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Cooking in Bronze Age northern Greece: an investigation of thermal structures

Evanthia Papadopoulou,
Sandra Prévost-Dermarkar, Anastasia Dimoula,
Niki Chondrou, Soultana-Maria Valamoti

Abstract

The thermal treatment of food plays an important role in cooking processes, as it strongly affects its taste, texture and physico-chemical properties. Thermal structures are the loci and the means of these transformations and, thus, offer a unique source of information for approaching prehistoric cooking traditions. Following this view, we attempted to investigate the potential of cooking installations from the perspective of cooking technologies possibly developed during the Bronze Age in northern Greece (Macedonia region). Collecting this large amount of data (203 structures from 27 different sites, dating to the three periods of the Bronze Age) was a long process and their systematic analysis raised many methodological problems.

The resulting database founded on techno-morphological criteria shows a great typological diversity of structures. It appears that the majority of the structures is made of clay. The most frequent type in the EBA is the multifunctional U-shaped/oval hearth with upper opening serving as a vessel support. It diminishes in the LBA, while the circular/oval type of structures increases in number, as does a certain type of vessel, the pyraunos, adopted around the same time. Firing installations reveal chronological and regional variations in Bronze Age cooking techniques that are discussed in relation to cooking pottery styles.

Keywords: cooking, thermal structures, Bronze Age Greece

23.1 Introduction

Cooking is undeniably one of the most important activities performed on a daily basis in domestic contexts, as it affects people's nutrition and hence, their maintenance capacity. At the same time it forms an essential element of social, ritual and symbolic aspects of past societies. This performative task involves a material component, a cognitive asset and social etiquette. In cooking settings social groups often find the proper means to express affiliation, lineage and solidarity or to display wealth, authority and antagonism. Cooking technologies have a major social impact and power and therefore, they are promising fields of archaeological research. They offer the means to explore past culinary traditions and everyday social negotiations performed in their context that affected the cultural identity of prehistoric societies.

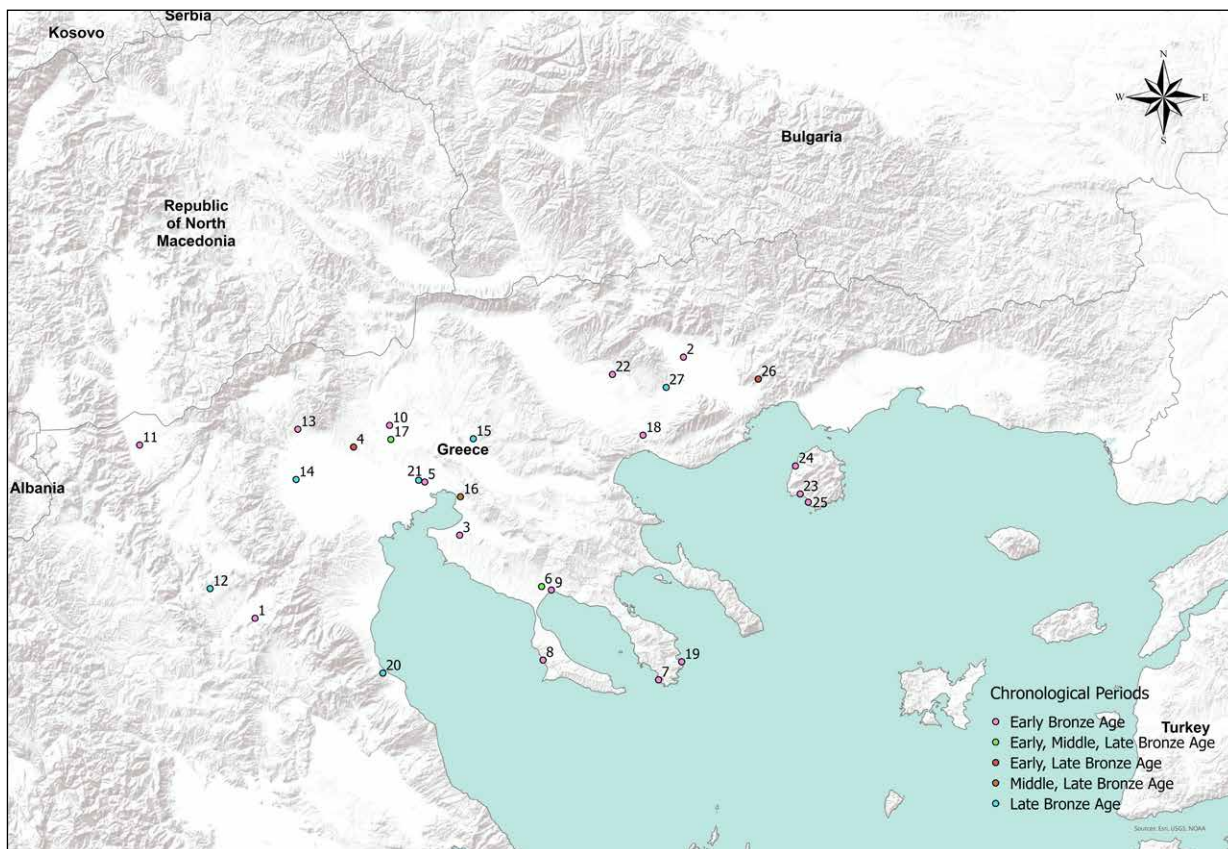


Fig. 23.1 Map of the Bronze Age sites at the Macedonia region. 1. Serbia; 2. Sitagroi; 3. Mesimeriani Toumba; 4. Archontiko; 5. Agios Athanasios; 6. Agios Mamas; 7. Torone; 8. Siviri; 9. Molyvopyrgos; 10. Axiochori (Vardaroftsa); 11. Armenochori; 12. Platania (Boubousti); 13. Mandalo; 14. Angelochori; 15. Assiros; 16. Thessaloniki Toumba; 17. Kastanas; 18. Kryoneri; 19. Kriaritsi; 20. Rema Xydias; 21. Anchialos; 22. Pentapoli; 23. Limenaria; 24. Skala Sotiros; 25. Agios Antonios Potou; 26. Dikili Tash; 27. Angista.

With the aim to explore that potential the present paper investigates the cooking technologies developed at the Bronze Age settlements of northern Greece and their gradual transformation during the course of the Early, Middle and Late Bronze Age, i.e. the 3rd and 2nd mill BC. The research geographically focuses on present day Macedonia, a vast region that over time exhibited local diversities in material expressions.

The material imprint of cooking in archaeological settings in Macedonia is rather variable. In the present study we concentrate on thermal cooking installations, namely purposefully arranged spaces that are equipped with a feature destined (not necessarily exclusively) for the thermal treatment of foods. Based mainly on this evidence our analysis aims to reconstruct cooking technology in BA domestic contexts in Macedonia. As cooking encompasses various techniques and tasks it should be stated from the beginning that our intention here is to approach only the aspect of the thermal processing of foods. In the absence of an overview of the rich record of fire installations,

our primary goal is to fill in this apparent gap in the relevant literature by bringing together, for the first time, all available published evidence¹. Methodologically, the presentation and classification of the thermal features will follow specific techno-morphological criteria leading eventually to a better understanding of their thermal behavior. After all, an effort is made to assess their cooking potentials by taking into consideration also other kinds of cooking gear, cooking vessels in particular.

23.2 The study area

Hearths and ovens are a usual find in Bronze Age (3300-1050 BC) settlements in Macedonia and the increased number of excavations over the last forty years has brought to light various habitation spaces devoted to cooking activities. The compiled inventory discussed below contains 203 thermal structures and it was processed by

1 For previous efforts see Prévost 1993; Papadopoulou 2010, 420-434, 444-448.

means of a database that was especially produced for this purpose by the ERC funded project PlantCult (Valamoti et al 2017).

The data under study come from twenty seven sites (Fig. 23.1). The dominant site type of the period is the tell with multiple phases of occupation. Due to the successive rebuilding of the houses at the same location over long periods of time, tell deposits offer the possibility to detect local changes in culinary traditions, especially during transitional periods. In the Early Bronze Age (3300-1900 BC), tell sites co-exist however along with settlements of shorter duration. Those are usually established in marginal zones around plains, on hilltops, often near the sea, or on promontories (Andreou 2014, 144; Andreou 2010, 644-645). As for the Middle Bronze Age (1900-1650 BC) evidence is limited in most parts of Macedonia. With the exception of Chalkidiki and Pieria where there are attested influences from central and southern Greece, the rest of the Macedonian region remains more or less attached to its EBA traditions and the Balkan cultural trends. The only available information on MBA cooking installations comes from Kastanas, Thessaloniki Toumba and Agios Mamas.

In the Late Bronze Age (1650-1050 BC) tells dominate the Macedonian landscape with some of them acquiring considerable height due to the construction of massive terraces at their slopes, as for example Angelochori, Axiochori, Assiros and Thessaloniki Toumba. The period is also characterized by a rise in settlement numbers which is combined with the expansion of the habitation on higher elevations and the establishment of a hierarchical network of sites (Andreou 2010, 649; Andreou et al 1996, 578, 585, 587). Storage and redistribution practices basically of crops and foodstuffs have been very popular in theoretical proposals trying to account for rising social inequalities and hierarchies that become apparent in LBA communities.

23.3 The dataset: methodological considerations

Taken into consideration the diversity of the thermal features and the disparate body of information that had to be assembled, a series of methodological problems arose during the design of the database and the recording process. To begin with, the data of the study had to be obtained from various published works, some of preliminary and others of final and detailed character, a fact that, by extension, led to the concentration of an uneven quantity and quality of information. Hence, for some sites we had at our disposition minute descriptions, measurements and designs of the thermal structures, whereas in others the mere mention of their presence in a space. In order to circumvent this problem, we decided to enter all referenced structures in the database, so as to evaluate them quantitatively. However, those that did

Structure frequency per period

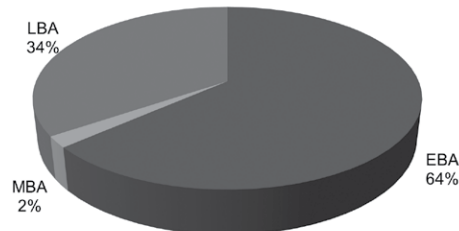


Fig. 23.2 Pie chart depicting the frequency of thermal structures at each period.

not possess sufficient information on their morphology, dimensions or construction technique were excluded from the relevant statistical analysis.

Another methodological issue raised during the recording phase was the problem of the terminology (Papadopoulou 2010, 91-94). The lack of a standardized terminology, based on techno-morphological qualities and discrete criteria, has often led to a chaotic fusion of information that usually fails to render field reality. For instance, the same type of installation may be assigned dissimilar definitions at different sites, a fact that obstructs the formation of typologies and the identification of technological trends. Another observed tendency in the publications is the misuse of the functional terms hearth and oven. These terms point to an open or closed firing environment respectively which can be achieved, in both cases, by a variety of structures (Papadopoulou and Prévost-Dermakar 2007, 127; Prévost-Dermakar 2002, 223-232). As a consequence the wide application of the hearth/oven designation obscures in many cases fire structure variability.

In order to address these critical questions, we decided in the first place to gather for any structure all available published information regarding its techno-morphology². This information was systematized according to the following criteria: a. plan shape, b. presence or absence of framing, c. the structure's floor relationship to the ground level, d. the construction technique of the floor, e. the framing/wall profile, f. the presence of an entrance and its orientation, g. construction technique of the framing/wall, h. decorative features. All mentioned dimensional measurements related to the above structural parts were also registered. The database was furthermore

2 For examples of previous terminologies adopted in other geographical areas and/or time periods, see Deshayes 1974; Leroi-Gourhan 1979; Molist 1986, 11-13; Petrasch 1986; Kalogiropoulou 2013, 76-79.

supplied with spatial, contextual and preservation related information regarding each individual structure.

