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Sociocultural dimensions of production, use, and circulation of Late Neolithic pottery from southern Balkans

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Archaeology

by

Gazmend Elezi

2020

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ABSTRACT OF THE DISSERTATION

Sociocultural dimensions of production, use, and circulation

of Late Neolithic pottery from southern Balkans

by

Gazmend Elezi

Doctor of Philosophy in Archaeology

University of California, Los Angeles

Professor Sarah P. Morris, Co-Chair

Professor John K. Papadopoulos, Co-Chair

Pottery is the most common archaeological material recorded in large quantities at the excavation of the Neolithic sites in the Aegean and the Balkans. Thus, it comprises the best proxy to understand the Late Neolithic communities in the southern Balkans, especially prehistoric technology, daily life practices, human-object interactions, and local or regional contacts. Despite the attention that the Neolithic pottery has received in previous publications, its social dimensions have been poorly studied in Albania. The current dissertation approaches such aspects by exploring the sociocultural journey of the ceramic assemblages in Korçë region in southeastern Albania as they traverse various itineraries from the manufacture and use to cross-site circulation. This research adopts a holistic, interdisciplinary approach combining contemporary theoretical perspectives, traditional recording techniques, and a multianalytic approach.

My research views the sociocultural dimensions of the pottery as dynamic interactions between humans and vessels, interhuman relationships, and cross-site or interregional contacts providing a narrative told by vessels as they move from one social practice to another. It perceives technological choices as practices that emerge through the interaction of tradition, relationship with the material world, and cross-site contacts. The study considers the active role of the Neolithic Pottery in the southern Balkans beyond functionality and identity negotiation, imposing through its attributes such as size and shape, specific behaviors of the residents regarding their use, and the interaction with other members of their community. This approach also assigns an active role to ceramic assemblages in local or regional contacts putting the communities of potters at the center of such connections since they facilitate the circulation of technologies and raw materials. As links or boundary objects, potters and ceramic technologies bring together social groups from different sites and regions, shaping and maintaining interregional communication channels in southeastern Albania. The participation of potters within such networks plays an essential role in the local and regional patterns of ceramic tradition in the Late Neolithic period in the region of Korçë and the southern Balkans.

The dissertation of Gazmend Elezi is approved

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University of California, Los Angeles

2020

To Evri and Kristi

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2019 Elezi, Gazmend. “Analysis of ceramic assemblages” Paper presented at Shire-UCLA Archaeological Field School, Shire, Ethiopia, December 6.

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2019 Elezi, Gazmend. “Manufacture of Late Neolithic pottery from the southern Balkans: an integrative approach”, Paper presented at 84^{th} Annual Meeting of the Society for American Archaeology, Albuquerque, NM, April 10-14.

2018 Elezi, Gazmend. “Construction, Use, and Repair of the Late Neolithic Pottery from Albania” Paper presented at Cotsen Institute of Archaeology, April 18^{th}.

2015 Urem-Kotsou D., Papadakou T., Papaioannou A., Silva T., Elezi G.,Saridaki N., T. Dimula and Kotsakis K. “Different ways of crafting a Pot: variation in techniques in Neolithic potters in northern Greece”. Oral presentation at the EAA 20th Annual Meeting. Istanbul, September 2014.

Publications (abridged)

In press Elezi, Gazmend. “Manufacture and Use of the Late Neolithic Pottery from SE Albania”, Paper presented at Research in the Prehistoric Archaeology, Maliq, Albania, November 12-13.

In press Hasa, Ergys, Gazmend Elezi, and Vanessa Muros. “Graphite-painted pottery in Albania”. Proceedings of the Research in the Prehistoric Archaeology Conference, Maliq, Albania, November 12-13, 2018.

2020 Elezi, Gazmend. “By the river they settled: settlement pattern and the Neolithic Landscape of Albania”. In Making Places into Places. The North Aegean, the Balkans and Western Anatolia in the Neolithic, Edited by D. Urem-Kotsou, N. Tasic and M. Buric, BAR International Series.

2019 Elezi, Gazmend, Kostas Kotsakis, and Maria Pappa
“Keramiki apo ton Neolithiko oikismo stin Thermi Thessalonikis”. Archaeological excavations in Macedonia and Thrace 2015. AEMTH 28: 529-538. In Greek.

2018 Urem-Kotsou, D., A. Dimoula, G. Elezi, T. Papadakou, A. Papaioannou, N. Saridaki, I. Siamidou, T. Silva, Tzemopoulou, E. and K. Kotsakis
“Patterns in Contemporaneous Ceramic Traditions: Inter-Regional Relations between Thessaly and Macedonia during the Early and Middle Neolithic.” In Communities, Landscapes and Interaction in Neolithic Greece, edited by A. Sarris, E. Kalogiropoulou, T. Kalayici, and E. Krimali, Ann Arbor, MI: International Monographs in Prehistory: Archaeological Series no 20: 324-338.

1. Introduction

As a synthetic material per se, pottery is heavily manipulated by humans since the beginning of its journey, with all the manufacturing sequences from the procurement of the raw material and the preparation of the paste through building and finishing to firing, resulting in a drastic and irreversible transformation like few other objects. Simultaneously, against these human actions, the material world in the form of the properties of the ceramic clay, inclusions, and firing process, resist. Thus, the vessels are a product of the interaction between potters and the material world. This interaction will characterize the entire journey of a vessel. Used in a vast range of social activities, from the mundane to spiritual ones, pottery is engaged in an overly complicated relationship with humans. This tangled relationship and their abundance in the archaeological layers have elevated pottery vessels as the best proxies to study past societies, especially in the periods that go deep into the past, such as the Neolithic. Ceramic vessels have been present in most of the social activities that have taken place in a Neolithic settlement in the southern Balkans. The interaction between Neolithic inhabitants and ceramic vessels is multidimensional and multicontextual since they were used for a variety of reasons, such as to prepare, store, and consume food, either at an individual or a communal scale. Ceramic vessels were also markers of individual, local, or regional Neolithic identities, carriers of various ritual activities, and containers where the remains of ancestors were laid to rest. Neolithic vessels were also repaired and exchanged, although in limited quantities. Many of the aspects of such an entanglement are well known in the Aegean and the Balkans due to intensive research conducted in the 20th century. However, our knowledge about Neolithic communities in modern-day Albania is poor, and this part of the puzzle is still missing. Despite the abundance of ceramic sherds in archaeological excavations, the study of pottery for understanding Neolithic communities in

Albania has been limited, as it was mostly focused on identifying chronological and geographical cultural groups. The study of the Neolithic pottery focused exclusively on morphological and decorative aspects of the vessels, which is evident not only in the excavation reports but also in the two main monographs published for this period (Korkuti 2010; Prendi and Bunguri 2014). Research on technology remained for decades on the level of macroscopic observations of the fabric inclusions, wall thickness, and surface treatment. The research has only recently included analytical approaches to investigate the petrographic and chemical profile or identify the pigments used for painting decoration of the Neolithic vessels in southeastern Albania (Ndreçka 2018; Ruzi 2013). Other aspects of pottery manufacture and their social implications are still poorly studied. Approaches of the function, on the other hand, remains even today unrepresented in the Neolithic research, while vessels are perceived just as utilitarian tools. Therefore, systematic approaches to Neolithic daily life and the engagement of vessels in these activities were left out of ceramic studies for many decades mainly because of the political and ideological objectives of the academic and research strategy set by the dictatorial regime during the second half of the 20th century (Korkuti 1987; Bejko 1996)

Similarly, the intra- and inter-regional contacts during the Late Neolithic period and the role of pottery within such networks are poorly studied. A few recent publications have pointed out that during the late Neolithic period, goods, artifacts, and settlements were involved in an extended network of exchange (Hasa, Elezi, and Muros in press; Korkuti 2010; Prendi 1982; Prendi and Bunguri 2018; Ruka et al. 2019). The Neolithic communities were likely involved in regional and interregional exchange through the land in the east and maritime routes westward as shown by the presence of obsidian tools from Melos in the Aegean and Lipari in the Tyrrhenian Sea, or the identification of bitumen originated from south Albania neolithic potsherds in the southern part of the Italian peninsula (Ruka et al. 2019; Pennetta et al. 2020). The role of pottery in such interactions remains understudied. Scholars have explained pottery similarities among Late Neolithic sites in southeastern Albania through cultural groups that share morphological and decorative attributes. Thus, the similarities and differences of the pottery reflect the geographical or chronological limits of these groups. The presence of decorative elements from adjacent regions like Thessaly or western Macedonia in north Greece, for example, have been considered as a result of interregional contacts (Korkuti 2010, 201-3, 208; Lera 2009; Prendi 1972; Prendi and Bunguri 2014, 234-40). Heavily influenced by the culture-history tradition and the borders of the moderns states in the region, such approaches provide a misleading picture of the interactions in the Late Neolithic southern Balkans. Such approaches, which have dominated the Neolithic research in Albania and the entire Balkans, view pottery just as a representative of these groups or contacts giving it a passive role in shaping the landscape of interactions in the region.

Aiming to understand the daily life of the Late Neolithic communities, regional interactions, and the role of pottery in these social practices, my research for the current dissertation approaches the ceramic assemblages in southeastern Albania from a holistic perspective. It uses a multidimensional, interdisciplinary, and multianalitic approach to explore the sociocultural journey of the pottery through its manufacture, use, and circulation. The research focuses on pottery manufacture to explore the technological strategies made by the potters and identify potential intra- and cross-site patterns of similarities or variations. In turn, these technological patterns, along with identifying circulated vessels and raw materials, will provide insight into the arrangement of regional networks of contact and the role of pottery in them. The study approaches the use of vessels to understand the interactions between people and pottery as they are engaged in various social practices and how such relationships shape the way people perform their daily activities.

Figure 1.1. Map of southern Balkans showing the main regions and the Neolithic sites mentioned in the text. Map provided courtesy of C. Oberweiler and edited by the author.

My project focuses on three Neolithic settlements, Maliq, Kamnik, and Kallamas in the Korçë region in southeast Albania, as well as Dimini, Thessaly, in Greece. Compared to the rest of the country, the region of Korçë has been crucial for studying the Neolithic period due to the intensity of research in the area and a large number of excavated sites (Figure 1.1; Prendi 1976; Korkuti 2010). This project focuses on the ceramic assemblages of Maliq and Kamnik because these are type sites: their pottery has been used to establish the relative chronology of the Late Neolithic period in Albania (Prendi 1966; Prendi and Aliu 1971). Kamnik is also an excellent example for exploring Neolithic ceramic production. It seems to be a specialized production site suggested by the presence of several intensively used ceramic kilns, inside of which were found intact vessels (Aliu and Jubani 1969). Kallamas, in contrast, apart from being recently and systematically excavated, is the only site in southeastern Albania with a complete series of radiocarbon dates from the Middle and Late Neolithic period (Oberweiler, Touchais, and Lera 2017).

All three settlements also provide insights into the interregional interactions and the role of pottery in these contacts. Based on the preliminary publication of the sites, the pottery of Maliq has more in common with Kamnik, while it is geographically closer to Kallamas. In all three sites, the possibility of imported vessels from Thessaly, a region 300 km away in northern Greece, has been noted (Prendi 1982, Prendi 2008, Lera 2011). At Kamnik, scholars have mentioned the presence of 'classical' Dimini pottery (Prendi and Aliu 1971, Prendi 1971). This is the reason why my research focuses on the pottery from Dimini, particularly the painted categories, including the brown-on-cream vessels, which comprise a distinctive decorative group produced at the site and circulated in the region (Hitsiou 2013; Souvatzi 2008; Tsountas 1908; Vlachos 2009). Evidence for Neolithic interregional contacts and the participation of the sites in southeastern Albania has been recently identified from the study of obsidian tools originating from the island of Melos in the Aegean (Ruka et al. 2019).

Consequently, the study of ceramic assemblages from these settlements is a unique opportunity for a holistic interdisciplinarity approach that will provide insight into the sociocultural dimensions of manufacture, use, and circulation of the Late Neolithic pottery in the southern Balkans. Its results will advance the knowledge about the manufacturing techniques and will offer new evidence about the Late Neolithic pottery traditions in southeastern Albania. The research on the use of the vessels will create the first dataset available for future studies on such a topic in the region. It will also provide an alternative perspective on the study of vessel use and the interaction with people as they perform their daily activities. Similarly, my research suggests a new interpretative framework of the Late Neolithic regional contacts in southern Balkans, putting at the center the pottery and the communities of potters, while it will provide new data on the circulation of technologies, raw materials, and vessels.

1.1 Outline of dissertation

The dissertation contains nine chapters organized around three thematic subjects: the first provides a theoretical, methodological, and archaeological framework; the second focuses on data analysis; the third discusses the results and conclusions. As a holistic, interdisciplinary approach, this work balances archaeological visual-macroscopic recording and interpretation of ceramic assemblages with scientific methods, and they are sometimes combined in the same chapter.

Along with the order of the work, Chapter 1 provides a brief introduction to the topic focusing on the archaeological issue that it is trying to approach and the reason why it was chosen.

Chapter 2 presents a historical review of ceramic studies and discusses the theoretical and methodological directions of the research. The historical review elaborated in the first section follows the main theoretical phases of the discipline of archaeology. The narrative comprises snapshots of the trends of ceramic analyses regarding classification, technology, use, and distribution. The second part introduces the general theoretical framework of the approach, referring to the main element of each perspective. The chapter concludes by presenting the methodologies utilized for this study organized into visual observation and recording, and analytical techniques.

Organized in four sections, Chapter 3 compares the archaeological research and data of the Late Neolithic period in different regions in the southern Balkans. It first defines the chronological and geographic frame of the study, which roughly includes the period between 5500 and 4500 BCE in southeastern Albania, northern Greece, as well as Pelagonia and the Ohrid region in North Macedonia. The next two sections summarize the history of prehistoric research in these areas, followed by a discussion on settlement patterns and architectural elements. The last part focuses on the ceramic assemblages, comparing the morphological and decorative regional patterns.

Chapter 4 provides a comprehensive review of the archaeological context of the three sites in southeastern Albania, Maliq, Kamnik, and Kallamas, and the ceramic material being studied. Each section presents the history of research and provides information about settlement patterns, architecture, pottery, and other archaeological records. The last part of the chapter also discusses the results of the sorting, typological, and stylistic classification of the ceramic assemblage from the Late Neolithic layers in Kallamas produced for this dissertation project.

Chapter 5 deals with the visual-macroscopic observation of traces on the surface of potsherds that reveal information about pottery manufacture technology. It presents the data gathered about the raw material, primary and secondary manufacturing techniques, the firing process, and mending methods. The methodology and the results of firing tests on archaeological samples are also discussed.

Chapter 6 provides the results of a multianalytic approach to identify petrographic and compositional profiles of vessel fabric, characterize painted decoration, and organic material used in pottery manufacture. It discusses issues associated with the technological choices made by the Neolithic potters and their provenance. The analysis that included optical microscopy, portable x-ray analysis, x-ray diffraction, and organic chemical analysis was conducted not only on the archaeological material from the sites in southeastern Albania but also on samples from Dimini, Thessaly, in northern Greece.

Chapter 7 focuses on the use itineraries of pottery. From a theoretical perspective, the approach considers vessels as having agency in their interaction with humans. It also builds upon the notion of spatial narratives called itineraries that comprise the journey of a vessel. Methodologically, it combines the visual observation and recording of use-wear traces with residue analysis, focusing primarily on cooking vessels.

Chapter 8 offers a general discussion on the outcome of the research and is organized into four thematic sections. The first compares the pottery from Kallamas with the other two sites and how the systematic typological and stylistic classification results combined with radiocarbon dates impact the relative chronology and our knowledge about Late Neolithic pottery in southeastern Albania. The second section discusses the use itineraries of a vessel either as a whole object, individual sherds used as tools, or inclusions and how the vessel as a mediator of human agency affects human actions by imposing a particular posture on the body to accomplish basic tasks. The third part interprets the results of the analytical techniques focusing on the reconstruction of technological choices and the comparison between the sites. The last section discusses the circulation of pottery and the role of communities of potters in shaping Neolithic network connections.

Chapter 9 provides a general overview of the dissertation research project focusing mainly on the interpretation of the results. It also indicates research to be conducted in the future

2. The historical, theoretical, and methodological framework of ceramic studies

As one of the first synthetic materials produced and used by humans and the most abundant archaeological material worldwide, pottery has received increased attention from archaeologists of almost all historical periods. Until the mid-1990s, the study of ceramics and the space it occupied in archaeological excavation reports were disproportionately high (Rice 1987, 24), especially when compared to other artifacts. Interest in studying pottery has faded for several reasons, mainly related to the general shift in archaeological analysis and the challenges scholars face when dealing with it. The struggle with the relevance of material culture approaches to understanding past social practices has directed archaeology toward more "direct evidence" analyzing human skeletons, for example, rather than their tools. What has assisted this endeavor is the broader use in archaeology of several new scientific methods that focus mainly on human and animal biological remains. Regarding the study of a ceramic assemblage itself, the decrease in scholarly interest is probably related to the enormous time and energy required to accomplish the task. Nevertheless, the study of pottery is crucial in understanding various daily practices, economic activities, and trade among past societies.

2.1 A brief historical overview of ceramic analysis

Previous research has approached pottery production and use from different perspectives, including artistic, archaeological, mineralogical, and chemical (Rice 1987, 24-25). From a historical, archaeological perspective, Orton et al. (1993, 3-15) refer to three main phases of ceramic studies: art-historical, typological, and contextual. Similarly, Rice (1987) has listed three main approaches of ceramic analysis: typological classification, stylistic or decoration studies, and compositional analysis. These approaches are complementary to each other even though each one has received more significant consideration in different periods following the general trends of archaeological studies. For these reasons, the overview of ceramic studies presented here will follow the theoretical framework of the discipline in different periods starting with the so-called formative stage, moving into the "new" or "processual" perspective, and ending with contemporary approaches. The chronological-theoretical timeline will provide a better understanding of the research context for applying these three major approaches, their main features, and how they supported the theoretical and methodological trends of the discipline.

Although ceramic analysis of each historical period has its own theoretical and methodological elements, there is a characteristic feature that transcends this conventional and reductive chronological division of ceramic studies beyond the physical properties of the ceramic material. While I am aware of the danger behind such generalizations, ceramic studies have been highly influenced, in my view, by the perspective of a binary dichotomy that has characterized the archaeological discipline. Even though they have been useful analytical tools, the distinctions of style-morphology, style-technology, function-use, symbolic-utilitarian, or fine vs. plain vessels, all have their roots in the duality of body-mind, culture-nature, or human-objects that characterize modernism (for a detailed discussion on the connections between archaeology and Western modernity see, for example, Trigger 1989; Latour 1993; Hodder and Hutson 2003; Jervis 2019; Johnson 2006; Lucas 2012; Thomas 2004), while there has been a tendency in the last two decades to reject these divisions (see, example, Stark 1998), style, technology, and function are still considered as discernible and are often studied by different ceramicists (see Pfaffenberger 1992; Stark 1998; Dietler and Herbich 1998, 236-44)[1]. The distinction becomes

[1] The excellent work of Vincas P. Steponaitis ([1983] 2009) on the ceramic material at Moundville is among the few examples, to my knowledge, where the different aspects of the pottery are studied next to each other using a

even more evident when these aspects of ceramic analysis tend to get unequal attention in different historical phases of archaeology, based on how well they serve the goals of the theoretical trend of the discipline at the time (see Stark 1998, 3-7 for a brief critical review of the historical trajectories of technological studies in anthropology and archaeology).

Ceramic analysis and culture history

In the first half of the twentieth century, the culture-historical paradigm and the normative concept dominated the archaeological discipline as a whole. In the so-called Old World, the normative model of culture was formulated at the beginning of the century by Gustaf Kossina and elaborated by Gordon Childe (1936; Shennan [1989] 2003, 4-14) in his seminal work, which found fertile ground in archaeological research. The basic principle of this concept lies in the idea that material culture, especially the form and decoration of artifacts, is directly related to ethnic or cultural identity. Therefore, the distribution of objects or the appearance of their main features in a specific region reflects the geographical or chronological spread of ethnic or cultural groups (Trigger 1989, Johnson 1999). The role that pottery played in archaeology until the 1960s was limited to describing the morphological features of the best archaeological vessels, usually those decorated because they served better the definition of archaeological phases and the cultural links between regions or groups. Childe (1950) was among the first scholars who used the geographical distribution of pottery to trace the movement of people from east to west as part of the spread of agriculture from the Near East to Europe. Unfortunately, some scholars still use

multidimensional approach. However, it is noteworthy to highlight that there are also practical reasons such as time efficiency that deter ceramicists from conducting similar studies.

the chronological or geographical variations of Neolithic ceramic vessels to distinguish different cultural groups in the Balkans.

Around the same period, in the Americas, the study of archaeological ceramics was heavily influenced by the deterministic model and the Boasian tradition (for a review and critique on different aspects of early ceramic studies see, for example, Arnold 1985: 4-12, Stark 1998). Among the main concerns of the early ceramicists were the definition of the units of analysis and the establishment of systems of classifications, such as type, wares, or clusters (Colton 1943; Wheat, Gifford, and Wasley 1958; Gifford 1960). The framework of analysis was shaped by borrowing elements from human nature. As Dean Arnold (1985, 4-7) has elaborated, the analogies with the work on human personality and linguistic analysis dominated archaeological research and the study of ceramic material during the so-called formative period. As in Eurasia, American scholars associated the concept of pottery type with cultural components and changes in space and time (Krieger 1944).

To put it in other words, quoting Daniel Miller (1985, 2-3) "'*cultures' as the movement of styles were assumed to represent movements of people, and entities such as 'culture' and 'style' rather than society itself became the goal to which archaeological resources were primarily directed."* Within the same perspective were also conducted studies on ceramic technology. Among the earliest and essential contributions was the work of Anna Shepard ([1956] 1985), which incorporated issues related to ceramic technology into the broader context of the study of cultures. Shepard and Wayne Felts were the first scholars to use petrography to analyze ancient ceramics, focusing mainly on questions associated with the origin of artifacts (for a brief review of the early literature on ceramic technology and petrography, see, for example, Rye 1981, 2-4;

Quinn 2013, 10-16). In contrast, inorganic chemical analysis was already part of archaeological research since the nineteenth century. As with petrography, its primary goal was to identify the geographical origin of archaeological materials. It also provided information for tracing the age of artifacts and their material composition (Meschel 1978, 3-9; Tite 1991, 140; Pollard and Heron 1996, 7).

Toward a more scientific, socioeconomic, and ecologic approach of ceramic analysis

In the 1960s, there was a significant shift in the ceramic analysis. The introduction of a new theoretical and methodological framework, and the emphasis on different aspects of pottery, established a new direction for ceramic studies. These changes resulted from the new perspective introduced in the discipline of archaeology by several North American scholars, with Lewis Binford (1962; 1965) being the most prominent (for a detailed discussion of processual archaeology and its main elements, see, for example, Johnson 1999; Trigger 1989, 20-42; Wylie 2002, 23-161,). Focused primarily on cultural changes and adaptation, the New or Processual Archaeology (Klejn 1977) rejected traditional approaches regarding the chronological and geographical tracing of ethnic groups based on similarities and differences in their material culture. In this new archaeological paradigm shift, where culture was seen as a systemic process, ceramic studies experienced a significant transformation from both theoretical and methodological perspectives, moving away from tracing historical and cultural groups through similarities and differences of the morphological and stylistic attributes of pottery. From a theoretical point of view, ecological and socioeconomic aspects were now at the center of research interests. At the same time, ceramic sociology, ceramic ecology, and evolutionary theory became the most widely adopted approaches, at least in the North American tradition, but not exclusively (Arnold 1985; Hill 1970; Kotsakis 1983; Longacre 1970; Matson 1965; Neff 1993; Rice 1996a; Skibo and Feinman 1999).

Although the basics such as typology and stylistic approaches to artifact variability were still essential tools, technology, function, trade, and discard became the main focus of ceramic analysis (Rice 1996a, b). The tripartite division of artifact analysis into technology, function, and style imposed by the New Archaeology was deeply rooted in ceramic research (for a critique, see, for example, Rice 1996a, 184-6; Stark 1998, 4-5). Ceramicists considered pottery production and use as a socioeconomic subsystem or part of a larger systemic structure, such as culture. Methodologically, the new positivism in archaeology created fertile soil for more science in pottery analysis, giving new dimensions in the relationship between ceramic studies and other disciplines outside archaeology. Studies of the production and distribution of pottery incorporated such theoretical and methodological combinations. Scholars investigated production based on political and socioeconomic approaches (Brumfiel and Earle 1987; Costin 1991; van der Leeuw 1977). Simultaneously, the study of the technological aspects of the manufacture of pottery relied more on physicochemical and petrographic analysis (Neff 1992; Middleton and Freestone 1991; Peacock 1970). Studies on pottery function, in contrast, focused initially mainly on morphological, stylistic, and physical aspects to understand the use of vessels (Braun 1980; Bronitsky and Hamer 1986; Ericson, Read, and Burke 1972; Hally 1983; Henrickson and McDonald 1983; Schiffer 1990; Schiffer and Skibo 1989). Later, the introduction of residue analysis by the end of the 1980s opened new avenues to study the direct use of pottery (Evershed 1993; Skibo 1992). A large number of ethnographic and experimental ceramic studies developed with the rise of New Archaeology and supported archaeological approaches on the production and use of pottery (Arnold, P. 1991; Hagstrum 1988; Longacre 1991; Schiffer and Skibo 1989; Schiffer et al. 1994; Sinopoli 1988).

Contemporary approaches of ceramic analysis; from pots as social beings to pots as agents

The critiques of New Archaeology, its positivism, and the systemic ecological approach in the 1980s took the form of an avalanche of sorts. In the middle of the decade, a new theoretical model eventually labeled either as Contextual or Post-processual Archaeology appeared. The pioneering work of Ian Hodder played a crucial role in this new shift, which rejected the model of systems in favor of social structure and individual agency. Hodder and his followers advocated for interpretative archaeology, putting at the center of archaeological thinking the conscious individual who actively negotiates her/his position, role, or status within the community (Hodder 1982; 1992; Hodder and Hutson 2003; Johnson 199; Shanks and Tilley 1987; Trigger 1989; Whiley 2002). In my opinion, one of the most remarkable contributions of this theoretical movement was the liberation from the rigid ecosystemic 'heavily academic' archaeological thinking, setting the foundation for multivocal and pluralistic archaeology. In other words, the post-processual tradition forced archaeology closer to the individuals and communities themselves, past and present (for a discussion on multivocal and pluralistic archaeology, see among others Wylie 2015; Hodder 2008; Smith 2018).

This new theoretical environment also had an enormous impact on ceramic analysis more recently, as we have seen a plethora of ways to approach pottery. Scholars have focused on the agency of technological choices, aspects of life history and cultural biography of vessels, ceramic style, consumption and identities, relationships between people and pots through communities of practice, or multiscalar network analysis. Lately, there is a new trend in ceramic studies where vessels and their manufacturing materials are perceived as having agentic properties. Prudence Rice (1996a, 185) has argued that until the middle of the 1990s, a new theoretical environment was still missing, and post-processual archaeology had no impact in ceramic studies. Although one could disagree with such an observation, this should come as no surprise when bearing in mind that a distinct theoretical approach to ceramic analysis attached to the New Archaeology was not clearly articulated before Arnold's work in 1985. It is a fact that what James Skibo (1999, 2) labeled as the *"schizophrenic existence.....of pottery studies,"* referring to the engagement of other fields outside archaeology in ceramic analysis that started with the New Archaeology, has been a challenge for ceramicists. This collaboration, which has been developing and increasing over the last decades, although it has provided a robust analytical tool, requires ceramicists to balance different disciplines, many of them not adjacent to archaeology (Nigra, Faull, and Barnard 2015; Tite 2008). As a consequence, being a heavily inter-and cross-disciplinary field where scholars from different backgrounds have little or no knowledge about the theoretical discourse in archaeology, ceramic studies have moved at their own pace and, in my view, have lost their interpretive flexibility. The fractioning of the ceramic studies has also facilitated this rigidity. For example, apart from the ceramicist focusing on morphological and stylistic analysis, at least four specialists with knowledge in organic and inorganic chemistry, geology, and material science should be involved in studying a vessel.

Nevertheless, many ceramicists took advantage of the pluralistic theoretical framework and approached the social dimensions of ceramic assemblages in various ways and from different perspectives. The connecting link among these studies was the idea that it is mainly the sociocultural context and not the environment that affects and regulates both the production and consumption of pottery (Miller 1985; van der Leeuw 1993). Focusing on the agency of individuals or specific groups within a broader social corpus, the question of identity and values, including status, gender or age, and the way they are negotiated, is often central to the study of pottery during these last decades (Costin 1998; David, Sterner, and Gavua 1988; Gosselain 1998; Hegmon 1995; Pentedeka and Kotsakis 2008; Pauketat 2001; Weissner 1989). By putting the social choice in the center of research, many approaches have perceived ceramic technology as an integrative part of individual or group identities (Hosler 1996; Mahias 1993; Lemonnier 1993; Stark, Elson, and Clark 1998; Vitelli 1995). Combining concepts of the chaîne opératoire, cultural biography of the objects, and communities of practice, some scholars advocated that other aspects of pottery, such as consumption or discard, are also part of the social actions that contribute to defining and negotiating relationships and identities (Chapman 2000; Dietler and Herbich 1998; Dobres and Hoffman 1994; Mills and Hopkins 2006).

Even though all the above studies gave pottery more or less an active role in constructing social life, archaeologists still considered it as a tool or object in the hands of the potters, traders, or consumers, just as in the previous generations of ceramicists. Drawing on recent theoretical approaches that focus on diminishing human primacy and overcoming the modernistic division between culture and nature or subject and object, some studies have tried to demonstrate the agentic nature of pottery (see for a brief review of the new theoretical approaches in archaeology, see Kosiba 2019; Witmore 2014; Van Dyke 2015, 3-32). Extending the object biographies of Igor Kopytoff (1986) to the manufacturing stages, and drawing on Alfred Gell's (1998) object agency, Tanya Chiykowski (2015), for example, has argued that vessels have agency embedded there by the potters. Using as a case study the plainwares in the greater Southwest in North America, she claimed that the animacy of the clay and the involvement of the senses, bodily experiences, and the potters' beliefs in the manufacture make the pots animate Chiykowski

(2015, 85-93). Similarly, using Gellian extended mind and secondary agency, other scholars have shown that ceramics could act as ambassadors of a specific group in power (Fullen 2015), or convey social appropriateness and discipline masses (Coelho 2015). Drawing on Actor-Network Theory and material agency (Latour 2005), Astrid van Oyen (2015) showed how ancient socioeconomic and political processes involved in the production, use, and distribution created and stabilized the well-known Roman terra sigillata ware as a ceramic category by imbuing it with agency. This agency played a crucial role in the future of this category as a highly standardized, widely exported product in ancient times and an important analytical tool on the hands of archaeologists.

Another new trend in ceramic studies is associated with the investigation of multiscalar social relationships, technological innovation, diffusion, and mobility using network analysis, communities of practice, and cognitive theories of learning and apprenticeship, often in combination (Eckert, Schleher, and James 2015; Knappett 2018; Mills et al. 2013; Pentedeka 2017; Sassaman and Rudolphi 2001; Stark 2006). For example, several compelling ceramic studies by Barbara Mills and her team (2018; Mills et al. 2015) incorporate network analysis and practice communities. Drawing upon boundary objects, she gives specific ceramic categories the independence of being perceived in various ways by different social groups in a situated context while functioning as a multiscalar mediator among other various spheres (Mills 2018; Star and Griesemer 1998; Wenger 1998).

2.2 Theoretical approaches

The study of the ceramic assemblages from Maliq, Kamnik, and Kallamas raises some challenging issues, especially when drawing general conclusions about Neolithic societies in this region. The excavation method and the collection of archaeological materials vary between the three sites since Maliq and Kamnik were investigated in the 1960s and 1970s, while Kallamas was excavated recently. These differences create methodological and interpretative boundaries that restrict the use of quantitative analysis. Among others, they limit the possibility of understanding the relationship between the use of the ceramic vessels and the organization of space or even the chronological and geographical variation of the pottery. Thus, for this project, the study of pottery will focus on three main itineraries of a vessel's journey: technology, use, and exchange. To approach all these aspects of pottery, I adopted a synthetic theoretical framework combining various anthropological and archaeological perspectives such as the chaîne opératoire, cultural biography-itinerary of objects, communities of practice, and network theories. The use of different theoretical frameworks in my research is more than a choice; it is necessary due to the broad focus of the study.

Chaîne opératoire, cultural biography, and object itineraries

Technology is about making things in a specific way within a particular sociocultural context. The technological system consists of techniques, which, according to Marcel Mauss ([1934] 1992; Lemonnier 1986, 154), are derivatives of performative actions. Techniques are links between humans and objects during the process of artifact production (Heidegger 1977), and are incorporated into the cultural tradition of a particular society (Mauss [1934] 1992). They are unconscious, unintentional social choices made within the context of social knowledge and operational effectiveness (Lemonnier 1993, 6-7; Sillar and Tite 2000, 10). To investigate all the technological applications involved during the manufacture of artifacts, scholars have used the empirical analytic technique known as chaîne opératoire. This method, which was introduced into anthropology by Andre Léroi Gourhan ([1964] 1993, Audouze 2002), is used to record and reconstruct the successive choices and gestures of the people involved in the manufacture of objects from the procurement of the raw material to the finished product. Through all these tasks, scholars can approach social values and symbolic perceptions (Dobres and Hoffman 1994, 214; Dobres 2010, 106-7).

However, technological knowledge and tradition are only a small part of social dynamics. Throughout their life, from the manufacture through use to the final discard and deposition, vessels accumulate history during their interactions with humans (Appadurai 1986; Gosden and Marshall 1999, 174). The notion of the cultural biography of things introduced by Arjun Appadurai (1986) and Igor Kopytoff (1986) provides an insight into other aspects of the life of objects beyond the technology of manufacture. Cultural biography is based on the idea that the meaning of objects is affixed to people or activities with which they are associated. The significance of objects is not constant. As they are involved in various social contexts during their life, their meaning changes according to users and the context of their use (Jones 2002). The configuration of meaning is not a one-way process. Whle things accumulate biographies, they give meaning to people or events related to them (Gosden and Marshall 1999, 170). Consequently, the Neolithic pottery of the southern Balkans has its cultural biography ascribed through its production, use, and exchange in various social contexts. The same Neolithic vessel could accumulate various meanings or values through its involvement in different activities (see Papadopoulos and Urton 2012).

However, the idea of cultural biography has its limitations, especially when dealing with objects that have lived more than once (Joyce and Gillespie 2015, 11-3), such as, for example, the repaired vessels in southeastern Albania recorded through my research (see chapter 4).

Dealing with these limitations, Rosemary Joyce (2015) introduced the notion of itineraries, elaborating on the work of the French scholar Michel de Certeau, who considered itineraries as spatializing actions and stories narrated by things (1984, 120, cited from Joyce 2015, 23). She argued that, when dealing with things that do not have a clear delimited lifespan, such as human life with birth and death, biographies could deform their stories (Joyce 2015, 2-23). Things tell their stories as they move from one place to another. Quoting Joyce, itineraries can trace the constant mobility of things:

> *"As an alternative to object biographies, we can capture this mobility over time with the concept of object itineraries. "Itineraries" are the routes by which things circulate in and out of places where they come to rest or are active. Examining object itineraries requires consideration of technologies for circulation; transformations that happen along the way; and the value of circulating objects for the production and reshaping of relations among humans, nonhumans, and other forces. Treating things as active in transit puts even partial and collective object histories into context as segments of potentially unending itineraries that shape space and enable action"* (2015, 29).

In terms of my research, the idea of stories being told by things as they move from one action to another is of great interest. As I understand it, unlike biographies that incorporate the idea of the life hierarchy of things based on their chronological order, such as birth, death, or interment, itineraries as spatially centered narratives do not assign any importance to stories according to their chronological sequence. Itineraries provide a robust way to deal with the division between primary or intended and sub/secondary use of vessels. In fact, this distinction was rooted in archaeology long before, but cultural biographies extended and emphasized their use by humanizing objects (for discussion on primary and secondary use, see Braun 1980; Skibo 1992). With itineraries, the prominent position of primary use and the distinction between function and use has no value. As vessels, either as groups or individually, move from one action to another, they ascribe whole or segmented itineraries that are different but may converge, creating a meshwork, as Tim Ingold (2011) would say, by interacting with, humans, other vessels, other objects, and places (Joyce 2015, 29-30; Joyce and Gillespie 2015, 11-3). So, rejecting the idea of the life of vessels as a straight line with a start and end, we can clearly see that these objects live more than once. They are produced, used often and for different purposes, repaired, discarded, buried, discovered, rediscovered, selected, studied, published, exhibited, reburied, stored, destroyed for analysis, or displayed in museums. As it has been argued, not all vessels follow the same itineraries (Joyce and Gillespie 2015, 13). Thus, the values assigned to each of these journeys are not necessarily directly associated with the intent of manufacture, but with the dynamics unfolded with each itinerary through the relations with the surroundings, be they humans, animals, or things.

Human and material agency

Through the reconstruction of technological choices, to use Pierre Lemonnier's term (1993), a chaîne opératoire provides an insight into the cultural tradition (Sillar and Tite 2000, 5) and the social structure of a community (Mahias 1993). It also provides clues about the links between technology and use and the interactions between communities and pottery. However, when dealing with micro-scale interactions (Hodder 1999, 137) and choices made by individuals or households, this method does not offer the best approach for understanding such relations. The diversity within similar categories such as shape, size, surface treatment, and decoration among the pottery studied for my project shows that there is a variety of choices related to the technology and use of ceramic vessels within the general framework of a specific ceramic tradition (Chapter 4; Prendi 1966; 2018; Prendi and Aliu 1971; Lera et al. 2011). This variability of choices created by the producers and users of pottery within the same community or region can be better understood through social agency, an approach developed by Pierre Bourdieu (1977) and Anthony Giddens (1979) and introduced into archaeology by Ian Hodder (1982). The choices made at these smaller scales are outcomes of individual or group agency, the materialization of which is based on the interpretation, adoption, modification, or rejection of communal norms according to their social roles, identities, and worldview (Hodder 1982, 2000; Dobres and Robb 2000).

Human agency is only one side of the complex relationship between the producers and consumers, on the one hand, and ceramic vessels, on the other. Objects are actively involved in the socialization of subjects, not only because they are used by humans, but also because sometimes they look like human actors (Miller 2005, 11). According to Bruno Latour (1993), the consequences of their being, or participation in the subject-object relationship, can be independent of human agency. So, although the physical properties of ceramic clay have been controlled, the actions of Neolithic ceramists in the Balkans during the production of pottery were limited by its properties. Similarly, the fragility of vessels as finished objects guides or imposes the way people look after them. Besides, artifacts can have agency by functioning as mediators or "as a distributed mind" of their creators (Gell 1998). In this way, the embedded agency of objects can affect other social actors. For example, the way people interact with vessels as they use them is determined mainly by the shape and size given to them by potters. No doubt, there is a social structure and tradition behind these technological choices in the production of vessels and the context of the human practices related to their use. Still, the objects themselves become almost independent mediators and active agents through which a social world is constructed, maintained, and negotiated. In other words, the outcome of the relationship between morphology and function (Henrickson and McDonald 1983; Hally 1986) perceived by the producers (designers) within a particular sociocultural tradition is embedded in ceramic vessels. These specific morphological and physical properties not only affect the performance of the object (Braun 1983, 108; Hally 1986, 276), they also transform it into an active agent in people-object interaction by guiding human actions and influencing their decisions to achieve specific goals. The ability of objects to guide human actions is also evident in James Gibson's (1977) theory of affordances, which was introduced to interpret the way people perceive the world and the function of objects. According to Gibson, affordances are the possible actions that the physical properties (shape, dimension, material) of the objects make available to humans, who in turn choose among these possibilities based on their needs, goals, and their perception of these properties or options (for a detailed discussion of affordances see Heft 1989; Knappett 2005, 44-58). The idea of object affordances is useful for exploring the interaction of ceramic vessels with humans as they hold and use them to perform some of their basic daily practices. The vessels impose limitations and challenges on human actions through their materiality, including shape, dimension, and size. To overcome these barriers, humans should adjust their body, head, hands, and feet to accomplish tasks, such as drinking, eating, preparing, or cooking the food as effectively as possible.

Communities of practice, boundary objects, and networks

The study of pottery circulation has been closely linked to the organization of production and consumption patterns. The approaches to ceramic distribution are integrated within the models proposed for the distribution of goods in general. The main models of the distribution of goods include reciprocity, redistribution, and exchange, all of which explain the socioeconomic context of the relation between producers and consumers (Polanyi 1957; Earle and Erickson 1977; Rice 1987). These models are similar to those that Carlo Zaccagnini (1983) refers to as “patterns of mobility” in the Aegean Bronze Age (Papadopoulos 1997). In her seminal book, Rice summarizes the main variables used in archaeological approaches on pottery circulation. She enumerates the range of movement, the amount of exchange, the timespan involved, the direction and intensity of the distribution, and the degree of centralization as the main variables used to study pottery circulation (1987, 168-206). Central to these approaches is the spatial occurrence and its links with these variables. The circulation of pottery is also considered an important component for understanding craft production and has been examined on the basis of modes of organization (Costin 2005; Rice 1987; Papadopoulos 1997). In addition, the strategies of consumption include the preferential selectivity of local communities to adopt or refuse specific goods of foreign origin that are also taken into consideration when studying the distribution of the pottery (Dietler 1998; 2010; Dietler and Herbich 1994). Rice (1987, 192-7) discusses five main mechanisms that are involved in the process of the distribution of pottery: a) the consumer travels to the potter, b) the potter travels to the consumer carrying the products; c) both potter and consumer travel to a third location, such as market or fair; d) the potter sends the goods to a third party who interacts with consumers; e) the potter takes his goods to some central agency, which gives him other goods in exchange. Many combinations may occur in a single society, while other mechanisms may be involved (Miller 1985; Rice 1987). It is worth noting that all these mechanisms and the models of distributions are in a way emphasizing the economic aspect of the phenomenon.

Besides the circulation of pottery as finished products, archaeological ceramics are widely distributed also as containers for other goods. Ancient Greek (Whitbread 1995) and Roman (Peacock 1977) amphorae are among the most representative examples. They have been traded as objects and as containers of oil, wine, and other commodities throughout the Mediterranean. Scholars have also considered the relocation of potters and workshops as one of the mechanisms of the distribution of the pottery from the Aegean into a different region of the eastern and western Mediterranean since the Bronze Age and well into the Classical period (Papadopoulos 1997). Similarly, the movement of people within marriage patterns and kinship ties rather than objects has been suggested as among the possible explanations for the distribution of the pottery (Mills 2018). Following this path, Karen Vitelli (1977) argued that female potters moving to the husband's house after being married could have spread the Middle Neolithic Urfinis vessels among different communities of southern Greece. Kostas Kotsakis, however, has argued that the circulation of the Neolithic pottery in the northern Aegean and the Balkans was likely carried within the model of reciprocity, potentially as containers for other goods rather than as finished products for consumption (Kotsakis 2010).

To trace the interregional relationships in the southern Balkans during the Late Neolithic period. I draw upon two theoretical perspectives: network theories (Knappett 2011, 2013) and the 'boundary objects' notion introduced with communities of practice (Lave and Wenger 1991; Star and Griesemer 1989). The idea of communities of practices developed by Jean Lave and Étienne Wenger (1991) has been widely adopted in ceramic analysis, at least in North America (see, for example, Habicht-Mauche, Eckert, and Huntley 2006; Mills 2016; Minar 2001). Conceptualized as communities of apprenticeship-learning (Wenger 1998), archaeologists have used them often to investigate the social context of the choices made in ceramic production, innovation, and transmission of a technological tradition (Fenn, Mills, and Hopkins 2006; Sassaman and Rudolphi 2001; Stark 2006). In my research, I consider each Neolithic settlement or group as bundles of communities of practice. Such communities would include potters, as well as lithic, textile, or basket workers, and they may transcend the household or the social organization of the settlement (Stark 2006, 29-6; Van Keuren 2006, 87). The potters of two or more neighboring settlements, for example, could form one community of practice. At the same time, they can also participate in more than one community of practice outside pottery, thus facilitating the transmission of knowledge from one craft to another. Consequently, the Neolithic Balkans could be perceived as a landscape of intertwined communities of practices engaged in complex regional and interregional interactions through which it is possible to trace the spatial distribution of many new ceramic categories introduced in the late Neolithic period in southern Balkans. Following Mills's recent work (2016; 2018), I will use the notion of boundary objects (Star and Griesemer 1998. Wenger (1998, 107) has argued that "*boundary objects can be artifacts, documents, terms, concepts, and other forms of reification around which communities of practice can organize their interconnections" and that in everyday life, there are artifacts that connect us* [communities of practice, my emphasis*] in various ways to [other, my emphasis] communities of practice*." There are three main aspects of a boundary object: interpretative flexibility, material/organizational structure, and scale/granularity (Star 2010, 602). According to Star (2010, 603), the boundary should be perceived as a "*shared space*", while the "*object* [is] *something that people act toward and with, and their materiality derives from the action and not from the thingness*." Thus, boundary objects could be a vessel, a ceramic category, or a specific ceramic manufacture technology (Mills 2018, 1056). Another notion used by Mills to trace cross-region similarities and variation of pottery is that of the "broker." She has argued that "*potters, as brokers, are engaged with certain forms of material culture as boundary objects that facilitate the transmission process when people with different backgrounds come into contact*" (2018, 1052).

The interpretation of interregional interactions that involved pottery in the Late Neolithic Balkans is not an easy task since the evidence of these interactions is very limited due to the small-scale movement of people. No large-scale migratory movement is evident so far, while the local networks are poorly studied (Pentedeka 2008, 2017). However, by integrating into the network other artifacts or raw materials, not just pottery, it is feasible to trace the contacts between the region of Korçë and Thessaly. Network analysis provides the methodological tools to describe regional and interregional relations, especially the smaller scale movement of people (Knappett 2011, 136; Mills 2018, 1052), as in the Late Neolithic Balkans (Halstead 1994; Kotsakis 1999; Pentedeka 2008). Also, by drawing upon the communities of potters and considering morphological and stylistic categories of vessels and the technology of their manufacture as boundary objects that bridge regional social groups with different backgrounds, but within a similar broader tradition in the region, it is possible to investigate the nature of these contacts.

2.3 Methodology of analysis

The main goal of the study of the manufacture of the vessels is the investigation and reconstruction of all the operational stages and to understand the technological strategies from the procurement of the raw material to the finished vessels (for a detailed discussion of the chaîne opératoire of pottery production, see among others Orton, Tyers, and Vince 1993; Rice 1987; Roux 2019; Shepard [1956] 1985; Sinopoli 1991). Embedded in the cultural tradition of a group and actively involved in the negotiation of social values and identities (Mauss [1934] 1992; Lemonnier 1993, 3, 16, Mahias 1993, 177, Dobres and Hoffman 1994, 214), technological choices provide insights into the sociocultural dimensions of the ceramic technology and its role in the shaping the Neolithic societies in the region. My research approached the technological aspects of the pottery through a multidimensional methodological framework composed of visual observation and different analytical techniques such as optical spectroscopy, x-ray fluorescence analysis (XRF), x-ray diffraction (XRD), as well as gas chromatography-mass spectrometry (GC-MS). The study of the manufacture was organized in two sections: the investigation of the raw material and the primary techniques of shaping the vessels, and the secondary techniques such as surface treatment and decoration. The path chosen for pottery circulation is broader since the research focuses not only on the potential circulation of ceramic clay or the objects themselves but also on other raw materials used in the manufacturing process. Such an approach will better investigate the active role of pottery in (inter)regional networks of contacts and exchange around 5000 BCE in the southern Balkans. Both technological investigation and pottery circulation in the region have been approached by combining the analytical techniques mentioned above. In addition, my research also utilized the geological data available from each area and the results of previous studies on similar topics conducted in the region.

The methodological framework of my research contains two main components: visual observation of the ceramic material and the analytical techniques. The systematic macroscopic study of the ceramic assemblage from Maliq and Kamnik came across a problem that seems to be common in the region with old archaeological excavations. The excavation teams collected and stored only the diagnostic sherds at both sites, including decorated body fragments, rims, bases, handles, and whole vessels. Their choices raise some methodological issues about the study of pottery, especially for understanding the engagement of vessels in various social activities, comparing the results of analysis among these sites, and drawing general conclusions about the Neolithic communities of southeastern Albania. Moreover, these divergences significantly restrict the application of quantitative methods for understanding similarities, variation, and the correlation between different aspects or features of ceramic assemblages. Although this is an important issue that will often come to the surface during this dissertation, it does not significantly affect the methodological framework of the project since it is based mainly on qualitative analysis of the data.

2.3.1 Visual observation and data recording

Visual observation, which is the first level of the study, was designed according to the methodology developed by the Prehistoric Laboratory at the Aristotle University of Thessaloniki (Kotsakis 1983; in preparation; Urem-Kotsou 2006; Elezi 2014). Visual observation was used to classify ceramic assemblages, select and study the diagnostic sherds, and collect samples for further scientific analyses (Rice 1987, 274-88; Sinopoli 1991). It was organized in two stages: sorting the ceramic material and studying the diagnostic sherds. During the general sorting, the entire assemblage of potsherds was the focus of the observations and descriptions. The initial or preliminary classification of the material was based on the color, surface treatment, and decoration.[2] The first stage was also used to record taphonomic data such as surface abrasion, the detection of joins between sherds, and their size, even though this information is rarely used

[2] The color of the surface and fabric was recorded with a digital device, Munsell Capsure Color x-rite.

in my dissertation since it focuses on different aspects of pottery (for the general sorting form and the database, see Appendix A-1).[3]

The study of the diagnostic potsherds was aimed to gather more information about the shape, decoration, size, technology of manufacture, and use of the pottery. Consequently, the analysis focused on all the diagnostic fragments such as rims, handles, bases, carinations, and sherds with decorative motifs, manufacturing traces, or usewear, recording in detail all these features in an Access database. For a statistically controlled or systematic sampling (Van Pool and Leonard 2011: 307-13) and accuracy in defining the shape and dimension of the vessels, the rims, bases, and fragments of the carination selected for diagnostic recording were larger than 5% of the total diameter. The classification of the ceramic assemblages from Kallamas, Kamnik, and Maliq has also been integrated into the regional ceramic database, including typological classification and the terminology used by previous scholars who worked on Neolithic pottery in southeastern Albania (Prendi 2008; Korkuti 2010).

The visual (macroscopic) analysis also included the observation and recording of the color of the ceramic fabric after refiring tests. The refiring was completed in an electric kiln under a controlled oxidizing atmosphere with temperatures higher than that at which the vessels were initially fired.

2.3.2 Microscopic analysis and analytical techniques

During the last decades, interdisciplinary approaches became the norm in ceramic studies,

[3] Regarding the size of the sherds, they were classified into three groups: small, the sherds that fit within a square 2.5 x 2.5 cm; medium, those that do not exceed the borders of a square 5 x 5 cm; large are considered all the other sherds with larger dimensions than the other two categories.

with chemistry, geology, and materials science playing a prominent role. Introduced very early into archaeological research and often combined, they are nowadays an integrated part of any serious study of archaeological pottery (Felts 1942; Meschel 1978; Killick 2015; Peacock 1970; Pollard and Heron 1996; Shepard [1956] 1985; Stott et al. 2003; Tite 1991). The mineralogical and elemental approaches are used to investigate the nature of the ceramic fabric, slips, and decorative pigments, as well as manufacturing techniques, raw materials, and provenance. Through organic chemistry, ceramicists explore the use of the vessels primarily associated with cooking and identify organic materials used in pottery manufacture (Neff 1992; Heron and Evershed 1993; Jones 1986; Nigra, Faull, and Barnard 2015; Ownby, Druc, and Masucci 2017; Roumpou et al. 2013; Tite 2008; Urem-Kotsou et al. 2002, Regert 2004).

Due to the holistic approach of my research, several analytical techniques from these fields, such as thin-section petrography, pXRF, XRD, and GC-MS were used as a complement to the macroscopic recording and sorting of the pottery. Thin-section petrography analysis is used to investigate the operational sequences and the technological choices of the manufacture of Neolithic pottery in the region of Korçë through the identification of the mineral composition and recipes of the ceramic fabric. More specifically, using thin sections and polarized microscopy, this method identifies the type of raw material, its composition, and its origin. It is also useful for understanding and defining the ceramic clay preparation and the building techniques used to manufacture the vessels. Through ceramic petrography, this project also explores the possible links between the use of the vessel, its shape, and size, with its fabric. While petrography is very effective with coarse-grained materials, it has limitations in investigating fine-grained ceramic fabric. As a complementary tool to avoid some of these restrictions, pXRF analysis was conducted on many fine-grained samples from the three sites in southeastern Albania as well as those from Dimini in Thessaly (for a discussion and use on these techniques, see among others Arnold, Neff, and Bishop 1991; Pollard and Heron 1996; Quinn 2013; Reedy 1994; Tite 2008; Whitbread 1989; 1995).

Regarding manufacturing techniques, in addition to petrography, a small number of sherds from Kallamas were analyzed with x-ray imaging, although this analysis was abandoned in its initial stage due to the lack of clear results. As to the investigation of surface treatment, pXRF and XRD analyses have been performed on vessel surfaces and decoration to characterize the composition of the off-white and red slip, as well as white, red, dark brown, and black painted motifs. These two methods are combined for more informative results about the characterization of the materials used for the slip and paint (see, for example, Angeli et al. 2019; Centeno et al. 2012; Mantler and Schreiner 2000). While pXRF and XRD were used to analyze inorganic materials, GC-MS was chosen to identify organic material found on some ceramic sherds from Kamnik. This analysis provides valuable information about the use of such materials in ceramic manufacture and its organic compounds, as well as origin (Connan and Deschesne 1992; Connan et al. 2004).

The use of vessels, especially those related to the preparation, consumption, and storage of food, will be investigated through the visual recording of physical properties such as fabric, shape, size, surface treatment, as well as use-wear (Hally 1983; 1986; Skibo 1992; Urem-Kotsou 2006). In addition to macroscopic observation, the study of cooking vessels also includes analyzing organic remains on the interior surface and those absorbed within the walls of a vessel. Through GC-MS, organic residue analysis is used to identify food wastes and culinary practices (Barnard and Eerkens 2007; Heron and Evershed 1993; Nigra et al. 2015).

Finally, the circulation of the pottery has been approached through a combination of ceramic petrography and elemental analyses. A portable x-ray fluorescence instrument was used to identify the elemental composition of ceramic sherds (Hunt and Speakman 2011; Pollard and Heron 1996). The advantages of this method rely on the fact that it can be applied to a large number of objects without removing them from the location where they are stored (Phillips and Speakman 2009). The combination of pXRF and ceramic petrography increases the accuracy of the results and helps overcome financial and permit-related issues. Finally, the research included a detailed and systematic documentation process through drawing, photography, digital microscopy (using a Dino-Lite Premier 20x-220x), and recording forms.

3 The Late Neolithic period in the southern Balkans

The goal of this chapter is to provide the general archaeological context of the geographical limits, chronology, history of archaeological research, as well as the Neolithic material culture with a focus on the period between the middle of the sixth and mid-fifth millennium BCE. This time frame corresponds to the end of the Early and the beginning of the Middle Neolithic period in Thessaly and western Macedonia, and the transition between the Middle and Late Neolithic in the region of Korçë and Pelagonia (Table 3.1).

Table 3.1. Aegean and Balkan Neolithic chronology after Andreou, Fotiadi and Kotsakis 1996, 538, Table 1; Papadimitriou and Tsirtsoni 2010, 15; Prendi and Bunguri 2014, Table CLXXIV.

<table>
<tr><th>Calendrical Chronology (BCE)</th><th>Aegean Chronology</th><th rowspan="2">Balkan Chronology</th></tr>
<tr><td rowspan="2">6700</td><td rowspan="2">Early Neolithic</td></tr>
<tr><td rowspan="2">Early Neolithic</td></tr>
<tr><td>5800</td><td>Middle Neolithic</td></tr>
<tr><td>5400</td><td>Late Neolithic I</td><td>Middle Neolithic</td></tr>
<tr><td>4800</td><td>Late Neolithic II</td><td>Late Neolithic I</td></tr>
<tr><td>4500</td><td>Final Neolithic</td><td>Eneolithic[4]</td></tr>
</table>

[4] The last phase of the Neolithic period referred as Eneolithic or Chalcolithic in Albania and the Balkans, is known as Final Neolithic in Greece.

The focus of the first section is to establish a baseline to define the geographical areas that are included under the general region of the southern Balkans and the motivation behind this choice. It will also present the Neolithic chronological systems adopted in each of the regions under consideration. The following section will discuss the history of archaeological research for each area, respectively. The remaining two sections will review the data regarding settlement patterns and architectural features, as well as the ceramic assemblages for all the regions together. The discussion of the Neolithic communities and their material culture in the southern Balkans as a single context raises many challenges as both differences and similarities have heavily disintegrated as a result of modern national borders. The formation of nation-states in the Balkans has not only fragmented this relatively small area into different contemporary administrative units and languages, but it has also enclosed the material culture heritage, including the Neolithic. The division of the past based on modern state borders is common in European archaeology, but in the Balkans, this is much more emphasized and problematic for many reasons, the discussion of which goes beyond the goals of the dissertation research. Archaeology in the Balkans is highly indoctrinated historically, religiously, and politically (Kotsakis 1998; Bailey 1998; Novakovic 2011; Gori 2012). As a result, bringing together information in order to shape a framework for my research from three different countries—Albania, Greece, and North Macedonia—and languages with their own historical particularities and peculiarities has its own pitfalls since we are dealing with three diverse and often confrontational and interconnected archaeological realities. Thus, the regional context of this work will reassemble a puzzle including several archaeological research stories, diverse Neolithic material culture, a complex often overlapping chronological system, as well as different approaches to doing archaeology and theorizing about it (as an example of the chaotic chronological system for the prehistory of the region, see Bailey 2000).

3.1. Chronological and geographic boundaries

The main focus of my research is the Late Neolithic period in the region of Korçë in southeastern Albania located in the southern Balkans, which for the purposes of this work also includes Thessaly and the region of Western Macedonia in Northern Greece, as well as the regions of Ohrid and Pelagonia in the Republic of North Macedonia. The reason why these territories have been chosen as the broader research context is not only due to their geographical proximity with the region of Korçë, but also because of the similarities of the material culture and the contacts established among them during the Neolithic period. Although a small area, the southern Balkans is geographically very diverse with significant changes of elevation as it includes different mountainous and hilly areas, the Aegean Sea coast, large rivers, three large lakes, and, of course, extended plains. Similarly, the climate also varies from the Mediterranean on the eastern coast of Thessaly to more continental in the northern and western areas such as the basin of Korçë and the Ohrid region. (Figure 3.1; Kabo et al. 1991; Caputo et al. 2015; Higgins and Higgins 1996; Fouache et al. 2001; Fouache and Pavlopoulos 2011; Puteska et al. 2015; Naumov 2016a)

The early agropastoral villages occurred in different time periods in various parts of the Balkans. Consequently, there are differences between the chronological frameworks adopted in different countries. Roughly, the Neolithic period in the Balkans lasted from about the beginning of the seventh millennium to the end of the fourth millennium BCE, and it is divided among Early, Middle, Late, and Final or Eneolithic periods. Except for Thessaly and western Macedonia, the available absolute radiocarbon dates for the region are limited. In terms of relative chronology, the period between the middle sixth and fifth millennium BCE corresponds to the Late Neolithic I and II for Thessaly and western Macedonia. In the Korçë region, this period covers the Middle and Late Neolithic phases. In contrast, the picture in the Pellagonia and

Ohrid area is more complex due to the fact that the Middle Neolithic, as well as the end of the Late Neolithic period, are not well defined yet (Gimbutas 1976; Prendi 1976; 1982; Andreou et al. 1996; Bailey 2000; Fidanoski 2009a, 31-34; Papadimitriou and Tsirtsoni 2010; Maniatis 2014; Tsirtsoni 2016; Reingruber et al. 2017; Oberweiler et al. 2018).

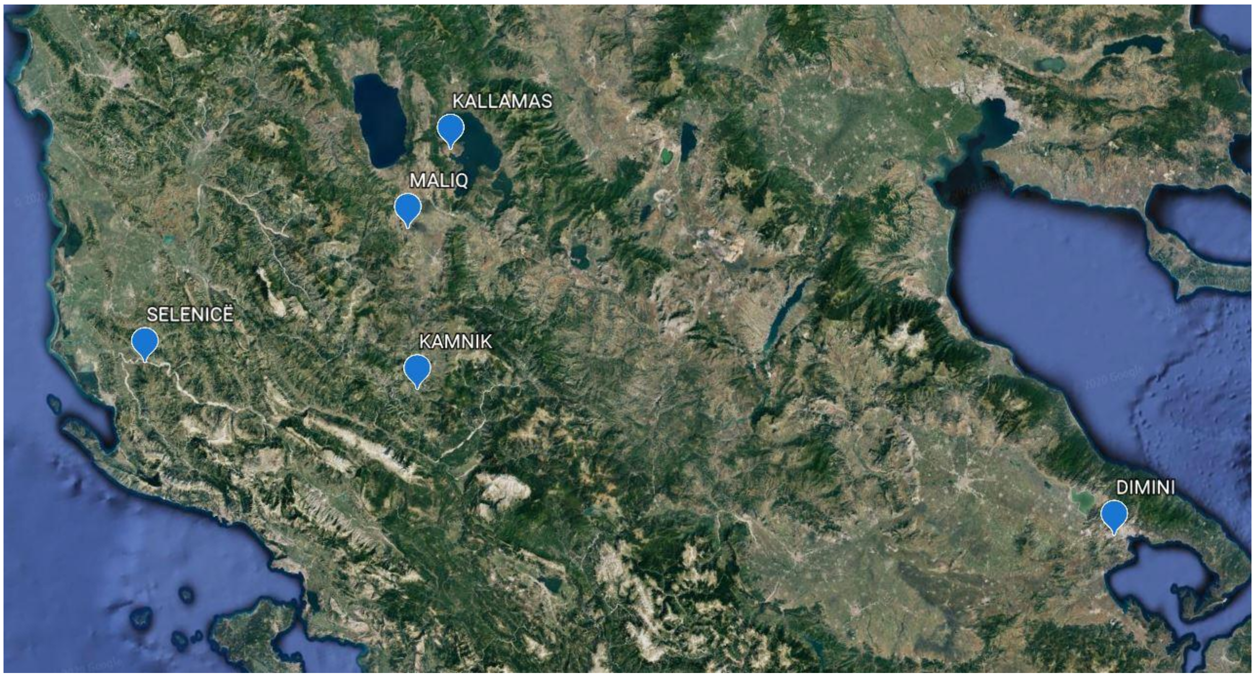

Figure 3.1. Southern Balkans. Google earth image.

3.2. History of the prehistoric research

The history of the prehistoric research in the southern Balkans is a multi-narrative and multi-perspective story with many convergences and divergences. Being incorporated in different modern states, the history of research in the region has many similarities as well as differences. The similarities are mainly correlated with historical events at a greater scale that have profoundly impacted the region, such as the Balkan conflicts and the First World War, the Second World War, and the political changes in Eastern Europe and the Balkans in the 1990s. These past events also provide historical boundaries between different phases of archaeological research in the region. The particularities are primarily associated with the social and political directions of each country, in which a specific area was incorporated after the establishment of the modern states.

The interest in prehistoric research, including the Neolithic in the southern Balkans, started at the beginning of the 20th century (Kotsakis 1997; Tsonos 2009; Naumov 2016a). The surveys and very small-scale excavations were conducted almost exclusively by central or western European scholars appointed mainly by their governments, the geopolitical interest of which was intensified due to sociopolitical turbulences in the region as the result of the dismemberment of the Ottoman Empire. Before the First World War, when archaeological research of the ancient Greek and Roman civilizations was spread throughout the southern Balkans, the exploration of the prehistory was still sporadic (Heurtley 1939; Rhomiopoulou 2014; Prendi and Bunguri 2014, 13-21; Naumov 2009). During the interwar period, archaeological remains of prehistory were still underrepresented, and it was only after the Second World War that significant quantitative and qualitative work was carried out (Grammenos 1984; Korkuti 1987; Kotsakis 1998; Naumov 2016a). The most significant differences in the trajectories of theoretical and methodological archaeological research among Northern Greece, Albania, and North Macedonia took place during the period between the end of the Second World War and the political changes in the Balkans with the collapse of the Eastern Bloc. A mix of strong historical tradition, ethnocentrism, empiricism, as well as cultural history characterized the archaeology of Greece, Albania, and the former Yugoslavia, part of which was North Macedonia (Andreou et al. 1996; Bejko 1996; Novakovic 2011, Gori 2014). The theoretical mixture of cultural history with nationalism and ethnocentrism, the legacy of which is still persistent today, has dominated the archaeological discipline in all of these countries.

Albania and the region of Korçë

The history of archaeological research in Albania has not been subjected to analytical historical studies per se[5]. Recently professor Ilir Gjipali (personal communication) from the Institute of Archaeology in Tirana has started working on the topic, and hopes that results from his work will be published in the near future. Archaeological interest on the prehistory in Albania goes back to the early twentieth century with the pioneering studies and publications of Theodor Ippen (1910) and Franz Nopcsa (1912), as well as the innovative work of local researchers including the catholic priest Shtjefën Gjeçovi, and the archaeologist Shyqyri Demiri (Islami 1979; Shukriu 2003; Prendi 1988; Prendi and Bunguri 2014, 15). Archaeological research in Albania has gone through very diverse stages, three of which are considered to be the most significant, according to Prendi and Bunguri (2014, 6). The first phase includes the initial attempts in the early twentieth century until the Second World War, with an intensification of research during the interwar period. The second phase, which started within the second half of the 1950s and lasted until the 1990s, was characterized by a structured heavily politicized and targeted archaeological investigation. The third stage of the research, in contrast, covers the period after the collapse of the political regime in the 1990s until around 2010 and its distinct feature was an openness to the rest of the world and collaboration with international institutions. In my view, this phase could be labeled as the "transition period," following the general transformation of the socio-political and economic life in the country. During this time, archaeological research was a mix of very well established theoretical and methodological perspectives inherited from the previous period with new research elements imported mainly by

[5] A historical overview of doing archaeology in Albania is usually incorporated as introduction in various publication, but three are a few works that address many aspects of this topic (Korkuti 1987, Prendi 1988; Tsonos 2009).

foreign scholars. However, because the research was focused mainly on the large and famous Greek-Roman sites, the intensity and density of investigation of the prehistoric period were drastically reduced during this period. Although Prendi and Bunguri have argued for a tripartite historical division of archaeological research, a fourth, namely the post-transition phase, may well be added to this list. It corresponds with the last decade starting around 2010. A number of factors such as the reorganization of the responsible institutions and the establishment of the Archaeological Service, the foundation of the Department of Archaeology and Culture Heritage at the University of Tirana, the new generation of Albanian archaeologists, many of whom studied abroad, the intensive systematic survey almost throughout the country (Allen and Gjipali 2014; Lera, Touchais, and Oberweiler 2016; Galaty et al. 2018), and large scale excavations as the result of extended public constructions including the Trans Adriatic Pipeline (Zoto and Meshini 2019), are fundamentally changing the archaeological scene, especially for the prehistoric period (Table 3.2).

Table 3.2. The historical phases of the prehistoric research in Albania.

Interwar phase	1918 - 1940
Archaeology under dictatorship	1948 - 1990
Transition phase	1991 - 2010
Post-transition phase	2010 - present

The presence of the prehistoric occupation of southeastern Albania became known initially on the shore of the Lake Ohrid near Pogradec by the archaeologist and member of the French army, Charles Picard, during the First World War (Picard et al. 1918-1919). The first Neolithic site in Albania, however, was only identified during the period 1937-1940 from the discoveries of the Italian archaeologist Luigi Cardini in the region of Vlorë in southern Albania (Mustilli 1942; Francis 2005). As we have seen, prehistoric research was largely lacking during the first half of the 20th century as more systematic and methodological research would only take place only after the Second World War (Prendi 1982, 189; Korkuti 1996). From this time period until 1990, archaeological research was notably intensified as large-scale excavations were carried out almost throughout the country. However, it is remarkable that no major survey was conducted during this period, even in the Korçë Basin, which was and still remains the best archaeologically investigated area in Albania. Only in the last four decades has systematic surveys become an integrated part of archaeological research.

The archaeological research carried out during the last seven decades in the Korçë region has discovered many prehistoric sites (Prendi and Bunguri 2014), making it the most important area in the study of prehistory. In fact, the history of systematic studies of the deep past in Albania has its origin in the Basin of Korçë. In 1948 the work of draining Lake Maliq brought accidental discoveries of prehistoric archaeological material near the modern village Maliq (Ceka and Adami 1949). However, the exploration of the prehistoric site took place only in 1961. The fieldwork seasons 1961-1966 marks not only the beginning of the research in Maliq but also initiates the first stage of systematic prehistoric and Neolithic research in the region of Korçë and Albania (Prendi and Bunguri 2014: 19). Due to multiperiod occupation and the spatial extension of Maliq, two other main fieldwork seasons took place in 1973-1974 and 1988-1990 (Prendi 2018), while a trial small scale excavation was also conducted in 2017 (Hasa 2018).

By the end of the 1980s, archaeological research in the region had identified and excavated a large number of prehistoric sites, many of them with layers of Neolithic occupation. It should be stressed that most of the sites were accidentally discovered either by local inhabitants or by workers during the large scale public constructions in the Plain of Korçë, where, in addition to Maliq, Sovjan, Dunavec, Podgorie, Dersnik, Barç were also identified (for detailed information about these sites and others in the area see (Lera 2009, Korkuti 2010, Prendi and Bonguri 2014, Elezi 2020). The Basin of Korçë was without a doubt at the center of archaeological activities, but also other areas in southeastern Albania have provided important prehistoric sites like Kamnik and Luaras near Kolonjë, or the Cave of Tren on the bank of Small Prespa Lake. The archaeological work of the second research period in the Korçë region has significantly shaped the contemporary knowledge of the prehistory in Albania.

The third period is characterized by a few archaeological projects in the entire country, including the southeastern part. The excavation of Konispol Cave, the Mallakstra Regional Archaeological Project (MRAP), and the Lofkënd Archaeological Project, are among the few important prehistoric research projects outside the Korçë region. (Korkuti et al. 1996; 1998; Davis et al. 2003, Papadopoulos et al. 2014). All were collaborations between local and international scholars. During the first half of this phase, in the region of Korçë, there was only one archaeological excavation, the joint French-Albanian project at Sovjan, which lasted for more than ten years. Around the year 2000, the excavation of the tumulus of Kamenica was carried out by the Institute of Archaeology in Tirana (Bejko 2004). In addition, a small-scale rescue excavation was conducted in an Early Neolithic site at Pogradec (Prendi and Bunguri 2014: 20).

It was only around the end of the first decade of the twentieth century that archaeological investigation in the Korçë region flourished again. This revitalization, together with the large projects in other parts of the country, marks the beginning of the post-transition stage of archaeological research in Albania. The American-Albanian excavation of Vashtëmi, the Southern Albanian Archaeological Project (SANAP), the French-Albanian survey, the excavation at Kallamas and the Archaeological Prospection in the Korçë Basin (PALM), as well as the large scale rescue excavation in Turan and Dërsnik on behalf of Trans Adriatic Pipeline Project (Lera et al. 2012b, 2012c; Lera, Touchais and Oberweiler 2014; Allen and Gjipali 2014; Lera, Touchais and Oberweiler 2016; Zoto and Meshini 2019), are the most significant projects of this period in the region. As it has already been pointed out by the preliminary results of all these projects, their final publications not only will significantly increase our knowledge about the prehistory of the Korçë basin and southeastern Albania, but they will contribute to revising our perception of the Neolithic period in this area.

Thessaly

While the region of Korçë has been at the center of the Neolithic studies in Albania, Thessaly was undoubtedly at the center of European research on early farming since the discoveries by Christos Tsountas at Sesklo and Dimini. But it was V. Gordon Childe in his seminal 1925 monograph *"The Dawn of European Civilization,"* who elevated Thessaly as the cradle of the Neolithic culture in Greece and Europe (Andreou et al. 1996). Many archaeological projects that include both surveys and excavations have been carried out in the Thessalian plain since the beginning of the twentieth century (Andreou et al. 1996, Gallis 1979; 1996, Rondiri 2009).[6] The interest in the prehistory of northern Greece, however, had its roots many decades before

[6] Various scholars have stressed different works as the element of different phases in the history of archaeological research in Thessaly or they have adopted a slightly different perspective in respect to the chronological division of the research.

Childe's seminal work, already in the nineteenth century, when a number of Central and North European travelers visited the area and recorded the main visible prehistoric sites (Wace and Thompson 1912, 1-2; Rondiri 2009, 49-51). Although Thessaly has always been at the center of the Neolithic studies in the Balkans, the intensity of the research had its own fluctuations (Krahtopoulou 2019). Since the first decade of the twentieth century, two important works were published relating to prehistoric research in Thessaly. In 1908, Christos Tsountas, also called the "father" (Marthari 2002) or "grandfather" (Wardle 2014) of prehistoric archaeology in Greece, published the first book on the prehistory of the region about his excavations conducted around 1900 at Sesklo and Dimini. His pioneering work in Thessaly has been recognized by many scholars as a multidimensional contribution to Neolithic research, including chronological seriation, the study of the Neolithic pottery, as well as the investigation of the prehistoric sites (Rondiri 2009, 52-6). Four years later, Wace and Thompson (1912) published their synthetic monograph on the prehistoric period in Thessaly. Besides their work, the book includes research conducted by other scholars such as Tsountas, Apostolos Arvanitopoulos, and Georgios Sotiriadis. For the first time, Wace and Thompson used the term Chalcolithic to label the transition period between the Neolithic and the Bronze Age, while their publication also provided the first catalog of prehistoric sites in the region of Macedonia (Gallis 1979; 1996, 23-4).

Archaeological research during the interwar period was limited due to the lack of funding. However, a number of important projects took place at that time, including the research conducted by Arvanitopoulos and the French School of Athens at the region Pherai-Velestino near Volos and the publication of the German philologist Friedrich Stählin (1924) regarding ancient Thessaly, where he describes the main known prehistoric sites (Rondiri 2009: 62-4).

Other significant contributions before the Second World War were the largescale synthetic works on the Neolithic period in Greece published by George Mylonas in 1928, the work of Hazel Hansen (1933) during the 1920s, and the mapping of the Neolithic sites by the German scholar Kimon Grundmann published in 1937 (Gallis 1979; Rodiri 2009, 65). Archaeological research in Thessaly continued even under the Nazi occupation with the work of Hans Reinerth and the excavation of the site Magoula Visviki in 1941 (Gallis 1979; Gallis 1996, 26, Alram-Stern et al. 2017).

