rare cases where my research benefitted from biographical photographs of basket-makers and their baskets, where relatives are shown performing the craft. For the purposes of this study two autobiographical photographs were accessed (Section 3.4.1.4.).

Public (non-autobiographical) photographs were also employed, and could be grouped in two main types. The first one is the photographs preserved in the museums' archives, where five of the accessed museums (National Ethnographic Museum, Regional Ethnographic Museum – Plovdiv, Regional Historical Museum – Silistra, regional Historical Museum – Bratsigovo, Regional Historic Museum of Kzanlak) contained photographic material, of which thirty-six photographs were selected because they depicted baskets. The second type of photography is that published in other media, such as in the existing scholarship, where seven photographs were identified, showing basketry. In addition, three independent (non-museum) photographers were identified, with their photographs displaying basketry: Spas Stoyanov, Dimitar Karastoyanov and Krum Savov (Section 3.4.1.4).

The majority of the photographs were produced while observing traditional agricultural activities, for example where baskets were employed for multiple usages. Several photographic series, were observed, by means of originating from the same locale (even settlement), representing similar activities (i.e. seasonal agricultural actions), and being created by the same author (i.e. an ethnographer/photographer with particular interest in the photographed region or events). This type of photography is definitely a type of ethnography, at least in terms of the process of observation and record. Thus, taking advantage of this already existing record I used photographs as documents. For example, when reviewing an Ethnographic Museum's photographic archive displaying baskets, I was able to summarize the types of baskets dedicated to specific activities (for example, photographs of an area known in the past for its rose petals harvest, showed this activity being performed in big baskets). On the other hand, when reviewing private photographs, conclusions as per the social meaning of basket-making were drawn, such as if an elder family member passed his/her knowledge of the craft upon a younger family member.

The photographs of at least one type of photographic evidence were available for all studied areas. Amongst the larger group of photographs – the bibliographical one – the photographers were often not mentioned and are to be assumed identical with the author, while at the museum archives the photographers were mostly mentioned, along with the year or decade of taking the actual photograph, reaching a total of twelve known museum and independent photographers. Regardless of their known or anonymous authorship, photographs were used as a documental illustration of the different types and roles of basketry objects in the past. In the cases where the images were attached to existing scholarship, their use and sometimes a guess for the plant material they were made of, were described. Amongst the single photographs, which were not illustrating a text, but being an individual media, a very brief or none description of provenance, locality and depicted activity was provided. But in both cases, the visual material informed about aspects of basketry and was later reviewed as a separate strand of evidence on basket-making in the last century (Section 3.4.1.4.). I managed to attribute a visual document – regardless of which type - to each ethnographic region, but the photographs do not display all the known from the scholarship variety of basketry objects and their uses. But photographs do confirm several types of baskets and their uses, both discussed in the existing literature and later recorded during my field work. This verification of the primary and secondary evidence was the main reason behind the analysis of the available photographic material, including basketry.

3.3.2.2. Museum basketry objects

The basketry items accessed were both displayed at museum exhibitions and stored in museums archives. Four (4) museums with their collections, which were accessed for the purposes of this study: Ethnographic Museum Etar (Balkandjii group, Sveernyashki region), Ethnographic Museum of Plovdiv (Thrace), Historical Museum of Bratsigovo (Rhodope), and Historical Museum of Silistra (Dobrudja). The samples from museum collections were limited to the museums where permits were gained. It must be said that obtaining permits for access and sampling of Portable Cultural Antiquities (PCA), such as basketry items proved extremely difficult, firstly because of their status as PCA (thus official permits were necessary) and second because of their neglected placement amongst museum exhibitions and archives. The latter means that often the "best" basketry items were on display – being exceptional in their size, techniques or unusual utility, taking their place in the Historic or Ethnographic museum halls. The "second best" or repetitive in their characteristics items were sometimes even non-present in the museum inventories, but covered with dust in the museum storage rooms. However, access was gained for several museum collections, which provided valuable data for my research and included Ethnographic Museum Etar, Regional Ethnographic Museum Plovdiv, Regional Historic Museum of Silistra, Instirute for Ethnography and Folklore with Museum (Bulgarian Academy of Sciences).

The material from museum collections did not often provide extensive information in terms of background data, which was mostly restricted to the object's origin, usage and relative dating. Very rarely a basket's origin was linked to its maker, retailer or donor. This pattern may have resulted from the secondary object's evaluation (secondary, i.e. not in the time when the object was made, was in use and in circulation) by the museum authorities. As a tendency, it may be pointed out that museum objects of greater monetary value are recorded in greater detail on every information which may be known about them (i.e. jewellery items, luxury clothing, objects possessed by royalties were tediously recorded, *see Discussion)* in contrast to everyday objects with lower value and frequent abundance.

3.3.2.3. Botanical samples

Only in two cases wild plant material was collected from their natural environment, as a sample of the chosen species for basket-making plant by my interviewees. All the rest of the ethno-botanical samples belong to two categories: primary basketry samples collected by the author during field work (produced or possessed by my informants) and basketry samples accessed via museum collections (Section 3.3.2.2., Fig. 3.4.a). The primary collected material (i.e. fragments of baskets or whole basketry items) usually brought a great amount of data regarding the relationship between the object and its maker, such as origin, material, age, physical properties, usage, value, uniqueness. The reason for examining the plant material was to cross check the identifications of plants provided by the informants from my fieldwork or by the museums' collections. I aimed at identifying the different taxa, chosen for making the different elements of the basketry items, because of their various plant properties. This was often neglected to be mentioned when basketry was reported (by either the makers or the museum staff), because traditionally a basket is made of whichever plant represents its main weave (hence, the plants chosen for the other elements such as handles), remained undescribed.

A total of seventy-six (76) samples (of minimum 1x1cm) were sectioned and analysed with the GSL–1® microtome in the Swiss Federal Institute for Forest, Snow and Avalanches (WSL) in Klösters–Davos, Switzerland (Fig. 3.4. b) and with a Richter microtome in the Plant Anatomy Laboratory of the Royal Botanic Gardens Kew (Fig. 3.4.c). Five of these samples were selected from their natural environment, with while conducting the field interviews and the remaining seventy-one originate from basketry objects. A procedure of sample preparation, sectioning, staining and permanent mounting was followed, as demonstrated by Gärtner and Schweingruber (2013). As the specimens were in a herbarised condition, an impregnation was performed with distilled water and corn starch water solution (ibid. Fig. 3.4.d). Where necessary, hardwoods were macerated for 10 to 25min at 100°C, with a test performed at each 5min to check if the sample was ready to be sectioned. Upon completion of the maceration, a resting time of circa 10min proved to be successful and allowed the excessive water, retained in the wood vessels during maceration to be drained out. Hazel, ash, spindle and maple wood took longer to soften and to be ready to be mounted in the microtome.

Some very thin hazel splints were either manually sectioned or placed in a piece of cork and then adjusted at the microtome. The reason for this is that their primary state was not suitable for microtome cuts, as the basketry splints are longitudinally split and usually have one growth ring width, which means they are extremely thin and fibrous (fibres appear perpendicular to the microtome head, when a cross section is aimed). Some one- or two-year-old willow shoots, woven or twisted with their bark, were also difficult to be sectioned with their bark, which tends to separate while the cut is performed and because of this no maceration was applied to the samples which looked-alike, but only distilled water brushing. Old man's beard samples were also not macerated, but instead water-brushed, because of their large vessels absorbing a high amount of water and resulting into a "spongy" tissue, which was not compatible with microtome-sectioning. Monocots, such as cattails, rushes and sedges, were only cross-sectioned, while their epidermal tissues were observed without a thin section because in all cases they were dyed when woven into a product, which greatly facilitated their microscopic examination.

The samples were microtome sectioned, and transversal, tangential and radial (where necessary) sections of c. 10 µ to 15 µ (for the very brittle specimens) were obtained for each of them. The sections were further red-blue stained with Safranin®, (staining red the xylem and the lignified tissues) and Astrablue® (staining blue the phloem and the non-lignified tissues). Safranin® powder (0.8g) and Astrablue® (0.5g) – each dispensed in distilled water (100ml) with a drop of acetic acid (2ml) – were mixed and applied with settling time of 3–5 min (Gärtner and Schweingruber, 2013). Then the process of sample dehydration followed, rinsing the stain from the section with 75% and then 96% Ethanol and afterwards a second rinsing with a few drops of Xylol® (in WSL) or Histoclear® (in Kew). Permanent mounting or embedding of plant sections was attempted next and was done with Canada balsam® as a microscopic medium (Fig. 3.4.e). Afterwards the microscopic slides were placed in a furnace with temperature of 60°C for 12 hours, which ensured their stabilization for the purposes of the subsequent analysis. The microscopic analysis was done with both epi-illuminated (for the dyed epidermal tissues, which were not thin sectioned) and transmitted light for the micro slides (Olympus BX51®) with magnification from x5 to x50. Where necessary a SEM analysis was performed (Quanta 550®). The botanical identifications were conducted following Schwengruber (1990, 1990a). The identified plant taxa were then compared with the

Macrolides Collection of the Royal Botanic garden Kew (2018) reference collection (Fig. 3.4.f). A micro-photographing procedure of selected slides was undertaken at the Digital Microlab of Kew with Leica DM 6000 and Leica LAS X® software.

Figure 3.4. Sample preparation with a microtome: a. sampling, b. sectioning with a vertical microtome (GSL – 1® at WSL, Switzerland) and c. with a horizontal one (Reichter®, Kew Gardens), staining, dehydration and embedding (d.), "resting" of the samples in the mounting medium before their placement into the furnace, f. comparison with microslides reference collection.

3.4. Results and analysis

This section summarises the results from the ethno-botanical research conducted in this thesis. It is doing so in three sub-sections, where the first one synthesises the data obtained from the existing scholarship and documents. The second one discusses the basketry plants and their botanical identification, while the third one considers the basket-makers, as seen via the interviews performed during the primary ethnographic field work.

3.4.1. Basketry: scholarship and documents on plants, trade and tradition

The bibliographical research contributed to identifying existing or past basket-making centres or craftsmen. It also brought up diverse information regarding the plant choice for weaving baskets – in some cases scholars observed the plants used for basketry in great detail, in others this information was not mentioned at all. The existing scholarship also helped distinguishing original from artificial basket–making centres, whereby the original centres represent regions where basket-making was a local craft, while as artificial are recognised the regions where in the early 20th century basket-making was an imported/forced commercial activity, a livelihood – non indigenous for the concrete region until then. In addition, the most recent literature supported some of my interviews, as some of my informants have been previously interviewed by other authors, but with no botanical insights into the craft. This aided my interviews, because of the extreme scarcity of the living practitioners of this craft and also minimised the possibility of interviewing non-informative informants (see description of second cluset of interview questions in 3.3.1.).

3.4.1.1. Basketry plants

Amongst the existing scholarship on ethnographic basketry from South-east Europe, there is a single series of studies, dedicated to the plant choices (Nedelcheva *et al*., 2011, Nedelcheva *et al*., 2007, Dogan *et al*., Dogan *et al*., 2008), as it has been alredy discussed earlier in this thesis (Section 2.3.2). There, the identified basketry woods included: Cornelian cherry, Hazel, poplar, willows, linden, elm, wayfarer, chaste tree. Amongst the monocotyledonous plants - reeds, cereal grasses, cattails and sedges were considered (ibid.), Nevertheless, it should be stressed out that the above studies considered a large area covering several Balkan countries (Albania, North Macedonia, Bulgaria, Romania), but also Turkey. Hence, the plants list suitable for handicrafts (amongst which basketry), was rather diverse, but still it represents the only ethno-botanical approach conducted in the region, including basketry products.

3.4.1.2. Commersialisation of basketry

Several of the ethnographic regions – both north and south of the Balkan Mountains - are subject to an interesting historical process: the commercialisation of basket-making in the late 19th and the early 20th century (Fig. 3.1.). This effort paused after the mid-20th century when the craft of weaving baskets slowly migrated into the hands of some Roma groups, to be eventually established as their main occupation (Semerdjieva, 2014; Lilova, 2011). An opposing attempt for transforming basket-making from family-based activity into an organised manufacture was strongly emphasised in the 1940s and continued for about a decade (ibid.). They do not discuss this transformation but its commercial aspect and, as an illustration, they mention the work of the Rousse Trade and Industrial Association, which in 1932 investigated the sources of red and yellow osier (*Salix purpurea* and *S. viminalis*) and their possible commercial sawing in the Teteven region (Balkandjii group) and the Gorski Senovets (Severnyashki region), where 50 ha of osier fields were sewn. Here, the Association organised workshops and focused at an effort to commercialise the craft of basket-making, employing mainly school students from the countryside as apprentices (Semerdjieva, 2014).

An interesting and accidental finding in support of the above was presented to me by one of my informants from a different ethnographic region (Shopski, see Q6) and it consists of an original leaflet entitled “Catalogue of the latest basketry items” by Fabian (1920/21, Fig. 3.5.a-f.), which presents photographs of a great variety of basketry items produced in the National Furniture and Basketry School in the city of Pleven (still Severnyashki region). Since the year of publication was not printed on the leaflet my research showed that this specialized school existed for one year between 1920 and 1921, after which it was renamed ‘Practical Chair-making School’ (Word Press 2017). Hence, at the second decade of the 20th century the craft of basket-making was thought of as a profession in the region and its products possessed a great variety of designs, shapes, and functions. Some of the items, offered in the catalogue included furniture (Fig. 3.5. a), bin baskets (Fig. 3.5.b), newspapers holders, brush holders (Fig. 3.2.d), small sewing kit baskets (Fig. 3.5.c), fashion items, such as hand bags (specified in their description as woven with cattail), bath shoes, hats (Fig. 3.5.e) and travel items (Fig. 3.5.f), various suitcases and bicycle baskets (Fig. 3.5.f). One of the most impressive designs is the fully completely woven seat of a four-wheeled phaeton, meant to be driven by a horse (Fig. 3.5.f).

At the mountainous area of the Severnyashki region, inhabited by the Balkandjii group, gradually at the beginning of the 20th century, the traditional occupations were replaced by a new profession – trade. The harsh mountainous region was successfully connected to the lowland towns and the rest of the country by the opening of the first railway line in 1912, which enabled, among others, the booming of the textile industry in the towns at the foot of the Balkan. This way, basket-making found a new niche – weaving baskets to be used as fabric-storing containers to facilitate their shipping. After the Balkandjii men returned from World War I (1919), new machine-oriented skills were introduced into the region (Ilieva, 2012). An illustrative example is the introduction of the machine lathe and the progressive abandonment of manual wood work. This applied to basket-weaving too, as machine-produced wooden straps (such as by-products of the furniture industry) were preferred instead of the wood splints split by hand, and in this way accelerated the commercialisation of this craft (Semerdjieva, 2014).

Nowadays basket-making north of the Balkan Mountains still exists as a commercial niche and was documented by the research of Bichard (2007) at its stage in the very beginning of the 21st century (the author visited Bulgaria in late 2003). He recorded the still existing nowadays basket-weaving company 'Prolet' in the city of Shumen, which after the end of the Communist period was privatised and turned into a successful business (Fig. 3.1.). The main material employed in weaving a great variety of objects (baskets, furniture, interior decorative panels etc.) was and still is buff willow skein. The material was locally grown (Bichard gives information on 4 ha willow rods) and, when freshly cut boiled and hand-stripped and left to dry outdoors. Bichard (2007) mentioned that weaving was performed on moulds, which increases the accuracy and the quantity of the produced items. He also noticed that all the workers at the company, both in the processing and weaving stages were Roma women (op.cit.). He also comments on the established during the Communist period, but surviving today occupation of basket-making workshop of the prison on the island of Belene (Fig. 3.1.). Here makers also used buff willow skeins and, besides baskets and furniture also wove peculiar items, such as photo frames and miniature cigarette lighter cases (ibid.). Another company-survival after the Communist period is the privatised 'Kamysh Rakita' in Silistra, which before 1989 was in fact a large factory, performing all the processing stages of willow and specialising in weaving furniture. These large items were made on moulds and numerous workers from the town were employed here (Semerdjieva, 2014; see Q 13).

An attempt for the commercialisation of basketry was also documented on the other side of the Balkan Mountains in Thrace, where the villages of Strandja Mountain (such as

Stoilovo) were known for the export of the abundant in the region hazel wood material to Lozengrad (now Kirklareli), where local craftsmen were weaving baskets in the 1910s (Fig. 3.1). After The Balkan War (1912) the craftsmen from Stoilovo were able to travel and transport their own plant material for weaving baskets *in situ* at the South Black Sea markets and consequently by the end of the 1930 in Stoilovo there were more than 200 households having their main occupation in basket-making (Semerdjieva, 2014). Another evidence in support of the establishment of basket-making as an industry comes from Plovdiv (Fig. 3.1), where in 1928 – 1932 there were fifteen permanent basket-making workshops (Semerdjieva, 2014). In post-WWII years in Bulgaria basket-making was seen as a craft suitable for employing disabled people - mainly blind - and at that time, several companies opened: i.e. "The Blind Union" in 1947 and "Trud" in 1948, which employed young blind and deaf people upon their completion of high school. Basket-making classes were also formed in some agricultural high schools in Varna, Pavlikeni, Pleven (Lilova, 2011). The picture looked different, when at the beginning of the 21st century, Bichard (2007) visited Thrace and documented only one still exciting private basket-making workshop (see Q5) in Stara Zagora, where the basket-maker inherited the knowledge and skills of working with white willow from his father, who was taught basket-making at the 'Practical Chair-making School' of Pleven (see above). This single workshop was a side occupation of his owner, and not a principal one.

To the far west, in the region of Pirin, there is also evidence that basket-weaving was commercially-oriented by the 1920s and baskets were traded in regions where basket-weaving was not widely spread out (Kolev, 1980). An example of that are the baskets woven in the village of Gabar (Fig. 3.1.), which were offered at the markets of the village of Novo Selo (after the Balkan War, this village was annexed to North Macedonia) The merchants from Novo Selo were further selling the baskets into the larger markets of Thessaloniki, Greece, where the major clients were fishermen (ibid.).

The artificial commercialisation of basket-making at the end of the 19th century and especially after WWII led to a mixed character of the ethnographic museum collections. In this respect, the term 'artificial' commercialisation is used by means of not being a (natural) consequence of the commercial aspect of a traditional craft. As the majority of the ethnographic museums were founded as regionally-oriented institutions, the traditional region-specific crafts were to be put on display. But the abundance of basket-makers in an X region, at the early 1950s for example, did not necessarily mean that this region had a long-established tradition in basket-making. For instance, this could mean that at the moment of the collection of the museum item (basket, mat etc.), the inhabitants of this region were weaving baskets as an occupation, which fit into a new commercial niche. In addition, the choice of plant material employed in commercial basket-weaving was dictated by certain features, such as their abundance in the surrounding environment or low price at the market, if supplied from other regions; easy and fast processing; short natural regeneration (i.e. willow or hazel rods which may be coppiced annually). This automatically reduced the plant material diversity used for trading purposes because of the quantitative requirements of the market. It should be pointed out that that the extensive ethnographic expeditions during the Socialist period in Bulgaria and their subsequent multi-volume publications (Vakarelski, 1977 and Georgiev *et al*., 1983), happened to collect their field work data at this last stage of basket-making commercialisation, when in some regions the traditional material for baskets may have already been replaced with willow. But regardless of if the ethnographic accounts describe “commercialised” or not basketry, the available ethnographic scholarship is a valuable source of concentrated information on this craft.

Figure 3.5. Archive photographs from Severnyashki region (a-f): a. Cover page of the “Catalogue of the latest basketry items” by Mihail Fabian (1920/1); b. Bin baskets; c. Sewing

baskets and boxes; d. Brushes holders; e. Fashion items including hand bags, hats and bath sandals; f. Travel accessorises – picnic baskets, suitcases, bicycle with woven seats (phaeton).

3.4.1.3. Traditional basketry

The common traditional Bulgarian folklore calendar involves baskets in several events: the Easter eggs are placed in a basket, the Christmas bread/pita is often placed in a basket, the bridal gifts are stored in a basket, on the day of St. George (6th May) lamb is carried in a basket, at Eniovden, the night of the 22nd June, the herbs collected from the mountain in complete silence are placed in a basket, to name but a few examples. There are also some region-specific calendar events, performed with a basket, such as the basket-burning in Strandja, which is an annual custom seven weeks before Easter (Vasileva, 1990). But there is one particular custom - spread and practiced in all ethnographic regions – where the basket has an important role in its performance: *Lazaruvane/Lazarka. Lazaruvane (literally in honour of St. Lazar)* is performed during the week before Easter and was a rite of passage for the young girls into the being-ready-to-be-married status of adolescents (Goev, 2001). *Lazarka* is each of these young girls, participating in the custom and whose main attribute is the basket. The moment where the future *Lazarka* is given the basket with which she will participate in the custom is very important into the adolescent's life. This is the time when she is given the communal agreement, she has grown up enough to be a *Lazarka*, which assigns her into the ready-to-be-married status. Her basket has to be brand new and unused for any other purposes, so the preparation of a girl who will be a *Lazarka* for a first time starts much before the actual day with the search for a basket. Goev (2001) mentions that in the Balkandjii tradition this basket has to be woven of old man's beard (*povet*), and there are numerous riddles related to this choice, for instance that as the *povet* is bending around, the *ergeni* (unmarried young men) should be bending around the *Lazarka)*. He also mentions many indicative riddles, pointing towards a girl, who has already participated in the custom and is ready for a marriage: 'She has got the basket on her shoulders' or 'She grabbed the basket'. The *Lazarka*'s basket should also be full and this is why during the day, when the custom is performed, the young *Lazarki* are passing through gardens and fields, filling their baskets. Then with a basket full of flowers and fruits and with a braided hair decorated with a flower wreath they will be ready to cross hands with each other on the circular dance (*horo*) performed in front of the community (Goev, 2001, Vasileva 1999).

Very little has been discussed in the literature in terms of the traditional basketry of the ***Severnyashki*** region when the Balkandjii group is excluded because the area was marked with significant commercialisation of the craft in the 19th and 20th century, which was subject to discussion in the scholarship (Section 3.2.1.). Known as non-commercial and widely spread basketry-related crafts in the Severnyashki region are the needle and loom work with maize leaves (*Zea mays*). Given that the area has proved of great agricultural importance, the scholarship agrees that the maize crop arrived here in the 1830s and was firstly sown in the western Danube Plain and later in the central and east (Yordanova 2009). Popular in the Severnyashki region were the rugs and mats of corn leaves, called "*rogozchenka*" (*rogozka means rug*) and similar to other ethnographic areas (within the Balkandjii group and Thrace, *see below*) maize-leaves weaving was a specific female-only activity (op. cit.). But if the weaving or knitting involved strictly female participants the processing and transportation of the raw plant material involved men: usually these were young, unmarried men, who would then later visit the house where the *rogozchenka* – weaving was performed. The weaving skill, together with the riddle and joke telling, were considered along the physical beauty of a young unmarried woman as desirable when the unmarried men were "choosing" a future wife. This is why the process of maize leaves weaving has yielded rich folklore heritage including songs and riddles (op. cit.).

As opposed to the plain areas of the Severnyashki region, the basketry of the mountainous group of the ***Balkandjii*** has been commercialised to a minor degree. This is why its traditional aspects were discussed in the bibliography along with the various wood-based crafts specific for this group - either as part of the household inventory or as a tool aiding agricultural activities (Ilieva, 2012). The locale of this group aided the recognition of the forest as a key source for primary material applied in crafts and architecture. An example for this is that the Balkandjii traditional house exterior and interior is exclusively wooden and carefully selected during summer-camps of the craftsmen in the woods (Lilova, 2011). Baskets were often made as a side activity during these expeditions or raw material for basketry was selected. The baskets were of diverse shapes and sizes, using diverse techniques, and their utility was closely related to their physical properties (Ilieva, 2012, 2012a; Lilova, 2011). For example, baskets a few metres tall were employed as grain and flour storage containers – this is one variation of the *kosh* (the large container, or a crate, as the one on Fig. 3.13.h-i.). The grain storage *kosh* was a mud-and-hay coated one, but according to Semerdjieva (2014) this was rather rare in the mountainous settlements of the region, while it was more likely to be seen at the areas situated at a lower altitude, such as the plains of the Severnyashki region. Other slightly smaller types of *kosh* (still up to a metre tall) were designated as transporting devices, meant to contain hay, dry leaves or fodder and to be carried on the shoulders or as a donkey load or to be used as a cover of the new-born lamb when it had to separate from its mum (Ilieva, 2012). The plants chosen for these containers were mainly wood species of hazel, spindle tree and osier willow, because they are durable enough to form the ribs of the *kosh.* The even ribs' number, with even distance between each of them were pushed into the ground in a circle, where the main weave was to be intertwined between them. This activity was usually performed on the earthen floor of the workshop or the house yard at the Bulgarian village houses until the early 20th century and, according to Ilieva (2012), it was mainly attributed to male basket-weavers due to the physical demand of the weaving process.

As shown in the literature, and confirmed by my field work, when a basket shape decreases in size, a greater variety of weaving techniques and plant material combinations are employed. Many baskets were designed to contain fresh or dry fruits, nuts and bread, eggs, dry freshly washed linen clothes (Fig.3.13. a-b., j.), or to store small kitchen items, such as wooden spoons (Fig. 3.13.g). The most popular and of multiple use baskets of the area are the so called *pachnitsi* – semi spherical frame baskets (Fig. 3.13.a.; Ilieva 2012). According to Ilieva (op.cit.), the dominant plant material chosen for the main weave of the *pachnitsi* baskets is the old man's beard, while the frames and the "suns" were often made of hazel, ash, Cornelian cherry/spindle tree or willow strips (Fig. 3.13. a, d.). Other basketry items were related to animal food supply activities, such as fishing, fox hunting or bee keeping: numerous types of fish and fox-traps (Fig. 3.13.e), along with skeps, were woven with basketry material and techniques (Fig. 3.13.f). In the case of skeps (*kosheri*) – conical beehives, which often are mud-and-hay plastered, their size, shape and weaving technique classifies them between the big *kosh* containers and the small baskets. These beehives are also often woven of old man's beard, supported by ribs of woody species. Some peculiar items were also basket-made, such as baby swings, baskets for hatching chickens, and baskets for loom weights or spindles (op. cit.).

Basketry-related crafts, such as cordage and needle knitting or loom weaving of plant material, were also known in the Balkan region. Ilieva (2012) refers to lime bast (*Tilia cordata*) being used in rope making and gives insights into the process required, including a recommendation of bast collecting in the spring time (due to higher moisture content) and a retting period (of 10 – 12 days) aiding the fibre separation. Dencheva (2012) describes the craft of maize leaves needle work and loom weaving (knows as *bèlenitsa* in the area, op. cit.), where laces of corn leaves as a by-product of the corn cultivation were employed in household crafts, producing floor or bedding mats. Both the lime bast cordage and the *bèlenitsa* items were used as binding elements in the textile industry, ensuring the transportation (in woven basketry vessels) of the fabrics (Ilieva 2012, Dencheva 2012).

West of the Severnyashki region, in ***Dobrudja***, Vakarelski (1964) described with illustrations various woven items employed in agricultural activities, household needs and as fishing devises. Oval semi-spherical baskets, with a sturdy handles and “suns” for their attachment (Fig. 3.6.a-b), similar to the ones woven of old man’s beard in the Severnyashki region, knitted bags of corn leaves (Fig. 3.6.e) and large *kosh* – containers for hey transportation with adapted wooden shoulder stick (Fig. 3.6.c, d. third row, left), or *kosh* for grain and flour storage with wooden base (not woven), splint baskets for spoons and ox muzzles are amongst the everyday items. The category of the fishing devices is very diverse, which can be explained with the fishing being one of the major livelihoods in this situated on the south-east bank of the Danube region. Most of the fishing devises shown by Vakarelski (op.cit) are various nets, but some of them are woven in basketry techniques, such as the small ‘*kepche*’ – a scoop-like device with wooden handle, dedicated to shallow water river fishing (Fig. 3.6.d., bottom right). Beekeeping was another popular livelihood in the region of Dobrudja and the bee-keepers were making their bee-hives themselves (Blagoeva, 1974). There were two types of beehives, the woven skeps (*tryvna*), similar to those made in the Severnyashki region and a type made of a hollow wood trunk with a tile, flat stone or piece of wood on top (*stupel,* as the ones shown on Fig. 3.6.d., upper raw). The skeps are described as woven from old man’s beard and vitex (ibid.) and their conical shape is supported by ribs of a plant with a dialect common name ‘*tetra’,* possibly European smoke tree *(Cotinus* *coggyria),* and then they were traditionally mud-plastered. The people of Dobrudja were also known for their bast fibre cordage, produced in a straight forward way by twisting the bast, aided by a 35 cm wooden stick (similar to the spindle with a yarn). The bast ropes were widely used for numerous activities and the knowledge on how to make cordage was widely spread (not specialised to a particular maker, Vakarelski, 1964).

Figure 3.6. Archive photographs from the Dobrudja region: a. Wine harvest (Grozdober) by Spas Stoyanov, 1930s (Stoyanov, 1930). The photograph is of unknown provenance, but the traditional costume suggests Dobrudja or the Severniyashki region; b. Men at the Town's Market in the 1930s (Silistra); c. Coop-market in 1961; d. Woven devices in Dobrudja (Vakarelski, 1964, p. 49); e. Friday market in front of Bairikli mosque in 1933.

On the other side of the Balkan Mountains, in ***Thrace***, but also very similar to the Balkadjii region, widespread was the corn leaves needle and loom work. Ilieva (2012), Bineva, (2012) and Yordanova (2009) discussed this craft with its local specific names (of Turkish origin): *shoshlúp* or *(h)asúr.* Sometimes boiled, bleached or dyed corn leaves were knitted or woven into household matting mainly throughout the countryside in the plain areas of the region. These items were extremely popular in the 1920s in Bulgaria according to Vakarelski (1974) and were often produced with a simple four-beamed loom (Yordanova, 2009). Waiving with corn leaves, as women-only, and predominantly young women-only activity in the past, has been widely studied by ethnologists, because of the various type of "events" organised around this task: singing, riddle-telling, storytelling, joke-telling, but mostly these were some of the most suitable moments where the young unmarried men could "choose" a girl for a future wife, according to her skills in knitting the *(h)asúr* mats, or her singing or joke-telling (Yordanova, 2009, Bineva, 2012). As providing endless opportunities for creation of different objects (except mats) nowadays, the making of corn leaves items is becoming very popular and often demonstrated at the Traditional Crafts Fairs in Bulgaria, with objects such as containers, decoration, and jewellery (see Q3).

In terms of basketry in Thrace, the existing literature is extremely limited with the main source being Marinov (1962), who provided insights into the basketry tradition of the Roma minority in Thrace (Fig. 3.7.e-g.) The author describes different Roma groups originating from settlements in Thrace whose main occupation was making baskets: different in size and shape and often woven from willow and osier rods, old man's beard or hazel branches. He also states that basket-making involved the whole family during the process of raw material collection, its processing, and the actual weaving and basketry trade. According to Marinov (ibid.), the plant collection was performed by the Roma groups directly from the surrounding environment before the Socialist period, while during this period special permits from the Forestry Department were issued for the basket-weavers. Since some of the Roma groups (*katun*) were transiting to nomadic life in the warmer part of the year they were weaving their baskets as they moved from place to place and trading them (Fig. 3.7.f). They established a temporary campsite everywhere they moved, which consisted of horse/donkey cars roofed and walled with *(h)asúr* mats; this was their temporary home and basket-weaving workshop too (Fig. 3.7.f-g).

At the east end of Thrace, in ***Strandja***, river fishing with *kosh* was known in the areas where the river deltas are joining the Black sea (Popov and Raychevski 1996). This variation of the fishing *kosh* was spread only in these parts of the south Black sea coast, where rivers are present but, in general, numerous woven fishing devises were known in all the ethnographic regions where river fishing was a livelihood (*i.e. see Severnyashki* or *Dobrudja*). The fishing *kosh* in Strandja was usually woven from old man's beard, white vitex (*Vitex agnus-castus*) or willow rods. Another woven fishing device from the region is the *lesá*, a fence like object, which was to be positioned in a river leg during night time and is collected in the morning; as its name shows, it is usually woven of hazel (*leská,* op. cit.). Here, as in other regions, fishing and bee-keeping were additional occupations and authors mentioned that at the beginning of the 1910s most of the households in the rural Stradja owed beehives (*kosheri*) – skeps woven, as the fishing *kosh*, from old man's beard, vitex, willow rods and mud plastered. As in other traditional regions, the beehives had upright conical shape. The way the honey was extracted every autumn out of these woven beehives is quite spectacular – water is being poured on top of the whole beehive and then when shaken, the bees are being covered with earth (hence killed) and the honeycombs – collected. Similar basket-like conical containers were used during the process of traditional silk extraction (ibid.). Popov and Raychevski (1996) have also given information on the process of plant material collection for weaving baskets, which according to them, starts in April, when the basket-makers were setting out for a few-months camping in the woods, where they were collecting suitable material for weaving. Usually the basket waivers were choosing places next to the rivers where hazel trees have been already coppiced in the past, so the new shoots are straight, flexible and long enough (ibid.).

An interesting custom spread in Strandja, again involving a fire element (Section 3.2.3.), is the burning-*kosh* (*palikosh*), which has been observed (Section 3.4.1.4) as performed within the winter–spring calendar seven weeks before Easter (op.cit., Fig. 3.7.h). The burning-kosh is a large kosh filled with hey, which is meant to be lifted up in the air while burning with the support of two very long wooden sticks. This was done by the male members of the community, while the female members dance a circular dance (*horó*) around the scenery. The burning of hey collected from the winter stables symbolises the end of the winter and the large basket – a vow for fertility and wellbeing for the community during the new summer (op.cit.).

Figure 3.7. Archive photographs from Thrace: a. Rose petals harvest in Kazanlak by Felix Kanitz (1882, p. 238); b. the village of Bania by Dimitar Katsev (1960s; Katsev, 2017a); c. at Sushica (Katsev, 2017b) and d. Karlovo district (Katsev, 2017c); e. Roma basket-makers prepare hazel splints for basket-making by Marinov (1962, p.230); f. Roma phaeton near Karnobat (op. cit.: 259); g. Roma woman weaving h) asúr on a vertical loom near Karnobat (op. cit.: 240); h. Kosh – burning custom (Palikosh) from the village of Brushlian (Strandja group, after Popov and Raychevski 1996: 325);

East of Thrace, the main and traditional livelihoods of the ***Rhodope*** region were and still are agriculture, tobacco industry, grape and rose cultivation, mining and timber industry. Some of these occupations required basketry objects for collection, transportation and storage of grapes, rose or tobacco leaves, and grain and flour storage (Fig. 3.8.a, b, d) as seen in the available photographic documentation, courtesy of the Ethnographic Museum of Plovdiv and the Regional Historic Museum of Bratsigovo. The region was also famous with the richly decorated Chiprovski carpets woven on a vertical loom with animal fibre, which have attracted ethnographers, but also high in the mountainous Rhodope villages, a simple two-beamed ground loom was used at least until the early 1930s, as documented by photographer Savov (Fig. 3.8.c). Vegetal crafts in the Rhodope, such as basket-making were very popular until the middle 20th century, according to Semerdjieva (2014), but were not subject to earlier ethnographic observations. She interviewed two modern basket-makers from the West Rhodope Mountains, who according to their attestations weave their baskets from osier and willow and from ash tree and Cornelian cherry (Q 11). The informants also gave information on the material collection stating that the best one for baskets comes from relatively low altitude – between 300m and 900m, because above 1000m it is difficult to find these species. The basket-weavers also emphasised that best are the plants growing on the south-west facing slopes, rather than on the north-east (even when they are at similar altitude, op. cit.).

Figure 3.8. Archive photographs from the Rhodope region: a. "Grape gathering" ("Grozdober") by photographer Dimitar Kacev (1960s) at the village of Cherven (Digital Plovdiv 2017); b. Tobacco leaves processing and its associated semi-spherical old man's beard frame basket (REM Bratsigovo); c. "Faces from the Rhodope" ("Lica ot Rodopite") by photographer Krum Savov, 1930s (Savov, 2017), displaying mat/carpet- weaving on a two-beam ground loom with woven skeps at the top right corner; d. Rose distillation factory of Atanas Grihchev at Bratsigovo (1909); e. Kosh for flour (1929) from the village of Chiprovsti (after Vakarelski 1977, p.349).

At the neighbouring to the Rhodope region of ***Pirin***, basket-weaving was practised in spring time, while during autumn the raw material was collected (Kolev, 1980). According to Kolev (op.cit.) the raw material had to be collected from sunny slopes because of its durability (the branches from shady slopes were more fragile) and this material was mainly hazel wood rods and branches. The wood was grouped in bundles of 350 – 450 sticks each and sorted in equal sizes. Later, the bundles were carried with a backpack to the workshop of the basket-maker, where they would dry with the tips pointing upwards, as the opposite would spoil them (op. cit.). Sometimes split work was employed by the basket-weavers in the region and for these larger hazel branches had to be collected. Kolev (1980) mentions that willow is very rare in the region, so it is rarely used in basket – making here. Kolev (ibid.) describes three types of characteristic baskets for the Pirin region: the big sturdy *kosh*, mainly for transporting goods, the rectangular *koshnica* for everyday needs and an "old" type of grapevine basket, which was shaped as a bucket and was still woven only by the old basket-makers of the time of his observations (1970s, op.cit.). He does not associate the types of basketry with a particular plant but it may be assumed, based on the mentioned hazel wood, that as in other mountainous regions (*see Balkandjii group, Rhodope*), the big *kosh* (crate, similar to the shapes of the items from Fig. 3.8.e or Fig. 3.9.d.) was made of hazel wood and the smaller baskets of hazel splints. Similar to the Rhodope Mountains the recommendation is to collect wood material from the sunny (i.e. south facing) slopes (*see above*).

North-west of Pirin, within the ***Shopski*** region, no scholarship was found on the craft of basketry. Even if building bigger structures in weaving techniques, such as summer huts and big fox traps (Fig. 3.9.c), was popular and recorded by ethnographers nothing was mentioned on basketry.

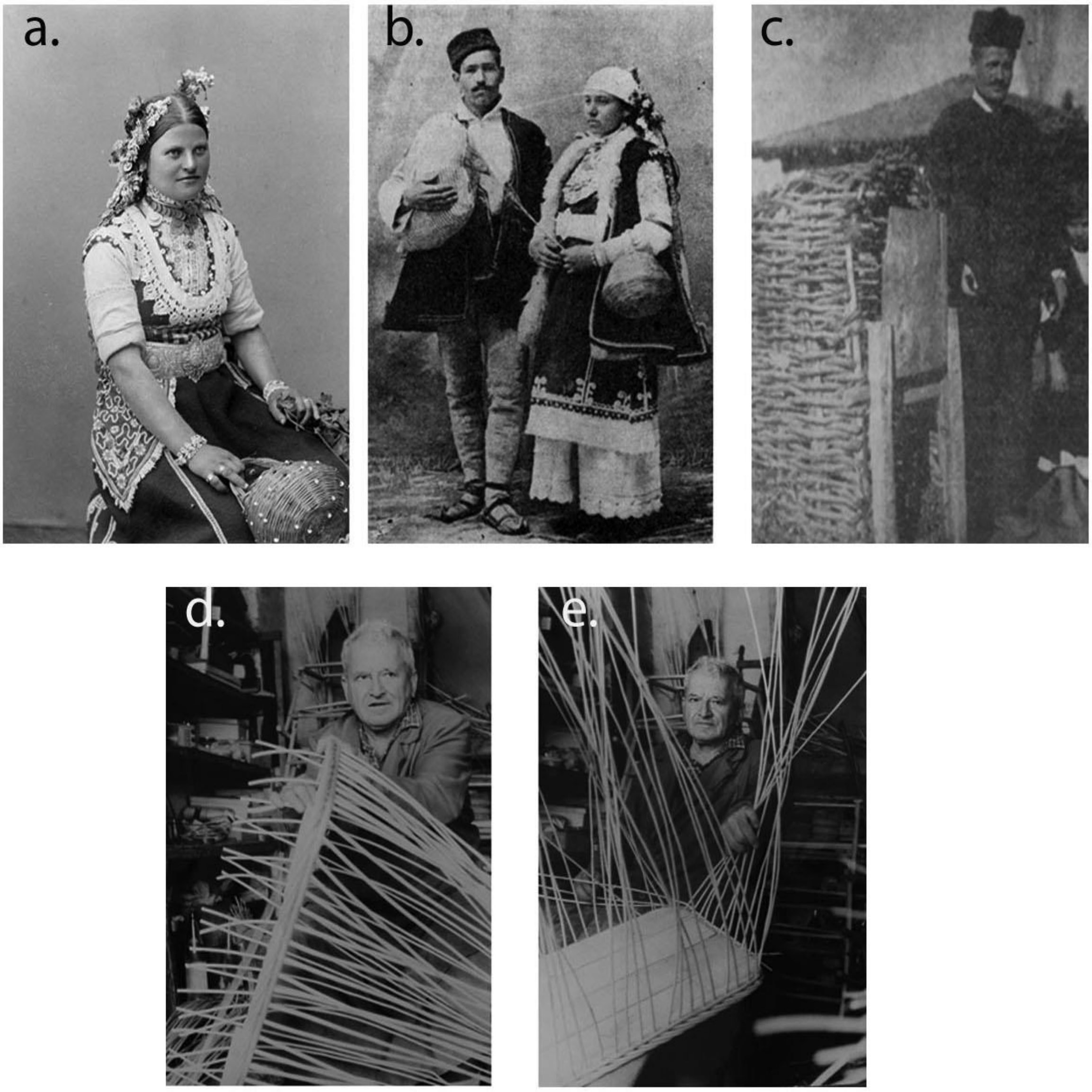


Figure 3.9. Archive photographs from the Shopski region: a. "Girl with Gornobanski costume", holding a small basket with attached beads, studio portrait by Dimitar Karastoyanov (Karastoyanov, 1882); b. Married couple from the Shopski region, 1930s, unknown photographer (Manuilova, 2018); c. Fox trap, Belchinin in 1936 (Vakarelski, 1977, p.163, Fig. 125); Archive photographs from the border between Shopski and Pirinski regions: d: Weaving big kosh from stripped willow rods, e. Making a baby-swing. Photographs of Georgi Damyanov (1922, born in Pirinski and resettled in Shopski region).

REGION	BASKET	USAGE	REPORTED MATERIAL
SEVERNYASHKI/BALKANDJII	*kosh*	Large container, crate; Transporting container	Hazel; Spindle Tree; Osier willow
	pachnitsi	Transport/storage of small items/goods	Old Man's beard – structure Hazel, Ash, Cornelian cherry, Spindle Tree, Willow – "suns"
	kosheri	Skeps	Old Man's beard
	Tryvna, stupel	Skeps	Old Man's beard, Vitex, European smoke tree
THRACE/STRANDJA	Various "Roma" baskets	Containers/Transporters	Osier, hazel, Old Man's beard
	kosh	Fishing	Old man's beard, Vitex, Willow
	lesa	Fishing fence	Hazel
RHODOPE	Various baskets	Tobacco, grape, rose collection	Osier; Willow; Ash; Cornelian cherry
PIRIN	Various baskets	Containers/Transporters	Hazel splints
	kosh	Large container, crate; Transporting container	Hazel rods

Table 3.2. Types of baskets within their regions, for which the plant material for weaving was discussed in the scholarship (excluding types of baskets, where no basketry plants were mentioned)

3.4.1.4. Photography of baskets

Together with the "Catalogue of the latest basketry items" from 1920/21, the same informant (Shopski, Q6) showed me two personal family photographs of his father-in-law, who was weaving baskets and furniture and later taught his son-in-law the craft (Fig. 3.9.d-e). This interview triggered my interest towards the museum photographic record on basketry as complementary evidence to the existing ethnographic literature and my field work result. Thus, several museum archives were accessed: Archive of the National Ethnographic Institute with Museum (NEIM), Archive of the Historic Museum of Silistra, and Archive of the Ethnographic Museum of Plovdiv. Due to unavailable funding for legal reproduction of the analysed photographs their visual copies were not used for the purposes of this study but only the detailed description of the cadres. The total accessed photographs from NEIM were thirty-eight, but despite the interesting scenarios and basketry items nine were eliminated because of their unknown provenance. The remaining twenty-seven (27) belong to four thematic groups: Ethnic and religious minorities, livelihoods, Crafts and Agricultural Activities. The captured activities may be grouped into the following sub-themes: various types of harvest – grape (3), rose petals (5), raspberry (1), potato (1), tobacco (1), chestnut (1), grain winnowing (2), bean winnowing (1); bee keeping (3); household items (4); market goods (4); farmyard inventory (8) and other activities involving baskets, such as gardening (2), basket-making (1), calendar events (1), which could be seen in Appendix 2 of this thesis.

Eight photographs are from the Severnyashki region showing grape harvest; baskets displayed on markets, farmyard inventory and winnowing of wheat grains. The type of baskets captured include mostly big koshes, woven with rods or splints and sometimes with a shoulder handle and one grain winnowing fan and one bean storage kosh. Another eight cadres are originating from Thrace and they depict rose petals harvest and processing, grape harvest, farmyard inventory and gypsies' temporary camping equipment. The items displayed are hand baskets, large panniers, frame baskets, lidded trapezoidal and big koshes. Another six are from the Shopski region and show raspberry and potato harvest, gardening, farmyard inventory and a calendar feast (the custom "Koukeri"). The baskets depicted are frame baskets, baskets on a yoke, big koshes with a shoulder pole. Three cadres are originating from the Rhodope region and they depict farmyard inventory, process of barley winnowing, markets and basket-making. The variety of items shown include knitted bag (perhaps of monocotyledonous leaves, based on their appearance), hand baskets, and big splint koshes. One photograph comes from the Pirin region and shows goods' transportation with two even koshes attached as a donkey load.

In addition to the large photographic archive of the National Ethnographic Museum, three smaller museum archives were also accessed representing Dobrudja (Historic Museum of Silistra), Thrace (Regional Ethnographic Museum of Plovdiv) and Rhodope (Regional Historic Museum of Bratsigovo). The diverse shapes and sizes of the basketry items is shown in the photographs from Dobrudja which display the town markets of Silistra in the period between the 1930s and the 1960s, where small semi-spherical baskets (*pachnici* type) are seen in the market's stalls, full with goods for sale (especially potatoes), but also smaller hand baskets carried by the shoppers (Fig. 3.6.b.). A large *kosh* container full of apples is seen on another stall, surrounded by men and obviously dedicated to the transportation of this heavy load (Fig. 3.6.c); other shopping bags, made of flexible material, are seen on the market's ground (Fig. 3.6.e.). Another archive photograph by Stoyanov (1930) displays a young girl from Dobrudja during the wine harvest with two semi-spherical baskets full of grapes, carried on a decorated yoke on her shoulders (Fig. 3.6.a). These photographs suggest the popularity of this shape of basket, traditionally woven of old man's beard almost without exceptions in all regions of Bulgaria (Section 3.4.3.2).

The photographs from the archive of the Ethnographic Museum of Plovdiv were identified as depicting basketry objects while performing the traditional for the region rose petals harvest. The photographs show three localities of Thrace (Kazanlak, Bania and Sushica) by photographer Dimitar Katsev, where hand circular and trapezoidal baskets are displayed along with trapezoidal ones (Fig. 3.7.d.) The choice of basketry items to be employed in this activity was determined by their physical properties as light-weight items with transpiration properties were required for both grapes and rose petals transportation, but also the handy shapes of the trapezoid, spherical or semi-spherical baskets (Fig. 3.7.c-d). Another group of photographs on Thrace has been published by Marinov (1962) and three of them display gypsy temporary camps (*katun*), where basket-making was performed, along with the sale of woven items and a mat weaving on a vertical loom (Fig. 3.7.g). One more photograph, published by Popov and Raychevski (1996), shows the traditional for Strandja custom *Palikosh*, when a kosh full of hay was lifted up in the air and then deliberately burned (Fig. 3.7.h). Related to Thrace is the century older image by Felix Kanitz (1982), who while describing his travel through Bulgaria published a drawing of rose petals harvest in Thrace, where numerous baskets are displayed: twin baskets on a yoke, carried by a young woman, big *kosh*, carried by a male personage, and a shallow one, being filled up with freshly harvested rose petals (Fig. 3.7.b). The neighbouring region, Rhodope, is represented in the photographs from the Historic Museum of Bratsigovo, where tobacco processing and rose oil distillation are shown (Fig. 3.8.b, d,). In addition, skeps are captured in the Savov's photograph of mat/carpet weaving from Chiprovtsi (Fig. 3.8.c.).

Two photographs from the Shopski region displaying small hand baskets were analysed (Fig.3.8. b-e., 3.9.b). Both of them show identical small bi-conical hand baskets from stripped, very likely willow rods. The two photographs display them as a female attribute and one of them, taken as a studio portrait of a young unmarried girl with the traditional for the Shopski region garment is even elaborately decorated with beads (Fig. 3.8.b.). The other photograph shows a couple (the white head clothe of the female indicates she is married), where the small basket is being held in her left hand, while in her right hand she keeps a spindle with a yarn (Fig. 3.9.b.). This size of baskets may have been used as spindle/yarn inventory but they may also represent the traditional *Lazarka* basket at least in the case of the portrait of the unmarried young girl.

3.4.2. Basketry Plants: botanical identifications within the weaving techniques

A total of seventy-six (76) basketry objects were sampled, which resulted in hundred-and-three (103) samples. They were all obtained from both museum collections and informants' products or collections (Appendix 3). The botanical identifications of these samples confirmed to a very high degree the mentioned by my interviewees' species, but there were also some unexpected results. A total of twelve (12) different species were identified: white, red and dwarf willow (*S. alba, S. purpurea, S. viminalis*); hazel (*Corylus avellana*); old man' beard (*Clematis vitalba*), broad and narrow-leaved and cattails (*Typha latifolia* and *T. angustifolia*), common rush (*Juncus effusus*) and sedge (*Carex* sp.); European spindle tree (*Euonymus europaeus*); ash (*Fraxinus excelsior*); wild vine (*Vitis vinifera* ssp. *sylvestris*).

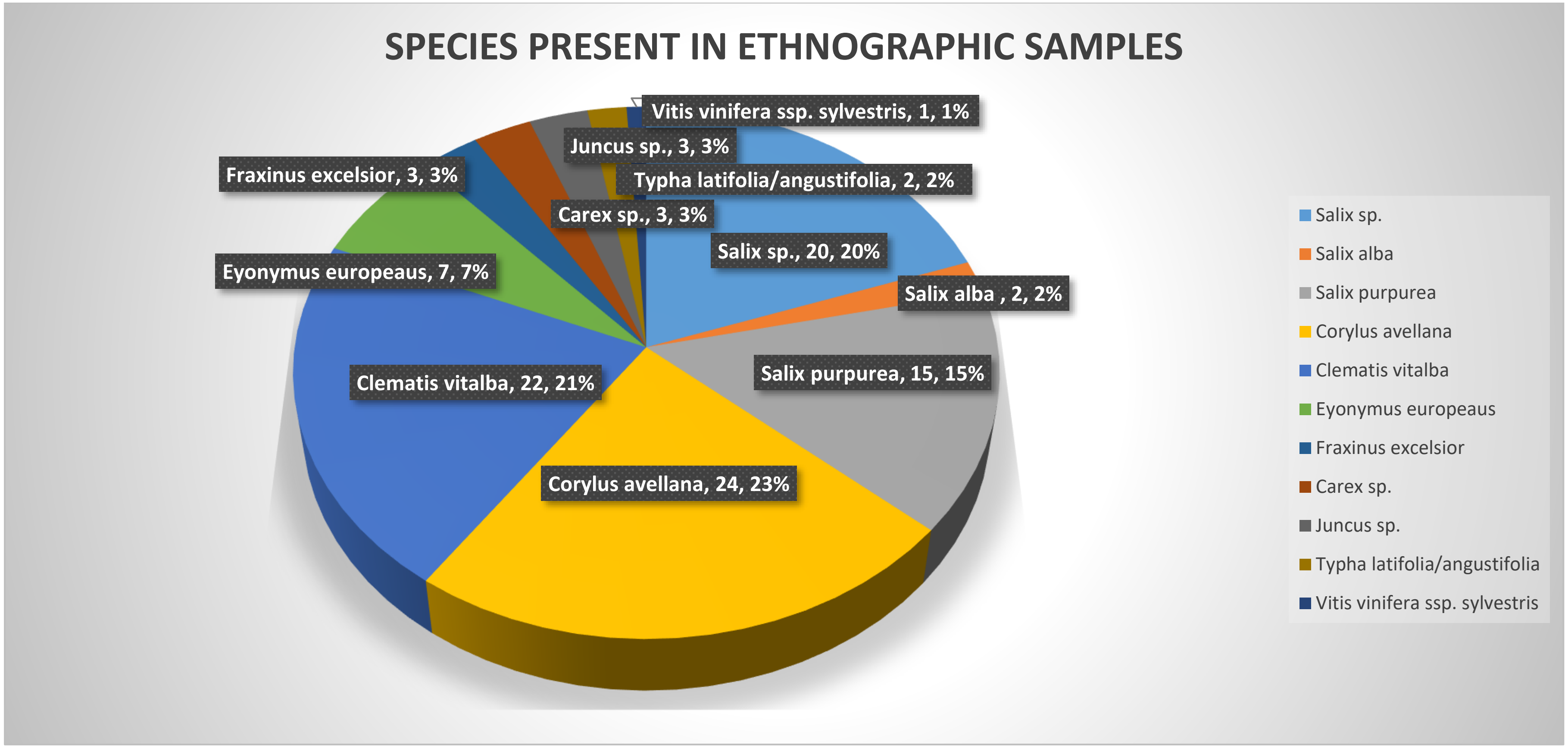


Figure 3.10. Proportion of species, identified amongst the studied samples.

A few discrepancies between the information collected from the existing scholarship and the conducted interviews were shown after the botanical identifications were performed. The first one is the confusion of Cornelian and spindle tree, as all the items informed as made of Cornelian, proved to be made of spindle tree; the reason for this was probably their similar common name and similar habitat and overall appearance (but not when their fruits are mature!). The second is the maple, which was reported as material chosen for handles, which was confused with ash, perhaps on the basis of their identical common names. The third one is the splints of the "gypsy" baskets, which were commonly reported as being lime, but proved to be hazel wood splints; it is possible that indeed in the past lime splints were chosen for these types of baskets, but this was not registered botanically in the samples. Last one is one case where vine rods were chosen for the weaving of a frame basket, typically woven from Old man's beard, which may be evidence for the lack of the desired material, or for recognition of the similar plant properties of the wild vine.

The willow samples represent the majority (by 37%, detected in samples: 4,6,9,11,12,13, 14, 25, 27, 36, 39, 42, 44, 45, 48, 50, 52, 55, 60, 62, Fig. 3.10.; 3.12.e-g) of all analysed objects and usually young rods - one to two years old were chosen for weaving. Almost half of the surface of these young shoots is occupied by the pith, while the one or two growth rings - form the rest. Willow rods were both stripped and with their bark preserved. Usually the bark was chosen for decorative purposes, especially in the case of red willow (*S. purpurea,* registered in 15 cases: samples 29, 30, 31, 32, 34, 36, 37, 39, 46, 48, 50, 54, 55, 59, 62 Fig. 3.11.a.). When in herbarised condition the red-brown colour of this type of willow darkens but if macerated or water-brushed it could be distinguished (because the white, red and dwarf willows cannot be distinguished based on their wood morphology, Fig. 3.11. a-c.). The willow rods were either woven as a whole, or split usually into two, with the pith forming the middle, or into three, with the help of a dedicated device (Fig 3.12.ba-bd). When used for weaving *damadjana*-s often commercially split thin lines of only c. 1mm width were chosen as this way more strips may be produced from the same rod and thus a larger surface covered on the bottle (Fig. 3.12.be-bj). When used for making handles or rims often willow rods were twisted, which resulted in highly fibrous herbarised material, which could not be sectioned at the point of twisting (but before or after that).

Hazel wood was mainly presented in splints (23% and present in samples: 6,7,8,14, 16, 18, 19, 20, 22,25, 26, 33, 35, 41,49,53,57,58,59,60,61,65, 66,74 , Fig.3.10; 3.12.s-u), where they were split along the rays and usually at the ring boundaries, so often in the case of thin splints only one ring was preserved (while the previous and the successive ones had been chipped off). In the case of hazel used for handles usually thicker branches were chosen and were then steam-bent to achieve the required curvature. Because of the key structural role of the handles sampling was not permitted from the concave part but only from the sides – the invisible parts of the handles interwoven in the main weave. It would have been interesting to see the compression and tension deformations in the steam-bent wood, but for this purpose, a handle should have been sampled from the middle and hence the item would have been heavily impacted.

Old man's beard is the third in frequency (21%), present in samples: 6,8, 10, 16,20, 21, 33, 47, 49, 51, 55, 56, 57, 58, 61, 62, 63, 65, 66, 71, 73, 74), after willow and hazel work, material chosen for making the main weave of baskets, and especially the frame baskets, for which this plant seems to be reserved for (Fig. 3.10.). Here again young stems were chosen, which consist of 50% of their surface occupied by the large pith of this climber plant. The extreme plasticity of the old man's beard is due to its extremely fibrous rays and hence its high bending properties. The herbarised condition of the museum specimen lead to very intense infestation of parasites, which seemed to have found a suitable environment in the large vessels of old man's beard. Often samples were infested in the area between the rays and outside of the pith, where the large early wood cells were consumed completely (with parasite galleries ranging up to c. 10mm in diameter, Fig. 3.12.h-m). In one case (Sample 64 from Etar Museum, Appendix 3) wild vine tree was chosen for the same purposes as old man's beard, but perhaps this could be a replacement action because of the unavailability of the old man's beard, and the similar wood properties of the wild vine, such as flexibility and desired length. Old man's beard was both stripped (mostly in the cases of frame baskets) or unstripped in the cases of skeps, where its fibrous bark creates a furry appearance of the item when herbarised. Similar physical properties and optical appearance are valid for the wild vine too, so this an interesting (replacement) choice.

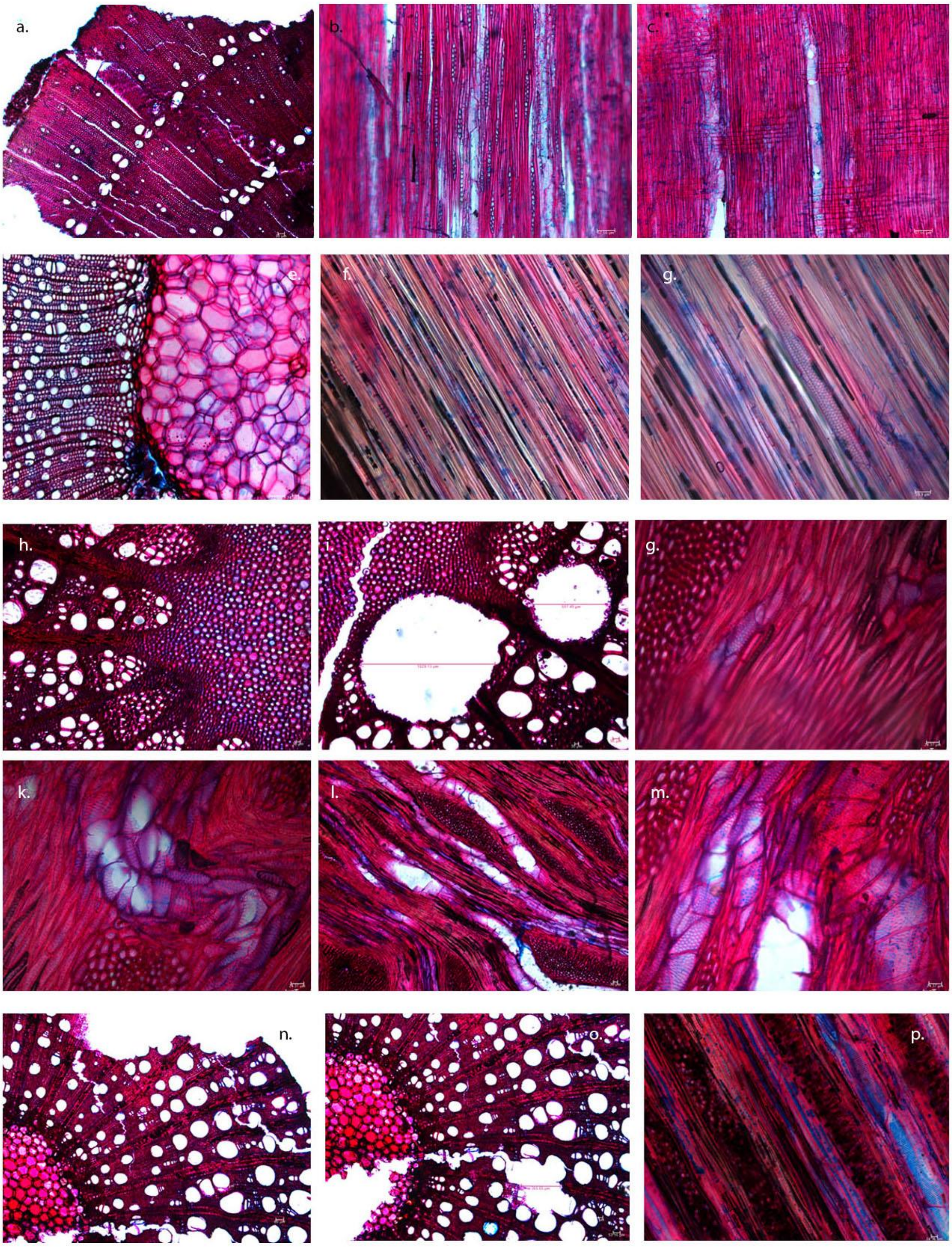
Rushes, sedges and grasses were often chosen together for weaving mats and screens and represent a total of 8% of the studied samples (Fig. 3.10.; 3.12.cd-mn). As the plants' habitat is the same it is not clear if this is a result of lack of knowledge in distinguishing them or there is a utilitarian purpose. This combined choice may be governed by physical aspects of these plants – for example one suggestion may be that rigid sedges may enhance a soft rushes weave. An actual mat weaver was not interviewed but mats and rugs were encountered as part of museum or personal collections. The green stems of both rushes and sedges were dyed for decoration purposes - soon after harvested or if stored, they were boiled before being dyed. The opposite process, staining herbarised stems of rushes and sedges failed in laboratory conditions, but a maceration process was applied: the preserved cubiculum waxy layer prevents the penetration of the stains within the tissues, while if soften with maceration the elasticity and absorption properties of the epidermis are renewed and stain can be applied. The same is valid for the broad and narrow-leaved cattails. Cattails were also usually picked up and woven together. Sometimes broad-leaved cattails were split into strips, similar to the maize leaves (Fig. 3.12. v-ab), while narrow-leaved ones were chosen for stitching or for making the salvages. Only use of the leaves of cattails was registered on the field but one of my interviewees informed me that small decorative items and toys were made of their stems (Q10).

Corn leaves were registered as the material chosen in the last century and a half for traditional mat and rug making. Today, they are even dedicated artists who are creating items in various techniques with maize leaves (Q3). But corn leaves objects were not sampled as the crop arrived quite late on the Balkans and does not apply to the historically traditional plant material chosen for weaving. On the other hand, the properties of this plant are similar to other long-leaved monocots, such as the described above cattails and allow similar techniques, such as coiling and weaving, to be used.

Cornel and spindle tree are two examples where species were confused by my informants (which happened in two cases, by the two informants of Q11), stating they are weaving exclusively of "wild Cornelian" and ash (the latter was confirmed by my analysis, Fig. 3.11.e.). The two species bear similar common names: Cornel and 'wild Cornel', but botanically belong to two different families: Cornaceae and Celastraceae, and since the botanical analysis was performed it proved only spindle tree was present (representing 7% of the whole assemblage, Fig. 3.10; 3.12. q-r) in all samples from the Rhodope region (informed as Cornel in Q7 and 11). In the Severnyashki region big containers (*kosh*) were said to be made with Cornel rods for wefts and hazel young twigs (not one-year old shoots) for ribs (Q7). Cornel was said to be preferred as a whole rod (Q7), while spindle tree was mostly stripped, because of its light wood and unstripped rods were inserted as a decorative pattern. One reason for spindle tree being chosen for splints may be its compact uniseriate rays, while the multiseriate rays of the Cornel wood may not result into fine thin strips, desired for small items.

Ash was registered in 3% of the samples and was often in combination with spindle tree in the baskets from the Rhodope Mountain (Fig. 3.10; Fig. 3.11.d., Fig. 3.12.a-c). The chosen ash rods were of one- to two-years old young shoots, which were either split in very fine strips – in pair per rod or in four, where the two inner ones include part of the pith, or woven as whole rods (Q11). When woven as complete rods often their bark was left as its spotty appearance was a desired decorative motive. Barked rods were usually placed as rims or handles or as mid-way pattern at the body weave. Sometimes in the cases when a larger branch was chosen its outer splint was kept for this purpose.

Figure 3.11. Three different types of willow, collected from the forest and an old willow plantation in the Koniovska Mountain with my informant from Q12: a. red willow, b. white willow, c. dwarf willow; Primary material collected from the forests above Peshtera (Rhodope) with my informants of Q11: d. ash, e. spindle tree woods.


a.
b.
c.
e.
f.
g.
h.
g.
k.
l.
m.
n.
o.
p.

