THE ART AND ARCHAEOLOGY OF COOKING: A COMPARATIVE STUDY OF LATE MINOAN COOK-POTS FROM MOCHLOS AND PAPADIOKAMBOS

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by

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"...no one is born a great cook, one learns by doing."

Julia Child

ABSTRACT

This thesis explores functional aspects and cultural roles of cook-pots to evaluate domestic cooking on the island of Crete (located in the Southern Aegean Sea) during the Late Bronze Age (Late Minoan, *ca.* 1600-1190 BC). The Integrated Approach to Ceramic Analysis (IACA) is proposed as a methodology for identifying interrelationship between people and pots in terms of production and use – by focusing on key elements of the vessels' design, *i.e.* shape, ceramic fabric, size. IACA enhances the characterization of cook-pots beyond defining morphologies and fabric-types; it includes an experimental component that evaluates hypotheses concerning production and use. IACA is applied in reevaluating established cook-pot typologies to address our lack of knowledge about how individuals performed daily tasks in the prehistoric Aegean.

Two case studies target cooking contexts well-placed to investigate cook-pot production and function, in both space and time. The cultural groups concerned are the towns of Mochlos and Papadiokambos on the northeastern coast. Mochlos was a thriving harbor town in the LMI period; Papadiokambos was its contemporary, a prosperous enough settlement. Mochlos was abandoned for a generation; it was reoccupied when Mycenaean influence was strong on Crete (LMII-III). Essentially, the cook-pot suites at Mochlos and Papadiokambos belong to a broader tradition, utilizing open and closed vessels. Experimental work that produced LM-style vessels out of similar clays as the archaeological cook-pots shows that while closed, bowl-shape bodies were used for slow cooking (*i.e.* stewing liquid-based foods) and open vessels are better suited for quickly sautéing, grilling, and baking foods there are hidden steps to producing and using these vessels. These actions are multifaceted and complex. This work encourages us to rethink how these tasks were

performed to understand better why choices were made that have materialized in the archaeological record.

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CHAPTER 1: INTRODUCTION

Cooking is a uniquely human activity that physically alters food by means of heat using learnt methods of boiling, boiling/stewing, steaming, frying, grilling, roasting, and baking (McGee 1984:782-786). How people cook is dependent on their intended outcome, which in turn reflects social expectations, the types of foods they prepare, as well as the types of cooking technologies and techniques employed. Technologies and techniques differ; technology is the application of knowledge used for practical purposes and technique is a way of carrying out a particular task (Collins 1995:1583). In cooking, technology is used to develop and produce tools (*e.g.*, cook-pots, ovens) needed for preparing food, while techniques are the steps taken to produce food using the tools.

Cooking and eating are essential elements of day-to-day living and social interaction. Better understanding of the role of cooking therefore provides essential insights into social organization. For example, domestic cooking for sustenance differs in significant ways from cooking activities designed as an integral aspect of communal feasting (Wright 2004). Domestic cooking is typically on a much smaller scale, thus the workload involving food preparation can be performed by one or a few individuals cooking, serving, and cleaning; whereas at the communal level cooperation between individuals is needed. Less food and equipment is needed and the space utilized is smaller for domestic cooking. Also relationships between individuals differ. Domestic is largely dominated by immediate and close kin relationships whereas in communal cooking there are likely to be wider social implications involving community-wide events, status, and obligations.

Cooking is materialized within the archaeological record by the occurrence of diverse remains, *e.g.*, cook-pots, stone tools for processing foods, metal and stone cutting tools, architectural features that have been physically altered by fire, burnt and ashy soils, wood charcoal, and food remains (Platon 1971; Shaw 1990; Hallager 2003a, b, 2011; Soles 2003, 2008). By definition, a cook-pot is a specialized vessel used to prepare food by utilizing heat that is directly or indirectly transferred to the vessel to warm the food within, without cracking it (Kingery 1955, 1989; Rye 1976; Bronitsky and Hamer 1986). A cook-pot can therefore be isolated within the above list because of its function, specific performance properties of the material used in its production, and its greater likelihood of preservation compared to organic components used in cooking. To utilize direct heat the vessel is placed in contact with a source, *e.g.*, bed of hot coals, hearth-flame, whereas to utilize an indirect source (*e.g.*, oven) the vessel is placed in close proximity to the heat. Like cooking, designing and producing cook-pots is not a universally prescribed process; rather the end result reflects both the culture and environment in which the vessels were produced and used (Goody 1982).

In this vein the functional aspects and the cultural role of cook-pots is examined and evaluated to better understand how domestic cooking and eating activities can be linked to social groups living in Crete during the Late Bronze Age, *i.e.* Late Minoan (LM) *ca.* 1600-1190 BC (Figure 1.01; Table 1.01). The methodology developed expands the characterization of these vessels beyond defining cook-pot morphology and ceramic fabric to include an experimental component that evaluates hypotheses of production and use of LM cook-pots. This approach is needed for defining prehistoric Aegean vessels because we know little about how people performed daily tasks so long ago. To examine these aspects other evidence must be examined: cook-pots are one such vehicle, because how food is prepared and consumed is associated with creating social identity (Scholliers 2001:11). This chapter outlines the research problem, geographical, chronological, and cultural focus of the case study.

1.1 RESEARCH PROBLEM

Research investigating ancient ceramic production and use is readily able to draw distinctions between fine decorative table wares for serving and display and coarse wares for storage and cooking. Yet until recently cooking pots have received little attention on the grounds that they could not be used to securely date archaeological deposits due to their relatively limited changes in vessel design through time. Archaeological ceramic research has a legacy of constructing and refining typologies based on fine decorated pottery; pottery studies now incorporate functional studies for social analysis that include both fine and coarse wares. In archaeology, cook-pots form a distinctive category within ceramic assemblages because of their function. They are the subject of laboratory-based tests that measure performance limitations and advantages of the cook-pot design to better understand how cook-pots operate under specific conditions (Skibo 1992; Kilikoglou, *et al.* 1998; Tite, *et al.* 2001; Müller, *et al.* 2011). While these studies are informative regarding mechanical properties**,** they often place the human side of cooking aside to focus on the more technological aspects, namely the cook-pot design.

Another approach that can examine both cultural and technological aspects of cook-pots is the *chaîne opératoire* of pottery production. This is a sequence of technological choices, as well as the actions that accompany the choices, and within each step are variants (or choices) made that do not change the final outcome of the vessel, but do reflect environmental conditions and cultural frameworks within which potters worked, technology and techniques used for production, intended vessel function, physical make-up of potting materials, skill levels, as well as potters' preferences (van der Leeuw 1993, 2008). Cross-culturally cook-pots are produced in a variety of shapes, sizes, and ceramic fabrics, which supports the argument that there is more to cook-pots than just measureable properties.

1.1.1 Approach and Methodology

A research program is developed and evaluated in this thesis to investigate how cook-pots can be examined in their archaeological contexts to explore cultural and technological aspects of cooking. The current state of knowledge about cook-pots is evaluated first to identify key questions that focus on production, distribution, and use of cook-pots. Established LM cook-pot typologies are reevaluated in the second phase by employing a methodological approach called Integrated Approach to Ceramic Analysis (IACA) that can be used to identify the interaction of production and use between people and pots by focusing on key elements of the vessels' design—*e.g.*, shape, ceramic fabric, size. IACA defines potting traditions by incorporating the *chaîne opératoire* of pottery production alongside an experimental component that together use technological analogies to map potential sequential steps utilized to produce and use a vessel. IACA explores how people interact with specific vessel types by incorporating examinations of morphology, fabric, and surface irregularities that identify manufacturing techniques, function, and use. The benefit of this approach is that a constructed operational sequence provides a way of thinking through the materials by establishing a sequence of actions that are based on cause-and-effect. The strength of this sort of analogy is that because the action is known the end result can be more accurately defined and measured. Additionally, information can be extracted through experimental work and plugged into the gaps that researchers often are unable to recognize when only objects are examined. The limitation to this approach is that the constructed sequence is able to record only physical actions of the researcher or the participant and not the thoughts or creative process of an ancient person. Because of this, some steps might not be recorded due to limited knowledge of how to execute a particular task, or limited access to tools and materials required; however, the experimental component in IACA provides a more rigorous way to better identify and examine conceptual parts of the sequence.

The cook-pot typology developed in IACA is able to differentiate between human action and cook-pot function. For example, in pot making human action relates to sequential steps needed to produce a vessel, such as those mapped in the *chaîne opératoire*, while cook-pot function relates to how morphological features of a vessel define ways an individual can use it to cook food**.** Distinctions between action and function are critical because once they are defined researchers can examine particular cook-pot types in specific contexts to explore how ancient people cooked and what this might mean from an anthropological perspective. In the final phase of this research program the cook-pot typology is evaluated within its archaeological context.

1.1.2 Case study: Prehistoric Aegean Communities

The study of food in Greek prehistory has primarily focused on production and collection (*i.e.* crops, animal husbandry, wild plants, marine life), distribution, and consumption, rather than preparation and methods of cooking (Isaakidou 2007). Methods of cooking, *i.e.* stewing, steaming, roasting, grilling, frying, baking, are largely derived from cook-pot morphology and use-wear analysis, Sections 2.3, 4.1, 4.2; however, most of these studies are theoretical and have not explored these hypothesis using experimental archaeology. For example, based on vessel morphology and an understanding of modern cook-pots and cooking techniques outlined in cooking books (or from personal experience), researchers studying prehistoric cooking in the Aegean hypothesize that the deep-bowl shape of LM tripod cooking pots is well-suited for producing liquid based foods by methods of boiling and simmering/stewing, Sections 4.1, 4.2 (Figure 1.04:A, B; Betancourt 1980; Rombauer and Rombauer Becker 1995; Barnard and Brogan 2003; Isaakidou 2007). But how ancient people operated and organized cooking areas and vessels to prepare a soup is not completely understood because Minoan culture cannot be observed using ethnographic methods. Thus hypotheses about cook-pot use have not been evaluated in this manner.

IACA is evaluated by examining and systematizing LM (*ca.* 1600-1150 BC) cook-pot assemblages from Mochlos and Papadiokambos to explore if cultural variation between cooking assemblages in northeastern Crete can be identified, Sections 1.2-1.4 (Figures 1.02, 1.04; Table 1.03). Mochlos and Papadiokambos are coastal sites approximately 14 kilometers from each other by sea and strategically located on two plains separated by the Ornos Mountains. Both settlements have considerable quantities of Cretan and foreign imported vessels. LMI and LMII-III ceramic imports at Mochlos indicate that the town had stronger socio-political and economic connections to the western palace of Gournia (Figure 1.02). Whereas at Papadiokambos LMI imports indicate people living there had greater connections to communities in far eastern Crete with the settlements of Petras, Palaikastro, and Zakros (Figure 1.02; Brogan, *et al.* 2011).

Archaeological investigations at Papadiokambos began in 2006 (Sofianou and Brogan 2009) and are in their infancy compared to extensive excavations and publications carried out at Mochlos since 1908 (Seager 1912; Soles and Davaras 1992, 1994, 1996); yet at both sites the material culture associated with domestic cooking activities is well-preserved and the excavation, study, and publication are comparable. These sites were chosen to analyze as a case study because at Mochlos there is evidence for local ceramic production and at Mochlos and Papadiokambos there is evidence for spatial organization and use in living quarters. Each program includes extensive examination of architecture, metal, stone, and ceramic finds, floral and fauna remains, as well as the local geology and geography (Soles 2003, 2008; Sofianou and Brogan 2009; Brogan, *et al.* 2011; Brogan, *et al.* 2012).

Three assemblages are examined; two of which are from Mochlos: material from the LMIB Artisans' Quarters and Chalinomouri Farmhouse, and from the LMII-IIII settlement. The third is from the LMIB House A.1 in Papadiokambos. In both LM periods the Mochlos cook-pot assemblage is comprised of tripod cooking pots, cooking dishes, and cooking trays; however, based on the material culture Mochlos was settled in the LMI period by Minoans and in the LMII-III period most likely by Mycenaean foreigners and local Cretans (Figure 1.04:A, B, D-G; Barnard and Brogan 2003; Smith 2010). These same three vessel-types also comprise the Papadiokambos cook-pot assemblages, but cooking jars are found too, which appear to be more common in south-central and western Crete, Section 4.1 (Figure 1.04:C; Rutter 2004; Tzedakis and Martlew 1999; Brogan, *et al.* 2012). The approach usually taken when examining cook-pots is to create a site typology based on fragments scattered through various strata (Betancourt 1980). This is appropriate for generating a pottery typology but does not lend itself to interpretations of production, function or use. This thesis has a distinctly different focus in that it is concerned specifically with cook-pot production, function, and use: this demands a rigorous approach in selecting cook-pots from specific contexts that offer the most favorable conditions for developing robust interpretations. The result is that while numbers are necessarily limited, the cook-pots examined have supporting evidence from their archaeological contexts. Two case studies have been selected to target cooking and eating contexts that are critical to investigating cook-pot production and function. The necessity of using such well-defined contexts means that the size of the dataset is somewhat restricted, but given the focus of this research there is little to be gained from developing a typology based on stray sherd material. The sample selection includes 156 vessels—55 are from LMIB Mochlos, 72 are from LMII-III Mochlos, and 29 are from LMIB Papadiokambos (Table 1.03).

By careful selection of both material and contexts, this work will generate fresh insights into the different roles of cooking represented in the archaeological record of LM Crete. By focusing on the acts of potting and cooking through experimental and experiential knowledge rather than studying the material object—cook-pots—in isolation, this study makes accessible the changing role of cooking through time and space.

1.2 GEOGRAPHICAL FOCUS: THE ISLAND OF CRETE

Crete is located at the boundaries of the Aegean and the Mediterranean Seas and is the largest of the Greek islands (Figure 1.01; Higgins and Higgins 1996:196). It is 160 km southeast of the Greek mainland and 300 km north of the African coast between Libya and Egypt. It has an elongated shape of approximately 8,200 square km, measuring roughly 250 km west to east, and about 57 km north to south; with its widest point in the center and its narrowest in the east (Figures 1.02, 1.03). A coastline of approximately 1,050 km with naturally protected harbors allows Crete to be accessed from all directions. Geologically, the island is apart of the Hellenic Island Arc that is located in the southern extent of the Aegean Sea between the Volcanic Arc to the north that includes the islands Melos, Santorini, and Nisyros, and the Hellenic Trench to the south where plates collide subducting the African Plate beneath the Aegean Sea Plate (Rackham and Moody 1996: 13; Higgins and Higgins 1996:196, 197).

1.2.1 Topography and geology

Crete has a diverse landscape that contains four mountain ranges, caves, gorges, valleys, above and underground rivers, springs, and lakes, as well as mountain and coastal plains.

Mountain massifs naturally divide it into regions, which form environmental zones across the island with similar resources that support the existence and growth of complex societies (Moody 2012). Mountain-building and erosion have exposed various rock types and clays that have been used for producing pottery since the Neolithic, *ca.* 7000-3000 (Broodbank 1992; Tomkins 2004). Because the LM cook-pots examined in this thesis were produced with clays containing dominant inclusions of phyllite (*i.e.* metamorphic rock with plate-like structure), the primary geological deposit of concern is the East Crete Phyllite-quartzite Series, Sections 5.1, 5.2 (Betancourt and Myer 1995; Day 1995; Day, *et al.* 2003; Nodarou 2010). The formation and geology of Crete is complex and to better understand the East Crete Phyllite-quartzite Series the geological formation of the island is summarized below.

During the late Cretaceous period (70 million years ago) Crete, the Cycladic islands, and most of the Greek mainland formed under the sea and emerged during the Miocene, 25-10 million years ago. The core and basement of Crete, called the Plattenkalk series, is comprised primarily of hard crystalline limestone (Higgins and Higgins 1996:197, 219), *i.e.* sedimentary rock composed of calcium carbonate formed in shallow seas from the accumulation of skeletal fragments of marine life and/or lime-mud (Tucker 1982:20). This progressive emergence was part of the Alpine Orogeny, *i.e.* mountain-building event that was partially responsible for defining the mountains and geology of Europe (Higgins and Higgins 1996:16-25). Several million years later at the end of the Miocene (*ca.* 11.5 million years ago) subsidence cause the land-mass to break apart and for Crete, all but the highest peaks were re-submerged until the middle Pliocene, *ca.* 5 million years ago. About two million years ago (end of the Pliocene/beginning of the Pleistocene) Crete's modern coastline was created as movements of the earth's crust formed grabens—*i.e.* a depressed block of land bordered by parallel faults (Higgins and Higgins 1996:219), which permanently separated Crete from its surrounding land-mass (Rackham and Moody 1996:14). Grabens within Crete were also responsible for separating the primary mountain ranges (Rackham and Moody 1996:14, 28). The past 5,000 years have been relatively quiet with periodic series of earthquakes, such as those that happened during the Bronze Age and those in the 4th and 6th century A.D. (Table 1.02; Rackham and Moody 1996:15).

The Permian-Triassic Phyllite-quartzite Series runs down the length of the Peloponnese and through Crete. It is mainly exposed in the east and west ends of the island (Figure 1.03). It comprises the overlying nappe [*i.e.* large body of rock that has been moved more than 5 km above a thrust fault from its original position (Fassoulas 2000:101)] of the Plattenkalk series (Fassoulas 2000:14-22). The Phyllite-quartzite Series is a complex mélange of material with inconsistencies caused by both high-pressure and low-temperature metamorphic conditions. Even within Crete there is a variation and the west and east exposures are distinct chemically and physically from each other (Greiling 1982; Zulauf, *et al.* 2002). The primary rock types associated with the series are phyllites and quartzites. Phyllites and quartzites are metamorphic rocks, *i.e.* rocks that were exposed to heat and pressure resulting in chemical and physical alteration of the original rock (Pough 1988:31, 32, 371). Phyllites are mainly composed of silicate minerals and clay that have a block-like or plate-like structure and often break down to form a clayey soil (Rackham and Moody 1996:29). Quartzite consists largely of quartz and is derived from sandstone, but also includes the metamorphic quartz rock, *i.e.* metaquartzite (Pough 1988:34). For purposes of examining east Crete LM cook-pot ceramic fabrics the most noticeable distinction is the variety of color of the phyllite fragments, Sections 5.1, 5.2.

1.2.2 Climate and weather

Crete falls within the Mediterranean climate zone with relatively warm rainy winters and hot dry summers. South-central and southeast Crete has a North African climate with considerably higher temperatures and more direct sun year round. In general the western side of the island is wetter because rain-bearing winds come from the west and empty their rain and snow as they move east, creating there a drier and more arid climate (Rackham and Moody 1996:34). The high elevation of the mountain ranges complicate Crete's seasonal weather patterns across the island by producing rain-shadows—*i.e*. relatively dry area on the leeward side of high ground in the path of rain-bearing winds (Collins 1995:1282), and rain-excesses—*i.e.* portion of rainfall that contributes directly to runoff. This phenomenon contributes to the development of a landscape with exceptionally diverse microclimates that provides nourishment for the growth of a multitude of plant and animal resources (Rackham and Moody 1996:34; Moody 2012).

1.2.3 Population and people

There is no aboriginal group of people on Crete and for thousands of years people have migrated to the island from Europe, Africa, and the Near and Far East, and in the past hundred years from the Americas. Despite its cosmopolitan flare Crete has a distinct culture that is not dependent on its people having a specific origin, rather it is one of identity that is displayed in its dialect, music, poetry and dance, and food (Rackham and Moody 1996:1, 88, 89). Today Crete is divided into four provinces. From east to west they are Lasithi, Herakleion, Rethymnon, and Khania. The principal archaeological case study in this thesis includes north-coastal sites located in Lasithi, *i.e.* Mochlos and Papadiokambos, which are near the modern city of Sitia. Sitia has a long history of occupation and the Bronze Age site of Petras is recognized as one of the palatial centers (Tsipopoulou 2012).

1.3 CHRONOLOGICAL FOCUS

Minoan archaeology has existed as a discipline for a little over one hundred years. In the 1900's Sir Arthur Evans began the excavation and study of material in north-central Crete at a site named Knossos (Figure 1.02; Evans 1921-1936:3-70). The Minoan civilization is characterized as a prehistoric culture (*i.e.* one developed before the appearance of a written language) even though there are three main writing systems— Cretan hieroglyphics, followed by the Linear A and B syllaberies, (Younger and Rehak 2008:173-177). The text is limited and only Linear B is a fully deciphered script.

Evans (1921-1935) constructed a chronological system using a relative-dating scheme based on his excavation and study at Knossos to explain the evolutionary phases of development, maturity, and decline of the Minoan civilization. It is comprised of three phases—Early Minoan (EM), Middle Minoan (MM), Late Minoan (LM)—and each is triply divided into sub-phases (Shelmerdine 2008:3-7). These phases remain as broad chronological markers, but Evan's chronology has been reshaped and further subdivided as excavation and study across Crete has continued and scientific approaches and tools have advanced. The development and application of absolute-dating techniques using radiocarbon dating and dendrochronology has allowed researchers to place approximate calendar dates on these phases (Table 1.01; Manning 1995; Friedrich and Heinemeier 2009; Heinemeier, *et al.* 2009).

The advantage of refining Evan's chronological system allows time to be measured in terms of generations rather than in broad historical epochs, which provides a platform for examining Minoan culture to explain local variation and sites at the individual level (McEnroe 2010:7). There are limitations with these revisions that have sparked controversy, especially for the early Late Bronze Age: because synchronisms between some absolute dates derived from radiocarbon dating and others of a relative nature derived from archaeological contexts cannot be made to match (Shelmerdine 2008:5). For this reason there are two established chronologies, one that is referred to as low and the other as high. Low chronology is based on absolute-dating methods that have developed Late Bronze Age ceramic synchronisms by using the more established Egyptian and Mesopotamian ceramic sequences, which have been checked and refined by lists of kings, astronomical observations, and points of synchronism with other Near Eastern cultures (Shelmerdine 2008:5, footnotes 12,13). High chronology is primarily derived from radiocarbon dating, which is a laboratory-based technique that measures the amount of radioactive carbon isotopes still present in organic samples to calculate its estimated age. The estimated age of the organic material is considered to reveal the date it "died" and is used to date archaeological deposits (Shelmerdine 2008:5-7).

An overlap of Crete and Mainland chronologies are referenced in this thesis because the Minoan and Mycenaean worlds merge at the end of the Bronze Age either through invasion and conquest of the Minoans by the Mycenaeans, or another form of integration (*i.e.* political, economic, social) between the two civilizations (Table 1.02). Mycenaean civilization emerged on the mainland of Greece during the MHIII-LHIIIC period (Table 1.02) and is believed to have advanced through conquest as much as by trade or other moves of diplomacy (Chadwick 1976; Dickinson 1977). Mycenaean foreign contacts were far reaching and include all of modern day Greece and both island and mainland communities across the Mediterranean Basin (Ridgway 1992:3, 4; Balmuth and Tykot 1998; Castleden 2005:194; Vianello 2005).

1.4 CULTURAL FOCUS: EAST CRETE

The domestic cooking contexts examined in the case study are from LMI and LMIII communities at Mochlos and LMI houses at Papadiokambos in east Crete (Figure 1.02). To place these communities within a cultural context the highlights of the LM period are discussed in the following sections. The Neopalatial period is discussed first followed by the Final Palatial and Postpalatial period.

1.3.1 Neopalatial period (MMIIIB-LMIB)

The Neopalatial period (MMIIIB-LMIB, *ca.* 1700-1450 BC) was a time of growth and contact on Crete (Table 1.01). By LMIA Minoan culture and administrative influences are found on the Anatolian west coast and Aegean numerous islands, *i.e.* Thera, Keos, Melos, Kos, Samothrace, Kythera (Schofield 1982; Branigan 1984; Broodband 2004; Knappett and Nikolakopoulou 2005). Art and craftsmanship flourished and raw materials (*i.e.* copper and tin ingots, precious metals, semi-precious stones, elephant and hippopotamus tusks) distributed to produce tools, weapons, and luxury items indicating that the Minoan civilization had regained its wealth and was prospering (Hallager 2010:153).

Substantial resources were exploited in rebuilding the destroyed palatial centers (*i.e.* Khania, Knossos, Malia, Phaistos) and establishing new urban settlements associated with new palaces, small villages, villas, and farmsteads across the island (Figure 1.02; Younger and Rehak 2008:140-143). Most likely a three-tier administrative hierarchy was constructed with Knossos the "supraregional" center for the island; however, how and what types of administrative and economic decisions were made at the top levels is unknown (Younger and Rehak 2008:150-152). Knossos was the largest palatial center and its architectural elements [*i.e.* central court, magazines, west wing, reception halls, residential quarters (Graham 1962; McEnroe 2010:81-88)] are the most elaborately decorated. Knossos houses an extensive archive, massive storage magazines, and a great quantity and fine quality of metal, stone, ivory/bone, faience and ceramic finds (Hallager 2010:151).

East Crete palaces are Gournia in the Mirabello Bay (Boyd 1904-1905; Watrous, *et al.* 2012), Petras in the Sitia Bay (Tsipopoulou 2012), and Zakros on the far eastern coast (Figure 1.02; Platon 1971). Outside of these centers small towns, villages, villas, and farmsteads were settled. Evidence for large and small-scale industry of craft goods (*i.e.* pottery, weaving, stone vase, metal objects) and farming (*i.e.* cereals, pulses, wine, olive oil) are found which suggests that the economic system was flexible and could include both professional and home-based industry (Younger and Rehak 2008).

In LMIB people were recovering from the Theran eruption, which was a catastrophic volcanic eruption that devastated the island of Thera and affected the western end of the Mediterranean basin (Warburton 2009). Towns were rebuilt and continued to flourish [*i.e.* east Crete—Gournia, Mochlos, Petras, Papadiokambos (Figure 1.02)], while others where abandoned (Soles 2003, 2009; Brogan 2009). Foreign trade also continued (Davis 2008). Shortly after rebuilding another phase of severe destruction marked the end of the Minoan civilization. Palaces, villas, towns and hamlets were all burnt. Rebuilding was slow, spasmodic and initially on a rather limited scale: what emerged incorporated elements of a new Mainland character, *ca.* 1425 BC, (Table 1.01; Hallager 2010:153).

The character of the destruction caused from the Theran eruption indicates that while it could have been sudden, people had time to flee leaving precious materials, as well as prestigious and domestic objects behind (Preston 2008; Younger and Rehak 2008). Post-Theran destructions only occurred within specific areas of the settlements and specific communities (Hallager 2010). For example, at Knossos the palace was intact, but many parts of the settlement were destroyed; whereas Khania and Kommos were not damaged (Figure

1.02; Hallager 2010). LMIB destruction layers in east Crete may have occurred later than in other regions and took place after the introduction of LMII ceramics at Knossos. If the destruction was propelled by human force then it appears that there could have been strategic decision-making involved and that central Crete was targeted before those in the hinterlands (MacGillivray 1997; Preston 2008).

One or more of three scenarios could have contributed to the destruction of the Minoan civilization. First is that there was internal unrest against the dominant administration power at Knossos (Evan 1921-136). Second, following the decipherment of Linear B (*i.e.* Mycenaean script used for economic administrative; lists of people and commodities) and based on the weaponry listed it has been proposed that Crete was invaded by Mycenaean mainlanders (LMIB/LHIIA, Table 1.02; Shelmerdine 2008:14); however, whether or not the Mycenaean civilization was developed and strong enough to conquer and control Crete in this period is debatable (Hallager 2010). Third, a series of natural catastrophes, *i.e.* earthquakes, occurred and weakened the centers of administration beyond repair (Younger and Rehak 140). Or a combination of the above.

1.3.2 Final Palatial (LMII-LMIIIA1) and Postpalatial (LMIIIA2-LMIIIB) periods

The Final Palatial (LMII-LMIIIA1) and Postpalatial (LMIIIA2-LMIIIB) periods are considered to be the transition between Minoan and what appears to be the beginning of Mycenaean rule, the latter of which ended with the close of the Bronze Age in LMIIIC (Tables 1.01, 1.02). The wide-spread introduction of mainland goods, adoption of mainland burial practices and architecture, and the use of Linear B script in place of Linear A is evidence that people from the mainland settled on the island and integrated with the local Cretan population (Preston 2008). These periods are discussed in tandem because the case studies of domestic cooking context examined in this thesis date through the LMIIIB period.

The LMII-LMIIIA rebuilding is mainly concentrated in central, western, and mid-eastern regions of the island with Knossos remaining the central polity. The lack of toponyms in the Knossian archives of east Cretan polities indicates that centers in the far eastern region were independent (Preston 2008); however, Knossian administration could have reached the Mirabello Bay (Figure 1.02). In the LMII-III Mochlos cemetery Mycenaean material goods, burial ritual (*i.e.* "killing" of objects) and interment practices are associated with an individual identified as the local Mochlos governor who most likely had connections with the administrative seat of Gournia (Soles 2008). This is significant because it is evidence that the LMII-III settlement at Mochlos most likely had some form of socio-political link to a Mycenaean world. Knossos is destroyed in LMIIIA1/2 (c. 1375 BC): its Palace did not get rebuilt, though the settlement goes on.

LMIIIA2-LMIIIB centers (*i.e.* Archanes, Khania, Kommos, Mallia, Phaistos-Aghia Triada) that possibly had served Knossos became affluent in their independence, as is evidenced by the presence of elite goods, construction of monumental building, and increase in elaborate tombs (Hayden 1987; Preston 1999, 2004, 2008; d'Agata and Moody 2005; Shaw and Shaw 2006). Political organization is not entirely understood, but regionalism is present in the material culture suggesting that some form of autonomy remained (d'Agata and Moody 2005). Towards the end of LMIIIB the political structure changed and the previous displays of wealth declined (Preston 2008). Khania is an exception: it continues to thrive and extended its influences through trade and perhaps held the only known LMIIIB Linear B archive on Crete during this period (Hallager 1997; Hallager and Vlasaki 1997; Hallager 2003a, b). By the end of LMIIIB-C all of the administrative centers had been destroyed or abandoned; refugee-type settlements were established in naturally defensible positions, marking the end of the Cretan Bronze Age (Pendlebury, Pendlebury, and Money-Coutts 1937-1938; Nowicki 2008:80-84).

1.3.3 Mochlos and Papadiokambos communities

At Mochlos material from all phases of the Bronze Age, the Hellenistic and Early Byzantine periods have been uncovered on an island that was once connected to the Cretan mainland by a narrow isthmus, which was submerged due to earthquakes (Soles 2003). On the adjacent fertile plain an LMIB artisans' quarter and farmstead, and a LMII-III cemetery were excavated (Soles 2003, 2008). The last phase of the Neopalatial period (LMIB) and LMII-III settlements are highlighted in this thesis.

A well-organized Neopalatial settlement was built on the island around paved roads, comprising multiple structures reaching two or three-storeys high (Soles 2008:5, 6; Barnard and Brogan 2011). On the coast directly across from the island the Artisans' Quarters comprised at least two, multi-room but single-story, buildings. Based on the division of private and workspace, the excavators propose that people lived and worked in this compound (Soles 2008:5, 6). It was established in LMIB after the Theran eruption but it is unclear if the artisans were local people or foreigners that moved into the area as the town of Mochlos was rebuilding (Soles 2003:1, 2). Nevertheless the occupants had diverse skills and benefited from the rebuilding of Mochlos; however, their time was limited.

Reoccupation of the Mochlos settlement on the island during the LMII-III period took place approximately 30–40 years after the destruction and abandonment of the Neopalatial town and Artisans' Quarters. Mycenaean Greeks were then in control of the palace at Knossos and could have been expanding their control into east Crete (Soles 2008:5). Mochlos would have been a strategic location to establish a satellite governor and settlement because the new community could take advantage of the naturally protected harbor and agricultural plain. Since the time between the destruction and abandonment of the LMI and LMII-III settlements was brief, it is proposed by the excavators that some of the new settlers could have been direct descendants from families that once lived at Mochlos (Soles 2008:5-9). It is also possible that with the change in governmental structure foreign people moved into the area bringing new ways of doing daily activities, such as cooking.

The settlement is comprised of 13, single story, one-to-three room structures that were built amongst the ruins of the Neopalatial Town. Six houses have a quadrangular plan with an axial arrangement, and several are distinguished by a separate cook shed located in an adjacent space (Soles 2008:6-9, 12-128). Cook sheds are defined as an enclosed, or semi-enclosed space, with an abundant quantity of cooking and food processing equipment, charcoal, food remains, and eating, drinking and storage vessels. They are set apart from living quarters, and typically restricted to domestic work associated with food. These architectural features may reflect mainland influence, or are at least a distinct LMIII feature on Crete (Hayden 1987; Hallager 1997:184, 185; Soles 2008:8). Cook sheds are also associated with LMIII buildings in east Crete at Chrysokamino, and in central Crete at Malia and Kommos (Figure 1.02; Shaw 1990:233, 239; Driessen and Farnoux 1993, 1994:54-64; Nixon 1996; Floyd 2000).

Excavations at Papadiokambos have uncovered three large houses from the LMI period with earlier MM deposits below (Table 1.01). The material examined is from House A.1, which the excavators propose was built on the western outskirts of the settlement (Sofianou and Brogan 2009; Brogan, *et al.* 2011; Brogan, *et al.* 2012). It is a well-preserved, two-story, building located directly on the coast. Excavations in House A.1 from 2006-2009 revealed nine rooms on the ground level with a staircase leading to a similar number of rooms on the upper story. Based on the bioarchaeological remains and ceramic studies, the excavators argue that its inhabitants were engaged in crop processing, fishing, and food and cooking preparation activities (Sofianou and Brogan 2008; Brogan, *et al.* 2012). At the time of the building's destruction, three cooking areas equipped with one hearth and at least one large vessel: one in the South Porch, and two on the ground floor—*i.e.* one in Room 5, the others in Room 8. The artifact assemblage for each is different, yet the archaeobotanical remains are similar (Sofianou and Brogan 2008; Brogan, *et al.* 2012), suggesting that food was prepared and cooked using different methods.

1.5 THESIS STRUCTURE

The thesis is presented in seven chapters. The research problem is laid out in Chapter 1, along with an outline of the geographical, chronological and cultural foci. Chapter 2 investigates the "meaning" of cook-pots from an ethnographical and archaeological viewpoint. The methodology developed for this thesis is outlined in Chapter 3. Chapter 4 defines LM cook-pots in Crete and provides the cultural and archaeological background for the Mochlos and Papadiokambos cook-pot typologies defined in Chapter 5 and 6. Chapter 5 contextualizes the material object, whereas in Chapter 6 potting and cooking experiments are constructed and executed to evaluate hypotheses of vessel production, function, and use. In Chapter 7 the LM cook-pot typology is utilized to examine food-related deposits to discuss potential cultural/social differences in the Mochlos and Papadiokambos communities during the LM period in east Crete. Chapter 8 sets out the conclusions and program for future research.

CHAPTER 2: FINDING MEANING IN COOK-POTS

Since the mid-to-late 1900's researchers have utilized a multitude of scientific methods and theories to relate ceramic technology to culture, to better understand artifact variability. The pioneering works of Shepard (1956) and Matson (1965) systematically described physical properties of ceramics and observed production activities of potters to explain ancient production that created typologies based on form and decoration. Similarly, Schiffer (1972) and Braun (1983) argued that "pots" can be used as tools to explain actions and traits of human behavior by building models to demonstrate that interactions between individuals and objects are based on a chain of behaviors (*e.g.*, material procurement, manufacture, use, maintenance, discard) rather than isolated events (Schiffer 1972). These chains of behaviors link the performance characteristics of a vessel to its functional role, which is linked to variability and change in the archaeological record (Schiffer 1996). The drawback to using this approach is that the function of vessels can be slow to change and the specific ways individuals use them over time might not be evident. Cretan pithoi (*i.e.* storage jars) are one such example. In the early-to-mid 1900's they were produced and distributed locally by itinerant potters to store foodstuff (Voyatzoglou 1974, 1984), however, today pithoi are mass produced in private studios and exported as decorative landscaping items (pers. comm. Michalis Houlakis, Thrapsano potter, 2000). This recognition of changing function is not directly evident from the material culture but based on contemporary verbal communication. It therefore relies on information that is unavailable when interpreting the archaeological record.

Another approach to explain technological choices and variation of material culture is by utilizing the *chaîne opératoire* of pottery production, a notion inspired from lithic studies (Leroi-Gourhan 1943, 1945). This is a sequence of technological choices made by potters, as well as the actions that accompany the choices. Each step consists of variants, which are essential stages in the production and function of a specific artifact type, and variants (or choices) made that do not change the final outcome of the vessel but reflect environmental conditions and cultural frameworks in which potters worked, technologies and techniques used to form vessels, intended vessel function, physical make-up of potting materials, as well as potters' skill levels and preferences (van der Leeuw 1993, 2008). Utilitarian potters design their vessels to serve an intended function (Leach 1976) and researchers can use this intention to acquire a sense of potter's choices made within the steps of the *chaîne opératoire* (van der Leeuw 1993, 2008; Gosselain 1998).

To understand better how the potter's creativity, craft, and material knowledge are interrelated to produce vessels van der Leeuw (2008) calls for researchers utilizing the *chaîne opératoire* to study technology to reexamine how they look at vessel creation. van der Leeuw (2008:226) argues that researchers typically use a linear approach that first examines vessels, and then works backwards using a formulaic, cause-and-effect approach to reconstruct how vessels came to exist, rather than taking the potter's perspective to understand why and how they were created. The advantage of looking at vessels from the creator's point of view is that the researchers can more accurately understand how creation and innovation influenced the invention, *i.e.* the vessel, as well as question why changes occurred by looking at sustainability in terms of human and environmental interaction and co-evolution (van der Leeuw 2008:227).

This disconnection between the material object and the emotive and cognitive side of creation and innovation can be bridged by utilizing a non-linear dynamic network system to examine ceramic production and distribution to better understand vessel use. Six interpretative frameworks have been constructed, based on the potter's knowledge to produce usable vessels and run successful workshops (van der Leeuw 2008:232-242, figs. 12.2-12.8, table 12.2). The interpretative frameworks with the specific variants are below:

- Material procurement: clay, labor, fuel.
- Paste preparation: clay properties, non-plastic components of paste, water.
- Pottery concept: function, pottery shape, tools available, techniques known, quantities to be made.
- Shaping vessel: potter's 'know-how', properties of paste and fuel.
- Marketing and sales: production value (*i.e.* marker value, functional usefulness, lifespan, quality, competition products), production costs (*i.e.* raw materials, manufacturing, labor costs, fuel), marketing costs, losses.
- Workshop organization: labor, space, capacity, time.

Outside of these frameworks are cultural and environmental constraints that set boundaries on the production process and that are exclusive of potters' 'know-how' craft knowledge. For example, when there is an established tradition, cultural restrictions can make it difficult to introduce new types of vessels or new ways of production (van der Leeuw 1993). Material properties of clay and weather variation also constrain the potter to use specific techniques and technologies during specific conditions to produce vessels (Rye 1981).

These constraints may or may not be obvious: if the researcher is not aware that they can exist and so does not take them into consideration, then how ancient potters produced vessels could be misinterpreted. To minimize errors, it is best if the researcher is familiar with the production process from a potter's view point, the natural and social environment in which the potter lived and worked and, for comparative purposes, have knowledge of the vessel assemblage (Moody, *et al.* 2012). Even if the researcher is a potter and has acquired an intimate awareness of constraints that affect the *chaîne opératoire*, it is still challenging to determine the steps ancient potters used to produce vessels, because how we learn to do specific tasks (*i.e.* cultural transmission) has an immediate impact on the way we choose to work.

The transmission of culture through the use, or production, of material objects that reflects social identity does not appear randomly, but results from a learning process that is culturally embedded (Gosselain 1998, 2000). How the learning process manifests in an action, such as a learned skill [*i.e.* proficiency acquired through training or experience (Collins 1995:1448)] like potting or cooking, implies that most people can learn these skills. But those who are taught may be chosen according to a set of customs, and how they perform the actions may depend on the society being examined. From an archaeological perspective, researchers begin this exploration by examining the finished artifact, so to some degree they must work backwards to define function, production and use, which is not always self-evident in the material object. Furthermore, material objects can also have more than one role.

Investigating the many ways potters produce pottery is one aspect of the production process, but marketing and workshop organization equally influence invention and production. For example, in order for potters to produce vessels that people can use they must know what function is needed. One such interaction was documented in an ethnographic account collected from Kentri village in east Crete where many potters produced various types of small portable vessels, except cooking casseroles because these were imported from the island of Sifnos. One potter did make casseroles but did not sell them because the local women preferred the imported vessels (Blitzer 1984). It is the communication between potters and patrons that allows the concept of a particular type of vessel to materialize into a useable domestic tool. If the individual is both the user and potter, then roles overlap and internal dialogue takes place to decide what type of vessel is needed (Gosselain 1992). If the potter and patron are different individuals, then questions of person-to-person communication and accessibility arise as illustrated in the Kentri example.

van der Leeuw's (2008) approach of using a non-linear dynamic network directly addresses the concept of the invention and production of material objects, yet it negates the vessels' functional aspects when an individual is using it to perform particular tasks. The analysis of LM cook-pot production and use in this thesis pushes van der Leeuw's (2008) application of a non-linear dynamic network to better define cook-pot production and cooking practices in northeastern Crete by applying an experimental component to the analysis that investigates both vessel production and function. The experimental component aims to reconstruct the steps followed by ancient potters to produce LM cook-pots, as well as to explore their functional properties and how people could have used these vessels for cooking.

The relationships between people, cooking and potting practices, and cook-pots are analyzed in this chapter. Discussion of the ethnographic evidence is divided into subsections to examine how cook-pots can be produced to better understand how material objects become apart of the archaeological record, Section 2.1, as well as to provide basic definitions of cooking; ethnographic examples are utilized to investigate who is procuring the food and cooking in various domestic situation, Section 2.2. Examination of workshop organization for cook-pot manufacturers and cook-pot distribution at the domestic and professional level and its link to ancient life is saved for future research, because the primary focus of this thesis is the production and use of the cook-pot as a material object. To close the chapter, how ceramic researchers can identify ancient cook-pot function and use by examining the vessels' shape and surface attrition is discussed, Section 2.3.

2.1 CHAINE OPERATOIRE OF POTTERY PRODUCTION: ETHNOGRPAHICAL APPROACHES

The organization of pottery production and pottery use for prehistoric cultures is challenging to define because the incentive to create and use vessels is complex. Many cultural and economic factors of these processes might not be accessible to researchers due to a poorly preserved archaeological record or their interpretation may be complicated by the cultural perspectives of the researchers. As a discipline archaeology is concerned with the recovery and study of past human behavior as it is reflected through its material remains; as such it has utilized various ethnographic approaches to link material culture with living cultures to develop explanations (Binford 1962, 1965, 1972).

In this vein, craft ethnographers have demonstrated that there are a multitude of variants within the *chaîne opératoire* of cook-pot production, and that broad classifications based on production techniques can guide researchers to study and understand the various conditions under which pottery was produced. These classification systems are referred to as modes of production (Balfet 1965:162, 163; van der Leeuw 1977, 1984; Peacock 1981, 1982). They are constructed by evaluating manufacturing processes and technology, as well as the relationships between the potter and consumer to describe the organizational process of ceramic production. For example, van der Leeuw (1977, 1984) and Peacock (1981, 1982: 8-10) construct ethnographic schemes that can be applied to prehistoric contexts to identify five modes of production, which are household production, household industry, individual workshop industry, nucleated workshops, and itinerant potters. Because the primary focus of this thesis is to explore how LM cook-pots were produced and used discussion differentiating between these modes of production and correlating them to social and political structures is omitted. To provide an overview of potting practices, techniques, and tools a *chaîne opératoire* that relates to the production of undecorated pottery is discussed here because the LM cook-pots examined in this thesis are considered undecorated pottery, Sections 5.1, 5.2.