After World War II, archaeological research in Thessaly started again around 1950 with the research carried out by Saul Weinberg, which introduced the tripartite division of the Neolithic period in Thessaly (Gallis 1996, 26). However, the archaeological research intensified only in the 1960s, when various projects were initiated throughout the Thessalian plain. A number of scholars, among which Vladimir Milojčić, Demtrios Theocharis, Georgios Hourmouziadis, and David French were the most prominent. Together, they significantly contributed through their research not only to enrich the catalog of the prehistoric sites in the area (French 1967; Papathanasopoulos 1996, Kotsakis 2004) but also to give Thessaly a privileged position making it the referential point for Neolithic research in Greece (Andreou et al. 1996, 539). While the research of Milojčić (et al. 1962) enhanced issues related to the relative chronology by establishing the divisions of the Neolithic periods and filling many chronological gaps, Theocharis (1967, 1973) was especially interested in questions about the Early Neolithic period and the origin of farming (Gallis 1996, 27; Rondiri 2009, 68). From an almost entirely different perspective, the research of Georgios Hourmouziadis in Thessaly has greatly influenced the following generations of Greek archaeologists working primarily in northern Greece. His contribution is not necessarily related to excavations at Prodromos or Dimini, which are of great value for the Neolithic research in Thessaly and Greece, but especially on his ability, for the first time in the history of the Greek archaeology, to incorporate in his work contemporary theoretical approaches and to initiate community archaeology. George Hourmouziadis will also be remembered as the scholar who introduced the New Archaeology in Greek archaeological discourse, breaking the existing well-established traditional approach (Rondiri 2009, 70-71; Kotsakis 2019). Perhaps his greatest contribution and legacy was making prehistoric studies at Aristotle University of Thessaloniki, a highly competitive program that has produced many generations of theoretically and methodologically qualified archaeologists, which has greatly advanced prehistoric research in northern Greece (Elezi 2014, Papaefthimiou-Papanthimou 2014, Kotsakis 2019). The next two decades following the 1980s and 1990s are characterized by relatively low-intensity Neolithic research and a limited number of systematic excavations. Among the most notable contributions could be listed the catalog of the prehistoric sites in eastern Thessalian plain published by Gallis (1992), the research of Paul Halstead on the socio-economic issues and the interactions between the Neolithic sites in Thessaly, and the research of Kostas Kotsakis (1983, 1994) on the settlement and the pottery from Sesklo, who continued the work of Theocharis interrupted by his sudden death (Rondiri 2009, 72-75).

Prehistoric research in Thessaly was revitalized in the first two decades of the twenty-first century. The main elements of prehistoric research during the last twenty years are the small- and large-scale rescue excavations conducted by the Greek Archaeological Service regarding major public constructions, various multiscale multidisciplinary surveys and excavations carried out by both Greek and international scholars, as well as extensive systematic survey and small-scale excavations conducted by the local Ephorates of Antiquities (Krahtopoulou 2019, 74). If there is a word that would best characterize the outcome of the major research projects in Thessaly since the turn of the twenty-first century, it would have to be revision. Re-examination of the archaeological levels of some of the well-known Neolithic settlements and their material assemblages was the main goal of a number of studies (Reingruber 2011). Others aimed to fill the gaps and revise the chronological phases and the absolute dates of many sites in the region (Reingruber et al. 2017). Of great interest are also the results of multiple surveys and excavations in the western Thessalian plain that suggested a revisiting of the Neolithic topography and the settlement patterns in the area. Unlike the eastern and coastal part of Thessaly, the western region was considered empty from the previous research (Andreou, Fotiadis and Kotsakis 1996, 539; Hamilakis et al. 2017; Krahtopoulou 2019, 75-7). The extended prehistoric research in Thessaly has produced a detailed classification of the Neolithic periodization and robust radiocarbon dates (Table 3.3; Reingruber et al. 2017, Table 5;), as well as a significantly dense map of the Neolithic sites.

Western Macedonia in Northern Greece

Although scattered information about the prehistoric period in the region of Macedonia in northern Greece was available since the nineteenth century (Kotsakis 2008, 1; Rhomiopoulou 2014), the first decades of the twentieth century could be considered as the first of the three main phases of archaeological research. The other two productive periods in the history of prehistoric research are the 1960s and the period after the 1980s and 1990s (Grammenos 1984, Andreou, Fotiadis, and Kotsakis 1996, Fotiadis 2002). More than a century of occasionally intensive research has drastically changed the prehistoric and especially the Neolithic topography in Macedonia from a marginalized and “empty” area until the 1990s to a densely occupied region with some of the earliest agricultural settlements in the Aegean and the Balkans (Elezi 2014, 23-24; Maniatis 2014; Maniatis, Kotsakis and Halstead 2015).

Table 3.3. Table of the chronological phases and their absolute dates for the Late Neolithic Period in Thessaly after Reingruber et al. (2017, Table 5).

5500–5300	LN I (early)	Theopetra, Makrychori, Prodromos-M. Ag. Ioannis
5300–5000	LN I (late)	Theopetra, Makrychori
4900–4700	LN II (early)	Mandra
4700–4500	LN II (late)	Rachmani, Prodromos-M. Ag. Ioannis, Vasilis, Peukakia M.

In general terms, the conventional tripartite division also applies to western Macedonia, where the first archaeological research was initiated in 1930 by Walter A. Heurtley (1939) in Servia, a site on the banks of Aliakmon River discovered two decades earlier by Alan Wace and Maurice Thompson (1912, 154, footnote 2) and examined and presented a few years later by Wace (11914, 123). Other scholars, such a Leon Rey (1916) and Mylonas (1928), conducted important research activities during the first half of the twentieth century in Macedonia.[7] However, Heurtley's work stands out as the first methodological and synthetic attempt aiming to address issues related to the prehistory of the region (Rhomiopoulou 2014, 34). Apart from Servia and other excavations conducted by him, promptly published in his very famous and influential monograph *"Prehistoric Macedonia,"* he also presented archaeological material collected by other scholars, as well as a brief history of the research in Macedonia, including its western part. As previous scholars have already mentioned, archaeological research of this first phase was characterized by the culture-history tradition, with the main goal being the cultural and ethnic categorization of the region (Andreou, Fotiadis, and Kotsakis 1996, 562). Right before and during the Second World War, a few small-scale research projects took place in

[7] For a historic review of the research during the first period see (Grammenos 1984 and Rhomiopoulou 2014).

central and western Macedonia. The investigation of Dispilio on the shore of the Lake Orestiada by the Greek archaeologist Antonios Keramopoullos and the excavations conducted by German scholars at Toumba Thessalonikis and Vergina among them (Rhomiopoulou 2014, 34-35).

The second phase of archaeological research that started in the 1960s is marked by the following main studies: the excavation of Nea Nikomedeia conducted by the British School of Athens under the direction of Robert Rodden (Rodden et al. 1962; 1996), and the publication in 1967 by David H. French (1967) of the Index of Prehistoric Sites in central Macedonia. While the excavation of Nea Nikomedeia was to become a model for future research in Greece since it was the first systematic research incorporating contemporary archaeological approaches, French's catalog remains to this day a primary work of reference for prehistoric studies in Central Macedonia (Andreou, Fotiadis, and Kotsakis 1996, 561-2). As for western Macedonia, the construction of the Polyphytou hydroelectric dam on the middle-Aliakmon valley initiated a series of rescue surveys and excavations including those at Servia (Ridley and Wardle 1979, Hondrogianni-Metoki 2012).

The third phase is probably the most important period of prehistoric/Neolithic research in Macedonia in general and especially in the western areas, regarding the intensity and also both the quantity and quality of the data produced. Throughout northern Greece there are a considerable number of research projects run either by local archaeological services, universities, or foreign archaeological schools located in Athens. Starting from the 1990s, the "empty" prehistoric landscape of Macedonia was filled with hundreds of sites from the Early to the Late and Final Neolithic period changing radically the knowledge about the Neolithic period in northern Greece (Aslanis 1992; Papathanasopoulos 1996; Andreou, Fotiadis, and Kotsakis 1996; 2001; Grammenos 1997; Grammenos, Besios, and Kotsos 1997; Kotsos and Urem-Kotsou

2006). The large scale of research, including both surveys and rescue excavations due to a number of public construction projects and the devotion of the new generations of archaeologists, many of them graduates of the program of prehistoric studies at the Aristotle University of Thessaloniki, played a crucial role in this direction. Another turning point of the period is the shift from a simple stylistic and typological analysis of the archaeological assemblages, primarily pottery and lithics, to the study of a plethora of artifacts as well as bioarcheological remains under more synthetic and society-oriented approaches, as also highlighted by Kostas Kotsakis (2014, 709). The most typical examples of the large-scale projects consist of prehistoric research in western Macedonia, where extensive surveys and rescue excavations started earlier in the 1980s due to the construction of power plants. The archaeological survey in the middle-Aliakmon valley that has located no fewer than 58 Neolithic sites started in 1985 and is still ongoing (Hondrogianni-Metoki 2012; 2014, 337). A similar extensive project is the rescue excavations run for decades by the local Ephorate of Antiquity to "save" many archaeological sites, including those of the Neolithic period, from the expansion of the lignite fields in the Ptolemaïda basin. These large-scale efforts have resulted in identifying and examining at least 88 Neolithic sites, most of them with Late Neolithic occupation levels (Karamitrou-Mentesidi 2005; 2014: 235-6, Tab. 1a,b).

Pelagonia and Lake Ohrid Basin

As in Albania, there are not many publications concerning archaeological research connected with the prehistoric period in the Republic of North Macedonia. Only recently has it been included either within a few monographs that review the Neolithic period in the region or in publications that discuss the archaeology of the Balkans (Bailey 2000; Garašanin 1982; Naumov et al. 2009; Novakovic 2011 for a short review on the archaeology of former Republics of

Yugoslavia). The history of prehistoric research is divided into two main periods, with the Second World War being the chronological border between them (Naumov 2009; Novakovic 2011). The beginning of prehistoric research in the Ohrid basin and Pelagonia is similar to other regions discussed in this chapter, especially Aegean Macedonia and southeastern Albania. Evidence regarding archaeological sites has been available since the nineteenth century by European travelers in the Balkans, including W. H. Leake or Léon Heuzey. The work of the Greek scholar Margaritis Dimitsa that explored the Ohrid region is of great interest, though its focus was directed more toward the Classical period rather than prehistory. The presence of prehistoric sites in the Republic of North Macedonia was first confirmed at the turn of the twentieth century by the exploration of Sir Arthur Evans and especially the research of the French archaeologist Étienne Patte. The archaeological work of the first period is closely related to Pelagonia as most of the early work was done within this area. The early prehistoric research is associated with several prospections that took place during the First World War and limited small-scale excavations conducted by different expeditions. Two of the latter are the main contributors during the first period that had a great impact on future work in the region: the work of Vladimir Fewkes and his team from Harvard University that discovered and excavated the first Neolithic site, and the publication of Heurtley (1939), *"Prehistoric Macedonia"* already mentioned, in which he also included the research he conducted in Pelagonia. Before the Second World War, a number of Serbian archaeologists including A. Stanojevic and B. Sariwere were active in the region and had dedicated their research to the Neolithic period, however their work is not well documented (Naumov 2009, 3; Bugaj et al. 2014, 223; Naumov 2016a).

The starting point for the second period is considered during the configuration of the Socialist Federal Republic of Yugoslavia in 1945, after which the emphasis on the issues of ethnogenesis in order to support the socio-cultural cohesion of the very diverse society became the main goal of archaeological research. This period is characterized by two significant events with large social and geopolitical impacts in the region: the constitutional decentralization in 1974 and the independence of North Macedonia in 1991 as a result of the disintegration of Yugoslavia. Archeological research included extended surveys and excavations as well as rescue interventions. While the first decades of the period of Neolithic research were conducted mainly by Serbian and Slovenian archaeologists such as Miodrag Grbić, Miluting Garašanin, and Josip Korošec, the second half was dominated by local archaeologists, many of them members of regional museums, the number of which had increased significantly (Dzino 2008, 44-45; Naumov 2009, 3-6; Novakovic 2011, 417-427). Although there are no indepth studies, it has been argued that before the constitutional rearrangements, archaeological research in North Macedonia was, in a way, marginalized as it was not at the center of the discourse on Yugoslavian identity (Novakovic 2011; Gori 2014, 300). Neolithic studies, on the contrary, had a different trajectory due to the great academic interest in this period. The region of North Macedonia was among the main Neolithic channels of communication between the Balkans and the Aegean (Novakovic 2011, 426). Important Neolithic sites that were excavated in Pelagonia include Porodin and Topolčani (Naumov 2016a, 328), while the survey in the region of Ohrid in the 1950s discovered the sites of Gorno Sredoreče Zlastrana and Vraništa–Crkveni Livadi, which were also explored later (Alihanidis 2008, 11-12).

A real research spur in North Macedonia was recorded in the 1970s and 1980s, right before and after the constitutional changes, which are considered as a starting point for the rise of the national archaeology in all the republics of former Yugoslavia (Novakovic 2011). The introduction of the archaeological program at the University of Skopje also has its contribution in this direction. The work of the local archaeologist Vojislav Sanev has been prominent in the advancement of Neolithic studies in North Macedonia during this period. A number of productive projects were initiated, including collaborations with international institutions and scholars, the most important being with Maria Gimbutas and UCLA on the excavations of Anzabegovo that were finalized with the monumental publication on Neolithic Macedonia (Gimbutas et al. 1976; Naumov 2009, 4-5; Novakovic 2011, 417-427).) Although Neolithic research was primarily based on rescue excavations, their intensity increased significantly both in Pelagonia and the Ohrid region. Among many sites investigated in Pelagonia, which became one of the most important areas for this period, Veluška Tumba, Mogila-Senokos, Trn, and Mogila Tumba were among the most significant. Noteworthy is also the research program "Neolithic and Chalcolithic Southwestern Macedonia" in the Ohrid region, where the sites of Dolno Trnovo and Velmej-Kutlina were discovered and excavated (Alihanidis 2008, 15). In the mid- to-late 1980s, there was a decline in Neolithic research in Pelagonia and in the rest of the country associated by some scholars with the underlying economic and political turbulences in Yugoslavia that resulted in the breakup of the Federation into several independent states at the turn of the 1990s (Novakovic 2011; Naumov 2016, 328).

It is interesting that there is no distinction between archaeological research in North Macedonia during the former Yugoslavia and the period after the independence in 1991. However, as in other former Yugoslavian Republics (Dzino 2008; Rizzeto 2010), one could expect that the independence and especially the active engagement of archaeology in the New-Macedonian issue and the construction of national identity in the newborn state, could have also influenced the framework and the main goals of the prehistoric research in the country.[8] Even in cases where independence is recognized as a development that significantly changed the way of doing archaeology in North Macedonia, the archaeological research of the period before and after was still discussed as the same phase without any notable distinction (Novakovic 2011, 417-427). On this issue, Novakovic (2011, 420) has pointed out that "*The transformation of FYR Macedonia […] to an independent country […] had, of course, certain consequences on some infrastructural aspects of the discipline […], but in general terms, it represented a continuation of schemes and concepts designed in the 1970s onwards.*"

Archaeological research after 19991, however, followed the fluctuation of the socio-politic situation in North Macedonia. In general, there was a lack of interest on the Neolithic period probably due to financial reasons, but also because the archaeological research was focused on other prehistoric periods, such as Iron Age, that served better the negotiation of ethnic identity and the New-Macedonian question, which was at the center of the socio-political as well as archaeological activities (Gori 2014), at least until 2019 when a solution of the dispute with Greece was accepted by both parties. A characteristic example of the decrease of Neolithic research is Pelagonia, where a number of projects including geophysical survey, excavation, absolute chronology, and archaeobotanical studies, run by a new generation of archaeologists, took place only after the 2000s (Naumov 2009, Kanzurova and Zdravkovski 2011; Bugaj et al. 2014; Naumov 2016a).

[8] For an extended discussion on the Macedonian question and the role of archaeology see especially (Kotsakis 1998; Cowan 2000; Roudometof 2002; Hamilakis 2007, 125-168; Gori 2014).

3.3. Settlement patterns and architectural features of the Late Neolithic period

The way Neolithic settlements are embedded within the natural environment, space arrangement, and architectural features in the southern Balkans are characterized by chronological and geographic variation as well as uniformity. Some of these elements show a remarkable continuity throughout the period; others undergo drastic changes as we move toward the end of the Neolithic period. In general, the sites multiply in number and grow in size from the Early to the Late Neolithic period, occupying more diverse landscapes. They also have many occupation levels, sometimes lasting for millennia, or they have been reoccupied after a long period of abandonment. As to the type of dwelling and architectural arrangements, the picture is more complex due to the lack of a clear chronological or geographical pattern. (for e review on the settlement pattern and the Neolithic sites in the region see Theocharis 1973; Prendi 1982; Gallis 1992; Kokkinidou and Trandalidou 1991; Papathanasopoulos 1996; Andreou, Fotiadis, and Kotsakis 1996; 2001; Halstead 1999; Bailey 2000; Mitrevski 2001; Demoule and Perles 1993; Naumov et al. 2009; 2017; Korkuti 2010; Naumov 2016a; Prendi and Bunguri 2014; Elezi 2020).

Settlement patterns

Scattered in the landscape, the early Neolithic settlements in the southern Balkans are limited, and they are associated mainly with locations near water sources and fertile alluvial or colluvial soils in river or stream terraces and near lakes (Van Andel, Gallis, and Toufexis 1995; Perles 2001; Mitrevski 2001; Naumov 2016b; Korkuti and Prendi 1992; Prendi and Bunguri 2014). During the Late Neolithic period, both their presence, as well as size, increased significantly. They occupy even more unconventional or extreme microenvironments such as high elevation landscapes. A good example is in Northern Greece, where the significant increase of Late Neolithic sites has been recorded almost throughout the region (Papathanasopoulos 1996, 200-208; Andreou, Fotiadis, and Kotsakis 1996; Fotiadis et al. 2000; Kotsakis 2005; Hondrogianni-Metoki 2012; Karamitrou-Mentesidi 2014). Scholars have argued that this phenomenon is closely associated with population growth (Halstead 1994; Kotsakis 1999). Halstead (1995, 15) has suggested that the occupation of different natural environments represents variation in agricultural strategies. The multiplication of the sites within a homogenous environment could have reduced the ability of the Late Neolithic communities to face natural risk factors, while these challenges lead to the increase of regional contacts (Halstead 1995, 17-9). However, recent extended research in the western Thessalian plains that focuses on the investigation of prehistoric habitation topography has shown that many sites were occupied for a short period of time, while they decrease during the Late Neolithic period, questioning widely accepted arguments about long duration and their numeric growth from earlier to later phases (Krahtopoulou 2019, 76). Short term occupation is common also in the middle Aliakmon valley and the Ptolemaïda-Amynteo basin in western Macedonia, where a large number of sites have been founded during the Late Neolithic period (Hondrogianni-Metoki 2012; Karamitrou-Mentesidi 2014, 235-6, Tab. 1a, b). In contrast, in the region of Korcë many sites usually had multiple occupation layers and were characterized by longevity Elezi 2020). As to their density in the landscape, only the plain of Korcë (Maliq) shows an increase in the number of sites as well as their size during the Middle and Late Neolithic period, while people started occupying locations in high altitudes that sometimes exceed 1000 meters (Aliu and Jubani 1969; Prendi and Bunguri 2014; Elezi 2020). Similarly, sites with multi-phase habitation that last for millennia are common in the Pelagonia and Ohrid regions. In these areas, there is a preference for hilly or mountainous locations during the later stage of the Neolithic period, which has been interpreted as a result of population displacement from regions with lower altitudes (Mitrevski 2001; Naumov et al. 2009, 37-38; Verčík et al. 2019). While the evidence on the settlement patterns in southeastern Albania is fragmented, it has been argued that the above model used in Thessaly and northern Greece could also be adopted for the region of Korçë (Elezi 2020, 35-6).

Open-air sites, pile-dwelling lake settlements, and caves are the three main types of habitation during the Late Neolithic period in southern Balkans. The open-air sites are the most frequent, and research has recognized two distinct groups based on their spatial arrangement and the stratigraphic features, namely tells and flat extended settlements (Wace and Thompson 1912; Heurtley 1939; Chapman 1989, Tringham and Krstić 1990; Kotsakis 1999; for a detailed discussion about the types of settlements in northern Greece see Pappa 2008, 25-53; Toufexis 2017, 23-30). Tells are monumental anthropogenic features formed by continuous building at the same location, so the foundations of the new dwellings were set on top of the old ones. They are considered as habitation islands in a sea of natural features characterized by a dense accumulation of buildings very close or attached to each other; they are also habitation islands in terms of time and ancestral memory (for the definition of tells and their characteristic features, see Sherratt 1993, Chapman 1990, Kotsakis 1999). Flat-extended settlements, in contrast, have a different spatial arrangement. Such sites grow horizontally through the displacement of the occupation levels in space extending significantly the limits of the inhabited area, which may reach even 50 hectares as in the case of Makriyalos in Pieria (Andreou and Kotsakis 1986; Andreou, Fotiadis, and Kotsakis 1996; Kotsakis 1999; Pappa and Bessios 1999). The houses are apart from one another and surrounded by open spaces used probably for various economic activities (Kotsakis 2004).

Tells, either smooth (low) or high, seem to have dominated the Neolithic landscape of Thessaly as they are the most common type of settlement by far (Andreou, Fotiadis, and Kotsakis 1996, 539-560; Krahtopoulou 2019). This is also true for Pelagonia (Naumov 2016a), but there, the number of tells diminished during the Late Neolithic period, and relocation of settlements in elevated areas have been observed (Naumov 2016a; Naumov 2016b, 181). Although present, tells are not common in western Macedonia, the Neolithic settlement pattern is characterized by flat habitations, usually in river terraces or on the edges of plains. In the middle Aliakmon valley, for example, Late Neolithic sites are usually situated on strategic locations either on naturally fortified hills or near the road and river crossings (Andreou, Fotiadis, and Kotsakis 1996, 575; Pappa 2008, 27-30; Hondrogianni-Metoki 2012; Karamitrou-Mentesidi 2014, 235-6, Tab. 1a, b). Unlike in other areas, archaeological research has not identified tells in the region of Korçë, except the low anthropogenic mound of Sovjan. As in western Macedonia, the sites are located on the edges of the basin, near lakes, or terraces within the river and stream valleys (Korkuti and Prendi 1992; Lera et al. 1994; 2009). Interestingly, flat-extended settlements are also limited. Apart from Maliq and Kallamas, no other site can be safely classified in this category. Even these two settlements in some areas have considerably thick vertical stratigraphy (Lerat et al. 2009; Prendi 2018). Therefore, we should probably consider moving beyond the dichotomy between tells and flat-extended settlements. As I argue elsewhere (Elezi 2020), some sites in southeastern Albania combine elements of both these two groups. Similarly, a mix of space-arrangement elements has been observed at the Late Neolithic site at Kleitos Kozanis in western Macedonia (Ziota 2014, 331-333).

Pile lakeside dwellings appear in the southern Balkans around the middle of the sixth millennium BCE. Such settlements are situated on the shore of lakes, and the houses are constructed on top of wooden platforms that rest on pillars. Although they have been identified in western Macedonia (Hourmouziadis 2002; Chrysostomou, Giakoulis, and Maeder 2015), in the Korçë (Prendi 1966, Korkuti 1974) basin and Pogradec (Anastasi 2018), as well as in the Ohrid region (Tolevski 2009, 38; Naumov 2016b, 182), the number of palafittes is very limited. Unlike pile dwelling settlements, caves and rock shelters have been systematically frequented during the Neolithic period. A number of caves with Neolithic layers have been reported form Korçë region, Thessaly, and western Macedonia, while there is no evidence for their use in Pelagonia and Ohrid region thus far (Papathanasopoulos 1996, 37-40; Korkuti 2010, 31; Prendi and Bunguri 2018; Tolevski 2009, 38). In general, although they have multiple cultural layers, caves are not considered as primary habitation units but associated with main settlements used either as temporary shelters or as places with specific functions, such as keeping livestock. However, caves like Theopetra in Thessaly seem to have been used for long-term habitation (Kyparissi-Apostolika 2000; Trantalidou, Belegrinou, and Andreasen 2010, 298).

Architectural features

Although there is not sufficient data from all the regions, it could be argued that the construction and the typology of Late Neolithic architecture in the southern Balkans are characterized by a remarkable diversity. Stone walls, ditches, wooden fences, quadrangular surface houses built of mud bricks or wooden posts, rounded pit-huts, pile dwellings, storage and dumping pits, as well as fire structures, are frequently reported (Theocharis 1973; Prendi 1982, 2018; Prendi and Korkuti 1992; Andreou, Fotiadis, and Kotsakis 1996; Kotsakis 2004, 64; Hondrogianni-Metoki 2014, 340-341). The occupation area of a number of tells and flat-extended sites is often enclosed by large ditches, stone walls, or wooden structures, while in some cases these have also been used for intra-site spatial organization (Andreou, Fotiadis, and

Kotsakis 1996; Pappa 2008 27- 53, Mitrevski 2001, 92; Naumov 2016b, 332, Krahtopoulou 2019, 79). The site of Dimini, located on a rocky hill near the city of Volos in Thessaly, where six or seven concentric stone walls were built around the settlement organizing it in four distinct areas, is the best example of such practices. A number of internal walls have further divided the main space units into smaller areas accessible through complex, radial, concentric, and straight passages (Tsountas 1908; Hourmuziadis 1979; Andreou, Fotiadis, and Kotsakis 1996, 542-546; Souvatzi 2008, 107-145). At the beginning of the twentieth century, Christos Tsountas (1908; 31-35) had argued for a defensive function of these “monumental” architectural features. However, after a reexamination of the site, Hourmouziadis (1979, 110-159) supported the idea that the walls were constructed to organize four main areas associated with specific domestic activities around a central yard. The discovery of part of a stone wall in Kamnik near Kolonjë in the region of Korçë gave space for a similar discussion (Prendi and Aliu 1971; Prendi 1982, 204; Korkuti 2010, 203). Several sites in western Macedonia, including Servia, Kleitos, Aygi and Giannitsa have a system of large ditches to delimit the inhabited area (Pappa 2008, 27-30). At Kleitos Kozanis the ditches were combined with double stake fences in some parts of the settlement (Ziota 2014; 326).

Late Neolithic houses can be categorized into three large groups: surface houses, pit-huts, and pile dwellings. During this period, the houses became larger, sometimes having interior space divisions or even a second floor, and they are often organized around a central courtyard. The ground level dwellings are usually quadrangular with wooden posts and walls built in wattle-and-daub. Rarely, the use of mud bricks for the upper-structure has been reported. (Andreou, Fotiadis, and Kotsakis 1996; 543, 553; Hondrogianni-Metoki 2014, 340-341; Naumov 2016b, 332, Elezi 2020). The preservation of Neolithic houses in the region of Korçë is extremely poor. A complete plan of a house is still to be found; consequently, the information concerning the size and the exact form is very fragmented. The remains of a double-spaced rectangular house in Maliq with dimensions at least 11 x 5 m is the best preserved example. Its floor consists of baked clay mixed with straw and placed on top of horizontal wooden beams, probably for hydro insulation, as it has been argued by many local archaeologists (Prendi 2018, 183-184; Gjipali 1997, 28, Korkuti 1974, 3). The use of wooden structures under either baked or just compressed earthen floors is common in the region of Korçë (Lera 2009, 49; Prendi and Bunguri 2014, 212). Stone slabs instead of wooden beams are used under the floor of the dwellings from Dërsnik (Lera 1988, 25). A similar technique has also been reported from Kleitos Kozanis in western Macedonia, where the earthen floor of a few houses was set on a wooden-plank structure. A number of rectangular houses have been found with their area ranging from 100 to 120 square meters. Their post-frame structures were embedded on foundation ditches, while the walls were covered with straw-clay and a thin finishing layer, often with incised or painted decoration (Ziota 2014, 323). Enclosure and foundation ditches have also been reported from other sites in western Macedonia, such as the Late Neolithic phases at Aygi Kastorias (Stratouli 2005). Rectangular wooden post-framed surface houses are also common in Thessaly and Pelagonia (Andreou, Fotiadis, and Kotsakis 1996, 539-561; Naumov 2016b, 332). Along with ground-level buildings in western Macedonia, Thessaly, and Pelagonia, pit-houses have also been excavated (Andreou, Fotiadis, and Kotsakis 1996, 539-576; (Tolevski 2009, 39; Krahtopoulou 2019). At the site of Makryialos, for example, the semi-subterranean and subterranean pit-dwellings that were clustered within the extremely large occupation area enclosed by a set of massive ditches were replaced in a later phase by rectilinear post-framed buildings (Pappa and Besios 1999, 181-186). In the western Thessalian plain circular or oval subterranean structures were related either with pit-houses or underground level of surface buildings (Krahtopoulou 2019, 78). Associated exclusively with lakeside settlements, pile dwellings are found in the Ohrid region, the basin of Korçë, and western Macedonia. Due to poor preservation, there is not much information about such houses, besides the fact that they are constructed primarily of wood and set on platforms, which are supported by pillars (Hourmouziadis 2002; Tolevski 2009, 41-42; Prendi 2018).

Among other architectural features found within the Late Neolithic settlements in the southern Balkans, the fire structures are the most common. They are clay constructions mainly associated with cooking practices located primarily inside the house. Fire structures are square or rectangular with smooth corners, ovoid, or semi-oval in shape. Many houses in Pelagonia and the region of Korçë have one hearth and oven in each room (Tolevski 2009, 42-43; Prendi 1982, 205; Prendi and Bunguri 2014, 215-219; Elezi 2020), but at Kamnik, a complex of five ovens and one ovoid hearth was found outside the building (Prenid and Aliu 1971, 16-18). These are almost unique structures not only for the Neolithic of the region but for the Balkan Peninsula and Europe in general, as they could have also been used as pottery kilns (Prenid and Aliu 1971, 17). In Late Neolithic Thessaly, the ovens are usually constructed either inside houses or in areas with limited access, as in Dimini for example (Andreou, Fotiadis, and Kotsakis 1996, 2001). This pattern has been considered as a trend towards more isolation of the household and less sharing with the neighbors (Halstead 1994; 1999, 80). In western Macedonia, the picture is more complex as the fireplaces are located inside houses in tells, while in extended flat settlements, the hearths are found outside them (Kalogiropoulou 2014, 366, 367).

3.4. Late Neolithic ceramic assemblages

There is a remarkable transformation in technology, typology, style, and use of the Neolithic vessels throughout the southern Balkans around the middle of the sixth millennium BCE. The pottery of this period is characterized by both a remarkable typological and stylistic diversity forming complex micro-regional patterns. Carinated vessels with dark-colored surfaces became the norm replacing the light-colored pottery with the rounded body of the previous period. The vessels are now widely involved in the storage, preparation, and cooking of food, unlike the Early Neolithic period, where the use of pottery for daily life activities was limited (see Vitelli 1989). At the same time, the obvious homogeneity among different regions is an indication of the intensification of contacts through the exchange of ideas, objects, or even people (Koukouli-Chrysanthaki 1996; Gallis 1996; Vitelli 1977; Fidanoski 2009b, 79-82; Kotsakis 2010; Korkuti 2010; Prendi and Bunguri 2014). The complexity of the interaction between different regions reflected in ceramic assemblages was noticed even during the earlier Neolithic periods in Thessaly and Macedonia (Urem-Kotsou et al. 2017). In general, the data show that there is a positive correlation between the increase of the circulation of pottery and the intensification of regional and interregional network connections (Prendi 1976; Halstead 1995; Hitsiou 2017, Pentedeka 2008; 2017; Korkuti 2010). As Kotsakis (2010, 69) has argued for northern Greece, this picture reflects the active role of the pottery in regional and interregional network connections.

Regarding production and technology, although the primary elements of manufacture remain similar or show slight differentiation from the previous phases, there are some changes associated with the organization of production and secondary forming techniques. As previously discussed, Late Neolithic pottery is handmade with all the operation sequences being accomplished mechanically, and coiling was still the main forming technique. However, there is a significant increase in ceramic production, and elements of household, small-scale workshop industry, and specialization have been observed at least for some specific categories of pottery, mainly in Thessaly and probably at Kamnik in the region of Korçë[9]. The technological changes are primarily associated with the introduction of new morphological features, surface treatment, and decoration techniques (Chapter 4; Demoule, Perles, and Manolakis 1988; Prendi and Aliu 1976; Schneider et al. 1991; Yiouni 2001; Pentedeka 2008; 2017, 145; Souvatzi 2008, 123-127; Hitsiou 2003; Fidanoski 2009b; Vlachos 2009; Ndreçka 2018; Kozatsas et al. 2018, Elezi 2020).

The increase in pottery production along with typological and stylistic changes could be associated with the intensification of the engagement of ceramic vessels in the daily life of the Neolithic communities. Karen Vitelli (1995) has suggested that 30-40% of the Late Neolithic pottery in Greece was used for cooking, indicating a significant shift in pottery function compared to previous periods. Moreover, the great diversity of types, dimensions, surface treatment, and decoration is a clear indication of the complexity of such activities, especially storage, cooking, and consumption of food. In addition, ceramic containers have often been involved in a ritual or symbolic manifestation. Recent research has associated these changes with the construction and negotiation of the identities of the potters and users, as well as with different scale of social interactions (Bailey 2000, Urem-Kotsou 2006, Kotsakis 2010; Startouli et al. 2010; Valamoti, Moniaki and Karathanou 2011; Urem Kotsou and Kotsakis 2007; Urem-Kotsou 2017).

[9] For a detailed anthropological discussion on organization of production see (Peacock 1982; Costin 1991, Cross 1993), and for its application on the production of the Neolithic pottery from Greece (Perles 1992; Perles and Vitelli 1999).

As it has been previously observed (Elezi 2014, 31-32), even though the ceramic material occupies a significant place in preliminary reports of the Neolithic excavations in the Balkans, the primary research and publication of excavations in the region, except for several studies, treats Neolithic pottery as a passive witness of chronological phases, cultural and ethnic groups or interactions between them. Another issue is related to the use of different morphological and stylistic terms for the same category or the use of identical labels in various contexts. Nevertheless, compared to other elements of the archaeological record, the bulk of information with regard to pottery has facilitated a better understanding of various aspects of the ceramic assemblages, especially style and typology. Consequently, it is feasible to generalize on the geographical and chronological comparison of the Late Neolithic pottery in the southern Balkans. The remainder of this section will discuss the main typological and stylistic characteristics of pottery, focusing primarily on similarities and differences between different areas and periods in southern Balkans.

Ceramic categories and decoration style

As an attribute sensitive to transformations, the style of decoration of ceramic vessels shows remarkable changes as we move toward the middle of the sixth millennium BCE. The introduction of the dark-colored vessels, namely black and gray burnished that will dominate the Late Neolithic period, will replace the red-surfaced and light-colored pottery of the previous phases. In addition, there is an increase of decorative techniques to elaborate the surface and an expansion of typological variation. Light-colored vessels will not entirely disappear, but their numbers will diminish drastically during the second half of the sixth millennium BCE. Only toward the middle of the fifth millennium BCE does the production of light-surface pottery mark another growth, only to decrease again during the Eneolithic (Chalcolithic) period. Although to different degrees in terms of time and pace, these transformations will take place throughout the southern Balkans (Korkuti 2010, 109-216; Prendi and Bunguri 2018, 198, Koukouli-Chrysanthaki 1996; Gallis 1996, Bailey 2000, 76-93; Kotsakis 2010; Fidanoski 2009b, 82).

The gray and black burnished pottery becomes the distinct feature of the Late Neolithic period showing a remarkable geographical homogeneity, although often disrupted by regional, micro-regional, as well as chronological patterns. Within Thessaly, for example, an uneven distribution of gray burnished categories has been observed. While it is abundant in the eastern parts of Thessaly, gray vessels rarely occur in the western Thessalian plain (Demoule, Perles, and Manolakis 1988, 20-21; Pentedeka 2008, 71). During the latter, so-called Arapi phase, this type of pottery almost disappears from Thessaly (Gallis 1996, 121). The variety of decoration techniques used on dark burnished vessels is another indicator of such patterns. Black burnished pottery with white painted motifs are common in the Late Neolithic II in central Macedonia, but at Dispilio Kastorias and other sites in western Macedonia, they appear mainly during the Late Neolithic I. In Korçë Basin, on the other hand, this category is almost absent from sites like Dunavec Dërsnik or Barç, which are more or less contemporary to Dispilio (Korkuti 1971; 1973; Koukouli-Chrysanthaki 1996, 114-115; Lera 2009; Voulgari 2011, 114-125).

Blacked-topped vessels consist of another important category of the period. As can be guessed by the name, the upper part of their body is black or gray, while the lower part has a pale, brown or red surface, often with a layer of slip or even painted. This new technique is achieved through the combination of reduced and oxidized firing. Black-topped vessels often occur in western Macedonia and less in Thessaly. In both areas, they are associated with the second half of the sixth millennium BCE (Late Neolithic I) (Demoule, Perles, and Manolakis

1988, 35; Koukouli-Chrysanthaki 1996, 114-116; Chontrogianni-Metoki 2009; Bonga 2013, 151). In the region of Korçë this category is not common during the sixth millennium BCE since only a few examples have been reported from Dunavec and Dersnik (Korkuti 1974, 385; Lera 1988, 31). Black-topped vessels are usually found in an archaeological layer of the second half of the fifth millennium BCE. The Late Neolithic settlements of Barç, Maliq, and Kamnik have provided the most abundant examples of this type of vessel (see Chapter 4, Prendi and Aliu 1971; Prendi 1976, 38; 2010; Lera 1987, 34;) The site of Kallamas is an exception, since the presence of black-toped vessels is constant throughout all its Neolithic phases, although their number increases as we move toward the middle of the fifth millennium BCE (Chapter 4; Lera et al. 2019). Nevertheless, it should be highlighted that the absolute chronology of the Middle and Late Neolithic periods in Korçë region is very fragmented and far from being informative.

In Thessaly, the gray burnished pottery with gray decoration (gray on gray), a category that is considered as transitional from the light-to-dark-surface pottery, is very important for the relative chronology of the so-called Tsangli-Larisa and Arapi Late Neolithic phases (Gallis 1996, 121; Kotsakis 2010, 72). The changes that took place in the middle of the sixth millennium BCE in Pelagonia are reflected in the so-called Mala Tumba Trn group that represents the transition from the Early to Middle Neolithic phase. The ceramic material of the most representative sites of the first phase of this new tradition, such as Mala Tumba Trn, Čuka Topolčani, and Tumba Mogila, is dominated by gray and black tones. The decorative techniques and motifs have similarities with Late Neolithic I in northern Greece and Middle Neolithic in the region of Korçë (Simoska and Sanev 1976, 180-190; Alihanidis 2008, 102; Fidanosky 2009b, 65-82, Korkuti 2010, 120).

Other decorative motifs that occur in the southern Balkans are painted red on white, matt-painted, black on red, brown on cream, polychrome, incision, barbotine, pattern burnishing, impression, punctuation, channeled, rippled, red-topped, and plastic decoration. Often two or more decoration techniques are combined on a single vessel. The ornaments are usually created by pairs or multiple diagonal or vertical lines to the rim, and straight and zigzag lines of punctuated dots, painting, incision, and solid or hatch filled geometric shapes such as triangles and rhomboids (for detailed information on decoration, see Wace and Thompson 1912; Heurtley 1939; Holmberg 1964; Haptman and Milojčić 1969; Gallis 1985, 1996, 121-122; Demoule, Perles, and Manolakis 1988; Koukouli-Chrysanthaki 1996, 114-116; Malamidou 2004; Pentedeka 2008, 67-74; Alihanidis 2008, 102-105; Naumov et al. 2009; Lera 2009; Voulgari 2011, 121-158; Bonga 2013; Prendi and Bunguri 2014).

The domination of the black burnished pottery fades in the fifth millennium BCE. Ceramic assemblages are now more light-colored, as different shades of brown, red, and pale became the norm. In addition, there is an increase of vessels elaborated with painting that becomes the major decorative technique, except at Pelagonia and the Ohrid region, where painted motifs were not among the first choices of the potters. While other techniques such as incision, punctuation, or plastic decoration are still present, matt-painted, black on red, and brown on cream are the most frequently decorative elements of the other areas in the southern Balkans. The motifs became more synthetic, covering either the upper part of closed vessels or the entire body, while often decoration is also applied on the interior. Simple or double solids or hatched spirals, meanders, abacus, bands of straight, zigzag, or wavy vertical, diagonal and horizontal lines appear frequently. In addition, in the region of Korçë there has been a number of recorded vessels from Kamnik and Maliq with black linear motifs of natural bitumen origin (Chapter four; Koukouli-

Chrysanthaki 1996; Gallis 1996; Malamidou 2004; Souvatzi 2008, 118-130, 255-26; Lera 2009; Fisanoski 2009b, 74-78; Prendi and Bunguri 2014, 203-253).

Perhaps the most famous category of pottery of this second period is the so-called classical Dimini Ware. They are known for their stylish and copious decorative motifs (Tsountas 1908, Souvatzi 2008). The relative frequency of the decorated vessels at Dimini was calculated at over 31% of the total, with 96% of them being painted Dimini wares (Souvatzi 2008, 119, fig. 5.5). Although there is no statistical data, high quantities of painted vessels have also been recorded at Kamnik and to some extent at Maliq in the region of Korçë (Chapter 4; Prendi and Aliu 1971; Prendi 2018). Kamnik and Dimini represent the most interesting cases to understand better the stylistic changes in ceramic assemblages in the southern Balkans around the middle of the fifth millennium BCE.

Morphology

Morphological changes around the middle of the sixth millennium BCE are also of great significance. Carinated forms instead of rounded-wall vessels that had dominated the previous period now characterize the morphology of the ceramic material. In addition, the morphological and size variation of the vessels also increases. New forms were introduced, such as conical and amphiconical, while spherical and hemispherical vessels are still in use. A multiplication of closed shapes has also been recorded, although the open vessels are still the most abundant, while hole-mouthed vessels are sparse as before. As with the decoration techniques, the morphological homogeneity throughout the southern Balkans goes along with microregional variations, although the widespread distribution of common vessel shapes is more distinct.

The ceramic material of the sixth millennium BCE is characterized primarily by carinated open small- and medium-size bowls and cups, as well as biconical vessels. Some carinated types have cylindrical or conical collars. The variety of carinated open forms is impressive. As a new shape, it seems that the potters were experimenting not only with the shape and direction of both lower and upper walls, but also their combination in single carinated vessels (see, for example, Hauptmann and Milojčić 1969, Taf. 1-23, Beil. I). This unprecedented variation for a single type of Neolithic vessel should go well beyond any functional causation, although this argument may be precocious at this level of analysis.[10] Among other forms that have been frequently reported are the hemispherical, conical, spherical, S-shaped, and cylindrical bowls and cups. Jars of spherical, carinated, pear-shaped, or squashed body, with or without handles, are the most common types of the closed vessels. Usually, they have short or long cylindrical, concave, or converging necks. More rarely are encountered are askoi, strainers, tripod- or tetrapod-pots, plates, pans, pithoi, as well as spouted vessels.[11] Toward the later phases of the period, the morphology of the vessels gradually changed, although many earlier types continue even at this time. There is a reduction of carinated shapes, and the bodies of vessels become more rounded or smoother as the carination loses its sharpness. Conical and hemispherical cups and bowls are probably the most sought-after shapes, while the closed vessels with spherical or smoothed biconical body occurred more frequently (for detailed information about the types of the vessels and their regional characteristics see also Haptman and Milojčić 1969; Gallis 1996, 121-122;

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[10] Due to the lack of detailed studies, it is impossible for the time-being to talk about the relations between the different variations of carinated vessels within a broader scale in the southern Balkans. It would be interesting to see if there is a geographic, chronological, functional, or stylistic pattern. However, the fact that these different types occur in many areas including at least Thessaly, western Macedonia, and the Korçë region, is an indicator of their spread.

[11] For a brief review of forms and terminology of Late Neolithic vessels from Greece in English see (Kalogirou 1994, 72-98; Bonga 2013, 31-32)

Demoule, Perles, and Manolakis 1988; Koukouli-Chrysanthaki 1996, 114-116; Mitrevski 2003; Fidanoski 2009b, 69-73; Lera 2009; Korkuti 2010; Voulgari 2011; Bonga 2013; Prendi and Bunguri 2014).

Among the most interesting unconventional types that occur throughout the region are fruitstands, anthropomorphic and zoomorphic vessels, as well as rhyta. Fruitstands are usually shallow conical and hemispherical vessels with high to very high concave foot, which in some cases have circular, rhomboid, or trapezoid cutout windows. Usually, they carry painting decoration both inside and out, and rarely the motifs are made by incision technique. The anthropomorphic and zoomorphic vessels, in contrast, have a distinct diversity, something that has been mentioned from many sites in the southern Balkans. They have an extremely rich morphologic, iconographic, and stylistic repertoire. Even more unconventional types are the zoomorphic or anthropomorphic semiglobular vessels with four solid legs and a single large handle on top called rhyta. The anthropo/zoomorphic vessels are present in both the sixth and fifth millennium BCE, the rhyta are usually found at sites dated in the first half of the period. As for the fruitstands, although they occur during this first period, they are primarily associated with later phases (Prendi and Aliu 1971, Biagi 2003; Pilidou 2006; Souvatzi 2008, 120-123; Bonga 2014; Lera 1987; 1988; Voulgari 2011, 173-1976, 217-218; Kotsakis 2010; Korkuti 2010, 129-131; Prendi 2018).

4. Archaeological context

As mentioned in the introduction, three sites, Maliq, Kamnik, and Kallamas in the region of Korçë in southeastern Albania, were selected as case studies to investigate the socio-cultural dimensions of pottery in the first half of the fifth millennium BCE in the southern Balkans. The region of Korçë is relatively well investigated and of great interest for the study of prehistory, especially the Neolithic period in Albania and the Balkans. The sites are significant for investigating the trajectories of the Late Neolithic period in southern Albania. The differences and similarities in duration, spatial organization, and material culture of their Late Neolithic occupation phases provide a unique opportunity to investigate the multifaceted socio-cultural aspects of the ceramic assemblages. In this section, I will present in detail each site, reviewing the existing data about the history of the research, stratigraphy, architecture, ceramics, and other archaeological records. The discussion on the pottery from Kallamas, however, will be based mainly on the study conducted for this dissertation, as the material is still being studied.

4.1. Neolithic Maliq (Maliq I)

The prehistoric site of Maliq is situated on the western edge of the Korçë basin, 13 kilometers northwest of the city of Korçë at an altitude reaching 850 meters above sea level. Maliq was a lakeside settlement situated on the southwesternmost edge of the lake with the same name (Prendi 1966). The lake used to cover 40 km^2 of the northwest part of the Korçë basin until the 1950s when agricultural drainage formed a fertile plain (Figure 4.1; Fouache et al. 2001).

Figure 4.1. Location and extent of the prehistoric Maliq.

The site was occupied for several millennia from the Late Neolithic period to the Iron Age, and it is considered to be a flat extended settlement. Its habitation phases evolved horizontally by moving from one location to another nearby, thus covering a large area, which has been calculated to be around fifteen hectares (Korkuti 2010). This is common in the Neolithic Balkans and northern Aegean, especially after the middle of the sixth millennium BCE, where many large size settlements used to mark the landscape (Andreou and Kotsakis1986; Pappa and Bessios 1999; Pappa 2008). Maliq is a type site, and its pottery was used for establishing the relative chronology of the Late and Final Neolithic periods in Albania and, to some extent, in adjacent areas (Prendi 1966; 1982; Prendi and Aliu 1971).

4.1.1. Archaeological research

The prehistoric settlement was first mentioned by Hasan Ceka and Jovan Adami (1949) in their report about the unprecedented archaeological material that came to light as the result of drainage works in lake Maliq northeast of the modern village during the 1947-1948 seasons. The material discovered there was considered as Mesolithic and Early Neolithic by Ceka and Adami (1949, 98). The first excavation attempts were made in 1952 by Frano Prendi, but the site was underwater, and the drainage project was still underway (Figure 4.2). In 1961 the excavation of Maliq was an emergency operation since the work for widening and deepening the riverbed of the Devolli River brought to the surface for the second time numerous archaeological artifacts including ceramic sherds, lithic and bone tools, a bronze and an iron spearhead, as well as rows of vertical wooden oak piles of different diameters. The bronze weapon and the plentiful black burnished ceramics gave scholars the impression that they were dealing with a Bronze Age site. With that, the decision for a proper archaeological excavation was made, and a group of Albanian archaeologists under the direction of Frano Prendi started the first of three fieldwork seasons that took place over the course of three decades (Prendi 1966; 2018, 167-75, Fig. 6).

From 1961 through 1990 the excavation in Maliq stood out not only as the first systematic prehistoric excavation in Albania but it was also the largest and the most important among many other projects that Albanian prehistorians have implemented in the second half of the twentieth century. The impressive size of the excavated area, calculated to be around 3200 m2 at the end of the project, along with hundreds of thousands of archaeological objects, is a strong indication of the extent and importance of the project (Picture 4.3).

The first fieldwork season lasted six years from 1961 to 1966 and was initially designated as a rescue excavation intending to save parts of the settlement threatened by the extension of the riverbed. During this period, an area of more than 2600 square meters was excavated in two sectors, A and B, which were divided into trenches of 20 x 20, 10 x 10, and 5 x 5 meters. Based on the ceramic sequences, the archaeological layers recognized in these trenches represent three prehistoric periods: Late Neolithic, Eneolithic, and Bronze Age. Besides the numerous portable artifacts, remains of the pile dwelling phase were found, a rectangular two-roomed plan house, and several ovens. The second excavation phase took place from 1973-1974, and is characterized by sondages opened in sector B designed to control the Late Neolithic stratigraphy established in the previous years. Besides the clarification of the Neolithic layers, the archaeological research of this period came up with the identification of the Iron Age occupation levels, known as Maliq IV (Prendi and Andrea 1981; Prendi 2018).

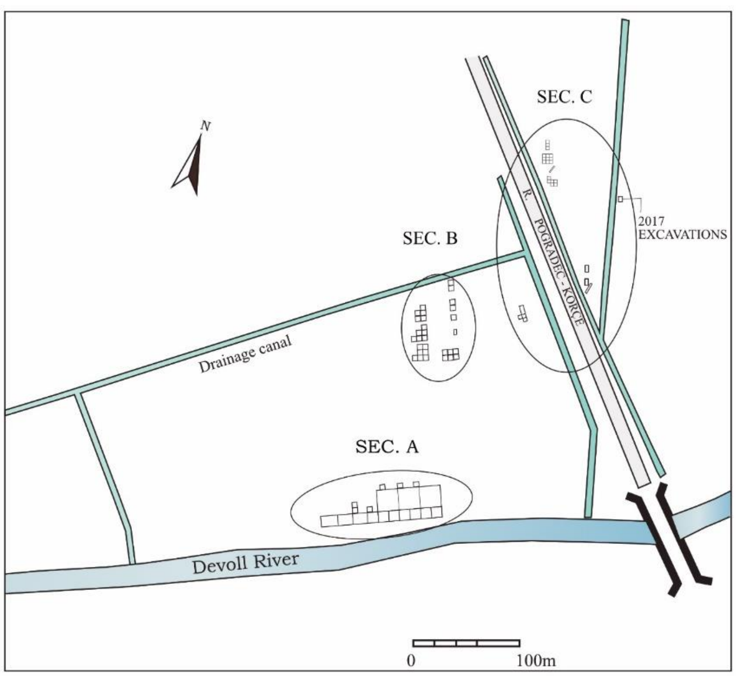


Figure 4.2. General plan of the excavated trenches at Maliq. Map provided courtesy of E. Hasa and edited by the author.

In 1988, the Albanian Institute of Archaeology initiated the third period of fieldwork in Maliq under the direction of the archaeologist Petrika Lera. The main goal of this project was to conduct further investigation of the Iron Age layers and their archaeological material. For that reason, the excavations took place in three test trenches in a new location named sector C, east of the previous areas of excavation. Although there are no preliminary publications from these excavation seasons, it has been reported that in this sector, archaeological research was able to identify the Neolithic and Eneolithic occupation levels at the same location, stratified one on top of the other (Prendi 2018, 25). In 2017 Ergys Hasa, from the Institute of Archaeology in Tirana, carried out a small-scale test control excavation near Sector C. His main goal was to clarify the Eneolithic layers of the settlement and to collect samples for radiocarbon dating. While the results are in the process of publication, the most notable finding from the last season was the discovery of a row of several wooden pillars. The excavator has considered this wooden structure to be part of the palafitte settlement discovered in sector A (Hasa 2018, 418). In this case, the spatial extension of the pile-dwelling occupation level in Maliq must have been substantial. Conversely, as I will argue in the following section, this wooden feature may testify to the existence of another pile dwelling phase distinct from the first one.

Taking all the evidence into consideration, it is evident that the scale, intensity, the extent of excavations, and the amount of discovered material in Maliq were, and remain, unparalleled for the history of prehistoric research in Albania. The following sections will provide a review of the Late Neolithic layers with discussion of the chronological phases, the occupation levels, and their architectural features, as well as the material culture recorded at the site.

Figure 4.3. Pile-dwelling remains at Maliq. Institute of Archaeology in Tiranë.

4.1.2. Stratigraphy and the architectural features

Maliq was occupied in prehistory for about 4000 years, and its complex stratigraphy witnesses the historical and cultural traces of several periods and subperiods from the Late Neolithic to the Iron Age (Table 4.1). Three habitation phases that belong to the Late Neolithic period, according to Albanian chronology, have been discovered at Maliq throughout all the excavation periods (for the Neolithic chronological phases, see Chapter 3, Table 3.1). The most numerous and representative findings of this period, however, come from the 1965-1966 and 1973-1974 seasons. The excavation during the summer of 1973 has provided the most tangible and clearcut evidence of this period. Maliq's Late Neolithic layers vary stratigraphically from 1.30 to 1.50 meters in depth and have been divided into two phases: Maliq Ia and Ib (Figure 4.4;

Prendi 1974; Korkuti 2010, 200-3). Maliq Ib has been considered as a transitional phase to the Eneolithic (Prendi 2018, 178, 186). However, in the last two publications regarding the site, the phase Maliq 1b was classified either as Eneolithic or Proto-Eneolithic (Prendi and Bunguri 2014, Prendi 2018)[12].

Table 4.1. The table with chronological phases recognized in Maliq and their conventional names (after Prendi 2018, 178).

Late Neolithic I	Maliq Ia
Late Neolithic II or Proto-Eneolithic	Maliq Ib
Developed Eneolithic	Maliq IIa
Late Eneolithic	Maliq IIb
Early Bronze Age	Maliq IIIa and IIIb
Middle Bronze Age	Maliq IIIc
Late Bronze Age	Maliq IIId
Early Iron Age	Maliq IVa
Developed Iron Age	Maliq IVb

The uncertainties about identifying different chronological phases and stratigraphic boundaries between the Neolithic and Eneolithic layers are present in almost all the publications about Maliq. Such an issue should be closely related to the extension of the site as well as the excavation method. The large dimensions of the trenches and the horizontal development of the occupation phases have played a crucial role in the presence of layers from different phases and

[12] It seems that the clarification of the chronological phases of Maliq greatly preoccupied Frano Prendi for a long time, considering the fact that he had supported contrasting arguments about the chronology of the Maliq Ib phase and the transition from the Late Neolithic to the Eneolithic period, clearly seen even in his two last publications, both of which came into light after his death.

periods occurring at the same level. Thus, the transitional phases mentioned by the excavators based on the presence of material from two successive periods at the same depth of a single trench may be misleading and a result of misinterpretation caused by the improper methodology of excavation.

The layers of the early Late Neolithic phase of Maliq Ia are up to one meter thick and are well represented in sector B, which was excavated in 1965 and 1966. Compared to the Eneolithic and Bronze Age, the Neolithic layers have provided a relatively weak archaeological context. The archaeological assemblage consists mainly of ceramic sherds as one of the most abundant materials, lithic and bone tools, stones, zooarchaeological and human remains, as well as other fired clay objects. Except for the pottery, which has been stylistically and typological relatively well examined, the rest of the material is poorly studied.

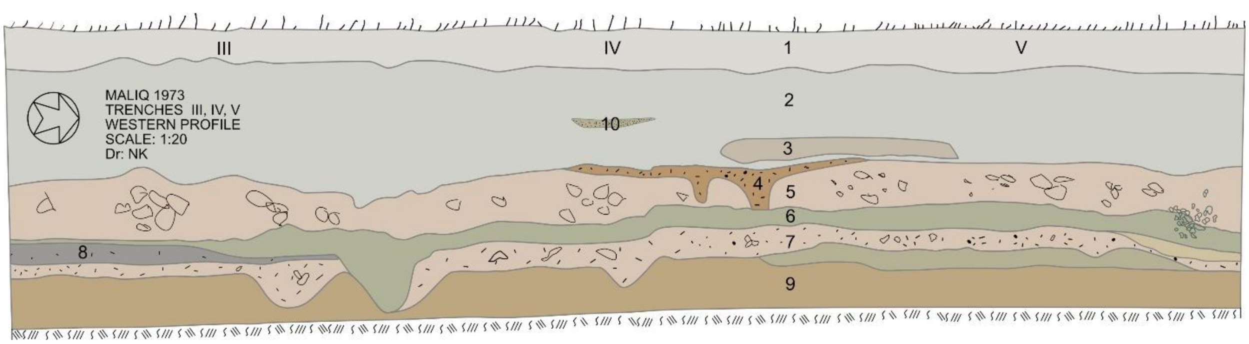


Figure 4.4. Late Neolithic layers at Maliq. Archives of the Institute of Archaeology in Tiranë. Digitized by the author.

Due to the large amount of material discovered at Maliq, there is a vibrant repertoire of all the categories, although the collection of the archaeological findings was selective. The architectural remains of this period are almost missing except the plan of a rectangular building found within the earliest layers in sector B. The house, the dimension of which was 11.5 x 5.1 m, had two distinct spaces. The two rooms were divided with a wall built of wattle and daub, a technique that was probably used for the whole building according to the excavators, although the rest of the house was not preserved. Both rooms were furnished with a square-plan oven with smooth corners, next to which was placed a rounded hearth. The ovens are poorly preserved, and any information related to the construction of the upper part was inferred from the comparison with similar features discovered in the Maliq Ib phase or Late Neolithic Kamnik near Kolonjë south of the Korçë basin. In contrast to the ovens, the floor construction of the house is better understood due to the high degree of preservation. The entire building had a wooden beam floor laid in a grid and covered with mud and straw layers (Prendi 1966; 2018, 182-184, fig. 8; Korkuti 2010, 200).

The Maliq Ib phase has been identified in several trenches, where the thickness of its cultural strata varies between 30 to 50 centimeters. The excavators have reported that the Proto-Eneolithic or Eneolithic Maliq Ib layers are deposited on top of the Late Neolithic Maliq Ia, without any hiatus (Prendi 2018, 190). However, the continuity between Maliq Ia and Ib may be debatable not only due to the stratigraphic issues mentioned earlier in this chapter, but also because the absence of a hiatus has not been explained with clarity in all the publications, including the most recent. Moreover, searching through archaeological documentation, especially the stratigraphy of the site available in the archives of the Albanian Institute of Archaeology, I have not been able to identify such a continuation. As will become apparent in the discussion of the ceramic assemblage in the following section, from the trench where the transition phase has been recorded, there are ceramic categories that belong to both Late Neolithic and Eneolithic periods.

The uncertainty about the stratigraphy of Maliq goes beyond the Late Neolithic layers and their relationship with the subsequent Eneolithic levels. The identification of the main Eneolithic phases, for example, remains unsettled, and the debate is still ongoing (Prendi and Bunguri 2014, 257; Korkuti 2010; 200-203; Prendi 2018, 176-179; Hasa 2019, 98-117). The improper method of excavation for a stratigraphically multicomponent site like Maliq, the extension of the excavated area in a relatively short period, more than 3000 m^2 trenches in only ten fieldwork seasons, as well as the lack of absolute dating have greatly contributed to such uncertainty. Only three radiocarbon dates are available from Maliq. The first C^{14} date result was obtained in the 1990s, and the sample taken from the Maliq IIa layers yielded an absolute chronology with a vast range between 4660-4092 cal. BCE (Guilaine and Prendi 1991, 575). The other two C^{14} dates from the last layer of the test trenches excavated in 2017 were analyzed by Brian Damiata at the AMS Laboratory at the University of California Irvine. As can be observed from figure 4.5, the earliest layers from the last excavations are dated before the middle of the fifth millennium BCE.

This new evidence is certainly intriguing and may provide new insight into the discussion regarding the Neolithic layers of the settlement. In my view, the absolute dates fit better to the Late Neolithic rather than to the Eneolithic period, although they are just before 4500-4300 BCE, which, for almost all the Neolithic scholars working in southern Balkans, is considered the borderline between these two periods. The ceramic material collected from the layers with the absolute dates (Hasa 2018, 418-419; 2019, 115) may support this argument. According to the excavator Ergys Hasa, the decoration of the ceramic assemblage from this level is dominated mainly by incision and punctuation motifs, while painting is less frequent. In addition, the reexamination of the pottery from Eneolithic Maliq (IIa,b) shows that the ceramic material of the earliest phase of this period is characterized primarily by painted decorations such as white (gray) on black surfaces or crusted motifs (Hasa 2019, 101-106).

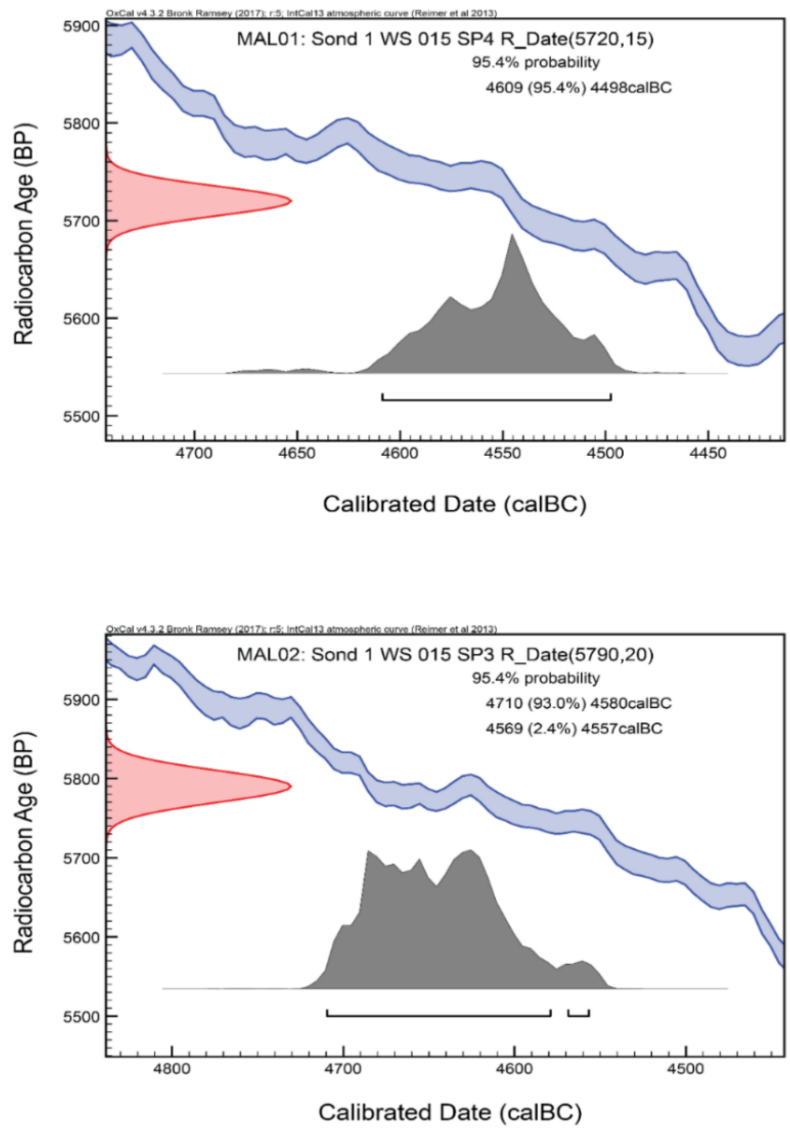


Figure 4.5. Calibrated radiocarbon results from Maliq, after Has (2019, 115-6, fig. 237-8).

Thus, the limited number of painted sherds in the trench with the recent radiocarbon dates may support the argument that these layers should be associated with the ultimate phase of the

Late Neolithic period. Moreover, the incised decoration is one of the main characteristic elements of the Late Neolithic II pottery from Dimini, which contemporary with Maliq (Hourmouziadis 1978; Souvatzi 2008), while similar motifs are also present at Makrygialos II (Vlachos 2009; Hitsiou 2017). Finally, the dates from the last excavation season in Maliq are in line with the new schema of the Neolithic chronological phases from Thessaly, where the Late Neolithic IIb is framed between 7700 and 7500 BCE, in which the Rachmani phase has been incorporated (Reingruber et al. 2017, Table 5; Chapter 3, Table 3.1).

Taking this argument further, it can be suggested that the wooden piles discovered within the earliest layers from the excavations of 2017 (Hasa 2018, 418) may belong to the Late Neolithic phase Maliq Ib. As such, the pile-dwellings could have initially occurred in Maliq earlier than the Eneolithic phase IIa, as has been previously argued (Prendi 1966; 2018, 197-200; Korkuti 2010). However, additional evidence, especially absolute dates and their connections with the chronological phases, are required to build a robust basis for such an argument[13]. Regardless of the chronology of this palafitte phase, the successive alternation of surface houses with those on piles following the lake-level fluctuation, in order for the settlement to remain in the same area, has probably been used as an indication of the symbolic or ideologic bonds of the occupants of the Neolithic and Eneolithic Maliq with this specific location (Elezi 2020).

4.1.3. Pottery and other archaeological assemblages

Pottery

[13] I would like to thank my colleague Ergys Hasa from the Institute of Archaeology in Tirana for the constructive discussions on these topics while we were both working on the ceramic material from Maliq with him focusing on the later Eneolithic (Chalcolithic) period.

Until very recently, the Late Neolithic pottery from Maliq was not published, and its study was in a preliminary stage (Prendi 1966; Korkuti 2010; Prendi and Bunguri 2014). Even the final publication of the site and the archaeological material does not provide a detailed and systematic study of the pottery. The volume focuses primarily on determining types, categories, and style of the ceramic material and its cultural, geographical, and chronological analogies (Prendi 2018). Nevertheless, based on the previous publications (Prendi 1966, 256-7; 1974, 15-20; 1976, 35-8; Korkuti 2010; 200-1; Prendi and Bunguri 2014, 222-9; Prendi 2018, 187-92)[14] and my research conducted for the dissertation project, it is evident that the Maliq I phase has yielded a large number of ceramic sherds and a wide variety of types, categories, dimensions, and decorations.

Figure 4.6. Ceramic assemblage being sorted in the field. Institute of Archaeology in Tiranë.

Two large groups can be distinguished within the pottery of the Maliq Ia phase: coarse and fine ware. The first category includes mainly gray or black and, less frequent, light-colored

[14] The discussion of the Late Neolithic pottery from Maliq is based primarily on the information provided by Frano Prendi (1966; 1974; 1976; 2018, Prendi and Bunguri 2014) in his publications, the excavations reports archived at the Albanian Institute of Archaeology, and my own study of the ceramic assemblage of this phase.

vessels that have low to medium burnishing, rough, and smoothed exterior surface. Their ceramic paste contains primarily middle and coarse temper, although some vessels have a fabric with fine inclusions. Regarding the typology, the coarse pottery has a relatively limited repertoire dominated by open small- to middle-sized spherical, hemispherical, and carinated vessels. A clearly-distinguished group of coarse vessels is the relatively deep conical or straight-walled containers that recall the stewpot and the shallow large oval-shaped pans (Appendix B, Plate I; Prendi 2018, Tables. I-II, XV-XX,). Both these types have thick walls, while many of the pans, if not all of them, have the interior bottom covered with finger imprints. Decoration is not common on the coarse vessels, and it consists mainly of plastic motifs, such as circular and elongated knobs or bands. In a limited number of potsherds, barbotine, impresso, and incised decoration are present.

Figure 4.7. Decorated sherds from Maliq.

Unlike the first group, the fine wares are characterized by a vast range of forms, dimensions, and decorative motifs. Their well burnished or polished surfaces are dominated by light colors, such as different tones of brown, red, and very pale brown or yellow. Less frequent are the dark gray or black colored vessels. Small to medium-size vessels, also called cups and small bowls, are the most common types found within the layers of the Maliq Ia phase. Usually, they have a hemispherical, biconical, carinated, or conical body. Middle size vessels are represented in large quantities. This group consists primarily of conical, cylindrical, and spherical vessels. The closed spherical, biconical, or pushed down vessels with conical, cylindrical, and converging neck or mouth are some of the forms that appear frequently (Appendix B, Plate II; Prendi 2018, Tables III-XIV). These types of vessels are almost missing from the coarse ware group. As to the surface treatment and the finishing of the fine wares, it is worth noting that black or red burnished or polished vessels occur more frequently, although this picture may not reflect reality since they could belong to a specific type of pottery, namely the black-topped (for a description of black-topped vessels see Chapter 3). During the macroscopic study of the material, I noted the presence of many rim fragments with a black burnished surface, as well as light brown or red burnished bases. As such, the black-topped vessels may be misrepresented, while the number of black and red burnished categories is boosted artificially. Black-topped vessels usually have bodies with a smooth or sharp carination, which marks the border between the two colors, although some are conical. Some of the fine ware vessels have lids of various shapes with burnished or polished surfaces often decorated with painted or plastic motifs (Appendix A-2; Figure 4.7; Prendi 2018, Tables I-XX).

Painting is the most common decorative technique in Maliq Ia. Matt-painted and black-on-red constitute by far the largest categories. Both these categories have matte painted decoration. There is another painting category, where motifs have burnished surfaces. They usually are red or brown reddish applied on a very pale brown or pale white background, which also has traces of burnishing. In general, their motifs are of various tones of red, brown, and orange applied with different size brushes before firing. The decorative patterns consist of single motifs or zones of linear and geometric forms, such as straight or wavy lines, spirals, triangles, and rectangles often combined on the same vessel. The geometric motifs are either solid or filled with linear, zigzag, and wavy lines. A very interesting category of painted vessels is the polychrome group, although limited in numbers. Its decoration covered the entire body and is composed of light shades of brown, yellow ochre, or and red motifs as opposed to white or pale ones, both with traces of fine burnishing. Additionally, the borders between the contrasting motifs were marked with a distinct dark brown matt-painted line. Post-firing decoration referred to as crusted is present in Maliq Ia. The motifs of such vessels are mainly geometric made of white paste and red ochre applied both on the exterior or interior surfaces right after firing on a dark gray and rarely brown background. There is at least one crusted fragment with white paste motifs that create large areas filled with thick parallel straight diagonal lines or cross-hatching on a brown background, separated by a wide band of red paste, resembling the matt-painted or polychrome techniques (Figure 5.8,b). Both matt-painted, as well as crusted decoration, were applied onto the entire body of the vessels. However, matt-painting was often used only on the upper part on the closed biconical or pushed-down shapes. Aesthetically, the results of these painting techniques are impressive. Other decorative motifs that occur in fine ware pottery are incision and punctuation, often paired on a single vessel, while the former is sometimes combined with post-firing white paste applied within the tiny holes (Appendix A-2).

The pottery of Maliq Ib has many typological and stylistic similarities with the previous phase, although changes have been noted, especially in the ratio between different ceramic categories (Prendi 2018, 190). Black burnished or polished, matt-painted, crusted, and black-topped are among the ceramic wares that continue. Unlike the preceding phase, in Maliq Ib, the amount of black burnished pottery increases remarkably, while the matt-painted vessels occur in limited numbers. Instead of painted ornaments, incision and punctuation seem to be the most frequent decoration motifs that often occur on the same surface. The vessels are usually decorated with zones of parallel lines diagonally applied on the surface and combined with an oblique line of shallow punctuated dots. Another frequently occurring category includes the black burnished vessels with gray linear decoration. This category is the same as white-on-black decoration observed in the Late Neolithic of northern Greece (Bonga 2013, Voulgari 2014, Elezi 2014), but Albanian archaeologists use a different term. As to typological variation, it is worth noting the presence of biconical and elliptical-mouthed incised and punctuated cups, conical bowls, the so-called milk vessels, large conical or hemispherical vessels with curved lips, casseroles with a wide mouth and narrow base, as well as shallow pans with finger impressions on the interior bottom. (Appendix A-2). Many of these categories continue during the succeeding Eneolithic phase (Prendi 1966, 2018).

Other finds

Other than pottery, archaeological materials such as bone and stone tools, ornaments, as well as clay objects are found in a limited amount in Maliq I (Prendi 1966; 1974; 2018; 185-6). The tools made of stone, bone, or antler are relatively rare finds. The stone tools are mainly polished axes and adzes, and several spindle whorls of different shapes and dimensions with a pierced vertical axis. There are some ovoid grindstones of small dimensions that have a slightly concave surface caused by their use. The most common flaked-lithic tools are knives, blades, scrapers, and flakes, all made of flint, while some have traces of retouch. In the Late Neolithic layers, a retouched blade fragment of Melian obsidian has been found, believed to have reached Maliq from the region of Macedonia, where several sites have provided large quantities of such material (Ruka et al. 2019). Tools made of animal bones or horns, such as needles, awls, and some worked and well-polished fragments, are also present in Maliq. Fired-clay objects are another interesting group of artifacts. They are small weights grouped by the excavators in two typological categories: saddle-shaped and isosceles trapezoid prisms. The saddle-shaped weights have two tiny holes along their edges, while the trapezoidal ones carry a large hollow right in the center of the short base. Usually, such clay artifacts are functionally associated with activities taking place near hearths, as they have been found often near them.

Ritual objects or jewelry are not very well represented in Maliq I. It is worth mentioning the presence of necklace beads made of deer horns or pierced fragments of *spondylus gaederopus* ornaments. The spondylus, along with the obsidian blade, is clear evidence of the contacts between Maliq and the Neolithic Aegean world. Besides the archaeological artifacts mentioned above, there were also recorded human remains of two children in Maliq I. The skeletons were located near the two-spaced building within a shallow double grave, placed on their right side in a fetal position, without any trace of grave goods. Found within the inhabited area, these burials, along with another located between the wooden piles, have been used as supporting evidence to argue specific links between the prehistoric residents of Maliq and their settlement involving social memory and identity negotiation (Elezi 2020).

4.2. Neolithic Kamnik

Neolithic Kamnik occupies an elevated rocky hill in the Kolonjë district north of the Lengaricë River near the modern homonymous village. Located in rugged terrain, the hill of Kamnik is about 1200 meters above sea level. The hill consists of two crests and is surrounded on the north and east sides by several terraces, while its southern part is characterized by a steeped topography along the Barmashi stream. Like many Neolithic sites in Albania, Kamnik has been occupied for a long period from the Neolithic through the first centuries of the Common Era. The remains of the Neolithic habitation were found in the area between the two crests, as well as north of the northwest peak (Figure 4.8-4.9; Aliu and Jubani 1969; Prendi and Aliu 1971).

Figure 4.8. Location of the Neolithic Kamnik.