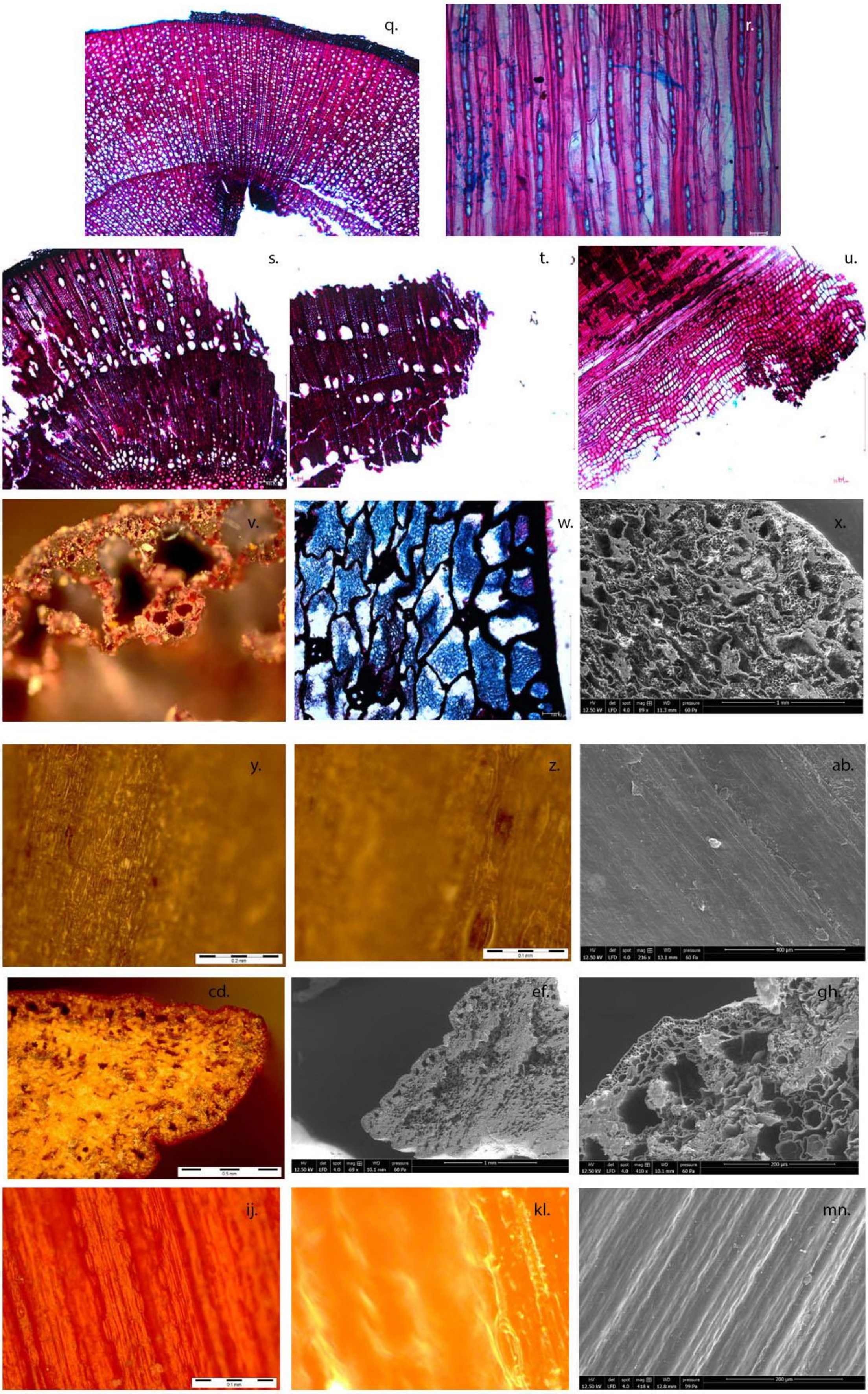

q.
r.
s.
t.
u.
v.
w.
x.
y.
z.
ab.
cd.
ef.
gh.
ij.
kl.
mn.

Figure 3.12. Microslides of ethnographic basketry samples: a-c. Sample PE 1, Fraxinus sp. (a – T plane, b – TA plane, c – Rplane); e-g. Sample 4096 Salix sp. (e – T, f – TA, g – TA detail); h-m. Sample 408 Clematis vitalba (h – T with pith section, i – T with insect galleries, j – TA, k – TA with new piths, l – TA with perforation vessels, m – TA detail); n-p. Sample 48 CC Vitis vinifera cf. ssp. sylvestris (n – T, o – T with insect galleries, p – TA); q-r. Sample PE 2 Euonymus europaeus (q-T and r – TA); s-u. Sample BR 14 Corylus avellana (s – T, t – T of a splint, u – TA of a splint); v-ab. Sample 15 Typha sp.(v – T under epi-illuminated light, w – T microtome sectioned, x – T under SEM, y – TA, epi., z – TA with stomatal units, epi., ab – TA under SEM); cd-mn. Sample 23 Carex. sp. (cd – T epi., ef – T under SEM, qh – T under SEM detail, ij – TA epi., kl – TA detail epi., mn – TA under SEM).

3.4.3. The Basket-makers and their Baskets: field interviews and museum collections

3.4.3.1. Shapes, sizes, uses

The shapes, sizes and uses of different basketry items were identified on the basis of the existing literature, the information given by the informants, the museum artefacts and photographs and by analogue, where no information was present. The uses of the various basketry objects always matched the ones described in the scholarship and the ones described by the basket-makers or owners. In some cases, creative usage was attributed to an item, which had a different use in the past – an example for this are the modern flower baskets, which were traditionally playing different roles in the household.

One of the very popular and very used in the past basket type is the big ***kosh*** – container or a transporting device, which may exceed a human height and may reach very large diameter (2-3 metres) depending on its utility. In the past the largest of such containers were used for grain and flour storage and most of the time they were immobilised in the ground because of their function and their content (Fig. 3.13.h-i; 3.14.a-b, e, r, s). Often their inner walls were layered with mud plaster in order to insulate and protect the contained goods. A very good example of this very large container was registered in the Balkandjii group, displayed in the exhibition of the Ethnographic Museum of Etar. Nowadays this type of gabion is not woven anymore due to the lack of demand and none of my informants has ever made such a vessel, but some of them remembered seeing it in use during their childhood (Sverenyashki region: Q1, Q7). The more recent variations of the *kosh* are reasonably smaller and were woven in two sizes. The bigger ones, dedicated to hey or fodder transportation are reaching about 1-meter height and circa 0.5 metres in diameter and are woven of larger warps, but always the wefts are young rods of *circa* 0.5cm diameter. These devices are often equipped with a steam-bent shoulder handle, which aids the process of transportation. The smaller *kosh* meant for fruit harvest are often done in splint work, which makes them extremely durable and capable of transporting even rocks or coal. Usually all the elements of these sturdy vessels are woven of one type of material – same for the warps, wefts and the handles. The hay transportation *kosh* was registered almost in all studied regions, excluding Rhodope and Dobrudja, and a good example of it was on display in the exhibition of the Ethnographic Museum of Plovdiv (Fig. 3.13.k). The *kosh* woven with splints was recorded predominantly in mountainous areas: the Balkandjii group, Rhodope and Pirin. These two smaller versions of *kosh* (woven rods or splint work) were often used in pairs as a donkey or horse load, especially during the harvest season and when paired they are called ***samar***. Examples of *samar* were found in the Severnyashki and Pirin regions in the form of donkey load (Fig. 3.14.i.).

The absolutely multifunctional type of basket woven in the past but also widespread nowadays is the ***koshnica*** (literally basket, Figs.3.13.a-b; 3.14.c-d,k). Its shapes are diverse and vary from trapezoidal (Rhodope and Thrace, where it is called ***kofa*** – a bucket – because of its shape), to curved (Thrace, Severnyashki) or semi-spherical frame basket (all regions, called ***pachnici*** in the Balkandjii group) or even hat-like shapes (Thrace and Rhodope). This basket is normally woven of at least two different plants with different properties: the warps and the handles are usually steam-bent hardwood, while the wefts are young wood rods or climber's stems; sometimes a third type of material is employed, when the handles are stabilised to the main weave (see 'suns', Section 3.4.3.2.). The *koshnica* serve all sort of household, agricultural or even festive activities and is the most popular item still woven today. Its multiple uses include egg and nut storage, grape, rose petals, other fruits and tobacco leaves harvest, but also *koshnica* is held by the young *Lazakra* during the festive performance (Section 3.3.2). This type of vessels was also paired in the past, attached on a steam-bent yoke and often carried by females because of their relatively light weight (while carrying a single *kosh* was usually a male task).

Another devise known in all regions was the covered glass bottle, ***damadjiana*** (Fig. 3.14. wx-bj). These covered bottles were also used for different contents, including wine, oil, spices (such as grinded red pepper) and their size was determined by their use, i.e. the ones meant to contain wine were very large (10 litres and more), while the ones containing sun flower oil were smaller. The *damadjiana* is normally woven of one type of vegetal material but the handle(s) are always made via twisting as for cordage, which ensures their durability. This item was popular in the past and was present in every household; nowadays some basket-makers are specialising in *damadjiana*-weaving (such as in Shopski region, Q6).

Similar in appearance but different in use are the traditional conical skeps, ***kosheri***, often known as ***tryvni*** *(made of grass)* in all six regions and are most of the times mud-plastered (Fig. 3.14.p-q). These devices function as beehives and are woven in conical shape to be placed upside down, where by the rim of the skep there is a small opening for bee circulation. The warps of these items are the ones shaping the cone, so they are tightened together by the tip of it with a vegetal rope. If the vessels are meant to be placed on the ground and used as beehives, they are mud-plastered. But each bee-keeper kept a few non-plastered skeps for catching the new swarms of bees, which are separating from each bee hive at spring time. These devices do not have a 'door' too because they are used as a trap once the swarm is caught, the wide part is covered with a piece of fabric and the whole skep safely transported to the permanent mud-plastered bee hive. The choice of plant material suitable for weaving skeps played an important role (Section 3.4.3.3.) and this is why there were specialised skep-makers, as shown from the conducted field work, who knew how to weave the desired shapes, but also how to attract bees within the newly woven skeps by adding a straw of Lemon balm (Q10).

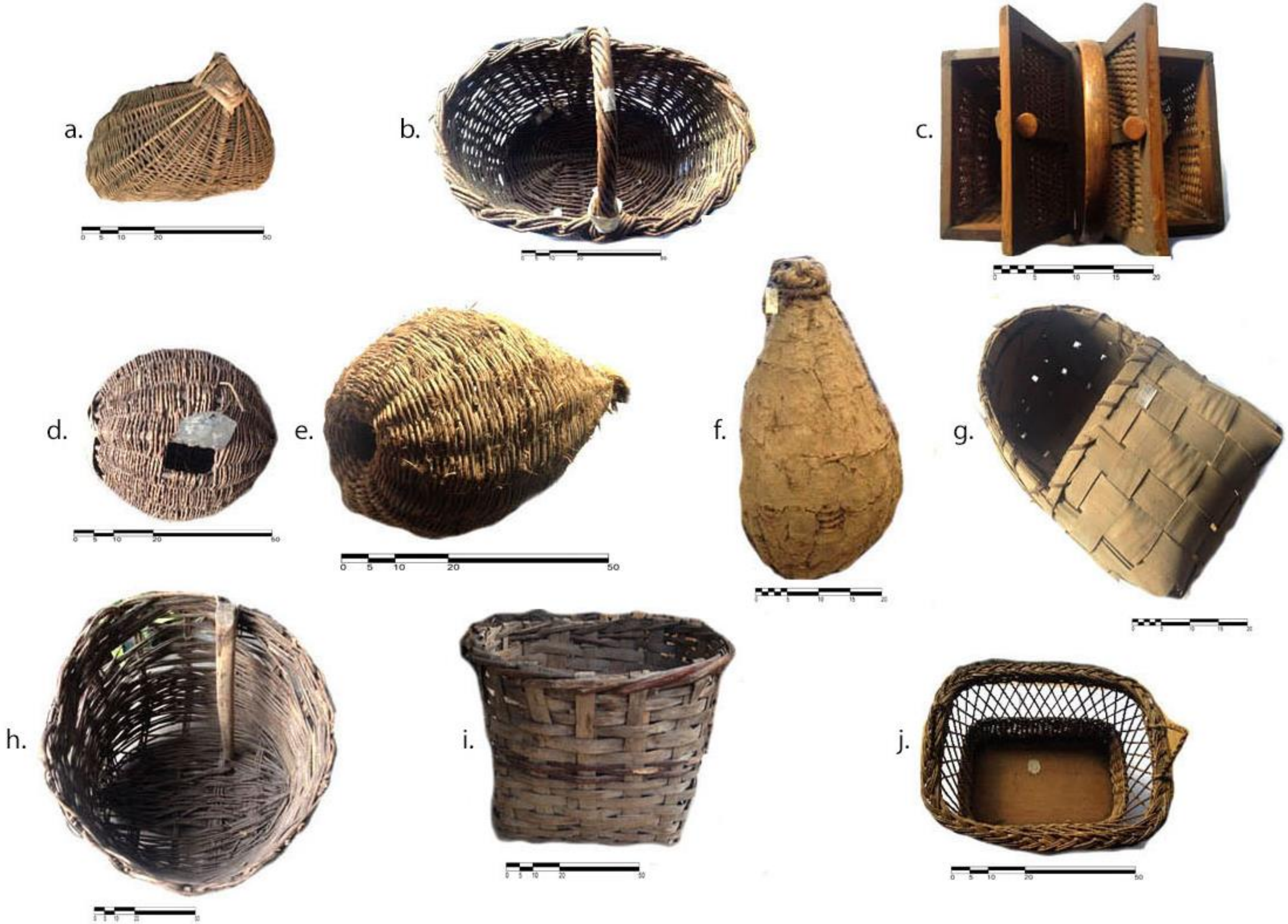
Peculiar woven devices, again known in all studied regions, but in different sizes and shapes, are the fishing traps. A smaller version of them is the ***sliiap kosh*** (*blind kosh*), an oval shape with a small (usually tin) gate in the middle of the weave (Fig. 3.13.d). These devises are meant for river fishing and the gate attached prevents the fish from escaping once caught. They are registered as used in mountainous rivers with fast current (as for instance in the Balkandjii group). In calmer and bigger rivers and in the sea, there is a bigger version of the *sliap kosh* employed or a ***dupek***, a vessel with double walls, where the rim is woven inwards and forms a vessel in the vessel. Here no gate is applied, as the fish is easily trapped once entered the device (it enters through the elongated rim and is caught in the larger volume, Fig. 3.13.e).

A shallow version of the *kosh* and smaller in diameter are the ***panniers***, woven and used in all studied regions (Fig. 3.13.q; 3.14.o.). They were often the place where the freshly harvested rose petals, grapes or tobacco leaves were piled until transported further. The panniers are characteristic with their spaced weaves, narrowly linked to their use. Their content was not stored there for long periods but was meant to be transported in them and so the air-circulation properties of the vessel were necessary. Another identical shape but usually of smaller diameter are the woven fans, which served as winnowing fans, or sometimes also used as scale plates in the markets.

Several peculiar shapes made with basket techniques were recorded in the museum collections and during the field interviews. These are a dedicated basket for spoon storage – ***lyzhichnik*** (Fig. 3.13.g; Appendix 3, Sample 59), baby swings (all regions, Fig. 3.14. e) laundry dryers (Balkandjii), spindle baskets (Severnyashki, Balkandjii), 'backpacks'/school bags (Fig. 3.13.l), woven rucksacks with a lid and strips to be adjusted on both shoulders (Thrace), and animal muzzles (Pirin, Shopski). In addition, local knowledge of vegetal cordage production was presented at all studied regions. This was usually employed in basket-making, when adjusting the handles, closing the skep or sometimes while weaving a basket, and some elements were temporary fixed with a rope, which was later removed (Pirin, Shopski).

In terms of basketry-related crafts, rug and mat making was known in all regions. Different sizes and shapes of mats (***rogozka***) made of vegetal fibre were very common in the household interior, often used in the past as floor or bed cover in a rectangular or heart-like design. The latter one was specific for Dobrudja, registered in the Ethnographic Museum of Silisra, but also mentioned by informants as "the best mats" (Q9, Q10). This type of usually floor mat was made in coiling technique and by stitching together two semi-oval halves, often dyed in green and red colours (Fig. 3.14.w-y). Other rectangular mats were woven in the simple twine technique and on a vertical or horizontal loom, sometimes with tread stitching (Thrace) and were also often dyed in red and green (Fig.3.14. bv). Other parts of the house interior and exterior are the woven furniture items, which were mostly chairs with woven seats or backrests in the past but nowadays the diversity of designs is endless (Q6 and Q13). Some of the interviewed informants (ibid.) were specialising in this aspect of weaving –

mastering furniture making, which seems to be amongst the items on higher demand today (Section 3.4.3.4.).


a.
b.
c.
d.
e.
f.
g.
h.
i.
j.


k.
l.
m.
n.
o.
p.
q.
r.
s.
t.
5368

Figure 3.13. Ethnographic museum specimens: a-h. Museum specimens from the Ethnographic Museum of Etar: a. Frame basket of old man's beard, hazel "suns" and handle, b. Oval hand basket, c. Lidded picnic box, d. Walnut trap of old man's beard and hazel wood "suns", e. Fish trap of unstripped old man's beard, f. Mud plastered conical skep of old man's beard, g. basket for storing spoons, h. Large kosh of vine rods and a hazel wood shoulder stick, i.Large kosh of hazel splints, j. Linen clothes dryer; k-t. Museum specimens from the Ethnographic Museum of Plovdiv: k. Kosh with an attached shoulder handle, l. Lidded woven backpack, m. Kosh from hazel splints , n. Large pannier, p. Trapezoidal grape/rose petals harvest basket, q. Shallow basket, r. Frame grapevine harvest basket, s. Round hand basket; Specimens from the Ethnographic museum of Silistra: o. Round cattail floor mat t. Rectangular sedge floor mat.

3.4.3.2. Plants and technology

Old man's beard (Clematis vitalba) was and still is very popular material for vegetal crafts. This plant is a climber, often treated as weed, as it overgrows the edges of cultivated areas, such as fruit tree gardens. It also grows into the shrub shady forest layer, where it behaves as a parasite, climbing tree trunks or bending around thick branches. It has been and is still intensively harvested for basket-making because of its high flexibility and suitable length. Informants mentioned there are two seasons for its harvest – spring and autumn, because this is when "the juices are running" (Q1, Q7). The plant's stem is used as a whole and never in splints, as its diameter varies from 2-3mm for young one-year-old shoots to 1cm older stems, which allows the selection of desired diameters and is usually worked immediately when harvested and while still green. The characteristic ridged surface of the old man's beard stems is even more prominent when its fibrous bark is stripped off. This procedure is usually performed because when the material dries out the unstripped rods have a furry appearance, which is not preferred by the weavers. Old man's beard items are often woven in close simple twine, but sometimes in coiled technique. This is the material (*povet*) commonly used for the wefts of the frame baskets (see 3.4.3.3.). But its high flexibility allows creativity of shapes amongst the contemporary basket-weavers, as for instance the making of flower vases or other decorative objects (Q11). This property of the plant has given one of its common names – *povet*, which means the *one which twists/bends around*. This is also the plant commonly chosen for weaving skeps because “the bees choose it” (Q10) and often straws of lemon balm (*Mellissa officinalis*) are placed within the skeps to attract the bees (ibid.). When woven into skeps, the old man’s beard stems are sometimes unstripped from their bark. Another case when the plant is chosen with its bark is for decorative purposes by alternating stripped (lighter) and unstripped (darker) stems.

As popular as the old man’s beard is the *willow work.* Different types of willows were chosen for different purposes but this material remains universal, regardless of the studied region. Its ecological characteristics, such as its abundance along river banks and lakes, its fast growth and the length of its young rods and branches, classify it as frequently chosen for weaving diverse items. The rich harvest of this material determined it as suitable to be commercially grown in the past and nowadays, according to the existing scholarship (Section 3.4.3.3.; Q5, 6, 12, 13). Willows are woven both when collected and while still green or after a period of storage, when they have to be placed in water to achieve elasticity. All sorts of items were made of willows, from small decorative panniers, classical designs of baskets to big containers and furniture. Usually willows are woven in the open or close simple twine technique when forming the main body of an object, but when making a handle for example they are twisted in the manner of cordage. Some of the interviewed informants specialised in willow work and even had their own growing plots or were buying them from others (Thrace: Q3, 4, Shopksi: Q6, Pirin: Q12, Dobrudja: Q13). One basket-maker from the region of Pirin was harvesting three different types of willows, white (*S. alba*), red (*S. purpurea*) and dwarf willow (*S. viminalis*) for the different items he makes (Q12). White and dwarf willows were commonly used for small and medium sized items and covered bottles, while red willow was chosen either for larger containers, or as a decorative pattern within a white willow weave (ibid.) because it was “better” for larger items and a “good choice” for decoration (Q12). Another maker from the Shopski region, specialising in *damadjiana* weaving, worked only with white willow, which he was purchasing from the Severnyashki region (Q6). White and red willows were chosen for furniture making in the family factory of Silistra (Q13). Willow rods are woven both stripped and unstripped from their bark because sometimes the darker colouring effect when the bark is kept is desired as decorative pattern, especially in the case of red willow, where the bark creates red-brown appearance when dried out (Q12). Another decorative aspect is the lightness or matte darkness of the stripped willow rods, which is a result from boiling (Q13) or a longer soak in cold water (darker, greyish colour, Q6). Sometimes stripping off the willow bark or splitting the willow rods into lines for *damadjana* weaving are assisted by different devices (such as the flint splitter, Fig. 3.14.bb) and even designated lathes (Q6, Fig 3.14.bd), which facilitates significantly the preparation process.

Hazel wood (*Corylus avellana*) is a hardwood used either as splint work or as whole branches. Because of its ecological characteristics it is abundant in mountainous regions (Balkadjii, Strandja, Pirin, Shopski), which explains why it is frequently chosen there. It is usually harvested during spring time or late in the autumn and preferably from the south-facing slopes, which are exposed longer to sunshine and therefore allow a better grow (Q1). Hazel branches are split in splints while green and soon after they have been harvested; they can be also worked after a storing period, when they will be steam-bet, but unsuitable for splint work. Hazel wood is known amongst the basket-makers for its rigidity and sturdiness, and this is why it was often chosen as material for the ribs or warps of basketry items, or for their handles. When split, hazel was used for making medium sized containers (Q1) and when meant to be used as a whole branch, it is sometimes steam-bent to create the desired oval shape (Q1, 7). The point of contact between the handle, the rim and the main weave of the frame baskets is being secured with an additional element – the "suns" (possibly called like that after their visual appearance), also made of hazel. The position of these elements is very important, as they have to be made very tight in order to provide necessary resistance and because of that, in the later times they were even woven of metal wire. Here the hazel wood is split and the splits are split in swills, so these thin lines are forming the rhomboid "suns". Hazel is also forming the "skeleton" of various items – it is used for the warps or the frames of a basket, for the ribs of a skep and for the structure of the big *kosh* containers. The weave of the last ones always starts with the rods stuck in the ground or the earthen floor of the farm yard and arranged in circle of uneven number (Q1, 7). Around the hazel rods will be woven the wefts of the basket or container, usually from different and more flexible material. In the case of splint work, most of the items lack the typical basketry base, but are made in a bag-like technique, increasing their resistivity by the lack of numerous joining elements (Q1).

European spindle tree ("wild Cornelian cherry", Euonymus europaeus) is another species which grows above the forest layer at the high-altitude pastures or occasionally in the lower zones, amongst willows in the humid areas. Its shrub-like appearance determines the length of its rods, but its wood properties have been recognised for the making of items of larger size and meant to transport light goods with high volume (i.e. the hay transportation *kosh*). This species was described as “wild Cornelian” by my informants, but my botanical identification proved that all analysed items were actually made of spindle wood (Section 3.4.2.). Often spindle tree items are woven in open simple twined wefts, facilitating the air circulation for the carried content, and on a hazel wood warps. Usually young one/two years old shoots are chosen and worked with unstripped bark, which when dried out presents furry fibrous appearance. The young spindle tree rods allow very fine splint work and are often split in order to make a smaller item (Q11). One-year old rod may be split in four lines, where the inner two will be less good because they include the pith and may be discarded. The splitting procedure may be carried out ad hoc in the forest while selecting material to be woven later. Spindle tree rods may be also stored for some period of time and, similar to willow, could be worked after application of a water soak (Q1).

Ash and maple wood are other hard woods mentioned as material for handles amongst the Balkadjii group (Q1) while in the Rhodope region, ash wood was chosen for weaving entire items (Q11). Both its whole young shoots and splints of its older branches were processed with stripped or unstripped bark into open and close simple twine technique. Its preferred harvest happens in the early autumn and basket-makers choose south-facing slopes in the steep mountain forests to collect ash wood. In the Rhodope forests, ash and Cornelian wood often grow together in a mixed forest and this was an important factor for the choice of an area for harvest (Q11). Usually the first one to be found is the ash wood and higher up, where the forest is less dense, Cornelian cherry appears. According to my informants (Q1, 11) these species have to be harvested with a sharp knife (and not to be chopped by hand), because they were “better” for storage that way (Section 3.5.1). Then the sorted bundles of material are lowered off the slopes and carried to the weavers’ workshop. Ash wood can be stored and woven later but water application is carried out, as for the above-mentioned species (ibid.).

Lime bast was traditionally known for its use in cordage. As ropes were necessary equipment for each household all of my elder informants knew how to twist a rope from lime fibres (Q1, Q7, Q10, Q12). Sometimes wild vine or chaste tree were mentioned as replacement of old man’s beard (Q1, Q7, Q10) whenever it was not available but all informants agreed on the better quality of the old man's beard, especially when meant for frame baskets.

Cattail mats, rushes mats and maize leave mats are associated with basketry products. Each of the studied regions, presented at least one weaving technique associated particularly with one of these plants. Mats and rugs have multiple uses within the household, so the variety of techniques and designs differs from region to region. Cattails were chosen for very neat weaves in coiled technique of floor rugs in the northern regions, Severnyashki and especially Dobrudja. Rush work was known south of the Balkan Mountains in Thrace, where nowadays is characterised as "gypsy" craft. Rush rugs and mats were usually dyed in red and green colours, which also sometimes applies to the cattails heart-shaped floor mats. Rush work was produced on vertical or horizontal looms and was woven in close simple twine by means of fabric, where the wefts were stitched with vegetal threads (hemp, linen or cotton). Rush items are lighter and less durable than the ones made of cattails, and this is why rush mats were used as wall and tent screens, sunshades, ceiling, bedding rugs, and not that often as flooring. Maize leaves were and are both woven on a loom and knitted as needle work. If cattails and rushes should be worked immediately after they have been harvested, this is not the case with maize leaves. These could be stored and dried outdoors, be boiled at a later stage, if a lighter colour is desired or to be dyed with the addition of a colouring agent, and worked while moist (Q3). The variety of items produced with this material is endless because of its properties – a single leaf may be worked with its whole width or very fine strips may be cut from it, which makes them suitable for needle work. In the case of maize leaves usually the stitching is from the same material, which applied to the products of cattails too. Even though from different habitats (moist areas for the cattails and rushes and cultivation plots for the maize), these three plant species were always harvested when their leaves achieved maximum length, which is by the end of the summer season.

The last three additional unconventional materials used by my informants are *paper, plastic and wire*. Paper baskets were made by twisting strips of paper in the manner of making cordage and then weaving the "rope" like it was a vegetal weft (Q13). Plastic lines were also woven in basketry technique creating different items, baskets and covered bottles (Q2). Metal wire was used to replace the fault "suns" attaching the handles to the body of the frame baskets, where the wire was woven in the same manner, creating a rhomboid element, similar to the one of the vegetal materials (Q7). These three replaced materials were described as low cost and time-efficient, as the basket-makers do not have to select any vegetal material for weaving from the forest or the river bank.

It was proved that each aspect of plant processing has its particular *instrumenatrium* according to each basket-maker. In some cases, the bark was being stripped off with the support of a bark-stripping device, and the rod – being sliced into even or uneven strips – with the hand tool or with a lathe-like device (Q6). In others this was done by a simple pocket knife and completely by hand (Q1, 2, 5, 7, 8, 11). These differences expand to the actual weaving process, whereby some makers prefer to be assisted by moulding devices, such as basins, buckets, bottles, while others are using their own body to assist the making process by stepping on the base or supporting the body weave onto their own core (Q12). Often the makers using assisting devices but not their own body in the process of making mentioned, that the others, who are using their own body, are “the true basket-weavers” or are “weaving in the true way” (Q6). For example, an elder informant (Q12) was using his body to support the different elements while weaving, but a younger one has a range of devices, facilitating the weaving process and he never uses his body (Q6). These personal choices were often stressed as “the spice of the craft” (Q6, Q11, Q12) and I was asked to not share them with other basket-makers by the informants who shared their process-improving or energy-saving devices.

3.4.3.3. Economic aspects

At a smaller scale, many of the interviewed basket-makers were selling principally or occasionally their products. The ones whose basket weaving was their primary occupation were more likely to trade their items - a relationship which is visible at the answers of the related questions of the questionnaire. These informants were selling mostly smaller baskets and occasionally working upon customers’ demand (Q1, 3, 5, 11, 12). On a corporative scale, the two active basketry companies of Bulgaria, nowadays privately managed businesses, but founded during the Communist era - “Kamyshit – Rakita OOD” (Silistra) and “Prolet OOD” (Shumen) – are focused mainly on woven furniture and large garden accessories. They also produce baskets, containers and decorative items of all designs and sizes, depending on the customers’ demand (Albiz, 2018; Prolet, 2011). The items and their prices are catalogued and the price depends on the time needed to weave the item, its size, the complexity of the weave and decoration and the quantity of items (Q13). The basketry companies' products may be ordered online or purchased *ad hoc* from their workshops. On the other side, the single basket-makers willing to trade their baskets (Table 3.1.) that represent the majority of my informants (9/12 trading their baskets) are doing so mainly on traditional craft fairs and upon small businesses demand, such as floristic shops or wedding accessories companies. If prices for identical sizes and designs would be compared, then a conical medium sized basked produced in the commercial companies will be significantly cheaper than the same shape woven by a single weaver. Here the plant material also plays a role as the single basket-weavers are still sometimes choosing plants different than willows (which are the choice of the basketry companies), which is a time consuming process and adds its value to the final price (e.g. 23BGN = circa 11GBP for a large laundry basket and 89BGN = circa 44GBP for a woven chair; Prolet, 2011).

The general tendency amongst the single basket-weavers is that they concentrate on trading their basketry items after they are retired from their occupations, when they have the time to be fully dedicated to basket-making (Q1, 11, 12). A few of my younger informants were trying to keep basket-trade parallel to their daily jobs (Q5, 6), accepting custom orders and dedicating additional time of their daily routine to this secondary occupation. This last group of weavers mentioned that the workload increases by the end of the summer, when many clients order covered bottles for their home-made wine. Similar workload change is noted by the commercial weavers who receive more orders during spring time, when woven furniture items are preferred as garden, cafés and restaurants' equipment (Q13).

Amongst the single basket-makers there is a trend of replacing some of the more time-consuming elements of a basket with simpler ones in case of larger orders. An example for that is the swap of the woven base with a wooden one (usually light coniferous wood), which saves a lot of time and the weave can begin straight from the basket's walls (Q12). In some cases, where weavers preferred to keep the traditional woven base, they had several diameters of already woven bases prepared and awaiting the next order to proceed into shaping the acquired design (Q12, 6). Similar intention exists in the storage of "good handles", already stripped and sometimes even kept bent (with the support of a string or a rope) until the moment they will be attached to an item (Q11). In terms of material meant to shape the main (body) weave of their products, usually willows were preferred. Both commercial and single basket-makers intend to pre-order from willow plantations or pre-collect themselves the desired diameters of rods. The material of similar length and diameter is then grouped into bundles, aiding the following weaving process. Most of my informants said they do not leave behind a "spoilt bundle", i.e. when a willow bundle is soaked or boiled in water then it has to be used because otherwise if it dries out its weaving properties are decreasing (brittleness, decolouration or unwanted uneven colouration, Q6, 13, 12, 5).

An observation made during the conduct of the field interviews is the excellent fame of the northern willows (Q4, 5, 6, 12, 13): many weavers mentioned they used to order, or they would if they had the chance to, their willow rods from several plantations located around the town of Shumen and servicing the basketry company there (Severnyashki region, Fig. 3.1.). On the other hand, no commercial willow plantation is known to exist south of the Balkan Mountains but only the weavers' private ones or their harvest spots located in the wilderness. None of the other hardwoods was mentioned as imported or preferred from particular region. In terms of soft material maize leaves are ordered from commercial plots because of the desired long length of the forage maize (in contrast to the esculent corn, Q3). Exotic material, such as raffia palm fibres (Q3) and Japanese paper (Q13), were purchased from abroad while plastic for covering bottles (Q2) was usually locally recycled. A choice was made for suitable plastic items, which could be split in thin lines for the wefts of an item.

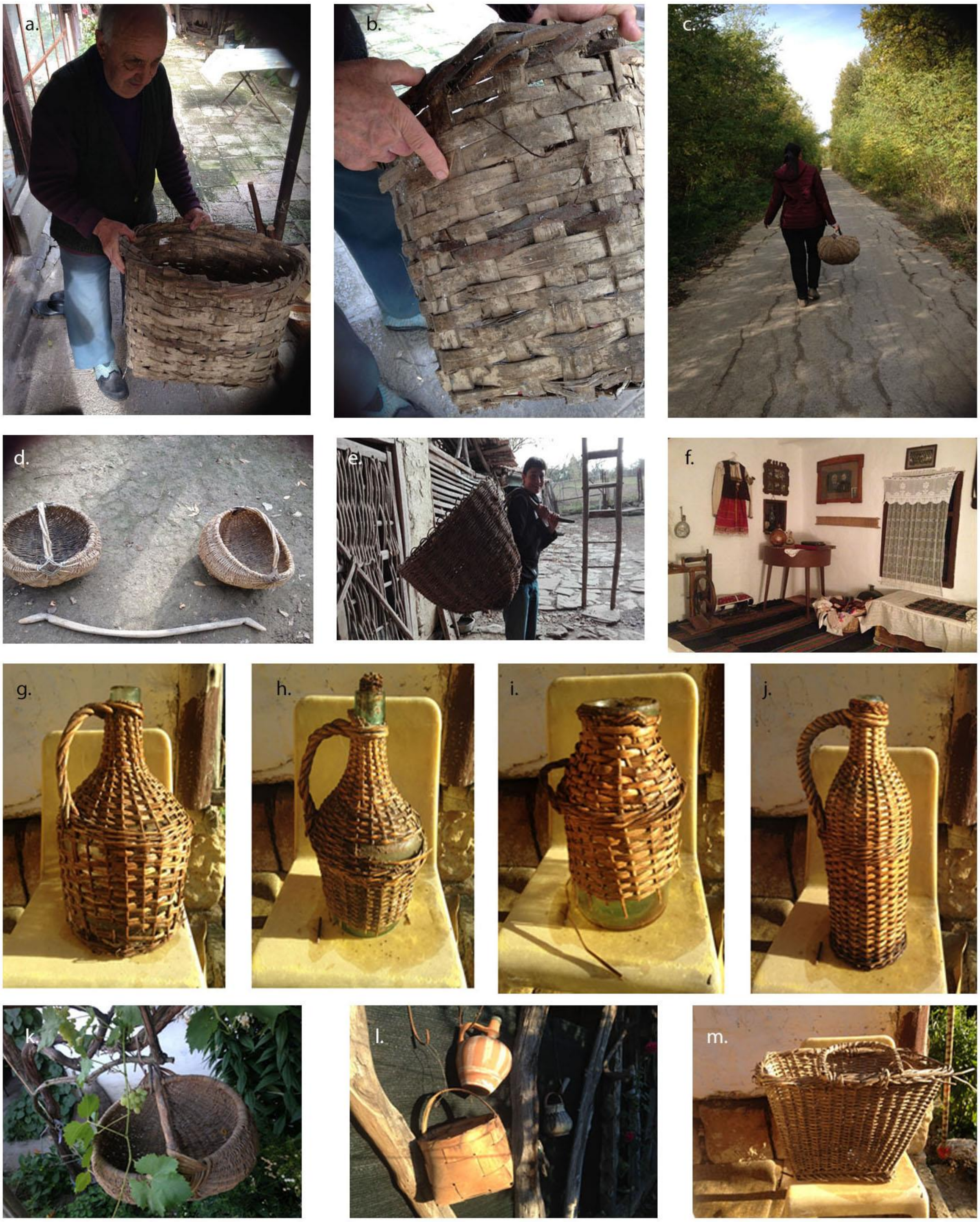
Repairing woven items by themselves but also by other makers is also a commercial activity performed by most of my informants. The covered bottles were the usual candidate for repair due to their frequent transportation and manual handling. The fault weave is removed and then a new weave is made to cover again the bottle (Q6, Fig.3.14.bg). In the recent past beehives were also commonly repaired but as the bee-keeping rule is that once colonised, a bee-hive is good to be used for as long as possible (it keeps attracting new bees during spring time and the hive, thus production multiplies), skeps were usually repaired partially (Q9, Fig. 3.14.p,v). Beehives made of Old man's beard were sometimes repaired with willow rods because of unavailability of the primary plant and then their inner mud plastered covered was renewed (ibid.). Another type of repair is the reinforcing of fault "suns" with metal wire, instead of hazel wood strips, which was applied in the cases where a basket was meant to carry heavy load or when it is qualified as "second hand" and its use is redirected to different one than its primary (i.e. a frame basket for grape harvest, which when faulty is reinforced and meant to transport small stones when removed from the cultivation plots during deep tillage, Q7, Fig. 3.14.c-d).

This decreasing of status of an older basketry object was also noticed while conducting my observations in the museum collections. A few items were always displayed as illustration of village life or agricultural equipment but numerous were kept in the museum archives because of their similarity to the ones displayed in the exhibition, their poor state of preservation, their "usualness" or their low monetary value. Indeed, by the time when most of the museums were established (mid 1900s, Chapter 1), basketry objects were still extremely common in the Bulgarian village life and many of them were donated to the museums but rarely purchased by them (like items with higher monetary value). This institutional attitude towards the basketry items proves illustrative too, regarding the perception of their economic value (for the "invisible" baskets in the museum collections - Section 3.3.2.2.).

3.4.3.4. Social meaning and traditions

Half of the interviewed informants (10/20) have inherited the knowledge on how to weave baskets from members of their families, while a few of the interviewees were self-taught (Table 3.1). The elder informants learnt how to weave baskets from their fathers and kept this as a side occupation, while performing other agricultural activities in their early childhood. It should be noted, that none of the interviewed informants stated they were passed the knowledge on how to weave baskets from their mothers or other female family members. This fact points towards the male dominance within the living practitioners of this craft, but of course it does represent only the isolated case of the conducted interviews. A very typical example for this is that children were weaving while shepherding cattle in the countryside during the summer months (Q1, 7, 8, 9, 12). This activity was not specialised and was a common knowledge amongst inhabitants of the villages: "everyone knew how to weave a basket" (Q1). The younger informants picked basket-weaving out of curiosity or necessity but the commonly spread justification for not teaching their own children basket-making was "this is a gypsies' craft". Only 5 out of 20 interviewees (Q9 is a collector, and not weaver) were female and they usually learnt from their weaving husbands or in one case from their father (Q13).

Indeed, three of my informants represent the Roma minority and two of them mentioned all of their families were involved in producing baskets (Q4, 14), while one was weaving exclusively alone (Q15).The members of the Roma families were also involved in distributing the production – usually informally, on foot, while carrying a large number of basketry items (Q4, 15) or officially at a stall at an open market (Q14). Two of my male informants have taught their wives as their apprentices, who later proceeded into weaving alongside their husbands (Q6, 11) and one has taught his daughter, who later proceeded into weaving, but also managing the family basketry business (Q13). Upon the question if they did or they will teach their children to weave, the majority disagreed and added an argument that there is no economic value in basket-weaving as a profession nowadays. One informant (Q12) was currently teaching a blind neighbour how to weave baskets and together with that providing seminars during the summer schools for children ran in the local museum. Another one added the option of running a basketry workshop in his family-run guest house (Q6) and mentioned it is indeed frequently booked.


a.
b.
c.
d.
e.
f.
g.
h.
i.
j.
k.
l.
m.


n.
o.
p.
q.
r.
s.
t.
u.
v.
w.
x.
y.


z.
ab.
cd.
ef.
gh.
ij.
kl.
mn.
op.
qr.
st.
uv.


wx.
yz.
ba.
bb.
bc.
bd.
be.
bf.
bg.
bh.
bi.
bj.

*Figure 3.14. Photographic highlights during the field interviews.**a-y. Severnyashki** region: a-b. Chervena lokva (Q1), medium – sized kosh of hazel splints; c –e. Koshnichari (Q7, Q8), c-d.Frame baskets from Old man's beard on a steam-bent yoke, e. Kosh to be carried on a shoulder with a steam bent hazel handle; f-n Svalenik (Q9), f. Traditional house interior by TM (Q9), g-j. Different types of covered bottles: damidjana, k. Grapes basket of Old man's beard,*

l. "Gypsy" baskets said to be of lime splints, but proved to be of hazel, m. Spindles and loom devices basket, n. Informant TM (Q9) and damidjana; o-y. Svalenik (Q10), o. Informant MM (Q10) and his basketry collection, p. Skep of Old man's beard repaired with willow rods, q. Retired new hives "catchers", r. Kosh of willow rods and its attached twisted handle - s., t. Loo devices basket, u. Bee entrance of a skep (p, q), v. Repair detail (p.), w. Cattail floor mat and x. – the initial point and y. – detail from the bundled coils; ***z-uv. Pirinski****: z. DZ (Q12) Identification of osier, ab. Testing the bark, cd. Selection of rods, ef. Coppiced osier, gh.DZ choosing the best rods, ij. Sorting and trimming osier rods, kl. Starting a crossed base, mn. Tightening the base, op. Weaving the base, qr. Body weave start, st. The "rays" (warps) of a basket, uv. Warps in progress;* ***wx-bj. Shopski****: wx. VD (Q6) cutting even willow rods, yz. Rod splitting, ba. Rod splitting into three, bb. Flint denticulate rod-splitter, bc. Electrical lathe for rod splitting, bd. Lathe splitting, be. Red willow rods selection, bf. Measuring, bg. Damidjana start, bh. Damidjana in progress – whole and split rods, bi. Base in progress, nj. VD and SD (Q6) with a completed new and old damidjana;* ***bk-bp. Rhodope****: bk. MS (Q11) Testing selected material, bl. EB (Q11) splitting "wild Cornelian cherry", proved to be spindle tree, bm. Base splints, bn base in progress, bo. Shaping the warps, bp. Wevingthe wefts, g. EB "finishing" a basket;* ***bq-bv. Thrace****: bq - bs. JG (Q3) and her corn leaves items, bt. Antiques shop in Plovdiv and basketry, bu. Dyed rush and sedge floor mat, bv. SA (Q4) doing his trade.*

3.5. Discussion and Final Remarks

3.5.1. Baskets and plants: wood properties and technology

Big baskets vs. small baskets. Big designs are made of larger elements – bigger diameter of wood or wider splints. Smaller items are woven with thinner strips, swills or one-year old rods. If the hazel, ash and Cornelian hardwoods can be easily split longitudinally along their rays, climber plants such as old man's beard or wild vine cannot be split longitudinally because of their very large vessels and narrow rays (Schweingruber, 2007). This determines the use of climber plants in their whole stems and larger hard wood as splints. Splint work remains reserved for bigger or less pliable items, while liana plants are chosen for more sculpturesque items. Somewhere in between are willows, which with their large piths and compact rays are very elastic and can be selected in different diameters: thinner young shoots for smaller objects or elements, involving coiling, twisting or stitching, and larger rods for bigger and sturdier objects. Willows can be also stripped to thin strips, which can be even stitched and this renders them highly versatile material.

Techniques. Hardwoods are mainly woven into simple twine or chosen as the load-bearing elements of a basket, such as the ribs or the handles (often steam-bent), because of their hardness and reduced flexibility. Climbers and willows are woven in simple twine but also, they are twilled and coiled – techniques requiring bending of the fibre in 360◦. The simplification of the techniques by mainly choosing simple twine nowadays does not determine the choice of hardwoods for this. Instead willows are preferred and have slowly become synonymous to basket-weaving – also known as willow work. The hard woods chosen for basket-weaving in the recent past and preserved at the museums' collection, remain more traditional and slowly abandoned material today and that way a general pattern of hardwood seen as traditional and soft woods as commercial can be drawn.

Both hard woods and climber plants are bent to a certain degree while woven into different basketry techniques. This is usually performed while the wood is still green regardless of whether whole rods or wood splints are to be bent. A technological explanation of this is that the bendiness degree of green wood is higher than in seasoned wood (Hoadley, 1980). An additional factor is that the wood strength is weaker in green wood, which increases the bending potential. But each wood has its elastic limit – the forces acting in a bent beam are compression on the concave side and tension in the convex one – and exceeding this limit the wood fails. For example, even 1% of elongation in tension may have an undesired outcome; on the other hand, wood compression is extended until up to 30% by steaming (ibid.), usually applied to thicker branches, such as the hazel wood frame basket handles (*see above*). Thinner pieces, such as splints and swills, would normally not need steaming but sometimes application of water to increase their plasticity. A good example of this are the twisted *damadjana* handles, whereby whole young willow rods are firstly soaked in water and then twisted around each other into > 360° twist.

Willows, hazel, ash, cornel and spindle woods are said to be preferably harvested from sunlit south or south-west facing slopes. One reason for this may be the late snow and frost retained on the north-east facing slopes in the mountain, whereas trees and shrubs positioned on the sunny faces grow better. In particular, Cornelian cherry and spindle tree are very often a big shrub rather than a small tree, which defines it as more dependent on early spring temperatures, when every year the early wood starts its development. This, together with the seasons for cutting, either spring or autumn, means well-formed early wood or well-formed late wood, which increase the wood properties in terms of flexibility: by either high water content circulating during spring time, or lower water content but well-stabilised wood structure during the autumn. The early wood cells are large but thin-walled while the late wood ones are smaller and thicker-walled. In the early wood, under favourable conditions, the proportion of thick-walled ground tissue cells is high. In the mid-season during the formation of the cells the storage types of cells have priority, while the stabilising ones (fibre) develop later (Schweingruber, 2007). This means that basketry wood is chosen by the end of the seasonal cycle in both cases – when early or late wood are already formed, and hence its fibres are already established.

On the other hand, this well-developed stabilising cells will harden the harvested wood since their moisture content is displaced, which is why freshly cut wood is either processed soon after its collection, or if not – water or steam are applied to achieve its plasticity. This is why the moulding process of the woven item is also sometimes assisted by a moulding device, which together with keeping the material moist, results in the desired shape. An example may be given with the covered bottles, which are shaped on top of the glass bottle itself, or some conical baskets, which are woven with the help of a bucket and mimic its shape. In some cases, in order to protect their inner wood and hold on to the moisture content longer, the newly harvested rods are kept with their bark. In this context, some species, such as red willow, which are usually woven with their bark are reported to be suitable for larger items (Q12), which may relate to the fact they are kept unstripped with their bark protecting their wood, which may be in favour of a large sturdy item made of this plant.

Another interesting aspect on harvesting is given in the advice that ash should be always cut with a sharp knife (Q11). Even if no functional explanation was given by my informants, except that "this way is better", this recommendation may indicate the minimising of the fibres 'distortion, as if cut with a blunt tool. Sharply cut, with usually pointy edges (Q6, 11, 12) the rods of willow, ash and spindle could be sometimes stored, until their time to be woven comes (see below), so keeping the wood fibres undistorted perhaps plays a role in terms of the quality ofl the material.

Technology. The differences in the technological processes, such as body or device use, manual or machine-assisted plant processing, may be interpreted as a pattern of differentiation between traditional and commercial or between older and more recent manner of making baskets. Because indeed a large order of numerous items will be aided by a devise use, which will facilitate the weaving and will be less tiring for the maker. On the other hand, any moulding device may have been used in any period of time only justified by the choice of the basket-maker, so this would not automatically indicate a commercial activity. The mentioned above technological secrets of the craft, regardless of whether the weaving process had a commercial or non- character, could also represent the set of inherited knowledge when the interviewed weavers learnt their craft from a relative. These "secrets" may also be seen as evidence for contemporary creativity and hence -development of the craft.

Basketry-related crafts, such as mat and rug making, are also governed by the choice of the plant material to the object which will be made out of it. Broad-leaved monocotyledonous plants, such as cattails and maize, were woven in coiled technique, plaited, twilled and knitted. Narrow – leaved monocots, such as rushes, were woven with the support of loom devices and added weights to adjust the density of their weave. They were often stitched and the appearance of the objects made in rush work corresponds to the textile crafts. Hence the choice of technique – plating or weaving – is strictly dictated by the choice of material. And the plant material, along with the chosen technique would determine the choice or not of a making device – a loom, needles or the weaver with his/her own body.

Regional or traditional. The northern and southern planes amongst the studied regions were and are still known of basket-making with willows and climbers, while the mountainous regions showed preference to hardwoods. A pattern of the weavers from the mountain choosing hardwoods against the weavers from the plane regions choosing willows could be drawn out of the conducted interviews for this study. This choice is ecologically supported too because the plane regions offer generously and easily accessible the willow and osier wood, while in the mountainous settlements, weavers are offered the choice of the nearby forests. The plane northern regions (such as Dobrudja) were also famous for their cattail mat work, while the southern plane regions (Thrace) presented rush work. This difference could not have an ecological explanation because both plant families are available in wet habitats, which are present in both the North and the South of the studied region. A possible reason for this could be the regional-specific knowledge, supporting the particular plant choice.

Some interesting exceptions were mentioned by the interviewed informants, regarding for example now-a-days willow worked basket designs, which according to them "in the old times were woven from hazel/Cornel" (Q6, 12), or vice versa, the now woven "in the old tradition" baskets from ash and Cornel (which proved to be spindle tree, Q11) were mentioned to be often made with willow by other-makers (ibid.). Again here, no ecological factor is to be considered but adaptation to the weaving technique to a process of less effort, typical when the basket-makers are aging. Two of the interviewed weavers (Q7, 12) mentioned they changed their weaving plants because they were willing to continue weaving, but could not go in the mountain/in the far-away-willows anymore, so they choose a simple white and osier willow rather than hazel wood or red willow (ibid.). Hence the adaptation of the chosen basketry plants could be also based on personal circumstances rather than ecological or traditional factors. This should be valid in terms of the binary *regional vs traditional*, where in some cases the representative for the region plant choice may be indeed the traditional one, or may have been adapted, due to various factors, where the traditional choice would not anymore be identical to the regional.

3.5.2. Baskets and People

Tradition & trading. Since the basketry items are not anymore, a required everyday household item or agricultural instrument their use has been neglected and replaced by other materials serving the same needs. Instead, their status has shifted into a decorative, souvenir or a gift item, hence not required into everyday activities. In the meanwhile, after the replacement of the basketry items with plastic or metal ones for the purposes of agriculture and the modern recognition of baskets as mainly non-utilitarian items there is a gap of time, where the knowledge carriers, the basket-makers themselves seemed to have reoccupied themselves, admitting that "no one is needing baskets anymore". Here the migrating Roma groups took over the basket-weaving craft as the non-Roma basket-makers did not weave anymore because of the diminished state of basketry, and mainly its lowered economic value. But the weaving Roma groups continued weaving and supplying baskets wherever they were needed – as a small household item or as decoration. Even if there was "no money in it" (Q1, 2, 3, 5, 7, 12) basket-making was preserved as an additional to other crafts, practiced by the Roma and slowly became recognised as “gypsy’s craft”. An interesting result of the craft’s practitioners is the recognition of the Basket-makers (*Koshnichari*) as an eponym and a subgroup of one the three main Roma communities in Bulgaria (the one of the *Daskane Roma,* Metodieva *et al.*, 2008). The majority of this subgroup is now-a-days settled in the North-east part of Bulgaria (Severnyashki and Dobrudja regions) but Romani basket-makers belonging to other regions were interviewed too.

All of the interviewed Roma basket-makers were weaving exclusively with willows and no other material. The recorded mats and rugs made with cattails, rushes and sedges were often called “gypsy mats”, which adds to the plants, chosen by these craftsmen. Here an open question may be positioned of whether the Roma weavers may have influenced the dominant nowadays willow choice as a kind of adaptation of the craft to their semi-nomadic life; or whether they “picked up” upon an already facilitated choice of “easier” weaving with willows? The shift of plant choice, expressed in hard woods being neglected and willows being preferred was recorded as mentioned above in all studied regions, so this may simply portray the modern stage of the craft. It has to be mentioned that some of my non-willow-weaving informants expressed a sense of superiority of their craft since they were not making baskets of willows but were using “real wood” (Q11), hence, according to them they were weaving in the traditional way.

Both the words “tradition” and “trade” originate from the same Latin verb: trado (tradere), meaning to hand over, to give up, to transmit (Voynov and Milev, 1937). Paradoxically, in English the two words are often contrasting, with *tradition* containing a context of preservation of original knowledge, while *trading* is synonymous to selling a good on a market. Indeed, commercialisation of certain activity has the tendency in reducing the sources (such as diversity in material, time consumption, quality) in order to increase productivity. This is when *harvesting* the basketry material is replaced by *purchasing* already selected ones and the actual makers acquire their material by dedicated *suppliers*. On the contrary, purchasing the raw material does not absolutely indicate a lack of tradition. For example, one of the interviewed willow weavers (Q6) learnt how to make baskets with willow rods from his father in law and he also inherited his tools and his workshop when he started weaving on his own (ibid.). Some of the other informants also had inherited tools, usually the handiest ones, which are in use every time one is processing or weaving a basket, such as a pocket knife, or a pair of scissors (Q7, 12). Amongst all of them was known the proverb "You've got the tools; you've got the craft!" (ibid.). But the craft had to be sometimes 'stolen'. In the cases where the weavers did not learn by a relative but while observing secretly or evidently a basket-maker until the moment when they started weaving on their own (Q1, 2, 3, 6, 11, 12) or already being basket-makers, they learn new "tricks" from others, hence they "stole" them and applied them into their own craft. In this context, another very popular proverb, amongst these weavers who "stole" their craft was: "Learnt craft is the stolen one" or vice versa "A stolen craft is a learnt craft", or "If you want to learn a craft, you will have to steal it" (ibid.). And there were plenty of ways *to steal*: to watch a maker, to work as an apprentice, or to consult the properties their items have - both technological and regarding the plant choice for the different basket parts, as not being made by themselves (i.e. presenting them as purchased items) and hence make the other weavers explain their work in details, Q1, 11, 12).

Authenticity vs identity. Nowadays this *stolen* in the past craft has a complex character amongst its collectors. Basketry items could often be seen as an illustration of the village life of the past two centuries on display either at museum exhibitions or at private ones (such as restaurants, claiming to offer "authentic" traditional atmosphere for example). Their low monetary value and their extreme abundancy as usual everyday items at the time where most of them were donated to the museums (see *Introduction*) also did not support their recognition as individual items but only the exclusive ones amongst them. This non-separation of the craft from the tradition, the commonly-accepted in the recent past meaning of a basket, as automatically illustrating *per se* the tradition, the translation of the visual object as part of the invisible symbolic of traditional rural life, places the basketry products as a synonymous of this tradition, hence as synonymous of identity.

An interesting trend in terms of the material obtained from the museum collections are the photographs depicting a basket. Often the built dedicated scenarios for taking a photograph meant to represent certain activities (i.e. rose petals, Tabaco leaves or grapes' harvest) that included a basket as a key inventory of the performed activity. But in a few cases portrait photographs were taken in order to represent the traditional costume of a certain region and a basket was attached to the personage as a signal referring to the rural life, depicted by the traditional garment and the hand-woven basket (Section 3.4.1.4.). This visual "authentic" rurality also contains the tradition perceived as more content in the country side than in the urban centres and, hence, read in a traditional way, a basket states the status of a female: according to the folklore calendar, a young girl with no head-clothe and a basket in hand means she has already been a *Lazarka*, thus she is ready to be married (ibid., Fig. 3.4.a). On the contrary, a mature woman, with a head clothe and a basket in hand could be a metaphor for a woman with a "full basket" – family (and children), house, prosperity in life etc. (Fig. 3.4.b.).

If the "authentic" rural and countryside past was to be displayed with the presence of baskets along with traditional costumes and various items, today the arrangements of baskets in contemporary spaces and their contemporary users claim to be synonymous to the true (Bulgarian) identity. A traditional (Bulgarian) tavern or a touristic souvenir shop would almost exclusively include basketry items, indicating *the traditional*. Small "local" floristic shops, "eco" wine producers or "fair trade" fruit and vegetable retailers would nowadays choose a hand-made basket, covered bottle or a large woven *kosh* for their goods, as an illustration to their local (i.e. authentic Bulgarian) trade and provenance of traded items. This pattern may be viewed as a shift in the 1980s-1990s perception that basket-making is a "gypsy" craft – the main argument applied by my informants, including the low economic value of the basketry items, for not transmitting the knowledge of basket-weaving to siblings and relatives. In support to this is the information shared with my informants that before each traditional crafts fair (either as part of museum initiatives or organised by different non-professional societies), they attempt to weave as many items as possible because "the young people are now looking for baskets" (Q11, 12, 13). The interviewees whose family business is their basket-making company (Q13) also mentioned that the principal clients for their woven furniture tend to be young private individuals or newly established customer service businesses (co-working spaces, cafés, sports and leisure centres), "ran by younger people" (Q13).This may be interpreted as a pattern of contemporary change in the public perception of basketry objects: now-a-days they are seen as part of diverse contexts, which have no relation with the rural past. This "role change" converts basketry items into an object with new meanings, such as decoration. This decoration itself also has a particular trend to "comfort", to soften the public places design, by importing items related to the rural past, hence symbolising tradition. One possible explanation of this, could be as a process of maintaining identity into the contemporary globalised world. But the roots of this process could probably be found into the recent history of the region, while moulding its last century-old new political borders.

3.6. Conclusion

This whole range of contexts – utilitarian and metaphoric – outlines the complex relationship between the craft of basket-making and its practitioners. These last remaining craftsmen are also the last living knowledge keepers in terms of traditional or chosen plants and techniques for basket-making. Unfortunately, this study has encountered only a few cases when basketry is being taught to younger weavers, who will continue weaving baskets in the traditional techniques or the ones chosen by themselves. But as few they are, they are willing to share and communicate it to others.

The interviews show that the social meaning of baskets and basket-making has shifted through time, if the production and consumption of baskets was a usual craft with everyday appliances in the agricultural activities and countryside households in the past, nowadays, it has mainly decorative character and less utilitarian. The current economic framework of Bulgaria also does not encourage the production of basketry items, as this was the case during the period between the 1950s and the 1980s. Instead basket-making proves to be a private (leisure) activity or a family-based business, in the cases when it is successfully commercialised (Q13).

Nevertheless, only a century ago, basketry was a flourishing craft performed in great variety of shapes, sizes into the different studied regions. The basketry plants were also diverse (Section 3.4.2.) and indeed, up to a certain degree they were determined by the regional geographic location with the assigned by this ecological characteristic of the area. Basket-makers, their basketry plants and their baskets were dependent on each other, but also dependent on the vegetation habitats at the locations they lived, chose their plants and wove their baskets. This relationship will be further explored into the next Chapter 4, which is dedicated to baskets and basket-makers from the Prehistory of the studied region.

CHAPTER IV. THE ARCHAEOLOGY OF BASKETS: DIRECT AND INDIRECT EVIDENCE FOR BASKETRY IN NEOLITHIC AND BRONZE AGE SOUTH-EAST EUROPE

4.1. Introduction

This chapter presents the direct (Section 4.2.) and indirect (Section 4.3.) evidence for basketry in Prehistoric South-east Europe – by means of the relevant archaeological record and the case studies for this thesis - both plant remains and impressions on pottery (Fig. 4.1; Table 4.1.). It discusses the challenges of preserving (taphonomically) and conserving (post excavation) the 'invisible' archaeobotanical remains, and also the 'enigma' of the basketry items impressed onto pots from the region under consideration. The chapter aims at the absolute (up to a species level) or approximate (up to family and/or sub-family level) botanical identification of this type of evidence as a key to understanding choices in craftsmanship in Neolithic and Bronze Age Bulgaria and Greece. A new identification tool kit is proposed to be applicable to other regions and time periods which have provided perishable basketry remains or their proxies as pottery impressions. The advantages and disadvantages of the methods applied to the two types of evidence are discussed in the last part of the chapter (Section 4.4.).

Figure 4.1. Studied prehistoric sites (white symbols) with basketry plant remains mat-impressions, amongst the summarised in the bibliography (black symbols). Legend: circle – ENMN; triangle LN-EC; square EBA, diamond MBA – LBA, square with dot – uncertain due to literature.

STUDIED SITE	MAIN FEATURES	RELATIVE DATING*	TYPE OF EVIDENCE	NUMBER OF ITEMS
PROMACHONAS-TOPOLNITSA	Tell and extended settlement	Late Neolithic	Plant remains	2
AKROTIRI (SANTORINI)	Settlement	Late Cycladic IA	Plant remains	9
PROVADIA-SOLNITSATA	Tell, production site and extended settlement	Late Neolithic – Late Chalcolithic	Mat-impressions	100
KURILO	Extended settlement	Middle – Late Neolithic	Mat-impressions	3
BULGARCHEVO	Terraced extended settlement	Middle – Late Neolithic	Mat-impressions	5
TOPOLNITSA	Terraced extended settlement	Late Neolithic – Late Chalcolithic	Mat-impressions	2
DANA BUNAR I	Extended settlement	Early – Late Chalcolithic/Early Bronze Age	Mat-impressions	27
DIKILI TASH	Tell and extended settlement	Late Neolithic – Late Chalcolithic	Mat-impressions	38
AGIOS ANTONIOS	Extended settlement	Late Neolithic-Early-Middle-Late Bronze Age	Mat-impressions	1
KASTRI	Extended settlement and necropolis	Late Bronze Age – Early Iron Age	Mat-impressions	1
SKOTEINI	Cave dwelling and necropolis	Late Neolithic	Mat-impressions	28
FRANCHTHI	Cave dwelling	Middle-Late Neolithic – Early Chalcolithic	Mat-impressions	4
MALIA	Extended settlement	Late Minoan	Mat-impressions	6
PALAIKASTRO	Extended settlement	Late Minoan	Mat-impressions	2

Table 4.1. Overview of the sites studied in this thesis, along with their main features, relative dating (for detailed chronology see Table 5.1.), the analysed type of basketry evidence and the number of accessed and studied items.*

4.2. Direct evidence: plant remains from basketry

4.2.1. Presentation of sites

Neolithic and Bronze Age South-east European archaeology has not yielded numerous basketry remains. On the contrary, this type of archaeological record is extremely rare, mostly because of the absence of favourable conditions for their preservation. Even in the uncommon contexts where plant remains of archaeological basketry have been preserved, their *in situ* and post-excavation conservation represents a major challenge, because of their fragility and perishability. Despite the aforementioned obstacles, though, very few Neolithic and Bronze Age sites within the studied area are known with their actual plant remains of basketry.

Chronologically, the earliest site from where such evidence has been retrieved is the Late Neolithic extended settlement at *Promachon – Topolnitsa*, located on the Greek-Bulgarian border, where two basketry objects were mineralised within the sediment from the fill of a pit and from a floor level (Koukouli-Chrysantaki *et al.,* 2007). These objects are currently stored in the Archaeological Museum of Serres and in the Archaeological Exhibition of Siderokastro, where for the purposes of this study access was permitted and both objects were sampled.

The next site on the chronological axis is the Early Bronze Age *tell Younatsite*, located in Bulgarian Thrace, where a single charred mat fragment was found (Merpert, 2007). The mat was found on a building floor level in the space between several grain storage pits and was woven in the coiled technique of *circa* 80cm in diameter (ibid. p. 23 – 27, Fig. 15, 16). It was split in two main pieces by the wooden logs part of the construction of the building. Since the moment of its discovery, this object has been stored in the Historical Museum of Pazardhik, but access for its study was denied as it is still being conserved.

The third site which yielded numerous basketry remains is the LC IA settlement at Akrotiri on Thera (Santorini). Twenty-nine charred basketry objects of diverse shapes and sizes were discovered with their plant remains preserved, while thirty-six impressions of basketry objects were also found embedded into the volcanic tephra (Beloyanni, 2008; 2003b). Sampling was permitted and was performed on nine objects for the purposes of this study.

Excavations have revealed further LBA basketry remains in Assiros tell (North Greece), where in phase 6 (LH IIIC) a granary structure has been discovered, consisting of the remains of multiple charred large woven items. The last were interpreted as granary also due to the large amount of charred grains found in this feature (Wardle and Wardle, 2007, Plates 4-5). Unfortunately, access to none of these objects was permitted.

On Crete, the LM III necropolis of Armenoi has produced evidence of a single basketry object originating from Grave 187 (Paterakis, 1996). This was perhaps a conical basket, *circa* 25cm in diameter, woven with coiling and decorated with bronze beads. This object was preserved in desiccated mode and the partial botanical identification has suggested it was probably woven with palm leaves (ibid.). The basket is on display in the Archaeological Museum of Rethymno, and unfortunately access for the purposes of this study was denied.

4.2.2. Sampled sites with basketry plant remains

4.2.2.1. The LN settlement at Promachon-Topolnitsa (Greece and Bulgaria)

The extended settlement of *Promachon-Topolnitsa* was excavated by Greek, Bulgarian and joint Greek-Bulgarian teams during several campaigns, starting in 1978 and terminating in 2003 (Fig. 4.1, Koukouli-Chrysanthaki *et al.* 2007). The site was considered with four occupational phases of which the earliest building stage is dated to the Early Neolithic (end of 6th millennium BC, ibid.). Here the wooden floors and wall structures were covered with clay and this is the phase that yielded the two preserved basketry objects.

The published photograph of one of these basketry objects shows it was woven in coiled technique with an approximate diameter of the coil 12-17cm, and was decorated with white paint (Koukouli-Chrysanthaki *et al.* 2007: 56, Fig. 15.1 and Fig. 4.2.a, d in this thesis). It was found in the fill of a pit amongst other botanical remains, such as bark - also with painted decoration - and wooden timber (Koukouli-Chrysanthaki *et al.* 2007: 56, Fig. 15.1.). It has been suggested that this fragment may have originated from mural decoration, which later collapsed into the pit, where the great depth and moisture favoured the object's preservation. It is unclear whether this was a three-dimensional object – a type of vessel, or a two-dimensional one, such as mat or wall panel (ibid., also Koukoukli-Chrysanthaki, 2018). The other woven object from the site is clearly three-dimensional – i.e. a vessel; upon its discovery it was block-lifted with its sediment fill and later stabilised externally with a bandage and gypsum plaster. The objects are with an approximate diameter of 32 cm (Fig. 4.2.b-c). The technique used for the manufacture of this item was undeterminable, because of the restricted access to its actual weave (covered with gypsum bandage). Almost thirty years after their discovery (between the late 1970s and the 1980s, Koukouli-Chrysanthaki *et al.*, 2007) and owing to the very adequate conservation and storage, these two objects still exist and were stored in the Archive of the Archaeological Museum of Serres (the first one) and in the Archaeological Exhibition at Siderokastro (the second one), where sampling was allowed for the purposes of this study.