23.4 Data analysis

As has been mentioned the database contains 203 structures from twenty seven different sites. However, the absolute number of thermal structures that have been revealed in the excavations is admittedly much higher than the actual published examples. The EBA period is represented at twenty sites, the MBA at only three and the LBA at ten (Fig. 23.1). Although the EBA sites significantly outnumber the LBA sites, it is noteworthy that in certain tells the extent of the excavated LBA habitation layers is significantly higher.

The chronological distribution of the thermal structures reveals that two thirds (64%) come from EBA contexts, a slim percent (2%) from MBA and the rest (34%) from LBA (Fig. 23.2). At first sight this tendency appears to be the outcome of the overrepresentation of the EBA, as 59% of the sites have habitation layers that date to the 3rd mill.

The state of preservation of the thermal structures at the Macedonian sites we have examined is rather mediocre, as usually the floor of the structure survives, whereas the clay superstructure, due to its fragile nature, demonstrates severe damages. Inevitably, estimations about the degree of the structures' preservation were necessarily based on their published plans. According to this criterion only 17% of the assemblage has a fully and 52% a partially preserved ground plan. As frustrating as these results may be, they obtain another dimension if we take into consideration that for 31% of the structures we have no published information about their degree of preservation. In general however, one has to admit that BA thermal features are poorly preserved at Macedonian sites.

23.4.1 Thermal structure typology and technological attributes

For the purposes of the study the thermal features have been divided in two large categories: the fire features that display no permanently built elements and the structured features that dispose more or less fix constructed parts.

In settlement deposits, areas that are characterized by thermally altered sediments, charcoal fragments, ash and other burnt materials, organic or not, are often interpreted as the remnants of open fires. These fire areas may be related to various activities, other than cooking, therefore their culinary function has to be supported by further contextual evidence and/or special analysis³.

The structured features are difficult to classify as they display great variability. The first criterion used for their classification was the correlation of the firing surface to the ground level. This led to the identification of two wide

3 Various analytical methods have been applied to the study of open fire features. For an exhaustive overview see Mentzer 2014 and also Aldeias et al 2016; Friesem 2018.

groups: A. above-ground structures and B. pit structures. In the case of type A structures the fire was set on, close to or occasionally higher than the soil surface. Clay structures with floors founded in shallow pits were also included in this category provided their use surface was placed on ground level. As type B structures we characterized all dug-out formations, pits or shallow depressions wherein fires were lit (Fig. 23.3).

The above-ground installations constitute the majority of the studied material. The first step taken for their classification was to group them into stone built (type A.1) and clay installations (type A.2), according to the prevalent material used for their construction. The clay structures were furthermore subdivided in single (type A.2.1) and multiple (type A.2.2) room structures. Based on specific technical traits, we finally proceeded with the discrimination of sub-groups (Fig. 23.3).

By adopting this typological scheme that is based on techno-morphological attributes, we tried to sidestep the eternal dilemma, hearth or oven, a choice that apparently conceals technological diversity and carries a latent functional predetermination. Furthermore, the proposed typology is potentially liable to extensions and additions of new categories and is susceptible to incorporating even poorly preserved installations.

23.4.2 Presentation of the archaeological assemblage

The EBA period is represented by 129 thermal structures, while the LBA by 70. The limited number of four structures attributed to the MBA allows only a few suggestions (Fig. 23.2, Tables 23.2-4). The quantitative distribution of the structures at each site per period is depicted in Fig. 23.4.

23.4.2.1 Non structured thermal features

Non structured fire features are extremely rare in EBA settlement contexts at Macedonia, since only one example has been so far reported. It comes from late EBA Armenochori and it consists of an accumulation of ashes found on an exterior space, probably sheltered, where a lot of animal bones were disposed (Chrysostomou 1998, 342). In the LBA, fire features remain equally rare, as only one probable example is reported from Final LBA Thessaloniki Toumba. It is described as a burnt stain on the floor III of room A3 with burnt sherds of cooking pots around (Karadimou 1999, 84).

23.4.2.2 Structured thermal features

A. Above ground structures

In the EBA period, the above-ground thermal structures correspond to 124 examples, forming thus 96% of the assemblage. The sub-group of the clay made features clearly constitutes the dominant trend of the period with

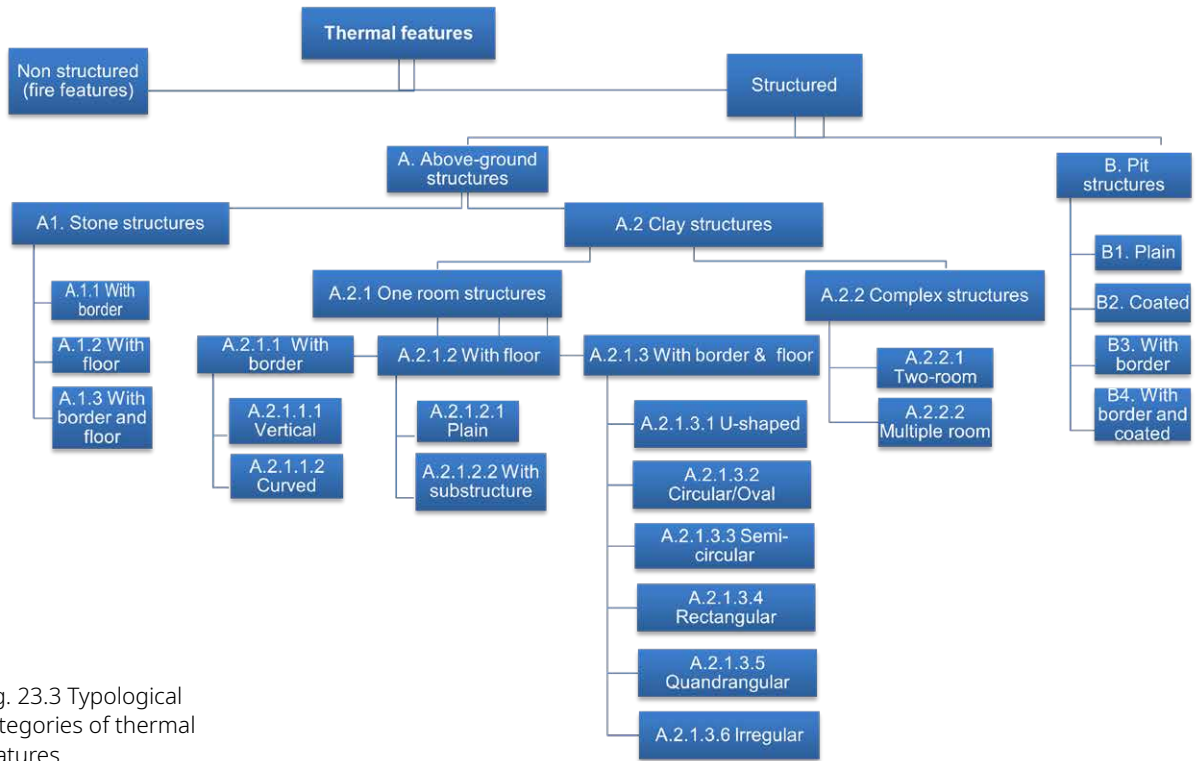


Fig. 23.3 Typological categories of thermal features.

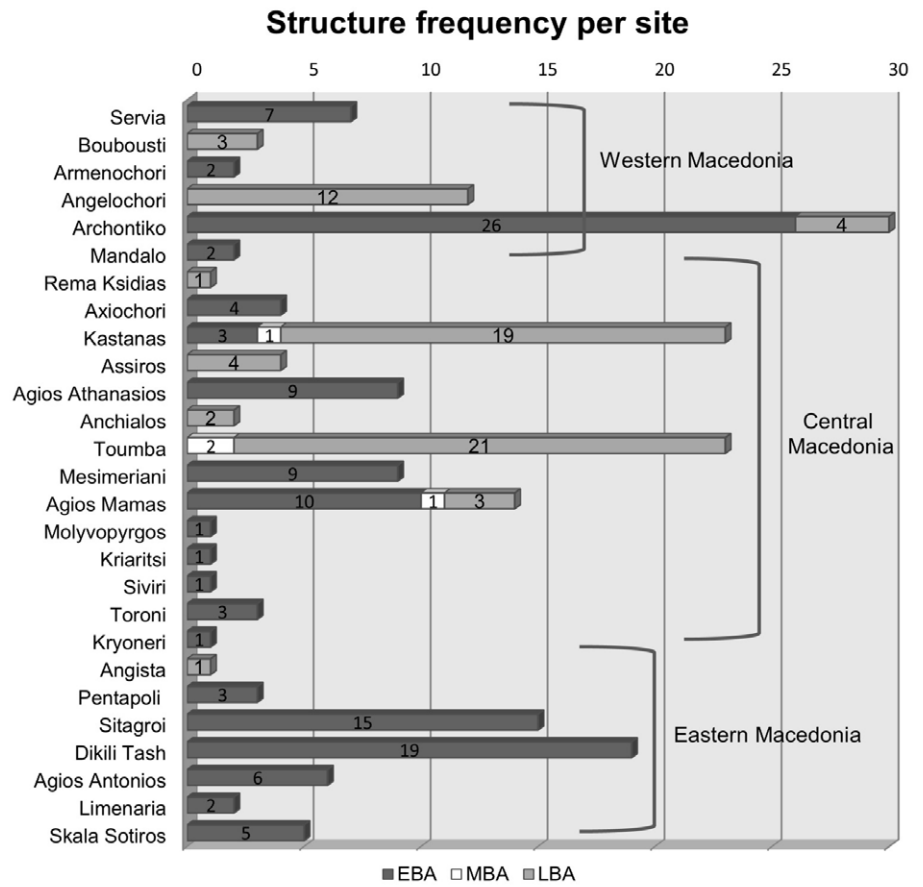


Fig. 23.4 Frequency distribution of thermal structures at individual sites per period.