The study of the archaeological material from the site has serious challenges. Apart from the problematic method of excavation and the random and biased collection of the material,[15] all the

[15] Most of the prehistoric excavations prior the 1990s in Albania were conducted through arbitrary layers of 20 or 10 centimeters, while the collection of the archaeological material was made based on the cultural, chronological, or aesthetic value of the artifacts and less on their statistical representation. In fact, these methods served better the main goals of archaeological research such as the definition of geographical and chronological cultural groups (see Chapter 3 for the discussion on the prehistoric research in Albania).

documentation, such as field reports, archaeological diaries, plans, as well as drawings of the profiles filed after each excavation season in the Archives of the National Institute of Archaeology in Tirana, are missing. Consequently, my review of the excavations in Kamnik will be based only on a few articles, two of which provide detailed annual reports published in two Albanian archaeological journals, and on my research on the ceramic assemblage.

4.2.1. Archaeological research

Kamnik has been part of the Albanian archaeological map since the 1960s. In the summer of 1967, the Museum of Ersekë surveyed the region to record all the Illyrian fortified sites in the district of Ersekë. On top of the "Kamnik Rock," the researchers discovered the remains of a fortified classical watchtower, as well as a high concentration of prehistoric ceramic sherds. The excavation of the site was conducted in three successive fieldwork seasons from 1968 to 1970. The first excavations were carried out by the local Museum of Ersekë under the direction of Skënder Aliu and with the participation of several high-school teachers from the district of Kolonjë. The main goal was to define the chronological period associated with the material found on the surface. Thus, the archaeologists designed and opened several test trenches on the terraces located between the two hills and close to the highest crest. The dimensions of trenches were 5 x 5 m, while the excavated area was labeled Sector A (Aliu 1969; Aliu and Jubani 1969). The data collected from the archaeological record discovered during the first excavation season did not provide adequate information beyond the broader categorization of the material culture as Late Neolithic. Consequently, research continued in the following year. The exploration of the nature of the site, the clarification of different chronological habitation layers, as well as the investigation of the architectural remains discovered the previous year were the main goals of the second excavation season that took place in the summer of 1969. The richness of the archaeological material discovered from the previous year had attracted the interest of the Albanian Institute of Language and History, part of which was the Department of Archaeology.

The Institute took over the excavations in Kamnik, while the collaboration with the local museum and the teachers continued throughout the end of the fieldwork. During the second year, the excavations continued in Sector A, where the excavators opened new trenches. Also, two other excavation trenches were opened in another location labeled Sector B, situated on a terrace between the two crests (Figure 4.9).

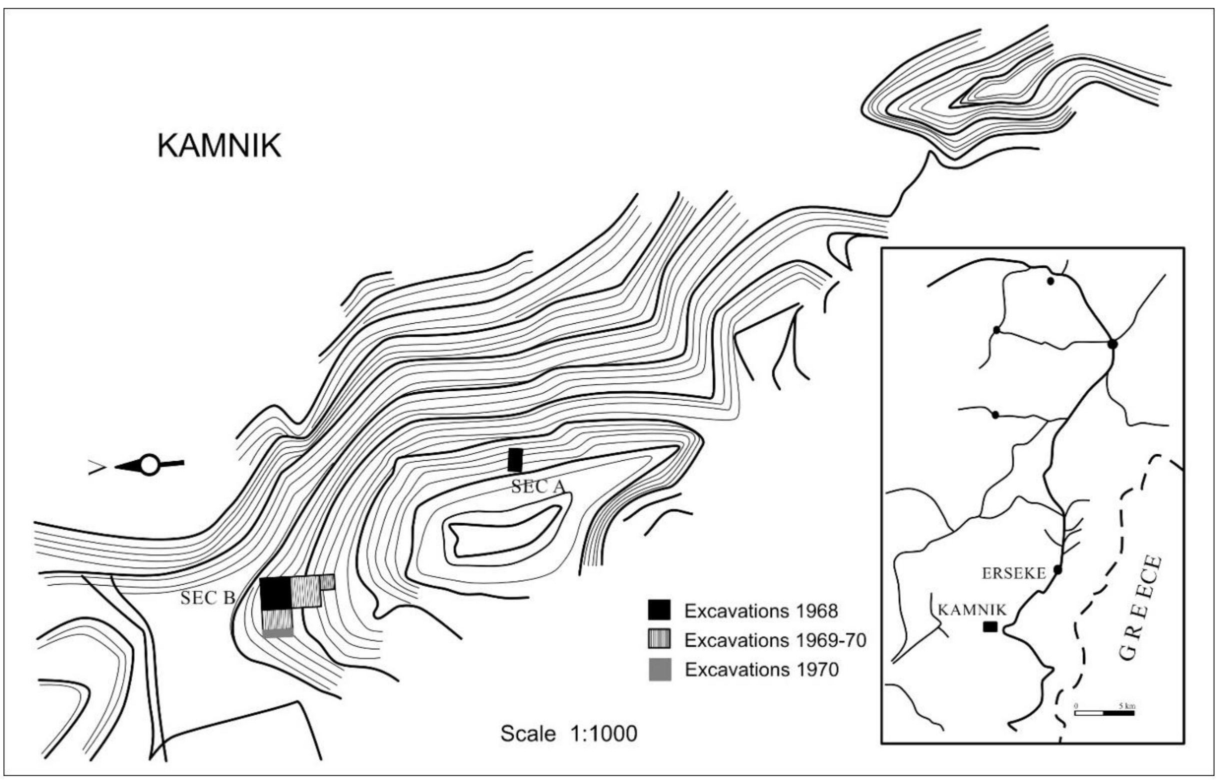


Figure 4.9. Plan of the excavated areas in Kamnik. After Prendi and Aliu 1971.

The final excavation season in Kamnik that took place in 1970 was directed by Frano Prendi, who was also the excavator of Maliq. During this year, archaeologists finished the excavation of the trenches from the previous season and opened three new ones in Sector B. The objectives of this last season, which were the same as the previous one, included the investigation of the architectural features and the definition of occupation levels. The goals of the excavations in Kamnik were greatly shaped by the efforts to compare and associate its material culture, especially pottery, with the Neolithic phases in Maliq. This is reflected in the preliminary publications of the archaeological material, where the juxtaposition with Maliq received a central role. Since that time, the Late Neolithic period in Albania was called the Maliq-Kamnik cultural group (Aliu and Jubani 1969; Prendi and Aliu 1971; Prendi 1971; 1972; 1976, 33; Prendi and Bunguri 2014, 203).

4.2.2. Stratigraphy and architectural remains

Throughout the three fieldwork seasons in Kamnik, the archaeologists excavated a total area of over three hundred square meters. The investigation provided information about the extent of the site, the density of occupation, as well as the nature of this Neolithic hill-top settlement, unconventional in Albania. Although the excavation activities focused only on two specific locales of the site, the excavators argued that the extent of the settlement was very limited, judging mostly from the restricted area suitable for habitation on top of the "Kamnik Rock" (Figure 4.9; Prendi and Aliu 1971, 14). Similarly, the duration of the occupation was relatively short compared to other Neolithic sites like Maliq, for example. Three different perspectives of the relative chronology of Kamnik have been elaborated in the literature, based primarily on the typological and stylistic variations of the ceramic assemblage. According to the first approach, the occupation of Kamnik covers the largest part of the fifth millennium BCE, from the beginning of the Late Neolithic to the early phases of the Eneolithic period (Aliu and Jubani

1969, 12-3; Korkuti 2010, 204). In another version, the habitation phases of Kamnik are associated only with the Late Neolithic period (Prendi 1971; 1976). A recent reconsideration of the ceramic material from the site resulted in the extension of its diachronic duration from around 5000 to 4000 BCE, a period that includes the end of the Middle Neolithic, the Late Neolithic, as well as the Early Eneolithic phase (Table 4.2; Prendi and Bunguri 2014, 232). It is almost certain that the lack of a robust ceramic sequence created such uncertainty. The unclear relationship between the typological and stylistic variations of the pottery and the archaeological layers is directly associated with the excavation method applied in Kamnik, as well as the lack of absolute dates.

Table 4.2. Chronological phases in Kamnik, according to Prendi and Bunguri (2014: 353-355, table 3, 4, 5).

Middle Neolithic	Kamnik I
Late Neolithic	Kamnik IIa
Eneolithic	Kamnik IIb

Unlike the extent and duration of the settlement, the occupation intensity of the site was considerably high. The archaeological layers of the Late Neolithic period are more than two meters deep, with at least five successive habitation phases (Korkuti 2010: 204), thus classifying Kamnik as a multicomponent site. However, not all the occupation phases are present in every single excavated trench. This phenomenon has been interpreted by the excavators as an indication of the different stages of the expansion of the settlement, starting from the foot of the hill and moving toward the top (Prendi and Aliu 1971, 14). Each of the phases has yielded rich architectural remains of houses, but their preservation is very poor. Neolithic Kamnik is well known for two unique architectural features for the Neolithic period in Albania: a stone wall and a complex of clay-built ovens (Figure 4.10).

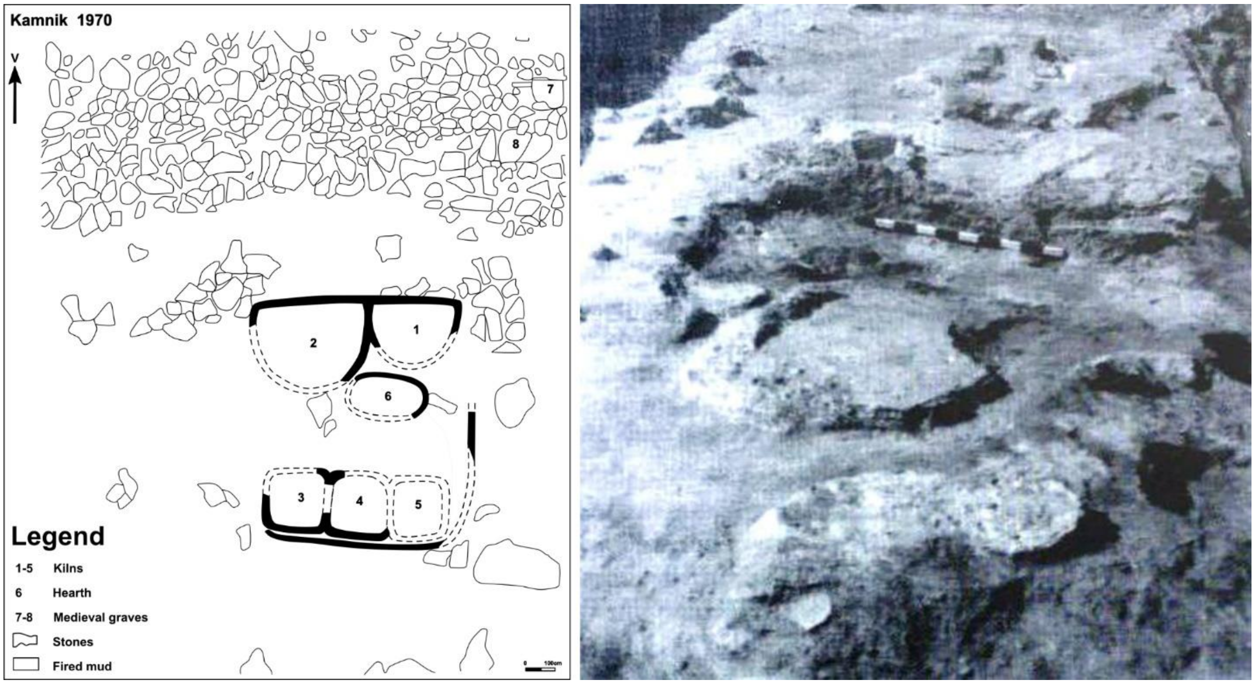


Figure 4.10. Plan and photo of the trenches where the ceramic kilns and the stone wall were discovered. Plan, after Prendi and Aliu 1971, photo by courtesy of Skënder Aliu.

The stone wall defines the edge of the habitation area extending on the northeast terraces of the higher crest. Its function has been the object of two different interpretations. Prendi (1982, 204) has associated its presence with defensive purposes to protect the inhabitants from outside threats. In contrast, Muzafer Korkuti (2010, 203) has argued that the stone wall was probably a terrace retaining structure. Regarding the large clay ovens found at the site, there is consensus that they should have also been used for firing ceramic vessels (Aliu 1969, Prendi and Aliu 1971). These fire installations consist of a complex of five structures encircled and separated from the rest of the habitation area by a clay mantel. They are rectangular or semi-oval with dimensions ranging from 1 x 1 to 1.90 x 1.50 m. The ovens have shared walls, which consist of many layers of clay due to their intensive use. Their upper parts form arches that have holes for controlling the firing temperature. Inside the kilns, there were found several intact semi-fired vessels. Besides these structures in Kamnik, several hearths of different shapes and dimensions have been found, some of which are built on paved stone platforms (Prendi and Aliu 1971, 17-8).

4.2.3. Ceramic and other archaeological assemblages

Pottery

The ceramic material is the most interesting archaeological assemblage found at Kamnik, not only due to the remarkable quantities but also because pottery production could have been one of the main activities taking place at the site. Despite its importance, the pottery from the site has not been fully published, except for a few preliminary reports. However, there is already a typological and stylistic diversity to be noted, as well as the high-quality aesthetic of the ceramic assemblage in Kamnik. The excavators have highlighted that the amount of pottery is larger in the two earliest phases, while the ratio between plain (coarse) undecorated and fine decorated pottery remains consistent throughout the cultural layers. It has also been argued that, despite the changes in their ratio, all the ceramic types and the decorative motifs recognized in Kamnik are present in all the occupation levels (Prendi and Aliu 1971, 21). However, the absence of quantitative data concerning ceramic material from the site and the methodological issues of the excavations prevents a more precise evaluation of the density of the ceramic sherds in each occupation level and the ratio between different categories.

The ceramic material has been divided into two main groups: the sherds with thick walls and those with thin walls. This differentiation is a more subjective way of categorizing coarse or plain and fine wares. The coarse wares are characterized by limited typological and stylistic diversity. They usually have monochrome burnished or even polished surfaces, but rough and smoothed finishing was also applied. The most common colors are the dark shades such as gray and black, while brown, red, and off-white are less frequent. In some cases, the surface of the plain vessels is covered by a bright red slip, while others have been decorated with plastic motifs, usually low relief knobs. The fine or thin-walled pottery is primarily decorated. In general, they have light-colored surfaces such as red, brown, yellow ocher, and off-white. Less frequent are black, gray, or dark brown. The main decorative categories are painted, including matt-painted, black-on-red, brown-on-cream, polychrome, crusted, bitumen, and off-white (gray) on black or brown backgrounds. Other techniques such as plastic, incised, impressed (finger impression), impresso (finger-or nail-pinched), black-topped, and pattern-burnished are also present, although these categories are not common[16] (Appendix A-3; Figure 4.11-4.12). Excavators have argued that, although the decorated vessels were found in all the occupation phases, they appear more often within the earliest layers. (Aliu and Jubani 1969, 5-6; Prendi and Aliu 1971, 20-1).

The most distinguished and abundant ceramic category in Kamnik is that of the painted vessels (Figure 4.12-4.14). Their artistic expression is impressive. Painting is usually implemented on the exterior, covering the entire body of the vessel, but interior surfaces are often elaborated. Many biconical jars, however, are painted only on the upper part of their body,

[16] In the region of Korçë black-topped wares are associated primarily with the Albanian Late Neolithic phases (first half of the fifth millennium BCE), although they seem to be present even earlier, whereas in Maliq they have been found in the so called Protoeneolithic or transitional phase Ib (early second half of the fifth millennium BCE). In northern Greece, on the contrary, black topped categories are common during Late Neolithic I (see Chapter 3).

while black-topped vessels have painting primarily on the lower outer walls. As at Maliq, the painted motifs are mostly matt and less often burnished. Their color is characterized by a great diversity of pigments. Brown, red, orange, gray, and black color motifs have usually been applied on light-colored surfaces. The background, which is frequently covered with a layer of slip or engobe, is given various shades of pale, yellow ochre, brown, light red, and orange.

Figure 4.11. Decorated potsherds from Kamnik.

Figure 4.12. Sherds with painted decoration from Kamnik.

The motifs of the painted decoration have exclusively abstract geometric and linear elements without any reference to naturalistic features. They are composed of straight, wavy, or zigzag sets of parallel lines, straight or meander bands, spirals, barbed motifs, squares, rhomboids, grid-pattern, triangles, circles, and semicircles. The geometric shapes are usually either solid or hatched with straight, wavy, or zigzag lines. In many cases, more than two different motifs appear on a single vessel (Aliu and Jubani 1969, 6; Prendi and Aliu 1971, 23). An interesting ware category consists of the polychrome vessels with their impressive decoration that covers the whole body. The background, which is often covered with a layer of engobe, is usually pale or white. The main motifs are painted with different tones of light red and brown, yellow, or orange. The outline between the motifs is highlighted with a dark brown or gray-colored thin line. As at Maliq, the background and the ornaments are burnished, while the dark outline motif is matt.

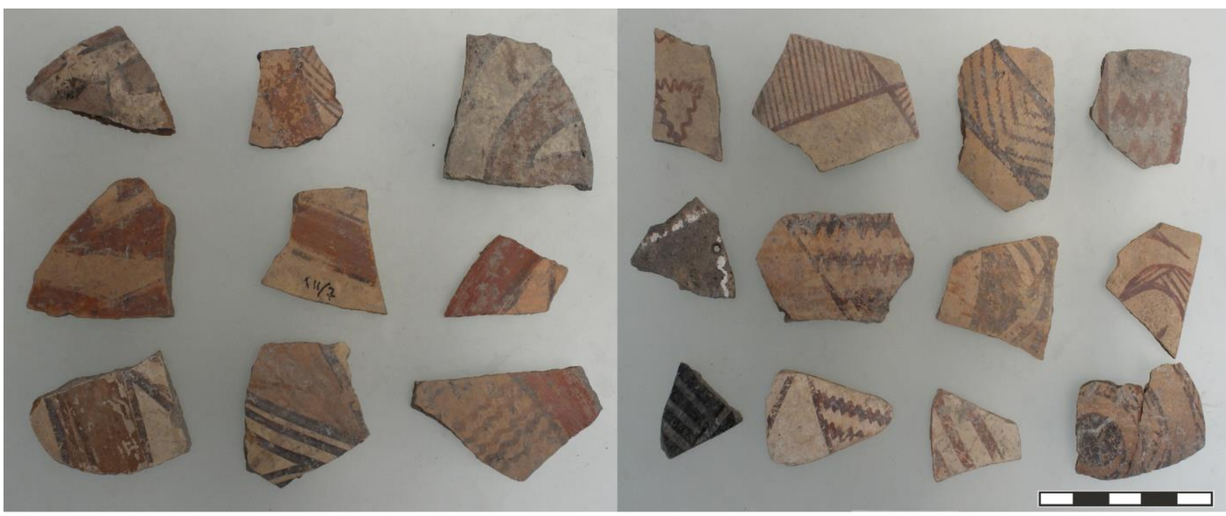


Figure 4.13. Painted ceramic sherds from Kamnik.

Similar decorative elements with painted vessels are also found on crusted pottery, where a thick white, red, or yellow paste was applied after firing. Unfortunately, the crusted motifs are poorly preserved due to the weak bonds after firing painting creates with the surface. Unlike the painted pottery, crusted ornaments are applied on a vessel fired either in the reduced or oxidized environment, resulting in dark and light colors surface, respectively. In cases where the motifs covered the whole exterior or interior surface, the red or orange pigments are used as background (Figure 5.8b). Another painted decorative category, where the motifs are probably applied after firing, is the white (gray) on black or brown surface.[17] In Kamnik, painted motifs on vessels have been found to be made of natural bitumen. The bitumen-decorated wares are not of great quality, and the variety of the motifs are limited and consist mainly of relatively thick parallel lines carelessly applied on the surface. However, these vessels have important research value due to the origin of the material used for decoration, which, as it will become clear in the following paragraphs, was brought from another region (Appendix A-3; Aliu and Jubani 1969, 5-6; Prendi and Aliu 1971, 22-3).

Painted linear or spiral motifs are often present in black-topped vessels, a bicolored category where the upper body is dark gray or black, and the lower part is red or orange. Although the duotone effect is the result of different firing atmospheres, usually, the lower part is covered by a bright red or orange slip for a sharper contrast with the black upper part. The black-topped decoration is present mainly on biconical shaped vessels where the borderline is either at or just below the carination. Less often, black-topped vessels could have conical or hemispherical

[17] In Maliq, the white (gray) on black vessels are characteristic of the Eneolithic layers (second half of the fifth millennium BCE). Due to the presence of just a few examples from Neolithic Kamnik, it has been argued that this type of decoration was first introduced in the Albanian Late Neolithic period (first half of the fifth millennium BCE), while at Maliq it continues until the beginning of the Bronze Age (Prendi 1966, 258-9; Prendi and Aliu 1971, 24). In northern Greece this type of decoration is common in the Late Neolithic I period (second half of the sixth millennium BCE) period (see Chapter 3).

bodies (Appendix A-3; Prendi and Aliu 1971, 24).

Figure 4.14. Potsherds from Kamnik with painted motifs.

Incision is another decoration technique encountered at Kamnik, but less represented than the painted one (Figure 4.11). Although the use of incision is present in all the cultural layers, it is most common in the upper three habitation phases. As in painted decoration, incised ornaments are linear and geometric. They are arranged in various patterns, such as a set of short straight parallel lines located under the rim of the vessels, empty or hatched with parallel lines and dotted triangles, circles, semicircles, as well as bands of parallel L-shaped motifs. In some cases, the incision is combined with punctuated elements. Punctuation is primarily used to fill the incised geometric motifs, such as triangles or bands. This decoration is used independently to create lines of dots, which may be filled with white paste. Other decoration techniques such as impression, impresso, rippled, channeled, pattern burnished, or plastic elements rarely occur in Kamnik (Appendix A-3; Aliu and Jubani 1969, 5-9, Prendi and Aliu 1971, 24-25).

The Late Neolithic vessels from Kamnik are also characterized by great morphological diversity. The most recognizable shapes are the jars with a spherical or biconical body and a conical or cylindrical neck. Open conical, spherical, carinated, or hemispherical cups and bowls are frequently present. Other common types are the fruit stands and hole-mouthed spherical or squashed vessels with a cylindrical mouth. Straight-walled pans, strainers, spouted pots, milk-pots, as well as deep semi-ellipsoid vessels have also been recorded (Appendix B, Plates III-IV; Prendi and Aliu 1971, 23-24). The typology of the bases is similarly diverse. The vessels have a flat, ring, high-footed, discoid, or concave base. Some lids were found in Kamnik associated with both coarse and fine wares. They have a cylindrical or flaring mouth and carinated bodies with four perimetric holes at the carination. Handles are more common on plain undercoated vessels. Usually, they are lugs or have projecting handles, such as tongue-like, with a depression or a V-shaped tip. The decorated vessels are equipped with perforated conical or cylindrical knobs, as well as tongue-like lugs. Vertical or horizontal strap handles are rare (Appendix A-3; B, Plates III- IV; Prendi and Aliu 1971, 24). Also found at Kamnik are a number of peculiar vessels, such as anthropomorphic, zoomorphic, and large bell shape ritual containers with two spheres extending from the top, probably reminiscent of human or animal ears. They are decorated with incised and painted motifs before or after the firing. The bell-shaped ritual vessels are unique artifacts for the Neolithic period in Albania and the Balkans more generally (Appendix A-3; Prendi and Aliu 1971, 25).

Other finds

Unlike pottery, the other archaeological categories from Kamnik are limited in number. This may be considered as additional evidence of the connection between the nature of the settlement and the pottery production at the site indicated primarily by the existence of the ceramic kilns. Despite the limited amount, there is a remarkable diversity among these categories. Lithic tools, polished and grinding stones, bone tools, as well as different ritual clay objects, including figurines, have been reported. Among the lithic objects, flakes of different dimensions and blades are the most common. The blades, most of which were fragmented, are straight or slightly curved with poor of finely retouched traces, whereas many preserve usewear. Other flint artifacts found in Kamnik are drills, scrapers, burins, as well as very few projectile points, all of them with retouching traces on both edges. All of these artifacts were manufactured of gray, white, brown, and honey-colored flint exploiting the local sources near the site (Aliu and Jubani 1969, 11; Prendi and Aliu 1971, 19). Three obsidian objects found in Kamnik are of interest because, as in Maliq, they originated from the island of Melos in the Aegean (Ruka et al. 2019). This is a clear indication of the engagement of the inhabitants of the settlement in the interregional networks of contacts and exchange.

Different types of stone and bone tools have been discovered at Kamnik. Axes, adzes, hammerstones, spindles, stone balls, mortars, and pestles are the main types of polished stone tools. Unlike their typological variation, the total number is extremely limited, except for the spindle whorls, which are very common. The bone tools, in contrast, are frequently found at the site. They are represented by drills, pins, projectile and spear points, polishers, spoons, and other objects of unknown function. Two necklaces made of wild boar teeth and one bone bracelet have also been found. Less common are the artifacts made of antler, which include three cylindrical hammers with hafting holes, one unfinished hoe, and several unknown objects with hole (Prendi and Aliu 1971, 19-20; Prendi and Bunguri 2014, Tab. LXXXVII).

A copper chisel without a clear archaeological context was also reported, although the excavators believe that it should belong to the upper archaeological layers associated with the Eneolithic period. Of particular interest are also some fired clay objects. Among them are a dark brown burnished human hand with very realistic fingers and some other parts of the human body, including a fragmented shoulder and one foot (Aliu and Jubani 1969, 11). Due to the remarkable size and its realistic illustration, it is obvious that the hand probably belongs to a large figurine or statuette. Other clay objects found in Kamnik are several fragmented ritual tables, two engraved stamps, a fired clay bead, several conical "Salkuca" type weights (Prendi and Aliu 1971, 25, tab. XVI 1, 2), as well as a broken spoon. Besides the artifacts, the excavators have recorded a large amount of domesticated and wild animal bones, as well as some grain seeds, which were randomly found within the area of the kilns (Prendi and Aliu 1971, 20).

4.3. Neolithic Kallamas

The site lies at the end of the bay on the western shore of the Great Prespa Lake. Located just below the modern village of Tuminec, which was recently named, the prehistoric settlement was founded in a lacustrine plain that was underwater several decades ago, whereas nowadays it is fertile agricultural land (Figure 4.15). The village, which was also called Bezimisht in the past, is only 3 km away from the Albanian - North Macedonian border, and it is part of the ethnic Macedonian minorities of the Pustec Municipality (Lera et al. 2008, 897; Lera et al. 2009, 690; Oberweiler, Touchais, and Lera 2013, 56). The habitation phases of the Neolithic settlement, the official name of which remains Kallamas, have created a smooth tell, while due to its horizontal expansion, the site has reached almost 8 hectares (Figure 33). Within this area, the habitation zone was separated from the rest of the site, but the enclosure feature was found (Oberweiler, Touchais, and Lera 2013, 56-8). As a lakeside settlement, Kallamas is part of a common pattern in the region, where Neolithic villages were closely related to aquatic environments. As at Maliq, the stratigraphy of the site was formed through the combination of the vertical and horizontal expansion, a phenomenon that is common for many Neolithic sites in Albania (Elezi 2020). In this section, I will provide a brief discussion on the research, the issues related to stratigraphy and chronology of the settlement, as well as the architectural features and other archaeological finds, with a focus on Late Neolithic occupation levels. Recently excavated, Kallamas is not yet fully published; thus, its presentation here will be based mostly on several preliminary reports and excavation documentation provided by the leading team of the project.

Figure 4.15. Location of the Late Neolithic Kallamas. By courtesy of C. Oberweiler.

4.3.1. Archaeological research

The site was identified in 2007 when a considerable amount of archaeological material, including pottery, polished tools, and clay figurines, were collected on the surface (Lera et al. 2008: 897; Lera et al. 2009: 689). The Neolithic settlement, known in some publications as Kallamas I (Lera et al. 2008, 897), was recently excavated by a joint French-Albanian archaeological expedition under the co-direction of professors Gilles Touchais and Petrika Lera. The excavation started in 2008 and lasted for four fieldwork seasons until 2011. Their principal objectives, as they were set by the research group, included the investigation of the lakeside settlement and its cultural, environmental context, as well as the exploration of the stone tools manufactured in extremely large quantities at the site (Oberweiler, Touchais, and Lera 2013: 57).

The establishment of the stratigraphic sequences to define the Late Neolithic level indicated by the archaeological material on the surface, as well as defining the borders of the site, were the two main goals set for the first excavation season in 2008 (Lera et al. 2009: 689). The area was divided into four main sectors A, B, C, and D, through two perpendicular lines that intersected near the top of the smooth tell, which was called "point zero" (Figure 4.16). Northeast of point zero, near the highest point of the site, was designated the main trench C1 with dimensions 4 x 4 m for investigating the vertical stratigraphy. Its location was dictated primarily by the concentration of the surface material, as well as the elevation of the terrain. For defining the geographical boundaries, three sets of 2 x 2 meters trial trenches were established toward the edges of sectors A, C, and D away from trench C1 (Lera et al. 2009, 692-5). By the end of the 2008 season, the excavation team had identified Late and Middle Neolithic cultural layers respectively in trenches C1 and A2. As for the extent of the occupation area, these were identified to the south, southeast, and northeast (Lera et al. 2009, 695-9).

In 2009 the objectives of the excavations were associated with the further investigation of the stratigraphic sequences and the horizontal development of habitation phases, the localization of the production center of polished stone tools, as well as the definition of the limits of the site.

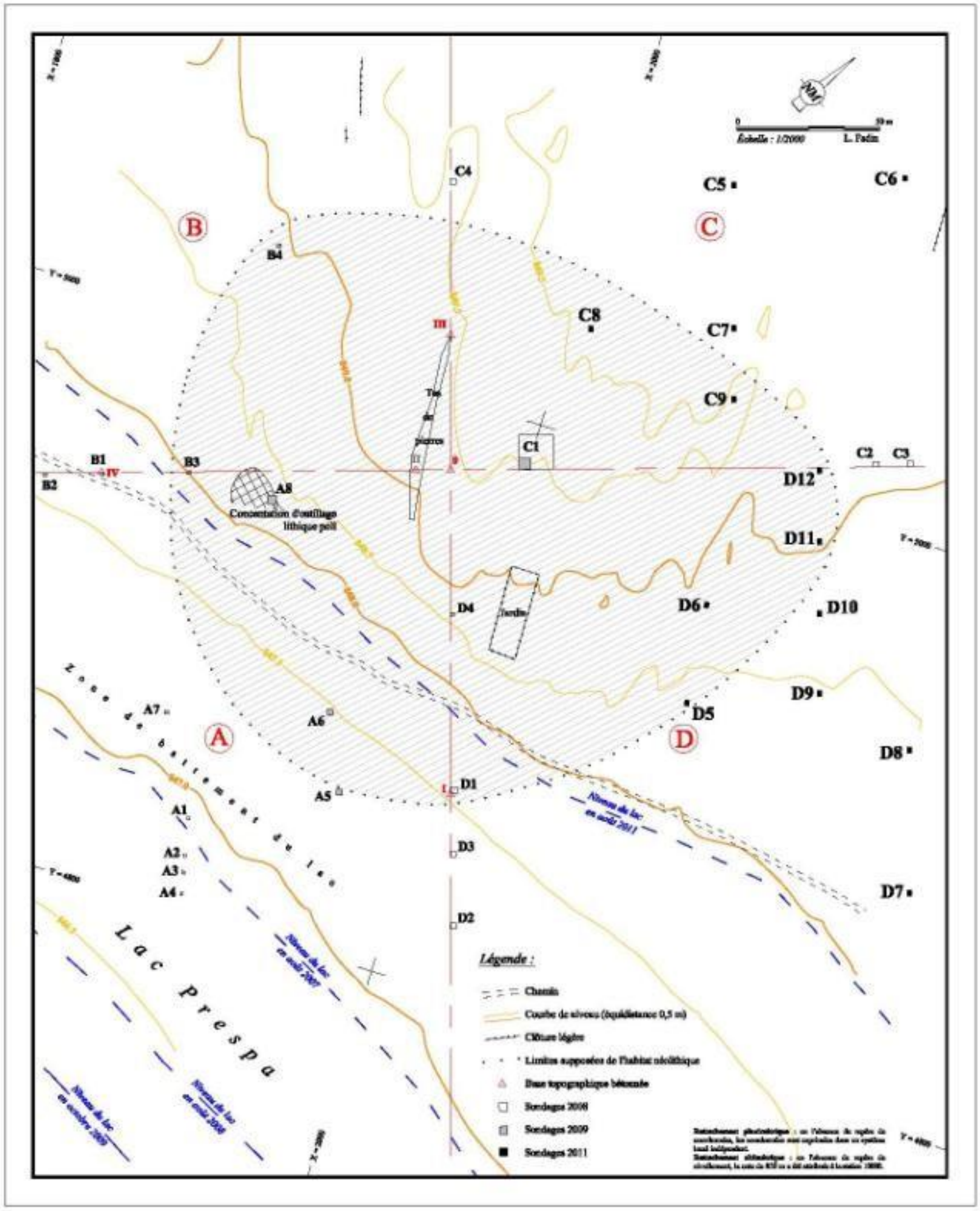


Figure 4.16. General plan of the excavated area at Kallamas. By courtesy of C. Oberwieler.

Consequently, alongside the investigation of trench C1, other sondages were set in sectors A, B, and D, most of which were located away from the point with the highest elevation. In the western part of the site, trench B2 was set to examine the extremely high concentration of polished lithic tools in the area. The preliminary result of the research during this season showed the existence of at least two occupation phases in trench C1 in addition to that discovered in 2008. The archaeological material found belonged to the Late Neolithic period. In trench A8, elements of the Middle Neolithic period were found. The hypothesis regarding the possibility of the displacement of the settlement from near the lakeshore to the west remains to be proved. As to the limits of the site, they were well defined only in the western part of the habitation area, while in the southwest, the picture seems more complicated as the areas with occupation traces alternate with those without cultural layers. Finally, the excavation of trench A8 revealed probably a center of production of polished stone implements.

Unlike the previous two seasons, 2010 was dedicated to the study of the stratigraphy of the site and the archaeological material to establish a relative chronology at various parts of the site and to specify the nature of the settlement. The research was thus focused on the investigation of the stratigraphic sequences with the preliminary study of ceramic assemblages and polished stone tools (Lera, Touchais, and Oberweiler 2011). The study conducted this season showed that the stratigraphy of the site was more complex than previously thought and that the earlier hypothesis of a clearcut horizontal displacement of the habitation space from the Middle to the Late Neolithic period was no longer supported by the evidence (Lera, Touchais, and Oberweiler 2011, 671-4).

The last fieldwork season in 2011 combined the study of the archaeological finds with excavations. The study of the material culture from Kallamas continued this year with the examination of lithic (flint) tools, polished stones, pottery, and the fired clay textile objects. The main goal of the targeted excavation was the identification of the north and northeast borders of the settlement (Lera, Touchais, and Oberweiler 2012a). For that, the excavation team opened 13 test trenches with dimensions 2 x 1.5 m in the north, northeast, east, and southeast areas (Lera, Touchais, and Oberweiler 2012c, 371). In addition to the archaeological fieldwork seasons, the exploration of Neolithic Kallamas and the surrounding area continued for the following two years in 2012 and 2013. The primary objective, however, was the archaeobotanical, zooarchaeological, geomorphological, and ancient environmental research to reconstruct the ancient plant economy of the site, the fauna of the region and the lake-level fluctuations, as well as to define and study the geological layers of the area where the settlement was located (Lera, Touchais, and Oberweiler 2012b; 2014).

4.3.2. Stratigraphy, chronology, and architectural features

By the end of the excavations at Kallamas, there were a total of 20 opened test trenches. Many test trenches spread across the areas with a concentration of surface archaeological material, which has provided insights into the stratigraphy and the extent of Neolithic Kallamas. Although still in the preliminary phase, the study of the archaeological material has provided strong evidence for defining the chronological phases, as well as information on the nature of the settlement.

Except for a few trenches near the lakeshore, where only the geological layers were present, a ternary stratigraphic sequence was observed throughout the tested areas, which includes the upper alluvial depositions, the sterile bedrock, and the intervening anthropogenic layers (Figure 4.17). The cultural strata manifest a remarkable variation of thickness, composition, texture, color, and the presence of architectural features. They consist of several distinct phases of occupation, which seem to have been denser near the center of the inhabited area. There, the layers are around 2.20 meters thick, forming the highest point of the site, while in the borders of the settlement, the deposition varies between 0.35 to 1.05 meters.

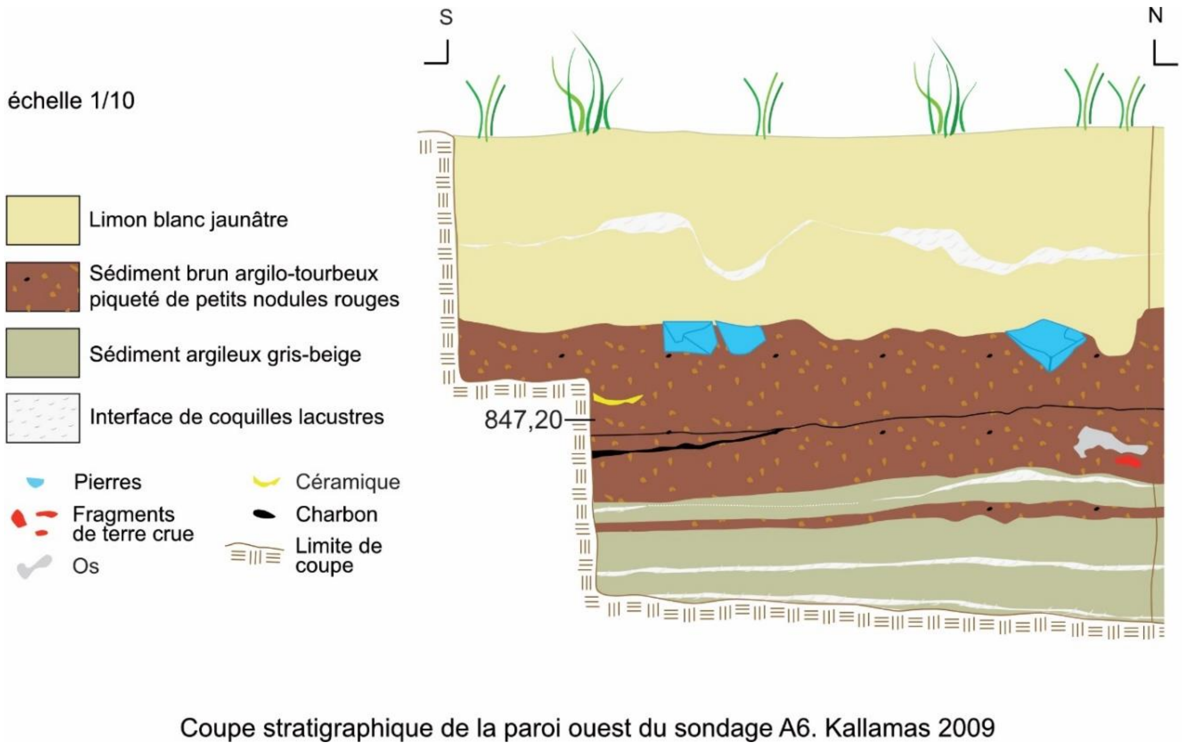


Figure 4.17. West profile of the trench A6. By courtesy of C. Oberweiler.

Based on the preliminary study of the pottery, the anthropogenic layers are composed of two different chronological horizons, according to Albanian prehistoric chronology: the Middle and Late Neolithic period. The Late Neolithic layers contain at least two habitation phases, I and II, while the Middle Neolithic only one, which was named phase III (Lera et al. 2010; Lera, Touchais, and Oberweiler 2011). Research on the stratigraphic sequences also revealed that, apart from the trenches near the elevated area, where the Late Neolithic layers were deposited on top of the Middle Neolithic, the two distinct phases do not overlap. The Middle Neolithic remains are mainly located in the south-southeast section of the settlement, while the Late

Neolithic in the north-northeast (Figure 4.16; Lera, Touchais, and Oberweiler 2011: 672). In some areas, the layers of the two periods are separated by a sterile alluvial deposit, which has not been observed in the north-northwest periphery of the site (Lera, Touchais, and Oberweiler 2012a, 690). However, the study of the ceramic material from trench C1 that I recently conducted, a detailed presentation of which will follow at the end of this chapter, has indicated the presence of another phase in Kallamas probably associated with the Eneolithic (Chalcolithic) period. This new phase is evident in the upper archaeological layer of the trench C1 on top of the Late Neolithic sequence. The main elements that support its existence at the site are the presence of a Bratislava lid, black polished sherds with rippled ornaments, and painted white linear motifs on brown or gray surfaces, which are defining elements of the Eneolithic period in the region (Appendix 1).

Due to a high level of erosion, especially near the lakeshore, and the convolution of the Late Neolithic stratigraphic units, the spatial relationships between the two chronological periods is complex. This, in turn, has prevented excavators from providing a final interpretation for the use of space in the Neolithic period. The stratigraphic density on the top and near the smooth tell was initially translated as an indication of the importance of this specific area. In contrast, the absence of the Late Neolithic layers on top of the Middle Neolithic occupation in the southern quadrant near the shore has been interpreted as a horizontal displacement of the settlement, dictated probably by the rise of the lake water level. Another possible explanation of the absence of the Late Neolithic phases considered the potential degradation of the layers from shoreline erosion or anthropocentric factors, such as recent agricultural activities. Also, the presence of alluvial deposits between the Middle and Late Neolithic layers is a clear indication of abandonment. Whether this is localized only to specific areas, or it is a general phenomenon that had affected the entire site has not yet been fully understood (Lera, Touchais, and Oberweiler 2011, 674). Considering all the evidence, the excavators have classified Neolithic Kallamas as a flat-extended site (Oberweiler, Touchais, and Lera 2018, 187). Regarding the extent of the settlement, the research team has concluded that there is a clear division between the residential sector and the other areas in use within the limits of the site. The extent of the entire site was calculated to be around 8 hectares, and this, according to the excavators, qualifies Kallamas as the largest settlement in the southwestern Balkans. In contrast, the primary inhabited area in Kallamas is about 3.5 hectares (Oberweiler, Touchais, and Lera 2013, 58).

Kallamas is one of the few prehistoric sites in Albania that has a rich series of radiocarbon dates for the Middle and Late Neolithic period (Lera, Touchais, and Oberweiler 2012a, 698-9; 2016). According to the dates obtained so far, the site was established around 5400 BCE and lasted until the middle of the fourth millennium BCE. The Middle Neolithic layers, also referred to as phase III, are dated from around 5400 to 5200 BCE, while the absolute dates of the phases I and II of the Late Neolithic period in Kallamas vary between 4800 and 4500 BCE (Table 14; Oberweiler, Touchais, and Lera 2018, 188, Lera et al. 2019).

Despite the relatively small scale of the excavations, many trenches have provided evidence concerning the various architectural features indicating the use of space for daily domestic activities. Although much of the evidence is fragmented, the architectural remains are present in both the Middle and Late Neolithic layers. The early layers contain remains of a house floor with several complete vessels in situ on it, many fragments of fired architectural clay and part of a wattle-and-daub wall, as well as several rounded or elliptical firing structures (ovens). In contrast, the Late Neolithic phases have usually provided postholes and associated clay structures, along with many daub fragments with imprints of wooden structures (Oberweiler, Touchais, and Lera 2013, 58-60).

Table 4.3. Occupation phases and chronological periods of the Neolithic Kallamas.

Occupation Phases	Chronological Period	Calendric Years (BCE)
Phase Ia	Eneolithic ?	_____
Phase Ib	Late Neolithic	4800 - 4500
Phase Ic		
Phase II		
Phase III	Middle Neolithic	5400 - 5200

4.3.3. Pottery and other archaeological assemblages

Pottery

As mentioned in the introduction of this work, unlike Maliq and Kamnik, where the collected pottery is highly biased due to the targeted selection method, at Kallamas, the entire ceramic assemblage is available for study. Although not in large quantities due to the limited scale of the excavations, the site has produced a considerable amount of pottery. The ceramic assemblage of the site has been studied since 2016. So far, the general sorting of the pottery is nearly complete, but the study of the diagnostic sherds is still ongoing, except for trench C1, where all the stages of the macroscopic analysis have been finalized. Consequently, the results presented here are not final, as they will be further updated in the coming years. However, the current database provides an early glimpse of the ceramic assemblage from almost the entire excavated area.

Macroscopic observation showed that the ceramic material, in general, is characterized by a high degree of post-deposition abrasion. The number of potsherds classified as uncertain due to an entirely abraded surface can reach 65% of the total. This observation is consistent with the horizontal development of the settlement's habitation phases, as well as its locations on the shore of the Greater Prespa Lake. From the general sorting of the material, the domination of the potsherds from open vessels is also evident, although there is a significant number of uncertainties as to their shape from the fragments alone. The typological classification of the material indicated a significant typological variation of forms and dimensions. Among the most common forms are conical, hemispherical, carinated, and spherical shapes. Other shapes, such as piriform or pear-shaped, pushed down, ovoid, ellipsoid, and spouted vessels, are less frequent.

Around 30% of the ceramic sherds are undecorated, and their surfaces are mainly burnished, less polished, and a limited number are smoothed or rough. The presence of decorated sherds is low, merely 3.7% of the recorded material. The diversity of the decoration pattern is notably rich at Kallamas, especially during the latter occupation period, phase I. The most common ware categories in this level are black-topped, barbotine, painted red-on-cream as well as plastic decorations. All the above categories, except painted red-on-cream, are also dominant during the earlier phases. While the rest of the decorated ceramic categories are limited to the early layers, during the latter period, several forms of decoration, such as incision, impressed, punctuation, and painted red-on-brown, are relatively well represented. Based on these results, Kallamas, which chronologically represents both Middle and Late Neolithic according to Albanian (Balkan) chronology, is not a typical example where one can trace the distinction between these two periods in the ceramic assemblage (for the graphs, see Appendix C-1).

As to the color of the surface, the picture is less complex compared to the decoration. A great number of diagnostic sherds have cloudy surfaces either because of the firing process or on account of their use. In general terms, the dark colors dominate the ceramic assemblage of the earlier phases II and III. Their predominance, however, fades as we move toward the later occupation levels. Instead of dark and gray, brown, pale, and red are now the most frequent colors. In this respect, Kallamas follows the main trend that characterizes most of the Neolithic settlements in the region during the transition from the 6th to the 5th millennium BCE, where the light-colored ceramic vessels are replaced by darker shades such as black and gray (see Chapter 3).

Other archaeological finds

In addition to potsherds, a large variety of other archaeological materials have been discovered both from the survey and the stratigraphic context in Neolithic Kallamas. They include polished stones, different terracotta objects, lithic and bone tools, clay figurines, as well as ornaments made of various materials. Large amounts of faunal and floral remains have also been reported.

Large quantities of polished stone material have been found at Kallamas. As such, the excavators have argued that the production of polished stone tools could have been of great importance. Evidence of such activities was recorded in both the Middle and Late Neolithic phases. Thousands of debitage fragments and a considerable number of tools such as axes, adzes, millstones, and polishers were collected from the stratigraphic units, as well as the surface. The raw material used for their manufacture belongs to the group of syenite rocks, which are imported to Kallamas since they are not present in the vicinity. Some of the polished stone tools were made from metamorphic or sedimentary rocks of local origin (Lera, Touchais, and Oberweiler 2012a, 699-707).

Fired clay objects are another set of artifacts of particular interest in Kallamas. The textile tools are among the most numerous and include spindle whorls and loom weights. The spindle whorls are convex or discoid. Some have incised decoration, while others are more elaborate and preserve fabric imprints on the surface. As for the weights, three different types were recognized: semicircular double-perforated, crescent-shaped, and coil-shaped. Their lightweight, as well as neat forms have been interpreted as an indication of the fineness of the weaving process and the production of quality textiles. Many sherds with notches and small naviform (boat-shape) or rhomboid objects whose function is unknown, although they are usually classified as weights, are also found. The rhomboid artifacts, which are considered as fishing or net weights, are characterized by a set of two perpendicular grooves that divide each side, usually into four equal parts. The notched objects, in contrast, are reused broken sherds of usually elongated shape with two symmetrical notches located on the longest axis (Lera et al. 2009, 704-5; Lera et al. 2010, 626; Lera, Touchais, and Oberweiler 2012a, 708-10).

Chipped stone tools consisting mainly of fragments, but also blades, lamellae, scrapers, drills, and cores, are well represented in Kallamas. Some of the tools, including blades, knives, and drills, have characteristic use luster, while several scrapers have retouching edges. Most of the raw material comes either from a reddish-brown color stone with dark or green shades, also known as "chocolate flint," or from "honey flint," which has a light brown color and is a semi-transparent material with fine inclusions. It has been argued that due to the lack of these particular types in the region, flint was also imported from another region, as was the material used for polished stone tools (Lera et al. 2009, 707; Lera, Touchais, and Oberweiler. 2012a, 699-700).

Although of limited quantity, bone tools, figurines, and ornaments made of different materials were also found both on the surface and within the archaeological layers. The bone tools include several types, such as awls, hooks, and harpoons, while the reports also mention the presence of horns with worked edges. Several ornaments, including rings and pendants, are also made of bone. Some rings and pendants are made of stone. As for the figurines, they are limited in number, and many of them were collected from the surface. They are of different types well known in the Balkan and northern Aegean, while at least one is very distinct and idiosyncratic, with no known parallels (Lera et al. 2009; 2010; Lera, Touchais, and Oberweiler 2012a).

4.3.4. Late Neolithic phases in Kallamas

Stratigraphy and archaeological context

Although Kallamas was occupied in both the Middle and Late Neolithic periods, for the purposes of this study, I will focus only on the latter. The Late Neolithic layers have been recognized primarily near the center and in the north-northeast sector of the site. These cultural layers are better represented in the trench C1, located near the highest point of the site, where they reach the largest thickness. Remains of the Late Neolithic occupation have been identified in more peripheral trenches such as C8 and C9 within sector C north of C1, although their cultural layers are much thinner (Figure 4.16; Lera, Touchais, and Oberweiler 2012a, 698). As a result, trench C1 has provided not only the best Late Neolithic stratigraphic sequence but also the most abundant ceramic material of the period. Furthermore, the existence of many radiocarbon dates from this unit provides the possibility not only of tracing the transition between the Middle and Late Neolithic in calendrical terms but also of associating the changes or continuity of the ceramic assemblage within, and among, these phases with the absolute dates. Moreover, the existence of the radiocarbon sequence provides additional certainty for the interpretation of the pottery and its comparison with other sites in the southern Balkans that also have absolute dates.

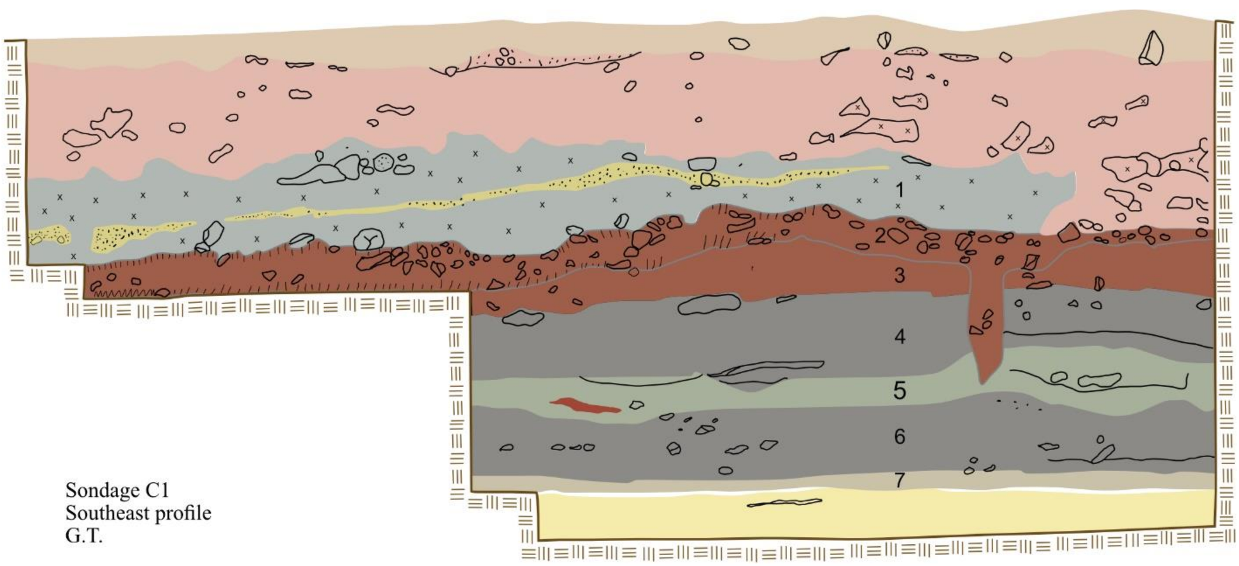


Figure 4.18. Section of the southeast profile in trench C1. By courtesy of C. Oberweiler.

The excavators opened trench C1 in 2008 near the highest point of the site, aiming to understand better the occupation layers. Its initial dimensions were 4 x 4 m, but in order to investigate all the anthropogenic layers deposited, it was gradually reduced to 2 x 2 m by the end of the 2009 season when its excavation was completed. From a 2.2 meter thick sequence, at least three occupation levels have been recognized, of which the upper two were assigned to the Late Neolithic period and the deepest to the Middle Neolithic (Figure 4.18). The first layer under the surface was referred to as phase I, and its thickness was calculated to be about 0.7 meters. Based on the stratigraphic context, phase I was further divided into two distinct occupation levels Ib and Ic. The layer of phase Ib was gray, mixed with large chunks of fired clay. It contained scattered postholes, traces of walls, clay fragments of various architectural features, as well as hearths. The habitation unit is more evident in the layers of phase Ic. In one of these, a flat architectural feature was discovered made of small and medium-sized white limestones with numerous potsherds and several antler tips on top, which has been identified as a floor (Lera et al. 209, 693-702; 2010, 619). Immediately below the phase I layers was the second Late Neolithic occupation level referred to as phase II. This layer was 0.3 to 0.4 meters thick and contained tiny fragments of fired clay and small pieces and flecks of charcoal. A thin, sterile clayish green-colored abandonment layer separates the late Neolithic Phase II from the Middle Neolithic phase III. This last layer has a dark gray color, while its thickness was around 0.3 meters. The presence of large fragments of charred wood and the concentration of reddish clay were recognized as remains of a collapsed structure. The deepest anthropogenic layer was deposited on top of a lacustrine bluish-gray silty sand layer covered by small white shells (Lera et al. 2010, 619).

Ceramic assemblage

The presentation of the Late Neolithic ceramic assemblage from trench C1 will be based on the research conducted for this dissertation project. The systematic record of the material from Kallamas has provided the opportunity for a multidimensional approach to the pottery. Consequently, in this section, I will discuss and compare the results of the taphonomic, typological, and stylistic examination of the pottery from all four occupation levels that have been identified in this trench.

From all the excavations units in trench C1, a total of 18,363 potsherds have been recorded. About 279 sherds belong to the Middle Neolithic levels, phase III, 280 to the Late Neolithic phase II, 2,084 to the Late Neolithic phase Ib and Ic, and the rest to the uppermost phase Ia layers, for which no absolute dates are available. The detailed record of the count and weight of the sherds, in combination with the volume of the excavated area, offers a rough picture of the density of pottery in this location. The results show that the pottery is much denser within the upper occupation level of the Late Neolithic phase I than the lower phase II. Within the layers of phases Ib and c, it was calculated that in one cubic meter, there are around 579 potsherds with an average weight of about 26.1 grams per sherd. The density of the sherds in phase II, in contrast, is about 200 potsherds per cubic meter, and the average weight is 44.5 grams per sherd. The potsherd density of phase II is very similar to that in the Middle Neolithic phase III level, with 249 sherds with 39 grams average weight per cubic meter, while it was not possible to calculate the density for the upper phase Ia (Appendix D-1).

In order to gain information about post-deposition processes and likely use of the space, the size of the sherds and the level of erosion were recorded. In general, the excavation units with medium-sized fragments were the most numerous, followed by those with small and large potsherds. More specifically, medium and medium to large ceramic fragments are the most frequent in the units of phase Ib, while only one excavation context has mainly small to medium-sized sherds. Medium-sized fragments dominate the ceramic assemblage gathered from the phase Ic. The situation in phase II is radically different since there is a larger diversity of small to large ceramic fragments, without any distinct size category. The Late Neolithic pottery from trench C1 shows a limited level of abrasion. Except for one excavation context where the weathering was extremely high, in most of the units, the abrasion level varies from 10% to 30%, while the rest were recorded at lower than 40%. Both occupation levels Ib and Ic, show a similar picture regarding the erosion lever, which alternates between 20% to 40% and 10% to 30 %, respectively. Phase II differs from the first two levels. Its ceramic material shows a higher degree of weathering variation, reaching as low as 10% and as high as 100 %, but in general, the level of post deposit abrasion in most of the units is limited and does not exceed 10%. The reduced level of abrasion from the Late Neolithic context is also reflected in the low number of ceramic fragments classified as uncertain during the recording process (Appendix C-2).

Based on surface treatment, the ceramic assemblage was classified as monochrome and decorated categories. Around 71% of the material collected from the Late Neolithic context is undecorated, 8% of which have decorative elements, while the rest is classified as uncertain due to the absence of the surface. The picture is more or less the same through the different levels of this period. However, it is noteworthy that the decorated sherds of the Late Neolithic number half as many as the Middle Neolithic phase from the same trench. Many undecorated sherds are burnished, fewer are polished, and only a very limited number have rough or smooth surfaces (Appendix A-4; C-3).

As for the color, the dark-colored sherds dominate the pottery of phase II. A significant drop in their number, however, is observed during the later occupation phases Ib and Ic, where light-colored monochrome categories replace them. A detailed observation focusing on the examination of the color showed that a large number of burnished fragments had patchy surfaces with fire clouds, many others are brown, gray, pale-colored, black, and significantly fewer red-colored. The most frequent categories of the phases Ib and Ic are the burnished brown-colored surfaces with clouds. While the potsherds with clouds are the main elements even during the habitation level II, the number of brown burnished sherds diminishes. In contrast, the pale-colored and gray burnished, two other main categories, follow an opposite path in respect to each other, since the presence of the first group diminishes as we move from the upper to lowest layers, whereas the other increases. An interesting case constitutes the black burnished and polished categories. Although their appearance is notable throughout the Late Neolithic levels, only during phase II, they do dominate the ceramic assemblage (Appendix A-4; C-4).

The decorated fragments show a remarkable variety, including black-topped, painted red-on-cream, plastic decoration, barbotine, punctuated, incised, channeled, painted red-on-brown surface, incision with encrusted paint, rippled decoration, white (gray) paint on black background, and matt painting. Phase Ib shows a greater variety of decorated categories compared with levels Ic and II. The same phase has the largest variation of painted sub-groups. Most of the decorated sets are represented in all three occupation levels, with the black-topped being by far the largest category, especially during phases Ib and Ic. From phase II, the punctuated, incised encrusted, and white-on-black motifs are missing. The rippled decoration is absent in phase Ic, which has the poorest record in terms of painted sherds. Matt-painted motifs, impressed, red-topped, and sherds with a combination of decorative techniques have been recorded only within the layers of phase Ib (Appendix C-5).

In a similar vein, the Late Neolithic pottery from trench C1 is highly diversified morphologically. To investigate the ceramic types, I have utilized the data collected from the macroscopic observation of diagnostic sherds. For this task, the level of quantitative analysis has shifted from the total amount of the ceramic material to the total number of vessels. The quantification has been calculated based on the maximum number of vessels combining rims and part of the bodies that preserve their maximum diameter, such as carination. Consequently, for statistical purposes, one vessel was estimated for every single rim and carination or group of joining fragments with specific features.[18] Thus, from the Late Neolithic layers of trench C1, there were recorded a total of 224 vessels. The morphological groups were created by using both hierarchical and non-hierarchical classification to combine geometrical shapes, dimensions, and functional features. Vessel size constitutes the first level of categorization, while its geometric form was set as the next category. Four main size categories were defined based on the opening of the rim and/or the maximum body diameter: small-, medium-, large-, and very large-sized vessels. This classification was primarily based on the spread of the values of the rim and maximum body diameters in the frequency graphs. According to the graphs, the medium-sized are the most frequent vessels, followed by small and large, while only a few have been categorized as very large. Regarding the forms, the main geometric shapes are carinated, hemispherical, conical, spherical, and biconical. Finally, this section will also briefly address the typological variation of specific parts of a ceramic vessel, such as bases, handles, and lids.

Small-sized vessels/cups (rim diameter <13 cm, maximum body diameter <16)

The vessels with a rim opening under 13 cm or maximum body diameter less than 16 cm are categorized as small-sized. Such vessels consist of the second large group and are present in all three habitation levels. They show a morphological heterogeneity consisting of carinated, biconical, hemispherical, conical, spherical, mainly open, but also closed shapes. However, from

[18] Although the technique of the maximum estimated number may artificially increase the total number of the vessels, their calculation through estimated vessel-equivalent (EVE) proposed by Orton (1993: 173, Orton et al. 1993: 166-81) is questionable. As I have argued in my MA thesis (Elezi 2014, 69), the application of EVE could face serious issues of efficiency and representation especially on a large number of handmade and highly diversified forms. The carinated body sherds that are decisive for defining a specific type were included to avoid the misrepresentation (Rice 1987, 291-2) of different types of vessels with cornered walls.

phases Ic and II, no other types have been recorded except carinated and biconical. The small-sized vessels are characterized by a relatively large variety of ware-categories. Their surfaces are burnished and polished with the colors varying from pale, brown, and red to gray and black, while a considerable number are decorated with various techniques. The monochrome categories are dominated by burnished with clouds, gray, black, and polished gray vessels. Black-topped is the most numerous group among the decorated vessels, with a limited number having plastic and incised motifs (Appendix B, Plate V; C-7).

Medium-sized vessels/ bowls (rim diameter 14-27, maximum body diameter 17-32 cm)

The largest group by far consists of the medium-sized vessels, the rim opening of which varies between 14 and 27 cm and has a maximum body diameter ranging between 17 to 32 cm. Found in all the Late Neolithic occupation phases, the medium-sized vessels show a notable variation with respect to morphology and ware-categories. The majority are open shape carinated, hemispherical, conical, and spherical. The limited number of biconical types, along with the presence of ovoid, ellipsoid, piriform, and hole-mouthed vessels, are among the most distinct elements of this set. Regarding ware-categories, this largely populated group is even more diverse, with numerous decorated and monochrome vessels. The number of decorated middle-sized vessels is extremely high and is dominated primarily by black-topped. Other vessels have been decorated with various techniques such as punctuation, plastic elements, channeled, impressed, encrusted, and painted. While the stylistic (surface treatment and color) diversity of the undecorated categories is remarkably high, this subgroup is dominated by burnished with clouds vessels. Frequently present are the black burnished and polished, as well as pale-colored and brown burnished vessels. Less common are some other categories such as polished with firing clouds, gray burnished and polished, pale-polished, or red-slipped (Appendix B, Plate VI; C-8).

Large vessels (rim diameter 28-35 cm, maximum body diameter 34-36 cm)

The diagnostic potsherds under the large vessel category have a rim opening that varies from 28 to 35 cm and maximum body diameter between 34 and 36 cm. There are fourteen large vessels, and they have been found in all phases; Ib, Ic, and II. As with the other groups, the large ceramic containers are more numerous in the later phase Ib. The most common forms are hemispherical and cylindrical, while other types, such as carinated, biconical, spherical, conical, hole-mouthed, are represented only by one vessel each. Four vessels have decorated surfaces. The carinated shape belongs to the black-topped category; one hemispherical vessel is decorated with impressions, one biconical has dark paint, while on the surface of the conical vessel, there are punctuated motifs. The rest have cloudy surfaces or are brown, pale-colored, and black burnished (Appendix B, Plate V; C-9).

Very large vessels or storage (rim diameter >35 cm, maximum body diameter >36)

Four vessels with the rim opening greater than 35cm and maximum body diameter greater than 36 cm were classified as very large. Even in this small set, there is a remarkable diversity. Two have a conical-shaped body, one is carinated, and one is biconical. As for their surfaces, one of the conical vessels is burnished with clouds, and the other has plastic motifs. The biconical is decorated with painting, while the carinated is black burnished. Two types of vessels, namely the conical and the biconical vessels, were found within phase Ib, while a third, which has a carinated body, comes from level II (Appendix B, Plate V).

Bases, handles, and lids

Along with body sherds and rim fragments, trench C1 yielded complete and incomplete bases, handles, as well as lids to cover the openings of the containers. A large number of fragments of bases have been recorded from all the Late Neolithic levels, with most of them found in phase Ib. Many have their exterior bottom diameters varying between 6 and 12 cm. The second major group consists of bases with diameters between 14 to 16 cm. Many of the bases are concave, of which a few have a convex interior bottom. Some are high concave feet, often with rounded or rectangular windows, and the remainder belongs to a simple flat, ring, or discoid base categories. Although lower in number, the handles have been found in all three Late Neolithic phases. About fourteen are associated with open vessels, only one with a closed vessel, and the rest with uncertain shapes. There are three main recorded types: lugs, which are the most common, strap handles, and there is one projecting handle. The first two groups are found in all occupation levels, while the perforated lugs and the vertical strap handles are present only in phase Ib. Finally, a few lids with diverging and cylindrical walls were also recorded (Appendix A-4; B, Plate VII).

5. Macroscopic description of technical choices

This chapter will present the main results of visual observation and recording of the ceramic material from the southern Balkans. While the macroscopic analysis focused mainly on the Late Neolithic pottery from southeastern Albania, I will also occasionally refer to the ceramic material from Dimini in Thessaly. However, due to time- and permit-related issues, it was impossible to conduct a systematic recording of the pottery from this settlement in Thessaly (Greece). The visual observation comprises an essential step of ceramic analysis that relies on the qualitative description of traces on the archaeological potsherds associated with pottery manufacturing techniques. The systematic collection of all this information was accomplished through macroscopic and microscopic observations during the general sorting of the material and the recording process of the diagnostic potsherds. A detailed Access database was used to assemble these data. In the database, the section on technology has been designed to record information related to all the operation sequences involved in the manufacture of ceramic vessels, such as the preparation of the ceramic paste, primary and secondary shaping techniques, surface treatment, as well as firing process (Appendix A-1, see chapter 2).

5.1 Raw materials and primary shaping techniques

The set of data presented in this section derives from the recording of 865 diagnostic sherds from Kallamas, Maliq, and Kamnik. In general, the material from all three sites is dominated by fine- and medium-grained potsherds. The coarse-grained fabrics are limited, although, at Kallamas, they represent a significant amount (Appendix C-10). The observation of the fabric was achieved through a Dino-Lite Premier Digital Microscope with a magnification range of 10x, 50x, 220x, while the frequency of the inclusions is calculated based on the visual estimation percentage charts (Matthew, Woods, and Oliver 1991). A tripartite classification was adopted where fabrics with at most 3% inclusions are considered fine-, 5-10% medium-, while those with more than 10% are classified as coarse-grained (see Elezi 2014, 52).

Figure 5.1. Traces of coil joints on sherds from Kallamas and Kamnik.

As shown from previous research, visual observation may provide valuable evidence about the primary manufacturing sequences, such as shaping the body and other integrated features of the vessel, including the base and handles (Roux 2019, 142-62; Rye 1981, 58-84). The recording of the ceramic assemblages for my dissertation has identified many potsherds with characteristic marks of forming techniques. The cross-sections of some fragments at Kallamas, Kamnik, Maliq, and Dimini preserve the imprints of joint coils placed either vertically or oblique on top of each other, suggesting the use of the coil-made technique, which is a common method in the Neolithic Balkans (Figure 5.1; Kozatsas et al. 2018; Elezi 2014).

Besides the macroscopic and microscopic observations, vessel-building techniques have also been explored with more sophisticated methods, such as x-ray radiography or ct-scanning (Carr 1990; Kozatsas et al. 2018). I used the first technique in my research, although the attempt was abandoned early due to the lack of results. The investigation of several vessels from Kallamas with x-ray imagery did not identify gaps between the coil-joints (see Rye 1977; Carr 1990 for more information about the method).[19] The lack of gaps means that either the potters used a different technique than coiling to shape this vessel or that the coils' joints are not visible. The joints could have been obliterated by secondary manufacturing techniques such as smoothing or beating to thin and consolidate the walls (Rye 1977, 207; Carr 1990, 17). The X-ray image of at least one sample showed star-shaped cracks that characterize beating, according to Rye (Appendix 1-5; 1977, plate 3). Although atypical for the Balkans, researchers in other areas have mentioned the combination of coiling with paddle- and anvil finishing (Steponaitis [1983] 2009, 22; van der Leeuw 1981, 106-7). The combination of different shaping techniques within the same vessels has been pointed out by a recent study on the Middle Neolithic pottery from Sesklo in Thessaly, Greece (Kozatsas et al. 2018)

In addition to coiling, the pinching technique should also be considered an obvious choice for shaping the vessels, primarily the miniature ones. However, this is an argument inferred mainly from the size of the pot and not from any specific traces on its surface. The visual observation of the ceramic assemblages for this project revealed another interesting aspect from a technological perspective.

[19] The x-ray radiography was conducted at the Medical Clinic “Kristi” in Korçë with the contribution of the x-ray technician Kerol Duçi.

Figure 5.2. Ceramic sherds from Kallamas with additional layers of clay interior and exterior.

Several potsherds showed on the edges of their fractures three successive layers of clay, with the two thinner layers enclosing the core of the wall. This pattern, which has been observed by various scholars in many different regions, was explained by the potential displacement of clay in uneven areas during the scraping of the coils to thin them (see, for example, Elezi, Kotsakis, and Pappa 2019, 532-3; Roux 2019, 146-8; Rye 1981, 86). However, in some cases from southeastern Albania, especially Kallamas, the exterior layers are relatively thick and distinct from the core. Rather than being remnants of scraping that filled the gaps between the coils, these examples may provide an insight into another operation sequence. It seems that between the scraping or beating process to make the wall thinner and the next stage of surface treatment, the potters could have applied another layer of clay on either the interior or exterior of the vessel (Figure 5.2). On the contrary, in other cases, like a black on red jar from Maliq, the interior surface was poorly worked after the vessel was shaped (Figure 5.3). The additional surface layers seem to have been applied mainly in open vessels, although there are no adequate data to assign any correlation between them. Although this has been observed at the Neolithic Thermi in northern Greece (Elezi, Kotsakis, and Pappa 2019, 532-3), more research is needed to explore this technique and its patterns, which seems rather unusual.

Figure 5.3. Ceramic sherd from Maliq with an indication of joint coils and poor surface treatment.

Another aspect that captured the attention in this observation was the thickness of the wall of the diagnostic sherds. In all three sites, the thickness varies between 2 and 18 mm, with the majority being concentrated around 4 and 9 mm. Within the range of the dense concentration of values, a large number of vessels from Kamnik have walls with a thickness of 6 and 7 mm, while at Kallamas and Maliq, the distribution is smoother. Contrasting the thickness of the vessels with a few other recorded ceramic variables, several observations recorded in this process are of particular interest. First of all, looking at the relation between the thickness and vessel size, the plot showed that, with the exception of Kallamas where the larger vessels tend to have thicker walls, there is no obvious correlation between the attributes at the other two sites. Secondly, comparing the wall thickness and the shape, besides the fact that the open shapes represent a wide variety of thicknesses and a large number with 6 mm walls, there is no significant difference between them and the closed vessels. Finally, also, there is no clear positive correlation between the wall thickness and the amount of fabric inclusions (Appendix C-11).

Figure 5.4. Handle attaching techniques: 1) attachment, 2) piercing, 3) impression. Dimini 1a, 2a; Kallamas 1b, 2b; Maliq 2c, 3a; Kamnik 1c, 2b-c.

The sorting process recorded many handles and lugs at all three sites, characterized by a vast typological variation. The handles can be grouped into six main categories: unperforated lugs, perforated lugs, semiperforated lugs, projecting handles, and strap handles. My dissertation project does not focus on typological and stylistic analysis, which is covered in chapter 4 for Kallamas and by other scholars in Maliq and Kamnik. Instead, I will investigate the manufacturing aspects of the handles, especially the way they were attached to the body. Visually, such technological choices can be inferred either by observing the fracture of the walls or the detachment of handles from the main body. At least three techniques were identified: attachment, piercing, and impression. The attached handles were stuck onto the body, and then the surrounding area was smoothed. The second technique, piercing, is entirely different. Here, an extension from the handle in the shape of a peg was inserted within a hole pierced through the wall of the vessel. Both techniques are also encountered at Dimini, while they were widely used in the region during the Neolithic and Bronze Age periods (Elezi 2014; Gori and Krapf 2015; Yiouni 1995). The third technique was observed only at Maliq and Kamnik, where peculiar concave lug-handles were formed by pressing a small section of the interior surface through the wall. As a result, a rounded or pointy lug-handle was formed on the exterior and a hollow at the same location on the interior surface (Figure 5.4).

Like handles, bases also represent a considerable part of the recorded material and increased typological variability. It is worth noting the large number of high concave feet, especially at Kamnik and Maliq, as well as the dominance of simple concave bases at Kallamas (Appendix B, Plate VII). Despite the large number of recorded bases, only a few have visible traces of manufacturing techniques. The application of an additional layer of clay, either on the interior or the exterior bottom of the vessel, has been frequently observed. Furthermore, on concave feet, discoid, and ring bases, an additional clay wedge was added on the exterior part probably to cover the joint with the body and give the preferred angle. I have also observed at least two ways of attaching the base to the body. Using the first method, the potters have placed the body on top of the central disc of the base, in which sometimes they create a depression for better adherence to the upper section of the vessel. Through the second technique, the body of the vessel is built from the exterior of the central disc enclosing it. It is premature to talk about the correlation between each technique and specific base types due to limited examples. In any case, the potters seem to have used coils to form the ring or the hollow foot for the ring-based and concave footed vessels, respectively (Figures 5.5).

Figure 5.5. Base manufacturing techniques. a) Base fragment from Kallamas with the body built on top of the disc and an additional coil around it to shape the exterior part. b) Base fragment from Kamnik with the body built around the disc and extra clay layer on the exterior bottom.

5.2 Technology of surface treatments and decorations

After they had built the vessels and brought them to a specified thickness and smoothed their walls, the potters usually burnished the surface very well. The observation of the tool traces on the body showed that the movements of the potters' hands during the burnishing process were primarily horizontal at the rim of the vessel. Some vessels preserve traces of vertical burnishing. In some other cases, the potters combined both techniques in different parts of the vessel without overlapping. Rarely the surface has crosswise burnishing from different directions or diagonal burnishing. On the surface around the handle, perimetrical burnishing movements were also present (Figure 5.6).

Figure 5.6. Image showing potsherds with burnishing traces: a) horizontal, b) horizontal and diagonal, c) diagonal, d) vertical.