Figure 4.2. Sampled objects from Promachon- Topolnitsa: a. Decorated woven fragments possibly from wall frescoes from Promachon-Topolnitsa (Fragment #1, Malamidou, 2018); b. Block-lifted woven vessel from Promachon-Topolnitsa (Fragment #2); c. Detail from the sampled surface of object #2; d. Preparation for transportation of the sample from item #2.

4.2.2.2. The LC settlement at Akrotiri (Thera, Greece)

Akrotiri is located on the Cycladic island of Thera (Santorini) and has been continuously excavated over the last 50 years (since May 1967). The settlement dates to the Late Cycladic period and its end came with the eruption of the Theran volcano in the 16th century BC. Numerous basketry objects or their impressions were recovered from the volcanic tephra. Twenty-two 'woven devices' of small and large size were discovered at Complex D (Spaces 18a and 18b) in 1994 and 1995, where many originated from the fills of pithoi and jars (Fig. 4.3.; Beloyanni, 2003, 1997).

A group of woven vessels comes from the content of pithos A106 – these are two baskets in a simple twine technique with their cross-like bases preserved, where the beginning of the weave was formed of eight branches (Beloyanni 2003, Fig. 1-3). Beloyanni (2007) refused the hypothesis that these baskets were meant to be used as covers or lids for the pithoi, but she suggested they had a metric role (i.e. they were used as measurement units) regarding the content of the jar. Another group of baskets originates from pithos A164, where a small basket (*spyris*) of coiled technique was found with its base – where the wefts were coiled around a "grass" bundle, forming nine coils (Beloyanni, 2003, Fig. 4). After the removal of this small vessel, another twelve small baskets (*kanistra*) were discovered towards the bottom of the pithos. These *kanistra* were of coiled and simple twine (8 of them) techniques and were discovered close to each other within the charred content of the pithos (ibid., Fig. 5). Beloyanni (2007) mentioned that all these baskets were placed carefully in the pithos, along with rope fragments and fishing hooks. Pithos A206 also presented a poorly preserved woven base of coiled technique, which was found within its charred content (ibid.). From the north-east area of Space 18a, there was one more woven vessel, which was preserved in a good condition (ibid., Fig. 6). This is a large basket (*kalathouna*), *circa* 1m high and 0.60m in diameter. It was found with its content – a wooden box, which contained wooden items, and a rhyton of alabaster. The basket was woven in a split twine technique and Beloyanni (ibid.) believed it was made of common reed (*Phragmites* sp.).

In Complex D (Space 18b) also a compound of two baskets was found. One of their bases was clearly consisting of eight strands shaping the cross-like begging of the weave (similar to the ones of 18a). Beloyanni suggested this item was made of wicker and common reed, based on contemporary parallels and its diagonal twill weaving technique (ibid., Fig. 7). Next to this basket, there was another one – made in coiled technique and shaped as a small pithos; it was found turned upside down (ibid, Fig. 8-9). After the removal of the above-mentioned compound of vessels, there was another one – a large basket with two handles and woven in diagonal twill (ibid, Fig. 10).

Beloyanni (2007) also mentioned another group of charred baskets from the West House 9 Rooms 4 and 5), which also came from the inner fill of pithoi (4303, 4918, 4250, P2; Fig. 4.3.). They were woven with simple twine and diagonal twill. She proposed their use as units of measurement, by bringing in linguistic (the Mycenean word *ka-ra-to* deciphered as basket and as measuring unit) and ethnographic evidence from different parts of Greece (in the words *mazourokalataho*, *axai*, *napos, pinaki* and *kofini(os)* for measurement of cereals, lime, grapes or olives.

Other spaces where impressions of basketry items were found are the Grinding House (also called Mylonas, Sector A; Fig. 4.3.), where a woven vessel was found impressed in the volcanic ash in 1969 (Beloyanni 2007, Fig. 2). This was an object woven in diagonal twill with very thin straps of wood and Beloyanni (2007) believed it was made of chaste tree (*Vitex agnus-castus*). The vessel contained spikes of sea urchin, which were also spilt over the floor level, where the basket was discovered. The following year of excavation, in 1970, another basket was found in the same house (Room 2; ibid.: Fig. 3), while in the same building (Room D1) a small woven container (*spyris*) was also recorded (ibid., Fig. 4); the latter was made in coiled technique.

The abundance of baskets (or their impressions) found within pithoi or jars at Akrotiri has been interpreted as an important element of the economy of the settlement, given that they may have been used as transportation and storage vessels (and may determine the spaces where they were stored as storage rooms) and perhaps also as measurement units, as proposed by Beloyanni (2007). On the basis of observations of contemporary basketry, she (ibid.) proposed that the baskets were woven of chaste tree (*Vitex agnus-castus*), common reed (*Phragmites* sp.), rushes (*Juncus* sp.) and Spanish (weavers) broom (*Spartium junceum*).

To verify these suggestions, plant remains were sampled from the immediate proximity of nine of the woven objects (Fig. 4.3; Fig. 4.4.). They all originated from different spaces/buildings within the settlement: $001 from a Pillar Shaft 58B (south-east from Xeste 4;

Fig. 4.4.a-b.); $002 from Pillar Shaft 43 in the centre of Room 15 of Xeste 4 (Fig. 4.4.c-d.); $011 (Fig. 4.4. e-f.) and $012 (Fig. 4.4. g-h.) from Shaft 23A of the West House; $027 from Room 18A in Delta Complex (Fig. 4.4. i-j.); $034 (Fig. 4.4. k-l.) and $035 (Fig. 4.4. m-n.) – from Shaft 68A, west of Xeste 5; $064 (Fig. 4.4.o-p.) and $065 (Fig. q-r.) – from the Shaft 61A, near Xeste 4. The sampled objects aimed at providing a larger image on basketry at Akrotiri and this is why they have different spatial origin. Since restrictions to sampling applied, it was not possible to obtain examples from each context of the excavation, which contained basketry.

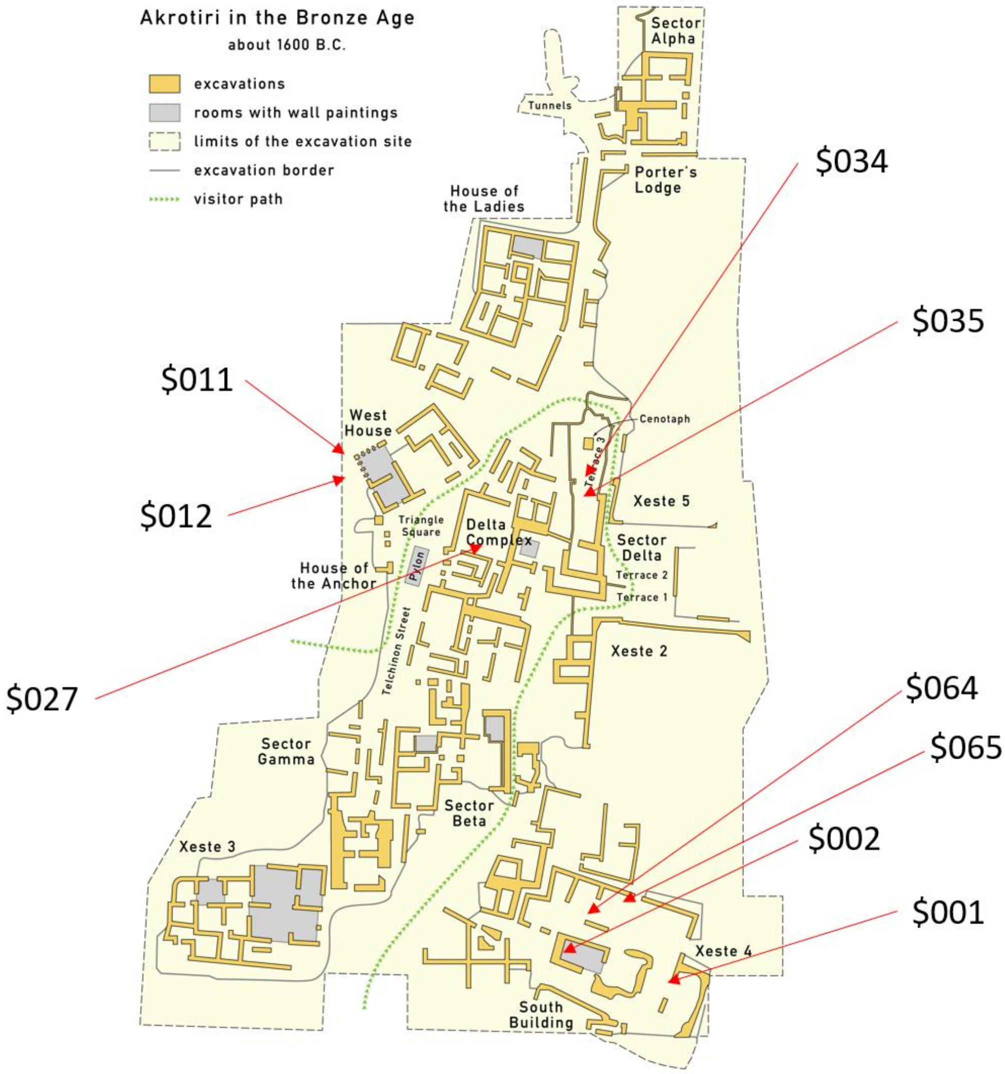


Figure 4.3. Map of the town of Akrotiri ca. 1600BC (Dörrbecker, 2007) with pointers to the sectors, where the samples studied in this thesis originated from.

Figure 4.4. Sampled basketry from Akrotiri (object prior to sampling and sampled fragments): a. Object $001; b. Sample $001; c. Object $002; d. Sample $002; e. Object $011; f. Sample $011; g. Object $012; h. Sample $012; i. Object $027 i. Sample $027; k. Object $034; l. Sample $034; m. Object $035; n. Sample $035; o. Object $064;p. Sample $064; q. Object $065; r. Sample $065.

4.2.3. Method for the study of the primary evidence

4.2.3.1. Conservation and optical microscopy of plant remains from basketry

The conservation of the largest part (samples from Akrotiri) of all examined plant remains of archaeological basketry was done with a thermo-plastic resin Paraloid B72® (10% solution), and only a small part (samples from Promachon) of the studied assemblage was conserved without any surface treatment. The Paraloid B72® is an acrylic resin (ethyl-methacrylate copolymer), characteristic for its durability and non-yellowing. Despite the fact that it is soluble in acetone, ethanol, toluene and others (Davidson and Brown, 2012), an experiment for removing the film from the samples was not attempted, mainly because of the necessity of the resin's application to stabilise these extremely brittle samples.

It is not uncommon for archaeological basketry and matting samples to be resin-impregnated. For instance, di Lernia *et al.* (2012) dealt with Paraloid B72® - treated samples from the early-middle Holocene site of Takarkori, Lybia; Paterakis (1996) applied Butvar B98® to the basket from the Late Minoan necropolis at Armenoi, Crete, because its low molecular weight favours its better penetration into the treated material. Similar is the case with the Late Cycladic baskets and basketry fragments from Akrotiri (Doumas, 2017). Nevertheless, there are other conservation techniques, applied to desiccated archaeological or ethnographic basketry, which are permitting further archaeobotanical analysis, such as Japanese kozo paper fixation (mulberry fibre, Wills and Hacke 2010; Wills, 1995a) or the application of fixating carbohydrate pastes, such as wheat starch (Alarcón *et al.*, 2012; Wills, 1995a, b).

The restrictions for botanical analysis with optical microscopy when resins are applied to the plant tissues are major because while the resin fixates the tissues in their anatomical order, the latter are not suitable for microscopic examination due to the majority of the cell morphology being filled and/or smoothened with the resin's film. Depending on the porousness of the plant tissues, the penetration of the resin substance varies – i.e. in bigger wood fragments with several growth rings preserved, the resin's intervention is likely to terminate at the first few rows of the preserved early/late wood pores, or at the level of the bark, if present. This would not be the case with wide radial cracks present in charred wood, or in the case of monocotyledonous plants, which consist of a great volume of porous tissues – i.e. parenchyma and aerenchyma in wetland plants. These porous tissues are fully absorbing the resin, applied in the process of conservation, because in most cases when monocotyledonous plants are preserved archaeologically, they are in charred, mineralized, waterlogged or desiccated stage. These stages of preservation mean that their cuticle layer (the thin wax layer in the epidermis) is no longer present and it is not preventing the resin's penetration within the existing tissues and that way result for example into made-invisible stomatal cavities in the epidermis of the monocotyledonous plants.

Nevertheless, it should be noted that there is one positive aspect in terms of the Paraloid B72® treatment observed during the analysis of this material, and this is the capacity of this resin to polarise the plain reflected light when applied to opaque material, such as charred or desiccated samples, which highlights the existing anatomical features, even if it prevents their detailed observation.

On the other hand, the fragments which were not treated with resin presented other obstacles during sampling and analysis. For example, as the sampled basketry object from Promachon was block-lifted with its *in situ* sediment fill, the latter was a major challenge during the process of sampling. The sediment consisted of very hard and finely grained silt soil, which has transformed into a compact block, supporting the basketry object during its period of deposition. The disturbance of this block in order to reach the very poor plant remains preserved in a mineralised (not charred) state proved to be a difficult task because the whole structure was extremely fragile. Finally, a brittle vegetal fragment was extracted and later studied (Fig. 4.4. c).

Optical microscopy was applied to all remains of both modes of preservation (charred and mineralised). The analysis followed the examination of the object into three planes: transversal (cross), tangential (longitudinal) and radial plane (Fig. 4.5.; Schweingruber, 2007). This combined approach is traditionally applied by the discipline of wood anatomy – either on modern, ethnographic or non-charred archaeological (desiccated, mineralised or waterlogged) wood via obtaining thin sections in these three planes, or on charred archaeological or fossil wood via manual fragmentation until reaching the three planes. The performed optical microscopy differs by the chosen light in the two cases: transmitted light for the non-charred thin sections and reflected light for the charred fragments. There are light filters aiding the two approaches, which again differ – a polarising light is often chosen to enhance the image into the thin sections, while dark and bright filters are preferred for anthracology. In all cases the observed anatomical features of the wood are the same: in the transversal (Fig. 4.5.a.) section there are annual rings, including early and late wood vessels, radial rays in the deciduous wood and resin canals in the conifers; in the tangential plane there are sliced radial rays and perforation plates (Fig. 4.5.b.), while in the radial plane – the intersections of the two previous planes are visible (Fig. 4.5.c). The different vessel types have different features which are analysed, such as early-late wood alignment, single or clustered radial rays, presence or absence of resin canals, perforation plates and relief onto the different cell types (i.e. pitting). Some vessels also differ by type in different species, such as the perforation plate (simple or perforated). All the above-mentioned morphological features are diagnostic for the determination of the wood species and in most cases all three planes are required for full identification.

In terms of the second studied plant category – the monocotyledonous species – a combination of optical (high-powered microscope with PPL light) and SEM was applied too. Similarly, to the wood anatomy, analysis in different planes was necessary also here, but they were reduced to two – cross section (transversal plane) and longitudinal, which in the case of monocots is equal to the epidermal surface. In a complete cross section, the following tissues and organs should be detectable (from the outermost layer of the epidermis towards the innermost pith): sclerenchyma, aerenchyma (for aquatic plants), rings vascular bundles, pith (Fig. 4.5.d, f.; Evert, 2006). In the longitudinal plane, when the epidermis is complete, an alternation of long and short epidermal cells should be visible with interzones covered with stomatal cells (Fig. 4.5.e.).

Some of the diagnostic features in the cross section are the presence/absence of aerenchyma, the shape, size and morphology (the development of xylem and phloem vessels) of the vascular bundles (Fig. 4.5.f). Nevertheless, the cross section should always be combined with the epidermal anatomy for completeness of the analysis. The diagnostig features in the epidermis are the shape of the long and short epidermal cells – the cell wall relief (undulated or not) and the overall shape of the short cells; the anatomy of the stomatal cells – are they simple or compound (parasytic) and how are the subsidaty cells positioned; also the overall appearance of the stomata – are they superficial or sunken bellow the level of the long and short cells. When in archaeological contexts, the long and short epidermal cells may be subject to silicifying and then they are analysed as phytoliths; here again their shape is diagnostic (Fig. 4.5.f. – left; Piperno, 2006).

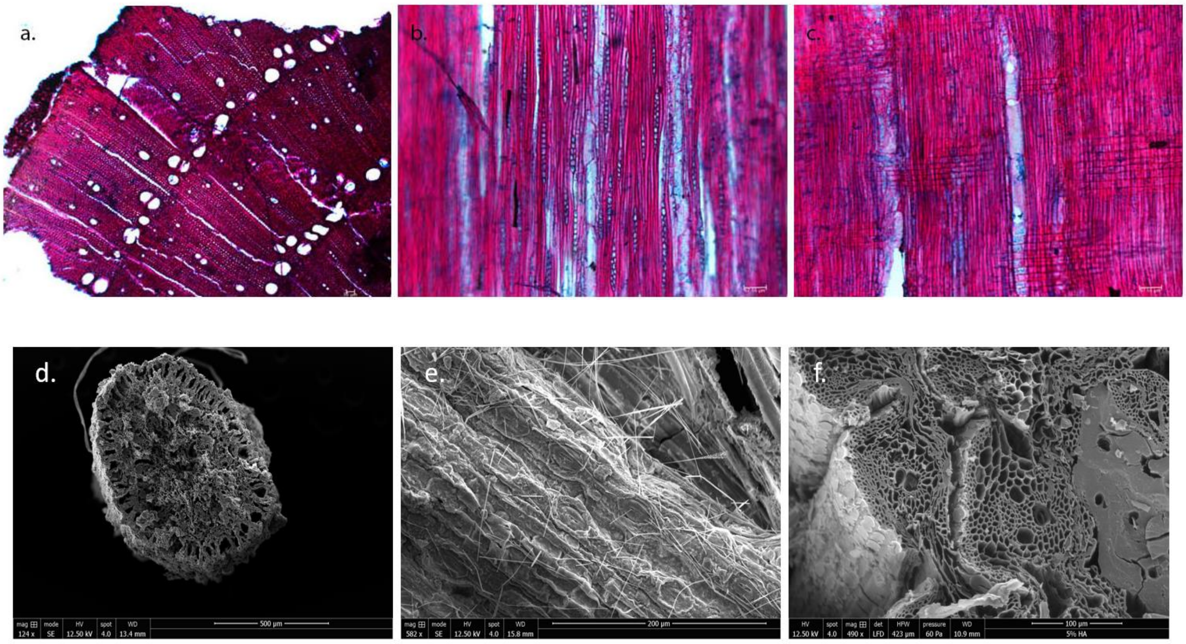


Figure 4.5. The three planes for comparative wood anatomy of ash (Fraxinus sp.): a. Transversal (Cross section), b. Tangential (Longitudinal section), c. Radial plane; Two planes for the anatomy of monocots: d. Transversal, e. epidermis and f. cross section and epidermis.

4.2.3.2. X-ray computed tomography (CT) scanning

The last two decades have witnessed a significant advance in the application of x-ray computed tomography (CT) to the analysis of wood anatomy, ecology, chronology and archaeology. This method was applied to one sample from Akrotiri in order to assess the state of preservation of its plant tissues and to further estimate the potential of the method for the purposes of botanical analysis and identification of charred basketry remains (Fig. 4.6).

CT is an x-ray-based analysis and plain x-rays have been used in archaeology since the 19th century to first look inside a mummified Egyptian mummy (Hughes, 2011). The x-ray method was then frequently applied to mummified bodies between the 1970s and the 1990s, both in Europe and the US. The first CT scanner was invented in 1972 by Sir Hounsfield, who later received a Nobel Prize for his discovery (ibid.). Only a few years later the CT scanner was utilised for medical diagnostics, being the first instrument producing a 3D image of the human body (ibid.).

The general principle is as follows: an x-ray beam is directed to the patient/object and is absorbed differently from the different material between the x-ray source and detector. As the density of the material increases, the attenuation of the x-ray beam increases too (Hughes, 2011). According to Mansbridge (2015), there are four standard densities or colours, corresponding to a standard radiograph (as CT uses x-rays): white (bone), soft tissue, fat and air (black). Based on the density of the human brain, there are hyper dense images (such as bones, acute haemorrhage, and calcification) or hypodense (air, oedema, and infarction).

There are several advantages and disadvantages in the application of the CT scanning. Amongst the pros are: CT scanning is a non-invasive technique and this is its greater advantage – the ability to show an internal structure in a non-destructive way. It eliminates the interference with the object, while conventional microscopy requires destructive methods, sectioning and plane achieving, which are time-consuming and harm the object. CT scanning also represents the object's original structure and features, creating a three-dimensional examination, without any damage to the cells or creating artefacts during the sample preparation (Bulcke *et al*., 2009). On the other hand, the major restriction is the impossibility for detailed anatomical observation.

Recently x-ray CT scanning was applied to the study of heritage wooden objects of all sizes, varying from large Japanese wooden statues (Morigi et al., 2007), Italian or Flemish medieval musical instruments (Sodini *et al.* 2012, Bulcke *et al*. 2009) to Renaissance miniature paintings (Morigi *et al*. 2007). This tool for non-invasive diagnostics and analysis revealed a great range of aspects of the inner construction and structure of the observed objects, such as the application of 'invisible' adhesive, fixating or supporting elements – glue, micro pins, and micro wooden wedges. Apart from the technological analysis, CT scanning was applied to the study of wood anatomy of archaeological objects too.

Stelzner and Million (2015) applied CT (μ-XCT and Sub-μ-XCT) scanning to archaeological wood contained in two block lifted soil samples (stored for "future analysis in the 1900s, when the excavation was carried out) and wood originating from a metal sword, from an early Medieval cemetery in Lauchheim-Wasserfurche in Germany. The CT scanning of the sword gave further insights into its scabbard, hilt and pommel construction, as the use of a wooden wedge in the making of the pommel. But in terms of criteria for botanical identification of the wood, the main issue of the analysis was the achieved resolution (ibid.). The wood from the block-lifted samples was preserved in 30 x 10 x 4mm and 130 x 90 x 14mm surfaces and in the first case the resolution obtained was 115μm, while in the second – 125μm (while applying μ-XCT). The combination of recorded features (large-luminal early wood vessels, their lumen diameter, 2-3 visible ring boundaries, medullary rays etc.) allowed the authors to identify the wood as oak (*Quesrcus* sp.) and to conduct further dendrochronological measurements. In the third case the wood fragments were larger in size (i.e. 13 x 8 x 1.5 mm) and the applied Sub-μ-XCT reached a better resolution of 25μm for the first sample and 2μm for the second one, which was sufficient for the identification of beech (*Fagus sylvatica*). In addition, these results were verified by comparison with a CT scan of another wood sample and with micro sections from the same species in combination with classical reflected light microscopy.

Modern and archaeological wood preserved in the metal corrosion layers of weaponry from a medieval cemetery in Belgium was studied by Haneca *et al.* (2012) with the application of Sub-μ-XCT. The sample size was 1mm³ and the authors identified two wood species, holly (*Illex aquifolium*) and cherry (*Prunus avium*) by applying a voxel pitch of 0.75 x0.75 x 0.75 μm³. Despite the obtained good visibility of the wood anatomy some features were hard to be observed, such as the scalariform perforation plates, where bars were difficult to be counted. However, the authors managed to achieve images at 100 μm scale, where they were clearly visible in both modern and archaeological wood (for instance, the width of the scalariform perforation plate in *Illex aquifolium* were *circa* 25 μm). Another difficult to detect feature was the spiral thickness, which Haneca *et al.* (2012) managed to detect only in modern wood, and not in the archaeological samples (the width of these helically ridged vessels is < 20 μm). The aforementioned limitations were overcome once again by combining the CT scans with an optical light microscopy of both modern and archaeological woods samples and this way a complete botanical identification was achieved. Still, the authors stated that the 3D visualisation of the CT segments is to be considered 'a powerful tool' (ibid: 899) towards the wood identification, at least when applied to modern samples.

Mizuno *et al.* (2010) analysed a 16th century wooden mask from Japan (but perhaps originating from Korea) by applying synchrotron x-ray micro-tomography. They managed to identify the wood species as willow (*Salix* sp.), which changed what was believed to be the wood chosen for the mask's make (alder, *Alnus* sp.). The wood fragment they analysed was of size 5 x 3 x 7mm, and the region of investigation (targeted observation, ROI – region of interest) was 1 x 1 x 0.7mm. The achieved resolution was 0.5 µm/pixel, which made most of the wood anatomical features visible, even the small ones like the vessel ray pitting. The authors also combined their CT scanning of the mask with optical light microscopy of reference material of the questioned species, which was also Ct scanned and allowed them to produce high quality 3D reconstructions.

Four fresh wood samples, representing hard-and soft-wood in both temperate and tropical climates: Scots pine (*Pinus sylvestris*), beech, movingui (*Disthemoanthus benthamianus*) and afzelia (*Afzelia bipindensis*) were studied by Bulcke *et al.* (2009). The samples from this species were microtomed in size 1 mm^3 and then scanned with the Sub-µ-XCT. The achieved voxel size was <1µm and the achieved resolution < 25µm. Except for the microtomed slides, the authors examined also Scots pine volumes of size 1.6x1.8x1.1mm. The performed x-ray sub-micron scanning of the samples from this fresh wood samples allowed them to observe all the internal wood anatomy as scalariform perforation plates, ray pitting and prismatic crystals (pits and larger crystals are with diameter *circa* 20 µm). The sufficient achieved resolution in combination with the good state of the wood anatomy (as originating from fresh samples) resulted in advanced 3D image visualisation, demonstrating the potential of the method.

Bird *et al.* (2008) recommend CT scanning should be conducted on archaeological charcoal, prior to their radiocarbon dating, in order to remove the possible contamination of environmental carbon (deriving from soil deposition, fungi etc.). They observed experimental laboratory produced charcoal of Scots Pine (of sample volume 0.7cm^3), along with ancient and archaeological charcoal. The authors aimed at studying the internal wood structure alterations caused by the pyrolysis and the deposition process, such as changes in wood porosity and mineralisation. Again, here the major limitation while applying CT scanning to wood anatomy analysis was the resolution of the scans. The achieved resolution was above 21 µm, and even in wood characteristic with its high porosity, most of the pores are < 20 µm, so any other feature (such as smaller pores or cell walls) falling below this scale was not possible to be observed. The authors observed an increased wood porosity after the pyrolysis with 3D reconstructions, using the CT segments. They also recorded the mineralisation of the outer surface, and the inner features (such as pores) of archaeological wood, using the X-ray density imaging (displaying the mineral particles as denser, i.e. brighter) and stated that recording this will aid the better understanding of the environmental alteration and degradation process of charcoal.

A micro CT analysis was conducted with one fragment from Akrotiri (sample $035, Fig. 4.6.a-d) with Phoenix v/tome/x M® industrial scanner and was performed at the Hounsfield Facility of the University of Nottingham in order to estimate the plant tissues' preservation and confirm the weaving technique's determination. The scans were performed with a resolution of 8μ due to the relatively big sample size (*circa* 4mm in diameter), which determined the FOD (focus-to-object distance) of 818.6(7) and 32.74(9)μ, operating in magnification 24.9. The scans were analysed with Phoenix datos/x 2.0 CT software, where three-dimensional images and a video were produced. The imaging was oriented along the X and Y axis of the specimen, where the horizontal (X) view represents the longitudinal plane, while the vertical (Y) shows the transversal plane.

Even if the application of CT scanning to samples of archaeological basketry was experimental and performed only via test scans (no detailed and systematic scans of each sample), it proved a successful tool for the assessment and diagnostics of charred, brittle plant remains of minimal size. It allowed the estimation of the preserved tissues and guided the choice of destructive analysis.

4.2.3.3. Scanning Electron Microscope Imaging (SEM) and Energy Dispersive X-ray Spectrometry (EDS)

SEM imaging was applied to all plant remains from the two studied sites, which yielded botanical remains of basketry. The aim of the SEM analysis was to achieve a botanical identification where possible to a species level. This was done by imaging cross and longitudinal plains of monocotyledonous and dicotyledonous plants. In the case of monocots, the preserved plant tissues, which were visible in the transversal plane were the epidermis, sclerenchyma, parenchyma/aerenchyma, and vascular tissue; while in the tangential plane the morphology of the epidermal tissue was studied, including the epidermal and stomatal cells and their coastal zones. In the case of dicots (wood), only a transversal section was obtained, while the tangential remained inconclusive due to the state of preservation of the material.

It should be noted that the SEM imaging was a challenging process, for a number of reasons. Firstly, the samples' size was below the commonly accepted for traditional anthrocological analysis (up to 4mm per fragment, with an absolute minimum of up to 2mm in the cases where an identified charcoal assemblage has been already established, Asouti and Austin, 2005). This was the reason why the mounting of both cross and longitudinal planes of the fragments onto carbon stubs for SEM analysis was very difficult. Successful object stabilisation in transversal section (upwards) was almost impossible because once placed in the chamber, the fragments were shifting from their original places (according to mounting) and this produced 'noise' (blurriness and unclear feature imaging) in the SEM imaging. An attempt to avoid this was done when using 30% angled stubs, so the object was mounted in an angled position where via the SEM camera rotation trajectory both cross and tangential planes were observed (see Setion 4.2.4.). In addition, unfortunately, some of the smallest (i.e. 1mm x2mm) fragments were destroyed during the mounting process or during the coating process. Another conservation issue also challenged the SEM imaging and this is the Paraloid B72® treatment of the samples from Akrotiri (Section 4.2.4.2.) The plant anatomy where the resin had penetrated was smoothened and obscured by the film, creating false features or preventing the identification of the micro-morphology, such as the type of stomatal aperture (i.e. parasytic or simple stomata).

In addition to the SEM imaging, energy dispersive x-ray spectrometry (EDS) with back scattered electrons was conducted with the samples from Promachon – Topolnitsa, where via chosen fields on the surface of the specimens the present chemical spectra was analysed. EDS is a commonly applied method along with the SEM imaging because of its capability for elemental analysis. The samples from Promachon-Topolnitsa raised a question of their elemental composition, because of the presence of a decorative pattern. The elemental spectra were also shown proportionally and an option for detecting patterns among the elements was applied (i.e. if different chemical elements have similar spatial distribution and saturation, which creates a pattern (Fig. 4.9).

The advantages of the applied combination of SEM and EDS include their complementarity when used together but the EDS spectra would be more informative when applied to multiple samples, so that the elements spectra may be analysed and compared. The SEM imaging proved an absolutely necessary tool for the imaging and the identification of the above described samples of minimal size and brittle mode of preservation. No constrains were registered here, except the difficult sample mounting and sample stability in the cases of extremely small specimens.

4.2.4. Results: assessment and identification of the direct evidence

This section presents the process of assessment and identification (protocol) of the botanical remains of basketry studied in this thesis. All diagnostic features were imaged, while the achieved absolute (to species level) or approximate (to a family and/or subfamily level) identifications were summarised in Table 4.1.

A test micro CT scanning was applied to fragment $035 from Akrotiri in order to estimate the level of preservation of the plant tissues and to direct the destructive sampling for optical microscopy and SEM. The stage of preservation of the plant tissues is visible in shades of grey, which can be interpreted with the Hounsfield grey scale, corresponding to a standard radiograph: where the black colour shows air voids, grey less dense tissues and white very dense tissues (Mansbridge, 2015). The radiograph views (Fig.4.6. a-c.) was combined with a surface determination views (Fig. 4.6.d), where the density of the preserved plant tissues can be shown.

As expected, being in a charred stage of preservation and following a deposition process, which lasted more than 3500 years under the volcanic tephra, the porous tissues were almost decomposed, which is particularly visible at the Y axis (virtual transversal section). The organs, contained in the ground tissue as the vascular bundles were not visible on the CT scan, but the highly porous aerenchymatic and parenchymatic tissues seemed to be preserved (Fig. 4.6.c). On the other hand, the epidermal tissue, shown on the X axis was less dense, thus not that well preserved, as shown in the surface determination mode (i.e. with grey, rather than white for the cross section).

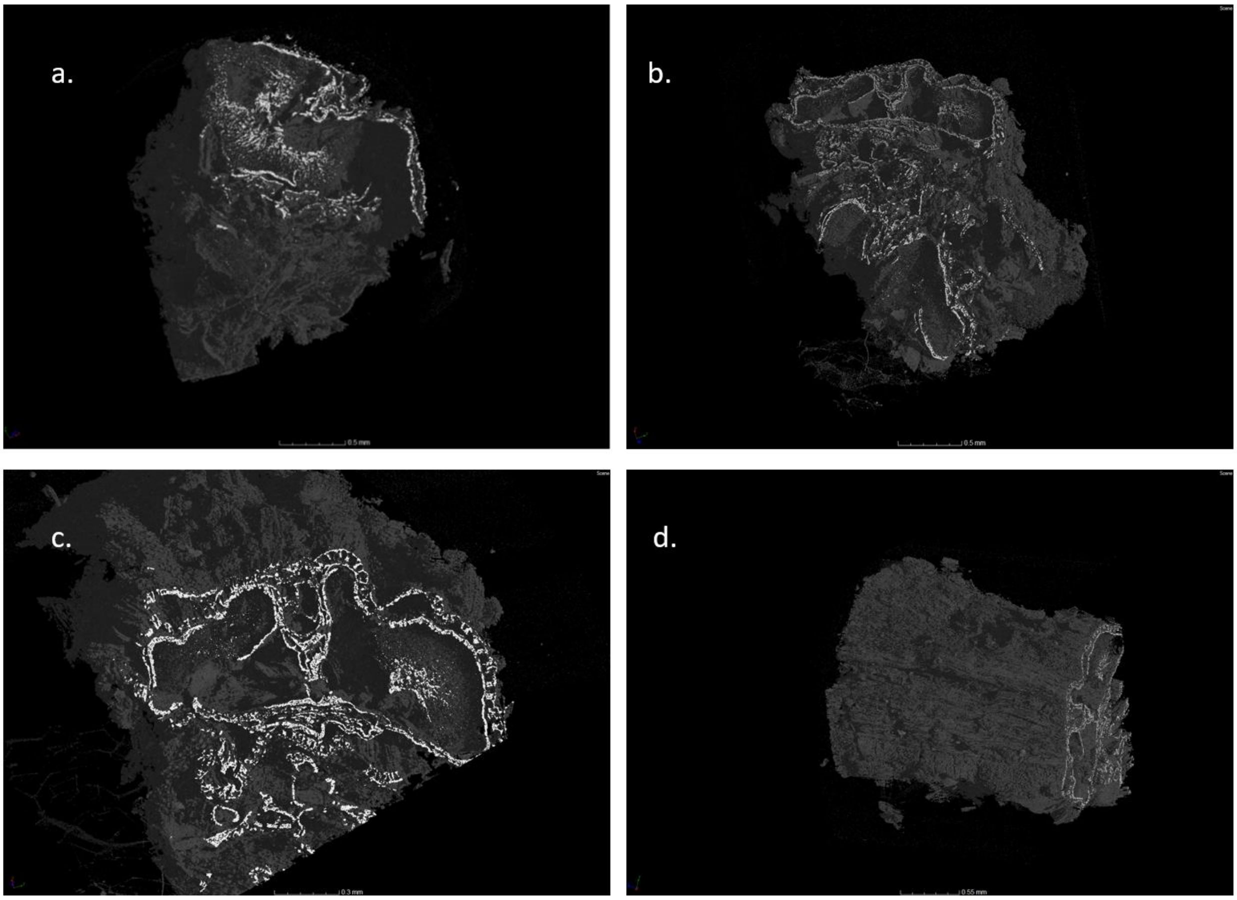


Fig. 4.6. CT scans of Sample $035 from Akrotiri: a – c. different angles of a single cross section; d. epidermal surface with angled cross section.

4.2.4.1. Promachon-Topolnitsa

SEM imaging (performed with Quanta 650, operating with software "x T microscope Control v 6.1.10 build 3365" in the Nanoscale and Microscale research Centre of the University of Nottingham, UK) and EDS analysis were applied to the two (2) fragments from basketry objects from Promachon-Topolnitsa. The first analysed fragment (P-T 1) was the one thought to have its origin from a wall structure, mainly because of its white paint decoration. The second one (P-T 2) originated from a floor structure and was block-lifted together with its content.

Transversal orientation of the P-T 1 was achieved but with no conclusive morphology to inform on any possible botanical identification. The mounting of the fragment into a position suitable for obtaining the transversal plane was done very precisely, given the minimal sample size and its fragility, on a 30% inclined stub (4.7.a-d). Unfortunately, the uneven cross section was deeply layered with sediment debris, along with an external layer, perhaps a secondary deposition product (Fig. 4.7. d). On the other hand, the longitudinal plane was achieved much easier, owing to the elongated shape of the studied fragment. Here the abovementioned external layer was disturbed at some points and the cellular plant morphology was reached. Again, the latter was heavily disturbed; possibly as a result of taphonomic issues as well as the current extremely brittle state of this fragment (which certainly caused further damage of the preserved features, when transporting and especially when mounting for SEM analysis).

It should be noted that the longitudinal plane of this fragment presented two types of phytoliths (Fig. 4.7.c), which were identified originating from the short cells (also known as silica bodies) and long cells of the leaf epidermis (Piperno, 2006; Metcalfe, 1960). This is the only actual botanical information towards the identification of this fragment, pointing to the direction of a monocotyledonous plant of the Poaceae family (Piperno, 2006), which may have been chosen for the weaving of this decorated mat. The observed phytholiths are as follows: bilobate short cells, also known as dumbbell-like (Panicoideae, type 1.), elongated long cells with undulate walls (Pooideae, type 3.) and *cf*. rundells/disturbed trichomes, which resemble of *cf*. type 4-5 in Pooideae, or may correspond to broken trichomes with their basal cells, as shown by Di Lernia *et al.* (2012, Fig. 7.f.) at their SEM image of *Panicum* type epidermis. Both the short (bilobate) and the long cells (undulate) phytoliths are arranged parallel of the length of the stem. They are also surrounded by what looks like as hyphae, but may also be trichomes. The combination of bilobate phytholits and hairs is associated with *Panicum* type plants (di Lernia *et al.,* 2012).

The subfamily of Pooideae is the largest subfamily of the Poaceae, including more than 4000 species, while the Panicoideae covers more than 3000. Here the two patron species of the abovementioned phytolith types could be examined closer, i.e. *Panicum* sp. and *Poa* sp. For *Panicum* sp., the only classified as native species on the territory of the Balkans, including Greece and Crete is *Panicum repens* (EuroMed database: Valdés *et al.* 2009), which grows up to 1m and its leaves are densely covered with papillae on the apices and on the sides of the ribs of the adaxial surface (Metcalfe, 1960). The epidermis of *Panicum milliaceum,* classified as alien is also covered by trichomes (ibid., Euro+Med, 2006)

The long cells of *P. milliaceum* are described as slightly sinuous by Metcalfe (1960), while the silica bodies are described as cross shaped, but mostly tall and narrow (ibid.). The non-native for the Euro-Mediterranean zone species of *P. capillare* and *P. millieaceum* (Valdés *et al.* 2009) also have their epidermis abundant with trichomes and their silica bodies are cross to dumbbell shaped, situated between the veins and sometimes with distorted appearance (i.e. *P. capillare*, Metcalfe, 1960). *P. capillare* and *P. milliaceum* have relatively short leaves (up to 30 – 40cm), while the native for Cyprus *P. turgidum*, being the closest geographically to the Balkans native species, grows up to 1m tall and also has trichomes on its epidermis (Di Lernia et all., 2012).

For *Poa* sp. the major native species for the Balkans, including Greece are: *P. alpina*, *P. bulbosa*, *P. cephalonica*, *P. compressa*, *P. glauca*, *P. palustris*, *P. pratensis*, *P. trivialis* (Valdés *et al.* 2009). The long epidermal cells of all species, excluding *P. glauca,* are described as sinuous and *P. alpina* and *P.bulbosa* as very sinuous; *P. alpina* also has pitted walls (Metcalfe, 1960). The long cells (Fig. 4.6. e, g) are more likely to be classified as slightly sinuous and no pitting is detected on the image. Of these species a few grow quite high in their length: *P. compressa* reaches up to 60cm, *P. palustris* – up to 150cm, *P. trivialis* – up to 100cm (GrassBase: Clayton *et al.*, 2018). Only *P. compressa* is described as definitely having trochomes (not prickles, Metcalfe 1960), but in any case, the image on the sample from Promachon – Topolnitsa does not present a clear picture - whether the trichomes' basal cells are present (i.e. they are not detected as positioned regularly) or whether these rounded structures correspond to other phytholith elements.

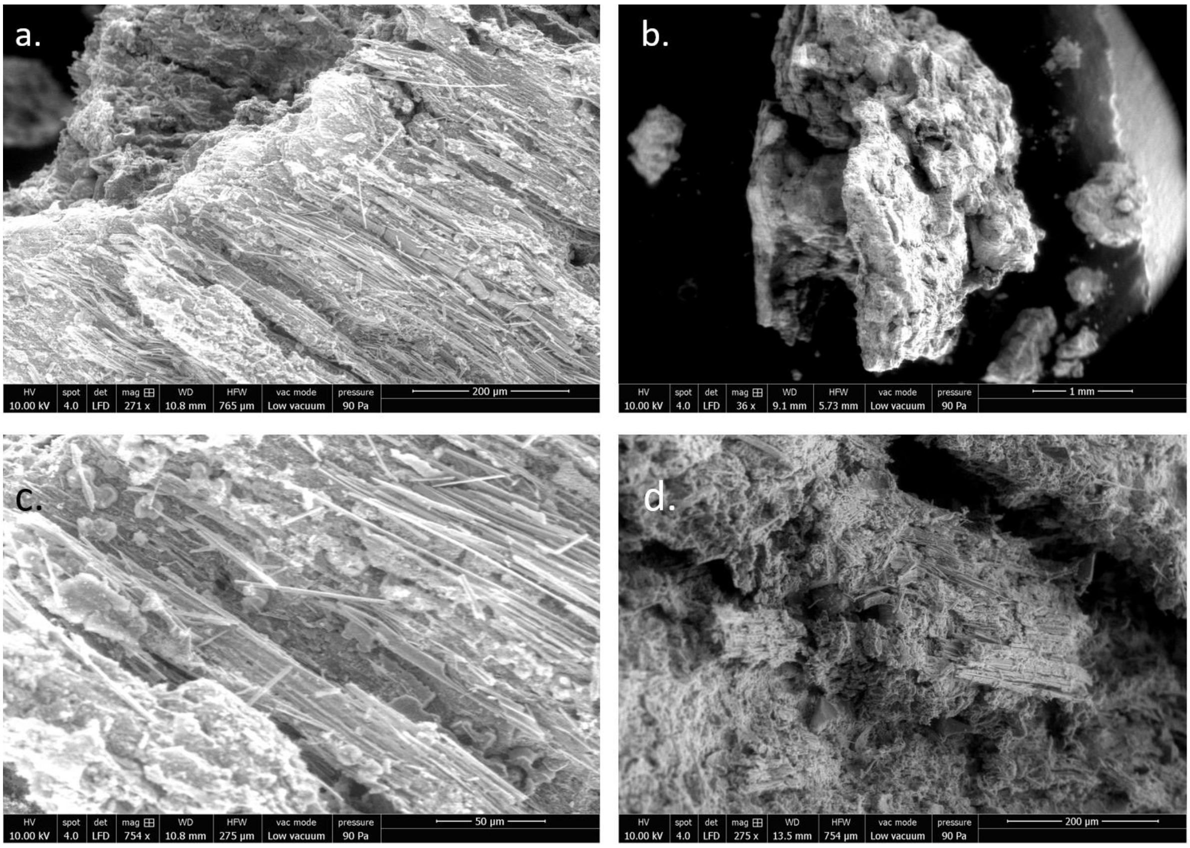


Figure 4.7. First painted fragment from Promachon – Topolnitsa (P-T 1): a. Longitudinal and partial cross section view, aided by an inclined stub; b. Cross section of the painted sample, disturbed and obscured morphology; c. Elongated undulate, billobate (dumbbell-like) and cf. roundel photoliths on the painted sample, along with papillae/hyphae; d. Disturbed morphology in longitudinal section of the painted sample.

Questioning the secondary coloured layer which covers the abovementioned fragment from Promachon - Topolnitsa and putting forward the hypothesis that this may be either a taphonomic by-product and/or a product of the decorative white paint, an energy dispersive spectrometry (EDS) analysis was applied with back scattered electrons to this uncoated object' surface, during the SEM imaging of this fragment. Thirteen (13) zones were targeted into the longitudinal surface of the fragment of which one (Spectrum 13) partly captures the cross section (Fig. 4.8.a-b.).

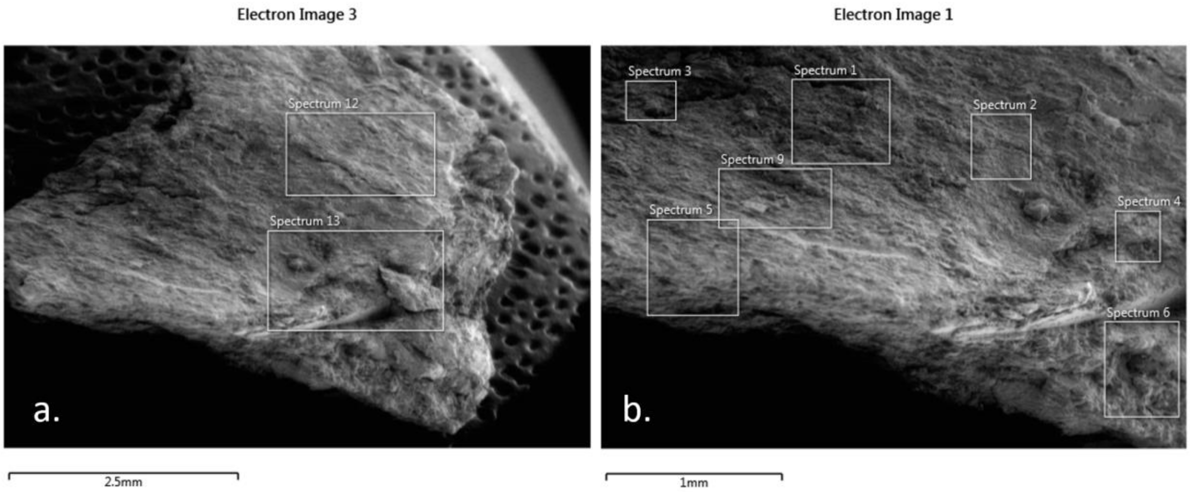
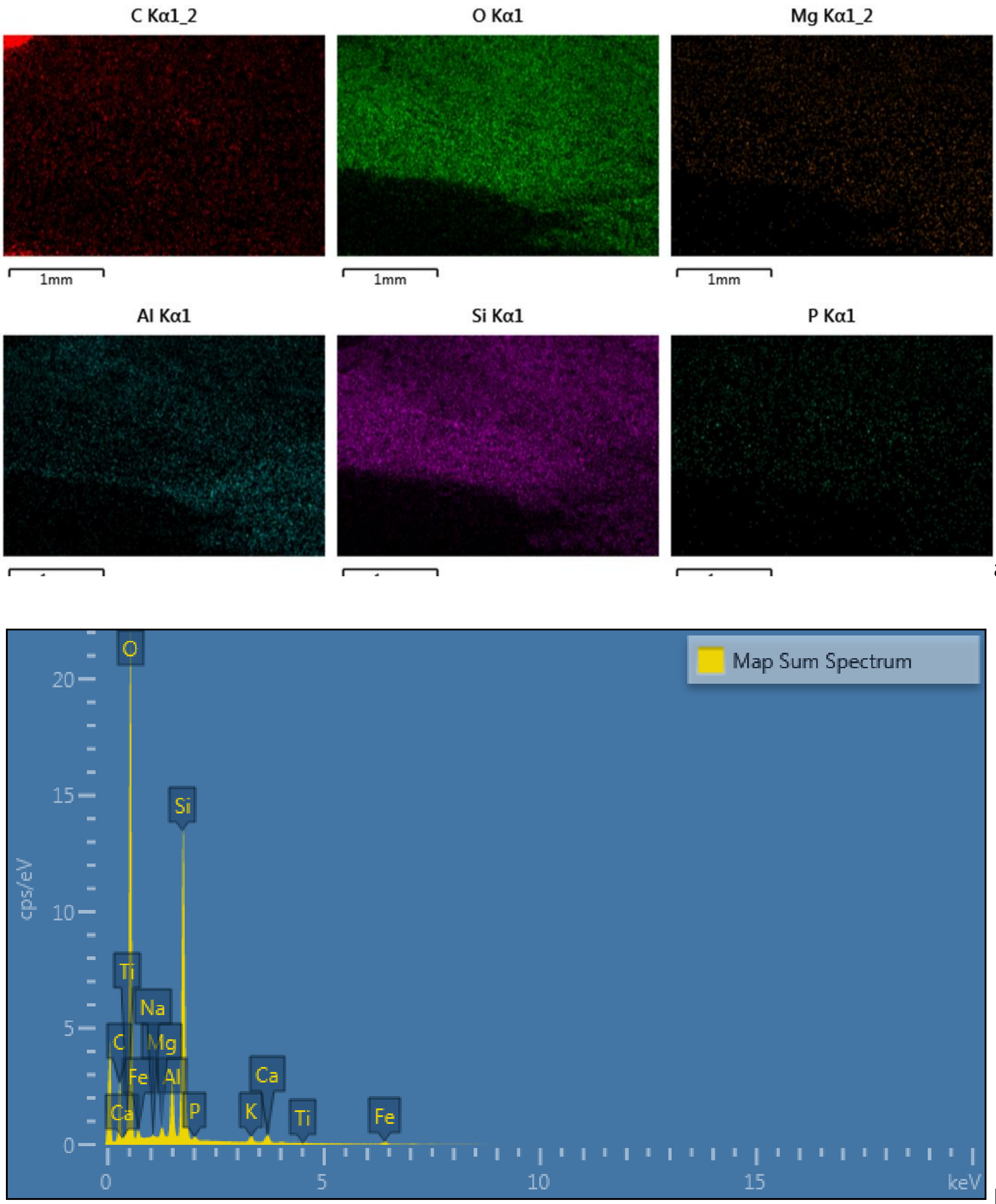


Figure 4.8. Zones for EDS analysis on fragment P-T1: a. terminal (12 – 13) spectra and b. initial ones (Spectra 1 – 9).

The chemical spectra contained extremely high values of oxygen (O), high values of Silica (Si), lower values of Natrium (Na), Aluminium (Al), Iron (Fe), Calcium (Ca) and very low values of Potassium (K), Ti, P (see spectral sum in Fig. 4.9.b). The patterns of the chemical spectra correspond to O, Si, Al and Mg, where O shows highly saturated pattern, Si and Al less and Mg – the least (Fig. 4.9.a). The high Si values are also definitely corresponding to the opalisation process during the formation of the phytoliths with the formation of silicon dioxide (SiO_2) (Piperno, 2006). Si and Al may be associated with clay minerals originating from the sediment or from any secondary treatment to the woven surface, such as mud-plastering (Di Lernia *et al*., 2012); this could also support the hypothesis that this fragment may be part of a wall decoration. Ca may refer to gypsum (ibid.) or any lime-based substance, which may be used as a colour decoration of the fragment. Nevertheless, a conclusive interpretation could not be provided, because of the lack of other comparative spectra from other samples from the site. Here it may be only suggested that the analysed fragment may have originated from a coloured wall decoration, perhaps representing its base – a woven structure attached to the wall and supporting the paint.



a.

b.

Figure 4.9. a. Patterns of the chemical elements after the EDS analysis; b. Spectral sum of 13 different spectra, obtained via 12 points along the longitudinal surface of the fragments and 1 – partly at the transversal.

Fragment P-T 2 from Promachon – Toppolnitsa comes from a block-lifted with its fill circular vessel (*cf*. a basket or type of container). Here no decoration of the surface was detected as the weave surface was deeply embedded into the sediment fill. This made the determination of the technique also impossible. The fragment, which was sampled from this object was in a better condition than the previously discussed one. Here a transversal plane was obtained and a woody plant was determined (Fig. 4.10.a-c). One ring boundary and partially a second one was observed and then it was concluded that the material is a ring-porous wood with flame-like distribution of early wood vessels and alternating uni- and bi- to triseriate rays (following Schweingruber, 1990). As other than transversal sections were not achieved because of the brittleness of the specimen, the exact determination to a species level was not possible (Fig. 4.10.d). An example of taxa with the abovementioned characteristics (ring porous wood with flame like distribution and alternation of uni- and multiseriate rays) is oak (*Quercus* sp.), but no botanical determination is possible here, unless more material is granted for study.

The two analysed fragments from Promachon- Topolnitsa represent two completely different basketry products. P-T 1 is very likely to represent a flat woven object, forming a structural base for a coloured wall decoration. It was woven with fine monocotyledonous wefts shaping robust fabric, supporting the layered painting. P-T 2 represents a three-dimensional storage or transportation vessel, which was sturdy and designed to bear its content. It was made with thin wood shoots – flexible when woven, but hardening through time and that way creating a rigid vessel. The two analysed items provide two strands of information on architectural features, such as wall decoration, and of everyday domestic activities, such as storing of goods.

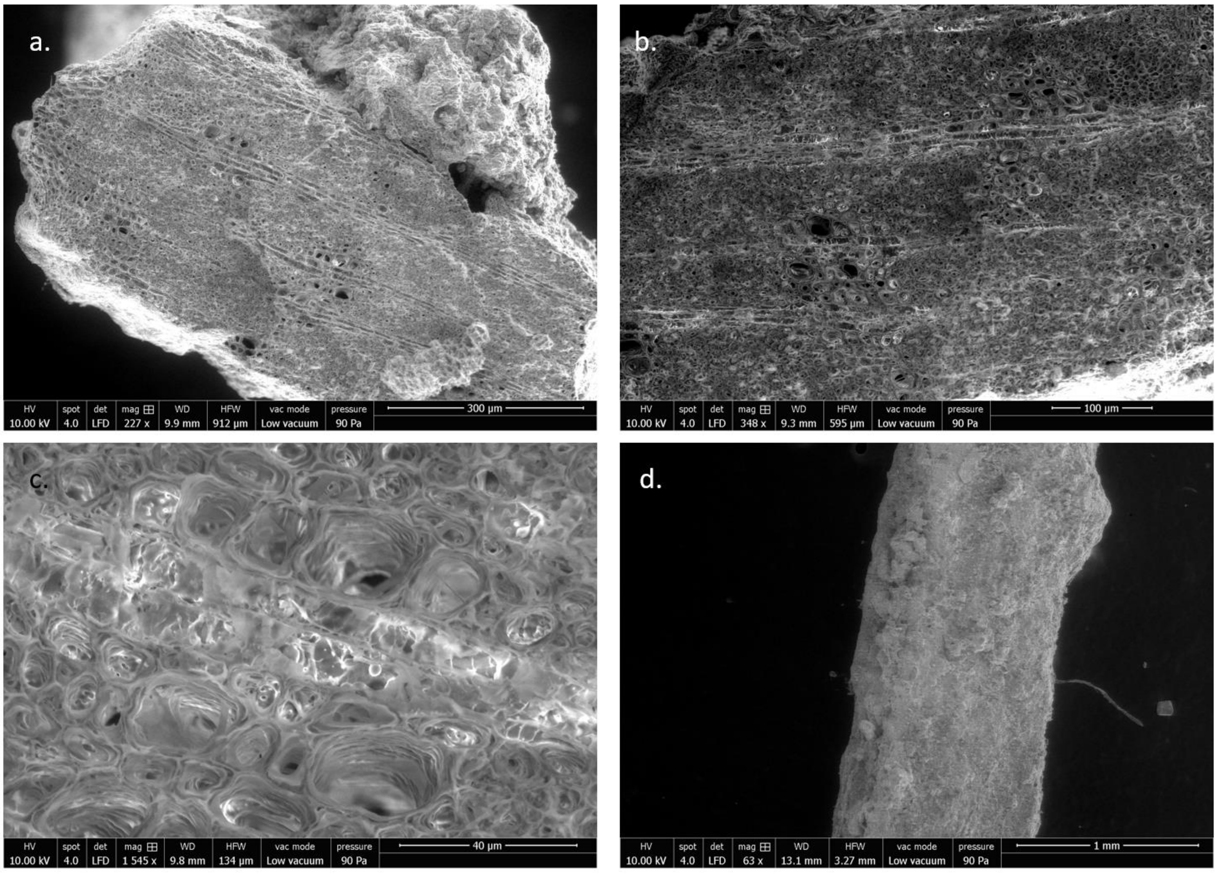


Figure 4.10. SEM imaging of P-T 2: a. Cross section of P-T 2 with flame-like distribution of early wood vessels; b. Close-up of the cross section – early wood vessel with spiral structure and bi and cf. tri-serrate rays; c. Close-up of an area of early wood, divided by a bi-striate ray; d. unidentifiable structure (cf. bark.

4.2.4.2. Akrotiri (Thera)

Nine samples from nine different woven objects of the LC settlement of Akrotiri were analysed. Following sampling limitations, all of them were retrieved from the fragmented parts of the basketry object, in order to avoid destructive sampling of the preserved weaves. All fragments were further divided in the laboratory facility and the most promising ones were selected for analysis (see Chapter 6 on limitations of this study). Object **$001** (8844) originates from the Mill House (Mylona), Sector A, Pillar shaft 58B and is determined as *kophinos* (conical basket, Beloyianni 2007, 2003) with dimensions: 0.31m in diameter and 0.213 in height. It was discovered full of lime inside an earthen grape-pressing floor. The *kophinos* is woven with doubled wefts in simple twine technique (Beloyianni 2007, Fig. 20). Its base is also preserved along with the initial cross point where the weave commences (Fig. 4.4.a-c). Beloyanni (2007) suggested the object was made of rushes (*Juncus* sp., with a common name in Greek 'vourla'). Object **$002** is an unpublished object of unknown shape and size and it is not clear if this was a 2-d or 3-d woven item. It originates from the floor of the first floor of Room 15 of Xeste 4, Pillar Shaft 43 and it was found full of pumice. Object $002 is of coiled technique and circular orientation, i.e. the fragment may be part of a basket's base, a bag (or zembil) or a mat (Fig. 4.4. c-d.). Object **$011** originates from Pillar Shaft 23 A, it was on top of amphora A44 (Beloyanni CAT 9.2) and is an unpublished item of possibly coiled technique. Similarly to object $002, it could be part of a basket base, a mat or a bag, either a two- or three-dimentional item (Fig. 4.4.e-f.). Object **$012** is an unpublished item which originates from the same context as $011 but was found West of amphora A64. Object $012 is partially made with coiled technique and may be part of a mat with its selvage and/or stitches (Fig. 4.4. g-h.). Object **$027** is an unpublished item from Room 18A, but there are other woven objects from the same context, which have been published (Be 2007: 60, Fig.16; Beloyanni, 2003, p. 443, Fig. 12; in this thesis Fig. 4.4.i-j.). The determination of the technique of this item is not possible, because of its distorted stage of preservation. Object **$034** is a published woven zembil with one preserved handle from Pillar Shaft 68A. The zembil is woven in a simple twine technique, while the handle itself appears to have been made with coiled technique (Fig. 4.4. k-l.). Object **$035**(8860, 8862) is a published woven item, which comes from Pillar Shaft 68A and is a two-handled zembil (Beloyanni, 2007). The zembil is woven in diagonal twill, while the handles are coiled. The size of the item is 0.175cm in height and 0.275 cm in diameter (ibid.). Another smaller woven vessel was discovered inside vessel $035 together with the content of the zembil – carbonised barley grains (ibid.; Sarpak, 1992; in this thesis Fig. 4.4. m-n.). Object **$064** is an unpublished woven item, which was discovered in Pilar Shaft 61A; the object is preserved in an extremely distorted state and it was not charred, but mineralised (Fig. 4.4. o-p.); the weaving technique is non-determinable. Object **$065** comes from the same context as $064 and is in the same state of preservation with non-identifiable technique (Fig. 4.4. q-r.).

Sample $001 was taken from the surroundings of the actual object as direct sampling from the basket was not permitted. A total of 4 wood charcoal fragments were analysed with SEM imaging. Two T sections were obtained. One is much distorted and non-identifiable (Fig. 4.11.a.). The second one (Fig. 4.11.b) represents one ring boundary of ring porous wood with flame-like distribution of pores in late wood, and tyloses in several of the early-wood pores. It had Uni- and multiserate rays; multiserate rays were noted to be frequently absent in young shoot, so it may be hypothesised that the present sample does not originate from a young shoot. A good TA section was not achieved but instead a non-accurate plane situated between the Radial and the Tangential section was obtained. Here the open aperture of the vessel-ray pits was visible (Fig. 4.11.c). The proposed identification of this specimen is oak (*Quercus* sp.) (following Schweingruber 1999, p. 401; Schweingruber, 1990, p. 144), but it should be noted that the origin of the sample may not be the same as that of the object $001.

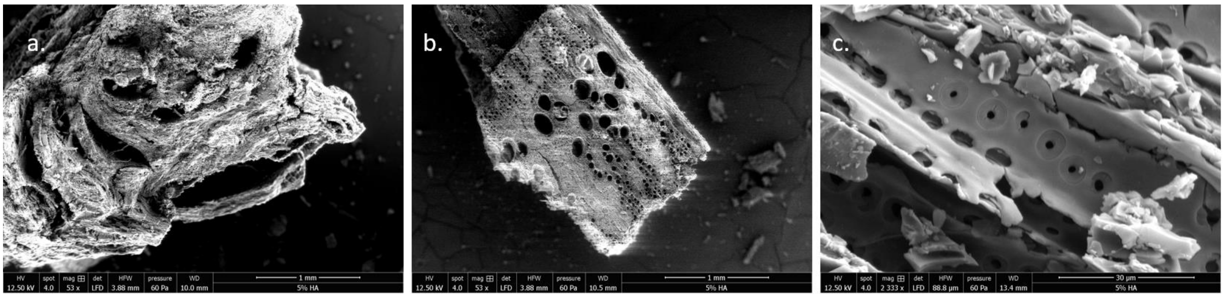


Figure 4.11. SEM images of Sample $001: a - b. Transversal plane with flame-like distributed porous (b.) and c. Inside a pitted vessel in Longitudinal plane.

Sample $002 was also not taken from the actual object, but from its immediate proximity. It was divided in a total of five fragments and a circular leaf/culm of a monocot was identified. The preserved tissues were epidermal, ground and vascular tissues. The analysis of sample $002 started with LED light, which was applied with a stereoscope and a grid scale was used. The diameter of the leaf/culm was *circa* 1mm. The maximum preserved surface of a fragment was *circa* 16mm long and wide 6mm. Reflected light microscopy was then applied with magnifications lenses 10 to 50x. Fungi affected the fragments and their hyphae were visible, polarising the light (PPL), together with the applied during the conservation process Paraloid B 72® (Fig. 4.12.b-d.). In T section, a preserved mesophyll was distinguished, where several vascular bundles were visible (Fig. 4.12.b.). In the longitudinal plane (TA), sunken stomatal cavities were visible in the epidermal tissue, while the epidermal cells were elongated, roughly 3 times longer than wider (Fig. 4.12.c-j.). The SEM imaging confirmed the observed with the optical microscopy morphology and added more detail: In T section, the parenchyma cells were mainly polyhedral, type A of Esau (Evert, 2007, p. 131, Fig. 7.7.) or as illustrated by Hather (2000, p. 27, Figs. 67-68) for Poaceae and Cyperaceae, hexa- or octagonal (Fig. 4.12.he-f.). Surrounded by the parenchyma cells, and under the sclerenchyma layer, were two rings of vascular bundles - *circa* 10 in the outer r and 8-10 smaller and seated within the larger ones; the outline of the bundles was angular. On the TA plane, the stomata were simple (non-paracytic), sunken and with open cell aperture (Fig. 4.12.h-i). It is very likely that the vegetative part was a leaf and not a culm because of the high density of the stomata. The epidermal cells were approximately 3 to 4 times longer than taller and were with undulate walls. Between them, the short epidermal cells were transformed into silica bodies and represented squarish phytholiths (Fig. 4.12.i) of the type 1-2 Bambusoideae or type 1 of Arundinoideae – both groups including grasses (Poaceae) of open habitats and swamps, such as *Arundo* sp. and *Phragmites* sp. (Piperno 2007).

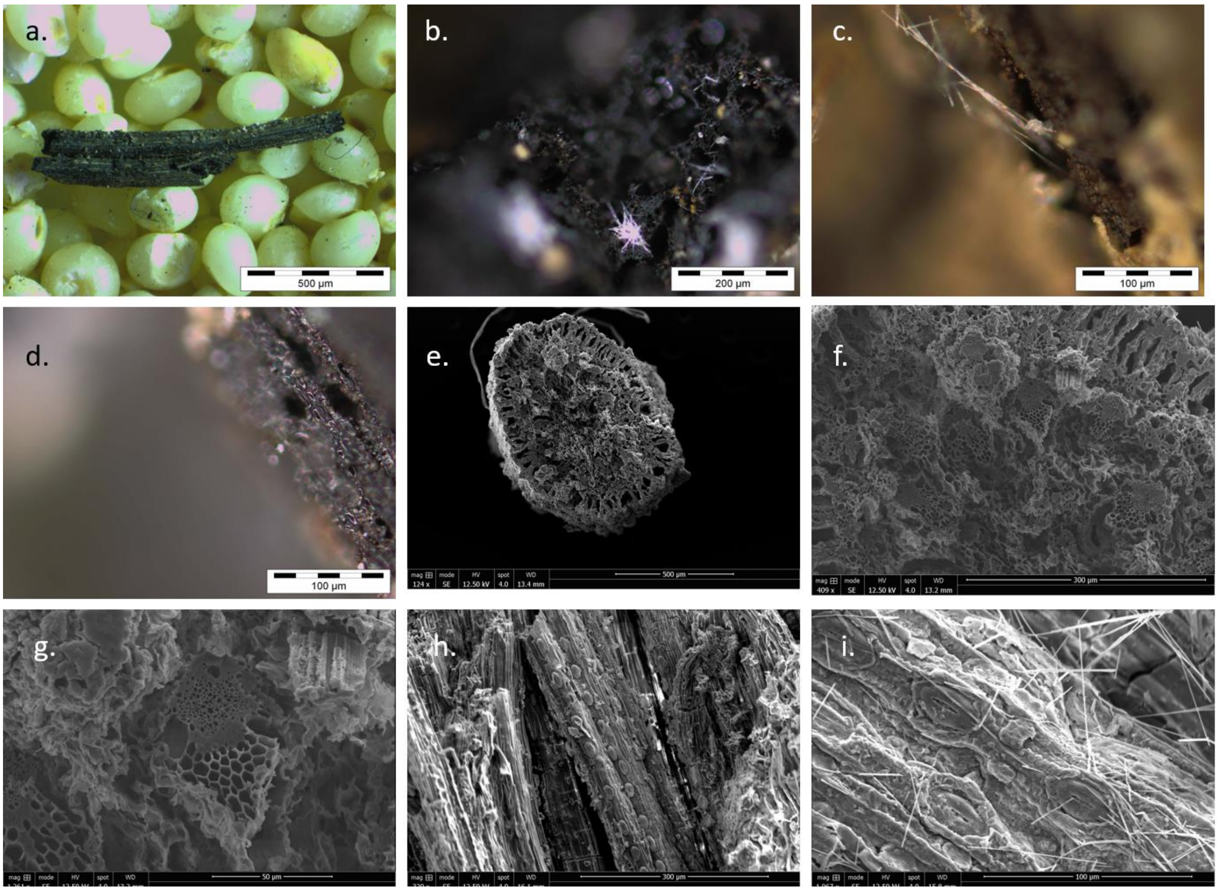


Figure 4.12. Images of Sample $002: a. $002 under stereoscope (LED light); b. Transversal section under PPL and hyphal infestation; c-d. Longitudinal (epidermal) view; e. Complete T section under SEM; f. detail of T section with sclerenchymatic vessels and rings of vascular bundles; g. detail of a vascular bundle; h. Tangential view – stomatal cells; i. detail of TA view with stomata.