Structure type			Total number			
A1. Stone structures	A.1.1 Structures with border	EBA	Vardaroftsa 5-7 (Heurtley and Hutchinson 1925/1926, 41, fig. 26-28), Mesimeriani 5 (Grammenos and Kotsos 2002, 128), Agios Mamas (Heurtley 1939, 5, fig. 5c), Kriaritsi (Asouhidou et al 2000, 333), Dikili Tash IIIA-B/S24-5 and R25-4 (Treuil 1992, 50, pl. 37A, Séfériadès 1983, 657), Agios Antonios (Papadopoulos et al 2011, 517-518, fig. 4), Limenaria (Malamidou and Papadopoulos 1997, 586, fig. 2)	11		
		LBA	Archontiko I (unpublished), Toumba Thessaloniki IV (Karadimou 1999, 70, 83, 122)	5		
	A.1.2 Structures with floor	EBA	Servia 9/ features PP, QQ and one in structure 2 (Heurtley 1939, 55, fig. 46; Mould and Wardle 2000, 60, 93)	3		
		LBA	Toumba Thessaloniki IV (Karadimou 1999, 57)	1		
	A.1.3 Structures with border and floor	EBA	Dikili Tash IIIB/ S24-1 and S24-2 (Treuil 1992, 29, 50, pl. 37C-D)	2		
A2. Clay structures/ A2.1 Single firing space	A.2.1.1 Structures with border	EBA	Sitagroi IV and V (Renfrew 1986, 187, 189, 191, 205, 208, 210 and pl. XX2, XXIV2 and XXIX3)	8		
		LBA	Kastanas V (Hänsel 1989, 183, fig. 67, 73, 74, pl. 25.2), Toumba Thessaloniki IV (Karadimou 1999, 157)	2		
	A.2.1.2 Structures with floor	EBA	Agios Athanasios 1-2/ E3, E10, E13 and E16 (Mavroidi 2012, 38-39, 55-56, 69, 76-77), Mesimeriani 4 (Grammenos and Kotsos 2002, 63)	5		
		MBA	Kastanas II (Aslanis 1985, 60, fig. 28)	1		
		LBA	Boubousti 1 (Heurtley 1939, 40), Kastanas V (Hänsel 1989, 176, fig. 70)	2		
	A.2.1.3 Structures with border and floor	EBA	U-shape	Servia 9 (Mould and Wardle 2000, 61, pl. 2.7a), Sitagroi Va/ oven 1 (Renfrew 1986, 191, fig. 8.12), Mesimeriani 3-4 (Grammenos and Kotsos 2002, 62, 75), Archontiko II-IV/ pk 1, 5, 6, 8, 9, 10, 19, 31, 32, 36, 58, 68, 69, 84, 90, 92 (Papadopoulou 2010, 167-172), Agios Mamas I (Hänsel and Aslanis 2010, 67-68, 76-78, 85), Kastanas Ia (Aslanis 1985, 56-57)	27	
			Circular	with entrance	Mesimeriani 5 (Grammenos and Kotsos 2002, 960), Agios Mamas I (Heurtley 1939, 5-7)	15
				without entrance	Mesimeriani 2 (Grammenos and Kotsos, 2002, 57-58), Agios Athanasios/ E2 (Mavroidi 2012, 55, 75-76, fig. 4), Agios Mamas I (Hänsel and Aslanis 2010, 67, 76), Armenochori 3 (Heurtley 1939, 59, fig. 55-56), Mandalo III (Pilali-Papasteriou et al 1986, 455), Kastanas Ia (Aslanis 1985, 24, fig. 8), Skala Sotiros (Papadopoulos et al 2007, 428, sx. 2), Dikili Tash IIIA/ T24-3 (Treuil 1992, 28, 50, pl. 37F).	
			Oval	with entrance	Archontiko IV/ pk 26 (Papadopoulou 2010, 214-215, 170, fig. 5.5, appendix I: pk 26)	5
		without entrance		Agios Athanasios 1 and 2/ E1, K7, E5 and one in space H3 (Mavroidi 2012, 39-40, 54-55, 68, 71)		
		Semi-circular	Mesimeriani 6 (Grammenos and Kotsos 2002, 101)	1		
		MBA	Circular	Agios Mamas II (Hänsel and Aslanis 2010, 141)	1	
		EBA	U-shape	Angelochoi II (Stefani 2010, 139-141 and fig. 4.2.13, 4.2.20, 4.2.7), Kastanas V (Hänsel 1989, 157-158 and fig. 55-56), Archontiko I (Papaefthymiou-Papanthimou and Pilali-Papasteriou 1994, 84, fig. 2), Anchialos (Tiverios 1992, 357-358 and fig.1), Toumba Thessaloniki IV (Andreou et al 2010, 360, fig. 1B)	7	
			Circular	with entrance	Boubousti 2 (Heurtley 1939, 43), Kastanas IV-V (Hänsel 1989, 111, 156-157, 183 and fig. 36, 55-57, 67, 73-74)	16
				without entrance	Agios Mamas IV (Hänsel and Aslanis 2010, 198), Boubousti 1 (Heurtley 1939, 40-43), Assiros 7 (Wardle 1987, 323), Thessaloniki Toumba IV (Andreou et al 2010, 360), Kastanas III-V (Hänsel 1989, 68, 81-82, 113, 143, 167, 165, 183)	
	Oval		with entrance	Angista (Koukouli-Chryssanthaki 1980, 56)	3	
			without entrance	Archontiko I (Papaefthymiou-Papanthimou and Pilali-Papasteriou 1994, 84, fig. 3), Kastanas V (Hänsel 1989, 165)		
	Semi-circular		Agios Mamas IV (Hänsel and Aslanis 2010, 218)	1		
	Rectangular/ Quadrangular	Agios Mamas IV (Hänsel and Aslanis 2010, 241, 247-248, plan on Beilage 8), Kastanas V (Hänsel 1989, 183, fig.73 and pl.25.1)	2			
	A2. Clay structures/ A2.2 Complex structures	A.2.2.1 Two-room structures	EBA	Archontiko III-IV/ pk 7, 11, 18, 25, 33, 46, 54, 66 (Papaefthymiou et al 2007, 142-143, Papadopoulou 2010, 172-174), Sitagroi Va/ oven 2 and Sitagroi Vb/ features C/D and G/H (Renfrew 1986, 187, 191, fig. 88, pl. XXI.1, XXX-XXXI), Dikili Tash IIIA/ 6-058 (Darcque et al 2021, 408)	12	
A.2.2.2 Multiple-room structures		EBA	Archontiko III/ pk 55 (Papadopoulou et al 2007, 80, fig. 3; Papadopoulou and Maniatis 2013, 114-115)	1		
B. Pit structures	B1. Plain pits	EBA	Dikili Tash IIIA/ 6-023, 6-024 (Darcque et al 2021, 408)	2		
	B2. Coated pits	EBA	Sitagroi IV (Renfrew 1986, 177)	1		
	B3. Pits with stones	EBA	Molyvopyrgos 2 (Heurtley 1939, 14-15)	1		
		LBA	Kastanas IV (Hänsel 1989, 125, pl. 15.1)	1		

Table 23.1 Typology of Bronze Age thermal structures from Macedonia.

EBA SITES	A. ABOVE-GROUND STRUCTURES									B. PIT STRUCTURES			TOTAL
	A.1 Stone structures			A.2 Clay structures						B.1	B.2	B.3	
	A.1.1.1	A.1.1.2	A.1.1.3	A.2.1.1	A.2.1.2	A.2.1.3	A.2.2.1	A.2.2.2	A.2Unclassified				
Agios Antonios	1					1			4				6
Agios Athanasios					4	5							9
Agios Mamas	1					9							10
Archontiko						17	8	1					26
Armenochoiri						1							1
Dikili Tash	2		2			2	1		10	2			19
Kastanas						2			1				3
Kryoneri									1				1
Kriaritsi	1												1
Limenaria	1								1				2
Mandalo						2							2
Mesimeriani	1				1	5			2				9
Molyvopyrgos												1	1
Pentapoli						2			1				3
Servia		3				2			2				7
Siviri									1				1
Sitagroi				8		1	3		2		1		15
Skala Sotiros						4			1				5
Toroni						1			2				3
Vardaroftsa	4												4
TOTAL	11	3	2	8	5	54	12	1	28	2	1	1	128

+1 Non-structured installation from Armenochoiri

Table 23.2 Typology of thermal structures at the Early Bronze Age sites.

MBA SITES	A. ABOVE-GROUND STRUCTURES				TOTAL
	A.2 Clay structures				
	A.2.1.1	A.2.1.2	A.2.1.3	A.2Unclassified	
Agios Mamas			1		1
Kastanas	1				1
Toumba				2	2
TOTAL	1	0	1	2	4

Table 23.3 Typology of thermal structures at the Middle Bronze Age sites.

LBA SITES	A. ABOVE-GROUND STRUCTURES								B. Pit structures			TOTAL	
	A.1 Stone structures			A.2 Clay structures					B.1	B.2	B.3		
	A.1.1.1	A.1.1.2	A.1.1.3	A.2.1.1	A.2.1.2	A.2.1.3	A.2Unclassified						
Agios Mamas						3							3
Anchialos						1	1						2
Angelohori						3	9						12
Angista						1							1
Archontiko	2					2							4
Assiros						3	1						4
Boubousti					1	2							3
Kastanas				1	1	14	2				1		19
Rema Ksidias							1						1
Toumba	3	1		1		5	10						20
TOTAL	5	1	0	2	2	34	24	0	0	1			69

+ 1 Non-structured installation from Toumba

Table 23.4 Typology of thermal structures at the Late Bronze Age sites.

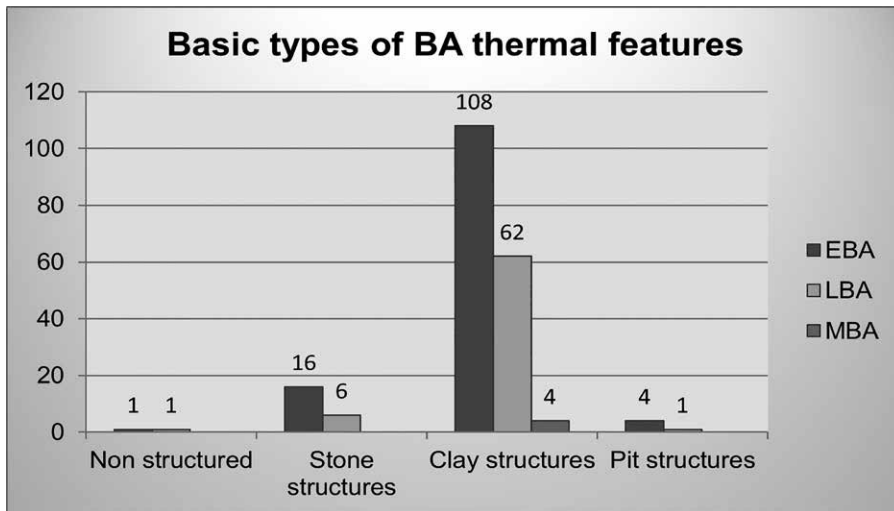


Fig. 23.5 Frequency of basic types of thermal structures in different Bronze Age periods.

108 examples, whereas only 16 belong to the stone built sub-group (Fig. 23.5).

Similar trends are also observed for the LBA period, as above-ground structures are by far the most numerous, being represented by 68 out of 69 structures (97%). As regards construction materials, only six specimens belong to the stone-built subgroup, while the rest (62) fall into the category of clay structures (Fig. 23.5).

A1. Stone structures

Hearths or ovens exclusively constructed of stone material are rare in EBA settlements (16), as they roughly represent 12% of the studied sample. In the LBA, their number diminishes further (6), reaching thus only the 9% (Fig. 23.6a-b).

In the stone-built structures stones are applied either to delineate the area around the fire or to form a paved surface where the fire is set. Generally, the stones are used unmodified and exhibit a variety of forms, ranging from rough stones, cobbles and pebbles to flat slabs. Unfortunately, we rarely encounter information about the type of the rock or the fire alterations it underwent. Tightly or loosely arranged, the stones are fixed as a rule without connective mortar, except probably for LBA Thessaloniki Toumba where clay is used. The techniques applied are simple and minimal, yet effective, as the stone border prohibits the dispersal of the charcoals and the paved or cobbled floor limits thermal losses and accumulates heat. Based on morphological features, three general types are detected:

A.1.1 Structures with stone border

This is the most popular stone-built category in the EBA (Fig. 23.7, Table 23.1). It consists of an earthen floor and a frame composed of one layer of stones set directly on the ground. The outline of the stone border may be circular (Mesimeriani, Dikili Tash), semi-circular (Agios Mamas), elliptical (Agios Antonios Potou), rectangular (Kriaritsi) or

irregular (Vardaroftsa) (Fig. 23.8a). Little can be said about their dimensions, as only in one case we have available information.⁴

Archontiko I (Early LBA) and Thessaloniki Toumba IV (Final LBA, Building A, rooms A2, A3 and A6, see Karadimou 1999, 70, 83, 122) offer the only LBA stone bordered fire installations (Fig. 23.7, Table 23.1). As in the EBA period, the border consists of stones, although in one case at Thessaloniki Toumba large sherds were also added. Their shapes were circular, semi-circular or irregular.

A.1.2. Structures with a stone floor

This particular type incorporates structures with paved floors and no framing (Fig. 23.7, Table 23.1). It is known from EBA Servia where two features (PP and QQ) consisting of a roughly circular floor with cobbles were found by Heurtley, while another one is reported from the later excavations (Mould and Wardle 2000, 60). Heurtley (1939, 55 and fig. 46) informs us that one of them was made of rough limestone blocks and measured 0.80m in diameter. Nearby, the bases of two cooking pots stood *in situ* and a pocket of soft black earth spread along (Fig. 23.8b). In our view, there is a high possibility that the PP and QQ features are the remnants of clay structures, namely the stone bedding of their floors which was originally covered with a clay plaster that was destroyed. After all, this technique was quite familiar to the inhabitants of EBA Servia (Mould and Wardle 2000, 60, 95).