Besides burnishing, slipping is another technique used to treat the vessel surface, especially at Kamnik, where many potsherds were recorded with slip either on the interior or exterior. A slip of pale tones of brown, red, and yellow is common at all three sites, while red-slipped vessels are less frequently encountered. Slip seems to have been used mainly for aesthetic purposes, since whether applied on the interior or exterior, it is primarily associated with the background of painted decoration. However, as is shown by other scholars, the slip and other surface treatment applications, that reduce the permeability of a vessel, prevent the liquid content from dripping and protect the object from abrasion (Skibo and Schiffer 1987, 91-3). A few fine painted small closed shape vessels from Kamnik have an interior clay coating, the primary use of which was obviously for waterproofing and exterior slip used as a background for the painted decoration. At the same site, to waterproof the vessel, the potters also used a black coating of organic material, which, as I will discuss in the following paragraph, originated from natural asphalt (Figure 5.7).

Figure 5.7. Two painted brown on cream sherds with coating from Kamnik: a) clay slip, b) bitumen layer.

Decoration of the vessels is the last step of the surface treatment sequences before the drying and firing processes. In this section, I will deal mainly with the technological aspects of painting decoration. Late Neolithic painted decoration is characterized by great diversity and a high complexity of motifs, patterns, and arrangements on the vessel surface. This decorating technique is among the most distinctive features of the Late Neolithic pottery in the region, while, at the same time, it comprises a valuable field for applying different analytical techniques. The visual analysis identified two main categories of painting decoration: motifs implemented before and after the firing process (Figure 5.8; Appendix A-2, 3, 4).

Figure 5.8. Painted potsherds from Maliq and Kamnik: a) pre-firing decoration, b) post-firing decoration.

The after-firing decoration group consists mainly of a specific ware category called crusted, represented in limited examples at Kamnik and Maliq, while it is absent at Kallamas (Figure 5.8b). These vessels were fully decorated with bold linear and geometric motifs of white and red paste. The preservation of such motifs is very poor due to the weak bonds that post-firing paint creates with the surface (Figure 5.8b). Other categories of pottery where the post-firing painted decoration was chosen are the encrusted incised and probably white on black vessels (for detailed descriptions of the painted categories, see chapter 4). The black motifs of organic material recorded on several vessels from Kamnik seem to have also been applied post-firing. This type of decoration is identified as bitumen and was applied on a light-colored background. To determine whether such material originated from plant-based tar or natural asphalt, I conducted a chemical analysis on several samples. The results will be discussed in the following chapter.

The pre-firing decoration comprises the main group of painted vessels. The typological, aesthetic, and technological variability of their ornaments is impressive (see chapter 4). The color of these motifs is diverse and includes various shades of red, brown, gray, and black. This type of decoration can be classified into two main categories: a) matt painted motifs; b) painted ornaments with a burnished surface. The lack of traces from the burnishing tool suggests that matt-painted decoration should have been applied after the vessel surface was burnished. Pottery decorated with matt motifs is the most frequent painted category at Kamnik and Maliq, while it is rarely present within the Late Neolithic layers at Kallamas. In contrast, the burnished decoration ornaments seem to have been applied before the burnishing process. After its implementation, the motifs, as well as the background, were burnished. Vessels with burnished painted decorations are more common at Kallamas, and they are most likely associated with the black-topped ware category. The other two sites, especially Kamnik, have provided just a few vessels decorated with this technique. A combination of both methods is observed on the polychrome vessels, where the pale tone background and the main red decoration motifs have been burnished, while the dark brown borderline between them is matt. This pottery category is present primarily at Kamnik, although a few examples are also identified at Maliq (Figure 5.8a; Appendix A-5).

5.3 Firing process and refiring tests

For most of the vessels, firing is the last step of the manufacturing sequence, except when post-firing treatment or decoration is involved. This process is vital for the journey of the vessels because not only it turns a clay object into a durable synthetic material with specific physical attributes (Kotsakis 1983, 140; Rice 1987, 80-1), it is also the main component that affects their aesthetic appearance. Control of the firing processes achieved a new level in the Late Neolithic period. In fact, the kiln complex at Kamnik excavated in the 1970s (Prendi and Aliu 1971), which unfortunately was not known to the archaeological communities of the Balkans, and the recent discoveries of ceramic kilns in Thessaly (Krahtopoulou et al. 2018), could be an indication for widespread use of ceramic kilns for the Middle and Late Neolithic period, at least in contrast to what has been supported thus far (Kotsakis 1983, 137-40; Elezi 2014, 56; Jones 1986, 73; Pentedeka 2008, 77-176; Yiouni 2001, 22-3). As with the black on red vessels in northern Greece (Yiouni 2001, 23), the high quality of painted categories and most likely black-topped vessels from southeastern Albania could have been fired in ceramic kilns, and the firing structures at Kamnik strongly support such an argument.[20] To investigate the firing conditions of the ceramic material, I observed the color of both exterior and interior surfaces and the fabric, while refiring tests were also performed.

[20] Although no waster and firing faults are reported from the excavations of the clay firing structures ak Kamnik, I have recorded several of them within the cermic assemblage.

5.3.1 Ceramic color and redox conditions during firing

The result of firing is associated with temperature, atmosphere, and duration. While the temperature and duration are closely associated with the type of fuel and the method of firing (open fire or kilns), the conditions are affected by the presence or absence of oxygen. The lack of oxygen results in reduction, while its presence provides oxidizing conditions. The color of the vessels is determined mainly by the firing conditions and composition of the ceramic paste. The vessels fired in an oxidizing atmosphere have light colors, while reduced conditions will produce dark shades. Thus, recording the color of the sherds and their fabric will provide direct evidence about the firing process (Maniatis and Tite 1981; Rye 1981, 96-7; Rice 1987, 333-6; Shepard [1956] 1985, 103-4, 213-5).

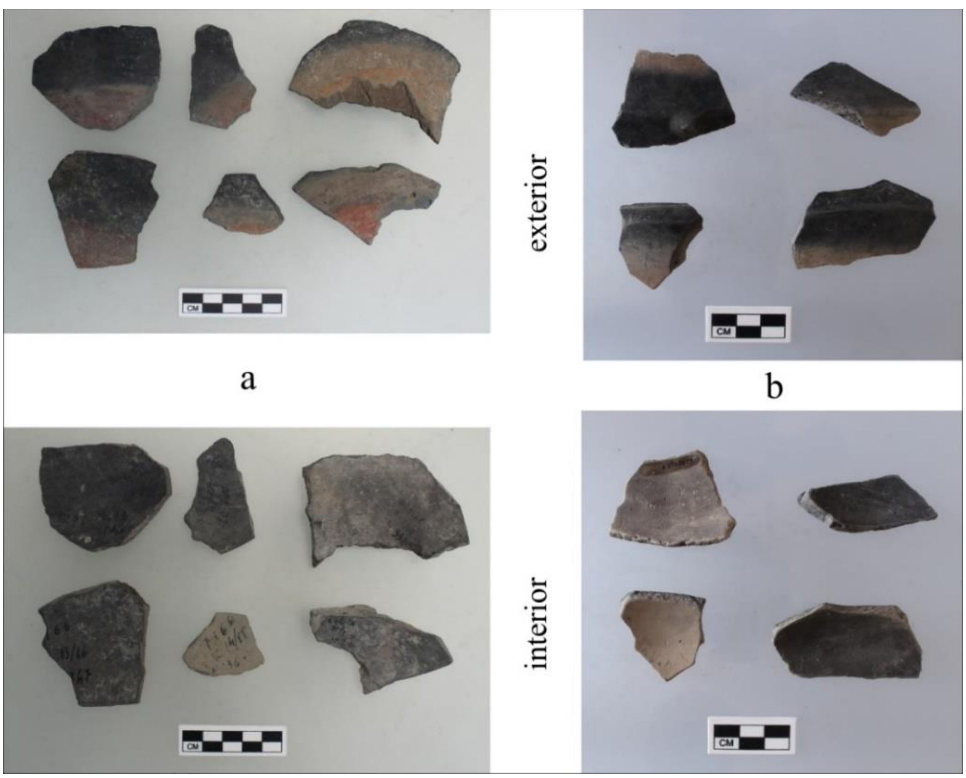


Figure 5.9. Image showing the interior and exterior surfaces of black-topped vessels: a) Maliq, b) Kallamas.

Systematic observation of the surface color of the ceramic material from southeastern Albania was conducted for the diagnostic sherds and all the samples collected for analysis. The recording showed that, in general, both interior and exterior were fired in the same atmosphere. The light-colored vessels had both surfaces on the interior and exterior fired in an oxidizing atmosphere. Similarly, the dark-colored pottery was fired in the complete absence of oxygen. There are exceptions, however, where brown, yellow, or red vessels had gray or black interior surfaces and vice versa. The combination of dark interior and light-colored exterior is mainly associated with the black-topped category, although the interior of many vessels from Kallamas and a few at Maliq is light-colored (Figure 5.9). In other cases, it seems that the potters had intentionally chosen to fire each surface in different firing atmospheres since it appears more frequently on open rather than closed shaped vessels. This pattern was observed at all three sites, although it is more pronounced at Kallamas (Appendix C-12).

The recording of the color of the fabric showed that they include light or dark uniform, gray core, and half-dark and half-light, indicating various firing atmospheres. On the gray core fabric, the center is dark-colored, while the edges have light shades. The fabrics with dark and light colors occupying different edges are considered half oxidized. Many potsherds recorded for this project have a uniform color testifying to a steady firing environment, either rich in oxygen or lacking it altogether. Others have gray core fabrics showing that the high temperatures probably did not reach the center of the walls (Figure 5.10; Appendix C-12). The transition between the reduced core and the oxidized edges of the fabric on many of these samples is gradual, advocating for a steady low temperature of firing. However, many of these sherds show sharp borders between light and dark colors in the fabric, resulting from the abrupt transition between different atmospheres and the limited time of the firing process. A similar explanation could also be adopted for the sherds with oxidized core or those with half-oxidized fabrics. An interesting case where the control of the firing process has reached high levels comprises a few black and gray vessels with oxidized core (Figure 5.10). Here, the potters fired the vessels first in high temperatures and in conditions rich in oxygen. Later, they introduced a reducing environment, probably for a short period judging from the abrupt transition recorded on their fabric, to obtain the dark-colored surfaces. The same mastering of the firing process is also required for producing the bicolored vessels called black-topped. Often the borderline between the black upper section and the light-colored lower body on this vessel is quite uniform. It is important to highlight here that the shade of the ceramic fabric is just an indicator of the firing atmospheres and sequences because other factors such as the type of the clay matrix and the temper affect its color

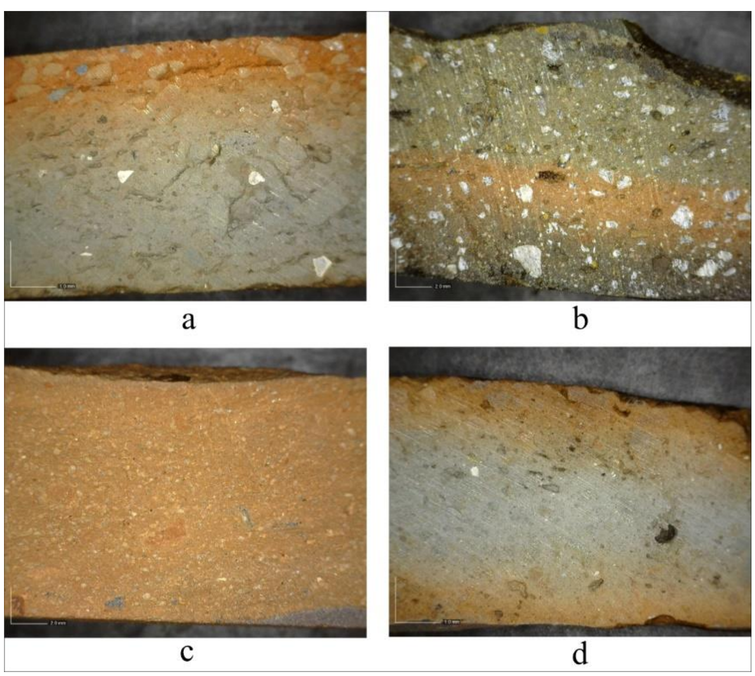


Figure 5.10. Image showing fabric firing atmosphere; a) half-oxidized, b) oxidized core, c) uniform, d) gray core. Microphotographs 50x40mm.

5.3.2 Refiring tests

Firing tests were conducted to explore the composition of the ceramic paste, decoration, or slip through their color (Elezi 2014, 62; Kyriatzi 2000, 90-92; Whitbread 1995, 390). For this reason, small fragments of 129 sherds, some of them with painted decoration, were refired in an electric oven, and the color of the fabric was recorded before and after the experiment. The samples were refired for five to six hours, with the temperature gradually reaching between 891-915°C on the first and 1045-1077°C on the second test, while they were left to cool inside the oven overnight (Figure 41-43). These temperatures were chosen to be sure that the refiring temperatures are higher than the original ones. The refiring test was not conducted on all the samples used for petrographic analysis to avoid further destruction of the ceramics or because no material was left after the preparation of the thin sections.

5.3.2.1 Results

The refiring test showed that the fabric of most of the samples became bright red or orange, indicating preferences of the potters for iron-reach clay sources. A limited number of sherds turned into pale shades of brown or yellow, characteristic colors of the calcareous-rich clays. In Kamnik, for example, from a total of forty-five samples fired in 900°C, a large number of sherds had fabrics of pale hues, while after they were refired in 1050°C, only six (KA11, KA18, KA26, KA31 KA36, KA67) maintained the same color and the rest were transformed into red or red-orange. Similarly, in Maliq, only three of forty-two samples (ML04, ML06, ML58) remained pale brown or red color. At Kallamas, in contrast, except for one potsherd (KL34), the fabric of forty-two samples originated from iron-reach clay.

The refiring test also showed the use of two different clays in at least one vessel (KL18) from Kallamas (Appendix A-5).

Regarding the painted decoration, the red motifs either remained the same or turned into bright red. The white-slipped background and white paste decoration did not change. Similarly, the dark brown matt motifs remained almost the same color. Thus, there are at least three different materials used in painted vessels. The white slip is expected to contain white clay or kaolinite, the red decoration probably originates from a fine clay rich in iron oxides, the dark brown motifs should contain manganese, while the white paste decoration has calcium carbonate. These results are identical to previous research findings in the region on painted decoration (Kotsakis 1983 113-4; Kyriatzi 2000, 62-5; Ndreçka et al. 2014; Urem-Kotsou and Dimitriadis 2002, 638; Yiouni 2001).

Figure 5.11. Ceramic fragments from Kamnik with repairing traces. a) mending with a layer of clay, b) traces of adhesive (natural bitumen).

5.4 Ceramic mending techniques

The study of the material from Kallamas, Maliq, and Kamnik identified many sherds with mending holes. Around the world, repairing ceramic vessels has been practiced by many ancient societies. In the Balkans and the Aegean, this phenomenon goes back to the Early Neolithic Period (Vitelli 1989; Papadakou 2010; Andoni 2019). People have used mending holes and organic adhesive or clay layers to reassemble broken vessels (Dooijes and Nieuwebhuyse 2007; Elezi, Kotsakis, and Pappa 2019, 533, Fig. 3e). The combination of holes and adhesive is used to repair vessels that were broken during their use.

Figure 5.12. Sherds from Kallamas, Maliq, and Kamnik with mending holes.

Sherds with repair-holes are common in ceramic assemblages, while traces of the organic glue are rarely preserved. The other method, where a layer of clay is applied on the cracked surface, seems to have been used by potters after the vessels were damaged during the drying process. There is one medium-sized conical painted vessel with thin walls from Kamnik that preserves traces of both techniques. A layer of clay was probably added to cover the crack created after the drying process. There is also a mending hole at the same location, which seems to have been pierced later after the vessel was eventually broken during use. A few ceramic fragments from Kallamas and Kamnik have remains of the adhesive either on the broken section or within the mending holes (Figure 5.11). The systematic recording of the pottery, especially from Kallamas, showed that the sherds with mended holes belong to vessels of different shapes, dimensions, colors, and surface treatment (Figure 5.12). To identify the origin of such material, I have conducted organic chemical analysis on several samples. The potsherds with preserved organic adhesive from Kallamas belong to stratigraphic layers of an early chronological period not included in my dissertation project, while the results of the analysis on the samples from Kamnik are discussed in the following chapter.

5.5 Conclusions

The macroscopic observation of the Late Neolithic ceramic assemblages from southeastern Albania revealed a rather synthetic picture of the technological spectra with similarities and variations between sites and regions. Building techniques seem to be limited in general, and they are relatively homogenous among settlements and areas. Vessels built with coiling are frequently present in all three sites (Maliq, Kamnik, and Kallamas). The technical choices of shaping and attaching handles or bases, however, shows a relative diversity. The lugs and handles, for example, are attached to the walls of a vessel in three different ways. Apart from the concave handles, which are observed only at Kamnik and Maliq, the other two techniques were used at all four sites, including Dimini. Even more diverse are the secondary manufacturing techniques since potters used various methods to treat the vessel surface, which, besides burnishing, is often slipped and decorated. Different raw materials were used for the slip and painted decoration of the vessels. The broken vessels also were repaired through two distinct techniques involving piercing, organic adhesives, and clay reinforcement. The Late Neolithic potters in the Korçë region, especially at Kamnik and Maliq, probably had full control of the firing conditions using ceramic kilns, as indicated by the structures discovered at Kamnik and the color uniformity of the painted vessels.

The systematic macroscopic observation to investigate technological aspects of ceramic production has provided important information about pottery manufacturing at a settlement and regional level. The technology of manufacturing is characterized by the coexistence of cross-site homogeneity, microregional patterns, technological conservatism, and plurality, indicating the complexity of the interactions between the potters and the ceramic material and the cross-site exchange of knowledge. The potters from Kamnik and Maliq, in contrast to Kallamas, seem to share a ceramic tradition or exchange technological knowledge by participating in a common network of contacts since they use many similar manufacturing techniques. At the same time, the plethora of shared technological knowledge indicates the active role of pottery in regional contacts. Due to the lack of analogous studies from previous or later phases and other Late Neolithic sites in southeastern Albania, it is impossible to incorporate the above results into a regional and chronological context. However, similar techniques have been systematically used in the north Aegean since the Early Neolithic period (see, for example, Dimoula 2012, 87; Elezi, Kotsaki, and Papa 2019; Kotsakis 1983, 120; Kozatsas et al. 2018; Papadakou 2010, 31; Papaioannou 2011, 44), indicating the continuity of a particular ceramic tradition and the extent of the regional networks of contacts within which the pottery should have been directly involved.

6. Fabric and composition of the ceramic assemblages

This chapter presents the results of the scientific analyses conducted on a selected set of potsherds to investigate the texture, mineralogical and chemical composition of the ceramic fabric as well as the characteristics of the slip and painted decoration with the objective to better understand the procurement of raw materials, technological choices of manufacture and possibly, to identify pottery circulation patterns. To this end, a brief overview of the geology of Albania and the geological context in the region of Korçë is also given.

The methodology is based on a multianalytical approach combining various techniques such as optical microscopy, pXRF, XRD, and GC-MS. Optical microscopy was primarily used to study the texture and petrography of the ceramic fabric by examining the characteristics of the clay matrix and the nature of the inclusions, while pXRF provided data about the elemental composition and was supplemented by XRD analysis on a few sherds, mainly to identify specific phases present in the slip and/or the decorated areas. Because of permit-related issues, optical microscopy observations were limited to the ceramic sherds from the settlements in southeastern Albania, whereas pXRF analysis could be done on samples from all four neolithic sites, including Dimini in Thessaly, Greece. Finally, the analysis and identification of organic materials used to decorate, waterproof, and/or mend several vessels from Kamnik, named by the excavators as bitumen, was conducted with GC-MS.

6.1 Geological context

Characterized by a diversity of geologic formations, Albania is part of the Dinarides, the mountain range that stretches along southern and southeastern Europe and separates the Adriatic

Sea from the Balkan Peninsula. In northern Albania, there is the transition between the Dinarides and the Hellenides, which run along the rest of the country. The geological structure in Albania is known as Albanides, which is in fact the northernmost part of the Hellenides and the southernmost section of the Dinarides separated by the Shkodra-Peja transversal. It is divided into internal and external zones known as inner Albanides and outer Albanides, respectively. The geological structure of Albania is characterized by a tectonic complexity integrating different zones with the Shkodra-Peja transversal separating them in northern and southern groups. Located in the southeastern part of the country, the region of Korçë is constituted of four structural and tectonic zones known as the Mirdita, Krasta-Cukali, Kruja, and Korabi zones, as well as the Albanian-Thessalian depression that includes the Korça and Devolli basins (Meço and Aliaj 2000, 8-21; Xhomo et al. 2002, 22-7, Fig. 1-4). Thus, the region is characterized by a complex geological signature, especially the district of Kolonjë where Kamnik is situated. The area is dominated by marls and other carbonated rocks, some of which containing globutruncana microfossils. Other common rock formations are conglomerates, serpentinite, ophiolites, and siliceous rocks. The geological setting of the Korçë basin, on the western edge of which the Neolithic site of Maliq is located, is characterized by colluvial and alluvial deposits, ophiolites in the south and east, limestones northeast, and molasses in the west part (Figure 69 Fouache et al. 2010, 526, Fig. 1). Pleistocene and Holocene prolluvial and alluvial sediments, carbonated rocks, conglomerate, dolomite, and metamorphic rocks are the main geological components of the area around Kallamas on the shore of the Greater Prespa Lake (Figure 68, Hoffmann et al. 2010). Natural bitumen sources are found in several locations, mainly in the south and southwestern Albania. Bitumen deposits occur in Selenicë, Visokë, Dukat, Fterë, and Delvine in the south-southwestern part of the country and Makaresh in the north (Buri and Turku 1998, 21, fig.8). The bituminous coal or maltha in Selenicë is the most famous source also mentioned in ancient texts (see Hammond 1992, 30-1; Morris 2006, 2).

6.2 Selection of the sherds, preparation, and sampling

A large set of ceramic sherds was created by choosing a total of 389 samples from the sites of Kamnik, Maliq, Kallamas, and Dimini. The selection was primarily based on typological, stylistic, and use criterias, and though it could not be implemented systematically because of various issues, the set can be considered highly representative, and therefore adequate, for a comparative study between the sites. For petrography, the sherds came from both decorated and undecorated vessels of different shapes and sizes whose fabrics were visually characterized as medium- to coarse-grained. On the other hand, for pXRF analysis, the focus was on sherds with a fine-grained fabric in order to minimize compositional heterogeneity linked to the presence of large inclusions. As to the chemical composition of the painted decoration, the selection covered a great variety of painting motifs, colors, and application techniques. For the sherds from Kamnik with remnants of dark organic material, the selection was simply guided by its presence, though target sampling was carried out in cases where the body of the sherds with such traces was large enough to represent the various uses of the material. A summary of the number of sherds or samples from the different sites used for the various analysis is given in Appendix D.

6.3 Analytical techniques and methods

6.3.1 Optical microscopy

The petrographic analysis of the ceramic thin sections was accomplished with a Leica DMRM polarization microscope equipped with a digital camera for imaging. The thin sections were also scanned with a Nikon scanner at 4000 dpi resolution in both plain and cross-polarized light. The high-resolution images were processed with the open-source image analysis software JMicroVision (Roduit 2020). For each thin section, the texture of the clay matrix and the nature of the inclusions were described, while these characteristics were used to create groups based on fabric similarities. Because of time limitations and other practical reasons, the petrographic study remained primarily qualitative, though image analysis was also used to collect information about the microstructure and the size, distribution, and shape of the inclusions.

6.3.2 X-ray fluorescence

X-ray fluorescence analysis was performed with a handheld Tracer 5i XRF spectrometer from Bruker equipped with a rhodium (Rh) X-ray tube and a silicon drift detector. The instrument was set in "ceramic dual" mode, and compositional data were collected with a spot diameter of about 8 mm for 75 seconds in air to identify both heavy and light elements. The analysis was performed on both the surface of the sherds to identify specific elements present in the slips and painted motifs, and on cross-sections to investigate the composition of the ceramic fabric. pXRF data were collected on the dark brown or black, red, and white painted decorations as well as on the off-white slipped surfaces. The measurements were taken in direct contact with the surface, and the data were interpreted qualitatively. Regarding the composition of the fabric of the sherds from Kamnik, Maliq, and Kallamas, pXRF analysis was performed on the cut and flat surface used for the preparation of the thin sections. For those from Dimini, destructive techniques were not permitted and the analysis was carried out on the surface after a thorough cleaning.

6.3.3 X-ray diffraction

X-ray diffraction was used to identify the components of the slip as well as the phases responsible for the color in the decorated areas. The analysis was conducted in the CAEM laboratory located at the Cotsen Institute of Archaeology using a Rigaku R-Axis Spider X-ray diffractometer. Powder or flake samples from the paint and/or slip were fixed on a glass spindle with vacuum grease (Apiezon N, M&I Materials Ltd). The samples were run at 50 kV/40 mA using a Cu Kα radiation and rotated over 360° for 20 or 30 minutes. XRD diffractograms were processed and matched with reference spectra from the International Center for Diffraction Data (ICDD) files using the Jade software (v8.2, Materials Data Inc).

6.3.4 Biomarker analysis of bitumen

The residue analysis on sherds from cooking pots revealed the presence of two compounds associated with natural asphalt on a sample from Kamnik with a layer of a black organic material inside (see chapter seven for the residue analysis). The macroscopic observation recorded more than a dozen sherds with traces of similar material. Some of these carry decorative motifs on the exterior made from this material, identified by the excavators as bitumen, judging by its texture (Prendi and Aliu 1971, 23). Others have a thick layer on the interior most likely for waterproofing, while in one sample, the black material seems to have been used as a mending adhesive. Therefore, biomarker analysis of bitumen using GC-MS was carried out on 15 of the above samples to identify the molecular composition of the black material observed on their surface. Besides the molecular composition of the material, the biomarkers analysis was also used to investigate its provenance. For this reason, one geological sample from Selenicë in southern Albania, a region with natural asphalt sources, as well as two from California, were also analyzed for comparison (Figure 6.1; Table 6.1; for biomarker analysis of bitumen, see Connan and Deschesne 1992; Faraco et al. 2016; Wendt and Lu 2006).[21]

Table 6.1. List of archaeological artifacts with organic material and geological samples. EOM: extracted organic material, Asph.: asphaltenes, Sat.: saturated, Arom.: aromatic, and Res.: resins.

Sample reference	Site	Location on the vessel	EOM%	Asph. %	Sat./Arom. /Res.%
KA01	Kamnik Albania	Exterior surface	48	89	11
KA02		Exterior coating	61	94	6
KA03		Exterior decoration	23	75	25
KA04		Interior coating	53	87	13
KA05		Exterior decoration	21	81	19
KA06		Interior coating	17	95	5
KA07		Exterior decoration	18	83	17
KA08		Interior coating	12	70	30
KA09		Interior coating	38	82	18
KA10		Interior coating	33	87	13
KA11		Interior coating	41	87	13
KA12		Exterior decoration	1	100	0
KA13		Interior coating	1	100	0
KA14		Exterior decoration	1	80	20
KA15		Interior coating	19	84	16
SE01	Selenicë Albania	Geological sample	17	69	31
TP03	La Brea California		91	56	44
TP61			93	62	38

[21] The natural asphalt sample from Selenicë (please be consistent in your spelling) was collected with the generous contribution of two colleagues from Albania, Ergys Hasa and Kriledjan Çipa, while the samples from La Brea Tra Pits are provided by courtesy of Brenda Aguilar.

The weighted aliquot of each sample was placed in a glass test tube, and 2 mL dichloromethane was added. The samples were mixed vigorously on a Vortex mixer and centrifuged at 1500×g for 30 minutes to remove insoluble components. The supernatants were transferred into clean weighted test tubes and dried in vacuum. The dried samples were brought back into solution by adding 2mL hexane to separate the asphaltenes from the other classes of compounds present in natural asphalt, such as resins, saturated, and aromatic hydrocarbons. The samples were mixed and centrifuged at 1500×g for 30 minutes to bring down the asphaltenes that do not dissolve in hexane. The supernatants were transferred into clean weighted test tubes, and the samples were again dried in vacuum.

The dry samples were brought back into solution by adding 2mL hexane and fractionated with a 3mL Supelclean LC-Alumina-N SPE column using a four-stage sequential process. First with 1mL hexane, second with 1 mL of a mixture of hexane/dichloromethane (70:30, v/v), third 1 mL of a mixture of dichloromethane /methanol (90:10, v/v), and finally with 2ml hexane. To facilitate the flow, the columns were centrifuged at 400 RPM for 1 minute. Following activation, the samples were loaded on the column twice and the flow-through collected in a clean test tube. Second, the columns were eluted with 2mL hexane which eluded most of the saturated hydrocarbons. Third, the columns were eluted with 2 mL of a mixture of hexane/ dichloromethane (70:30, v/v) which eluded most of the aromatic hydrocarbons. Finally, the columns were eluded with 2 mL of a mixture of dichloromethane/methanol (90:10, v/v) which eluded most of the polar hydrocarbons. All fractions were dried in vacuum and redissolved in 100μL dichloromethane. The resulting solutions were transferred into autosampler injector vials and analyzed by gas chromatography followed by mass spectrometry (GC-MS).

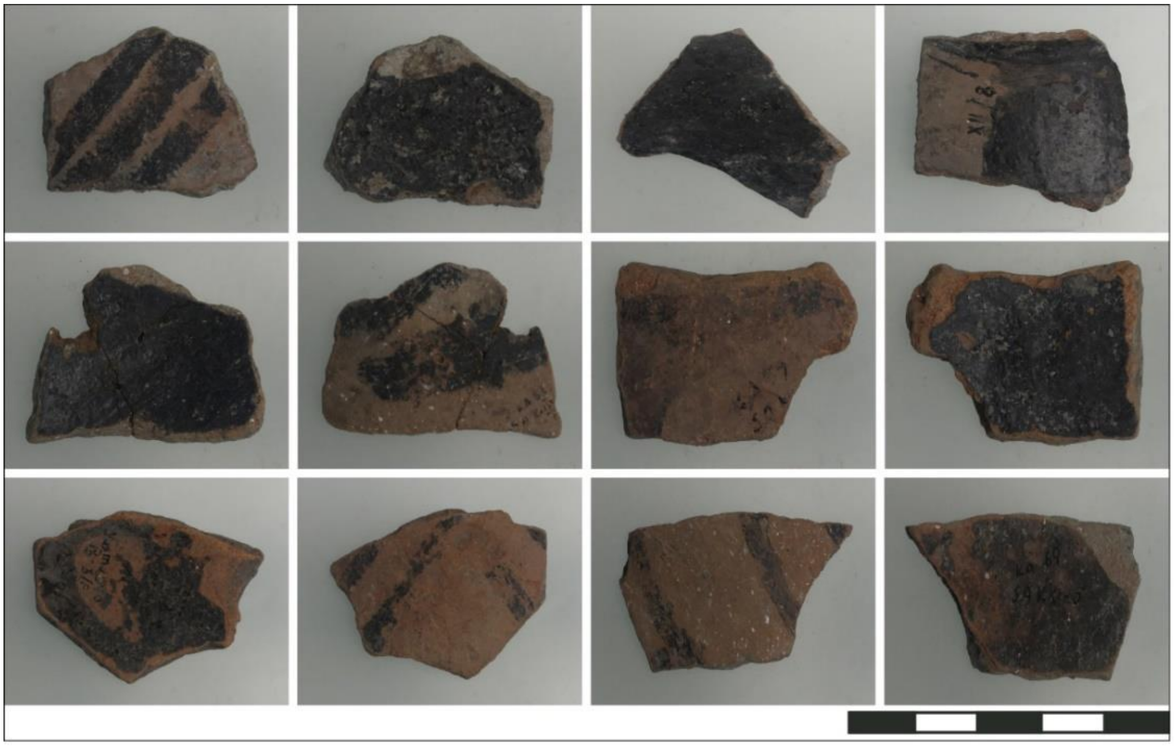


Figure 6.1. Potsherds from Kamnik with bitumen decoration and coating.

Of each sample, 1 μL was injected into an inlet set at 250°C and transferred in splitless mode onto a bonded-phase non-polar fused silica capillary column (Phenomenex ZB-5, phenyl/dimethylpolysiloxane 5/95, 60 m x 0.25 mm, 0.10 μm film thickness; injector port 250°C) and eluted (constant flow, 1 mL/min) with ultra-high purity helium (Thermo Scientific Trace 1310 GC system). The temperature of the oven started at 40°C and was raised to 300°C over a 40-minute temperature ramp (min/°C: 0'/40°C, 3'/40°C, 30'/300°C, 40'/300°C). The end of the column (GC/EI-MS transfer line at 250°C) was directly inserted into the EI source (280°C, 70 eV) of a high-resolution Orbitrap mass spectrometer (Thermo Scientific Q Exactive GCMS), calibrated with perfluorotributylamine immediately prior to the analysis of each batch of samples). After an 11-minute solvent delay, the spectrometer started scanning from m/z 70–1000 (FWHM resolution 60,000, AGC target $1e^6$, maximum IT 200 msec). Data were collected with instrument manufacturer-supplied software (Thermo Xcalibur). Identifications were based on the comparison of spectra averaged over the width of the ion peaks within the total ion chromatogram (TIC), after background subtraction, to the NIST 2008 Mass Spectral Library (version 2.2f). Positive identifications were based on NIST match factors of at least 750, indicating strong concordance between the unknowns and the library spectra, as well as acceptable visual concordance between the unknown and library spectra.

6.4 Results and discussion

6.4.1 Ceramic petrography and fabric characterization

A total of 88 thin sections were analyzed from the sites of Kallamas (28), Kamnik (34), and Maliq (26). Their study with optical microscopy and image analysis allowed for the identification of seven groups of fabrics based on the features of the matrix and the most common inclusion types. Some examples showing the diversity of fabrics are given in figure 6.2. Several groups are organized into fabric subgroups distinguished by the presence and relative proportions of other additional phases. For practical reasons to avoid having too many petrographic groups, samples from all sites were organized in the same group. However, there are fabric groups that contain specimens only from one site. Therefore, being in the same group does not imply any a priori provenance relation among them. Several thin sections did not fit any of the above groups, and they differed from each other (Appendix A-6; D-2, 3).

Subgroup 1a

This subgroup comprises sherds from Kallamas (6) and Kamnik (4). The fabric is heterogeneous with medium to coarse-grained and poorly sorted inclusions, mostly spathic calcite and rare sparitic limestone, embedded in a fine-grained matrix that shows shrinkage microcracks and randomly oriented voids.

Figure 6.2. Scans of potsherd thin sections belonging to the different groups and subgroups showing fabric characteristics and textural features.

The spathic calcite is present in variable proportions relative to the matrix and is often microporous because of partial decomposition during firing. In the samples KL57 and KA32, voids and inclusions were oriented along a concentric pattern indicating a relic coil feature, while KA07 has a thick reddish iron-rich slip apparently composed of two superimposed layers. Many sherds, especially those from Kamnik, contain fine calcium carbonate encrustations on the surface and/or within the voids (Figure 6.3).

Subgroups 1b

In this subgroup, all the sherds are from the sites of Kallamas (8) and Maliq (4). For the latter, the fabric is heterogeneous, with voids and discrete shrinkage microcracks, and is characterized by a matrix containing small grains of quartz and a relatively low amount of large spathic calcite inclusions. Sparitic limestone grains are also present, sometimes of sizeable dimensions as in sample ML11. For the set from Kallamas, the fabric has a coarse texture but is more homogeneous with higher amounts of moderately sorted inclusions of variable size, usually angular to subrounded. The matrix shows randomly oriented voids and a network of fine shrinkage microcracks running parallel to the long section of the sherds. Although spathic calcite is the most frequent, other inclusions such as individual grains of quartz and feldspars, notably microcline, as well as gneiss, micaschist, polyquartz, micritic and sparitic limestone, and deformed plutonic (felsic) rock fragments are present in significant amounts. For KL45, these inclusions are typically large and well rounded, a feature indicating that the raw material was probably coarse sand. Sample KL52 shows a concentric orientation of voids and inclusions indicative of a relic coil, while the interior surface of KL31 is coated with a thin fine-grained slip rich in calcareous material (Figure 6.3).

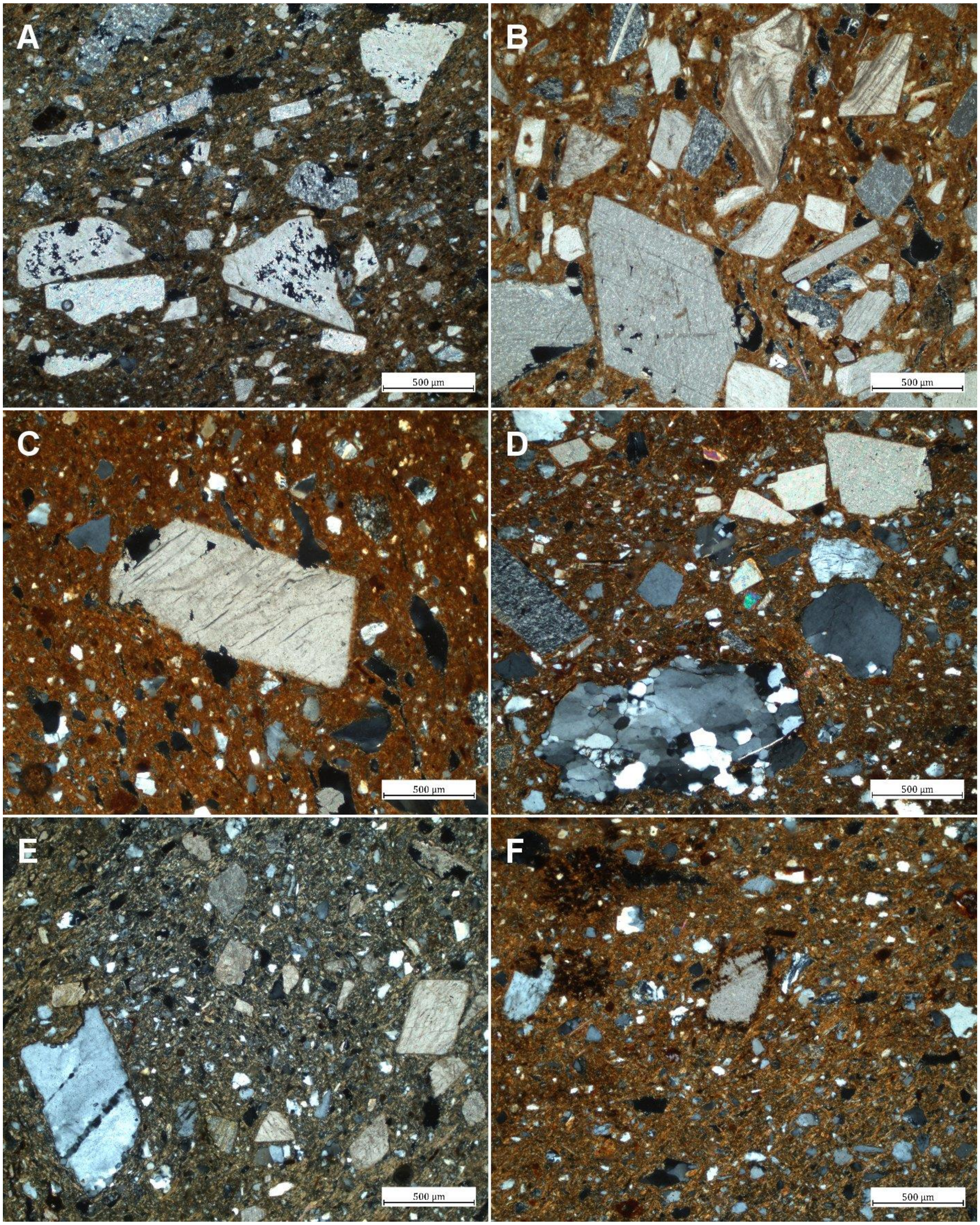


Figure 6.3. SubG(group)-1a: KA07 (A), KL57 (B); SubG-1b: KL52 (C), KL58 (D); SubG-1c: KL32 (E), KL28 (F).

Subgroup 1c

The sherds from this subgroup are all from Kallamas and their fine-textured fabric is composed of moderately to well-sorted subangular to subrounded inclusions embedded in a fine matrix with a limited number of voids and microcracks. The inclusions have a smaller size compared to subgroup 1b and are mainly comprised of individual grains of quartz, feldspars, and spathic calcite, lesser amounts of long flakes of muscovite and gneiss rock fragments, as well as rare grog and limestone. The amount of spathic calcite is relatively low, though significantly higher in KL32. For KL17 and KL28, the proportion of inclusions in total is higher and they are larger and more angular; KL28 also shows ferruginized particles and rock fragments most likely related to the alteration of specific mineral phases (Figure 6.3).

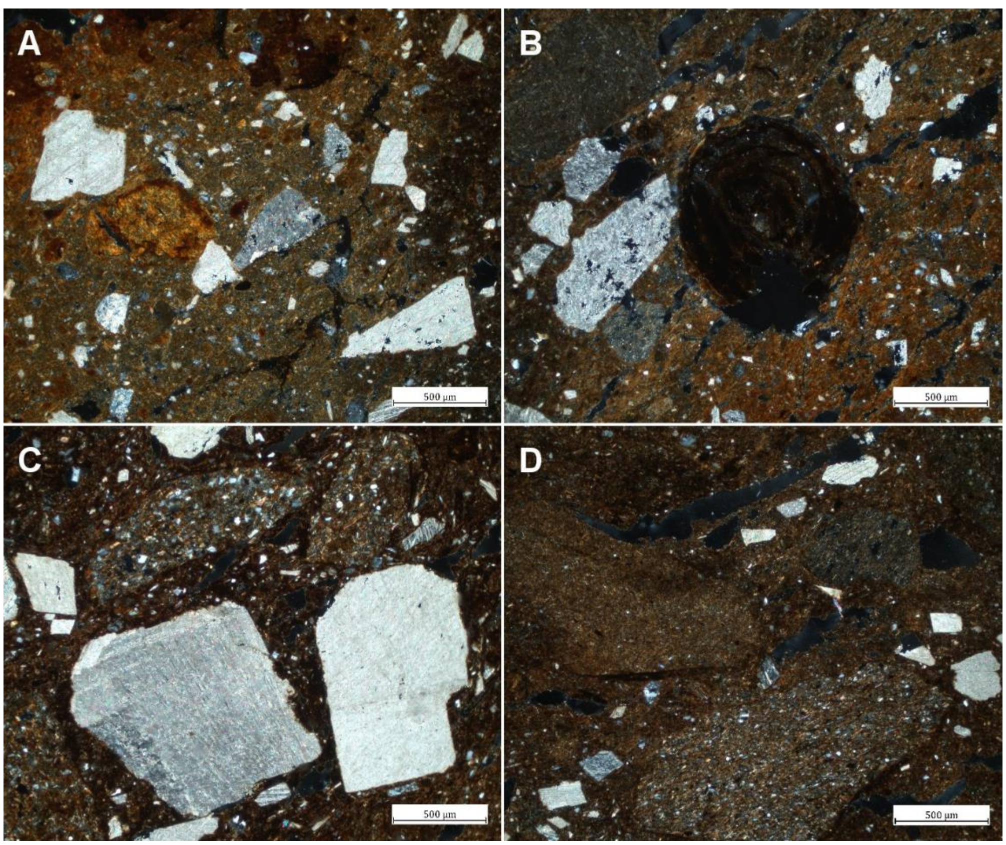


Figure 6.4. SubG-1d: KA17 (A), KA29 (B); SubG-1e: KA23 (C), KA28 (D).

Subgroup 1d

The three sherds in this group are from Kamnik. Their fabric is contrasted with many large and small inclusions embedded in a fine-grained but heterogeneous matrix marked by iron-rich areas, numerous voids, and a few microcracks. The voids and inclusions are rather randomly oriented. Beside spathic calcite, which is the predominant type of inclusion, a few subrounded limestone and mudstone rock fragments, as well as rare angular chert, could be identified. Some weathered rock fragments contain flakes of phyllosilicates associated with iron oxyhydroxides, while an iron-rich pisolith is also visible in sample KA29 (Figure 6.4).

Subgroup 1e

The three sherds in this subgroup are also from Kamnik, and some of their characteristics are similar to those of subgroup 1e. The fabric is heterogeneous, with a high proportion of large and small inclusions dispersed in a fine-grained matrix. However, in addition to the spathic calcite, the other inclusions are primarily composed of subrounded shale and siltstone rock fragments, which can be very large like in sample KA28. The matrix is also marked by the presence of large voids and a dense network of shrinkage microcracks oriented parallel to the edges of the thin section or circumscribing the large inclusions. The siltstone rock fragments are composed of fine angular particles of quartz and feldspars, and in sample KA23, they also contain chlorite and biotite (Figure 6.4).

Fabric group 2

This group contains eight samples from Kamnik that belong to polychrome, black on red or red on cream jars, and two hemispherical brown on cream and burnished hemispherical vessels from Maliq. Their fabric is composed of relatively large inclusions in variable proportions which are dispersed in a fine-grained micromass that contains small grains of quartz as well as numerous macro-voids and fine shrinkage microcracks.

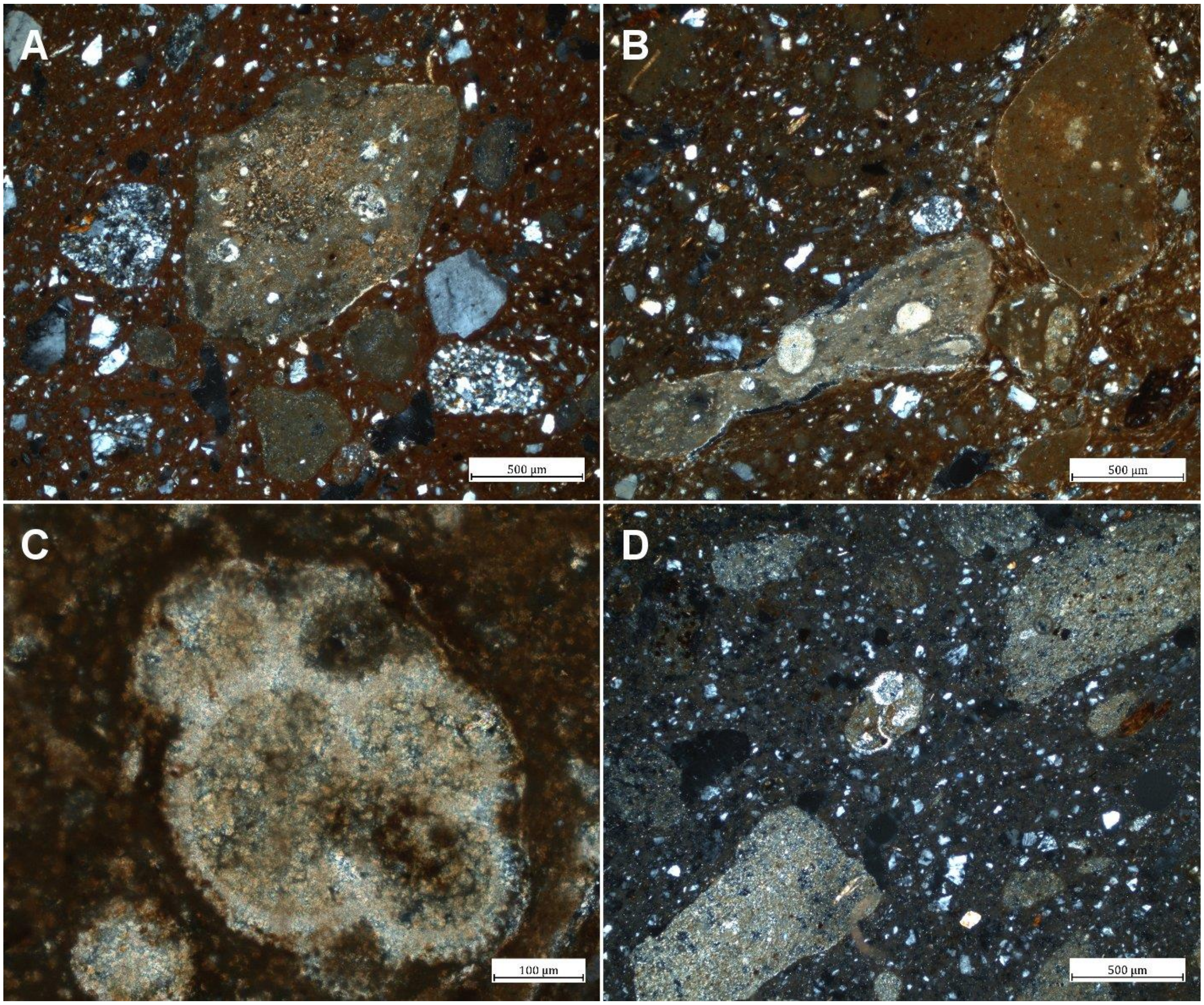


Figure 6.5. Group-2: KA14 (A), KA12 (B), KA12 (C), ML07 (D).

In samples KA08 and KA11, the cracks are wider and randomly oriented and often run around the large inclusions. These are primarily composed of marly and fossiliferous limestone rock fragments containing notably microfossils from the globigerina genus. Other inclusions are shale, mudstone, and a few deformed plutonic and/or gneiss rock fragments. KA14 might also contain some glauconite, while ML12 has both sparitic and micritic limestone, which often incorporate angular grains of quartz. Almost all sherds have calcareous encrustations on the surface and/or inside the voids and cracks within the ceramic body. A calcareous clay-based material was used for the slip present on the sherds from Kamnik and for KA12, and this material is identical to the marly limestone inclusions (Figure 6.5; Appendix D-2, 3).

Fabric group 3

The sherds in this group are almost exclusively from Kamnik (12), with only one from Maliq. The fabric is characterized by the predominance of shale and mudstone inclusions. The sample from Maliq stems from a brown on cream necked jar. Those from Kamnik were sampled from jars, open vessels with or without high foot, storage containers, and piriform hole-mouth vessels. They belong to brown on cream, black on red, polychrome, red on cream, and plain burnished ware categories. The samples of this set are organized into three subgroups based on other mineral phases that coexist with the primary inclusions (Appendix D-2, 3).

Subgroup 3a

In this subgroup, the fabric is dominated by calcareous shale and mudstone inclusions. A few limestones, siltstones, and rare metamorphic rock fragments are also present. The poorly sorted inclusions are subrounded to rounded and dispersed in a clayish micromass containing fine and angular quartz grains. The microstructure is characterized by some large voids and a network of shrinkage microcracks either randomly oriented or circumscribing the inclusions. The shale fragments, in general, are composed of a fine matrix with oriented mica flakes and tiny quartz grains. Most siltstone inclusions are composed of sub-angular quartz and feldspar grains, mica, and iron oxides, while a few contain sparitic calcareous material. Most sherds, including that from Maliq, show calcareous encrustations on their surface (Figure 6.6).

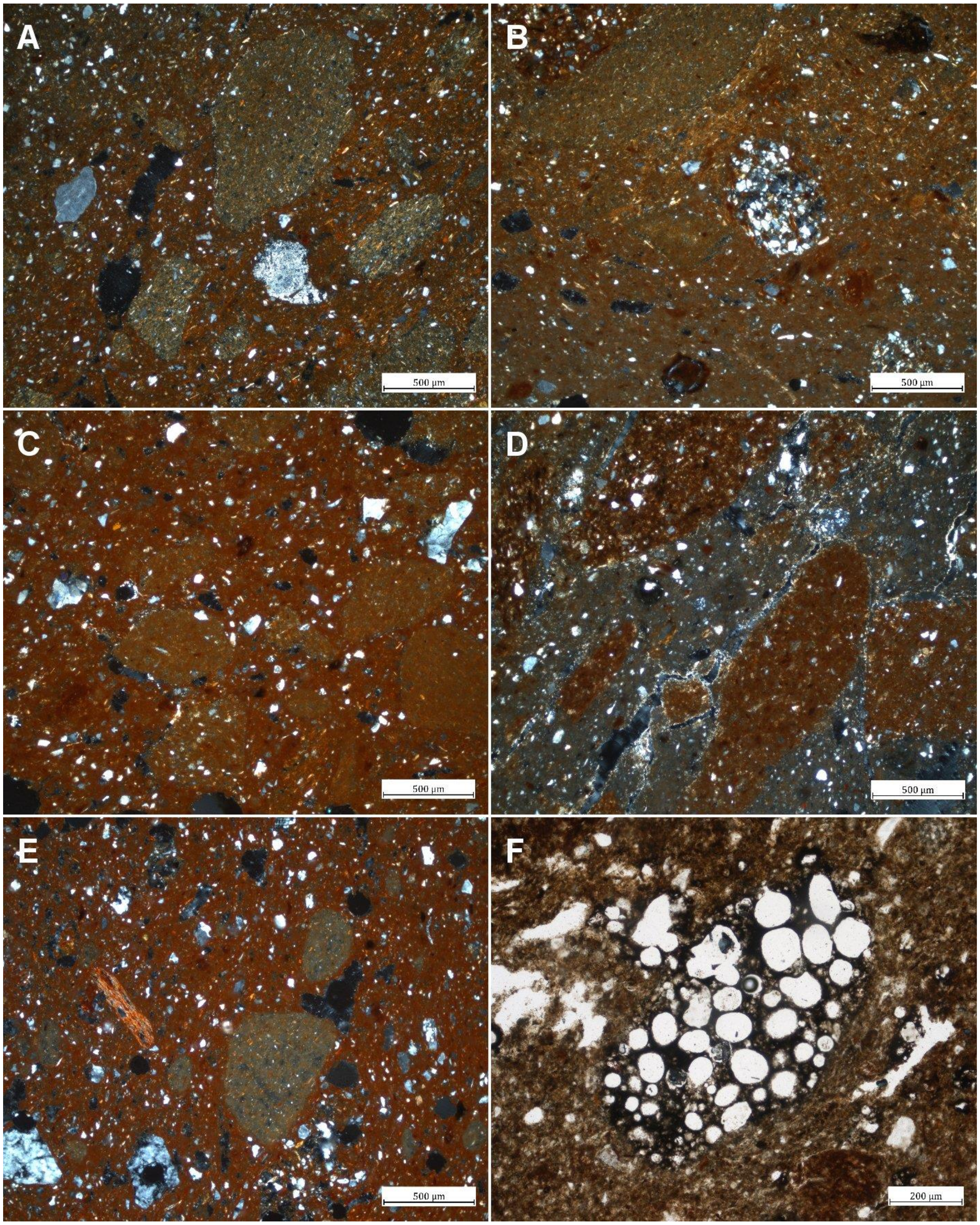


Figure 6.6. SubG-3a: KA05 (A), KA22 (B); SubG-3b: KA01 (C), KA10 (D); SubG-3c: KA09 (E), KA04 (F).

Subgroup 3b

The fabric of the two sherds in this subgroup is characterized by a relatively high proportion of rather large though poorly sorted, sub-rounded and rectangular inclusions composed of various types of rock fragments, mainly calcareous mudstone and iron-rich shale, lesser siltstone, and few micritic limestones. These inclusions are dispersed in a heterogeneous calcareous micromass marked by the presence of small grains of quartz, large irregular shaped voids, and shrinkage microcracks and voids. The latter run around the inclusions and were created by the retraction of the clay matrix, leaving an open space at the interface. In both samples, a fine calcareous material can be observed in the form of surface encrustations and precipitated within the voids and microcracks present in the body (Figure 6.6).

Subgroup 3c

In comparison to the previous subgroup, here, the fabric is characterized by lower amounts of calcareous mudstone and iron-rich shale inclusions, more siltstone, and the presence of individual and sizeable grains of quartz and feldspars, as well as metamorphic rock fragments. Most siltstone inclusions contain glauconite grains and a few, calcareous material. The small grains of quartz are more abundant in the micromass, and a peculiar type of inclusion was observed in KA04 and could be rounded scoria fragments. The thin sections also show the presence of a thin calcareous slip with, in some areas, an iron-rich painted layer on top (Figure 6.6).

Fabric group 4

Group 4 represents two sherds from Maliq that belonged to a jar and a fruitstand and are classified in the brown on cream painted category. The relatively homogeneous fabric is characterized by the predominance of subrounded to rounded sandstone rock fragments, some with a graywacke typology, and their constitutive mineral phases as individual particles points toward crushed sand for the raw material. Other inclusions present in lesser amounts are composed of siltstone, quartzite, and gneiss rock fragments as well as rare limestone, notably in ML24. A few irregular shaped voids are scattered in the micromass, and both samples are coated with a thin calcareous slip and a discontinuous iron-rich layer corresponding to the painted decoration (Appendix D-2, 3; Figure 6.7).

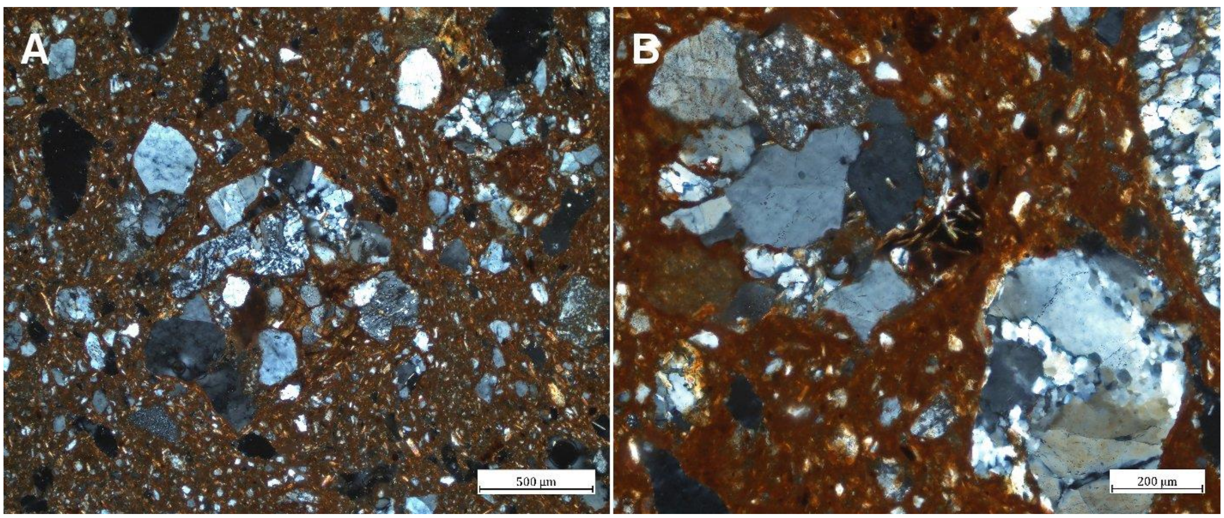


Figure 6.7. Group 4: ML10 (A, B).

Fabric group 5

This group comprises samples from Maliq (12) and Kallamas (7) with fabrics characterized by the prevalence of felsic minerals and metamorphic and deformed felsic plutonic rock fragments. Based on the shape and the diversity of the inclusions, it is most likely that they come from a crushed sand material added to the clay paste. The sherds were organized into four subgroups based on the occurrence and relative proportions of the different types of inclusions.

The sherds from Maliq belong to jars, pans, and fruitstands, as well as conical and hemispherical vessels. The majority have burnished surfaces, with only three being decorated either with barbotine or painted motifs. Noticeable is that six vessels belong to cooking pots, three of which are pans. Similarly, most sherds from Kallamas come from burnished vessels, while there is one with impressed decoration and another with a red slipped surface. Regarding typology, the set from Kallamas is more diverse since forms like jars, spherical, biconical, and basket-type storage containers are represented (Appendix D-2, 3).

Subgroup 5a

This subgroup contains two sherds from Maliq and one from Kallamas. Their fabric is dominated by quartz, feldspars, and muscovite, while other less common inclusions are gneiss, quartzite, siltstone, shale, and rare micritic limestone. In ML15 and KL6, the inclusions are on average larger than in ML16, which also contains individual grains enriched in iron oxides corresponding probably to altered mineral phases. The micromass is marked by the presence of a few irregular shaped voids and fine grains of quartz (Figure 6.8).

Subgroup 5b

Six sherds, three from each site, are classified in this subgroup. Individual grains of quartz, potassic feldspars (orthoclase and microcline), and plagioclase are the prevalent inclusions. In ML18, potassic feldspars with perthitic texture or sericite alteration, and plagioclase with myrmekite or albite twinning are common. Poorly sorted, subrounded to rounded, inclusions composed of gneiss, quartzite, schist, and deformed plutonic rock fragments are also present, though in lesser quantities. The microstructure is characterized by a limited number of small and larger voids randomly oriented, except in ML18, where inclusions and voids are aligned in concentric arrangements resembling a relic coil feature. Sherd ML21 has calcareous encrustations on the surface, while for ML18, they partially fill larger microcracks in the body of the ceramic (Figure 6.8).

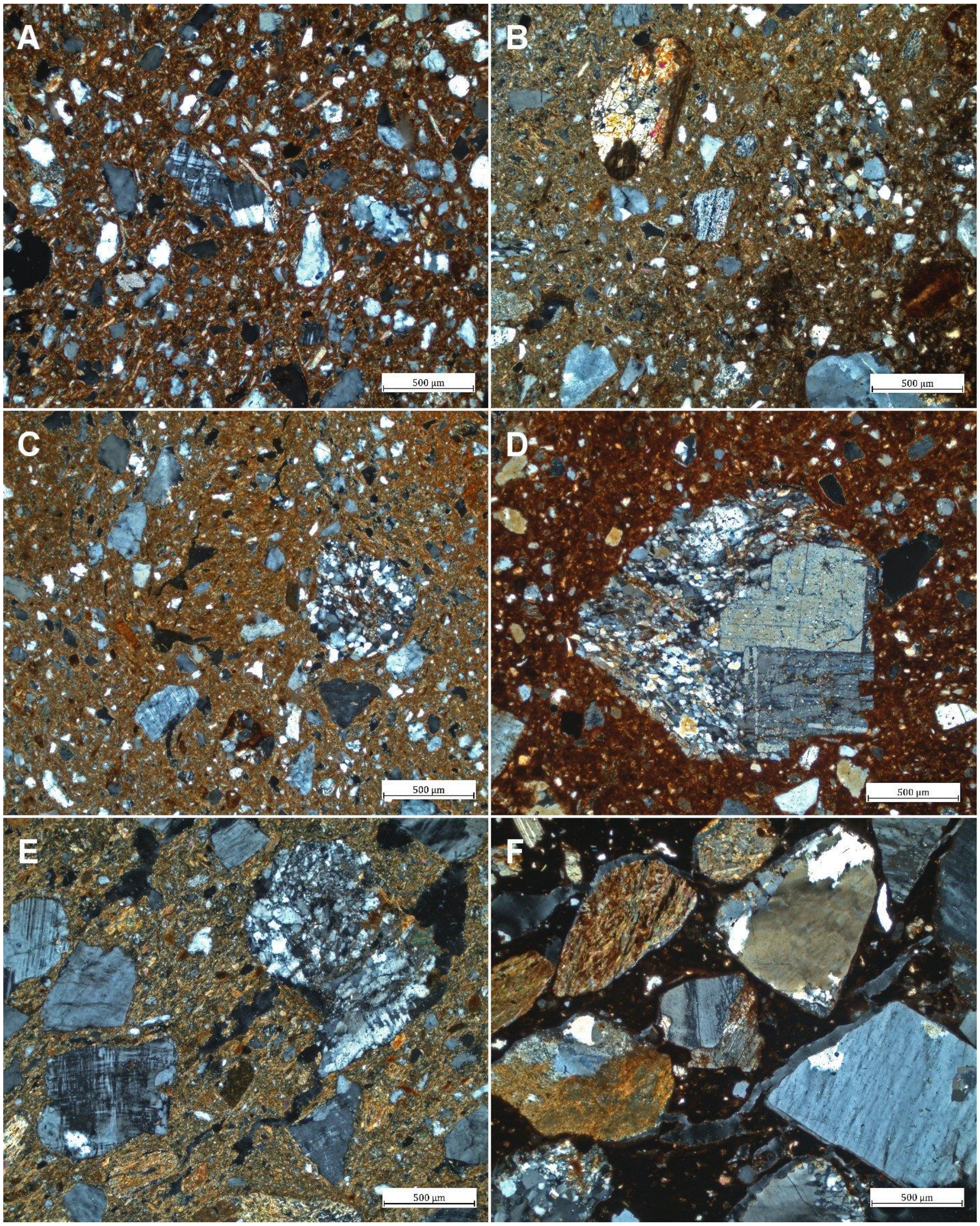


Figure 6.8. SubG-5a: ML15 (A), KL61 (B); SubG-5b: ML21(C), ML18 (D); SubG-5c: KL27 (E), KL46 (F).

Subgroup 5c

The three sherds in this subgroup are from Kallamas, and their fabric is composed of relatively high amounts of various types of inclusions dispersed in a fine-grained matrix with voids and shrinkage cracks. The latter are more developed in KL16, which also contains small and large randomly oriented voids, while these are smaller and less frequent in KL21. In sherd KL46, voids and cracks are preferentially oriented in two concentric arrangements resulting probably from the joining of two relic coils. The inclusions are mainly composed of deformed plutonic, probably granodiorite, and metamorphic rock fragments such as schists and gneiss. Less frequent are quartz, weathered feldspars (sericite), and amphiboles. In KL16 and ML21, the inclusions are of variable size, poorly sorted, and subangular to subrounded, whereas in KL46, they are subrounded to rounded, medium-sized, and relatively well sorted (Figure 6.8).

Subgroup 5d

This is a homogenous group that includes seven sherds from Maliq with inclusions of different sizes and shapes, from small to large, angular to rounded or elongated, and in general, poorly sorted, originating from crushed sand. Most are composed of metamorphic rock fragments, mainly schists, phyllites, and gneiss, while individual grains of quartz and feldspars are less abundant and result probably from the breaking of larger rock fragments. These, as well as the K-feldspars, often show different degrees of weathering marked by the formation of sericite. Voids of various sizes and thin shrinkage cracks are frequent and randomly oriented in most samples. In ML23, however, the orientation of the microcracks and inclusions develops a more complex pattern with a diagonal path on half of the section which, in the second half, becomes more random from the center towards the exterior surface and, at the same time, parallel to the edge of the interior surface. A few sherds also show calcareous encrustations on their surface (Figure 6.9).

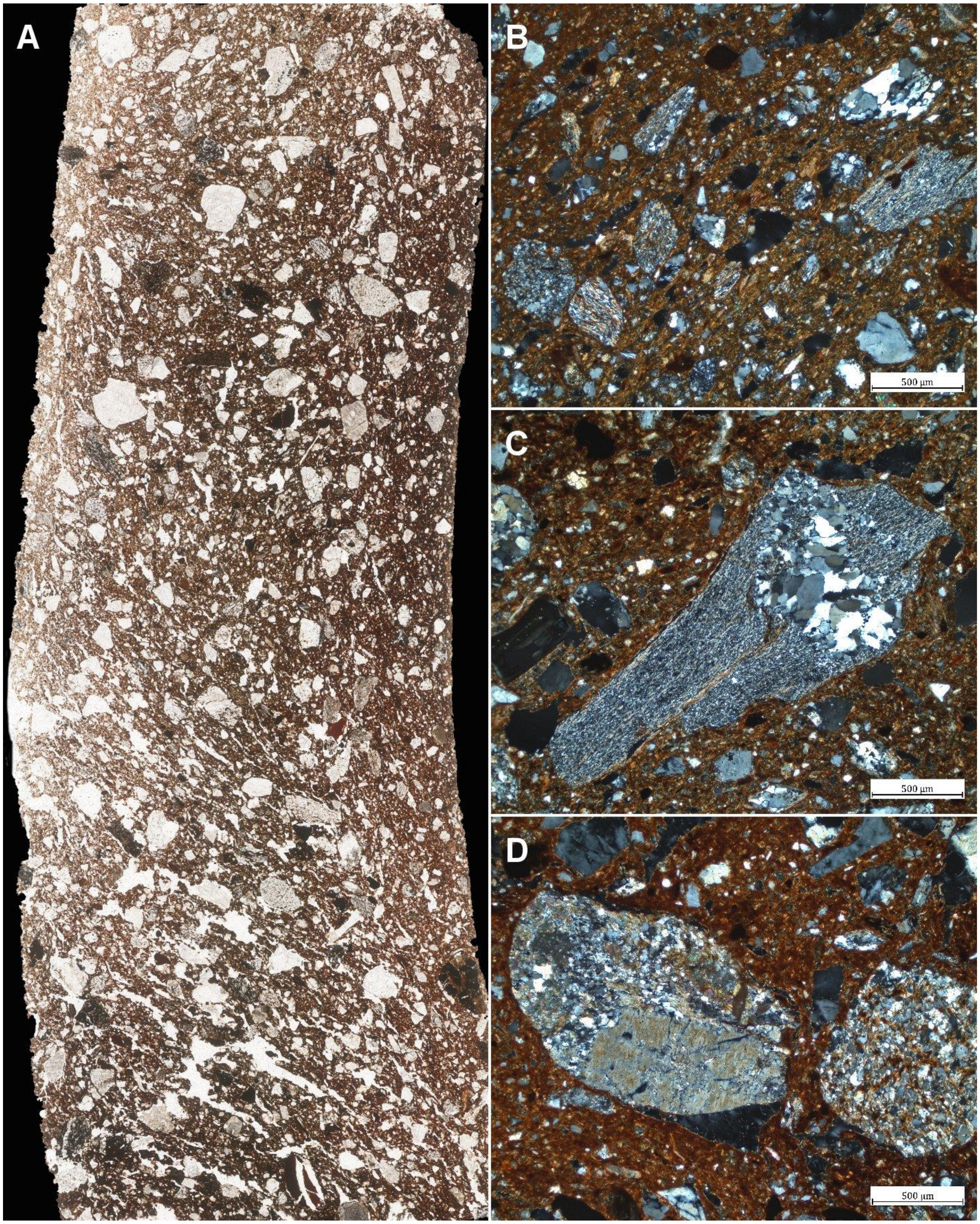


Figure 6.9. SubG-5d: ML23 (A), ML01 (B), ML31 (C), ML26 (D).

Fabric group 6

This group includes three sherds from Maliq and one from Kamnik, and its specificity is the presence of fibrous organic material or, more precisely, remnants of it as most of it was burned during firing. Sherd KA16 comes from a burnished brown hemispherical vessel, while ML08 was part of a hole-mouth cooking pot with barbotine decoration, ML30 of a painted jar, and ML17 of a burnished cooking pan. KA16 also contains significant amounts of spathic calcite and marble inclusions, lesser shale, and rare schist and quartzite rock fragments. The matrix contains a large number of elongated voids initially occupied by the organic fibers and aligned parallel to the long edges of the section. This sherd also shows calcareous encrustations on the surface. For the sherds from Maliq, other common inclusions are schists and gneiss rock fragments with different shapes and sizes. The matrix is marked by the presence of randomly oriented shrinkage cracks and a few irregular shaped voids. On ML08, there is a thick layer, different from the body, composed of a very fine material that corresponds to the exterior barbotine decoration. (Appendix D-2, 3; Figure 6.10).

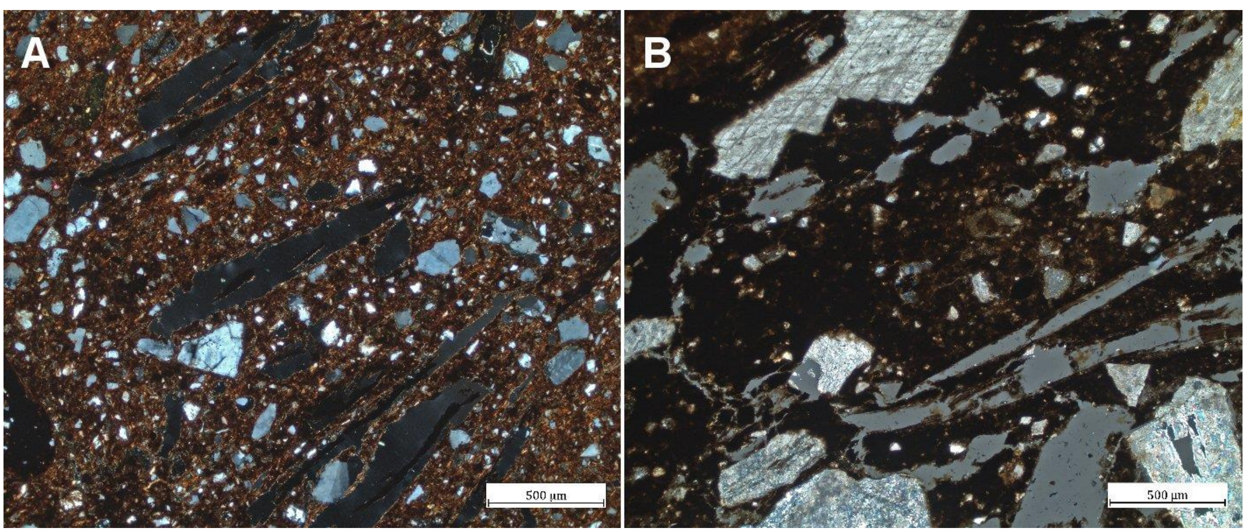


Figure 6.10. Group-6: ML30 (A), KA16, 75% XPL (B).

Fabric group 7

The samples listed under this group have a fine fabric without deliberately added inclusions, and they come from Maliq, Kallamas, and one from Kamnik. Their fabric is homogenous with fine-grained micromass, some shrinkage cracks, and voids without any preferential orientation except KL10, where they are aligned diagonally to the thin section's edges, as shown in figure 6.11. Inclusions are rare and composed primarily of a limited amount of fine-grained angular, subangular, and elongated randomly oriented well-sorted particles. Quartz, feldspars, and metamorphic rock fragments are the most common, while they also have spots rich in iron or not well-mixed clay.

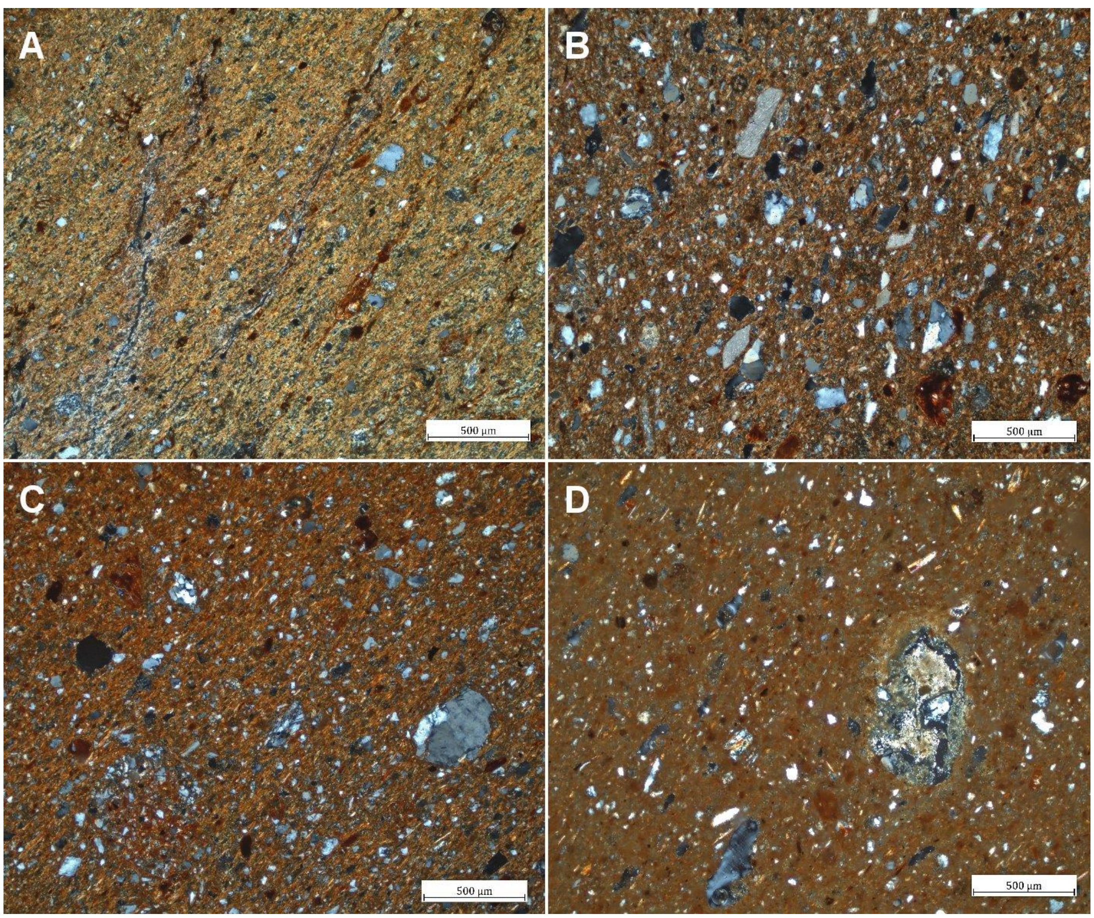


Figure 6.11. Group 7: KL10 (A), ML04 (B), ML05 (C), KA36 (D).