Pottery production is comprised of several steps, for example: locating and processing potting materials (steps 1, 2), vessel forming (step 3), surface finish application (step 4), drying (step 5), and firing (step 6) (Figure 2.1; Leach 1976). A specific *chaîne opératoire* can be called a potting tradition. Hypothetically, systematic changes in a potting tradition, such as the selection of a different type of clay or changing the way a handle is attached [*e.g.*, through–the-wall handle (McDonald and Wilkie 1992)] reflect new technological choices, which may be the result of cultural or environmental change (van der Leeuw 1993). Ancient potting practices are better understood when pots are related to human behavior within this paradigm, because this approach to ceramic studies utilizes both inductive (*i.e.* from a specific vessel to human action) and deductive (*i.e.* going from human back to the vessel) reasoning (Jones 2012) and is applied here to demonstrate how ethnography can be applied to archaeological studies. Information in this section is a compilation of ethnographic accounts of pottery production and technical ceramic reference books. It is written to highlight actions made by potters to better explain the steps of production rather than focusing on specific cultural approaches to pottery production.

2.1.1 Step 1: locating clay

Potters in the past, like those of today who do not obtain commercially cleaned clays, traveled within their surrounding landscapes to collect raw clays and tempers (Arnold 1985). Potters can collect clays from natural exposures, such as dried rivers, streambeds, or ravines. They can also collect clay by removing top layers of unwanted earth to access clay in field or specific areas within a flood plain. There are three main types of clays (earthenware, stoneware, porcelain), but relevant to this thesis is earthenware clay because the LM cook-pots examined were produced with secondary clays, Sections 4.1, 5.1; meaning that the clay was transported from its place of formation by forces of wind and water to be re-deposited in riverbeds or flood plains (Rhodes 1973:12). The clay becomes naturally porous as it moves to its new location because the platy shapes of its minerals allow it to easily attach to and surround aggregates, organics, soluble minerals, and other materials with which it makes contact (Rhodes 1972:12). The high iron content of earthenware clay gives it its distinctive reddish-brown color and allows potters to fire their vessels at low temperatures, 700º-900ºC (Rye 1981:98), which is typically the firing range for LM cook-pots (Roumpou, *et al.* 2012:table 1).

2.1.2 Step 2: processing potting materials

Potting materials—*i.e.* clays, tempers—must be processed to make workable clay bodies for potting. Clay bodies transformed through the firing process into a ceramic fabric are referred to by ceramic researchers in archaeology as a ceramic fabric. After cleaning potters can manipulate clays by mixing two or more clays, and by tempering it with organic or inorganic materials. An explanation is provided below.

Cleaning clay

Most raw clays need to be cleaned by removing unwanted pebbles, leaves, and twigs. This is accomplished by sieving (Rye and Owens 1976), winnowing (Dillingham 1992), or kneading (Krause 1985). All clay must be well hydrated to work. This is done by either mixing it with water to make it plastic for immediate potting (Steensberg 1939) or letting it sit in water until the microscopic platy clay minerals are thoroughly saturated with water (Sayers and Rinzler 1987:118-20, 145-47, 166). To make clay more plastic it can be aged (*i.e.* allowing bacteria to break down all organic material; thereby releasing amino acids which act as flocculants, causing the clay particles to become more attracted to one another). To achieve this potters add old clay, vinegar, urine, or blood to clay (Rhodes 1973), or expose it to extreme weathering conditions—*e.g.*, repetition of freezing and thawing after it has been dug and set aside for potting (Steensberg 1939).

Determining how ancient clays were cleaned is taxing. There are two types of evidence: processing features (*e.g.*, settling tanks, basins) found in close proximity to spaces associated with pottery production, and clay paste. Settling tanks and basins could indicate the practice of levigating, *i.e.* separating heavier sediment fraction (sand, silt) from clay (Rye 1981). This results in a more refined clay that can be removed and used for producing a slip, made by accumulating clay particles suspended in water, or potting finer wares (Rye 1981).

Clay mixing

Potters mix clays for numerous reasons. They mix clays when they do not have access to a single suitable clay source (Blitzer 1984), such as when a clay with high shrinkage but poor firing quality is mixed with one that has poor workability but low shrinkage and good firing qualities (Rye 1981:31). Clays and other additives may be combined to produce material that is appropriate for constructing specific vessel types, *e.g.*, cook-pots. Clays are also mixed because of potters' traditions and training (Day 2004). Mixed clay bodies can be identified using microscopic analysis; however, identifying clay mixing is difficult. A more secure identification is made when a collection of potting materials, geological literature, and map(s) from the researched area is referenced (Whitbread 1995:374-376) because a comparison can be made between the characteristics of geological materials and archaeological ceramic fabrics.

When using microscopic analysis to describe ceramic fabrics, specialists can determine if inclusions in the matrix display a unimodal (one grain-size) or bimodal (two different grain-sizes) grain-sized distribution, because the different modes may identify mixes that have been created by clay mixing and/or adding temper (Whitbread 1995:386, 388-390). A bimodal grain-size distribution, however, is not secure evidence that a clay body was intentionally mixed. It could be the result of natural weathering processes and integral to the collected clay source (Whitbread 1995:386). Bimodal grain-size distributions may result from clay mixing, but this is only an interpretation and should be treated as such. The basis on which an understanding is made should be stated and wherever possible tested against other sources of evidence, such as other ceramic fabrics and potential raw materials.

Tempering

Potters mix organic and inorganic material with clay to improve its workability, to decrease the risk of cracks during drying and firing, and to enhance its thermal shock properties (Rhodes 1973). Such added materials are referred to as temper. Organic tempers burn out of clay, leaving voids in the fired material, thereby creating a porous textured ceramic fabric. Examples of organic tempers are small seeds used in cook-pots from Mali (McIntosh 1995); mosses used in cooking and storage vessels made by Native Americans in Florida (Cordell 1991, 2001); ash, dung, and straw used in Faro Cameroon (Smith 2000). Inorganic tempers (*i.e.* rock fragments, crushed pottery—grog) do not burn out of the clay. Instead they remain as aplastic inclusions that have thermal expansion rates similar to or different from the clay body (Rye 1976). Contrasting expansion rates create gaps between the aplastic grits and the clay platelets, opening up the clay body and making it more thermally durable. Tempering can also result from potters mixing coarse and fine clays.

To determine if aplastic inclusions within clays are added temper various criteria can be used, such as bimodal grain-size distribution and the angularity of the inclusions (Myer 1984). Also, if there are present two or more inclusion sets with different origins, then aplastic inclusions might also be a temper (Rye 1981:52). Using the angularity/degree of roundness of aplastic inclusions to identify tempering agents can be complex (Whitbread 1995:374), because the forces that shape inclusions vary. It is often assumed that inclusions with rounded edges were shaped by natural alteration during transport (Rice 1987:410) and inclusions with angular edges were shaped by crushing with a tool (Myer 1984). Whitbread (1995:374, 375) warns against making assumptions about the angularity of fragments identified in fabrics based strictly on a cause-and-effect relationship since angular fragments are also found in residual clays (Whitbread 2007). Furthermore, the angularity of a fragment depends upon the distance it has been transported, its mineralogy, and its original grain-size.

2.1.3 Step 3: forming vessel

Potters form vessels using different techniques and many types of tools: primary hand-building techniques—*e.g.*, pinching, coiling, slab-building (Reina and Hill 1977), a potter's wheel (Sweezy 1984; Zug 1986; Sayers and Rinzler 1987), various shapes and sizes of press molds (Kramer 1997:60), as well as combinations of the aforementioned techniques (Carlton 2003). These techniques are defined below.

- Pinching: Squeezing clay between fingers and thumb or between fingers and opposing hands forms the vessel; walls are thinned and altered by repeating this action (Rye 1981:70).
- Coiling: Clay rolls, or coils, of uniform thickness are stacked in a spiral to form the vessel. Ring building is a variant of this technique and involves laying a series of

coils on top of one another to construct the form. Once positioned the coils are often obliterated using fingertips or tools to smooth the edges together (Rye 1981:67).

- Slab-building: Flat slabs are formed and joined by pressing or smearing the edges. It is best utilized for rectangular shapes and large vessels (Rye 1981:71).

After the initial vessel forming in many cases the next step is to trim the base, scrape or shave the body (Guthe 1925), as well as attach handles, feet, or spouts (Steensberg 1939; Rye 1981). These secondary stages of forming are critical to the overall success of the vessels' function.

Irregularities on the vessel surfaces often relate to the production process. Detailed macroscopic analysis and experimentation are ways to identify construction techniques. In this context these irregularities are called remnants of construction: some production techniques are more reliably detectable than others, depending on how well the potter smoothed or coated the vessels' surfaces after formation. For example, if the potter did not smooth the surfaces of a wheel-made vessel then rilling-marks are present. These are concentric and spiral undulating ridges on the surface of a vessel formed as a potter creates a vessel by pressing their fingertips against wet clay as it sits rotating on a wheel (Rye 1981:74-78). They indicate that the potter produced the vessel using some form of wheel technology. Joins between both coils (even if smoothed) different vessel parts (*i.e.* necks, shoulders, based), and appendages (*i.e.* handles, legs) can often be seen in raking light or felt with the finger-tips. However, this is not always possible depending on how the potter finished the vessel. Xeroradiography analysis can be used to shed light on production techniques by examining the characteristics of inclusions and interior pore space in ceramic fabrics and by detecting manufacturing details through identifying possible joins created during the manufacturing process (Johnston and Betancourt 1984; Carr 1990; Berg 2008).

2.1.4 Step 4: surface finishing of undecorated and unglazed vessels

The surfaces of a pot can be left unaltered or finished in a variety of ways that enhance its function by making it less porous or altering its appearance. Common surface finishes are slip, pigment, and burnishing (Rhodes 1973). Post-firing treatments tend to be more functional in nature—*i.e.* resin coatings (Skibo 1992:62); organic lining—*i.e.* using a layer of interwoven leaves on the vessel interiors (Skibo 1992:67); melted beeswax (Evershed, *et al.* 1997); smoke-curing the vessel (Steensberg 1939). The presence of organic surface, or lack of, in archaeological materials can be detected using residue analysis (Roumpou, *et al.* 2013).

Slip finishes are applied when a vessel is leather-hard, bone-dry, or after it has been fired to a bisque-ware state (fired but not glazed) when it readily absorbs liquids (Rye 1981). Slips are created by suspending a mixture of powders, such as fine clays, colorants, and fluxes in water (Dillingham 1992). They are applied by either dipping the vessel into a vat containing the mixture and shaking off the excess, by pouring the mixture over the vessel, or by using a brush to apply the mixture to the vessel surface (Peterson 1992).

Burnishing is done to leather-hard vessels. This is the condition of clay that has been partially dried. It is still damp but can be handled without deformation and can be incised without breaking (Peterson 1992). Burnishing is achieved by rubbing a hard tool such as a piece of wood, bone, smooth rock (*i.e.* agate, quartz, quartzite) over the leather-hard surface, compressing the clay body and aligning the flat surfaces of the clay minerals (Guthe 1925; Dillingham 1992). The compaction of the clay platelets and grains within the fabric creates a more impermeable surface, while the alignment of the minerals creates a highly shiny finish.

Examining the vessel can identify pre-firing surface finishes. But many of the post-firing surface treatments are not recognized without laboratory tests, *i.e,* residue analysis

(Evershed, *et al.* 1997). This is because over time, during use, or in specific post-depositional conditions, post-firing treatments erode or leach away from the surface, making it possible to detect only the materials that have penetrated into the fabric (Roumpou, *et al.* 2013). Additional factors that erode both pre-firing and post-firing surfaces happen during excavation and conservation, such as scrubbing a sherd too hard during washing or adding too much acid to the washing water (Rogers 2004:149-154).

2.1.5 Step 5: drying vessel

The finished vessel is slowly and evenly dried to ensure that hairline cracks do not form and jeopardize its structural integrity. There are many environmental factors that must be considered when drying a vessel: humidity, temperature, drafty winds, direct heat from the sun. In cool, wet climates potters typically dry vessels indoors to protect them from the elements (Lynggaard 1972). In hot, dry climates vessels are dried indoors or outdoors in covered areas where they are protected from direct wind and sun (Voyatzoglou 1984). Even though a vessel may be bone-dry (*i.e.* without a trace of moisture), chemically combined water remains in clay until it is heated to 500°C for a specific length of time. At this temperature the clay becomes completely dehydroxilized and is unable to revert back to a plastic state (Rhodes 1973:16).

It is difficult to determine how ancient vessels were dried. Environmental reconstruction provides information about the sorts of climates the potter worked in and could help develop hypotheses about what times of year were more suitable for pot making (Whitbread 1995). The examination of indoor and outdoor preserved architectural features that are identified with, or in close proximity to, areas associated with production can be compared to ethnographic studies that map work space to hypothesize where potters might have dried their vessels. One such study was conducted in Rajasthan, India where there was a marked difference in spatial organization between urban and rural potters, because urban potters had many more spatial constraints (Kramer 1997:57-80, 183-212). For example, one urban potter from Udaipuri worked, stored, and dried his pottery in the streets because he and his family live in a one-room house (Kramer 1997:65, fig. 29); while other urban potters produced, stored, and dried pots on the roofs of their houses (Kramer 1997: 62, fig. 28). Even though it was not stated in the accounts, the rural potters had more space and presumably were able to work both in and outdoors.

2.1.6 Step 6: firing vessel

Vessels can be fired using either non-kiln technologies such as bonfire, pit-fire or opening firing (Carlton 2002, 2004), or kiln technologies (Rhodes 1968). While many techniques are used to fire pottery with non-kiln technology all share these characteristics: slow burning fuel bed on the ground; vessels are placed over the fuel; more fuel (*i.e.* grass, dung, wood chips, dried brush, twigs and small sticks) is placed on top and around the vessels to complete the firing (Kramer 1997; Carlton 2002, 2004). Non-kiln firings all take a relatively short period of time (*ca.* 45-60 minutes) and achieve low temperatures (*i.e.* 600°-950°C) (Gosselain 1992; Carlton 2004). The potter is limited to earthenware clays and can only use slips, pigments, and burnishing to finish the surfaces (Dillingham 1992). It is difficult to produce a completely oxidized atmosphere using non-kiln technology, instead vessel surfaces tend to be mottled with different-coloured fire clouds; however, it is easy to create a reducing atmosphere by covering the vessels with fuel to trap the carbon and so create uniformly black pottery (Carlton 2003, 2004).

Kilns are structures constructed out of refractory materials (*i.e.* mud, stone, brick) that are thermally insulated. There is a great variety of kilns: but they share features, which are firing chambers for the vessels, and firebox for the burning fuel (Leach 1976). Kiln firing can last anywhere from one day to a few weeks (Sayers and Rinzler 1987) and reach a range of low (*i.e.* 600°-950°C) and high temperatures (*i.e.* 900°-1000°C) (Carlton 2002, 2004). For this reasons potters can fire vessels produced in all clay types whose surfaces are left plain, or enhanced with slip or glaze.

This overview of the *chaîne opératoire* of pottery production, specifically cook-pots, demonstrates how ceramic researchers identify variants within each production step for undecorated pottery. By identifying variants within the production process, ceramic researchers are able to limit the scope of study to focus on specific vessel types to address particular questions relating to production. To address questions of vessel function ceramic researchers must apply different knowledge that focuses on vessel use. What follows now in Section 2.2 is a discussion of how cooking is defined in this thesis and ethnographic examples of food preparation and home cooking.

2.2 FOOD PROCUREMENT AND COOKING PRACTICES: ETHNOGRAPHICAL APPROACHES

As the function of a cook-pot is to prepare food, then a general exploration of cooking is essential to better understand the relationships between people and cook-pots in the past. In the following sections the exploration begins with a broad definition of cooking that includes an explanation as to why it is an essential activity to sustain human life, Section 2.2.1. Ethnographic investigations of food preparation and home cooking are explored (Section 2.2.2), which can be applied to archaeological studies. Culture-specific knowledge of this type is challenging to detect, yet it influences interpretations of the social context in which ancient people prepared food.

2.2.1 Cooking as defined in this thesis

Wrangham (2006, 2009) proposes that the adoption of cooking was an evolutionary survival adaptation that humans made as our teeth and stomachs became smaller and our delicate digestive systems needed processed foods to absorb the nutrients. He explains that by tenderizing meats and softening plant materials the act of cooking changed the lives of early humans in at least four substantial ways. Cooking increased the range of edible foods humans were able to consume, which allowed us to move into new biogeographical zones and/or rely on foods to sustain life during off-season growing periods or times of environmental strain. Cooking also softens foods so that adults can supplement infants' diets when milk supplies are not abundant, thus increasing their chances of survival. Furthermore, activity levels were positively affected because the amount of time and energy an adult individual spent on chewing and digesting was shortened. Most importantly, the act of cooking changed the way humans distributed food (Wrangham 2006, 2009), which in turn affected the daily organization and ultimately shaped the social relationships we are concerned with in archaeology.

Clearly, cooking helps to sustain human life and is an essential component to our daily experience. Whether one agrees with Wrangham that cooking had a tremendous impact on our evolutionary adaptation is not relevant to this thesis. However the relationships described between cooking and humans are fundamental to understanding how cooking structured domestic activities and social dynamics—*e.g.*, food preparation compared with collection, storage and consumption, individual and group activity, social cohesion within groups. In Section 2.2.2 social aspects of home cooking are investigated through the discussion of specific ethnographic case studies.

2.2.2 Food preparation and home cooking

To demonstrate how cooking structured domestic activities and social dynamics six ethnographic studies are discussed that focused on agricultural communities where there was a clear division of labor for food procurement and cooking based on gender and age. The term domestic in this thesis refers to “home-based unpaid activities, undertaken to enable the daily and intergenerational maintenance and continued functioning of the local, national and international economic system” (Madge 1994:280). These studies conducted in the southern United States, North and West Africa, and the Philippine Islands in the mid-to-late 1900’s illustrate how food procurement and cooking reinforced gender roles, family, and communal bonds at the domestic level within agricultural communities where the household served as the primary economic unit.

Labor division should be considered at the domestic level because it relates directly to who does the cooking and in some cases the pot making, which are domestic aspects concerned in this thesis. For example, in Northern Ghana the men were responsible for commercial trading, agriculture, hunting, butchering, roasting, and grilling meats; while women were the primary care givers of children, tenders of agricultural crops and household gardens, masters of culinary arts, and potters for household vessels (Goody 1982:49-51, 71). In the communities examined both men and women follow rules, or guidelines, within their communities and homes, yet some are more flexible than others when situations of need arise.

A principal theme threaded through these cultural groups is the ideological link between life, nourishment (*i.e.* food procurement, cooking) and women. To highlight a woman’s role within the Beti [from Cameroon (Houseman 1988:51-52)] and LoDagaa [(from Northern Ghana (Goody 1982:70)] communities, her fertility is linked to her life sustaining abilities that transforms raw materials into consumable foods and needed household items—*e.g.*, producing and firing pottery, making soaps, extracting oils, brewing beer. For this reason, it is argued that female roles and life cycles interrelate to form a belief system that organizes home-based communities and influences technology (Costin 1996; McGaw 1996; Wright 1996). The theme of women's work is repeated throughout these ethnographies, because it is through the doing that women pass their skills (*i.e.* powers and secrets) and tools (*i.e.* cook-pots and wooden spoons) to the younger girls to carry out the culturally inherited rules. This concept goes farther by arguing that motherhood and women's work transcends biological connections to include all community members, and it is through this connection that women hold the community together (Beoku-Betts 1995:550).

Gambian women's work in West Africa revolves around domestic and specialized skills. In the home they are responsible for domestic work—*e.g.*, food processing, childcare, washing clothes, collecting water, making pottery; while for the community they perform work requiring specialized skills (*e.g.*, midwifery) and receive some form of payment or exchange for services (Madge 1994:281, 283). This sort of dual domestic-professional role for women's work is practiced in other cultures. In Northern Ghana, LoDagaa women sell their home-brews and prepared foods in the markets (Goody 1982:69, 70). For Kalinga women, living in the Philippine Island of Luzon, pottery production evolved from a domestic task to a part-time craft specialization—*i.e.* in economic terms this is the practice of skilled work in return for some form of payment or exchange (Stark 1991; Stark 1994:172, 173). While women universally have taken on roles and responsibilities inside and outside the home; the home remains their domain.

Self-sufficiency is the primary goal of the food system and is practiced through the ideology of West African cultures and African-American Gullah communities examined here by weaving humans, plants, animals, ancestors, unborn children, and nonliving things together within a shared environment (Goody 1982; Houseman 1988; Madge 1994; Beoku-Betts 1995). To keep this dynamic natural order in balance, food procurement and cooking are embedded within the ideologies of the natural and spiritual worlds and are bound together by divisions of labor based on gender (Madge 1994; Beoku-Betts 1995; Goody 1995:48, 55, 56, 69, 71). Significantly, while both men and women contribute to the procurement and preparation of food, they do tasks differently (*i.e.* food gathering, hunting, fishing), thus maintaining a clear division. For example, Gullah women fish using the rod and reel system, while men use a net and casting technique (Beoku-Betts 1995). Gullah women are also known to hunt when there is a need, but LoDagaa and Gonja women are forbidden to hunt. For the LoDagga and the Gonja, hunting and butchering, at both the household level or in exchange for commodities and/or currency, are strictly organized and carried out by men (Goody 1982:48, 53-56, 71). To insure that this division of labor continues, men teach the boys and women teach the girls their respective household and community duties.

Not all cultural systems are strict and in some societies girls and boys cook, yet particular tasks are reserved for women. The Gullah maintain the balanced order between the natural, spiritual and human worlds by promoting flexibility within a system that has gender-specific roles and responsibilities. The women teach both girls and boys how to cook so they can be free when the rice crops demand attention or when other needs must be met (Beoku-Betts 1995). Again, this is different in some African households, for example only Gambian women cook and are assisted in the kitchen by young girls (Madge 1994:chart

284). In fact, during the "hungry season" when women are short on time due to agricultural duties and money, it is not always possible to make sauce and most households eat only plain rice (Madge 1994:283). The limitation with these two case studies when applying gender roles to various tasks is that there is no mention of what the men are doing in the ethnographic account because it was primarily focused on women. However, as far as food preparation and cooking are concerned it is solely the woman's domain and if she is unable to perform her tasks either cooking becomes the children's responsibility or the household goes without.

The flexible system of governing household cooking tasks that the Gullah adopt also exists for the Kalinga, but is extended to include men. The women are primarily responsible for cooking the meals on a raised, 3-foot square hearth with three large stone or ceramic supports, called chalpong, located inside the kitchen (Skibo 1992:64, 1999:28, 85, fig. 30, 31, 88), yet men will cook so that women can do other tasks (Skibo 1992:64). Even though men prepare meals on occasion—*e.g.*, mostly meats or seafood by means of roasting or grilling—it is not socially acceptable for them to be the primary provider of home-cooked meals. Like the Gullah and the Gambian very little is mentioned about the roles and tasks men are responsible for, while the women tend to the meals.

This ethnographic discussion has provided specific explanations of the social aspects of home cooking for select groups of people, which often manifest in the organization of the physical spaces where people cook (*e.g.*, location and hearth arrangement in relationship to living structures). Ultimately, only the physical evidence of cooking (*e.g.*, cook-pots, hearth structures, food processing tools, food debris) remains in the archaeological record and ceramic researchers can use the information recorded in ethnographies as a broad analogy to help interpret the social organization of ancient cooking activities. For example, in the examined African, African-American, and Philipino communities the hearth fire is strictly the woman's domain (Goody 1982:70; Houseman 1988; Madge 1994; Beoku-Betts 1995). For this reason researchers could use these case studies to identify aspects of social connections in ancient material culture found in food processing and cooking areas. For example, it can be argued that the presence of artifacts associated with domestic work (*i.e.* bone needles, spindle whorls, loom weights used for sewing and weaving; scrapers for pot making or leather working; stone pounders and grinders, small knifes and blades that could be used for food processing) could indicate that women were present and performing these sorts of tasks in or around the kitchen. Furthermore, these ethnographic studies offer insight into how rigid or flexible the social aspects of domestic cooking can be, which also provides a guide for archaeologists to consider when evaluating practices of ancient daily life.

What follows next is a discussion of how ethnography can be used to identify and define cook-pot use. These studies are critical for ceramic researchers examining archaeological material in prehistory, because they provide a link between human action and the material object. Analytical approaches that incorporate ethnography are presented Section 2.3 to demonstrate how ceramic researchers can examine vessel shape and surfaces to discern how an individual might have used it for cooking.

2.3 INDENTIFYING COOK-POT USE: COMBINING ETHNOGRAPHICAL AND ANALYTICAL APPROACHES

Relationships between shape, function, and use are not always coherent when examining archaeological vessels, because multiple decisions are made during the production process that might not be given equal consideration or follow modern principles of production (Rice 1987:236, 237). This creates challenges for the ceramic researcher when applying his or her knowledge to examining ancient material to discern how an individual used a specific vessel type to prepare food. This section focuses on how ceramic researchers can correlate shape, function and use to identify ways individuals used these vessels to prepare food. To help overcome these challenges a discussion linking vessel shape and use examines how specific cooking techniques are better suited for specific cook-pot types, Section 2.3.1. Following is a discussion of how ceramic researchers can examine vessel surface attrition and discoloration to determine cook-pot use, Section 2.3.2.

2.3.1 Correlating cook-pot shape and use

Cook-pots display similar shape characteristics that distinguish them from other vessel types because their function is to efficiently utilize heat to prepare food, yet within cook-pot assemblages there are various shapes and sizes of vessels. Ethnographers also demonstrate that specific vessel shapes and morphological features correlate to the ways in which individuals use cook-pots for preparing food. Boiling, simmering/stewing, frying, toasting and roasting are the most common forms of cooking techniques associated with cook-pot use practiced in household cooking (McGee 1984:782-786). How each technique is better suited for specific types of vessels is discussed below.

Boiling and simmering/stewing is one of the most common and the second oldest cooking technique after roasting and grilling (McGee 1984:784). In boiling the food is heated by convection currents in a hot liquid and cooked—*i.e.* the maximum boiling temperature for water at sea level is at 212°F/100°C. Cooking below the boiling temperature is ideal to preserve the taste and texture of foods, especially fish and meat, because when foods cook in a boil the exterior surface can be over cooked while the interior merely heats through leaving it tough and difficult to chew (McGee 1984:784). Stewing is a lower temperature version of boiling that ranges between *ca.* 140°F/60°C—180°F/80°C and is better suited for slow-cooking (McGee 1984:785). Both boiling and simmering/stewing require a cook-pot that has rounded contours with thin-even walls that minimize the different thermal gradients across the vessel when it is heated, which allows the ceramic vessel to withstand thermal shock (Rye 1976:114, 207). These types of vessels typically have conical or globular-shaped bodies and open-mouthed for adding, stirring, and removing the food contents within (Arnold 1985:144; Woods 1986; Rice 1987:table 7.2).

Conical and globular-shaped cook-pots are the most widely produced and used in both the ancient and modern worlds; yet there are morphological differences in many of the vessel designs that are linked to how individuals cook in them. Arnold (1985:150) notes that in the tropical forest of eastern Peru cook-pots have pointed bases, out-slanting sides, and constricted necks because the Amahauca method of cooking was to place firewood around a conical depression in a dirt floor in which the vessel rests for cooking, rather than suspending it above fire. One reason for using this type of technique is environmental, because there is limited amount of stones and non-combustible material available.

Partially burying a vessel is in contrast to cooking techniques that utilize suspension apparatus to elevate vessels above the hearth fire, or to placing vessels on the ground with hot coals or fire underneath or surrounding it in kitchens where hearth cooking was practiced. Globular cook-pots in the 20th century rested above the fire on three individual ceramic supports called "chalpong" in Kalinga households located in Luzon, Philippines to prepare vegetables, meat or rice (Skibo 1992:64, figs. 4.6, 4.9, 4.12—4.16; Kobayashi 1994:figs. 1—7). In North Jutland, Denmark during the Iron Age rope was used to suspend globular cook-pots over a hearth, threaded through four equally spaced pierced holes near the rim. The threaded ropes were tied to a central one that hung from a support above the hearth (Steensberg 1939). This technique of suspending cooking pots allowed the vessel to be hung in balance with the ropes tied in a manner so that they did not obstruct access to the vessels' interior so that food could be added and stirred while cooking (Steensberg 1939).

Above are a few examples of how the shape of a cook-pot and the nature of the hearth are tailored to one another to construct a cooking space that provides the proper amount of heat to boil or stew foods. Conical and globular-shaped cook-pots can also be used for frying and roasting; however, other vessel types are often better suited for these cooking techniques.

Fats and oils are an efficient cooking medium because they can be heated to temperatures above the boiling point of water, which dries, crisp, and browns food (*e.g.*, primarily meat, poultry, fish) while the interior remains moist (McGee 1984:161). In shallow frying (*e.g.*, *sauté*) the bottom and sides of food is cooked, whereas in deep-frying it is completely immersed in oil and cooked (McGee 1984:160). Frying is an efficient mode of cooking because the cooking time is quicker than boiling and simmering/stewing (Rombauer and Rombauer Becker 1995:147—149), another advantage is that less fuel is consumed. While conical and globular-shaped cook-pots could be used for deep-frying, vessels with flatter bases and an open-mouth are better suited for shallow frying (Rice 1987:240). Examples of vessel shapes that are well suited for shallow frying are bowl-shaped, or wok-shaped, vessels (Rombauer and Rombauer Becker 1995:149). Additional vessels with a flat profile and a shallow rim include those used to fry or bake cakes. In the Guatemala highlands, women use a flat griddle called comales to fry or bake corn cakes, *i.e.* tortillas (Arnold 1985:151). In Imbros, Greece women use a pouma (*i.e.* pie slab) (Psaropoulou n.d. :266). These sorts of flat vessels can also be used for roasting and toasting foods.

Roasting and toasting is a process that involves heat, but it is not a complete cooking method because only the exteriors of foods are altered. Often leaving it crunchier, intensifying the flavor, and allowing the food to be processed easier (Rombauer and Rombauer Becker 1995:154). Roasting and toasting of coffee beans, nuts, legumes and other foods can be done in hot shallow vessels using various temperatures. For example, in India chickpeas are heated to around 180°F/80°C, moistened with water, rested for a few hours and then roasted in hot sand so that the seed coat can be easily rubbed off (McGee 1984:490). In the Peruvian Andes maize can be stored for a longer period of time if it is roasted. For this reason the Quechua toasted maize kernels on a flat utensil called a camcha, or popped them using various type of toasters called toqto (Arnold 19885:150). Worn-out or broken vessels are also used for roasting coffee, beans, peas, and chilies in the Philippines, where Kalinga women place the worn out globular cook-pots half-full of foods on the supports (chalpong) at a 45° angle for roasting. Once the vessel is heated the food within it is continuously stirred (Skibo 1992:72, 73:fig. 4.18).

2.3.2 Utilizing surface attrition to determine cook-pot use

Ceramic researchers can detect functional patterns associated with vessel use by examining cook-pots for surface attrition, which is the removal or deformation of the vessel surface caused by repeated actions like stirring, scraping, pounding, or grinding (Hally 1983b; Schiffer and Skibo 1989; Skibo 1992:106, 147—173). For example, Chernela (1969:fig. 3) notes that extensive wear, most likely from grating or grinding food, is present only on the rougher interior surface of Mesoamerican grater bowls; furthermore she notes that there is no wear on the fragile legs indicating that this vessel must have been held on the individual's knees during use. Utilizing surface attrition to determine vessel use is referred to in the literature as "use-wear" (Bray 1982, Jones 1989), "use-attrition" (Skibo 1992:106—141), and "use-alteration" (Hally 1983b, Kobayashi 1994). These types of studies range from the close examination of ancient vessel surfaces to ethnographic and experimental approaches that explore links between surface attrition and specific human interaction with vessels to perform specific tasks.

During the processes of cooking and cleaning, abrasive and nonabrasive forms often damage the surfaces of cook-pots (Rice 1987:234, 235; Skibo 1992:106, 107). Abrasion is the primary form of use-attrition and is a "trace that was formed by removal or deformation of material on a ceramic's surface by mechanical contact, specifically, the sliding, scarping, or striking action of an abrader (*i.e.* a particle, object, or surface)" (Schiffer and Skibo 1989:101—102). Nonabrasive forms of ceramic use-attrition are damage on the vessel surfaces caused by use but which does not involve mechanical action. One form associated with cook-pot use is thermal spalling, which, in short, is caused by the rapid escape of vaporized water that occurs as the vessel is heated, *i.e.* "steam blowing" (Skibo1992:106, 110).

As discussed in the previous ethnographic sections, cooking is a complex and repetitive action that can have a cumulative and often varied affect on vessel surfaces (Kobayashi 1994). Use-attrition studies that include an ethnographic and/or experimental component can more accurately demonstrate and define the complex relationship between cooking and surface attrition, rather than those that examine vessels to distinguishing cook-pots from other utilitarian vessels. The draw back of this approach is that it can be a challenge for ceramic researchers to identify the same level of use complexity on ancient vessels, because pre- and post-firing surface treatments might be poorly preserved and the hidden cultural aspects of cooking that affects how a cook-pot is used is often hidden in the archaeological record.

Nevertheless, use-attrition studies that incorporate ethnographic and/or experimental observations of how the process of cooking affects cook-pots has retrieved invaluable information (Skibo and Schiffer 1987; Schiffer and Skibo 1989; Kobayashi 1994). These studies provide a broad framework, which can be applied to experimental research whose objective it to better understand ancient material. Use-attrition studies associated with the Kalinga Ethnoarchaeological Project that began in 1973 with Longacre (1974, 1981, 1985) and continued for several decades with subsequent projects, are discussed to provide a baseline of understanding of how ceramic researchers formulate and execute these type of investigative programs. In this section, Schiffer and Skibo's work (1989) focusing on abrasive forms is examined, where as Kobayashi's (1994) analysis of carbon deposits on Kalinga cook-pots is incorporated into Section 2.3.3 that focuses on correlating the discoloration of vessels to determine cook-pot use.

Schiffer and Skibo's (1989) use-attrition studies utilized descriptive analysis, rather than quantitative analysis, to determine the general pattern of use-traces and link them to specific cooking and cleaning activities in the Kalinga household when the women prepared rice, vegetables, and meat in globular-shaped, low-fired ceramic vessels with polished surfaces and interiors coated with resin (Skibo 1992:110, 111, 132). The morphologies of the cook-pots are similar, but those used to cook rice have a narrower mouth (Skibo 1992: 132, 133, fig. 6.2). This work demonstrated that distinct and easily recognizable attrition cases that linked to specific cooking actions formed on specific areas of the cook-pot—*i.e.* exterior base; lower, middle, and upper exterior side; exterior and interior rim and neck; upper, middle, lower, and base interior (Skibo 1992:111, 141—143, table 6.1, fig. 6.1). A discussion of these findings and Schiffer and Skibo's (1989) inquiring methodology of use-attrition are in the following paragraphs beginning with the methodology.

Schiffer and Skibo's (1989) three-part inquiring method of use-attrition includes identifying the characteristics of the vessels ceramic fabric, the abrader, and the nature of contact between the vessel and abrader. Characteristics of the ceramic fabric includes defining paste hardness, hardness and distribution of the aplastic inclusions within the paste, the nature of the ceramic surface to identify the presence of pores, cracks, voids, as well as pre- and post-firing finishes (Schiffer and Skibo 1989:105—108). Characteristics of the abrader include defining its hardness, shape, and size, as well as the rate of the abrasion. Together these define the characteristics of the abrasive trace (Schiffer and Skibo 1989:108—111; Skibo 1992:108—110).

Determining the nature of contact between the vessel and abrader is complex because a multitude of factors are involved that affect the rate and traces of abrasion (Schiffer and Skibo 1989:111—113). For example, abrasion requires movement of the abrader, the cook-pot, or both simultaneously; and it is determined by the directionality, velocity, and rate of this movement (Skibo 1992:109). Furthermore, several complications of inferring use-attrition arise. A primary complication is that multiple abraders could have been in contact with the same vessel. Multiple abraders could leave distinct trace abrasions of one, a few, or all of the various types of abraders; it is also possible that one abrasive trace destroys one or more of the others (Skibo 1992:190). Another complicating factor of inferring use-attrition is when trace patterns are created by cook-pot, the abrader, and what Skibo (1992:109) refers to as a substrate. The illustration given is when a cook-pot is washed by hand using sand. In this scenario the hand moving over the pot is the substrate and the sand is the abrader (Skibo 1992:109). A final complication in inferring use-attrition is the presence of liquid, because liquid has been identified as a medium that increases the rate of abrasion, as well as creates traces that differ when liquid is absent even though a similar form of abrasion was used (Skibo and Schiffer 1987; Skibo 1992:109). An example of this is the affect of stirring foods when they are prepared in a large quantity of water or broths (*e.g.*, boiling and simmering/stewing vegetables or meats) to stirring foods that slowly simmered or steamed with a minimal amount of liquid (*e.g.*, cooking rice).

Through this work on the Kalinga cook-pots two broad categories of use-attrition traces associated with abrasion were identified and defined; marks and patches (Skibo 1992:110). A mark is the result of a single act that is related to the direction of motion and force applied by the abrader on the cook-pot, the angle of contact between the abrader and cook-pot, as well as the shape and type of abrader used. Attrition marks identified on the Kalinga cook-pots typically took the form of a scratch, pit, chip, or nick (Skibo 1992:110, 111). Patches are associated with repeated activity and is the result of multiple attrition marks that creates distinct zones that are described as having a center and periphery (Schiffer 1989:195; Skibo 1992:111). Attrition marks are often obliterated beyond recognition within the zone, yet the size, location, and characteristics of the pottery surface, can still provide information on use behavior during cooking and washing (Skibo 1992:113—141).

The Kalinga women typically prepare rice in one cook-pot and vegetables and meat in another (Tani 1994:52, 53). Generally speaking, the interior attritional traces identified on vessels to cook rice differ from those used to cook vegetables and meat. There was very little evidence of stirring in the rice cook-pots, but numerous marks associated with stirring were present on the vegetable/meat cook-pots (Skibo 1992:132, 133, 138, 141, table 6.1). This is due to two factors, the types of food being cooked and the material the cooking and serving utensils were produced in. For example, the women stirred the vegetable and meats multiple times during the cooking process and typically used metal ladles rather than those made of wood; whereas the women rarely stirred the rice during the cooking process and typically used wooden spatulas rather than a metal utensil (Skibo 1992:133, 134). This exercise illustrates that it is important for ceramic researchers examining ancient cook-pots to have an understanding of the types of foods that could have been prepared for human consumption because different types of food respond differently chemically and physically to boiling, or simmering/stewing, Section 2.3.3, as well as what types of materials the ancient "kitchen" utensils could have been produced in, *e.g.*, wood, bone, metal.

The exteriors of all cook-pots became dirty during cooking and were washed in a similar manner, thus leaving washing traces as the dominant attrition marks on the vessel exteriors (Skibo 1992: 118, 119, 142, figs. 6.6, 6.9, 6.11, 6.14). The women washed the exterior of their vessels by rubbing one hand across the cook-pot in a circular motion scrubbing it using water, sand, charcoal, leaves, and rice chaffs to remove the carbon and drips and splatters of burnt food (Skibo 1992:123). Further discussion of carbon deposits associated with burnt food on the interiors and exterior of the Kalinga cook-pots are incorporated in Section 2.3.3.

2.3.3 Examining discoloration of vessels to determine cook-pot use

Ceramic researchers can also detect functional patterns associated with vessel use by the presence and location of discoloration produced by heat and soot marks on the vessels' exterior (Hally 1983b; Kobayashi 1994; Gur-Aried, *et al.* 2011). Dark drips, splatters, and stains that resemble burnt food and liquid can also be detected on both the interior and exterior surfaces (Skibo 1992:149—152), and is a clear indication that the vessel was most likely used for cooking or other activities involving fire—*e.g.*, preparing medical tinctures or industrial products, such as dyes (Hally 1983b). This section discusses how ceramic researchers determine cook-pots use by examining the discoloration of vessels that is associated with hearth cooking technologies.

When cook-pots are exposed to a hearth fire, blackened and concentrated mottled areas of discoloration, also known as oxidized patches, appear on the vessels' surface (Skibo 1992:153; Gur-Arieh, *et al.* 2011). The blackened areas are soot deposits created by the incomplete combustion of organic fuels that adhere to the vessel, while some deposits are removed by rubbing and washing, others remain (Skibo 1992:152). Oxidized patches are created by exposing the vessel to high temperatures that burn off the previously deposited soot by oxidizing the atmosphere immediately between the fire and vessel (Hally 1983a, b; Skibo 1992:153). The concentration of the soot and oxidized patches depends on factors that affect the temperatures of the vessel, fire, and space between the vessel and fire. These factors are: fuel type, *e.g.*, soft wood, *i.e.* pine, or hard wood, *i.e.* olive wood (Skibo 1992:168—171) or burning embers (Gur-Arieh, *et al.* 2011); moisture, *e.g.*, how much liquid the vessel holds, and the amount that has permeated through the wall (Skibo 1992:162—163); the distance between the vessel and heat source (Skibo 1992: 157—162); environmental conditions, *e.g.*, wind (Gur-Arieh, *et al.* 2011: 351); vessel reuse (Skibo 1992; Kobayashi 1994; Gur-Arieh, *et al.* 2011).

The ethnographic and experimental studies demonstrate that while it is the norm, soot does not always appear on vessels when direct cooking heat is used. Soot does not appear on the areas of cook-pots that are placed in burning embers (Skibo 1992:154; Gur-Arieh, *et al.* 2011) and when there are windy conditions while cooking over a hearth fire (Gur-Arieh, *et al.* 2011). Soot also does not appear, or but faintly, on vessels that have not been used frequently, or do not have interior resin coatings (Skibo 1992:157-173).

Use-alteration analysis of the presence and placement of interior carbon deposits on cook-pots also demonstrates that there is a correlation between discoloration and vessel use (Kobayashi 1994). Interior carbon deposits result from carbonized food residues that adhere to the vessel wall during cooking, thus making the presence of both intense vessel heat and organic material the primary determinants of interior carbon formation (Kobayashi 1994:144). Factors that influence cook-pot temperatures are the amount of water in the pot (*i.e.* a large amount of moisture inside the vessel cools the vessels' wall and thus carbon deposits cannot be produced), the distance between the cook-pot and the hearth fire (*i.e.* shorter the distance the more intensive is the carbon deposit), the temperature of the hearth fire, and the heat conductivity of the vessel wall (Koyayashi 1994:144). Differences between interior and exterior carbon deposits occur: interior carbon deposits penetrate into the vessel wall, rather than lie on the surface and typically the deposits do not become oxidized after they are formed. These are important distinctions because interior carbon deposits are a cumulative process that often can be identified as a light brown patch after a cook-pot is first used, which gradually changes color to dark brown and then to black (Kobayashi 1994:144, 145). This is in contrast to exterior carbon deposits, which often are not visible after the first use, Section 2.3.2 (Hally 1983, 1986; Skibo 1994:145—169).

To document the correlation between interior carbon deposits and cooking, 40 houses in Kalinga were visited to record pottery use behavior when women cooked (Kobayashi 1994:128—130). Home cooking behavior was characterized by distinguishing between the types of food dishes being prepared (*e.g.*, rice, vegetable, meat) and noting the primary cooking technique (*e.g.*, boiling, which correlates to the cook-pot's globular shape). Much like the interior use-attrition marks on the Kalinga cook-pots, Section 2.3.2, the interior carbon deposits of cook-pots used to prepare rice and those used to cook vegetables and meat are distinct from one another, yet display similarities (Kobayashi 1994:163—168). This allows for the ethnographer working in Kalinga to more accurately discern between cook-pots used for cooking rice and those use for cooking vegetables and meat.