Item $011 was also sampled from the surroundings of the fragmented object, which was abundant with charcoal fragments and ashes; four fragments were retrieved. LED light was applied during the analysis with a stereoscope, where the circular shape of the cross section was distinguishable. The plant part was a leaf or stem of a monocotyledonous plant. It was visible that they were coupled: two leaves/culms forming a warp or weft. Grid measurement was also applied and the leaf/culm diameter was *circa* 2mm (Fig. 4.13.a-c). It is very likely that the analysed fragment represents part of the warp or the coil, of this weaving technique where the weft is being coiled around because often the coil itself is made of a bundle (of leaves or stems). The warp bundle is more rigid than a singular leaf or a stem and easily supports the body weave of an object. SEM imaging was performed for analysing the preserved plant tissues, the epidermis and the poorly preserved vascular bundles in the mesophyll (Fig.4.13. d.). In T section, the distorted loci of the vascular bundles were merely distinguished (best up, left of Fig. 4.13.d.). The outline of the leaf/culm was cylindrical and with pronounced ridging. The deep ridge grooves of the stem/leaf apply to the Juncaceae (Cutler, 1969, p. 24) and the Cyperaceae (Metcalfe 1971: 7, fig. 1. J), but in TA section the observed morphology corresponds to Poaceae. The preserved epidermal tissue showed the superficial and paracytic stomata (two guard cells surrounding the aperture and two subsidiary cells – slightly taller - surrounding the guard cell). The long epidermal cells were with sinuous walls, as visible on the disturbed image (Fig. 4.13.e-f.), while the short silica bodies were saddle shaped, phytholiths which correspond to the Chloridoideae (type 2) and Bambusoideae (type 3). While the Chloridoideae are short drought-adapted grasses and common field weeds, the Bambusoideae are tall grasses with swampy habitats (*see above*, Piperno, 2007). Considering the coiled technique in which object $011 was woven, the Bambusoideae leaves seem to be the better choice, mainly because of their length – suitable for continuous coiling.

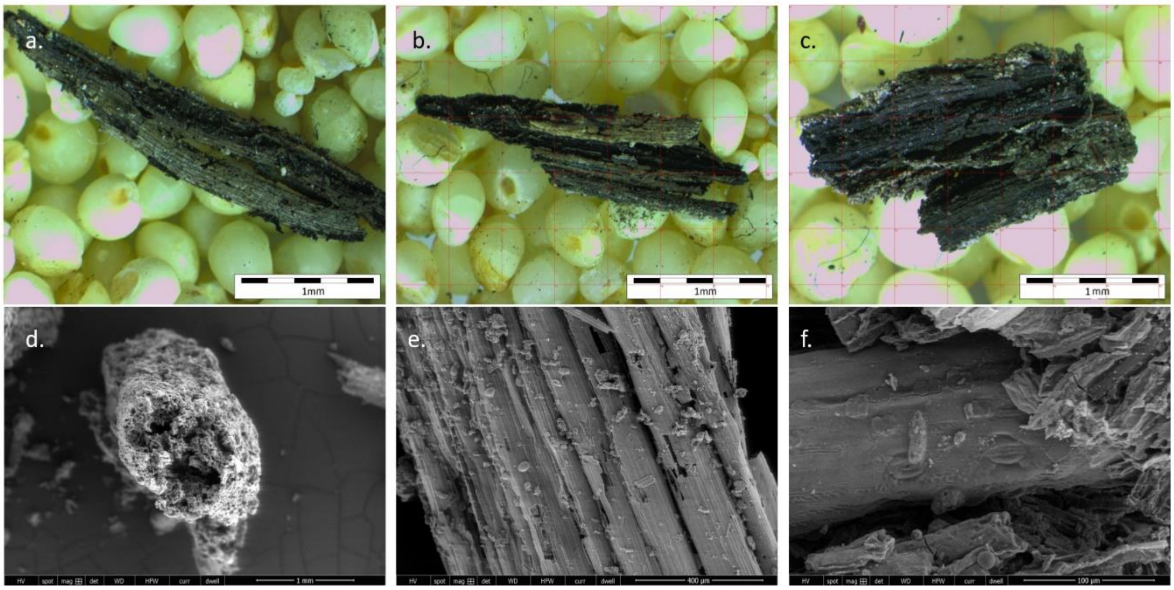


Figure 4.13. Images of Sample $011: a – c. $011under stereoscope (LED light); d. Transversal plane under SEM; e. Longitudinal plane (SEM); f. detail with stomata in TA.

Item $012 was not sampled from the direct object and eight fragments were later isolated from it, all with minimal size of maximum 0.8cm length. The imaged with SEM fragments represented a bundle, perhaps forming the warps of the coiled weave. In the T section *circa* three plant stems/leaves of circular shape were visible (Fig. 4.14.a). Two stem/leaves were deeply ridged, while the third one had smooth outline (Fig. 4.14. b: two on the left are ridged and to the right – smooth). At the cross section the preserved tissues and organs were epidermis, sclerenchyma, aerenchyma and vascular bundles (Fig.4.14. c.). The two ridged stems seemed similar (or even identical). They both had several rings of rounded vascular bundles (not pronounced or elongated), alternating between large and small (between the rings with large). The central leaf/stem was even preserved with its pith, which together with the absence of stomata at the epidermal tissue may be an argument for the use of a root or a stem, because roots or submerged leaves of aquatic plants generally lack stomata (Evert, 2007, p. 219 - 220); another argument supporting this is the high number of concentric vascular bundles' rings – *circa* 3 main rings plus 2 subsidiary (intermediate) ones. The third leaf or stem had a pronounced apex with concentrated parenchymatic cells. The leaf had one line of vascular bundles under the sclerenchyma and above the spongy zone filled with hexa- and penta- gonial parenchymatic cells (type A of Esau - Evert, 2007, p. 131; or as illustrated by Hather, 2000, p. 27, Figs. 67-68). The lower end of the leaf/stem, lacked fully vascular bundles. All these characteristics lead to the hypothesis that the analysed fragment is a slightly concave to flat leaf with abaxial and adaxial epidermis with a pronounced parenchymatic zone below the abaxial epidermis. In TA section, only the middle fragment (with the pith) showed the epidermal surface with the preserved saddle-like phytoliths and the superficial non-paracytic stomata with open aperture (Fig. 4.14.d.). The long epidermal cells of one of the fragments were three times longer than shorter, pitted and with non-sinous walls; here a dislocated scalariform perforation plate was visible (Fig 4.14.e-f.), which is present in the Cyperaceae, Juncaceae and Typhaceae families (di Lernia *et al*., 2012).

For the two deeply ridged leaves the Juncaceae family can be excluded because of the presence of silica bodies in the observed specimen (see above). The Cyperaceae family is excluded because of the overall roundness of the leaf/stem, which allows concentration of vascular bindles' rings. The dumbbell shaped phytoliths on these epidermal areas allude to Poaceae (together with the *cf.* sinuous long cell walls). For the spongy (parenchymatic) leaf, the subtriangular adaxialy concave (type H, Metcalfe, 1971, p. 11) leaf may correspond to the Cyperaceae family and not to the Typhaceae overall flat leaf lamina. The dislocated scalariform perforation plate may also support the suggested Cyperaceae (it is rare in the Poaceae, di Lernia et. al, 2012). Hence, the proposed identification for the analysed bundle is two stems (lower parts, cf. roots?) of Poaceae with Panicoideae type phytoliths (type 1, Piperno, 2007) and a Cyperaceae leaf. In support of the sedge identification comes the phytoliths data, obtained from soil samples from Akerotiri, where sedge is considered abundant (Vlachopoulos and Zorzos, 2014, p. 190).

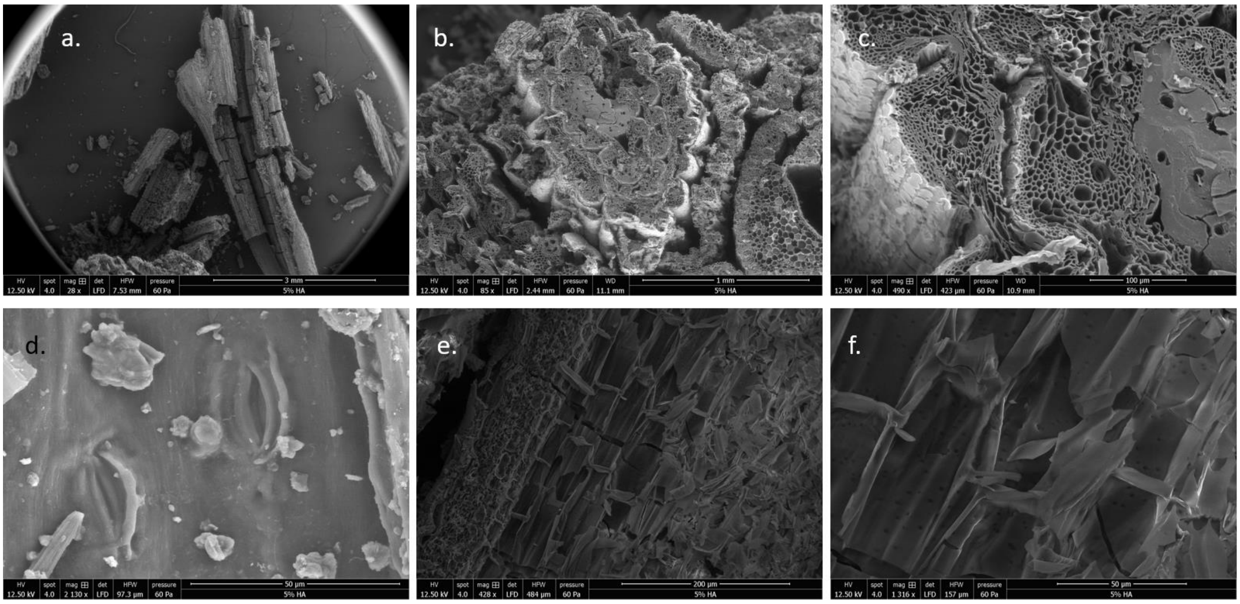


Figure 4.14. SEM images of $012: a. macro view of circa three stems longitudinally; b. Transversal plane of two stems; c. vascular bundles in T section; d. stomatal cells; e. epidermal cells in TA plane; f. detail of pitted epidermal vessels in TA section.

Item $027 was not sampled from the direct object and was divided into a total of six separate fragments. The sample was highly infested by ancient or contemporary parasites and its plant anatomy was poorly preserved. A larva was visible into the T section (Fig. 4.14.a). The cross plane showed non-woody structure of a *cf*. monocot with cylindrical stem/leaf with visible fragmented vascular bundles (Fig. 4.14.a-b.). At the TA plane the long epidermal cells may be determined as two to three times longer than shorter. Unfortunately, no identifiable morphology was preserved.

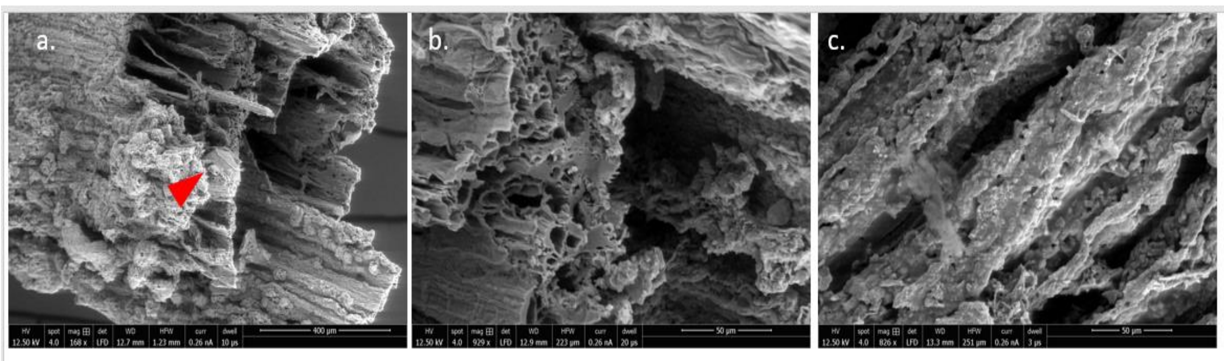


Figure 4.15. SEM images of $027: a-b. angled T section (arrow points at insect larva); c. TA plane with non-distinct anatomy.

Sample $034 consisted of eight separate fragments and another seven extremely small ones (below 1mm). This sample was also not taken directly from the object, but from the area surrounding it. The approximate surface of the fragments was calculated with the help of a stereoscope and a grid scale and varied between 8mm (lenghth) x 2.5mm (width) and 12mm x4mm to 14mm x 2.5mm. The SEM imaging revealed a sperical culm/leaf of a monovotiledonous plant with a mildly ridged overall outline. The preserved tissues were: epidermal, mesophyl and some of the organs in it, such as the cascular bundles. In T section at least three rings of vascular bundles were visible - two main raws and one intermediate. They were all V-shaped with a pronounced end towards the xylem pole, while the phloem pole was still abrupt but more U- than V-shaped (Fig. 4.16.b-c). The vascular bundles appeared sunken into the parenchymathic tissue, which were probably the degraded bundle sheaths, surrounding the vascular bundles (Cutler, 1969). The vascular ograns were also surrounded by preserved irregular or penta- and hexa-gonal parenchymatic cells (Fig. 4.16.c). In TA plane the epidermis was not very well preserved (Fig. 4.16.d.); the stomatal cavities were being located, but no features were visible, althought it may be hypothesised the stomata were rather sunken than superficial (if this was not a taphonomic issue). The long epidermal cells (Fig. 4.16.e-f), where it can be seen that they appear to be 3 times longer than shorter; sometimes they border lines of shorted squarish cells (almost even in length and width) and they are all with non sinous walls. There were no silica bodies detected on the epidermal tissue of $034. The lack of silica bodies in the epidermis and the abruptly shaped vascular bundles, alligned in concentric rings within the cylindrical culm/leaf, the *cf.* sunken stomata and the non-sinous long epidermal cells' walls, may suggest its idntification within the Juncaceae family (Poeaceae and Cyperaceae have silica bodies).

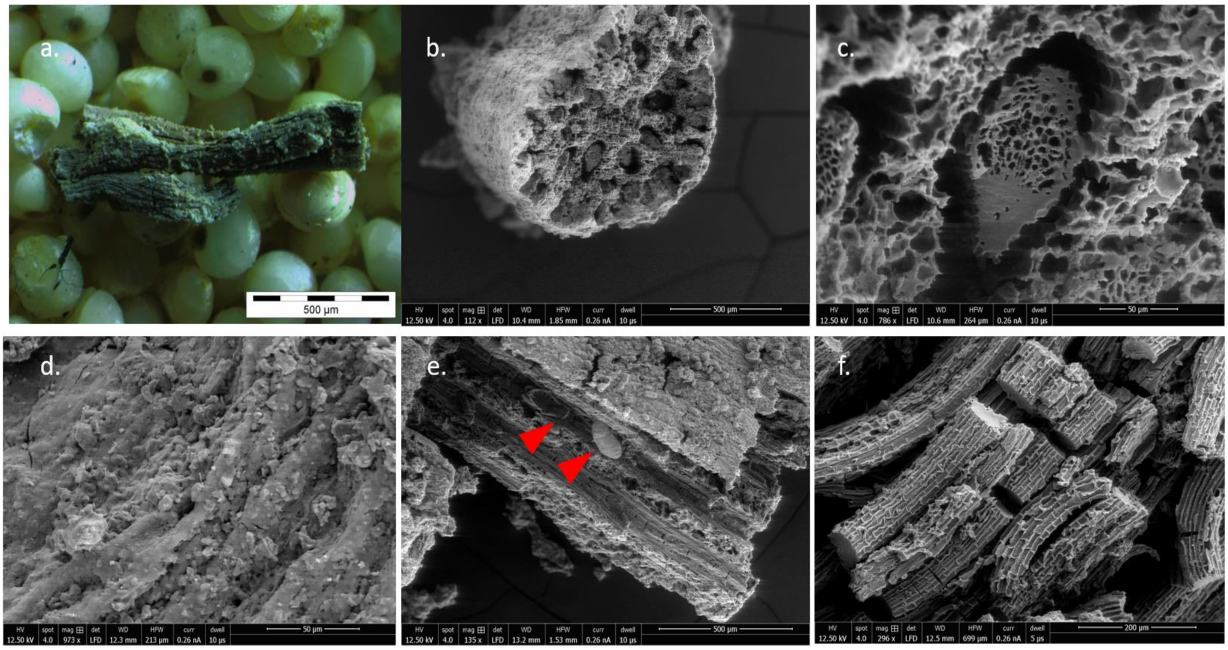


Figure 4.16. Images of $034: a. Epidermal view under stereoscope (LED); b. Cross section under SEM with rings of vascular bundles; c. detail of a vascular bundle in T plane; d. TA plane with distorted anatomy; e. inside a TA plabe with an insect (arrows); f. epidermal cells in TA plane.

Sample $035 was also taken from the immediate surroundings of the vessel, where it originates and consisted of a total of three separate fragments of *circa* max. 4mm² preserved surface (Fig. 4.17.a). Under the stereoscope it became clear that the sample consisted of *cf*. two to three stems/leaves of circular and acute overall outline (Fig. 4.17.a). This sample was also observed under PPL light where the treated with resin (Paraloid B72®) surface was polarising the light ejected from the microscope (see more on the "effect of the defect" into the Conservation section above). Only a TA plane was obtained under the microscope and the dense concentration (2 per 50µm, hence the observed plant part is a leaf) of non-paracytic *cf.* superficial (Fig. 4.7c) stomata with open aperture was visible (fig. 4.17.b). The SEM imaging reached a T plane of the sample and it became clear there was a bundle of leaves/stems, compiling the plane of the diagonally twilled item. The overall outline of the stems/leaves was not clear, but seemed to be a combination of circular (Fig. 4.17.h) and acute leaves (Fig. 4.17.f). The circular leave/stem was mildly ridged and it long epidermal cells looked two times longer than shorter; but it should be noted that the surface was artificially smoothened because of the resin treatment (Fig. 4.17.b-c). All the leaves/stems were with emphasised hollowness bellow the epidermal layer, which means the mesophyll was not preserved. At Fig. 4.17.g numerous distorted parenchymatic cells are visible (of *cf*. penta- and hexagonal shape), but no other morphology. The hollow space below the epidermis was also diagnostically detected with the CT scan (Fig. 4.6.a-d) and thus the cross section did not provide any diagnostic information. The TA plane showed the long epidermal cells with very densely undulate walls (Fig 4.17.i) and proved that the stomatal cells were superficial (Fig. 4.17.b-c.). It looks like there were lines of short silica cells similar to the asterisk-like phytoliths of type 6 Bambusoideae (Piperno, 2007) or the square one of type 2 and type 4 of the same sub-family.

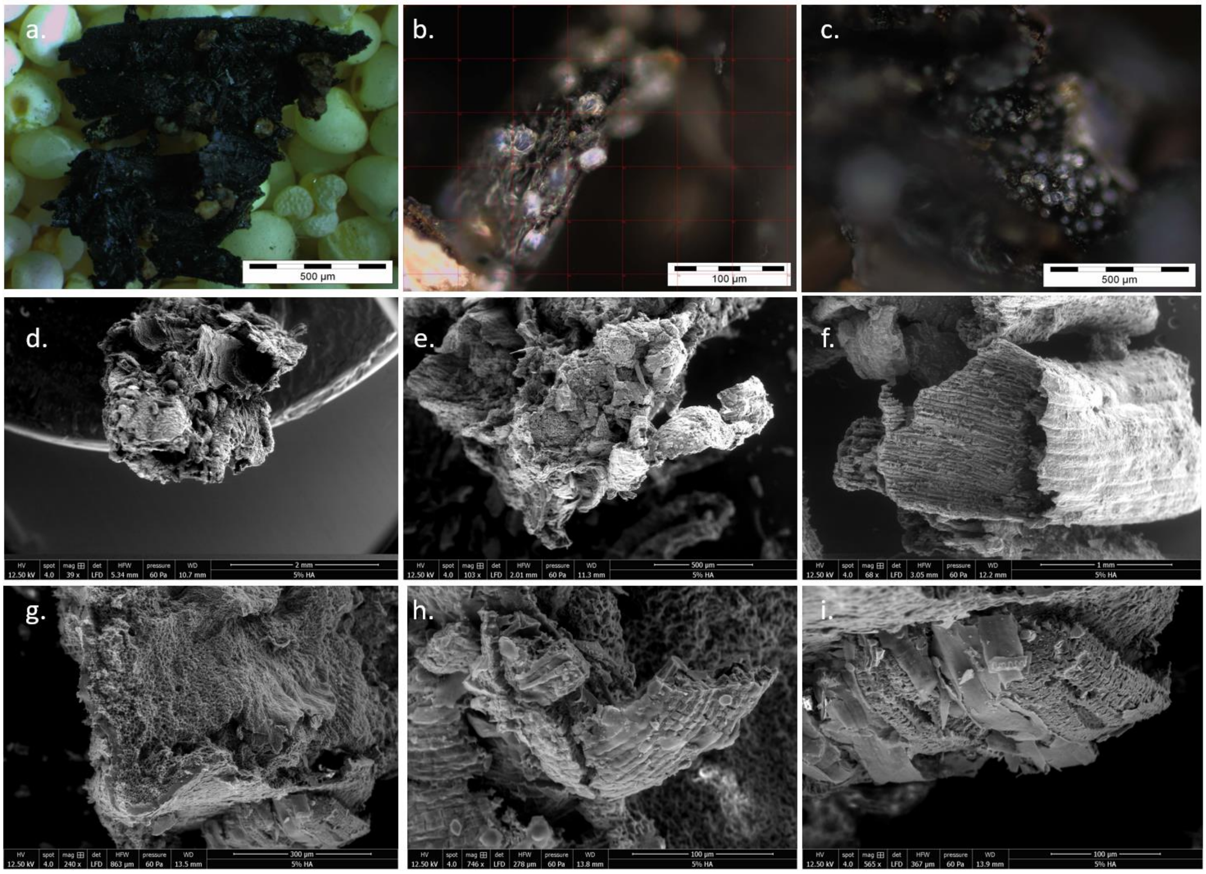


Figure 4.17. Images of $035: a. macro-veiw under a stereoscope (LED light); b. TA view under PPL light – stomatal cells polarise; c. stomatal cells; d. T view under SEM; e-f. detail of T plane (SEM) with hollow sectors of missing anatomy; g. distorted tissue; h. angled epidermal view; i. inside a TA plane – undulated epidermal cells.

Samples $064 and $065 were also not obtained from the object of their origin, but from their immediate surroundings; they both consist of one fragment each (Fig. 4.18.a; Fig. 4.19.a.). They are both preserved into a non-charred, mineralised stage, but have heavily absorbed the fine dusty volcanic tephra/sediment (Fig. 4.18.c). The two samples were both non-woody plants (monocotyledonous), which was visible during the primary observation by stereoscope. Their size was approximately 0.5mm in width and 1.5mm in length ($064) and 1mm in width and 2mm in length ($065). SEM imaging was applied to both of them for further analysis and both cross and tangential planes (with no visible phytholiths) were obtained. At the T plane of $064, *circa* three distorted square-like aerenchyma vessels were visible; given that the fragment was of non-sufficient size no further information could be given. There was a large crach/cavity by the what looked like the apex of the cross section, which may indicate acute leaf shape, as in the Cyperaceae family (see Fig. 4.18.b; see also above - comment on phytholiths for sample $012). At the TA plane of this sample there was an unclear picture of the long epidermal cells which seemed to be with non-sinous walls (Fig. 4.18.d).

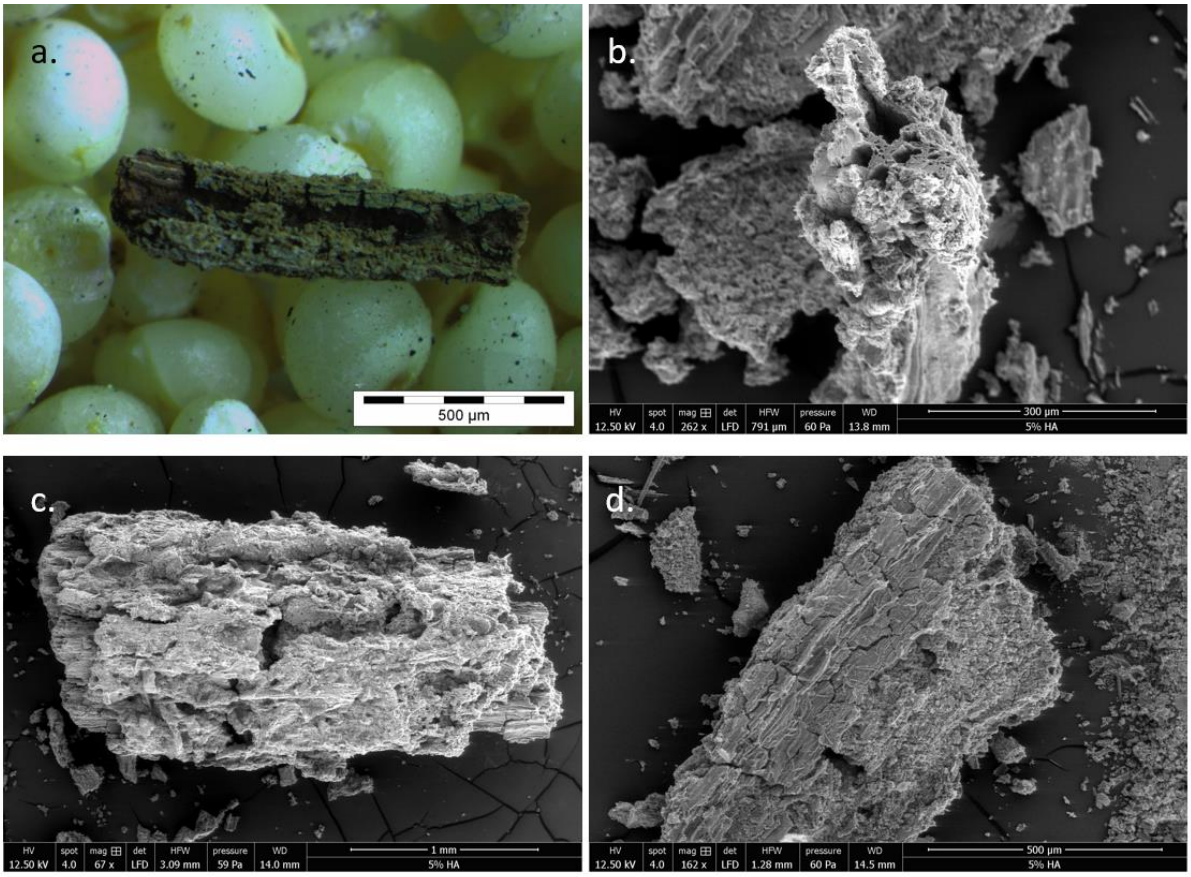


Figure 4.18. Images of $064: a.Stereoscopic macro view of $064; b. T plane under SEM; c. distorted anatomy covered with sediment; d. inside a TA plane.

On the T plane of sample $065 there was aerenchymatic tissue preserved, with the aerenchyma cavities aligning the leaf/stem fragment; the fragment was of unclear overall shape, possubly rather circular (Fig. 4.19.a). The TA plane of $065 was slightly better preserved - the long epidermal cells were two to three times longer than wider and were with non-undulate walls (Fig.4.19.c-d). Unfortunately, no further identification could be reached largely due the poor stage of preservation of these two last samples.

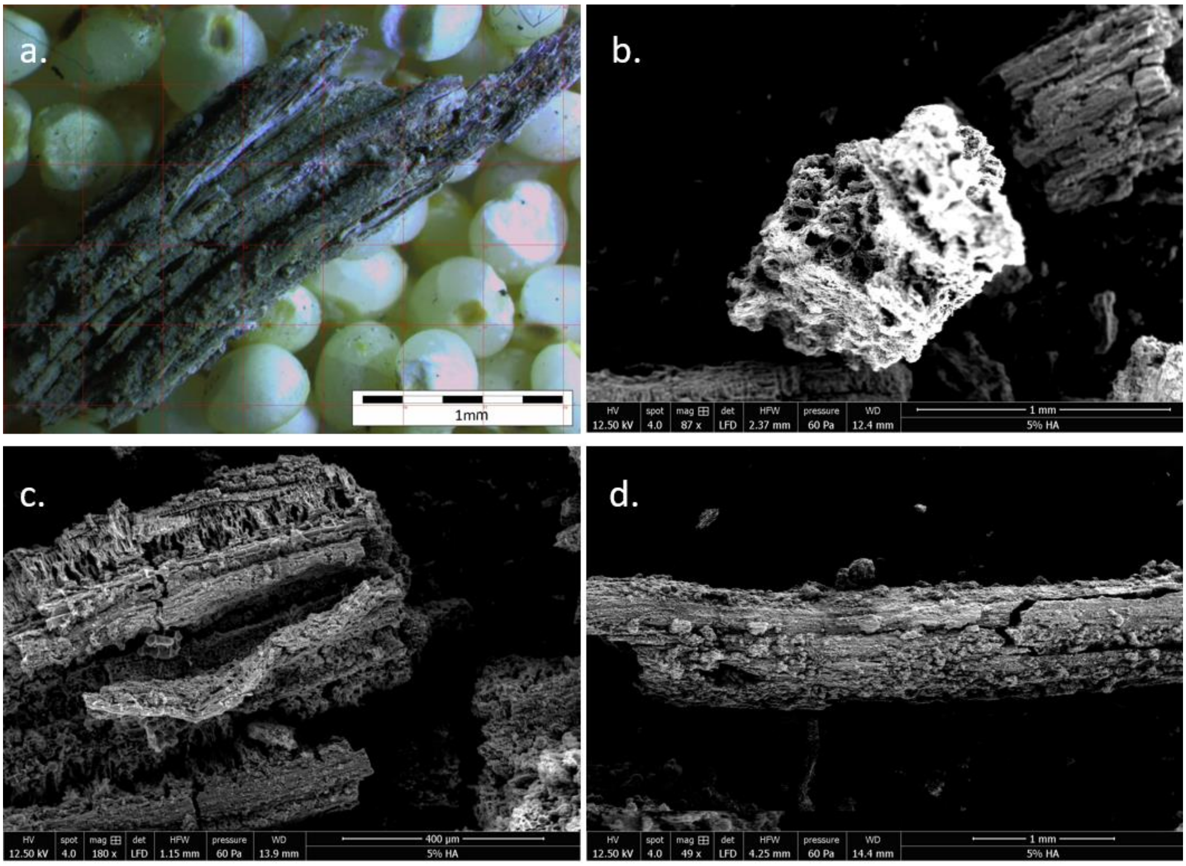


Figure 4.19. Images of $065: a.Stereoscopic view of $065; b. T plane under SEM; c. inside a TA view (SEM); d. epidermal view (SEM)

SAMPLE	PLANT PART	FAMILY	SUB-FAMILY/SPECIES
P-T 1	*cf.* leaf	Poaceae	*cf*. Panicoideae
P-T 2	wood	Fagaceae	*cf*. *Quercus* sp.
$001	wood	Fagaceae	*Qercus* sp.
$002	leaf	Poaceae	Bambusoideae/Arundonideae
$011	leaf/culm	Poaceae	Bambusoideae
$012	2 stems + 1 leaf	Poaceae + Cyperaceae	n/a
$027	n/a	n/a	n/a
$034	leaf/culm	Juncaceae	n/a
$035	*cf*. 2 leaves	Poaceae	Bambusoideae
$064	leaf	*cf*. Cyperaceae	n/a
$065	leaf	n/a	n/a

Table 4.2. Sampled and analysed archaeobotancal samples from basketry items from Promachon-Topolnitsa (P-T) and Akrotiri ($0).

4.3. Indirect evidence: basket/mat impressions on pottery

4.3.1. Presentation of sites

What was commonly described in the scholarship as mat-impressed pottery, in this thesis refers to the indirect evidence for ancient basketry in archaeological contexts where actual plant remains are not preserved. Although it covers basketry impressions too, the term 'mat-impressed' was widely attested in the accessed scholarship when describing this class of pottery decoration. Reason for this could be the materiality of the impression *per se*, i.e. – when on pottery it evokes the image of a flat two-dimensional mesh-, net- like object, which woven mats are. That way it conveys more accurately the decoration type – shape created by impressing another object into the clay of a pot. This is why in this text 'mat-impression' will be in circulation too, but with the additional note that the term also refers to basketry objects.

This category of indirect evidence was attested in numerous sites during the Neolithic, the transition to the Chalcolithic period, and during the Bronze Age. One of the problems when reporting mat-impressed pottery was that these fragments were often vaguely associated with the contexts where they originate from. Usually they were listed as a separate category of pottery, but rarely given a chronology which formed an obstacle in the case of multi-phase sites (as for example for Servia, Sitagroi, Vasilika in Greece – see below). This is why in this thesis, the impressions were discussed within the range of their site chronology. Another problem encountered while studying the existing scholarship on mat-impressed pottery was the lack of vessel shape specification, again with very few exceptions where specific shapes such as cheese-pots, bowls, fruit-stands or pithoi were associated with the impressions. In addition, the number of impressed fragments was rarely specified, but only their presence in the particular site/period – a fact that made the statistical analysis difficult.

The total sum of mat-impressed pottery sherds/pots, including the reviewed existing bibliography, where actual numbers for mat-impressed fragments/pots were mentioned plus the accessed unpublished material, came to 768 sherds, originating from 72 sites (Table 4.2). Based on this picture, for the purposes of this study mat-impressed pottery from 12 sites was accessed and originated from five sites in Bulgaria and seven in Greece. The total sum of the analysed sherds came to 215 (137 – from sites in Bulgaria and 78 originating from sites in Greece). The number of accessed and studied sherds represents 27.99% of all reviewed ones (both published and unpublished).

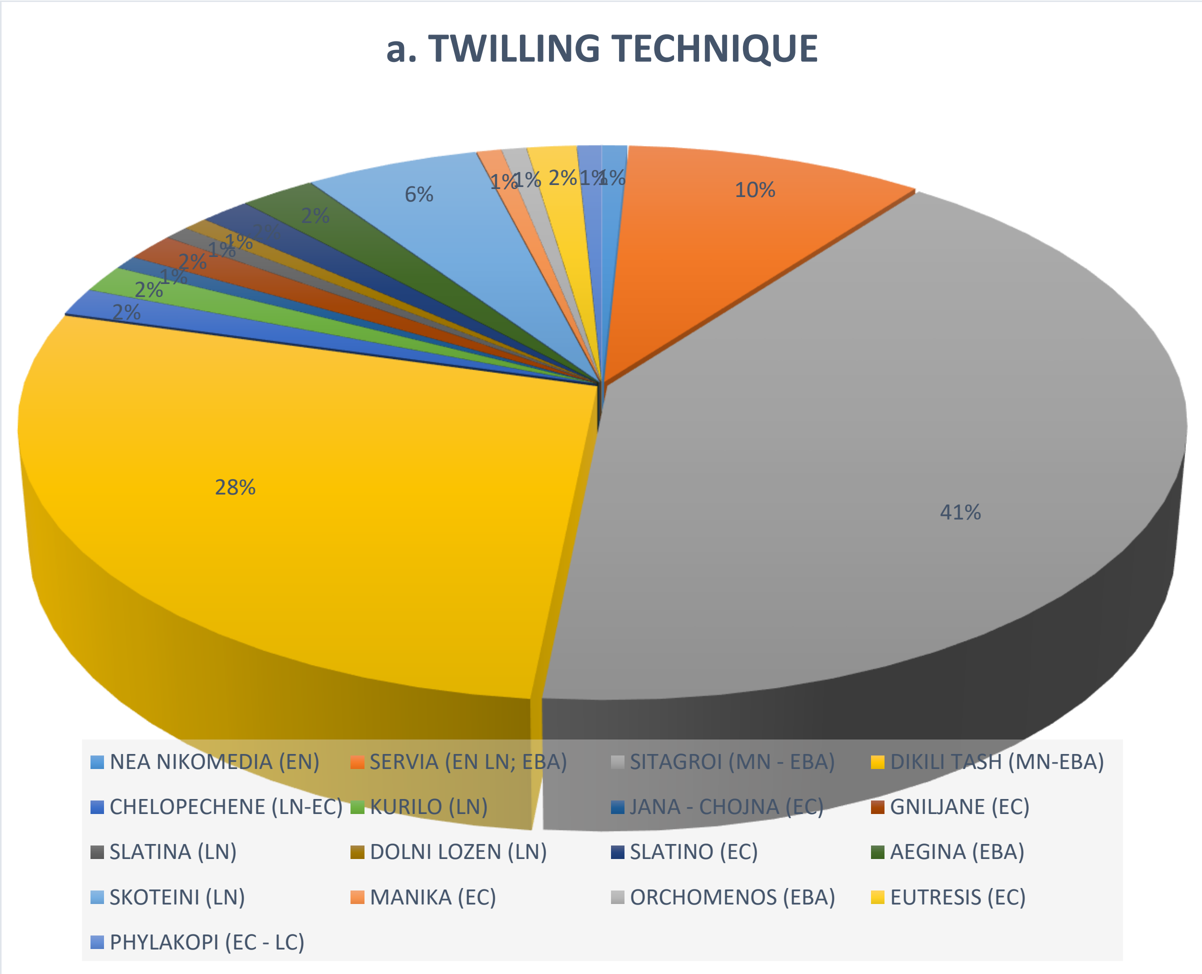
The earliest sites with mat-impressed pottery were those with Early Neolithic phases, such as Karanovo in Thrace (Seebacher, 1997) and Nea Nikomedia (Rodden, 1964a; Rodden, 1964b; Smith, 1977; Yiouni, 1996), Servia (Mauld and Wardle, 2000; Smith, 2000), Achilleon (Winn and Shimabuku, 1989), Sesklo (Teocharis, 1973) and the cave of Theopetra (Katsarou, 2016) in Greece. During the Middle Neolithic the reported mat-impressed pottery was slightly increasing: Sitagroi (Adovasio and Illingworth, 2003), Dikili Tash (Demoule, 2004), Vasilika (Grammenos, 1991); Makri (Yiouni, 1995), the final phase of Achilleion, Sesklo and Theopetra in Greece. The reported weaving technique is mainly twilling and the context of this type of pottery is domestic (Fig. 4.20.a).

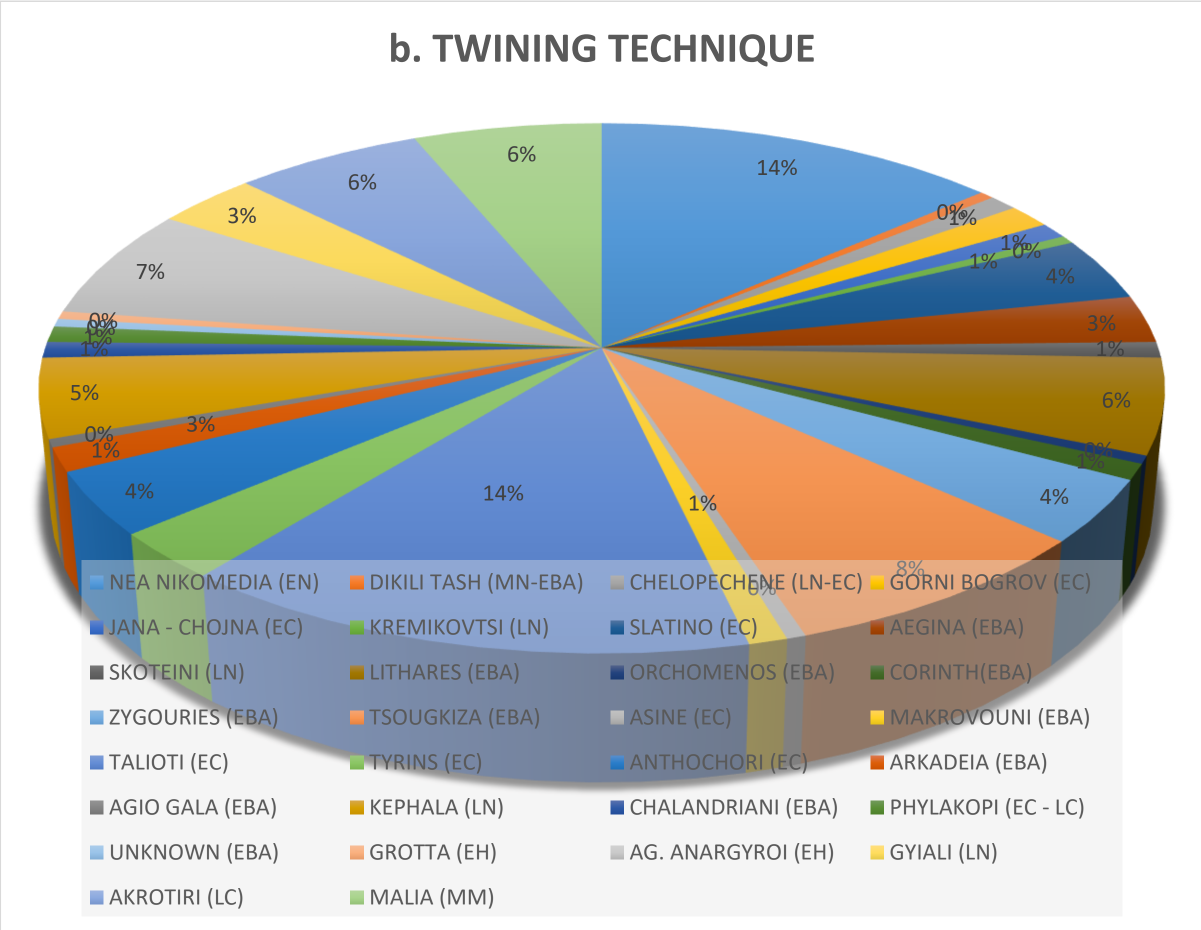
In the Late Neolithic the sites mentioned in the studied bibliography showed an increase. The abundant with LN extended settlements Sofia Plane, presented several sites where mat-impressed pottery has been discovered: Chelopechene, Kurilo, Kremikovtsi, Slatina, Dolni Lozen (Petkov, 1965). In Greek Macedonia, mat-impressions were still present at Servia (see above) and Ryzari (Beloyanni, 2003); and in Thrace at Paradimi (Bakalakis and Sakellariou, 1981). Further south, mat-impressedd pottery was registered in: Attica – Kitsos (Lambert, 1981), Kolonna (Walter and Felten, 1981), in Euboea – the cave dwelling of Skoteini (Beloyanni, 1993), in Peloponnese – the cave sites of Franchthi (Jacobsen, 1973) and Alepotrypa (Katsarou, 2016; pers. comm.). There were numerous impressions discovered on the Aegean islands: Tigani on Samos (Furness, 1956), Emporio on Chios (Hood, 1981), Saliagos (Evans and Renfrew, 1968), Kephala on Keos (Smith, 1977), Gyali (Sampson, 1988) and Partheni on Leros (ibid.). Several Early Chalcolithic sites have also produced mat impressions, such as Chelopechene, Gorni Bogrov, Jana-Choina in the Sofia plane (Petkov, 1965), Dana Bunar I in Thrace.

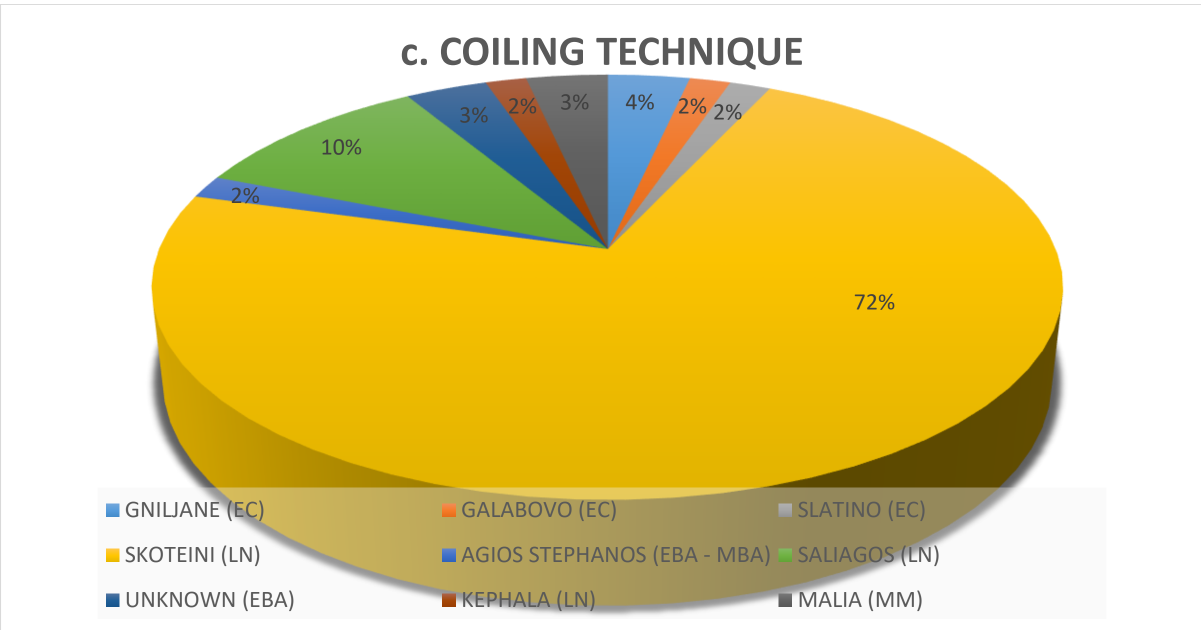
The Early Bronze Age, which corresponds to the Early Helladic on Mainland Greece and to the Early Cycladic in the Cyclades, continued the tradition of the mat-impressed pottery with its presence at almost all mentioned areas of the studied region. In Thrace they were present at tell Karanovo; in Greek Macedonia - EBA Servia, Sitagroi, Dikili Tash, Vasilika, Agios Anthonios and Kastri on Thassos have yielded impressed pottery; in Attica – Perachora and Raphina (Beloyanni, 1992) and Aegina (Weisshaar, 1994); in Euboea - Rovies (Sackett, 1966) and Manika (Sampson, 1985); in Beotia – Eutresis (Caskey and Caskey, 1960; Goldman, 1931), Lithares (Evjen, 1984) and Orchomenos (Kunz, 1934); in the Peloponnese – Asine (Frodin and Persson, 1938), Talioti (Weisshaar, 1990) and Tiryns in the Argolid (Weisshaar, 1990), Agios Stephanos (Taylor, 1972; Taylor and Janko, 2008) and Anthochori in Laconia (Zevvou, 2009), Zygouries (Blegen, 1928), Tsoungiza (Beloyanni, 1989), Makrovouni, Kefalari Magoula (Dousougli, 1987), Asea and Sfakovouni in Arkadia (Holmberg, 1944; Spyropoulos and Spyropoulos, 2000). Basketry-impressed pottery still occurs on the islands, such as at the sites of Agio Gala and Emporio on Chios (Hood, 1981), Chalandriani on Syros (Bosanquet, 1896 – 7; Forsdyke, 1925), Tsi Viglais on Amorgos (Myers, 1898), Grotta (Kondoleon, 1949; Coleman, 1977) and Agioi Anargyroi (Doumas, 1977) on Naxos. On Crete, the earliest mentioned impressions come from the Early Minoan Protopalatial layers of Knossos (Evely, 2000), followed by those attested in Middle Minoan Proto- and Neo-palatial town contexts at Palaikastro – Block M (Knappett and Cunningham, 2012), Neopalatial Malia – Quartier Pi (Poursat, 1980) and Neopalatial Kommos (Betancourt *et al*., 1990).

The twining (including simple, open, close, and split twine) weaving technique seemed to be the dominant one in the Early Bronze Age insular sites and the Peloponnese, with some occurrence of coiling and rarely of plain weave (Fig. 4.20.b.). It looked like the twilling (including diagonal twill) remained popular at the final stage of the Neolithic and during the transition to the Chalcolithic period, as evidenced in Greek Macedonia. A tendency was observed in the generally low number of impressed fragmel20nts from Late Neolithic (with the exception of Skoteini, hence the presence of this type of pottery persists during the LN, but still its number increases during the transition from the LN and the EBA/Chalcolithic period. This is not the case as we move backwards towards the Early and Middle Neolithic, when basketry-impressed pottery was not frequently reported.

The dominant contexts from where the basketry-impressed pottery originated were domestic – from extended Neolithic settlements to tell sites and cave dwellings. This pattern also remained constant during the Middle Bronze Age, where settlements have presented pottery with mat/basketry impressions. Perhaps this may explain the every-day utility of some pottery shapes, where impressions were registered, such as coarse storage vessels (the LN Skoteini), bowls of every-day utility (the MM Palaikastro, Kommos) or production vessels such as the so-called cheese-pots at the LN sites of the island of Gyali, Partheni at Leros, Kastro at Alim(n)ia amongst the Dodecanese.


a. TWILLING TECHNIQUE
10%
41%
28%
6%
2%
1%
NEA NIKOMEDIA (EN)
SERVIA (EN LN; EBA)
SITAGROI (MN - EBA)
DIKILI TASH (MN-EBA)
CHELOPECHENE (LN-EC)
KURILO (LN)
JANA - CHOJNA (EC)
GNILJANE (EC)
SLATINA (LN)
DOLNI LOZEN (LN)
SLATINO (EC)
AEGINA (EBA)
SKOTEINI (LN)
MANIKA (EC)
ORCHOMENOS (EBA)
EUTRESIS (EC)
PHYLAKOPI (EC - LC)


b. TWINING TECHNIQUE
NEA NIKOMEDIA (EN)
DIKILI TASH (MN-EBA)
CHELOPECHENE (LN-EC)
GORNI BOGROV (EC)
JANA - CHOJNA (EC)
KREMIKOVTSI (LN)
SLATINO (EC)
AEGINA (EBA)
SKOTEINI (LN)
LITHARES (EBA)
ORCHOMENOS (EBA)
CORINTH(EBA)
ZYGOURIES (EBA)
TSOUGKIZA (EBA)
ASINE (EC)
MAKROVOUNI (EBA)
TALIOTI (EC)
TYRINS (EC)
ANTHOCHORI (EC)
ARKADEIA (EBA)
AGIO GALA (EBA)
KEPHALA (LN)
CHALANDRIANI (EBA)
PHYLAKOPI (EC - LC)
UNKNOWN (EBA)
GROTTA (EH)
AG. ANARGYROI (EH)
GYIALI (LN)
AKROTIRI (LC)
MALIA (MM)


c. COILING TECHNIQUE
4%
2%
2%
72%
2%
10%
3%
2%
3%
GNILJANE (EC)
GALABOVO (EC)
SLATINO (EC)
SKOTEINI (LN)
AGIOS STEPHANOS (EBA - MBA)
SALIAGOS (LN)
UNKNOWN (EBA)
KEPHALA (LN)
MALIA (MM)

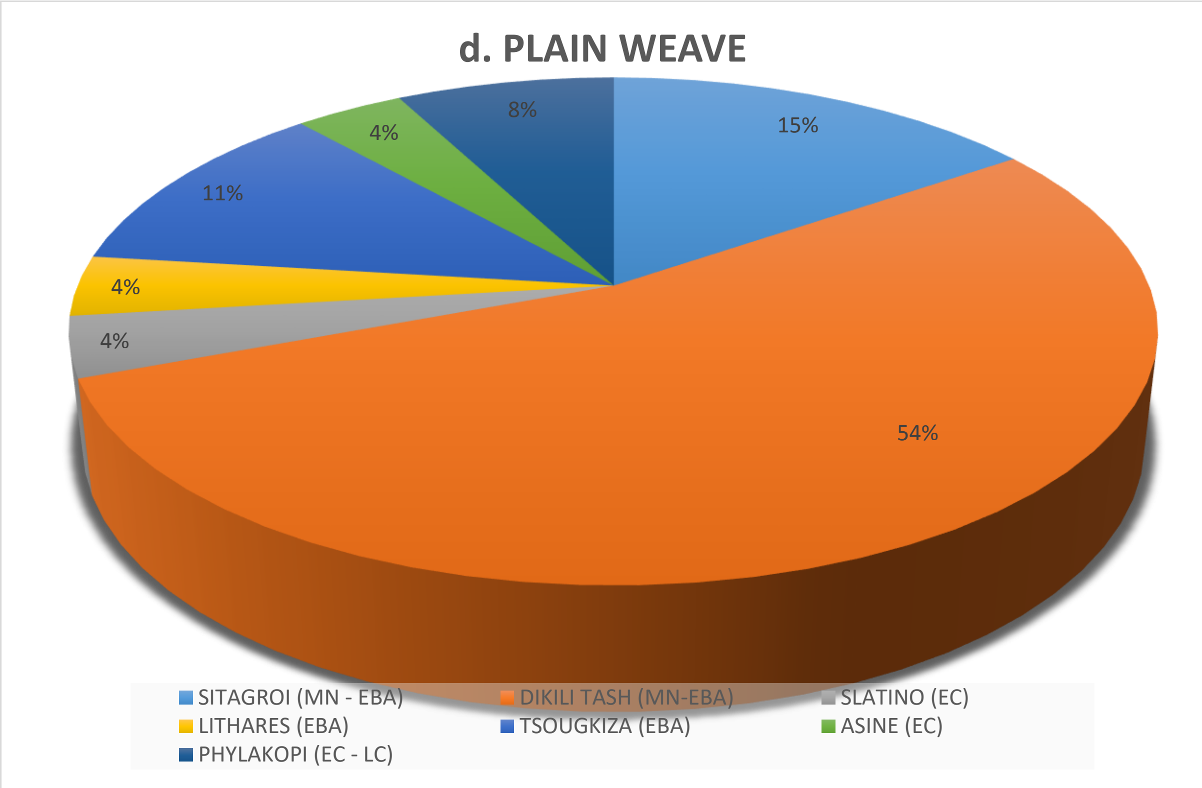


Figure 4.20: A comparison between the ratios of the different weaving techniques of basketry impressions on pottery from the available published and studied in this thesis Prehistoric sites with their relative dating: a. twill; b. twine; c. coil; d. plain.

REGION	SITE	TWILL	TWINE	COILED	PLAIN	TOTAL	REFF
MAC	NEA NIKOMEDIA (EN)	1	28	0	0	31	Rodden (1964a); Rodden (1964b); Smith (1977); Yiouni (1996)
	SERVIA (EN LN; EBA)	12	0	0	0	14	Mauld & Wardle (2000); Smith (2000)
	RYZARI (LN)	0	0	0	0	1	Beloyanni (2003) G
	SITAGROI (MN - EBA)	52	0	0	4	102	Adovasio & Illingworth (2003)
	DIKILI TASH (MN-EBA)	35	1	0	14	50	Demoule (2004)
	VASILIKA (MN - EBA)	0	0	0	0	4	Grammenos (1991) G
	AGIOS ANTONIOS (EBA)	0	0	0	0	1	Papadopoulos (2017), p.c.
	KASTRI (EBA)	0	0	0	0	1	Papadopoulos (2017) p.c.
SOF	CHELOPECHENE (LN-EC)	2	2	0	0	10	Petkov (1965) BG
	KURILO (LN)	2	0	0	0	2	Petkov (1965) BG
	GORNI BOGROV (EC)	0	3	0	0	3	Petkov (1965) BG
	JANA - CHOJNA (EC)	1	2	0	0	3	Petkov (1965) BG
	KREMIKOVTSI (LN)	0	1	0	0	1	Petkov (1965) BG
	GNILJANE (EC)	2	0	2	0	4	Petkov (1965) BG
	GALABOVO (EC)	0	0	1	0	1	Petkov (1965) BG
	SLATINA (LN)	1	0	0	0	1	Petkov (1965) BG
	DOLNI LOZEN (LN)	1	0	0	0	1	Petkov (1965) BG
	SLATINO (EC)	2	8	1	1	12	Petkov (1965) BG
THRAC	KARANOVO (EN - EBA)	0	0	0	0	63	Seebacher (1997)
	DANA BUNAR I (EC)	0	0	0	0	27	Petrova (2017) p.c.
	PARADIMI (LN)	0	0	0	0	1	Bakalakis & Sakellariou (1981)
	MAKRI (MN)	0	0	0	0	0	Yiouni (1995)
THESS	ACHILLEION (EN - MN)	0	0	0	0	0	Winn & Shimabuku (1989)
	SESKLO (EN - MN)	0	0	0	0	0	Theocharis (1962) G
	THEOPETRA (EN-MN)	0	0	0	0	13	Katsarou (2016) p.c.
ATTICA	KITSOS (LN)	0	0	0	0	0	Lambert (1981)
	PERACHORI (EBA)	0	0	0	0	1	Beloyanni (1992) G
	RAPHINA (EBA)	0	0	0	0	1	Beloyanni (1992) G
	KOLONNA (LN)	0	0	0	0	1	Walter & Felten (1981)
	AEGINA (EBA)	3	6	0	0	8	Weisshaar (1994)
EUBOEA	SKOTEINI (LN)	7	2	42	0	64	Beloyanni (1993)
	ROVIES (EC)	0	0	0	0	1	Sackett (1966)
	MANIKA (EC)	1	0	0	0	1	Sampson (1985)
BEOTIA	LITHARES (EBA)	0	12	0	1	13	Evjen (1984)
	ORCHOMENOS (EBA)	1	1	0	0	2	Kunz (1934)
	EUTRESIS (EC)	2	0	0	0	2	Caskey & Caskey (1960), Goldman (1931)

PELOP	FRAGHTHI (LN)	0	0	0	0	1	Jacobsen (1973)
	ALEPOTRYPA (LN)	0	0	0	0	15	Katsarou (2016) p.c.
	CORINTH(EBA)	0	2	0	0	2	Kosmopoulos (1948)
	ZYGOURIES (EBA)	0	8	0	0	8	Blegen (1928)
	TSOUGKIZA (EBA)	0	17	0	3	20	Beloyanni (1995) G, Pullen (2011)
	ASINE (EC)	0	1	0	1	2	Frodin & Persson (1938)
	MAKROVOUNI (EBA)	0	2	0	0	2	Dousougli (1987)
	KEFALARI MAGOULA (EBA)	0	0	0	0	0	Dousougli (1987)
	TALIOTI (EC)	0	30	0	0	30	Weisshaar (1990)
	TYRINS (EC)	0	6	0	0	6	Weisshaar (1990)
	ANTHOCHORI (EC)	0	8	0	0	8	Zevvou (2009)
	AGIOS STEPHANOS (EBA - MBA)	0	0	1	0	1	Zevvou (2009)
	ARKADEIA (EBA)	0	3	0	0	3	Holmberg (1944), Spyropoulos & Spyropoulos (2000) G
SAMOS	TIGANI (LN)	0	0	0	0	4	Heidendreich (1935 – 36), Furness (1956)
CHIOS	AGIO GALA (EBA)	0	1	0	0	1	Hood (1981)
	EMPORIO (LN - LBA)	0	0	0	0	3	Hood (1981)
PAR/ANTIPAR	SALIAGOS (LN)	0	0	6	0	6	Evans & Renfrew (1968)
PAROS	UNKNOWN (EBA)	0	0	2	0	2	Tsountas (1898) G
ANTIPAROS	UNIKNOWN (EBA)	0	0	0	0	1	Bosanquet (1896-7) G
SIFNOS	UNKNOWN (EH)	0	0	0	0	50	Gropengiesser (1987)
KEOS	KEPHALA (LN)	0	10	1	0	17	Smith (1977)
SYROS	CHALANDRIANI (EBA)	0	2	0	0	62	Tsountas (1899), Bosanquet (1896 – 7), Forsdyke (1925), Beloyanni (1996)
MELOS	PHYLAKOPI (EC - LC)	1	2	0	2	26	Egdar (1904), Cherry & Davis (1977)
AMORGOS	UNKNOWN (EBA)	0	0	0	0	1	Duemmler (1886)
	TSI VIGLAS (EBA)	0	0	0	0	1	Myers (1898)
	UNKNOWN (EBA)	0	1	0	0	1	Tsountas (1898) G
NAXOS	GROTTA (EH)	0	1	0	0	1	Kondoleon (1949)
	AG. ANARGYROI (EH)	0	14	0	0	14	Doumas (1977)
	GYIALI (LN)	0	7	0	0	17	Sampson (1988) G
LEROS	PARTHENI (LN)	0	0	0	0	0	Sampson (1988) G
ALIMNIA	KASTRO (LN)	0	0	0	0	0	Sampson (1988) G
THERA	AKROTIRI (LC)	0	13	0	0	0	Sotirakopoulou (1999)
CRETE	KNOSSOS (EM)	0	0	0	0	4	Evely (2000)
	PALAIKSATRO (MM)	0	0	0	0	2	Knappett & Cunningham (2012)
	MALIA (MM)	0	13	2	0	17	Poursat (1980), Poursat (2005), Poursat (2005a)
	KOMMOS (MM - LM)	0	0	0	0	0	Betancourt (1990)
						768	

Table 4.3. Absolute numbers of mat-impressed pottery sherds of the reviewed and studied in this thesis fragments

4.3.2. Sampled sites with basketry/mat impressions on pottery

4.3.2.1. Prehistoric Bulgaria

Provadia – Solnitsata is a Late Neolithic – Late Chalcolithic tell settlement and salt production complex (Fig. 4.1.). It is still excavated and is located on the bank of the Provadiiska River in north-east Bulgaria, occupying the surface above the largest natural salt deposit in the Balkans, which directed the prehistoric past of the site as a salt production centre (Nikolov and Petrova, 2008). The mat-impressed pottery fragments belong exclusively to bases on coarse conical or oval pots involved in the salt production process. These vessels were used for evaporation of the salt concentrate (ibid). More than seven hundred (700) such fragments were excavated but this study selected only a sample of one hundred sherds (100). They were chosen on the first-picked basis, because of the fact that these sherds were mixed with numerous pottery categories – piled and covering an area of *circa* 4m diameter and 2m height; it was decided that the 100 fragments would serve as a representative illustration of the whole assemblage, as they all shared the same characteristics.

Kurilo is a Middle and Late Neolithic extended settlement, located in the Sofia plane (Vaisov and Zidarov, 2013; Fig. 4.1). Three mat-impressed fragments from pot bases were studied from this site, but with no known context, as they originate from the early 1950s collection of the artist Kurt Peters, who was visiting the site each autumn during the period of tillage and ploughing. Kurilo is one of the several Neolithic sites located along the river of Iskar in West Bulgaria (Todorova and Vaisov, 1993).

Bulgarchevo is a Middle and Late Neolithic extended settlement, and *Topolnitsa* is a Late Neolithic-Early Chalcolithic flat settlement (Fig. 4.1.). They are booth-terraced complexes, situated on a plateau, near the river banks of Struma at South-west Bulgaria, excavated in the 1960s – 70s (Kulowa, 2008). Bulgarchevo and Topolnitsa are part of numerous Neolithic, Chalcolithic and Bronze Age sites situated along the riverbanks of Struma – a main communication artery from the South-west Balkans to the Aegean (Todorova and Vaisov, 1993). There are seven fragments coming from these two neighbouring sites: five from Bulgarchevo and two from Topolnitsa.

Dana Bunar I is an Early – Late Chalcolithic/Early Bronze Age extended settlement situated east of the Rhodope Mountain, on the riverbank of Maritsa (Fig.4.1.). It was excavated in 2000 and produced Early and Late Chalcolithic layers, along with EBA, and a complex of several pit-like structures and pits dated to the Late Iron Age (Leshtakov *et al*., 2018). Twenty-seven mat/basketry impressions have been discovered from this site, originating from the EC to LC layers of the complex with pit-like structures; the study of all of them was permitted for the purposes of this research.

4.3.2.2. Prehistoric Greece

Dikili Tash is a Late Neolithic and Early Chalcolithic tell settlement – one of the largest in the Balkans, covering an area of approximately 4.5 hectares and having a height of 17m. It is located in the south-eastern edge of the Drama plain (Macedonia, Greece, Fig. 4.1.). The site has been continuously excavated from a Greek-French team from 1961 to 2013. Several basketry impressions on pottery bases, originating from Late Neolithic layers (horizons II, V, VIII) have been published: five of diagonal twill (Treuil, 2004: Plate XXI: 4-5, Plate XXII: 1, 3) and two of probably coiling technique (ibid, Plate XXI: 4). Thirty-eight (38) unpublished basketry impressions were studied in the Spring of 2017 for the purposes of this study, secured with a Ministry of Culture study permit (number ΥΠΠΟΑ/ΓΔΑΠΚ/ΔΙΠΚΑ/ΤΕΕΑΕΙ/1830/1113/72/27).

Agios Antonios and *Kastri* are extended Neolithic and Bronze Age settlements situated on the island of Thassos (Macedonia, Greece, Fig. 4.1). They are both naturally protected from the hilly environments of the mountains of Potos and Theologos and are both located on hilltops. Agios Antonios was excavated in 1970 and has a Neolithic phase, but the settlement flourished during the Early, Middle and Late Bronze Age and the Early Iron Age (Papadopoulos & Neradzis, 2012). The prehistoric settlement of Kastri and its necropolis was explored between 1971 and 1980 and also presented evidence of a Neolithic occupation layer, but its major periods are Late Bronze Age to Early Iron Age (ibid.). Only two fragments were analysed (one per site) through a Ministry of Culture Study Permit ΥΠΠΟΑ/ΓΔΑΠΚ/ΔΙΠΚΑ/ΤΕΕΑΕΙ/1830/1113/72/27 and the oral permission granted by the former site director of Kastri (Koukouli-Chrysanthaki, 2018, *pers. comm*.)