ML04 and KL10 have the exterior surface covered with slip originated most likely from calcareous material mixed with clay, while ML05 has a micritic carbonated incrustation on the interior. The sample KA36 from Kamnik belongs to a brown on cream medium-sized hemispherical vessel, widely known as a 'classical' Dimini bowl. Its fabric is relatively homogenous and consists of fine-grained calcareous micromass with small grains of quartz and tiny flakes of muscovite. The vesicles, vughs, and inclusions are limited and randomly oriented. The most frequent inclusions are quartz, fewer feldspars, sedimentary rock fragments, such as limestone and sandstone, and one probable shell fragment. Some quartz grains may contain needles of rutile or tourmaline (Appendix D-2, 3; Figure 6.11).

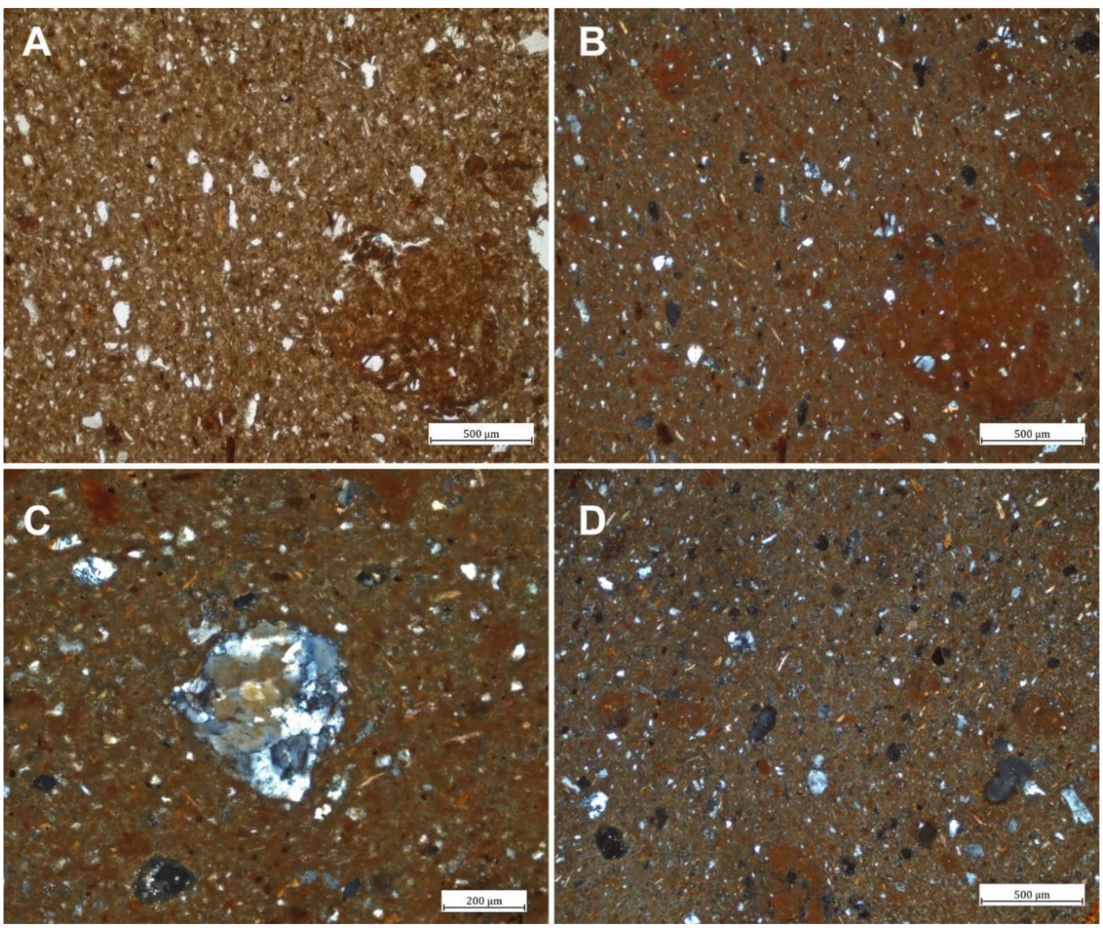


Figure 6.12. Figure 6.11. Group 7, KA36: (A) PL, (B-D) XPL.

As mentioned in the previous chapters, this vessel is among those that were considered by Prendi and Aliu (1971) as imports from Dimini in Greece, based on its specific stylistic features that make it unique for the ceramic assemblage of Kamnik. The comparison of the fabric KA36 with other samples from the same ware category published from Greece revealed strong similarities with the samples from the fabric groups FG 1-3 identified by Elissavet Hitsiou at Dimini (2003, 117-23, 416-21, pl. 6.1–6.9; 2017, 61-7) and FG8 from Visviki Magoula considered by Areti Pentedeka as an import from Dimini (2015, 246-7). More specifically, fabric KA36 is very similar to the fabric group FG1 from Dimini (Hitsiou 2017, 61). Consequently, this comparison could add robust evidence to the assumption made by Albanian archaeologists that the unusual brown on the cream bowl at Kamnik was an import from Dimini (see chapter 4).

6.4.2 Compositional profile of the fabric

The chemical composition of the fabric was investigated on a set of about a hundred sherds from the sites of Kallamas, Kamnik, Maliq, and Dimini. In order to minimize the influence of compositional heterogeneity due to the presence of large inclusions, sherds with a fine-grained fabric were preferentially chosen to build the set. In an attempt to identify the nature and potential sources for the raw materials of the clay, principal component analysis (PCA) was applied to the following selection of elements analyzed with pXRF: Si, K, Ca, Ti, Cr, Mn, Fe, Ni, Zn, Rb, Sr and Zr. In figure 6.2 the PCA 3D-plot shows the scores and loadings projected in the subspace of the first three principal components, which together account for 67.9% of the variance.

Although the distribution of observations seems roughly to separate different sites with the orientation chosen in figure 6.2, PCA is in fact not very successful at clustering the data set, a result which could already be foreseen through the relatively low values of the variance explained by PC1 and PC2. It remains, therefore, challenging to identify a characteristic compositional group in association to a specific site. Nevertheless, PCA reveals interesting patterns such as the strong positive correlation between chromium (Cr) and nickel (Ni), as well as the negative correlation between Si and Ca, based on the small and large angles between their respective vectors.

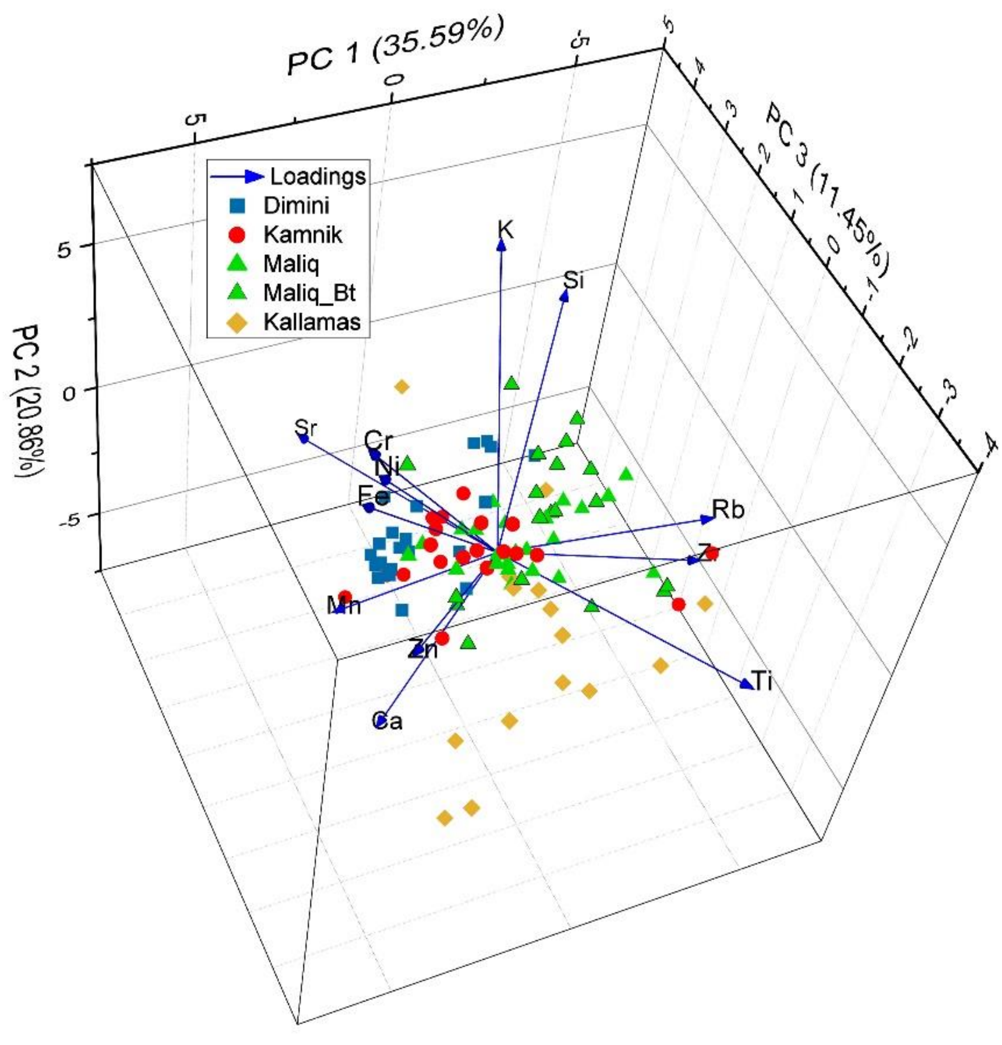


Figure 6.13. Figure 6.2. PCA 3D-plot of the first three principal components for compositional data collected with pXRF on sherds from Kallamas, Kamnik, Malik, and Dimini.

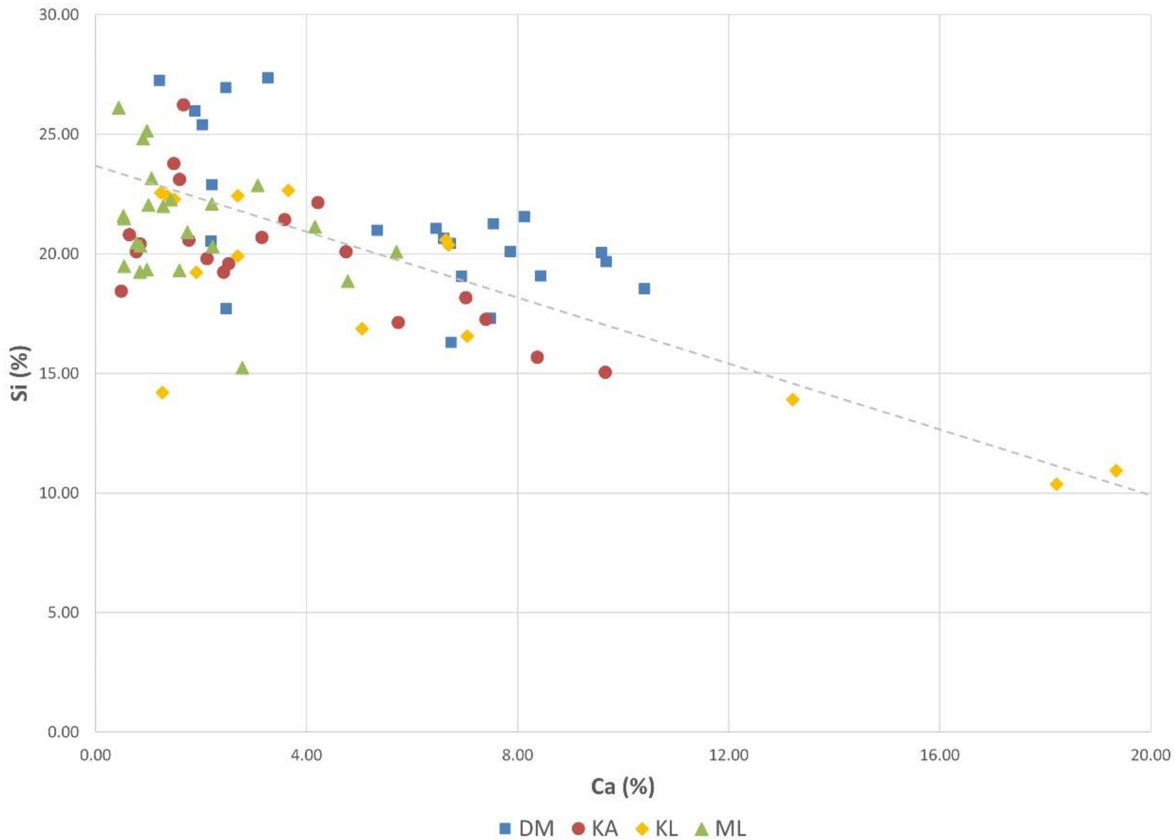


Figure 6.14. Si-Ca bivariate plot showing the negative correlation between these two elements for the sherds from all four sites.

The relationship between Si and Ca is better visualized on a bivariate plot that clearly shows the negative correlation between these two elements (Figure 6.3). Such a trend reflects the amounts of calcium carbonate present in the clay raw material and differentiates calcareous or marly from non-calcareous clays with a limit between Ca-poor and Ca-rich clays usually fixed at 4% of Ca (Schneider et al. 1991). In contrast, the extremely high levels of calcium found for two sherds from Kallamas are related to the presence of calcite-rich inclusions. Overall, the results indicate that both types of clay materials were used in Kallamas, Kamnik, and Dimini, while non-calcareous clays prevailed in Maliq. There are also a few sherds with both low Si and low

Ca, which might contain elements not detected with pXRF and present in significant amounts like residual carbon from organic materials.

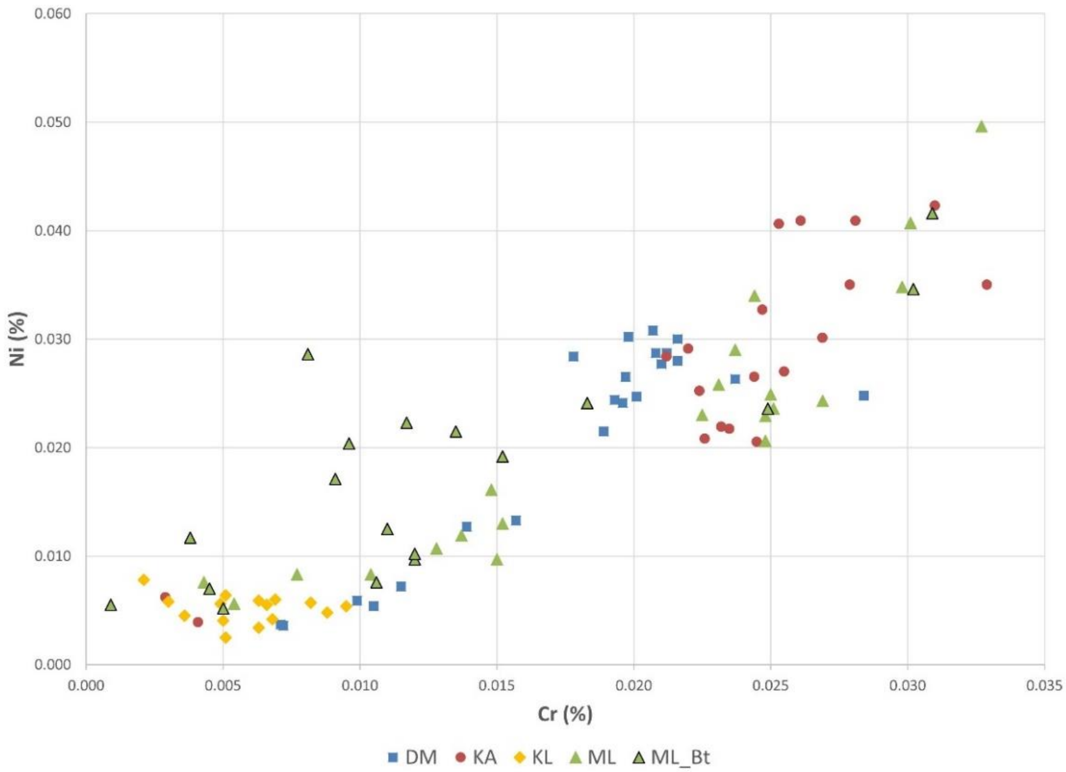


Figure 6.15. Ni-Cr bivariate plot illustrating the positive correlation between these two elements and two main compositional groups (high Ni and other outliers are not shown).

Among other noticeable features are the relatively high levels of Ni and Cr, up to about 500 ppm, and even close to 1000 ppm for Ni in one outlier (Appendix D-5, Figure 6.4). The bivariate plot also shows the positive correlation between these two elements, as already indicated by the PCA. Along the trendline, two groups can be distinguished based on the relative concentrations of Ni and Cr. The data for the sites of Dimini and Maliq are distributed among both groups, whereas most of those from Kamnik are part of the high Cr and Ni group. Plotted against Ca, both Cr and Ni show a positive correlation on the samples from Dimini. Interestingly, only

DM18 sampled from a black on red vessel at Dimini is clearly grouped with the samples from Maliq and Kamnik, with its values being very similar to the sampled brown on cream vessel KA22. While the set from Kamnik is characterized by high levels of Cr and Ni, there are two black-topped samples from Kamnik that belong to the low Cr and Ni group plotted close to the other ones of the same ware category from Maliq (Figure 6.5). The black-topped ware samples from Maliq, however, display a broader distribution, following the trendline of the other samples from the same site. For the sherds from Kallamas, Ni and Cr values are low, scattered below 100 ppm, and apparently uncorrelated.

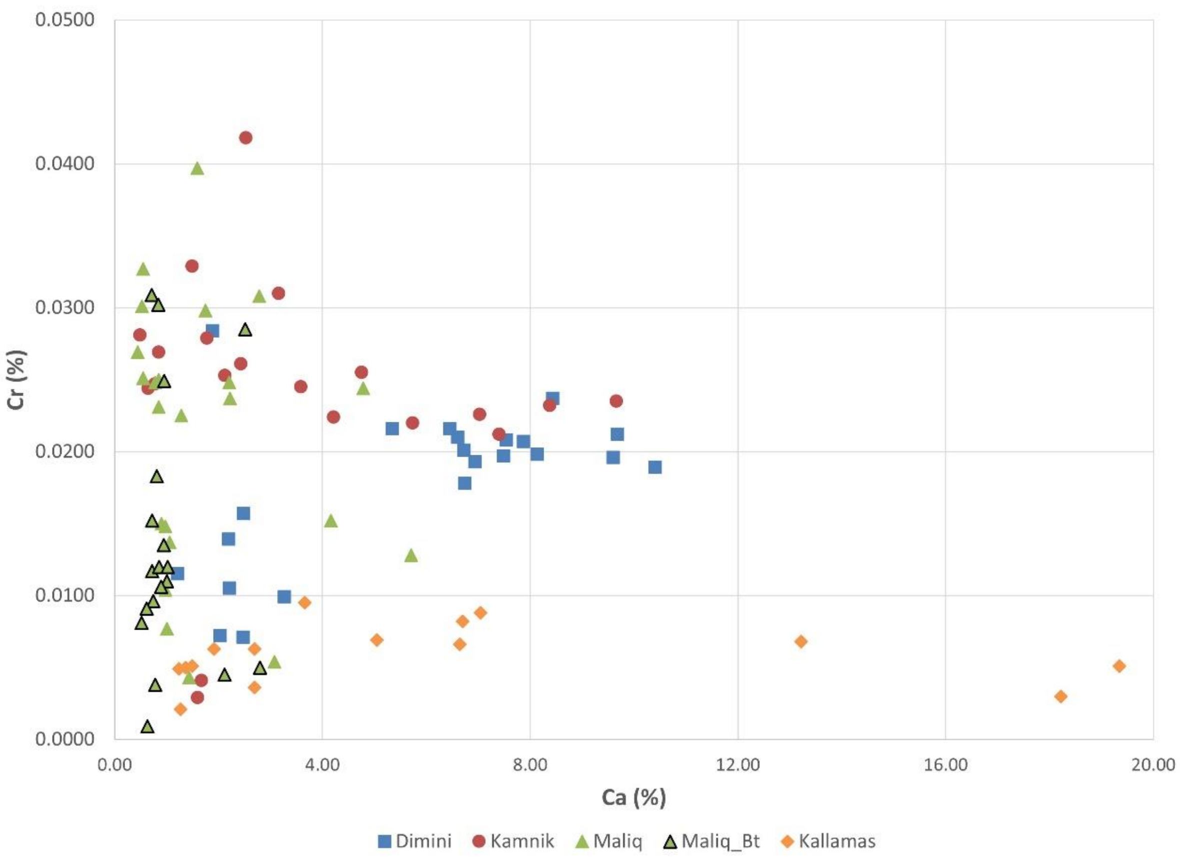


Figure 6.16. Ca-Cr bivariate plot illustrating the positive correlation between these two elements and the compositional groups (high Ni and other outliers are not shown).

The phases enriched in Cr and Ni are strongly associated with the clay raw materials. More importantly, apart from Kallamas, they all bear the geochemical signature of ultrabasic rocks forming the Mirdita ophiolite zone in Albania and, farther southeast, the Pindos, Koziakas, and Othris ophiolite complexes in Greece, Dimini being close to the latter (Bortolotti et al. 2004; Dilek, Furnes, and Shallo 2008; Pomonis, Tsikouras, and Hatzipanagiotou 2007). Consequently, it can be inferred that the source materials were most likely the quaternary alluvial deposits abundant in the Korçë basin resulting from the erosion and weathering of these ophiolites or their alteration products, such as the widespread Ni-rich laterite formations (Thorne, Roberts, and Herrington 2012) for Maliq and Kamnik. For Dimini, sediments associated with the erosion and weathering of the Othris complex would be a good candidate. In addition, it could also explain the unusual high magnesium content in some sherds as serpentine-group minerals are frequent in the alteration profiles of ultrabasic rocks. More generally, this common source also explains the unsuccessful clustering attempt because of the compositional similarities and intrinsic limitations of pXRF. The identification of a regional ophiolite fingerprint would require analyzing the matrix specifically using an analytical technique with much higher spatial resolution and sensitivity, such as laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) in order to obtain a complete geochemical profile, including other trace elements as well as rare earth elements (REE). An alternative approach would be to integrate the nature of the inclusions identified with petrography, which could reveal distinctive local geological features.

6.4.3 Painted decoration and slip: composition and raw materials

This section presents the results of the analysis conducted with pXRF and XRD on the painted decorations and slips observed on a large number of sherds from Maliq, Kamnik, and Dimini. The results are grouped and discussed in several subsections corresponding to standard Neolithic ware categories, like Black on red, brown on cream, polychrome, or red on cream, although it might not always correspond to the colors of the motifs, which can be, for example, black, dark brown, pink, or white (see chapter 3 for the categories of Late Neolithic pottery. Slips and other decoration types are also discussed under the same classification scheme. In addition to the detailed description, the measurement results are also provided in Appendices A-6, D-4, D-5.

Black on red

For all sherds from Dimini, the black painted motifs are characterized by higher levels of manganese (Mn) and iron (Fe) in comparison to the composition of the underlying material. A rough estimate of the Mn/Fe ratio indicates that the pigment contains more manganese than iron. This result suggests that the original painted material was most likely a manganese-based pigment. The other potsherds from Dimini and two out of four from Kamnik the original material was probably a manganese-rich type of umber, a naturally-occurring earthy pigment composed of goethite (FeOOH) and poorly crystalline manganese oxides in various proportions (Robertson 1975; Hradil et al. 2003; Shoval and Gilboa 2016). However, on all sherds from Maliq, but only one and two from Kamnik, the black decorations show higher levels of iron and no significant increase in manganese, which points towards a Fe-rich pigment, such as red ochre (hematite), and firing in a reducing atmosphere. On one of these sherds, XRD analysis of the black decoration showed the presence of magnetite (Table 6.2). These results are consistent with the reducing firing conditions (Maniatis and Tsirtsoni 2002; Nagy et al. 2000; Yiouni 2001), as well as minor maghemite and manganese oxide phase. Two sherds, one from Maliq and one from Dimini, have a red or pale-red slip on the surface which contains levels of Al, Si, Fe, and Ca similar to those found for the analysis of the untreated surfaces indicating that the material used for the colored slip was prepared by mixing non-calcareous or calcareous clays with various amounts of red ochre.

Table 6.2. Table showing the results of XRD analysis on painted motifs.

Sample Id.	Site	Decoration	Analyzed Surface	XRD Results
KL05	Kallamas	Red on cream	Red_dec	Silica-based clay
KA09	Kamnik	Polychrome	Black_dec_int	Graphite
KA11		Brown on cream	Dark_brown_dec	Magnetite, magnesioferrite, minor jacobsite, diopside
KA17		Brown on cream	Dark_brown_dec	Hematite, quartz, diopside
KA38		Brown on cream	Dark_brown_dec	Magnesioferrite, minor jacobsite, diopside, quartz
KA36		Red on cream	Red_dec	Magnetite, diopside
KA17		Brown on cream	Slip	Quartz, albite or oligoclase, diopside
KA19		Brown on cream	Slip	Quartz, rutile
KA46		Red on cream	Slip	Quartz, , muscovite or illite, periclase
KA30		Crusted	White_dec	Calcite, traces of quartz
ML10	Maliq	Black on red	Black_dec	Magnetite, minor maghemite, and manganese oxide
ML63		Crusted	Red_dec	Hematite, calcite, quartz
ML13		Brown on cream	Slip	Calcite, quartz, muscovite or illite
ML21		Red on cream	Slip	Quartz, periclase, illite or muscovite
ML63		Crusted	White_dec	Calcite

Brown on cream

The decorations of the brown on cream category are actually dark brown, and the analytical results are very similar to those obtained for the black on red wares. For the five sherds from Dimini and seven out of nine from Kamnik, a manganese-rich type of umber was used as a pigment, while for the three sherds from Maliq and the remaining two from Kamnik, an iron-rich pigment was applied and fired in reducing conditions. The dark brown material on three sherds from Kamnik was sampled and analyzed with XRD. For the sample with only high iron, magnetite and hematite were identified, while for the two with high Mn and Fe, XRD indicated the presence of magnetite and/or magnesioferrite as well as minor jacobsite, a manganese iron oxide. The occurrence of jacobsite would suggest a relatively high firing temperature, around 950 to 1000°C (Maggetti 1982; Schweizer and Rinuy 1982). The slip of several vessels from Kamnik originated probably from calcareous clay, as indicated by relatively high levels of Ca and Si. Another sample showed an increased Ca and Mg level, while another had a high signal of Al and Si, pointing to the use of calcium magnesium carbonate-rich material and aluminosilicate clay, respectively. A calcareous and magnesium-rich clay was most likely used for the off-white slip of some samples from Maliq. XRD analysis on the slip of a sherd from Kamnik identified quartz, diopside, and minor sodic plagioclase.

Polychrome

The polychrome vessels are decorated with black, red, and white painted motifs. For the black areas, the compositional features are similar to those described for the black on red and brown on cream categories with either higher levels of Mn and Fe, or just higher Fe indicating the use of umber and yellow or red ochres respectively, as original material. For one sherd from Kamnik showing high Mn and low Fe, a manganiferous ore was probably used as pigment. This same sherd also shows a peculiar black decoration on the interior of the vessel with almost no Mn and low Fe. Although present on a polychrome vessel, it is not part of a known pattern, where the black decoration is used as a borderline separating the red and white motifs. Its location inside the vessel, the deep black color, glossy, and solid geometric shape delimited by a thin dark brown or black line typical for polychrome ware make this motif unusual. The XRD analysis identified the presence of graphite, a common decorative material in the Balkans and northern Aegean during the Late Neolithic and Chalcolithic periods (Gardner 1979; Yiouni 2000; Martino 2017). The red decorations are all associated with higher levels of Fe in comparison to the unpainted surface or slip, as well as significant levels of Al and Si, suggesting the use of yellow or red ochres mixed with variable amounts of clay materials. Only the sherds from Dimini showed white decorations, which were most likely painted with a clay-based material, probably kaolinite, or a calcareous-rich clay to account for some of the higher Ca levels. Regarding the slip, they were basically made with clay-rich materials mixed with other mineral phases. Variable levels of K and Ca indicate that they originally contained more or less illite and calcareous materials, respectively. However, a note of caution should be added here as higher Ca levels could also be associated with secondary calcareous incrustations.

Red on cream, red on brown, and red on red

Like polychrome vessels, the red decoration on most sherds, including the two from Kallamas, is characterized by the presence of higher levels of Fe, indicating the use of yellow or red ochres as the original pigments. The latter were applied mixed with various types of clay materials, including relatively pure alumino-silicates as well as Ca and/or Mg-rich clays, most of which probably contain some tiny grains of quartz. Moreover, because the levels of elements such as Si, Al, Ca and/or Mg are often similar in the red decoration, the slip, when present, or in the body of the ceramic, it seems that for particular sherds, the same clay material was used to make the mixture with the pigment. Numerous sherds in these categories have a light-colored slip, and the XRD analysis of a few samples identified quartz, periclase, a magnesium oxide, illite, or muscovite as the main phases.

Crusted ware

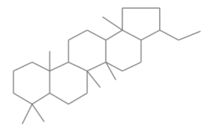
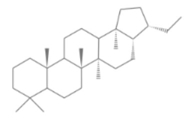
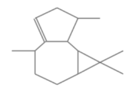
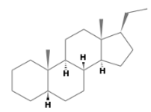
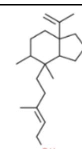
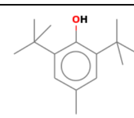
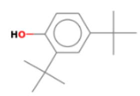
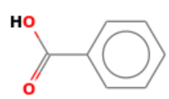
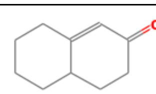
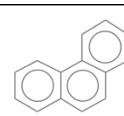
The white paste used for the decoration on crusted ware was applied post-firing and as indicated by the very high levels of Ca, is primarily composed of calcium carbonate, and more precisely calcite, which was identified with XRD on a sherd from Kamnik. The crusted pink motifs of two sherds from Dimini seem to be a mix of calcium carbonate with red ochre (hematite) since higher levels of Fe were detected in addition to the high Ca. In contrast, the high values of Fe found for the red crusted decorations from Maliq and Kamnik points to the use of red ochre.

6.4.3 Organic materials

From a total of 15 archaeological samples, only two did not return usable results. The GC-MS analysis of the black material on 13 samples from Kamnik appeared to contain organic molecules associated with the saturated and aromatic hydrocarbons present in crude oils and natural asphalt (Table 6.3; for identifying bitumen see Connan and Deschesne 1992; Moldowan et al. 1984, Connan et al. 2020).

Although my research was able to identify the molecular composition of the bitumen used inpottery manufacture at Kamnik, it revealed limited data for determining its provenance. Further analysis using other techniques such as stable isotope analysis is also required (Faraco et al. 2016; Connan et al. 2020). However, it is worth noting that the peaks distribution patterns of the terpanes are identical in all the samples from Albania, including the geological sample from Selenicë, and they differ from the Californian specimens (Figure 6.6). Moreover, the region near Selenicë contains the main bitumen deposits in Albania and southern Balkans exploited and traded since the Neolithic and Bronze Age period (Faraco et al. 2016; Morris 2006; Pennetta et al. 2020).

Table 6.3. List of the main organic compound detected on the analyzed samples.

Name	Molecular structure
28-Nor-17α(H)-hopane	
17α, 21β-28,30-Bisnorhopane	
3,5,7-Triazatricyclo[6.3.0.0(3,7)]undec-11-ene-4,6-dione	
Pregnane	
5-(7a-Isopropenyl-4,5-dimethyl-octahydroinden -4-yl)-3-methyl-pent-2-en-1-ol	
Butylated hydroxytoluene	
2,4-Di-tert-butylphenol	
Benzene	
Benzoic acid	
2(3H)-Naphthalenone	
Phenanthrene	

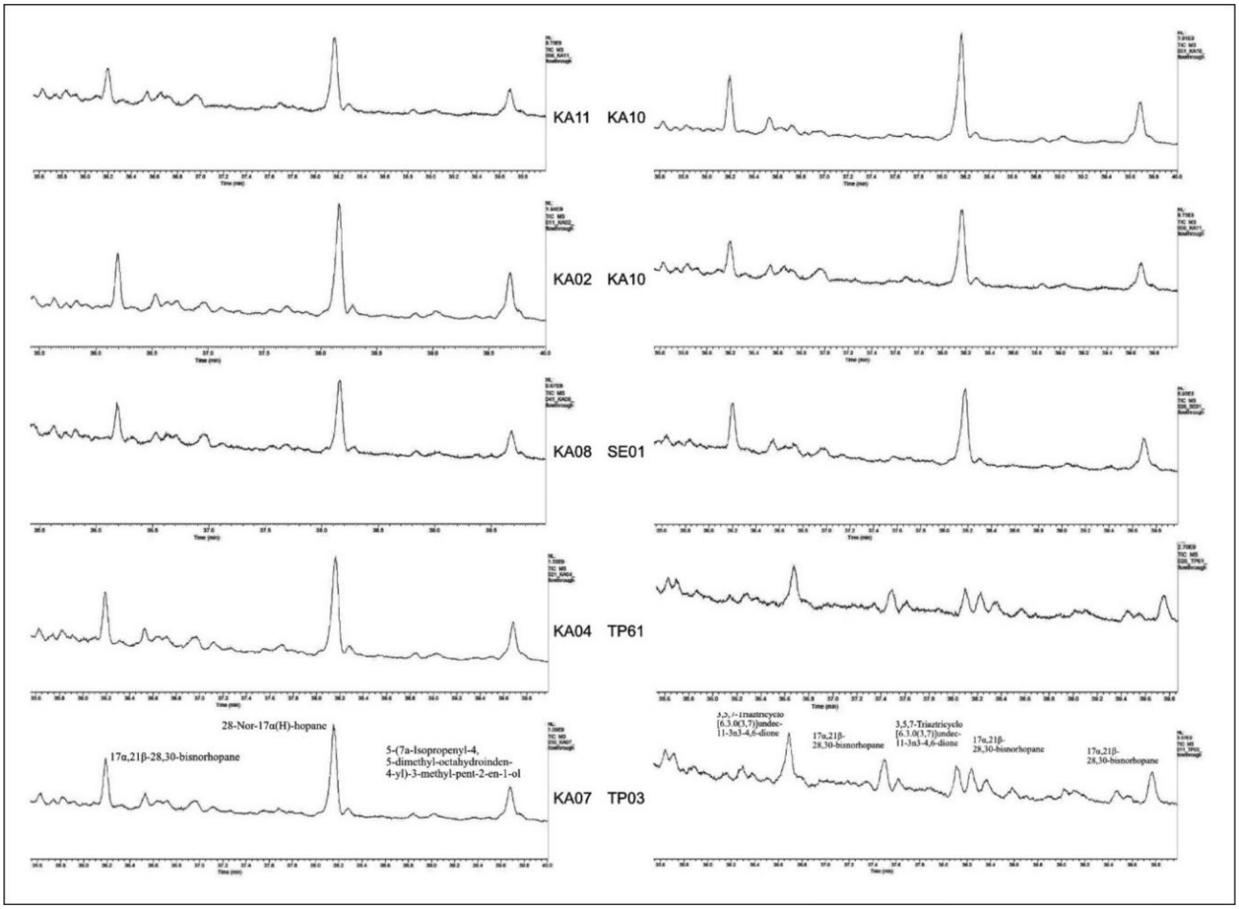


Figure 6.17. Peaks distribution of terpanes detected on the samples from Kamnik (KA), Selenicë (SE) in Albania, and Carpinteria (TP) in California.

6.5 Conclusions

The analytical methods provided significant information about the petrographic and compositional profile of the ceramic fabric, characterization of painted motifs, as well as various technological strategies used by the Late Neolithic potters at Kallamas, Kamnik, and Maliq in southeastern Albania, and Dimini in Thessaly, Greece. Although the compositional analysis of the ceramic fabric did not reveal any site-based grouping, several interesting patterns can be observed based on Cr or Ni levels and their relation with Ca. At least two groups were identified in all four sites. At Dimini, they are roughly arranged on the axis shaped by the positive correlation between Ca, on the one hand, and Cr, and Ni, on the other. The groups in Kamnik and Kallamas are defined by changes in the concentration of Ca since all the samples have high or low levels of Cr and Ni, respectively. In contrast, at Maliq, the high and low levels of Cr and Ni differentiate the two groups, although there are a few Ca-rich fabrics. The results from Kamnik and Maliq are consistent with these from a recent study at both sites. At Maliq, similar raw materials even have been used even by the potters of the Eneolithic phase (Ndreçka 2018, 167, 8).

As to the petrographic profile of the set from southeastern Albania, the observation of the thin sections identified et least seven main groups based primarily on the dominant inclusions present. Many samples from Kamnik have fabrics with spathitic calcite inclusions from crushed marbles or calcite veins. Others have shales and mudstone rock fragments, while a few are characterized by micritic fossiliferous limestones and marls. Like Kamnik, a large number of the fabrics from Kallamas contain primarily spathitic calcite with various less frequent other inclusions, while the other main group comprises samples with petrographic profile characterized by felsic minerals, metamorphic, and deformed plutonic rock fragment originating most likely from crushed sand. Maliq, however, shows a high degree of fabric variation. While the group with felsic material inclusions is the most numerous, some fabrics are characterized by spathitic calcites, a few have primarily micritic fossiliferous limestones, and others sandstone and siltstone rock fragments. Maliq and Kamnik also have a few fabrics with organic temper, while one sample from Kallamas contains grog.

The results of compositional and petrographic analysis of the ceramic fabric revealed important, though limited, information about the circulation of pottery between these sites. Two black-topped vessels recorded at Kamnik seem to have been manufactured at Maliq, as suggested by their compositional profile. Similarly, a sampled black on red vessel from Dimini in Greece could have been produced at Kamnik. Furthermore, the petrographic examination of the brown on cream hemispherical bowl from Kamnik confirmed its origin from Dimini.

The examination under the polarized microscope showed interesting results about the primary manufacturing techniques. At Maliq, the barbotine decoration of a sample formed by an additional layer of clay on the surface is composed of a different ceramic paste from the rest of the body. Furthermore, the calcareous slip of a vessel from Kamnik is similar to marly limestone inclusions of the same fabric. The iron-rich slip of another sample, however, is composed of two superimposed layers. Finally, several samples from all three sites in southeastern Albania show concentric arrangements of inclusions and voids on particular spots indicating the use of coils.

The analysis of painted decoration revealed an impressive diversity of raw materials used for the motifs and the slip. The potters seem to have used earthy pigments rich in Mn and Fe, such as umber and yellow ocher for the black and dark brown decorative elements. In other cases, the dark motifs resulted most likely from the reduced firing of Fe-rich material such as red ocher. The compositional features of the dark painted motifs are similar among different ware categories at the sites Maliq, Kamnik, and Dimini. However, umber was the common pigment used for the dark-colored decoration of black on red, brown on cream, and polychrome categories at Dimini. Umber origin dark motifs are less frequent in Maliq, where iron-rich pigments fired in reducing atmosphere were preferred. The potters from Kamnik, in contrast, were widely using both techniques. At Kamnik and Dimini a manganiferous ore was probably used as pigment for the black decoration of some black on red sherds, as suggested by the high Mn levels. Scholars have argued that manganese-based pigments have been widely used during the Late Neolithic period in Thessaly, while dark-colored motifs originated from iron-rich pigments fired in reduction atmosphere were more common in the region of Macedonia (Schneider et al. 1991, 26; Yiouni 2001). As with the chemical profile, the current results from Maliq and Kamnik are similar to the research conducted by Erinda Ndreçka (2018, 174).

At Kamnik, the XRD on a polychrome painted sample also indicated the use of graphite pigments. At the same site, the GC-MS analysis identified natural bitumen as the origin of the black motifs on several vessels. The black motif of a sherd from Dimini with combined, incised, and painted decoration is probably of organic origin. Fe-rich materials, including red and yellow ocher often mixed with various types of clays, seem to have been used at all sites for the red-painted motifs. A similar mixture should have been used for the pale red background of polychrome vessels, while off-white slips originated from aluminosilicate, calcareous and magnesium-rich clays. The post-firing white decoration of crusted ware from Kamnik, Maliq, and Dimini originated from calcite. At Dimini, calcite is sometimes mixed with red ochre resulting in a pink paste. The white paste of a polychrome vessel from Dimini, in contrast, was made of clay-based material, probably kaolinite.

The results of the analytical methods summarized in this section are in synchrony with the picture drawn by the visual observation discussed in the preceding paragraph. The technological choices made by the Late Neolithic potters are characterized by conservatism, plurality, local, and regional patterns, while technology, raw materials, and vessels were exchanged within the region of Korçë as well as with distant areas. The combination of technological conservatism, regarding the raw material with a variety of temper types at Maliq, for example, indicates the entangled interactions between the potters and the materials (see Hodder 2012). The potters seem to exploit the local sources of clay, and they further manipulate it by adding different types of mainly inorganic temper to prepare the ceramic paste. All three sites in southeastern Albania share some of the technological choices. However, Maliq and Kamnik are more likely to participate in the same ceramic tradition and the network of contacts. They seem to have exchanged technology and vessels between them, while both sites share the technological knowledge of the dark-motifs with Dimini in Greece. Besides technical knowledge, Kamnik and Dimini have also exchanged vessels. Furthermore, Kamnik was also involved in other networks of connection with distant regions in the southern Balkans, where the potters were acquiring raw materials for pottery manufacturing.

7. Use of the Late Neolithic pottery from Southeastern Albania

While information about the technology of the Late Neolithic pottery from Albania exists but is highly fragmented, studies on the use of the vessels are mostly absent. The only published information about this aspect of pottery derives from the typological seriations and the terminology used to address this question. My research seeks to explore the use of the vessels associated with the preparation, storage, and consumption of food, as well as repairing, recycling, or usage of individually broken sherds from the three sites of Maliq, Kallamas, and Kamnik. To understand production techniques, I identified the use of the ceramic vessels from southeastern Albania through a combination of visual observation and analytical techniques, including organic residue analysis and chemical investigation of plant-based tar and mineral bitumen.

Many archaeological, ethnographical, and experimental studies have approached the use of pottery and its social context through the investigation of metric, morphological, and physical attributes of the vessels (Arnold 1985; Braun 1980; 1983; Bronitsky and Hamer 1986; Ericson, Read, and Burke 1972; Hally 1983; 1986; Henrickson and McDonald 1983; Mills 1999; Schiffer 1990; Schiffer and Skibo 1989; Shapiro 1984; Skibo 1992; Smith 1988; Reid and Young 2000; Rice 1987; Turner and Lofgren 1966). Scholars have focused on size, shape, surface treatment, carbonated organic material named sootings, and use-wear to approach different aspects of vessel use. Their research was not limited to the identification of various techniques of processing food such as storage, preparation, cooking, or serving (see, for example, Turner and Lofgren 1966; Hally 1983; Lesure 1998; Smith 1983), but also included discussions on household size, communal consumption practices, social status, as well as the wealth of the users (see among other Arthur 2002, 2009; Halley 1986; Mills 1999, Lymperaki et al. 2016; Nelson 1981). In the Balkans and the Aegean regions, several studies have explored the use of Neolithic pottery based on the morphological and physical properties (Tomkins 2007; Vitelli 1989; Yiouni 1996). Others have used a more integrative approach by including chemical analysis of the organic remains within the vessels (Urem-Kotsou 2006; 2018; Urem-Kotsou and Kotsakis 2007).

As highlighted by Prudence Rice (1996b, 140), an issue central to use studies is the definition of 'use' in respect to the intention of the potters, actual or final, as well as inferred usage. These aspects of usage derive from the distinction between function and utilization - also known as primary and secondary use - concepts widely used in ceramic studies (see, for example, Braun 1980; Skibo 1992; Rice 1996). This division is conceptually questionable because it prioritizes certain usages against others on primarily scholarly criteria, neglecting the study of 'less important' use contexts. Most of the time, it is impossible to know whether Neolithic potters made a vessel for a single purpose or for a variety of functions. A pot, for example, was probably used not only for cooking but also as a container, as well as for serving food after it became part of a household set. Thus, instead of a tool (Braun 1983), it seems more appropriate to perceive a vessel as a set of tools, where there is more than one primary function, or the borders between different usages is blurred, questioning even its label as a cooking vessel. To negotiate this artificial distinction, I make use of the idea of itineraries introduced in archaeology by Rosemary Joyce (Joyce 2015; Joyce and Gillespie 2015). Itineraries, which are perceived as routes of an object journey (Joyce and Gillespie 2015, 11-13), are used to replace the well-known notion of the cultural biography introduced by Kopytoff (1986). It has been argued that biography is too anthropocentric and that thinking through itineraries provides flexibility to explore the artifacts that have been recycled and understand the dynamics of various social contexts in which they are engaged (Joyce 2015; Joyce and Gillespie 2015, 11). The idea of itineraries is similar to the notion of trajectories (see, for example, Van Oyen 2015, 2016), introduced almost simultaneously within archaeological discourse, both deriving from recent theoretical trends under the influence of the New Materialism (see Witmore 2014 for a discussion of the role of archaeology within this new shift). Therefore, I consider here any use within a given context being a specific itinerary or a "unique route," to quote Joyce and Gillespie (2015, 13), among a bundle of them that constitute the journey of a vessel. From this perspective, itineraries are extremely useful in understanding the use of ceramic containers. The complex story of vessels as they are used for different occasions in various social contexts, regenerated through repairing and utilized for different reasons, or used for other purposes once broken into sherds, can be better narrated through the idea of the itineraries. Furthermore, the division between intended and subsequent usages does not make sense. The so-called primary use loses its preeminent position, and all the different usages receive the same attention, at least from the perspective of analysis. Unlike biographies that emphasize the chronological dimension, itineraries are the stories of the object as it moves from one place to another, putting at the center spatial displacement (De Certeau 1984 cited from Joyce 2015, 22-3). In this way, although there may be a temporal difference between each itinerary, the hierarchical classification associated with the importance of each use that derives from the intent to bring into existence a vessel no longer exists. The use in various contexts may be different or similar, and they are part of the itineraries of a ceramic vessel, which, as Joyce and Gillespie (2015, 13) have highlighted, although they are unique, they may converge.

7.1 Defining the use of vessels through metric, morphological, stylistic, and use-wear observations

The detailed database designed for the recording of the diagnostic potsherds has the advantage of collecting information related to various attributes of the vessels that may point toward one of the potential uses through its journey from its manufacture to my working desk (for the database, see chapters 2 and 4). Following previous research (Hally 1986), my research has utilized data gathered on size, shape, surface treatment, and use-wear. Each variable was analyzed separately and in combination with others to investigate the possible use of the vessels and explore the dynamics of social actions associated with them.

The morphological classification of vessels is based upon the maximum body diameter, the orifice, base diameter, and height, as well as the surface treatment on the interior (for the description of vessel shape and classification, see among others Orton, Tyers, and Vince 1993, 152-65; Shepard [1956] 1985, 225-45; Rice 1987, 212-7). Open vessels are considered those with an opening diameter equal to or larger than the maximum body diameter, the base, or the height. Surface treatment, such as burnishing or smoothing of the interior surface, is also taken into account. Closed shapes are vessels with a smaller orifice diameter than the above metric attributes and rough or poorly worked interior surfaces. The ceramic vessels that do not fall into any of these two categories have been grouped as hole-mouth, characterized by converging upper walls and plain orifice (see also Elezi 2014, 66-8). The ceramic assemblages from all three sites are notable for their considerable variety of shapes and sizes. Both closed and open-shape vessels are present, although the number of the first category at Kallamas is very limited. Maliq and Kamnik also have hole-mouthed vessels. A large variety of forms is represented in the ceramic assemblages. Morphological categories such as carinated, hemispherical, conical, spherical, and closed vessels with a mouth and a very short neck, as well as biconical vessels, are present at all three sites. Closed vessels with a neck, common at Maliq and Kamnik, are rare in Kallamas (Appendix C-13).

For the analysis, the recorded vessels have been divided into miniature *(with rim and maximum body diameter less than 6 cm*), small *(rim 6-13, body 6-15 cm),* medium *(rim 14-28, body 16-30 cm),* large *(rim 29-34, body 30-36 cm)*, and very large vessels *(rim and body larger than 34 and 36 cm)* respectively. The medium- and small-sized vessels dominate the recorded assemblages from all three sites, less frequent are the large ones, while miniature and very large ceramic containers are rare. Although the general picture looks similar, at Kallamas, the number of small vessels is much lower compared to the medium-sized ones. The comparison of the size with the shape showed that miniature to very large vessels are present in almost all three main shape categories. Medium-sized vessels are characterized primarily as open, while the small-sized ones are mainly closed (Appendix C-13).

The detailed examination of ceramic sherd surfaces allowed the identification of use-wear traces, such as color or physical alteration of the surface, which can be related to a specific use of the vessels (see Hally 1983; Rice 1987, 234-7). My analysis focused mainly on the identification of sooting deposits on the inner or outer surfaces, color alteration of the exterior walls, either by the presence of fire clouds or due to oxidation mainly near the base from the direct contact with fire, and pitting. All these are associated with the use of the vessels for cooking or the preparation over the fire of other mixtures not associated with food, as indicated by previous research (Hally 1983, Urem-Kotsou 2006). Most of the sherds recorded have fire clouding, although it is difficult to identify which were created by use and which during the firing of the vessel. A few dozen have sooting deposits, mostly in the interior surface. Five bases from all three sites have oxidized areas on the exterior bottom. These belong to vessels of different forms and sizes.

Only two fragments recorded at Kamnik have pitting traces on the interior. One of them is classified as a small, closed vessel with a cylindrical neck, an opening diameter of 8 cm, and a maximum body diameter of 14 cm. Its exterior surface is slipped with painted decoration, although its technique and motifs remain unknown due to heavy abrasion. The second vessel is also closed and has a cylindrical neck but belongs to the medium-sized group with a maximum body diameter of around 28 cm. This jar has a brown, burnished exterior surface. While both vessels show pitting on their interiors, the medium-sized vessel also has traces of use on the inner surface of its neck. Due to the fact that both vessels are jars with a narrow opening not used in a fire, it is safe to conclude that the pitting was not caused by mechanical movement or thermal shock. Thus, the interior body of these jars might have been eroded by extended exposure to corrosive fluids associated with the liquid content stored in them (Figure 7.1; see Hally 1983, 18-9 for the distinction of different types of pitting).

Figure 7.1. Fragments from Kamnik with pitting traces.

Next to these observations, I also assigned potential uses to the vessels. As shown in the graph, a large number of vessels were likely mostly used as tableware, others to store and transport liquids, and only a few for cooking or the storage of solids. The tablewares are primarily small- or medium-sized open vessels with elaborate surfaces that were well burnished, slipped, or decorated (Appendix B). Vessels for liquids storage include jars of different sizes with a restricted orifice, except for the very large jars (Appendices C-14; B, Plate II, IV, V). Large closed and open storage containers are recorded in all three sites (Appendix B, Plate V, VIII). Vessels that have interior or exterior sooting, oxidized bases, and internal pitting were labeled cooking pots (see Hally 1983, Urem-Kotsou 2006). Although limited in number, cooking pots show a remarkable morphological and size diversity. Many are open vessels with carinated, conical, hemispherical, and spherical walls. Several have biconical bodies, and only one is a closed vessel with a cylindrical mouth (Appendix B, Plate, V, IX; C14). Noteworthy types of cooking pots are the so-called pans, a shallow medium- to large-sized vessel, relatively poorly worked with thick cylindrical or conical walls, while those from Maliq have deep finger impressions covering the entire interior bottom. There are also some vessels with distinct morphological characteristics associated with pouring or straining due to the presence of spouts or holes, respectively. Lids are also present at all sites, especially at Kamnik. At the same site, there are, in addition, several peculiar large, entirely painted bell-shaped vessels with two solid spheres on the bottom (see chapter four), probably for use on special occasions (Figure 7.2, 7.3; B, Plate III).

The low number of containers for storing liquids at Kallamas, compared to tablewares, is of particular interest. There are fewer than a dozen liquid storage vessels at Kallamas, and the numbers of all the other categories decrease from the later phase Ib to the earlier phase II. The number of undecorated tablewares in phase Ib increases compared to those with decoration. From phase II only a dozen vessels were classified as serving items, and there are as many decorated as undecorated vessels (Appendix C-14).

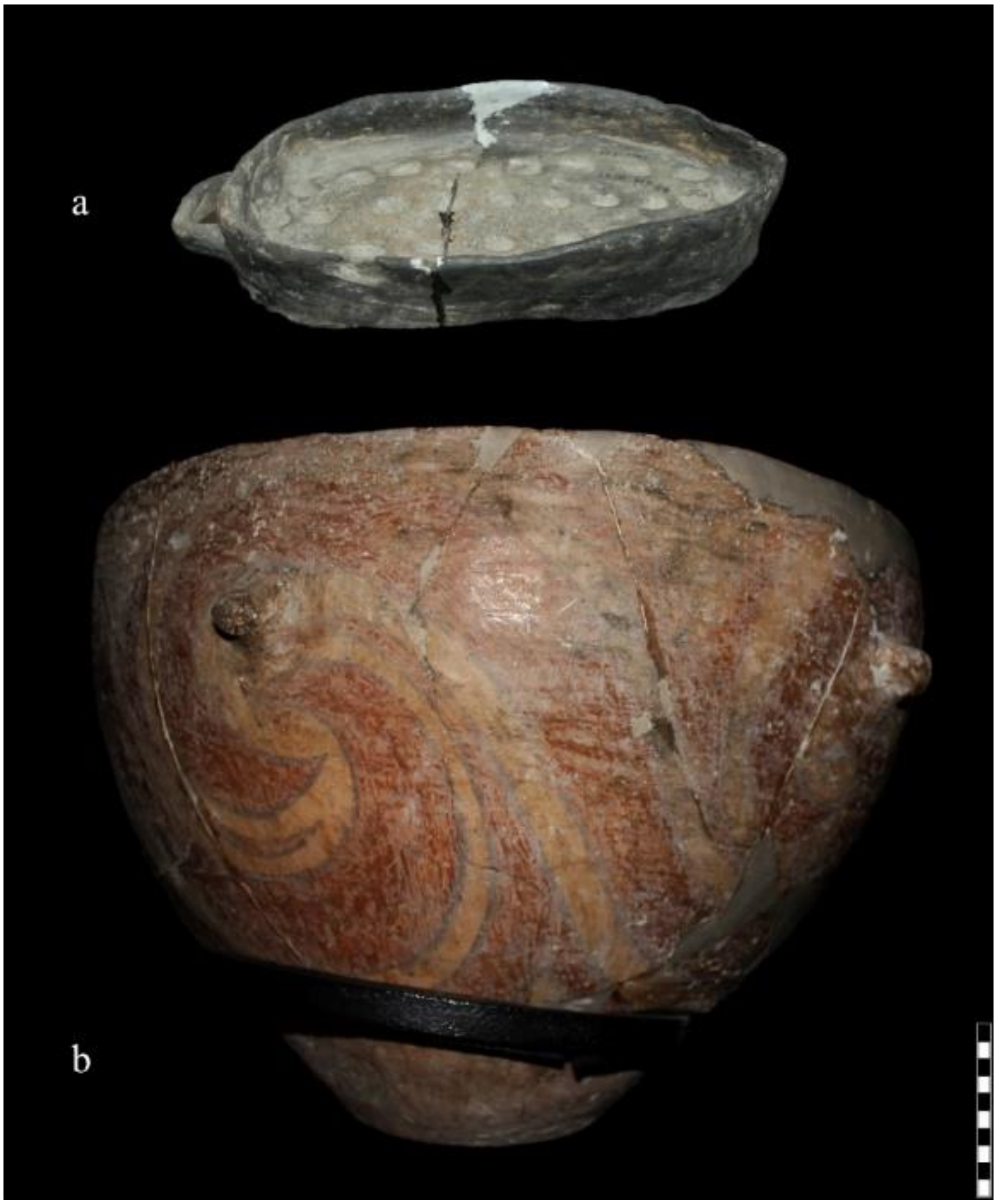


Figure 7.2. Image showing storage and cooking vessels: a) painted basket-type storage container from Kamnik, Albanian National Museum, Tiranë, b) pan with impressions from Maliq, Museum of Prehistory, Korçë.

At Kamnik and Maliq, the numbers of closed small and medium jars are considerably high. The majority of the tablewares and the vessels potentially also used to store and transport liquid at all three sites have decorated surfaces. A few storage and cooking pots are also decorated. The decorated tablewares at Kallamas are primarily black-topped and painted; several have punctuation motifs, while some other categories only occur once or twice. At Maliq and Kamnik, both tableware and vessels for storing liquids have mainly painted motifs. Interestingly, three of the five large storage vessels recorded from Kamnik were elaborated with painted elements, which form bold motifs and, at least in one case, cover the entire exterior surface of the container (Appendix C-14; Figure 7.2).

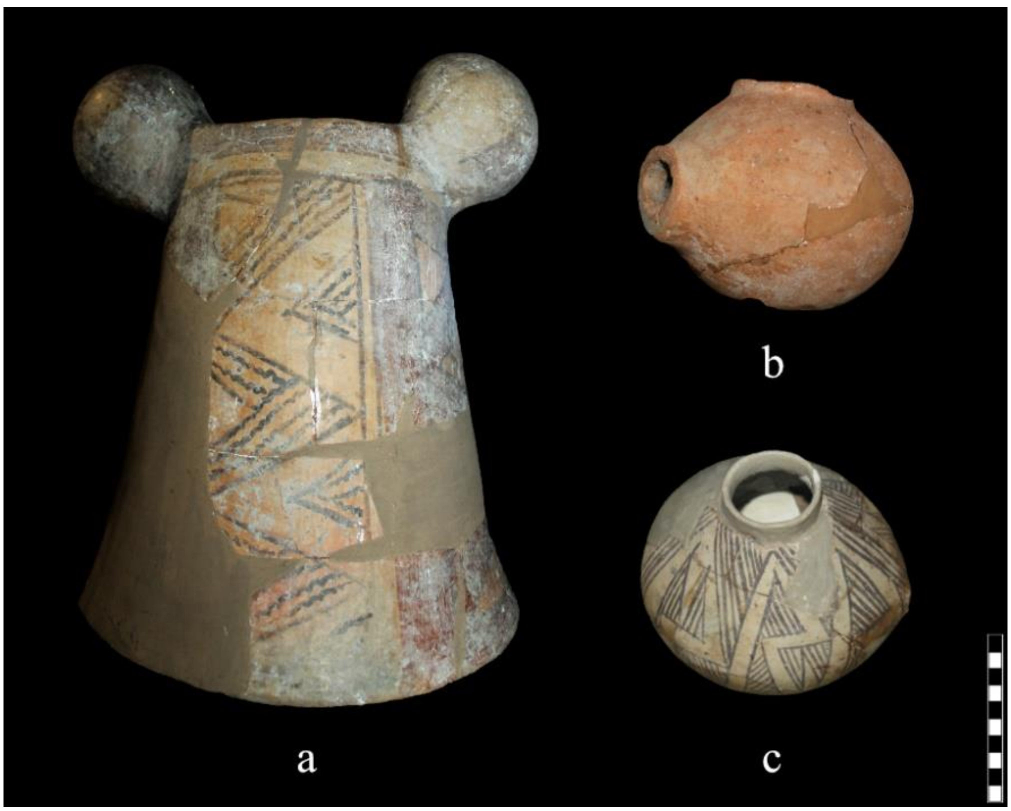


Figure 7.3. Ceramic vessels from Kamnik; a) bell-shaped polychrome container, b) spouted vessel, c) small brown on cream jar. Albanian National Museum, Tiranë.

An additional type of physical alteration of the exterior surface caused by mechanical movement is present in two hundred diagnostic fragments (Appendix C-14, see Schiffer and Skibo 1989 for a review on ceramic abrasion). As a result of continuous use, the surface of the vessel is abraded at specific spots of the body with the slip, paint, or the outermost layer missing. This type of use-wear appears mainly near the exterior base on the bottom and the lip of the vessel. The maximum diameter zone of the body, carination, and the handles also show traces of abrasion, but in lower frequencies (Figure 7.4). The abrasion on the bottom was created by long-term friction between the base and surfaces on which the vessels once stood. Following Michael Schiffer and James Skibo (1989, 111), the excoriation on the vessels' surface, according to my research, is probably created by three different abrasion modes. On the base, it was potentially formed by the movement of the vessel, while the abrading surfaces, either a floor or any other structure used to hold it, were stationary.

The alterations on the handles and the maximum body diameters were caused by holding or lifting the vessels. In this case, the abrasion process resulted from the movement of the abrader, the human hands. In contrast, the erosion on the lip and rim was formed either by the motion of human hands or a tool for mixing and preparing the content or cleaning the surface or by the movement of both the abrader and the vessel. I did not perform any morphological or use-wear analysis on these types of abrasion. Nevertheless, future review of these vessels may shed light on various aspects related to their use. The comparison of the location of the abrasion and shape of the pot did not show any specific pattern. It occurs in both closed and open vessels. In any case, it seems likely that the form of the vessels and the location of the alterations on the exterior walls are related. The abrasion at the maximum body diameter, for example, seems associated primarily with carinated and biconical vessels (Appendix C-14).

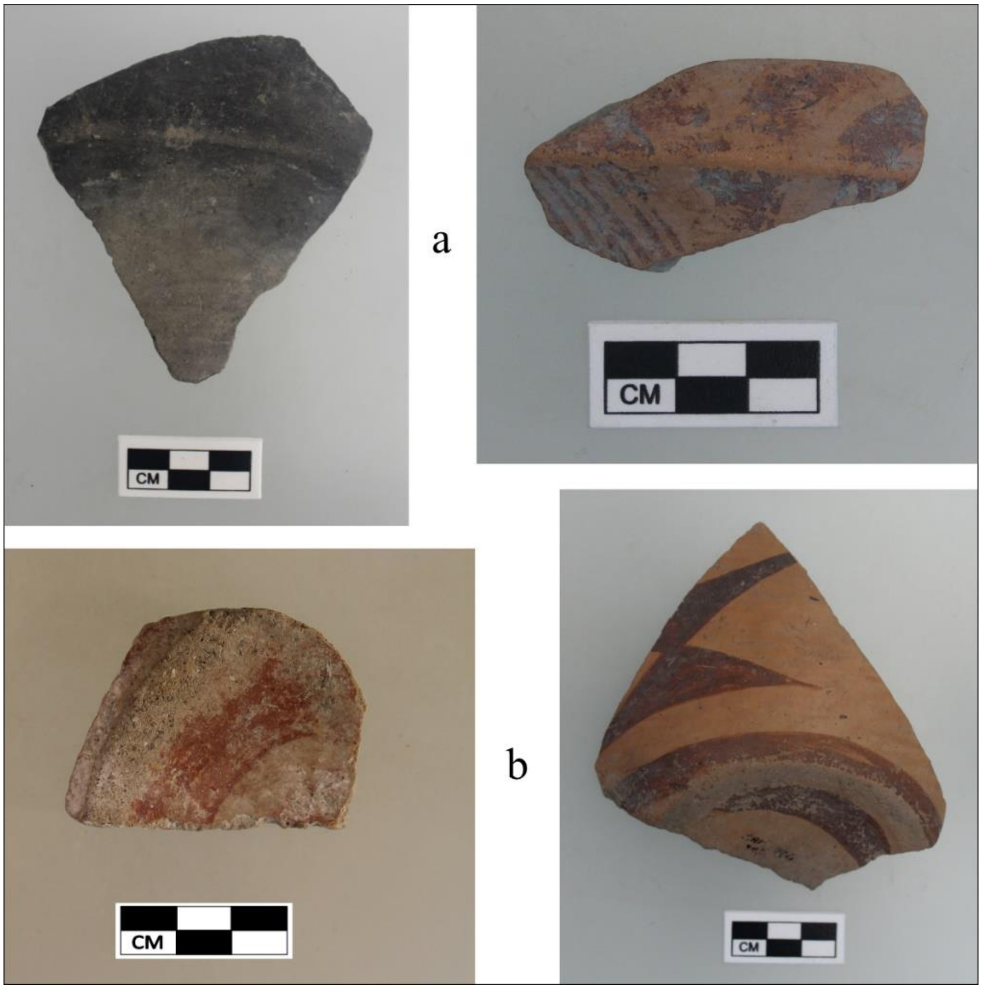


Figure 7.4. Image showing sherds with abrasion traces: a) at the carination, b) on the exterior bottom.

The use of a ceramic vessel does not necessarily end with its breakage, as occasionally it follows different itineraries either as a whole or as fragments. As discussed in chapter 5, the presence of many sherds with mending holes indicates that some ceramic vessels, instead of being discarded, were recycled after repair. Vessels of different ware categories, forms, and sizes seem to have been repaired (Figure 7.5). Their owners devoted time, effort, and technological knowledge to give the vessel another itinerary. Other broken vessels had a different usage journey. Some of their broken fragments have been used individually as tools, while others from Kallamas were recycled as inclusions (grog) for newly manufactured vessels (for a discussion on the use of ceramic fragments, see Deal and Hagstrum 1995; Lopez Varela, van Gijn, and Jacobs 2002; Sullivan 1989). My research identified a limited number of potsherds with apparent traces of use as individual tools, mainly from Kallamas. The method of selective collection of the archaeological material during the excavation of Maliq and Kamnik prevented such an examination of materials from these sites. The excavators of these two sites focused only on the morphologically and stylistically fine—"pretty"—or rare potsherds and buried the "ugly" sherds at the site, including those with abraded edges or surfaces.

Figure 7.5. Potsherds with mending holes from Kallamas, Kamnik, and Maliq.

Thus, my expectation of finding no used fragments from these sites was confirmed; only two potsherds from Kamnik have traces of use. Fragments of ring bases and other body sherds with use-wear were identified as individual tools at Kallamas. Although such finds are common at archaeological sites of the Late Neolithic Balkans, the only case mentioned in excavation reports are especially the modified sherds resembling net weights; to my knowledge, there are no systematic studies on this topic (Crandell, Ionescu, and Mirea 2016; Elezi 2014, 68; Lera et al. 2009, 706; Vukovic 2015). Based on morphological, experimental, and use-wear analysis, previous research in other areas of the world have identified various usages of ceramic fragments. They were probably tools for smoothing, scraping, incising, polishing, and boring (Lopez Varela, van Gijn, and Jacobs 2002, 1137-40, Fig. 6; van Gijn and Hofman 2008). Following these studies, I have recognized at Kallamas four different types of ceramic tools: as weights, tools for smoothing or polishing, abraders, and scrapers (Figure 7.6). There are at least two types of sherds modified into weights at Kallamas.

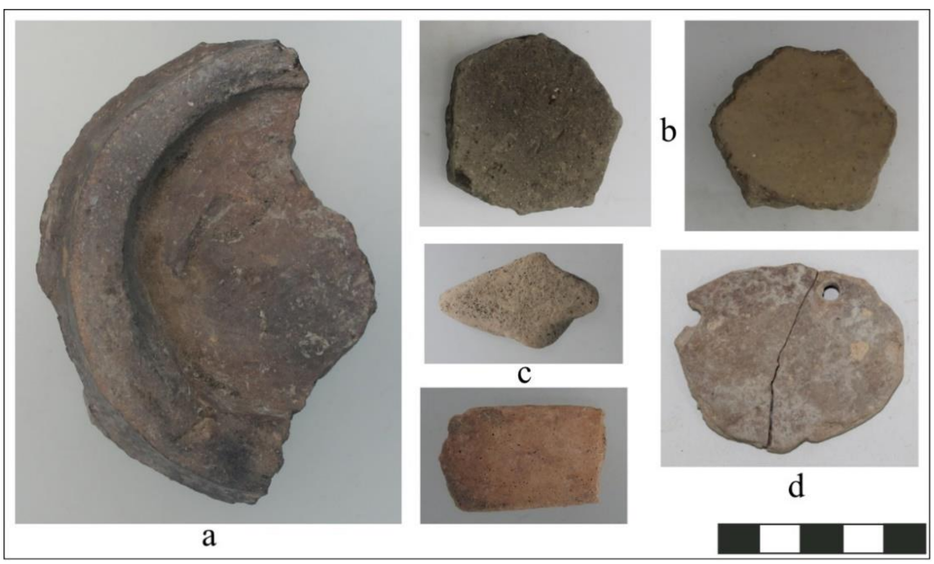


Figure 7.6. Sherd tools: a) Fragment of base used as abrader, Kamnik, b) scrapers, c) smoothers or polishers, d) weight, Kallamas.

Smoothers or polishers are probably sherds from the main body of the vessel and have a rectangular or trapezoidal shape with one to three edges worn from use. I have excluded the two bases from the above groups and labeled them as abraders because their morphology and their size do not seem suitable for polishing or smoothing. They are large fragments, and the users have utilized only the edge of the ring without any modification. At Kamnik and Kallamas several modified rounded ceramic sherds with sharp edges were recorded from a decorated vessel. Its morphology and the unworn margins classify it as a scraper (Figure 7.5; Lopez Varela, van Gijn, and Jacobs 2002, 1137-40, fig. 6)

7.2 GC-MS analysis of fatty acids in the archaeological ceramic sherds

Residue analysis on archaeological ceramics has become a common practice in archaeology, especially to analyze food remains and other organic residues within the vessel walls (Barnard and Eerkens 2007; Evershed et al. 1999; Heron and Evershed 1993; McGovern and Hall 2015; Nigra, Faull, and Barnard 2015). The introduction of this analytical technique to archaeological research provided new perspectives for the investigation of the use of vessels by the identification of organic molecules present in the potsherds (Evershed 1993). Ceramic studies defining the use of vessels related to the storage, preparation, and cooking of food have widely adopted the method of biomarker analysis of the preserved lipids. Lipids are omnipresent in nature and foodstuffs, and they preserve relatively well within the porous matrix of fired clay, and techniques and instruments for extraction and analysis are readily available (Barnard and Eerkens 2016; Erkens 2005; Evershed et al. 1999, 19-20; Skibo 1992). Fatty acids are the primary goal of lipid analysis in ceramic research. They are present in animal and plant cells and in fats and oils. Fatty acids are long-chains of hydrophobic (CH_2-) groups with a hydrophylic carboxyl group (-COOH) at the end. Based on the number of double bonds between the C-atoms, they are classified as saturated (no double bonds), monounsaturated (a single double bond), and polyunsaturated (multiple double bonds). The double bonds can oxidize into dicarboxylic acids, which have a carboxyl (COOH-) group at each terminus. The common method used to identify fatty acids in ceramic sherds is the extraction of the organic molecules preserved in the ceramic matrix, usually ground into powder, then added to an organic solvent, most often a chloroform/ methanol mix. This is followed by derivatization of active protons to increase the thermostability of the molecules and analysis with gas chromatography combined with mass spectrometry (GC-MS) (Barnard, Dooley, and Faull 2007 also for a discussion and list of the main fatty acids; Barnard and Eerkens 2016; Evershed, Heron, and Goad 1990; Malainey, Przybylski, and Sherriff 1999). While the method of analysis is more or less standardized and straightforward, the interpretation of the results faces additional challenges. Issues include physical or human post-depositional contamination, decomposition after microbiological attack, oxidation or hydrolysis, the complex use-history of the vessels, as well as the difficulties of identifying the specific source(s) from which the fatty acids originated (Barnard and Eerkens 2016; Eerkens 2005; Evershed 2008; Stern et al. 2000). Two main methods have been developed for the interpretation of the results of GC-MS analysis of archaeological fatty acids. One relies on the identification of specific fatty acids that can be considered as unique for a specific source. This method combines GC-MS analysis with the stable isotope ratio of ^{12}C and ^{13}C of the major fatty acids, such as stearic acid ($C_{18:0}$) and palmitic acid ($C_{16:0}$) (Evershed 2008, Evershed et al. 1999). A second method is based on comparing the ratios of the relative abundance of common saturated and unsaturated fatty acids, observed in both known and archaeological samples. Instead of a specific origin, this method can assign the identified fatty acid ratio to a broad class (Eerkens 2007, Malainey, Przybylski, and Sherriff 1999; also, Barnard and Eerkens 2016, Evershed 2008; Eerkens 2005 for a short review of both techniques and the arguments and counterargument for each of them).

To interpret the results of my analysis, I have used the second approach, discussed in more detail below. Besides practical reasons, this choice was made primarily based on the archaeological research questions within my research, which are related to the study of different aspects of the use of the Late Neolithic vessels, without necessarily exploring specific details of the Neolithic diet or foodways. Moreover, due to the complexity of the use of the vessels and the accumulation of fatty acids trapped within their walls from successive cooking events, both approaches provide insight only on some fraction of the various sequences of the itineraries of a pot. Previous research, for example, has supported the view that the preserved fatty acids trapped within the walls of the pot are the results of the first few cooking events (Eerkens 2005, 87). Consequently, the information gained from the general groups of fatty acids classified through the method that uses the relative abundance ratio for their identification was sufficient to address the research question for this study. The residue analysis for this project was conducted at the UCLA Pasarow Mass Spectrometry Laboratory under the supervision of Hans Barnard and director Kym F. Faull.