Similarities between the interior carbon deposits of the rice and vegetable/meat cook-pots are that they get darker and thicker each cook time, and each cook-pot has at least one carbon patch that formed on the middle interior that increases laterally each time the vessel was used (Kobayashi 1994:163, 164). Distinctions between the two types of vessels are more visible after the interior resin coating had worn away. In short, rice cook-pots have a darker and thicker interior carbon deposit that is wider, both vertically and laterally, than the vegetable and meat cook-pots making the interior carbon deposits more distinct; however, the most distinctive feature on the interiors of vegetable and meat cook-pots is the dark color of the non-carbon areas above and below the interior carbon deposits (Kobayashi 1994:166—168).

Kobayashi (1994:168) explains that factors such as the amount of water in the vessel at the time of cooking, the distance between the hearth fire and cook-pot, and the intensity of the hearth fire during cooking all contribute to the differences between interior carbon deposits produced from rice and those from vegetables and meat. A potential component of the formation of interior carbon deposits not taken into consideration that could be critical is how different food types react chemically and physically to heat and cooking techniques. For example, meat is comprised mainly of protein and fat (McGee 1984:121, 129, 130, 134) and when it is boiled, or stewed, the collagen (*i.e.* connective tissue within meat [McGee 1984:163]) is dissolved into gelatin and released into the stew along with the melted fatty tissues (McGee 1994:162, 163, 799). Vegetables and rice are carbohydrates and each food type reacts differently when boiled or stewed. Vegetables are high in fiber, which allows the cellular structure to break down easily when it they are steamed or boiled (McGee 1984:278, 285), especially compared to rice and meat. Rice, on the other hand, has a high starch content that must be heated for a specific period of time to allow the granules to absorb water, swell, and release starch molecules making it edible (McGee 1984:474, 804). When rice cools the starch molecules rebond forming a moist but solid gel (McGee 1984:804). Perhaps the cooking and cooling process of rice creates a food produce that has a higher potential than meat and vegetables to adhere to materials it comes in contact with, such as cook-pots and utensils. This thread of inquiry should be investigated further using chemical analysis and experimental methods.

2.4 CONCLUSIONS

Practical knowledge from ethnographic and experimental observations discussed in Chapter 2 provides a general understanding of how complex the relationships between people, cooking and potting practices, and cook-pots can be. Each section has provided insight into a hidden cultural aspect of cooking that affects how a cook-pot was produced and used, which archaeologists recover in the archaeological record. Although valuable, caution is necessary when utilizing these methods because limitations exist when comparing the archaeological cook-pots to the modern cook-pots observed in ethnographic studies. One limitation is that surface preservation of the ancient and modern material differs, which could affect how clearly the ceramic researcher is able to detect and record details of the vessels that are associated with production and use. The ancient materials have been in existence for longer periods of time above and below ground, and groundwater can physically and chemically affect ceramics, *e.g.*, identification of post-depositional chemical alternation of ceramics from the north coast of Papua New Guinea (Golitko, *et al.* 2012). Additionally, harsher methods of washing are typically used during conservation of ancient vessels than those used in daily kitchen cleaning. Another limitation is that ancient cook-pot shapes, sizes, and ceramic fabrics typically differ from the modern vessels, which may or may not affect the production or surface attrition of the cook-pots, but it should be considered. Also, the conditions of cooking are most likely not the same—*e.g.*, different cooking fuels, environmental conditions, cooking space, and cultural ideas of how and what to cook. The diversity of cooking practices outlined in this chapter highlights the difficulty of interpreting culturally specific aspects of cooking, especially when addressing ancient practices that can no longer be observed directly.

As discussed in this chapter, the *chaîne opératoire* provides a framework through which the numerous elements of the production process can be identified and analyzed. Ethnographic case studies offer analogous insights into the production and use of cook-pots. Both of these approaches have strengths and weaknesses when applied to the analysis of ancient vessels. Critical elements of the *chaîne opératoire* are not evident in archaeological material, such as those which leave no physical remains or for which traces of been removed or obscured by subsequent actions on the part of the potter. Ethnographic case studies provide valuable insights into cooking practices and contexts, especially for researchers with different cultural backgrounds who are not used to cooking with ceramic vessels on open fires, but nevertheless these are only analogues for past practices and conditions.

To advance understanding of cook-pot production and use in the past it is necessary to advance these approaches with reference to the specific archaeological material under investigation. To this end, Chapter 3 will develop a methodology through which the *chaîne opératoire* of ancient cook-pot production can be examined on the basis of physical remains of the ancient pottery. This methodology incorporates experimental reconstruction of ancient cook-pots as a dynamic means of engagement with the production process. Through this approach fresh insights into the *chaîne opératoire* and behavioral practices can be achieved that can be related to the properties of specific types of ancient cook-pots rather than relying solely on modern ethnographic analogies.

CHAPTER 3: METHDOLOGY

Technological typologies of LM cook-pots are constructed to characterize potting traditions in northeastern Crete from the sites of Mochlos and Papadiokambos, Sections 1.1, 1.4, 5.1, 5.2. The methodology developed and applied to the fore mentioned material is the Integrated Approach to Ceramic Analysis (IACA). Here IACA and the terminology used within the methodology are defined and evaluated to demonstrate what is distinct about this approach.

3.1 INTEGRATED APPROACH TO CERAMIC ANALYSIS

The Integrated Approach to Ceramic Analysis (IACA) has been developed to characterize technological aspects of potting traditions by identifying the interaction of production and use between a human and a vessel by focusing on key elements of the vessel's design. The aim of IACA is to better understand how people produced and used ceramic vessels to perform specific tasks. The technological typologies developed are distinct from those formed solely by utilizing stylistic and ceramic fabric analysis, because they include an experimental component that can differentiate between human action and vessel function by exploring real-world constraints [*i.e.* cultural and environmental factors outside of the potter's 'know-how' and craft knowledge, Section 2] in the processes of production and use of a vessel. This allows the ceramic researcher to more clearly define a cultural framework for the vessels they are examining. This is achieved by juxtaposing the *chaîne opératoire* (Section 2) of pottery production and use alongside an experimental component that is designed to be executed: together, using technological analogies, they map potential sequential steps to produce and use a vessel. The term *technological analogy* is used here to define the practical application of knowledge needed to produce and use specific types of ceramic vessels; based on similarities the vessels are grouped into an assemblage referred to as a *technological typology*. These sequential steps of human actions are referred to as *behavior models* in this methodology and differ from *chaîne opératoire* because the model incorporates both the *chaîne opératoire* used to define the initial technological typology and the proposed hypothetical processes of production and use. The experimental component of IACA is accomplished by reproducing the object in both shape, ceramic fabric, and size based on the examination of morphology, fabric, and surface irregularities that identify manufacturing techniques. Once the experimental object is formed, additional non-laboratory-based experiments are executed that evaluate *function* (*i.e.* activities vessels perform) and *use* (*i.e.* how people used vessels to perform a particular function). Together the technological typology and the behavioral model in this methodology define the potting tradition.

IACA is utilized to construct a technological typology of specific vessels types, such as cook-pots, by assimilating stylistic and ceramic analyses with an experimental component. This holistic approach of analyses ensures that the vessels are examined from multiple viewpoints, because production and use of objects are multifaceted (Sections 2.1-2.3), and this is key to better understanding how, and possibly why, objects were created. The four principle steps of IACA are bulleted below with a discussion following that demonstrates how each step is achieved and how it relates to approaches in the literature.

- Step 1: Define the technological typology.
- Step 2: Develop behavioral models.
- Step 3: Assesses behavioral models by experimentation.
- Step 4: Apply technological analogy and behavioral models to identify potential potting traditions.

3.2 STEP 1: DEFINE TECHNOLOGICAL TYPOLOGY

Material culture is examined using stylistic and ceramic fabric analysis to create a descriptive statement of the vessel's appearance to define the typology. This description can be used as a tool to form hypotheses about the *chaîne opératoire* of vessel production and use (Conkey 1990:2-3). Stylistic attributes recorded are shape, character of attached appendage(s) (*i.e.* handles, legs), decoration or surface finish, and size. General comments noting surface irregularities associated with manufacturing and forming techniques of each vessel are also recorded. For example, undulating ridges on the surface of a vessel are called rilling-marks, which are formed as a potter creates a vessel by pressing the fingertips against wet clay as it rotates on a wheel, Section 2.1 (Rye 1981:74-78). The presence of rilling marks on the surface of a vessel indicates that the potter produced or finished the form utilizing some form of wheel technology. Ceramic fabric analysis is utilized to define physical attributes of the clay used to produce the vessel by recording information such as color and texture of the clay paste—*e.g.*, fine, coarse, as well as characteristic features of rock fragments—*e.g.*, color, shape, size, quantity—and voids—*i.e.* spaces of various shapes within the clay that could be produced from burnt out organic matter, or air pockets, present within the clay paste (Rye 1981).

To demonstrate how IACA utilizes the strengths of both types of analysis, stylistic and ceramic fabric analyses are evaluated. Although stylistic analysis is presented first, stylistic and ceramic fabric analysis can be executed and discussed in any order within step 1. When appropriate the discussion below includes Aegean Bronze Age examples to provide context for this thesis focusing on Minoan culture, Sections 1.2, 1.4.

3.2.1 Stylistic analysis

In Aegean archaeology the early studies of Minoan pottery such as Evans's (1921-1935) through to more recent studies, such as Furumark's (1941) analysis of Mycenaean pottery and Rutter's (1995:11-37; 70-268) classification and catalogue of pottery from the prehistoric Greek settlement of Lerna, the physical attributes of shape and decoration have been applied to create ceramic classification systems. One purpose of this approach is to date sites either by association with other artifacts found in the same context that have a known date, *e.g.*, coins, or by seriation (Adams and Adams 1991; Orton, *et al.* 1995:189, 190). Seriation is a form of relative dating [*i.e.* a system that provides an order of events by correlations among different types found in reliable stratified deposits (Shelmerdine 2008:3)] that organizes artifacts according to physical changes over time. Both techniques are important to consider when examining and dating utilitarian coarse wares because these vessels are not particularly date-sensitive due to slow changes in their morphology. Other applications of stylistic analysis establish links between vessel shape and function, such as was constructed for LM cooking wares at Kommos in south-central Crete (Betancourt 1980); or between decorative motifs on fine wares and cultural identities used to distinguish between local and foreign participants of food and drink consumption in public spaces in the Late Bronze Age on Crete (Rutter 2004); or between vessel production and the *chaîne opératoire* to examine the various techniques used in ancient workshops in the Middle Bronze Age at Knossos in central Crete (Knappett 2004).

Stylistic analysis in IACA is concerned with describing the physical attributes [*e.g.*, shape; surface finish; dimensions of rim, body, base, appendages (*i.e.* handles, legs), decorative features] and irregularities on vessels' surfaces to discern remnants of production and use. These descriptions create systematic categories that can be utilized to broadly date, identify cultural groups, and map potential processes of production and use. However, as productive as stylistic analysis can be, it fails to include all aspects of a vessel, such as the composition of its ceramic fabric. Ceramic fabric is one of the fundamental features of the vessel because it is the material ceramic objects are produced with and is connected to the steps of pottery production, Section 2.1 (Figure 2.01; Rye 1981:16-20).

3.2.2 Ceramic fabric analysis

Ceramic fabric is a synthetic pyrotechnic material that is produced when clay, or various mixtures of clay(s) and organic and inorganic material(s), has been fired above 500°C (Rhodes 1973:16). At this temperature the water molecules are physically and chemically removed, thus causing the clay to become dehydrated, that is dehydroxilating and sintering and unable to revert back to a plastic state. What researchers refer to as a ceramic fabric potters call a clay body, and potters use clay bodies to produce vessels. The ceramic fabric of ancient vessels can be studied to investigate various aspects of production, use, and distribution. Classification systems based on ceramic fabrics have been used to date archaeological sites, determine settlement patterns in specific regions (Moody 1985, 1987; Moody, *et al.* 2003), locate pottery production areas (Barnard and Brogan 2003), redefine or create new ceramic chronologies based on fabric and stylistic changes (Day 1989, 1995; Cordell 1991, 2001), distinguish between imported vessels from regionally produced vessels (Stoltman 1991), identify long and short distance trade networks (Whitbread 1995).

Ceramic fabric analysis in IACA is designed to systematically create categories that describe the physical structure, rather than chemical structure, of the fabric used to produce the vessels examined. Defining the physical structure of the ceramic fabric used in production is essential because the principal aim of IACA is to construct a technological typology that is employed as an analytical tool to develop experiments that to evaluate hypotheses about production. Ceramic fabrics are directly linked to the first two steps of pottery production, which are locating and processing potting materials, Sections 2.1 (Figure 2.01; Rye 1981:16-20). Descriptions that define physical features of the fabric are standardized, and so provide a visual perspective of the material analyzed that includes the composition and organization of the components within the fabric, *i.e.* clay paste, rock, void inclusions (Whitbread 1995:365, 366; Moody, *et al.* 2003). For example, recorded are texture (*e.g.*, fine, coarse) of the clay paste, characteristic features of rock fragments (*e.g.*, color, shape, size, quantity), and voids (*i.e.* spaces of various shapes within the clay that could be produced from burnt out organic matter, or air pockets), and colour of the paste. In this examination the color of the paste also includes discoloration produced by hearth fire as a means to examine cooking techniques.

Ceramic petrography "is the systematic description of ceramic materials, their composition and organization, in hand specimen and thin section. Ceramic petrology encompasses the broader interpretation of raw materials selection, ceramic technology, and provenance determination based upon the results of petrographic investigations, with supporting data from other scientific methods, such as chemical analysis" (Whitbread 1995: 365). Macroscopic fabric analysis (referred to by Moody, *et al.* 2003 as MACFA) examines fabric on the surface and on a fresh break in hand sample using a 10x-30x hand-lens (Moody, *et al.* 2003). Examining the material in thin section requires a polarizing microscope to detect optical properties of rock and mineral inclusions (Whitbread 1995:365-396). Moody's MACFA and Whitbread's systems of petrographic description are used in conjunction to create a fabric description. These methodologies are complimentary because they describe and characterize similar features—*e.g.,* color of the clay paste, rock fragments (*i.e.* color, shape, texture, quantity, order within paste), voids (*i.e.* shape, size, quantity, order within paste).

Stylistic and ceramic fabric analyses together provide the information needed to develop a comprehensive descriptive statement of the vessel's appearance. To develop hypotheses that define human actions that produce vessels, behavioral models that map the production process are constructed in Step 2 by applying ethnographical accounts of pottery production and use.

3.3 STEP 2: DEVELOP BEHAVIORAL MODELS

Behavioral models of the *chaîne opératoire* of pottery production and use are constructed in Step 2 by relating the detailed description of the material culture examined in Step 1 to human action recorded in ethnographic accounts concerning these actions. The types of models developed in Step 2 serve as the foundation for experimental work executed in Step 3. As outlined in Section 2, the *chaîne opératoire* of pottery production is a sequential series of actions that produce pottery. A specific *chaîne opératoire* of pottery production can be defined by the systematic choices, or variants, that potters make within these steps (Mahias 2002; van der Leeuw 1993; Sillar and Tite 2000). Beyond identifying production processes, ethnographic analogies can be utilized to explore processes of vessel function and use, because, as with the production of a vessel, multiple decisions are made during its use that might not be apparent purely by examining the vessel. To help overcome these challenges ethnographic analogy can link vessel shape and use to explore how specific vessel forms are better suited for particular functions. Exploring such studies also provides a means to correlate surface attrition with vessel use, Section 2.3.

Ethnographic analogy is useful for creating human behavioral models that lead to an understanding of how and why systems might change (Binford 1962, 1965, 1972; Matson

1965; Arnold 1975a, 1975b, 1985, 1991; Longacre and Skibo 1994; Mathieu 2002). In fact, researchers studying ceramic traditions and technologies use ethnographies to build behavioral models based solely on how people responded to materials in their environment (Matson 1939, 1965; Binford 1962, 1965, 1972; Arnold 1975a, 1975b, 1985, 1991), or how people and the objects they created behaved in particular situations (Schiffer 1976; Schiffer and Skibo 1997), while others aspire to reach beyond the reactionary side of human behavior to include the intellectual and unconscious behavior that manifests itself in the choices people make to complete a task (Gosselain 1991, 1998; Mathieu 2002).

The strength of the sort of technological analogy is that since the action is known, the end result can be more accurately defined and measured to minimize incorrect assumptions about how material objects could have been produced. The benefit of this approach is that a constructed operational sequence provides a way of thinking through the materials by establishing a sequence based on cause-and-effects. However, one must use caution because it can be hard to identify and separate human action from external and invisible factors (*e.g.*, environment, individual choices verses the norm) that influenced the final product and use of the object. To minimize incorrect assumptions, behavioral models developed using a multitude of case studies that focus on cultural and environmental aspects can be more accurate because researchers need to understand how people respond to and operate within specific cultural and ecological situations.

What is missing is any link back to the material culture being examined. Fortunately, this sort of behavioral model can be developed through experience and experimentation.

3.4 STEP 3: ASSESS BEHAVIORAL MODELS BY EXPERIMENTATION

Behavioral models constructed in Step 2 are assessed by experimentation in Step 3 and the final outcome defines the technological typology. The overall aim of executing experiments that explore real-world constraints is to identify human action within a specific task, such a cooking. For example, ceramic specialists can employ experimental methods to address technological questions that relate to variants within the *chaîne opératoire* of pottery production. The vessels produced can be further explored in terms of their functional properties and the ways in which these can be used by an individual. This aspect of IACA's experimentation process is distinct from laboratory-based tests. Laboratory-based tests are particularly insightful when defining properties of vessels that focus on morphology or material performance, yet their high degree of control can constrain the evaluation of potters' choices based on empirical knowledge, cultural understanding, and environmental restraints. Such constraints can limit the range of potential alternatives when developing explanatory reasons as to why one type of material, or vessel form, was preferred. Additionally, because ancient potters cannot be observed using ethnographic methods the experimental component in IACA provides insight into how individuals in the past could have operated and organized the production and use of culturally specific vessel types.

For example, ceramic fabric replication experiments in three regions of western Crete tested the viability of local geological resources to produce Bronze Age cook-pot fabrics by locating and processing clay (Moody, *et al.* 2012). The experiments utilized the fabric descriptions of the ancient material to distinguish clays used to produce cook-pots from other wares in the respective research areas. Clays with similar geological components were collected in their respective environments and processed according to the fabric description (*i.e.* cleaned—removed inclusions larger than 2 mm, which was the largest rock fragment in the ancient material) and used to produce small pinch pots. To confirm the similarity of fabrics between the ancient and experimental vessels the pinch pot fabrics were described in the same manner as the ancient material. To determine if the fabric would crack when it came in contact with a direct heating source, *i.e.* hearth flame, and if it could hold liquids the experimental pots were tested by boiling water while being heated over a Bunsen burner (Moody, *et al.* 2012). By executing experiments that focused on the first two steps of pottery production (Section 2.1), we know that based on the similarities between the ceramic fabrics and local potting materials (*i.e.* clay) at least three regional traditions of producing tripod cooking pots were established in west Crete.

Another study utilizing an experimental hands-on approach was designed to re-assess the functional and cultural role of the Uruk coarse ware bevel-rim bowl, *i.e.* BRB (Goulder 2010). BRBs are crude mold-made vessels produced in Mesopotamia and the surrounding regions in the fourth and third millennium BC during a time of high urbanization and bureaucratic control when writing was introduced. The aim of Goulder's (2010:359, 360) study was to better understand the complex nature of examining BRBs as tools "designed to maximise ceramic and food production-line efficiency" rather than as a crude serving bowl for individuals considered to have lower social status. This was achieved by designing experiments that primarily focused on function, but considered production in terms of how the overall unskillful appearance of the vessel was linked to mass production methods. Goulder (2010) claims that the unskillful appearance of BRBs has caused ceramic specialists to misclassify these vessels, rather than explore their significance as objects associated with changes in social, political and economic structures. Unlike the experiment in west Crete that was primarily concerned with identifying and manipulating a similar clay source to produce cook-pots, Goulder's (2010) experiment focused on function. Vessel production in this experiment demonstrated that with little potting experience and simple tools BRBs can be produced; correlating to the mass-production of low-cost vessels. Usage tests were executed that explored leaven bread baking (*i.e.* mixture of emmer wheat and barley), yogurt and cheese making, and salt manufacturing; bread baking was the most successful according to Goulder. The main conclusion was that the "explosion" and distribution pattern of BRB to be used as bread-molds in the Uruk period indicates that there was centralized production and distribution of leaven bread to supply a staple for bureaucratic administrators.

3.5 STEP 4: APPLY TECHNOLOGICAL ANALOGY AND BEHAVIORAL MODELS TO DEFINE POTTING TRADITIONS

The information gained in constructing the technological typology in Steps 1-3 to identify potting traditions is evaluated using reasoning that is both inductive—*i.e.* from a specific vessel to human action, and deductive—*i.e.* going from human action back to the vessel. By defining such potting traditions it is possible to isolate and differentiate between human action and vessel function. In pot making human action relates to sequential steps needed to produce a vessel, such as those mapped in the *chaîne opératoire*, while vessel function relates to how morphological features of a vessel define the ways an individual can use it. Distinctions between action and function are critical because once they are defined researchers can examine particular vessel types in specific contexts to explore how people used them and what could have been the social implications.

IACA goes beyond the systemic model of the *chaîne opératoire* by exploring through experimentation how individuals interact with specific vessel types produced from examinations of morphology, fabric, and surface irregularities that identify manufacturing techniques and surface attrition associated with vessel use. The benefit of this approach is that a constructed operational sequence provides a way of thinking through the materials by establishing a sequence based on cause-and-effect. The strength of this sort of analogy is that because the action is known the end result can be more accurately defined and measured. The limitation to this approach is that the constructed sequence is able to record only physical actions and not the thoughts or the creative process of an ancient person. Because the approach only records actions, some of the *chaîne opératoire* steps might not be recorded due to limited knowledge of how to execute a particular task, or limited access to tools and materials required; however, the experimental component in IACA provides a more rigorous way to better identify and examine conceptual parts of the production and use sequence.

CHAPTER 4: LM COOK-POTS

Prehistoric cook-pot classes are defined by associating their shape with a presumed function because there is no contemporary text that explains the object. Furthermore, Minoan iconography depicted in frescoes, on vases, or within glyptic scenes is lacking in domestic cooking scenes. Linear B tablets on Crete do not mention cooking and eating either. Here the focus on LM cook-pots is to provide context for the archaeological material examined in this thesis from the LMI and LMII-III settlements at Mochlos and from the LMI House A.1 at Papadiokambos in east Crete.

This section briefly examines how LM cook-pots are identified in the archaeological record, Section 4.1, details vessel characterization in terms of production and use (Sections 4.2, 4.3), and addresses the limitations of cook-pot chronology, Section 4.4. Observations that define the primary cook-pot types are derived from published evidence and include the following sites (Figure 1.02):

- Western Crete: Kastelli Khania; Khamalevri
- Central Crete: Galatas, Knossos, Kommos, Villa of Pitsidia, Poros, Skinias
- Eastern Crete: Karoumes, Makrygialos, Mochlos, Palaikastro, Petras, Pseria

Where possible ethnographic and experimental information on pottery production and cooking is utilized to provide a practical, analytical or analogical perspective of how LM cook-pots could have been produced and used. Minoan pottery terminology is broadly established by the early excavators (Boyd 1901, 1904; Seagar 1912; Evans 1921-1936; Bosanquet and Dawkins 1923) with minor variations in vessel names and this discussion follows the same tradition.

4.1 IDENTIFYING LM COOK-POTS

The criteria utilized to distinguish cook-pots from other ceramic containers are surface discoloration produced by heat and soot marks (Hally 1983; Skibo 1992; Gur-Arieh, *et al.* 2011) and dark drips, splatters, and stains that resemble burnt food and liquid (Skibo 1992:149-152). Ceramic fabric is also studied to identify cook-pots, but solely utilizing this criterion is problematic because LM cook-pots across Crete are formed with multi-purpose coarse fabrics (Popham 1984: 176; Moody and Robinson 2000; Moody, *et al.* 2003; Barnard 2003; Day, *et al.* 2003; Nodarou 2010). Utilizing these criteria in conjunction with the archaeological context in which excavated vessels are found is a more secure method of identifying cook-pots because artifacts associated with kitchens (*e.g.*, architectural space, evidence for ovens or hearths, floral and faunal remains associated with food production and consumption, accessory utensils) are taken into consideration to aid in hypothesizing vessel function and use.

Researchers primarily recognize four LM cook-pot types: tripod cooking pots (Figure 4.01), cooking jars (Figure 4.03), cooking trays (Figure 4.04), and cooking dishes (Figure 4.05). These vessels are pan-Cretan, but the coarse fabrics potters used to produce them have regional and chronological significance (Moody 1987; Moody, *et al.* 2003; Watrous, *et al.* 2004; Watrous, *et al.* 2012). Additional vessels are identified as cooking equipment: grills (Figure 4.06:A); spit-rests, also called "souvlaki trays" in the nomenclature (Figure 4.06:B; Hruby 2008; Lis 2008); small pots or cups with lug handles (Figure 4.06:C); jugs of various sizes (Figure 4.06:D); tripod cooking pans with long attached spouts (Figure 4.06:A; Alberti 2012; Tsipopoulou and Alberti 2011; Chatzi-Vallianou 2011; Andreadaki-Vlazaki 2011:fig. 19b). These vessels are exceptions; this discussion focuses on broader issues and the primary four vessel types.

4.1.1 Tripod cooking pot and cooking jar

LM tripod cooking pots and cooking jars are deep bowl-shaped vessels with mouths wide enough to access the interior. The shoulder curvature dictates how restricted the mouth is—*e.g.*, slight shoulders produce wider mouths; pronounced shoulder curvature produces more restricted mouths (Figure 4.01:B—D, I, J). The rims are everted, inverted, or straight with round, pointed, or square lips and the bases are flat or rounded (Figures 4.01:C, G; 4.02:D, F; Sackett and Popham 1965; Betancourt 1980). A shallow pulled-spout is sometimes located on the rim between handles (Figure 4.01:E, K, L). Body shapes and definitions include the following.

- Globular—a spherical-shaped body with a defined shoulder, rims are straight or everted (Figures 4.01:A—D; 4.02:A).
- Elongated globular—share characteristics of a globular vessel, but the body is elongated; defined shoulder distinguishes it from a cylindrical vessel (Figures 4.01:E—G; 4.02:B, C).
- Piriform—an inverted pear-shaped profile where the shoulder is more pronounced than the body and base (Figures 4.01:H—J; 4.02:G, H).
- Cylindrical—a body where the contour of the shoulder, belly, and base create a straight-lined profile; rims are straight or everted (Figures 4.01:K—N; 4.02:D—F).

The deeper vessels with S-shaped profiles, (*i.e.* globular) are often referred to in the nomenclature as “Type A” and cylindrical cook-pots without or with narrow shoulders are “Type B” (Betancourt 1980:3; Barnard, *et al.* 2003; Alberti 2012).

The vessels with three legs attached equidistantly from each other at the junction between the base and body are called tripod cooking pots (Figure 4.01; Sackett and

Popham 1965; Betancourt 1980); those without legs are cooking jars (Figure 4.02; Sackett and Popham 1965:272; 197, fig. 17:P29; 299). The legs of tripod cooking pots are in section flat-oval, oval, and round, and they taper to square, pointed, or rounded tips (Hood, *et al.* 1964:52). For a firmer join, the legs are attached by scoring the vessel at the point of contact (Sackett and Popham 1965:285). Vessel shapes and sizes are varied, and chronologies based on these features tend to be more beneficial when examining material from a specific site with a large number of well-preserved vessels. Broadly applying the criteria to LM cook-pot vessels in general is less effective because the preservation can be unequal, thus creating inconclusive or inaccurate results (Betancourt 1980; Popham 1984:174; Banou 2011).

Typically, two round or oval handles sit opposite each other on the shoulder in either a horizontal (Figures 4.01:D—G, I, K—N; 4.02:A, B, D, E, F) or vertical orientation (Figure 4.01:B, C, H); however, LM cook-pots can have lug-type handles (Figure 4.01:J; Sackett and Popham 1970:224, 227, fig. 17:NP113; Hood 2011:170, fig. 51:P103). Placing handles in this position assisted the person performing cooking, serving, and cleaning tasks— *e.g.*, rotating the vessel over the fire to evenly warm it prior to cooking; tipping it to one side for serving with either a utensil or by lifting and tipping so liquid pours from the spout; carrying it from one location to another.

These vessels are not decorated with paint, yet sometimes horizontal ridges (Figure 4.02:A, B, G) and incised lines (Figure 4.01:M) are found on the bodies, and added knobs at and below the rim (Figure 4.01:F, K). Decorated legs are typically dated to the earlier Neopalatial phases (MMIII—LMIA) and later LMIII period, but are rarely found on LMIB vessels (Hood, *et al.* 1964:fig. 2; Sackett and Popham 1965:fig. 17:P17, P20; Betancourt 1980:fig. 2; Hallager 2003a, b:240, fig. 51:1; Rutter 2004:fig. 4.3:C9430). Decorative techniques include: linear grooves (Figure 4.02:A—D); finger impressions with and without grooves and slashes (Figure 4.02:C, E, F); vertical coils with impressions that mimic rope texture (Figure 4.02:G); circular impressions (Figure 4.02:H).

Contrast between the smooth exterior and the undulating interior surface produced by rilling-marks suggests that the ancient potter intentionally finished the exterior by pressing a hard tool (*e.g.*, wooden, ceramic rib) against the body as it rotated on the wheel (Rye 1981:74-80). Often the interiors of tripod cooking pots were coated with a light colored slip or one that resembles the clay in which the vessel was produced (Betancourt 1980; Rutter and van de Moortel 2006:342; Watrous 1992:115, 122). Others have water-wiped surfaces that create a smooth hardened finish (Barnard, *et al.* 2003:81). These finishes were most likely functional, rather than decorative, because they cannot be seen unless one looks inside the vessel. Descriptions of cooking jar surfaces are lacking in the literature.

4.1.2 Cooking trays

LM cooking trays are circular shallow vessels with convex (Figure 4.04:E, F) or relatively straight walls with straight or everted rims and flat-bottoms with beveled or straight edges (Figure 4.04:I). Bases are both thin and thick, typically with a rough surface underneath (Tsipopoulou and Alberti 2011; Alberti 2012). In the nomenclature, they are also called “flat trays” (Sackett and Popham 1970:233) and “baking pans” (Tsipopoulou and Alberti 2011). Often only fragments of tray profiles are found: this allows the estimation of rim and base diameters, but it creates a challenge when determining if the trays had added features (*e.g.*, legs, handles, spouts, knobs) since the preserved fragments may not come from the area of the vessel where the features were attached.

Sometimes three legs are attached at the base (Sackett and Popham 1970:232; Floyd 1998:185; Alberti 2012) to elevate the vessel above the ground (Figure 4.04:L, M). Well-preserved examples have two handles located opposite each other and set horizontally at or below the rim (Figure 4.04:J, K), but examples of vertically set handles that rise above the rim exist (Smith 2010:119, fig. 85:IIB.946). Handles are typically round in section, horizontal or elongated lugs that may be pierced (Barnard, *et al.* 2003:86, fig. 51:IB.582; Tsipopoulou and Alberti 2011; Alberti 2012). Often the edge of a round horizontal handle rises slightly above the rim (Figure 4.04:J), which makes it difficult to stack or turn the tray rim-side down for storage due to its inability to rest in a flat position. If the lug handle is pierced, then a cord could have been threaded through the hole to hang the tray when not in use. Additional features include: a single or a series of one to three knobs at the rim between the handles on LMI trays (Sackett and Popham 1965:fig. 16:P13; Barnard, *et al.* 2003:86; Alberti 2012:239); three finger depressions on top of rims (Figure 4.04:G ; Sackett and Popham 1965:fig. 11:n); pulled spout placed between the handles (Smith 2010:119; Hallager 2011a:35; Alberti 2012).

Cooking trays are also undecorated vessels, yet some have white-buff slip on the interiors and exterior walls (Betancourt 1980:7; Barnard, *et al.* 2003:86; Hallager 2003a:242; Smith 2010:119). LMI trays with burnished surfaces are found at Kommos (Betancourt 1980:7); while others have “water-wiped” surfaces (Barnard, *et al.* 2003; Alberti 2012).

4.1.3 Cooking dishes

LM cooking dishes are elliptical, bowl-shaped vessels with irregularly shaped thickened rims of varied height and shape and very thin walls (Figure 4.05; Sackett and Popham 1965:285, 290 fig. 11:p-s; Betancourt 1980; Popham 1984:174). They are also called “shallow dishes” (Sackett and Popham 1965:285) and “baking plates” (Vokotopoulos 2011:564). Some have broad spouts that span the width of the vessel (Figure 4.05:I, J;

Sackett and Popham 1965:285; Floyd 1998:184; Barnard, *et al.* 2003:fig. 51:IB.569). Finger "gouges" are occasionally found on top of the rim (Figure 4.05:F; Sackett and Popham 1965:285; Betancourt 1980). Holes (*ca.* 2 cm) near the spout are large enough to either insert a wooden rod (Figure 4.05:J; Hallager 2003a:241, 242; 2011a:352) or attach woven material (*e.g.*, cloth, basket). These features could aid in moving the vessel about or help to tip it to pour the contents of the vessel from the spout (Betancourt 1980).

Due to the fragmentary nature of cooking dishes, it is challenging to determine what morphological characteristics are associated with use (*e.g.*, spouts, handles, finger impressions at rim) and shared. Until those studied from Papadiokambos here, Section 5.2.3, only three with at least one-half rim or body profile existed in the literature, from different time periods and sites—*e.g.*, LMIA: Petras (Figure 4.05:L), LMIB: Mochlos (Figure 4.05:I), LMIIIB: Khania Kastelli (Figure 4.05:J, K). One shared feature is textural differences between surfaces. Exteriors are rough compared to the smoothed "water-swiped" or polished interiors (Betancourt 1980; Popham 1984:174; Barnard, *et al.* 2003:83; Smith 2010; Rutter and van de Moortel 2006). It is hypothesized that the stark contrast between the surfaces are a direct result of how the vessel was produced.

Initially, it was proposed that Kommos cooking dishes were formed by, "beating the clay out over a form—perhaps an inverted dish" (Betancourt 1980), but as excavations continued it was proved that these vessels were mold-made. Negative basket impressions on the exteriors of MMIIB—III vessels were found indicating that wet clay was pressed into a basket, and once the clay dried it was fired *in situ* (Betancourt 1990:66:no.48; Betancourt, *et al*. 1990:pls. XVI:C69817, C6860, C713; XIX:C4095; XX:C713). Basket impressions have not been identified from later periods at Kommos or other sites. To achieve this form other mold-making processes are proposed. It is suggested that earth-cut molds are made and either lined with skin (Rutter and van de Moortel 2006:342), or left plain (Barnard, *et al.* 2003: 83), so that wet clay could be pressed into the mold to form the dish. At Knossos it is suggested that the LMIII dishes from the Mansion where "thrown on sand" (Popham 1984:174). To create the rim it is proposed that once the body was formed in the mold it was finished by attaching a coil and smoothing the interior, thus creating a water-wiped surface (Mook 1999).

4.2 LINKING VESSEL SHAPE, COOKING TECHNOLOGIES AND TECHNIQUES

As previously discussed, cooking physically alters food by means of heat using learnt methods of boiling, simmering/stewing, steaming, frying, grilling, roasting, and baking (McGee 1984:780-786); the shapes of each LM cook-pot type could accommodate one or more of these methods (Betancourt 1980; Isaakidou 2007). Evidence for hearths, cooking holes, and mud-and-stone ovens indicates that people living in Crete during the LM period used technologies to cook food by controlling heat transfer to the cook-pots by direct and indirect means, Section 4.1. Using direct heat to warm the vessel to cooking temperatures requires the vessel and heating source to be in contact (*e.g.*, hearth fire, burning embers), whereas utilizing indirect heat (*e.g.*, ovens, cooking holes) requires the vessel and heating source to be in close proximity for radiant heat from the fuel to warm the vessel.

When cook-pots are exposed to a hearth fire blackened and concentrated mottled areas of discoloration appear on the vessels surface (Skibo 1992:153; Gur-Arieh, *et al.* 2011), and practical knowledge from ethnographic and experimental observations can be applied to hypothesize about the types of technologies used in ancient Cretan cooking, Section 2.3. For example, it is essential to understand the conditions that create soot and oxidized patches since the exteriors of LM tripod cooking pots, cooking jars, and cooking dishes are heavily mottled (Betancourt 1980; Rutter 2004) compared to the little evidence found on cooking trays (Hallager 2000:160, 161; Barnard, *et al.* 2003:33; Smith 2010:119; Tsipopoulou and Alberti 2011:492). The ethnographic and experimental studies demonstrate that while it is the norm, soot does not always appear on vessels when direct cooking heat is used—*i.e.* on the areas of cook-pots that are placed in burning embers, windy conditions while cooking over a hearth fire, on vessels that have not been used frequently, or do not have interior resin coatings, Section 2.3.

The LM cook-pot repertoire includes designs that naturally elevate the vessel above the ground (*e.g.*, tripod cooking pots, tripod trays) and those that do not (*e.g.*, jars, trays, cooking dishes). Another distinctive design attribute is that vessels without legs have bases that are rounded (*e.g.*, cooking dishes, jars) or flat (*e.g.*, trays, jars). These features are examined to hypothesize how heat was used to warm vessels for cooking. A question remains, *If the same technique is used to heat tripod cooking pots and cooking jars, then what does shape have to do with cooking technique and installations, such as those that are flat (i.e. hearth) or uneven, where a rounded vessel may be more stable?* Applying this sort of ethnographic knowledge to the shapes of LM cook-pots can be examined to hypothesize about how ancient people used these vessels to cook.

The legs of tripod cooking pots and cooking trays were attached to elevate the bodies above the floor so that fuel could be placed underneath the vessel and between the legs to warm the vessel to cook food (Betancourt 1980). The space between the vessel and ground created by the legs is considered a portable hearth in this examination because it is a space where heat can be regulated and adjusted. The body shapes of these two types of elevated vessels are different: moderate to extensive burning is found on the bodies, bases, and legs of tripod cooking pots, whereas very little burning is found on tripod cooking trays and trays without legs (Barnard, *et al.* 2003:81; Smith 2010:114, 115).

Trays are shallow, and if they were used for food preparation they would be well-suited for several activities: frying or steaming food (Betancourt 1980); baking pita (Betancourt 1980; Isaakidou 2007); roasting vegetables, grains, and nuts (Bottéro 2004:45); dehydrating condiments—*e.g.*, spices, herbs, teas. Trays without legs could have been used in ovens; however, there are no LMI and LMII-III ovens found, or yet published, in the archaeological record with an intact interior baking chamber that can be measured and compared to the archaeological vessels. For example, a free-standing LMI oven was found at the Mochlos Chalinomouri Farmhouse, but the stones walls are only preserved to 0.44 m-0.5 m in height with three layers of debris, fragments of mud brick, and ash inside (Soles 2003:122).

The deep bowl-shape of tripod cooking pots and cooking jars is well-suited for slow-cooking (*e.g.*, boiling, simmering/stewing) (Betancourt 1980), and lids could have minimized evaporation (Rombauer and Rombauer Becker 1995: 150; Isaakidou 2007: 12), as well as raised and maintained cooking temperatures. This cooking technique was recorded in ancient Mesopotamian texts dated to *ca.* 3000-2000 BCE (Bottéro 2004). An everted rim would provide a seating for any lid shape, whereas mouths with straight rims could be covered with flat or cup-shaped lids.

It has been suggested (Isaakidou 2007) that food was deep-fried in the deeper vessels, but it is unlikely because interior access is limited compared to other shapes, and the quantity of oil, most likely from olives or sesame seeds (Moody 2012), needed to deep-fry foods would have been too great compared to its high value based on the amount of effort used to produce a liter of oil (Foxhall 2007:21-54). If food was deep-fried in these vessels, then animal fats could have been used because they were potentially less valuable and more available. (By modern western cooking standards a 3-4 liter vessel requires almost 1.5

kilograms of fat [Rombauer and Becker 1995:147.]) Pigs, sheep/goat, and beef were readily available (Moody 2012), and fat from slaughtered animals could have been rendered to be used for cooking (Rombauer and Becker 1995:542). In the Mesopotamian texts the use of sheep/goat fat is mentioned when preparing “cooking broth,” but another ingredient translated as “pot fat” was either eaten immediately or stored as a cooking liquid (Bottéro 2004:67).

Wide-mouth cylindrical tripod cooking pots would have been better suited for frying than the deeper vessels since access to the interior is greater, and the body is typically more shallow (Isaakidou 2007). Some examples have a spout and opposing vertical handles that suggest it could have been used to thicken liquids that could easily be poured from the vessel—*e.g.*, sauces (Isaakidou 2007), concentrated stock (Bottéro 2004:67).

A modified technique of utilizing direct heat to cook in jars must have been adopted because they lack legs; examples follow. Unfortunately, the literature does not specify the placement of soot and oxidation patterns for these vessels, but one illustration of a Kommos jar (Figure 4.03:H) shows extensive burning on the exterior and interior bottom half of the vessel. By applying the previous discussion of soot and oxidation patterns to the discoloration on this jar, Section 2.3, it is hypothesized that it was elevated above the fire, or placed on burning embers rather than being buried in embers. In terms of quantity of food prepared, this image indicates that people did not always fill their vessels to the brim when cooking. Perhaps vessels were filled to various levels depending on the quantity and type of food being prepared, and cooking techniques (*e.g.*, steaming, boiling, simmering/stewing, frying).

Multiple types of suspension apparatus were used to elevate vessels above the fire in kitchens where hearth cooking was practiced, Section 2.3. To achieve elevation in a LM kitchen, cooking jars with flat or rounded bases could have rested on a stand directly placed on or in a bed of embers, or placed in close proximity to the fire to warm the vessel with radiant heat. The latter technique is similar to those proposed for the Mycenaean period (LHIIIC), in which food was cooked in amphorae at Athens (Rutter 2003:figs. 7.6) and jugs at Lefkandi (Popham and Milburn 1971:figs. 2.5, 2.6). A hanging device probably was not used for LM cooking jars because the body, number of handles attached to the vessel, handle shapes and placement are not well-suited for this. Unlike the North Jutland vessels the LM cooking jars would be difficult to hang above the hearth because there are only two handles, causing the vessel to hang unbalanced, and thus the food to spill out. Stands used to elevate the jars could be opportunistic (*e.g.*, rocks equal in size and shape) or crafted, *e.g.*, LMIIIC ceramic stands similar to those from Kastelli Khania (Tzedakis and Martlew 1999:102, fig. 73).

It raises the question of function and vessel design: *did ancient people intend jars to be used for cooking?* After all, the tripod cooking pots are widely produced and used. *Why then were the jars produced?*

Cooking dishes are seemingly awkward to handle because they are large, thin-walled, bowl-shaped vessels and considered fragile. This open shape, however, could accommodate numerous cooking and baking techniques, as well as operate as portable hearths or ovens. From the practical point-of-view of 21st century cooks that work both professionally and in the home (pers. comm. J. Alyounis, professional chef, 2009; pers. comm. J. Morton, professional chef, 2012) the way in which the vessels regulated heat is not well-understood. Nevertheless, the large and open vessel profile allows for multiple uses; the presence of extensive soot and oxidation patches and apparent burnt food remains indicate that cooking dishes were used in food preparation. Numerous suggestions are proposed in the following paragraphs.