For the LBA, only one stone floor structure is attested at Final LBA Thessaloniki Toumba IV (Fig. 23.7, Table 23.1). The discovered feature had a flat stone base covered by a white layer (ashes?) of oval shape (Karadimou 1999, 57).

⁴ This is Agios Antonios Potou, where the preserved structure measures 1.8 X 1.4m (Papadopoulos et al 2011, 517-518 and fig. 4).

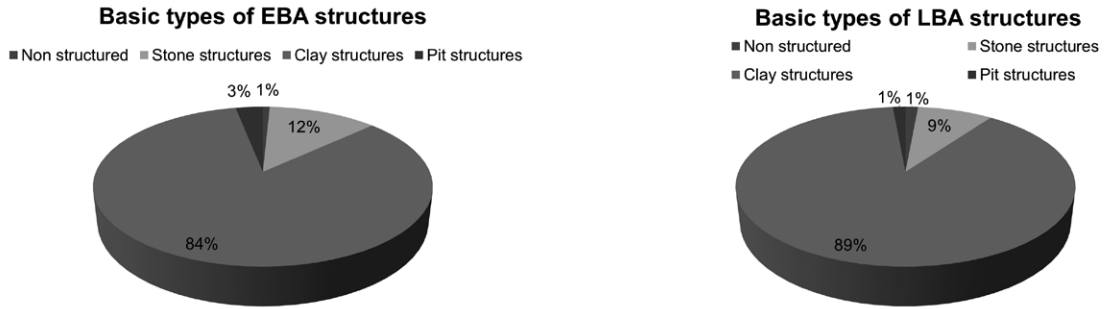


Fig. 23.6 Percentage of basic types of thermal structures. a in the Early Bronze Age; b in the Late Bronze Age period.

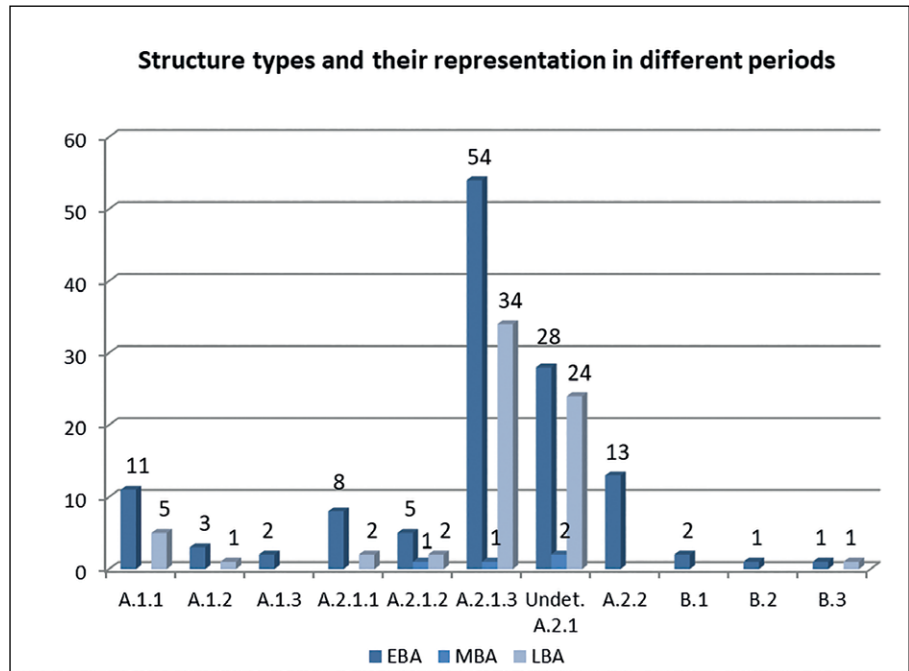


Fig. 23.7 Types of thermal structures and their representation in different Bronze Age periods.

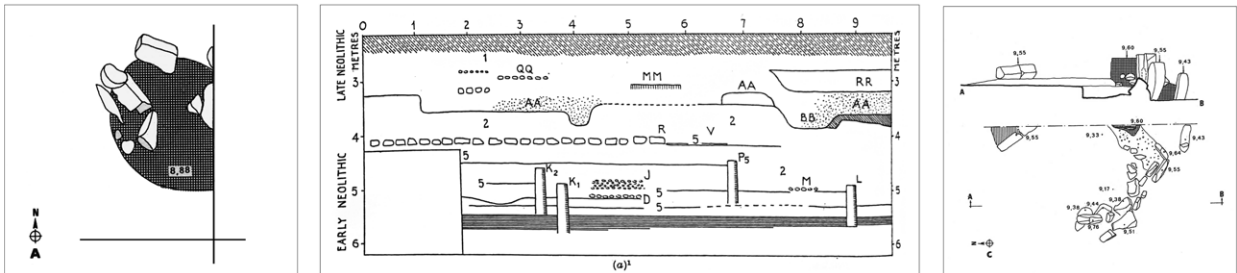


Fig. 23.8 Stone built thermal structures. a type A.1.1 from EBA Dikili Tash (S 24-2, after Treuil 1992, planche 37a); b type A.1.2 from EBA Servia (feature QQ in cross section, after Heurtley 1939, figure 46); c type A.1.3 from EBA Dikili Tash (S 24-2, after Treuil 1992, planche 37c).

A.1.3. Structures with a stone border and floor

The only two recorded examples of this type come from EBA Dikili Tash IIB (Fig. 23.7, Table 23.1). The first one (S24-1) consists of a more or less semi-circular stone border which was set around a layer of clay coated stones (1.10 x 0.70m), whereas the second one (S24-2) possesses a rim of stones, probably arranged in a rectangular plan, and a floor composed of stones (Treuil 1992, 29, 50, pl. 37C-D) (Fig. 23.8c).

A.2 Clay structures

During the BA, clay is the material used par excellence for the construction of the fire installations. The analyses conducted so far on their clay materials have revealed that the hearth/oven manufacturers practiced particular choices in order to develop clay recipes with specific qualities (Papadopoulou 2010, 192-202; Germain-Vallée et al 2011; Papadopoulou and Maniatis 2013; Prévost-Dermarkar 2019, 15-27, 42-45).

As far as the construction techniques are concerned, although they were more or less common over the vast area of Macedonia, they were applied freely, in different combinations and variations. For instance, the study of the floor construction methods in the EBA period has shown that in 95 out of the 108 clay structures the floors were founded on ground level and only in 9 cases they were set in a shallow pit (Mould and Wardle 2000, 61; Mavroidi 2012, 38-40, 54-56, 75-76; Treuil 1992, 29, 51). During the LBA period, however, all structures were founded on ground level.

The simplest floor version, attested in most BA sites, consists of a clay layer, a few centimeters thick that is occasionally burnished (Fig. 23.9a-b). Another floor variation, which is also quite common, is characterized by the presence of a sub-structure beneath the clay firing surface that enhances the thermal insulation properties of the installation. This sub-structure reveals great technical variability, as it may consist of a single or multiple layers of sherds, pebbles, slabs, packed clay or various combinations of these materials. Sometimes, ashes or sand may also be used (Fig. 23.9c-d). In the LBA, mudbricks make their appearance, as there is an oven sub-structure from Angelochori constructed of mudbricks, pebbles, sand and clay (Stefani 2010, 139-140, fig. 4.2.13). The sub-structures are usually founded on the ground and more rarely in a shallow pit. It is worth mentioning that in the EBA 8 out of the 9 floors characterized in publications as “underground”, actually had a sub-structure (Agios Athanasios, Dikili Tash). This pattern suggests that the pit is related to the sub-structure’s construction and it should not thus be connected, as it is sometimes erroneously done, to a subterranean functional mode of the structure.

The techniques applied for the construction of the walls are rarely reported. Nevertheless, it has been

possible to identify the use of the coil, the slab and the wattle-and-daub technique (Papadopoulou 2010, 204-209; Prévost-Dermarkar 2003, 218, 220-221). Of course, combinations of these different techniques may be applied for the fabrication of a singular structure. Throughout the course of the BA the two first techniques remained the prevalent modes of constructing clay structures (Fig. 23.10a). The wattle-and-daub technique, although it was known, it was used only occasionally. For example, at EBA Servia and Final LBA Kastanas, small post-holes probably represent a wattle frame that served as the supporting device for the vault’s clay covering (Mould and Wardle 2000, 61, 93; Hänsel 1989, 156-157, fig. 55-57, pl. 19.2).

The use of mudbrick for the construction of structure borders is extremely rare in the EBA. There is only one exceptional case at Torone, where mudbrick in combination with small stones composed a structure’s wall (Morris 2009/2010, 10, 13). Mudbricks become more common in the LBA, but still they remain rare, as we have recorded in total only five cases: two at Kastanas V (Hänsel 1989, 183, fig. 67, 72-74, pl. 25.2) and Assiros 7 (Wardle 1987, 323), respectively, and one at Thessaloniki Toumba IV (Karadimou 1999, 147) (Fig. 23.10b).

In the EBA period the clay structures are represented by 108 examples, corresponding to 84% of the assemblage. Their vast majority, namely 95, concerns single firing space installations, whereas eleven (13) specimens display more complex articulation and more than one structural compartment. All MBA and the majority of the LBA fire installations are made of clay and belong to the single space type (Fig. 23.5).

A.2.1. Structures with a single firing space

Three basic types have been identified based on the presence or absence of a clay border and clay floor (Fig. 23.3). However, a considerable number of structures (54), namely 33.5%, was not possible to be classified in more detailed groups due to the lack of published information or because of the structure’s poor preservation state (Fig. 23.7).

The layout of most of the EBA unclassified structures is unknown, except for eight that were of circular or oval outline. There is no information on the presence of a border, while almost half of them disposed a floor sub-layer. The unclassified MBA data come from Thessaloniki Toumba. In the trench 032, opened at the western slope of the tell, excavations recovered probable outdoor spaces with firing installations along with finds related to cooking and food consumption (phase 12 and 9) or to artisanal activities (phase 11) (Veropoulidou 2011, 351-352, Veropoulidou et al 2005, 180-181, fig. 2). Although, there are references to kilns, a small oven and a hearth, there are no descriptions of their forms