7.2.1 Archaeological data

An analysis of the fatty acid residues was performed on 51 archaeological ceramic fragments (Appendix D-6). Their selection was based on visual observation of organic traces present on the surface, such as sooting, as well as fire-clouding and morphology. Although the goal was to sample the area of the vessels near the neck and rim, which according to previous experimental research is considered the location with the highest accumulation of lipids (Eerkens 2007, 91; Evershed 2008, 29-32), this was often not possible. Instead, due to the small number of vessels which were obviously used as cooking pots, all potential candidate fragments, including the bases, were sampled. Of the total number of samples, 23 are from Kamnik. Due to the lack of undecorated body fragments, almost all samples are from rims and bases. Although this limited the number of samples selected from the settlement, it has provided an excellent opportunity to reconstruct the majority of the sampled vessels. The samples originate from vessels of different shapes and sizes that usually have undecorated, burnished exterior surfaces. They have traces of burnishing on the interior as well, except a few that have smoothed, yet still rather rough surfaces (Appendix D-6). Of eight samples selected from Maliq, only two sherds were decorated, one with barbotine and the other plastic decorative motifs. The exterior surfaces of the remainder have mainly burnishing traces with fire clouds. The interior surface is often also burnished, although poorly, indicating a lack of persistence by the potters. Morphologically, most of the samples belong to a type of shallow vessel with more or less cylindrical walls normally referred to as cooking pans. They have different sizes and thick walls, while on the interior bottom, there are deep or shallow finger impressions (Appendix A-7; B, Plate IX; Figure 7.2). Twenty sherds have been sampled from Kallamas that belong to both open and closed vessels of various forms. The majority have burnished exterior surfaces. A few have rough or smoothed finishing, while only two have decorative elements made with barbotine or plastic motifs. The interior has either burnished or rough finishing, and most of the vessels have burned organic residues from their use in fire (Appendix D-6).

7.2.2 Sample preparation and method of analysis

After the removal of both exterior and interior surfaces, small fragments of the selected archaeological sherds were crushed into powder. An amount of 500 mg of each sample was placed into a clean, marked test tube. Two mL of an extraction solution (chloroform/methanol, 2/1, v/v) was added to the samples, and they were vigorously mixed for 15 seconds, sonicated for 15 minutes, mixed again for 15 seconds, and centrifuged at 1500 g for 30 minutes. One mL of the supernatant was transferred into a second clean test tube. A 1 mL extraction solution was added to the remaining sample and the above procedure repeated. The supernatants were pooled, and 2000 ng nonadecanoic acid (C_{19}) was added as an internal standard, equivalent to a 20 ng/injection. Next, the samples were dried in a vacuum. The dried samples were brought back into the solution by adding 200 µL ethyl-acetate. The samples were transferred into a GC-MS autosampler champagne vial and dried in a vacuum. One hundred (100) µL benzene was added to each sample to bind all remaining water, and the samples were dried completely in a vacuum. The samples were then treated with methoxyamine HCl in pyridine (2%, wt/v, 50 µL), and the vials were kept at 60°C for 30 minutes to oximate possible keto-groups. The samples were subsequently dried once more in a vacuum. Finally, 50 µL ethyl-acetate and 50 µL N,O-bis (trimethylsilyl) trifluoroacetamide (BSTFA) containing 10% trimethylchlorosilane (TMCS; 50 µL, v/v) were added and the samples heated again (60°C, 30 minutes). This converts all carboxyl, amino, and hydroxyl functional groups to their corresponding trimethylsilyl derivatives. The derivatized samples were then placed in an autosampler from which an aliquot of each (1 µL) was injected onto a bonded-phase non-polar fused silica capillary column (Phenomenex ZB-5, phenyl/dimethylpolysiloxane 5/95, 60 m x 0.25 mm, 0.10 µm film thickness; injector port 250°C) and eluted (constant flow, 1 mL/min) with ultra-high purity helium (Thermo Scientific Trace 1310 GC system) over a 63-minute temperature ramp (min/°C; 0'/50°, 3'/50°, 53'/300°, 63'/300°). The end of the column (GC/EI-MS transfer line at 250° C) was directly inserted into the EI source (200°C, 70 eV) of a high-resolution Orbitrap mass spectrometer (Thermo Scientific Q Exactive GCMS), calibrated with perfluorotributylamine immediately prior to the analysis of each batch of samples) scanning from m/z 40-2000 (0.9 sec/scan at a resolution (FWHM) of 30,000) with a 15-minute solvent delay. Data were collected and visualized with instrument manufacturer-supplied software (Thermo Xcalibur). Reconstructed ion chromatograms were used to identify the main fatty acids, after background subtraction, by comparison with spectra of known samples in the NIST 2008 Mass Spectral Library (version 2.2f). Positive identifications were based on NIST match factors of at least 750, indicating strong concordance between the unknowns and the library of spectra and acceptable visual concordance between the unknown and library spectra.

7.2.3 Results

The interpretation of the results recovered from the GC-MS analysis is based on the ratios of the relative abundance value of selected common fatty acids (Eerkens 2005, 2007). Jelmer Eerkens advocated that, from an analytical perspective, the most effective way to treat the decomposition of the fatty acids from oxidation and hydrolysis is to look at ratios rather than absolute values. He argued that, although a number of factors, such as temperature, the presence of water and oxygen, and the original relative density of each fatty acid affect the accurate proportion of their decomposition, it is possible to compare the ratio of the compounds that oxidizes at the similar rate (Eerkens 2005, 87-8; 2007, 92). The compounds included in this method are 'the isomers of the same fatty acids, for example, C18:1ω9 and C18:1ω7, two monounsaturated fats with the double bond located at different positions along the carbon chain, or fatty acids with an identical number of double bonds and of similar length, like $C_{18:0}$ and $C_{16:0}$ or $C_{18:1}$ and $C_{16:1}$' (Eerkens 2007, 93).

Table 7.1. List of the fatty acids used for the ratio discrimination method.

Systematic names	Synonyms	Formula	Saturation
Dodecanoic acid	Lauric acid C12:0	HOOC-(CH2)10-CH3	Saturated
Tetradecanoic acid	Myristic acid C14:0	HOOC-(CH2)12-CH3	Saturated
Pentadecanoic acid	C15:0	HOOC-(CH2)13-CH3	Saturated
Hexadecanoic acid	Palmitic acid C16:0	HOOC-(CH2)14-CH3	Saturated
Heptadecanoic acid	Margaric acid C17:0	HOOC-(CH2)15-CH3	Saturated
Octadecanoic acid	Stearic acid C18:0	HOOC-(CH2)16-CH3	Saturated
9-hexadecenoic acid	Palmitoleic acid C16:1	HOOC-(CH2)7-CH=CH-(CH2)5-CH3	Monounsaturated
9-octadecenoic acid	Oleic acid C18:1	HOOC-(CH2)7-CH=CH-(CH2)7-CH3	Monounsaturated

Although the proportion of the value of the fatty acids decomposing at the same rate could be similar between different species, as they are used in analogous biological process in plant and animals, his research based on ethnographical and archaeological data showed that their ratios are systematically different across various food groups such as greens, roots, seeds, terrestrial mammals, and fish (Eerkens 2005, 89-90; 2007, 93). More specifically, he used four ratios—$C_{15:0} + C_{17:0} / C_{18:0}$, $C_{16:1}/ C_{18:1}$, $C_{16:0}/C_{18:0}$, and $C_{12:0}/C_{14:0}$—to refine this method (see Table 7.1 for the list of the fatty acids). For example, his research supported that the ratios of monounsaturated fatty acids $C_{16:1}$ to $C_{18:1}$ seem to be higher in greens than in berries and seeds, and the ratio of the odd-chained fatty acids ($C_{15:0} + C_{17:0}$) to $C_{18:0}$ is larger in roots compared to meat and berries. Also, to differentiate the fish and meat products from the other groups, Eerkens (2005, tab.2, 89-91) suggested the plotting of the ratio $C_{16:0}/C_{18:0}$, against $C_{12:0}/C_{14:0}$ (for more details on this method, see Eerkens 2005).

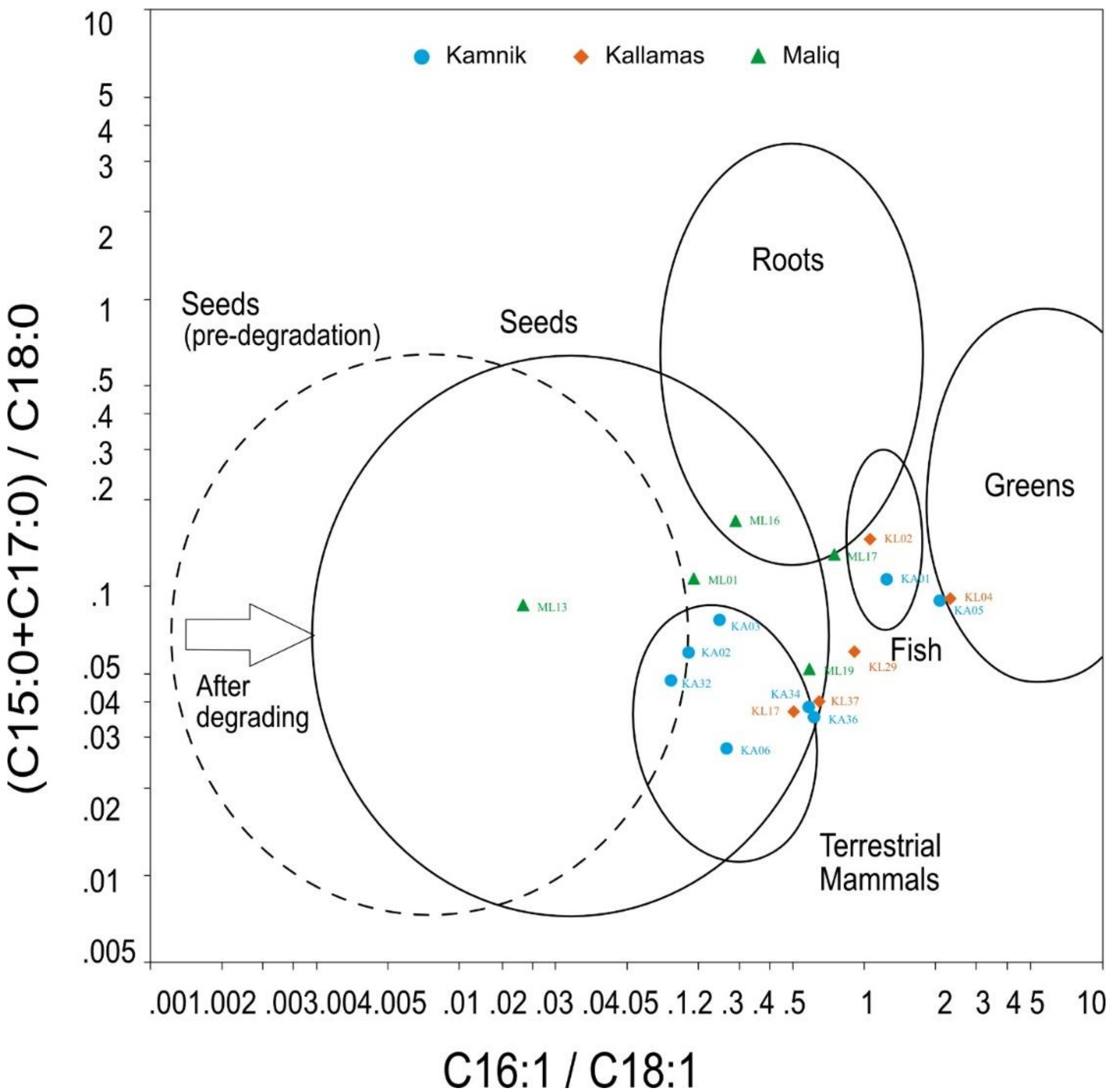


Figure 7.7. Biplot of two fatty acid ratios (C15:0+C17:0)/C18:0 to C16:1/C18:1 identified in the archaeological potsherds after Eeerkens (2005, fig. 5).

The GC-MS analysis of the potsherds from the three sites in southeastern Albania showed the presence of saturated fatty acids on almost all of the selected samples. Only four specimens from

Kamnik, namely KA08, KA09, KA10, and KA16, and Kl39 from Kallams, either did not provide any results or the chromatogram indicated a high level of contamination. Unsaturated fatty acids were identified on more than half of the total of 47 analyzed ceramic sherds, while several revealed the preservation of cholesterol ($C_{27}H_{46}O$). The ratio differentiation method indicated that the fatty acids are associated with all food groups listed in Table 7.2. However, the biplot ratios C_{12}/C_{14} to $C_{16:0}/C_{18:0}$ indicated that the majority of the fatty acids derives from seeds (Figure 7.7, 7.8; Table 7.2). Other samples preserved fatty acids related to terrestrial mammals. The number of sherds with fatty acids from terrestrial mammals at Kamnik is significantly large, while at Kallamas and Maliq it is small compared to those with molecular remains of seeds.

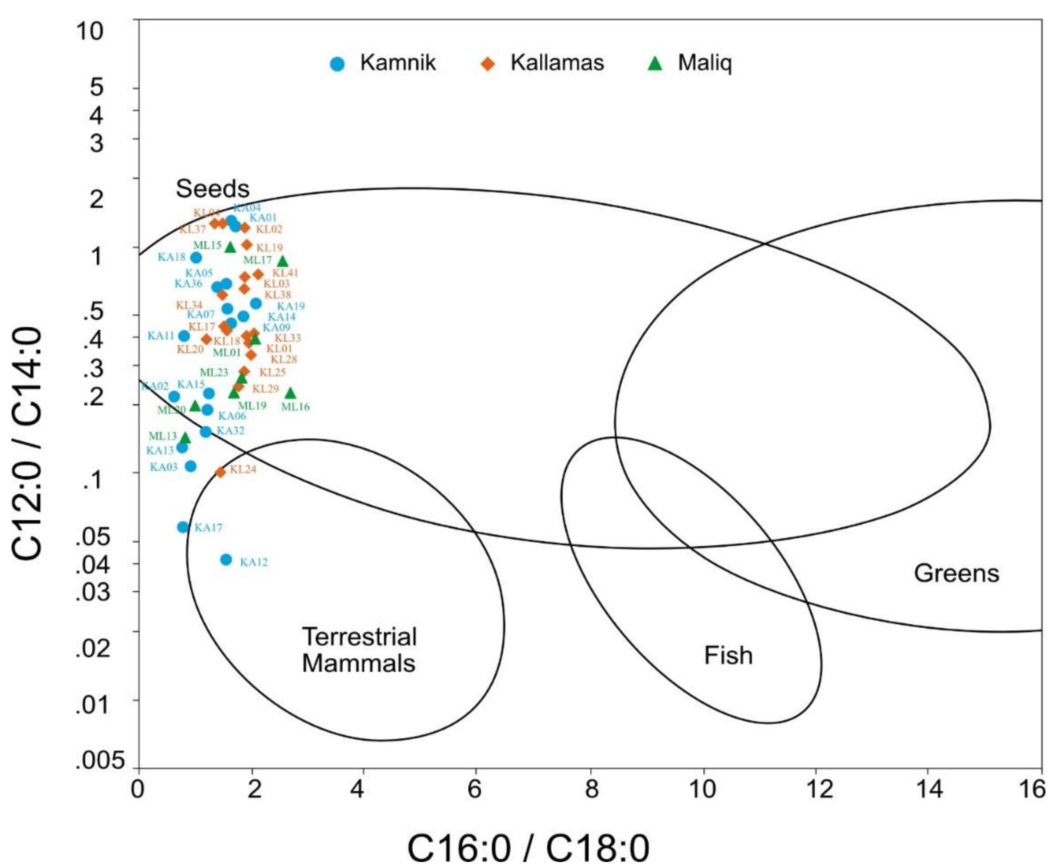


Figure 7.8. Biplot of other two fatty acid ratios C12:0/C14:0 to C16:0/C18:0, after Eerkens (2005, fig. 6).

However, the presence of cholesterol ($C_{27}H_{46}O$) in seven samples that are listed under the plant-based food groups increase the number of sherds with organic compounds of animal origin, especially at Maliq. The presence of residues of animal origin has also been identified by the presence of cholesterol in seven samples from all three sites. One sherd from Kamnik and one from Kallamas preserved fatty acids that can be assigned to fish. A couple of other samples from the same sites revealed fatty acids from greens, while those identified on two sherds from Maliq derive from roots. Finally, it should be highlighted that many sherds have preserved fatty acids possibly related to more than one food group (Table 7.2).

Table 7.2. Summary of the results of the GC-MS analysis combined with the ratio discrimination method.

Food groups	Archaeological samples		
	Kamnik	**Kallamas**	**Maliq**
Terrestrial mammals	KA02, KA03, KA06, KA12, KA17, KA32, KA34, KA36	KL17, KL24	ML19
Fish	KA01	KL02	-
Seeds	KA01, KA02, KA04, KA05, KA06, KA07, KA09, KA11, KA14, KA15, KA18, KA19, KA32, KA36	KL01, KL02, KL03, KL04, KL17, KL18, KL19, KL20, KL25, KL28, KL29, KL33, KL34, KL37, KL38, KL41	ML01, ML13, ML15, ML16, ML17, ML19, ML20, ML23
Roots	-	-	ML16
Greens	-	-	ML16, ML17

Regarding the use of the vessels, the presence of the fatty acids showed that both open and closed shapes were used at Kamnik for cooking and preparing food containing seeds and terrestrial mammals. The pan KA01 preserved residues of cooked seeds and fish (Appendix D-6; Table 7.2). At Kallamas, both closed and open vessels seem to have been used for cooking ingredients of seed origin, while only closed pots preserve remains of food originating from animals. In the closed pot KL02 from this set, it seems to have had cooked seeds and fish. At Maliq, all the pans revealed the presence of fatty acids associated with seeds. In contrast, one of the four pans at Maliq ML16 and one deep conical vessel ML17 seem to have cooked meals with components of both animal and plant origin, including roots and greens, which have not been identified at the other two sites (Appendix D-6; Table 7.2; Figure 7.7).

7.3 Conclusions

The Late Neolithic vessels from southeastern Albania were used in different ways. Through the physical properties of their fabric, shape, dimensions, or aesthetics, they have actively participated in many social practices, like storing, cooking, and serving food, or even manufacturing other vessels or objects. They were engaged either as new whole vessels initially, as renewal objects through mending, as sherd tools, or as grog inclusions inside the fabric of a different vessel. As they participate in the above social practices, the vessels often set the framework of the interactions with the users and impact how they interact with them and other community members. I view the use of the vessel as itineraries of a continuous journey unfolded as it engages in various social activities. All these usages are equally important since their relevance is shaped through interactions with humans in each itinerary without being necessarily related to the previous use, although sometimes they intersect.

As complete vessels, the pottery from southeast Albania is used to store, prepare, cook, and serve food or to participate in non-ordinary (ritual) occasions. They show a remarkable morphological and stylistic diversity, which varies from site to site. The recorded material does not reveal any strict correlation between general shapes and specific usages since both open and closed vessels seem to have been used for various purposes. It is very characteristic that even cooking and storage vessels, for example, that are limited in numbers include both open and closed shapes. The intra- and cross-site morphological variety of cooking vessels suggested by the macroscopic observation was also supported by residue analysis. Waste from different food groups originating from animals and plants was detected within cooking pots of various shapes and dimensions in all three sites.

While serving vessels are more frequently decorated, some cooking and storage containers also have elaborated surfaces. The existence of large storage vessels with fine painted motifs covering the entire body similar to tablewares at Kamnik is a clear indication of the equal attention given to these categories of objects and the activities associated with them. Regarding the dimensions, the domination of small and medium vessels may suggest a restricted household size, which is in concordance with the limited area of the houses and the settlements in the region (see chapter 4). The usage journey of many vessels did not end with their breakage. Some were repaired and continued the journey as renewed vessels. Other vessels had their broken fragments following different itineraries since many were probably discarded, while some of them seem to have been involved in the manufacturing of other objects. A considerable number of potsherds were modified and used as individual tools, and a few of them are embedded within the fabric of new objects as inclusions.

8. The sociocultural journey of the Late Neolithic vessels in the southern Balkans

This chapter will include a general discussion about the topics and the results of analyses presented in the previous chapters emphasizing the sociocultural dimensions of the human-pottery interactions. The ultimate goal is to juxtapose the outcome with the data available from previous studies and incorporate them within the current framework of Neolithic research in the Balkans and northern Aegean. The discussion will focus on four main topics, which have divided the chapter into the same number of sections following the general outline of the dissertation. The first compares morphological and stylistic elements of the ceramic assemblage from Kallamas, which is studied for the first time, with the pottery of Maliq, Kamnik, and other contemporary sites from southeastern Albania. It also focuses on the contribution of this study to revising the main characteristic features of the pottery and the chronology of the Late Neolithic period in the region. The second section summarizes the results of visual recording and analytical techniques and discusses the technological strategies adopted by the potters in each operation sequence of pottery manufacturing at all four sites. The third part elaborates on the use of the pottery, comparing the itineraries of various vessels and potsherds within and between the three sites in the region of Korçë. The last section discusses the circulation of technologies, raw materials, and pottery from the perspective of communities of practice and network connections in the southern Balkans.

8.1 Ceramic assemblages and the chronology of the Late Neolithic period in southeastern Albania

The Late Neolithic period in Albania and its material culture has been largely identified on the basis of two type-sites, Maliq and Kamnik. The ceramic assemblages of these two sites were used to set the relative chronology of this period; therefore, they have been at the center of the debate for decades. Although my research did not focus on morphological and stylistic analysis, the sorting of the material from these two sites observed several features of great interest. Due to the lack of radiocarbon dates and the methodological issues of excavations, discussion of the chronological phases and their association with the ceramic material of both sites is still ongoing. The phase Maliq Ib is characteristic of such a debate. It was initially considered the second Late Neolithic phase, later on as the earliest Eneolithic phase, while more recently, Proto-Eneolithic or transitional layers between these two periods have been postulated (Prendi 1966; 2018; Prendi and Bunguri 2014, 207). Since the occupation phases of the site developed horizontally, and no apparent transition between them was evident through my research, Maliq Ia and Ib may well be contemporary. The dark-colored vessels and their incised and punctuated elements, which increase in the Maliq Ib phase, could be an intra-site contrast rather than a chronological variation. Similarly, the presence of limited matt-painted categories within the layers of this phase, which is in contrast with their domination in Maliq Ia, may suggest different choices made by a section of the settlement to negotiate their position or identity. The stratigraphic issues became even more evident with the recent radiocarbon dates from the lower layers of the test-trench excavations conducted in 2017, where pile dwellings were discovered. Dark-colored surfaces, incision, and punctuation motifs also present in Maliq Ib, Kallamas, Barç, though less so in Kamnik, characterize the pottery of the test trench. The absolute dates place these layers at 5700 and 5500 BCE, which according to the Kallamas radiocarbon series and Aegean chronology, corresponds to the Late Neolithic period. Consequently, one of the pile-dwelling occupation phases of Maliq should be dated in the Late Neolithic instead of the Eneolithic period, as the excavators of the site had argued. Related stratigraphic issues were also encountered at Kamnik. Its cultural layers were initially characterized as Late Neolithic and Neolithic, while recently, the Middle Neolithic period was also added, based on polychrome linear decoration, which is characteristic of the Late Neolithic I in Thessaly. Despite the presence of such elements, which incidentally are scarce, the homogeneity of the material among all occupation phases does not support the new division of the chronological phases at Kamnik.

The recording of ceramic assemblages from Maliq and Kamnik showed that crusted decoration seems to be present in the early phase of the Late Neolithic layers at Maliq and Kamnik, where it has been found together with matt-painted potsherds. The issues with the stratigraphy of both sites impose a considerable level of uncertainty on this argument. However, potsherds from Maliq and Kamnik with white and red crusted linear motifs on light-colored backgrounds that resemble black on red or red on cream matt-painted decoration provide additional supporting evidence. Thus, unlike northern Greece, where the crusted wares are assigned exclusively to the Final Neolithic (Eneolithic) period, they appear within the Late Neolithic layers in southeastern Albania, which correspond to Late Neolithic II in the Aegean chronology.

The broader discussion of typology and decorative style of the Late Neolithic ceramic assemblage from Kallamas is necessary since it is a recent excavation with unpublished material. To integrate the pottery from Kallamas into the regional context, a comparison with Maliq and Kamnik as type sites for this period is crucial. The Late Neolithic layers of all three sites are contemporary, dated between 5800 and 5500 BCE. The many radiocarbon dates at Kallamas, the two from Maliq, and the imported brown on cream classical Dimini bowl within upper strata at

Kamnik constitute a solid ground for this argument. However, despite their contemporaneity, the ceramic assemblage from Kallamas is morphologically and aesthetically quite different.

Although the Late Neolithic pottery at Kallamas is characterized by a light-colored surface like Maliq and Kamnik, the most frequently decorated categories differ significantly. Black-topped is the most common decorated category recorded from the Late Neolithic layers at Kallamas, instead of matt-painted pottery that dominates the assemblages from the other two sites. In fact, the number of black-topped vessels could be highly underrepresented. As a bicolored black and red vessel, often with painted decoration, its fragments could be easily classified under black burnished, pale brown, red-slipped, or even painted wares. As a result, it is safe to say that the black-topped categories characterize the ceramic material of Kallamas. Maliq and Kamnik, however, contain assemblages characterized primarily by matt-painted wares, including black on red, red on cream, and brown on cream. The red on cream category is relatively frequent in Kallamas, but its motifs have burnished surfaces instead of matt paint like the other two sites. Plastic decoration and barbotine, which are also frequently encountered, seem rare in the other two settlements. Plastic decoration and punctuation are characteristic elements of two other Late Neolithic sites in the region, Dërsnik and Barç. However, they are considered precursors of the Maliq-Kamnik group and are classified as an early phase of the Late Neolithic period based only on pottery seriation (Lera 1987; 1988; 2009, 91-4; Prendi and Bunguri 2014, tab. CLXXIV).

Regarding the typology of the vessels, the differences between the sites are not significant since a great variety of forms are present at all three. At Kallamas, however, carinated and biconical shapes are the most common, while the morphology of the vessels from Maliq and

Kamnik is dominated by rounded forms such as spherical, hemispherical, and biconical. Morphologically, the pottery from Kallamas shares more elements with the ceramic material of Dërsnik and Barç. The issue of the Late Neolithic subdivision needs further investigation since the argument that both Dërsnik and Barç constitutes an early subphase of the period is weakened with the data gained from Kallamas. Consequently, two contemporary microregional Late Neolithic ceramic traditions occur in the region of Korçë in southeastern Albania represented by the Maliq-Kamnik group and Kallamas.

8.2 Technology of manufacture

The research results from Kamnik, Maliq, and Kallamas in southeastern Albania and Dimini in northern Greece provided insight into the Late Neolithic pottery technology revealing the social dynamics of the technological strategies. While the potters are conservative on selecting the ceramic clay and building techniques, they are more open to different tempers and technological choices regarding handles, bases, and painted decoration. Also, the geographical occurrence of the Late Neolithic pottery manufacturing techniques indicates the existence of local and regional patterns. Although the immediate chronological comparative framework is fragmented due to the lack of studies, it seems like some technological traditions have been implemented since the Early Neolithic, while others continue in the Eneolithic period. This multifaceted picture of the pottery manufacturing technology in the southern Balkans is probably an unfolding process of intertwined phenomena, including tradition, human interaction with materials and objects, and local and regional relationships. However, for the time being, it is difficult to provide a thorough interpretative analysis due to the lack of evidence available about the Neolithic Period in the region.

The variety of fabrics identified at all three sites in the Korçë region indicates the variety of choices made by potters regarding the raw material, exploiting local sources, and the preparation of the ceramic paste. While at Kallamas, Dimini, and Kamnik the potters used calcareous and non-calcareous clays, at Maliq, the latter source was the first choice. Other studies have pointed out the predominance of non-calcareous ceramic fabric that continues even into the later Eneolithic period at Maliq, even though calcareous clay sources can be found in the area (Ndreçka et al. 2017; Ruzi 2013). Consequently, the preference for this type of raw material is a local technological strategy of the community of potters at Maliq regardless of the availability of clay sources. The use of non-calcareous clays and the spathitic calcite temper in Maliq continues into the Eneolithic period (Hasa 2019, 121-9; Ndreçka 2018, 165-74). Although each site shows different preferences on the type of raw material and inclusions, what is striking is the widespread use of calcareous temper, including spathitic calcite, limestone, and marl inclusions. Spathitic calcite was a commonly added temper to ceramic pastes by Neolithic potters in the Mediterranean area (Vitelli 1989, Capelli 2008, Spataro 2011, Santacreu 2014).

My research did not find any particular correlation between the vessel fabric and ware categories or morphology. The compositional analysis on a set of 20 black-topped decorated potsherds from Maliq showed no indication of standardization. At Maliq, six cooking pots, including three pans, have similar fabrics classified under group 5, with non-calcareous clays and felsic inclusions. However, the use of calcareous clays is very limited in Maliq, while fabric group 5 is the most numerous set, and the samples from cooking pots are spread in pairs in three different subgroups.

All sites share various manufacturing techniques. The extensive use of coils to shape the vessels is suggested by macroscopic observations of traces present on the broken sherds and the examination under polarizing light and through image analysis of thin sections. The sites also share the techniques of attaching the handles onto the body of a vessel. Simple attachment and piercing are recorded at all four sites, while the impression method occurs only at Kamnik and Maliq. Each technique is not necessarily associated with a specific vessel form and dimension, although the data are too limited to understand fully such practices. Sherds with mending holes are also common, suggesting the use of piercing and glues to repair broken vessels. At Kamnik, the adhesive was of natural bitumen in origin, while it was also recorded that the other known mending method, through layers of clay, was present. Effort, time, and knowledge were invested in mending different morphological, stylistic, metric, and use-vessel categories. As I argue in a forthcoming paper discussing repairing practices in the Neolithic Balkans, the decision for mending a vessel was driven potentially by factors beyond functional, categorical, and economic realities. Such a phenomenon might be better understood through Koppytoff's (1986, 73-7) notion of singularized objects resulting from strong bonds between people and things at an individual or private level, not necessarily known by the other members of the community. Thus, the repaired Neolithic vessels from southeastern Albania could be considered what Sherry Turkle (2007) labels 'evocative objects,' where the relationships between people and things are characterized by a mix of feelings, emotions, and thoughts. The Late Neolithic pottery, especially the plain vessels, were not valuable objects, and unlike the Early Neolithic, where their number and use are limited, they are considered mundane due to the large quantity of production and extensive use (Vitelli 1989). Thus, even though they are 'mundane' and easy to obtain objects, the broken vessels were treated as being important to their owners since they did not discard but reassembled them back. I assign this added social value to the use itineraries of the vessels and the interaction with their owners. The use of the vessels is a journey that includes events, places, and persons that the repaired vessels could have evoked (Elezi forthcoming).

The results of the pXRF and XRD analysis on painted decorative elements in the southern Balkans are of great interest and provide the best example that emphasizes the complexity of the technological choices of the Late Neolithic potters in the southern Balkans. The potters from all sites studied in this dissertation used three different materials to get the dark brown and black colored motif: manganese- and iron-rich materials, Fe-rich materials, and manganese ore. All these techniques are used in the Balkans and Aegean during the Late Neolithic period. Previous research has pointed out that manganese-rich pigments were widespread in Thessaly, while the reduction of iron-rich material was more common in the region of Macedonia. The manganese-based decoration is also considered a Late Neolithic innovation in Greece (Bonga 2013, 65-77; Schneider at al 1991, 26-29; Yiouni 2001). Recent research from Albania has shown the use of manganese-rich pigments for the dark-colored motifs in at least two Early Neolithic sites at Vashtëmi near Maliq and Kolsh in north Albania. Manganese-based decorations were also identified at the Middle Neolithic Cakran in the southern part of the country (Ndreçka 2018, 107, 151, 174). Therefore, besides manganese ores, umber, known and exploited in the southern Balkans probably since the sixth millennium BCE, seems to have been widely used during the Late Neolithic period. Although this argument is still to be proven and more research is needed since, to my knowledge, no umber sources are known in the Balkans; such deposits are not uncommon in the Mediterranean: for example, they are known from Cyprus (Robertson 1975). The choices for the red-painted decoration, iron-rich slip, and the white paste of post-firing decoration, however, seem limited. The Neolithic potters in southeastern Albania primarily used red ochre for the red motifs and calcium carbonate for the white paste. In contrast, different clays, including calcareous, aluminosilicate, and magnesium-rich materials, are utilized for the off-white slip.

Although the XRD analyzed samples are limited for a thorough discussion on the firing temperature, the presence of diopside phases on painted motifs and slip from Kamnik may suggest a firing between 800º-900º C since it forms in the range of these temperatures (Trindade et al. 2009). The occurrence of jacobsite phases on two samples from Kamnik, one of which is the imported vessel from Dimini, indicates firing between 950º to 1000ºC (Maggetti 1982). Scholars have argued that lower firing temperatures can be reached in open-fires, but that for higher temperatures, a ceramic kiln is probably needed (Shepard [1956] 1985, 78-80; Rice 1987, 153-8; Rye 1981, 102, Tab.3). Considering these data along with the color uniformity of the painted vessels, which has also been noticed for northern Greece (Yiouni 2001, 210-1), and the presence of clay firing structures at Kamnik, it can be argued that the potters had better control of the firing atmospheres as the result of the ceramic kilns, at least in Maliq and Kamnik.

8.3 Use itineraries of the pottery

The systematic macroscopic and analytical analysis of the use of vessels provided insight into the daily life activities of the Neolithic residents in southeastern Albania and their interaction with pottery by approaching its engagement in storing, cooking, or consumption of food and the manufacturing of other objects. This study pointed out the variety of forms, sizes, and surface treatment and its indication of the richness of such practices and their social meaning. The households were practicing a variety of cooking and consumption methods that in general, are similar among sites, although some differences could be pointed out. Through their physical attributes, the vessels participate actively in these events by imposing a specific behavior on the Neolithic users and urging them to interact with the vessels and other residents in a particular way.

From a methodological perspective, I approached the use of Late Neolithic vessels from southeastern Albania by identifying their morphological and metric features, the observation of use-wear traces, and residue analysis. On a theoretical ground, the study of pottery use was based on the notion of itineraries as spatial stories told by the objects themselves and their active engagement in various social actions. My research adopted the concept of itineraries to challenge the division of primary and secondary use, in which primary use was getting imbalanced analytical attention. Moreover, the notion of a narrative that focuses on a spatial rather than a vertical chronological order of actions extends the potential to study various vessel usages. As such, itineraries fit better with the nonlinear journey of vessels, where neither the transition from clay to ceramic heralds its birthday nor does its breakage and discard marks the end of its story. The journey of a vessel from southeastern Albania contains various itineraries traversed alone or with others, as a whole entity, fragments, or as raw material.

The vessels were mainly used to store, prepare, cook, and serve food. Their rich morphological and decorative repertoire is witness to various social practices associated with food management, including storing, cooking, and serving. The variety of cooking and storage vessels is remarkable despite their limited numbers. Previous studies in the northern Aegean have linked different forms and dimensions of cooking pots with various cooking techniques, such as boiling, stewing, or baking (Urem-Kotsou 2006; Urem-Kotsou and Kotsakis 2007, 237). My research showed that these cooking techniques were used in all three sites, although at

Maliq, there is a tendency toward baking due to the relatively large number of cooking pans. The residue analysis from these pans and another two from Kallamas and Kamnik indicated organic molecules associated with seeds. There is only one pan from Kamnik with traces of food originating from fish. These results could support the above arguments, while they may also indicate a similar use of pans in all three sites. However, organic compounds of seed origin are present in many closed and open vessels.

Except for a few examples mainly from Kallamas, cooking vessels are medium-sized, indicating a limited household size. The same could also be argued for a large number of medium and small jars and serving vessels. The serving vessels have more elaborate surfaces with different motifs, although storage and cooking vessels are also decorated. This practice may indicate a similar level of additional social attention given to these vessels and their associated use context. At Kamnik, the exterior surface of a few storage containers was covered entirely with painted decoration. Scholars have argued that the bold decoration covering the entire exterior surface of a large vessel was made to draw attention to it from a distance (Mills 2007). However, the stunning basket-type storage vessels at Kamnik covered with polychrome painted motifs were most likely placed indoors within the main living space to protect its content from possible threats. Simultaneously, the containers could also have served as furniture revealing its glamour to both residents and visitors. Thus, the message or social status and identity the painted storage vessel was conveying or negotiating may not necessarily have been related to distant observers.

A limited number of vessels followed different itineraries, as suggested by the permanent traces on them. Instead of discarding them after their breakage, the owners provided additional care for them by putting the broken fragments back together. While most of the broken vessels were discarded, a few traversed different itineraries, not as whole objects but as individual potsherds. A number of broken fragments from all three sites in the Korçë region were transformed as individual ceramic tools, such as scrapers, smoothers, polishers, abraders, and weights. The residents of the Neolithic settlements have used different parts of the vessel, such as rims, body fragments, and bases. The vessel narratives are not finished even with their discard. Neolithic potters at Kallamas have used crushed ceramics from broken sherds as inclusions in the ceramic paste of newly manufactured vessels. Finally, many of the broken fragments were discovered through archaeological excavation and reached my study office. A small number were recorded, photographed, classified, and sampled for various analyses. These multidimensional processes comprise the itineraries of a vessel and indicate the nonlinear and mesh-like journey of a ceramic container that object biographies cannot fully capture.

Itineraries are not prearranged by the time a vessel was ordered or manufactured, but they are the product of intra-actions between people and objects. The vessels not only narrate their journey through their itineraries, but they also participate in shaping these stories by actively interacting with humans as they perform their daily practices. Human actions are only one side of the equation since the raw material, shape, and dimensions of the vessel pose limitations that they may overcome only by interacting with these properties. Thus, in such an intra-action, vessel properties urge humans to adopt a specific behavior, movement, or position of their body to accomplish a particular task. These properties also allow the pots to be open to many usage possibilities, called affordances (Gibson 1977; Knappett 2005). Since the vessel features are given or manipulated by the potters, they could be considered as mediators of human agency (see

Gell 1989). However, in both cases, the agency unfolds only through intra-action with humans as they perform various activities.

Drinking from an open or closed vessel, for example, requires an adjustment of the head, hands, lip, and probably the entire body that is different for each shape. Even the morphological variations of vessel attributes such as rim, neck, handle, and forms impose different postures of the human body. For example, human lips will adjust differently to a thick, thin, flaring, or straight vessel lip. Furthermore, using a medium-sized or large container to fill the most likely stationary storage needs from Kamnik and Kallamas requires a different strategy for each case since the movement, time, and energy will not be at the same level. If the Neolithic inhabitants had to displace these large containers, their interaction with those where the handles were in place would have been different from those without handles. Similarly, the use-ware traces of biconical and carinated vessels indicate that their angular shape made it possible to lift or hold the vessels from this specific location. Lifting and holding were performed differently on conical, hemispherical, or spherical forms, as suggested by the use-ware marks found on different parts of the body. Furthermore, the size of the vessels does not just indicate the household size, but it has direct implications on how the members of a Late Neolithic household perceive the preparation and consumption of food and interact among them, with the content of the vessels and other households as they accomplish such tasks. For example, on a daily basis, the size of the vessel, like morphology, largely determines human behavior as they cook and consume their food. Besides, in a crowded social gathering, the lack of large vessels requires either obtaining a large number of vessels from a household beyond their daily needs or oblige them to interact with other members of their community by borrowing containers.

8.4 Communities of potters and the circulation of the technology, raw materials, and vessels

Maliq and Kamnik are among the most distinct examples in Albania for approaching regional interactions and the role of pottery within Late Neolithic network contacts. Many decades ago, scholars pointed out the similarities of the ceramic material from these two sites with the Late Neolithic II pottery in Thessaly. They also argued for imported vessels from Dimini (Prendi 1966; 1982; Prendi and Aliu 1971). The identification of obsidian tools originating from Melos in the Aegean in all three sites (Maliq, Kamnik, and Kallamas) confirmed such indications showing the engagement of these communities in southeastern Albania within the Neolithic network connections in the Balkans (Ruka et al. 2019),

The results of my research strengthen such an argument, and they also reveal network contacts and circulation of goods that were not known before. The study of pottery from Kamnik and Maliq in southeastern Albania identified many similarities of painted vessels with the Late Neolithic II in Thessaly, especially classical Dimini, as suggested by previous scholars. Both areas share technological choices of painted decoration, especially the black and brown dark motifs. However, my research was able to identify only two potential imports from and to Dimini. One candidate is a brown on a cream bowl at Kamnik with its petrographic profile identical with the fabric of vessels from the same ware category produced at Dimini (Hitsiou 2017, 61; Pendedeka 2016, 246-7). The other is a black on red vessel found in Dimini with a compositional profile close to samples from Kamnik. In addition, both Maliq and Kamnik seem to have been interacting with each other. Apart from sharing morphological and decorative elements, the identification in Kamnik of at least two vessels manufactured most likely in Maliq could indicate the circulation of pottery and movement of people between these sites. The presence of graphite on the interior of a polychrome vessel at Kamnik shows the extension of such networks in eastern Macedonia in northern Greece. Furthermore, the residents of Kamnik were in contact with other Neolithic communities in the west, especially in southwestern Albania, from where they could have supplied the natural bitumen which was identified on the ceramic vessels from the site.

All these examples of exchanged objects, commodities, and technologies indicate a diverse network of interactions, although the amount of circulated goods is limited. What is the nature of these contacts? Despite the expansion and proliferation of such networks during the Late Neolithic period in the northern Aegean and the Balkans, they are poorly studied. Scholars have explained such a phenomenon in northern Greece through population pressure and the increase of settlements (Gallis 1992; Halstead 1994; Kotsakis 1999). The spread of the painted decoration style in Greece, for example, is considered as an indication of social contacts on a regional and interregional scale (Cullen 1985; Halsted 1999, Kotsakis 2010, Urem-Kotsou et al. 2017). What is the role of pottery in this network of connections? While it has been considered active in shaping and negotiating Neolithic identities (Pendedeka 2017; Kotsakis 2010; Urem-Kotsou and Kotsakis 2007), particularly the configuration of cross-site or interregional interactions, the role of pottery seems to be perceived as passive. In the best example, painted ceramic vessels were considered as a means for maintaining inter-regional social connections (Halstead 1995, 18-9). Conversely, in the Balkans, the spread of a particular morphological or stylistic feature has been related to the notion of a culture-group. The presence of the same pottery elements in two different sites would infer a cultural association between them. However, the contacts between Kamnik and other areas in the Balkans support a different narrative, where pottery is not just an indicator of the social connections but has an active role in shaping such interactions. The presence of raw materials such as natural bitumen and graphite acquired from distant areas used for decoration, waterproofing, and repairing vessels shows the essential role of the pottery in these exchange activities.

The identity of the Neolithic potters in the region has been inextricably linked with their settlement, which is considered an entirely distinct and autonomous social unit that interacts with others only in terms of economic or social needs. Instead of viewing the Neolithic landscape as inhabited patches with clear physical and social limits, it is probably more appropriate to perceive it as a lived organism. The increase in the number of settlements could have transformed the Late Neolithic lived topography into a dense meshwork of interactions and relationships that transcend the settlement level. The cross-site intra-actions, rather than the tension between the individual and the communal (Halstead 1995; Kotsakis 2006), seems to be at the center of social negotiations in the Late Neolithic period in the north Aegean and the Balkans. The way pottery technology, decorative elements, raw material, and vessels are shared and circulated in north Greece, for example, is characteristic of such interactions, which are not necessarily driven by spatial proximity creating patchy patterns (Elezi 2014; Urem-Kotsou et al. 2017, Pentedeka 2017). The same can also be argued for southeastern Albania, where Maliq shares more technological and decorative elements with Kamnik located 70 km away rather than other Late Neolithic sites within the Korçë basin. The ceramic assemblages of these two sites, especially the painted categories, have more similarities with Thessalian settlements, including Dimini near the Aegean coast, rather than Kallamas in the Greater Prespa Lake.

Communities of practice, boundary objects, and network thinking provide the means for a better apprehending of these interactions (Mills 2018, Star and Griesemer 1989; Wenger 1998).

In my view, the communities of potters transcend the social and physical boundaries of the settlement. As the potters from one or more settlements carry out the same craft and share technological knowledge, they comprise communities of practice according to Wenger's definition (1998, 45). The potters may participate in more than one community within a particular region. Thus, the dynamic configurations of the communities of potters should be considered as one of the main factors in the spread of technological, morphological, and decorative elements in the southern Balkans. Potters from a particular settlement may participate in different communities of practice creating technological, morphological, and stylistic variability within their settlement.

The exchange of the painted vessels between Dimini, Kamnik, and Maliq could have taken place within the context of reciprocity or hospitality since they are so few. Reciprocity and inter-communal hospitality, considered by Halstead (1995) and Kotsakis (2010) as the main social mechanisms for the spread of the Late Neolithic pottery styles in north Greece, could also explain the shared decorative elements between the three sites. However, to share the rather complex technology of dark painted decoration between Kamnik, Maliq, and Dimini cannot be transmitted only through exchange activities. The notion of boundary objects provides a better analytical tool to explore the means that facilitate contacts and exchange. In this perspective, the technology of dark painted motifs is the boundary object that connects the communities of potters from Maliq, Kamnik, Dimini, and potentially other sites in the region. The technological variations pointed out by my research suggest that the transfer of knowledge could have taken place through the participation of craftsmen in various communities of practice. Kamnik and Dimini shared the technology of gaining black motifs mainly through umber or manganese-rich materials. Thus, the craftsmen from Kamnik, for example, seem to have participated in the network of the communities of potters in Thessaly that has linked them with Dimini. Simultaneously, the potters from Kamnik could have participated in another network of communities of practice in the Korçë basin since they share various technological strategies with Maliq, including the reduction firing of Fe-rich materials to get the deliberate dark color, design patterns, and extensive use of off-white calcareous slip. Through this network, the potters of both sites, and others in the region of Korçë, have been linked with the communities of potters in western and eastern Macedonia in Greece. They share with the potters of these regions the extensive manufacture of black on red and black-topped vessels and the use of iron-rich black painted motifs. The presence of graphite in Kamnik and other sites in southeastern Albania (Hasa, Elezi, and Muros in press) is a strong indication of the contact between the potters of these regions. The lack of evidence, however, provides serious limitations in defining the social context of such a distant displacement of potters. Vitelli (1977) has suggested intermarriage as a critical factor for the regional homogeneity of the Urfinis painted wares in the Argolid of southern Greece. She argued that as potters, women could have spread the techniques when they moved to their husbands' homes. Intermarriage is a possible explanation, although the potters could also be men moving to their spouse settlement. In the southern Balkans, traditional pottery is a craft dominated almost exclusively by men. Furthermore, there is a remarkable continuity in this tradition that goes back to the first millennium BCE, since men run almost all the known ancient Greek pottery workshops (Boardman 2001; Pevnick 2010), for the history of ancient greek pottery). However, there is no evidence about the Neolithic period to support both Vitelli's and this argument. Isotope and DNA analysis could provide insight into this issue in the future, although the preservation of human remains in the region is poor.

In the Neolithic Balkans and Aegean, a potter or group of potters may also participate in different craft communities facilitating technological knowledge exchange between various crafts. Thus, the similarities between pottery coiling techniques and coiled basketry, on the one hand, and piercing handles and woodworking, on the other, could be attributed to the brokers; craftsmen who could have participated at the same time in pottery, basketry, or woodworking communities. Demetrios Theocharis (1973, 102) argued in the 1970s for the interaction between the decorated pottery of the 'classic' Dimini phase and woodworking, while a connection of painted motifs from the same site with textiles has also been suggested (Gallis 1996, 122; Souvatzi 2008, 125). Moreover, the cross-community craftsmen could have played an essential role in the morphological innovations of Neolithic pottery around the middle of the fifth millennium BCE with the adoption of carinated and biconical forms. Scholars have argued that woodworking and basketry were used much earlier than the introduction of pottery, and the exchange of technical knowledge in prehistory was probably a common practice (Adovasio 2016; Adovasio, Soffer, and Klima 1996; Bocquet and Noël 1985; Sofaer 2006).

Therefore, the communities of practices within the study of the Neolithic pottery in the Aegean and the Balkans will provide a theoretical framework through which scholars can approach the various scales of interactions on a local and regional level, where potters and the ceramic vessels were actively involved. It can also provide the means to understand innovation and the spread of specific technological choices in pottery manufacturing.

9. Concluding remarks and future research

In this dissertation, I have examined through a holistic, interdisciplinary approach the sociocultural journey of Late Neolithic vessels in the southern Balkans, focusing on the emerging interactions between people and pottery during manufacture, use, and circulation. My research integrated various theoretical perspectives and methodological tools in a multidimensional approach to exploring vessel itineraries as they are engaged in daily life activities and regional interactions and their ability to provide a multifaceted narrative. Basic tools of ceramic analysis like macroscopic observation and recording, combined with analytical techniques, were used to reconstruct primary and secondary manufacturing techniques, storage, preparation, and food consumption habits, cross-site circulation of vessels, as well as chronological or geographical patterns of ceramic traditions in the region of Korçë in southeastern Albania. The Late Neolithic settlements at Kamnik, Maliq, Kallamas, and Dimini and their ceramic assemblages provided the perfect archaeological context for such a holistic approach.

The current study provided an insight into the discussion of Late Neolithic relative chronology and ceramic traditions in the region of Korçë. Although the typological and stylistic analyses were not the primary goal of the dissertation, the detailed study and presentation of the unpublished ceramic material of the Late Neolithic phases from Kallamas and its comparison to that of Kamnik and Maliq provided an opportunity to contribute to such issues. The morphological, decorative, as well as technological differences between the pottery of Kallamas on the one hand, and Maliq and Kamnik, on the other, although they are contemporary and dated within the first half of the fifth millennium BCE, suggest the existence of two Late Neolithic ceramic traditions in southeastern Albania. These two traditions are not strictly geographically defined and are composed of communities of potters that transcend them sharing different elements. The shared morphological and stylistic features between Kallamas and Maliq, combined with the recent radiocarbon dates from both sites, question the current chronological sequences that distinguish or separate the Late Neolithic from the Eneolithic cultural layers of Maliq. However, the above arguments require further investigation that should include small or large scale excavations at Maliq and Kamnik, especially since they have many stratigraphic issues and both lack a systematic study of the entire ceramic assemblages. Furthermore, a reexamination of the pottery from other Late Neolithic sites in the Korçë basin will provide valuable information about the patterns of the ceramic traditions in the area.

The technological study of the ceramic assemblages was carried out through systematic visual observation of traces on the surface of potsherds and a multi-analytic approach that included optical microscopy, pXRF, XRD, and biomarker analysis. It provided an insight into how potters engaged with different types of raw material by acquiring, handling, and mixing them to prepare the ceramic paste, decorative pigments, and the slip. The research also revealed information on manufacturing techniques, including shaping, scraping, or adding layers of clay, attaching different parts, elaborating the surface, firing, and post-firing treatment to transform the ceramic paste into a vessel. Overall, this study pointed out a complex landscape of pottery manufacturing technology shaped by a number of phenomena, such as ceramic tradition, interactions of potters with materials and objects, as well as the local and regional social contacts. So, the communities of potters in southeastern Albania seem to have been more conservative as to the raw material and the building techniques, whereas they used more than one method to work the walls of a vessel, attach the handles or the base to the body, as well as elaborate the surface. There are similar techniques among settlements and regions, some are more site-specific, while others transverse the chronological framework of the Late Neolithic period. Usually, pottery exploited local sources, while at Kamnik, they also seem to have used raw materials from distant areas.

Despite the results presented in the current dissertation, the investigation of the technological aspects of pottery manufacture from the three sites in southeastern Albania has not been completed. A more detailed examination of the petrographic samples presented here is in progress using a quantitative descriptive technique, while there are a considerable number of other prepared thin sections ready to be studied. Also, compositional analysis of the fabric through pXRF should be expanded to more samples, especially those used for petrographic examination. This would enlarge the set of samples for a better representation and will increase the accuracy of both methods. For a thorough discussion on the exploitation of the local raw materials and the provenance of the vessels, a comparative petrographic and compositional analysis of clay samples is necessary. Finally, phase identification analysis with XRD should be performed on more painted motifs for understanding local or regional patterns of painting technologies in southeastern Albania.

Like technology, the use of vessels was approached through a combination of various methods. The study focused on vessel attributes such as morphology and size, use-wares, and residue analysis. From a theoretical perspective, my research adopted the notion of itineraries for an object-centered narrative and avoiding the analytical distinction between primary and secondary use. At the same time, it considered ceramic vessels capable of acting upon their users as they accomplish various activities. The study revealed information about some of the itineraries of Late Neolithic vessels in southeastern Albania. These itineraries narrate how people and vessels as whole objects and potsherds are entangled in storing, preparing, and consuming food or manufacturing other objects.

My research identified the circulation of a limited number of vessels between Maliq, Kamnik in southeastern Albania, and Thessalian Dimini in Greece. My study investigated the role of pottery in the Late Neolithic regional network contacts in the southern Balkans by considering the potters as being organized in communities of practice that transcend the settlements and the shared technology of dark matt-painted decoration as one of the boundary objects connecting these groups. Involved in complex interactions that could include the movement of members from one community to another, potters not only accommodate the spread of pottery technology, morphology, or decorative elements, they also shape the networks of contact in the southern Balkans. Besides the efficacy of tracing interregional contacts and technological changes in an interconnected world, the idea of communities of practice in a Neolithic landscape provides an opportunity to move beyond the rigid settlement-centric approach in the northern Aegean, where the household and the settlement have been at the center of the analysis. At the same time, it also rejects the ethnocentric notion of culture-groups based on the spatial spread of a distinct type of pottery that is still dominant in the scholarly traditions of the Balkans. Finally, the current dissertation has provided evidence for an interregional network that extended from the north Aegean to the Adriatic coasts, where the settlements in southeastern Albania were. However, more research is needed, including the biomarker analysis of bitumen samples from Kamnik to define its sources and circulation in Albania and the southern Balkans. Furthermore, a systematic multi-analytic study has to be carried out to investigate other Late Neolithic networks within the geographical area between southeastern Albania and Thessaly by tracing the circulation of the 'classical' Dimini painted bowls.

To conclude, both the holistic, interdisciplinary research adopted in the current dissertation and the results of the multianalytic approach presented here have a theoretical and methodological impact on the study of Neolithic pottery in the southern Balkans. This research may contribute in shifting Neolithic studies in Albania into new directions, focusing on the communities themselves and their daily life interactions with the material world. It could also motivate other studies on the contacts between the region of Korçë, Thessaly, and beyond and on the role of Late Neolithic pottery within the Balkan and the north Aegean network connections.

Appendix A

Images

A-1. General sorting forms, size chart, and Access database for the diagnostic sherds.

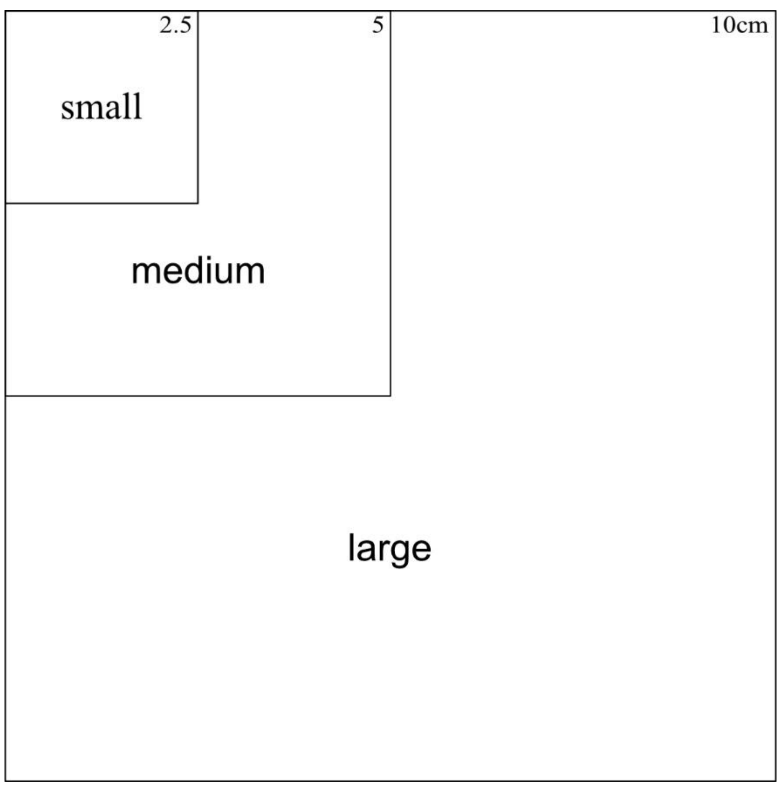
KALLAMAS		SECTOR							TRENCH						
						LAYER			DATE					No.	
WARE CATEGORIES		OPEN					CLOSED				UNCERTAIN				Mend. hole
		No.	B	C	R	H	B	C	R	H	B	C	R	H	
POLISHED	BLACK	1													
	GRAY	2													
	BROWN	3													
	WITH CLOUDS	4													
	PALE	5													
	RED	6													
	RED SLIPPED	7													
BURNISHED	BLACK	8													
	GRAY	9													
	BROWN	10													
	WITH CLOUDS	11													
	PALE	12													
	RED	13													
	RED SLIPPED	14													
SMOOTHED	BLACK	15													
	GRAY	16													
	BROWN	17													
	WITH CLOUDS	18													
	PALE	19													
	RED	20													
	RED SLIPPED	21													
ROUGH	BLACK	22													
	BROWN	23													
	WITH CLOUDS	24													
	PALE	25													
	RED	26													
DECORATED	BLACK ON RED	27													
	BROWN ON CREAM	28													
	BLACK ON CREAM	29													
	RED ON CREAM	30													
	POLYCHROME	31													
	WHITE ON BLACK	32													
	WHITE ON RED	33													
	RED ON BROWN	34													
	GREY ON GREY	35													
	MATTE PAINTED (BROWN)	36													
	BLACK TOPPED	37													
	WHITE TOPPED	38													
	RED TOPPED	39													
	INCISED	40													
	ENCRUSTED INCISED	41													
	ENCRUSTED	42													
	PATTERN BURNISHING	43													
	IMPRESSED	44													
	PLASTIC	45													
	ANTH/ZOOMORPHIC	46													
	CHANNELLED	47													
	CHANNELLED GROOVED	48													
	RIPPLED	49													
	IMPRESSO	50													
	BARBOTINE	51													
	COMBINATION	52													
	PUNCTUATED	53													
	BROWN ON BROWN	54													
	MATTE PAINTED (RED)	55													
	RED ON RED	56													
	BROWN ON RED	57													
	OTHER	58													
	PAINTED UNCERTAIN	59													
	UNCERTAIN	60													
WEIGHT															

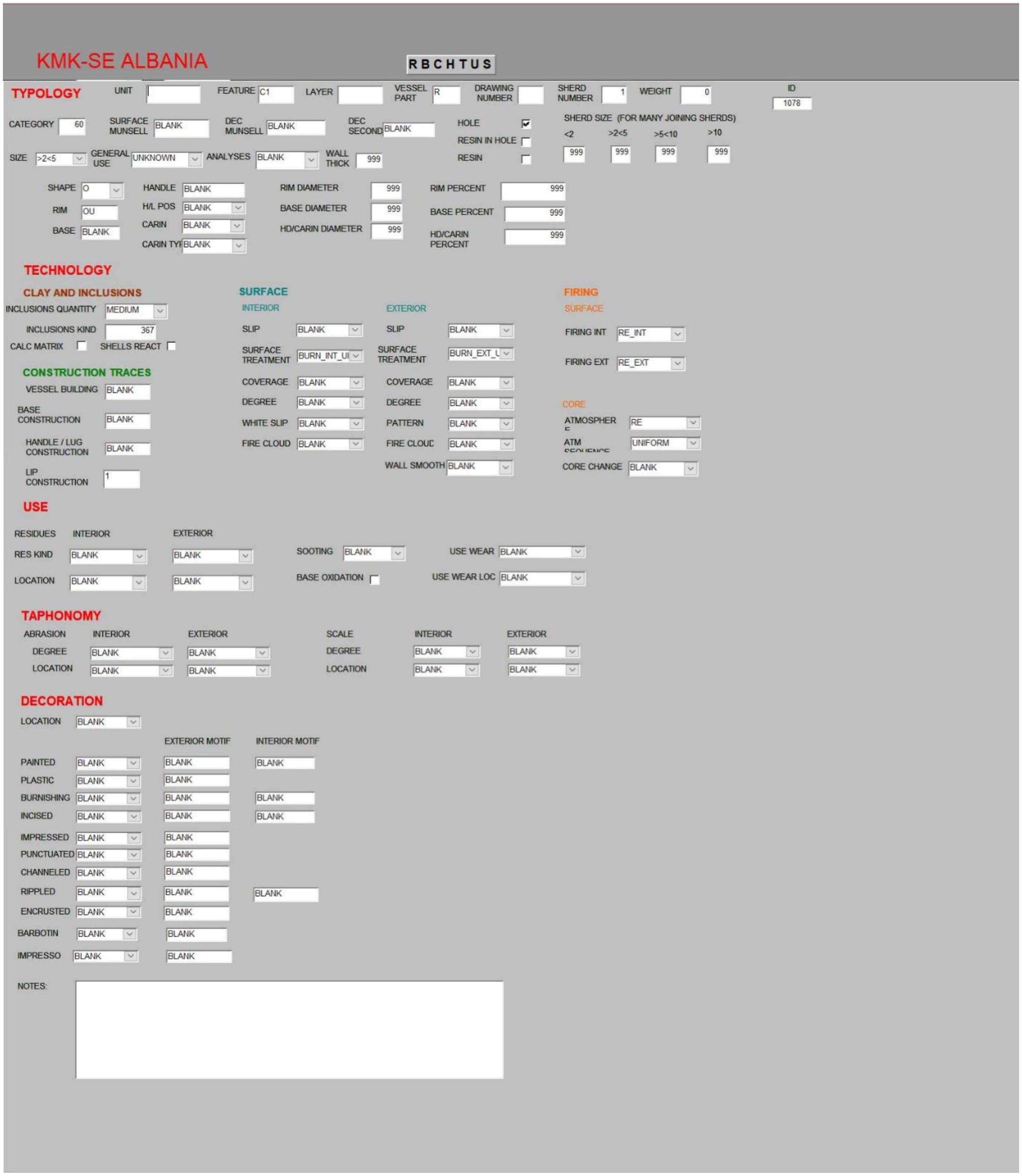
KALLAMAS

POTTERY

1. Clay Used in Construction ☐
2. Abrasion: 10%☐ 20%☐ 30%☐ 40%☐ 50%☐ 60%☐ 70%☐ 80%☐ 90%☐ 100%☐
3. Size of Sherds: SMALL ☐ MEDIUM ☐ LARGE ☐
4. ME ☐ Number____________, Category ___________
5. A ☐ Number____________, Category___________
6. Bones ☐
7. Shells ☐

8. Joins Sherds ☐ Category	Number	9. Remarks




KMK-SE ALBANIA
RBCHTUS

TYPOLOGY
UNIT | FEATURE C1 | LAYER | VESSEL PART R | DRAWING NUMBER | SHERD NUMBER 1 | WEIGHT 0 | ID 1078
CATEGORY 60 | SURFACE MUNSELL BLANK | DEC MUNSELL BLANK | DEC SECOND BLANK | HOLE ☑ | RESIN IN HOLE ☐ | RESIN ☐
SHERD SIZE (FOR MANY JOINING SHERDS): <2 999 | >2<5 999 | >5<10 999 | >10 999
SIZE >2<5 | GENERAL USE UNKNOWN | ANALYSES BLANK | WALL THICK 999
SHAPE O | HANDLE BLANK | RIM DIAMETER 999 | RIM PERCENT 999
RIM OU | H/L POS BLANK | BASE DIAMETER 999 | BASE PERCENT 999
BASE BLANK | CARIN BLANK | HD/CARIN DIAMETER 999 | HD/CARIN PERCENT 999
CARIN TYP BLANK

TECHNOLOGY
CLAY AND INCLUSIONS
INCLUSIONS QUANTITY MEDIUM
INCLUSIONS KIND 367
CALC MATRIX ☐ | SHELLS REACT ☐

CONSTRUCTION TRACES
VESSEL BUILDING BLANK
BASE CONSTRUCTION BLANK
HANDLE / LUG CONSTRUCTION BLANK
LIP CONSTRUCTION 1

SURFACE
INTERIOR: SLIP BLANK | SURFACE TREATMENT BURN_INT_U | COVERAGE BLANK | DEGREE BLANK | WHITE SLIP BLANK | FIRE CLOUD BLANK
EXTERIOR: SLIP BLANK | SURFACE TREATMENT BURN_EXT_L | COVERAGE BLANK | DEGREE BLANK | PATTERN BLANK | FIRE CLOUD BLANK | WALL SMOOTH BLANK

FIRING
SURFACE: FIRING INT RE_INT | FIRING EXT RE_EXT
CORE: ATMOSPHERE RE | ATM SEQUENCE UNIFORM | CORE CHANGE BLANK

USE
RESIDUES: INTERIOR | EXTERIOR
RES KIND BLANK | BLANK | SOOTING BLANK | USE WEAR BLANK
LOCATION BLANK | BLANK | BASE OXIDATION ☐ | USE WEAR LOC BLANK

TAPHONOMY
ABRASION: INTERIOR | EXTERIOR — SCALE: INTERIOR | EXTERIOR
DEGREE BLANK | BLANK — DEGREE BLANK | BLANK
LOCATION BLANK | BLANK — LOCATION BLANK | BLANK

DECORATION
LOCATION BLANK

		EXTERIOR MOTIF	INTERIOR MOTIF
PAINTED	BLANK	BLANK	BLANK
PLASTIC	BLANK	BLANK	
BURNISHING	BLANK	BLANK	BLANK
INCISED	BLANK	BLANK	BLANK
IMPRESSED	BLANK	BLANK	
PUNCTUATED	BLANK	BLANK	
CHANNELED	BLANK	BLANK	
RIPPLED	BLANK	BLANK	BLANK
ENCRUSTED	BLANK	BLANK	
BARBOTIN	BLANK	BLANK	
IMPRESSO	BLANK	BLANK	

NOTES:

A-2 Images of potsherds and vessels from Maliq


Photo: A. Hyka

A-3. Images of the ceramic assemblage from Kamnik

Photo: A. Hyka

Photo: A. Hyka

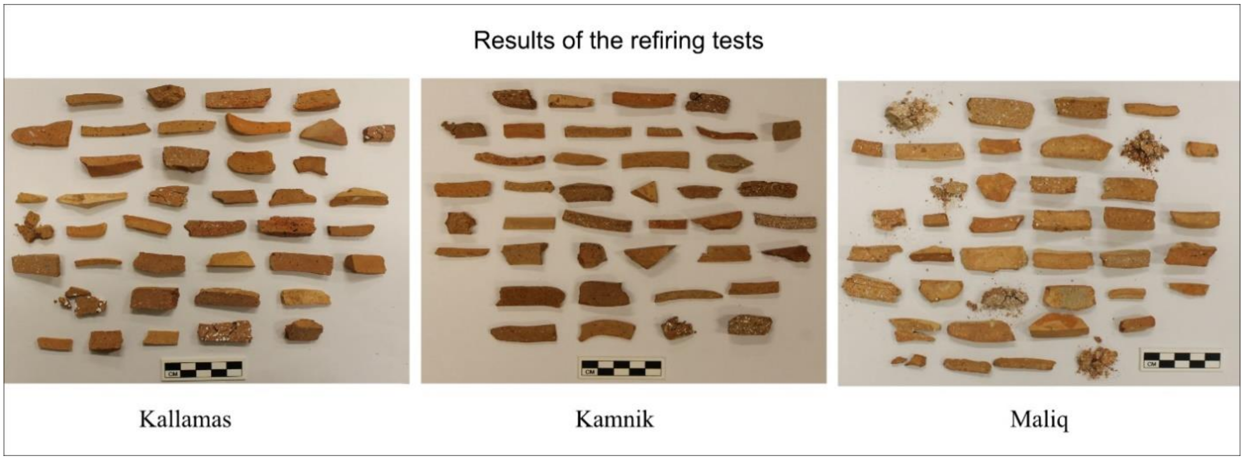

CM
CM
CM
CM

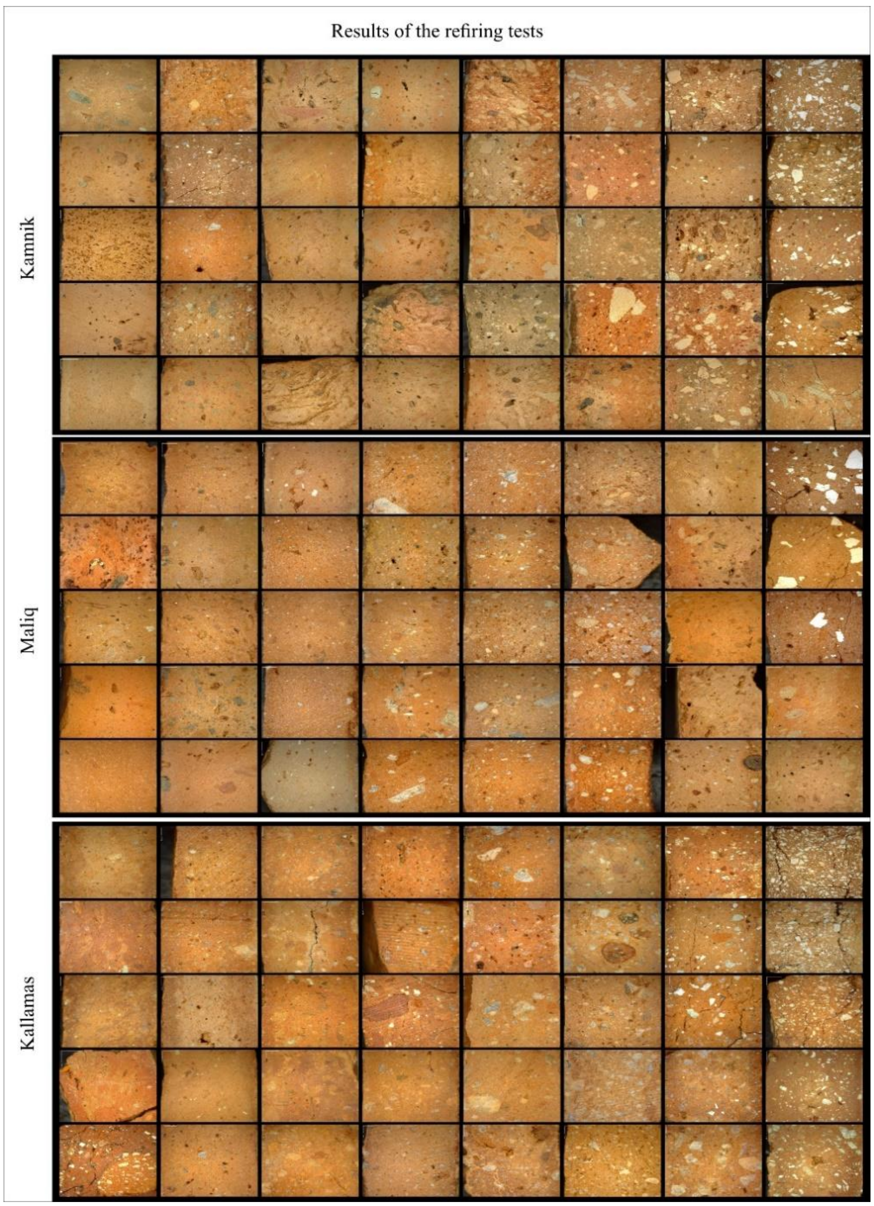
A-4. Images of vessels and potsherds from Kallamas


CM


CM

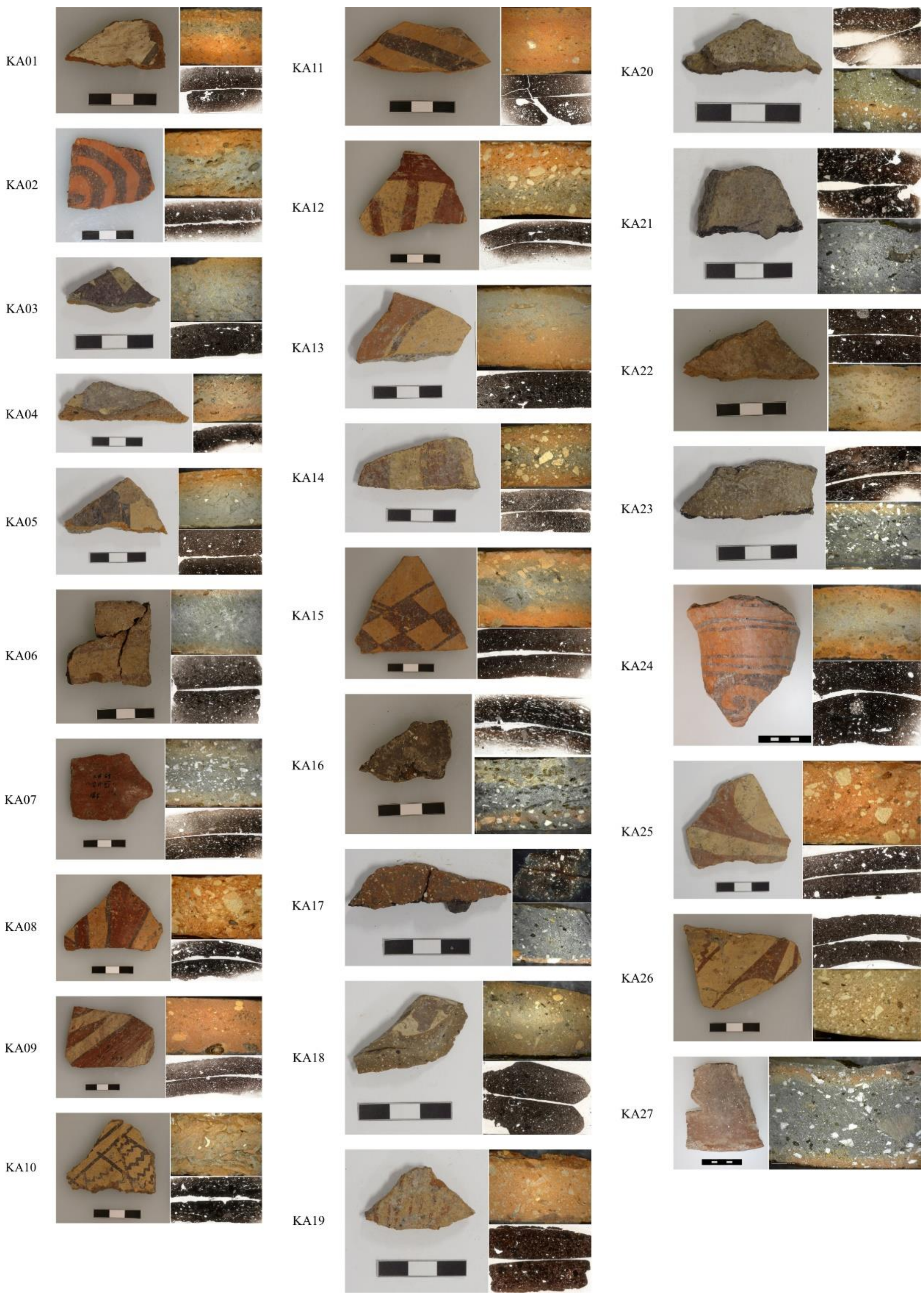
A-5. Macroscopic observation of technological traces.