More than one cooking dish has been found *in situ* with the exterior nested into the ground or a built structure, thereby exposing the interior: one example was found on the floor in a hole of some depth (Sackett and Popham 1965:285), and another was embedded into a hearth (Hallager 2011a:352); however, the excavators did not expand on the description to determine whether or not these contexts were of primary or secondary uses. For this type of installation, it would be difficult for the exterior of the dish to become discolored from heat and soot since it would be protected from smoke produced by the fuel. It might also be taxing to bring the vessel to correct cooking temperatures because this installation provided very little access to heat (pers. comm. J. Alyounis, professional chef, 2009; pers. comm. J. Morton, professional chef, 2012). Perhaps, in this type of semi-permanent installation, the interior of the bowl also held embers to transform the cooking dish into a portable grill where sticks of meat and other foods could be placed on the rim for cooking (Seiradaki 1960:9; Sackett and Popham 1965:285). Furthermore, the interior of the bowl could be used as an insular lining of shallow pits for slow-cooking or baking (Isaakidou 2007).

Other installations suggest the dish was inverted on top of another vessel of the same kind to create a portable oven (Betancourt 1980) or inverted on top of embers to create a domed surface, perhaps for baking pita (Betancourt 1980; Mook 1999). When inverted, the spout theoretically would create a space to regulate temperature by managing airflow and fuel. To regulate temperature within the portable cooking dish oven, the open area created by the connecting spouts could be covered as needed. By observing the absence of soot on the apex of the base with heavy soot at and near the rim, it was suggested that the inverted installation on embers created a domed cooking surface (Mook 1999). Based on this description and the knowledge gained from the previous discussion of soot and oxidation patches, it is possible that the deepest part of the vessel was buried in a bed of embers thereby leaving only the shallowest part and rim exposed for soot to be deposited.

Many examples have what appear to be splatters and drips of burnt oily food substances and large discolored areas on the interior suggesting that various methods of cooking were used to prepare food in these vessels (Betancourt 1980). Nested into a bed of coals, the dish could have been used as open shape, similar to an oriental wok, to fry or *sauté* food (Betancourt 1980); yet well-preserved LM cooking dishes have scoop-shaped profiles with the area nearest the rim shallower then the opposing bowl-end (Figure 4.05:J). Heat could have been regulated by moving food to various locations within the vessel to control temperatures; hypothetically, the deep-end would have been the hottest because it was lying directly on embers (Betancourt 1980).

Liquids could have been reduced to various thicknesses by either allowing evaporation to take place slowly (with or without heat) or removing the unwanted liquid by tipping the spout (Betancourt 1980). It is possible that many dairy products (*e.g.*, yogurt, cheeses) could have been prepared by using a slow boil (Villainous 2003; pers. comm. T. Cunningham, field director of Palaikastro Excavations in Crete, 2006). The openness of the interior also would have allowed grains and nuts to be roasted (pers. comm. J. Morton, professional chef, 2013).

4.3 LM COOK-POT PRODUCTION

The primarily focus of this thesis is techniques and technologies of production and use, not on modes of production which correlates how a vessel was made with who was producing and using the pottery – in turn directly related to the workshop organization and marketing

(Peacock 1982). For the purposes of this thesis and based on the many LM examples excavated on Crete we assume that the workshop is the mode of production, whether it takes the form of an individual example, nucleated workshops, or itinerant potters (Peacock 1981, 1982:8-10). The presence of a pottery workshop in LM communities is identified in the archaeological record as spaces that are equipped with advanced production tools, such as freely spinning "wheel heads" or "wheels" (Evely 1988; 2000:269, 271, figs. 112:33, 35; 113; 114; 115:95) and updraft kilns (Evely 2000:300, 308—311, figs. 121—123). These sorts of workshop deposits are associated with trained potters because of the knowledge that is needed to organize and operate such technologies. How LM potters organized themselves professionally is unknown—*e.g.*, independent potters, cooperative, guild. Organized pottery workshops are wide spread on Crete (Traunsmuller 2009: 39-48); yet despite these remains, there is only indirect evidence that trained potters produced cook-pots.

Cook-pots are not associated with kiln material. Out of at least twelve excavated LM kilns found in various regions [*e.g.*, west Crete—Stylos (Davaras 1973); central Crete—Aghia Triada (Touchais 1977), Knossos (Warren 1981), Kommos (Shaw, *et al.* 2001), Phaistos (Pernier and Banti 1951:215, fig. 134, 135), Zomithos (Sakellaraki and Panagiotopoulos 2006:59); east Crete—Mochlos (Soles 2003:81, 83-87, 95, 122, 123), Palaikastro (Davaras 1980), Zou (Figure 1.02; Platon 1956:238ff)] only the one at Kommos held vessels within its firing chamber. The last kiln load here contained painted and unpainted fine, medium-fine, and coarse wares of various shapes and sizes that were fired between 750º—1050ºC (Shaw 2001; van de Moortel 2001:47—65; Day and Kilikoglou 2001:122—124, table 13). The vessel types include cups, bowls, kalathoi, jars, jugs, ewers, rhyta, oval-mouth amphora, basins, large jars, and pithoi. Even in the kiln dump of 300 wasters and damaged vessels, only 6% of the material was identified as cooking ware. The presence of cook-pots is interpreted as daily usage discard, rather than production mistakes (van de Moortel 2001:25—27).

At the Zominthos workshop in Room 12, 250 preserved vessels were seemingly found in groups accordingly to vessel size or type suggesting that this could have been a storage room for finished goods (Traunmuller 2009:36—39). The vessel types also include cups, bowls, decorated jars and jugs, kalathoi, incense burners, and conical rhytha (Traunmuller 2009:70, table 1), but no cook-pots. In fact, cook-pots were not even found as evidence for cooking in the building. At the Mochlos Artisans' Quarters in the Rear yard of Building B stone and clay kiln slabs, jars, amphorae, and cups, but not cook-pots were found next to Kiln B; whilst the area near Kiln A was clean. Fragments of cooking trays and cooking dishes were found scattered around, but the worn edges and discoloration of the surfaces suggests that these sherds were reused in the kiln construction (Soles 2003:81). Again, cook-pots were not identified by the excavators as products of the workshop.

With the exception of the Kommos kiln site and the Zominthos and Mochlos workshops little evidence specifies which types of vessels were produced at the workshops. Therefore identification of products is made using indirect evidence. Researchers examined assemblages as whole units to determine vessel frequency and form standardization (Barnard, *et al.* 2003:103), and vessel surfaces to identify remnants of produce—*e.g.* horizontal concentric grooves called rilling-marks that are associated with wheel technology (Roux and Courty 1995; Evely 2000:269). Macroscopic and petrographic descriptions are widely employed in LM studies to distinguish between local and imported vessels. While these observations shed light on the technologies utilized for LM assemblages, cook-pot forming techniques in regard to the *chaîne opératoire* of pottery production and firing technologies are topics that warrant further examination because they are largely omitted in the literature.

4.4 DATING LM COOK-POTS

Chronological distinctions in LM cook-pot typologies can be suggested, but should be applied with caution since there are limitations when using cook-pots to define chronological sequences, or draw chronological comparisons between sites or regions. Overall, the function of cook-pots and how the vessels seemed to have been used did not require alteration of the basic vessel design. Also, ceramic studies do not always extensively focus on coarse wares, which include cook-pots, thus making it difficult to apply the information. Chronologies between sites and regions are not always compatible with each other. The following discussion examines details of tripod cooking pots and cooking jars to demonstrate the strengths and limitations of applying strict cook-pot chronologies by providing a broad overview of specific domestic assemblages across Crete. Cooking trays and cooking dishes are also included in the discussion; however, compared to tripod cooking pots their morphology is not well-known.

4.4.1 Tripod cooking pots and Cooking jars

Betancourt's (1980) typology and chronology of tripod cooking pots is the one most applied by researchers examining MM and LM pottery: it was the first study demonstrating that the design of tripod cooking pots varied and that this variation in design could be chronological. The typology is based on the body shapes of vessels found at Kommos during the first excavation campaign that begun in 1976 (Figure 1.02; Shaw 1977). It classifies the vessels into Types A and B, and as discussed, Section 4.1.1. Type A vessels have S-shaped profiles (*i.e.* globular body with everted rims) (Figure 4.01:B—D, H—J) and Type B have straighter profiles with wide-mouths and various shaped rims (Figure 4.01:K—M). Type A were proposed to be LMIII indicators even though at Kommos they appear earlier, but most likely in limited quantities (Betancourt 1980). Generally, Type B appears earlier and was initially assigned to the MM—LMI periods (Betancourt 1980); but at some sites, *i.e.* Poros and Kommos in central Crete, it continues into LMII (Banou 2011: 500) and LMIII (Rutter 2004; Rutter and van de Moortel 2006). Generally, decoration on the legs appears in the earlier Neopalatial phase (MMIII—LMIA) and in the later LMIII period (Figures 1.02, 4.02; Hood, Warren, and Cadogan 1964; Sackett and Popham 1965; Betancourt 1980; Hallager 2003; Smith 2010).

Recent studies of ceramic material found in LM deposits demonstrate Types A and B overlap thus complicating this initial chronological sequence. It is more accurate to utilize the typological aspect of Betancourt's classification to identify site and regional traditions, rather than as strict chronological markers. Studies of LMIB cook-pots demonstrate that Type A vessels frequently appear in east Crete (Figure 4.07; Tsipoulou and Alberti 2011:484). Sites include: Karoumes (Vokotopoulos 2011); Mochlos (Barnard, *et al.* 2003:80—82, figs. 47, 48:IB.480, IB.491; Barnard and Brogan 2012: 432, fig. 6:P4286, P7509, P4338); Palaikastro (MacGillivray, *et al*. 2007:81; Sackett and Popham 1970:227, 228, figs. 17:LNP113, 18:NP120); Petras (Tsipoulou and Alberti 2011); Pseira (Figure 1.02; Floyd 1998:184, fig. 3:BS/BV35). Whereas in central and west Crete Type B vessels seemingly dominate LMIB deposits (Figure 4.08; Tsipopoulou and Alberti 2012). Central Crete sites include: Chalara (Levi 1967:fig. 84); Galatas (Rethemiotakis and Christakis 2012:fig. 16); Hagia Triada (Puglisi 2006:nos. 5.21, 5.61, 5.62, 106.23, 106.29); Knossos (Hood 2012:fig. 51, 61:P103); Kommos (Rutter 2004; Rutter and van de Moortel 2006); Pitsidia (Chatzi-Vallianou 2012:fig. 16:PIT.XIV.P13, PIT.XIV.Z14, PIT.XXII.A7); Skinias

(Mandalaki 2012:fig. 14). West Crete sites include: Khania (Figure 1.02; Andreadaki-Vlazki 2012:fig. 19:a).

In examining LMIA and LMIB material from Petras to determine if there was continuity in shape between the periods before and after the Theran eruption (LMIA-LMIB) an intermediate shape was defined that is interpreted by Petras ceramic experts to demonstrate cultural change (Tsipoulou and Alberti 2011; Alberti 2012). Morphologically, Type AB combines the deeper body of Type A with the wide-mouth of Type B making elongated globular vessels with relatively straight rims, shallow shoulders, and flat bases (Figure 4.01:E; Tsipoulou and Alberti 2011:fig. 35; Albert 2012:fig. 1). While this classification is meaningful at Petras it is of limited significance when applied to broader regional and chronological studies. Morphological distinctions between Types AB and B are subtle (*e.g.*, body height) and the definition of Type B is flexible enough to accommodate the variety of LMI and LMIII Type B vessels, thus leaving Type AB seemingly arbitrary and open to debate when broadly applied. Alberti (2012) claims that Type AB parallels are seen at Kommos amongst Type B examples and at Mochlos amongst Type A examples, but no references are given. Based on research for this thesis elongated globular vessels with wide-mouths and shallow shoulders are not identified at either site. Further if this typology indicates cultural change *between* LMIA and LMIB periods at Petras, then it looses meaning if applied to earlier or later periods at Petras or other sites.

In the Postpalatial period (LMII—III) distinct changes in cook-pot morphology are apparent at some sites (*e.g.*, Kommos, Khania), while others (*e.g.*, Mochlos, Palaikastro) remain connected to their LMI predecessors. In east Crete at Mochlos (Smith 2010:129) and Palaikastro (Sackett and Popham 1965:297; MacGillivray 2007b:157, 158) very little change occurs other than size. LMII—III tripod cooking pots are slightly larger, yet remain globular, or piriform, with everted rims that can be spouted, and many have horizontal handles and round or oval legs (Figure 4.01:D, H—J). This also coincides with Isaakidou's (2007) observation that the quantity of people being served increases, which would reflect a change in cultural organization, cooking, eating. What exceptions between the LMI and LMIII Palaikastro cook-pots exist are small: some LMIB vessels have nipples set below the rim (Hatzaki 2007:22, fig. 3.6:30), some LMIIIA2 vessels have oval vertical handles (Hatazki 2007:63, fig. 3.34:245).

Palaikastro LMII—IIIB cook-pots are referred to as either "tripod cooking pots" or "cooking pots" (Sackett and Popham 1965, 1970; MacGillivray 2007a:112, 117, 128, 134, 144); it is unclear from the descriptions if "cooking pots" are cooking jars or tripod cooking pots without preserved legs. Nevertheless two LMIII "cooking pots" without legs are illustrated with complete profiles, thus classifying them in this study as cooking jars. One shallow cylindrical vessel with an everted rim is LMIIIA1 (Figure 4.03:G; MacGillivray 2007:fig. 4.24:584); the other is an LMIIIB (most likely) globular vessel with an everted rim (Figure 4.03:A; Sackett and Popham 1965:fig. 17:P29). Both examples have flat Minoan style bases rather than Mycenaean rounded bases (Borgna 2004a:148; Hallager 2003a:240, 2011:350), suggesting these vessels were produced and used by local residents, rather than by foreign peoples, possibly from the Greek mainland. Cooking jars are not identified at Mochlos in the LMI or the LMII-III periods (Barnard and Brogan 2003; Smith 2012). One of the questions is, *Have cooking jars escaped identification at Mochlos, or are they not present because jars were not used for cooking?*

Numerous LMI and LMIII cooking jars of various shapes and sizes are identified at Kommos; the well-preserved vessels have flat bases (Figures 4.02, 4.08; Rutter 2004; Rutter and van de Moortel 2006). The eclectic LMIII Kommos collection of cooking jars

(Figure 4.08) are a stark contrast to the Neopalatial tradition of producing and using Type B tripod cooking pots in the western Mesara—*e.g.* Kommos (Betancourt 1980, 1990:78, 79; van de Moortel 1997:fig. 77; Rutter 2004; Rutter and van de Moortel 2006:375, 477), Chalara (Levi 1987:fig. 84), Hagia Triada (Puglisi 2006: nos. 5.21, 5.61, 5.62, 106.23, 106.29), Villa of Pitsidia (Chatzi-Vallianou 2011). This tradition continues at Kommos into LMIIIA2 (Watrous 1992:136, fig. 26:C581), but changes in LMIIIB when globular tripod cooking pots with everted rims and round legs, some with deep finger impressions on the upper leg, dominate the assemblage (Figure 4.08; Betancourt 1980; Watrous 1992: 144, figs. 62:C1654, 63:C1664, 1663). This introduction of Type A vessels occurs later in the Mesara than in north-central Crete where at Knossos Type A vessels are introduced in LMII and continue into LMIIIC (Hatazki 2005: 95, 113; Warren 2005: 98, fig. 2:C).

This period is considered to be one of cultural and political transition between the Minoan and what appears to be the beginning of the Mycenaean rule. Knossos was most likely the central polity and centers in the Mesara (*i.e.* Kommos, Aghia Triada) would have served the northern governing seat, Section 1.3.2. If this is correct, then the introduction of Type A vessels in north-central Crete first and then in the Mesara could indicate that Mesara potters were influenced by pottery used at Knossos, including cook-pots. Or that potters from north-central Crete moved into the Mesara, introducing pottery, even cook-pots, of a different style. To further examine this observation the styles and morphologies of additional fine and coarse wares from Knossos and the Mesara need to be compared. However, the scope of this comparison is vast and this topic must be covered later in a supplementary study.

In south-central Crete regional (western Mesara) and local (Villa of Pitsidia) LMIB—II traditions of producing and using specific types of cooking jars co-existed

(Figure 1.02). Two identical elongated wide-mouthed cooking jars with square, hook-type rims are found at Kommos; one is LMIB, the other LMII (Figure 4.03:C; Watrous 1992:15 no. 273, pl. 7; Rutter 2004:fig. 4.5:C2760, C2563). LMIB jars with this shape and size are found at Phaistos (Levi 1976-68:100 F.4002 and n. 7, fig. 83a) and Aghia Photini (Warren 1981:fig. 26; van de Moortel 1997:209, 210); there could be a regional tradition of producing and using elongated jars with square, hook-shaped rims that most likely began in LMIB and continued into LMII in the Western Mesara (Figure 1.02). Yet at the Villa of Pitsidia this shape is not seen, instead two LMIB cylindrical cooking jars with straight rims, round horizontal handles, and rounded bases are found (Figure 4.03:D, F; Chatzi-Vallianou 2011:fig. 16:PIT.XIV.P3, PIT.XXII.A13). No parallels have been identified, but they are classified as Type B, which follows the regional LMIB Western Mesara tradition.

The excavators state that there is evidence that a small-scale workshop at the Villa produced smaller fine wares (Chatzi-Vallianou 2011:figs. 22:PIT.XIX.P1, 25:a, b; 26); perhaps the resident potter also crafted specialized household vessels, such as these jars. The pottery is identified as local and regional products, thus implying that these jars are not imports. The Villa was destroyed at the end of LMIB (Chatzi-Vallianou 2011), and as evidenced by LM Kommos pottery there were many connections between foreign lands (*i.e.* Anatolia, Cyclades, Cyprus, Egypt, Italy, Messenia on the Greek mainland in the southern Peloponnese, Syria-Palestine) and south-central Crete communities (Watrous 1992:153; Rutter 2004; Rutter and van de Moortel 2006). However, in LMIB the cook-pot design was most likely not influenced by the rounder profiles of mainland coarse wares, as happened later in LMII and LMIII. Perhaps this local jar with a rounded base served a specific function at the Villa, or was influenced by another factor, *i.e.* off-island traders and seafarers the region, that has yet to be determined.

Northwest from the Mesara, in Rethymnon, Types A and B vessels were contemporary within the same LMIIIA1 building, possibly close to a hearth, at Khamalevri (Andreadaki-Vlasaki and Papadopoulou 1997:111—114, 133—136). No cooking jars are identified in the assemblage, which suggests that people did not use jars for cooking food (Figure 1.04:C). Based on the dissimilarity of the shape, size, surface finish, and fabric description these five vessels (two Type A; three Type B) could be products from different workshops. The best-preserved Type A vessel has round horizontal handles, water-wiped surface, and was produced with red to brown-red coarse clay with schist and gravel inclusions (Andreadaki-Vlasaki and Papadopoulou 1997:figs. 52:P13284, 54), while the other was produced with red coarse clay (Andreadaki-Vlasaki and Papadopoulou 1997:figs. 52:XAM93/13, 56). One Type B vessel, also produced with red coarse clay, most likely had a different kitchen function since a round vertical handle was attached to its body opposite a pulled-spout with knob handles on either side (Andreadaki-Vlasaki and Papadopoulou 1997:figs. 52:P13281, 53). This shape implies that it would be better suited for preparing sauces, thickening broths, or frying food, rather than stewing food, Section 4.1.2 (Isaakidou 2007). The remaining two Type B vessels have stout cylindrical bodies with round horizontal handles; one has an everted rim (Andreadaki-Vlasaki and Papadopoulou 1997:figs. 51, 52:P13278), the other a straight rim and was produced with yellowish-red clay (Andreadaki-Vlasaki and Papadopoulou 1997:figs. 52:XAM93/12, 55). The vessel with an everted rim (P13278) has a knob below the rim and was also produced with red to red-brown coarse clay with schist and gravel inclusions.

Due to its geographical position it is proposed that Khamalevri most likely served as a cross-roads during the LMIIIA2 period connecting Knossos from the east with Phaistos from the south and Kydonia (*e.g.*, the modern town of Khania) in the west (Andreadaki-

Vlasaki and Papadopoulou 1997:148, 149). It is possible that during this time people traveled to and through this area trading goods or staying for a period of time for work and rest, which means that there could be influx of ideas, "ways of doing things", and objects that were introduced and possibly adopted within the local culture. It was not until LMIIIC that a new Type A tripod cooking pot with a flaring everted lip and oval-flat vertical handles (Andreadaki-Vlasaki and Papadopoulou 2005:figs. 8, 24, 33) was introduced alongside the previous Type A vessel (Andreadaki-Vlasaki and Papadopoulou 2005:figs. 9, 12). LMIIIB1 vessels from Khania Kastelli parallel this new shape (Hallager 2011b:pls. 117:80-P1396, 119:70-P1153), which is proposed to be a west Cretan LMIII design (Hallager 2011a:350), thus implying perhaps a new sort of economic or social control began in the area of Khamalevri (Andreadaki-Vlasaki and Papadopoulou 2005).

In west Crete tripod cooking pots are seemingly the vessels of choice for cooking in LMIIIA1—IIIB2 since very little evidence for cooking jars exists at Khania Kastelli other than in LMIIIB1 levels (Figure 4.08). This is a contrast to LMIIIC deposits where many cooking jars are found (Hallager 2003a:240). During the LMIIIA1—IIIC period very little morphological change occurred in local tripod cooking pots (Figure 4.07) which are similar in shape to the LMIIIA2/B1 Kommos vessels (Hallager 2003a:240; 2011a:349, 350), but the Khania Kastelli vessels have oval-flat vertically-set handles, rather than round horizontal ones, and some have flaring legs that are splayed slightly further apart (Hallager 2011b:pls. 117—119). In LMIIIB the larger pots have incised, vertical slashes, or finger impressions on the upper part of the leg; however, vertical slashes appear earlier (LMIIIB1), finger impressions are later (LMIIIB2) and both forms of decoration appear in LMIIIC (Hallager 2003a: 240, 2011a: 349, 350).

One LMIIIA2—B1 vessel produced in local Khania Kastelli fabric stands out as a shape either influenced by Mycenaean cook-pots (Hallager 2011a, b:350, pl. 118:71-P0818), or a product of a mainland potter working in Khania. It has a low globular body with a high neck and everted, round rim, with legs attached in a way that is reminiscent of Mycenaean cooking pots (Hallager 2011a, b:350, pl. 118:71-P0818; Mountjoy 1993:117, 118, figs.344—348). Unfortunately, the handles are missing and the base profile is not complete making it difficult to identify specific features that could be a mainland influence. Additional mainland influence is detected in an LMIIIB2 vessel with a more open and stout body, everted rim and round vertical handles set with one end at the rim and the other at the lower body, with the legs approximately attached below the handle and a rounded base (Hallager 2003a, b:240, pl. 74:71-P0833). The rounded base is a feature associated with Mycenaean vessels (Borgna 2004a: 148; Hallager 2003a: 240, 2011a: 350; Mountjoy 1993:117, 118, figs.344—348). The fabric is atypical compared to the local vessels, suggesting it was potentially an import, possibly from the mainland (Hallager 2003a:240). If this assumption is correct than perhaps this is proof that people from the mainland were living and working on Crete; however, it is also possible that only the objects from the Mainland came to and stayed on Crete, Section 1.4.

4.4.2 Cooking dishes

Compared to tripod cooking pots and cooking jars the evidence for change in the production and design of cooking trays and cooking dishes is limited. Perhaps this is due to the fragmentary nature of these vessels and poor preservation described in excavation reports and pottery studies; perhaps the design of cooking trays and cooking dishes did not change significantly because there was a continuity in how people used them. Until more cooking deposits are excavated, studied, and published it is not possible to draw many conclusive statements; however, a closer examination of the Mochlos LMI and LMII-III cooking dishes in relationship to contemporary vessels from other sites can provide insight into LM vessel morphology.

The poor preservation of cooking dishes creates a challenge when constructing typologies and chronologies because very few vessels found have complete profiles: often they can be misidentified as cooking trays, and depending on if the rim is viewed at the spout, sides, or bowl-end of the vessel it can have a different shape (Figure 4.09). Despite these limitations broad typological and chronological observations were made by comparing the rim shapes of LM Mochlos cooking dishes. The typology consists of four types—A, B, C, D (Figure 4.10; Barnard and Brogan 2003:82, 83; Smith 2010:115, 116); Types A and B are merged into one group because of new evidence gained from this study, Section 5.2.3. The definitions of rim types are as follows:

- Type AB can have a rim that turns downward (typically the spout) or upward (typically the body) and is often demarcated from the body on the exterior (Barnard, *et al.* 2003:83).
- Type C has a thickened, square or round, rim that is flush with the wall; however, the rims of the spouts are often downward turning (Smith 2010:115). It is distinguished from Type AB, because on the exterior there is no demarcation between the rim and body.
- Type D has a relatively high, round or pointed, rim that is similar to the sides of a cooking tray. It can be distinguished from trays because the body is very thin (*ca.* 0.3 cm-0.5 cm) and slopes downward, which causes the sherd to sit unevenly; whereas the tray bases are thick (*ca.* 0.5 cm-1.5 cm) and approximately flat (Smith 2010:115).

Due to the fragmentary nature of the material, it is unclear if this cooking dish type is spouted.

LMIB cooking dish rims from Mochlos are classified as Type AB (Barnard, *et al*. 2003:84—86), whereas LMII—III cooking dishes were produced with all rim types—Type AB was the most popular and Type D the least (Figure 4.10; Smith 2010:116—118).

All cooking dishes are produced from local clays (Barnard 2003; Day, *et al.* 2003; Nodarou 2010), which suggests that people living at Mochlos produced and made cooking dishes. As stated at the beginning of this section, the primary focus here is potting technology and techniques rather then modes of production, but based on this model hand-made vessels are typically associated with household production (Peacock 1981, 1982). Meaning that these vessels are produced at home for use or as part of a house-economy. The question is, *Why did people only produce Type AB cooking dishes in the LMI period and all three types in the LMII-III period*? There are explanations. Perhaps Types AB, C, and D each belonged to cooking dishes with distinct features (now invisible from poor preservation) that may or may not have been used to perform specific tasks (Figure 4.5:I—L).

CHAPTER 5: CONTEXTUALIZING MATERIAL OBJECTS: TECHNOLOGICAL TYPOLOGY OF LM COOK-POTS

Chapter 5 explores the human side of cook-pot production and use in Crete during the LM period by examining the assemblages from Mochlos and Papadiokambos to develop an in-depth analytical description of the vessels that includes fabric, Section 5.1, morphological features, and surface finish, as well as proposed production methods, Section 5.2. This approach is applied to the individual vessel rather than examining large quantities of material statistically to define patterns and trends that group and classify cook-pots, because part of the examination includes an experimental component that is designed to test hypothesis about ancient cooking techniques based on archaeological evidence, Section 6. The value of this work is that while the LM cooking assemblages are well-known and defined morphologically, how ancient people produced and used these vessels for cooking food has only been explored theoretically. This discussion focuses on ceramic fabrics at Mochlos and Papadiokambos and examines characteristics that reflect the production and use of cook-pots, Section 4.1.

The LM cook-pot assemblages recovered from Mochlos and Papadiokambos were chosen because they are neighboring coastal sites in northeastern Crete and the excavation, study, and publication programs of each are comparable to the other (Figures 1.02, 1.04). In total three LM assemblages were examined; LMI and LMII-III from Mochlos, LMI from Papadiokambos. Only cook-pots recovered from cooking contexts are evaluated, because it is important to assess vessels that are associated with cooking activities to understand better how the vessels could have been used. As outlined in Section 1.1, this thesis is concerned with cook-pot production, function, and use, which requires a rigorous approach in selecting cook-pots from specific contexts that offer the most favorable conditions for developing robust interpretations. Though numbers are necessarily limited, the cook-pots examined have supporting evidence from their archaeological contexts. The sample selection includes 156 vessels—55 are from LMIB Mochlos, 72 are from LMII-III Mochlos, and 29 are from LMIB Papadiokambos (Table 1.03).

5.1 LM COOK-POT FABRICS AND POTTING MATERIALS FOUND AT MOCHLOS AND PAPADIOKAMBOS

In general the LM coarse ware fabrics at Mochlos and Papadiokambos are described as low-temperature, non-vitrified, earthenware that ranges in color between purple, red-orange, orange-tan. Comparative studies using macroscopic and microscopic fabric analysis are made between the archaeological ceramic material and raw clays collected in the study areas, because testing of the archaeological material involves costly laboratory tests. Raw clays were sampled that have a similar material make-up (*i.e.* type, size, angularity of rock fragments present) to the archaeological material. Raw clay samples are characterized by conducting basic tests (*i.e.* plasticity, shrinkage, porosity) potters use to assess clay types (Rhodes 1973; Rye 1987; Peterson and Peterson 2003). These tests were also helpful in defining the workable properties of the clays to conduct the experimental component of this thesis, Section 6. Details of the raw clays are outlined in Section 5.1.5.

All, but one of the fabrics associated with cook-pots at Mochlos and Papadiokambos are composed of materials derived from the East Crete Phyllite-Quartzite Series—*e.g.*, they contain rock fragments of phyllite in various colors, silver-mica schist, quartzite. One Papadiokambos fabric is comprised of fragments that macroscopically resemble the fine-grained texture of a mudstone. Additional materials that are recognized microscopically in the Mochlos fabrics are calcareous and derived from Miocene marine deposits (*e.g.,* fragments of various limestone, fossils, swirls of yellow-green clay) that could have been a tempering agent, or are naturally occurring, because exposures of the Phyllite-Quartzite Series and Miocene marine deposits are juxtaposed (Figure 5.01; Day, *et al.* 2003; Nodarou 2003, 2010). Some of the cook-pots at Mochlos and Papadiokambos are lined with a cream-white slip, which, based on its color and texture, was most likely produced with clays associated with Miocene marine deposits (Barnard, *et al.* 2003; Day, *et al.* 2003; Smith 2010; Brogan, *et al.* 2011). The geological deposits are examined further in the following section.

5.1.1 Geology of East Crete Phyllite-Quartzite Series

The geological make-up of east Crete is discussed because the cook-pot assemblages examined here are from archaeological sites located in this region and were most likely produced using local clay bodies with sand-sized grains, and rock fragments (Day 1995; Barnard 2003; Day, *et al.* 2003; Nodarou 2003, 2010). The composition of the ceramic material reflects both the raw materials exposed in east Crete and choices made by potters, and comparisons between the local geology and material components of the ceramic fabrics are used to make inferences about provenance, as well as to examine how the potters might have manipulated the clays for pottery production (Day 2004). The geological discussion includes rock types and calcareous and non-calcareous sediments associated with LM pottery production that are exposed in the region between the Ierapetra isthmus, located at the eastern end of the Bay of Mirabello on the north coast, and east towards the Sitia Plain, and from the north coast to the peaks of the Ornos Mountain range.

East Crete is comprised first of pre-Neogene (Figures 1.03, 5.01, 5.02) rock units dating from the Carboniferous-Permian to the Oligocene. These were overlain in the Neogene by post-tectonic fresh-water and marine sediments, composed of conglomerates, sandstones, clays, and limestones (Meulencamp 1971; Hall, *et al.* 1996). Materials that are primarily used to produce pottery in the LM period are those associated with the metamorphic (*i.e.* rocks that were exposed to heat and pressure resulting in chemical and physical alteration of the original rock; Pough 1988:31, 32, 371) Permian-Triassic Phyllite-Quartzite Series (Day 1995, 2004; Day, *et al.* 2003; Nodarou 2010).

As previously discussed in Section 1.2.1, the Permian-Triassic Phyllite-Quartzite Series is mainly exposed in the East and West of Crete and comprises the major tectonic unit (*i.e.* nappe) overlying the Plattenkalk Series (Fassoulas 2000:14-29). It is a large and complex unit running the length of the Peloponnese and through Crete. It contains numerous inconsistencies because it is a mélange of materials (Greiling 1982; Zulauf, *et al.* 2002). Although the Phyllite-Quartzite Series in both west and east Crete has been metamorphosed under high-pressure and low-temperature conditions, the west and east Cretan parts of the Series reflect different degrees of Alpine metamorphism (Greiling 1982; Zulauf, *et al.* 2002). This is one of the reasons why the west and east exposures are distinct chemically and physically from the other; the degree of alpine metamorphism is less developed in the east than in the west, as indicated by the occurrence of metamorphic index minerals (Zulauf, *et al.* 2002: 1808).

For the purposes of examining east Crete LM cook-pots in hand-sample the most noticeable distinction is the variety of phyllite colors. Phyllite is a metamorphic rock, like slate, but having undergone further metamorphism has larger mineral units, predominantly chlorite and muscovite, which give the rock its characteristic block-like, or plate-like, cleavage and silky sheen on freshly broken surfaces (Judson and Kaufman 1990:127). The chlorite and muscovite are phyllosilicate minerals, as are clay minerals, that break down during weathering. In west Crete the phyllites are commonly brown, black or yellow

(Moody, *et al.* 2003); the eastern phyllites are purple, dark-gray or greenish (Haggis and Mook 1993; Barnard 2003).

Other primary rock components of the Phyllite-Quartzite Series are quartzites, which are also metamorphic rocks. Quartzites largely consist of quartz and are derived from sandstone, but the term can also refer to metamorphic quartz rock, *i.e.* metaquartzite (Pough 1988:34), as in this case. Additional rock types include mica-schists, red limestones, marbles, gypsum, and andesites (Hall, *et al.* 1996).

5.1.2 Geology of the Mochlos Plain

The Mochlos Plain is long and wide (*i.e.* 4.5 km long from east to west; the widest area north to south is 1 km) and lies in a tectonic valley surrounded on the east, south, and west by the Ornos Mountain range with the Cretan Sea to the north (Figure 1.01). As a result of tectonic activity the plain and present island have experienced considerable subsidence; in the Bronze Age the two were connected by a narrow land bridge. Eight mountain ravines cut through the plain to the coast; today only the far eastern end at Chalinomouri runs with fresh water year round. Two ravines are located west of the modern and ancient village in the Limenaria Cove and four are located to the east across the plain (Soles 2003:1, fig. 1).

The plain consists of crystalline limestone with the southern side dominated by the East Crete Phyllite-Quartzite Series of the Permian-Triassic periods (Figure 5.01). This series is characterized by dark gray, greenish, red-brown, and purple phyllites, other low-grade metamorphic rocks with intercalations of sandstone, quartzite, conglomerate, dark colored crystalline limestone, and dolomite (Papastamatiou, *et al.* 1959a). The geological make-up of the plain consists of Pleistocene fluvial deposits that contain gravels, pebbles, and red sands, along with Miocene marine formations comprised of sandstone and marl, *i.e.* a fine-grained sedimentary rock, of calcium carbonate or lime-rich mud that contains various amounts of clay and silt (Higgins and Higgins 1996:219; Nodarou, *et al.* 2008). For the most part the calcareous materials, *i.e.* marl, are located directly on the coastline, but there are exceptions with exposures located in the foothills between Mochlos and the mountain village of Lastros (Figure 5.01; Day, *et al.* 2003:16; Nodarou 2010:4). Ethnographic accounts of 20th century pottery-manufacturing record potters working in the surrounding mountain villages of the Mochlos Plain often mixed calcareous clay with a low to non-calcareous red clay to make a suitable clay body to produce various types of jars (Day, *et al.* 2003:16; Day 2004:122, ills. 23, 129-132, 141, 142). These ethnographical accounts broaden the interpretation of the archaeological material to demonstrate that potters have more than one way of using and mixing material to make pottery in this area of east Crete, and that how they do these tasks is based on their training and knowledge gained through experience.

5.1.3 Geology of the Papadiokambos Plain and coastal areas around Sitia

The Papadiokambos Plain spreads west of the Phaneromeni (or Trachilos) peninsula on the coastline of the Cretan Sea (Figure 5.02). It is roughly 4 km from the northwest to the southeast and at it widest point northeast to southwest is 2 km wide. The plain is dominated by a variety of Holocene and Neogene deposits. The coast itself is comprised of Holocene sand alluvium, as well as talus-slope colluvial deposits (Papastamatiou, *et al.* 1959b). To the west and south are Pliocene marine and lacustrine deposits dominated by marls, clays, sands, and some conglomerates.

Steep cliffs cut into a Miocene marl plateau that extends southeast towards Sitia defining the plain's southeastern border. The plateau, including the Agii Pantes gorge, is characterized by yellowish marly sandstone and greenish marl that grade upwards into a gray hard marl (Papastamatiou, *et al.* 1959b). The Liopetra uplands west of the plain are composed of Permian or Carboniferous bluish crystalline limestone with flaggy intercalations of fine-grained chert nodules. To the southwest, forming the head of the Papadiokampos catchment is a small nappe of the Phyllite-Quartzite Series including andesite, flaggy limestone, as well as more typical deposits of phyllite and quartzite (Papastamatiou, *et al.* 1959b).

The Phaneromeni peninsula geology is complex. Deposits include Permian or Carboniferous flaggy limestones on the west, Miocene marly sandstone on the east, and a residual deposit of the Phyllite-Quartzite Series at the tip. Pleistocene sandstone forms the peninsula's neck (Papastamatiou, *et al.* 1959b).

Towards Sitia, the tip of the Vamvakia peninsula includes small exposures of phyllite-quartzite, dolomite, and crystalline and flaggy limestone within the extensive Miocene marl plateau. On the geological map (Papastamatiou, *et al.* 1959b) one small exposure of the Phyllite-Quartzite Series is noted on the northwest, near the neck of the peninsula, but it was not located when explored for this study. The Periferiaki Aerodromiou Sitias highway (Greek National Road-E75) and other structures built since 1959 could cover it.

5.1.4 LM cook-pot fabrics from Mochlos and Papadiokambos

The metamorphic fabrics associated with LM cook-pots from Mochlos and Papadiokambos are defined by their macroscopic (*i.e.* examining a hand-sample using a 10X-20X magnification lens) properties. The Mochlos cook-pot fabrics are also defined microscopically (*i.e.* examining under the petrographic microscope using 25X magnification lens). The former is necessary for field observations both of cook-pot fabrics and when identifying potential sources of raw materials. Microscopic analysis provides more accurate identification of inclusions and textures, which is necessary for comparisons with raw materials and for identifying potential methods of raw materials processing, such as clay mixing or tempering. Results from these two levels of cook-pot analysis will be used to characterize the fabrics and support interpretations of how ancient potters selected and manipulated raw materials to produce LM cook-pots.

Mochlos cook-pot fabrics

Three independent fabric studies have sampled, described, and published LM coarse wares from Mochlos. The late Neopalatial (LMIB) assemblage from the Artisans' Quarters and Chalinomouri farmhouse is macroscopically (Barnard 2003) and microscopically (Day, *et al.* 2003) described, whereas the Postpalatial (LMII-III) assemblage from the settlement and cemetery is only described using microscopy (Nodarou 2010). To characterize the LMII-III vessels in hand-sample the LMIB macroscopic fabric groups were applied because the majority of the material was considered to be local and the study was primarily concerned with shape and decoration in order to date and identify the foreign exchange of goods at Mochlos (Smith 2010:19, 125, 130-134). A fourth fabric study is currently underway that is a comparative examination between material from the Neopalatial (MMIII-LMIB) island settlement and the published LMIB coastal plain deposits (Nodarou and present author, 2006-current).

While each study concludes that LM Mochlos potters used materials associated with the Phyllite-Quartzite Series exposed in the plain to create a range of vessel types—*e.g.*, storage jars, basins, cook-pots, bowls, cups—there are differences in fabric composition, texture, and paste color. Because the sampling strategies of the archaeological material vary and a minimal amount of geological sampling related to pottery production was conducted, or published, it is a challenge to determine what created this observed variation. It could be that the differences mark a chronological shift in material collection and manipulation, or it could be due do to the strategies of sampling the vessels, or simply the varied nature of the

Mochlos potting materials. The aims and sampling strategies of the published studies are critically evaluated to demonstrate the strengths and weaknesses of each approach when applied to extracting information concerning the production of specific vessel types, such as cook-pots.

The aim of Barnard's (2003:3-11) macroscopic study of the LMIB assemblage was to characterize the material, define the local fabrics associated with the pottery workshop identified in the Artisans' Quarters, and establish parallels between ceramic fabric, manufacturing techniques (*e.g.*, surface finish, firing techniques), and vessel type. The material was divided into fine and coarse groups, with coarse being defined as having 10% or more inclusions within the paste. Thirteen coarse fabrics were identified and numbered. Types 1-5 fabrics are dominated by phyllite inclusions: the color of the low-grade metamorphic inclusions and vessel surface finishes distinguishes one from the other, *e.g.*, Type 1 the phyllite are reddish-grey or weak red, reddish-brown; Types 2, 3, 4 the phyllites are reddish-brown and dark grey and are more rounded than elongated; Type 5 the phyllites are grey or black, but so is the matrix of the fabric (Barnard 2003:5-7). Whereas Types 8 and 9 are also dominated by phyllite, but contain "large amounts" of silver mica; however, what constitutes a "large amount" is not stated. Also in Type 8 the phyllite inclusions are the same as Type 1, whereas in Type 9 phyllite inclusions are not obvious or absent (Barnard 2003). Additional coarse fabric traditions defined for the overall assemblage include foreign fabrics (Types 6, 7, possibly 9, 10-12) and one that is associated with Prepalatial material (Type 13).

Most LMI cook-pots from the Artisans' Quarters and Chalinomouri are classified as macroscopic Types 1 or 8. Both fabric groups are defined as multi-purpose, but Type 1 vessels are grouped into cooking and non-cooking vessels based on the red fabric color (*i.e.*

Munsell: 2.5YR 5/6-6/6) and the observation that "inclusions appear more frequently on the surface" (Barnard 2003:5). It is unclear which surface is being described, *e.g.*, the interior, exterior, or fresh-break, and whether this suggests that cooking fabric is coarser than the non-cooking fabric. Either way it conflicts with the published catalogue descriptions, which describe the vessel surfaces as having a "strenuously water-wiped inside and out, smooth, hardened surface" (Barnard 2003:81).

Type 8 is described primarily as a cooking fabric and is more commonly used to produce the vessels found at the Chalinomouri farmhouse on the eastern end of the plain rather than vessels found in the Artisan's Quarters on the west end (Barnard 2003:8). One proposed explanation by Barnard (2003:8) is that the farmstead residents were collecting clays near the mountain villages of Exo Mouliana and Myrsini located above the eastern end of the plain, because according to Day (*et al.* 2003) silver mica schist is exposed in this area (Figure 5.01). This implies pottery manufacturing was also practiced on the eastern end of the plain, which agrees with Soles' (2003:122-123) observation that the oven in the northwest yard could have also served as a kiln because pithoi and basin wasters were found in the outer chamber. Yet no other potter's tools are located in the area, which Soles (2003:123) suggests could be evidence for itinerant potters working at Mochlos to produce large vessels. According to published microscopic analyses (Day, *et al.* 2003; Nodarou 2010) and reported mud brick sampling (Nodarou, *et al.* 2008), geological samples were not collected in this area.