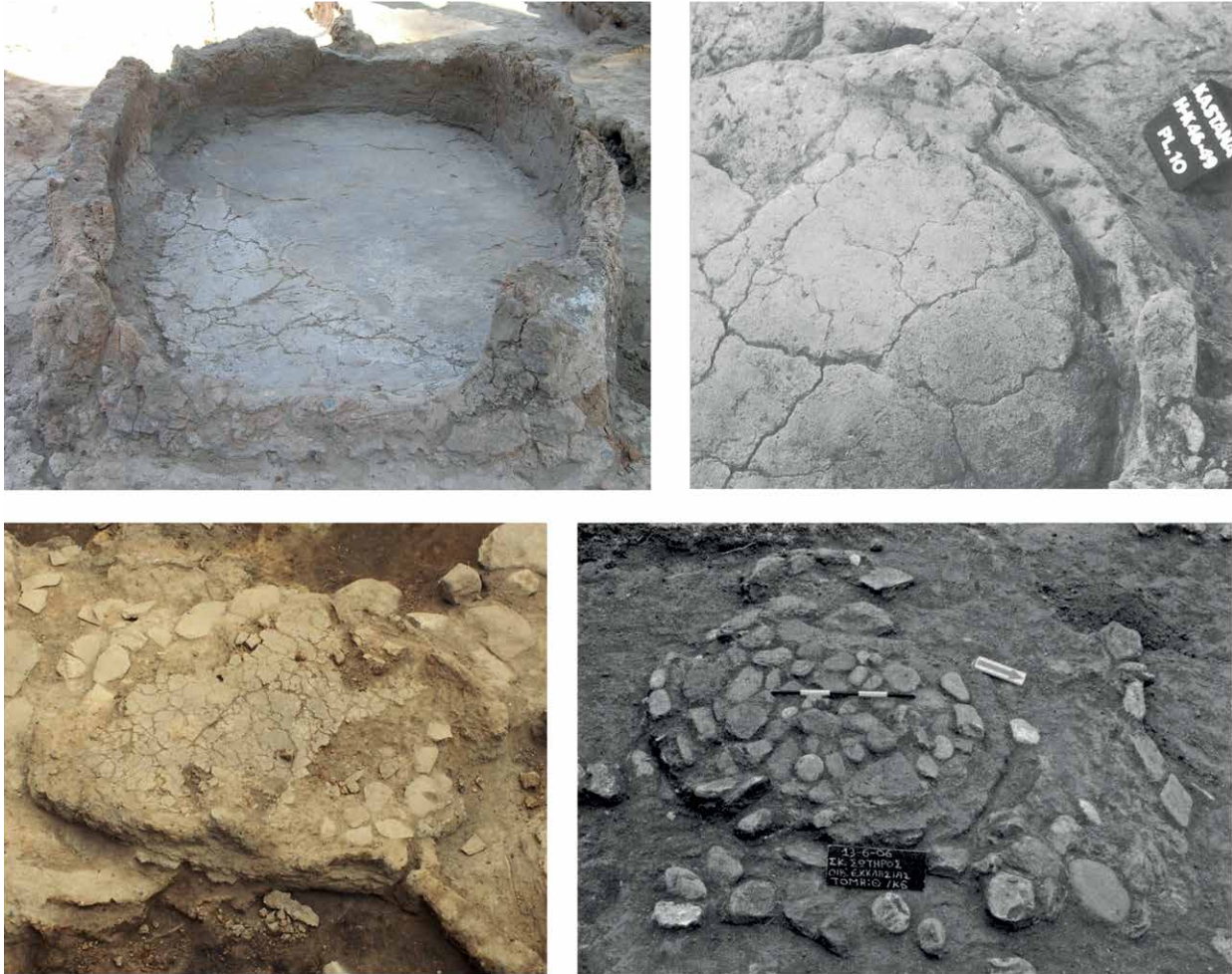


Fig. 23.9 Construction details from clay structures' floors. a upper surface of a burnished clay floor from EBA Archontiko (pk 31); b LBA Kastanas (layer 13, Ofenhalle, after Hänsel 1989, Tafel 20.1); c floor sub-layer consisting of sherds, EBA Archontiko (pk 68); d floor sub-layer with pebbles, flat stones and sherds from EBA Skala Sotiros (after Papadopoulos 2007, figure 5).

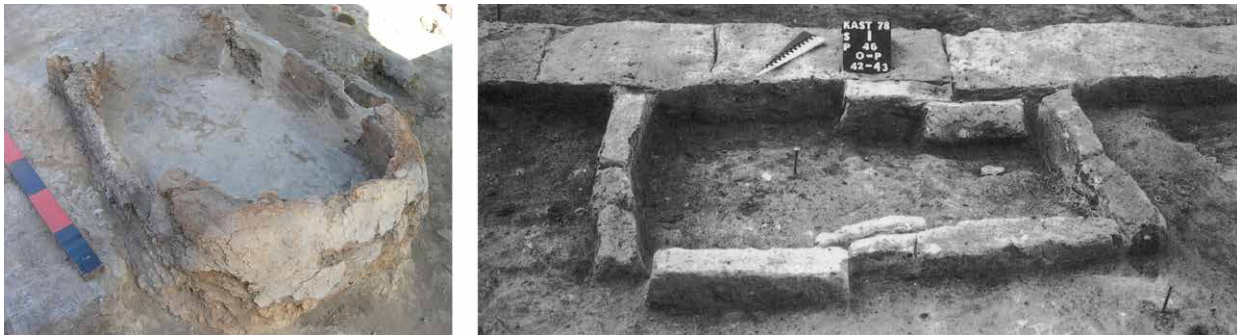


Fig. 23.10 Construction details from clay structures' walls. a the walls were formed from adjoined slabs of clay set in two superimposed rows and then their surfaces, both interior and exterior, were covered with plaster. EBA Archontiko (pk 36); b mudbrick used for the construction of the structure's frame. LBA Kastanas (layer 12, Nordhof, after Hänsel 1989, Tafel 20.3).

and construction techniques. The unclassified LBA clay structures are characterized by a variety of shapes with the circular being the most common (Fig. 23.7).

A.2.1.1 Structures with a clay border

Structures disposing only a border are rare in EBA and LBA contexts alike (8 and 5% respectively). All EBA examples come from Sitagroi IV and V (Renfrew 1986, 187, 189, 191, 205, 208, 210 and pl. XX2, XXIV2 and XXIX3) (Fig. 23.7, Table 23.1). This structure variety, described by Renfrew as hearth ridge, is “simply a linear feature some 40cm long and rising about 15cm above the level of the floor” (Renfrew 1986, 187) (Fig. 23.11a-b).

In the LBA, only two structures with a clay border have been identified (Fig. 23.7, Table 23.1). At Kastanas V, at a semi-roofed space of “Nordhof” (layer 12) and in contact with a wall, a rectangular hearth (1.2x0.8m) was formed by a vertical border built of mudbricks (Hänsel 1989, 183, fig. 67, 73, 74, pl. 25.2) (Fig. 23.10b). The other feature comes from Thessaloniki Toumba IV and concerns a rectangular structure found in Building A (room A11, hearth 2, 1.1x0.8m, see Karadimou 1999, 157).

A.2.1.2 Structures with a clay floor

This subgroup consists of thermal features that disposed only a flat floor surface and had no border and is attested in very few BA sites (Fig. 23.7, Table 23.1).

In the EBA, borderless structures constitute 5% of the assemblage. Their shape is either circular, as in Agios Athanasios (E3, E10, E13 and E16) where diameters range from 0.63m to 1.1m and floors have a sherd sub-layer commonly founded in pits (Mavroidi 2012, 38-39, 55-56, 69, 76-77), or rectangular, as in Mesimeriani, where a 5cm thick clay layer was laid on the ground (Grammenos and Kotsos 2002, 63).

MBA Kastanas offers a single example, recovered in layer 22a and consisting of a clay floor 1.10x0.90m large (Aslanis 1985, 60, fig. 28) (Fig. 23.11c).

In the LBA, there are two examples (3%). The first was found in Platania (Boubousti) and it is described as a clay floor 0.04m thick, circular in plan with a 1m diameter (Heurtley 1939, 40). The second is a circular clay floor, 1.4m in diameter, located in room 1 of the “Haupthaus” of Kastanas V (layer 12) (Hänsel 1989, 176, fig. 70).

A.2.1.3 Structures with a clay border and floor

This is the largest category of BA single room clay structures, comprising 89 items, 55%. Specifically, the EBA assemblage counts 54 examples (57%), the MBA one and the LBA 34 (55%) (Fig. 23.7, Table 23.1). This group presents great morphological diversity and, therefore, sub-types have been identified based on the plan form,

the wall profile (straight or incurved) and the floor’s construction technique (with or without substructure).

In the EBA period, 23 out of the 54 installations had some kind of substructure at their floor, whereas for 13 there is evidence that their walls were curved.⁵ It is noteworthy that almost all of the structures with incurved rims had a U-shaped plan, except for three that were circular/oval. As far as the plan shapes are concerned the U-shaped is the most common with 27 examples, followed by the circular with 15, the oval with 5 and the semi-circular with one. In six cases poor preservation did not allow the identification of its form (Fig. 23.12). Of the 28 installations that exhibit a frontal entrance, the 26 belong to the U-shaped plan and the other two are circular and oval.

It becomes apparent that the prevalent type during the EBA is the U-shaped structure with a frontal opening for fuel loading and an inward curved border (Table 23.1, Fig. 23.13a).⁶ At nine examples a sub-structure reinforced the clay floor.⁷ The U-shaped features shown in the Fig. 23.14 diagram are medium-sized.

The structures with circular/oval plans are subdivided in two groups (Table 23.1). The first group includes three specimens equipped with a frontal opening (Fig. 23.13b). Due to this configuration, but also because of their overall construction details and dimensions, these features resemble the U-shaped structures and should be considered as a variant of this type. The second group contains 17 circular/oval features that were fully enclosed by a clay rim (Fig. 23.13c). In most cases there is no explicit information about the profile of the walls, since usually a few centimetres are preserved.⁸ At 11 examples the floor possesses a sub-structure, with sherds being the most frequent construction material. At Agios Athanasios, the floor is either laid in a pit or on the ground.⁹ The diameters of the structures range between 0.40 to 1.20m.

- 5 Incurved rims are attested at Archontiko (Papadopoulou 2010, see appendix I for pk 5, 19, 26, 31, 36, 58), Mesimeriani (the oven of the “Burnt House” and one structure at level 5 in trench III, see Grammenos and Kotsos 2002, 62, 96), Sitagroi Va (oven 1 of the “Burnt House”, see Renfrew 1986, 191) and Agios Mamas (two structures in “Haus 1” and one in “Haus 2”, see Hänsel and Aslanis 2010, 67-68, 76-78). Here, we include also the so-called “potter’s kiln” that Heurtley (1939, 5-7) reports from Agios Mamas. We believe that it was rather a cooking feature, since it bears a great resemblance to the EBA ovens revealed at the latest excavations at the settlement, e.g. the oven in the “Haus 3” (Hänsel and Aslanis 2010, 85).
- 6 The inclination was possible to be identified only in the well-preserved cases, where the walls were standing at a height of 0.20-0.30m.
- 7 This number is probably higher, since in some well-preserved features their floors were not tested with sections for sub-layers.
- 8 An exceptional example is reported at “Haus 2” Agios Mamas. It had a low rim, 0.10m thick, on which three circular depressions were formed (diam. 0.20m) for placing pots.
- 9 These variations correspond to the types A1 and B of Agios Athanasios (Mavroidi 2012, 75-77).

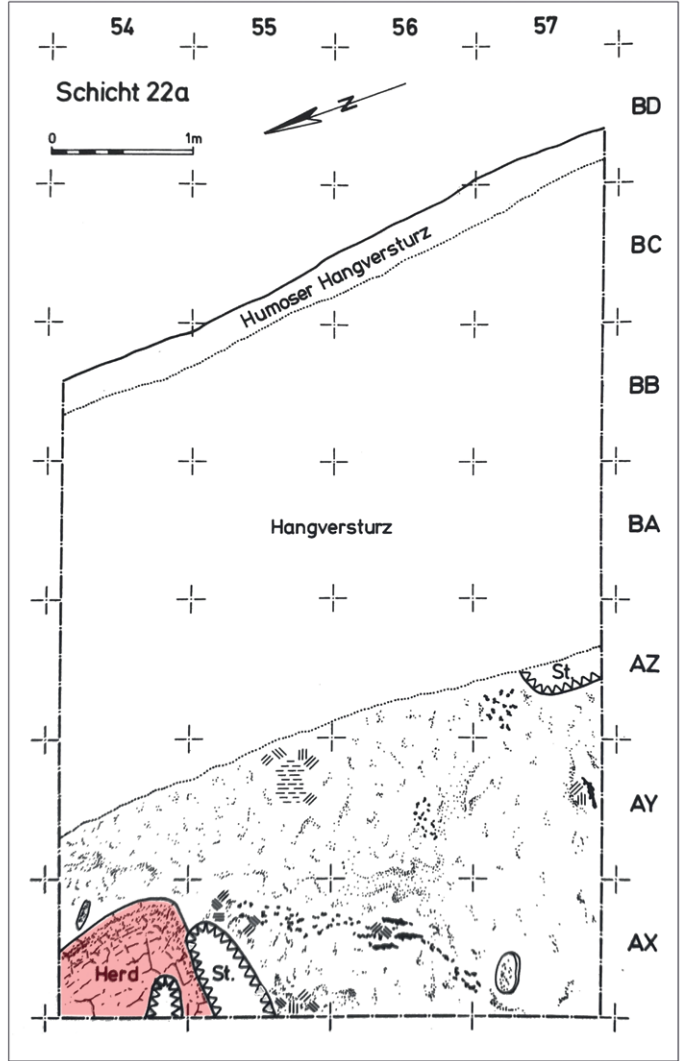
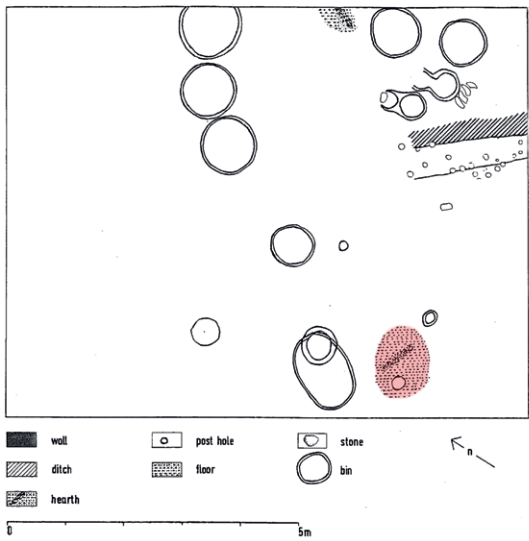


Fig. 23.11 Various types of clay structures. a type A.2.1.1 from EBA Sitagroi (Burnt house, after Renfrew 1986, plate XXIX); b from EBA Sitagroi (Bin Complex, after Renfrew 1986, figure 8.8); c type A.2.1.2 from MBA Kastanas (layer 22a, after Aslanis 1985, Abbildung 28).