Results of the refiring tests
Kallamas
Kamnik
Maliq

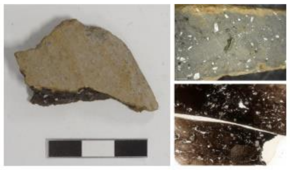

Results of the refiring tests
Kamnik
Maliq
Kallamas

A-6. Fabric and composition of the pottery.

Samples for petrographic analysis

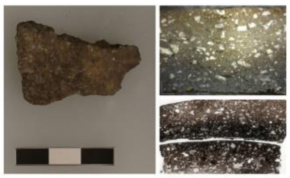


KA28



KA29

KA32



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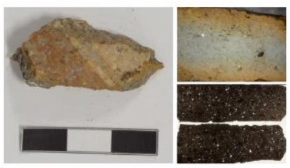

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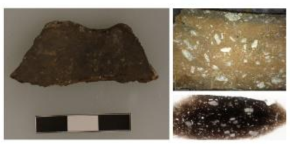

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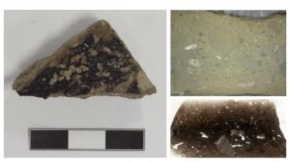

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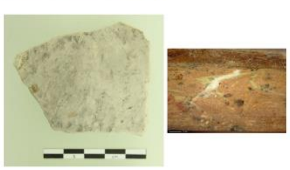
KL09

KL10



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KL16

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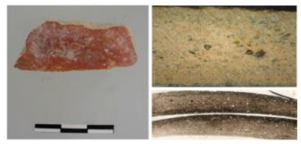

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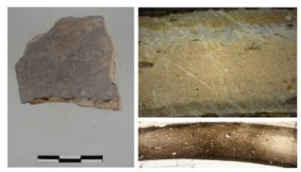

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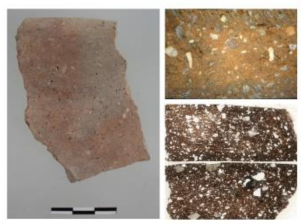

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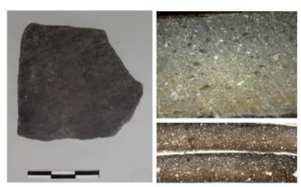

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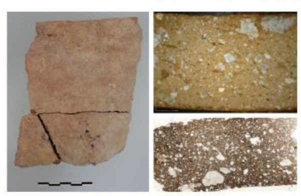

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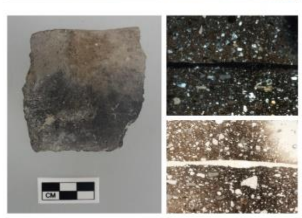

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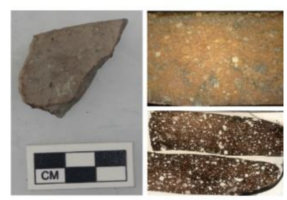
KL37

KL38

KL45

KL46

KL52



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KL57

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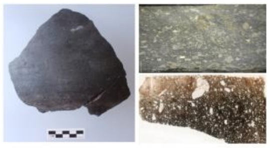
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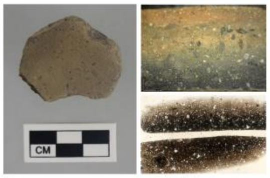
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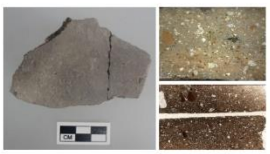
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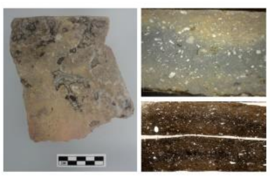
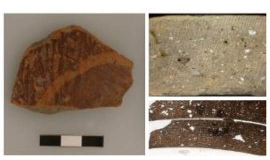

ML01

ML02

ML03

ML04

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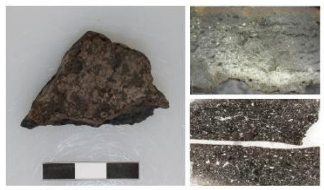
ML06

ML07

ML08

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ML11

ML12

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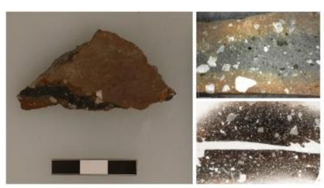
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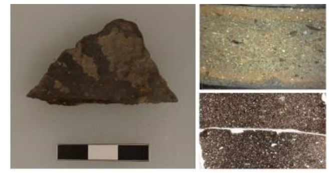
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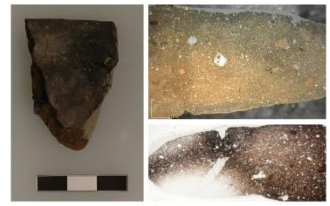
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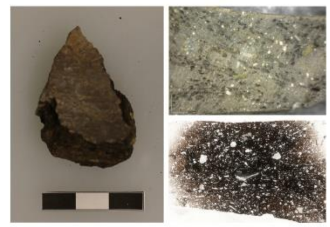

ML18

ML19

ML20

ML21

ML22

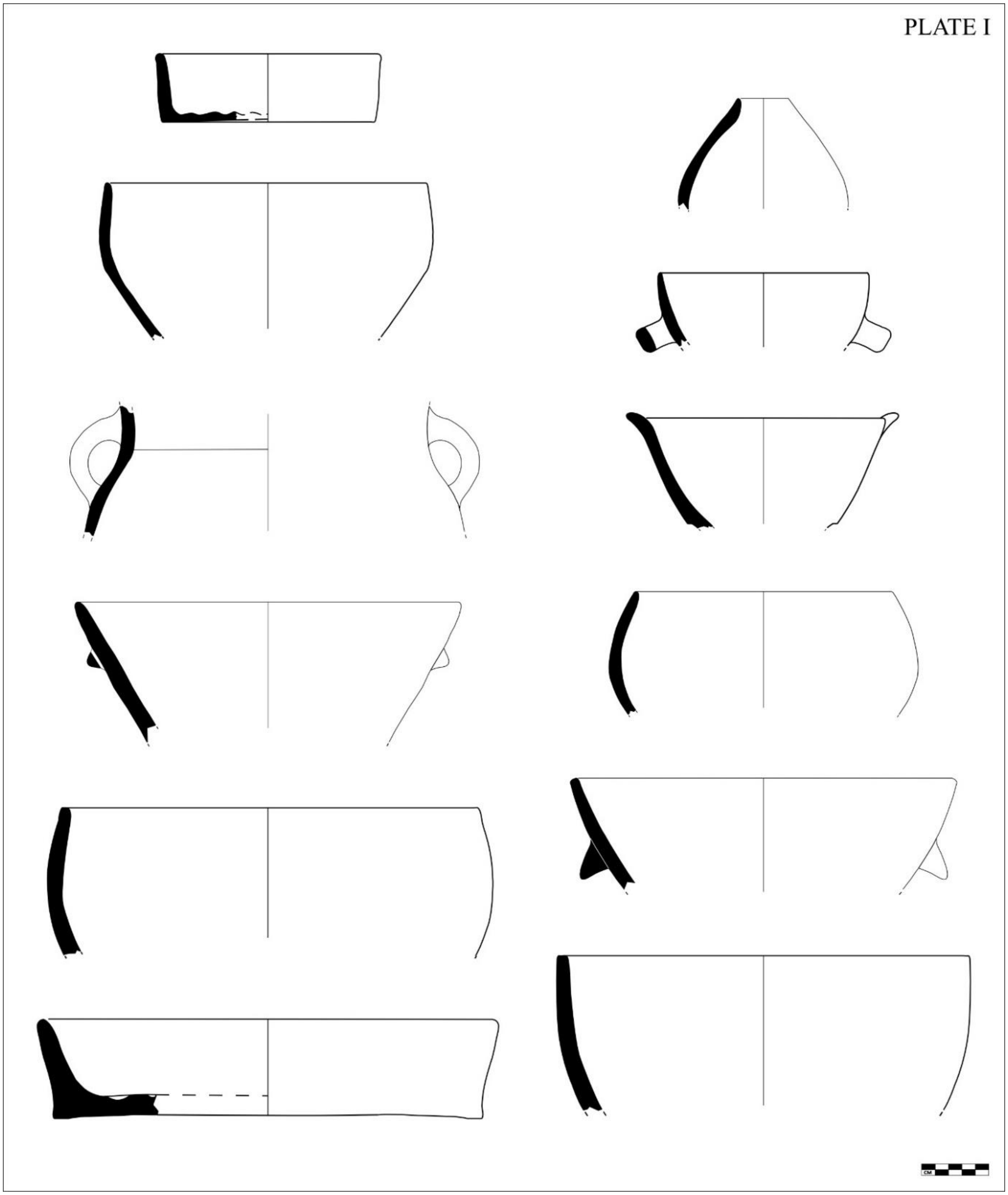

Samples for pXRF and XRD analysis

A-7. Samples for residue analysis


KALLAMAS
CM

Appendix B

Tables of drawings



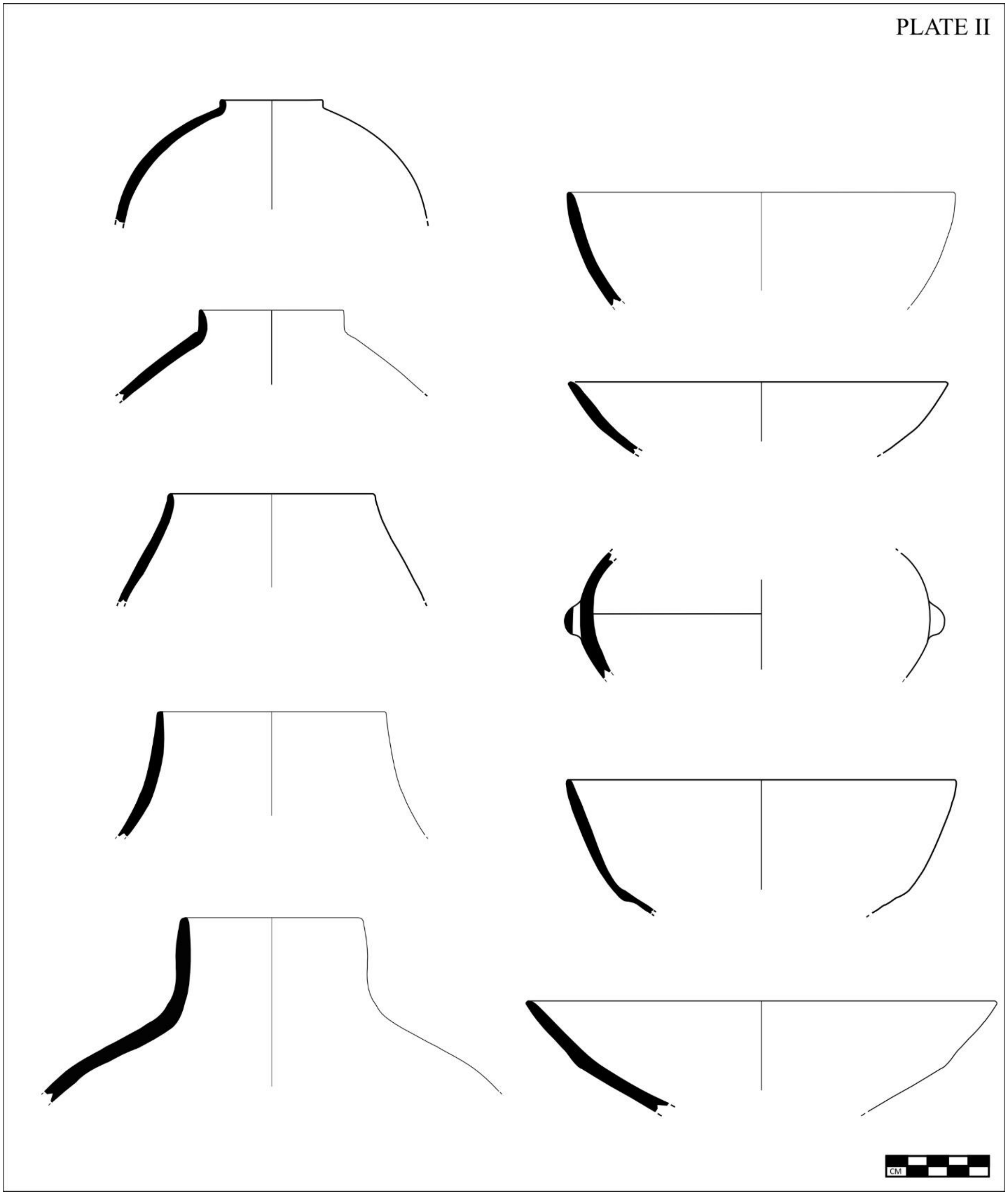
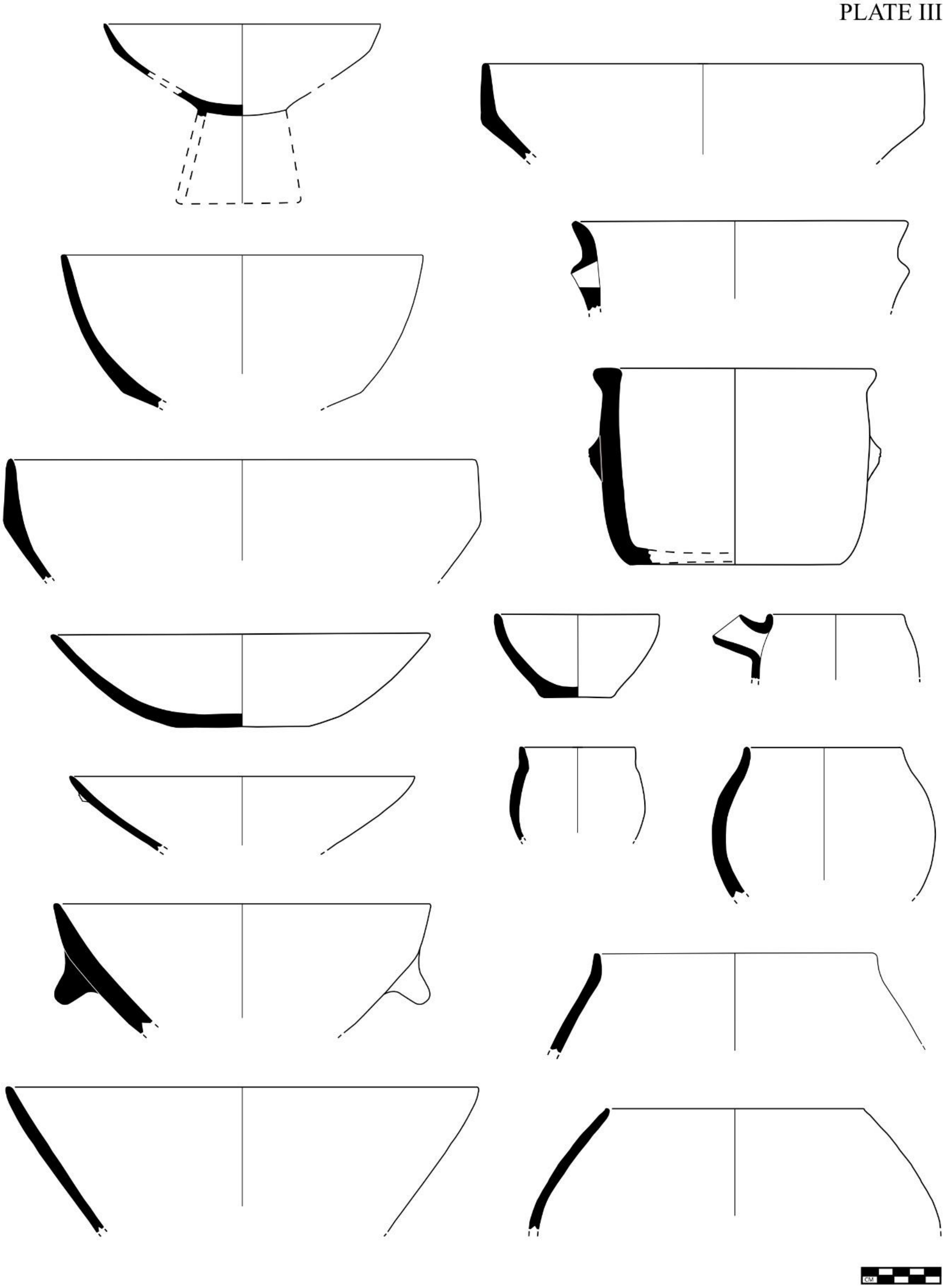


PLATE II
CM

PLATE III



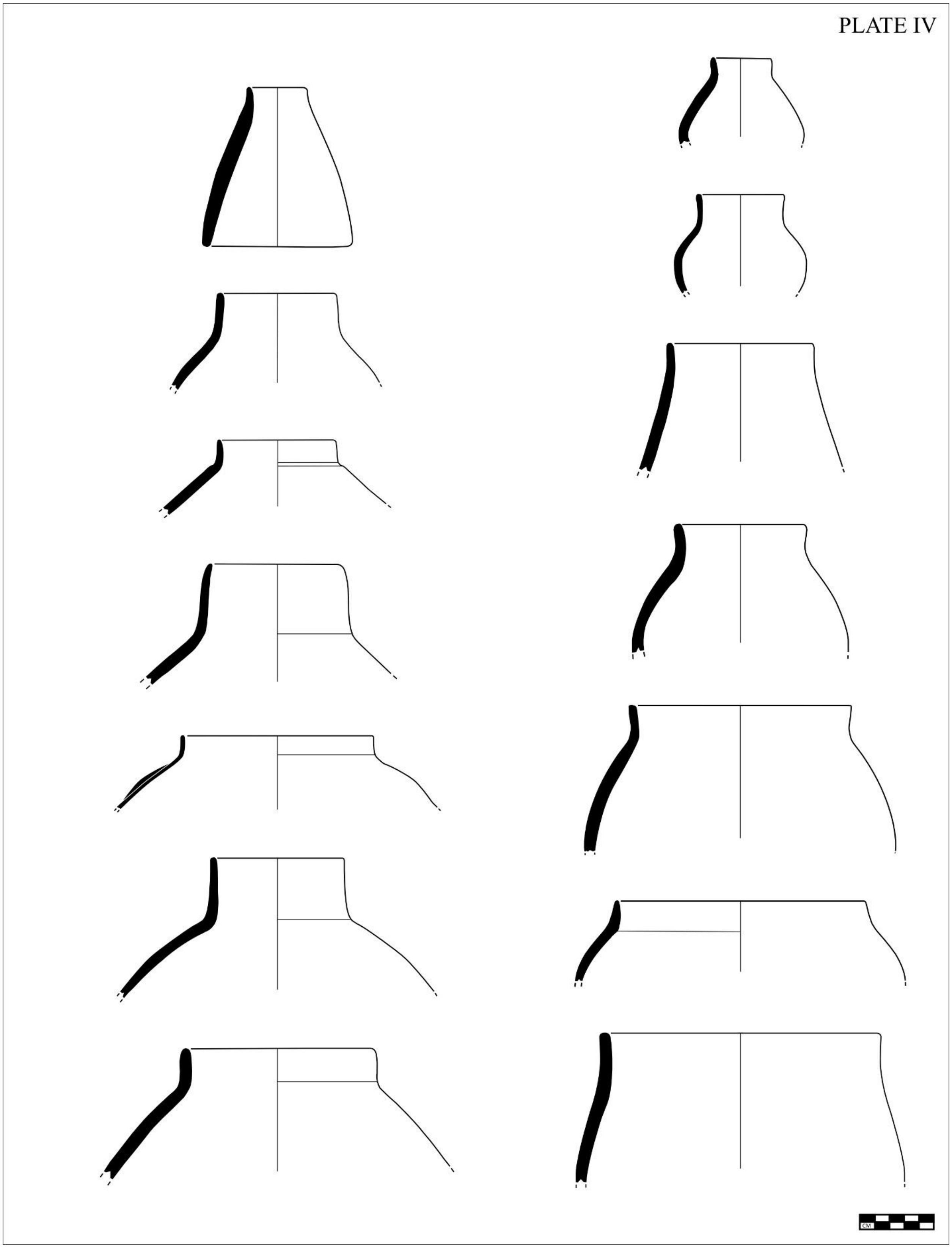


PLATE IV
CM

PLATE V

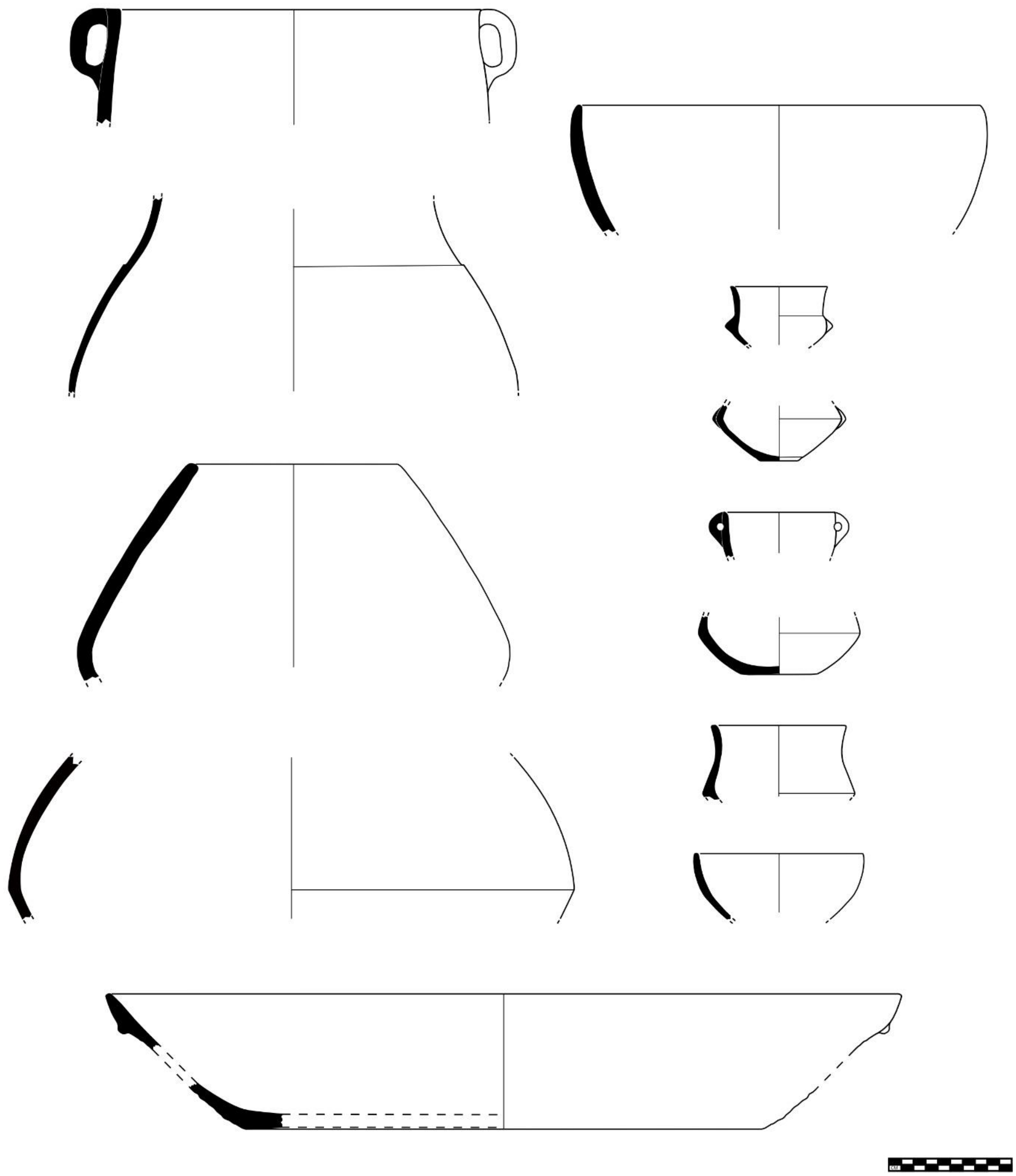
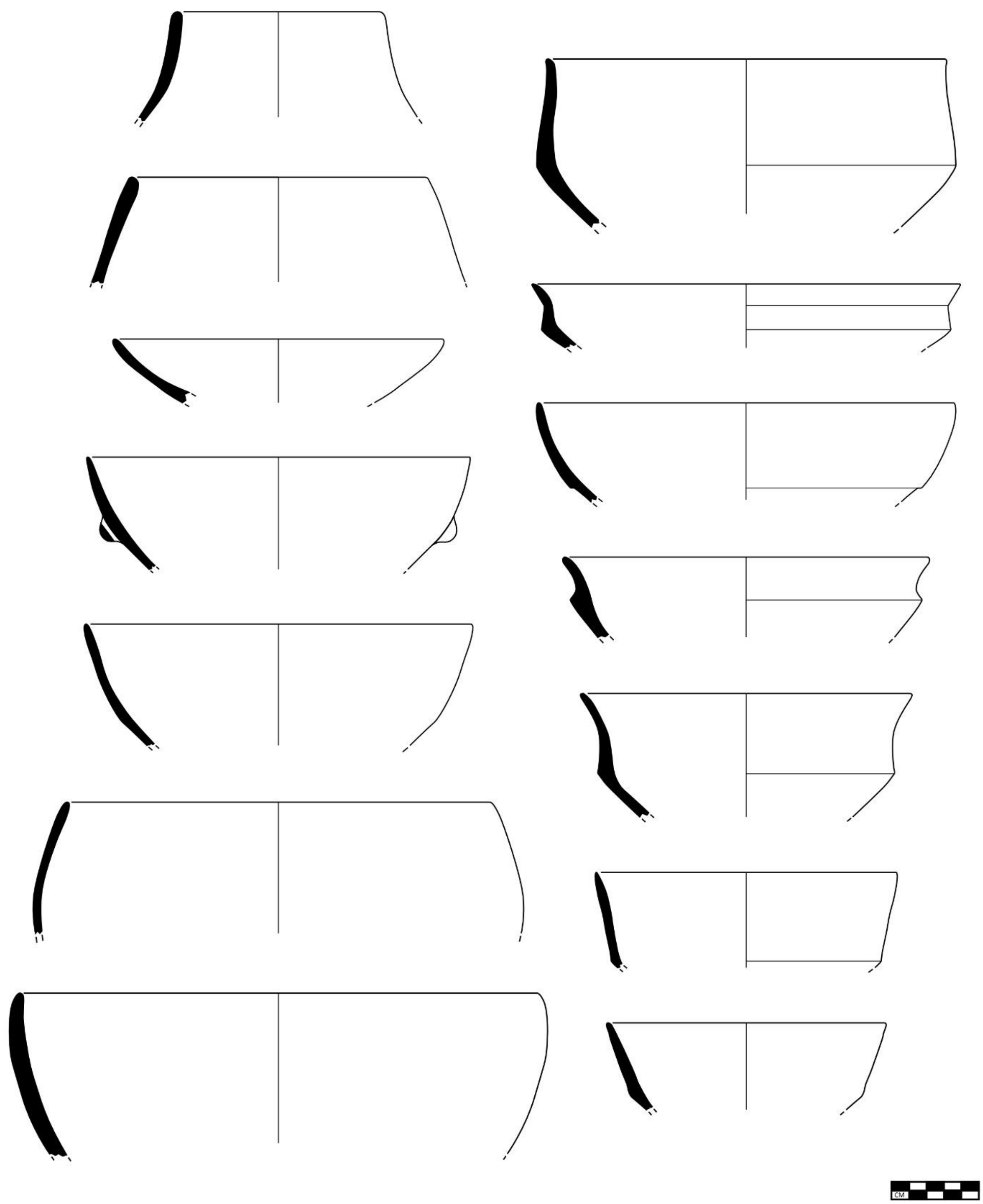


PLATE VI



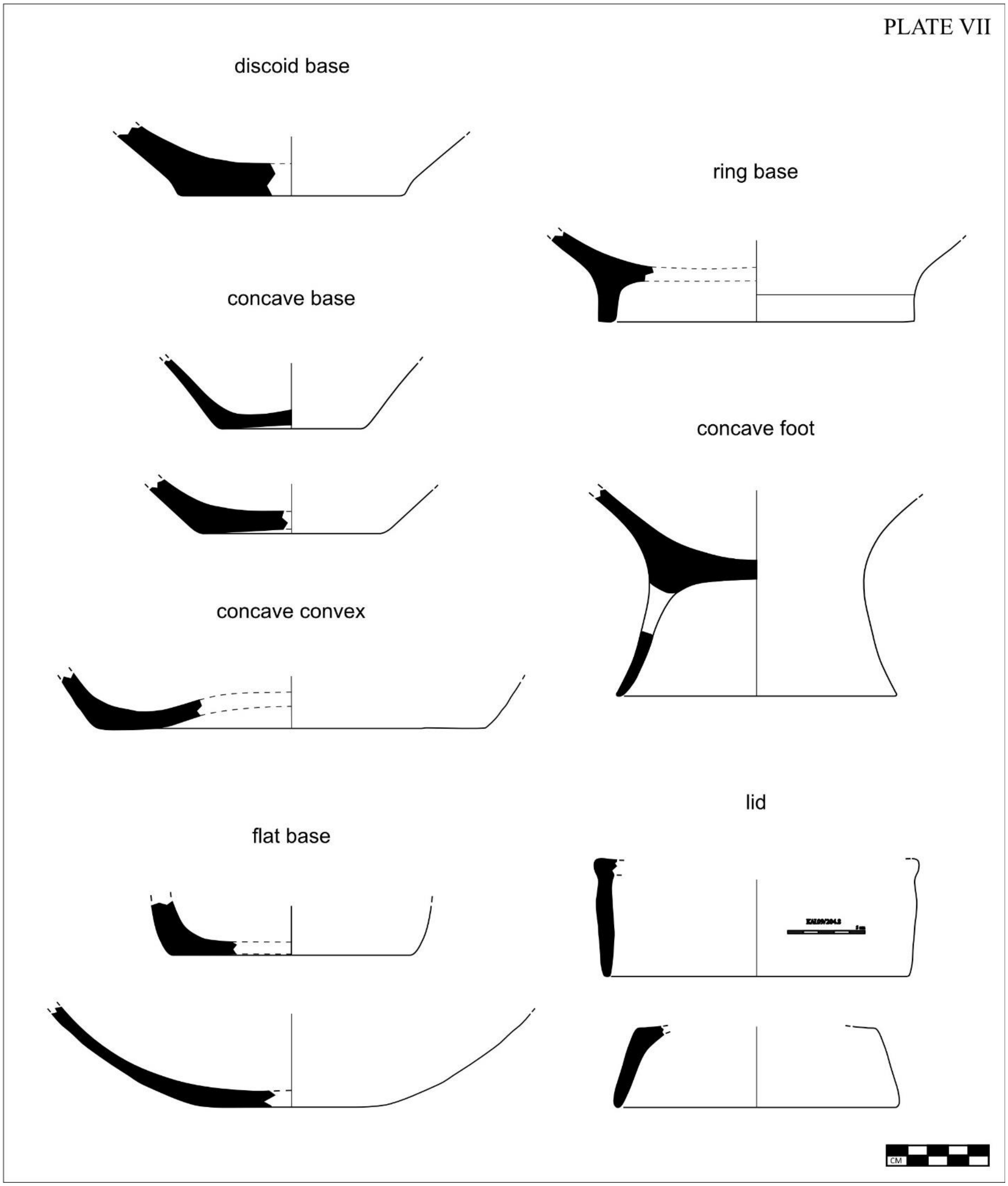
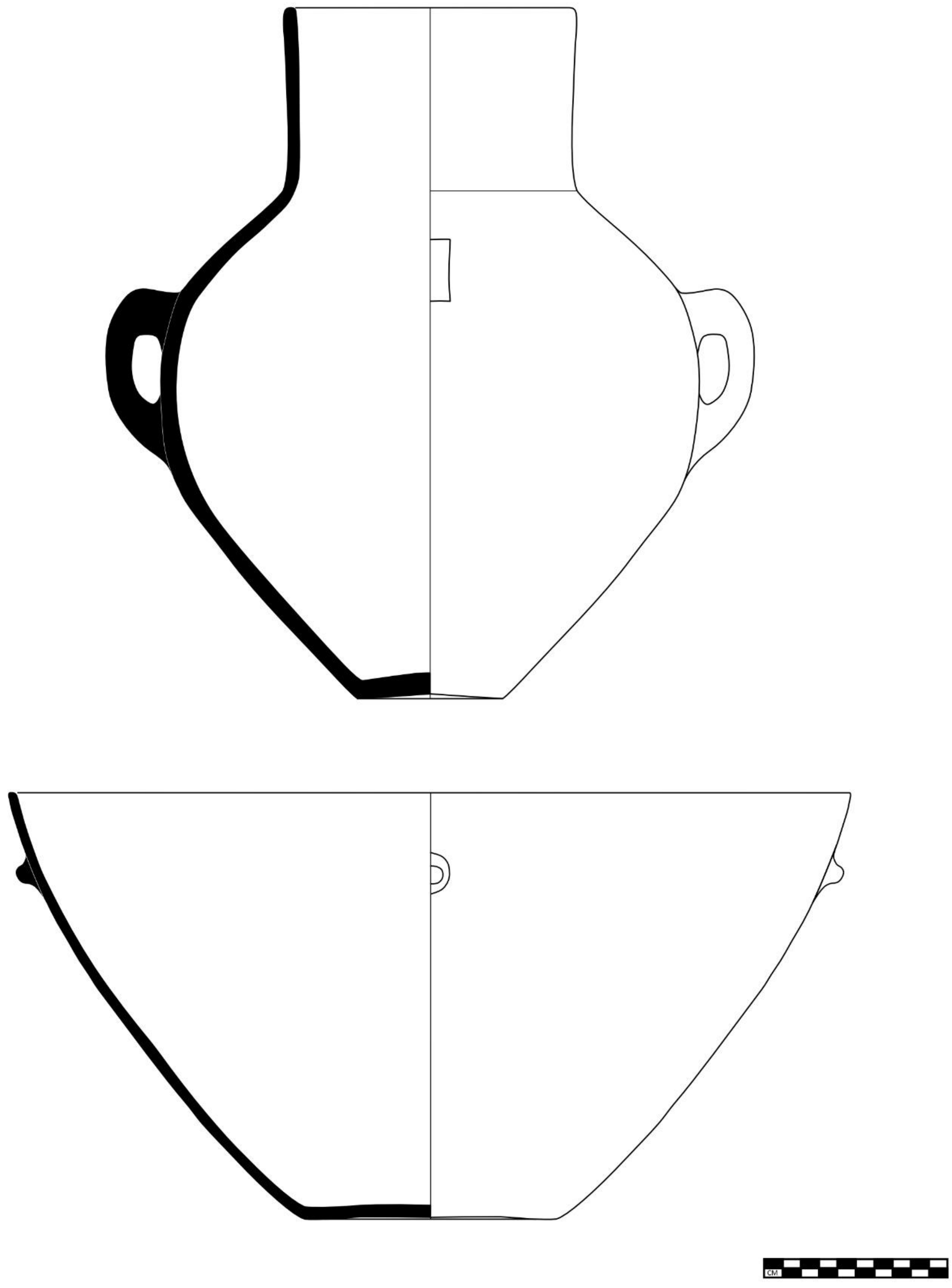
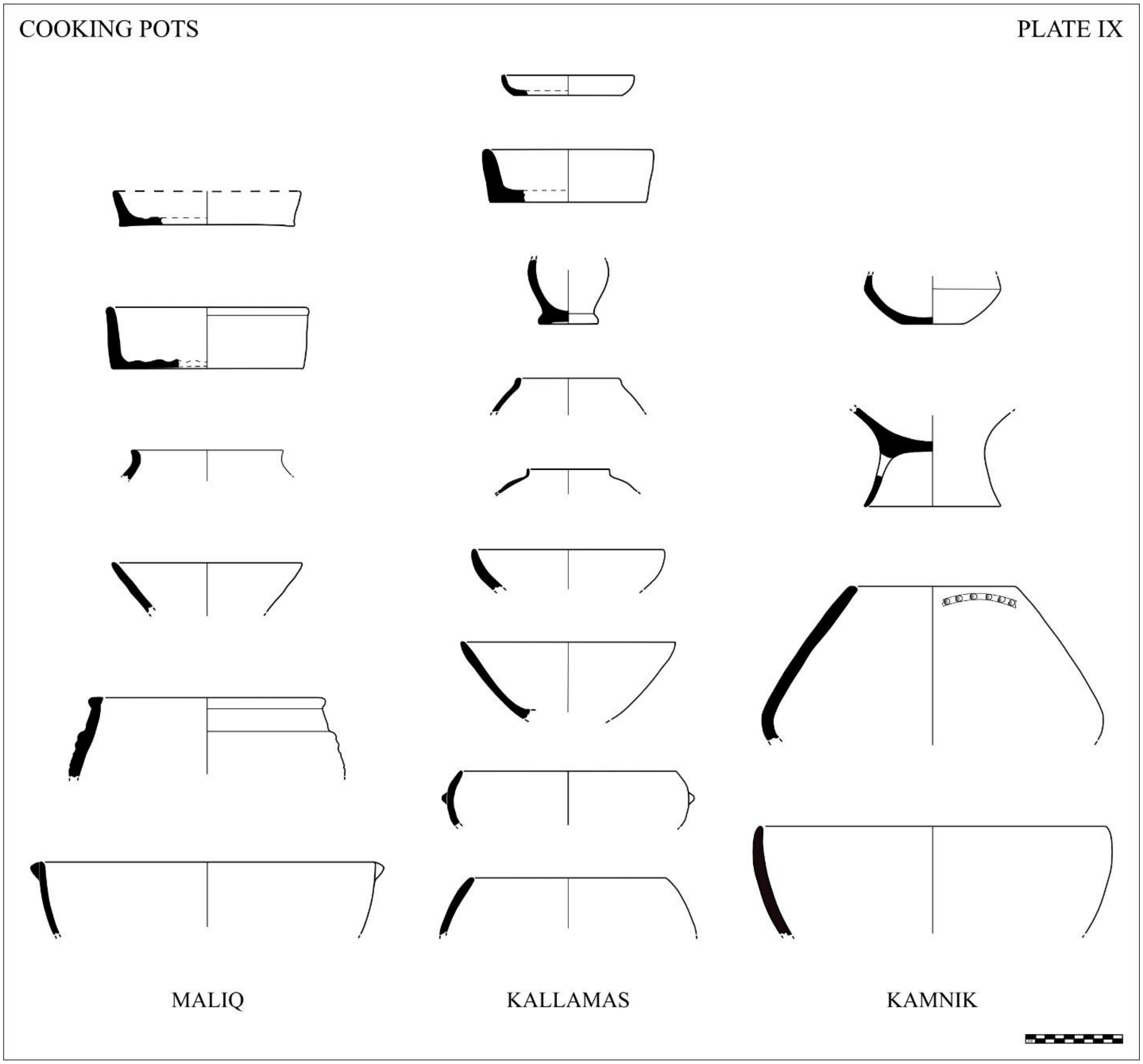


PLATE VII
discoid base
ring base
concave base
concave foot
concave convex
lid
flat base
CM

KAMNIK

PLATE VIII



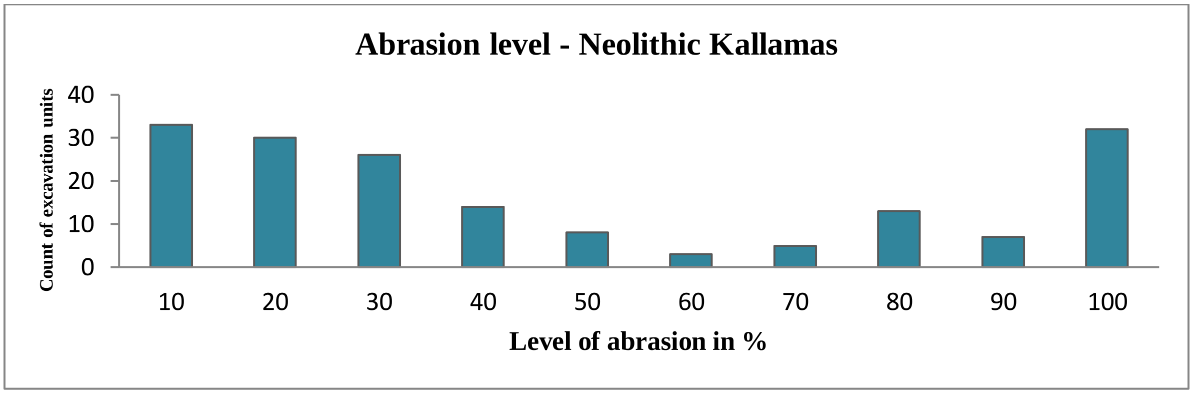


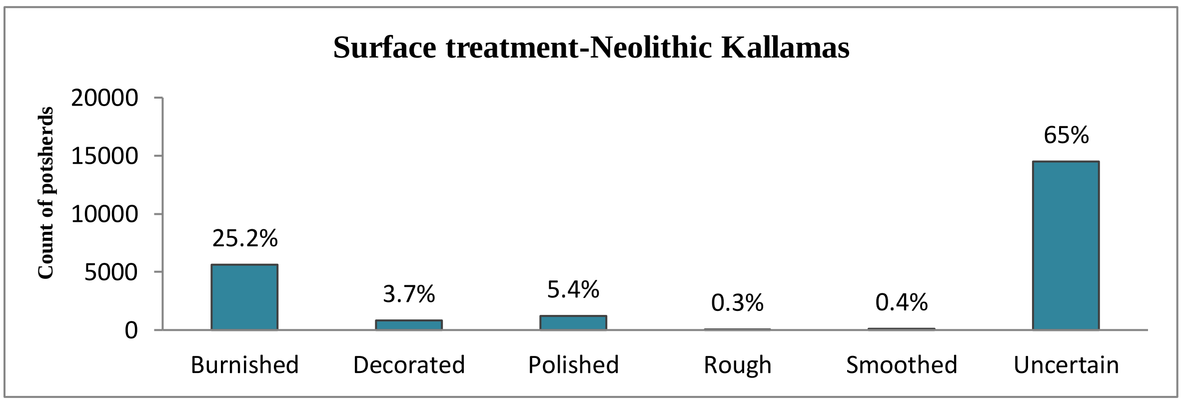
COOKING POTS
PLATE IX
MALIQ
KALLAMAS
KAMNIK

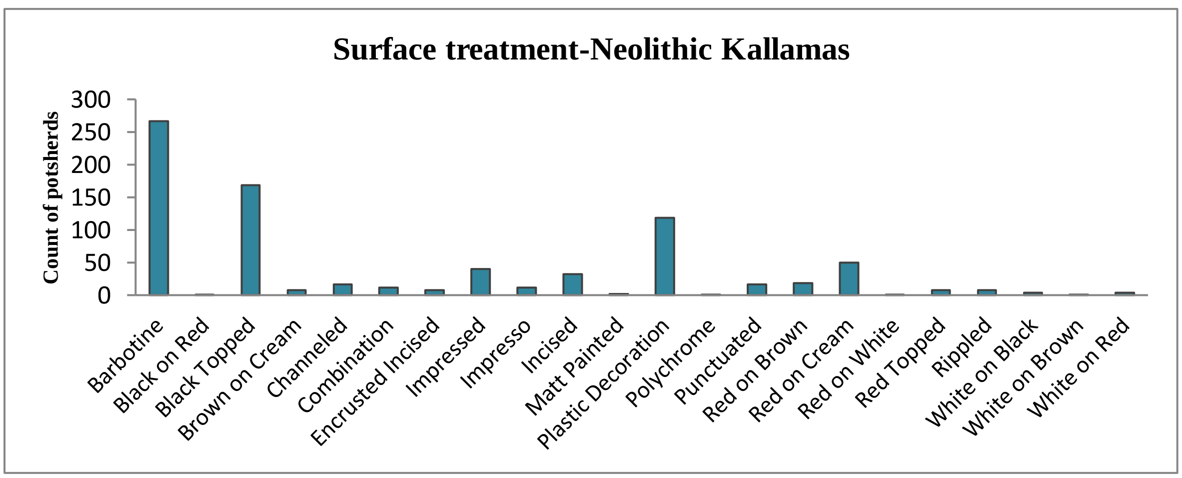
Appendix C

Graphs

C-1. Neolithic Kallamas, abrasion level, and ware categories.

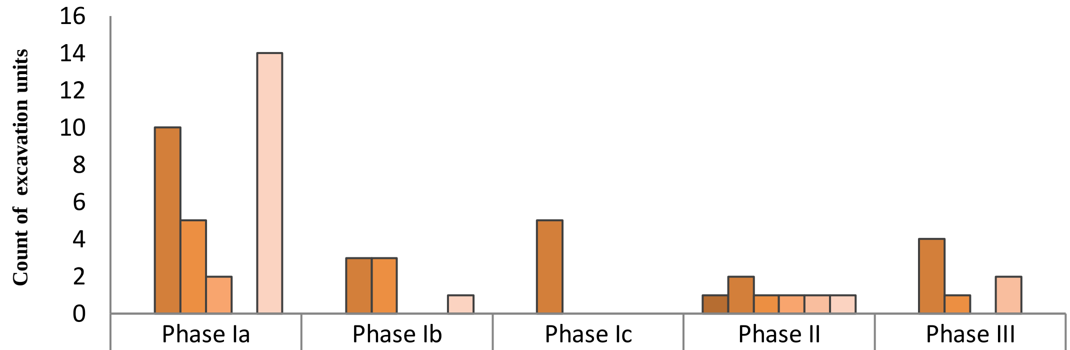






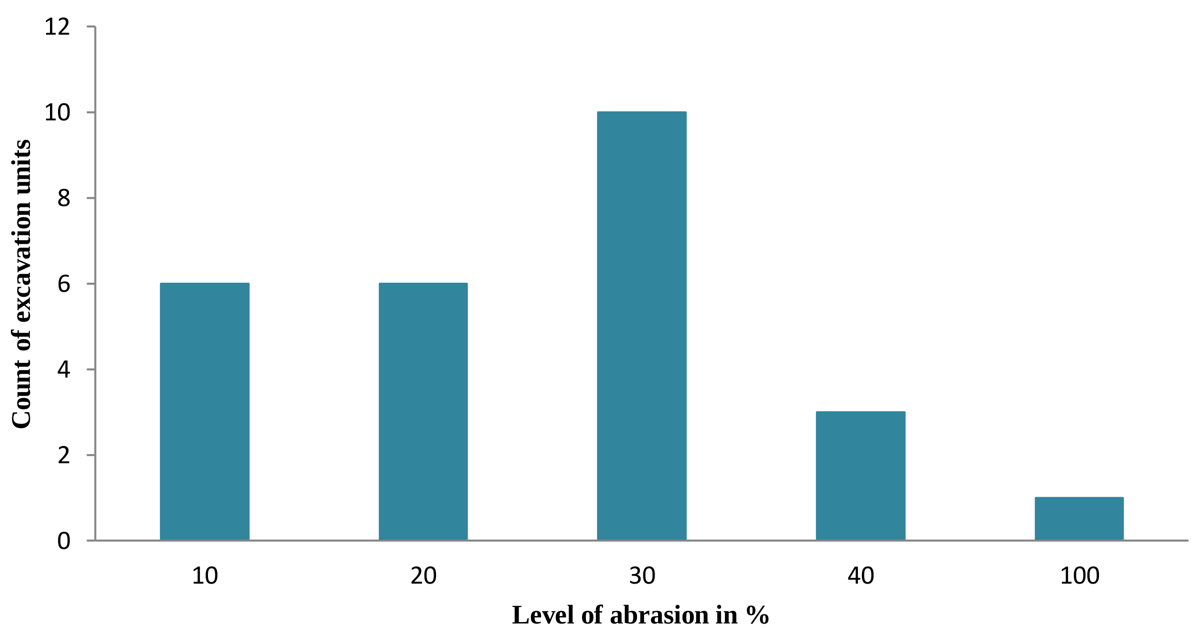
C-2. Late Neolithic Kallamas, sherd size, and abrasion level.

Sherds size - Neolithic Kallamas, Trench C1



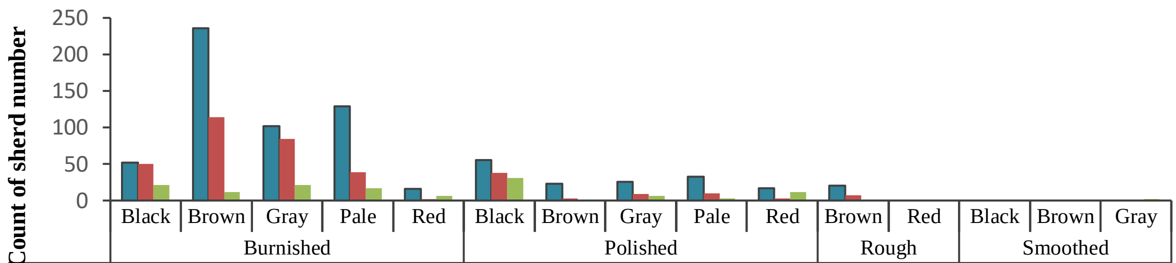
	Phase Ia	Phase Ib	Phase Ic	Phase II	Phase III
Large	0	0	0	1	0
Medium	10	3	5	2	4
Medium & Large	5	3	0	1	1
Small	2	0	0	1	0
Small & Large	0	0	0	1	2
Small & Medium	14	1	0	1	0

Abrasion level - Late Neolithic, Trench C1

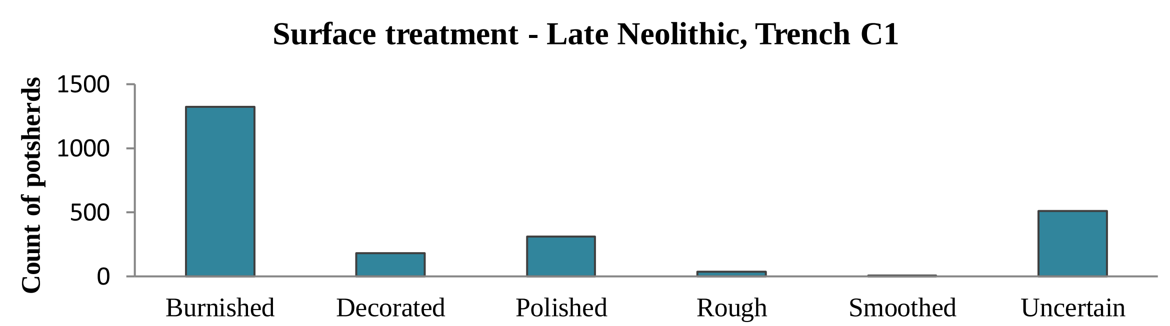


C-3. Surface treatment of the vessels.

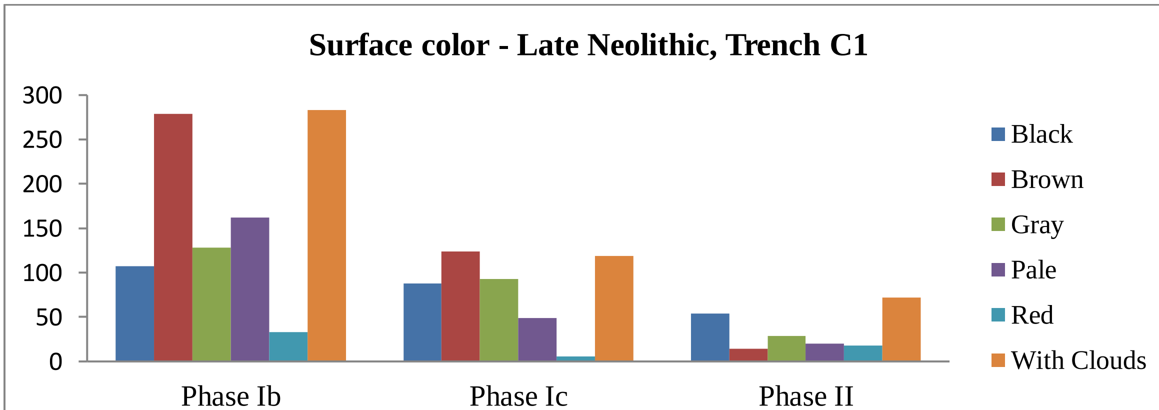
Surface treatment vs color- Neolithic Kallamas, trench C1

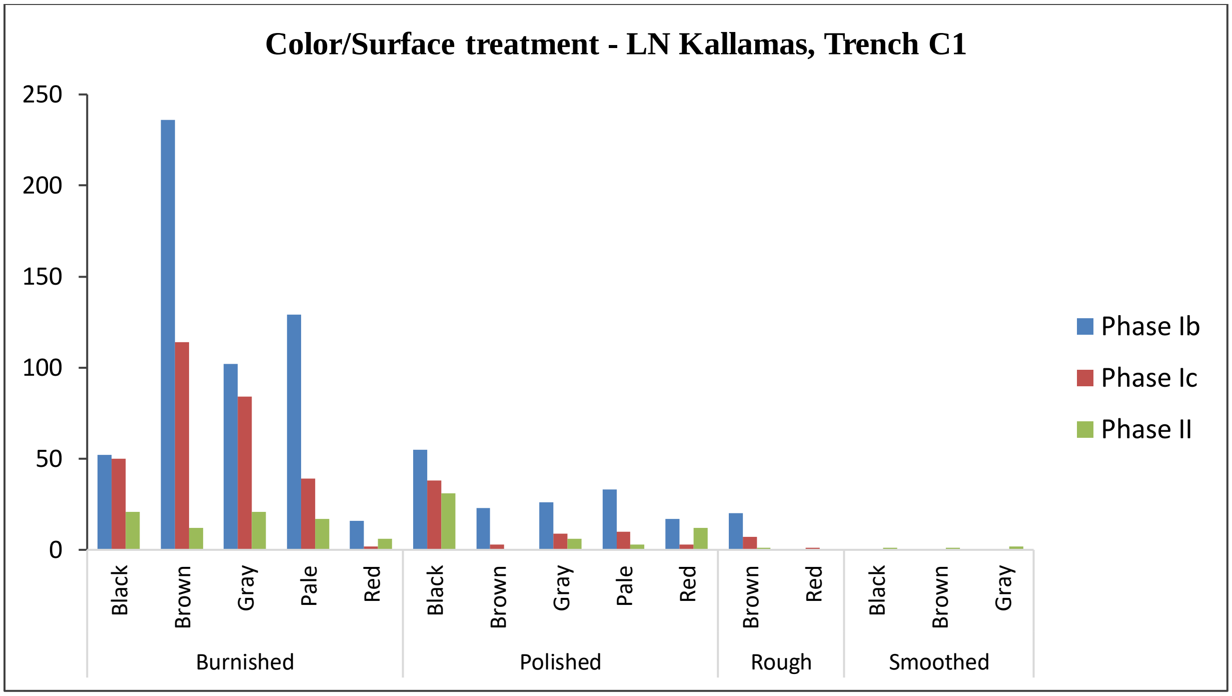


	Burnished					Polished					Rough		Smoothed		
	Black	Brown	Gray	Pale	Red	Black	Brown	Gray	Pale	Red	Brown	Red	Black	Brown	Gray
Phase Ib	52	236	102	129	16	55	23	26	33	17	20				
Phase Ic	50	114	84	39	2	38	3	9	10	3	7	1			
Phase II	21	12	21	17	6	31		6	3	12	1		1	1	2

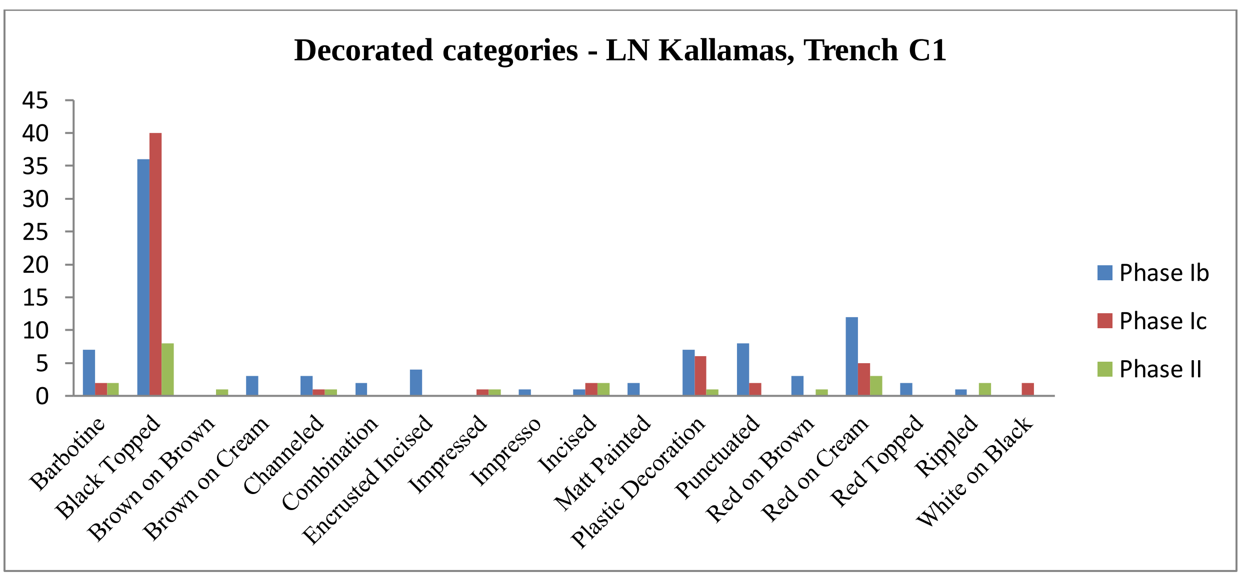


C-4. Surface color.

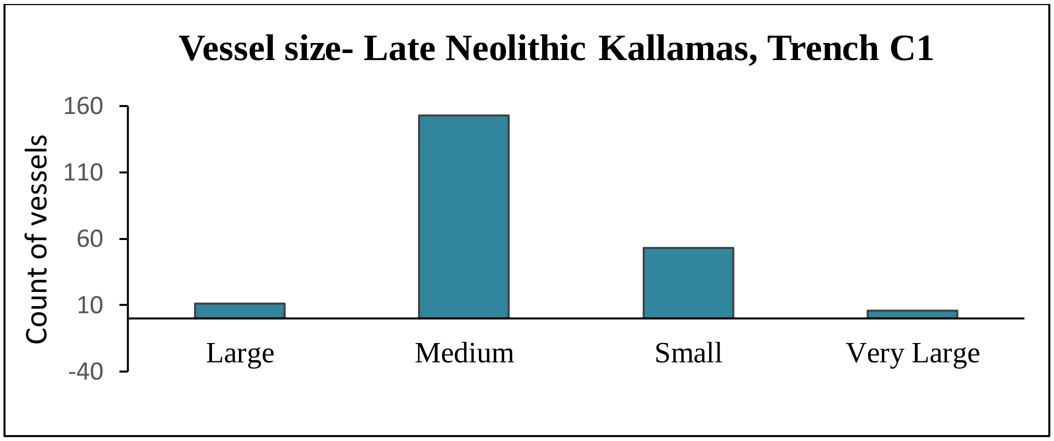


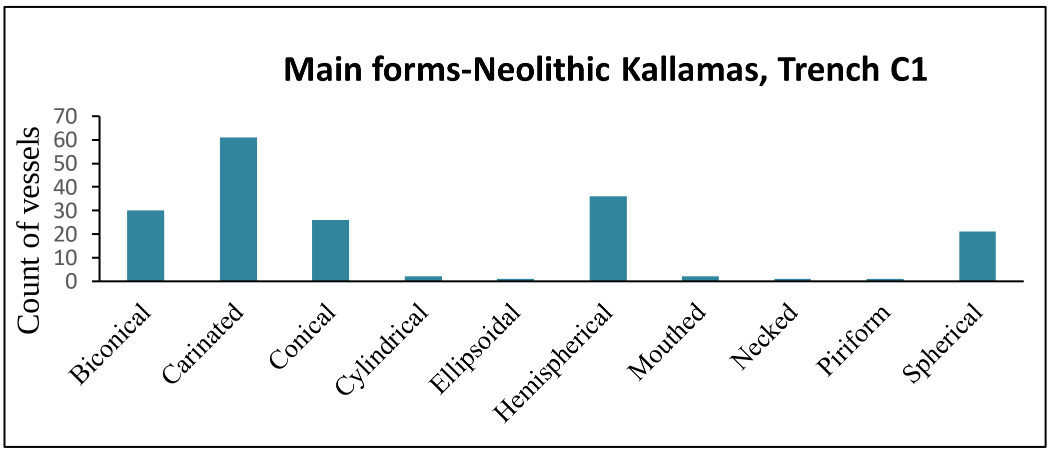


C-5. Decorated categories.

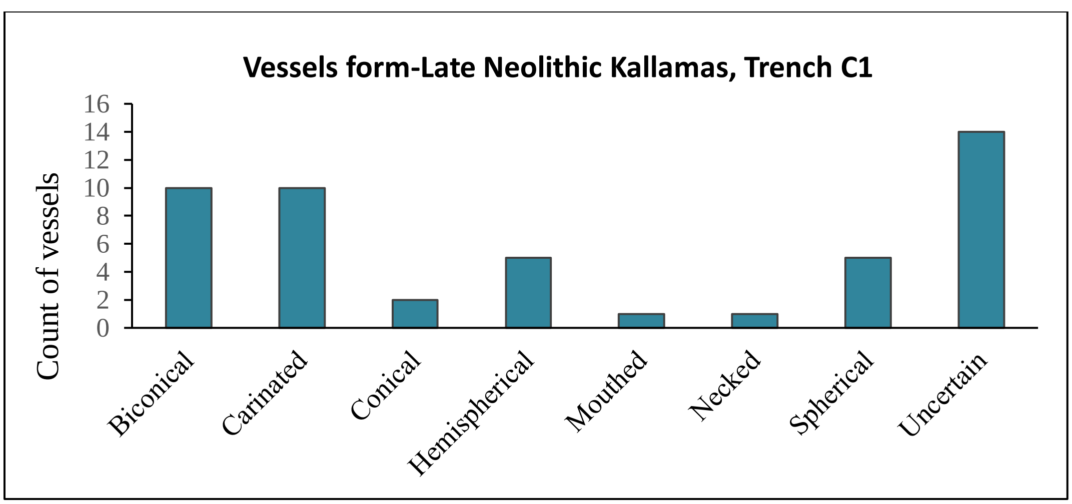


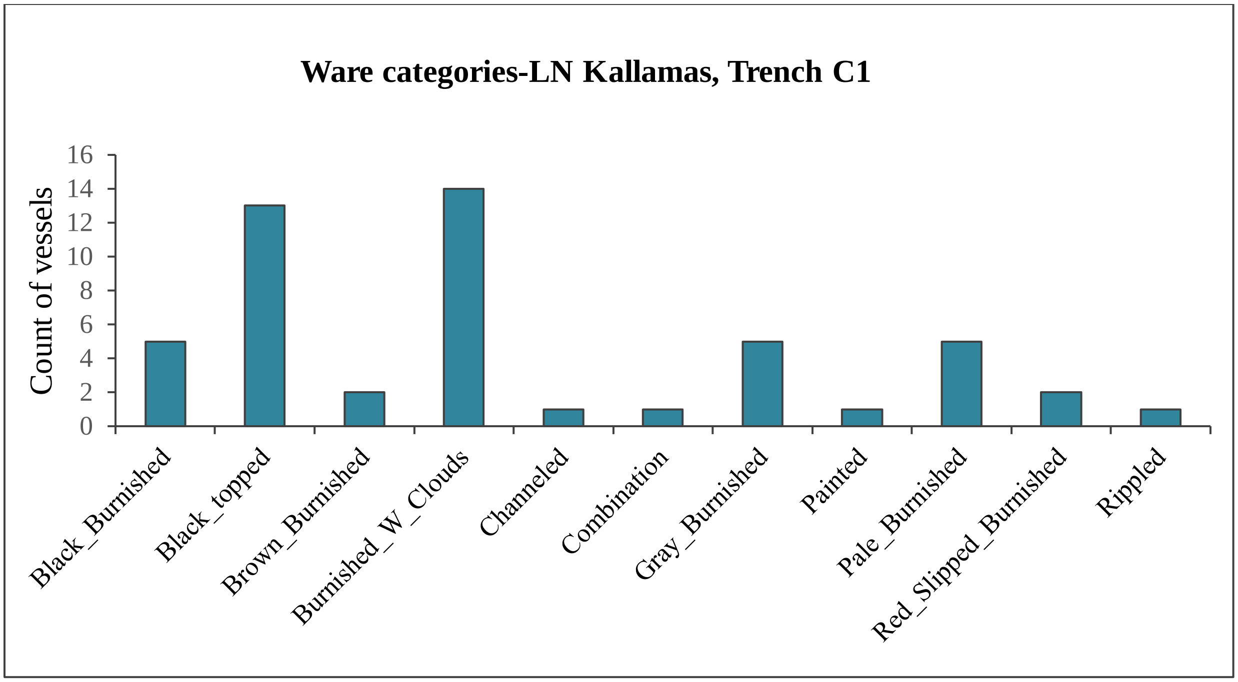
C-6. Vessels size.



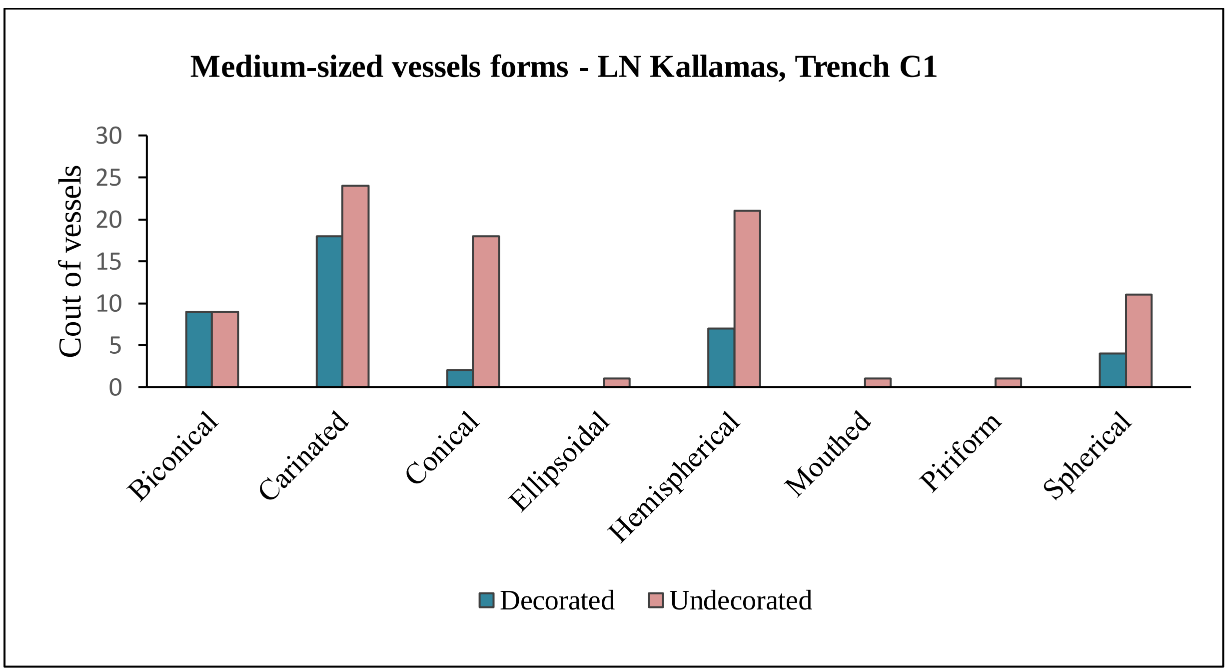


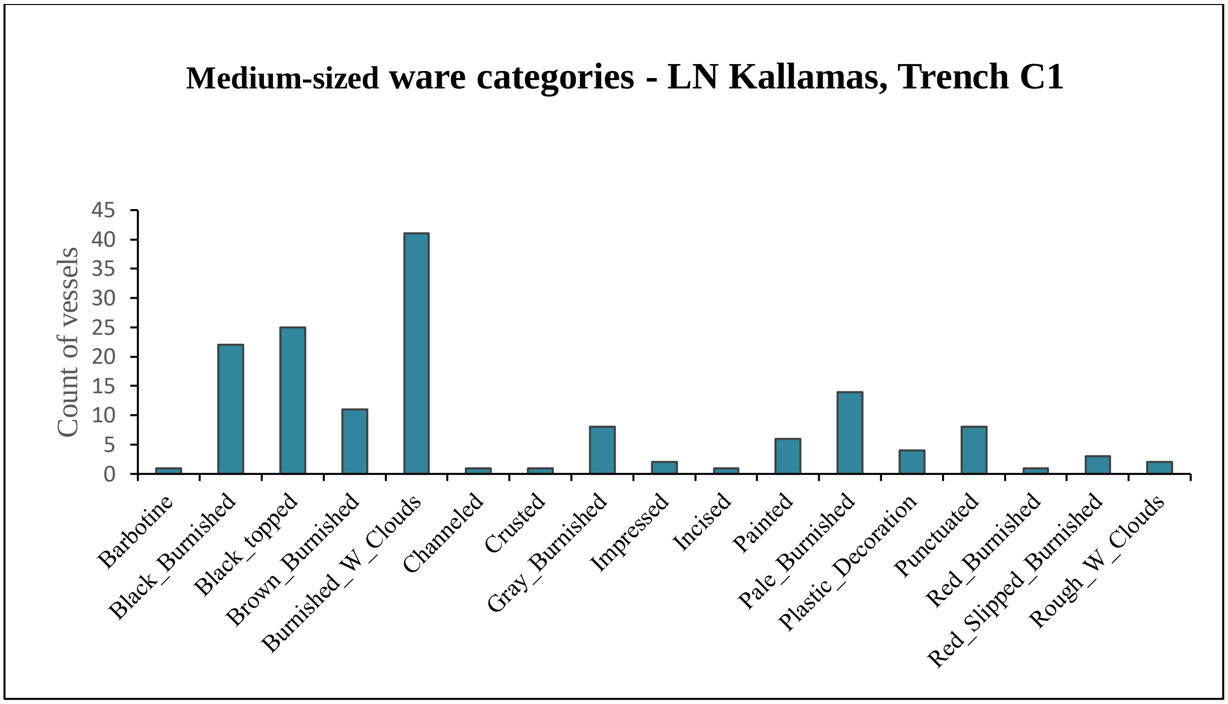
C-7. Small-sized vessels from Late Neolithic Kallamas.



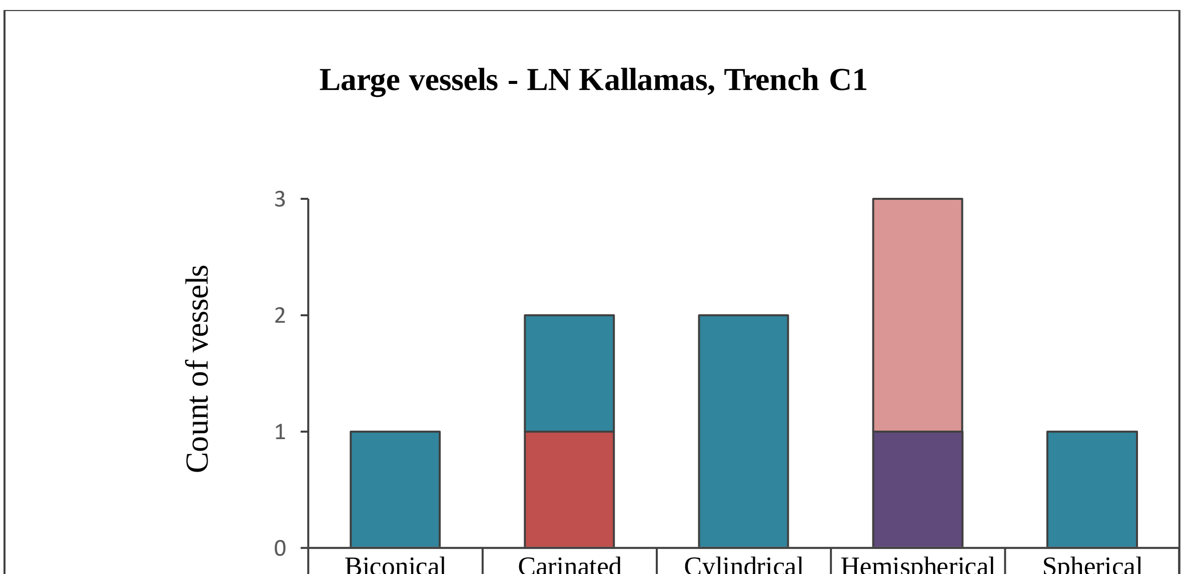


C-8. Medium-sized vessels from Late Neolithic Kallamas.



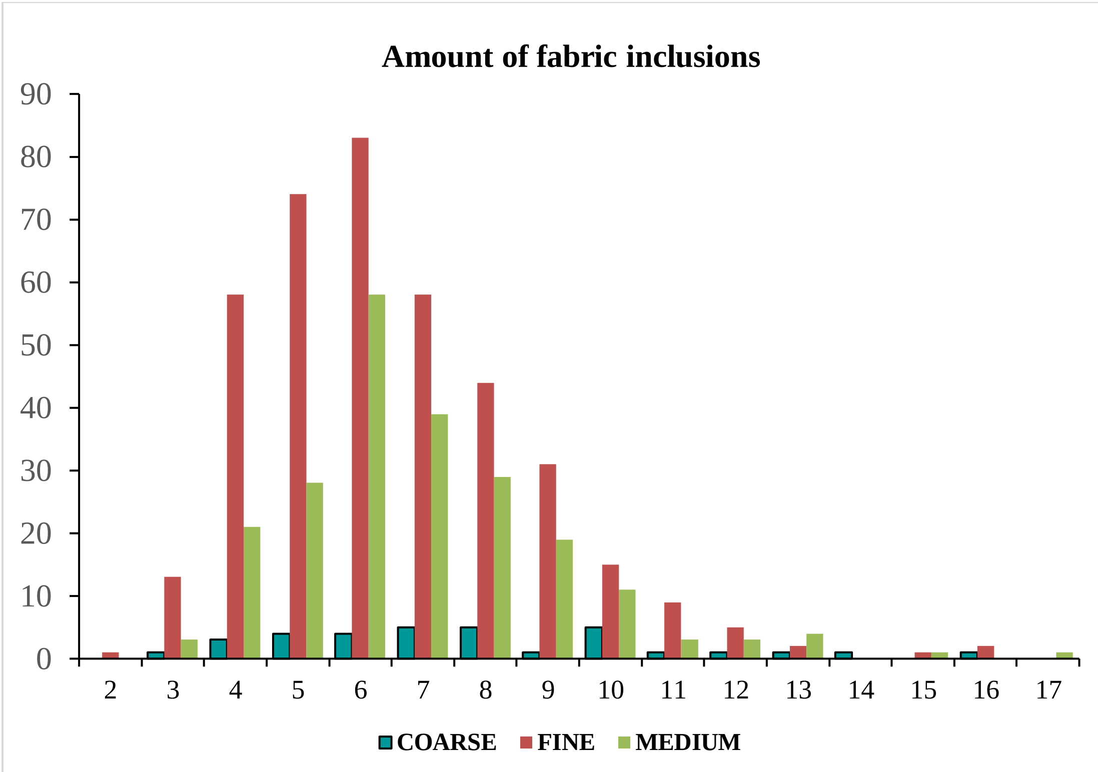


C-9. Large vessels from Late Neolithic Kallamas.