Both LMI (Day, *et al.* 2003) and LMII-III (Nodarou 2010) microscopy studies employed Whitbread's (1995) system of description to further refine and quantify Barnard's (2003) macroscopic groups. Beyond this, both of these studies aspired to link the phyllitic fabrics to geological sources within the Mochlos Plain, establish technological use of the material, and compare the local fabric typologies to neighboring Cretan and off-island sites. The sampling strategy for the LMII-III material analyzed the fabrics according to vessel shape and function, whereas the LMI study mostly analyzed body sherds from miscellaneous or closed vessels that represented the macroscopic groups (Day, *et al.* 2003). (Only three samples were taken from diagnostic vessels: cook-pot, piriform jar, amphora.) The sampling strategy applied to the LMII-III assemblage allows for more secure observations to be made when evaluating specific vessel types, *e.g.*, cook-pots, because samples were taken from known objects rather than undiagnostic body sherds. The sample strategy for the LMII-III material (Nodarou 2010) works well, especially when examining pottery from sites located east of the Ierapetra isthmus because many ancient potters used clays predominantly comprised of geological materials associated with the East Crete Phyllite-Quartzite Series (Haggis and Mook 1993; Day 1995; Day, *et al.* 2003). It is essential to define which vessel types are in the local assemblages.

All of the LMI and LMII-III fabrics have low-grade metamorphic inclusions set within a homogenous, fine matrix that contains small grains of monocrystalline quartz, but they differ in paste granularity (*i.e.* composed, or appearing to be composed, of granules or grains; having a grainy texture), auxiliary inclusions, and color of low-grade metamorphic inclusions (Tables 5.02-5.07). Five microscopic fabric groups are associated with cook-pot production: two groups include cook-pot samples and three include samples of body sherds that may or may not be from cook-pots, but are associated with cook-pots by correlating the macroscopic and microscopic descriptions. Those groups with cook-pot samples are LMI Fine Phyllite—one unknown cook-pot type was sampled (Day, *et al.* 2003:26-28), and LMII-III Coarse Phyllite 1a—out of 29 samples 10 are cook-pots: five tripod cooking pots, three cooking dishes, two cooking trays (Nodarou 2010:5, 6). The other fabric groups are LMI and include Low Grade Metamorphic Rocks, Red Metamorphic Fabric, and Dark Phyllite Fabric (Day, *et al.* 2003:15, 16, 20-23).

LMII-III Coarse Phyllite 1a fabric group has a coarser texture than the LMI fabrics. This discrepancy is not always recognized macroscopically, which could demonstrate the objectivity of the viewer. Nevertheless, the ratio of fine and coarse inclusions to voids is between 60:33:7-45:51:4, with grains <6.9 mm for LMII-III Coarse Phyllite Ia (Table 5.06). The density of the coarse inclusions is practically double that of the LMI fabrics: LMI Dark Phyllite, 35:60:5-30:60:10, grains <4 mm (Table 5.04); Red Metamorphic Fabric, 30:65:5, grains <3.5 mm (Table 5.05); Low Grade Metamorphic, 25:70:5-35:58:7, grains <2.5 mm (Table 5.03); Fine Phyllite, 25:70:5, grains <5 mm (Table 5.02).

While paste granularity differs between the LMI and LMII-III samples, the properties of the matrix between samples appear to be similar. For example, under the microscope the fabrics are orange-, red-, and yellow-brown, gray-brown, often there is a color differentiation between core and margins, and the groundmass ranges from optically inactive to active, *i.e.* the optical state of the clay matrix under rotation in cross polars. Generally optical activity (described as inactive or active) refers to the degree of alteration of the clay mineral due to firing—optically inactive "no change in optical properties on rotation," optically active the "domain display interference colours and extinction" (Whitbread 1995:382; Quinn 2013:94-97). This suggests that under the microscopic, other than the paste granularity, there is no differentiation between LMI and LMII-III cook-pots and possibly even other Mochlos coarse ware vessels, *e.g.*, cups, bowls, jugs, jars, amphorae. The alternative is that the LMI and LMII-III groups, as published, are not comparable because the sampling strategies are different; one defines a range of local fabrics (LMI), while the other defines a range of local fabrics used to produced specific vessel types

(LMII-III). To make these comparisons new microscopic study of the LMI Mochlos coarse wares is underway that has adopted the LMII-III sampling strategy (Nodarou and present author, 2009-current).

Auxiliary inclusions are materials associated with the East Crete Phyllite-Quartzite Series, but are not present in all of the fabrics and therefore considered in this discussion as secondary inclusions. They include limestone (mainly micrite), microfossils, mica (*e.g.*, biotite mica, muscovite mica), and slate (Day, *et al.* 2003; Nodarou 2010). The presence of these materials suggests that the ancient potters could have practiced one or more of the following actions: mixing clays, tempering clays, collecting clays from multiple deposits. For example, the presence of microfossils and green-gray calcareous clay within the red phyllitic clay of microscopic groups LMI Low Grade Metamorphic Fabric (Table 5.03) and LMII-III Coarse Phyllite 1a (Table 5.06) is evidence that the ancient potters mixed a calcareous clay with a phyllitic clay, or tempered it with crushed calcareous materials (Day, *et al.* 2003; Nodarou 2010). The color of the phyllite inclusions varies even though they are all representative of the East Crete Phyllite-Quartzite Series (Greiling 1982; Zulauf, *et al.* 2002). For example, yellow (or golden-brown), orange, dark-brown, dark reddish-brown (or possibly purple) are identified microscopically in both LMI and LMII-III fabrics; whereas gray, pale brown, red-gray, and white are present only in LMI fabrics, and silver-gray and greenish-gray only in LMII-III fabrics (Tables 5.02-5.07). Through raw materials analysis it is verified that the rock materials present in the clay range in size from 1-20 mm and that the rock material must be removed in order for the clay to be workable. How much and what size rock fragments were removed depended on the various parent clay bodies, Section 5.1.4.

The distinguishing characteristics of paste granularity and color of phyllite inclusions between the LMI and the LMII-III microscopic groups could indicate a chronological shift in material procurement and/or processing; however a limited quantity of samples for each period has been examined and not all of the samples are taken from cook-pots, opening such a conclusion to challenge. To unify the LMI and LMII-III Mochlos fabric studies and to specifically examine Mochlos cook-pots the fabric of each cook-pot studied in this thesis was reexamined using Moody's (*et al.* 2003) MACFA analysis (Table 5.08) to obtain the information needed to execute raw material prospection and replication experiments. The fabrics of the LMI and LMII-III Mochlos cook-pots here examined are divided into a primary group with three subgroups. Each are defined and evaluated to propose how local materials could have been manipulated to produce cook-pots. These fabric groups are:

- Primary fabric group: Mochlos Low-grade Metamorphic coarse and medium-fine

  Subgroups:

  - Mochlos Low-grade Metamorphic with Silver Mica; coarse, medium-fine
  - Mochlos Low-grade Metamorphic with Chaff-temper
  - Mochlos Low-grade Metamorphic with Calcareous Inclusions

Mochlos Low-grade Metamorphic

Mochlos Low-grade Metamorphic is both a moderately-sorted, medium-coarse fabric (3%-10% ratio of inclusions to paste) and a poorly-sorted, coarse fabric (25%-30% ratio of inclusions to paste) with the dominate inclusions being sub-rounded, sub-angular, and elongated low-grade metamorphic fragments that typically measure <2-4 mm, but can be <6 mm (Figures 5.03-5.12; Table 5.08). This primary fabric group is subdivided based on coarseness of fabric and presence of rock fragments. The inclusions are set within reddish to yellowish-red or dark red paste that is comprised up to medium-sized grains, *i.e.* 0.025-0.5

mm. Additional mottled colors on the surface of the vessels include dark pink-brown, pale red, pink-grey, pale brown, and pale yellow-brown (Munsell: 2.5YR 6/6, 7.5YR 6/2, 7.5YR 6/3, 10YR 6/4). Others have a grey-black matrix (Munsell: 10YR 5/1-2/1) that parallels Barnard (2003:7) macroscopic Type 5, which she created to determine if the darkened core could be correlated to specific vessel types; however, no patterns were found. Most likely, the mottled colors and the brown-black areas of the fabric were created due to the initial reducing firing atmosphere of the vessels, over-firing the vessels, and from repeated use over a hearth fire, Section 4.1.2 (Hally 1983; Skibo 1992; Gur-Arieh, *et al.* 2011).

The dominant inclusion type present is elongated, sub-angular to sub-rounded grains of phyllite in multiple colors. The colors include: purple, pink, blue-green-gray; the latter is only present in LMII-III fabrics with silver mica. The phyllite color range is attributed to either the composition of the phyllite (Greiling 1982; Zulauf, *et al.* 2002), *e.g.*, those identified microscopically as probable metamorphosed siltstone-mudstone (Tables 5.02, 5.03, 5.06) and chlorite-iron oxide phyllites (Table 5.02) (Day, *et al.* 2003; Nodarou 2010) and/or exposure to oxidizing and reducing firing atmospheres either during the initial firing of the vessel or while it was used to cook food over a hearth-fire. To accurately describe the phyllite color the fabric was examined from multiple areas of the vessel.

The color combinations of phyllite within each fabric group vary. There could be multiple reasons for this, such as the mélange quality of the East Crete Phyllite-Quartzite Series (Greiling 1982; Zulauf, *et al.* 2002), potters collecting clays from multiple areas which contained different inclusions associated with the Phyllite-Quartzite Series, two or more metamorphic clays were mixed, or metamorphic clays were tempered with additional metamorphic rock inclusions that were of various sizes or colors. There are seven color combinations, five of which are present in LMI and LMII-III cook-pot fabrics and two are only present in medium-coarse LMII-III fabrics (Figure 5.03-5.12; Tables 5.08, 5.10). The five combinations present in LMI and LMII-III fabrics are:

- blue-grey, red-brown
- purple
- red-brown
- red-brown, purple
- pink, red-brown, purple

All are coarse fabric, but red-brown and purple are both coarse and medium-coarse and the latter is only present in coarse fabric. The remaining two combinations of phyllite are from LMII-III vessels and classified as medium-coarse, which could indicate a difference practice in procurement (Figure 5.03:C, D):

- pink, red-brown
- blue-grey, red-brown

Additional inclusions within Mochlos Low-grade Metamorphic are:

- white, translucent, and white-gray, sub-rounded, quartz (or quartzite), <3 mm.
- possible sedimentary fragments, red-brown, pink, or blue-gray, elongated, sub-round, sub-angular, <2 mm.
- silver mica laths, not present in all samples.
- white-cream, hard and soft calcareous fragments; possibly including fossils, not present in all samples.

Mochlos Low-grade Metamorphic with Silver Mica

The distinguishing characteristic of Mochlos Low-grade Metamorphic with Silver Mica is elongated, sub-angular, sub-rounded, and occasionally rounded fragments of silver mica-schist. This comprises 15%–30% of the fabric and is typically <2 mm, but can be 3-6 mm.

This fabric is subdivided into medium-coarse and coarse. The medium-coarse fabric has red-brown and purple phyllite (Figure 5.09), while the coarse has various combination of red-brown, purple, blue-gray, and blue-green-gray (Figure 5.10).

Neither the LMI nor the LMII-III microscopic studies identified cook-pots with micaceous fabrics, yet micaceous fabrics were previously recognized macroscopically (Barnard 2003) and microscopically (Day, *et al.* 2003; Nodarou 2010). This is most likely due to sampling procedures and macroscopic misidentification of the fabric. For example, LMI cook-pots produced with micaceous fabrics are identified macroscopically, yet only one local micaceous fabric is microscopically identified, *i.e.* Red Metamorphic Fabric (Table 5.05), but the sample group is poor and comprised of only one undecorated miscellaneous vessel (Day, *et al.* 2003:22, 23). Also, the LMII-III cook-pots are macroscopically classified as Type 1 (Smith 2010:141-121), which is a non-micaceous, low-grade metamorphic fabric (Barnard 2003:5, 80-87).

This study shows that 10 out of 71 revaluated LMII-III cook-pots are classified as being produced with a local silver-micaceous fabric (Table 5.06). Perhaps if the macroscopic analysis of the material had been more rigorous, then LMII-III cook-pots produced in a silver-micaceous fabric would have been sampled for microscopic analysis and could have been classified as Coarse Fabric with Muscovite Mica-schist (Nodarou 2010:6, 7, 141, 142).

Mochlos Low-grade Metamorphic with Chaff-tempering

Distinguishing characteristic of Mochlos Low-grade Metamorphic with Chaff-tempering is elongated voids (2-6 mm in length) that are equally distributed within the paste (Figure 5.11). Grass, or chaff, tempering burns out of the clay at 300°-800°C (Rye 1981:31) leaving only the casts of the grass, which are these elongated voids. Macroscopically chaff-tempering was not identified in the LMI or LMII-III material (Barnard 2003; Smith 2010). Red-brown and purple phyllite is present in this fabric.

Microscopically, chaff-tempering is not identified in the LMI cook-pot assemblage, but it is in the LMII-III Coarse Phyllite Ia (Table 5.06) and Semi-coarse Phyllite Fabric Ib (Table 5.07; Nodarou 2010:6, 141, 142); however, it is associated with basins and not cook-pots (Nodarou 2010:7, 139, 140). Organic temper was identified in the microscopic LMI Fine Phyllite Fabric (Table 5.02), which sampled one cook-pot, but it is described as a concentration of very well rounded grains (Day, *et al.* 2003:27). This could be another type of organic material, *e.g.*, seeds or dung, that was either intentionally added or mistakenly mixed into the clay and did not fully burn out because high enough temperatures were not reached for a long enough period of time. Nevertheless, the organic inclusion described by microscopic analysis does not appear macroscopically. It also does not appear in the LMII-III chaff-tempered fabrics associated with basins, or in the macroscopic analysis of the LMI and LMII-III cook-pots.

Mochlos Low-grade Metamorphic with Calcareous Inclusions

White-cream, soft-medium inclusions are the distinguishing feature of Mochlos Low-grade Metamorphic with Calcareous Inclusions (Figure 5.12; Table 5.08). In hand-sample these inclusions do not always share similar physical characteristics, yet they are identified as calcareous materials since the larger fragments effervesce with HCL diluted by water—*e.g.*, 2 parts acid to 3 of water; 1 part acid to 5 of water (Pough 1988:9, 10). Microscopically, limestone—*i.e.* micrite and sparite (Day, *et al.* 2003:26-28; Nodarou 2010:5, 6) and sandstone (Day, *et al.* 2003:15, 16, 20, 21) are identified as being present in the LMI fabrics. The presence of this material could be an indication that the potter tempered the clay, as was practiced in the mountain villages surrounding the plain in the 20th

century (Day 2004). These inclusion types could naturally occur if either a calcareous and a non-calcareous deposit lay in contact or catchments of the phyllite deposits included materials from the Miocene marine formation.

Relating Mochlos coarse wares to cook-pot types

Results from this examination of the LM Mochlos cook-pot fabrics are consistent with the previous studies (Barnard 2003; Day, *et al.* 2003; Nodarou 2010; Smith 2010) showing that pottery at Mochlos in the LMI and LMII-III periods was produced and distributed locally. All the coarse wares examined contained materials associated with the East Crete Phyllite-Quartzite Series that were exposed in the plain. The cook-pot fabrics were organized into a primary group termed Mochlos Low-grade Metamorphic, having coarse and medium-fine fractions. Initially consisting of two groups—medium-coarse and coarse, this primary group was formed to define more consistently fabric and fabric use. Researchers can differentiate the paste granularity and inclusion size, yet the groups remain together: the difference may not have been significant for the ancient potters. Other subgroups highlight distinctions within the primary fabric that could reflect material manipulation; thus one may understand better any processing of components within the fabric. The subgroups are: (1) Mochlos Low-grade Metamorphic with Silver Mica (coarse, medium-fine), (2) Mochlos Low-grade Metamorphic with Chaff-temper, (3) Mochlos Low-grade Metamorphic with Calcareous Inclusions. It is currently unclear if silver mica and calcareous inclusions indicate tempering, result from clay mixing, or were naturally present in the collected clay. The size of the voids and distribution of chaff within the matrix, being uniform, are evidence of intentional material manipulation. (To better define material use and manipulation, fabric replication experiments are planned, based on information collected from geological prospecting for this thesis, Section 5.1.5. The experimental focus for this thesis was to produce and use cook-pots with Mochlos clays that geologically is a close match to the ancient material; cleaning the clays chosen was sufficient. No need existed to explore material manipulation further.)

The lack of a strong association between specific cook-pots types and subgroups suggests that workshops in the LMI and LMII-III periods produced cook-pots of the full range of subgroups. The exception is chaff-tempering, used to produce only cooking trays in both the LMI and LMII-III periods (Table 5.09). Other chaff-tempered vessels identified in LM deposits are basins (Nodarou 2010:7, 139, 140), functionally and morphologically distinct from cooking trays. In terms of paste granularity and size of inclusions the medium-coarse fabrics are typically associated with LMII-III vessels, but two LMI tripod cooking pots are produced with medium fabrics (Table 5.09). Different fabrics might represent more than one workshop or choices in raw material sources. This range of use also attests to the workability of the Mochlos clay.

In terms of clay collection, different color combinations of phyllite rock fragments are present within the cook-pot material. Due to the *mélange* nature of the East Crete Phyllite-Quartzite Series (Greiling 1982; Zulauf, *et al.* 2002), Sections 1.2.1, 5.1.1, it is possible that different clay exposures have different colors of phyllite fragments present: each color combination thus represents a clay deposit the potters collected from. Another possibility is that phyllite fragments of one color were collected, processed and used to temper a phyllite-based clay with another.

To understand better the relationship between the color combinations of phyllite and the subgroups (Table 5.10). The eight phyllite color combinations are—(1) purple, (2) red-brown, (3) red-brown, purple, (4) pink, red-brown, (5) blue-grey, red-brown, (6) blue-green-grey, red-brown, (7) pink, red-brown, purple, (8) blue-grey, pink, red-brown. Out of this range the red-brown/purple phyllite color combination was present in all fabric subgroups. Red-brown and purple phyllite have been cited in previous fabric studies as a marker that distinguished Mochlos phyllite-based fabrics from others in east Crete (Day 1995; Day, *et al.* 2003; Nodarou 2010). This is critical because materials from the East Crete Phyllite-Quartzite Series are prevalent in LM fabrics, see Papadiokambos fabrics in the following section. The remaining color combinations fall within 2 or 3 subgroups (Table 5.10). If these color combinations are representative of different clay deposits, then either the red-brown and purple phyllite is the dominant rock type exposed in the Mochlos Phyllite-Quartzite Series, or the potters are choosing particular clay exposures during the LM period with this color combination.

When comparing cook-pot production in the LMI and LMII-III assemblages chronological distinctions between material collection and processing seem apparent. All LMI and LMII-III cook-pots are produced in coarse fabrics with the 4 color combinations—(1) red-brown; (2) red-brown, purple; (3) blue-grey, red-brown; (4) pink, red-brown, purple (Table 5.09). This underlines what was previously stated, that potters collected clays with a variety of color combinations, processing them to obtain a coarse texture. This appears the typical practice. However, there are also indications that potters processed clays differently, without altering the fabric significantly and making no longer suitable for cook-pot production. From the ancient potter's viewpoint this distinction in fabric might not be meaningful, but for a researcher these sorts of subtle variations in the material culture help us understand better how people performed various tasks. For example, medium-coarse fabrics with red-brown and purple inclusions were used to produce LMI tripod cooking pots, whereas in the LMII-III period medium-coarse fabrics with pink and red-brown inclusions were used to produce all cook-pot types. Because these color combinations are also present in the coarse version of these fabrics, then this indicates that some potters chose to manipulate medium-coarse clays for potting.

In terms of clay collection these chronological distinctions indicate that whilst potters in LMII-III collected clays from deposits similar to the LMI potters, they also collected from other deposits. One subgroup that is associated only with LMII-III production is coarse silver mica with blue-green-gray and red-brown inclusions. This mix resembles a clay collected in the Limenaria Cove (*i.e.* sample 2, DR-C), distinctive in both color and geological composition, that was used for the experimental component of this thesis, Section 5.1.5.

Papadiokambos cook-pot fabrics

Nine multi-purpose coarse-ware fabrics are defined for the Papadiokambos House A.1 LMI cooking assemblage using macroscopic fabric analysis (Table 5.15). Materials associated with the East Crete Phyllite-Quartzite Series are the primary components of most of the fabrics, while one could be more related to sedimentary deposits. Because the geological make-up of the material is similar descriptive names are created using the matrix color and the color and type of the most dominate rock fragments present—*e.g.*, orange matrix with purple metamorphic inclusions. Thus far no direct evidence of pottery production—*e.g.*, potters' wheels, kilns, ceramic wasters—was found at Papadiokambos and very few potting materials are exposed today in the plain and none are associated with East Crete Phyllite-Quartzite Series. This suggests that people living at Papadiokampos in the LMI period had access to and depended on a larger production-and-distribution system to acquire their coarse-wares.

The fabric descriptions are grouped into the dominant inclusion types (*i.e.* metamorphic, sedimentary) and matrix color (*i.e.* red, orange-tan, tan). As definition of the matrix color is a crucial feature, the matrix is examined in various parts of the vessel to assure accuracy of the color notation. There are four fabric groups; metamorphic rock fragments dominate three, sedimentary fragments dominates one. The metamorphic fabrics are divided into those with red, orange-tan, and tan matrix and the sedimentary fabric is orange-tan. Multiple divisions of the Papadiokambos cook-pot fabrics have been made because these fabrics are not as similar to each other as those defined in the LMI and LMII-III Mochlos assemblages, and as demonstrated by Day's (1995) microscopic examination of domestic pottery from the nearby Petras region there were multiple pottery workshops operating during the LMI period (extended discussion in relationship to Papadiokambos fabrics in section below. Relating Papadiokambos coarse wars to cook-pot types). One possible explanation as to why there is lacking a homogenous quality in the Papadiokambos cook-pot fabrics is that these cook-pots were produced in various east Crete workshops and brought to Papadiokambos. The significance of these preliminary fabric divisions potentially represents the different LM east Crete pottery workshops.

Papadiokambos red coarse wares with metamorphic inclusions

Fabric One

Papadiokambos Red Matrix with Brown-pink and Red Metamorphic Inclusions is a poorly-sorted coarse fabric (25%-30% ratio of inclusions to paste) with the dominant inclusion being sub-rounded, sub-angular, brown-pink and red phyllite/slate inclusions, that measure <7 mm (Figure 5.13:A, B; Table 5.12). The inclusions are set within a red fabric (Munsell: 2.5YR 5/6, 10R 5/6). The fabric is subdivided into two groups: a non-micaceous (Coarse A) and micaceous (Coarse B). The exterior of the vessels has a hard, smooth surface that resembles a slip coating, but of the same type of clay used to make the vessel.

Fabric Two

Papadiokambos Red Matrix with Purple and Brown-red Metamorphic Inclusions is a poorly-sorted coarse fabric (25%-30% ratio of inclusions to paste) with the dominant inclusion being sub-rounded, sub-angular, brown-pink and red phyllite/slate inclusions, that measure <9 mm (Figure 5.13:C; Table 5.13). The inclusions are set within a reddish-yellow to yellowish-red and dark red fabric (Munsell: 5YR 7/6-7/8, 6/6-6/8, 5/6-5/8; 2.5YR 6/6-6/8). The interior of tripod cooking pot (PDK0040) is coated with a cream slip. The exterior of the vessel has a hard, smooth surface that resembles a slip coating, but resembles the same type of clay used to make the vessel.

Fabric Three

Papadiokambos Red Matrix with Red-black Shiny, Brown-red Metamorphic Inclusions with Silver-white Foliate Metamorphic Inclusions is a poorly-sorted coarse fabric (25%-30% ratio of inclusions to paste) with the dominant inclusion being a possible mica-schist or gneiss (<8 mm), brown-red phyllite, (<7 mm) and silver-white mica-schist (2-6 mm) (Figure 5.13:D; Table 5.14). The inclusions are set within a red paste (Munsell: 2.5YR 5/6, 10R 5/6).

Papadiokambos orange-tan coarse wares with metamorphic inclusions

Fabric Four

Papadiokambos Orange-tan matrix with Silver-Blue Metamorphic Inclusions is a poorly-sorted fabric that is divided into three subgroups based on paste granularity and size of inclusions, details below (Figure 5.14:A; Table 5.15). The dominant inclusion is sub-rounded, sub-angular, silver-blue phyllite/slate, which measures 2-8 mm. The grains are set within an orange-tan fabric (Munsell: 5YR 2/6, reddish-yellow).

Subgroups:

- Medium-fine (2%-5% ratio of inclusions to matrix, fragments <4 mm).

- Medium-coarse (15%-20% ratio of inclusions to matrix, fragments <4 mm).
- Coarse (25%-30% ratio of inclusions to matrix, fragments <6-7 mm).

Fabric Five

Papadiokambos Orange-tan Matrix with Purple Metamorphic Inclusions is a poorly-sorted fabric that is divided into two subgroups based on paste granularity and inclusion size; details below (Table 5.16). The dominant inclusion is angular, sub-rounded, purple, purple-brown, phyllite/slate, that measure <6 mm. The inclusions are set within an orange-tan fabric (Munsell: 5YR 6/6, reddish-yellow).

Subgroups:

- Coarse (25%-30% ratio of inclusions to matrix, fragments <4-6 mm).
- Very coarse (40%-50% ratio of inclusion to matrix, fragments <6-8 mm).

Fabric Six

The ancient potter used two closely related clays to produce at least one tripod cooking pot; one clay was used to produce the body and another was used to form the legs. Macroscopically the clays are similar, yet one has silver mica and the other does not, though it has larger inclusions of milky-white quartz. Microscopic analysis will be able to further define these fabrics, but for this preliminary study they are grouped because they were collected and used to produce the same vessel.

Papadiokambos Orange-tan Matrix with Milky-white Quartz Inclusions and some Red-purple and Brown Metamorphic Inclusions with Various Amounts of Silver Mica is a poorly-sorted coarse (25%-30% ratio of inclusions to matrix) fabric (Table 5.17). The dominant inclusions present in the material used to form the body are sub-rounded, sub-angular fragments of milky-white quartz that measure <6 mm, and sub-rounded, sub-angular, elongated, red-purple and brown phyllite/slate fragments that measure <9 mm

(Figure 5.14:B). The dominant inclusions in the material used to form the legs of the vessel are sub-angular, sub-rounded, silver-mica schist that measure <4 mm (Figure 5.14:C). The inclusions for both clays are set within an orange-tan fabric (Munsell: 2.5YR 5/6).

Surface finish is only applied to the exterior. The lower body and underneath of the vessel is coated in a thin silver micaceous slip. The rest of the vessels' body has a hard, smooth surface that resembles a slip coating, but of the same type of clay the vessel body is produced with.

Fabric Seven

Papadiokambos Orange-tan Matrix with Brown-purple and Red Metamorphic Inclusions with Silver mica-schist is a poorly-sorted fabric that is divided into three subgroups based on paste granularity, size and type of inclusions—*i.e.* silver mica, calcareous materials; details below (Figure 5.14E; Table 5.18). The dominant inclusions are elongated, sub-rounded, sub-angular, brown-purple phyllite/slate that measure <7 mm. Silver and silver-blue mica-schist fragments that measure <6 mm also comprise the distinguishing components of the fabric, but they are not as common in the matrix as the phyllite/slate inclusions.

Subgroups:

- Coarse A (25%-30% ratio of inclusions to matrix).
- Coarse B (25%-30% ratio of inclusions to matrix), there is a greater amount of mica and calcareous materials present.
- Coarse C (25%-30% ratio of inclusions to matrix), there is a greater amount of irregular shaped voids (*i.e.* square, round, elongated) fragments measure <7 mm.

Papadiokambos tan coarse wares with metamorphic inclusions

Fabric Eight

Papadiokambos Tan Matrix with Brown-red, Grey-blue Metamorphic Inclusions with Silver Mica-schist is a moderately-sorted coarse (25%-30% ratio of inclusions to matrix), micaceous fabric in which the dominant inclusions are brown-red and grey-blue, elongated, sub-angular phyllite/slate, and sub-rounded, silver mica-schist that measure <6 mm (Figure 5.15:D; Table 5.19).

Papadiokambos orange-tan coarse wares with sedimentary and metamorphic inclusions

Fabric Nine

Papadiokambos Orange-tan Matrix with Fine-grained, Soft, Orange Inclusions is a poorly-sorted fabric that is divided into three sub-groups based on paste granularity of the dominant inclusions that is either a metamorphosed mudstone or a siltstone (Figure 5.14:E, F; Table 5.20). This division is significant because different classes and sized vessels were produced in the different subgroups (Table 5.22). For example, small vessels, *i.e.* cups were produced in the Medium-fine subgroup, whereas cook-pots and medium-sized jugs were produced with Coarse A, and larger vessels, *i.e.* basins, were produced in the Coarse B.

The interior of tripod cooking pot (PDK0314) is coated with a cream slip. The exterior of the vessel has a hard, smooth surface that resembles a slip coating, produced from the same type of clay as the vessel.

Subgroups:

- Medium-fine (2%-5% ratio of inclusions to matrix).
- Coarse A (25%-30% ratio of inclusions to matrix) fragments measure <4 mm.
- Coarse B (25%-30% ratio of inclusions to matrix) fragments measure <8 mm.

Relating Papadiokambos coarse wares to cook-pot types

Day (1995) encountered a variety of ceramic fabrics when examining MMIII-LMI material from seven sites within Sitia Bay near Petras, some 10-12 km east of Papadiokambos (Figure 1.02). His aim was to identify technological information and local specific centers of production. His conclusion was that 10 fabric groups, some divided into sub-groups, plus 15 loner fabrics, existed: each demonstrating a link between vessel shape and function. In this analysis tripod cooking pots had the greatest variation of fabrics (about 5), but consistently utilized phyllite-based clays. Day (1995) hypothesized that this diversity could reflect a greater number of workshops producing cook-pots, or more variability in the raw materials forming their paste. Petras in this period was the largest settlement in the area, considered to be an administrative center, Section 1.2.3, yet there were at least three centers of production whose distribution of everyday pottery—*i.e.* cups, jars, cook-pots—overlapped. The centers of production hereabouts are Petras, Achladia, and Zou (Figure 1.02). In 1995 this conclusion was startling because it argued that an "intra-island" movement of everyday goods was practiced in Bronze Age Crete (Day 1995), which disclosure influenced the way researchers envisioned the production and distribution of goods in regions with administrative centers.

LMI House A.1 at Papadiokambos was the deposit targeted for this present analysis because of its numerous well-preserved cooking deposits and its strategic location between two large settlements on the north coast of east Crete—Mochlos to the west, Petras to the east, Sections 1.1, 1.4 (Figure 1.02; Brogan, *et al.* 2001, 2012). Below is a summary and discussion of the Papadiokambos LMI coarse fabrics that are associated with cook-pots.

Nine Papadiokambos coarse fabric groups are identified macroscopically: all but one phyllite-based. Most groups divide into subgroups on quantity and size of inclusions within the matrix, but not all sub-groups are associated with cook-pots (Table 5.21). For example, Fabric 4 is divided into three subgroups (*i.e.* medium-fine, medium-coarse, coarse), yet only one is associated with tripod cooking pots. The medium-fine and medium-coarse subgroups are associated with cups and small jugs, whereas the coarse subgroup (Figure 4:A) is associated with various size jars, basins, and cook-pots. This finding recalls Day's (1995) when analyzing the material from the Sitia Bay region: that many of the fabrics could be further subdivided. What is not evident either in his petrographic work of this Sitia Bay material or in this macroscopic analysis of the vessels from House A.1 at Papadiokambos is the relationship between fabric groups to pottery production centers. *Does each fabric group, subdivisions included, represent a single production center in this part of northeast Crete, or are these relationships between fabrics and production centers more complex?* Day (1995) proposed that even if more than one workshop used the same geological material, the way the potters chose to manipulate it could be different: this implies that each fabric group, or even subgroup, could represent one center, or at least an individual potter. Such questions are not the focus of this study; but it is important to consider them to understand better the range of possibilities why multiple phyllite-based cook-pot fabrics are identified macroscopically in House A.1 at Papadiokambos. As the study of the Papadiokambos material advances, incorporating microscope study and additional geological prospecting, these scenarios can be better defined and compared in a more systematic way to studies such as Day's (1995). In this thesis, it is critical to identify the fabrics and their relationships to cook-pots.

Just as with the Mochlos fabrics, all but one Papadiokambos fabric display multiple purposes, associated with numerous everyday vessel types—*i.e.* cups, bowls, jugs, jars, pithos, amphorae, basins, and cook-pots (Table 5.21). Fabric 6 is associated only with tripod cooking pots, but these particular vessels were distinct in that two fabrics were used in the vessel: one for the body (Figure 5.14:C) and a micaceous one for the legs (Figure 5.14:D). This manner of fabric use and manufacture is not identified at Mochlos for cook-pots or any other type of vessel; however, it has been noted for tripod cooking pots in the Sphakia region of west Crete (Moody and Robinson 2000). This shows a tradition of sorts using materials on Crete, but not one identified or documented much for cook-pots.

In the Papadiokambos cook-pot assemblage 29 vessels were examined. Tripod cooking pots (12 vessels) and cooking dishes (11 vessels) comprise the majority of the sample, the remaining are 4 cooking jars and 4 cooking trays (Table 5.21). As previously stated, nine fabrics are associated with cook-pots: Fabric 9 has two subgroups—Coarse A, Coarse B (Tables 5.21, 5.22). The fabrics are associated with specific cook-pot types, yet no fabric is associated with all of the cook-pot types. For example, Fabric 4 (coarse) is associated with two tripod cooking pots, two cooking jars, and four cooking dishes (Table 5.22). Three fabrics are associated with two types of cook-pots, one of which is a tripod cooking pot. For example, Fabric 1 (coarse) is associated with tripod cooking pots and cooking jars. Whilst Fabric 2 and 3 are both used to produce tripod cooking pots, yet cooking dishes were made with Fabric 2 and trays with Fabric 3 (Table 5.22). The remaining six fabrics are associated only with one cook-pot type: three with tripod cooking pots [*i.e.* Fabrics 6, 9 (coarse A & B)f], and two fabrics [*i.e.* 7 (coarse A), 8] with cooking trays. Only one fabric was solely used to produce cooking dishes, namely Fabric 5 (coarse) (Table 5.22).

At Mochlos evidence from pottery production and the fabric studies all conclude that LM potters used the local phyllite-based clays to produce cook-pots distributed locally. The cook-pot corpus at Papadiokambos is more varied, demonstrating a situation just as Day

(1995) describes. This is one indication that people living at Papadiokambos had connections to other communities in the east Crete region and could have participated in some form of exchange in everyday vessels with these production centers.

5.1.5 Geological prospection for LM cook-pot production

The majority of Mochlos and Papadiokambos LM cook-pots were produced with materials derived from the East Crete Phyllite-Quartzite Series and one Papadiokambos fabric group is comprised of sedimentary and metamorphic material. Materials from the East Cretan Phyllite-Quartzite Series identified are various colors of phyllite, silver mica-schist, quartzite, and milky-quartz. They are widely available on the north and south coasts in an area that extends from the Ierapetra Isthmus, at the eastern end of the Mirabello Bay, to the eastern edge of Crete (Figure 1.03). Through an extensive series of evaluations and examinations researchers agree that local materials associated with the Phyllite-Quartzite Series were used at Mochlos in the LMI and LMII-III periods to produce a range of vessel types, which also includes cook-pots (Barnard 2003; Day, *et al.* 2003; Nodarou 2003, 2010). The examination and evaluation of the Papadiokambos ceramic assemblage are in the early stages; the fabrics are being defined and the construction of a geological reference collection of potting materials is underway.

Auxiliary materials identified in the LM cook-pot fabrics are calcareous based, and include marl, sandstone, and limestone. The Miocene calcareous materials act as a non-plastic ingredient, which creates a clay body that is difficult to shape into a form because its properties are short (Rye 1981:32, 33). Also, if the pottery is fired 750°-1000°C the calcium carbonate begins to change structure and expand (*i.e.* CaCO3 to CaO, and rehydrate to CaOH2 expansion) (Rye 1981:32, 33), thus compromising the vessel structure causing it to break apart over a short or a long period of time, as seen by crumbling vessel walls. This process is called spalling; it is a common problem for Cretan potters who work with local materials. [The white spots on the bars are soft, calcareous materials and the cracks are formed as the calcareous inclusions expand and contract (Figures 5.46:B, 5.48:B, D)]. To combat this problem the 20th and 21st Cretan pithos potters soaked, or docked, their vessels in water for at least 24-48 hours when they were removed from the kiln to dissolve the calcareous material present in the fabric (per. comm. D. Limberidis, Cretan potter, 2011). Ancient potters may have used this technique, but unfortunately, this particular procedure does not leave physical evidence and cannot be proven.

Microscopically, the presence of calcareous based materials within metamorphic clays is interpreted as evidence for possible clay mixing or tempering (Nodarou 2010). Another use of calcareous materials, which has not been explored by the previous Mochlos studies, is the production of cream-white slips. These occur on the interiors of cooking trays and early Neopalatial tripod cooking pots at Mochlos and tripod cooking pots at Papadiokambos (Barnard, *et al.* 2003:33-98). These study areas were explored by geological prospection to understand better where the types of potting materials identified in the cook-pot fabric studies are located in relation to the LMI and LMII-III settlements at Mochlos and the LMI houses in the Papadiokambos Plain.

Examination of potential potting materials available for ancient pottery production of cook-pots at Mochlos and Papadiokambos opens with the aims and methods of processing and testing the viability of the collected clays for potting. The discussion of materials is organized by study area and begins with Mochlos. Within each discussion the collection sites and samples are introduced followed by a detailed examination of properties for each sample.

Aims and methods of geological prospecting

To interpret how and where ancient fabrics were created one must compare clays, rock fragments, and sand-sized grains identified in the ancient fabrics to those exposed in the geographical area from which the vessels where recovered (Quinn 2013). Often, this is a repetitive process, where the knowledge gained from each step aids further examination. If the fabric components and geological materials are similar, than it is possible that the pots were locally made (Day, *et al.* 2003; Nodarou 2010), or come from an area of similar geology. Furthermore, if the pots were locally made one can examine the materials to explore how they were used for pottery production (Moody, *et al.* 2012). If the geological materials and components of ancient fabrics are dissimilar, than most likely the recovered vessels were imported (Whitbread 1995), or materials consistent with the pots have not yet been identified in the area.

Beyond locating potting materials available today in the landscape potters need clays that do not crack and break during drying, firing, or use (Leach 1976). How potters evaluate which clays are acceptable and which need manipulation is largely based on their training and experience in detecting properties of clay that affect its workability to produce a pot. These include plasticity, shrinkage, porosity, and permeability (Rye 1981; Arnold 1985:21). Plasticity is the property that allows clay to change shape when pressure is applied and retain shape when pressure is removed (Rye 1981:146). The loss of mechanically combined water (*i.e.* moisture in the atmosphere) and physically combined water (*i.e.* water on the molecular level within clay) during drying and firing cycles is one reason why clay shrinks. Another is vitrification (*i.e.* formation of glass during heating) of clay during firing (Rye 1981:147). Porosity is the amount of space in a ceramic fabric that is occupied by pores or voids; whereas permeability is the rate at which a liquid passes through a ceramic vessel from one surface to the other and is primarily dependent on the types, size, quantity, and distribution of pores (Rye 1981:146). Other factors that affect permeability are the presence of cracks and flaws in the vessel, the differences in pressure and temperature on each side of the vessel, thickness of the piece, and test duration (Grimshaw 1971:436).

Plasticity and shrinkage are related to the material properties of the clay, *i.e.* mineral composition, particle size, degree of crystallinity, as well as the amount of soluble salts, plastic, and non-plastics present (Arnold 1985:21). For example, the greater amount of water needed to hydrate clay to achieve plasticity, the greater it shrinks, which increases the probability that the vessel will crack during drying and firing (Grim 1962:56-58). To accommodate high shrinkage rates of clay potters will either only produce small vessels with these clay types (*e.g.*, potters in Ticul, Yucatan, Mexico and the Melanesia Amphlett Islands), travel farther distances to collect higher quality clays, rather than use those near their village (*e.g.*, Chacobo potters in northeastern Bolivia traveled 15-20 minutes to collect better quality clays than use poorer local clays), or mix and temper clays (*e.g.*, Jutland potters in Denmark who added sand to clay to produce cook-pots and jugs) (Steensburg 1939; Arnold 1985:21). From a production viewpoint, the potter must know the shrinkage of a vessel from the wet-to-fired state, because how much it shrinks determines drying conditions (*i.e.* indoors/outdoors, covered/uncovered with light cloth, fast/slow) and the size once fired (Peterson and Peterson 2003:140). For example, red earthenware clays typically have a wet-to-fired shrinkage of 6%-8%, so pots produced with this clay type must be produced 6%-8% larger than desired, so that once fired the vessel will be the desired size (Lawrence 1972; Rice 1987:table 1.2). This variability also allows for specific conditions created by seasonal weather changes.

Porosity and permeability are important material properties for potters to consider when producing specific vessel types (Arnold 1985:21-23). For example, clays used to produce cook-pots must be able to retain heat so that food can be cooked within the belly of the vessel without cracking; thus the clay must be relatively impermeable so that liquids do not seep through the vessel wall, but it must also be porous enough to withstand variable degrees of thermal shock (Rye 1976:113; Arnold 1983:23). All ceramic material contains pores or voids, *i.e.* spaces that exist between or within the solid particles. Pores are characterized by size, shape, and position within the ceramic fabric, *e.g.*, sealed or open to the exterior surface. Open pores are those that are open to the exterior of the ceramic material. Sealed pores are those without connections to the exterior that occur naturally or are created by mixing materials—*i.e.* voids created within the fabric when organic temper is burnt out during firing, tempering clay with non-plastic material (*i.e.* sand). Sealed pores may also develop as the fabric heats up and open pores become sealed through shrinkage and vitrification (Rice 1987:350).

Aims

The aims of geological sampling at Mochlos and Papadiokambos are independent of each other because the understanding of the coarse wares from each site is at different stages of examination. At Mochlos this study and previous fabric studies (Barnard 2003; Day, *et al.* 2003; Nodarou 2003, 2010) along with geological sampling demonstrate that the ancient potters used local clays to produce coarse wares (Day, *et al.* 2003) and mud bricks (Nodarou, *et al.* 2008). The aim of the Mochlos study is to advance current knowledge of the local materials into a more practical understanding by using them to produce vessels that resemble the forms and physical properties of LM cook-pots. Material sampling questions include:

- Which materials available today within the Mochlos Plain can be formed into vessel shapes and sizes that are consistent with LM cook-pots?
- Can the materials available today be used to produce vessels that are similar in function to LMI cook-pots?

At Papadiokambos multiple fabrics produced with materials derived from the East Crete Phyllite-Quartzite Series have been defined in this thesis, but a local fabric has not been identified because until now geological prospecting for potting materials has not been executed. The aim for the Papadiokambos study is to define what materials are available today in the plain and surrounding areas that resemble the ancient fabrics, in order to explore the possibility of local production. Thus far, macroscopic identification of the material is complete; future microscopic studies are planned.

Broad material sampling questions include:

- Which materials available today within the study areas can be formed into shapes?
- Do the materials in the study areas reflect the composition of LM cook-pot fabrics?

Tools used for geological prospection include: plastic bags to contain samples; waterproof tags to record the type and location of samples; geological rock hammer to create fresh breaks on rock fragments, reduce sample sizes and extract clay; field notebook to record the type and location of the sample, the exposure description; camera and scales to record the size of the exposure and sample. Two IGME (Institute of Geology and Mineral Exploration) maps—the isthmus of Ierapetra and Mochlos Plain (Papastamatiou, *et al.* 1959a), the Papadiokambos Plain and Sitia (Papastamatiou, *et al.* 1959b)—were consulted for guidance on the variety, character, and location of the different lithologies.