Plan shape of BA thermal structures (type A.2.1.3.)

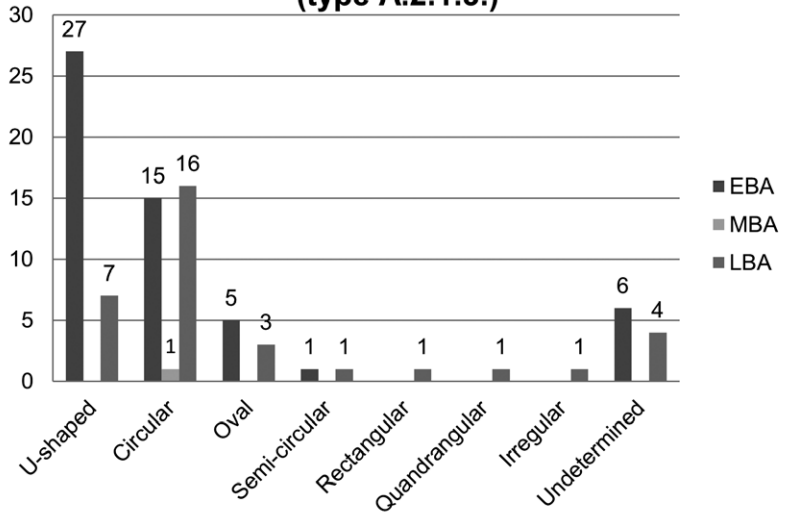


Fig. 23.12 Plan shape of the type A.2.1.3 structures in different Bronze Age periods.



Fig. 23.13 EBA clay structures of type A.2.1.3 with: a U-shape plan from Archontiko (pk 19); b oval plan and frontal opening from Archontiko (pk 26); c circular plan without opening from Agios Mamas (house 1, after Hänsel and Aslanis 2010, Abbildung 24).

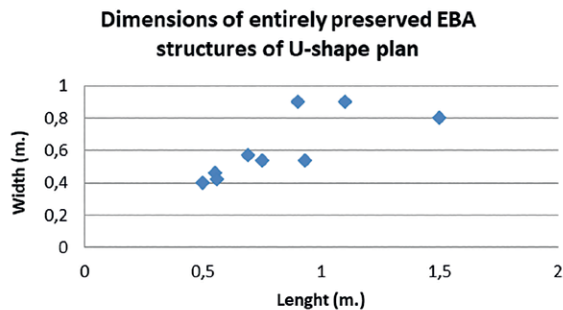


Fig. 23.14 Dimensions of entirely preserved EBA clay structures of U-shape plan.

Finally, a semi-circular structure with a clay floor is mentioned at Mesimeriani 6 (Grammenos and Kotsos 2002, 101).

The MBA period is represented by only one circular clay structure that comes from MH II Agios Mamas (layer 15, North complex, Raum 1) (Table 23.1). It consists of a clay floor 4cm thick that was enclosed by a low clay rim (Hänsel and Aslanis 2010, 141).

In the LBA, the clay structure assemblage is more limited than the EBA one (Fig. 23.7). Nine out of the 34 recorded examples have a floor sub-structure, whereas nine show evidence of curved walls.¹⁰ The most common plan is the circular plan with 16 examples, followed by the U-shaped plan with seven, the oval with three, and finally the semi-circular, the rectangular and the quadrangular plan each with one example (Table 23.1, Fig. 23.12). A frontal opening is attested at 13 cases of which seven

10 Curved borders are attested at Platania/Boubousti 1-2 (Heurtley 1939, 40-43 and fig. 40.3, 41-43), Angelochori II (Stefani 2010, 139-141 and fig. 4.2.13, 4.2.20, 4.2.7), Kastanas V (Hänsel et al 1989, 156-157, 183 and fig. 55-57, Pl. 19.2, 20, 25.1), Toumba Thessaloniki (Andreou et al 2010, 360) and Angista (Koukouli-Chryssanthaki 1980, 56).

have a U-shaped plan, four are circular, one is oval and another rectangular.

The U-shaped type with frontal opening is also found in the LBA but in lower frequency (seven examples, see Table 23.1 and Fig. 23.15a-b). In two cases a sub-structure was found. Actually, at Angelochori II an elevated platform made of pebbles, sand, clay and mudbricks is reported in one example (Stefani 2010, 139-140 and fig. 4.2.13, 4.2.20). The size of these structures remains modest (Fig. 23.16).

The circular/oval plan structures are the most frequent LBA type. As with the EBA assemblage we distinguished two sub-groups (Table 23.1). The first one is represented by five structures with frontal opening and curved rims (Fig. 23.15b). Their diameters oscillate between 0.8 to 1.5m, while the oval example measures 1X0.8m. Two have a floor sub-structure. The second sub-group, without frontal opening, counts 13 installations. Little explicit information exists on the walls' form.¹¹ A pebble sub-structure is observed in two cases and a mixture of sherds and pebbles in another. For circular constructions, the diameters range from 0.5m to 1.3m, while for the oval structures, the length measures 0.9m and the width 0.8m.

Two rectangular/quadrangular structures are recorded at Kastanas V and Agios Mamas IV. The first one is 0.75 X 0.7m, while the second one 1.3 X 0.6m. Finally, one semi-circular structure is mentioned at advanced LBA Agios Mamas in layer 6 (Hänsel and Aslanis 2010, 218) (Table 23.1).

A.2.2. Complex structures

Clay structures with multiple compartments appear during the EBA. A two-room installation (type A.2.2.1), referred to here as the "Archontiko type", is attested at Archontiko III-IV,

11 An original construction detail is reported from Boubousti 1 where part of a structure's border, preserved 0.70m high, consisted of a great pithos sherd. Also, fragments of "griddles" and bones were found on its floor (Heurtley 1939, 40-43 and fig. 41).

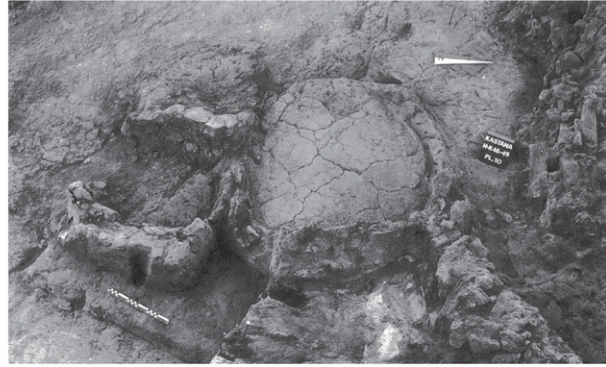


Fig. 23.15 LBA clay structures of type A.2.1.3 with: a U-shape plan from Anchialos (after Tiverios 1992, figure 1); b U-shape plan on the left and circular with entrance on the right from Kastanas (layer 13, Ofenhalle, after Hänsel 1989, Tafel 25.2).

Fig. 23.16 Dimensions of EBA and LBA clay structures of U-shape plan.

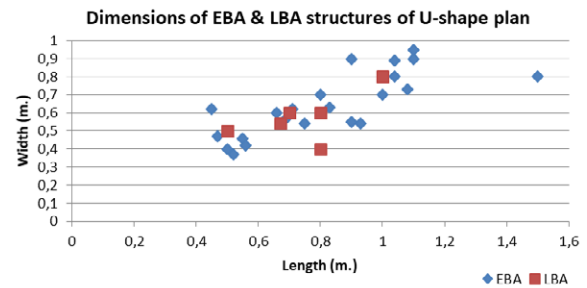


Fig. 23.17 EBA complex thermal structures with two rooms (type A.2.2.1) from: a Archontiko (pk 25); b Sitagroi (Bin complex, feature C/D, after Renfrew 1986, plate XXI.1); c with multiple rooms (type A.2.2.2) from Archontiko (pk 55).



Sitagroi Va-b¹² and possibly at Dikili Tash IIIA (Darcque et al 2021) (Fig. 23.17a-b). The type is well known from eight examples at Archontiko III-IV, of which one is almost fully preserved. It is composed of two discrete communicating parts, a U-shaped firing chamber and a cylindrical baking space. A hole at the back of the firing chamber permits the hot airs of the combustion to enter the baking room, whereas another hole at the side of the latter facilitates the air flow or the release of some substance. In some structures, a small circular casing is attached just below

the lateral hole. The mean dimensions of the Archontiko structures are 0.55 X 0.36m (Papaefthymiou et al 2007, 142-143, Papadopoulou 2010, 172-174).

Archontiko III offers us, finally, another peculiar type of thermal installation with multiple compartments (type A.2.2.2, Fig. 23.17c). It is oblong in plan (1.26m X 0.23-0.29m) and composed of two parallel, slightly converging clay walls. At one end the walls probably formed a small combustion space, while at the other they flanked a 0.10m diameter hole in the ground, surrounded at its rim with complete or fragmentary grinding stones that suffered burning. On top of the walls a small piece of clay floor suggests that the structure had also a second level (Papadopoulou et al 2007, 80, fig. 3; Papadopoulou and Maniatis 2013, 114-115).

12 After the Archontiko finds the oven 2 of the “Burnt House” and the features C/D and G/H of the “Bin complex” should be revised as two-room thermal structures (Renfrew 1986, 187, 191, fig. 88, pl. XXI.1, XXX-XXXI).

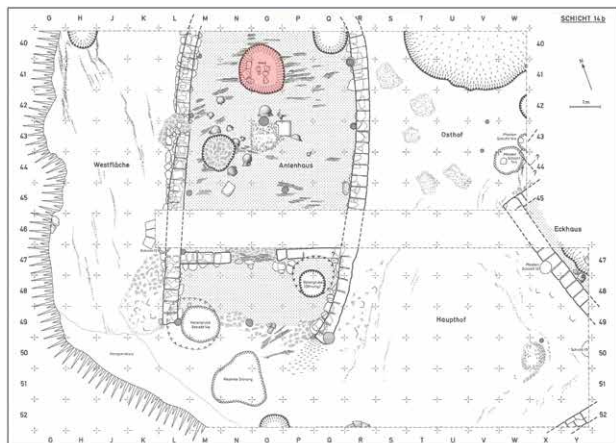


Fig. 23.18 Pit structures: a type B.1 from EBA Dikili Tash (6-023); b type B.3 from LBA Kastanas (after Hänsel 1989, Plan 12).