Skoteini is a Late Neolithic cave dwelling and necropolis, situated on the top of a limestone rocky hill nearby the village of Tharrounia in Euboea (Map 4.1). The excavation of the site started in 1986 and its research continues to date (Sampson, 1988). There is an abundant number of basketry impressions on pottery bases, which have been discovered both at the settlement and in the necropolis. The total of 64 impressions have been published and discussed by Beloyanni (1993). All of them were found on bases of coarse ware pottery with coiling being the dominant weaving technique (noticed for about 42 fragments). Less popular is the diagonal twill (7 fragments), but there are also limited examples of simple and split twine (2). Most of the impressions are not well preserved, so full identification of the techniques was not possible for most of them. Access to 28 fragments was granted for the aims of this research (Study Permit ΥΠΠΟΑ/ΓΔΑΠΚ/ΕΠΣ/ΤΑΠΙΠ/211793/127013/3092/1286).

Franchthi is a Middle and Late Neolithic/Chalcolithic cave settlement in the Peloponnese (Fig. 4.1), which was excavated in two main campaigns: an American excavation took place between 1960 and 1970 and a later joint Greek-American project took place in the 1990s. From the earlier excavation, one (1) coarse ware pottery base with mat-impression was published (Jacobsen, 1973, P. 271 – 272, Pl. 51c), while it became clear that more basketry impressions were uncovered during the last campaign. Four unpublished impressions were studied for the purposes of this research, secured by a Study Permit (ΥΠΠΟΑ/ΓΔΑΠΚ/ΕΠΣ/ΤΑΠΙΠ/211793/127013/3092/1286).

Malia and *Palaikastro* are Late Minoan sites on Crete situated in the middle of the north cost of the island and in the northeast part of it respectively (Fig. 4.1). Malia is a Middle Minoan palatial complex, which was destroyed by an earthquake during the Late Minoan period, but it was then rebuilt, so the major part of the excavated (by l'École française d'Athènes since 1920s) remains of the settlement belongs to this stage (Poursat, 1980). The complex of Palaikastro was excavated by the British School of Athens during several campaigns starting from the end of the 19th century and up until 2016. The investigations uncovered a large Middle and Late Bronze Age town, which proved connected with the rest of the island and the other major Bronze Age centres (Knappett and Cunningham, 2012). Both sites have produced fine ware with basketry impressions on their bases and walls, which have been already published (ibid., Knappett 2010, 2004). The impressions of Malia come from 16 vessels (Poursat, 1980), while the ones from Palaikastro are two (Knappett and Cunningham, 2012). For the purposes of this study, access was kindly granted by the site directors to six fragments from Malia and the two from Palaikastro.

4.3.3. Methods applied for the study of the pottery impressions

4.3.3.1. Physical characteristics and primary documentation

The physical aspects of the studied pottery mat/basketry impressions were first recorded and documented. The recording was divided between parameters of the pottery fragments: thickness of the base, lower wall or both; in some cases - estimation of relative or absolute diameter and fragments' weight and parameters of the impressed weave: circular or perpendicular orientation, technique, width of the warps/wefts, presence or absence of centre. All original studied fragments along with their wax casts were photographed for reference purposes (Appendix 4). This was done with cold light source and no filters (with cameras iSight 5c and Canon EOS 450D equipped with lens Canon EF-S 10-22mm with aperture f/3,5-4,5 and focal length 16-35mm).

Estimation of the potential minimum and maximum diameter of the circular weaves (where an absolute diameter was not available) was applied to the bases from two sites, Dana Bunar and Dikili Tash. The same was applied to the perpendicular weaves, where the curvature of the base edge was taken into account. Measuring both the curvature of the circular weaves and the edge of the pot base at the perpendicular weaves were guided by the Rim Chart (Tyers, 2014), where the estimated radius was multiplied by two in order to achieve the minimum/maximum estimated diameter of the weave/pot base. Here the *minimum diameter* is based on the outmost preserved weave curvature (the most external weft) on the pottery impression. The *maximum diameter* was estimated where the edge of the base joining the pot's wall was preserved; this means that the outmost curvature of the weave was present. Several fragments had preserved both the initial centre of their circular weave together with the outmost weft, in which cases an *absolute diameter* was obtained.

The photography and base diameter estimation were combined as an initial recording method, guiding the forthcoming microscopic analysis (photography) to study the pottery shapes and sizes of the impressed vessels. It should be noted that the diameter estimation was considered only a relative measurement, aiding the abovementioned pottery properties. The weight measurements were taken at a later stage of this study and because of permit restrictions, it was not possible to apply them to the whole assemblage included here. If there was a chance for complete weight values recording, this could complete the physical characteristics of the preserved mat-impressed bases.

4.3.3.2. Optical microscopy (LED, Dinolite, PPL, XPL*)*

The next level of the analysis was performed with a stereoscope (Polar, with magnification lenses ranging 0.7 – 1.5x) and cold light source (LED), where images of details from the impressions in higher resolution were produced. These images targeted the morphology of the impressions, such as singular strand, weft of warp's bed and the preserved in it features, which were observed and described. In the cases where the impressions were displaying pronounced details, such as the vertical striations of the monocotyledonous leaves, Dinolite (with magnification ranging 20x-800x) photography was also used, aiming at documenting a higher detail.

Plain polarised light (PPL) was applied to three fragments from Dana Bunar I (N4, N10, N11) and to two of the wax impressions from Malia (N68 and N71). Cross-polarised light (XPL) was applied only to one wax impression from Malia (N 69). These light filters were set up as an experiment in order to estimate the potential of their application onto mat-impressed pottery fragments. It was determined that only contemporary plant remains are visible onto the fragments' surface, including plant fibres and storage/restoration contamination of twisted cotton fibres. It was concluded that this approach is not informative about any plant morphology which could be visible into the mat-impression. The reason for this was the lack of diagnostic anatomical details at the impressions *per se*, but only some general features (such as striations).

4.3.3.3. Sampling impressions: application of dental wax

Sampling casts of the mat/basketry impressions was done with dental wax, applied with a heat source with temperature up to 80°C (heat gun Bosch PHG 600-3). The cast were placed on the fragment and then heated; pressure was applied with fingers to aid the moulding process. After a short settling period (2-5mins, depending on the size of the fragment and the size of the piece of wax), the casts were separated from the original. After a complete cool down period (*circa* 1h in a room temperature of about 22°C), the wax casts were ready for microscopic observation and storage (Fig. 4.21.a-b). The storage was done in dry lidded containers, where each cast was separated from the other with rice paper, eliminating the possible adhesive effect between the impressions. Dental wax was also applied to herbarium specimens (Institute of Biodiversity and Ecosystem research of the Bulgarian Academy of Sciences) of targeted species, where leaf and stem impressions were compared with the ones sampled from the mat/basketry impressed pottery. The herbarium species of interest were chosen on the basis of pre-existing ethnographic scholarship and primary field study (Chapter 3).

4.3.3.4. Imaging experiments: SEM, 3D scanning

Aiming in further detail of imaging in order to estimate the probability for any archaeological plant remains embedded in the impressions on pottery, four test SEM scans were conducted on both original fragments and wax casts. Only two original fragments from Dana Bunar I (N 19 and N 20) were sampled for SEM imaging, while two other wax casts from Malia (N 69M, N 1545) were also scanned. These were performed experimentally in order to estimate the potential of SEM scanning of mat-impressed fragments. Despite the information to-be-brought from the SEM imaging this would be a destructive approach because of the required small sample size, so a test was necessary. The SEM imaging did not provide any information on plant identification but rather insignificant insights into the technology of the impressed weaves, such as the degree of wear of the impression which may be an intentional production act of a result of usage; also the SEM scans presented evidence of recent contamination (such as sediment vegetation or conservation material – i.e. cotton fibres). Thereafter, it was decided that optical microscopy and wax casts are sufficient in terms of the acquirable level of detail of the basketry impressions on pottery (Fig. 4.21.c).

Figure 4.21. Sampling mat-impressed pottery with dental wax (a. cast production, b. molding with a heat gun, c. SEM imaging of wax casts)

4.3.3.5. Ethnographic knowledge

The existing ethnographic scholarship in combination with primary field work and sampling guided the choice of plant taxa to be proposed as employed for the woven items impressed onto pots (Chapter 3). The data from the different ethnographic regions of Bulgaria and Greece were integrated into the vegetation framework of these regions – Continental and Mediterranean and suggestions were reviewed. Even if direct parallels between ethnographic and archaeological examples could not be drawn, ethnographic knowledge on basketry proved a guiding proxy for studying archaeological products of basket-making.

4.3.4. Results from Mat/basketry impressions on pottery

This section presents the results from the analysis of a total of 215 mat-impressed fragments, originating from 12 Neolithic and Bronze Age sites: 5 from Bulgaria and 7 from Greece. 137 fragments come from sites in Bulgaria and 78 - from sites in Greece. The number of accessed and studied sherds represents 28% of all reviewed ones, while the number of studied sites is about 17% (Fig. *4.1.*). The identified weaving techniques include plain weave, coiling, simple and split twine, simple and diagonal twilling, which are all main basketry techniques (Chapter 2).

4.3.4.1. Provadia – Solnitsata (North Black Sea cost, Bulgaria; Late Neolithic – late Chalcolithic)

Weaving Technique. The weaving technique of the impressions from Provadia was not always perfectly preserved, hence, given the incredible abundance of mat-impressed pottery, only 'promising' fragments were selected for study (50 bases and 50 bases with walls). The studied fragments from Provadia all presented diagonal twill without exception (Fig. 4.22. a-c.). The general appearance of the impressed weaves was compact but not very knit. Very often errors or misses were detectable on the bases, such as doubling the weft (PROV 4) or missing the 1:1 sequence (instead of one under, one over, there may be one under, two over or vice versa (PROV 21, 29). Some of the impressions were very clear and no mistakes were visible, such as PROV 39, 35, 52, 55, 56.

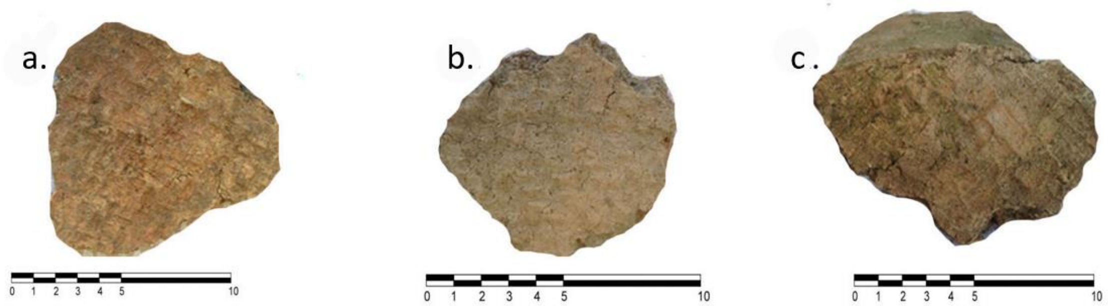


Figure 4.22. Diagonal twill from Provadia: a. PROV64, b. PROV98, c. PROV13.

Vessel Shape & Size. The mat-impressed vessels from Provadia were classified as mass-produced salt evaporation vessels and are either two-handled conical or two-handled oval pots, both of medium size (Nikolov and Petrova, 2008). The general tendency was that the bases' thickness (mean = 15.133; SD = 4.31; range 9-32mm) and the walls thickness (mean = 14.26; SD = 3.6; range 9-32mm) were close in terms of thickness, but this did not apply to the whole continuation of walls because only their initial bit was preserved (Fig. 4.23). But even keeping this in mind, together with the "hastly-made" appearance of the impressed weaves, it may be suggested that this pottery shape was one of the main industrial (salt production) vessels of the Neolithic Provadia.

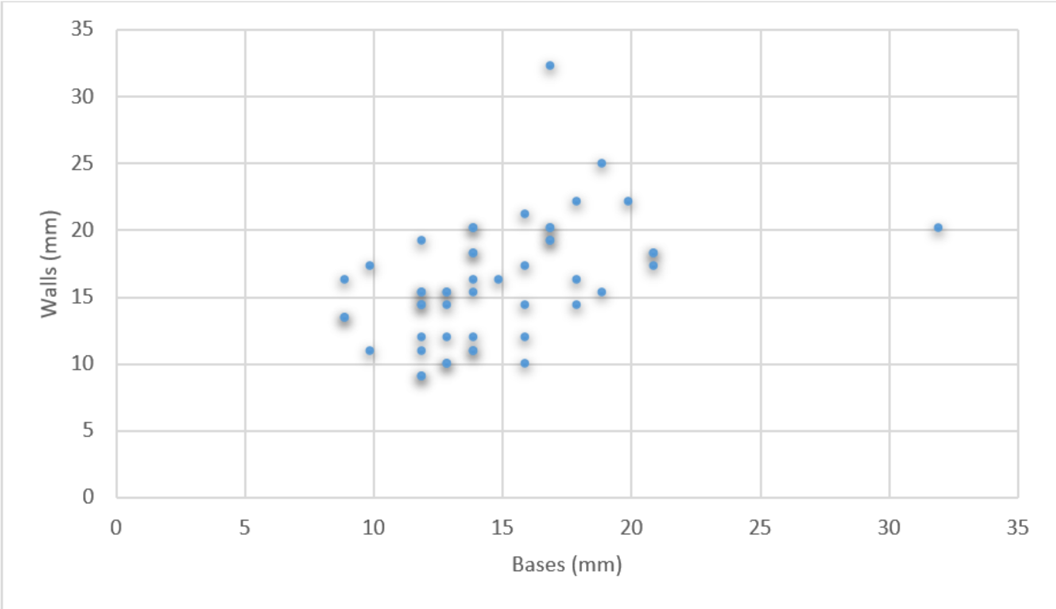


Figure 4.23. Correlation between base wall and thicknesses of 50 fragments from Provadia – Solnitsata, where both bases and walls were present; 50 bases-only are excluded from the plot.

Weaving Material. The wefts of the studied fragments ranged between 0.6 – 0.9cm and the majority of the clear impression display central keel or two parallel main venation along the leaves used in the weave (Fig.4.35. t-u). Where visible, the space between the veins (or better developed veins in the leaf surface) was *circa* 1mm. The thickness of the leaves and the venations specifics may suggest leaves from the grass family, including the cereal cultivars. This hypothesis could be supported by the analysed archaeobotanical remains, where cereals are present including einkorn, emmer and barley (Marinova, 2008).

4.3.4.2. Kurilo (Sofia plane, Bulgaria; Late Neolithic)

Weaving Technique. The tree mat-impressed bases from the region of Kurilo displayed diagonal twill. Fragment N1 showed very compact weave in open angles and with no errors. Fragment N 2 was impressed with wider leaf in almost right-angled weave and no mistakes. Fragment N 3 was the best-preserved one in terms of weaving technique and its wefts were joining each other under right angles. This very knit plaiting was probably done with the aid of a devise, such as the comb-like one, used in loom weaving; another possibility when the weave is kept compact and tight is when the weaver uses their own body do sit/stand on the finished woven bit while weaving the rest (Fig. 4.24.a-c).

Vessel Shape & Size. The mat-impressed vessels have been suggested to have their origin from one of the mass pottery types at Kurilo – the biconical bowl of medium size (Petkov, 1965, Todorova and Vaisov, 1993, Fig: 99. 8-11). All base diameters and bases and walls thickness were in support of a medium size vessel too: the approximate diameter fragment N1 was *circa* 9cm, of fragment N2 -14cm and offragment N3 -16cm, while the base thickness ranged between 9 and 16mm (mean = 13.7; SD = 3.38; range 9.97 – 16.46mm) and the walls thickness ranged between 10 and 21mm (mean 15.98; SD 7.44; range 10.72 – 21.25mm; Fig. 4.24.).

Weaving Material. The wefts of fragment N1 from Kurilo were of circular or flattened circular outline and had *circa* 3mm diameter (Fig. 4.35. j-k). They display parallel venations as the stems and leaves of rushes. Very similar were the impressions on fragment N 2, where the weft was of circular of flattened circular outline, again displaying striations and diameter between 2 and 3mm. The weft on fragment N3 was certainly a flat leave much wider than the previously discussed ones, and possibly originating from a monocot with leaf width 5 – 6mm. These leaves displayed one or two central veins (keels), so these may correspond to a product woven with grass leaves or grain cultivars, but may not be cattails (which have the described width but they do not show central ribs in their leaf relief – no central veins, but only smooth parallel ones).

Fig. 4.24. Diagonal twill from Kurilo: a. KUR1, b. KUR2, c. KUR3);

4.3.4.3. Bulgarchevo & Topolnitsa (Struma Valle, Bulgaria; Early-Late Chalcolithic)

Weaving Technique. The mat-impressed pottery from Bulgarchevo (5 fragments in total, Fig. 4.25.a-c) and Topolnitsa (2 fragments, Fig. 4.25. e-h) displayed several weaving techniques: diagonal twill (4 from Bulgarchevo), twining in its variations of close simple (1 from Bulgarchevo) twine and split twine (1 from Topolnitsa); and one coiled (Topolnitsa). The much knit, close simple twine of BUL 586 could have also originated from a plain-woven object as the orientation of the wefts was perpendicular to each other. Two are the cases where the diagonal twill was done with exceptionally wide wefts ranging from 6-7mm (BUL 1599, 1443) to 11-15mm (TOP M14M). Another two amongst the diagonally twilled fragments were made with narrower wefts (4-5mm), but still the weave was compact and the elements were following a right-angled pattern (BUL 1452 and TOP N14). In addition to the twinning, there was one fragment impressed with split twine weave (TOP 242), where some stitches/corrections/mistakes were visible. The last type of weave was the fragment with coiled weave, where only the coils were detectable but the actual warp was not visible, as the sherd was much worn.

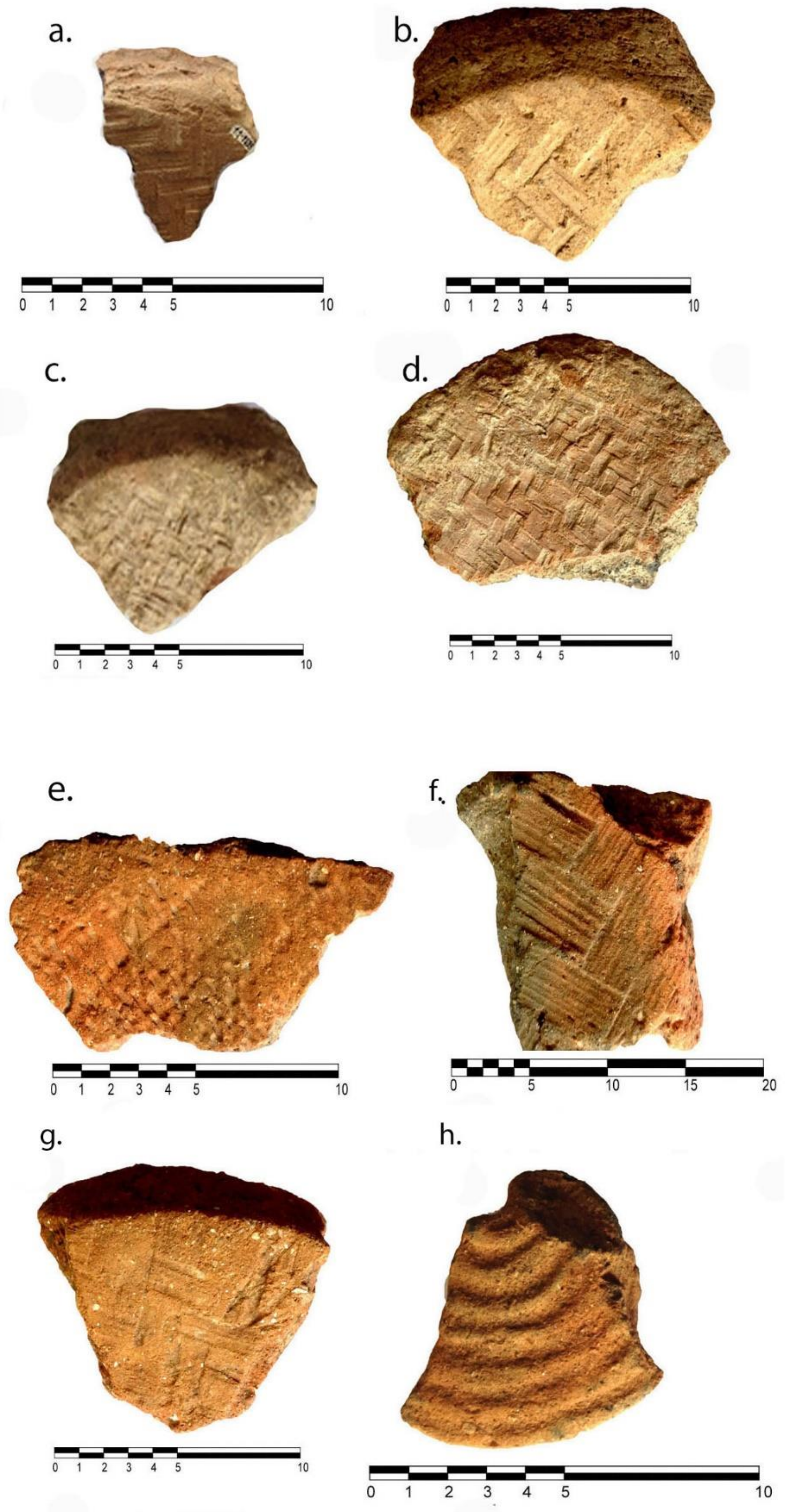


Figure 4.25. Mat impresions from. Bulgarchevo: a-d. Diagonal twill from (BUL 1599; BUL 1443; BUL 1456, BUL 1452) and Topolnitsa: e. Simple twine in 1:2 ratio (TOP 242); f-g. Diagonal twill (TOP M14; TOP N12); h. Coiled (no number);

Vessel Shape & Size. The bases from Bulgarchevo presented thickness (mean = 12.58; SD = 4.43; range 8.05 – 17.3cm) ranging between 8-17mm, while the two bases from Topolnitsa varied between 10-13mm (mean = 12.73; SD 1.66; range 10.82 – 13.72mm), while the only preserved wall part from Topolnitsa was *circa* 17mm. These measurements suggest medium to large vessels (the 200A from Topolnitsa) which were mat-impressed. Their shape could not be commented as there was no fully nor partially preserved vessel, which could give a hint on the geometry of this type of pottery.

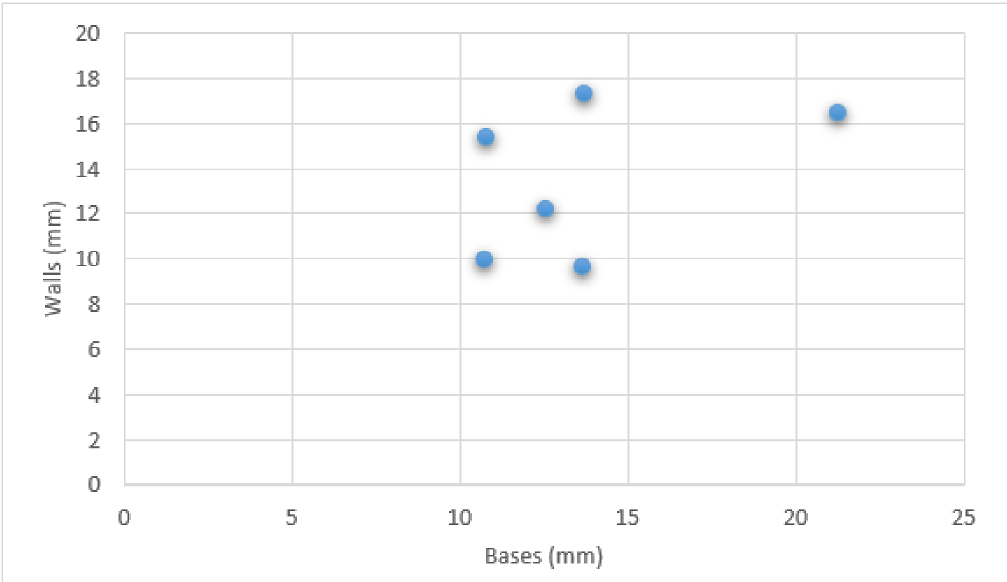


Figure 4.26. Correlation between base and wall thicknesses of the studied 3 out of 5 fragments from Bulgarchevo, 1 out of 3 Topolnitsa and 2 out of 3 from Kurilo, where both bases and walls were preserved (bases-only were excluded from the plot).

Weaving Material. The majority of the impressions present on the pottery from Bulgarchevo and Topolnitsa was with flat leave outline (Fig. 4.35.j-k.). Three groups of suggested weaving material could be distinguished here. The first one was the impressions showing very wide leaves with distinct parallel venation and no keel (central vain), which could reach up to 1.5-1.7cm width (TOP M 14) or 0.9 – 1.1cm (BUL 1599, BUL 1443) while the leave venation was spaced in 1 – 2mm distance. These general characteristics could correspond to wide leaves of the family of the cattails (Typhaceae). The second group of possible plants, chosen for weaving were the flat leaves of narrower width (0.4-0.5mm) and had central keel, such as in fragments BUL 1452, BUL 1456 and BUL 586. This morphology could suggest a representative of the grass family, such as wild grasses or cultivated cereal plants. The third group included the split twined fragments, where the leaves or stems used for weaving the object impressed in this base (TOP 242 864) were of possible circular outline and appeared flattened when woven. They had diameter/width of 2-3mm and could be plants like rushes or sedges (Juncaceae or Cyperaceae).

4.3.4.4. Dana Bunar I (Rhodope, Bulgaria; Early-Late Chalcolithic, Early Bronze Age)

Weaving Technique. The weaving techniques registered on the twenty-seven pottery impressions of Dana Bunar I were of two types (Fig. 4.27.a-d). The circular weaves were present in 19 fragments and were in close simple twinning with one exception in open simple twinning; while the perpendicular weaves were in simple plaiting. In several cases the starting point of the circular weave was preserved on the impression: DB 1, DB 3, DB 4, DB 9 and DB 16, while in 2 other cases only part of it: DB 17, DB 19. The starting point was probably formed by an even number or crossing in a right-angle twined warp element, i.e. grouped in sets of four. The wefts were then twinned around the warps shaping the surface of the weave. Some fragments displayed presented a rim/salvage of the woven object preserved on the walls of the vessel (DB 14, DB 15b), which may indicate the use of shallow woven baskets employed in the process of building the pot. The warps of the weave originated from the starting point and sometimes additional warps were present (added later, to supplement the rigidity of the weave), as in DB 16. The wefts were directed from left to right in the pottery impressions, which should read reciprocal in the original woven object. The wefts were in interval 1:1 – once under the warp and once on top of the next one. The wefts of the circular weaves of Dana Bunar I were all with circular cross section, which allowed its measurement and it varied from 1.5 to 3mm, with the exception of DB 15b, which was 5mm. Several weaves were exceptionally regular and its wefts were predominantly staying at 2mm diameter (DB 3, DB 4), while others were irregular and balanced with additions of warps (DB 1, 15b).

The perpendicular weaves were represented by eight bases from the whole assemblage and they were all in simple plaiting (chequer weave) in an interval 1:1. The majority of wefts were very knit and compact with the exception of DB 21, DB 22, DB 24, DB 27, but a few of them displayed exceptionally well preserved weave: DB 20, DB 23, DB 25. The wefts were with a flat cross section and their width varied between 5 and 11mm. Two paired (coupled) plant parts, such as leaves/culms of the wefts was sometimes present in order to achieve wider or more durable surface.

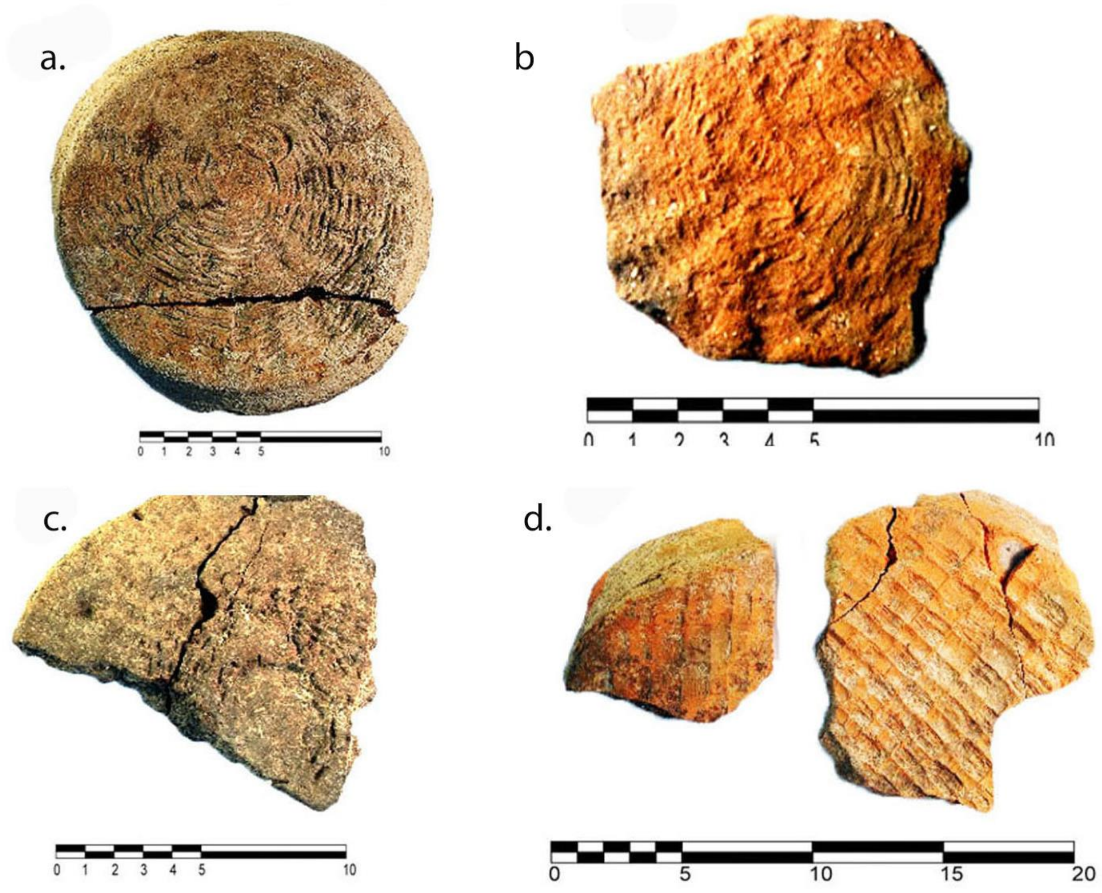


Figure 4.27. Mat impressions from Dana Bunar I: a-b. Open simple twine (N 1, N2; c. Open simple twine with shifted base (N 9a); d. Close simple twine (N6).

Vessel Shape & Size. There is not much to be discussed regarding the vessels shape as there was no fully preserved one. As for the size, it could be argued that some of the vessels were of small to medium size because their bases' diameter ranged between 18 and 32mm (Fig. 4.28.). The ratio between the thickness of the preserved bases (mean=11.83; SD =3.67; range 3.24-19.39mm) and walls (mean=11.28; SD=3.39; range 5.58 – 18.38mm) also supported this suggestion These sizes could correspond to shapes, such as bowls or *kadoi*, but of course, this could be discussed further, only if a larger part of this type of pot were to be preserved.

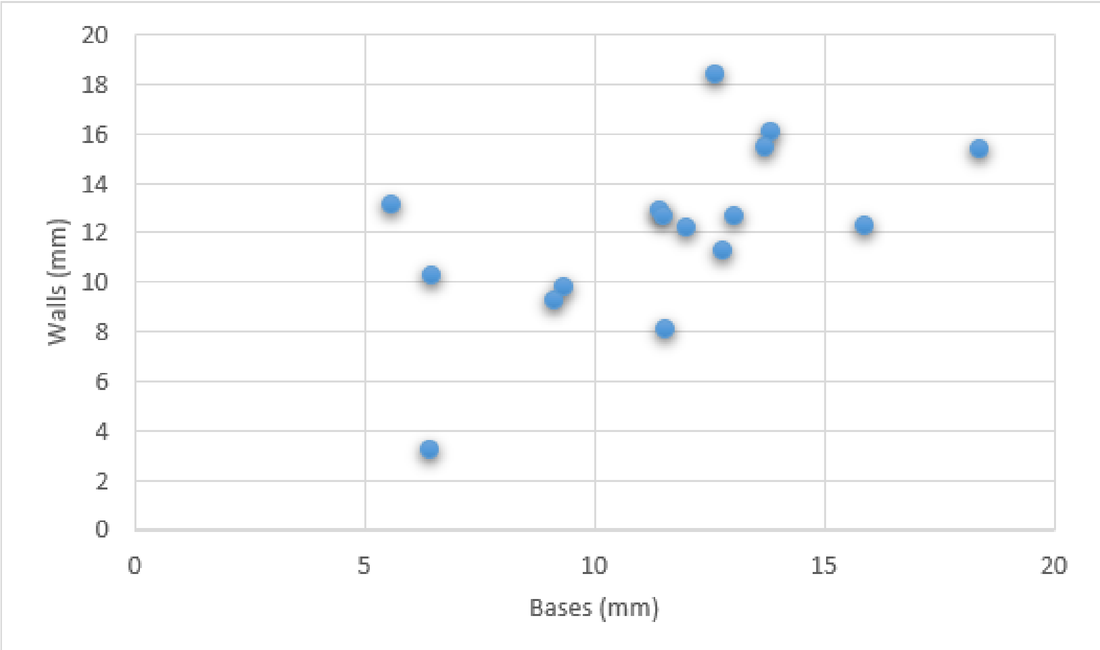


Figure 4.28. Correlation between base and wall thicknesses of 15 out of 27 of the studied fragments from Dana Bunar I, where both base and wall were preserved (bases-only were excluded from the plot).

Weaving Material. Three fragments of the assemblage from Dana Bunar I were subject to destructive sampling in order to obtain a small in size sample for SEM imaging (circular weaves 17, 19 and perpendicular 20). Only one of them (19) presented plant tissue morphology with non-diagnostic cell walls (Fig. 4.35.p-q). As there were no actual diagnostic plant remains preserved within the mat/basketry impressions from the site only some hypothesis can be provided here. As visible under stereoscope, along with the SEM images, most of the plant parts which left their impressions presented parallel striations in both circular and perpendicular weaves (Fig. 4.35.r-s). Among the circular weaves (Fig. 4.35.l-m), all the wefts with circular cross section, which together with their leaf/stem diameter, the leaf/stem relief and the information obtained in the ethno-botanical bibliography of the region, may point to the families Juncaceae, Cyperaceae and Poaceae (Bichard 2008, Wendrich 1999, Gale & Cutler 2000). In particular, these families are proposed on the basis of the diameter (for the circular weaves) and the width (for the rectangular ones) of the leaf/stem impressed onto the pot base; the leaf/stem morphology, such as parallel venation and the interspacing between the different veins; and based on the available ethnographic scholarship and primary research. In the case of the circular wefts, where no parallel striations were observed, and especially in the case of fragment 15b where the diameter of the weft value was higher, the chosen plants may have been dicotyledounous too. As per the ethno-botanical literature for the region these may be young shoots of woody plants members of the families Salicaceae, Aceraceae, Fagaceae, Betulaceae, Cornaceae, Malvaceae (for example Bichard 2000, Dogan & Nedelcheva 2008 et al.). Among the perpendicular weaves (Fig. 4.31.n), the flat cross section identifies the chosen plant part: leaf. Here the flat monocotyledonous leaf with a higher width and known choice for basketry/matting from the ethno-botanical sources points towards the families Typhaceae and Poaceae (op. cit.).

4.3.4.5. Dikili Tash (Macedonia, Greece; Early – Late Neolithic, Chalcolithic)

Weaving Technique. The examined mat impressions on pottery from Dikili Tash (49 fragments), showed a predominant diagonal twill weave with a few exceptions (Fig. 4.29.a). In particular, twenty-nine fragments were identified as diagonal twill, while seven were determined as *cf.* diagonal twill. These were usually cases when the impression was too worn but a diagonal twilling pattern could be distinguished (Fig. 4.29.a). Three fragments were classified as simple twine and only one as split twine; another ten fragments were classified as not identifiable, due to the heavily worn state of the impression, making impossible its determination.

a.

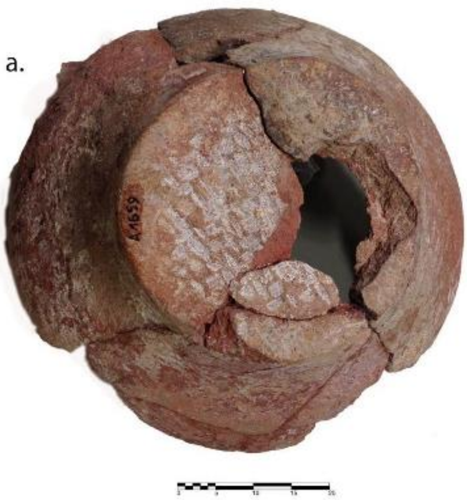


Figure 4.29. a. Jar/amphoreas A1659 from Dikili Tash.

Vessel size and shape. Measurements of the vessels' bases where the impression occurs and the vessels' wall, where those were preserved, were taken. The results based on 18 fragments which preserved both walls and bases are in favour of the higher base value compared to wall thickness. For the bases the average width was *c*. 11mm (mean= 11.44; SD= 3.46; range 5.6 – 28.96mm), while for the walls the average width was *c.* 10mm (mean=10.59; SD=3.01; range 7.36 – 18.64mm; Fig. 4.30.). It should be stressed out, that the two measured values are generally close, because the measured walls were at the joining point with the bases (where they are constructively thicker); however, these values suggest medium – sized pottery. On the other handm the vessels' shape(s) from where the mat-impressed bases originate could be storage vessels, such as jars and/or amphorae. In addition, an almost complete example, vessel A1659, features a conical body and bears an impression of diagonal twill weave on its base (Fig. 4.26.a); at the time of my examination the vessel was under restoration so it could not be photographed with the base pointing downwards). The overall thickness of the wall (at the bottom of the body, where it commences from the base and towards the rim) of A1659 was also of close value to the thickness of the base itself (*circa* 10mm), which corresponds to the measured values of the examined mat-impressed fragments from Dikili Tash.

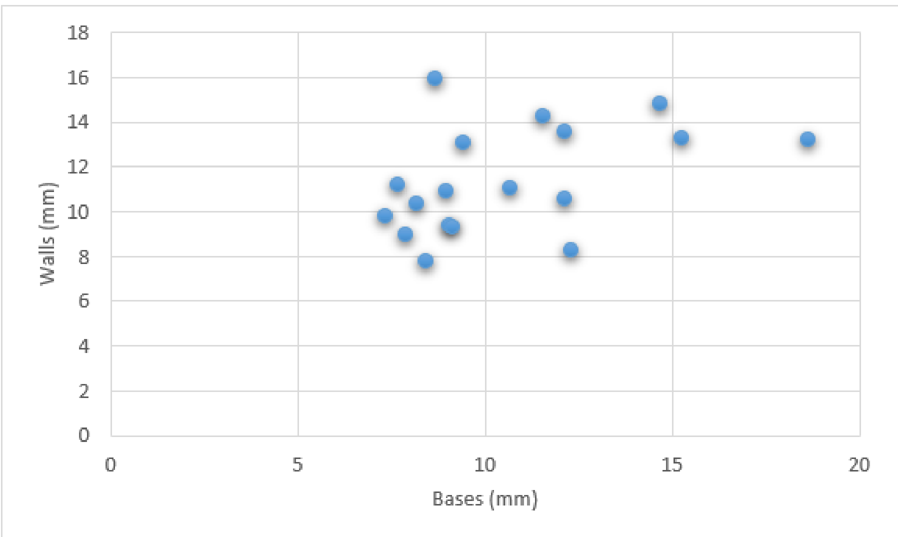


Figure 4.30. Correlation between base and wall thicknesses of 32 out 49 fragments from Dikili Tash, where both bases and walls were present (bases-only were excluded from the plot).

Weaving material. The examined mat-impressed bases from Dikili Tash presented a consistent weaving technique: the diagonal twill. This type of weaving, along with the simple twine (shown in only three examples), was achieved with flat and relatively wide leaves, as proven by the minimum and maximum wrap/weft values (here counted as wefts only, because there is no difference between these elements in the case of diagonal twill or twinning). The minimum weft value was under 10mm (*circa* 8mm), while the minimum was ranging between 4-5mm, and the maximum between 5-6mm. There was no correlation between the base thickness and the width of the vegetal leaves employed in the weaving, i.e. a thick base did not necessarily bear an impression of weaving with wide leaves. An example is the impression of DK334-5/133-4/001 with a minimum and maximum leaf width of *circa* 10mm, which originated from a base of only *circa* 11mm (Fig. 4.30); the impressions of DK137-318-020//602238-004 with min/max of the weft *circa* 8mm originated from a base/wall ratio 11/10mm (Fig. 4.35.a). The majority of leaf laminas shaping the diagonal twill impressions presented a central keel (also called a mid-rib) and very prominent, parallel striations/venation. These two characteristics of the leaf relief are restricted to the monocots (i.e. in the leaf blades of the woody plants the venation is reticulate and never parallel). For example, most grasses (Poaceae), sedges (Cyperaceae) and cattails (Typhaceae) exhibit laminas parallel venation (rushes, too, but their leaves are excluded here because of their circular cross section). Some of the sub-families of the Poaceae do present a strongly emphasised central keel, such as the Cerealia (e.g. *Triticum* sp., *Hordeum* sp.). This is illustratively visible at the close-up look of one of the best preserved impressions of Dikili Tash: DK6202-002 (Fig.4.35.a).

One exception from the flat and wide leaves is the weave of fragment DK6541-004, which was done in split twine. Here double or twined wefts of circular outline and *circa* 2-3mm width were woven into the twine technique, where the wefts were V-split into every second row. No details were visible when this fragment was analysed, i.e. no venation was recorded as present onto the circular leaves or stems. It could be only suggested that their diameter corresponds to the leaves of numerous rushes (Juncaceae) or the stems of most of the grasses and sedges.

4.3.4.6. Ag. Antonios and Kastri (Thassos, Greece; Early – Late Neolithic)

Weaving Technique. The mat-impressed base from Ag. Antonios was woven in a close simple twine technique where the wefts are tripled. The warps were not visible as the weave was very tight and the wefts covered the parallel warps. There were six rows preserved and some elements of the seventh; there were also four warps, seen as fully dressed by the body weave (Fig. 4.31.a). The space between the warps ranged around a centimetre (10 – 12mm), while the total width of a weft was between 7-9mm. Each single element of the weft bundles was of circular outline and was *circa* 2mm diameter.

The fragment from Kastri was impressed with a widely spaced open simple twine technique. The material was of circular outline of *circa* 2-3mm in diameter. The warps were spaced in 1o – 12 mm distance, while the wefts were placed with an average of 2mm in between, and forming a right angle between the two elements (Fig. 4.31.b.). The wideness between the elements of the impressed weave suggests an item, such as a mat or a kind of screen (i.e. window screen, ceiling or any other household two-dimensional object).

Vessel Size and Shape. The base from Ag. Antonios was relatively thick (21-23mm) and this may indicate a medium to large vessel with a stable foundation of perhaps heavier weight and potential storage use (if we accept that heavier items are less mobile). As the base was incomplete and no parts of the body of this vessel ware preserved, the actual vessel shape was not determinable. It is unclear if this mat-impressed fragment is of isolated occurrence, or whether there are more similar fragments from the settlement of Ag. Antonios (Papadopoulos 2016, Hatzituluzis 2016; Malamidou 2018).

The fragment from Kastri was a body sherd, which places it as an exception to the general tendency for mat-impressions attested on pot bases. It was not possible to determine the vessel shape but the thickness of the wall (8-9mm) suggests a medium sized vessel. As this mat-impressed fragment was a rather isolated phenomenon of Kastri, no further details on the vessel specifics could be provided.

Weaving material. The tripled weft bundles of the base from Ag. Antonios suggested highly elastic material of circular outline. This may be stems/culms of monocotyledonous plant, which were tightly placed together in a bundle, in order to create a solid base for the weaving of the wefts of the item. The warps were not visible, as they were covered with the wefts, and they could be equally monocots and dicots, and no further analysis was possible.

The circular outline of the material used for weaving the item which left its impression on the pottery sherd form Kastri could be also either monocot or dicot. The only hint here could be the elasticity of these two categories of material. As the monocots are highly flexible, they are intended to be employed in tighter weaves, while the thin, but rigid woody rods or splints of dicots may be used for a less dense open twine, such as the case from Kastri.

Figure 4.31. a. Close simple twine with triple weft from Ag. Antonios (AE16); b. Open simple twine from Kastri (O-D/1-3);

4.3.4.7. Skoteini (Euboea, Greece; Late Neolithic)

Weaving Technique. Amongst the twenty-eight fragments that were studied, five fragments with impressions on their bases and one from fabric (1, SK23 T3,4) were not identified due to the unclear state of the impression (sometimes not even a weave, but only a vegetal impression). Nevertheless, fourteen fragments from the analysed assemblage were woven in coiled technique, which forms 51% of this assemblage with an addition of 2 *cf*. coiled sherds (Fig. 4.32.a-g). The type of coiling from Skoteini was achieved by employing flat leaved material, which was used in single strands for both wefts and coils. There are three almost complete bases, which preserve the commencing point of the weave. These starting points are not very precise, but it looks like the initial coil was compressed and/or stitched with the weft. The centres were also shifting themselves from the pottery fragment's centre. The further development of the weave continues to be unelaborated and there is irregularity in the spacing between the wefts (as in A8, 38 and C6). Sometimes there were mistakes in the weave – missed weft ratio, or even weft coiled around the next/previous coil (not the one they belong to). A possible interpretation of these "mistakes" could also be a secondary use of the woven objects and their repair or adaptation for the purposes of pottery production. This is sharply visible on the base of C6, where the left and the right sides of the impression perhaps originate from different woven objects and were joined together to create a larger surface (Fig. 4.32.c).

The second by frequency technique identified on the mat-impressed pottery from Skoteini was twinning. Two of its variations have been identified: the simple twine (5 fragments) and the split twine (1 fragment). The simple twined fragments were all in close tight twinning, visible to a great extent onto the almost complete base of C6. The wefts of the twinned objects were sometimes coupled (i.e. the weft is formed of two strands of material) as in A 31. In other cases (such as fragment G15 – 19 T8-9 40 and G9 T8 26), the wefts were woven in ratio 1:2, i.e. they pass once under the warps and twice above (Fig.4.32.f). In the case of the split twine fragment (7A6T6) the warp was split into two forming the Greek letter *lambda* (Λ) and passing through the weft. This type of weave is similar to net-making because wefts and warps are identical as elements (usually a rope or a type of twisted strand). Here the impression seemed to be regular weave with no errors or repairs and both wefts and warps were with *circa* 2mm diameter.

Vessels Size & Shape. The mat impressions of Skoteini were almost exclusively on pot bases except one with unclear weaving technique, which was present at the inner wall of the fragment (*see above*). The mat-impressed vessels were classified as medium to large in size and for storage purposes (Beloyanni, 1993) and measurements of the base thicknesses were not performed. All the bases with identifiable impressions of coiled weave were very deep, which corresponds with the vessel's weight. If the hypothesis related to the pottery production where mats are being used for the raw shaped vessels to dry on is adopted, then it may be concluded that these vessels were of significant weight, given the depth of the impression. On the other hand, the vessels with non-identifiable impressions, where they look 'worn' may be associated with transportation actions and uses, which are activities deforming and erasing even the deepest impressions on the pot bases. But on the other hand, an erosion of the base surface may be also caused by the mechanical impact of water or humid conditions caused by the long-term standing of the vessel in one place (i.e. at the earthen floor, serving as a storage volume).

Weaving Material. The close-up look into the flat leaved impressions on the fragments with coiled technique showed that thee weft ranged from 4 - 8mm and its overall appearance showed a general rigidity and reduced elasticity, i.e. an elastic material would coil much more precise and regular. The leaves that were used for coiling were flat and relatively wide. They were used in their full width but also as strips where necessary, i.e. at the point where the weave starts from. The wefts were also compressed while coiling around the coils (which were formed by the leaves into their full extend and full width, Fig 4.35.b-e). These compressions and the general uneven view of the weaves was probably a result of the sturdier material used.

The leaves had very prominent parallel venation and no central keel (Fig. 4.32.a-b). The depth of the impression and the clear view of the veins point towards highly fibrous, not very flexible and slightly rigid (still elastic enough to perform coiling) leaves. Given the width of the leaves and the abovementioned physical characteristics, these could be either dried and woven when wet (i.e. when water is applied onto the once dried plant parts) grasses or cultivars, or green, seasoned (previously cut and stored as dry material) or completely dry (old) palm leaves (because they preserve their weaving properties due to their highly fibrous leaves).

Regarding the simple and split twine weaves it could be said that they were made of stems or leaves with circular outline with no evidence of twisting (i.e. rope-like wefts). If we accept that these circular stems/leaves were woven in their original state (with no further processing), they may include a wide range of rushes, grasses, and sedges. Since there was no ribbing/venation visible into these circular wefts and warps, no further suggestions regarding the used plant material could be provided (Fig 4.31.c).

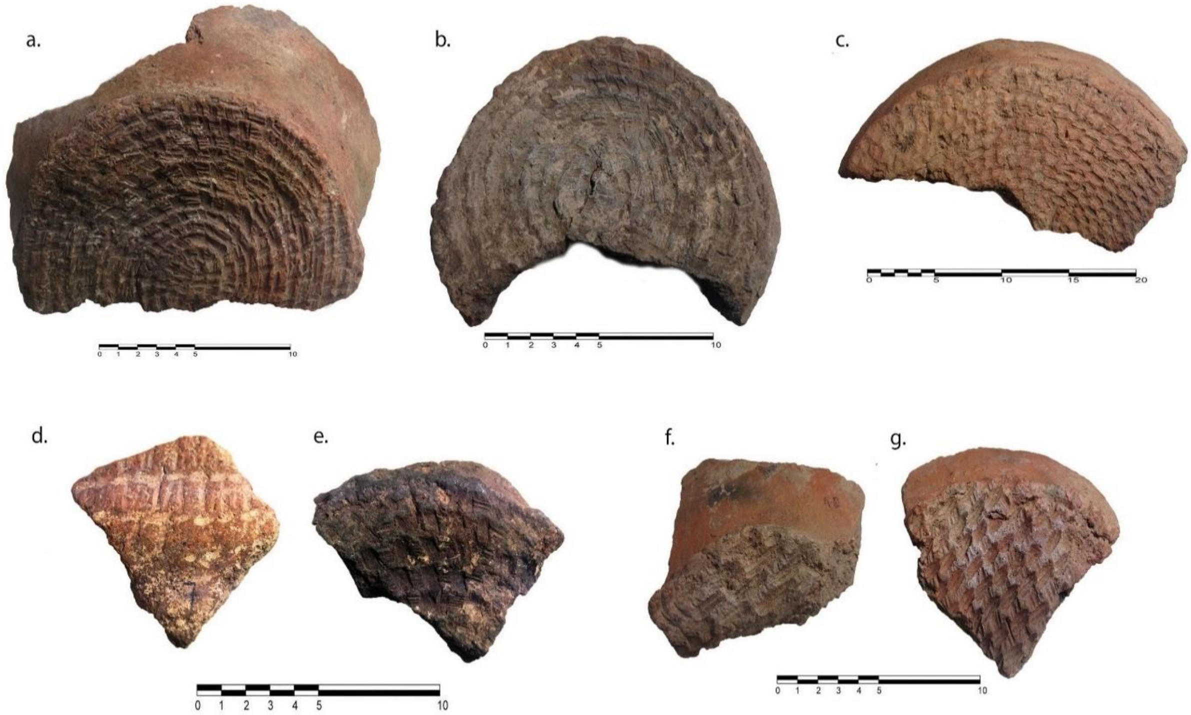


Figure 4.32. Skoteini: a. Coiled (SKA8); b. Coiled (SK38); c. Coiled (SKC6); d. Split twine (SK7A6T6); e. split twine (G23/T3/4); f- j. Simple twine (G15 – 19/ T8-9 40 – left and A31 right).

4.3.4.8. Franchthi (Peloponnese, Greece; Early-Late Neolithic)

Weaving Technique. Four mat-impressed fragments from the cave dwelling at Franchthi were studied. Amongst them was a complete base that comes with a major part of the vessel it originates from (FR 906, Fig.4.33.d); the other two are fragments from bases and one is a vegetal impression (but perhaps not a weave) by the rim of a vessel (FR 907, Fig. l). All three fragments showed close simple twine technique (where FR 908 could also be a plain weave). On fragment FR 604 (Fig 4.33.b) the weave was particularly tight and the wefts were compacted without a mistake, creating an even surface. The wefts were single and the twinning was in 1:1 ratio; the warps were narrowly spaced in 7-9mm. On fragment FR 742 the twinning was done with doubled wefts and the weave was less compact with spacing 1.1. – 1.3mm, but still in 1:1 ratio. The other two fragments proved not very informative in terms of technique, also because the complete base appeared much worn, and nothing else despite the perpendicular pattern of the weave could be distinguished.

Vessel Shape & Size. The above-mentioned complete base was preserved with more than 50% of the vessels it comes from, along with its walls and rim. The vessel shape was a bin-like (*kados*) with conical appearance, narrower towards the base and wider towards the rim. As proven by the smoothened base, it may have been used as a transportation vessel but due to its weight it may hves been dragged, rolled while moved, or regularly stabilized into the earthen floor of the dwelling.

Into the range of vessels from Skoteini fragment FR 907 could be also included, which bares vegetal (but very likely not woven) impressions by its rim perforation. In fact, vessel FR 907 is preserved by two rim fragments; both feature rim perforations, but the second one does not show any vegetal impressions. The possible shape or size of this type of vessel should be of medium value, as the relatively flat and open-angled rim indicates. The perforations along the rim together with the vegetal impressions may indicate any sort of insulation of the vessel walls, such as the modern *damidjana* known in the Balkans– covered bottles (Beloyanni, 1993; Sampson 1988). Another interpretation of the perforations may be functional – they may be of help, while the vessel is being carried and with the support of a rope/strap is being stabilised while transported full of (i.e. liquid or loose) content; another possibility is that they could have been attaching a lid.

Weaving Material. Amongst the impressions from Franchthi there are probably two types of chosen weaving material, even if used for the same technique. Fragment FR 604 appears with circular outline while FR 742 with *cf*. triangular (the impressions on the doubled wefts were sharper and slightly deeper). Both rounded and triangular stems/leaves had diameter of 2-3mm, which corresponds to the rushes and sedges families.

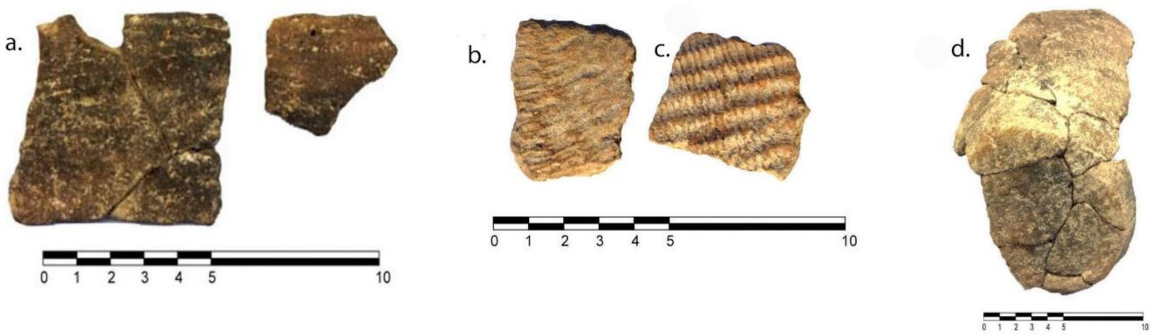


Figure 4.33. Franchthi: a. Vessel with a rim perforation from Franchthi (FR 907); b. Close simple twine (FR 604); c. Open simple twine (FR 742); d. bin-like vessel (FR 906).

4.3.4.9. Malia & Palaikastro (North and West Crete, Greece; Late Minoan)

Weaving Technique. Amongst the published sixteen mat-impressed fragments from Malia, two major weaving techniques were recorded: coiling and twinning, with its variations of simple open and close twine and split twine (Poursat, 1988). These techniques were also observed amongst the studied six fragments (out of 16). Fragments 68M69 and 69M2263 are both bases with impressed coiled weave, of which the first one preserved the center of the coil where the weave commences. Four fragments (69M2214, 76M 325, 71 M390 and 69 M 943) were impressed with twinning technique – open, close and split twine, and their impressions were found on the base, walls or foot of the studied fine ware vessels (Fig. 4.34.a-f). The two impressed fragments of Palaikastro were woven in close simple twine and their impressions were found on the base and walls of the vessels (Fig. 4.34.g.).

One of the studied fragments from Malia (71 M390) shows close simple twine with doubled weft. This fragment was of compact 1:1 ratio and the spacing varied between 4 to 6mm. The compact appearance of the weave was also visible in the points where the weft was passing under the warps, where the weft was compressed in order to create a tight fabric. Identical in terms of weave were the fragments from Palaikastro, both showing very compact close simple twinning in single wefts with a diameter of 0.2-0.3mm.

The other two twined fragments from Malia were woven in open simple twine 69M2214 and 76M 325 (or 70 M 325 in Poursat, 1988, p. 96). Despite the wide spacing of *circa* 25mm (visible in 69M2214) between the warps, the weave of both fragments appeared very tight and compact. These tight wefts may be maintained compact during the process of weaving with the aid of a comb-like device known in the different loom knitting techniques. This may support the even arrangement of the created fabric because no frequent warps were present to distribute the dynamics of the wefts.

The last analysed fragment from Malia bore the impression of an object woven in split twine with double wefts (69 M 943, Fig 4.30.f). This is the most complicated impression as the net-like fabric was woven in two complex patterns. The upper part of the fragment appeared as simple twine because the uppermost weft was not visible. In this upper bit, the warps were longer and were spaced in 1.2-1.4 mm between their joining points with the wefts. The wefts themselves were formed into twinning technique too, in ratio 1:1, passing above and under the wefts and that way creating a pause into the vertical alignment of the warps. This technique, which is similar to type of knotting, fixates the widely spaced warps and ensures the creation of a surface with specific properties, such as ventilation. At the lower part of this fragment the twinning was done with denser wefts, spaced in 0.4-0.5mm. This tightening or compressing of the structure may have been done because of the increasing curve of the body of the woven vessel, so this way a narrower shape is achieved. At the weft lines, there was a characteristic for this technique splitting of the warps, which appears as the Greek letter *lambda* (Λ) and again contributes to the airy properties of the object woven in this technique.

Vessel Shape & Size. There are several shapes, which could be distinguished amongst the basketry-impressed pottery of Malia. The fragments showing close simple twine from pottery bases may be associated with the mat-impressed *kalathos* published by Poursat (1988, Fig. 124). This is a bin-like vessel with handles of which the body and the base were fully impressed from a woven basket in close simple twine. The fragment with woven in open simple twine of 69M2214 was described as an *egg-stand* type of vessel (Poursat, 1988), a pedestalled wide circular vessel. The woven fragment originated from the pedestal part of this particular vessel. The curved body fragment of 69 M 943 was similar to another curved body sherd, which again bore an impression of split twine item (Poursat 1988: Fig. 131) and it is clear that these fine ware vessels were of oval to circular shape, regardless of whether they were pedestalled or not, such as the bowls.

The fragment from Palaikastro which bore an impression of simple twinning on its base and walls is with preserved straight perpendicular wall and very pronounced line framing the base and this way making clear that it was not part of the original woven object, but a result from the pot making. The straight walls resembled the *kalathos* from Malia, which also bore the same weaving technique, impressed on its base and walls (see above), or perhaps this fragment may have originated from a pedestaled vessel, similar to the *egg stand* from Malia (and mostly because of the narrow diameter of the specimen from Palaikastro).

In terms of size, all studied basketry impressed vessels may be classified as fine ware of small to medium size – i.e. the base with coiling weave which preserved its center would have been of a total diameter of *circa* 7-8cm, the spherical sherd with split twine impression would be part of a vessel with approximate base diameter of 20cm (i.e. the preserved fragment was *circa* 5cm and represented nearly ¼ of the body of the vessel). Some of the other published mat-impressed vessels also support this: the preserved *kados* from Malia has base diameter 5.7 cm (Poursat 1988, Fig.124).

Weaving Material. The two impressions in coiled technique from Malia do not present a great detail in terms of their weaving material. It is visible that the weft of both of them consisted of flat and fibrous leaves, which were tightened while coiling around the coils (Fig. 34. a-b.). This was particularly visible at the point where the wefts pass around and under the coils, creating a fibroid pattern of several thinner lines, composing the leave itself. The coils/warps of both fragments appeared to have average diameter 0.4-0.6mm, but it could not be discussed further whether they were consisting of bundles or woody material (Fig. 4.35.g-h).

The close simple twined fragments of Malia showed wefts of 0.2-0.3 mm in diameter, and where they were doubled, the single one would be *circa* 0.2mm. This effect may be achieved by choosing species, such as young rushes or sedges (it is not clear if the outline of the wefts is completely circular or rather triangular). The weft of the woven with open simple twine fragment from Malia 69M2214 had a 0.2mm diameter and circular to compressed outline. At several points along the wefts, parallel striations could be noted, which correspond to items woven with rushes – very distinct on the microphotograph. The warps of the studied split twined fragment from Malia were also with circular outline and unclear parallel striations; this places them together with items that could be woven with rushes.

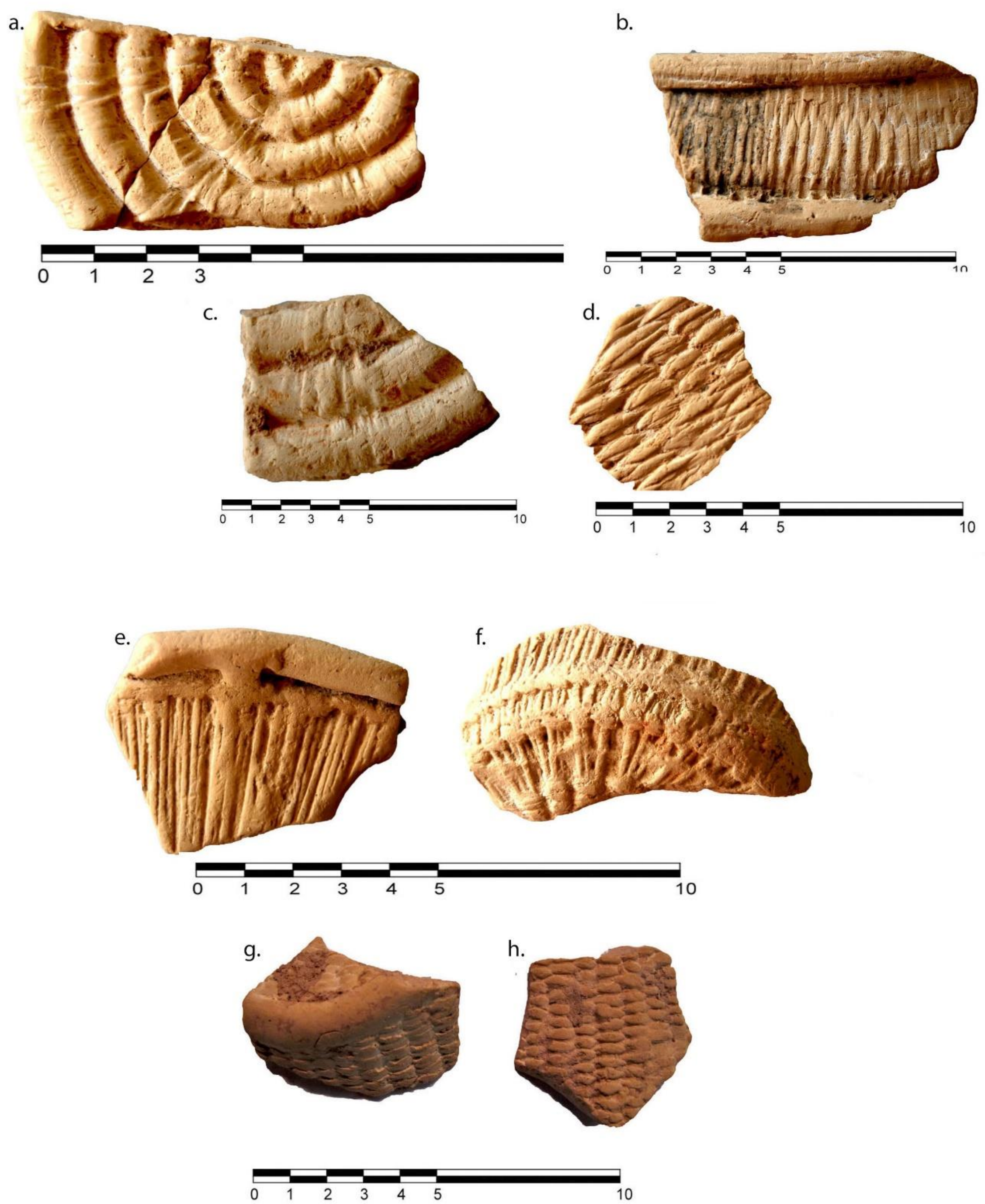


Figure 4.34. a-f Malia (Quartier Mu): a. Coiled (68M69); b. Open simple twine (69M2214); c. Coiling (69M2262); d. Close simple twine (71M390); e. cf. Simple twine (76M 321); f. Split twine (69M 943); g -h. Palaikastro: Close simple twine (N 1 – left and N2- right);

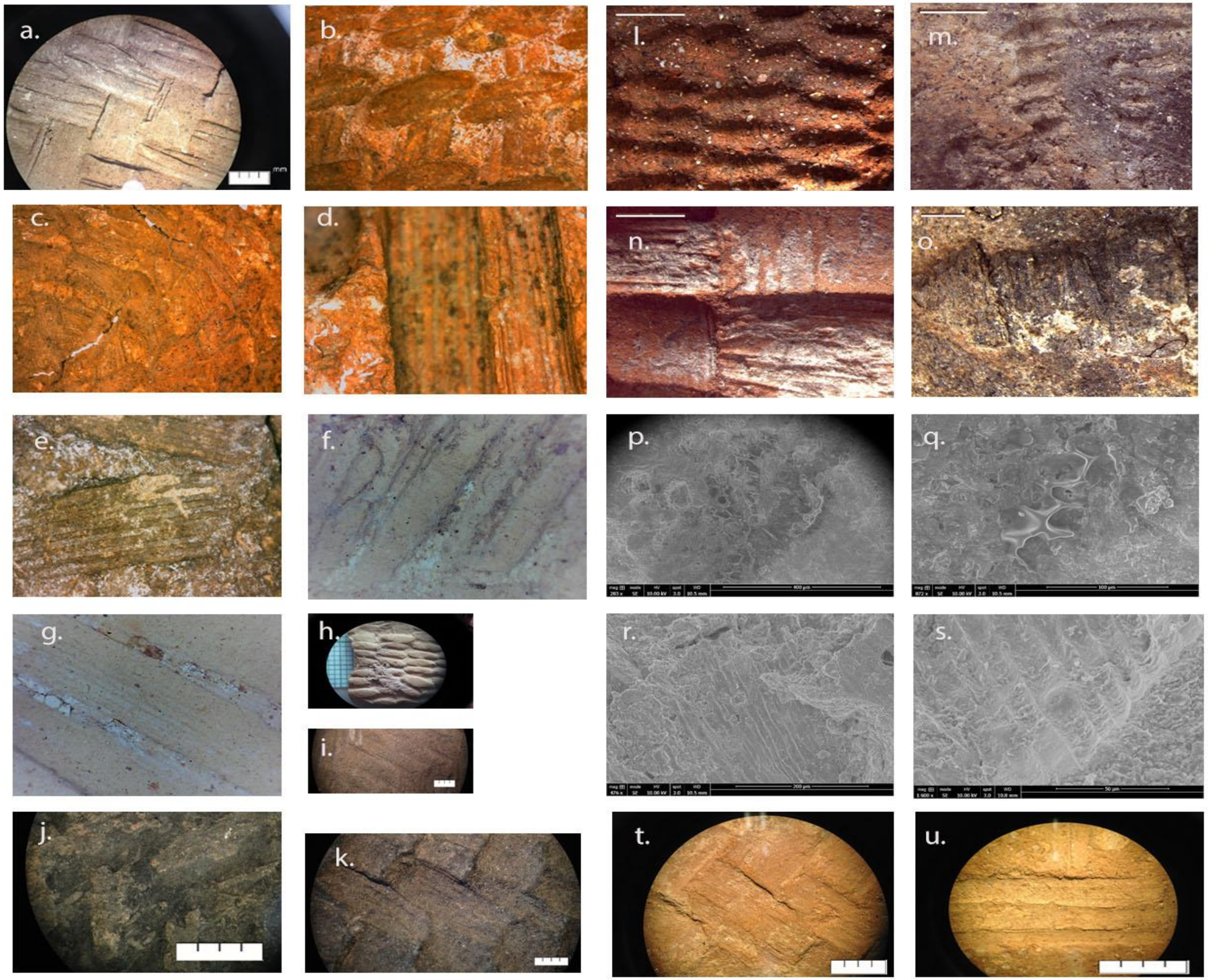

a.
b.
l.
m.
c.
d.
n.
o.
e.
f.
p.
q.
g.
h.
i.
r.
s.
j.
k.
t.
u.