To locate potting materials the IGME maps (Papastamatiou, *et al.* 1959a, 1959b) were referenced, but the scale is large (*e.g.*, 1:50,000) and represents a range of lithologies that are distinctive at the microscopic scale of thin section analysis. To pinpoint materials of interest the landscape was explored by driving and walking on paved and unpaved roads, the coastline, and in dry riverbeds. The maps were made in 1959 and much building of roads and structures has occurred since then, which possibly exposed or covered materials. At Mochlos the eastern and the western ends of the plain (Figure 5.17) were heavily sampled because these areas are associated with LMI and LMII-III pottery production. Ethnographic accounts that reveal potters normally collect materials that are within 1-7 kilometer range (Arnold 1985; Soles 2003:33, 34; 2011:62; Day 2004). At Papadiokambos the areas explored were near the archaeological structures and accessible areas across the plain, as well as to the east in the neighboring Agii Pantes Gorge and on the Vamvakia peninsula (Figure 5.18). Geological prospection limitations include visibility due to dense vegetation and accessibility caused by environmental and human factors—*e.g.*, riverbeds blocked by flashflood deposits, eroded coastline, fences, buildings, construction debris.

Processing raw clays

The geological samples were cleaned by removing unwanted rocks, twigs, and leaves, sieved to a grain size that is similar to those in the Mochlos and Papadiokambos coarse fabrics, which is typically 2-3 mm, formed into briquettes with a 10 cm line incised on one side, and fired 750º-850ºC in an electric kiln for 1-6 hours (Moody, *et al.* 2012; Quinn 2013:134, fig. 5.15). This firing procedure was chosen for specific reasons. Bronze Age cook-pots are typically fired to these temperatures (Roumpou, *et al.* 2012:table 1), which is often lower than other vessel types (Day and Kilikoglou 2001). Because of the experimental component of the thesis that produces vessels in Mochlos clays for hearth cooking, Section 6.1, the firing length closely follows that of a potter that uses electric kiln technology, which is a longer period of time than many laboratory-based tests that fire samples for about an hour (Quinn 2013:134). Additionally, the samples served as geological material references, and were analyzed and described both in hand-sample and under the microscope. For microscopic evaluation the materials were fired and made into thin-sections (Quinn 2013:134).

Potter's test to determine viability of raw clays

To determine the viability of the East Cretan clays for pottery production at Mochlos and Papadiokambos field-based plasticity, shrinkage, and absorption tests were executed. Each are outlined below.

Field-based plasticity tests:

Tests were made by collecting a handful of clay, wetting it, rolling it into a ball and a coil to wrap around the finger. If the "clay" was overly plastic it stuck to the hand and would not hold a shape, and if the "clay" was not plastic enough, *i.e.* short, it cracked when rolled into a ball or coil and could not be formed into a shape (Quinn 2013:132, figs. 5.13, 5.14). Ideally, clay can be formed into a shape without cracking; however, the sampled clays at Mochlos and Papadiokambos cracked when tested, but could be shaped. Because they resembled the ancient fabrics they were collected.

Shrinkage of raw clays:

The percentage of wet-to-fired shrinkage of Mochlos and Papadiokambos clay samples was measured using an equation that is based on linear shrinkage: % of linear wet-to-fired shrinkage = (length fired–length wet)/length wet x 100 (Peterson and Peterson 2003:140). To calculate the equation the briquettes with the 10 cm line is set aside for drying. Once dried completely the line on the bar is measured and the equation: % of linear dry shrinkage = (length dry–length wet)/length wet x 100 is calculated to determine the wet-to-dry shrinkage. After the bar is fired and cool, measure the 10 cm line and follow the equation: %

of linear fired shrinkage (length fire-length dry)/length dry x 100. Add wet-to-dry and dry-to-fired percentage for the total shrinkage of the sample.

Absorption Test:

Porosity of ceramic vessels is described as true or apparent. True porosity refers to the total proportion of the bulk volume of open and closed pores that is estimated using microscopic methods—*e.g.*, point counts, areal analyses (Rice 1987:351, 352). Apparent porosity includes only open pores and is determined by calculating the equation: % of absorption = (bar saturated-bar dry)/bar dry x 100 (Rice 1987:352; Peterson 2002). Three methods can be used to calculate apparent porosity: liquid immersion technique, water absorption, mercury intrusion porosimetry (Rice 1987:352). To test the clay samples a water absorption test was conducted because it can be achieved using very little equipment, which is ideal for field-testing. To execute the test the fire clay briquettes are dried in direct sunlight for 5-8 hours and weighed. The dried sample is placed in a suitable container, covered with water for 24 hours. (If the sample absorbs all of the water, more is added so that it remains immersed in water.) After 24 hours the saturated briquette is removed, the access water is wiped off, and it is reweighed. The weights are recorded and calculated using the equation to determine the apparent porosity of the samples.

Mochlos geological prospection

Like the 20th century potters living near and in the Mochlos plain (Day 2004), people living during the LM period knew how to use local materials to build stone and mud brick structures (Soles 1983, 2003; Nodarou, *et al.* 2008), cover walls and floors with plaster (Soles 2008; Westlake 2011), collect stones to create tools (Carter 2004, 2011), and make pottery (Barnard 2003; Day, *et al.* 2003; Nodarou 2003, 2010). For mud brick and pottery production they also knew how to combine ingredients—*e.g.*, clays, organic matter, rock fragments—to produce what they wanted or needed; however, the approaches varied as evidenced by the many local fabrics defined by chemical and microscopic analysis of the mud bricks (Nodarou, *et al.* 2008) and fabric analysis of the pottery (Barnard 2003; Day, *et al.* 2003; Nodarou 2010). Comparing the geological materials used to produce mud bricks and pottery is valuable to better understand the ancient potter's engagement with the clay resources. Detailing this type of information helps guide the researcher to collect more appropriate samples for this type of scientific work.

The sampling structure for Mochlos was primarily concerned with locating and collecting materials identified in the previous fabric studies (Day, *et al.* 2003; Nodarou 2010), as well as those identified in the macroscopic examination of the material studied here. The section on geological sampling is organized by location in the plain—*i.e.* west, middle, east—to geographically orient the following detailed discussion. The areas were chosen because of their visibility and accessibility. Twelve samples were collected that fall within two geological groups—clays with metamorphic materials associated with the East Crete Phyllite-Quartzite Series, marls associated with Miocene marine deposits (Figure 5.17; Table 5.25).

Sampling began in the west end of the plain in the Limenaria Cove and Mochlos village because the material sourcing for mud brick production (Nodarou, *et al.* 2008) and the locations proposed in the microscopic studies came from this area (Figures 5.19; Day, *et al.* 2003; Nodarou 2003, 2010). For example, five samples were collected to examine raw material use for mud brick construction, which is similar to the ancient pottery: two (R1, R2) from Holocene Alluvium in the Limenaria Cove, one (R4) from Miocene marl deposit in the modern village, one (R3) from Pleistocene Alluvium east of the modern village, one (R5) from a phyllite deposit also located east of the modern village (Nodarou, *et al.* 2008:fig. 21).

Another reason to begin in this area was that the Limenaria Cove is located 1 km from the LMI Artisans' Quarters and the LMII-III settlement where pottery production tools have been found (Soles 2003:33, 34; 2011:62).

A total of four samples were collected (Figures 5.19-5.22; Table 5.25). Samples 1-3 are associated with the Phyllite-Quartzite Series: two clays—sample 1, Purple Phyllite Hill Clay (PPH-C); sample 2, Development Red Clay (DR-C); metamorphic rocks from the Limenaria scarp—sample 3, Marina Metamorphic rocks (MM-R). Sample 4 is Miocene marl (EH-C) that was collected in the Mochlos village. To fill in the gaps of the material knowledge the Limenaria Cove samples were collected in locations not previously examined (Nodarou, *et al.* 2008). This is important for locating and characterizing workable clays if the end goal is to understand better the processes of ancient pottery production at Mochlos from an experimental viewpoint. Especially so in an area with mountainous terrain: because the multiple catchments in the Ornos Mountains that drain seasonal water run-off through the plain and into the sea are comprised of different materials that could affect the quality of the clay (Papastamatiou, *et al.* 1959a). For example, in the Limenaria Cove the catchment for DR-C is more varied than the neighboring PPH-C, which is comprised of two kinds of deposits—*i.e.* flaggy limestone, the Phyllite-Quartzite Series (Figure 5.01). The catchment for DR-C includes Miocene marine marls, sandstones, conglomerates, and components of the East Crete Phyllite-Quartzite Series including its gypsum deposits. Whereas the catchment that is most likely associated with Nodarou's (*et al.* 2008:fig. 21) sample R5 is comprised of material associated with the East Crete Phyllite-Quartzite Series, including its deposits of dolomite and diabase (*i.e.* igneous rock equivalent to volcanic basalt), as well as Miocene marine marls, sandstones, and conglomerates (Papastamatiou, *et al.* 1959a).

Geological prospection continued to the center of the plain near the coast, north of the modern mountain villages of Sfaka and Tourloti (Figures 5.23, 5.24; Table 5.25). Samples 5 and 6, Silver Mica-schist a, b (SM-Sa, SM-Sb) were collected. The exposure contains mica-schist fragments and weathered sand-sized grains.

At the east end of the plain samples 7-12 were collected; all are associated with the Phyllite-Quartzite Series (Table 5.25). Samples 7 and 8—Venetian Town Road Red Clay (VTRR-C), Venetian Town Road Red Rock (VTRR-R)—are from near the Venetian tower that is located northeast of the mountain village of Myrsini (Figure 5.25). VTRR-C is red-orange clay with green-tan metamorphic inclusions and VTRR-C is green-tan metamorphic rock fragments (Figure 5.26). Farther east in the foothills above the coastal LMI Chalinomouri farmhouse, samples 9-12 were collected; two rock, two clay (Figure 5.27; Table 5.25). The rock samples are Chalinomouri Metamorphic Rock a, b (CH-Ra, CH-Rb). Phyllite/slate in CH-ra is green, blue-gray and purple, and in CH-rb it is green, blue-grey, and brown (Figure 5.28). The clay samples are Chalinomouri Purple Phyllite Clay a, b (CHPP-Ca, CHPP-Cb). Both samples are purple clay, but CHPP-Ca has purple phyllite inclusions with some green-tan phyllite fragments, and CHPP-Cb mainly has green-tan phyllite-fragments with some purple phyllite (Figure 5.29).

Metamorphic materials at Mochlos associated with the East Crete Phyllite-Quartzite Series

Clays with metamorphic fragments are the predominant potting material for LM coarse wares. The exposures are located in the east and west ends of the plain. They contain low-grade metamorphic rock fragments that vary in composition and color, but are typically characterized by purple phyllites and are associated with the Permian-Triassic East Crete Phyllite-Quartzite Series (Day, *et al.* 2003; Nodarou 2003, 2010; Nodarou, *et al.* 2008). The raw unfired clays are either purple or red-orange. Based on field observations the purple clays are probably weathering by-products of the purple phyllite exposures that have remained relatively *in situ* because the grains of this particular colored phyllite was the same as the clays. Whereas the presence of multiple grain sizes and the variety of rock fragments within the red-orange clays indicate they did remain in situ, but could have been transported, possibly by tectonic activity (Moody 1987) or flash floods, such as that witnessed by Rackham and Moody (1996:20) in Pachia Ammos village in east Crete.

The scale of the IGME geological map (Papastamatiou, *et al.* 1959a) is large (*e.g.*, 1:50,000) and indicates that the purple and red-orange clays are a part of the same formation; this map is used as a guide even though it lacks adequate detail needed for clay prospection, which can be corrected through field observations. The clays are awaiting XRD analysis to determine their mineralogical composition at the Department of Geology at the University of Patras, Greece (Iliopoulos and Passa) to help clarify the field observations to: 1) identify the parent material of the clays, 2) determine if there is material variation between the catchments of the Ornos Mountains.

The following discussion is divided into sections that examine the properties of the Mochlos purple and red-orange clays, as well as mica schist.

Mochlos purple clays

Three purple clays were collected; sample 1, Purple Phyllite Hill Clay (PPH-C) in the Limenaria Cove and samples 11 and 12, Chalinomouri Purple Phyllite Clay a and b (CHPP-Ca, CHPP-Cb) in the eastern foothills above the LMI farmhouse (Figures 5.20:A, C, 5.29; Tables 5.25, 5.27). Macroscopically the unfired and fired sample colors are the same, which is purple (unfired Munsell: 10R 4/3, 5/3; weak red; fired to 750°-850°C in an electric kiln Munsell: 2.5YR 5/6; red), but microscopically they are different. Under the microscope in cross-polarized light the groundmass of sample 1 (PPH-C) is red-brown, and the groundmass of sample 11 (CHPP-Ca) is brown-purple (Figure 5.30:B, C). While the matrix of both samples microscopically is poorly-sorted and displays a bimodal grain-size distribution, the optical state of the matrix varies; sample 1 (PPH-C) is optically active, sample 11 (CHPP-Ca) is slightly optically active. Because both samples were fired between 750°-850°C in the same electric kiln the difference in the optical state of the matrix is most likely due to material composition. Macroscopically, the colors of the phyllite fragments present within the matrix of the two purple clay samples are different. Also, the workability of the two clays varies dramatically. The samples are described below.

Sub-rounded and sub-angular fragments of purple phyllite characterize sample 1 (PPH-C) auxiliary inclusions identified microscopically include quartz, quartzite, mica laths, and fine-grained limestone (Figure 5.20:A, B). These rock and mineral fragments present within the matrix are representative of the catchment associated with sample 1 (PPH-C), which is comprised of flaggy limestone and Phyllite-Quartzite Series (Figure 5.01) (Papastamatiou, *et al.* 1959a). The clay is very plastic and can be easily formed into a shape; however, the shape does not hold if the walls are too thin. It has a greasy feel (Table 5.27). The optically active state of the groundmass is most likely due to the nature of the clay minerals composition, grain-sizes, and order (Whitbread 1995).

Samples 11 and 12 (CHPP-Ca, CHPP-Cb) are characterized by sub-rounded and sub-angular fragments of tan-green and purple phyllite fragments. Only sample 11 (CHPP-Ca) was sampled for thin-sectioning because it could be worked into a briquette, whereas sample 12 (CHPP-Cb) was too fragile and would easily break before and after firing. The auxiliary inclusions identified microscopically in sample 11 (CHPP-Ca) include quartz, quartzite, fine-grained limestone, and mica laths (Figure 5.30:C, D). The catchment associated with samples 11 and 12 includes materials associated with the Phyllite-Quartzite Series along with its deposits of diabase and crystalline limestone (Figure 5.01; Papastamatiou, *et al.* 1959a). The rock and mineral fragments present within the matrix are also representative of the catchment, but no identified diabase (*e.g.*, igneous rock mainly composed of feldspar and pyroxene) fragments are present and the accessory minerals are not obvious—*i.e.* hornblende, biotite, apatite, pyrrhoitite, chalcopyrite, serpentine, chlorite, calcite (Papastamatiou, *et al.* 1959a). The geological composition of the catchment associated with sample 11 (CHPP-Ca) is similar to Nodarou's (*et al.* 2008:fig. 21) metamorphic clay sample R5 collected in the eastern plain, and comparisons between the color and optical state of these two samples would be informative in determining if the Ornos Mountain catchment systems affects the material composition of the Phyllite-Quartzite clays, which might also affect the workable properties of the clays. In terms of workability samples 11 and 12 (CHPP-Ca, CHPP-Cb) are not as plastic as sample 1 (PPH-C), but they can be formed into shapes; however, the shapes easily crumble in your fingers and break when dropped in both a wet and fired state. When wet samples 11 and 12 (CHPP-Ca, CHPP-Cb) are much drier than the greasy feel of PPH-C (Table 5.27) and are difficult to shape. The optically active state of the groundmass is most likely due to the composition of the clay, which could include higher soil content.

Based on field-based plasticity tests the most workable Mochlos purple clay is sample 1 (PPH-C) that is located in the western end of the plain in the Limenaria Cove. The components also vary between the clays collected in the western and eastern ends of the plain; only purple phyllite fragments are present in sample 1 (PPH-C), in samples 11 and 12 both tan-green and purple phyllite fragments are present.

Mochlos red-orange clays

Two red-orange clays were collected; sample 2, Development Red Clay (DR-C) in the Limenaria Cove and sample 7, Venetian Tower Red Clay (VTR-C) in the eastern plain (Figures 5.20:A, B, 5.26; Tables 5.25, 5.27). Macroscopically and microscopically the unfired and fired samples colors are the same: hand-sample—red-orange (Munsell: 5YR 6/6; reddish yellow), microscopic—red-brown (Figure 5.31:B, D). Under the microscope the micromass is optically active for both samples. Compared to the Mochlos purple clays, the red-orange clays are characterized by a greater variety of metamorphic fragments, which can also be identified macroscopically and microscopically. The workability of the red-orange clays share qualities; both are semi-plastic so they can be formed into a shape but it quickly dries and cracks if water, or a very thin slip, is not used to coat the surface (Table 5.27). The samples are described below.

Sub-rounded and sub-angular fragments of green, silver, brown, and purple phyllite and milky-white quartz characterizes sample 2 (DR-C), auxiliary inclusions identified microscopically include quartzite, fine-grained limestones, mica-schist and mica laths (Figure 5.31:A, B; Table 5.27). The catchment associated with sample 2 (DR-C) (Figures 5.01, 5.19) includes Miocene marine marls, sandstones, conglomerates, and components of the Phyllite-Quartzite Series including its gypsum deposits (Papastamatiou, *et al.* 1959a). For the most part these rock and mineral fragments present within the matrix of the DR-C sample are representative of the catchment; however, gypsum was not identified in the thin section.

Sub-rounded and sub-angular fragments of tan-green phyllite fragments characterize sample 7 (VTR-C), auxiliary inclusions identified microscopically include silver mica-schist, mica laths, quartz, quartzite, and minor amounts of fine-grained limestone (Figure

5.31:C, D; Table 5.27). The catchment associated with sample 7 (VTR-C) is comprised of materials from the Permian-Triassic Phyllite-Quartzite Series along with its diabase, conglomerate, and dark thin-bedded crystalline limestone, and possibly includes materials from the once overlying Miocene formation—*e.g.*, marls, clays, sandstone, conglomerates (Figure 5.01) (Papastamatiou, *et al.* 1959a). Like DR-C, the materials present within the matrix are representative of its associated catchment, but diabase and the accessory minerals were not identified.

Two red-orange clay were collected on opposite ends of the Mochlos Plain—samples 2 (DR-C), 7 (VTR-C). They share characteristics, such as the same color, both are semi-plastic, and are characterized by a greater variety of metamorphic fragments than the Mochlos purple clays. DR-C and VTR-C could be potentially used for potting.

Mochlos silver mica-schist exposure

Clays containing a large amount of silver mica, *e.g.*, LM fabrics Mochlos Low-grade metamorphic coarse and medium-coarse with silver mica (Figures 5.09, 5.10), were not located in the plain; however, bedrock exposures of silver mica-schist, samples 5 and 6 (SM-Sa, SM-Sb), with consolidated rock fragments and weathered sand-sized grains are located in the center of the plain northwest of Tourloti near the coast (Figures 5.23, 5.24; Table 5.29). Samples 5 and 6 (SM-Sa, SM-Sb) are weathered and could be easily collected, processed, and mixed with clay to create a micaceous fabric. The more weathered SM-Sa when sieved >0.5 mm grain-size is plastic enough to make briquettes (3 x 5 cm) and shallow pinch pots (3 cm), but these shapes are extremely fragile even after they are fired (750°-850°C in electric kiln) (Figure 5.32). They are best used as a temper.

Mochlos Marls associated with Miocene marine deposits

One marl, sample 4 (EH-C) was collected in Mochlos village (Figures 5.21, 5.22; Tables 5.25, 5.27). It is derived from the Miocene marine formation and was exposed by a cut for a house foundation (Papastamatiou, *et al.* 1959a) (Figure 5.01). While other deposits of this type are exposed, sample 4 (EH-C) was sampled because it contains fine-grained sand (1/8-1/4 mm) and is more plastic than other Miocene materials exposures in the western end of the Mochlos Plain near the coast. For example, the marls exposed in the Limenaria Cove and to the east of the village do not break down when soaked in water, because there is either no, or a low amount, of clay minerals in the sample or there is a high calcareous component in the marl that does not allow it is break down to a plastic material. Sample 4 (EH-C) breaks down in water and can be formed into crude small (3 x 3 cm) round and flat shapes and fired. The briquettes are fragile, even after firing (750º-850ºC in electric oven), and broke apart during the manufacturing of a thin section; therefore no macroscopic and microscopic images are available. The fine-grained property of sample 4 (EH-C) could make it a good fine-grained temper, or part of an ingredient for clay mixing because it can be equally distributed within the clay. This is also evidenced by the use of marls in the ethnographic studies of 20th century potters working in the mountain villages surrounding the plain (Day 2004).

Papadiokambos geological prospection

The sampling strategy of the geological materials associated with Papadiokambos cook-pots was organized to locate and collect materials identified in the macroscopic fabric study of the cook-pots examined. The purpose of sampling was to create a geological reference collection of clay and rock resources that would be appropriate for producing pottery. (See previous discussion of aims and methods of geological prospecting.) The prospecting was executed in two phases and a total of 12 samples were collected (Figure 5.18; Table 5.26) that are grouped into red-orange, tan and purple clays and white-grey Miocene clays.

Geological prospecting began in 2008 in the Papadiokambos Plain in the immediate areas of LMI coastal Houses A.1, B.1, and B.2, northwest in the Liopetra uplands, southeast on the Phaneromeni (Trachilos) Peninsula—albeit no samples were located in this location, and to the east in the neighboring Agii Pantes Gorge (Figures 5.18, 5.33-5.37; Table 5.26). These areas are close to LMI structures, easily accessible, and moderately free from structures built during the last 20-30 years when foreign building materials might be deposited locally. Samples 13-24 were collected.

Samples 13 and 14 (I-C, II-C) were collected in the foothills of the Liopetra uplands (Figures. 5.33, 5.34; Table 5.26). Sample 13 (I-C) is red clay derived from the Permian or Carboniferous formations (Figure 5.02; Papastamatiou, *et al.* 1959b). Due to the large map scale (*e.g.*, 1:50,000) and the complex nature of the geological deposits exposed in the Papadiokambos Plain it is challenging to determine which formation sample 13 (I-C) was collected from. It was collected on the same hill as the ruins of a Venetian, or Turkish, farmstead. The rocks removed by wet sieving are sub-angular and sub-rounded and are comprised of tan, tan-green, dark green, purple, and red sedimentary and metamorphic fragments. Very few, *i.e.* two or three, purple phyllite fragments and milky-quartz are included in material >3 mm (Figure 5.35:A; Table 5.28). Down slope less than a kilometer on the gravel road towards the sea is a shallow deposit (*ca.* 20-30 cm deep) of purple clay, sample 14 (II-C), derived from the Pliocene diluvium (Papastamatiou, *et al.* 1959b). Rock fragments in sample 14 (II-C) are sub-rounded and sub-angular sedimentary and metamorphic rock fragments that are tan, various shades of green and red, milky-white and clear quartz (Figure 5.35:B; Table 5.28).

Samples 15-17 were collected on the coast near LMI Houses B.1 and B.2 and are derived from the Holocene alluvium (Figure 5.36; Table 5.26; Papastamatiou, *et al.* 1959b). Two clays—one red, sample 15 (III-RC); one tan, sample 16 (III-TC)—were collected in deposits beneath LMI Houses B.1 and B.2 on the coast. Beach sand, sample 17 (III-S), near LMI Houses B.1 and B.2 was also collected. The sand grains are sub-angular to sub-rounded metamorphic, igneous, and sedimentary materials that have washed down from the Ornos Mountains, Liopetra highlands, and Miocene plateau. The rock fragments present within samples 15 and 16 (III-TC, III-RC) are similar to those identified in the beach sand.

Sample 18 was collected in the Agii Pantes Gorge (Figure 5.37, Table 5.26). Agii Pantes Gorge Clay, sample 18 (APG-C), is white-grey and derived from the Miocene marine formation (Papastamatiou, *et al.* 1959b). It is fine-grained and is a potential source that could be used as a temper, or to make a light colored slip used for coating vessel surfaces, such as those described on the interior of LMI cook-pots (Barnard 2003).

In an effort to locate materials associated with the Phyllite-Quartzite Series that could have been used to produce Papadiokambos cook-pots the search continued on the Vamvakia Peninsula along the Greek national road Periferiaki Aerodromiou Sitias (E75) (Figures 5.18). The decision to explore the Vamvakia Peninsula before the surrounding mountains to the west and south was based on archaeological and geological evidence. The peninsula creates the northwest boarder of the Sitia Plain where the Minoan Palace of Petras is located, and it is proposed by some researchers that there could have been political or economic connections between Petras and Papadiokambos during the Protopalatial and Neopalatial periods (Sofianou and Brogan 2012). If there were connections between the settlements, than there could have been an exchange of material goods that could include various types of ceramic products, such as cook-pots. Also, people could have moved or traveled between these settlements for various reasons and brought their cooking tools with them.

Deposits of the East Crete Phyllite-Quartzite Series are illustrated on the IGME map on the Vamvakia Peninsula, albeit the area is modest in extent compared to those surrounding the Mochlos Plain (Figure 5.02; Papastamatiou, *et al.* 1959b) and those described by Day (1995:152) in his study of east Crete production centers immediately to the south and east of Petras (Figure 1.02). However, these exposures are a considerable distance from Papadiokambos and are associated with specific Bronze Age centers of pottery production (Day 1995). To add to geological knowledge gained by Day's (1995) sampling and to sample areas closer to Papadiokambos the Vamvakia Peninsula was sampled. Samples 19-24 were collected and described below.

Five clays were collected along the Greek national road Periferiaki Aerodromiou Sitias (E75); two are fine, white-grey and three are coarse, red (Figures 5.18, 5.38-5.42; Table 5.26). Samples 19 and 20 (Ea-C, Eb-C) are fine white-grey clays derived from the Miocene marine formation and are exposed on the northwest side of the peninsula. Sample 21 (Ec-R) is located across the road from samples 19 and 20 (Ea-C, Eb-C) and is comprised of green, dark and light brown, and cream-white rocks which, based on their color and texture, are most likely a mix of metamorphic and sedimentary material; these types of rock fragments are identified in close proximity and in one sample of the red clays (Figures 5.40-5.42; Tables 5.26, 5.29).

The three red clays are located further along the road towards the west entrance of Sitia near the port. Sample 22, Airport Road Red Clay (ARR-C) is located on the northwest side of the peninsula, whereas the two remaining red clays, samples 23 and 24 (C-RC, D-RC), are located on the southeast side. They are derived from the Permian-Triassic or

Miocene formation. Much like samples 13 and 14 (I-C, II-C) collected in the Papadiokambos Plain, it is hard to determine the specific formation based on the IGME map because of the scale and complex geology of the area created by the numerous deposits in a relatively small area. Also, the map was published in 1959 and the construction of buildings and expansion of the road is more recent, which is problematic when orienting locations. Sub-rounded and sub-angular tan, dark brown, and various shades of green sedimentary and metamorphic rock fragments were removed by wet sieving the clay (Figure 5.40:C; Table 5.28).

Coastal red-orange, tan, and purple clays at Papadiokambos and Vamvaki Peninsula

Seven earthenware clays were sampled in the Papadiokambos coastal plain, lower slopes of the Liopetra uplands, and the Vamvaki Peninsula; five red-orange, one tan and one purple (Figures 5.34, 5.36:A, 5.40-5.42; Table 5.26). The red-orange clays and their locations are sample 13 (I-C) Liopetra uplands, sample 15 (III-RC) Papadiokambos coast, samples 22-24 (ARR-C, C-RC, D-RC) Vamvaki Peninsula. The purple clay is sample 14 (II-C) from the Liopetra uplands and sample 16 (III-TC) from the Papadiokambos coast. The samples were processed as outlined in the methodology above. The building of the geological reference collection and the workability tests are incomplete, because after nine months (*e.g.*, the time period between the study seasons) four out of seven briquettes and broke into pieces due to spalling as the calc material (*i.e.* CaO) within the fire clay rehydrated, see following paragraph for detailed explanation (Figure 5.43). Three fired clay samples remained intact: sample 15 (III-RC) from the Papadiokambos Plain and samples 23 and 24 (C-RC, D-RC) from the Vamvaki Peninsula (Figure 5.44).

The fired samples (Figures 5.45, 5.47) most likely broke apart due to the high calcareous content of the clay created by the predominant Miocene formation and the

Permian or Carboniferous bluish crystalline limestone, which breaks down to create red clays, *i.e.* Cretan terra rossa (Betancourt and Myer 1995). Today there are a limited number of red clays available in the Papadiokambos Plain and on the Vamvaki Peninsula. The located clays are exposed in shallow deposits, *e.g.* II-C, making it difficult to collect samples that are not contaminated from topsoil or underlying dirt. Overall the majority of the clay samples have a high calcareous content that can create structural problems when producing forms and after they are fired, as evidenced by the spalling samples discussed above. Three fired clay samples remained intact: II-RC from the Papadiokambos Plain, C-RC and D-RC from the Vamvaki Peninsula. In terms of LM cook-pot production, it is highly unlikely that these clays were used to produce the vessels unearthed in House A.1, unless they were tempered with metamorphic rock fragments because the predominant fabric associated with Papadiokambos cook-pots is comprised of materials associated with the East Crete Phyllite-Quartzite Series.

Coastal white-grey Miocene clays at Agii Pantes Gorge and Vamvaki Peninsula

Three Miocene clays were collected in the coastal plain and lower slopes, and peninsula (Figures 5.37, 5.38; Table 5.26); one is located in the Agii Pantes Gorge (APG-C) and two (Ea-C, Eb-C) are from the same exposure located on the northwest side of the Vamvaki Peninsula. The samples were processed according to the procedure set in the methodology. Like the red-orange briquettes these samples broke apart (Figure 5.47). The workability of the APG-C was much better than samples 19 and 20 from the Vamvaki Peninsula. It has the same semi-plastic quality as the red-orange clays collected in the plain and on the peninsula and can be shaped into forms (Table 5.28). Thus far no microscopic analysis has been completed on the Papadiokambos cook-pots to identify if Miocene clays and red clays were mixed, as has been identified in the Mochlos material (Day, *et al.* 2003; Nodarou 2010);

however, these white-grey clays could have been used in the same manner. These clays might also be used to produce a slip that is similar to those that were applied to the interiors of LMI Papadiokambos cook-pots. Future experiments using these materials are planned to produce slips and as a temper.

Viable East Cretan clays for pottery production

To characterize properties of the Mochlos, Papadiokambos, and Sitia clay samples plasticity, shrinkage and porosity tests where conducted (Lawrence 1972; Peterson 2002). The samples were prepared according to the methodology previously outlined. To determine which fired clays could maintain structural integrity for a specific period of time without damage due to spalling the bars were left exposed on trays during the wet Cretan fall-winter-spring periods. Five of the 16 clays collected maintained structural integrity, which were purple and red-orange clays (Figure 5.48; Tables 5.27, 5.28). Those that warrant further testing are samples 1 (PPH-C), 2 (DR-C), 7 (VTR-C), 23 (C-RC), are 24 (D-RC).

The percentage of wet-to-fired shrinkage for the majority of the clays is 5%. This includes Mochlos samples 1, 2, and 7 (PHH-C, DR-C, VTR-C) and sample 23 (C-RC) collected on the Vamvaki Peninsula. The remaining sample 24 (D-RC) is from the Vamaki Peninsula and has 11% shrinkage (Tables 5.28). However, all of the clays fall between the 6%-25% shrinkage ranges that characterize earthenware clays (Lawrence 1972; Rice 1987:table 1.2). The percentage of porosity, or absorption of liquid, of the samples is more varied than the shrinkage percentage. The Mochlos samples have a range of 9-14% (PPH-C—9%, DR-C—11%, VTR-C—14%), whereas the Vamvaki Peninsula samples (C-RC, D-RC) have 15% porosity. These results fall within, or near, the absorption range of earthenware clays, which is 10%-15% (Peterson and Peterson 2003:28).

With respect to workability for vessel production, the percentage of shrinkage implies that clays with 5% shrinkage are more plastic than the one with 11% shrinkage (Grim 1962:56-58), yet the feel of these clays varies, which can correlate to workability (Tables 5.26, 5.28; Peterson and Peterson 2003). The clay samples are characterized as having a particular type of feel that is described as either greasy (*i.e.* smooth, elastic, has a shiny quality in light), semi-dry (*i.e.* smooth, elastic, can crack while drying), or dry (*i.e.* brittle, cracks while drying, if dried on the hands it pulls the skin). Only sample 1 (PPH-C) has a greasy feel, while samples 2, 7, 23, and 24 (DR-C, VTR-C, C-RC and D-RC) have a semi-dry feel. The Mochlos clays associated with the East Cretan Phyllite-Quartzite Series have the same shrinkage, which implies that they might have been equally desirable for producing pottery; however, this might not be the case because they feel different from one another. The clay collected outside Sitia on the tip of the Vamvaki Peninsula (sample 23, C-RC) is the only viable clay collected in the area, yet it does not have rock fragments that are similar to the ancient cook-pot fabrics. Once microscopic analysis has been completed at Papadiokambos further investigation can commence. As it stands, no clays in the Papadiokambos Plain or on the Vamvaki Peninsula compositionally compare to the LM Papadiokambos cook-pot fabrics.

The aim of the Mochlos geological prospecting was to locate clays that could be used to produce vessels in the style of LM cook-pots. The clays sample 1 (PPH-C) and sample 2 (DR-C) clay located in the Limenaria Cove was chosen to produce pinch pots because they fall within the range of workable clay and they are the closest to the known LMI and LMII-III pottery centers (Soles 2003, 2008). The clays have different feels and from a potter's view point I want to test their workability because while they both have materials associated with the East Cretan Phyllite-Quartzite Series, the composition is different. Both clays could be used to produce pinch pots and were collected in large quantities to produce vessels, Section 6.1 (Figure 5.49).

5.2 EXAMINATION OF LM COOK-POT MORPHOLOGIES FROM MOCHLOS AND PAPADIOKAMBOS

This examination of the vessel morphology is designed to analyze components of the Mochlos and Papadiokambos cook-pot assemblages in terms of functional aspects, stylistic preferences, possible production techniques of each cook-pot design. These attributes of the tripod cooking pots, cooking jars, cooking trays, and cooking dishes could have been dictated by either the potter or consumer; however, this analysis is concerned with defining these attributes so that the knowledge is applied to a broader experimental program that explores the *chaîne opératoire* of ancient vessel production, function and use.

The cook-pot overview in Chapter 4 serves as background information for the development of this in-depth analytical description of the vessels. To further understand ancient cook-pot production and use, the uniformity of specific vessel features (*i.e.* body and rim shape, handle shape and orientation, leg shape, surface finishes) within each assemblage is compared and examined in the following ways. Chronological comparisons between the LMI and LMII-III cook-pot assemblages at Mochlos explore the possibility of changes in vessel design that could have been affected by the cultural shift between the LMI Minoan and LMII-III potentially Minoan and Mycenaean settlements. Comparisons are also made between the LMI assemblages of Mochlos and Papadiokambos to examine how local pottery production could affect the uniformity of a vessel assemblage. This aspect of the examination is based on the proposed hypothesis that according to the fabric study and geological prospecting in the respective areas; local cook-pot production was practiced at Mochlos, while at Papadiokambos it was unlikely. The experimental component of this thesis utilizes the analytical description developed for the Mochlos vessels to produce and use experimental vessels to cook foods that were available during the Minoan times.

The primary challenge of studying the morphologies of the Mochlos and Papadiokambos cook-pots is that within each assemblage the sample size is small and the vessels are fragmentary, making it impossible to identify statistically patterns or trends in vessel production. Observations for each assemblage are noted to better understand how ancient people produced these vessel types and cooked in them; however, interpretations are made with caution so as to not overstate claims. The morphological examination includes shape (*i.e.* body profile, handle, leg), size (*i.e.* rim diameter) and capacity, and surface finish. Where appropriate information that relates to vessel morphology from the Mochlos publications (Barnard, *et al.* 2003; Smith 2010) and topics relating to vessel design and cooking techniques are included.

5.2.1 Tripod cooking pots and cooking jars

A total of 45 tripod cooking pots and four cooking jars were examined; 35 tripod cooking pots are from Mochlos (LMI—21, LMII-III—14), the remaining 10 and the four cooking jars are from LMI deposits at Papadiokambos (Tables 5.33, 5.34). Overall the material is poorly preserved and vessels typically have incomplete body profiles, missing handles, and/or legs. A general description of the assemblages is provided to orient the following in-depth examination of the vessels' designs. The primary components examined include: body shape, rim profile, handles, legs, pre-firing surface finish. The auxiliary components include: spouts on the rim between the two handles, added plastic decoration. Macroscopic analysis of the vessels surfaces are used to detect features that could be associated with specific production techniques and included in the discussion when appropriate. Body shape definitions are (Figures 5.52, 5.53):

- Globular—Vessel with a spherical body profile and defined shoulder.
- Elongated globular—Vessel share the characteristics of a globular vessel, but the body is elongated. Its defined shoulder distinguishes it from a cylindrical vessel.
- Piriform—Vessel with an inverted pear-shaped profile where the shoulder is more pronounced than the body and base.
- Cylindrical—Vessel with a cylinder-shaped body profile where the contour of the shoulder, belly, and base make a straight line.

Production and General description of tripod cooking pot and cooking jar designs

LM tripod cooking pots examined from Mochlos and Papadiokambos are for the most part undecorated globular, elongated globular, piriform, and cylindrical with everted round, everted pointed, straight round, or straight pointed rims and a flat base (Figures 5.50-5.53, Tables 5.30:A-5.32:A). The interior surfaces have concentric undulating ridges called rilling-marks (*e.g.*, formed as a potter creates a vessel by pressing their fingertips against wet clay as it rotates on a wheel) (Figure 5.54:B, D), which indicate that the ancient potters produced the bodies of tripod cooking pots and cooking jars using some form of wheel technology (Rye 1981:87, 88). The exterior surfaces are smooth (Figure 5.54:A, C) and to achieve this, the ancient potter most likely used a hard tool made from wood, stone, bone, or clay as the vessel turned on the wheel either while it was being formed or afterwards. This is indicated by the concentric, horizontal drag marks in the clay produced from grit inclusions (Rye 1981:86). If rilling-marks are not detected on the interior of the vessel (Figure 5.54:F), than this is not necessarily an indication that the potter did not use wheel technology to produce it. In fact, sometimes the potter smoothed the surfaces so well that the rilling-marks became very shallow grooves that are only visible when the contour of the pot changes—*e.g.* between neck and shoulder, between shoulder and body (Figure 5.54:A, C, E, G, H). In these cases one can identify rilling-marks using raking light, or feeling them with their fingertips. Other indications that wheel technology was used is the absence of features that are associated with hand-made pottery—*e.g.* random vertical, horizontal, diagonal scrapping marks on the surface; irregularity in the form (Rye 1981:87, 88).

Globular vessels with everted rims appear to be the preferred vessel shape in the examined tripod cooking pot and cooking jar assemblages. Globular and piriform cooking jars with everted round and everted pointed rims were also produced, but they are only identified in the Papadiokambos assemblage (Figures 5.50, 5.51, 5.53; Table 5.32:A). Based on the examination of the tripod cooking pots it appears that the LMI assemblages, especially Papadiokambos, are more varied in vessel shapes, sizes, and surface finishes than the LMII-III Mochlos assemblage.

On all tripod cooking pots and cooking jars potters set two round or oval shaped handles opposite each other on the vessels' shoulder in either a horizontal (Figure 5.55:A, C, D) or vertical (Figure 5.55:E) orientation. Round, horizontal handles appear to be the preferred handle type attached to LM tripod cooking pots and cooking jars. The size of the handle easily fits into the palm of an adult hand, which aids in using the vessel to perform a variety of tasks.

The legs of tripod cooking pots are either oval, round-oval, or flat-oval in section with square or pointed tips; the leg length elevated the vessels off the ground 6-12 cm (Figures 5.54:A, B, G; 5.56:E, F; Tables 5.30:A, 5.31:A, 5.32:A). They are attached at the junction between the lower body and base equi-distant from each other by scoring the vessel wall to provide a more secure join (Figure 5.56:C). Before the legs are attached the exterior base could be either smoothed or left rough (Figure 5.56:A, B).

Shape

In previous Mochlos publications, the majority of the LM tripod cooking pots were classified as Type A (Betancourt 1980:3); all but three LMI vessels are classified as Type A (Barnard, *et al.*, 2003:80-82) and all of the LMII-III vessels are classified as Type A (Smith 2010:114, 115). According to the nomenclature Type A vessels have S-shaped profiles (*i.e.* globular body with an everted rim) and are associated with LMIII deposits, Section 4.1.1. Type B vessels have straighter profiles with either a shallow shoulder or one without a shoulder (*i.e.* elongated globular, cylindrical profile) and are associated with the earlier MMIII-LMIA periods (Betancourt 1980). Barnard (*et al.* 2003:81) states that MMIII-LMIA tripod cooking pots recovered from the island settlement were almost exclusively straight-sided, rimless, Type B vessels, which in her evaluation is a contrast to those with globular bodies and pronounced rims recovered from the LMIB deposits from the Artisans' Quarters and Chalinomouri farmstead. She interprets this as "evidence that re-emphasizes Betancourt's general dating of the two types" (Barnard, *et al.* 2003:81) that place Type B vessels chronologically before Type A (Betancourt 1980).

An in-depth examination of the Mochlos and Papadiokambos vessels is needed that expands the shape range of body profiles without placing chronological significance on them, because dating tripod cooking pots only by morphology is more complicated than once proposed, Section 4.1.4 (Betancourt 1980). For example in the LMI Mochlos assemblage tripod cooking pot MOC2931 (Figure 5.52:D) is classified by Barnard (*et al.*, 2003:82) as Type A, which by definition (Betancourt 1980) means that it is a globular vessel, but it is not. The shoulder diameter is more pronounced than the belly of vessel, which classifies the body shape as piriform. This is significant because different shapes may related to different potters or different methods of production.

Based on this examination of the vessels it appears that the LMI Mochlos and Papadiokambos assemblages have a greater variety of body shapes than the Mochlos LMII-III assemblage, and that globular vessels could be more frequent at Mochlos than at Papadiokambos (Figures 5.50, 5.52, 5.53; Table 5.33). The LMI tripod cooking pot assemblages from Mochlos and Papadiokambos include all shapes (*i.e.* globular, elongated globular, piriform, cylindrical, Table 5.33), but there are more globular vessels at Mochlos than at Papadiokambos (*i.e.* Mochlos—11 out of 21, Papadiokambos—2 out of 10; Table 5.33:A). This is a contrast to the LMII-III Mochlos tripod cooking pot assemblage that has almost an equal amount of globular and elongated globular vessels, and no piriform or cylindrical vessels (*i.e.* globular—6 out of 14, elongated globular—4 out of 14; Table 5.33:B); however, 4 vessels have incomplete body profiles and cannot be classified.