B. Pit structures

Fire pits seem not to be popular in the BA period. As their distinction from other kinds of pits, for e.g. rubbish pits, is not always easy, we believe that their original number was higher (Fig. 23.5, Table 23.1).

The EBA examples have been recovered at Sitagroi IV (Renfrew 1986, 177), Dikili Tash IIIA (Darcque et al 2021) and Molyvopyrgos 2 (Heurtley 1939, 14-15). In the first two sites the pits come from early EBA levels and they were circular in plan with their diameters ranging from 0.25 to 1.1m. The two shallow pits from Dikili Tash (6-023, 6-024) had their bottom rubified and contained ashes (type B1) (Fig. 23.18a), while the small pit from Sitagroi was coated with burnt clay (type B2). The pit from Molyvopyrgos is oval, bowl-shaped in profile and much larger, 2X1m and 0.40m deep (type B3). It was lined internally with stones set in clay and filled with a greasy deposit of black ash and charcoal, mixed with sherds and a few animal bones.

The only known LBA fire pit is recorded from the early LH IIIC “Antenhaus” of Kastanas IV (layer 14b) (Fig. 23.18b). A circular pit, 1.5m in diameter and filled with fine ashes, was found near the house’s apse. It was flat bottomed and in the centre some stones were arranged in two parallel rows (Hänsel 1989, 125, pl. 15.1).

23.5 Discussion: reconstructing cooking techniques in Bronze Age northern Greece

The emerging picture resulting from the analysis of the thermal features of northern Greece reveals a great morphological variety across the BA, a fact that implies inter-site variability, imaginative technological inventions and diversity in cooking methods. Nonetheless, the prevalent construction material is clay, a trend probably inherited from the Neolithic and widely adopted across the region in the BA. Following the intriguing thought that the thermal structures are suggestive of diversified and

intricate culinary traditions, we will engage then in an effort to reveal aspects of these traditions by associating each structure type with possible functional modes and cooking techniques.

Stone built installations are generally rare and their number gradually decreases from the Early to the Late Bronze Age. With measurements generally lacking, it is safe to say that their diameter ranges between 0.50-1m and specimens over 1m are rare. They appear in roofed and open spaces alike. Equally impressive is also the scarcity of the non-structured fire features. This fact may be partially a result of the incomplete or preliminary nature of the publication record and/or of the fragile character of the features’ material remains.

Stone hearths and fire structures are both related to open fires and therefore, they can be linked to various procedures of direct or indirect cooking. In most sites stone hearths co-exist with clay structures. This pattern may suggest a diversified or complementary use. Open hearths serve also for heating and providing light when in indoor areas.

Underground fire structures are scarce. It is highly probable, however, that some pits with indications of burning and ashes or charcoal in their filling deposits, published as of undetermined use, were in fact destined for cooking. A dug-out structure may serve as a hearth or as an oven. In the first case, the fire burns in the pit and on its rim grills or spits can be placed for roasting. Alternatively, pots may be placed in the hearth on top of stones, stands or tripods. This was probably the case with the Final LBA hearth at the “Antenhaus” of Kastanas. The two parallel rows of lined up stones in the pit may have supported some of the cooking pots found nearby, such as handled deep pots and shallow pans (Hänsel 1989, 128, fig. 45; Hochstetter 1984, fig. 44-45).

In the case of the pit oven, the foodstuffs could have been rolled up in leaves, animal skins or other protective materials and then placed in the preheated pit and covered

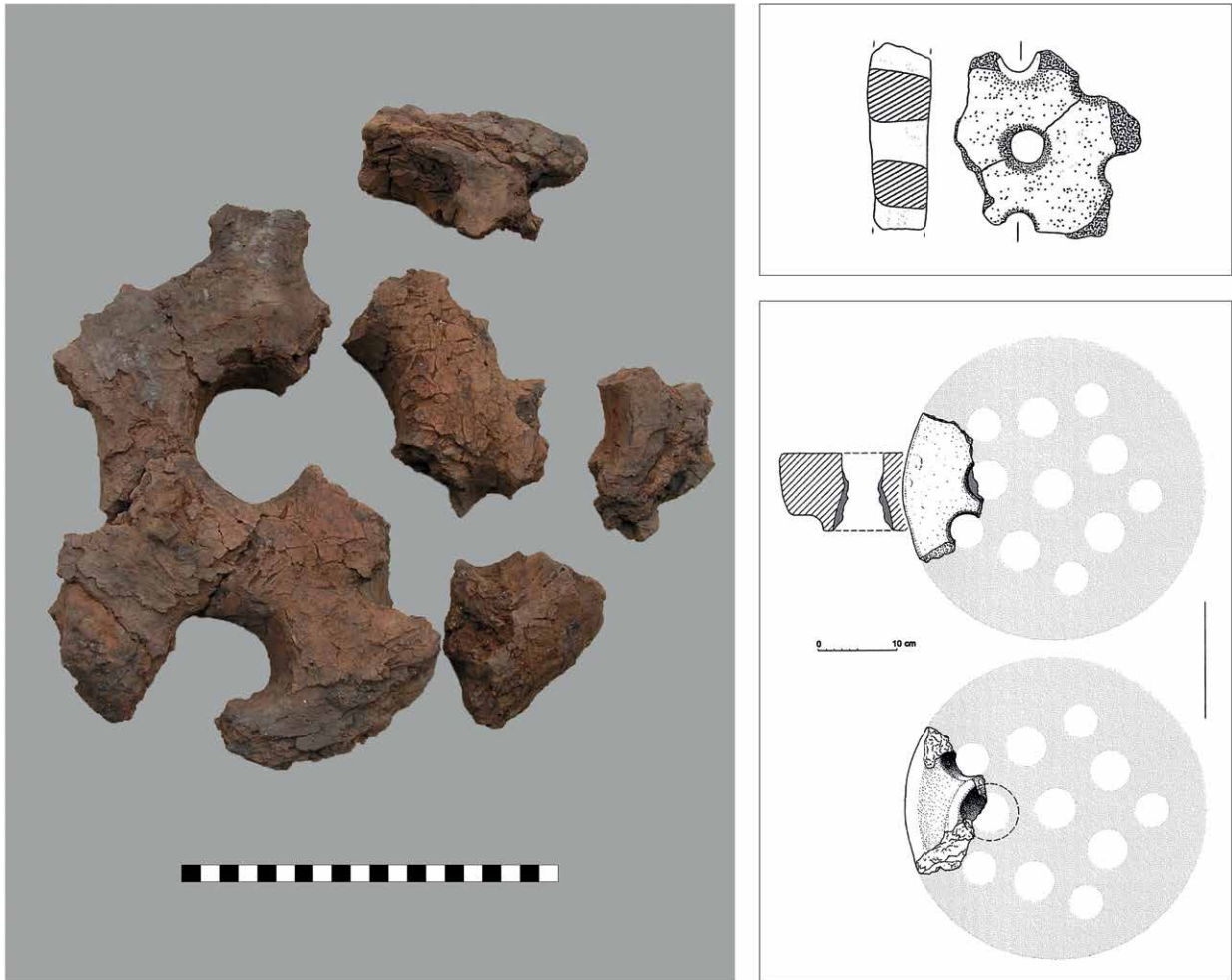


Fig. 23.19 Fragments of portable grills. a EBA Archontiko. The fragmented grill was found inside a U-shaped structure (pk 19); b Kastanas. The piece comes from a fill separating the EBA and MBA layers (after Aslanis 1985, Tafel 80.13); c EBA Agios Mamas. The grill fragment was retrieved from the debris of a U-shaped structure in house 3 (after Hänsel and Aslanis 2010, Abbildung 40).

with charcoals and earth. Sometimes stones are added in the oven in order to enhance its thermal efficiency (Papadopoulou and Prévost-Dermarkar 2007, 125). In this way the foods are slowly baked in a closed, humid environment, a technique known today in Greece as “kleftiko”. The large, stone lined pit at EBA Molyvopyrgos was probably used likewise.

The clay thermal structures display more technical sophistication than their stone and pit counterparts. The first type (A.2.1.1) is solely composed of a clay border and is attested only at EBA Sitagroi and advanced LBA Kastanas. Technically, the border protects the fire zone from air drafts, diminishes accidents of fuel dispersal and directs the heat. The low linear rims of Sitagroi however are difficult to interpret, as they seem to be placed in the middle of the firing zone. At Kastanas the border is upright and rectangular in plan, forming a hearth

that functioned next to the two U-shaped installations. Overall, rectangular shapes appear to be rather avoided in thermal structures. Although such shapes would have been appropriate for delimiting the combustion area, they would have been inconvenient for direct support of cooking vessels.

The second type (A.2.1.2) of single room clay features is characterized by the presence of a constructed floor that assures insulation from the ground and stores heat. A great disadvantage though is the absence of a protective surrounding screen that probably accounts for the limited dispersion of this type. Almost all examples, regardless of time period, are circular with the exception of one rectangular structure at EBA Mesimeriani.

The third type (A.2.1.3) of clay structure with 89 specimens is the most popular throughout the BA and technically the most efficient as it is equipped with a border



Fig. 23.20 Ethnographic examples of U-shaped hearths where cooking is conducted with pots or pans. a-b India, top row (©Wikimedia Commons, credit photo to: a Aurobinda Dutta; b Shivya at wts wikivoyage) c Ethiopia, bottom row, left (©Wikimedia Commons, credit photo to: Rod Waddington) d Mexico, bottom row, right (©Wikimedia Commons, credit photo to: Thelmadatter)

and an insulating floor. In the EBA the most frequent type is the U-shaped structure with the incurved walls and the frontal opening (Fig. 23.13a). The formation of the upper part of the walls is a critical technical matter, since it differentiates the function of the structure. A wide opening defines the feature as a hearth, while a small ventilation opening transforms it into an oven. Evidence that supports the first scenario comes from Archontiko IV where it was possible, with the help of reassembled clay fragments, to reconstruct an opening at the top of the clay structure (pilokataskevi) registered as pk19. Pieces of a portable grill that were found lying on the structure's floor confirm the presence of the opening and furthermore suggest that its diameter was around 0.30m (Papadopoulou 2010, 256 and fig. 7.2-7.4) (Fig. 23.19a). Fragments of similar clay grills are also reported at Kastanas II in layer 20 (Aslanis 1985, 129, Tafel 80.13 and 129.11), at EBA Agios Mamas (Hänsel and Aslanis 2010, 76-77) and at MBA Toumba Thessaloniki (Veropoulidou 2011, 351) (Fig. 23.19b-c). The limited size of the frontal entrance is another indication suggestive of

an open and not domed setup. With an average width of 0.26m it is rather inconvenient for inserting foods and pots into the structure.¹³

The U-shaped hearths and their limited circular variant are ideal for supporting cooking vessels and hence, for the preparation of dishes, such as soups, gruels and stews. The vessel sits safely on the hearth's rims with large part of its body immersed in the hearth, while the cook can easily control the cooking temperature by adding or removing fuel from the frontal opening (Fig. 23.20). The shapes and dimensions of the BA cooking pots, as well as evidence of fire traces (see Dimoula et al this volume), comply with the morphology of this hearth type, supporting the suggested arrangement of a pot placed on a hearth's rim.

13 The average width was measured from 13 EBA structures from Agios Mamas and Archontiko. The height of the entrance is known only in three cases: EBA Agios Mamas (0.10m) and Archontiko (0.15m) and LBA Anchialos (0.17m) (Hänsel and Aslanis 2010, 67; Papadopoulou 2010, 214; Tiverios 1992, 357).