Figure 4.35. Optical microscopy of mat-impression on pottery. a. Close-up of diagonal twill from Dikili Tash - fragment DK6202-002; b. Simple twine with double wefts from Skoteini - SK 42; c. Coiled technique from Skoteini - SKA8; d. SK A8; e -f. coiling technique detail from SK 38; g. split twine in 69 M943 from Malia; h. open simple twine in 69 M 2214; i. detail from fragment N2 from Palaikastro; j. diagonal twine from Kurilo N 1; k. Kurilo N2; l. Kurilo N3; m. Dana Bunar I - close simple twine of the wefts of fragment № 6; n. Open simple twining of the wefts fragment № 17; o. Simple plaiting in fragment № 20; p- q. SEM image of non-diagnostic plant tissues: cell walls from fragment № 19 of DB I; r-s. SEM image of parallel striation within the impression of a monocotyledonous leaf/stem from fragment № 19; t-u. Diagonal twill and leaf lamina detail from Provadia.

4.4. Discussion

The proposed integral approach for the study of direct and indirect evidence for basketry proved successful onto several levels. The combination of CT scanning and SEM imaging was the right choice for the assessment and identification of plant material from basketry. Even if CT scanning was restricted in terms of resolution, it proved to be an informative assessment tool, which was complemented by the SEM. The mat-impressions were also studied with a combined technique, consisting of optical microscopy and cast sampling, which worked towards approximate botanical identification. Here, an additional SEM imaging and PPL/XPL imaging of the wax casts of mat-impressed sherds were experimentally applied, but did not prove to be informative for the purposes of this thesis.Some of the limitations of this approach and how it does relate to patterns of tradition and technology will be discussed in this section.

4.4.1. Limitations or limits of evidence

The archaeobotanical remains of basketry are not an isolated phenomenon: basketry impressions on pottery were discovered both at Promachon and Akrotiri. In addition, the LC settlement of Akrotiri is well known with its frescoes depicting numerous basketry objects (Doumas, 1992). Altogether, the "real" baskets, their impressions on pottery and their images at decorative contexts represent the existing direct and indirect evidence on Prehistoric baskets (Section 5.3). All types of evidence do complement each other and this is why, where they all exist, they should all be assessed aiming at providing a more complete picture on this craft (Sections 5.3. and 5.4).

Even if a single category of evidence is not "telling the whole story" such as the extremely rare and fragile botanical remains from basketry in prehistoric contexts in South-east Europe, it should be analysed and where possible compared to other lines of evidence. A very clear illustration of this statement is the state of preservation of the basketry remains, which is very often inconclusive regarding the weaving techniques for example. In these cases, perhaps a botanical sample may be obtained, analysed and even identified, but no detail on the technical aspects may be provided because of the unclear picture shown by the object itself. This is where the indirect evidence, such as the pottery impressions, on this craft may deliver insights into the 'incomplete' direct evidence. The complexity of this approach promises a “fuller” picture but this type of material dos not necessarily exist at all prehistoric sites where basketry remains of any kind have been discovered.

This is why a systematic and synchronised approach of both botanical and non-botanical aspects of the basketry craft should be undertaken. Namely, this is the largest limitation amongst the existing literature on prehistoric baskets from South-east Europe. Even if various protocols for recording this class of material culture have been already proposed (Adovasio, 1977 for North America and Wendrich, 1999 for Africa), those have not been applied to the identified and published botanical remains from basketry in the studied area (Assiros, Armenoi, Younatsite, Akrotiri, Section 4.2.). On the other hand, the numerous mat-impressions on pottery have not been systematically described either. Often their precise percentage amongst the other classes of pottery is not provided, and sometimes only the highlights of the weaving techniques are mentioned or in other instances there is only a mention just to the presence of this ceramic category without a single description of the weaving technique employed.

The present proposed combined approach towards the direct and indirect evidence for archaeological basketry aims at providing a study toolkit in which the different elements complement each other, similarly to the types of evidence. The identification of actual plant remains has been obstructed by the extremely small sample size and the conservation treatment. Nevertheless, it has proved successful and the identifications have been narrowed down to specific species levels, covering several species with identical morphology. Both monocotyledonous and dicotyledonous plant sources are suggested for a total of 11 vegetal samples, coming from two prehistoric sites (Promachon and Akrotiri). There were three identification methods applied to this material: optical microscopy, SEM imaging and CT scanning, while the employed techniques fall in the sphere of two archaeobotanical sub-disciplines: anthracology and phytolith analysis (Section 4.2.3.). This toolkit has achieved in-depth results and unveiled the potential of the still very rarely applied in archaeobotany CT scanning.

Here complementing archaeobotanical data from other plant parts, such as seeds, pollen and wood would be required in order to complete the identification process (see Chapter 5). This would position the achieved identifications within the larger context of the sites, regions and periods to which they belong too. This would not be determined constrain of the analysis, but - as a standard procedure, when further insights are pursued. If there was a full limitation registered during the performed analyses, these was only the sample size and conservation treatment. They could be overcome if a standard sample size (as for anthracology) is obtained, and if there is a non-impacting conservation technique applied to the basketry object in situ on the field (Section 4.2.3.).

On the other hand, the analysis of the indirect evidence for archaeological basketry – the mat-impressed pottery, met several obstructions for achieving such an in-depth botanical identification, as for the direct evidence. First, the pottery impressions did not present any evidence for preserved archaeological botanical material – even some of the smallest morphological plant cells, such as the fibres, while only contemporary/contamination structures were registered. Second, the preserved within the impressions impressed plant part did not provide identifiable features, but only their general outlines. Again, there were 3 techniques applied to 215 pottery impressions in order to gain as much as possible information regarding the plants composing the impressed weaves: optical microscopy with polarising filters, SEM imaging and warm wax modelling. This way in-depth data were collected concerning the weaving techniques and their specific details (such as repairs), and also some information on the pottery types, shapes and their use but no definitive details allowing a complete botanical identification were obtained. This is why only descriptive identifications down to the family level were provided and particular species were proposed on the basis on the pre-existing ethnobotanical literature and primary research (Chapter 3).

A major obstacle towards the broader interpretation of the data gained from the mat-impressions on pottery is the lack of systematic information about them in the scholarship. This means that the impressed weaving techniques and the suggested identification possibilities of the plant material they were woven from could not be positioned into a wider context, fewer patterns in terms of techniques and plants could be extracted and no quantitative analysis could be applied.

4.4.2. Localism, tradition and practice in basket weaving

Several patterns between the weaving techniques and their general chronology may be drawn from the studied material. During the Late Neolithic the analysed basketry impressions on pottery have showed that twinning and coiling was present and consistent at the sites from the south area of the studied region (Franchthi, Skoteini, Dikili Tash, Ag. Antonios, Kastri; Table 4.3.). The variation of twinning with split weft (**split twine**), which is a marginal technique between the basketry and netting, proved most popular amongst the studied sites. It was registered in Late Neolithic Franchthi - 4 and Skoteini - 4, and EBA Ag. Antonios – 1 and Kastri - 1. This is of particular interest, because of the diverse possibilities for object-shaping provided by the split twine technique. Namely because of the split weft, the objects made that way are 'breathable' and light, as the density of the weaving material is reduced.

Split twine is also restricted to the type of plant material chosen for splitting – these are culms or leaves of circular outline as the ones from the grasses or rushes family, which are easy to manipulate while making an object in this technique. This is because usually one of the wefts is doubled, then the two are split and then doubled again. A very illustrative modern example of this technique is the still woven and sold today *toupi* – a cylindrical cheese molding basket, woven with rushes in different techniques in Crete (including coiling and simple twine) but always presenting an element of split twine, usually towards the middle of the vessel. Another basketry object, made exclusively in split twine is the old-fashioned *kertos*, a fishing device, which was used for river and seawater fishing in Crete and nowadays is most likely to be seen in its chandelier transformation, mostly because of the decorative light-dispersing effect, created by the split twine weave.

Amongst the studied sites, split twine decreases as a technique, registered on pottery impressions during the Early Chalcolithic and disappears during the Late Bronze Age (two fragments with impressions in split twine from LBA Malia are published by Poursat 1988, but they were not accessed for the purposes of this research, see above). If a systematic research had previously existed in the bibliography, then the presence of the split twine impressions on pottery could be plotted carefully on a regional and chronological map. Since, according to the existing ethnographic literature (Beloyanni 2007; Leontidis 1986) this technique is attributed to basketry devices for fishing or cheese production, a hypothesis looking for these (or related) activities at the prehistoric sites, which show pottery impressions in split twine, could be proposed. One of the proxies for verifying this could be a combined study of the zooarchaeology and archaeobotany of those sites. Could a possible link be traced to provide insights into everyday life, including domestic and agricultural activities of past societies?

On the other hand, amongst the (frequently) chosen weaving techniques in the prehistory of South-east Europe is the much simpler **simple twine** (Table 4.3.). Here the weft if passed under and over the warp, most of the times in ratio 1:1 but sometimes in 1:2. The simple twine is defined as close when the weave is knit and the spacing between the warps is narrower, while open simple twine is where there is wider spacing between the warps, creating a less compact surface.

Simple twine is probably the most popular technique, and often it is also called “basket weave”. This is a highly versatile technique, allowing the creation of both two and three-dimensional shapes. If the split twine remains mainly present in the southern part of the studied region (Central Greece and the islands) during the Neolithic and Chalcolithic, then the simple twine was registered further North – in the Balkans (North Greece and Bulgaria) and also in Crete. The sites where simple twine was registered are Late Neolithic Dikili Tash and Skoteini (1 fragment at each site), Early Chalcolithic Dana Bunar I (8), and Late Bronze Age Malia (3) and Palaiskatro (2) (Section 4.3.4). The contemporary environment of all these locations includes woody plants, as they are all located into hilly landscapes with partially or fully presence of forests. An interesting observation would take us into a look at the paleoenvironmental record to verify if this type of vegetation was present during the studied period (Chapter 5). This is of importance because woody material is almost exclusively necessary for weaving in simple twine. If two-dimensional objects, such as mats could be woven with more flexible material, the three-dimensional ones such as baskets, do require wood rods/shoots/splints. The use of a basket-like object may be verified with high certainty, when the pottery impressions preserve the commencing centre of the weave. Usually this has a rectangular shaped cross-like structure, which is also exclusively related to the simple twine objects. But even having the initial point of the weave on a pottery impression one could not be certain of the final shape of the woven product, as impressions on the body of the vessel are rarely preserved. This means that the depth of the woven item may vary. It could be a tray or a winnowing fan but it may also be a deeper storage basket – all of them having the same construction of the base. This is why the simple twine technique covers a very wide range of vessels, and therefore, could be hardly used as an identification marker for precise activities.

The studied impressions in split twine occur in Late Neolithic and Early Bronze Age sites but in none of the LBA sites, while the simple twine in the Late Neolithic and Early Chalcolithic and the LBA. The twinning technique was consistently present amongst the reviewed available literature too (Table 4.3.). No differentiation has been made between the simple and split twine when reviewing the literature because of the non-systematic published data, so only generalised observations may be made. As twinning is widely spread both in the North and the South of the studied area and shows presence during the whole duration of the periods of interest, it may be concluded this technique was widely used in South-east Europe during the Neolithic and the Bronze Age. According to the reviewed data (Table 4.3), twinning peaks at the EN assemblages of Nea Nikokedia in Greek Macedonia, then slightly declined in LN Kephala (Keos), Ag. Anargyroi (Naxos) and the island of Gyali. At the Early Chalcolithic, twinning was also recorded in the Sofia plane at Slatino. The most numerous are the sites belonging to the EBA where twinning was found impressed on pottery – the majority of the sites come from Peloponnese (to name a few: Zygouries, Tsougkiza, Talioti, Tiryns and Anthochori), one site was registered in Boeotia – Lithares, and one in Attica – Aegina. This picture shows the popularity of this universal technique, allowing the weaving of diverse shapes with all sorts of material – both dicots and monocots and including its variations of split and simple twine. It is of no wonder that twinning is also commonly called "basket weave" by contemporary basket-makers (Section 3.4.1.3).

The next most popular technique is the **diagonal will**, which was present consistently into the following sites: LN Dikili Tash (39), Kurilo (3) and Provadia (107), and the Early Chalcolithic Dana Bunar I (17), Topolnitsa (2) and Bulgarchevo (4). In addition to these sites, there is a single (1) base with impression with diagonal twill coming from the studied for their plant remains EN – LN Promachon-Topolnitsa (Table 4.3.). Amongst the studied material diagonal twill was not registered in any Bronze Age site. This weaving technique is also strictly dedicated to a specific type of objects, which could be made in it. These are flat shapes, such as mats, screens or objects made with these flat surfaces, such as bags, covers and so on. Another feature of the diagonal twill is the required predominantly flat outline of the plant parts used for it and very rarely a circularly outlined vegetal part. This automatically reduces the choice of plant material, i.e. for the creation of larger surfaces, flat-leaved vegetation is preferred, such as cattails, cereal (and grass) plants or palm leaves.

The environmental profile of the abovementioned plant groups and the contemporary geographic characteristics of the archaeological sites suggest a wetland area, as nearby Kurilo, Dana Bunar I, Topolnitsa, and Bulgarchevo, a sufficiently irrigated area, as for Kurilo, Topolnitsa and Bulgarchevo, or coastal sites, as for Provadia. The habitats would be suitable for cattails, cereals or palms trees. Indeed, all sites where diagonal twill was registered in the framework of this study are located near fresh water sources, mostly rivers (Kurilo is along the river of Iskar, Topolnitsa, Bulgarchevo and Dikili Tash are along the Strymon river, Dana Bunar I is close to the Maritsa (Evros) river and Provadia is near a modern salt lake in proximity to the Black Sea coast). This could be an example of environmental factors, such as vegetation habitats, framing the human choice for plant-based crafts. The particular vegetation availability could supply a particular type of weaving, which could result into a local tradition or regional practice.

Moreover, a local tradition or a regional practice could be transformed into industry or an industrial element, as in the case of Provadia. At the Neolithic settlement of Provadia, the products woven in diagonal twill played an important role into one of the key industries of the site – the salt extraction. This was a task performed with the aid of the evaporation technique, which used a specific type of coarse pottery made with the use of mats. Diagonal twill was registered as the single technique impressed onto all studied pot bases from Provadia and as the pottery itself, the weaving was also coarsely done – very often mistakes and repairs were visible when the impressions were analysed. This leads to a hypothesis for the short life of this type of pottery (as a single use, or at least non-continuous use), because of its non-precise making and its employment into a particular industry. This also points towards the secondary use or re-use of woven objects, such as the diagonally twilled mats. There is a pattern of relation between the discarded woven object and their re-use within the production of this particular pot shape – the salt production vessels (Chapter 5). The abovementioned links could be detected in the example from Provadia because this is an isolated case where a single weaving technique is impressed onto a single pottery type of a single utility and this combination has quantitative potential because of its great abundance. The uniqueness of this case illustrates tradition, localism and industrial practice related to a particular combination of pottery and woven objects. This is not only a very good example for an “ideal” scenario, but it also shows the patterns, which could be analysed in the future.

Peaks of twilling in mat-impressions on pottery was registered at the EN – EBA Macedonia - Servia, the MN-EBA Sitagroi and Dikili Tash. It was present in lower values at LN/EC settlements in the Sofia plane at Kurilo and Chelopechene, Gnilyane, Slatino; the LN Skoteini in Euboea, the EBA sites of Pelopenese Aegina, Orchomenos, Eutresis, and amongst the islands at EC Phylacopi (Melos). Having in mind this list and the studied material, it looks like twilling is restricted to the environmental conditions which would be in favour of plants suitable for weaving in this technique. If compared with the abovediscussed twinning, twilling is less versatile and more limited regarding the shapes of objects and the choice of plants. On the other hand, twinning could be applied to multiple objects and to diverse groups of plants.

Coiling is the least spread technique amongst the studied sites and is attested in Late Neolithic Skoteini (6), LM Malia (2) and Akrotiri (in 2 baskets and 1 pair of handles; Table 4.3.). This technique was performed with highly flexible material, which is compatible with coiling or wrapping around into a fool loop. But when coiled, these highly flexible materials create and shape a highly rigid item. These stiff items could be mats, trays, winnowing fans, baskets or their transportation attributes, such as handles – all done in a very compact weave, suitable for carrying heavy goods or resisting impacting usage. Possibly this special feature of flexible material, shaping rigid surfaces, was chosen when the items made in this technique were employed into the pot-making process. For example, the heavy pithoi/amphores from Skoteini, may have been transported while drying with stiff coiled items.

The coiling material may be grasses, cattails or palm leaves and nowadays one or more groups of this type of vegetation is present in the coastal sites of Skoteini, Malia and Akrotiri. If the presence of these plants into the paleo-environment is confirmed, then it may be argued that the local vegetation determined to a certain extent the production of woven objects at the sites. An element of localism cannot be discussed in the case of coiled items, at least amongst the studied material. Tradition into weaving in coiled technique may be hypothesised only regarding Skoteini since the evidence for coiled products impressed onto pottery bases is stronger.

Amongst the existing scholarship on pottery impressions, the coiling technique seems to be one of the rarest; it was registered in higher values in the LN Skoteini, while in very low values in LN Saliagos. This paradoxical technique of employing very flexible material but creating very rigid objects may also be environmentally specific, exactly because of the specific plant choice. If compared to twilling as discussed above, it is even more narrowly specialized in terms of diversity of shapes and plant choices. The very rare choice of items woven in this technique in the process of pot-making (at least according to available scholarship and the research undertaken for this thesis) may also be an indicator of the specific materiality of the coiled items: less breathable, less flexible, less three-dimensional (Chapter 5).

SITE STUDIED IN THIS THESIS	LN SIMPLE TWINE	LN PLAIN WEAVE	LN COILED	LN SPLIT TWINE	LN DIAGONAL TWILL	EC DIAGONAL TWILL	EC SIMPLE TWINE	EC PLAIN WEAVE	EC SPLIT TWINE	LBA SIMPLE TWINE	LBA SPLIT TWINE	LBA COILED
Fragthi	0	0	0	4	0	0	0	0	0	0	0	0
Dikili Tash	1	0	0	0	39	0	0	0	0	0	0	0
Skoteini	1	1	6	4	0	0	0	0	0	0	0	0
Agios Antonios	0	0	0	1	0	0	0	0	0	0	0	0
Kastri	0	0	0	1	0	0	0	0	0	0	0	0
Kurilo	0	0	0	0	3	0	0	0	0	0	0	0
Dana Bunar I	0	0	0	0	0	17	8	0	0	0	0	0
Provadia	0	0	0	0	107	0	0	0	0	0	0	0
Topolnitsa	0	0	0	0	0	2	0	0	1	0	0	0
Bulgarchevo	0	0	0	0	0	4	0	1	0	0	0	0
Malia	0	0	0	0	0	0	0	0	0	3	1	2
Palaikastro	0	0	0	0	0	0	0	0	0	2	0	0

Table 4.4.Weaving techniques amongst the studied mat-impressions

4.4.3. Pots on mats or mats for pots?

The pottery shapes impressed with basketry products, which were registered amongst the primary studied material, are six shapes from five sites. From the Late Neolithic sites there are the *kados* type from Dikili Tash, the oval two-handled vessel from Provadia, the trapezoidal *kados* from Franchthi and the biconical bowl from Kurilo. From the Late Bronze Age sites there is the double handled *kados* and the “egg-stand” from Malia. All vessel shapes, with the exception of the “egg-stand” belong to medium-sized vessel types. Even if the combination of a fully preserved vessel with mat-impressed base is rare, a few common features may be drawn on the basis of the abovementioned cases. All five shapes could be storage and/or transportation (in this order) vessels. In both scenarios, some physical aspects of the mat-impressed base may be of importance and perhaps they could have been deliberately sought after. Such properties may be the relief created by the mat-impression, which (when even) provides stability of the pot with its adjacent non-slippery surface. The medium-sized storage/transportation vessels, such as the *kadoi* and bowls, could be of everyday domestic usage within the household and their content could be of diverse character, including liquid or coarse goods (Sections 3.4.1.3 and 3.4.3.2).

If the mat-impressed pottery was meant to serve everyday needs and activities, this may be a pattern towards the hypothesised re-use of woven products into the pot-production process. Coarse ware of no elaborate decoration may have been produced with the aid of woven items, which in their turn came at a secondary use. If these mats/basketry items were already discarded from their original purpose within the household or were repaired, they probably did have a secondary value too, which together with their physical properties (breathability, durability), made them suitable for use in pottery production at Neolithic and Bronze Age sites where mat weaving and basketry making was a developed craft.

Possibly the physical properties of the woven products were important too, when used in pottery production. For example, the simple twine technique was used in two different scenarios: as coming from a basketry item and as originating from a mat. In the first case, the rigid basket’s base was impressed onto the pot’s base, while in the other – a more delicate matting surface was impressed onto the pot’s base or walls. The first case is exclusively related to coarse (storage/transportation) ware, while the second is associated with fine (serving) ware. The specifics of the clay receipt and the character of the woven item, chosen for the functional or decorative impression seem to be interrelated, at least on the basis of the mat-impressed pottery studied here. For example, coarsely woven or repaired objects were impressed on coarse ware (e.g. examples from Skoteini, Provadia), or finely woven objects were impressed in fine ware (e.g. Malia, Palaikastro).

Another example within the above discussed contexts could be pottery bases impressed with diagonal twill. The matting items plaited in this technique are less delicate than the ones made with simple twine. The diagonally twilled objects are also more durable and suitable, for example for "dragging" a raw pot from one place to another, or for supporting its weight, while drying prior to firing. On a scale of durability, the coiling technique produces items with highest durability due to its compact weave. Thus, woven items in coiled technique would support the heavier pots and will be even better for their movement during their making or the subsequent transportation, while they are still raw. This tendency could be proven in the larger coarse ware vessels from Skoteini, which probably represent the largest pot shapes amongst the studied material.

Last, but not least, is the relation between the mat-impressed pottery and the actual woven products, as evidence for non-preserved material culture or non-documented past activities. These could be hypothesised, also through the obtained ethnographic data in combination with the weaving techniques preserved onto the impressions and their adjacent woven items. For example, a base made in simple twine may be attributed to different basketry items – deeper baskets (i.e. for collection and storage of goods) or shallow winnowing fans, associated with the crop production and processing. Split twine technique, when preserved, may be attributed to woven items meant for fishing or diary-products (i.e. the "cheese molds"). The remaining twilling and coiling could be seen as evidence for household interior or production of flexible storage and transportation items (e.g. bags).

4.8. Conclusion

This study managed to access two out of four known Neolithic and Bronze Age sites in South-East Europe which have yielded basketry remains. The 11 botanical samples obtained, which represent direct evidence for prehistoric basketry, were identified with a combination of tools including optical microscopy, SEM imaging and CT scanning. In addition, there were

215 mat-impressed pottery sherds out of 768 known in the scholarship (28%), which represent indirect evidence for archaeological basketry; they were analysed combining optical microscopy, SEM and warm wax moulding. These two strands of archaeological evidence were combined in order to gain a more in-depth knowledge of the plant choice in past societies and its aspects when employed into a specific craft.

Amongst the botanical samples, there were two types of craftsmen's choices – for the making of rigid containers dicotyledonous plants were chosen for weaving, while for the making of flexible covers or containers, monocotyledonous plants were employed in the weave. A total of 4 families, 2 sub-families and 1 species were identified (Table 4.1): Fagaceae (*Quercus* sp.), Poaceae (Bambusoideae, Arundonideae), Cyperaceae, and Juncaceae. Amongst the mat-impressed pottery, again a distinction between items made by dicots and monocots was made. They were employed into weaving in 4 different techniques: plain weave, twinning, twilling and coiling, and they were found mainly on the bases of 6 types of pottery shapes: kadoi with no handles or double-handled, bowls, egg-stands, kalathos, and oval double-handled salt-evaporation vessels. Based on the morphology of the impressions and the existing ethnographic scholarship, combined with primary field studies, several species in addition to the abovementioned could be suggested: amongst the monocots there were the Typhaceae and the Arecacae and amongst the dicots the Salicacae, Sapindaceae, Betulaceae, Cornaceae, Malvaceae.

In the case of mat-impressed pottery, the analysis could not go further also because of the non-systematic publication of similar material from other sites. A possible explanation about this inconsistency may be the lack of full identification of the mat and mat-impressed pottery as a separate ceramic category when compared to the other ceramic classes. Even if the shapes and sizes of the mat-impressed pots may be even or corresponding to the remaining pottery of a site there is one technical difference and this is the use of basketry products during the process of their formation or decoration. This should not be influenced by the number of objects belonging to this separate category of pottery; even if this is very low, but still present, these fragments should be recognised and recorded. Hence, it should find its defined place amongst others, in the ceramics' classification of a site. The recognition and consistent precise description of the mat-impressed pottery would certainly aid a wider view of this phenomenon in the studied area. Thus, it will allow a further interpretation of the technical, botanical and social aspects of the basketry as a craft practised in Prehistoric South-east Europe.

Studying both the direct and indirect evidence for archaeological basketry is important for gaining a more comprehensive knowledge of this ancient craft and its practitioners. The weaving techniques, the diversity of woven objects, their primary and multiple usage, and the particular plant choices of the prehistoric basket-makers of South-east Europe were the questions which this proposed approach has shed light on.

CHAPTER V. INTERLACING THE EVIDENCE: HABITATS OF BASKETS AND BASKETRY IN CONTEXT

5.1. Introduction

This chapter starts by combining three types of archaeobotanical evidence, including micro (palynology) and macro disciplines (archaeobotany, anthracology) to investigate the possible human plant choices made by the prehistoric basket-makers of South-east Europe. The proposed combination of environmental and archaeological data provides new insights into the craft of basket-making, integrating the available pre-existing and primary collected information. Materiality and human choices as dictated by environmental factors are then discussed together through the perspective of basket-making, a craft rooted into the prehistory of South-east Europe, but also surviving today with its unique practices and practitioners.

5.2. Basketry and palaeo-habitat reconstruction

This section reviews the published ancient plant related data, both micro- and macro-remains, related to the studied, in this thesis, archaeological sites in Bulgaria and Greece. The aim is an approximate reconstruction of the local and/or regional habitats, based on the available palynological, anthracological and archaeobotanical evidence. The potential plant resources accessible for basketry and the choices the weavers may have made in the past are discussed through these habitats' reconstruction. The potential families and species that could have been used for weaving baskets are also compared with the identifications conducted in Chapters 3 and 4 of this thesis. Similarities and differences between habitats, sites and plant choices are highlighted.

5.2.1. Interlacing data for palaeo-vegetation: palynology, anthracology and archaeobotany

The archaeological material studied in this thesis originated from Neolithic and Bronze Age sites in Bulgaria and Greece. If this chronology was to be placed onto the geological timescale, it would be positioned within the last Quaternary era, the Cainozoic, and within its latest epoch or age, the Holocene. The Holocene is the age, which followed the last Quaternary glacial period, commenced at about 10 000 yr BP and continues to the present day. The highly mountainous topography of the Balkans and Greece was considered a refugium for temperate tree taxa during the cold stages of the Quaternary, mainly due to its steep temperature gradient, which allowed various microclimatic conditions at a relatively narrow latitudinal range (Willis, 1992). The pollen data from the region in this case can be extremely informative regarding the understanding of the palaeoclimatic and vegetation conditions of the Balkans, and of Europe too. On the other hand, these microclimatic differences cannot not be discussed only on the basis of the existing pollen data, firstly because the same is not available for the whole territory of interest, and secondly because of the generality of the information provided, i.e. large regional basins have been cored but not many small and local ones (ibid.). Also, the time span of the pollen data continues back in time much further than the discussed in this thesis period of interest. As a result, often the late Quaternary/Holocene data are overlooked on account of the Pleistocene data and because there were no major climatic events, such as glaciation or extreme droughts. In addition, the obtained late Quaternary radiocarbon dates are often not many or they are missing, although most of the pollen diagrams do propose a chronostratigraphy, which aids the data interpretation.

Some major pollen signals can be considered as climate and vegetation markers, such as arboreal pollen (AP): high values of deciduous oak indicate warm and moist forest conditions, while mixed oak forests with *Tilia, Corylus, Fraxinus,* and *Ulmus* cannot stand long summer droughts and point towards a temperate climate (Rossignol-Strick 1993). Amongst the shrubs, *Pistacia* pollen is conceived as an indicator towards climatic optimums (mildest winters) and hence as a pointer of very favourable conditions for human activity; when *Pistacia* disappears, it is suggested that the winters are becoming colder and the summer moisture decreases towards aridity (ibid.). Within the saccate APs, the conifers, high *Abies* values indicate cooler climate, while that of *Pinus,* increasing precipitation and higher temperatures. In the group of non-arboreal pollen, an event of extreme aridity may be deducted from high values of Chenopodiaceae/*Artemisia*; when these taxa expand, oak and mixed oak forests decrease (ibid.). In addition, the pollen record provides data related to human activity, such as agriculture, animal husbandry, and the related to these forest consumption and clearance, pasture exploitation, and vegetation clearance (i.e. by fire, Bottema 1994). In addition, it should be mentioned, that not all pollen types are commonly detectable and recorded within the palynological studies. An example for this could be one of the key basketry plants, the rushes (Juncaceae), which has specific low weight and minimal size, so it is missing from the pollen diagrams. Nevertheless, rushes share similar habitats with other detectable species, such as grasses and sedges, and therefore their presence may be speculated in an indirect manner, if supported also by other lines of evidence.

Fire, or the process of carbonisation of wood material, is the key event governing the discipline of anthracology, where environmental data could be used to refine and add to interpretations. Depending on the contexts where charcoal material is retrieved from, anthracological spectra are reflecting past-vegetation, the human impact on it and human choices for utilising wood material. The sampling contexts also depend on the questions asked in terms of the particular archaeological sites, e.g. if information on the palaeo-vegetation is needed, then layers of scattered charcoal particles are preferred, rather than single-use contexts, such as hearths, and kilns. Anthracological diagrams may be often used in conjunction to pollen data and this is an ideal combination of these two strands of information for the past vegetation – the presence/absence of tree pollen is recorded, but also the actual human choices in relation to wood too.

On the other hand, the past environment can be reconstructed via the recording of combinations of taxa. For example, charcoal, where predominant are pine or oak taxa, is very likely to be related to a mainly pine, or respectively, oak wood lands in the studied area. Mixed forests are indicated by charcoal of oak, maple, ash etc. and this may refer to more open habitats, where sunlight demanding taxa, such as hazel, Cornelian cherry, apple, pear, or *Pistacia* tree and juniper in the Mediterranean areas, occur. In the warmer Meso-Mediterranean habitats, fig tree, evergreen oak and different monocotyledonous plants are also present, forming the woodland undergrowth. Areas with fresh water, such as river zones, would display riparian taxa, such as ash, elm, willow, poplar, birch, wild vine, yew, and elderberry.

In addition to charcoal and pollen data, the archaeobotanical remains or seeds can help inform on cultural activities, such as collecting/gathering, processing/cooking practices, consumption or cultivation, but are also of great support to palynology and anthracology when environmental aspects are to be discussed. For example, high values of cultural plants may indicate the presence of sufficient agricultural land, forming an open landscape ensuring the existence of other sunlight demanding taxa, as well as they may inform on the presence of raw material for craft activities, such as basketry. The environment could also be revealed by the ecological characteristics of the non-cultural plants –i.e. the wild and weedy taxa. Their decrease/increase through time could suggest changes in the environmental conditions and could also inform on agricultural practices.

5.2.2. The environmental data of the studied archaeological sites and the possible basketry choices

The sites with pollen data reviewed here are chosen according to their proximity to the regions under study, whereas a full review of all existing palynological data dated to the Holocene of Bulgaria and Greece is outside the scope of this chapter. Almost none of the archaeological sites had its own palynological core, except two sites in Crete: Palaikastro (Cañellas-Boltà et al. 2018) and Malia (Lespez et al., 2003). From north to south, the reviewed pollen cores for both Bulgaria and Greece, in addition to those of Palaikastro and Malia, can be summarised as follows (Fig. 5.1.): for Provadia-Solnitsata – Lake Durankulak (Marinova and Atanasova, 2006); for Kurilo – Begbunar Bog (Osogovo Mts, Lazarova et al., 2015); for Bulgarchevo – Begbunar Bog (see previous site); for Dana Bunar – Straldzha Mire (Connor et al., 2013); for Promachonas-Topolnitsa – Lailas (Gerasimidis and Athanasiadis 1995) and Rhodope diagrams (Bottemma 1994); for Dikili Tash – Tenaghi Philippon marsh (Bottemma, 1994, Wijmstra, 1969), for Thassos – marine core SL 152 (Kotthoff et al., 2008).; for Skoteini cave – Lake Xinias (Bottema 1994; Turner and Greig 1975), for Franchthi cave – Lerna (Jahns 1993); for Akrotiri – there are no pollen data available.

Amongst the studied archaeological sites, some of them included anthracological analyses: Provadia-Solnitsata (Marinova, 2008a-e); Bulgarchevo (Marinova and Ntinou, 2018), Dikili Tash (Malamidou et al., 2017); Franchthi (Asouti et al., 2018); Skoteini (Valamoti, 2009), Akrotiri (Mavromati, 2017; Bottema-McGillavry 2005; Asouti, 2003), Palaikastro (Bottema - Mac Gillavry, 2019); while for others, the nearest possible charcoal data dated to the same period were taken into account: for Kurilo – Slatina (Marinova and Ntinou, 2018); for Ag. Antonios and Kastri on Thassos – Limenaria (Marinova and Ntinou, 2018); for one site the material is still under study and was not available for review here (Malia, Crete; Sarpaki, 2019).

The archaeobotanical studies resemble the anthracological ones with several sites including archaeobotanical research: Provadia-Solnitsata (Marinova, 2008a-e); very limited data were provided for Dana Bunar I (Leshtakov et al., 2018); Bulgarchevo (Marinova, 2017); Promachonas-Topolnitsa (Valamoti, 2009, Popova, 2010), Dikili Tash (Valamoti, 2015, 2009), Franchthi (Hansen, 1991), Skoteini (Mangafa, 1993), Akrotiri (Sarpaki, 1992), Malia (Pomadere and Zurbach, 2007), Palaikastro (Sarpaki, 2007, Macgillivray et al., 1989), while for others information from sites in nearest proximity and similar chronology were considered: for Kurilo – Slatino (Popova, 2010); for Ag. Antonios and Kastri on Thassos – Limenaria (Marinova and Ntinou, 2018).

BC	EUROPEAN PERIODS	AEGEAN PERIODS	BALKAN PERIODS	GREECE MAINLAND	CYCLADES/CRETE	MACEDONIA/ THRACE	BALKAN PENINSULA
6800-6500	PRECERAMIC (PPN)			Argissa Franchthi	Yiura Knossos X		
6500-5800	EARLY NEOLITHIC (EN)			Protosesklo Franchthi	Ag. Petros Yioura Knossos VIII-IX	Servia V	Karanovo I
5800-5300	MIDDLE NEOLITHIC (MN)	MN		Sesklo I-III Chaironeia Nea Makri	Ag. Galas I Ag. Petros Knossos V-VII	Servia	Karanovo II Starchevo Anza I-III Porodin I
5300-4800	MIDDLE NEOLITHIC	LN Ia	MN (-5200) LN (-4800)	Arapi Tsanagli-Larissa Nea Makri	Konossos V-VI Franchthi 3-4 Tharrounia Ia Saliagos I Ftelia Ag. Galas II Emporio IX-X	Dispilio Makryalos I Vassilika I-II Paradimi I-III Makri II Dikili Tash I Sitagroi I-II Paradimi I-II	Karanovo III –IV Usoe Hamangia I-II **Kurilo** Vinca A-B Porodin II Anzabegovo IV **Bulgarchevo**
4800-4500	LATE NEOLITHIC (LN)	LN Ib	EC MC	Dimini Otzaki Ag. Sophia Nea Makri Gonia Diros **Skoteini**	Knossos IV Saliagos II Emporio VIII **Franchthi 4** Poros Grotta Zas Tharrounia Ib	Dispilio Makryalos II Vassilika III – IV Olynthos I-III Makri **Agios Antonios** Paradimi IV **Promachonas-Topolnitsa**	Karanovo V **Bulgarchevo** Marica I-IV Vinca C1 Maliq I-Kamik Hamangia III-IV Vinca C **Provadia-Solnitsata** **Topolnitsa**
4500-3200	EERLY CHALCOLITHIC (EC)	FN/C LN IIa LN IIb	LC FC Proto BA	Rachmani Peukakia Petromagoula Attica-Kephala Diros Mikrothives	Alepotrypa Knossos II-III Franchthi 5 Tharrounia II Kephala Poliochni I Emporio VI-VII Pyrgos Phaistos	Sitagroi IIIA-B-C **Dikili Tash IIA-C** Kastri Mandalo I-II Kritsana Sitagroi IIIB-C Makri Katrsi	**Provadia-Solnitsata** Karanovo VI Kolarovo Yagodinska **Dana Bunar I** Haramijska Chernavoda I Hotnitsa-Vodopada Kodzadermen Bubani Hum Ia Vinca C2/D
3000-2000	MIDDLE CHALCOLITHIC (MC)	EBA I EARLY HELLADIC (I-III)	EBA		EARLY MINOAN (I-III) *Prepalatial (2600-1900)* Grotta-Pelos Eutresis III-VIII Keros-Syros (Kastri) Phylakopi I	Sitagroi IV Dikili Tash IIIA-B	**Topolnitsa** Kovacevo Ezero A-B Mihalitch Ezerovo Magura Cotofeni Baden Kostolac **Dana Bunar I**
2000-1625	MIDDLE BRONZE AGE (MBA)	MIDDLE HELLADIC (I-III)	MBA		MIDDLE MINOAN (IA,B-IIA,B-IIIA,B) PROTOPALATIAL (1900-1700)	**Kastri**	
1625-1200	LATE BRONZE AGE (LBA)	LATE HELLADIC (I, IIA,B-IIIA,B)	LBA		NEOPALATIAL (1700-1400) POSTPALATIAL (1400-1150)	**Malia** **Palaikastro** **Akrotiri**	

Table 5.1. Comparative table of the relative Neolithic and Bronze Age chronologies and the major archaeological sites; the studied in thios thesis sites are in bold (after Tsirtsoni, 2016, p. 20, Table 1).

Figure 5.1. Studied in this thesis archaeological sites with mat-impressed pottery and archaeobotanical basketry remains (circle) and reviewed sites for environmental data (triangle). Map design: ArcGIS® (2019).

5.2.2.1. Neolithic tell and salt-producing centre Provadia-Solnitsata

There are no pollen data coming from the archaeological site of Provadi but there are archaeobotanical analyses including both seeds and charcoal (Marinova, 2008a-e). The earliest archaeobotanical material is retrieved from LN structures and contained *Quercus* sp. 61%, *Carpinus* sp. 11%, Rosaceae 7% and *Cornus* 5%; in addition, very low values of *Fagus* and the riparian *Ulmus* and *Fraxinus* were recorded. The Rose family and Cornelian cherry are light demanding taxa, pointing towards an open stage of woodland, which is supported by the steppe like archaeobotanical finds, including *Glaucum, Stipa, Phleum, Physalis, Teucrium* and fruits of the recorded wood species of charcoal, such *as Cornus mas, Corylus avellana,* and *Prunus* sp. Amongst the cultural plants of this period, Cerealia are present, including naked barley (*Hordeum vulgare*), einkorn (*Triticum monoccocum*) and emmer (*T. diccocum*), along with legumes, including lentils (*Lens culinaris*). Later during the Mid-Calcolithic (MC), the cultural plants include barley, einkorn, emmer and millet (*Panicum milliaceum*), one of the earliest contexts with millet in Bulgaria (Marinova, 2008a-e), and pulses consisting of lentils and peas (*Pisum sativum*). The wood charcoal of this period was composed of 33% oak (*Quercus* sp.), 38% hornbeam (*Carpinus* sp.) and plum (*Prunus* sp.).

The closest to Provadia location with pollen data is Lake Durankulak (also a BA archaeological site itself), where data were obtained for the EBA and the LBA periods of occupation of the site (Marinova and Atanasova, 2006; Fig. 5.1.). Even if Durankulak is situated about 100km NE of Provadia, they are both located at or in proximity to the Black Sea coast, and the site of Provadia is very close to the Varna Lake (ca. 20km), which is also connected to the sea; hence at least on the basis of their geography, the two locales should present some vegetation similarities. The radiocarbon dates (5 in total) obtained for the core from Durankulak are ranging between 4194 and 3904 BP (circa 2241 – 1954 BC). The pollen data for this site were done alongside macrofossil analysis. During the earliest phase of the core (EBA) the presence of tree pollen is very limited, while the NAP, such as herbs and aquatic plants, have higher values: Poaceae peak at about 50%, but Cerealia are still extremely limited or absent; Chenopodiaceae start with higher signal at the bottom of the core (30%), but as time progresses they decrease (while Poaceae increase); Cyperaceae and cattails (*Typha latifolia*) pollen are also limited during this period (ibid.). The EBA is also characterised by increasing microscopic charcoal particles alongside the coprophilous NPPs but it was assumed that this does not necessarily point towards human pressure on the local vegetation, such as woodland clearance, because the vegetation was already open. Amongst the macrofossil remains of this period *Carex* sp. fruits and *Schoenoplectus* sp. nutlets have been also registered (with the latter reaching 40% towards the end of the EBA), along with *Humulus* and *Sambucus* seeds. It was suggested that taxa, such as the aforementioned shrubs, were surrounding the lake and the APs originated from the vegetation along the rivers flowing into the lake.

The LN-MC-EBA natural habitat around the settlement of Provadia according to the available data so far can be thus summarised as follows: it was dominated by open oak lands, mixed with patches of hornbeam and abundant step-like herbaceous vegetation into the open spaces, where sunlight demanding taxa may have been growing. The open landscapes are also confirmed by the registered cultural plants – cereal or pulses – all requiring sufficient light. Steppe vegetation and cereals are of interest in terms of basketry and mat-making in the Neolithic Provadia since, based on the analysed mat impressions of pottery, it was assumed that their diagonal twill technique along with the identifiable leaf morphology of the imprints are very likely to be attributed to monocotyledonous grass plant leaf material (see see 4.3.2.1). The leaf material for weaving could have been sourced out of some of the wild grass plants, recorded archaeobotanically, such as timothy grass (*Phleum pratense*) and/or esparto (needle) grass, or of some of the grain cultivars, such as barley or wheat.

Timothy grass and esparto grass have not been detected during the primary ethnographic work conducted for this thesis but they are known in the literature. Timothy grass is suggested as one possible material for weaving contemporary basketry objects in Crete, Greece (Leontidis, 1986), while the esparto grass is suggested by Bichard (2008) as weaving material known in European weaving practices (Table 2.1.). Both suggestions are made on a non-botanical basis and lack of specific details as to what kind of objects they were preferred for. In regards to the studied material from Provadia, the esparto grass can be eliminated, because of its very narrow leaf lamina, which does not correspond to the wide leaf impressions visible onto the pottery bases. Timothy grass' lamina length is not optimal for weaving two-dimensional objects, such as mats, where a continuous weft is needed in order to minimise the stacking/stitching points. Here an interesting detail, observed amongst the mat-impressed basses of Provadia comes in support of the possible use of Timothy grass: these are the recorded "errors" or stitching into several of the impressed weaves. An explanation of this may be the non-sufficient weft length, which means a non-sufficient leaf length. If these “errors” do not relate to a secondary use of the woven objects (i.e. used once they have been already retired from their primary use, due to their failure), it could be assumed that they serve in their primary use. Then it may be suggested that the “mistaken” impressions could be applied as a chronological indicator marking the earliest, studied in this thesis, mat-impressed bases, the LN ones from Provadia, i.e. woven with Timothy grass, but in order to fully hypothesise this a larger or complete part of the pottery material should be assessed.

The next studied botanically cultural period of Provadia is the MC, where its vegetation seems to have been open oak woodlands, now even more open and transformed into equally mixed with hornbeam open forests. In this period, the archaeobotanical analysis has recorded cereals and no other grass or monocotyledonous plants have been identified at this stage. The leaf laminas of both barley and wheat would present the already described leaf morphology, recorded on the pot bases, and this places them as a very likely source for mat-weaving for this period (see 4.3.4.1.). If the “errors” of the weaves are assumed to be a chronological indicator, then the majority of the recorded fragments would be placed into the periods after the LN.

5.2.2.2. The LN settlement of Kurilo (West Bulgaria)

No archaeobotanical data (neither pollen, nor charcoal or seeds) have been published regarding the Neolithic settlement of Kurilo, so a proxy-analyses from other sites were borrowed in order to help reconstruct an approximation of the past environmental conditions and vegetation in the area. The closest anthracolological spectra for Kurilo comes from the Neolithic settlement of Slatina situated in the south of the city of Sofia (Marinova and Ntinou, 2018; Fig. 5.1.). The local vegetation for the EN (5500-5620) of Slatina is characterised as alluvial hardwood forests and as sub-mediterranean to sub-continental mixed oak and oriental hornbeam (*C. orientalis*) forests (ibid.). According to the charcoal, the wood taxa for Slatina were dominated by deciduous oak forests, including maple (*Acer* sp.) and very low signal of hop hornbeams (Ostrya). The open woodland below the oak forest contained Cornelian cherry, hazel with low values of plums and the rose-family (Rosaseae). The vegetation along the river (Iskar) was composed of elms (*Ulmus* sp.), ash (*Fraxinus* sp.) and alder (*Alnus* sp.). Since the anthracological material was assigned to a single phase of the settlement of Slatina (EN II), there is no base for comparison of possible vegetation changes and/or human imprint on them through time.

For Kurilo, the closest Holocene pollen data comes from the peat bog Begbunar at Osogovo Mts (Fig. 5.1.), which is lying about 90km south-west of the Sofia plane (Lazarova et al., 2015). The pollen core from Osogovo presented two stages, grouped at the intervals c. 5000 – 3300 cal. BP (c. 3050 – 1350BC) and 3300 – 4000 BP. The bottom phase of the core corresponds to the transition between the FN and the EBA. At this period the mountain slopes have been covered by conifers, dominated by silver fir (*Abies alba*) and pines (*Pinus* sp.); amongst the deciduous trees – the expansion of birch (*Betula* sp.) starts at this stage, which could indicate the opening of the forest. The NAPs are represented by high Poaceae values (up to 50%), low Cerealia signals (*Triticum*/*Avena* type) and even lower aquatics, such as Cyperaceae, of which no fruits were found within the macrofossil remains; nevertheless, fruits of rushes (*Juncus* sp.) have been registered in very low quantities (ibid.)

The closest archaeobotanical data for Kurilo come from Slatino (Popova, 2010), which is a Chalcolithic settlement situated south-west from Kurilo and the archaeobotanical remains from this site include mainly emmer, but also einkorn, naked barley and bitter vetch (*Vicia ervilia*). The weed spectra include winter sowing indicators, such as brome grass (*Bromus* sp.), woodruff (*Asperula arvensis),* knotweed (*Polygonum convolvulus*), and a large amount of goosefoot (*Chenopodium* sp.).

In terms of baskets there are two suggested identifications for the plants used for weaving the mat surfaces that have left their impressions onto the three pottery fragments from Kurilo: rushes (material with low leaf diameter and of circular outline) and leaves with two secondary parallel venations, such as cereals (see 4.3.4.2.). Both categories of plants have been recorded at the above reviewed sites in proximity to Kurilo: fruits of *Juncus* sp. are known in low quantities from the Begbunar bog in the Osogovo Mts, where its presence is associated with the opening of the fir-pine forest vegetation of the area during the transition from the FN to EBA. On the other hand, cereals are known from the Chalcolithic contexts of the settlement of Slatino. Both FN-MBA Begbunar and Chalcolithic Slatino tend to be dated slightly later than the LN mat-impressions of Kurilo, but the open-character of the woodlands could favor growing of rush communities into the open patches, where more sunlight is reaching the forest undergrowth. In terms of cereals, it could not be determined if such have been locally cultivated in the LN settlement of Kurilo, because of the lack of archaeobotanical data, but for certain emmer, einkorn and barley are known in the area at the very end of the Neolithic, i.e. the Chalcolithic period.

5.2.2.3. The Neolithic settlement Bulgarchevo (South-west Bulgaria)

Pollen data are not available for the immediate area of Bulgarchevo and the already reviewed core from the Begbunar bog (Osogovo Mts; Fig. 5.1.) is considered as the closest possible, covering the FN – LBA time span (see above). Nevertheless, there is an anthracological spectrum obtained from the archaeological site of Bulgarchevo that covers two phases, the MN (5800 – 5500 BC) and the LN (5500 – 4900 BC), during which period the local vegetation is described as sub-Mediterranean to sub-continental mixed oak and oriental hornbeam forest (Marinova and Ntinou, 2018). A study incorporating targeted non-domestic and not of single-use contexts, but only scattered charcoal material within the settlements' layers (ibid.) is reviewed here in order to provide information on the past vegetation and its utilisation by the inhabitants of Bulgarchevo.

Based on the information obtained from the charcoal material from Bulgarchevo during the LN, the area of the site was dominated by deciduous open forest, including riverine taxa and with a conifer layer at the higher elevations (Marinova, 2017). The pine charcoal (*P. nigra*) increased slightly during the LN, in comparison with the previous MN period when it was poorly present. The deciduous oak values also increased, as did the utilisation by the inhabitants of the area of the open woodland and the riparian wood taxa identified. The vegetation composition during the LN remained the same as in the previous MN period: deciduous oak forests were dominant, including birches, Cornelian cherry, and plum, followed by taxa of forest undergrowth, including juniper (*Juniperus* sp.), along with riverine communities composed of elm, ash, willow/poplar (*Salix*/*Populus* sp.). The conifers remained poorly present and hence their utilisation by humans - restricted. The increased charcoal values during the LN period support the greater human impact on the local vegetation and were contemporary to the development of the major Neolithic settlements along the Struma Valley (ibid.).

The archaeobotany of Bulgarchevo was also studied for the three major phases of the settlement: EN, MN and FN, but all of them displayed the presence of cultural plants, such as emmer, einkorn, pea and lentils, which originated from storage contexts (Marinova, 2017). Emmer was the dominant cereal crop during the EN and the FN (being less important during the MN), while einkorn – during the MN and FN (and displaying lower values in EN). Pea was recorded in very high values during the FN, while lentils were dominating in EN (ibid.). Some of the cereal storage contexts also had cereal chaff, including leaf laminas along with low-growing weeds, such as hooked bristlegrass (*Setaria verticillata*) and fumitory (*Fumaria* sp.), which led to the suggestion that hulled wheats were harvested closely to the ground (ibid.) Impressions of grains and other vegetative parts of cereals were also registered on daub fragments. In addition, during all phases of the settlement wild edible fruits were recorded, including Cornelian cherry, wild vine, plums, apples/pears, strawberry (*Fragaria vesca*), blackberry/raspberry (*Rubus* sp.), indicating their collection (ibid.).

The mat-impressed pottery from Bulgarchevo and Topolnitsa was divided into three suggested groups for the possible weaving plants which left their impressions on the pot bases (Section 4.3.4.3.). The first one is the wide, smooth (no keel) leaves with almost invisible venation, assigned to cattails; the second ones were the ones with very prominent central keel, visible in the leaf lamina, assigned to the grass plants and perhaps cereals; the third one is the group of the low diameter leaves or stems, such as rushes and sedges. With the exclusion of cereals (present in all studied periods) none of the other abovementioned plants have been registered archaeobotanically at Bulgarchevo. Nevertheless, the riparian vegetation recorded from the MN onwards would support the possible presence of cattails, while the open mixed forests would favor the growth of rushes or sedges into the sunlit open patches of the woodland that could have been used for basket-making.

5.2.2.4. The Chalcolithic settlement of Dana Bunar I (East Rhodope, Bulgaria)

During the excavation of the Early Chalcolithic settlement of Dana Bunar I no archaeobotanical study was conducted but only a very limited analysis of 28 pottery fragments with cereal grain impressions within their fabric (Leshtakov et al., 2018). These included grains of barley, wheat and rye (ibid.). Since cultivated rye is a later phenomenon in South-east Europe, this identification needs to be handled as tentative, until its revaluation

(Zochary, Hopf and Weiss, 2012, p. 65). Hence, the closest environmental data, which could be related to Dana Bunar I, could be retrieved from the Straldzha Mire pollen core (Fig. 5.1.), lying approximately 50 km north-east from Dana Bunar I (Connor et al., 2013). The Straldzha core extends back from the Late Quaternary to the present day and its time-depth model was designed with 10 C14 dates (ibid.). Here the Mid and Late Holocene phases are considered to provide insights into the past vegetation of the area enclosed north of the Rhodope massive, south of the Balkan Mts, and west of the Black Sea coast. As the core is disturbed between ca. 8000 and 5000 BP, here the cultural periods to be taken into account are the FN, EBA and LBA. During the FN, the dominant APs were oak (50%), followed by pine and hazel that were represented at ca. 10%. The oak woods also included low signals of beech (*Fagus* sp.) and elm (*Ulmus* sp.). Amongst NAPs, the Poaceae were dominant by ca. 20% with few inclusions of other herbs, such as knotweed (*Polygonum* sp.) and bedstraw (*Gallium* sp.). During this period the charcoal particles into the sediment were relatively few, but they increased towards the EBA. During the EBA the oak woods were decreasing, while the charcoal increased. In terms of the coniferous vegetation, the pine values also increased (ca. 20%) and there were very low values of junipers (*Juniperus* sp.). The oak woodlands became more open, with the increase of hazel (*Corylus* sp.) and elm. Amongst NAPs, the Poaceae decreased, the Chenopodiaceae/Artemisia signal stayed very low and the other steppe taxa almost disappeared.

Since the mat-impressions of Dana Bunar I are thought to date to the Early Chalcolithic period (Leshtakov et al., 2018) here of interest are the first two phases: the oak woodlands of closed type during the FN and the open mixed deciduous forest of the EBA. The described vegetation in the broader area of Dana Bunar I would fit to the suggested plant identification for the woven objects which left their impressions on the pot bases from the site (see 4.3.4.4). The mat-impressions from Dana Bunar I were divided into two types of plant material including monocots and dicots. Amongst the monocots, the first category are the circular weaves woven with leaves of circular outline, suggested to be rushes or sedges. The second group of monocotyledonous plants relates to the perpendicular weaves, where two plant families were suggested: cattails for the impressions with no prominent keel and Poaceae for the ones with prominent primary and secondary venation. Amongst the dicotyledons, one impression with material of circular outline but higher diameter was taken into account and it was suggested that the original object may have been woven of wooden material (see 4.3.4.4.).

The first category of monocots (rushes and sedges) could be debated, because, there is no systematic archaeobotanical study conducted at Dana Bunar I. Hence the presence or absence of rushes and sedges cannot be debated. Given that rush pollen cannot not be detected in pollen diagrams, the only way of proving its existence is archaeobotanically, in the form of fruits any other of its vegetative parts. Hence, it can only be suggested that the reconstructed environment of the broader area would favor rushes and sedges' growth. In terms of the rectangular weaves with keeled leaves, these could be attributed to cereal cultivars. Those (with the very likely exception of rye) could be those that were recorded within the fabric of the EC Dana Bunar I pottery (Leshtakov et al., 2018). Other suggestions, such as cattails (non-keeled leaves), could not be debated because of the lack of a more systematic archaeobotanical study from the archaeological site. In terms of the wood material suggested for one of the circular weaves and according to the ethno-botanical literature of the region these may be young shoots of woody plants members of the families Salicaceae, Aceraceae, Fagaceae, Betulaceae, Cornaceae, and Malvaceae (for example Bichard, 2008, Nedelcheva et al., 2011). Indeed, beech was recorded in the Straldzha Mire diagram in both the FN and the LBA, but obviously its presence could be discussed further only if archaeobotanical data from Dana Bunar I were to be available.

5.2.2.5. The Neolithic settlement of Promachonas-Topolnitsa

The excavation of the Neolithic settlement of Promachonas-Topolnitsa has been conducted on both sides of the Greek-Bulgarian border, and in fact there are two separate excavations (Fig. 5.1.). There is an extensive archaeobotanical study from Promachonas (Valamoti, 2009), while the one from Topolnitsa is extremely limited, listing a few wood taxa, identified as charcoal material and including predominating *Quercus* sp., followed by the rose family (Rosaceae), pine *(Pinus* sp.) and maple (*Acer* sp.) (Popova, 2010). At Promachonas during the LN cereals, including einkorn and emmer, barley and New Type wheat, have been recorded and in addition lentils representing the legumes (Valamoti, 2009).

Palaeo-environmental information can be obtained from the closest sites with Holocene pollen data, Lailas (Vrontou) and Rhodope (Gerasimidis and Athanasiadis 1995; Bottemma 1994; Fig. 5.1.). At the lowest part of the core from Lailas (dated to 6020+/- 150 BP/5135 – 4720 BC, which would correspond to the MN and the onset of the LN) the vegetation is summarised as thermophilous deciduous forest, including lime tree (*Tilia* sp.) species, and low signals of hazel (*Corylus* sp.) and beech (*Fagus* sp.). The conifers pine (*Pinus* sp.) and fir (*Abies* sp.) appear as minor elements of the forest composition (ibid.). At this phase NAPs, such as Poaceae were present with extremely strong signal of > 90%, while Cyperaceae were missing (they appeared much later at about 1870+/-140BP – the MBA - with mid values of 30% and kept increasing up to the present day).

At the Rhodope diagram (west from Lailas, but closer to Promachonas-Topolnitsa), the earliest registered stage of vegetation at 3384+/-321 BP /2130-1320BC are the coniferous woodlands, at a time when the thermophilous deciduous woodlands are lower. The upland coniferous woodlands were considered to have been impacted by human activity, which favoured the expansion of birch (*Betula* sp.) in these highlands; in contrast, the strong presence of oak was interpreted as growing into the lowlands, unaffected by human forest clearance. At this stage the NAPs Poaceae were about 80%, while the Cyperaceae 40%; their values persisted in the later period of time with only small changes. The next phase, which could be placed in the Iron Age, according to the data from Rhodope was the mixed coniferous and beech forest, whereby beech and oak competed with pine, fir and spruce (*Picea* sp.); this phase was cross dated with the Lailas profile to 1870+/- 140 BP. This phase was also characterised by the fall of AP, while NAP increased, a fact interpreted as a severe forest clearance. In addition, the presence of walnut (*Juglans* sp.) and chestnut (*Castanea* sp.), which are considered introduced trees (except for Rhodope, where walnut is thought to belong to the natural population), indicated once again anthropogenic activity (ibid.).

The suggested basketry plants for the two botanical samples from Promachonas-Topolnitsa match the reconstructed MN-LN landscape. The first sample was identified as belonging to the grass family and displaying the morphology of the Panicoideae sub-family (see 4.2.4.1.). Even though millet has not been registered (millet is a later phenomenon in the area, Zochary, Hopf and Weiss, 2012, p. 70), the archaeobotanical data for the LN of the site support cereal processing activities, showing high amounts of einkorn and emmer chaff, along with their grains and other cereals. Here it could be only suggested that the vegetative remains of cereal ears may have been employed in craft, such as mat-weaving. One such case has been already previously reviewed (Chapter 2) and it comes from the Middle-Holocene basketry assemblage from the Saharan Takarkori (di Lernia et al. 2012), where Panicoid type was identified amongst the weaving material (suggesting broomcorn, *P. milliaceum* and forxtail, *S. itallica* millets) and for which it was proposed that different vegetative parts of the same plant were used for crafts and consumption (ibid.)

The second sample from Promachonas-Topolnitsa displayed a ring porous wood that was identified as *cf.* oak. This is in agreement with the recorded high oak signals from Lailas during the MN-LN phase. The use of oak wood material for basket-making thus showed one more aspect of forest consumption, and precisely the oak woodland resources of the area around Promachonas-Topolnitsa. The pollen data from Rhodope, which continue into the MBA-LBA and the Iron Age, displayed the decrease of oak pollen and its replacement by other taxa into the periods following the LN. Basket-making with oak was also recorded ethnographically in the Balkans in the preexisting scholarship (see Table 2.2.) and during the primary research of this thesis (see 3.4.).

5.2.2.6. The Neolithic tell and extended settlement of Dikili Tash

The archaeobotanical data for Dikili Tash have two phases, whereby during the FN cereals, including high amounts of einkorn, barley and emmer, were registered; in addition, high amounts of legumes, such as grass pea, lentils, fava beans, were also recorded (Valamoti, 2015, 2009). During this period many fruits were also gathered, including large amounts of wild pear (*P. amygdaliformis*), rowan (*Sorbus* sp.), fig (*F. carica*), acorns, raspberries, elderberries, whitebeam, but also large quantities of grapes. During the second phase, the EBA, the presence of einkorn and barley was identified, but also grass pea and bitter vetch; amongst the fruits only grape seeds were recorded (ibid.). These archaeobotanical remains outline an open-enough landscape during the FN in order to favor cereal and pulses' cultivation, but at the same time point towards the availability of several wild fruits. The identified fruit taxa require open wood canopy and sufficient sunlight, and the recorded fruit-baring shrubs, such as raspberries and elderberries, require sufficient moisture. All these details shape a mosaic landscape with open spaces for agricultural activity, but also (widely) growing deciduous vegetation. This landscape image may have changed during the subsequent period of EBA, when grape seeds were registered, as vines require well drained soils and more sunshine along with warmer temperatures.

The preliminary anthracological data from Dikili Tash showed an open deciduous woodland, including decisions oak, ash, oriental hornbeam and maple. Cornelian cherry, hazel, wild pear/plum trees, juniper and wayfaring tree (*Viburnum lantana*) represented the undergrowth (Malamidou et al., 2017). The open woodland was also composed of sunlight-demanding taxa, such as terebinth, Christ's thorn (*Paliurus spina-christii*), and evergreens, including mock privet (*Phyllirea latifolia*), strawberry tree (*Arbutus* sp.), and evergreen oak (ibid.). There were also several riparian taxa recorded in the charcoal diagram, which could have been growing nearby water supplied areas, including willow/poplar, alder, oriental plane, elm, ash and vine (*Vitis vinifera* ssp. *sylvestris*).

For Dikili Tash the nearest pollen diagram refers to Tenaghi Philippon (Bottemma, 1994, Wijmstra, 1969). Tenaghi Philippon (Macedonia, North Greece; Fig. 5.1.) was a former marsh and the area has been extensively studied at diverse sampling locales, including the former marsh, mountain peat bogs or marine sediments (ibid.). There were a total of 15 coring sites studying the Tenaghi Philippon's dynamics, two of which were retrieved from the archaeological site of Dikili Tash (Galais et al., 2016). The original Tenaghi Philippon core is the longest pollen diagram for the region with several 14C dates (Rossignol-Strick 1993; Wijmstra, 1969). The diagram shows that at *circa* 6000BP the arboreal pollen (AP) was quite limited with the presence of ash (*Fraxinus excelsior)* and hazel (*Corylus* sp.) type and higher values of oak (*Quercus* sp.) and pine (*Pinus* sp.) type; very low was the presence of the semi-desert taxa Artemisia and Chenopodiaceae. This chronostratigraphy would correspond to circa 4050BC which roughly corresponds to the Late Neolithic in Greece and Bulgaria. The next radiocarbon year was 5210 yr BP, which can be related to the FN/Chalcolithic in Greece and Bulgaria (3260 BC). Here the AP signal was even weaker with the exception of the peaking hazel and pine types and the increasing semi-desert markers. The next 14C date is 4420yr BP, which would correspond to 2470BC and EM/EH in Greece. Here oak pollen is twice higher than that of ash and hazel (still high values) together with the pine types, while the Artemisia-Chenopodiaceae group drops.