Lid use in relationship to rim profile is important to consider when examining the Mochlos and Papadiokambos vessels, because in the cooking contexts a greater number of cook-pots exist than lids (Soles 2003; Soles 2008). This raises the question: *How did people maintain heat within the belly of a vessel to cook food? Did they use ceramic lids, as well as lids produced from other materials (e.g., flat stones, wooden boards) to cover the vessel?* From a functional viewpoint rim shape is important because the angle it is juxtaposed to the body affects how a lid rests on the vessel to hold heat within its belly to cook food, Section 4.1.2. For example, an everted rim (Figure 5.51) provides a seating to inset a flat (Figure 4.20:B-D; 4.30:H) or cup-shaped lid (Figure 4.20:A; 4.30:G). Mouths with straight rims can also be covered with flat or cup-shaped lids, but they might not create a secure cover because they are not inset within the seating channel and could allow heat to escape, thus cooling the cooking temperatures within the vessels. To prevent this a malleable substance, *i.e.* dough, could be used to seal the gap between the lid and rim. This is practiced today in Crete when people use lidded ceramic casseroles to cook food in ovens (pers. comm. A. Sfirogiannakis, professional cook and restaurant owner, 2009). On the other hand, cup-shaped lids that cover the mouth by covering the exterior of the rim and resting on the upper shoulder could also provide a secure fit, Section 4.1.2.

Another feature of tripod cooking pot and cooking jar rims are shallow spouts placed between the handles (Figures 5.52:E, 5.53:C, D, F), most likely produced by pulling out and shaping the rim of the vessel immediately after it was formed and the clay was very wet (Peterson 1992). These spouts would allow someone to tip the vessel to pour liquid contents into another container. Spouted rims are also noted to have an association related to body profiles, chronological periods, and sites.

To understand better the possible relationships between cook-pot rim profiles and vessel use in the LMI and LMII-III Mochlos communities and the LMI Papadiokambos community comparisons of rim profiles between the assemblages are made. Caution is used when drawing chronological and site comparisons because the amount of material examined is limited. These observations are outlined below.

Everted rims appear to be the preferred profile for LM tripod cooking pots, which creates a seating to inset flat or cup-shaped lids to cover the mouth (Figure 5.51; Table 5.33). In the LMI assemblages the everted rims are classified as everted round (*i.e.* Mochlos—15 out of 21, Papadiokambos—5 out of 10; Table 5.33:A, C) and in the LMII-III assemblage they are classified as everted pointed (*i.e.* Mochlos—13 out of 14; Table 5.33:B). Cook-pots with straight rims are only seen in the LMI assemblages; *i.e.* Mochlos—2 out of 21, Papadiokambos—3 out of 10 (Table 5.33:A, C). Only 8 out of 45 Mochlos and Papadiokambos vessels examined have spouted rims. The Mochlos LMI and

LMII-III spouted vessels have everted round rims, whereas the LMI Papadiokambos vessels have everted round, straight round, and straight pointed rims.

The LMI Papadiokambos cooking jar assemblage is comprised of only four vessels and like the tripod cooking pots from this site there is variation in body profile. The cooking jars are classified as globular vessels with straight round rims (*i.e.* 1 out of 4, Table 5.34) and piriform vessels with everted pointed rims (*i.e.* 2 out of 4, Table 5.34). Only one vessel has an everted round rim, but the body shape is not preserved (Table 5.34). Two jars have spouts, but one is a shallow pulled spout (PDK0288) and the other is much larger and was formed and then attached (PDK0412) (Figure 5:57).

In the LMI period there appears to be a greater variation of rim shape, yet overall everted rims appear to be the preferred profile for the LM cook-pots examined. Everted rims are suitable for all lid types, which created a more flexible design for people because multiple lid shapes could have covered the mouth of the vessel, or when a lid was not available they could have improvised by using flat pieces of wood or stone. A limited number of tripod cooking pots have spouts: unlike the one that was formed and attached to cooking jar (PDK0412), they are shallow. Experimental tests are needed to understand better the function and the use of such small spouts.

Size

Vessel size of Mochlos and Papadiokambos tripod cooking pots and cooking jars are classified according to rim diameter because only the upper body of many of the vessels is preserved. Ideally, vessel capacity would be measured so that the maximum amount the cook-pot could hold is known. This provides a base knowledge of how much food could have been prepared in a single cook; however, maximum capacity does not equate to serving size, nor does it imply that people always prepared the maximum amount of food. For example, one spouted, globular cooking jar from Papadiokambos (PDK412) Figure 5.57) is preserved enough to measure the capacity by filling it to the brim with dried lentils and measuring the amount the vessel could hold. The capacity of the jar is 8.5 liters. 1 liter of soup produced a recommended serving for 6, based on 1950's serving size in the United States of America. Thus this pot could produce about 54 servings of soup (Rombauer and Becker 1995:167). Conical cups at Papadiokambos in House A.1 range from 90-110 ml. Approximately 10 conical cups at Papadiokambos could be filled with one liter, so this pot could produce 85 conical cup servings.

Rim diameters of the vessels range from 10-32 cm (Tables 5.30:D, 5.31:D, 5.32:D, 5.35), with the majority between 15-22 cm (*i.e.* 25 out of 32 vessels with rims large enough to measure), two vessels are smaller (*i.e.* 10-13 cm), and five are larger (*i.e.* 24-31 cm). There does not appear to be a correlation between rim diameter and body profile in any of the assemblages. The size range of rim diameters is present in all tripod cooking pot assemblages; whereas the few cooking jars in this assemblage are 20-22 cm, but there are fewer vessels in the LMI Papadiokambos assemblage compared to LMI and LMII-III Mochlos assemblages of tripod cooking pots (Table 5.35). This size range is also present at other LMIB sites located in east Crete. At Palaikastro there are numerous tripod cooking pot with a similar Type B shape in sizes ranging from *ca.* 20-50 cm in height (Hemingway, *et al.* 2011:526:fig. 10b), which Hemingway proposed could be used to prepare various types of sauced and liquid-based foods (per. comm. Hemingway, ceramic specialist, 2012).

There is no correlation between the shape of the vessel and the proportions of rim and base diameters to each other that relates to design or function. For example, the Mochlos and Papadiokambos vessels, no matter the shape, have rim diameters that are mostly larger than the base (*i.e. ca.* 0.5 cm-3 cm, 14 out of 18 vessels with preserved rim and base diameters), with far fewer equal to the base diameter (*i.e.* 1 out of 18 vessels with preserved rim and base diameters), or smaller than the rim (*i.e. ca.* 0.5 cm, 3 out of 18 vessels with preserved rim and base diameters) (Tables 5.30:D, 5.31:D, 5.32:D). These proportions are close to one another, yet not exactly the same. From a production viewpoint this implies there is a degree of uniformity in basic form, but there are variations that could be a reflection of individual potters' styles.

Handles

Round, flat-oval, and oval-shaped in section handles are placed opposite each other in either a horizontal (Figure 5.55:A, C, D) or vertical (Figure 5.55:E) orientation on the shoulders of LM Mochlos and Papadiokambos tripod cooking pots and cooking jars (Tables 5.37, 5.39). Placing two handles in these positions assisted the person to perform a variety of activities using these vessels, *i.e.* cooking, cleaning, and serving food, as well as protecting their hands from being scalded by rising steam from food being boiled or fried in the vessel, or burnt from touching the exterior of a hot cook-pot. Handle orientation and shape could affect the position in which person placed their hands when lifting the vessel or tipping it to access the interior, Sections 4.1.1, 4.1.2. Another functional feature of the handle is that it is set so that its top ridge does not rise above the rim. This could have been intentional so that after food was prepared and served the pot could be safely turned upside down for storage.

Almost one-half of the vessels examined (*i.e.* 26 out of 45 tripod cooking pots, Table 5.37) have body sections without preserved handles, which creates a limitation when defining handle preference for the vessels produced and used in the LMI and LMII-III Mochlos settlements and the LMI Papadiokambos settlement; however, the analysis provides insight into how ancient people might have used the vessels to cook. All handle shapes, *i.e.* round, oval, and flat-oval handles have dimensions that are similar to mugs and jugs used today. Like the handles attached to these vessels, the width of handles attached to LM cook-pots could rest in the palm of an adult hand, which would make it possible for someone using the vessel to easily grab and hold the handle.

How an individual lifted, held, and tipped tripod cooking pots and cooking jars using the handles is dependent on their orientation. Horizontal or vertical orientations of handles create different ergonomic relationships between the users and cook-pot because these require different hand placement and wrist action. Vertical handles are held by placing the fingers around the handle with the palm and wrist facing the vessel, *e.g.*, how a coffee cup is held by its handle. Ergonomically, this creates a straight line between the wrist, lower arm, and elbow, which typically does not create strain or discomfort. Two different positions can be used to hold a horizontal handle. One position is similar to that used for vertical handles, but when holding the handles the back of the hand is facing in a downward position with the handles resting in the palm as the palm and fingers face up. When lifting handles in this position the wrist, lower arm, and elbow are in a straight line. Another position used to hold a horizontal handle is by rotating the arm slightly inward so the elbow is facing away from the body and the back of the hand is facing towards the vessel while the palm holding the handle is facing away. Ergonomically, this could cause more discomfort than the former position because as the elbow bends to lift the vessel it moves outward and if the upper body is not in a straight position it could put strain on the wrist and elbow. The ergonomic use of LM cook-pots could be different than those described because there are two handles attached opposite each other on a vessel that when full could be heavy and difficult to move. Handle orientation should be explored experimentally, because how an individual holds and moves with the vessel is important to understanding its design, Section 6.2.

Round horizontal handles (Figure 5.55:A, C, D) appear to be the most frequent type attached to LM tripod cooking pots and were placed on all body shapes (*i.e.* Mochlos: LMI—8 out of 10 vessels with preserved handles, LMII-III—1 out of 4 vessel with preserved handles; Papadiokambos LMI: 2 out of 4 vessels with preserved handles; Table 5.36). Round vertical handles (Figure 5.55:E) were also attached to tripod cooking pots, but are only identified on globular vessels from LMII-III Mochlos and LMI Papadiokambos deposits (Table 5.36:B, C). Only one exists in each assemblage. The cross section diameters of round horizontal and vertical handles range from 1.1 x 1.1—1.8 x 1.8 cm (Tables 5.38, 5.40).

Flat-oval and oval handles are also attached to tripod cooking pots, but in this assemblage they are set in a vertical orientation and identified on globular vessels within the Mochlos LMI and LMII-III assemblages (Figure 5.52:A, B, H). There are two vessels with flat-oval vertical handles (*i.e.* Mochlos: LMI—1 out of 10 vessels with preserved handles, LMII-III—1 out of 5 vessels with preserved handles, Table 5.37) and two with oval vertical handles (*i.e.* Mochlos: LMI—1 out of 10 vessels with preserved handles, LMII-III—1 out of 5 vessels with preserved handles, Table 5.37). The cross section diameters of flat-oval handles are 0.8 x 2.5 cm (LMI vessel) and 1.3 x 2.6 cm (LMII-III vessel), and the oval handles are 0.8 x 2.3 cm (LMI vessel) and 1.8 x 2.2 cm (LMII-III vessel) (Table 5.38:A, B).

LMI cooking jars from Papadiokambos have round horizontal and oval vertical handles (Figure 5.53:G-I). Round horizontal handles are the most frequent and are associated with piriform vessels in this assemblage (*i.e.* piriform vessel with round horizontal handles—2 out of 3, Tables 5.32, 5.39). The cooking jar with an oval vertical handle is globular (Table 5.39). The cross section diameters are comparable to those at

Mochlos: round horizontal handle—1.5 x 1.5 cm, oval vertical handle—1.5 x 2.8 cm (Table 5.40).

Because many of the examined vessels with preserved handles have the end attached to the vessel it is difficult to determine how the potter might have achieved this. For example, was the surface of the vessel altered to form a more secure join by scoring—*e.g.*, incised marks made with a sharp tool when the clay is leather hard, or adding extra slip in the area on the vessel that the handle was attached. Upon closer examination of the handle ends, a few suggestions can be made. Some handle ends (Figure 5.55:C-E) look as if the potter pushed the clay of the handle to the wall of the vessel and then neatly smoothed the end. Other handle ends are not as defined and in raking light there are parallel ridges at the root that could be interpreted as a coil that has been wrapped around the handle end to secure the join between the handle and the vessel (Figure 5.55:A).

Legs attached to tripod cooking pots

The most distinctive feature of tripod cooking pots is the legs, because they elevate the body to provide space for fire underneath the vessel. Legs attached to tripod cooking pots in the LM Mochlos and Papadiokambos assemblages are oval, flat-oval, or round-oval in section with square or pointed tips (Figures 5.54:A, G; 5.56:E, F; Table 5.41). The same challenges of preservation that arise when examining handles exist for examining legs. Less than one-half of tripod cooking pots has at least a portion of a preserved leg (*i.e.* 21 out of 45), and about one-forth of these vessels have complete legs, *i.e.* 13 out of 21 vessels with at least one preserved leg (Table 5.41). This analysis examines this element of the vessel design from a functional and stylistic perspective.

Leg length impacts on functional aspects of the design more than the shape or thickness of the leg, because the length of the leg determines the distance the vessel was elevated off the ground. The space between the vessel base and ground is where fuel was placed to heat the vessel to cook food, and the dimensions of this space could relate to the types, or quantity, of fuel used for cooking. The lengths of complete legs range from 6—13 cm and there does not appear to be a correlation between leg shape and length for either the Mochlos and Papadiokambos assemblages (Table 3.44). There is a significant range in size when considering that the length of the leg creates the vessels portable hearth. Unfortunately, due to the fragmentary nature of the material it is not possible to investigate if there is a correlation between the leg length and vessel shape, size, and capacity, but these correlations could be considered for larger and better-preserved assemblages.

Vessels with attached legs preserved typically have only one, but three LMI vessels (*i.e.* vessels: Papadiokambos—1, Mochlos—2) have more than one preserved. The leg lengths of these individual vessels are not equal, which could have affected the stability of the vessel (Table 5.44). For example, one of the round-oval legs attached to Papadiokambos vessel (PDK0314) (Figure 5.53:B) has two legs preserved and they are within 2 mm of the other, *i.e.* one leg is 7.3 cm, the other is 7.5 cm (Table 5.32:C). This is not a great difference and does not cause instability for the vessel. The two Mochlos vessels have a greater difference in length, *i.e.* 0.5 cm, between the preserved legs. One vessel (MOC0095) (Figure 5.52:C) has two oval legs preserved; one is 7.6 cm, the other is 8 cm in length (Table 5.30:C). The other vessel (MOC1043) (Figure 5.52:B) has two and one-half legs preserved; one broke in antiquity and was filed to a point so the vessel could still be used by propping up the broken leg (Soles 2003:73, 74). The measurements of the legs attached to MOC1043 are—11 cm, 11.5 cm, and 6.5 cm (the last is the broken leg; Table 5.30:C). Based on the measurements of the preserved legs, the legs do not have to be the exact same length in order to maintain stability for the vessel. Experimental vessels must be made and used to better understand how the vessel design created stability for the tripod cooking pot and what the possible threshold was for inconsistent leg lengths in an individual vessel.

Stylistic features, *i.e.* shape including cross section, tip, leg thickness, can be determined as long as at least one half of the leg is preserved. The majority of the LM vessels from Mochlos and Papadiokambos have oval and round-oval legs, but one LMI Mochlos vessel (MOC1043) has a flat-oval leg (*i.e.* Mochlos LMI: oval legs—6 out of 21 vessels with at least one preserved leg, flat-oval legs—1 out of 21 vessels with at least one preserved leg, round-oval legs—2 out of 21 vessels with at least one preserved leg; Mochlos LMII-III: oval legs—4 out of 14 vessels with at least one preserved leg. Papadiokambos LMI: oval legs—6 out of 10 vessels with at least one preserved leg, round-oval legs—1 out of 10) (Tables 5.41, 5.42). Oval legs can have square or pointed tips (*i.e.* oval legs with square tips—Mochlos: LMI—2 out of 8 with complete legs, LMII-III—2 out of 2 vessels with complete legs; Papadiokambos LMI: 1 out of 3 vessels with complete, Table 5.42; *i.e.* oval legs with pointed tips—Mochlos: LMI—3 out of 8 vessels with complete legs, Papadiokambos LMI: 1 out of 3 vessels with complete legs, Table 5.42:A, C). Round-oval legs have square tips (*i.e.* Mochlos: LMI—2 out of 8 vessels with complete legs, Papadiokambos LMI: 1 out of 3 vessels with complete legs, Table 5.42:A, C).

The widths of leg cross-sections vary, but slightly. For example, oval shaped legs attached to LMI vessels from Mochlos and Papadiokambos range from 1.5 x 3.3—2.3 x 3.7 cm and those attached to LMII-III Mochlos vessels are 2 x 2.8—3.6 x 4.7 cm (Table 5.43). The larger vessels (size based on rim diameters) have slightly wider legs, but this could be because larger vessels need wider legs for support. It is also possible that the potter made a conscious decision to vary the width of the legs so that they are in proportion to the tripod cooking pot being produced. To explore how the vessel size and the width of leg cross-sections correlate, a larger and better-preserved assemblage must be studied. The width of the flat-oval and round legs corresponds to their shape; one side of the flat-oval leg is significantly greater than the other (1.5 x 3.3 cm), whereas the dimension for the round-oval leg is equal (1.7 x 1.7 cm, Table 5.43).

Parallel scoring marks are present on the scars located on the lower body of tripod cooking pots where a leg was once attached (Figure 5.56:C). These marks suggest that to form the most secure join possible between the leg and vessel, ancient potters would score the body of the vessel and then attach the leg. On some legs there are parallel ridges seen in raking light (similar to those on the handle ends), which indicate that the potters also wrapped a coil or extra clay around the top of the leg to form a more secure and finished join (Figure 5.56:F). On other legs, the join between the leg and vessel is smoothed with no parallel ridges that resemble a coil (Figure 5.56:D, E).

Surface finishes

All tripod cooking pots examined have some form of surface finish, whereas the jars do not appear to have one. The two types of surface finishes are application of cream slip (Figure 5.58:A) and "self-slipped" or "water-wiped" surface created by the potter after the vessels is formed by running wet hands over the surface of the vessel (Figure 5.58:B).

Auxiliary features

LM cook-pots are considered to be plain, or undecorated, vessels. Only one cook-pot examined in the assemblage has decoration preserved. The LMI Papadiokambos spouted cooking jar (PDK0412) had plastic decoration of a horned animal and rope decoration on the upper shoulder (Figure 5.57; Brogan, *et al.* 2011).

5.2.2 Cooking trays

A total of 48 cooking trays were examined; 44 are from Mochlos (LMI—22, LMII-III—22), and 4 are from LMI deposits at Papadiokambos (Figures 5.59, 5.62; Tables 5.49-5.55). Overall the material is poorly preserved, but due to the circular, shallow form, profiles with rim and base diameters are normally preserved so vessel size can be determined. The challenge to understanding LM Mochlos and Papadiokambos tray morphology is that the majority of samples are non-joining fragments for vessels that range from 15-55 cm in diameter. These fragments typically comprise less then one-quarter of the vessel and may or may not have auxiliary features, *i.e.* spouts, attached handles and legs, or knobs. Tripod trays from Mochlos LMI and LMII-III deposits are not included in this discussion because they are not found in the archaeological cooking contexts examined (Soles 2003:7-90, 103-126; 2008:5-128). No tripod trays were found at Papadiokambos House A.1 in cooking context (Brogan, *et al.* 2011). To better understand cooking tray morphologies the rim shape, diameter and heights of the vessels are examined, together with surface finishes (Figure 5.58). When preserved, handle types, their placement and added features (*i.e.* spouts, added knobs) are included (Figure 5.62). Macroscopic analysis of the vessels' surfaces are used to detect features that could be associated with specific production techniques and included in the discussion when appropriate.

General description of LM cooking trays

Mochlos and Papadiokambos LM cooking trays are circular and were produced in a wide range of diameters (*i.e.* diameters 15-55 cm). They are shallow (*i.e.* 2-5 cm) vessels with straight round, straight pointed, or everted flat rims (Figures 5.59-5.61; Tables 5.49:A, 5.50:A, 5.51:A). Coil-joins (Figure 5.63:H-J) and irregular spaced undulating marks that could be coil-joins (Figure 5.63:A, D, E, G), or rilling-marks, are normally identified on the exterior surfaces of the trays, which indicate that some form of wheel-fashioning method (Roux and Courty 1998) was used to produce the vessels. Most of the handles attached to trays are round horizontal and set on the rim (Figures 5.55:B, F; 5.59:F, G; 5:60:C), but round vertical handles (Figures 5.55:G; 5.61:D), and lug handles are also attached (Figure 5.58:B, C). It is likely that, as with tripod cooking pots and cooking jars, trays with handles had two, set opposite each other to assist the person using the vessels. Trays with preserved surfaces are either coated with a cream slip (Figure 5.58:A) or have a self-slipped surface (Figure 5.58:B). Added knobs in pairs or in a group of three (Figure 5.62) are attached on some of the LMI trays from Mochlos and Papadiokambos; whereas one LMII-III tray has a spouted rim (Figures 5.55:G, 5.59:D).

Compared to other cook-pot types, there are few soot marks on the exterior surfaces of the trays (Figures 5.55:G, 5.63:A-C, E-J); however, there is normally slight discoloration of the fabric and light-to-dark gray markings from fire (Figure 5.63:F, H-J), which suggests that these vessels were most likely used to prepare foods using heat. If trays were used for cooking, drying, or smoking food, then either an indirect heating source (*i.e.* produced by an oven; placement close to, but not over the hearth fire), or a very low direct heat was most likely used, Section 4.1.2. This aspect of using trays could be explored if more ovens were found better preserved. For example, the interior chamber of the LMI oven found at the Chalinomouri farmhouse is not well-preserved, so it is not possible to study the dimensions of space to guess what types of vessels could have been placed inside the oven for baking (Soles 2003:122, 123).

Shape

The circular, shallow cooking trays have straight round, straight pointed, or everted rims (Figure 5.61; Tables 5.49:A, 5.50:A, 5.51:A). Trays with round straight rims are the most frequent in each assemblage (*i.e.* Mochlos: LMI—11 out of 22, LMII-III—12 out of 22; Papadiokambos: LMI—4 out of 4, Table 5.52). The Mochlos assemblages also have straight pointed rims (*i.e.* LMI—6 out of 22, LMII-III—7 out of 22) and everted rims (*i.e.* LMI—5 out of 22, LMII-III 3 out of 33) (Table 5.52). The everted rims are flat, unlike tripod cooking pots and cooking jars, and do not create a seating for a lid to rest in. If a lid was used to cover the tray than it would rest directly on top of the vessel; however, in LMI and LMII-III deposits at Mochlos only lids with diameters ranging from 18-42 cm could be used for trays (Barnard, *et al.* 2003:78, 79; Smith 2010:104-106), which are too large for the smaller sized trays in the range 13-16 cm or too small for trays in the range from 43-55 cm (Tables 5.49:A, 5.50:A, 5.51:A). If lids were used for these smaller and larger trays than materials such as wood, which would have decayed and therefore no longer in the archaeological record, or flat stones could have been used to serve as a lid.

Size

Rim and base diameters and wall height for the majority of LM Mochlos and Papadiokambos cooking trays were measured; there appears to be no correlation between rim and base diameters and wall height, or between rim profiles, diameters, and vessel height (Tables 5.53, 5.54). The sizes of the trays are based on rim diameters, which the rims and bases have approximately the same measurements with a difference normally being 1-2 cm (Tables 5.49:A, 5.50:A, 5.51:A). LM cooking trays were made in a variety of sizes that are both slightly smaller (13-20 cm) and larger (24-52 cm) than typical cake pans (22-23 cm) used in kitchens today (Rombauer and Becker 1995). The range of sizes is greater in the Mochlos assemblages (*i.e.* Mochlos LMI—16-52 cm, LMII-III—13-<48 cm, Table 5.50:A, B). This is not the case of the Papadiokambos assemblage, but it has fewer vessels then the Mochlos assemblages, comprising only 4 trays. Two are 34 cm, one is 38.6

cm, and the other is too fragmented to measure (Table 5.50:C). The height range of the vessel wall is 1.5-5.2 cm (*i.e.* Mochlos: LMI—2-5 cm, LMII-III—1.5-5.2 cm; Papadiokambos LMI—3.1-4.6 cm, Table 5.50). Trays can have a wall that is irregular in height with a difference of 1-3 mm.

Handles

Handles could be used to hold the tray and move it from one location to another, and the different types of handles indicated that people had different ways of handling or controlling the vessel. There does not appear to be a correlation between rim profile and size (*i.e.* rim and base diameters, wall height), but less than one-half of the cooking trays examined have preserved handles (*i.e.* 15 out of 32, Tables 5.49:B, 5.50:B, 5.51:B); 11 are round (*i.e.* Mochlos 10, Papadiokambos 1) and 5 are lug (*i.e.* Mochlos 4, Papadiokambos 1) (Figures 5.59, 5.60; Table 5.55).

The majority of the vessels with round handles have them set horizontally on the side of the rim (Figure 5.59:E-G; 5.60:C). There are two LMII-III trays with round handles that have their handles positioned differently; one tray (MOC1595) (Figure 5.59:D) has round handles that rise above the rim, *ca.* 3 cm, and on the other tray (MOC4951) (Figure 5.59:H) handles were positioned from the mid-wall to the base (Table 5.50:B). Round handles attached to trays are approximately the same diameter as those attached to tripod cooking pots and jars, *i.e.* 1.3 x 1.6 cm - 1.8 x 1.9 cm (Tables 5.49:B, 5.50:B, 5.51:B). But unlike the round horizontal handles attached to tripod cooking pots and cooking jars, the tops of the handle rise above the rim of the tray, which would have made it difficult to securely stack trays or turn them rim-side down for storage.

Lug handles may be pierced, and could be used to either hang the tray for storage or to slide the vessel from place-to-place when it is hot, by placing a sharp instrument in the hole (Figure 5.59:B, C). These handles are placed at or below the rim. Lug handles are *ca.* 1.2 cm thick and between 0.5 cm x 1.5 cm and 1.5 cm x 1.9 cm (Tables 5.49:B, 5.50:B, 5.51:B). Trays with lug handles are only identified in the Mochlos assemblages.

Surface finishes

Mochlos and Papadiokambos cooking trays have similar surfaces as tripod cooking pots, and include a cream slip and self-slipped surfaces (Figure 5.59; Tables 5.49:C, 5.50:C, 5.51:C). Stylistically, the application of a cream slip could have been used to decorate the vessels, as in the tradition of decorating cups, bowls, jugs, and jars found at Mochlos and Papadiokambos (Barnard and Brogan 2003:33-98, 99-112; Smith 2010:15-138, Brogan, *et al.* 2011), or to distinguish cooking trays from other vessels, such as other functional vessels used to perform other unknown domestic tasks. Functionally, any type of slipped surface could have been desired to make the vessel less permeable (Rye 1981); however, a flatter, smoother surface could have been desired and a slip coating is one way to achieve this.

The cream slip was applied to the interior and exterior of the vessel pre-firing and the self-slipped surface was most likely produced during the forming of the vessel; Section 6.1. Only Mochlos trays have cream slip and they appear more often in the LMI assemblage (*i.e.* Mochlos: LMI—7 out of 22, LMII-III—1 out of 22, Tables 5.49:C, 5.50:C). Trays with a self-slipped surface are in all assemblages (Tables 5.49:C, 5.50:C, 5.51:C). There appears to be no correlation between vessels with a cream slipped surface and rim profile.

Auxiliary features

Shallow, pulled spouts similar to those on tripod cooking pots and added knobs that are placed on the rim in pairs or in a group of three are considered auxiliary features on cooking trays because they are not present on many samples (Figures 5.59:D, 5.62; Tables

5.49:C, 5.50:C, 5.51:C). This could also be due to the fragmentary nature of the vessels. Spouted trays are not typically associated with LM assemblages. In fact, only one vessel (*i.e.* LMI-III MOC1595; Figure 5.59:D) in the three assemblages examined is spouted. This tray is also distinct because it has round vertical handles that rise above the rim.

Added knobs placed on the rim, or slightly below, between the handles are a feature of various types of Neopalatial vessels, *e.g.*, bridge-spouted jar, tripod shallow pan, basin (Andreadaki-Vlasaki 2011:fig. 18:d; Hood 2011:fig. 38; Hemingway, *et al.* 2011:fig.1b). In terms of the examined cooking ware knobs are only present on LMI trays with everted rims. There are three from Mochlos with added knobs and 1 from Papadiokambos (Tables 5.49:C, 5.50:C, 5.51:C). The knobs are semi-round and range in size—*i.e.* 0.9 cm x 1.9 cm, 1 cm x 1.4 cm, 1.7 cm x 2 cm, 1.3 cm x 2 cm (Tables 5.49:C, 5.50:C, 5.51:C). It is unclear if these are a decorative feature, or functional—especially the larger knobs (Figure 5.62:A, B)—that could be used to help lift or tip the tray, or somehow used to help secure some form of cover, *i.e.* cloth, over the interior of the tray; however, the knobs are small and placed closed together so these action could be difficult to perform. To further investigate the potential function of knobs an experimental program could be formulated.

5.2.3 Cooking dishes

Mochlos and Papadiokambos cooking dishes are elliptical, bowl-shaped vessels with broad, shallow spouts that were most likely produced using a press-mold technique, *e.g.*, pressing clay into a form that is more rigid than the clay, Sections 4.1.1, 4.1.4 (Figures 4.11, 5.64-5.70). This vessel type is seemingly fragile because normally, only non-joining, irregular shaped rims and small, thin body sherds are preserved making it difficult to reconstruct the shape and size of the vessel. To complicate matters when defining vessel morphology, rim profiles can vary for specific types of cooking dishes depending on whether they are from the spout, sides, or bowl-end of the vessel, Section 4.1.1 (Figures 4.11, 5.67-5.70). As briefly discussed (4.1.4), a typology of cooking dish rim shapes has been constructed with chronological observations. The typology consists of four types: A, B, C, D (Figure 4.12); A and B are merged based on evidence gained from this study (Barnard, *et al.* 2003:82, 83; Smith 2010:115, 116). These definitions have been previously discussed in 4.1.1, but are also provided in this section with added comments on how the vessel rims where formed. Rim type definitions are:

- Type AB can have a rim that turns downward (typically the spout) or upward (typically the body) and is often demarcated from the body on the exterior (Barnard, *et al.* 2003:83). The rim is thicker and round or pointed. The thickness and shape was most likely achieved by adding a coil onto the unfinished vessel and smoothing it on the interior.
- Type C has a thickened, square or round, rim that is flush with the wall; however, the rims of the spouts are often downward turning (Smith 2010:115). It is distinguished from Type AB, because on the exterior there is no demarcation between the rim and body. Most likely no coils were added to produce the rim.
- Type D has a relatively high, round or pointed, rim that is similar to the sides of a cooking tray. It can be distinguished from trays because the body is very thin (*ca.* 0.3 cm-0.5 cm) and slopes downward, which causes the sherd to sit unevenly; whereas the tray bases are thick (*ca.* 0.5 cm-1.5 cm) and approximately flat (Smith 2010:115). Adding at least one coil to the unfinished vessel and flattening it to create a tall thin profile produced this shape. Due to the fragmentary nature of the material, it is unclear if this cooking dish type is spouted.

A total of 59 cooking dishes were examined: 23 LMI dishes (*i.e.* Mochlos—12, Papadiokambos—11), 36 LMII-III Mochlos dishes. While numerous spout and body rims of all types are preserved at Mochlos, only one Type AB LMI cooking dish (MOC2784) (Figure 4.11:B) has a rim profile that is over one-half extant. It is impossible to determine the depth of these vessels because very few body sherds join to the rims (Barnard, *et al.* 2003:85). Fortunately, four LMI vessels from Papadiokambos with complete profiles are preserved—two are Type AB (PDK0151, PDK0289) (Figures 5.67-5.69), two are Type C (PDK0017, PDK1485) (Figure 5.72)—providing insight into those two types. To cultivate a better understanding of cooking dish sizes and shapes, the LMI Papadiokambos vessels are described first because they are better preserved. The morphological features examined include: rim shape, surface textures, vessel capacity, finger impressions on rims. The proposed production process of the vessels is discussed in relationship to morphology and use.

Papadiokambos LMI Type AB and C cooking dishes

The LMI Papadiokambos cooking dish assemblage is comprised of Types AB and C vessels, with Type C apparently being the most frequent; Type AB—3 out of 11, Type C—8 out of 11 (Table 5.58). Four vessels have complete body profiles; two are Type AB, two are Type C (Figures 5.64, 5.66-5.70), providing a rare opportunity to gain insight into the production and use of Type AB and C vessels based on morphological features. Now conserved the shape and size can be defined and compared to other cook-pot types, adult humans, and architectural spaces to better understand how cooking dishes could have been used.

The profiles of cooking dish Types AB (PDK0151, PDK0289) and C (PDK0017, PDK1485) resemble a scoop because the spout is shallower than the bowl-end of the vessel

(Figures 5.64, 5.66, 5.68). The difference between the two types is the rim. Type AB rims are round, thick, and protrude (or rise) from the vessel wall *ca.* 0.2-1.5 cm (Figures 5.67, 5.78; Table 5.58:B). Type C rims are square or rounded and more-or-less flush with the vessel wall, rising only 0.1-0.2 cm above it (Figure 5.70; Table 5.58:B). By examining these four vessels it is clear that the irregularity of the form contributes to the varied rim shapes and stance. For example, spout profiles (Figures 5.67—nos. 1-3, 7, 8; 5.69—nos. 1-3; 5.70—nos. 1, 2) have a shallower position than those that belong to the bowl-end of the vessel (Figures 5.67—nos. 4-6; 5.69—nos. 5-7; 5.70—no. 4). This is an important distinction because initially the LMIB Mochlos cooking dish material was organized into Types A and B rims on the understanding that these profiles represented two different shapes and sizes of cooking dishes (Barnard, *et al.* 2003: 82-84). Further examination of these vessels Types A and B and comparison with those from Papadiokambos has led to their combination as Type AB: the supposed Types A and B rims are in fact different parts of the same vessel shape. This changes our understanding of the vessels form.

In terms of production the smoothed interior and rougher exterior vessel surfaces indicate that a press mold technique was to used to form the vessel—*e.g.*, clay would have been pressed into a form and smoothed, leaving the interior surface exposed and the exterior pressed against the mold so that the surface texture of the mold became impressed into the vessels' exterior wall. The interiors of Types AB and C are smooth with finger swipes that run in all directions (Figure 5.71:A-C), but the exterior surface textures of Types AB and C are slightly different. The exteriors of Type C dishes display an irregular texture that has a flatter look and feel (Figure 5.71:G-I), and Type AB dishes have a rougher texture (Figure 5.71:D-F; Table 5.60). These different exterior surface textures indicate that either different types of molds, such as those produced in wood, plaster, cloth or leather covered baskets, or even earth-cut molds, were used to create the vessel, and/or different types of mold-making processes were used. To confirm this observation and test this hypothesis a larger sample must be studied and an experimental program organized that uses these types of molds.

The size and capacities of the four conserved vessels vary. Type AB vessels (PDK0151, PDK0289) are 54 cm wide x 51 cm long and *ca.* 50 cm wide x 56 cm long with capacities of 8 and 11 liters (Table 5.58:B). The size of Type C vessel (PDK0017) is smaller at 42 cm wide x 42 cm long, but it is much deeper and thus has a greater capacity of 15.5 liters (Table 5.58:B). The remaining Type C vessel (PDK1486) has a capacity of 12.5 liters (Table 5.58:B). Vessel capacity was measured by filling it to the brim with Styrofoam packing 'noodles' so as to not damage the thin and extremely fragmented vessel.

Most of these dishes have the same volume or a few liters more than the LMI Papadiokambos cooking jar with 8.5 liters; one dish (PDK0017) has almost twice the capacity, *i.e.* 15.5 liters. If the cooking dishes were being used to cook food by means of frying or boiling then the maximum amount of food that could be prepared would be almost the same, or more, than what could have been prepared in the cooking jar. If other cooking techniques were being used, *i.e. sauté*, baking flatbread, then perhaps the capacity was not essential, but the amount of accessible surface space was more important. Other important factors relating to vessel size is how it compares to the size of an adult to better understand how it could have been handled (Figure 5.65), and the dimensions of architectural spaces (*i.e.* hearths, cooking holes, ovens) to better understand how it could have been placed over or near the hearth, or installed, for cooking, Section 4.1.2.

From a human perspective, even though the dish is relatively large, it is not very heavy when it is empty and could be carried by people even in the younger and older age groups. Without an experimental program that produces vessels of a similar shape and size it is difficult to know how heavy it would be if it was full of food, or how it could be manipulated during cooking.

By examining the morphological features of LMI Papadiokambos cooking dishes inferences can be made regarding the production and use of Types AB and C cooking dishes. In terms of production, the elliptical, spouted, scoop shape of Types AB and C and the contrast between the interior and exterior surfaces are similar, which suggests that a comparable form and mold-making process was used to produce these vessels types. The primary difference between the two is rim shape. The round, thick and protruding shape of Type AB rims gives the impression that a coil was added to the unfinished vessel while the form was still resting in the mold; whereas the square, or slightly round, Type C rims looks as if the edge of the dish was pressed against the edge of the mold to create and finish the form. The overall vessel shapes of Types AB and C are similar and the rim shapes do not significantly add height to the vessel wall, which suggests that the difference in design is not due to use, but could be attributed to the type of mold, or mold-making processes. The observations obtained by examining the more complete Papadiokambos cooking dishes are applied to the LMI and LMII-III Mochlos assemblages.

Mochlos LM Types AB, C, and D cooking dishes

Types AB, C, and D are identified in the Mochlos LM cooking dish assemblage (Table 5.56, 5.57, 5.59). Unfortunately, the Mochlos material largely comprises non-joining rim sherds so it is not possible to determine the shape, size, or capacity of the vessels; however, based on the better-preserved Papadiokambos dishes many inferences can be made. The

LMI assemblage is comprised only of Type AB dishes; whereas all three types are identified in the LMII-III assemblage (Figure 4.12; Table 5.59). The presence, or lack, of a cooking dish type in the individual examined assemblages could indicate a chronological distinction, but this is not always the case. For example, LMI Mochlos dishes are all Type AB, whereas LMI Papadiokambos dishes are Types AB and C. Comparing the LMI Mochlos and Papadiokambos assemblages it is possible to deduce that in east Crete Type C cooking dishes are produced in the LMI and LMII-III periods. If there is a chronological distinction between cooking dish types, then it could involve Type D, which is not present in either the LMI Mochlos or Papadiokambos assemblages. This observation must be made with caution because cooking dishes with complete body profiles from LMIA deposits at Petras (Figure 4.05:E, L) and LMIII deposits at Khania-Kastelli have similar shapes, which is an elliptical, scoop-shaped vessel with a tall rim (Figure 4.05:J, K; Hallager 2003:pl. 74:71-P0758; 2011:pl.119:70-P0694; Tsipopoulou and Alberti 2011:fig. 4:P90/1547; Alberti 2012:fig. 3c); however, at Khania-Kastelli there are also circular vessels similar to those found in LMIIIC deposits at Kastro in east Crete, Section 4.1.1 (Mook 1999).

Until more cooking dish comparanda is found and published with drawings and detailed descriptions it is premature to place strict chronological meaning to the cooking dish typology constructed on the Mochlos assemblage (Barnard, *et al.* 2003:82-86; Smith 2010:115-118). The discussion of the Mochlos vessels begins with Type AB, then Type C, and closes with Type D.

Type AB cooking dish

Type AB is seemingly the most frequent cooking dish produced at Mochlos, *i.e.* LMI—12 out of 12 vessels, LMII-III—25 out of 36 vessels (Table 5.59). Due to the fragmentary nature of the material it is not possible to determine the size or capacity of the dishes;

however, one LMI dish (MOC2784) has a rim profile that is over one-half extant and the length can be assessed from the spout to bowl-end of the vessel (Figure 4.11:B). It is *ca.* 46 cm long and *ca.* 40 cm wide, which is approximately the same proportions of length and width as the Papadiokambos Type AB vessels. The rim height, or thickness, of the LMI Mochlos dishes ranges from 0.5 cm-2 cm (Table 5.56:B) and the LMII-III vessels are 0.1-2.4 cm (Table 5.57:B).

As previously mentioned, the molds used to produce the dishes, or variations in the mold-making process, could be the reason why the exterior surfaces have different textures (Figure 5.71). At Mochlos there appears to be a shift from the production of Type AB vessels with rough exterior surfaces in the LMI period to Type AB vessels with both irregular (7 out of 35 vessels) and rough exterior (18 out of 25 vessels) surfaces in the LMII-III period (Tables 5.56:A, 5.57:A, 5.58:A). If the observation is correct and a press-mold technique was used to produce the dishes, then the production process could have changed between the LMI and the LMII-III periods at Mochlos.

Impressions the size of adult thumbs are preserved on three of the Mochlos vessels (Figure 5.72; Tables 5.56:B, 5.57:B). These may have aided the individual when moving the vessel or adjusting it by sliding it about, but they appear to be too small to aid in lifting the vessel. Further they are not present on many of the vessels or on any of the more complete samples. For example, in the LMI assemblage there are two vessels (MOC0358, MOC3802) with thumb impressions, and only one (MOC5627) in the LMII-III assemblage (Table 5.56:B, 5.57:B). No thumb impressions are preserved on the Papadiokambos vessels or the other cooking dish Types C or D.

Type C cooking dish

Type C cooking dishes are found at Mochlos in the LMII-III period, but not in many numbers, *i.e.* 7 out of 36 vessels (Table 5.59). The entire assemblage is comprised of non-joining sherd material, so the size and capacity of the Mochlos vessels is unknown; however the rim height, or thickness, is comparable to those at Papadiokambos, *i.e.* 0.1-1.3 cm (Tables 5.57:B, 5.58:B). Like at Papadiokambos the majority of Type C vessels have irregular exterior surfaces (*i.e.* 6 out of 7) and only one has a rough surface (Table 5.60). Again, this difference in exterior surface texture could be attributed to different molds or mold-making production processes.

Type D cooking dish

Type D cooking dishes are seemingly the least frequent form in the LMII-III Mochlos assemblages (*i.e.* 4 out of 36 vessels; Table 5.59) and absent from the LMI Mochlos and Papadiokambos assemblages. Type D vessels are extremely fragmented and only rim profiles with height ranging from 3 cm-3.5 cm are preserved, so the profile, size, and capacity cannot be determined (Table 5.57:B). This is unfortunate because it is unclear if the shape is elliptical with a spout, *i.e.* similar to Types AB and C and LMIA Petras, or if it has a circular form that may or may not have a spout, such as those from LMIII Khania (Figure 4.11:E, J, K, L). The smooth interior and rough exterior surface textures indicate that the same mold-making method that was used to produce Types AB and C was also used to produce Type D, but more than one coil was added to create such a tall rim. Until more cooking dish material of this nature is studied, drawn, and published, researchers will know very little about Type D cooking dishes and how they compare to Types AB and C during the LMII-III period.

From a functional view point, the difference in rim height between Types AB and C and Type D could indicate that these vessels were used to prepare foodstuffs that required a taller rim to keep the contents of the vessel from spilling, or that the Minoans used different types of cooking techniques or installations, *i.e.* cooking holes, Section 4.2. If specific types of food or cooking techniques and installations were used with Type D vessels, and Types AB, C, and D cooking dishes are present in the LMII-III Mochlos assemblage, then it is possible that people living at Mochlos during the LMII-III period prepared foods or used cooking techniques in more varied ways. The functional aspects of all three cooking dish types should be explored with an experimental program, because there is a cultural difference at Mochlos between the LMI and the LMII-III communities and it is possible that these two different groups of people prepared foods differently.