Cooking pots of the EBA and MBA are generally deep and open with a narrow base and handles or lugs below their rim. They are medium or large in size, with their heights varying between 16-46 cm and the rim diameters between 16-40 cm, occasionally exceeding these dimensions. In the course of the LBA cooking pots are characterized by more rounded body shapes and narrower mouths, whereas their bases are not exclusively flat, but frequently curved, requiring a sort of support to be placed over the fire. The pot dimensions again vary, 15-45cm for height and 15-50cm for rim diameter. Moreover, systematic study of fire traces on the cooking pots from Archontiko supports the hypothesis of their use over the upper opening of hearths (Deliopoulos et al 2011 for phases III-I; Dimoula et al 2022b for phase IV), corroborated by experimental results (Dimoula et al 2020). Finally, there is an example from Agios Mamas I, where a deep flat based cooking pot with handles and lugs, which contained some liquid food, was found fallen from the U-shaped hearth of House 1 at the site (Hänsel and Aslanis 2010, 73, fig. 44.3).

Several other cooking methods, such as grilling, roasting, parching or frying can be also achieved with the use of ancillary appliances, namely clay grills and pans, placed on the hearths we have identified. Shallow baking pans, or cooking dishes, of large diameter are encountered at many BA sites, while in the EBA they commonly have a series of perforations below the rim (see Dimoula et al 2022). Their bases are usually flat, especially of the pierced examples, but occasionally curved. Their average diameter could be estimated to 40cm and the height 5-10cm, but there are also much larger specimens e.g. a pan from Servia with d. over 60cm, (Wijnen et al 1979, 223, fig. 17). They commonly have fire traces on the rough exterior surface and very rarely in the smoothed interior. Such vessels could be placed among charcoals in hearths, or on stands or even over the rim of a hearth (Fig. 23.20b and d). The latter arrangement was probably attested at Boubousti 1, where Heurtley (1939, 40-43) claims to have found bones and fragments of “griddles” on the floor of a circular, high rimmed hearth.

The multi-functional U-shaped/oval hearths with entrance diminish in the LBA (Table 23.1). At the same time however, we notice that the circular structures increase in number (Fig. 23.12). Circular/elliptical or even rectangular fire installations, especially when their dimensions are large, demand some supporting device for the vessel in order to be at safe distance from the fire and to heat evenly. Stones are the simplest solution to the problem, as of course various types of portable stands. Interestingly, it is during the LBA period that elevated cooking pots are diffused in the region of Macedonia (see Dimoula et al this volume). Legged pots, such as tripods that are widely used in southern Greece, are only sporadically attested in the region, particularly in coastal sites e.g. in Pieria or Chalikidiki (see Dimoula et al 2022c). However, another type of vessel, the “pyraunos”, with a stand attached to its body makes its appearance in

the MBA and is adopted in almost all LBA sites (see Dimoula et al this volume, Figs 21.16a, 21.17, 21.19c). This type of cooker can be placed directly above charcoals or burning fires. In the LBA, its use spreads geographically, and at the same time hearths enclosed with vertical rims increase, a trend that probably suggests interlinked phenomena. The absence of pyrauna from EBA sites¹⁴ is another clue in favor of this hypothesis, since the U-shaped/oval hearths with the upper opening served the vessel's support.

Although, the favorite EBA U-shaped hearth was never abandoned, LBA cooks turned to new fashions and enriched their kitchen gear. Why then adopt a new technical mode? The obvious advantage of “pyraunos” is that it allows cooking in any place, being portable and its deep body is ideal for liquid foods and stews, in various quantities, the largest ones reaching the capacity of 30 l. Visible organic residues at Early LBA “pyraunoi” at Archontiko are rare and randomly dispersed at their interior, a pattern that does not support boiling at least of fatty foods (Deliopoulos et al 2011, 227-228). In contrast, the “pyraunoi” from LBA Angelochori preserve visible organic residues in the interior, both the bottom and the walls. Their analysis has indicated the preparation of liquid dishes (Dimoula et al 2022b).

LBA developments in cooking facilities and pottery may be linked to the increasing variety of plant food ingredients consumed during that period in northern Greece. A new plant food ingredient, millet, related perhaps to specific culinary identities as it was a foreign cereal until the LBA in the region, might have required different ways of preparation and along with its introduction in the region, new food cooking techniques might have also been introduced. The hypothetical association of “pyraunos”, a fusion cooking facility between a hearth and pot, may be linked to the arrival of millet in SE Europe, a hypothesis that needs to be tested on a large body of evidence with the support of residue analyses (for a discussion see Valamoti 2016).

An issue that arises from the data analysis and deserves further discussion is the difficulty of identifying vaulted ovens at the BA assemblages. Domed ovens are reported in the publications with the structure's layout, the entrance and the curved walls being the basic criteria for their identification. As we have stressed though, the same principles apply also for a particular BA hearth type. Since there is not yet an entirely preserved or at least a reconstructed dome from wall fragments, we lack solid evidence of fully covered structures. Preservation conditions are not in their favor, but this fact accounts for our difficulty in recognizing them rather than proves their complete absence from the archaeological record.

In all probability, ovens are hidden in the numerous unclassified examples and/or in the group of the U-shaped/

14 One “pyraunos” is reported by Aslanis (1985, Tafel 88.2) from EBA Vardaroftsa 4, but this is probably intrusive.

oval hearths with entrance. In the latter case, one has to seek for possible candidates in the few larger sized examples of the category that measure more than 1m in length or in the cases where a wooden frame was used for the construction of the walls. However, U-shaped structures are overall of modest size (their average maximal length is 0.72m and their width 0.64m)¹⁵, providing thus a small baking space. Supposing were they closed by a dome, their baking chamber would be accessible by the narrow frontal entrance. Hence, baking seems inconvenient in these small structures, a hypothesis verified also experimentally with an oven model of this form (Papadopoulou 2010, 321-322). An alternative suggestion would be to interpret the U-shaped/oval structures as multifunctional devices, serving as both hearths and ovens with some minor adjustments. However, cooking experiments conducted on U-shaped hearths reconstructed according to the Archontiko finds have demonstrated that bread baking in their firing box by tightly closing the top and front opening was not successful (Papadopoulou 2010, 316-318, Papadopoulou 2022). Nevertheless, it is possible that other foods requiring less cooking time and/or lower temperatures might have been prepared, a hypothesis that needs to be researched experimentally in the future.

The EBA period is characterized by the presence of complex cooking structures (A.2.2). The two types (A.2.2.1 and A.2.2.2) that have been so far identified, despite their enigmatic function¹⁶, suggest that EBA cooks developed sophisticated constructions for special thermal processing purposes. As we have seen, this tradition appears to have fallen out of use by the LBA communities of northern Greece.

A final issue of discussion is the spatial distribution of the various structure types in the settlements of BA Macedonia. The organization of these features in settlement settings, the search for local trends or the ways the different structure types co-exist at each site are matters that deserve a separate study. So, in the present paper only some general observations will be made. First, it appears that some sites exhibit high numbers of structures, as for instance Archontiko (26), Dikili Tash (19) and Sitagroi (15) in the EBA and Toumba (21) and Kastanas (19) in the LBA (Fig. 23.4). This first glance view needs to be checked in the future by considering factors, such as preservation conditions, the extent of the excavated surfaces, the nature of the deposits and the spaces. Secondly, most sites, both EBA and LBA, show structure variability on the intra-settlement level. This phenomenon is depicted in Tables 23.2-4 which list the different types encountered at each site. Thus, an interesting issue of further inquiry is the

spatial relationships and combinations of these different types as well as the specific settings where they were constructed. Lastly, any patterns observed as regards the distribution of cooking structures in habitation settings should be interpreted with caution. In the past, the placement of Bronze Age cooking installations in roofed domestic spaces was considered as an indication of a more “introvert” household engaged in social antagonisms and expressing rupture with reciprocity ties that were thought to be prevalent in Neolithic times (Halstead 1999). In the EBA, domestic settings are characterized by a higher frequency and diversity of thermal structures. At some tell sites, they are found concentrated inside domestic spaces (e.g. Archontiko, Mesimeriani, Agios Mamas and Sitagroi Va), whereas in other cases they are present at both indoor or outdoor settings (Servia, Agios Athanasios, Limenaria). Therefore, spatial patterns of cooking installations need not be generalized, as they are linked to various parameters, such as, for example, the type and temporality of the cooking activity and the overall equipment it involves, the settlement type and its architectural tradition, the extent and nature of the excavated deposits. Future research should concentrate on these issues in order to better understand domestic cooking activities in Bronze Age Macedonia and their social implications.

23.6 Conclusions

To summarize, we would like to highlight certain observations that emerged from the study of the thermal features in BA northern Greece. First of all, it should be stressed that both EBA and LBA communities share the same technological asset in the construction modes and in the morphology of the thermal structures. Hence, the basic EBA types, the U-shaped/oval structures with entrance and the circular/oval structures with vertical border survive well into the LBA. A noticeable exception though is the disappearance of the two-room features in the LBA and also the occurrence, albeit rare, of the rectangular structures. The construction techniques remain more or less the same, despite the occasional use of mudbricks in the LBA. With clay structures taking the lead, other types of cooking installations, such as the stone fireplaces or the fire pits were used sporadically in both periods.

The traced differences between the EBA and LBA repertoire of thermal structures are indicative of diverse preferences in structure types rather than of discontinuities and technological breaks. So, in the LBA circular/oval structures with border sidestep the U-shaped/oval structures with entrance and become more fashionable. Another element that is certainly impressive is the higher number of cooking installations in the EBA over the LBA settlements, an observation that needs further evaluation in the future under the light of parameters, such as the excavated size of the sites, the nature of their deposits and, of course, the

15 The measurements include also the wall thickness and were collected from 29 examples.

16 For suggestions about the operation of these structures, see Papaefthymiou et al 2007, 142-143; Papadopoulou and Maniatis 2013, 121.

changes in the spatial organization of habitation as large residential-blocks make their appearance in the LBA. Nonetheless, the data reveal differences of scale between EBA and LBA thermal structures and diverse choices, which appear to be linked with other parallel changes in the kitchen field, especially in the ceramic repertoire. We believe that in the LBA the wide diffusion of “pyraunos”, namely a portable hearth, is possibly accountable for the lower frequency of fire installations in this period as well as for the more restricted use of the U-shaped structures. A question for future research, in order to better understand this trend, would be to study the relationships of the portable “pyraunoi” with the fire installations at settlement spaces¹⁷. Even more puzzling are the reasons that triggered this cooking fashion. One should turn for plausible answers to the wider changes taking place, with the passage from the EBA to the LBA, in the dietary regime (e.g. the appearance of broomcorn millet, decrease in game, more intensive crop production) (Nitsch et al 2017), in food storage management (supra-household hoarding) as well as in the social realm (formation of large co-residential groups).

Cooking methods in both periods were diverse. Even on the settlement level we observed the parallel use of various forms of thermal structures. Boiling, simmering, stewing and steaming were achieved in cooking vessels placed directly or indirectly on the various hearth types and open fires or in “pyraunoi”. Grilling with the help of clay grills, wooden spits or sticks was another option as well as the low thermal treatment for specialized food processing, perhaps smoking (Papadopoulou 2022) or brewing (Valamoti 2018) that was practiced in the “Archontiko type” structures. The evidence for baking is more complicated, as baking ovens are difficult to identify. Some large U-shape/oval features, however, were probably used for that purpose. Wide rimmed pans are another possible means for baking.

The present research reveals the dynamic of thermal installations in studying cooking technology. At the same time it stresses the need to approach past cuisines as an ensemble through combined researches. Certainly, a lot of questions still remain to be explored, as for instance the organization of cooking in EBA and LBA domestic spaces, the combinations of different fire structures at the intra-site level, the relationship between kitchen ingredients and cooking technologies or the social contexts of cooking. Undeniably, there is a lot of work to be done in the field and a lot of new things to be learnt. We believe that our study will contribute towards future, integrated investigations of Bronze Age culinary practices in northern Greece and beyond.

17 E.g. the study of MBA-LBA cooking pottery from the region of Pieria has shown that in these sites “pyraunoi” were generally found in exterior spaces (Dimoula et al 2022c).

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