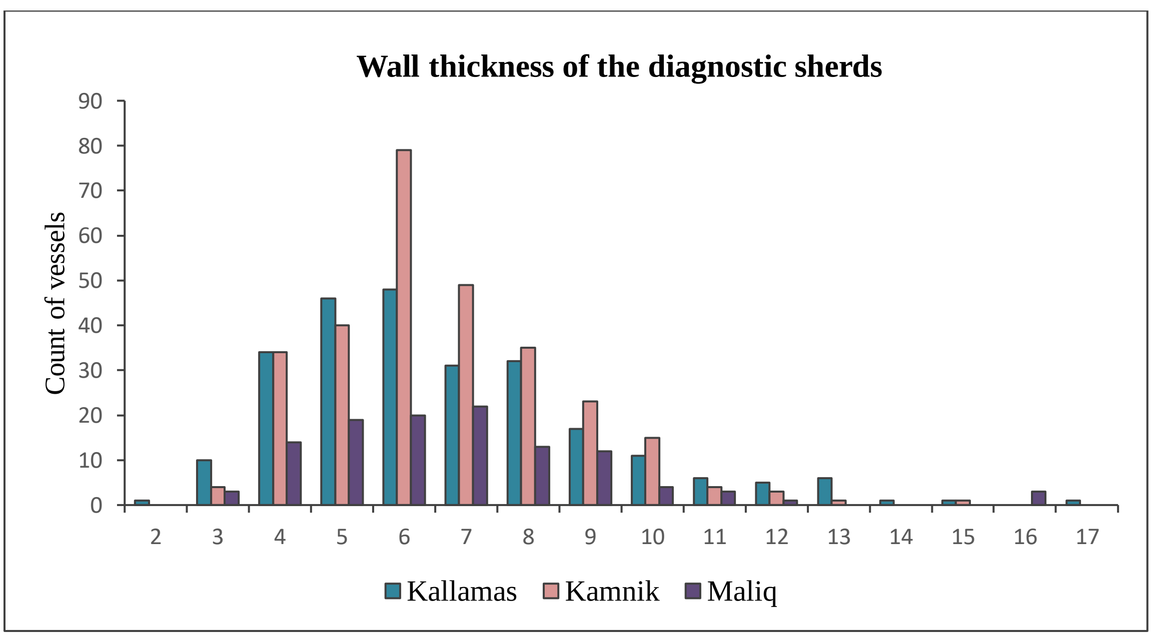


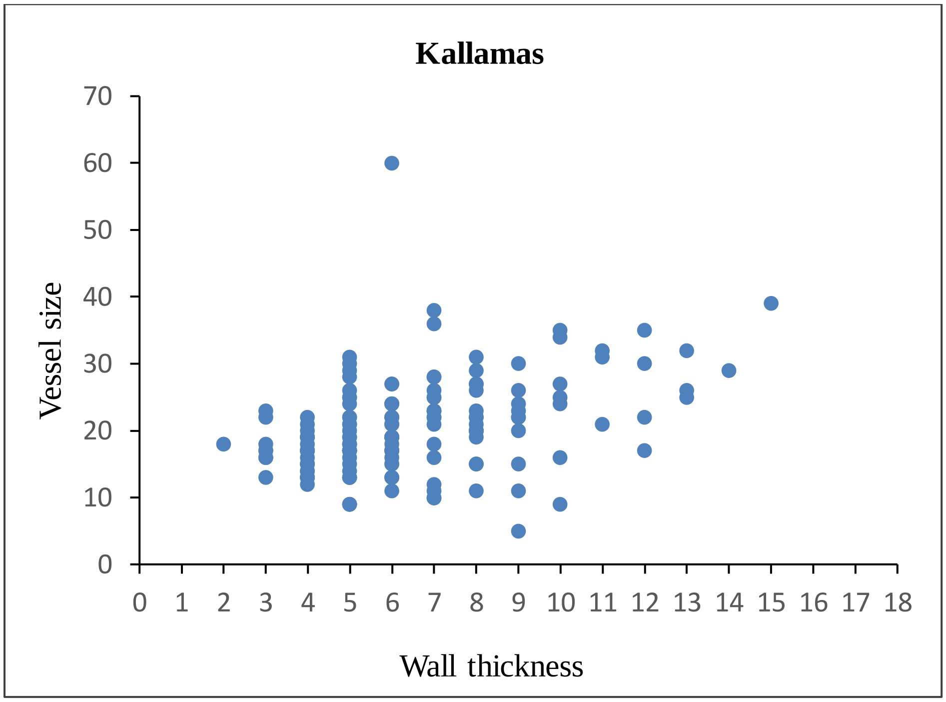
	Biconical	Carinated	Cylindrical	Hemispherical	Spherical
Burnished_W_Clouds	1	1	2	0	1
Brown_Burnished	0	0	0	2	0
Black_topped	0	1	0	0	0
Black_Burnished	0	0	0	1	0

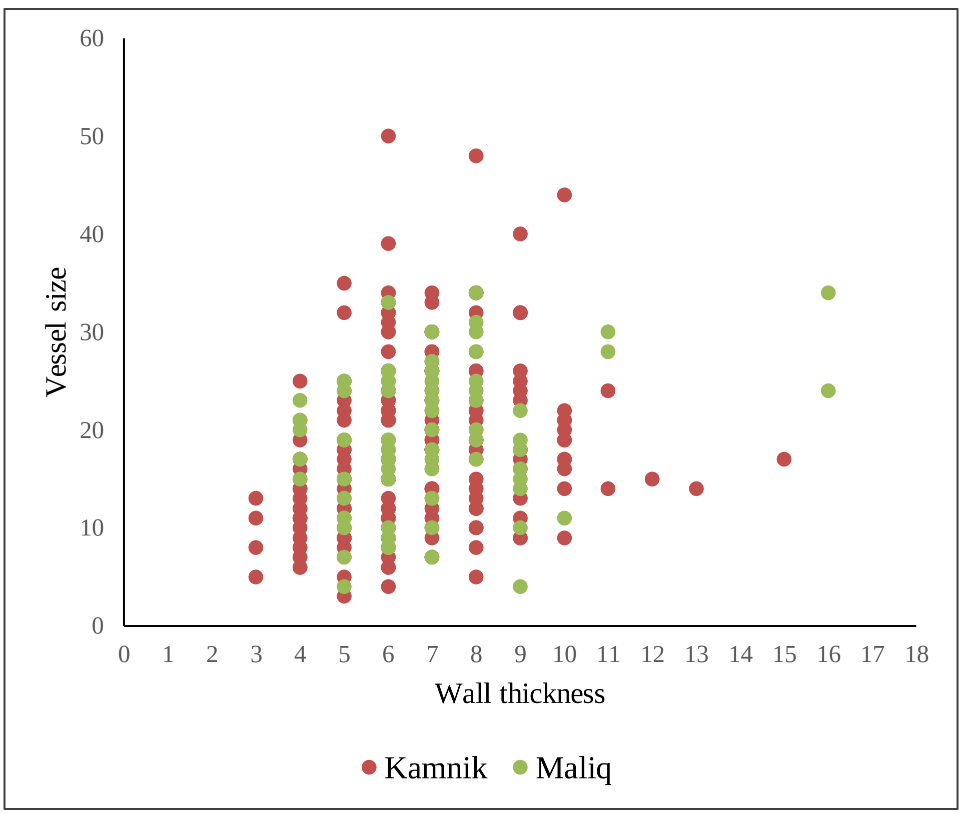
C-10. Inclusions amount within the fabric of the diagnostic sherds.

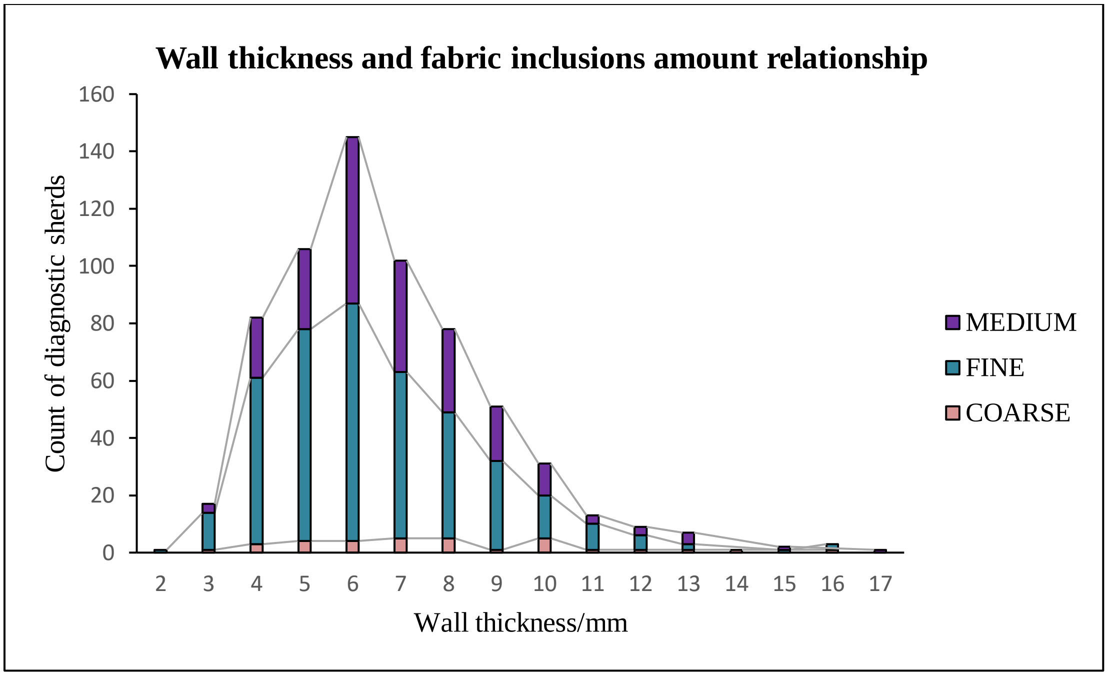


C-11. Wall thickness of the diagnostic sherds.

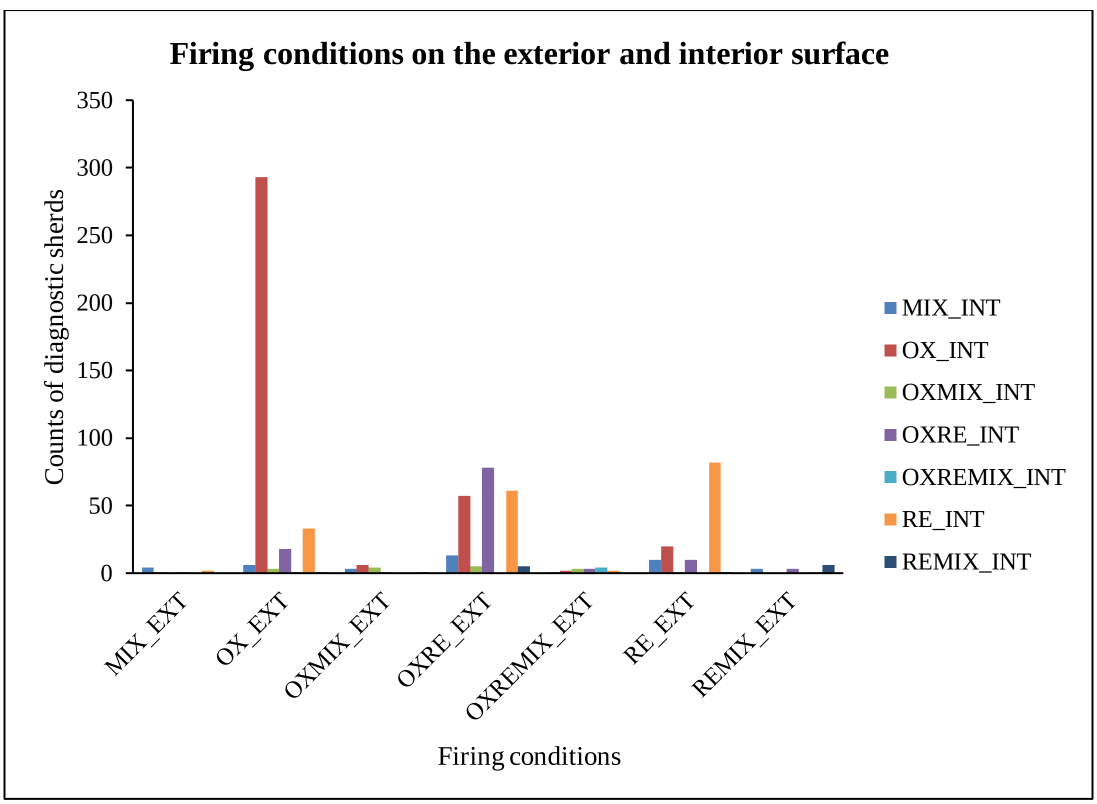


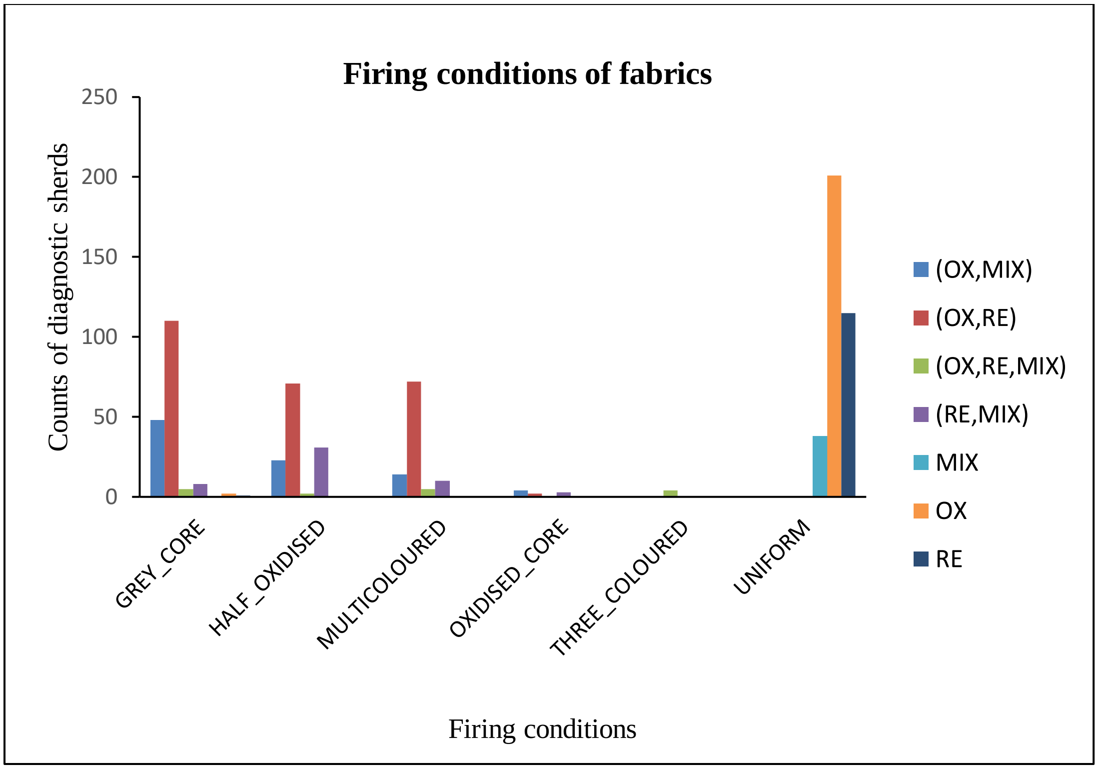

Kallamas
Vessel size
Wall thickness
0
10
20
30
40
50
60
70
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18


Vessel size
Wall thickness
0
10
20
30
40
50
60
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Kamnik
Maliq

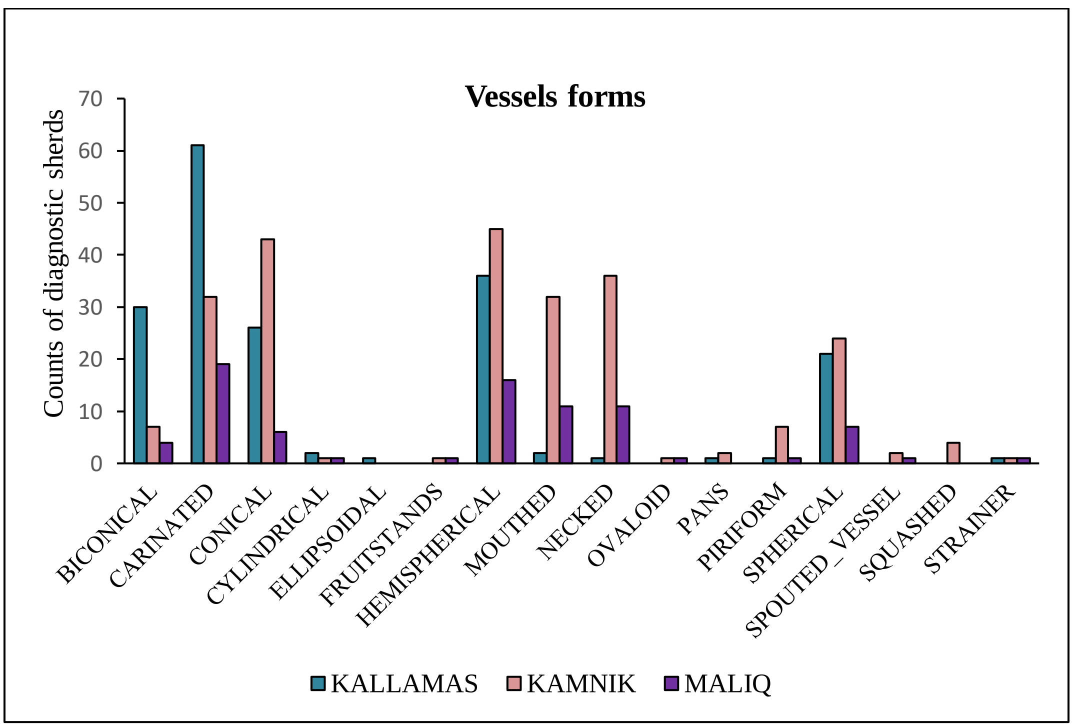


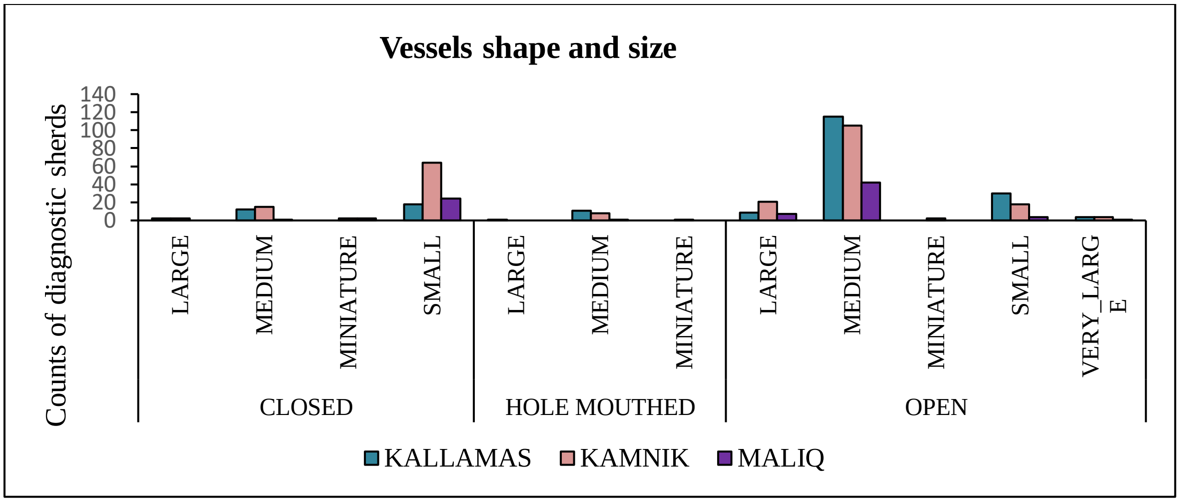
C-12. Firing conditions.



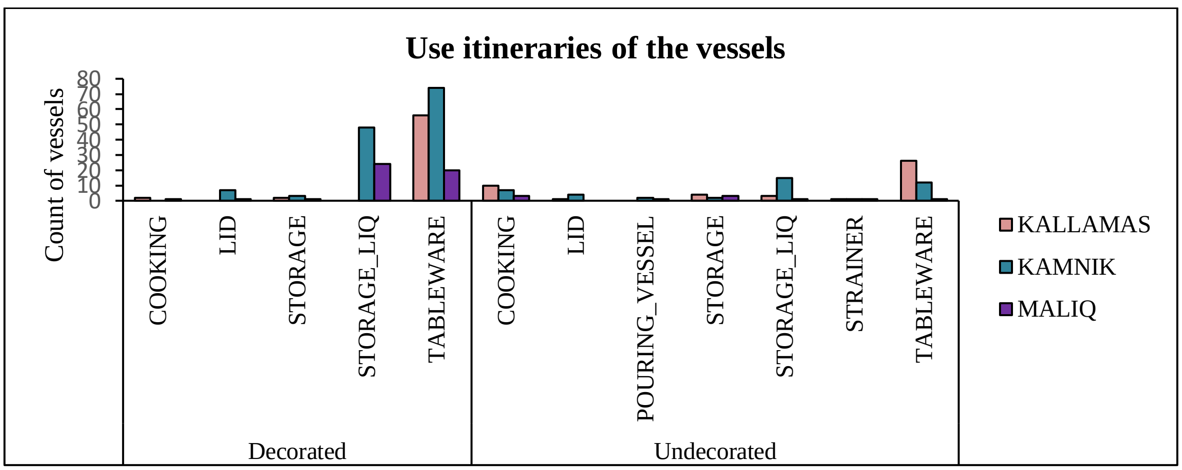


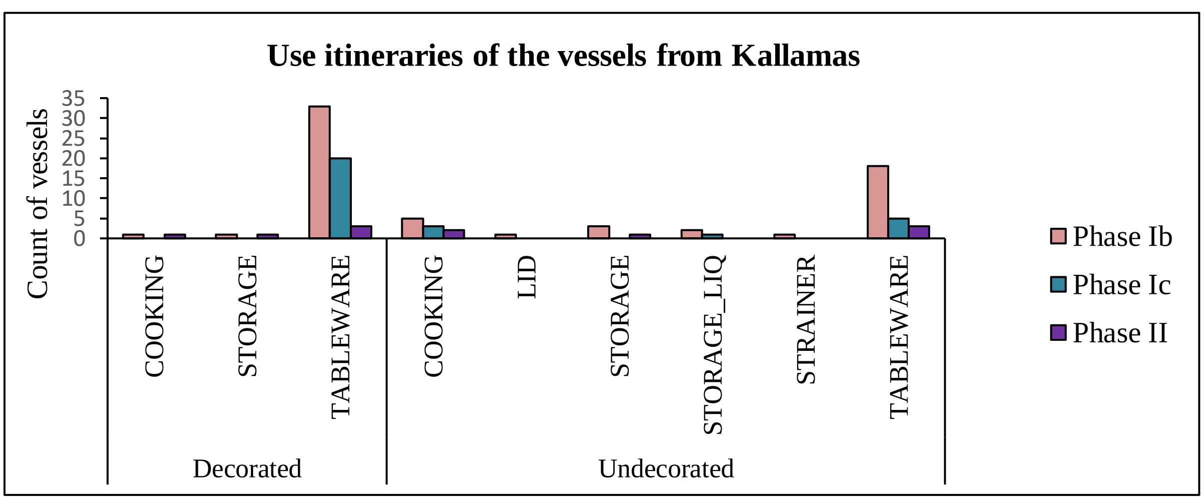
C-13. Morphology of the vessels.

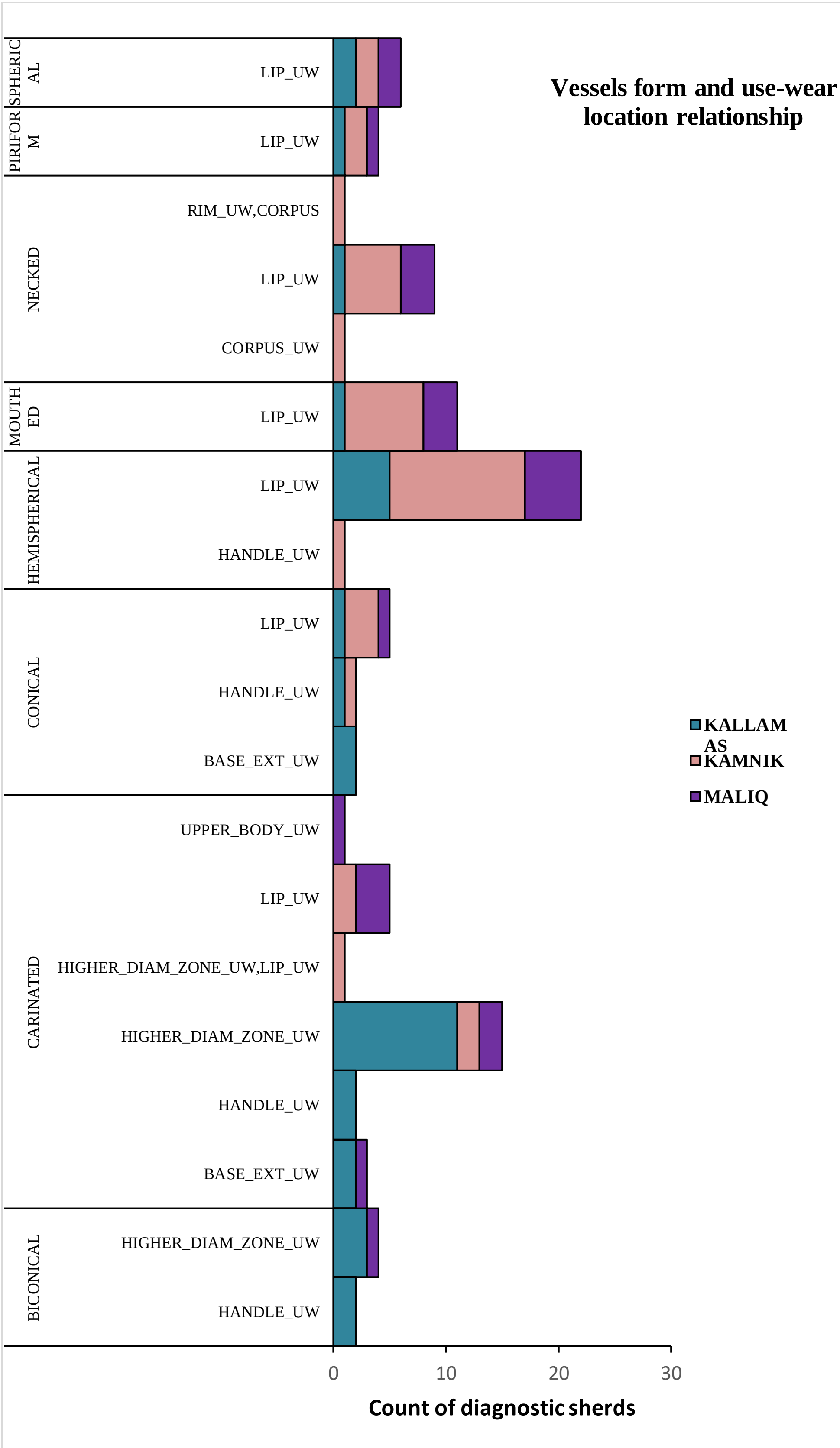




C-14. Use itineraries of the vessels.






Vessels form and use-wear location relationship
SPHERICAL
PIRIFORM
NECKED
MOUTHED
HEMISPHERICAL
CONICAL
CARINATED
BICONICAL
LIP_UW
LIP_UW
RIM_UW,CORPUS
LIP_UW
CORPUS_UW
LIP_UW
LIP_UW
HANDLE_UW
LIP_UW
HANDLE_UW
BASE_EXT_UW
UPPER_BODY_UW
LIP_UW
HIGHER_DIAM_ZONE_UW,LIP_UW
HIGHER_DIAM_ZONE_UW
HANDLE_UW
BASE_EXT_UW
HIGHER_DIAM_ZONE_UW
HANDLE_UW
0
10
20
30
Count of diagnostic sherds
KALLAMAS
KAMNIK
MALIQ

Appendix D

Tables

D-1. Spatial distribution of the ceramic sherds from trench C1, Kallamas.

Spatial density of potsherds-Trench C1-Kallamas					
Phases	**Sherds count**	**Weight (gr)**	**Volume (m3)**	**Density (sherds/ m3)**	**Sherds average weight (gr)**
Phase Ib-c	2084	33310	3.6	579	26.2
Phase II	280	12470	1.4	200	44.5
Phase III	279	8910	1.2	248	40

D-2. Table with the technological features of the samples used for petrographic analysis.

Sample Id.	Fabric group	Ware category	Surface Munsell color	Decoration Munsell color	Decoration B Munsell color	Fabric Munsell color	Fabric Munsell refiring at 900°C	Fabric Munsell refiring at 1050°C	Wall thickness/ mm	Firing atmosphere
KA01	3B	Brown on cream jar	2.5Y6/4 light yellowish brown	5YR3/1 very dark gray	—	10YR5/3 brown	5YR5/6 yellowish red	2.5YR5/8 red	9	Oxidized
KA02	3A	Black on red jar	2.5YR5/6 red	5YR4/2 dark reddish gray	—	10YR5/2 grayish brown	—	—	8	Gray core
KA03	3C	Brown on cream open vessel	10YR6/3 pale brown	5YR4/1 dark gray	—	10YR5/2 grayish brown	—	—	10	Reduced
KA04	3C	Brown on brown storage vessel	7.5YR6/4 light brown	7.5YR4/2 brown	—	10YR6/2 light brownish gray	2.5YR6/4 light reddish brown	2.5YR5/6 red	15	Gray core
KA05	3A	Brown on brown storage vessel	7.5YR6/4 light brown	5YR3/1 very dark gray	—	5Y6/2 light olive gray	7.5YR6/4 light brown	2.5YR5/8 red	14	Half oxidized
KA06	3C	Red on cream storage vessel	10YR6/3 pale brown	5YR4/3 reddish brown	—	2.5Y5/1 gray	7.5YR6/4 light brown	2.5YR5/8 red	15	Gray core

KA07	1A	Red slipped jar	10R4/6 red	—	—	10YR5/1 gray	5YR6/4 light reddish brown	10R5/6 red	8	Gray core
KA08	2	Polychrome jar	5YR6/4 light reddish brown	10R4/6 red	10YR3/1 very dark gray	2.5YR5/6 red	2.5YR6/6 light red	2.5YR5/6 red	5	Oxidized
KA09	3C	Polychrome jar	10YR7/3 very pale brown	10R4/4 weak red	5YR4/2 dark reddish gray	2.5YR5/6 red	2.5YR5/6 red	2.5YR5/6 red	6	Oxidized
KA10	3B	Brown on cream jar	7.5YR6/4 light brown	10YR4/1 dark gray	—	7.5YR5/3 brown	7.5YR6/4 light brown	2.5YR5/6 red	8	Oxidized
KA11	2	Black on red jar	7.5YR6/4 light brown	5YR4/1 dark gray	—	5YR6/6 reddish yellow	5YR6/6 reddish yellow	5YR6/6 reddish yellow	9	Oxidized
KA12	2	Polychrome jar	7.5YR6/4 light brown	10YR4/4 dark yellowish brown	7.5YR3/1 very dark gray	10YR5/3 brown	7.5YR6/4 light brown	5YR6/6 reddish yellow	6	Half oxidized
KA13	3C	Polychrome jar	7.5YR6/3 light brown	2.5YR4/4 reddish brown	2.5YR3/1 dark reddish gray	10YR6/2 light brownish gray	5YR6/6 reddish yellow	5YR5/6 yellowish red	10	Half oxidized
KA14		Black on red jar	7.5YR6/4 light brown	7.5YR3/1 very dark gray	—	10YR5/1 gray	—	—		Gray core
KA15	3A	Black on red jar	7.5YR6/4 light brown	2.5YR4/2 weak red	—	2.5Y5/2 grayish brown	7.5YR6/4 light brown	—	7	Gray core
KA16	6	Burnished brown hemispherical vessel	2.5YR4/4 reddish brown	—	—	1GLEY3/N very dark gray	5YR5/4 reddish brown	—	10	Reduced
KA17	1D	Burnished brown cylindrical vessel	10YR4/2 dark grayish brown	—	—	1GLEY2.5/N black	7.5YR5/4 brown	—	9	Gray core
KA18	0	Brown on cream high foot	2.5Y8/2 pale yellow	10R4/2 weak red	—	10YR5/2 grayish brown	7.5YR6/4 light brown	—	8	Reduced
KA19	2	Red on cream necked jar	2.5Y7/4 pale yellow	10R3/4 dusky red	—	5YR5/4 reddish brown	5YR5/4 reddish brown	10R5/6 red	7	Oxidized
KA20	1A	Burnished gray necked jar	10YR5/2 grayish brown	—	—	5YR5/4 reddish brown	—	—	9	Oxidized core
KA21	0	Burnished brown hemispherical vessel	10YR5/2 grayish brown	—	—	1GLEY2.5/N black	7.5YR5/4 brown	2.5YR5/6 red	13	Reduced
KA22	3A	Burnished gray piriform vessel	10YR5/2 grayish brown	—	—	10YR6/3 pale brown	5YR6/6 reddish yellow	2.5YR5/8 red	10	Oxidized
KA23	1E	Burnished brown spherical vessel	2.5Y5/2 grayish brown	—	—	10YR4/1 dark gray	—	2.5YR5/4 reddish brown	12	Reduced
KA24	3A	Black on red high foot	5YR5/4 reddish brown	5YR3/1 very dark gray	—	10YR5/2 grayish brown	5YR6/6 reddish yellow	2.5YR5/8 red	11	Gray core

KA25	2	Red on cream jar	7.5YR6/4 light brown	10R4/6 red	—	2.5YR5/6 red	2.5YR5/6 red	2.5YR5/6 red	7	Oxidized
KA27	1D	Burnished brown windowed foot	2.5Y5/2 grayish brown	—	—	10YR4/1 dark gray	5YR5/4 reddish brown	—	11	Gray core
KA28	1E	Burnished brown hemispherical vessel	7.5YR5/3 brown	—	—	10YR4/1 dark gray	—	—	11	Reduced
KA29	1D	Burnished w clouds spherical vessel	10YR4/1 dark gray	—	—	5Y4/1 dark gray	—	2.5YR4/6 red	7	Gray core
KA31	1E	Smoothed brown pan	7.5YR6/3 light brown	—	—	10YR4/1 dark gray	5YR6/4 light reddish brown	—		Half oxidized
KA32	1A	Burnished brown strainer	7.5YR4/2 brown	—	—	2.5Y5/1 gray	—	—	10	Reduced
KA33	3A	Polychrome windowed foot	7.5YR6/4 light brown	—	—	2.5YR6/1 reddish gray	—	—	10	Gray core
KA35	1A	Burnished gray piriform jar	7.5YR4/1 dark gray	—	—	5YR4/3 reddish brown	7.5YR5/4 brown	—	10	Oxidized
KA36	7	Brown on cream hemispherical vessel	10YR7/3 very pale brown	5YR4/2 dark reddish gray	—	7.5YR6/4 light brown	7.5YR6/4 light brown	7.5YR6/4 light brown	8	Oxidized
KA38	0	Red on cream hemispherical vessel	2.5Y3/1 very dark gray	—	—	2.5Y5/1 gray	7.5YR5/4 brown	2.5YR6/6 light red	13	Reduced
KL08	5B	Red slipped jar	10YR7/3 very pale brown	5YR6/4 light reddish brown	—	2.5Y5/1 gray	—	2.5YR4/6 red	5	Reduced
KL09	5B	Burnished gray spherical vessel	2.5Y4/1 dark gray	—	—	2.5Y5/1 gray	2.5YR5/6 red	2.5YR4/6 red	14	Gray core
KL10	7	Polished gray jar	2.5Y7/2 light gray	—	—	7.5YR5/4 brown	—	—	8	Oxidized
KL11	5B	Polished pale yellow jar	7.5YR7/3 pink	—	—	5YR6/4 light reddish brown	—	—	5	Oxidized
KL16	5C	Burnished brown spherical vessel	10YR5/2 grayish brown	—	—	10YR4/1 dark gray	2.5YR5/6 red	10R4/6 red	9	Gray core
KL17	1C	Red slipped open vessel	2.5YR3/4 dark reddish brown	—	—	10YR6/3 pale brown	2.5YR6/6 light red	5YR6/6 reddish yellow	5	Oxidized
KL19	1C	Burnished gray open vessel	10YR6/2 light brownish gray	—	—	10YR6/3 pale brown	—	—	8	Oxidized
KL23	1B	Burnished w clouds hemispherical vessel	2.5YR5/4 reddish brown	—	—	5YR5/4 reddish brown	2.5YR6/6 light red	2.5YR4/6 red	9	Oxidized
KL25	0	Polished black carinated vessel	1GLEY2.5/N black	—	—	2.5Y5/1 gray	5YR5/6 yellowish red	2.5YR4/6 red	7	Half oxidized

KL27	5C	Burnished brown basket-type storage	7.5YR6/4 light brown	—	—	10YR6/3 pale brown	7.5YR6/4 light brown	2.5YR5/6 red	18	Oxidized
KL28	1C	Burnished brown jar	10YR6/3 pale brown	—	—	5YR6/3 light reddish brown	5YR6/6 reddish yellow	—	11	Oxidized
KL31	1B	Burnished w clouds pan	2.5Y4/1 dark gray	—	—	1GLEY3/N very dark gray	—	—		Reduced
KL32	1C	Burnished pale brown ring base	10YR7/3 very pale brown	—	—	5Y7/2 light gray	—	—	7	Oxidized
KL36	1B	Burnished brown open vessel	10YR6/3 pale brown	—	—	1GLEY4.5/N dark gray	—	—	13	Half oxidized
KL37	1B	Burnished pale brown discoid base	10YR8/3 very pale brown	—	—	10YR6/3 pale brown	—	—	13	Oxidized
KL38	1A	Burnished pale brown conical vessel	2.5Y7/3 pale yellow	—	—	7.5YR5/3 brown	5YR5/6 yellowish red	2.5YR4/6 red	9	Oxidized
KL45	1B	Burnished gray spherical vessel	2.5Y5/1 gray	—	—	5Y4/1 dark gray	—	—	8	Reduced
KL46	5C	Impressed decoration biconical vessel	10YR5/3 brown	—	—	5YR4/1 dark gray	—	—	13	Reduced
KL52	1B	Burnished brown uncertain	10YR6/3 pale brown	—	—	5YR6/4 light reddish brown	2.5YR5/6 red	2.5YR4/6 red	9	Oxidized
KL55	1A	Burnished w clouds concave base	2.5Y6/2 light brownish gray	—	—	10YR5/1 gray	7.5YR7/4 pink	7.5YR6/4 light brown	12	Reduced
KL56	7	Burnished pale brown uncertain	7.5YR6/3 light brown	—	—	7.5YR5/4 brown	—	—	7	Oxidized
KL57	1A	Burnished gray necked jar	10YR6/3 pale brown	—	—	10YR6/3 pale brown	2.5YR6/4 light reddish brown	2.5YR5/4 reddish brown	12	Oxidized
KL58	1B	Polished black	10YR4/1 dark gray	—	—	10YR4/1 dark gray	5YR5/6 yellowish red	2.5YR5/6 red	11	Reduced
KL61	5A	Burnished brown uncertain	10YR6/3 pale brown	—	—	2.5Y3/1 very dark gray	2.5YR5/6 red	2.5YR4/6 red	13	Half oxidized
KL63	1A	Red slipped hemispherical vessel	5YR5/4 reddish brown	—	—	10YR6/2 light brownish gray	2.5YR6/6 light red	2.5YR4/6 red	11	Oxidized
KL64	1A	Burnished gray open vessel	7.5YR6/2 pinkish gray	—	—	10YR5/2 grayish brown	5YR6/6 reddish yellow	—	12	Oxidized
KL66	1A	Burnished brown basket-type storage	10YR5/2 grayish brown	—	—	10YR4/1 dark gray	2.5YR4/6 red	2.5YR4/4 reddish brown	10	Gray core
ML01	5D	Painted uncertain necked jar	10YR6/4 light yellowish brown	5YR3/2 dark reddish brown	—	2.5Y5/2 grayish brown	2.5YR5/6 red	2.5YR4/6 red	12	Half oxidized

ML02	5B	Crusted high foot	2.5Y6/2 light brownish gray	—	—	7.5YR4/1 dark gray	5YR5/6 yellowish red	2.5YR5/6 red	11	Gray core
ML03	0	Red on cream concave base	10YR7/2 light gray	10R5/4 weak red	—	7.5YR5/4 brown	2.5YR5/6 red	2.5YR5/8 red	12	Oxidized
ML04	7	Red on cream open vessel	10YR7/2 light gray	2.5YR5/6 red	—	7.5YR6/3 light brown	2.5YR6/6 light red	5YR6/6 reddish yellow	6	Non-uniform
ML05	7	Red on red jar	5YR6/6 reddish yellow	10R4/3 weak red	—	2.5YR5/6 red	5YR6/6 reddish yellow	5YR6/8 reddish yellow	7	Oxidized
ML06	3A	Brown on cream necked jar	5YR7/6 reddish yellow	2.5YR5/4 reddish brown	—	10YR6/3 pale brown	5YR6/6 reddish yellow	5YR6/6 reddish yellow	8	Gray core
ML07	2	Burnished brown hemispherical vessel	7.5YR6/4 light brown	2.5YR5/4 reddish brown	—	10YR5/1 gray	5YR6/6 reddish yellow	2.5YR5/6 red	6	Gray core
ML08	6	Barbotine hole-mouth vessel	7.5YR3/1 very dark gray	—	—	2.5Y3/1 very dark gray	—	—	11	Reduced
ML10	4	Brown on cream jar	10YR7/3 very pale brown	5YR4/2 dark reddish gray	—	5YR5/6 yellowish red	—	—	6	Oxidized
ML11	1B	Burnished gray biconical vessel	5Y4/1 dark gray	—	—	7.5YR4/2 brown	2.5YR5/6 red	2.5YR4/6 red	13	Oxidized
ML12	2	Burnished brown hemispherical vessel	7.5YR5/3 brown	—	—	5YR5/4 reddish brown	2.5YR5/6 red	2.5YR4/4 reddish brown	7	Half oxidized
ML13	1B	Burnished brown hemispherical vessel	7.5YR5/3 brown	—	—	1GLEY3.5/N very dark gray	5YR6/4 light reddish brown	—	12	Gray core
ML14	5D	Burnished gray pan	5R4/1 dark reddish gray	—	—	5YR2.5/1 gray	—	2.5YR4/6 red	11	Reduced
ML15	5A	Burnished black conical vessel	5YR2.5/1 gray	—	—	5YR4/1 dark gray	2.5YR5/6 red	2.5YR4/6 red	12	Reduced
ML16	5A	Burnished gray pan	5YR3/1 very dark gray	—	—	5YR4/3 reddish brown	2.5YR5/6 red	2.5YR4/6 red	17	Half oxidized
ML17	6	Burnished gray pan	5YR3/1 very dark gray	—	—	5YR2.5/1 gray	—	—	16	Reduced
ML18	5B	Barbotine jar	7.5YR5/3 brown	—	—	5YR4/1 dark gray	—	—	9	Gray core
ML19	5D	Burnished brown hemispherical vessel	10YR5/2 grayish brown	—	—	2.5YR3/1 dark reddish gray	5YR6/4 light reddish brown	2.5YR5/6 red	12	Half oxidized
ML20	5D	Burnished brown conical vessel	10YR5/3 brown	—	—	7.5YR5/3 brown	2.5YR5/6 red	2.5YR4/6 red	12	Oxidized
ML21	5B	Burnished brown lug-handle	7.5YR5/2 brown	—	—	7.5YR5/2 brown	7.5YR5/4 brown	2.5YR5/6 red	12	Gray core

ML22	1B	Painted uncertain jar	7.5YR5/3 brown	—	—	10YR4/1 dark gray	5YR5/4 reddish brown	—	8	Gray core
ML23	5D	Burnished brown ring base	7.5YR5/3 brown	—	—	5YR3/1 very dark gray	5YR6/4 light reddish brown	2.5YR4/6 red	12	Reduced
ML24	4	Brown on cream fruitstand	10YR7/3 very pale brown	7.5YR5/2 brown	—	7.5YR5/3 brown	—	—	7	Gray core
ML25		Brown on cream jar	10YR7/3 very pale brown	2.5YR3/2 dusky red	—	5YR4/1 dark gray	—	—		Gray core
ML26	5D	Burnished brown high foot	2.5Y4/1 dark gray	—	—	5YR5/2 reddish gray	2.5YR5/6 red	2.5YR4/4 reddish brown	10	Half oxidized
ML30	6	Red on brown concave foot	2.5YR3/1 dark reddish gray	—	—	5YR2.5/1 gray	2.5YR5/6 red	10R4/6 red	14	Reduced
ML31	5D	Burnished gray pan	1GLEY2.5/N black	—	—	10YR4/1 dark gray	2.5YR5/6 red	2.5YR4/6 red	13	Reduced

D-3. Table showing the fabric groups.

Fabric groups	**Main features**	**Archaeological samples**			**Comments**
		Kallamas	**Kamnik**	**Maliq**	
Group 1	Spathic calcite				
Subgroup 1a	Spathic calcite with minor other phases.	KL38, KL55, KL57, KL63 KL64, KL66	KA07, KA32, KA20 KA35		A concentric "relic coil" feature at the center of both facets of the thin section KL57. The sample KA07 has a thick iron-rich slip composed of two superimposed layers.
Subgroup 1b	Spathic calcite, less quartz, feldspars, microcline. RF: gneiss, micaschist, polyQ, micritic and sparitic limestone, deformed plutonic (felsic).	KL23, KL31 KL36, KL37, KL52, KL58, KL45		ML11 ML13, ML22	Most quartz, polyQ, feldspars are from gneiss. For KL45, the temper beside calcite comes from a multi-component sand.
Subgroup 1c	Spathic calcite, feldspars, and quartz. Less muscovite, gneiss, grog.	KL17, KL19, KL32, KL28			KL32 and KL07 contain more spathic calcite.
Subgroup 1d	Spathic calcite. RF: chert, limestone, metamorphized mudrock.		KA17, KA27, KA29		
Subgroup 1e	Spathic calcite, shale and siltstone rock fragments.		KA23, KA28, KA31		
Group 2	Micritic limestone with microfosslis (e.g., globigerina) and/or clays (marly), less shale and mudstone. A few deformed plutonic and/or		KA08, KA11, KA12, KA14, KA19, KA25	ML07, ML12	KA25 fired at a higher temperature than KA1.

	gneiss RF. Single quartz and feldspars.				
Group 3	Shale and mudstone rock fragments				
Subgroup 3a	RF: Calcareous shale and mudstone, micritic limestone, few siltstone, rare metamorphic. Fine quartz.		KA02, KA05, KA15, KA22, KA24, KA33	ML06	
Subgroup 3b	RF: Fe-rich shale, mudstone, siltstone, a few micritic limestone.		KA01, KA10		
Subgroup 3c	RF: mudstone, shale, and siltstone. Few quartz, feldspars, and metamorphic RF.		KA03, KA04, KA06, KA09, KA13		KA04 contains rounded scoria RF.
Group 4	Sandstone (immature, graywacke typology), siltstone, quartzite, gneiss.			ML10, ML24	
Group 5	Felsic minerals, metamorphic and deformed plutonic RF				
Subgroup 5a	Quartz, feldspar, muscovite. RF: gneiss, quartzite, siltstone, shale, rare micritic limestone.	KL61		ML15, ML16	
Subgroup 5b	Quartz, feldspars, microcline, plagioclase. RF: gneiss, quartzite, schist, and deformed plutonic.	KL08, KL09, KL11	-	ML02, ML18, ML21	From crushed sand.
Subgroup 5c	RF: deformed plutonic (granodiorite) and metamorphic (schist, gneiss). Lesser quartz, feldspars, amphiboles.	KL16, KL26, KL27, KL46			Crushed coarse sand, feldspars are weathered (sericite).
Subgroup 5d	Metamorphic rock fragments, mainly schists, and gneiss. Lesser quartz and feldspars.			ML01, ML14, ML19, ML20, ML23, ML26, ML31	Very homogeneous group. Temper from crushed sand.
Group 6	Organic temper		KA16	ML08, ML17, ML30	KA16 also contains spathic calcite.
Group 7	Very fine fabric with no added inclusions.	KL10, KL56	KA36	ML04, ML05	ML04 and ML05 contain single grains of quartz, felspars and a few RF in the silt size range. ML04 also contains some spathic calcite.

D-4. Technological table of the archaeological samples analyzed with pXRF and XRD.

Sample Id.	Ware category	Vessel type	Surface Munsell color	Decoration Munsell A	Decoration Munsell B or interior
DM01	Polychrome	High foot	5YR5/4 reddish brown	10YR8/1 white	1GLEY 3/N very dark gray
DM01F	Brown on cream	Hemispherical vessel	2.5Y7/2 light gray	10YR2/1 black	—
DM02	Crusted	High foot	10YR5/6 yellowish red	2.5YR4/6 red	7.5YR8/1 white
DM02F	Brown on cream	Hemispherical vessel	10YR7/3 pink	5YR2.5/1 reddish black	5YR2.5/1 gray
DM03	Polychrome	High foot	5YR6/6 reddish yellow	10YR8/2 very pale brown	10YR3/1 very dark gray
DM03F	Black on red	Hemispherical vessel	7.5YR6/6 reddish yellow	GLEY2.5/N black	1GLEY2.5/N black
DM04	Polychrome	High foot	2.5YR5/6 red	2.5Y8/4 pale yellow	5YR3/2 dark reddish brown
DM04F	Brown on cream	Hemispherical vessel	2.5Y7/3 pale yellow	5YR2.5/1 reddish black	—
DM05	Black on red	Hemispherical vessel	7.5R5/6 strong brown	1GLEY2.5/N black	—
DM05F	Brown on cream	Hemispherical vessel	2.5Y8/1 white	7.5R2.5/1 reddish gray	—
DM06	Black on red	Hemispherical vessel	10YR5/6 yellowish red	1GLEY2.5/N black	—
DM06F	Brown on cream	Hemispherical vessel	10YR8/2 pinkish white	7.5YR2.5/1 black	—
DM07F	Brown on cream	Hemispherical vessel	10YR7/3 pink	5YR2.5/1 reddish black	5YR2.5/1 gray
DM08	Polychrome	Open vessel	10YR8/4 pink	7.5YR6/6 reddish yellow	1GLEY 3/N very dark gray
DM08F	Brown on cream	Open vessel	2.5Y7/3 pale yellow	7.5YR2.5/1 black	—
DM09F	Black on red	Ring Base	10YR6/3 light reddish brown	5YR2.5/1 reddish black	—
DM10	Crusted	Closed vessel (jar)	7.5YR4/2 brown	2.5Y8/1 white	—
DM10F	Brown on cream	Hemispherical vessel	2.5Y7/3 pale yellow	10YR2/1 black	—
DM11	Crusted	Open vessel	10YR6/3 light reddish brown	7.5R8/4 light pink	—

DM11F	Brown on cream	Hemispherical vessel	10YR8/2 pinkish white	7.5YR2.5/1 black	—
DM12	Crusted	Hemispherical vessel	7.5R8/4 pink	2.5Y5/2 grayish brown	—
DM12F	Black on red	Concave base	5YR6/6 reddish yellow	5YR2.5/1 reddish black	5YR2.5/1 gray
DM13	Crusted	Uncertain	10YR8/1 white	7.5YR4/3 brown	—
DM13F	Brown on cream	Hemispherical vessel	10YR7/3 pink	10YR2/1 black	—
DM14	Black on red	Closed vessel (jar)	7.5YR6/6 reddish yellow	1GLEY 3/N very dark gray	—
DM14F	Brown on cream	Hemispherical vessel	10YR6/3 light reddish brown	10YR2/1 black	—
DM15	Brown on cream	Hemispherical vessel	10YR6/6 reddish yellow	10YR3/1 very dark gray	—
DM15F	Polychrome	Open vessel	10YR6/3 light reddish brown	5YR4/6 yellowish red	5YR2.5/1 gray
DM16	Black on red	Hemispherical vessel	10YR6/8 reddish yellow	10YR3/1 very dark gray	—
DM16F	Polychrome	High foot	10YR7/3 pink	5YR5/6 yellowish red	5YR2.5/1 gray
DM17	Brown on cream	Hemispherical vessel	2.5Y7/4 pale yellow	10YR3/1 very dark gray	—
DM17F	Polychrome	Closed vessel (jar)	10YR8/2 pinkish white	7.5YR4/6 strong brown	5YR2.5/1 gray
DM18	Brown on cream	Hemispherical vessel	10YR7/4 pink	10YR2/1 black	—
DM18F	Black on red	Hemispherical vessel	2.5YR4/6 red	GLEY2.5/N black	5YR2.5/1 gray
DM19F	Polychrome	Hemispherical vessel	10YR7/4 pink	5YR4/6 yellowish red	10YR3/1 very dark gray
DM20	Combined decoration	Uncertain	10YR6/2 pinkish gray	GLEY2.5/N black	—
DM20F	Polychrome	Uncertain	10YR8/2 pinkish white	5YR5/6 yellowish red	7.5YR2.5/1 black
DM21	Brown on cream	Hemispherical vessel	10YR7/6 reddish yellow	10YR2/1 black	—
DM21F	Crusted	Uncertain	2.5Y8/3 pale yellow	2.5YR3/6 dark red	—

DM22	Brown on cream	Open vessel	10YR7/3 pink	5YR3/1 very dark gray	—
DM22F	Brown on cream	Hemispherical vessel	10YR7/3 pink	5YR3/1 very dark gray	—
DM23	Black on red	Hemispherical vessel	10YR6/8 reddish yellow	10YR2/1 black	—
DM24	Black on red	Hemispherical vessel	10YR7/6 reddish yellow	10YR2/1 black	—
DM25	Black on red	Hemispherical vessel	7.5YR6/6 reddish yellow	7.5YR2.5/1 black	—
KA01	Red on red	Closed vessel (jar)	5YR6/6 reddish yellow	7.5R4/3 weak red	—
KA02	Black on red	Closed vessel (jar)	2.5YR5/6 red	5YR3/1 very dark gray	—
KA03	Red on red	Closed vessel (jar)	7.5YR6/4 light brown	2.5YR2.5/2 very dusky red	—
KA06	Brown on brown	Storage vessel	7.5YR6/4 light brown	7.5YR4/2 brown	—
KA08	Polychrome	Closed vessel (jar)	5YR6/4 light reddish brown	10R4/6 red	10YR3/1 very dark gray
KA09	Polychrome	Open vessel	10YR8/3 pink	7.5YR6/4 light brown	1GLEY2.5/N black
KA11	Brown on cream	Hemispherical vessel	10YR7/3 pink	5YR4/2 dark reddish gray	—
KA12	Polychrome	Closed vessel (jar)	5YR6/4 light reddish brown	10R4/6 red	10YR3/1 very dark gray
KA13	Polychrome	Closed vessel (jar)	10YR7/3 pink	10YR4/4 dark yellowish brown	7.5YR4/2 brown
KA14	Black on red	Closed vessel (jar)	7.5YR6/4 light brown	7.5YR3/1 very dark gray	—
KA15	Red on cream	Open vessel	10YR7/3 pink	10YR4/6 dark yellowish brown	—
KA16	Red on cream	Closed vessel (jar)	10YR7/4 pink	2.5YR3/3 dark reddish brown	—
KA17	Brown on cream	Closed vessel (jar)	2.5Y7/3 pale yellow	5YR4/1 dark gray	—

KA18	Polychrome	Closed vessel (jar)	10YR7/4 pink	10R4/4 weak red	5YR3/1 very dark gray
KA19	Brown on cream	Closed vessel (jar)	10YR7/3 pink	5YR4/1 dark gray	—
KA20	Polychrome	Closed vessel (jar)	10YR6/4 light reddish brown	2.5YR4/4 reddish brown	5YR3/1 very dark gray
KA21	Brown on cream	Open vessel	10YR7/6 reddish yellow	7.5YR3/1 very dark gray	—
KA22	Brown on cream	Closed vessel (jar)	2.5Y8/3 pale yellow	5YR3/3 dark reddish brown	—
KA23	Polychrome	Closed vessel (jar)	7.5YR6/4 light brown	10YR4/4 dark yellowish brown	7.5YR3/1 very dark gray
KA24	Black on red	Closed vessel (jar)	7.5YR6/4 light brown	7.5YR3/1 very dark gray	—
KA25	Red on red	Closed vessel (jar)	5YR5/6 yellowish red	10R4/6 red	—
KA25P	Red on cream	Closed vessel (jar)	7.5YR6/4 light brown	10R4/6 red	—
KA26	Black on red	Closed vessel (jar)	7.5YR6/4 light brown	2.5YR4/2 weak red	—
KA27	Brown on cream	Conical vessel	2.5Y7/3 pale yellow	7.5YR4/3 brown	—
KA28	Polychrome	Closed vessel (jar)	2.5YR6/6 light red	2.5YR4/4 reddish brown	10YR3/1 very dark gray
KA29	Brown on brown	Open vessel	7.5YR6/4 light brown	7.5YR4/2 brown	—
KA30	Crusted	High foot	7.5YR4/1 dark gray	7.5YR6/6 reddish yellow	10YR8/1 white
KA31	Polychrome	Closed vessel (jar)	10YR7/4 pink	5YR5/4 reddish brown	2.5YR3/1 dark reddish gray
KA32	Black on red	Closed vessel (jar)	10YR5/3 reddish brown	7.5YR4/1 dark gray	—
KA33	Red on cream	Closed vessel (jar)	10YR7/3 pink	2.5YR4/2 weak red	—
KA35	Black on red	Closed vessel (jar)	7.5YR5/3 brown	1GLEY2.5/N black	—
KA36C	Red on cream	Closed vessel (jar)	10YR7/3 pink	10R4/3 weak red	—
KA36P	Brown on cream	Open vessel	10YR7/3 pink	5YR4/2 dark reddish gray	5YR4/2 dark reddish gray

KA37	Brown on cream	Necked closed vessel (jar)	7.5YR6/4 light brown	7.5YR4/2 brown	—
KA38	Brown on cream	Hemispherical vessel	10YR7/4 pink	7.5YR3/1 very dark gray	—
KA43	Black on red	Closed vessel (jar)	10YR6/2 pinkish gray	5YR4/2 dark reddish gray	—
KA44	Brown on cream	Hemispherical vessel	10YR6/4 light reddish brown	5YR4/1 dark gray	—
KA46	Black-topped	Open vessel	10YR7/3 pink	2.5YR5/6 red	—
KA47	Red on cream	Closed vessel (jar)	10YR7/6 reddish yellow	10R4/4 weak red	—
KA60	Polychrome	Hemispherical vessel	10YR7/4 pink	10R4/4 weak red	7.5YR4/2 brown
KA61	Burnished brown	High foot	2.5YR5/3 reddish brown	—	—
KA66	Polychrome	High foot	10YR8/4 pink	10R5/8 red	7.5YR4/2 brown
KL01	Red on cream	Closed vessel (jar)	10YR7/4 pink	2.5YR3/3 dark reddish brown	—
KL03	Combined decoration	Closed vessel (jar)	2.5Y5/1 gray	5YR4/1 dark gray	—
KL05	Red on cream	Open vessel	10YR7/3 pink	5YR6/6 reddish yellow	—
ML03	Brown on cream	Open vessel	2.5Y8/2 pale yellow	7.5YR4/2 brown	—
ML04	Black on red	Closed vessel (jar)	7.5YR6/4 light brown	5YR3/1 very dark gray	—
ML05	Brown on brown	Hemispherical vessel	10YR7/4 pink	5YR4/3 reddish brown	—
ML06	Red on cream	Open vessel	5YR4/3 reddish brown	2.5YR5/6 red	—
ML07	Red on cream	Open vessel	10YR7/3 pink	10YR5/4 yellowish brown	2.5YR5/3 reddish brown
ML08	Red on brown	Open vessel	10YR6/4 light reddish brown	10R4/4 weak red	—
ML09	Red on cream	Closed vessel (jar)	10YR7/3 pink	2.5YR3/3 dark reddish brown	—
ML10	Black on red	Closed vessel (jar)	7.5YR5/4 brown	7.5YR4/1 dark gray	—

ML11	Red on red	Closed vessel (jar)	2.5YR5/6 red	10R4/4 weak red	—
ML12	Brown on cream	Open vessel	2.5Y7/2 light gray	10YR4/3 brown	—
ML13	Brown on cream	Closed vessel (jar)	10YR7/3 pink	10R3/1 dark reddish gray	—
ML15	Brown on cream	Closed vessel (jar)	10YR7/3 pink	2.5YR3/2 dusky red	—
ML16	Brown on cream	Closed vessel (jar)	10YR7/3 pink	5YR4/2 dark reddish gray	—
ML17	Crusted	Conical vessel	7.5YR4/1 dark gray	10YR8/1 white	7.5R5/6 strong brown
ML20	Black on red	Closed vessel (jar)	5YR5/4 reddish brown	7.5YR3/1 very dark gray	—
ML21	Red on cream	Closed vessel (jar)	2.5YR5/4 reddish brown	10YR7/3 very pale brown	—
ML22	Polychrome	Closed vessel (jar)	10YR7/4 pink	2.5YR5/6 red	5YR4/2 dark reddish gray
ML24	Brown on cream	Fruitstand	10YR7/3 pink	7.5YR5/2 brown	—
ML25	Brown on cream	Closed vessel (jar)	10YR7/3 pink	2.5YR3/2 dusky red	—
ML40	Red on red	High foot	2.5YR5/6 red	2.5YR4/4 reddish brown	—
ML48	Crusted	High foot	7.5YR5/3 brown	10YR8/1 white	2.5YR5/8 red
ML49	Crusted	Closed vessel (jar)	7.5YR4/1 dark gray	10R5.6 red	10YR8/1 white
ML60	Black-topped	Carinated vessel	1GLEY2.5/N black	7.5R4/4 weak red	—
ML61	Black-topped	Carinated vessel	1GLEY2.5/N black	7.5R5/6 light red	—
ML62	Burnished brown	Cylindrical vessel	7.5YR6/3 light brown	—	—

D-5. Table showing the results of the pXRF analysis on the decoration.

Reference Id.	Site	Decoration	Analyzed surface	pXRF results		XRD results
				Key elements	Potential raw materials	
DM05	Dimini	Black on red	Black decoration	Fe, Mn	Umber	
DM06		Black on red	Black decoration	Mn	Mn-rich phase	-
DM08		Polychrome	Black decoration	Fe, Mn	Umber	
DM14		Black on red	Black decoration	Fe, Mn	Umber	
DM16		Black on red	Black decoration	Fe, Mn	Umber	
DM20		Combined	Black decoration	Fe	Fe-rich phase	
DM23		Black on red	Black decoration	Mn	Mn-rich phase	
DM15		Brown on cream	Dark brown decoration	Fe, Mn	Umber	
DM17		Brown on cream	Dark brown decoration	Fe, Mn	Umber	
DM18		Brown on cream	Dark brown decoration	Fe, Mn	Umber	
DM21		Brown on cream	Dark brown decoration	Fe, Mn	Umber	
DM22		Brown on cream	Dark brown decoration	Fe, Mn	Umber	Magnetite, Maghemite
DM12		Crusted	Pink decoration	Ca, Fe	Calcium carbonate mixed with red ochre (hematite)	
DM13		Crusted	Pink decoration	Ca, Fe	Calcium carbonate mixed with red ochre (hematite)	
DM04		Polychrome	Red decoration	Fe	Hematite	
DM08		Polychrome	Red decoration	Fe	Hematite	
DM01		Polychrome	White decoration	Al, Si	Clay based material (kaolinite)	
DM04		Polychrome	White decoration	Si, Ca, Fe	Calcareous material	
DM05		Black on red	Red slip	Fe	Red ochre (hematite)	
DM10		Crusted	White decoration	Ca	Calcium carbonate	
DM11		Crusted	White decoration	Ca	Calcium carbonate	
DM14		Black on red	Red slip	Fe, Al, Si	Red ochre mixed with caly	

KL01	Kallamas	Red on brown	Red decoration	Fe	Red ochre (hematite)	
KL05		Red on cream	Red decoration	Fe, Si	Red ochre mixed with clay	Silica-based clay
KL01		Red on brown	Slip	Al, Si	Aluminosilicate clay	
KA02	Kamnik	Black on red	Black decoration	Fe, Mn	Umber	
KA03		Red on red	Black decoration	Fe, Mn	Umber	
KA09		Polychrome	Black decoration	Mn	Mn-rich phase	
KA12		Polychrome	Black decoration	Fe, Mn	Umber	
KA13		Polychrome	Black decoration	Fe	Fe-rich phase	
KA18		Polychrome	Black decoration	Fe	Fe-rich phase	
KA20		Polychrome	Black decoration	Fe, Mn	Umber	Fe-rich surface
KA26		Black on red	Black decoration	Fe	Fe-rich phase	
KA28		Polychrome	Black decoration	Mn	Mn-rich phase	
KA32		Black on red	Black decoration	Fe	Fe-rich phase	
KA09		Polychrome	Black decoration_int	Low values	Organic material	Graphite
KA11		Brown on cream	Dark brown decoration	Fe, Mn	Umber	Magnetite, magnesioferrite, minor jacobsite, diopside
KA17		Brown on cream	Dark brown decoration	Fe	Hematite-goethite mixture	Hematite, quartz, diopside
KA19		Brown on cream	Dark brown decoration	Fe, Mn	Umber	
KA21		Brown on cream	Dark brown decoration	Mn	Mn-rich phase	
KA22		Brown on cream	Dark brown decoration	Mn, Fe	Umber mixed with slip	
KA27		Brown on cream	Dark brown decoration	Mn	Mn-rich phase	
KA35		Brown on cream	Dark brown decoration	Fe, Mn	Umber	
KA37		Brown on cream	Dark brown decoration	Mn	Mn-rich phase	
KA38		Brown on cream	Dark brown decoration	Fe, Mn	Umber	Magnesioferrite, minor jacobsite, diopside, quartz

KA01		Red on red	Red decoration	Fe, Mn	Red ochre (hematite)	
KA09		Polychrome	Red decoration	Fe	Red ochre (hematite)	
KA12		Polychrome	Red decoration	Fe	Red ochre (hematite)	
KA13		Polychrome	Red decoration	Fe	Red ochre (hematite)	
KA16		Red on cream	Red decoration	Fe, Mg	Red ochre mixed with slip	
KA18		Polychrome	Red decoration	Fe	Red ochre (hematite)	
KA20		Polychrome	Red decoration	Fe	Red ochre (hematite)	
KA25		Red on red	Red decoration	Fe, Mg, Mn	Red ochre mixed with Mg-containing material	
KA28		Polychrome	Red decoration	Fe	Red ochre (hematite)	
KA30		Crusted	Red decoration	Fe	Red ochre (hematite)	
KA33		Red on cream	Red decoration	Fe, Mn	Umber	
KA36		Red on cream	Red decoration	Fe, Mn	Mn-poor umber?	Magnetite, diopside
KA40		Black on red	Red decoration	Fe, Mn	Mn-poor umber?	
KA46		Red on cream	Red decoration	Fe, Mn	Mn-poor umber?	
KA47		Red on cream	Red decoration	Fe	Red ochre (hematite)	
KA09		Polychrome	Slip	Fe, K, Si	Phyllosilicate clay (illite?)	
KA11		Brown on cream	Slip	Ca, Mg	Calcium magnesium carbonate (dolomite?)	
KA12		Polychrome	Slip	Ca, Si, Fe	Red ochre mixed with calcareous clay	
KA13		Polychrome	Slip	Ca, Si	Calcareous clay	
KA16		Red on cream	Slip	Al, Mg	Aluminosilicate rich in Mg	
KA17		Brown on cream	Slip	Ca, Si	Calcareous clay	Quartz, albite or oligoclase, diopside
KA18		Polychrome	Slip	Si, Al, K	K-containing clay	
KA19		Brown on cream	Slip	Si, Al	Aluminosilicate clay	quartz, rutile
KA22		Brown on cream	Slip	Ca, Si	Calcareous clay	
KA27		Brown on cream	Slip	Ca, Si	Calcareous clay	
KA36		Red on cream	Slip	Ca, Si	Calcareous clay	
KA37		Brown on cream	Slip	Ca, Si	Calcareous clay	
KA38		Brown on cream	Slip	Si, Fe	Clay	

KA46		Red on cream	Slip	Al, Si	Aluminosilicate clay	Quartz, , muscovite or illite, periclase
KA30		Crusted	White decoration	Ca	Calcium carbonate	Calcite, traces of quartz
ML04	Maliq	Black on red	Black decoration	Fe, Mn	Umber	
ML10		Black on red	Black decoration	Fe, Mn	Umber or Fe-rich material	Magnetite, minor maghemite and manganese oxide
ML20		Black on red	Black decoration	Fe, Mn	Mn-poor umber?	
ML03		Brown on cream	Dark brown decoration	Fe, Mg	Fe-rich phase mixed with slip	
ML13		Brown on cream	Dark brown decoration	Fe	Fe-rich phase	
ML22		Polychrome	Dark brown decoration	Fe	Fe-rich phase	
ML24		Brown on cream	Dark brown decoration	Fe	Fe-rich phase	
ML06		Red on cream	Red decoration	Fe	Red ochre (hematite)	
ML07		Red on cream	Red decoration	Fe, Mg	Fe-rich phase mixed with slip	
ML09		Red on cream	Red decoration	Fe	Red ochre (hematite)	
ML11		Black on red	Red decoration	Fe	Red ochre (hematite)	
ML17		Crusted	Red decoration	Fe	Red ochre (hematite)	
ML21		Red on cream	Red decoration	Fe	Red ochre (hematite)	
ML22		Polychrome	Red decoration	Fe, Al, Si	Red ochre mixed with slip	
ML47		Red on brown	Red decoration	Fe	Red ochre (hematite)	
ML63		Crusted	Red decoration	Fe, Ca	Red ochre mixed with slip	Hematite, calcite, quartz
ML03		Brown on cream	Slip	Mg, Fe	Mg-rich clay	
ML07		Red on cream	Slip	Mg, Si, Fe	Mg-rich clay	
ML09		Red on cream	Slip	Si	Clay	
ML13		Brown on cream	Slip	Ca, Si	Calcareous clay	Calcite, quartz, muscovite or illite

ML20		Black on red	Slip	Al, Si	Aluminosilicate clay	
ML21		Red on cream	Slip	Si	Clay	Quartz, periclase, illite or muscovite
ML22		Polychrome	Slip	Ca, Si	Calcareous clay	
ML24		Brown on cream	Slip	Ca, Si	Calcareous clay	
ML17		Crusted	White decoration	Ca	Calcium carbonate	
ML63		Crusted	White decoration	Ca	Calcium carbonate	Calcite

D-6. Table with samples for residue analysis

Samples for residue analysis				
Sample Id.	**Vessels form**	**Vessel part**	**Exterior**	**Interior surface**
KA01	Open shallow (pan)	Rim, handle, base	Burnished brown w clouds	Burnished w clouds
KA02	Hemispherical	Rim, lug	Burnished w clouds	Uncertain
KA03	Spherical	Rim, lug	Burnished brown w clouds	Burnished w clouds
KA04	Conical	Rim	Burnished gray w clouds	Burnished w clouds
KA05	Hole-mouth	Body fragment, base	Burnished brown with sooting	Rough w clouds
KA06	Piriform jar	Rim	Burnished w clouds	Burnished w clouds
KA07	Strainer	Rim	Burnished reddish brown	Burnished dark gray
KA08	Piriform hole-mouth	Rim	Burnished w clouds	Burnished w clouds
KA09	Necked jar	Rim	Burnished w clouds	Burnished gray w clouds and burnt organic remains
KA10	Oval pan	Rim, base	Smoothed w clouds	Burnished w clouds
KA11	Strainer	Base	Burnished w clouds	Rough
KA12	Spherical w cylindrical mouth	Rim	Burnished w clouds	Uncertain
KA13	Spherical w conical mouth	Rim	Burnished gray	Burnished w clouds
KA14	Hemispherical shallow (pan)	Rim, base	Burnished gray	Burnished w clouds
KA15	Necked spherical jar	Rim	Burnished gray w clouds	Burnished dark gray
KA16	Conical	Rim, handle	Burnished brown	Burnished w clouds
KA17	Jar	Base	Burnished brown	Rough

KA18	Jar	Rim, handle	Burnished w clouds	Uncertain, pitting traces
KA19	Spouted vessel	Body fragment	Burnished brown	Rough
KL01	Jar	Body fragment	Burnished pale w clouds	Rough gray with sooting
KL02	Jar	Base	Barbotine brown color	Rough black with sooting
KL03	Uncertain	Base	Burnished brown w clouds	Rough black with sooting
KL04	Jar	Body fragment	Heavy weathered	Rough black with sooting
KL17	Hemispherical	Rim, body fragment	Burnished pale brown	Burnished w clouds
KL18	Conical shallow (pan)	Base	Rough brown w clouds	Burnished w clouds
KL19	Open vessel	Base	Burnished gray w clouds and oxidation	Burnished w clouds
KL20	Open vessel	Body fragment	Burnished gray w clouds	Burnished gray w clouds
KL24	Jar	Body fragment	Weathered	Rough gray with sooting
KL25	Jar	Body fragment	Burnished pale brown	Rough gray with sooting
KL28	Windowed high foot (open vessel)	Body fragment	Burnished brown w clouds	Burnished gray w clouds
KL29	Uncertain	Base	Burnished yellowish brown	Black with sooting
KL30	Open vessel	Base	Burnished pale brown	Burnished black
KL33	Biconical	Body fragment	Burnished brown with impression decoration	Burnished gray w clouds
KL34	Biconical	Base, body fragment	Burnished brown w clouds	Burnished gray w sooting
KL37	Jar strainer	Body fragment	Burnished pale brown	Smoothed brown
KL38	Open vessel	Base	Burnished brown	Burnished dark gray w sooting
KL39	Conical shallow (pan)	Rim, body fragment, base	Smoothed w clouds and plastic decoration	Burnished w clouds
KL40	Uncertain	Body fragment	Weathered	Burnished w clouds
ML01	Pan	Rim	Burnished dark gray	Smoothed gray
ML13	Hole-mouth	Rim	Barbotine gray w clouds	Burnished gray w sooting
ML15	Hole-mouth	Rim, base	Burnished gray w clouds	Burnished brown w clouds
ML16	Pan	Rim, base	Burnished w clouds	Burnished w clouds and impressions
ML17	Conical	Rim, lug	Burnished brown w clouds	Burnished brown w clouds
ML19	Pan	Base	Smoothed dark gray w clouds	Burnished gray
ML20	Hemispherical	Rim, body fragment	Burnished and plastic decoration	Burnished w clouds
ML23	Pan	Rim, body fragment	Smoothed w clouds	Smoothed gray

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