Two of the later pollen cores (Dik 4 and Dik 12) were sampled in immediate proximity and within the site of Dikili Tash, and the palynological spectra from them are summarised here because they combine palaeoecological information with the human impact and utilisation of the local vegetation (Galais et al., 2016). During the MN-LN, as seen in the last phase of Dik4 (5650-4000 BC), there was a rapid increase of alder (*Alnus* sp.) pollen, reaching 70%, while the Chenopodiaceae, Poaceae decreased. The hydro-hygrophytic taxa values dropped, while the NPPS indicating erosion remained high. This state of the vegetation reflected a closing landscape by riparian vegetation, which was then followed by a water level drop. By the end of this zone, the alder values dropped again to ca. 30%, which pointed towards reopening of the landscape and the development of a diverse open woodland taxa, that included junipers, viburnums, ash, elm and Poaceae (ibid.).

The vegetation surrounding the settlement of Dikili Tash during the Neolithic is complex, mainly due to the nearby former Tenaghi Philippon marsh. But during all phases of the Neolithic the landscape was relatively open, including mixed and riparian vegetation, and allowing dense forest undergrowth and providing sufficient lands for cultivation. The diagonally twilled or simple twined weaves on the mat-impressions from Dikili Tash were assigned to the grass family and perhaps to the barley-wheat group because of their pronounced secondary keels, while one split twined weave was attributed to the rush family (Section 4.3.4.5.). The first suggested group of items woven with cereal leaves could be valid because of the archaeobotanical evidence for agricultural practices, including grain cultivars, such as wheat species and barley. The second suggestion for the use of rushes could not be proven palynologically but it may be concluded that the environmental conditions with the dominating riparian taxa in the area during the onset of the FN would have been very suitable for rushes' expansion. In addition, basketry should have been a known craft in the LN settlement of Dikili Tash, as proven by the numerous mat-impressions (see 4.3.4.5), but also by the *in situ* basketry objects found in Building 1 (Malamidou et al., 2017). The first case was described as "charred remains of mat on the floor" (ibid., p. 69), while the second as "clod of earth bearing the imprints of interwoven twines" (ibid.) and was interpreted as carrying net ("filet de portage"; Martinez, 2004). None of the last two received a botanical identification, but they were described as plant fibers (Malamidou et. al., 2017) and were recognised as woody material ("bois", Martinez, 2004, p. 220). So, in LN Dikili Tash both direct and indirect evidence for basketry was recorded, which together with the palaeoenvironmental reconstruction in support of the existence of basketry plants, pointed towards the abundancy of basket-making products.

5.2.2.7. The LN and EBA settlement of Ag. Antonios and Kastri, Thassos

For Thassos the closest pollen data come from the marine core SL 152, sampled in the Mt. Athos Basin, which is at *c.* 70km south-west from the island (Kotthoff et al., 2008; Fig. 5.1.). If during the moist Early Holocene (11.7 – 9.7 kyr BP) the forest cover of the northern Aegean was denser, during the Middle and Late Holocene (6.6 kyr BP to present) this changed with ericaceous species and conifers expanding to higher elevation and replacing the oak population (Kotthoff et al., 2008). In addition to the decreased moisture, the opening of the forests was probably also a result of human activity. Low deciduous tree pollen signals were registered several times from the Middle Holocene and later to the present day: at *c.* 5.6, 4.7, 2.2 kyr BP. These low non-saccate AP values, except the last one, were all parallel to increasing values of Chenopodiaceae pollen, but no other heliophilous herbal pollen. This was interpreted as evidence for drought events and was linked to contemporary data from north Africa, Mesopotamia and the Near East – all pointing towards drought episodes.

Eight 14C dates were obtained and the last one was calibrated to 4462+/-37kyr BP, which could roughly correspond to the Final Neolithic. At that time, according to the pollen percentages, the vegetation had overcome the previously described setback and the AP of oak was quite high (60%); linden (*Tilia* sp.), hop hornbeam (Ostrya), elm (*Ulmus* sp.) and hazel (*Corylus* sp.) were present with values 10% or less. Amongst the conifers, the Abies/Pine signals were quite low (less than 10%). The herb pollen consists of Poaceae, which were about 70%, and low presence of Chenopodiaceae/Artemisia (less than 10%). These data pointed towards a warmer climatic (low conifers values and high oak) to temperate (expansion of other deciduous AP) conditions. Followed this episode of regeneration, the last (before present) drought event from SL 152 (c. 2.2 kyr BP), was shown in the decrease of the non-saccate APs (oak values reach *c.* 35%, while lime tree 15%), but no aridity-indicating taxa increased with it (i.e. Chenopodiaceae/Artemisia were almost absent from the diagram); Poaceae were about 50% and they fluctuated parallel to the oak. Amongst the conifers, fir/pine (*Abies*/*Pinus* sp.) reached over 30%. Hence it was suggested that this last drought event was not climatically induced but the result of human activity (ibid.).

Anthracologocal data were available for the Neolithic settlement Limenaria on Thassos and relate to one phase of the settlement, the MN (5800-5500 BC) when the local vegetation was characterised as Mediterranean sclerophilous oak forest (*Q. coccifera*) partially combined with pine woodland (*P. brutia*, Marinova and Ntinou, 2018; Fig. 5.1.). During the MN, the charcoal assemblage showed almost even values of deciduous oak and juniper (*Juniperus* sp.), but slightly dominated by the latter. The two taxa belong to different forest communities, oak forms forest, juniper grows in the forest undergrowth and open woodland, where other light demanding species, such as *Pistacia terebithus* grow too (ibid.). At Limenaria pine and riparian zones were absent during this period, but conifers were also represented by cyprus (*Cupressus sempervirens*), which stands for the meso-Mediterranean elements of the woodland. In addition to the charcoal data, the archaeobotany of the MN Limenaria indicated the presence of cereals (mostly barley and einkorn), pulses (lentils and fava bean), fruits (*Pistacia*, figs) and wild taxa, including higher values of *Chenopodium* sp. (Megaloudi, 2006).

Since the two fragments from Ag. Antonios and Kastri were not bearing clear mat-impressions, a suggestion for plant species served as material for weaving the impressed mats was not made (Section 4.3.4.6.). Nevertheless, both woody and non-woody material seem to have been available on the island for the creation of woven items. The studied mat-impressed fragment from Ag. Antonios had a very close simple twine technique with tripled wefts. This could suggest a material with low-diameter, which could be grasses stems or rushes leaves; this is very likely to have been the choice, also because the palaeo-vegetation reconstruction supports the presence of these plants (even if rushes are not seen in the pollen diagram, conditions for their growth are certainly present). The fragment from Kastri showed open simple twine, which could be woven with both woody and non-woody material. The past environment would have offered numerous woody taxa, whose young spring shoots would have been suitable for basketry, such as oak and linden.

5.2.2.8. The Neolithic cave dwelling of Skoteini

The study of the archaeobotanical remains from Skoteini dated to the LN presented high amounts of barley (*H. vulgare*), but also einkorn (*T. monoccocum*), and bread/club wheat (*T. aestivum/durum*). Amongst the pulses, there were grass pea (*Lathyrus sativus*), pea (*Pisum* sp.) and fava bean (*Vicia faba*; Mangafa, 1993). Amongst the fruits, there were figs (*Ficus carica*), pear/apple/Rowan (*Pyrus/Malus/Sorbus* sp.). During the EBA, all the above-mentioned cereals were still present, but there was also einkorn and emmer; the pulses remained the same with the addition of bitter vetch (*Vicia ervilia*) which was dominating in high quantities over all the cultural plants during this period (ibid.).

In terms of the palaeoenvironment of the wider area the closest core with absolute dates is from Lake Xinias in south-central Greece (Bottema, 1994; Fig. 5.1.). The core from the lake Kopais in Beotia (Turner and Greig, 1975) was situated closer but has not been reviewed here because of its lack of absolute dating, which makes its relation to the other pollen diagrams problematic. The core from lake Xinias shows that at about 7000 yr BP (circa 5050 BC), during the LN, deciduous oak (*Q. cerris* type pollen) peaked and immediately after this period, the other deciduous species expanded, such as hop hornbeam (Ostrya), ash (*Fraxinus* sp.) and hazel (*Corylus* sp.), which suggested cooler winters. During the FN, in the period between 6500 and 5500 yr BP (4550-3550 BC), this changed with decreasing oak pollen and increasing beeches, hazel and *Pistacia* signals, along with fir (*Abies* sp.) and pine (*Pinus* sp.); here grasses (Poaceae) and Chenopodiaceae also increased, pointing towards drier and warmer climatic conditions.

The LN landscape at the broader area of Skoteini consisted of predominating deciduous oak and mixed deciduous forests, including birch, beech and hazel, which would indicate colder climatic conditions. This changed during the subsequent FN, when the mixed forest also included coniferous taxa, such as fir and pine, while oaks decreased, but grasses and Chenopodiaceae increased – all indicating a drier and warmer climate. The suggested sturdy material chosen for forming the coils of the coiled weaves from Skoteini could also have been wood of perhaps one of these taxa (see Chapter 4, section 4.3.4.7.). As discussed in Chapter 4, the bundles forming the coils where the wefts were being coiled around could also have been formed with grasses, sedges or rushes. The latter could have also been used for weaving the simple and split-twined objects from Skoteini and it could be suggested that they were available during the LN and FN at the area of the cave, where oak-dominated and mixed forests were forming the landscape. In terms of grasses, cereal pollen was recorded in mid values during the FN, while cereal grains and chaff were recorded in both periods. The last suggested plant material were the palm leaves, which could have been used as coiling material around the above discussed coils. As the wefts displayed leaf morphology which could also be assigned to palm leaves, the species considered native to the eastern Mediterranean could be suggested to be the Cretan date palm (*Phoenix theophrastii*). But since this species is considered to be native to Crete, the eastern Mediterranean islands (Lindos, Mitylene) and all Asia Minor (Euro+Med, 2006), this proposed identification should be handled as tentative, or in the case it is accurate it may be suggested that the woven objects may have been imported from areas where Cretan or palms are native (such as Crete, Asia Minor or the Levant).

5.2.2.9. The Neolithic cave dwelling of Franchthi cave

The analysis of the archaeobotanical remains from Franchthi cave recorded the presence of cereals, legumes, fruits, nuts and wild species during the whole Neolithic (Hansen, 1991). Here only the sequence dated to the MN-LN is reviewed (Zone VII), as it corresponds to the chronology of the studied mat-impressed pottery from the cave. Amongst the cereals there were emmer and barley. The pulses were represented by vetches, lentils, wild pea (*Pisum elatius*) and medick (*Medicago* sp.). An interesting observation in regards to lentils was their decrease in size through time, which raised the question whether they were cultivated or still their wild ancestors were consumed during the LN-FN (ibid.). In the category of fruits there were almonds (*Prunus amygdalus*), wild pear, *Pistacia* sp. and grape (*Vitis* sp.). The identified wild taxa included hackberries (*Celtis* sp.), storksbills (*Erodium* sp.) and mallow (*Malva* sp.); the lack of evidence of cereal weedy taxa was interpreted by Hansen as an indication for deliberately cleaned cultivation plots (ibid.). A couple of species, which could have been consumed as spices were also found: capers (*Capparis* sp.) and coriander (*Coriandrum* sp.).

In terms of the natural past vegetation of the region, for Franchthi, the palaeonvironmental core to be taken into account is the one from Lerna (Jahns, 1993), which is situated at the opposite site of the cave in the Argolid gulf (Fig. 5.1.). There was a coring site situated along the Kiladha River, which was in closer proximity to the cave, but its exact position and dating were uncertain, hence only Lerna is summarised here (Hans, 1991). During the palynological phase which corresponded to the LN (Zone II, 5200-3600 BC) the oak woodlands increased and the NAPs decreasde (Poaceae and Cyperaceae dropped at 56% and 95%); while the deciduous oak spread the other deciduous taxa, such as hornbeam (*Carpinus* sp.), ash (*Fraxinus* sp.), dropped. This resulted into a replacement of the open forest known in the previous period and the formation of an almost pure oak woodland (ibid.). During the FN (Subzone IIIa, 3600 BC) oak woodlands were reduced by the expansion of pine and the return of some open woodland species, such as hornbeam/birch and the light-demanding hazel (*Corylus* sp.); the *Olea* signal also first appeared at this phase. It was suggested that this change was the result of human activity, as pines grew onto the cleared (tree felling) ground around coppiced trees (ibid.). The NAPs decreased for Poaceae (28%), Cyperaceae remained similar to the previous period, while the aquatic taxa slightly increased (64%).

The anthracological data for Franchthi from the Last Pleniglacial to the Middle Holocene were analysed by Asouti et al. (2018). The last phase of their analysis (ca. 8100-6000 cal BP) falls within the cultural phase of MN and LN of this site. The onset of MN-LN phase started with high values of almond (*Amygdalus* sp.) reaching 40%, mid-signals for the apple tree family (Maloideae) and the plum tree family (Prunoideae). Very low were the values for the Mediterranean elements, both deciduous and evergreen oak and slightly higher for *Pistacia* sp. (10%). Amongst the riparian taxa, mapple (*Acer* sp.) appeared at this stage, while immediately after plane (*Platanus* sp.) appeared. As the phase progressed, the signal of the almond declined (reaching 10% towards the end of this stage), while the Maloideae increased (reaching 30% at the end of the phase), along with the evergreen and deciduous oaks (they displayed fluctuations during this stage, but by the end of the phase were present at ca 10% each). During the MN-LN the woodland vegetation of the area of Franchthi was characterised as Mediterranean maquis (mainly on south-facing slopes and alluvial plains) with riparian elements alongside rivers and streams (Asouti el. al., 2018)

The suggested sedges and rushes as chosen for the woven objects from the Neolithic dwelling at Franchthi could have been a resource available during the MN-LN phase of the settlement, but especially during its earlier phase, the MN, where sedges presented their higher values according to the pollen data (Section 4.3.4.8.). The presence of cereals during the whole reviewed period could also point towards other sources for weaving, choosing their stems, the physical properties of which, such as diameter and shape, resemble the ones of sedges and rushes.

5.2.2.10. The LBA settlement of Akrotiri (Thera)

For Akrotiri there are no pollen data because the edaphic and climatic conditions of Santorini, being arid, do not favor the preservation of pollen (e.g. Mavromati 2017, Asouti 2003, Bottema-McGillavry 2005). However, there are tree anthracological studies (Mavromati, 2017; Bottema-McGillavry 2005; Asouti, 2003). These deposits delivered charcoal attributed to three phases, Early, Middle and Late Cycladic (ibid.). The third anthracological study of material from the West House (Bottema-MacGillavry, 2005) is not reviewed in detail here because of its lack of dating of the analysed charcoal (ibid, p. 103).

During the LC, the percentage of olive presence increased (68% for both P35 and P65A), while pine and Cupressaceae were reduced to 7% each (both P35 and P65A) and deciduous oak re-appeared at 5% (same for P35 and P65A). The intensive cultivation of olive trees was supported also by the archaeobotanical evidence, which pointed towards domesticated olives at least from the LC (Sarpaki 1987). The use of the olive fruits was linked to the pruning of trees, which was subsequent to their harvest, and the branches could have been used as firewood (Asouti 2003). In fact, the use of olive wood for construction purposes and as a fuel was suggested as usage preceding its cultivation and the consumption of its fruits (Margaritis, 2013); but in any case, its exploitation in all of the above-mentioned scenarios were shown in Akrotiri. During the LC, there were low values of taxa that were considered to serve as evidence for water-retaining locales on the island, which could have supported vegetation, such as deciduous oak, and small quantities of alder (Alnus sp.), beech (*Fagus* sp.), willow/poplar (*Salix/Populus* sp.), tamarisk (*Tamarix* sp.) and Poaceae (Mavromati 2017). Willow/poplar and tamarisk were considered as withstanding salinity conditions and perhaps co-existing into halophytic communities, while Poaceae were interpreted as reeds (Asouti 2003), which could represent a unit in such habitats. It is also of interest to this thesis that the recorded by Asouti (ibid.) Poaceae were in “very fragmentary and brittle” state probably due to the thermal impact. This situation completely corresponds to the analysed in this thesis 9 basketry samples, which were recorded as highly fragile (see. 4.2.3.1.), and in addition, several samples were assigned to the grass family.

If the pollen preservation on Santorini was almost impossible (except in special scenarios, such as rodents' coprolites; Bottema-McGillavry, 2005), the preservation of charred seeds was excellent, mostly because of their often storage contexts within pots or baskets (Sarpaki, 1992). The plants originating from the West house included cultivated crops, the majority of which were discovered stored within pots (ibid.). Dominant were the pulses, including Spanish vetch (*Lathyrus clymenum*), lentil and common pea (*Pisum sativum*). Cereals were also recorded in large amounts, including barley and einkorn. It was also suggested that einkorn was certainly the only wheat cultivated on the island, but preference was given to barley (perhaps because of its gluten content, ibid.). The category of the wild plants was very rich but the main genera were catchfly (*Silene* sp.), poppy (*Papaver* sp.), docks (*Rumex* sp.), clover (*Trifolium* sp.) and chrysanths (*Chrysanthemum* sp.). Of particular interest in terms of basketry were the recorded archaeobotanically species (Sarpaki, 1992) of the rush family (Juncaceae), spiny rush (*Juncus acutus*), and Somerset rush (*J. subulatus*), along with species of the sedge family (Cyperaceae), distant sedge (*Carex distans*) and black dog-rush (*Schoenus nigricans;* ibid.). A note should me made here that the genus *Shoenus* sp. has several synonyms with the genus *Cladium* sp., an example for this is *Schoenus mariscus*=*Cladium mariscus* (Euro+Med, 2006). In the case of black dog-rush, there are no known synonyms with sawgrass (*Cladium* sp., ibid.), but this identification should be handled with caution.

The identified plant resources for basketry items from the settlement of Akrotiri included oak, reed grasses (Bambusoideae/Arundonideae), millet grasses (Panicoideae) and grasses in general (Poaceae), sedges and rushes (Cyperaceae and Juncaceae), which all could have been available during all of the main phases of the site (i.e. Poaceae were present with low charcoal signal during all stages; Section 4.2.2.). The identification of the grass family plants included the suggestions of two groups of completely different plants in terms of basketry. If reeds would provide long and wide leaf blades, the Panicoideae consist of mainly narrow and sharp leaf blades, which could also reach great length. Members of the Bambusoideae/Arundonideae subfamilies, and particularly the latter, have been registered in the scholarship related to basketry (Table 2.2.), including Halfa grass (*Imperata cylindrica*) recorded in archaeological baskets from Egypt (Wendrich, 1999; Brinkkemper and Van der

Heijden, 1999; Borojevic and Mountain, 2014) and it was also identified ethnobotanically in the Balkan Peninsula (Nedelcheva et al., 2011; Dogan et al., 2008); purple moor grass (*Mollinia caerulea),* which was mentioned as one of the contemporary European choices by Bichard (2008), and cane (*Phragmites australis/communis*) known for basketry in Europe today (Bichard, 2008) were registered ethnobotanically in Turkey (Ertug , 1997, 1999, 2006), and the Balkans (Nedelcheva et al., 2011; Dogan et al., 2008) and were found archaeologically in Egypt (Wendrich, 1999; Brinkkemper and Van der Heijden, 1999; Borojevic and Mountain, 2014). On the other hand, members of the subfamily of the Panicoideae were also recorded within the existing basketry scholarship (Table 2.2.), including the bunch grass *Andropogon=Chrysopogon gryllus*, which was recorded ethnobotanically in the Balkans (Nedelcheva et al., 2011; Dogan et al., 2008); wild sugar cane (*Saccharum spontaneum*), which was identified in archaeobotanical samples from Egypt (Wendrich, 1999; Brinkkemper and Van der Heijden, 1999); sorghum grass (*Sorghum bicolor*), also identified archaeobotanically in Egypt (ibid.), and Johnsons grass (*Sorghum halepnse*), recorded ethnobotanically in the Balkans (Nedelcheva et al., 2011; Dogan et al., 2008).

Within the second group of identified basketry plants, rushes (Juncaceae) and sedges (Cyperaceae), it is very important to note that these identifications are supported by the archaeobotanical record (Sarpaki, 2003; see Table 5.2). Rushes and sedges share similar ecological requirements and hence similar habitats; this means that they could have grown together into common ecological communities. In addition, their properties for basketry are quite identical; their culms and leaves are almost not-distinguishable as their culms continues straight into a leaf lamina, a characteristic which provides a great length for woven crafts. Also, the round diameter of rushes and the mostly triangular outline of sedges are difficult to be distinguished at a first look in the nature and may often have been harvested together. In the case of existing knowledge on the particular properties of each of these species, it is likely that sedges could have been chosen for joining the base elements of non-coiled items, along with tightening the beginning of the coil of coiled basketry, forming the bundles of the coils in coiled basketry, and stitching them. The reason for this is the increased rigidity and endurance of the sedge laminas – in contrast to the soft and flexible laminas of the rushes – which could have been best suited for weaving the body weave or the wrapping around the bundles in the case of coiled items.

The environmental conditions at Akrotiri did not favour a great expansion of wild grass species (see above), but they were present during all phases of the settlement, along with cereal cultivars. This fact, together with the registered contexts displaying grain storage within baskets (Sarpaki, 2003), may point to the direction of local knowledge on the utilisation of the cereal by-products, such as the leaf blades. Specific knowledge on the recognition and use of wild taxa, such as wild grasses, reeds, sedges and rushes, may have also existed, as shown in the species chosen for weaving basketry items. This plant knowledge dedicated to basket-making, which included wild and domesticated taxa, together with the high concentration of basketry items (Section 4.4.) may also serve in support of the important role that the basketry products had in LC Akrotiri.

5.2.2.11. The LBA settlement of Malia (Crete)

The archaeobotanical research at Malia included several sectors of the complex, along with the Quartier Mu, where the mat-impressed pottery was registered (Pomadere and Zurbach, 2007). At the Quartier Pi there were wheat, barley and lentils, along with grapes, almonds (*Prunus amygdalus*) and olives (ibid.). At the Quartier Nu, amongst the cereals there were wheat and barley; amongst the pulses lentils, grass pea, broad bean, pea; in the category of fruits, grapes, figs, olives, almonds; there were also some aromatic plants (Labiatae) and some wild weedy taxa, such as *Gallium* sp., *Silene* sp. and poppy (*Papaver* sp.) (ibid.). At Quartier Mu, the recorded archaeobotanical remains consisted of cereals (wheat and barley), legumes (lentils), fruits (figs, olives, almond, grape, and terebinth), aromatics (coriander, the shrub *Thymealea* sp. and the parsley family, Umbeliferae), oil-producing plants (possibly flax) and wild seeds (poppy, ibid.).

In terms of the past environment of the site of Malia the closest pollen site is the one sampled from an area located between the current sea level and the archaeological site (Lespez et al., 2003). It indicated that in the time span from the Neolithic to the Roman period (ca. 5200 – 1500 cal. BC) the area was occupied by a marsh, as proven from the hydrophilic vegetation and the peaty layers, including reeds (*Aundo donax* and *Phragmites phragmites*). At the beginning of the occupation of the site of Malia (EM II – 2800 – 2200 BC) the core presented dense concertation of wood charcoal, indicating fire clearance of a forest of limited extend. There were no signals of woody taxa and very low values of riparian species (ibid.).

The palynological data did not extend further until the Hellenistic times though, because of the coarse sandy fraction registered at the span between 1739 -1513 cal. BP and 190-414cal. AD (LM I to Hellenistic period). This gap was interpreted as fluvial or marine deposit and it consisted of pumice material. Its provenance was associated with the Thera eruption or with lower scaled local events, such as storm events or barrier breaching (ibid.)

Since the LM and the preceding period (EM) climatic conditions were quite favorable for growing cultural plants, such as cereals, pulses, almond and olive trees, and this would point toward sufficient open spaces and land suited for agriculture. In addition, the available hydrophilic vegetation nearby the site of Malia would have represented a good source of material for basketry. The reeds, together with the sedges and rushes, were probably growing in the same ecological units (although rushes' pollen is not commonly recorded, Section 5.2.1.) and could have been used in the simple and split twine weaves from Malia (Section 4.3.4.9). Grasses/cereal cutivars and sedges may have also been used for forming the bundles into the coiled weaves, but also for the weft (coil) itself.

5.2.2.12. LBA Palaikastro (Crete)

There is no published archaeobotanical information for Palaikastro's Block M, where the studied in this thesis mat-impressed pottery came from, but there is a study for the surrounding structures of the complex, including the open space (square, also known as Plateia) near Building 5 (Macgillivray et al., 1989) as well as data from two wells of the Bronze Age town. The Plateia's LM IB layers consisted of a fill because the sampled structure is actually an open courtyard, which is situated next to the road. The registered cultural plants included both cereals and pulses, such as einkorn, emmer, barley, broad bean (*Vicia fava*), and grass pea (Sarpaki 1989, Livarda pers. comm.). Some of the grain and legume findings from Building 4 were discovered into amphorae and jars, so they seem to have been stored in those vessels, even though these were assumed they were used presumably for liquids (Sarpaki, 1989). Another amount of split pulses was discovered *en masse* and it was suggested they were contained into a perishable container (such as a fiber sack or a basket). The same cultural plants, but with the addition of olives, grapes, figs and almond (*Amygdalus communis*) were also recorded in the archaeobotanical samples from two wells (605 and 576) within the complex, where the deposits were dated to the LM I and the LM III (Sarpaki, 2007).

Anthracological material were studied from Building 1 at Palaikastro , covering its four major occupational phases, of which the first three correspond to the LM (Mac Gillavry, 2019). Phase I (LMIB) was dominated by olive (*O. europea*) and evergreen oak (*Q. coccifera/ilex*), followed by pine (*P. brutia/pinea*); there were also low values of *P. terebinthis/lentiscus* and maple (*Acer* sp.). The second phase (LMII-IIIA), or the period of early re-occupation included olive (twice less than during the previous stage), pines and *Pistacia* with very low values of evergreen oak, *Prunus* sp. and fig. During Phase 3 (LM III), the charcoal assemblage was dominated by evegreen oak, and low values of olive and pine.

In terms of the palaeoenvironment, the published in 2018 pollen diagram from the beach and gulf of Kouremenos in immediate proximity to the archaeological site of Palaikastro can be taken into consideration here. It showed five landscape phases (Cañellas – Boltà et al. 2018). The core phases span between the LN and the EBA (EM II), hence here its last stages are reviewed. The period (Phase VI) dated to the EM I (c. 2780-2650 BC) registered by the pollen diagram from Kouremenos showed widespread grasslands and increased dung-related taxa, which was interpreted as evidence of intensive grazing. Amongst the herbs, the Poaceae (including Cerealia) and Cyperaceae signals of this period presented stable presence at about 10%. Several taxa increased at that stage, including olive and vine along with ruderal weeds (e.g. plantain). The last landscape phase (Phase VII, c. 2650 – 2525 BC, EM II) showed a continuous increase of olive, but also strongly reduced charcoal particle concentration, which was interpreted as abandonment of the vegetation clearance by fire in favour of grazing activities, which were sufficient to reduce the scrubland and keep enough opened lands suitable for crop cultivation (ibid.).

The very compact simple twine weaving impressed on the pottery fragments from Palaikastro and its finely woven fabric suggested the use of plant material with minimal diameter, such as sedges, rushes or cereal stems (Section 4.3.4.9.). These taxa would have been all present in the conditions of open landscape, adapted to agricultural activities and especially the olive culture (Cañellas – Boltà et al. 2018). In terms of basketry, given the minimal mat-impressed pottery assemblage (only two fragments) there is not much to be discussed. Nevertheless, further hypotheses may be proposed with the addition of new mat-impressed material, if such is recorded during the recent excavation of the complex of Palaikastro.

SAMPLE	PLANT PART	PROPOSED IDENTIFICATION
P-T 1 (PROMACHONAS-TOPOLNITSA)	*cf.* leaf	*Chrysopogon=Andropogon gryllus;* *Saccharum spontaneum;* *Sorghum bicolor;* *Sorghum halepnse*
P-T 2 (PROMACHONAS-TOPOLNITSA)	wood	*Querscus* sp.
$001 (AKROTIRI)	wood	*Querscus* sp.
$002 (AKROTIRI)	leaf	*Imperata cylindrica;* *Mollinia caerulea;* *Phragmites communis=australis*
$011 (AKROTIRI)	leaf/culm	Bambusoideae (=$002)
$012 (AKROTIRI)	2 stems + 1 leaf	Cerealia; *Carex distans;* *Schoenus nigricans/Cladium* sp.
$027 (AKROTIRI)	n/a	n/a
$034 (AKROTIRI)	leaf/culm	*J. acutus; J. sabulatus*
$035 (AKROTIRI)	*cf.* 2 leaves	Bambusoideae (=$002)
$064 (AKROTIRI)	leaf	*Carex distans;* *Schoenus nigricans/Cladium* sp.
$065 (AKROTIRI)	leaf	n/a

Table 5.2. Identifications of basketry plants and their proposed species identifications on the bases of the combination of archaeological, archaeobotanical and/or ethnobotanical analyses.

Figure 5.2. Proposed identifications of basketry remains of monocotyledonous plants, when combining all the available evidence: a. Badarau (2006); b. Sarangi (2019); c. Tackenberg (2019); d. Berende (2019); e. Topic (2019); f. Goddard (2010); g. Harper (1989); h. Trnkoczy (2010); i. Feenona (2019); j. Marcus (2007); k. Kers (2006); l. Meininger (2019);

5.3. Baskets in contexts

As previously discussed, basketry items were objects of multiple uses as both every day and special activities were performed that included baskets. This is suggested by the highly diverse contemporary aspects of their use and presence into daily activities of the last and a half century (Section 3.4.3.2.), but it is also reflected by the studied archaeological material, where baskets and mats were identified in both domestic and industrial contexts (Section 5.2). The presence and usage of baskets in prehistoric South-east Europe is also displayed into different iconographic scenes (see below). For the Neolithic and Bronze Age periods that are of interest in this thesis, the iconography of baskets is concentrated into the latter and geographically belongs to the Mediterranean and the territory of modern Greece. A selection of depictions of BA baskets are summarised in this section and their visualisations are divided according to three major functions: containing, transporting and measuring (Sections 5.3.1.-3.). Nevertheless, these three aspects are often mixed together, but in some cases only one activity is detectable. The various activities including baskets, already recorded ethnographically (Chapter 3) and archaeologically (Chapter 4) in this thesis, are then discussed here, considering also the iconographic evidence, while their function, use and role are also discussed, including their economic value and gender aspects of the basket-makers and users (Section 5.4.1.). In addition, aspects of materiality of baskets are considered, taking into account the skeuomorph pottery, resembling basketry (Section 5.4.2.). Last but not least, the basketry weaving techniques, witnessed in this thesis in both ancient and contemporary objects, are discussed as defining the properties and utility of baskets (Section 5.4.3.).

5.3.1. Baskets that contain

The act of containing is both static and mobile. An object may contain goods and store them while being immobilized, especially if the object is large in size and the goods are high in quantity and weight. This was explicitly visible at the very large baskets (*kosh*) recorded ethnographically (Section 3.4.3.2.), meant to usually contain food supplies, such as cereal grains, and also on the mat-impressed pottery, where the relevant pot fragments were taken to belong to large vessels (Section 4.3.). On the other hand, a container may also carry goods while in motion, such as transporting the content in long distances (e.g. at a procession or exchange), or in short distances (e.g. when serving domestic needs). These activities were suggested when analysing the archaeobotanical basketry remains and especially in the case when they were found together with their content, as for instance, at Akrotiri (Section 4.2.2.2.).

More detailed evidence on the use of baskets as containers comes from the available iconographic evidence, such as the well-known LM IIIA stone sarcophagus with rich polychrome decoration on all four sides from Agia Triada on Crete (Long, 1974). Here the two long sides (A and C, see Fig. 5.2.a-b.) of the chest will be considered. On Side C, which shows an act of bull-sacrifice performed with the participation of five figures, a panier is depicted "floating" above the head of one of the human participants in the ritual. This pannier is illustrated in yellow colour and the featured vertical lines and raising handles resemble the warps of a real pannier. The content of the basket is also depicted: these are "four disks" (Long, 1973, p. 65), which have been interpreted as fruits (Marinatos, 1993, p. 33) or germinating seeds (Nilson, 1950, p. 432-433).

Side A of the *larnax* represents a procession of seven human participants, which culminates into a divine (Nilson, 1950, p. 434), heroic (ibid., 438-443), also interpreted as "god of fertility" by Nauert (1965, p. 97), or deceased figure (Marinatos, 1933, p. 31). Indeed, this side consists of two iconographic registers: the right one depicts three participants carrying two animals and a ship-model towards a divine figure projected behind a three-stepped altar, all in a dark background. The left register shows three participants of whom one is a lyre player and the other two carry or hold baskets. The middle figure carries two vessels shaped like *kalathoi*, with raising handles and carried aided by a pole on the personage' shoulders. The front figure holds a vessel of similar style and performs what was interpreted as a libation scene of pouring the content of this vessel into another one, larger in size and positioned statically between two stands of double axes (Long, 1974, p. 36; Marinatos, 1993, p. 33). The latter vessel was considered a *krater* and, based on its dark colour, it was assumed it may be a depiction of a metal vessel, such as krater or cauldron (Long, 1974, p. 36). The other three vessels were also thought to be "buckets" by Long (ibid., 65) and hence containing a liquid content, which is not visible above their rims, to be poured into the krater, which according to some was depicted with a perforated base (Marinatos, 1993, p. 33). The iconographic problems regarding the content also relate to the three kalathos-shaped vessels, which were shown with polychromic details and linear diagonal decoration resembling the wefts of a basketry weave. A major obstacle for any secure interpretation is the lack of evidence of the content, i.e. the colour above the rims of the vessels as an indication of what pours out of the libation vessel into the *krater;* this is the main reason feeding the interpretation of liquid content being carried in the "buckets" (ibid.). A pointer towards a possible non-liquid content may be the yellow colouring of the carrier of the two vessels: this may be an indication to a saffron decorated headdress, and if extrapolated, it may also be a hint towards the content of the vessels, i.e. crocus stigmas (Day, 2011, p. 345).

In terms of the libation performance there are several other LBA contexts where similar scenes were depicted and a basket-like vessels was involved. The relief of the stone vessel from the MM-LM peak sanctuary at *Gypsades* (near Knossos in Crete) presents a figure kneeling down on a rock in front of an altar and probably performing a libation (Alexiou, 1959, p. 350; see Fig. 5.2.h.). Even if the object, which is being held in the hands of the performer is not clear, it was interpreted as a pannier (ibid.). On the other hand, the large vessel, was shown with raised handles and hatched rim, which provokes the suggestion of some sort of "elastic material" of which this krater-like vessel was probably made of (ibid., p. 351).

A more detailed act of pouring involving baskets is displayed on the famous fresco of the *Saffron Gatherers* on the north and east walls above the Lustral basin in Xeste 3 (Room 3) at Akrotiri (Fig. 5.1., Fig. 5.2.c –e.). The east wall shows two girls in visual contact, of which one is picking up crocus flowers with both her hands, while a conical basket with an arched handle is lying right behind her; the other girls is collecting crocuses with her left hand, while with the right she holds the same type of basket. The second basket displays a hatched motif and the two baskets are coloured in yellow hues, both resembling real woven baskets. The handles, rims and bases of the two baskets are depicted in darker red colour, another element which refers to actual baskets, when sometimes different plant material or such with wood bark is chosen for decorative or functional purposes. The north wall presents three female figures and a blue monkey: the first one to the right carries a basket, supported by a prussic on her shoulders, while approaching a platform. To the left and upon the tree-step platform there is a divine figure looking to the left, where there is a blue monkey and in between them lying in their feet is a small pannier-like basket in yellow colour. At the far left a third female figure is pouring crocuses from a conical basket into a larger pannier. The latter is the most explicitly depicted woven object on the fresco because its hatched pattern is clearly visible, which again together with the yellow colour code refers to the object's prototype. Here the content of the conical baskets, along with the content of the large pannier are referred to with the dense presentation of crocus flowers and stigmas, so there is no doubt when interpreting the image.

Apart from the act of pouring the content of a basket into another basket or a vessel, there is also one more mural fresco, presenting the act of gathering and once again, collecting crocuses. This is the *Saffron Gatherer/Blue Monkey* from the House of Frescoes in Knossos, depicting two blue monkeys surrounded by four conical basket-shaped vessels: three of them dotted, and one with a clear surface (Immerwahr, 1990, Fig. 5.2.i). Only the undotted one is shown in yellow and with horizontal lines, referring to the basket prototype, while the dotted ones are painted blue, but their rims and bases are toned in darker red. Crocus flowers are springing out of the four vessels pointing towards their functions as containing the gathered crocuses (ibid.).

To summarise, the iconographic evidence is elusive in terms of goods which are meant to be contained into baskets. Nevertheless, items requiring well ventilated and light containers, such as fruits or flowers (Tzachili, 2005), including crocus flowers or stigmas, may have been some of the primary contents of the basketry products in the Bronze Age Aegean. Frescoes are not definitive in terms of content, also because they do not depict everyday scenes, but "special" ones, including processions and religious actions or rites. But this could be also seen as informative on domestic and everyday utilities of basketry, because often everyday activities and rituals are interlinked.

On the other hand, delicate products, including fruits and mostly freshly harvested ones, such as grapes, and other perishable items, such as rose petals or tobacco leaves, were documented ethnographically in the north part of the study area of this thesis, the Balkans (Section 3.4.3.). This record may coincide with the archaeological iconographic depictions of basketry, but may also reflect the rationale behind storing perishable vegetal goods into baskets. Both containers and their content have particular physical properties and requirements, which seemed to be completed both ways when rose petals, tobacco leaves, crocus petals and/or their stigmas were placed into baskets.

5.3.2. Baskets that transport

Apart from the above discussed transporting scenes involving baskets from the sarcophagus of Agia Triada (two baskets carried on a pole upon the shoulders of a female figure) and from Xeste 3 of Akrotiri (one basket carried with a prussic upon the shoulders of a female figurine and one basket held by a crocus gatherer), there are several other depictions of actual acts of transportation. There are two fragmented mural frescoes from the *Royal Villa at Agia Triada*, which also show a basket (or perhaps two) carried on the figure's shoulder (Nilson, 1950, figs. 198A and 198B, Figure 5.2. p.-q.). This basket also shows some indications of weaving, a diagonal linear pattern just below the rim. Its content is also depicted, having the form of round objects, similar to the ones presented in the "floating" pannier on the sarcophagus. The second mural shows a partially preserved human torso and a conical basket positioned by the floor, or what would be the feet of a person. This basket also shows schematically its "weave" (Section 5.4.4.) and both objects feature raising handles, implying that they could be carried on a pole. The content of the latter one is not shown.

While the iconographical examples mentioned here depict two-handled conical baskets, similar to the contemporary *kophinia* or *kosh*, there are several examples of small woven items, such as panniers or *pyxides*. Some of them have already been mentioned above: a shallow pannier "floating" and full of fruits on side C of the Agia Triada sarcophagus, and a large shallow pannier from the *Saffron Gatherers* fresco at Akrotiri. Similar to the pannier depicted on the *larnax* is one mural fragment found at the doorway between rooms 4 and 5 at The West House at Akrotiri, the so-called *The Priestess* fresco (Day, 2011; Marinatos 1984). It depicts a female figure, holding a small pannier with both her hands, while offering/supporting its content. It was suggested the content of this vessel was the precious saffron, as suggested by its brown-yellow-red colour and the yellow-blue colour code of the figure herself (Day, 2011; Figure 5.2.f). There is another mural fragment from the Mycenean palace at Tiryns (LBA), which depicts *Women Bearing Offerings*, and one of them holds, in the same manner as the figure from the Akrotiri doorway (Fig. 5.2.g.), an almost rectangular or cylindrical item, identified as a *pyxis*, a wooden or ivory box, or a woven object (Rodenwaldt, 1976).

To summarise, the iconographic evidence also shows different settings of transportation of goods into basketry objects. Transportation prerequisites containing of certain items into containers and their mobilisation through space. Here, once again, the link between the properties of the what-is-to-be-a-content and the container itself is interwoven into the act of transportation, because the mobility of basketry items means mobility of the goods contained into those.

5.3.3. Baskets that measure

As the abovementioned iconographic evidence from the LBA Aegean shows, the everyday role of basketry items is illustrated when presenting them as containers and/or transporting devices. Somewhere in between these two functions the evidence for using baskets as measuring units could be placed. This function was suggested for the word *ka-ro-to* and the interconnected ideogram CUP (*155) on the Linear B tablets of the Ge series from Mycenae that record spices and aromatic plants (Ventris and Chadwick, 1973: 227-230). The word *ka-ro-to* was identified as being used in marking containers and their content (ibid.). It was also suggested that the use of this word implicates the meaning of the colour yellow (neutral plural in the tablets: KN 587.2, 598.2, KN. Od. 485, Od. 486, Od. 487; MY Oe.106.1, see Douskos, 1980).

Ethnographical data related to contemporary words for basket in Greek support this hypothesis. Such words include *talaros,* which indicates the type of basket, which is also a measuring vessel (Tzachili, 2005). At Thera, the word *kofinos* is widely used referring to the type of basket, but also used as a measuring unit (usually for grapes and olives) (Beloyanni, 2003). In Crete, the words *mazourokalatho* and *axai* again mark the types of baskets, but they are also used to refer to measurements of the cereals contained in them, while at Carpathos the *Pinaki,* and in Tinos the word *napos* have the same meanings (ibid.).

Some of the above-mentioned baskets serving as measuring units are quite small in size (i.e. the *pinaki*), which means they could have measured low volumes of goods. Another interesting note to be mentioned here are the pottery miniature basket models, also contemporary to the already discussed iconographic evidence. These are six miniatures from Knossos (Warren, 1984, p. 54), Pseira (Buchholz and Karageorgis, 1973, pl. 902), Nirou Chani

(Long, 1973, pl. 17), Agia Triada (Burke, 2003, Fig. 12) and Isopata (Knossos, Buchholz and Karageorgis, 1973, pl. 939) in Crete, and at Vourvatsi in Attica (Buchholz and Karageorgis, 1973, pl. 940). Some of these miniatures feature perforated bases and may have also served as *rhyta*, such as the first twin models from Knossos. An interesting common feature of all six miniatures are the raising handles mimicking the ones on real basketry items, which all could be virtually positioned on a pole, similarly to the depictions from Agia Triada.

The perception of basketry items as measuring units could support the ubiquity and availability of these items into everyday life in the past. Their presence in every aspect of life could render them as a suitable article to be used for measuring. The measuring of a content, with commonly known and accessible vessels could be seen as a standartisation process of both the measuring unit (i.e. the basket) and the particular volume in it (i.e. goods contained into the particular type of basket). Both could not be possible without a commonly valid recognition of the basket as an item, which is capable to contain, transport and measure. It may be concluded that in this kind of social agreements all primary functions of a basket as a vessel are united in order to perform a third one, which is specifically related to economic relationships within a particular society.

5.4. Deciphering basketry: value and perceptions

5.4.1. Economic value and gender aspects

Baskets that contain, transport and measure were recorded ethnographically and archaeologically in this thesis. Different aspects and specific details were extracted when observing particular contexts. All strands of evidence presented basketry items involved into diverse activities, both of everyday character and specialized ones. A good example to start with could be the act of gathering, which combines the functions of containing and transporting. Gathering could be performed at the basis of everyday contexts and household activities but it could also involve items of higher (or special) economic value. This was shown ichnographically on the murals of LBA Akrotiri where saffron gathering is depicted, but it is also recorded as a historic and recent practice in the Balkans (Chapter 3), e.g. rose petals' collection involving baskets. Similarly, to the crocuses in Thera, within the Balkan area, rose petals could be positioned on top of the goods to be collected in a basket, when compared by their economic value. Other goods of high economic value and importance are tobacco leaves and grapes, where their collection also involves basketry items.

In the case of rose petals or tobacco leaves and their further processing following their collection, these required procedures of measuring because of the particular ratios of each good in the rose oil or smoke tobacco production processes. Similar could be the case when grapes are processed into wine and ratios are required into the wine making process (Sections 3.4.1., 3.4.3.). Here baskets perform a triple function: firstly, they are used for their capacity to contain and transport and secondly, they are used to measure the good they contain, because the last would be involved into further processes requiring content measurement (e.g. ratios). At this point the everyday utility of a basket is linked to and recognised as an economic one.

An interesting (economic) observation could also be made in relation to the display of the types of content of higher economic value. In a way the act of pouring the basket's contents into another vessel could be perceived as part of the different processing activities. This moment was depicted in the past (pouring saffron on the Akrotiri murals, or unknown contents showed on the *larnax* of Ag. Triada), but also in modern times photographs portraying rose petals, grapes and tobacco leaves content. Sometimes they were shown as being poured into another vessel, or other times they were pictured as static, displaying a kind of surplus, baskets overflown with their content (see 3.4.1.4).

At least iconographically, some of the above-mentioned activities were often presented in association with female figures: the two persons on the Ag. Triada's libation scene (one carrying the two basket-like vessels on her shoulders, and the "pourer), all figures (except the monkey) on the *Saffron-gatherers* of Akrotiri, the offerings-bearer from Tyrins, who holds a pyxis and the "priestess" from Akrotiri, who holds a small pannier. One key pattern in this association would be the aforementioned physical properties of basketry, but also the recognition of particular activities as involving female participants.

From the Mediterranean LBA (see frescos above) until the modern traditional folklore customs in the Balkans (see *Lazarka* custom, Chapter 3.4.1.3.), this light item – the basket – is shown as carried easily upon a woman's shoulder, or in her one or two hands. The everyday utility of the basketry may be an additional factor supporting this link between household activities and female practitioners. A major one could be the food processing, preparing and storing: woven winnowing fans are known from West Bulgaria and were used for cereal grain processing (Section 3.4.3.2.), while all sizes of baskets are known ethnographically, but also evidenced archaeobotanically (Section 4.2.1.) for storing grains, pulses, fruits and nuts. Also, baskets seem to have been used for gathering precious content, such as the saffron gathering in baskets from Akrotiri or the processions involving basketry containers of Ag. Triada at Pylos. The food preparation and the preceding plant processing has its by-products, such as the cereal stems and leaves. These by-products may also have been utilised in weaving basketry items dedicated to food-related activities or other household practices. On the other hand, large-scaled items (such as *kosh*) or items demanding manual pressure (such as covered bottles) could require physical force, which could be more often provided by men basket-makers. Indeed, *damadjana*-makers or *kosh*-makers interviewed for this thesis were only men, while women were in an apprenticeship position, but never fully reaching a basket-maker' role (Section 3.4.3.1.).

The collection of weaving material could also be described as male activity, in regards to the outdoors practices in several instances, including sometimes long-distance walks in the mountain or where the basket wood grows, according to ethnographic studies. It was also involving coppicing and transporting this woody material to the places where basket-making was to take place. However, in all cases this happened within the immediate natural environment, where these plant resources were available. The basket-makers' choice was hence dictated first by the local environment and then by their knowledge for utilisation of this environment. For example, spring or autumn coppicing for the purposes of basketry are illustrating knowledge adapted to particular environments. This very careful 'timing' with the environmental conditions practically allows basket-making all over the year, when no major agricultural activities are undertaken, or perhaps also during these periods, if grain by-products were chosen for basketry. This division within the process of basket-making, commencing with the plant collection, processing and actual weaving, perhaps also defined the two genders' roles into the different stages.

5.4.1. Baskets that are not baskets

When discussing the basketry craft and its direct product, the basketry items *per se*, various interpretations may be put forward based on their uses, both as recorded nowadays or depicted in the past. In a way the different lines of evidence complement each other and provide deeper insights into different aspects of the basketry craft. The interpretation becomes more complex when indirect evidence for basketry is taken into account. This is the case of mat-impressed pottery, where basketry impressions have been 'deciphered' in order to extract data on the actual basketry object, which left its impression onto the pottery surface. In addition, a small group of vessel models were made to resemble basket's shape, and only in a few cases mimicking a woven surface by their decoration.

In semiotics, the objects, which look like baskets but are not actual baskets, even if they are made to resemble them in shape, size, or texture, would be classified as skeuomorphs. The phenomenon producing skeuomorphs is skeuomorphism: the manufacture of vessels of certain material that they resemble the appearance of other materials, e.g. pottery vessels mimicking stone or metal vessels by shape or decoration. The semiotic explanation given about skeuomorphs is that they are indexical signs physically representing their prototype and the skeuomorph refers to the prototype iconically (Knappett, 2004). Knappett (ibid.) illustrates this with an example from the Cretan LBA and particularly the mat-impressed pottery from Malia. He considered this pottery was shaped with moulds, which themselves were already impressed by actual baskets or mats. This relationship is quite complex but turned out to be causal, as the moulds were already modelled to resemble baskets to then create another object (pottery) which would again resemble a basket (ibid.).

It has to be mentioned that the mat-impressed pottery from Malia forms part of the later evidence of pottery impressions reviewed in this thesis. The earlier (Neolithic) examples were not created with the aid of moulds and instead the direct basketry object was intentionally impressed on the surface of the pot. The different aspects of the pottery production process in which both mats and baskets would be involved, are discussed in Chapter 4, but the pattern here is the direct contact between a basketry object and a non-basketry object. The linking element is the intention to create a non-basketry item, resembling basketry. Here the basketry object is presented beyond the already discussed direct functions it is capable of serving, such as containing and transporting. This new function could be described as aiding the creation of a non-basketry object, which looks like a basket.

Knappett (2004) explored further the complexity of the mat-impressed pottery from Malia and worked with the concept of affordances - an approach borrowed from the discipline of ecological psychology, where the affordances of a certain object consisted of the potentialities for a particular set of actions. He defined the affordances of things (both objects and artefacts) as linked both to the direct and indirect perception: their function could be read straight forward, but sometimes the possibilities for different functions could be explained indirectly, culturally, by association etc. For example, a basket may afford to contain (function perceived directly by its shape, size, and material), but it may be used as a mould to create any desired decorative patterns on pottery, a function perceived indirectly on the basis of a certain traditional, craft-related knowledge. Knappett (2004) also discussed the affordances of material objects in general: there are directly and indirectly perceived affordances. The first one was described as transparent (i.e. the object's function is guessed by its form, appearance, size etc.), while the second one is culturally affected (i.e. recognised in particular cultural contexts). In both cases the affordances of things are relational to the agents (with their meaning and constraints). These affordances of one particular object/artefact may also be shared and socialised where more than one person is involved. The agent is the link (mediator) between the affordances of certain objects and the objects themselves. This link is performed on the basis of the agent's knowledge gained by reflection and social acts (ibid.).

Another peculiar example for skeuomorphs are the basket-shaped vessel models, registered in Knossos (Fig. 5.2.j. and n.), Pseira (Gif. 5.2.k.), Nirou Khani (Fig. 5.2.l), Ag. Triada Villa (fig. 5.2.m), and Vourvatsi in Attica (Fig. 5.2.o.). All these vessels are of miniatures and some of them have perforated bases and may have served as rhyta. Only some of them mimic a basketry weave and create a visual impression for a woven texture, the ones from Nirou Chani, Ag. Triada and Vourvatsi. A common pattern shared between these three examples is their raised single or double handle, which may evoke an association with a real basket, which could be carried in hand or aided by a pole. This, along with their decorative 'weave' places them as more transparent skeuomorph of an actual basketry object. On the other hand, none of the transparent affordances of baskets could be performed by these vessels, mostly because of their physical restrictions, small in size and some with perforated bases (Fig. 5.2.j). The transformation into a rhyton of a basketry skeuomorph is even more controversial, because this could point towards its possible liquid content. In fact, the perforated base occurs upon the base of one of the three bag/sack-like shaped models: the twin models from Knossos. The other model, with similar shap, but with no perforated base is the one from Pseira. The example from Knossos is decorated with crocus flowers, while the one from Pseira with double axes. Here, none of the decoration motives may be interpreted as a transparent indicator for the content or function of these vessels. But all described aspects of these basket miniatures serve as an example for multi-layered affordances and the crossing between shared materiality of objects and complexity of social agency.

Harris (2014) has proposed an interesting concept in terms of the shared affordances of objects. She has extended the discussion on affordances and addressed it to textiles and textile-related crafts, and developed the Cloth-Culture concept, which accepts the idea that all societies use cloth-type material in a specific for them way. According to her, the cloth-type materials are flexible products which afford to clothe, cover or contain, without these being necessarily fibre products, but of animal origin as well (ibid.). Thus, the idea of cloth-culture includes the individual technologies and the raw material, employed in the production and usage of cloth-type material (ibid.). Grouped that way, the different types of cloth-type material share similar properties and according to this, basketry could be positioned as having the affordance of cloth (ibid.).

Harris (2014) used the affordance theory as a combination of substance, surface, shape and properties. If the cloth is having the affordance to cloth, cover and contain (to be folded, wrapped, shaped), then other fibre-based products like baskets are being brought together with products of animal origin (skins, intestines) for sharing this affordance (ibid). She questioned the type of basketry produced by the different techniques and whether basketry products have the affordance to cloth. Harris attributed the overlapping boundaries between textiles and basketry to the *versality* of the basketry products. They were described as versatile because they could be both two-dimensional and three-dimensional and could also offer the possibility to be used to cloth, and also to contain. She pointed at material such as birch bark, large leaves or reeds and rushes, which share the affordances of either cloth or cover, depending on their flexibility (ibid.).

Nevertheless, the versatility of basketry was seen differently by Ingold (2013), who has referred to the difficulty of our mind to accept basketry as cloth. He started from the determination of the act of making. When an artefact was being created, a "substance with surface" (ibid., pp. 55) had to be taken and, when force was applied a form was generated. Here the difference between making and growing was considered because a basket does not grow on its own. When Ingold discussed basketry, he rejected the word 'weaving' and adopted 'making' instead (ibid.). For making, a prior surface to be transformed was required, which was supposed to have an inner and outer part, but in the case of weaving "*it produced a peculiar kind of surface that does not, strictly speaking, have an inside and outside at all*" (ibid., pp. 55). With the application of human force (craftsman skills) this surface was transformed into a form, which does pre-exist only until a certain level in the mind of the basket-maker, but the actual form, generated after applying this force is a result of rhythmic repetition of skilled movement (ibid.).

In fact, the craftsmanship of the basket-makers as recorded ethnographically in this study (Chapter 3), including their skills, but mainly a very particular knowledge related to that skill, such as plant choice, processing and object-making, was a major pre-condition for the creation of a basketry item. If they were good *kosh* weavers, they were known for this and they were mainly making this type of basket. If they were specialising in covering large glass bottles (*damadjana*), they were making only this type of product for which they were sought after by their clients. There were also peculiar shapes and objects, such as the skeps (*kosher*, *tryvni*). Often, they required further treatment as, for example, mud-hay plastering for the beehives, and this type of craftsmanship was not guided only by the basket-maker's knowledge but also by the bee-keeper's. Similar would be the making of a fishing trap, which is indeed a type of basket but suited for fishing, where the item's weaving also involves knowledge on (river) fishing.

The view of a basketry item beyond its main dedicated functions, such as containing and transporting, as an object serving other proxy-activities (because a skep still contains bees and a fishing trap fish) is inevitable for objects of such a great everyday ubiquity. This everyday omnipresence serving multiple activities could perhaps be the reason for the depiction of basketry items in prehistory and their mimicking by impressing their weaves on pottery. The immediate availability of the plant resources required for basket-making could also have influenced the easy, time-effective making of these objects. However, the abundancy of basketry products into the household does not necessarily categorise them as low valued items. Indeed, some of them are difficult to be made due to their shape, their very large or very small size, or because of the particular plant species needed for their construction. In addition, basketry items (or specific basketry items) seem to have been involved into important activities, beyond the everyday ones, such as processions. Baskets seem to have also been involved into economically important activities, such as crocus gathering or the measuring of goods. All these unite the specific plant properties required for basket-making with the craftsmen knowledge and hence baskets may have acquired extra value, if they were made by particular basket-makers. Further, these objects took part into a diverse set of social activities, both performing their initially assigned affordances (to contain, transport etc.) and their special and unusual roles (such as containing specific goods). That way, basketry objects could be viewed as integral to past lifeways, where domestic and special contexts united.

5.4.2. Weaving plants to contain plants

Both ethnographically and archaeologically baskets seem to be associated with plants, more than other items. The basketry shapes and sizes were tailored according to their use and their expected content (Chapter 3). In a way, shape, size and content defined the usage of baskets. But there is one more physical aspect of the basketry products, which played a highly important role and governed their shapes, sizes, content and uses. These are the weaving techniques applied to the raw material, intended to be formed into a basket. The type of weave was specific to a particular shape and size of a basketry item. A woven item itself was meant to be utilised in containing, transporting or measuring different goods, according to its shape and size, and hence according to its weave, which defined its physical dimensions.

The weave itself was always restricted by the specifics of the raw material, i.e. the plants chosen for basket-making. For example, coiled or twilled items were predominantly made with monocotyledonous plants, such as grasses, sedges and rushes, while twined objects were mostly woven with woody material (Sections 3.4.2., 4.6.1.). However, each type of material required different harvesting, processing and weaving techniques. For instance, monocots were collected and woven green, while dicots were collected young (one or two-year old shoots) and green, but could have been stored for long periods and then further processed (soaked into water, boiled) prior to weaving. All these aspects of the raw material were rooted into the craftsmen' knowledge and hence strictly performed, according to the different prescriptions suited for the different plant material and the different basket weaves.

The particularities of activities, involving basketry items could be seen into the interrelation between particular goods (e.g. crocus' stigmas, rose petals, tobacco leaves, grapes) and particular types of baskets (Section 3.4.3.2.). This was also implemented into the technical aspects of the basket-making: e.g. baskets for grape collection recorded ethnographically had denser weave compared to the ones with airy appearance (i.e. widely spaced weave) and dedicated to rose petal collection. Wherever it was visible, widely spaced was the appearance of the weaves of the iconographically recorded panniers (Akrotiri, Ag. Triada, Gypsades), some of which were dedicated to the delicate saffron-gathering (Akrotiri). Several frescoes presented unidentifiable weaving technique but they partially showed some (fragments?) of the body weave of the depicted items. Examples for this are the depictions of the the libation scene on the *larnax* from Ag. Triada and on the murals from the Ag. Triada Villa, where only by the rim a widely spaced weave is distinguishable too. On the contrary, closely spaced and densely woven items were found archaeologically. In particular, the example ($035) from Akrotiri, woven in diagonal twill zembil, the content of which was barley grains (Section 4.6.1.).

To summarise, the craftsmen' knowledge on basketry weaves guided the choice of basketry plants and vice versa, while these two together defined the basketry shapes, sizes and use. The particular function of each basketry item was subject to the socially recognised affordances of this object, but also to a complex human agency (for example in the case of skeuomorphs). Some basketry products contained goods of higher economic value and/or accompanied gender-framed activities (for example rose petals or crocus collection), but all these were deciphered by the social perception and knowledge of basketry craft and its objects.

5.5. Conclusion

The reconstructed palaeohabitats in this chapter have proved suitable for providing the required plant resources for basketry, as identified ethnobotanically and archaeologically. On the other hand, these plant resources proved to be diverse and responding to the available ecological conditions. Accessibility to and availability of these resources strongly influenced the choices of the prehistoric basket-makers of South-east Europe. The same conditions also defined the choices of the contemporary basket-makers, whose specific choices and knowledge of specific plants, basketry shapes and sizes aided the interpretation of the prehistoric examples examined in this thesis. In both cases – prehistoric and contemporary – the craftsmen's knowledge and its immediate connection with the surrounding environment was identified and examined, outlining the determination of this knowledge from the environment itself. The versatility of basketry items allowed affording their major functions as containing and transporting, but also incorporating them into the iconography and even into multiple attempts to mimic them with other materials. The different social actors performing activities, involving basketry items, interpreted this versatility differently. This is why baskets found their place at both every day and special contexts, being integral in past lifeways. The versatility of basket-making also allowed the preservation of this craft until the present day. It also allowed its practitioners to keep, adapt and improve the existing knowledge, so it is still detectable even though as an endangered by disappearance craft.


a.


b.

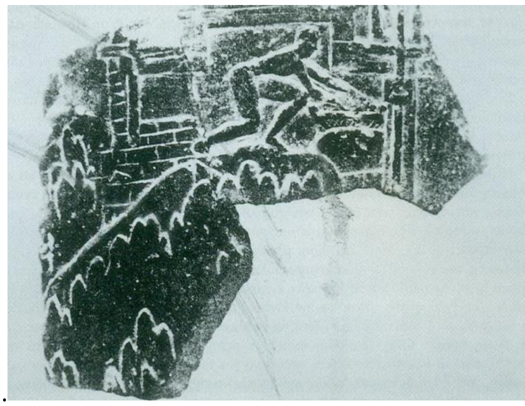

c.


d.


e.


f.


g.


h.


i.

j.  k.  l. 

m.  n.  o. 


p.

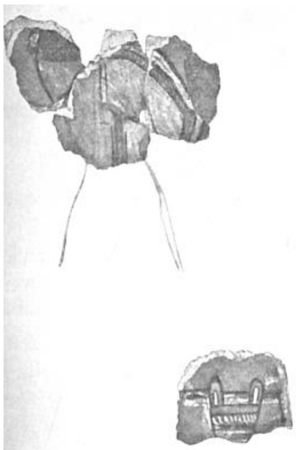
q. 

Figure 5.3. Depictions of basketry and ceramic basketry models: a. Detail from side A from the larnax from Ag. Triada (Sani, 2013); b. Detail from side C from the larnax from Ag. Triada (German, 2019); c. The Saffron-gatherers fresco from the Xeste 3 at Akrotiri (Doumas, 1992, Fig. 116); d. The Saffron-gatherers and the Goddess from Xeste 3 at Akrotiri (Doumas, 1992, Fig. 122); e. Detail of the Saffron-gatherers from Xeste 3 at Akrotiri (Doumas, 1992, Fig. 112); g. The priestess fresco from the West House of Akrotiri (Marinatos, 1984, Fig. 26); f.The Priestess fresco from the West House at Akrotiri (Marinatos, 1984, Fig. 26); g.Procession with offerings fresco from Pylos, as restored in the Archaeological Museum of Thebes; h. The libation scene from the stone vessel of the Peak sanctuary Gypsades on Crete (Beloyanni, 2003, Fig. 2); i. The Saffron Gatherer/The Blue Monkey fresco from the House of Frescoes in Knossos (Courtecy of the Archaeological Museum of Heraklion); j. Twin rhyta from the Cult Room Basement at Knossos (Rethemniotakis, 2005, p. 261); k. Basket model from Pseira (Buchholz and Karageorghis, 1973, Pl. 902); l. Basket model from Nirou Khani (Long, 1973, pl. 17); m. Basket model from Ag. Triada Villa (Burke 2005, Fig. 12); n. Polychrome vessel model with "double-ring handles" from Isopata at Knossos (Buchholz and Karageorghis, 1973, Pl. 939); o. "Bucket with bail handle" from Vourvatsi in Attica (Buchholz and Karageorghis, 1973, Pl. 940); p. Personage who carries (two?) baskets from Ag. Triada Villa (Nilson, 1956, Fig. 198A); q. Basket-carier from Ag. Triada Villa (Nilson, 1956, Fig. 198B). All Images have been enhanced and adjusted with the aid of Adobe Photoshop CS5.

CHAPTER VI. CONCLUSION

The aim of this thesis was to investigate a type of archaeological material, that of basketry, which although very abundant in the past, it is only rarely taken into account in archaeological studies. Employing a novel combination of approaches this study, focusing on prehistoric South-east Europe, managed to achieve significant results, answering the research questions set at the beginning of this research (Chapter 1). My study, in particular, has shown that prehistoric archaeological basketry in South-east Europe is visible and botanically identifiable, even if its preservation is often challenging. It can be assessed non-destructively in order to determine the optimal type of analysis for botanical identification whereas the indirect evidence for ancient basketry, the mat-impressions, can serve as a highly informative proxy on past basket-making practices (Chapter 4). Important information on still active basket-making technologies was obtained during the ethnographic work conducted in the context of this thesis (Chapter 3), which also served as a proxy for understanding archaeological basket-weaving. The combination of the two datasets (archaeological and ethnographic) led to several identifications in terms of basketry plants, while allowing important insights into the craft and lifeways of basket-makers and basket-users. Recording past and present basketry practices benefitted from each other and provided an in-depth view of several aspects of this ancient still existing, but endangered by disappearance, craft in South-east Europe.

6.1. Challenges and limitations of the research

Several inevitable challenges presented obstacles for the setting of this research. The most important one was the very low sample size provided for archaeobotanical analysis, despite the fact that the botanical remains of interest were preserved at a great scale. On the other hand, this problem proved to be the key to the development of a novel technique, integrating a state-of-the-art laboratory technology towards the botanical identification of these 'unidentifiable' samples. The non-botanical material, such as the mat-impressed pottery, was studied *in situ* with the exception of one site (Dana Bunar I), for which an exportation permit was issued. This limitation was overcome with the creation of dental wax casts, which were both easily transportable and exportable. The disadvantage of this was that the assessment method (such as the types of measurements of the original fragment) had to be conducted at the site without the possibility to return to some original pottery fragments when needed at a later stage because of the permits' expiry dates. Nevertheless, the admittedly very diverse strands of evidence were successfully combined and a multi-proxy approach to the basketry craft has been proposed in this thesis. Even if such a holistic approach may not be possible for each and every archaeological site that has yielded basketry remains, its importance is showcased by the findings and the achieved results of this thesis. In addition, the combination of different strands of evidence for ancient basketry and the proposed set of methodological approaches is applicable to other geographical regions and cultural periods beyond prehistoric South-east Europe, which opens the ground for the expansion of studies on basketry material.

6.2. "Impossible to identify"?

A multi-proxy approach to archaeological basketry was proposed in this study. The successful combination of established (anthracology, SEM imaging) and novel (CT scanning) methodologies led to absolute botanical identifications up to sub-family/family level but also in several cases up to species level. This was one of the major achievements of the botanical analysis as the samples selected for analysis presented a major challenge due to their minimal size. The implication of this is that the suggested approach has provided an excellent tool for the botanical identification of basketry even in cases that only a small part of the material is preserved or available for analysis. Mat-impressed pottery assemblages as indirect evidence for archaeological basketry were also studied. Botanical identifications were much more challenging for this material, but still this study managed to reach the family level and add a list of proposed species of each family (Chapter 4). The suggested identifications were verified with a combination of the use of contemporary *herbaria* material, comparisons with relevant literature, the ethnographic work conducted for the purposes of this thesis, and an approximate reconstruction of the plant resources available in each study area by employing archaeobotanical, anthracological and palynological data.

In order to obtain a better understanding of this challenging perishable material, an investigation in terms of basketry technology was also conducted (Chapter 2), which later served as a basis for the interpretation of the archaeological and ethnographic material. The ethnographic study, apart from aiding the process of narrowing down the botanical identifications obtained from the archaeological material, provided insights into baskets, basketry plants and basket-makers in the most recent past. During the primary fieldwork, the interviewed informants offered instructive information on technological (particular plant choices for particular basketry shapes; types of weaving techniques for types of baskets etc.) and botanical aspects of their craft (choice and seasonality of basketry plants) and also on socio-economic issues related to basket-making, applicable to both the past and nowadays (Chapter 3). The combination of archaeobotany, ethnography and archaeology proved to be a successfully integrated methodological approach for the assessment, identification and interpretation of basketry products. Iconographical evidence was also reviewed to explore the possible uses of the products of this craft, both in everyday activities and special contexts, as depicted visually (Chapter 5). Both proxies (environmental data and iconography) highlighted the link between the immediate natural environment and the basketry plants, along with the omnipresence of basketry products in different aspects of life in the past. A final discussion on the materiality of baskets aided interlacing the ethnographic with the archaeological research conducted in this thesis, via the link between the craftsmen' knowledge and their surrounding natural environment and the versatility of the products of the basketry craft.

6.3. Future research

The study conducted for the purposes of this thesis offers a fertile ground for future research, which could expand in several directions. The first, obvious, one is the collection of more botanical material from basketry, including that from various periods and contexts, where basketry remains may have been better preserved. In addition, the study area may be expanded towards neighboring regions, including the West Balkans and the East Mediterranean coast in order to allow comparisons with the already studied in this thesis material, and ensure the study of diverse cultural spheres of interaction. Another possibility is to expand on the study of indirect evidence for basketry, such as mat-impressed pottery, in order to explore and identify further weaving patterns and craft techniques as well as any association of perishable basketry products to pottery production. To do so, the measurements applied in this thesis could be refined (e.g. by including vessel reconstructions) and applied as a standard protocol to any sites/samples under examination. Finally, there is a great potential to expand the theoretical approach to basketry by examining the relation or dichotomy between fabric (textile) and basketry. The material culture of basketry could be also studied with the incorporation of approaches from other disciplines, such as linguistics, in order to gain a better understanding of the socio-cultural aspects of the craft.

REFERENCES

Adovasio, J. M. (1977*) Basketry Technology. A Guide to Identification and Analysis*. Chicago: Aldine Manuals on Archaeology.

Adovasio, J.M. and Illingworth, J. S. (2003) Basketry and Textile Impressions, pp. 252-257 in Elster, E. and Renfrew, C. (eds.), *Prehistoric Sitagroi: Excavations in Northeast Greece, 1968 – 1970, Volume 2: The Final Report*. Monumenta Archaeologica 20. Los Angeles: Cotsen Institute of Archaeology at UCLA.

Agar, M. (1996) *The professional stranger: an informal introduction to ethnography*. London: Academic Press.

Alarcón, T., Hern, R., Pearlstein, E. (2012) Case Studies in Basketry repair: two Abenaki splint baskets. *Journal of the American Institute of Conservation*, vol. 51 (2), pp. 123 – 143.

Albiz (2018) Website of "Kamyshit – Rakita OOD": https://3147-bg.all.biz [Accessed 10 May 2019]

Alexiou, S. (1959) Nea parastasi latreias epi Minoikou anaglyfou aggeiou. *Kritika hronika* 13: pp. 346 – 352.

Angelova, D. (2007) 'Dolnoto pole' I ovcharite Balkandjii In: Goev A. (Ed.) Narodna Kultura na Balkandjiite, Vol. 7, pp. 111-117. Gabrovo: Faber

Asouti, E. and Austin, P. (2005) Reconstructing Woodland Vegetation and its Exploitation by Past Societies, based on the Analysis and Interpretation of Archaeological Wood Charcoal Macro-remains. *Environmental Archaeology* 10, pp. 1-18.

Asouti, E. (2003) Wood charcoal from Santorini (Thera): new evidence for climate, vegetation and timber Imports in the Aegean Bronze Age. *Antiquity* 77: pp. 471-484.

Asouti, E., Ntinou, M. and Kabukcu, C. (2018) The impact of environmental change on Palaeolithic and Mesolithic plant use and the transition to agriculture at Franchthi Cave, Greece*. PLoS One*, [online] 13(11): pp. 1

Assyov, B., Petrova, A., Dimitrov, D., Vasilev, R. (2006) *Conspectus of the Bulgarian Vascular Flora. Distribution Maps and Floristic Elements*. Sofia: Bulgarian Biodiversity Foundation

Babcock Gove, P. (1971) *Webster's Third New International Dictionary of the English Language.* Massachusetts: Springfield and Merriam Co.

Badarau, A. (2006) *Chrysopogon gryllus.* Available at: http://www.floraofromania.transsilvanica.net/flora%20of%20romania/ac%20X%20sabin/Copy%20(18)%20of%20species.htm

Bakalakis, A. and Sakellariou, G. (1981) *Paradimi.* Mainz: Heildelberg Akademie der Wissenschaften

Barende, R. (2019) *Sorghum halepense*. Available at: http://www.freenatureimages.eu/Plants/Flora%20S-Z/Sorghum%20halepense/index.html#Sorghum%2520halepense%25203%252C%2520Saxifraga-Rutger%2520Barendse.JPG [Accessed 10 May 2019]

Beloyanni M. (2008) I kalathopletkiki kai i psathoplektiki tehni sthn oikonomia tou Akrotiriou, *Akrtotiri – Thiras: Trianta hronia ereunas 1967 – 1997 (Epistimoniki Synantisi 19 – 20 Dekemvriou 1997)*: pp. 199 – 214.

Beloyanni, M. (2007) Basketry: A Diachronic Art and Its Products at Prehistoric Akrotiri, *ΑΛΣ*, 5, Athens: Kathimerini: pp. 46 – 88.

Beloyanni M. (2003a), Klalathia apo to Sykgrotima D tou LC Oikismou sto Akrotiri Theras, *Arhaiologiki Efimeris*, 140: pp. 217 – 231.

Beloyanni, M. (2003b) I kalathoplektiki kai ta proionta tis stin proistoriki Ellada. *Althellenische Technologie und Technik, 21-23.03.2003.* Weilheim: Vorein zur Förderung der Aufarbeitung der Hellenischen Geschichte, p. 429 –451.

Beloyanni, M. (1996) *Kalathoplektiki kai Psathoplektiki stin Proistoriki Ellada*. PhD Thesis. National Kapodistrian University of Athens

Beloyanni, M. (1993) *Apotypomata plegmatos*. In: Sampson, A. (Ed.) *Skoteini Tharrounion. To spilaio, o oikismos kai to nekrotafeio*, pp. 360-369. Athens: En Athinais Arhaiologiki Etairia.

Beloyanni, M. (1989) Apotypomata plegmatos se Proistoriki keramiki ths Tsougkizas. *Arhaiologika Analekta ex Athinon*. Athens: Arhaiologikon Poron

Betancourt, P., Berkowitz, L. and Zaslow. R. (1990) Evidence for Minoan basket from Kommos, Crete. *Cretan Studies 2*: pp. 73-77.

Bichard, M. (2008) *Baskets in Europe*. Oxon: Fyfield Wick

Bineva, R. (2012) Ot umenieto kym tvorchestwoto. Za Julieta Georgieva I nejnite izdelija ot bèlenitsa, in In Goev, Angel, (Ed.) *Narodnite zanajati: minalo, nastojashte i bydeshte.*, pp. 221–234, Gabrovo: Faber

Bird, M., Ascough, P., Ascough, L., young, I., Wood, C., Scott, A. (2008) X-ray microtomographic imaging of charcoal. *Journal of Srchaologicval Science* 35, pp. 2698-2706.

Blagoeva, Sn. (1974) Zanayati. In Todorov, D. (Ed.) *Dobrudja. Ethnografski, folklorni i iezikovi prouchvaniya*. Sofia: Bulgarska Academia na Naukite, pp. 83 – 120.

Blegen, W. C. (1928) *Zygouries: a prehistoric settlement in the valley of Cleonae*. Cambridge, Massachusets: Harvard University Press.

Bojadjiev, R. (1983) Pchelarstwo i bubarstwo, in Georgiev, G., Primovski, A., Georgieva, B., Mihajlova, G., Radeva, L., Veleva, M. (Eds) *Ethnographia na Bulgaria, vol. II*. Sofia: Izdatelstvo na BAN, pp. 53 – 59.

Bondev, Iv. (2002) Geobotanichesko rajonirane, in Kopralev, I. et al. (Eds) *Geografia na Bulgaria, Fizicheska I socialno-ikonomicheska Geografiya*, pp. 336-351, Sofia: ForKom.

Borojevic, T. and Mountain, R. (2014) Microscopic Identification and Sourcing of Ancient Egyprian Plant Fibers Using Longitudinal This Sectioning. *Archaeometry* 55: pp. 81-112.

Bosanquet, R. C. (1896 – 1897) Notes from the Cyclades III, *The Annual of the British School at Athens*, Vol 3, pp. 52-70.

Bottema - Mac Gillavry, J.N. (2019) Chapter 11. The carbon remains. In: Mac Gillavry, J.A. and Sackett, L.H. (Eds.). *Palaikastro Building 1*. Supplementary volume 48

Bottema-MacGillivray, J.N. (2005) Wood of the West House, Akrotiri, Santorini (Greece). *Palaeohistoria 45*/46: pp. 95-120.

Bottema, S. and Sarpaki, A. (2003) Environmental change in Crete: a 9000-year record of Holocene vegetation history and the effect of the Santorini eruption. *Holocene* 13: pp. 733-749.

Bottema, S. (1994) The prehistoric environment of Greece: a review of the palynological record. In: Kardoulias, N. (Ed.) *Beyond the Site: regional Studies in the Aegean*: pp. 45-68. London: University Press of America.

Brinkemper, O. and Heijden, E. (1999) Appendix A. Fibre Identification Criteria, pp. 429 – 440 in Wendrich, W. (author), *The World According to Basketry. An Ethno – Archaeological Interpretation of Basketry Production in Egypt*. Los Angeles: Cotsen Institute of Archaeology at UCLA.

Brinkkemper, O. and Joosten, I. (2012) The Identification of plant fibres from the shipwreck Aanloop Molengat. Interne Rapportage project Aanloop Molengat [online]. Available at: https://www.researchgate.net/publication/303524017_The_identification_of_plant_fibres_from_shipwreck_Aanloop_Molengat [Accessed 25 June 2019].

Brown, T., Jones, G, Wardle, K. (2018) *New ways with old wheats: the science in detail*. [Online]. Available at: https://www.sheffield.ac.uk/archaeology/research/wheat/wheat2. [Accessed 22 November 2018].

Buchholz, H.-G. and Karageorghis, V. (1973) *Prehistoric Greece and Cyprus*. New York: Phaedon

Bulcke, J., Boone, M., Acker, J., Stevens, M and Hoorebeke, L. (2009) X-ray tomography as a tool for detailed anatomical analysis. *Annals of Forest Science* Vol. 55. Issue 5, pp. 66-508.

Burke, B. (2005) Materialization of the Mycenaean Ideology and the Ayia Triada Sarcophagus *American Journal of Archaeology* 109.3: pp. 403-422.

Butcher, M. (1986) *Willow Work.* London: Dryad.

Cañellas – Boltà, N., Riera-Mora, S., Orengo, H., Livarda, A. and Knappett, C. (2018) Human management and landscape changes in Palaikastro (Eastern Crete) from the Late Neolithic to the Early Minoan period. *Quaternary Science Reviews* 183: pp. 59-75.

Caskey, J. L and E. G. Caskey (1960) The Earliest Settlements at Eutresis. Supplementary Excavations, 1958, *Hesperia*, Vol. 29, No. 2 (Apr. - Jun., 1960), 126-167.

Cherry, F. and Davis, J. L. (2007) The other finds, pp. 401 – 465 in Renfrew, C., Brodie, N., Morris, Ch. and Scarre, Ch. (eds.), *Excavations at Phylakopi in Melos 1974 – 77*. Supplementary Volume No. 42, Witney: The British School at Athens.

Clark, J. G. D. (1952) Plaiting, nets, baskets and mats, pp. 226 – 231 in Clark, J. G. D. (ed.) *Prehistoric Europe. The Economic Basis*, London: Methuen & Co. Ltd.

Clayton et al., (2018) Grass base [online] Available at: http://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:320346-2 [Accessed 10 December 2018]

Connor, S., Ross, S., Sobotkova, A., Harries, A., Mooney, S., Longford, C. and Iliev, I. (2013) Environmental conditions in the SE Balkans since the Last Glacial Maximum and their influence on the spread of agriculture into Europe. *Quaternary Science Review* 68: pp. 200 – 215.

Coleman, J. E. (1977), *Keos I. Kephala: A Late Neolithic Settlement and Cemetery*. Princeton: American School of Classical Studies.

Crawford, M. (1993) *Plants for Basketry.* Torquay: Agroforestry Research Trust

Crowfoot, G. M. (1938) Mat impressions on Pot Bases. *Annals of Archaeology and Anthropology of the University of Liverpool 25*: pp. 3 – 11.

Crowfoot, G. M. (1954) Textiles, basketry and mats. In Singer, C., Holmyard, E. and Hall, A. (Eds.), *History of Technology I*, pp. 413 – 447. Oxford: The Clarendon Press.

Cuttler, D., (1969) *Anatomy of the Monocotyledons. IV. Juncales*. Oxford: Clarendon Press.

Davidson, A. and Brown, G. (2012) Paraloid B-72: *Practical Tips for the Vertebrate Fossil Preparator. Collection Forum, Vol. 26 (1-2)*, 99-112.

Davis, R. and Holmgren, P. (2000) Europe, In: *Global Ecological Zoning for the Global Forest Resources Assessment. The Forest Resources Assessment Programme. Final Report*. [online] Available at: ftp://ftp.fao.org/docrep/fao/006/ad652e/ad652e00.pdf [Accessed 10 November 2016].

Day, J. (2011) Crocuses in Contexts: A Diachronic Survey of the Crocus Motif in the Aegean Bronze Age, *Hesperia* 80.3: pp. 337 – 379.

Deforce, K. (2014) Houtidenticatie van een Romeinse vlechtwerkmand uit Dudzele (Brugge, prov. West-Vlaanderen), *Rapporten Naturwetenschappelijk Onderzoek OE*, 17 March 2014.

Demoule, J. P. (2004) Les recipients en ceramique du Neolithique Recent (Chalcolithique): description, evolution et context regional, pp. 63 - 270 in Treuil, R, Pellerin, C. C., Courtois, L., Demoule, J. P., Marangou, Ch., Tsirtsoni, Z. (eds.) *Diliki Tash. Village Prehistorique de Macedoine Orientale. Fouilles de Jean Deshayes (1961 – 1975)*. Volume 2 II, Bulletin de Correspondance Hellenique Supplement 37. Athenes: Ecole Francais d'Athene.

Dencheva, R. (2012) Svrazvashti elementi ot rastitelen proizhod. In: Goev, A. (Ed.*) Narodnite Zanayati. Minalo, nastoyashte i budeshte*. Vol. VII: pp. 214-221. Gabrovo: Faber

Di Lernia, S., N'siala, I., Mercuri, A. (2012) Saharan prehistoric basketry. Archaeological and archaeobotanical analysis of the early-middle Holocene assemblage from Takarkori 9Acacus Mts, SW Libya), *Journal of Archaeological Science* 39: pp. 1837-1853

Digital Cultural and Historical Heritage of Plovdiv Municipality (2018): http://digital.plovdiv.bg/EN/Pages/default.aspx [Accessed on 3 November 2017]

Dogan, Y., Nedelcheva, A., Petkovic, D., Padure, I. (2008) Plants used in Traditional Handicrafts in Several Balkan Countries. *Indian Journal of Traditional Knowledge* 7.1: pp. 157-161

Dörrbecker, M. (2007). *Map of Akrotiri,* Available at: https://upload.wikimedia.org/wikipedia/commons/6/6f/Map_Akrotiri_1600_BC-de.png [Accessed 10 May 2019]

Doumas, Ch. (2017) Personal Communication.

Doumas, Ch. (1992) *The Wall-Paintings of Thera*. Athens: The Theran Foundation

Doumas, C. (1977) Early Bronze Age Burial Habits in the Cyclades, *SIMA 48*, 134 – 144. Goteborg

Douskos, I. (1980) The Crocuses of Santorini. In: Doumas, C. (Ed.) *Thera and the Aegean World II. Papers presented at the Second International Scientific Congress, Santorini, Greece, August 1978,* pp. 141 – 146. London: Thera and the Aegean World

Dousougli, A. (1987) Makrovouni – Kefalari Magoula – Talioti. Bemerkungen zu den STufen FH I und II in der Argolis. *Praehistorische Zeitschrift*, 62, no. 2 (1987), 164-220

Duemmler, F. (1896) Mittheilungen von den griechischen Inseln. MITTEILUNGEN *des Deutschen Archäologischen Instituts* 11, pp. 15 – 46.

Edgar, C. (1904) Chapter IV: The Pottery, pp. 80 – 176 in Atckinson, T.D., Bosanquet, R. C., Edgar, C. C., Evans, A. J., Hogarth, D. G, Mackenzie, D., Smith, C. and Welch, F. B. (eds.), *Excavations at Phylakopi in Melos conducted by the British School at Athens*, Supplementary Paper No. 4, London: MacMillan and Co., Limited.

Elster, E. and Renfrew, C. (2003) Preface: Overview and Acknowledgements, pp. xxv-xxxvi in Elster, E. and Renfrew, C. (eds.), *Prehistoric Sitagroi: Excavations in Northeast Greece, 1968 – 1970, Volume 2: The Final Report*. Monumenta Archaeologica 20. Los Angeles: Cotsen Institute of Archaeology at UCLA.

Emery, I. (1980) The Primary Structure of Fabrics: an Illustrated Classification. Washington DC: Textile Museum

Ertug, F. (2006) An overview of the Plaited crafts of Turkey (Anatolia and Thrace). In: Ertug, F. (Ed.) *Proceedings of the Fourth International Congress of Ethnobotany (ICEB 2005)*, pp. 297-306. Istanbul: Yayinlari

Ertug, F. (1999), Plants used in domestic handicrafts in central Turkey, *Ot Sistematik Botanik Dergisi*, 6 (2), 57 – 68.

Ertug, F. (1997) *An Ethnobotanical Study of Subsistence and Plant Gathering in Central Anatolia.* PhD Thesis. Washington University

Euro+Med (2006-) Euro+med Plant Base – the information resource for Euro-mediterranean plant diversity. Published on the Internet: http://ww2.bgbm.org/EuroPlusMed/ [Accessed 10th June 2019].

Evans, J. D. and Renfrew, C. (1968) Mat impressions, pp. 71 – 72 in Evans, J. D. and Renfrew, C. (eds.), *Excavations at Saliagos near Antiparos*. Supplementary Volume V, The British School at Athens. London: Thames and Hudson.

Evely, D. (2000) *Mnoan Crafts: Tools and Techniques. An Introduction*. Studies in Mediterranean Archaeology, vol. XCII, Jonsered: Paul Aströms Förlag.

Evert, R. (2006) *Esau's Plant Anatomy. Meristems, Cells and Tissues of the Plant Body – Their Structure, Function and Development*, New Jersey: John Wiley & Sons Inc.

Evjen-Tsavela, Ch. (1984) *Lithares*. Athens: Arhaiologikon Poron.

Fabian, M. (1920/1) *Album s obrazci ot naj-moderni koshnicharski izdelija*. Pleven: Kooperativna pechatnica "Izgrev".

Feenona, F. (2019) *Juncus subulatus*. Available at: https://www.flickr.com/photos/elmores/265439416 [Accessed 10 May 2019]

Forsdyke, E. J. (1925) Catalogue of the Greek and Etruscian Vases in the British Museum: Prehistoric Aegean Pottery, London: Trustees of the British Museum; online: http://dfg-viewer.de/show/?tx_dlf%5Bpage%5D=103&tx_dlf%5Bid%5D=http%3A%2F%2Fdigi.ub.uni-heidelberg.de%2Fdiglit%2Fbm_vases1925bd1_1%2Fmets&tx_dlf%5Bdouble%5D=0&cHash=98cb08bcf8196209860aedae81cd58b6 [Accessed 10 May 2019]

Frodin, O. and A. Persson (1938) *Asine. Results of the Swedish Excavations 1922 – 1930*. Stockholm: Generalstabens Litografiska Anstalts Furlag.

Furness, A. (1956) Some early pottery of Samos, Kalimnos and Chios, Proceedings of the *Prehistoric Society* 22, 173-212.

Galais, A., López-Sáez, J., Lespez, L. and Davidson, R. (2016) Climate and human0encironmnet relationships on the edge of the Tenaghi-Philippon marsh (Northern Greece) during the Neolithization. *Quaternary International* 403: pp. 237-250.

Garbiel, S. and Goymer, S. (1991) *The Complete Book of Basketry Techniques*. London: David and Charles.

Gärtner, H. and Schweingruber, F. H (2013) *Microscopic Preparation techniques for plant stem analysis.* Remagen – Oberwinter: Verlag Kessel.

Georgakas, D. and Kazazis, J. (2005) *A Modern Greek-English Dictionary.* Thessaloniki: Centre for the Greek Language

Georgiev, G., Primovski, A., Georgieva, B., Mihajlova, G., Radeva, L., Veleva, M. (1983) *Ethnographia na Bulgaria, vol. II*. Sofia: Izdatelstvo na BAN.

Georgiev, M. (1979) *Fizicheska geografija na Bulgaria*, Sofia: Nauka i izkustwo.

Georgiev, Vl., Zaimov, J., Ilchev, St., Chalakov, M., Ivanov, J., Mihaylova, D., Anastasov, V., Dukova, U., Racheva, M., Todorov, T. (1979) *Bulgarski Etymologichen Rechnik, vol. II*. Edited by V. Georgiev. Sofia: Izdatelstvo na BAN.

Georgieva, B. (1983) 'Tipove zhilishta', in Georgiev, G., Primovski, A., Georgieva, B., Mihajlova, G., Radeva, L., Veleva, M. (ed.) *Ethnoigraphia na Bulgaria, vol. 2*. Sofia: Izdatelstvo na BAN, pp. 193 – 210.

Georgieva, B. (1983) 'Dvor I stopanski postrojki', in Georgiev, G., Primovski, A., Georgieva, B., Mihajlova, G., Radeva, L., Veleva, M. (ed.) *Ethnographia na Bulgaria, vol. II*. Sofia: Izdatelstvo na BAN, pp. 188 – 193.

Gerasimidis, A. and Athanasiadis N. (1995) Woodland history of Northern Greece from the mid Holocene to recent time based on evidence from the peat pollen profiles. *Vegetation History and Archaeobotany* 4,2: pp. 109-116.

German, S. (2019) *Hagia Triada sarcophagus (detail).* Available at: https://smarthistory.org/hagia-triada-sarcophagus/ [Accessed 10 May 2019]

Gimbutas, M, Sh. Winn and D. Shimabuku (1989) *Achilleion. A Neolithic Settlement in Thessaly, Greece, 6400 – 5600 BC*. Monumenta Archaeogica 14. Los Angeles: UCLA Intitute of Archaeology.

Gimbutas, M. (1976) Chronology. pp. 29 – 77 in Gimbutas, M., Winn, Sh., Shimbaku, D. (eds.). *Achilleion. A Neolithic Settlement in Thessaly, Greece, 6400 – 5600 BC*. Monumenta Archaeogica 14. Los Angeles: UCLA Intitute of Archaeology.

Goddard, P. (2010) *Mollinia caerulea*. Available at: https://www.flickr.com/photos/philip_goddard/39924583261 [Accessed 10 May 2019]

Goldman, H. (1931) *Excavations in Eutresis in Beotia*. Cambridge, Massachusetts: Harvard University Press.

Grammenos, D. (1991) *Neolithikes ereunes sthn kentriki kai Anatoliki Makedoneia*. Athens: Bibliothiki ths en Athinais Arhaiologikis Etairieas.

Gropengiesser, H. (1987) Sipnos, Kap Agios Sostis. Keramische Prähistorische Zeugnisse aus dem Gruben – und Hüttenreviuer II, *Mittleilungen des Deutschen Archäologische Instituts. Atheinische Abteilung*, 101, 1-54

Haneca, K., Deforce, K., Boone, M., Denis, V. (2012) X-ray sub-micron tomography as a tool for the study of archaeological wood preserved through the corrosion of metal objects. *Archaeometry* 54, pp. 893-905.

Hammersley, M. and Atkinson, P. (2007) *Ethnography: principles in practice*. London: Routledge

Hansen, J. (1991) The Palaeobotany of Franchthi cave. Excavations at Franchthi Cave, Greece, Fascicle 7. Bloomington: Indiana University press.

Harper, B., L. (1989) *Phragmites communis*, *LBJWC, Id: 78:* https://www.wildflower.org/gallery/result.php?id_image=78 [Accessed 10 May 2019]

Harris, S. (2014) Cloth culture in the Middle Neolithic of northern Italy with special reference to basketry (c.4900-4250 BC), In: Pearce, M. and Whitehouse, R. D. (Eds) *Rethinking the Italian Neolithic. Series: Accordia Research Papers, 13 (13)*. London: Accordia Research Institute, University of London, pp. 103–130

Harvey, V. (1975) *The Techniques of Basketry*. London: Batsford

Hather, J. (2000) *Archaeological Paraenchyma*. London: Archetype

Heidenreich, R. (1935-1936) Vorgeschichtliches in der Stadt Samos: Die Funde, *Mitteilungen des Deutschen Archäologischen Instituts* 60-61, pp. 125-183.

Hellstrom, P. (1987) Small Finds, pp. 83 – 87 in P. Hellstrom (ed.). *Paradeisos. A Late Neolithic Settlement in Aegean Thrace.* Medelhavsuseet, Memoir 7. Stockholm

Hoadley, R. B. (1980) *Understanding Wood. A craftsman's guide to wood technology.*Newtown: The Taunton Press191 - 202

Holmberg, E. J. (1944) *The Swedish Excavations at Asea in Arcadia*, Lund.

Hood, S. (1981) *Excavations in Chios 1938 – 1955. Prehistoric Emporio and Ayio Gala, Vol. I*, Supplementary Volume 15. London: The British School at Athens.

Hristov, Hr., Kosev, Todorov, N., Vasilev, V., Angelov, D., Bojinov, V., Ganev, Hr., Dimitrov, I., Isusov, M., palayotov, L., Sharova, Kr., Grancharov, St., Statelova, E. (Eds.) (1991). *Istoria na Bulgaria, Vol. 7, Vyzstanivyavane I utvurshdavane na Bugarskata dyrjava. Natsionalnoosvoboditelni Borbi (1878 – 1903)*, Sofia: Bulgarska Academia na Naukite.

Hughes, St. (2011) Chapter 4. CT scanning in Archaeology. In: Saba, L. (Ed.) *Computed Tomography. Special Applications*, pp. 57 – 70. Rijeka: InTech.

HURCOMBE, L. (2008) ORGANICS FROM INORGANICS: USING EXPERIMENTAL ARCHAEOLOGY AS A RESEARCH TOOL FOR STUDYING PERISHABLE MATERIAL CULTURE. WORLD ARCHAEOLOGY *40: PP. 83-115.*

Ilieva, V. (2012) 'Za njakoi redki domashni zanyatiya svyrzani s pletene', in Goev, A. (ed.) *Narodnite zanajati: minalo, nastojashte i bydeshte, vol. VII.* Gabrovo: Faber, pp. 151 – 158.

Immerwahr, S. (1990) *The Aegean Painting in the Bronze Age*. Pennsylvania: The Pennsylvania State University

Ingold, T. (2013) *Making: anthropology, archaeology, art and architecture*. Oxon: Routledge

Jacobsen 1973: EXCAVATIONS IN THE FRANCHTHI CAVE, 1969— 1971, PART II, HESPERIA 42, 253 –283.

Jahns, S. (1993) On the Holocene vegetation history of the Argive Plain (Peloponnese, southern Greece). *Vegetation History and Archaeobotany* 2: pp. 187-203.

Jalas, J., Suominen, J., Lampinen, R. Kurtto, A. (19990 *Distribution of Vascular plants in Europe.* The Committee for Mapping the Flora of Europe and Societas Biologica Fennica Vanamo. [online] Available at: http://www1.biologie.uni-hamburg.de/b-online//ibc99/IDB/afe.html [Accessed 16 September 2018]

Johnson, J. (19870 Decorated Pottery, pp. 55 – 76 in Hellstrom, P. (ed.). *Paradeisos. A Late Neolithic Settlement in Aegean Thrace*. Medelhavsuseet, Memoir 7. Stockholm.

Johnson, K. (1986), *Canework*. London: Dryad.

Kanitz, F. (1882) Donau-Bulgarien und der Balkan. Historisch-Geographisch-Ethnographische

Reisestudien aud den Jahren 1860 – 1879. I. Band und II. Band, Leiptzig: Bebhardt and Wilisch

Karastoyanov, D. (1882) *Momiche s Gornobanski kostium*. Archive of the History Museum Museum of Kazanlak

Katsarou, S. (2016) Personal communication.

Katsev, D. (2017a) *The village of Bania (1960s)*, Regional Ethnographic Museum of Plovdiv

Katsev, D. (2017b) *The village of Sushica (1960s)*, Regional Ethnographic Museum of Plovdiv

Katsev, D. (2017c) *Karlovo district (1960s)*, Regional Ethnographic Museum of Plovdiv

Kanitz, F. (1882) *La Bulgarie danubienne et le Balkan: études de voyage (1860-1880)*. Paris: Hachette.

Kers, B. (2006) *Schoenus nigricans*. Available at: https://www.flickr.com/photos/21933510@N07/3222732864 [Accessed 10 May 2019]

Knappett, C. (2004) 'The Affordances of Things: a Post-Gibsonian Perspective on the Relationality of Mind and Matter', in DeMarrais, Elizabeth, Gosden, chris, renfrew, C. (ed.) *Rethinking Materiality*. Exeter: McDonald Institute for Archaeological research, pp. 43–52

Knappett, C. (2010) '8. The Neglected Networks of Material Agency: Artefacts, Pictures and Texts', in Knappet, Carl and Malafouris, L. (ed.) *Material Agency. Towards a Non-Anthropocentric Approach*. New York: Springer, pp. 139–156.

Knappett, C. and Cunningham, T. (2012) Palaikastro Block M. The Proto- and Neopalatial Town. BSA, Supplementary Volume 47, London: The British School of Athens.

Kondoleon, N. (1949) Anaskafi en Naxo. *Praktika tis en Athinais Arhaiologikis Efimeris* 104, pp. 112-122.

Kosmopoulos, L. W. (1948) *The Prehistoric Inhabitation of Corinth*. Münich: Münchner Verlag.

Kotthoff, U., Müller, U., Pross, J., Schmiedl, G., Lawson, I., Schootbrugge, B. and Schultz, H. (2008) Lateglacial and Holocene vegetation dynamics in the Aeegean region: an integrated view based on pollen data from marine and terrestrial archives. *The Holocene* 18,7: pp. 1019-1032.

Koukouli – Chrysantaki, H., Todorova, H., Aslanis, I., Vajsov, I, Valla, M. (2007) Promachon – Topolnitsa. A Greek – Bulgarian Archaeological Project, pp. 43 – 78 in Todorova, H., Stefanovich, M., Ivanov, G. (eds.), *Struma/Strymon River Valley in Prehistory. Proceedings of the International Symposium Strymon Praehistoricus (27. 09 – 01. 10. 2004)*. Bulged: Sofia.

Koukouli- Chrysantaki, H. (2018) Personal Communication.

Kulowa, M. (2008) Rannoneolitnata kultura w dolinata na Sredna Struma, Yougozapadna Bulgaria, In: Giurova, M. (Ed.) *Praistoricheskite prouchvania v Bulgaria: novite predizvikatelstwa. Dokladi ot konferenciata po praistoria peshtera 26-29.04.2006*. pp. 56-65. Sofia: NAIM.

Kunz, E. (1934) Orchomenos III. Die Keramik der Fruhen Bronzeit. Munchen: Verlag der Bayerschen Akademie des Wessenshaften.

Lambert, N. (1981) *La grotte préhistorique de Kitsos (Attique): missions 1968-1978:l'occupation néolithique: les vestiges the temps paléolithiques, de l'antiquité et de histoire récente*. Athens: Ecole Française d'Athènes.

Lang, M. (1969) *The Palace of Nestor in Western Mesinia. The Frescos. (Pylos II),* Princeton: Princeton University Press

Lazarova, M., Marinova, E., Tonkov, S. and Snowball, I. (2015) A 5000-year pollen and plant macrofossil record from the Osogovo Moutnain, Southewestern Bulgaria: Vegetation history and human impact. *Review of Palaeobotany and Palynology* 223: pp. 1-9.

Lechman, J. (1907) *Systematik und geographische Verbreitung der Geflechtsarten*. Dresden: Abhandlungen und Berichte des Könglich Zoologischen und Anthropoologisch-Ethnographischen Museums zu Dresden, Band XI, nr. 3.

Legg, E. (1960), *Country Baskets*. London: Mills and Boon.

Leontidis, T. (1986) *Kritika Kalathia. Morfologiki kai kataskeuastiki meleti*. Heraklion: Voroi

Leshtakov, K., Machev, Ph, Popova, Tz, Vangelov, D., Vangelova, V., Stoilova, T., Petrova, V., Ilieva, D., Nikolova, N., Chavdarova, S., Andonova, M., Vasileva, Hr., Hristova, H., Zhelyazkov, Zh., Dimitrov, D. and Blagoeva, N. (2018) Social dimensions of ceramic production technology in South-east Bulgaria during 6th – 2nd mill. BC. Unpublished interim scientific report. Sofia: Sofia University.

Lespez, L., Dalongeville, R., Pastre, J.-F., Darmon, F., Mathieu, R., Poursoulis, G. (2003) Late-Middle-Holocene palaeo-environmental evolution and coastline changes of Malia (Crete). *The Mediterranean World: Environment and History*, 2003, Paris, France: pp. 439-452.

Lilova, I. (2011) 'Koshnicharstvoto – samobitno zatjatie na balkadjiite', in Goev, A. (ed.) *Narodnite zanajati: minalo, nastojashte i bydeshte, vol VI*. Gabrovo: Faber, pp. 88 – 93.

Livarda, A. (2019) Personal communication.

Long, Ch. (1974) The Ayia Triadha Sarcophagus: A Study of Late Minoan and Mycenaean Funerary Practices and Beliefs *SIMA* 41, Göteborg: Åströms.

Mac Gillavray, J. (2019) The carbon remains. In: Mac Gillivray, J. A. and Sackett, L., H. (Eds.) *Palaikastro Building 1*, pp. 411-424. London: The British School at Athens

Mac Gillivray, J., Sarpaki, A., Olivier, J-P., Weingarten, J., Sackett, L., Driessen, J., Bridges, R, Smyth, D. (1989) Excavations at Palaikastro, 1988, *The Annual of the British school at Athens*, Vol. 84: pp. 217-445.

Malamidou, D. (2018) Personal communication

Malamidou, D., Ntinou, M., Valamoti, S.-M., Tsirtsoni, Z., Koukouli-Chrysanthaki, h., Darque, P. (2017) An Investigation of Neolithic Settlement Pattern and Plant Exploitation at Dikili Tash: Reconsidering Old and New Data from the late 5th Millennium BC Settlement, In: Sarris, A., Kalogiropoulou, E., Kalayci, T., Karimali, L. (Eds.) *Communities, landscape and Interaction in Neolithic Greece. Proceedings of the International Conference, Rethymno 29-30 May, 2015*, pp.60-80. Michigan: Ann Arbor.

Mangafa, M. (1993) Arhaiovotaniki meleti tou spilaiou Skoteinis sta Tharrounia Euboias. In: Sampson, A. (Ed.) *Skoteini Tharrounion. To spilaio, o oikismos kai to nekrotafeio*, pp. 360-369. Athens: En Athinais Arhaiologiki Etairia.

Mansbridge, Ch. (2015) CT scan interpretation: http://www.oscestop.com/CT%20interpretation.pdf [Accessed 10 May 2017]

Manuilova, M. (2018) http://www.bebe.bg/semeistvo/shopi.htm [Accessed 20 April 2018]

Marcus, J., A. (2007) *Cladium mariscus*, *LBJWC, Id: 19547,* Available at: https://www.wildflower.org/gallery/result.php?id_image=19547 [Accessed 10 May 2019]

Marinatos, N. (1984) Art and Religion in Thera: reconstructing a Bronze Age Society. Athens: Mathiulakis.

Marinatos, N. (1993*) Minoan Religion. Ritual, Image and Symbol*. Columbia: University of South Carolina Press.

Marinov, V. (1962) Nabliudenija vyrhu bita na cigani v Bulgaria, *Izvestija na Ethnografskija Institut s Musej, vol. V,* Bulgarska Academia na Naukite, pp. 227 – 264.

Marinova, E. (2008a) Jama 4: arheobotanichni izsledvania, In: Nikolov, V. (Ed.) *Provadia-Solnitsata Prehistoric Salt-Producing Center. The 2005-2007 Excavation Seasons*, pp. 79-81. Sofia: Bulgarian Academy of Sciences.

Marinova, E. (2008b) Postrojka 5: arheobotanichni izsledvanija In: Nikolov, V. (Ed.) *Provadia-Solnitsata Prehistoric Salt-Producing Center. The 2005-2007 Excavation Seasons*, pp. 173-4. Sofia: Bulgarian Academy of Sciences.

Marinova, E. (2008c) Postrojka 3: arheobotanichni izsledvanija, In: Nikolov, V. (Ed.) *Provadia-Solnitsata Prehistoric Salt-Producing Center. The 2005-2007 Excavation Seasons*, pp. 202-203. Sofia: Bulgarian Academy of Sciences.

Marinova, E. (2008d) Postrojka 1: arheobotanichni izsledvanija, , In: Nikolov, V. (Ed.) *Provadia-Solnitsata Prehistoric Salt-Producing Center. The 2005-2007 Excavation Seasons*, pp. 273-274. Sofia: Bulgarian Academy of Sciences.

Marinova, E. (2008e) In: Nikolov, V. (Ed.) *Provadia-Solnitsata Prehistoric Salt-Producing Center. The 2005-2007 Excavation Seasons*, pp.   Sofia: Bulgarian Academy of Sciences.

Marinova, E. (2017) Archaeobotanical analysis of the Neolithic site of Bâlgarčevo, Southwestern Bulgaria, In: Lechterbeck, J. and Fischer, E. (Eds.) *Kontrapunkte. Festschrift für Manfred Rösch*, pp. 147-158. Bonn: Verlag Dr. Rudolf Habelt GmbH.

Marinova, E. and Atanasova, J. (2006) Anthropogenic impact on vegetation and environment during the Bronze Age in the area of Lake Durankulak, NE Bulgaria: Pollen, microscopic charcoal, non-pollen palynomorphs and plant macrofossils. *Review of Palaeobotany and Palynology* 141: pp.165-178.

Marinova, E. and Ntinou, M. (2018) Neolithic woodland management and land-use in south-eastern Europe: The anthracological evidence from Northern Greece and Bulgaria. *Quaternary International* 496: pp. 51-67.

Markov, G. *Grancharov, St., Nyagulov, B., Popetrov, N., Statelova, E., Toshkova, V (Eds.)* (2012). *Istoria na Bulgaria, Vol. 9. 1918 – 1944*. Sofia: TanNakRa.

Markov, G., Popov, R. and Todorova, Tz., Valchev, V. (Eds.) (1999). *Istoria na Bulgaria, Vol. 8, Kulturno razvitie (1878 – 1918)*, Sofia: GAL-IKO.

Martinez, S. (2004) Un filet de portage du Néolithique récent à Dikili Tash (Macédonie orientale – Gréce). In: Bodu, p. and Constantin, C. (Eds.) *Approches Fonctionelles en Préhistoire. XXVe Congrès Préhistorique de France. Nanterre 24-26 Novembre 2000*, pp. 217-224. Paris: Ministéere de la Culture:

Mason, O. (1904) *Basket-work of the North-American aborigines*. Washington: United States National Museum.

Mauld, C. A. and Wardle, K.A. (2000) The stratigraphy and phases, pp. 17- 70 in Ridely, C., Wardle, K. A. and Mould, C. A. (eds.), *Servia I*. London: The British School at Athens, Supplementary Volume 32.

Mavromati, A. (2017) Landscape and wood-fuel in Akrotiri (Thera, Greece) during the Bronze Age. *Quaternary International* 458: pp. 44-55.

Maynard, B. (1989) *Modern Basketry Techniques*. London: Batsford

Megaloudi, F. (2006) *Plants and Diet in Greece from Neolithic to Classic Periods. The archaeobotanical remains*. BAR International Series 1516. Oxford: Archaeopress.

Meininger, P. (2019) *Carex distans*. Available at: http://www.freenatureimages.eu/Plants/Flora%20C/Carex%20distans/Carex%20distans%206%2C%20Zilte%20zegge%2C%20Saxifraga-Peter%20Meininger.JPG [Accessed 10 May 2019]

Merpert, N. (2007) Tell Younatsite. Epoha Bronzi. Moscow: Vostochnaya literatura.

Metcalfe, C. R., (1960) *Anatomy of the Monocotyledons. I. Graminae*, Oxford: The Clarendon Press.

Metcalfe, C. R. (1971) *Anatomy of the Monocotyledons. V. Cyperaceae*. Oxford: The Clarendon Press.

Metodieva M., Tomova-Braikova, T., Pamporov, A., Kolev. D., Krumova, T., Yordanov, I. (2008). *Romite v Bulgaria. Informacionen Spravochnik*. Sofia: Institut Otvoreno Obshetstvo.

Mihaylova, G. (1983) Funkcii na narodnite nosii, in Georgiev, G., Primovski, A., Georgieva, B., Mihajlova, G., Radeva, L., Veleva, M. (Eds) *Ethnographia na Bulgaria, vol. II*. Sofia: Izdatelstvo na BAN, pp. 267 – 280.

Mizuno, S., Torizu, R. and Sugiyama, J. (2010) Wood identification of wooden mask using synchroton X-ray microtoography, *Journal of Archaeological Science* 37, Issue 11, pp. 2842-2845.

Mock, R. E. 1976. Anza I – III (pre-Vinca) Ceramics, pp. 78 – 116 in M. Giumbutas (ed.) *Neolithic Macedonia as reflected by excavation at Anza, Southeast Yugoslavia, Vol. I*. The Institute of Archaeology UCLA: Los Angeles.

Montaniari, F. (2015) *The Brill Dictionary of Ancient Greek*. Leiden: Brill.

Morigi, M. P., Casali, F., Bettuzzi, M., Bianconi, D., Brancaccio, R. Cornacchia, S., Pasini, A., Rossi, A., Aldrovandi, A., Cauzzi, D. (2007) CT investigation of two paintings on wood tables by gentile da Fabriano. *Nuclear Instruments and methods in Physics*, Vol. 580, pp: 735 – 738

Mount-Williams, L. Anza IV (Early Vinca) Ceramics, pp. 117 – 156 in M. Giumbutas (ed.) *Neolithic Macedonia as reflected by excavation at Anza, Southeast Yugoslavia, Vol. I*. The Institute of Archaeology UCLA: Los Angeles.

Myers, J. L. 1898 Textile impressions on an Early Cycladic Vessel from Amorgos, *Journal of the Anthropological Institute of Great Britain and Ireland* 27, 178 – 180.

Nauert, J.P. (1965) The HagiaTriada Sarcophagus.An Iconographical Study. *Antike Kunst* 8: pp. 91-98.

Nedelcheva, A., Dogan, Y., Obratov-Petkovic, D. and Padure, I. (2011) The Traditional use of Plants for Handicrafts in Southeastern Europe, *Human Ecology* 39: pp. 813-828.

Nikolov, V. and Petrova, V. (2008) tell Provadia – Solnitsata: Arheologicheski prouchvaniya, stratigrafia I periodizaciya, In: Nikolov, V. (Ed.) *Praistoricheski solodovivent center Provadia – Solnitsata. Razkopki 2005-2007*, pp. 35 – 50. Sofia: NAIM.

Nilson, M. (1950) *Minoan-Mycenaean Religion and its Survival in Greek Religion*. Lund: C.W.K. Greerup.

Novakov, Kr. (2000) The Bulgarian Museums: http://www.planinite.info/Vrazki/Muzei.htm [Accessed on 1 May 2018].

Okey, T. (1912) *An Introduction to the Art of Basket making*. London: Pitman and Sons.

Papadopoulos 2016, Hatzituluzis 2016,

Papadopoulos, S & Neradzis, N. (2012), I Proistoriki Erauna sth Thaso: 1922 – 2012, In: Stefani, E., Merousis, N, Dimoula, A (eds) *A Century of Research in Prehistoric Macedonia. International Conference Proceedings, Archaeological Museum of Thessaloniki 22 – 24 November 2012*, pp. 22 - 90, Athens: Ziti

Paterakis, A. (1996) Conservation of a Late Minoan basket from Crete. *Studies in Conservation*, Vol. 41, No.3: pp. 179-182.

Petkov, N. (1965) Praistoricheski pletki i tykani ot Sofiyskoto pole i blizkite mu okolnosti. *Arheologia* VII.1: pp. 1, 45 – 57

Piperno, D. (2006) Phytholiths: A Comprehensive Guide for Archaeologists and Palaeoecologists. Lanham, New York, Toronto: AltaMira Press.

Pique, R., romero, S., Palomo, A., Tarrus, J, Terradas, X., Bogdanovic, I. (2018) The production and use of cordage at the early Neolithic site of la Draga (Banyoles, Spain) Quaternery Internationl 468 (B), pp. 262-270.

Pomadere, M. and Zurbach, J. (2007) Malia, ville et territoire: organisation des espaces et exploitation des resources, colloque organise à l'École fraincaise d'Athènes les 2-3 novembre 2007. *Bulletin Correspondenance Hellénique* 131, pp. 821-887.

Popov, R., Raychevski, S. (1996) *Strandja. Materialna I duhovna kultura*. Sofia: Akademichno izdatelstwo 'Prof. marin Drinov'.

Popova, B. (2007) *Planinetsat v ravninata – adaptacija, integracia, nostalgia*, In: Goevm A.

(Ed.) Narodna Kultura na Balkandjiite, Vol. 7, pp. 133-140. Gabrovo: Faber

Popova, Tz. (2010) Plant Environment of Man between 6000 and 2000 BC in Bulgaria. BAR International Series 2064. Oxford: Hadrian Books.

pp. 411-424.

Poursat, J.-P. (1980) Chapitre III. Vanerie. *Etudes Crétoises* XXVI, pp.92-98.

Prolet (2011) website of "Prolet OOD": http://prolet-bg.eu/ [Accessed on 1 May 2018].

Pruckner, K. (2007) Matenabdrücke, pp. 253-262 in Hiller, S. and Nikolov, V. (eds.), *Karanovo Band IV. Die Ausgrabungen im Nordsüd-Schnitt, 1993-1999*. Wien: Phoibos Verlag.

Pyke, G. and Yiouni, P. 1996. *Nea Nikomedia: The Excavation of an Early Neolithic Village in Northern Greece, 1961 – 1964, directed by R.J. Rodden. The Excavation and the Ceramic Assemblage.* Supplementary Volume No. 25. London: The British School at Athens.

Radeva, V. (2012) *Bulgarski Talkoven Rechnik.* Sofia: Iztok-Zapad.

Renfrew, C. (2007) The development of the excavation and the stratigraphy of Phylakopi, pp. 5-19 in Renfrew, C., Brodie, N., Morris, Ch. and Scarre, Ch. (eds.), *Excavations at Phylakopi in Melos 1974 – 77*. Supplementary Volume No. 42, Witney: The British School at Athens.

Renfrew, J. 2003. Grains, Seeds and Fruits from Prehistoric Sitagroi, pp. 3-19 in Elster, E. and Renfrew, C. (eds.), *Prehistoric Sitagroi: Excavations in Northeast Greece, 1968 – 1970, Volume 2: The Final Report*. Monumenta Archaeologica 20. Los Angeles: Cotsen Institute of Archaeology at UCLA.

Rethemniotaki, N. D. (2005) *The Archaeological Museum of Heraklion*. Athens: Olkos.

Rodden, R. J. 1964a. A European Link with Catalhoyouk: the 7th millennium settlement of Nea Nikomedia in Macedonia. Part I – Site and Pottery, pp. 564-567. *The Illustrated London News*, 11 April

Rodenwaldt, G. (1976) *Tiryns II. Die Fresken Des Palastes.* Mainz/Rhein: Verlag Philipp Von Zabern.

Romero-Brugues, S., Pique, R., Picornell-Gelabert, L., Calvo, M., Pericot, J. (2018) The production and use of Cordage in the Balearic Bronze Age: the Cova de Pas (Ferreries, Menorca)

Rossignol-Strick, M. (1993) Late Quaternery climate in the eastern Mediterranean region. *Paléorient* 19,1: pp. 135-152.

Russel, N. 1990. The Bone Tools, pp. 521 – 548 in Tringham, R. and Krstic, D. (eds.). *Selevac. A Neolithic Village in Yougoslavia*. Monumenta Archaeologica 15. The Institute of Archaeology UCLA: Los Angeles

Sackett, L.H., Hankley, V., Howell, R.J., Jacobsen, T. W., Popham, M.R. 1966. Prehistoric Euboea: Contributions toward a Survey, *British School at Athens Monographs* 61, 33 – 112.

Sampson, A. (1988), Anaskafi sto Spilaio Skoteini Tharounnion, *Anthropologika Analekta*, 49.1 pp. 65 – 69.

Sampson, A. (1988) *I Neolithiki katoikisi sto Gyali Nisirou*. Athens: Auboiki Arhaiofilos Etairia.

Sampson, A. (1985) *Manika. Mia Protoelladiki poli sti Chalkida. Manika. An Early Helladic town in Chalkis.* Athens: Etairia Euboeikon Spoudon.

Sani, E. (2013) *Agia Triada Sarcophagus*. Available: https://www.flickr.com/photos/69716881@N02/11384263025

Sarangi, B. (2019) *Saccharum spontaneum.* Available at: https://pixabay.com/photos/kans-grass-saccharum-spontaneum-204202/

Sarpaki, A. (1992) A palaeoethnobotanical study of the West House, Akrotiri, Thera. *The Annual of the British School at Athens* 87: pp. 219-230.

Sarpaki, A. (2007) Chapter 11. Archaeobotanical observations. In: MacGillivray, J.A., Sackett, L. and Driessen, J. (Eds.) *Palaikastro. Two Minoan Wells. Supplementary Volume Np. 43*, pp. 211-216. London: the British School at Athens.

Sarpaki, A. (2019) Personal communication (a.sarpaki@gmail.com 10 June 2019), *Re: LitHelp*. To M. Andonova (m.andonovae@gmail.com) [Accessed 10 June 2019].

Savov, K. (2017) *Mesta i liica ot Rodopite (1992-1949)*. Regional Ethnographic Museum of Plovdiv.

Schliemann, H. 1880 (reprinted in 1976*). Ilios. The City and Country of the Trojans. The results of researches and discoveries on the site of Troy and throughout the Troad in the years 1871, 72, 73, 78, 79.* New York: Arno Press.

Schweingruber, F. H. (2007) *Wood strcture and environment*. Berlin: Springer.

Schweingruber, F. H. (1990) *Anatomy of European Woods. An Atlas for the identification of European trees, shrubs and dwarf shrubs.* Basel: Verlag Paul Haupt Berne

Seebacher, M. 1997. Mattenabdrücke, pp. 229-334 in Hiller, S. and Nikolov, V. (eds.), *Karanovo I. Die Ausgrabungen im Südsektor 1984-1992*, Salsburg-Sofia: Verlag Ferdinand Berger&Söhne.

Semerdjieva, S. (2014) 'Koshnicharstwoto – neshto staro, neshto novo', in Goev, A. (ed.) *Narodnite zanajati: minalo, nastojashte i bydeshte, vol. IX.* Faber, pp. 149 – 164.

Sharova, Kr., Kosev, D., Hristov, Hr., Todorov, N., Vasilev, V., Angelov, D., Bojinov, V., Gandev, Hr., Dimitrov, I., Isusov, M., palayotov, L., Hadjinikolov, V., Kosev, K., Majdrakova-Chavdarova, O., Traykov, V. (Eds.) (1987). *Istoria na Bulgaria, Vol. 6, Bulgarsko Vazrazhdane (1856 – 1878)*, Sofia: Bulgarska Academia na Naukite.

Simpson, J. and Weiner, E. (1989) *The Oxford Dictionary*. Oxford: Clarendon.

Slavchev, T. (2017) *Photo Archive Todor Slavchev*. Available at: http://photoarhiv-todorslavchev.com/ [Accessed 19 March 2017].

Smith, J. C. (1975) *Spinning, weaving and textile manufacture in Prehistoric Greece from the beginning of the Neolithic to the end of the Myceniaean Ages; with particular reference to the evidence found on archaeological material*, PhD Thesis, University of Thasmania. Available online: http://eprints.utas.edu.au/11442/.

Smith, J. C. (1977) Cloth and Mat Impressions. *I*n Coleman, J. E. (Ed.), *Keos I. Kephala: A Late Neolithic Settlement and Cemetery*, pp. 114 – 127. Princeton: American School of Classical Studies.

Smith, J. C. (2000) The Spinning and weaving implements. In Ridely, C., Wardle, K. A. and Mould, C. A. (Eds.), *Servia I*, pp. 207 – 262. London: The British School at Athens..

Smoor, B. 1976. Bone Tools, pp. 189 – 197 in Gimbutas, M., Winn, Sh., Shimbaku, D. (eds.). *Achilleion. A Neolithic Settlement in Thessaly, Greece, 6400 – 5600 BC*. Monumenta Archaeogica 14. Los Angeles: UCLA Intitute of Archaeology.

Sodini, N., Dreossi, D., Chen, R., Fioravanti, M., Giordano, A., Herrestal, P., Rigon, L., Zanini, F. (2012) Non invasive microstructural abnalysis of bowed stringed instruments with synchronisation radiation X-ray micro-tomography. Journal of Cultural Heritage 13, pp.

Stelzner, J. and Million, S. (2015) X-ray Computed Tomography for the anatomical and dendrochronological analysis of archaeological wood, *Journal of Archaeological Science* 55, pp. 188 – 196.

Spyropoulos, D. and Spyropoulos, G. (2000) *Arhaia Arkadeia*. Tripoli: Nomarhiki Autodoiikisi Arkadeias.

Stoyanov, S. (1930) *Grozdober*. Regional Historic Museum of Silistra

Tackenberg, O. (2019) *Sorghum bicolor*, http://www.i-flora.com/en/image-search/search.html

Taylor, W.D. 1972. Excavations at Ayios Stefanos, *British School at Athens Monographs 67*, 205 – 270.

Taylor, W.D. and Janko (2008) *Ayios Stephanos. Excavations at a Bronze Age and medieval settlement in southern Laconia*. BSA Suppl. Volume no. 44. London: the British School at Athens

Teocharis, D. (1973) Neolithic Greece. Athens: National Bank of Greece

Thimme, J. and Getz-Preziosi, P. 1977. *Art and Culture of the Cyclades in the Third Millennium BC*. Chicago: University of Chicago Press.

Todorova, H. and Vaisov, I. (1993) *Novokamennata epoha v Bulgaria*. Sofia: Nauka I izkustwo.

Topic, J. (2019) *Imperata cylindrica*. Available at: http://www.freenatureimages.eu/Plants/Flora%20D-I/Imperata%20cylindrica/index.html#Imperata%2520cylindrica%25201%252C%2520Saxifraga-Jasenka%2520Topic.JPG

Treuil, R. (ed.), 2004. Dikili Tash Village Préhistorique de Macédonie Orientale I Fouilles de jean deshayes 91961 – 1975), Bulletin Correspondance Hellénique, Supplement XXXVII

Tringham, R. and D. Krstic (eds.). 1990. *Selevac. A Neolithic Village in Yougoslavia*. Monumenta Archaeologica 15. The Institute of Archaeology UCLA: Los Angeles.

Tringham, R. and M. Stefanovic 1990. The Nonceramic use of clay, pp. 323 – 398 in Tringham, R. and Srefanovic, M (eds.), *Selevac. A Neolithic Village in Yougoslavia*. Monumenta Archaeologica 15. The Institute of Archaeology UCLA: Los Angeles.

Trnkoczy, A. (2010) *Juncus acutus.* Available at: https://www.flickr.com/photos/atrnkoczy/40208477412

Tsirstoni, Z. (2016) Chapter 1. The chronological framework in Greece and Bulgaria between the late 6th and the early 3rd millennium BC, and the "Balkans 4000" project. In: Tsirtsoni, Z. (Ed.) *The Human Face of Radiocarbon. Reassessing Chronology in Prehistoric Greece and Bulgaria, 5000-3000 cal BC*, pp. 15-46. Lyon: MOM Editions.

Turner, J. (1978) The vegetation of Greece during prehistoric times: the palynological evidence. In: Doumas, Ch. (Ed.) *Thera and the Aegean World I. Papers at the Second International Scientific Congress, Santorini, Greece*, pp. 765-773. London: The Thera Foundation.

Tyers, P.A. (2014) Rim Chart [online] Available at: http://potsherd.net/atlas/topics [Accessed 15 February 2017].

Tzachili, I. (2005) Athodokoi talaroi: The Baskets of teh Crocus-gatherers. In: Morgan, L. (ed.) Aegean Wall Painting. A Tribute to Mark Cameron (BSA 13), pp. 113-117. London: The British School at Athens.

UNESCO 2016 : Nestinarstvo: messages from the past: the Panagyr of saints Constantine and Helena of the village of Bulgari, Available at: https://ich.unesco.org/en/RL/nestinarstvo-messages-from-the-past-the-panagyr-of-saints-constantine-and-helena-in-the-village-of-bulgari-00191 [Accessed 1 May 2018].

Urban, B. and Fuchs, M. (2005) Late Pleistocene vegetation of the basin of Phlious, NE-Peloponnese, Greece, *Review of Palaeobotany and Palynology* 137: pp. 15-29.

Vaisov, I and Zidarov, P. (2013): *Praistorichesko selishte Kurilo-Kremenitsa. Arheologischeski otkritija I razkopki prez 2012*. pp. 50-53.

Vakarelski, H. (1977) *Ethnographia na Bulgaria*. Sofia: Nauka i izkustvo.

Valamoti, S-M. (2009) *I arhaiovotaniki ereuna tis diatrofis sthn Proistoriki Ellada*. Thessaloniki: University Studio Press.

Valamoti, S-M. (2015) Harvesting the 'wild'? Exploring the context of fruit and nut exploitation at Neolithic Dikili Tash, with special reference to wine, *Vegetation History and Archaeobotany* 24: pp. 35-46.

Vasileva, M. (1982) *Lazaruvane: bulgharski praznici I obichai*, Sofia: Septemvri.

Vaughan, S. (1994) *Handmade Baskets from Nature's Colourful Materials.* Tunbridge Wells: Search Press.

Veleva, M. (1983a) 'Domashnite zanjatija w jivota na bulgarskia narod', in Georgiev, G., Primovski, A., Georgieva, B., Mihajlova, G., Radeva, L., Veleva, M. (ed.) *Ethnographia na Bulgaria, vol. II*. Sofia: Izdatelstvo na BAN, pp. 66–70.

Veleva, M. (1983b) 'Drugi domashni zanajati', in Georgiev, G., Primovski, A., Georgieva, B., Mihajlova, G., Radeva, L., Veleva, M. (ed.) *Ethnographia na Bulgaria, vol. II*. Sofia: Izdatelstvo na BAN, pp. 83–88.

Ventris, M. and Chadwick, J. (1956) *Documents in Mycenaean Greek*. *Three Hundred Selected Tablets from Knossos, Pylos and Mycenae with Commentary and Vocabulary.* Cambridge: The University Press.

Vogt, E. 1937. *Geflechte und Gewebe der Steinzeit*. Basel: Schweitz. Gesellschaft fur Urgeschischte.

Voynov, M. and Milev, Al. (1937) *Latinsko-Bulgarski rechnik*, Sofia: Kazanlashka dolina.

Vlachopoulos, A. and Zorzos, L. (2014) Physis and Techne on Thera: Reconstructing Bronze Age environment and land-use based on new evidence from phytoliths and the Akrotiri wall paintings, In: Touchais, G. et al. (Eds), PHYSIS, *Aegaeum* 37, pp. 183-197

Walter, H. and Felten, F. 1981. *Ält – Agina. Die vorgeschichtlichte Stadt, Band III. 1*. Mainz-Rhein: Verlag Philipp von Zabern

Wardle, K. A. and Wardle, D. (2007) Assiros Toumba. A brief history of the settlement. In: Todorova, H., Stefanovich, M. and Ivanov, G. (Eds) *The Struma valley in Prehistory. Proceedings of the International Symposium Strymon Praehistoricus*, pp. 451-480. Sofia: Bulged

Warren, P. (1984) Knossos: New Excavations and Discoveries, *Archaeology* 37.4: pp. 48-55.

Weishaar, H.-J. 1994. Keramik des Südwest-Ägäischen Chalkolithikums von Ägina, in Dobiat, C. (ed), pp. 675 – 689. *Marburger Studien zur Vor – und Frühgeschichte 16 Festschrift für Otto-Herman Frey zum 65 Geburtstag*.

Weisshaar, H.-J. 1990. Die Keramik von Talioti, pp. 1-34 in *Tyrins: Forschungen und Berichte*, *Band XI*. Mainz am Rhein: Phlilipp von Zabern.

Wendrich, W. (1991) *Who is afraid of basketry? A guide to recording basketry and cordage for archaeologists and ethnographers*. Leiden: Centre for Non-western Studies.

Wendrich, W. (1999) *The World According to Basketry. An ethno-archaeological Interpretation of Basketry Production in Egypt*. Leiden: Centre for Non-western Studies.

Wendrich, W. (2005) Catalhöyük Basketry. In Hodder, I. (Ed.), *Changing Materialities at Catalhöyük: Reports from the 1995 – 99 seasons*. Catalhöyük Research Project Volume 5. British Institute at Ankara Monographs No. 39, pp. 333 – 339. Oxford: Oxbow.

Werner, O. and Schoepfle, G. (1987) *Systematic Field Work. Vol.1 Foundations of Ethnography and Interviewing; Vol. 2 Ethnographic Analysis and Data Management*. Newbury: Sage.

Wijmstra (1969) Palynology of the first 30 metres of a 120m deep section in Northern Greece. *Acta Botanica Neerlandica* 18 (4):pp 511-527

Wills, B. (1995a) The preparation and use of two starch pastes, In: Cruickshank, P. and Tinker, Z. (Eds), *Starch and Other carbohydrate Adhesives for Use in Textile Conservation*, pp. 20–24. London: United Kingdom Institute for Conservation of Historic and Artistic Works, Textile Section.

Wills, B. (1995b) Some methods of basketry repair, using Japanese tissue paper and starch paste, *Where to Start, Where to Stop, British Museum/ Museum Ethnographers, Group Ethnographic Symposium 1989*, pp. 109–113. Hull: Museums' Ethnographers Group.

Willis, K. (1992) The Late Quaternary Vegetational History of Northewest Greece. I. lake Gramousti. *New Phytologist* 121: pp. 101-117.

Winn, S. and Shimabuku, D. 1989. Architecture ans sequence of building remains, pp. 32 -74 in Gimbitas, M, Winn, S. and Shimabuki, D. (eds.), Achilleion: A Neolithic Settlement in Thessaly, Greece, 6400 – 5600BC. Los Angeles: The Institute of Archaeology UCLA.

Word Press 2017. Website of the Professional High school “Zaharij Zograf”, Pleven: http://www.daskalo.com/pgdm/%D0%B8%D1%81%D1%82%D0%BE%D1%80%D0%B8%D1%8F/ [Accessed on the 08 November 2017].

Wright, D. (1977) *The Complete Book of Baskets and Basketry*. London: David & Charles.

WWF 2017. Southern Europe: Bulgaria with small extensions into Greece, Macedonia, and Yugoslavia, https://www.worldwildlife.org/ecoregions/pa0435 [accessed on 08 November 2017.

Yiouni, P. 1995. Technological Analysis of the Neolithic pottery from Makri, *Bulletin de Correspondence Hellenique*, 119, livraison 2, 607 – 620.

Yiouni, P. 1996. Mat Impressions, p. 61 in Pyke, G. and Yiuni, P. (eds.), *Nea Nikomedia: The Excavation of an Early Neolithic Village in Northern Greece, 1961 – 1964, directed by R.J. Rodden. The Excavation and the Ceramic Assemblage*, p. 61, Supplementary Volume No. 25. London: The British School at Athens.

Yordanova, M. (2009) Pletena na asir v s. topoli dol, Pzardjishko, In: Goev, A. (Ed.) *Narodnite Zanayati. Minalo, nastoyashte i budeshte*. Vol. IV: pp. 83-90. Gabrovo: Faber

Yordanova, G. (2012) ‘“Na Rogoschenka” (po materiali ot gr. Popovo’, in Goev, A. (ed.) *Narodna kultura na Balkadjiite, vol. IX*. Gabrovo: Faber, pp. 107 – 114.

Yordanova, M. (2009) ‘Pletene na asur v s. Topoli dol, Pazardjishko’, in Goev, A. (ed.) *Narodnite zanajati: minalo, nastojashte i bydeshte, vol. IV*. Gabrovo: Faber, pp. 83 – 88.

Zevvou, E. 2009. Archaeological finds from the area of Anthochori, pp. 29 – 42, in Cavanagh, W, Gallou, C, Georgiadis, M., *Sparta and Laconia: from Prehistory to Pre-Modern*, BSA STudues 16, London: Senate House.

Zochary, D., Hopf, M. and Weiss, E. (2012) *Domestication of Plants in the Old World*. Oxford: Unoversity