CHAPTER 6: RELATING LM COOK-POTS TO HUMAN BEHAVIOR: EXPERIMENTAL APPROACH

Both potters' knowledge and individuals' use can be apparent in the final form of a vessel. However, there are hidden processes of production and use, as well as external and invisible factors (*e.g.*, environment, material properties) that cannot be detected when ancient objects are examined. This information gap can cause inaccurate conclusions when addressing objects from the past—*e.g.* Cretan large jars (pithoi) were an ubiquitous domestic storage vessel less than 50 years ago, but now are garden accessories although their manufacture, size and shape have not changed, Section 2. Therefore experimental work connecting the human side of pot making and use with ancient technologies and techniques is utilized to define technological typologies of Mochlos and Papadiokambos LM cook-pots (Sections 3.1-3.4), rather than a methodology that only defines material properties of clays or morphological features of vessels. The strength of this analogy is that because the action is known, the end result can be more accurately defined and measured. Additionally, information gleaned through experimental work may plug the gaps in knowledge invisible to researchers examining objects. This is critical when examining prehistoric cultures such as existed on Crete because Minoan production procedures and vessel usage cannot be observed using ethnographic methods.

To identify hidden human action in particular tasks (Section 3.4) it is necessary to produce and cook in LM-style tripod cooking pots, cooking jars, and cooking dishes to test hypotheses of production, function, and use. These vessels were chosen because they are associated with hearth cooking – the cooking technology used in Crete during the LM period, Section 7. Where possible the materials of the experimental tool-kits copied tools and materials that where available during the LM period. The individuals executing these experiments have the skills needed to pot and cook, because at this level of analysis the range of available choices when performing tasks must be critically appreciated. Thereby multiple scenarios can be identified and developed: potentially yielding a more accurate comprehension of how people make choices in everyday tasks. The individuals here are Jad Alyounis and myself. A trained potter, I have the skills to collect and process raw clays and to produce various vessel forms. Jad Alyounis is a professional cook able to merge his knowledge of food, temperature, and time with his memories of growing up in Jordan where he learned to cook over a hearth fire. The description and discussion of the experiments are divided into sections: Section 6.1 discusses the potting experiments, the cooking experiments follow in Section 6.2. Because of the nature of the experiments the discussion is presented in first person. This is justified in that the information is one of first engagement rather than formalized rigorist tests.

6.1 PRODUCING LM-STYLE COOK-POTS

The aim is to produce cook-pots in the style of LM vessels using Mochlos raw clays because archaeological and geological evidence exists for local cook-pot production, Sections 5.1, 5.2. The tool-kit used to produce tripod cooking pots and cooking jars includes—wooden ribs, thin-pointed sticks, sea sponge, hemp-string, canvas, kick-wheel, electric kiln. For cooking dishes the tool-kit differed: the initial attempt failed and a modified technique was employed. The initial experiment utilized earth-cut molds, thin-pointed sticks, and thin-woven cotton cloth; the modified experiment utilized olive oil, plaster mold and a wood-burning oven.

The discussions follow steps in the *chaîne opératoire* so to understand the actions and choices made while potting, Section 2.2. As examiner of the ancient objects and potter of the experimental vessels I illustrate the various problem-solving techniques needed in the experiment. Often my knowledge from examining the ancient vessels and my potting skills crossed: it was challenging to discern what underlay my observation and why I was making specific choices (*i.e.* forming and attaching handles and legs) during production. The execution of this experiment confirms that the process of learning and creating is a non-linear and multifaceted process: actions are deliberately taken and not taken, all influencing the object resulting, Section 2 (van der Leeuw 1993, 2008).

6.1.1 Preparing Mochlos clays for potting

Step 1: locating clays

Ancient potters working at Mochlos exploited, processed, and used materials derived from the East Crete Phyllite-Quartzite Series, Section 5.1 (Figures 5.01, 5.49). Purple Phyllite Hill Clay (PPH-C) (Figure 5.20:A, C) and Development Red Clay (DR-C) (Figure 5.20:A, B) are the most suitable for potting and are located in the Limenaria Cove (*ca.* 1 kilometer from the LMIB Artisans' Quarters), Section 5.1. Unfired PPH-C is purple and when fired is red, the dominant inclusion is sub-rounded and sub-angular fragments of purple phyllite (Figure 5.30:A; Tables 5.26). It is very plastic and can be shaped, but thin walls will collapse. DR-C has a greater variety of metamorphic fragments, *i.e.* sub-rounded and sub-angular green, silver, brown, and purple phyllite, milky-white quartz, and some silver mica; it is orange-red both unfired and fired (Figure 5.31:A; Table 5.26). It is semi-plastic: it can be shaped, but quickly dries and cracks often.

To produce the experimental vessels twenty soil bags (10 liters) of each clay were collected.

Step 2: cleaning clays

Clay exposures accessible today have rocks that measure well over 6 mm and are so plentiful that many must be removed before potting. The LM Mochlos Low-grade Metamorphic fabrics have sub-rounded and sub-angular, 2-3 mm (but can be <6 mm) metamorphic fragments within the paste, Section 5.1 (Figures 5.03-5.12; Table 5.08). If the ancient Mochlos potters used similar clays for cook-pots, then they had to remove the larger inclusions. Accordingly, the clays were wet sieved through a 2 mm screen to remove the larger rock fragments and organics (*i.e.* twigs, leaves) and stored in large ceramic jars (Figure 6.01a:A, B). Wet-sieving prevented the removal of the finer particles by the strong Cretan winds. Storing the clays in water allowed them to become completely hydrated; micro-plants and bacteria present in both clay and water had time to grow between the microscopic clay platelets, thus making it more plastic. Little evidence survives that suggests the potters wet-sieved their clays at Mochlos (Soles 2003: 7-90), but they had access to materials [*i.e.* grasses, reeds, sticks (Moody 2012)] to make sieves and large jars to store clay if needed.

To pot, clay was removed from the jar and dried on a piece of canvas. Once at a workable consistency (*i.e.* wet and sticky, yet dry enough to wedge and form coils), it was wedged to remove unwanted stray particles that passed through the screen during the cleaning process, eliminate air pockets that could endanger the drying or firing of the pot, and align clay particles so that it would be easier to throw (Figure 6.01a:C). To minimize the experimental variables the clays were not mixed or tempered. Fabric analysis of LM Mochlos cook-pots (Section 5.1) and ethnographic accounts of local potters (Day 2004) indicate that ancient potters could have either practiced clay manipulation or worked with them in their raw state after cleaning. Tests concerning material manipulation require a different focus and will be conducted in the future.

6.1.2 Producing LM-style tripod cooking pots and cooking jars

Production occurred in east Crete; September 2009, May and June 2010. The days then are sunny and warm, nights cool and humid. Seven elongated globular vessels with flat bases and everted and straight rims were made, with capacities ranging from 1.5-4.5 liters: three cooking jars, four tripod cooking pots, three of which are spouted (Figure 6.03). All handles were horizontally positioned except for two cooking jars, where they are vertical. The last also have added plastic rope decoration.

Steps 3 and 4: forming and finishing vessels

Concentric rilling-marks on the interiors of Minoan tripod cooking pots and cooking jars indicate that wheel technology was used (Figure 5.54:B, D). The exteriors are smooth (Figure 5.54:A, C): to achieve this, a hard tool of wood, stone, bone, or clay was pressed against the vessel as it turned on the wheel, either in formation or after, Section 5.2. Numerous wheels and a potter's pit indicate that potters at the LMIB Artisans' Quarters employed wheel technology (Soles 2003: 7-90).

With this in mind, I took a lump of wedged clay and started the kick-wheel. My first impression was, "This is NOT going to work!". Repeatedly the centered lumps of DR-C cracked when I opened them to form a shape. The few occasions when I succeeded, they still cracked the moment I squeezed clean water on them for the needed lubrication to form the wall. I concluded that DR-C was not plastic enough to form a pot using wheel technology. On the other hand, PPH-C was too plastic: if vessels were formed with thin walls, they collapsed.

Pondering this, I remembered two key points earlier learnt when potting on a replica LMI wheel (testing the relationship between the rotational speed when the potter turned the wheel and the throwing process; Evely and Morrison 2010). Then commercial clay and a slower speed was used; each time I shaped the clay the movement was direct and quick. Otherwise it was impossible to form a pot because when the wheel slowed I had to release the clay to spin it. Accordingly, I wedged more clay. I kicked the wheel using a slower speed and when shaping the clay I made direct and quick movements. This worked better: I could now make cylinders. Yet fresh water squeezed on them, for lubrication prior to drawing out the wall to produce a rounder shape, caused the DR-C cylinders to crack. PPH-C cylinders could be formed into a rounder shape, but if the wall was thin, or the wheel spun too fast, they collapsed.

Knowing that DR-C and PPH-C microscopically matched the ancient fabrics and pinch pots made out of the clays (Section 5.1), I tried another technique – wheel-fashioning (Roux and Courty1998). Wheel-fashioning has been identified in producing vessels of all sizes in Bronze Age Crete (Knappett 2004; Christakis 2005:71-86). Wheel-fashioning also utilizes the speed of a rotating wheel to draw up the clay and form a shape; however, a pre-form of coils is finished on a rotating wheel, rather than starting from a centered lump of clay (Roux and Courty1998). Within this technique exist a range of variants—*i.e.* pot is first produced with coils and then finished on a rotating wheel; pot is completely formed on the wheel by joining coils and shaping it (Roux and Courty 1998).

Because the collected clays were either semi-plastic (DR-C) or too plastic (PPH-C), the clay consistency needs to be slightly wetter than what a modern potter would use working with commercial clay on a fast-turning wheel. However such clays could not be used to coil the form first to finish it on the wheel, because the weight of the wet clay collapses the pot. If the form was built and dried in stages (*i.e.* bottom, middle, upper body) the lower, drier portions are strong enough to hold the weight of the next wet clay part; however, in this scenario the completed form is too dry to be manipulated into a rounder shape. Therefore the method that used a rotating wheel throughout was employed. A centered lump of clay was first flattened on the rotating wheel to produce the base. For the wall, coils were added and smoothed with my fingertips with the wheel stationary (Figures 6.01a:D-F, 6.01b:G). Then slowly turning the wheel, the exterior was smoothed using a wooden rib and the walls thinned to 0.5 cm-0.8 cm, similar to the archaeological vessels (Figure 6.01b:H). That done, the lip was formed and the pot removed from the wheel (Figure 6.01b:I, J). Using this method I could produce pots, yet minor cracks still appeared when fresh water was applied to the surfaces when I tried to create rounder shapes.

Confused, I examined the Minoan cook-pots for answers. I discovered that a "self-slipped" [*i.e.* water-wiped surface with a smooth hardened finish (Barnard, et al. 2003:81)] or a slipped surface could be a by-product of throwing, rather than a surface finish applied after formation, Section 5.2. To do this, the ancient potter would have used a slip-slurry – *i.e.* thin slip produced by placing trimmings and debris in water where they become super-saturated and break down – to lubricate the clay for shaping rather than fresh water. Using this technique solved the problem: DR-C forms no longer cracked and PPH-C forms did not collapse. I was able to produce tripod cooking pots and cooking jars with capacities that ranged from 1.5-4.5 liters (Figure 6.03). Although not intended, the experimental cook-pots have elongated globular and cylindrical bodies, a by-product of the method used to form the pots. With more practice, I would probably be able to produce globular and piriform vessels.

Compared to throwing commercial clay this was a much slower process. For example, it took about one hour to produce a body because the clay needed to dry after adding and shaping each coil (to prevent collapse). Modern clays and techniques cut this to about 20 minutes.

Next the legs and handles were formed and attached to the pot. A hand-full of clay was rolled and shaped to form each in a style that mimicked the LM cook-pots (Figure 6.01b:K, L). For example, tripod legs are thicker where attached to the vessel and taper to a pointed or squared tip, Section 5.2 (Tables 5.29-5.31). I made all the legs round-oval in section with pointed tips. Diameters and lengths were not measured, but created proportionally to the vessel by "eyeballing". I am uncertain whether I acted so because of the knowledge acquired from examining the archaeological material, or from being a potter – or both. Rolling a coil and bending it wide enough so 2-3 fingers could wrap around it, I formed the handles. In this case, my actions definitely derived from the examination of the vessels: I consciously produced handles that were a similar size and rested in the same position as those on the archaeological cook-pots.

Once formed the legs and handles were set aside to dry. When they could hold their shape, but before becoming leather-hard, they were attached to the pot resting lip-side down. To facilitate the join, the body was scored where the handles and legs would go using a pointed stick, then slip-slurry was placed on the scored areas and the appendages were attached. Scoring marks are identified on the archaeological cook-pots and I was also taught this technique, so my decision was formed from both (Figure 5.56:C). To further secure the join, a thin coil was wrapped at the junction between the leg and base and the handle and body, and smoothed. This joining method created parallel grooves on the surface at the junction between the leg and base similar to those seen on some Minoan vessels, indicating that at times the ancient potters could have also secured joins in this manner (Figures 5.55:A, B; 5.56:E, F). The legs were positioned equi-distant around the bottom and the handles were placed on the shoulders opposite each other in both horizontal and vertical orientations (Figures 5.52-5.57). The pots remained lip-side down and were set aside to dry.

Step 5: drying vessels

The wet vessels were dried in sheltered areas outdoors because the summer sun was too strong. After 5-6 hours the pots had reached something between a leather-hard and a bone-dry state. To protect them from the night's humidity and cooler temperatures they were moved inside and left uncovered.

Step 6: firing vessels

Local laws do not permit burning of materials in open areas during the summer, so it was not possible to fire the pots using non-kiln technology—*i.e.* bonfire, pit-fire. Nor did I have access to a wood kiln, so an electric kiln was used for firing. The temperatures reached 800°-850°C and the firing time lasted 6-7 hours. Though a lower temperature was desired, one closer to that for Bronze Age cook-pots, *i.e.* 700°-800°C (Roumpou, *et al.* 2013:table 1), this was not possible because the kiln thermocouple was not working properly. However, Bronze Age cook-pots can be fired to this temperature or higher, *i.e.* 850°-1050°C (Roumpou, *et al.* 2013:table 1), as are other vessel types (Day and Kilikoglou 2001:table 13). The kiln cooled over night before the pots were removed.

6.1.3 Producing LM-style cooking dishes

The stark contrast between the smoothed "water-swiped" interiors and the rough exteriors of the cooking dish results from how it was produced. Negative basket impressions identified on MMIIB-III Kommos vessels indicate that wet clay was pressed into the basket to form the pot (Betancourt, *et al.* 1990). On later LM Kommos vessels and those at other sites the exterior texture is again rougher than the interior, yet negative basket impressions are not identified. Other types of molds were used. Hypotheses include earth-cut molds that were unlined (Barnard, *et al.* 2003: 83) and lined with materials [*i.e.* skins (Rutter and van de Moortel 2006: 342)], Section 4.1. The varied exterior surfaces on the Mochlos and Papadiokambos vessels indicate that multiple types of molds and/or mold-linings were utilized, Section 5.2 (Figure. 5.71:D-I). Based on environmental records (Moody 2012) such molds may be from waxed cloth, leather, clay, plaster, wood, and stone and they could have been lined with clay, sand, cloth, and olive oil or animal fat.

In the initial experiment earth-cut molds in the shape of Types AB and C cooking dishes (Section 5.2) were used as a viable option – earth being readily available. Variants were tested—*i.e.* unlined, lined with clay, lined with a fine-woven cotton cloth (so as not to leave a coarse-woven imprint on the exterior; none are identified macroscopically on the dishes). Nothing worked. Whether I formed the pots by pressing clay (it was the same consistency as that used for tripod cooking pots and cooking jars) into the mold in direct sunlight to dry quickly or in a shaded area to dry slowly, it cracked (Figure 6.04:A, C). If I lined the mold with a fine-woven cloth, the form did not crack (Figure 6.04:B), but the clay seeped through the fabric, adhered to the mold beneath and when removed it broke (Figure 6:04:E). Other choices were available, but I was ignorant of them until I resorted to modern mold-making techniques. For example, olive oil or animal fat could have been used as a liner: this creates a waterproof barrier between the earth-cut mold and the wet clay so that the form did not stick and drying, it could shrink evenly without cracking.

This failed attempt demonstrates the value of testing hypotheses of ancient ceramic production because the experimental process systematically narrows choices, or "ways of doing things", within the *chaîne opératoire*. It also reveals how the individual's knowledge might not be sufficient to predict ancient production technologies and techniques. Untested hypotheses hinder archaeological interpretation rather than promote it. My tests failed either because necessary production steps were not detected in a physical examination and/or because my choices, derived from my knowledge (*i.e.* potting, researching archaeological and ethnographic literature, examining ancient cook-pots), was just not comparable to that of those producing and using cooking dishes in the past. Thus I was unable to produce the dish. This failure demonstrates the potential gap between ancient realities and our modern-day perspectives. This is liberating because it reminds us to be cautious when pronouncing on how people in the past performed tasks. Likewise, because an experiment *is* successful, this does not automatically mean that we have correctly identified the ancient technique; it means that we have figured out one way of performing a task to produce a visually similar result.

Due to lack of clay and time I opted to employ plaster mold-making techniques to produce the cooking dishes I required to investigate their function and use and to compare different techniques employed to cook food in close and open vessels. The steps are outlined below. Future experiments will be conducted, building on the failed attempts with the earth-cut molds.

Steps 3-5: forming and drying vessels using plaster molds

To create the plaster mold for forming cooking dishes a scoop-shaped dome of the same dimensions as Type AB cooking dish PDK0151 (*i.e.* 51 cm width x 54 cm length; Figures 5.65-5.68) was produced: it is the most complete dish examined. The dome was turned rim-side down, covered with layers of cotton netting and waterproof plaster, and dried overnight (Figure 6.05:A). The mold was inverted and the dome removed, leaving a cavity similar in size and shape to LM Type AB and C cooking dishes.

Olive oil was brushed on the cavity's surface repeatedly until a greasy film covered it. To form the dish small thin clay sheets (*ca.* 0.5 cm-1 cm) were pressed into the mold and their edges smeared together so that the interior of the cavity was apparently covered with a single clay sheet (Figure 6.05:B-F). Theoretically, one large thin sheet of clay could have been rolled out and pressed into the mold, but DR-C and PPH-C only have the elasticity needed to work in this manner when they are 1-2 cm thick, but the walls of the Minoan dishes are typically but 0.3-0.8 cm (Tables 5.55-5.57). A metal needle was used to measure the wall thickness by inserting it into the clay, but it was challenging to make a distinction between 0.5 cm and 1 cm thickness. If the mold was made out of a flexible material (*i.e.* basket, leather), it might have been possible to feel the exterior and interior at the same time to gauge the wall thickness. My feeling is that this type of knowledge is gained by repeated practice. Forming the dish took 20 minutes.

A coil was added to the edge of the form to create a rounded lip like those of Type AB dishes (Figure 6.05:C, D). The demarcation created on the exterior is similar to those on the archaeological material (Figure 5.71:D, F). To smooth the interior I dipped my fingertips in water and pressed the clay while moving my hands in a fast and random motion. This created a water-wiped, slip-type surface that mimicked the interiors of the old dishes (Figure 5.71:A-C). The vessel was left indoors until dried. As it dried the clay shrunk equally, so separating itself from the mold. To remove the dish a large board was placed over the mold and the whole inverted. The mold, now uppermost, was removed; the dish remained upside down until it was fired. The marks of the mold were impressed into the dish's exterior surface, confirming that the ancient examples were most likely produced in this manner.

Step 6: firing vessels

The cooking dishes were too large for electric kilns, so they were fired in a wood-burning oven (Figure 6.06:A, B). Temperatures reached <750°C. Olive-wood charcoal and wood and small logs of plane-trees (*ca.* 10 cm diameter) were used as fuel (Moody 2012, and references therein). The firing lasted for 3 hours.

6.2 SKILL, ART, TECHNOLOGY AND TECHNIQUE OF COOKING

The aim now was to cook food in the experimentally-created LM-style cook-pots to establish a sense of time, activities, and tools needed to cook food over a hearth fire with these vessel shapes. The experimental cook-pots, foods and fuel that were available during the LM period (Moody 2012, and references therein), and the tools and materials used to construct a hearth were given to Jad, who has but a minimal knowledge of Minoan culture. The experiment was designed to rely primarily on his culinary knowledge and memory of cooking with his family using a hearth fire, rather than testing specific observations deducible from archaeological evidence. This approach was taken because many hypotheses proposed by archaeologists focus on the types of techniques (*i.e.* simmering/stewing, sautéing) used to prepare foods in these vessel shapes rather than how food was prepared using these techniques, Section 4.2. This is a subtle difference, but critical when establishing cooking scenarios to analyze the function and use of ancient cook-pots.

In this experiment I was the observer, interpreter of cook's actions, and assistant when needed: this section is written from that perspective (Figures 6.07a:C, F; 6.07b:G). Where possible Jad's commentary is included in the discussion, but most of his thoughts were unspoken, being expressed in the form of physical action. The discussion is divided into two sections that highlight the primary activities: that of preparing the vessels for cooking, Section 6.2.1, and those of building the hearth and cooking, Section 6.2.2.

6.2.1 Prepping experimental cook-pots

Considerable ethnographic evidence exists on preparing vessels for cooking by smoke curing (Steensberg 1939), coating the interiors of cook-pots with viscous materials, and pouring boiling liquids containing specific types of plants into the cook-pot to saturate the fabric (Arnold 1985:140). These materials act as sealants and are used to improve the workability (*i.e.* hold liquids, retain heat) of cook-pots by controlling the porosity and permeability of the vessels' ceramic fabric. Smoke-curing happens during the firing process and is the job of the potter. Such was the practice in 20th century Jutland in Denmark where all vessel types were smoke-cured for multiple days, using dried peat (Steensberg 1939). Potters also applied resins, beeswax, and viscous juices to vessels (*i.e.* cook-pots, water jugs) immediately after they are removed from the fire, when they were hot and these materials could easily penetrate the fabric. For example, potters in Ecuador used resins, melted beeswax, and plant juices alone, or mixed together, to coat the interiors of cook-pots (Kelley and Orr:1976). Kalinga potters (Section 2.1.2) coated interiors of cook-pots and rim and neck exteriors with a pine tree resin (Skibo 1992:60-61); however, the cook-pot was discarded once the resin disintegrated because the interior turned white and altered the taste of the rice cooked within (Longarce 1981:63). This suggests that post-firing sealants might be only applied once; but this remain unclear from ethnographic accounts.

Boiling liquids of specific organic materials are poured into cook-pots by their users and allowed to soak into the pores of the fabric. Arnold (1995:140) provides ethnographic examples illustrating the various ways to achieve this—coconut milk and salt was used in the Philippines (Solheim 1952:52); coconut milk was used in Papua New Guinea; in Nigeria a tea consisting of a "large bean" and wood was used (Willett and Connah 1969: 138). To keep food from sticking and to aid in cleaning, individuals also lined the interiors of cook-pots with organic materials each time the vessel was used. Such was the practice of the Kalinga women who placed woven leaves in the vessels before cooking (Skibo 1992:76, fig. 4.10).

If or how ancient people prepared cook-pots is not obvious in the archaeological record (Skibo 1992:81-101), because the preservation of residue is poor due to burial, excavation, and post-excavation treatment (Roumpou, *et al.* 2007). Chemical residue analysis can be employed to identify the presence of vegetable oils (Rossell 1991), animal fats (Enser 1991; Regret, *et al.* 2003), and beeswax within the ceramic fabric (Regert, *et al.* 2001; Heron, *et al.* 1994; Roumpou, *et al.* 2013). However, it is difficult to discern how or why the organic materials were used, *e.g.* as sealants to enhance vessel function, materials stored, cooking ingredients. For this reason it helps if residue analysis is paired with ethnographic and contextual studies to better understand how ancient people used pots. For example, chemical analysis revealed LMI Mochlos conical cups either contained or were lined with beeswax, indicating that the cups could have been used as lamps, and in fact burn marks on the rims identified macroscopically indicate such use (Evershed, *et al.* 1997).

Beeswax is also identified in the absorbed residues of Middle and Late Bronze Age cook-pots from Akrotiri, Thera (*i.e.* island of Santorini, South Aegean Sea) along with vegetable oils, and animal fats. The molecular weight of the beeswax—*i.e.* "lower molecular weight counterparts, *e.g.*, C23, C25, present" (Roumpou, *et al.* 2013: 40)—and the degradation markers produced from animal fats indicates that heat treatment of vessels was minimal, meaning that high cooking temperatures were not used. Unfortunately, the temperature range of what is considered high and low was not discussed in the article. Also, from this study we know that meats and vegetables were cooked or processed in these vessels, but it is not clear if the presence of beeswax indicates that it was used as a food ingredient or a sealant. This is one example of how knowledge gained from such laboratory-based tests should be accompanied with experimental cooking tests or ethnographic case studies to integrate human activity with material analysis.

Women in Jordon coated cook-pots fired at 600º-800°C with beeswax to help hold liquids and retain heat (per. comm., Alyounis family, Jordan, 2010). Because the experimental cooking dishes were not fired above 800°C and evidence exists for beeswax in prehistoric Aegean to either enhance the vessels' performance (Evershed 1997; Decavallas 2007), or as a possible food ingredient (Roumpou, *et al.* 2007; Roumpou, *et al.* 2013), the interiors were coated with beeswax and warmed (Figure 6.06:C, D). Olive oil, a well-established product available during the Bronze Age (Foxhall 2007) and a well-known modern cooking ingredient in the Mediterranean, was massaged into the interior walls of the remaining vessels before cooking.

6.2.2 Cooking in experimental cook-pots

Cook-pot morphologies have inherent characteristics associated with vessel use, Section 5.2. For example, the three legs attached to a tripod cooking pot elevate its bowl-shaped body above the ground in a stable position allowing the cook to regulate heat by placing fuel directly underneath it between the legs to prepare soups or stews without the constant fear of burning the ingredients within, Section 4.1.2. A more open vessel, such as a cooking dish, whose shallow, scoop-shaped body could either be elevated above the hearth fire, when turned upside down, or nestled down into coals, creates a large, hot surface that is ideal for roasting, sautéing, or baking foods, Section 4.1.2. To test assumptions that correlate vessel morphologies and cooking technologies and techniques, the experimental cook-pots were given to Alyounis. Based on his understanding of how heat and time are used to prepare food in open and closed shapes a cooking plan was designed that included techniques of boiling, simmering/stewing, sautéing, and baking. All of the foods used were available during the LM period and included vegetables, legumes, grains, meat, and seafood (Moody 2012, and references therein).

Below is a list of cook-pots, cooking techniques, and food dishes prepared in cooking sessions 1 and 2 (Tables 6.01, 6.02). Following is an account of the cooking process and experience. The primary focus of the discussion is session 2 because all of the cook-pot types were utilized; whereas session 1 only used tripod cooking pots. (Note: To provide clear images of cooking actions, photographs from sessions 1, 2, and subsequent sessions are combined. Subsequent sessions are not discussed here because the cooking approach remained the same, but the tools-kits were refined—*i.e.* foil and leather-covered wooden lids were replaced by ceramic; stone hearth changed shape depending on space provided.)

Tripod cooking pots, 1.25 liters each: simmering/stewing

- Cuttlefish with ink simmered with wild onion, garlic, and white wine.
- Octopus simmered in beer with leeks and garlic and sweetened with honey.

Jars; large—3 liters, small—1.5 liters: boiling, simmering/stewing

- Beef liver, onions and garlic simmered in water sweetened with honey and pureed chestnuts.
- Lentils, onion, garlic, honey, and coriander boiled and topped off with fresh olive oil.

Cooking dishes, 8 liters: simmering/stewing, sautéing, baking

- Seafood soup—top shells, limpets, crab—was simmered and flavored with olive oil, leek, garlic, honey, grape syrup, and red wine vinegar.
- Lamb was sautéed with coriander seeds, garlic and leek, and finished in a red wine reduction.
- Dish turned upside down on stone supports was used to bake flat bread flavored with saffron and coriander seeds on its exterior, domed surface.

Subtle differences between the skill, art, technology, and technique of cooking became apparent as experimental cook-pots were placed around the hearth. To begin, a hearth measuring *ca.* 2 m x 2 m was built outside on a windless afternoon (November 2010) with temperatures 10º-17ºC. (Note: Hearth construction—session 1: nothing was constructed; sxession 2: the hearth was rectangular and made using bricks; Subsequent sessions: the hearth was round or semi-circular depending on the space used and constructed with fieldstones.) The hearth's center was dug out and the interior was filled with olive-wood clippings and charcoal (Figure 6.07a:A). Once the fuel was lit, it took *ca.* 45 minutes for the coals to attain the correct temperature, which during session 1 typically fluctuated between 433º-529ºC (Table 6.01). (Note: The thermocouple broke during session 1, but based on Jad's understanding of temperature as it related to cooking in ceramic pots this was not a concern. It is unfortunate that this study does not have temperatures recorded to compare to other ethnographic studies. Because the sessions took place in Crete a new thermocouple could not be procured.)

As the coals were heating, 7 cook-pots—*i.e.* 2 tripod cooking pots, 2 cooking jars, 3 cooking dishes—were placed around the hearth to preheat and after 30 minutes 0.5 cup of olive oil was placed inside the warmed vessels and rubbed into the interiors (Table 6.02). Preheating protects them from cracking due to thermal shock; hot coals can be placed near or next to them during cooking. One-by-one the vessels were pulled from the hearth, the ingredients placed inside and returned (Figure 6.07a:B). Lentils were cooked in the large jar (Figure 6.03:A, E, J), liver was cooked in the smaller jar (Figure 6.03:B, D, H). The two small tripod cooking pots (Figure 6.03:C, K, L) had been used the previous night to cook cuttlefish and octopus and here were used to reheat the foods (Tables 6.01, 6.02). After the ingredients were placed inside the cook-pots, a cooking dish was inverted to bake bread on its dome surface (Table 6.02).

To prepare the hearth for the cooking dishes, we moved hot coals into its corners and placed a small stone opposite the corner for the bowl-end of the dish to rest on: this allowed the coals to be placed directly underneath or on the sides to regulate heat as needed. Because the cooking jars with uncooked food needed more temperature for a longer period of time they were placed closer to the fire than those reheating foods. Alyounis commented that when one prepares several food-dishes together, timing is everything. For example, he began aggressively heating the large jar by placing it closer to the fire and adding coals around it to cook the lentils (Figure 6.07a:F), and then mixed dough for flat bread. As the dough was rising, I elevated the smaller jar on ceramic cups to slowly cook the liver (Figure 6.07a:E, F). Alyounis's comments that to his palette, "If you do not cook liver slowly, it tastes and has the texture of shoes" emphasizes the important relationship between food, time, and cooking temperature from a cook's perspective. He then placed the two cooking dishes into the much warmer corners of the hearth opposite the jar. In one dish seafood soup was prepared (Figure 6.07c:M); the other was warmed to sauté lamb (Figure 6.07c:N). Once the seafood soup was finished, it was removed from the hearth. While the lamb and liver finished cooking, the tripods were used to reheat the octopus and cuttlefish from session 1, and dough was baked on the dome of the upside-down cooking. All cook-pots were removed from the hearth before the food was fully cooked because the ceramic material retains heat and the food continues to cook; for this reason they sat for 30 minutes before serving.

Below are descriptions and the break down of time and critical points in the cooking process—*i.e.* order of ingredients added, sautéing ingredients, boiling—for each food dish. The list is organized by cook-pot type and the session and log table referenced.

Tripod cooking pots, session 1 (Table 6.01):

- Octopus took 1 hour and 45 minutes to cook. All of the ingredients were placed in the pot and within 10 minutes steam was rising from the interior, and within about 30 minutes it was boiling. After 45 minutes the octopus changed color from white-grey to pink (Figures 6.07b:I, J), which was an indication that it was cooking. Adding coals underneath and between its legs, and placing and removing the lid regulated the temperature inside the pot.
- Cuttlefish took 1 hour and 45 minutes to cook. All of the ingredients were placed in the pot and within 10 minutes steam was rising from the interior, and within 30 minutes one could hear it sizzle and boil. The temperature inside the pot was regulated the same way as above.

Cooking jars, session 2 (Table 6.02):

- Lentils took 2 hours to cook (Figure 6.07b:L). Within the first 20 minutes one smelled the ingredients cooking and saw steam rising from the vessel, and 19 minutes later it was boiling. Direct heat *(i.e.* pot placed on top of coals, coals placed around pot) was used for cooking. If the lids were removed the temperature within the pot fell, slowing or stopping the boiling. For this reason the temperature was regulated by adding coals and replacing and removing the lid as needed. After the lentils boiled for *ca.* 40 minutes, boiling water was added to keep them from sticking to the interior of the pot.

- Liver took about 1 hour and 30 minutes. Within the first 15-18 minutes the oil was heated; the garlic and onions were sautéed. Then the liver was sautéed and about 7-9 minutes later liquids were added. Ten minutes later (*ca.* 37 minutes into the cooking) one could smell the ingredients and steam rose from the interior. To insure that the liver slowly simmered (to maintain a soft texture) the temperature was lowered and regulated by elevating the pot on ceramic cups, removing and replacing the lid, and adding coals.

Cooking dishes, session 2 (Table 6.02):

- Seafood soup took 1 hour and 45 minutes. In the first 10 minutes the dish was heated, onions and garlic were sautéed until clear, and coriander seeds and seafood was added and sautéed until the shell of the crab turned red. From the color of the crab, we knew the seafood was cooked and the liquid for the soup was added. The soup was boiling 5-6 minutes later. After the flavors melded together and the soup thickened, coals were removed to lower the temperature. The shape of the cooking dish was a problem and Jad grew frustrated because he could not regulate the temperature inside the vessel and was constantly checking and stirring the soup so that the ingredients on the shallow-end did not burn. In his opinion this was not an ideal shape for making soup. For sautéing it worked well; however, he had to pay more attention and work with it more than he wanted. For this reason he preferred the tripod cooking pots and the cooking jars.
- Lamb in red wine reduction took 50 minutes. The dish was placed on the coals to heat, after 3 minutes the lamb was placed directly on the dish without any oil. The

aim here was to use the animal fat for flavor. After 6 minutes the lamb was cooked and the fat had pooled into the bowl-end, so garlic and onions were sautéed along with the meat. After 15-17 minutes, red wine was added and left to reduce for 20 minutes. Again, Jad had difficult regulating the interior heat of the cooking dish, but because of the ingredients were in the bowl-end it worked better.

6.3 SYNTHESIZING KNOWLEDGE GAINED BY DEFINING THE ARCHAEOLOGICAL OBJECT AND EXPERIMENTATION

Producing pottery and cooking are tasks in which one uses all the senses, meaning that potters and cooks use their eyes, finger-tips, ears and nose to "listen" to the cook-pot during all stages of the production and cooking process. The more one pots and cooks, the more experience one's senses gain, thus allowing the individual to intuitively solve problems through the production and use of each cook-pot. Careful observation of potsherds and whole vessels can reveal how a type was made; however, often hidden steps of production and use exist that go undetected if these observations are not tested experimentally. The overall aim in experimenting is to recognize human action within a particular task and to better address technological questions that identify variants within the steps of production, vessel function, and their usage. The knowledge gained by analyzing and defining the material make-up and morphologies of the LM Mochlos and Papadiokambos cook-pots is synthesized here with the potting and cooking experiments.

6.3.1 Experimental potting observations

The potting experiments focused on producing LM-style tripod cooking pots, cooking jars, and cooking dishes using Mochlos clays collected from the Limenaria Cove because Mochlos provides evidence for LM cook-pot production, Section 5.1. Even though cooking jars have not been identified at Mochlos this vessel type was produced so that experimental cooking techniques could be compared between tripod cooking pot and jars. These potting experiments shed light on three aspects of the production process—materials properties of the clays, production techniques, surface finish. These are linked to the material properties of the Mochlos clay, which may be similar to others exposed in east Crete. On a regional perspective, potting tests targeting well-known production sites would determine if potters in east Crete had to work in similar ways because of the material properties of the clay.

Materials properties of the Mochlos clays

Based on fabric description and comparative analysis of the geological materials, it was proposed that Mochlos clays located in the Limenaria Cove were used in the LM period to produce ceramic vessels and objects (Soles 2003; Barnard 2003; Day, *et al.* 2003; Nodarou 2010; Smith 2010). This hypothesis is realistic, but until these experiments only a compositional difference in Mochlos fabrics was defined (*i.e.* different color phyllite, presence of silver mica, Section 5.1). In fact, from a potter's viewpoint the most workable clays collected and tested (*i.e.* DR-C, PPH-C) have varied fabric descriptions, but most importantly in terms of pottery production they have different working properties, *e.g.*, DR-C is short, PPH-C is very plastic. This difference does not directly show up in the methods of ceramic fabric analysis used in this thesis.

To make tripod cooking pots and cooking jars, the consistency, speed of the wheel, construction methods, and timing was much different than what I expected as a trained potter working mainly with commercial clays. The material properties of the clays directly influenced how they could be used for potting. (See following paragraph for example.) Without these potting experiments, these details of the manufacturing process would not have been identified in this study. In the same vein, cooking dishes were also produced using the Mochlos clays, but the initial experiment failed and they were only produced using modern studio techniques. This warrants further investigation.

Production techniques

The presence of potter's wheels (Evely 1988; 2000:269, 271) and rilling-marks on the interior surfaces of tripod cooking pots have served as evidence that LM vessels were produced using wheel-technology (Betancourt 1980). This hypothesis is partially correct because this experiment indicates that potters working at Mochlos created vessels using a wheel-fashioning method (Courty and Roux 1995; Roux and Courty 1998). At first glance the parallel concentric grooves on the walls of LM Mochlos and Papadiokambos tripod cooking pots are reminiscent of rilling-marks, but typically rilling-marks are similar in size and evenly placed since they are formed as a potter creates a vessel by centering a lump of clay and then forming it by pressing their fingertips against it and moving the hand upwards as the pot sits rotating on a wheel, Section 2.2.2 (Rye 1981: 74, 75). Upon closer examination of the LM cook-pots, what could have been identified as rilling-marks could also be stacked coils whose joins have been obliterated by smoothing and shaping the form as it sat on a rotating wheel (Figure 6.02:C, D). Surface features that are most likely evidence of wheel-fashioning are exposed edges of coils (Figure 6.02:A, B), irregularities of wall thickness between rilling-marks, irregularities of width and uneven spacing of rilling-marks, rilling-marks that are larger or thinner than an average adult's fingertip (Figure 6.02:C, D).

To confirm this observation, xeroradiography analysis (Section 2.2.1) was used on the archaeological material and experimental cylinders produced using a wheel-fashioning method. In both cases no coil joins were detected, which indicates that this type of analysis is not always reliable. To understand why xeroradiography did not identify coil-joins on the experimental vessels or the archaeological materials warrants further investigation.

Surface finish

The surface finish of LM cook-pots are described as being coated with a light slip or "self-slipped", applied to enhance the performance of the vessel—*i.e.* greater water proofing, increased heat retention, Sections 4.1, 5.2. This experiment indicates that what has been identified as a "self-slip" on Mochlos cook-pots is most likely a by-product of the production process, rather then a surface finish that was applied after it was formed, Section 5.2. Due to the clay's material properties a slip-slurry was used in this experiment to lubricate the clay for shaping rather than fresh water. If fresh water was used the vessel cracked. The surfaces of the Mochlos and Papadiokambos tripod cooking pots are similar: if the potters at the latter site worked with clay that had similar properties at those at Mochlos, then these surfaces could also be a by-product of the vessels' creation.

6.3.2 Experimental cooking observations

These cooking experiments shed light on the identification of cook-pots, length of cook-time, and regulating temperature and cooking techniques. Specific points of the experiment are outlined below.

Identification of cook-pots

Surface discoloration created by the hearth fire and burnt ingredients—*i.e.* dark drips, splatters, stains—is one criteria utilized to identify cook-pots, Section 4.1.1. In cooking sessions 1 and 2 the majority of the discoloration was produced by burnt or oily ingredients. In fact, after cooking session 2 very little discoloration on the vessels was due to the hearth fire, instead on the tripod cooking pots and jars it was primarily created by food boiling over and running down the sides (Figures 6:03:A-E; 6.08-6.11) and on the cooking dishes from the oily splatters of sautéing food (Figure 6.15). Once food is burnt onto the vessel the stains rarely fade, as evidenced by stains on the archaeological vessels (Figures 6.12:D, E; 6.15:A). Discoloration from heat and soot also happens, but it takes multiple cooking sessions (*i.e.* at least 5-8) (Figure 6.03:F-L) and there are variable factors—*i.e.* fresh or dry fuel, amount of fuel used.

The archaeological implications of this observation is that if cook-pots are not used very often or just a few times the exterior surface of the vessels might not be discolored; they could be catalogued as another vessel type. When soot is present a few observations can be made with regard to excavated vessels that tie-in with other experimental work, Section 4.1.2 (Skibo 1992:153; Gur-Arieh, *et al.* 2011). For example, under the rims, handles, and edge of the bases on the experimental tripod cooking pots are the areas most discolored because cooler flames with more carbon come in contact with these areas (Figures 6.10, 6.11). Whereas the areas (*i.e.* underneath the vessel) that come in contact with coals, or a hotter flame, are comparatively less discolored (Figure 6.10:F, G; 6.11:C). The leg tips of the experimental vessels can be totally black (Figure 6.13:B) or light grey-white (Figure 6.13:A). Underneath the cooking jars the bases are hardly discolored when compared to the exterior wall.

Length of cook-time

Session 2 took 3 hours and 10 minutes (Table 6.02) from lighting the coals until the food was removed from the hearth, and session 1 took 2 hours and 45 minutes (Table 6.01). In session 1 two food dishes were cooked, whereas in session 2 six food dishes were cooked, plus flat bread. The activity level and organization was far greater in session 2, yet it was only 20-30 minutes longer. In all subsequent sessions the cook-time, starting with lighting the coals, ranged from 2.5-3 hours, indicating that there is a base-level amount of time needed to cook regardless if one is preparing one or more dishes. In almost all sessions the coals took *ca.* 45 minutes to reach and maintain temperature. In home cooking, the cook-time might be reduced if a small hearth fire was kept continuously smoldering and could be reignited when needed. This might also protect the ceramic vessels, if they were stored around the hearth to stay warm, lessening the possibility of them cracking.

Regulating temperature and cooking techniques

These experiments demonstrate that heat is regulated by the use of lids, quantity of fuel, and the juxtaposition between the vessel and fire. The primary difference between heat regulation for closed and open vessels is the exposure of the cook-pot interior. For example, while the ceramic material of the cooking dishes maintained temperatures suitable for sautéing and simmering/stewing, heat could not be retained inside it because the interior space is exposed. For this reason liquids evaporate quicker and this vessel is more suitable for preparing thicker sauces, soups, or sautéing. Conversely, the heat is retained within the interior space of the tripod cooking pots and jars because it is a more closed container, ideal for boiling and simmering/stewing. In these experiments foods were sautéed but they were soggy due to the slow evaporation from this vessel type. The temperatures within the vessels rarely exceeded 100°C (*i.e.* boiling point), which by modern standards is not sufficient for deep-frying foods with oil olive or animal fats. Today the correct temperature for deep-frying ranges between 130°-190°C depending on the type of oil used and food fried (Rombauer and Becker 1995:147-149). Further globular, elongated globular, and piriform shapes are less suitable for frying than cylindrical ones, because the condensation created by evaporation causes water to drop into the oil, leading it to explode: it is potentially harmful. Techniques of deep-frying could be associated with tripod cooking pots (Isaakidou 2007, Section 4.1); however, based on these experiments this seems highly unlikely. Frying is the one cooking technique that warrants further experimentation.

Overall, the foods cooked in the experimental cook-pots did not require a significant amount of time. In fact, after the coals attained the correct temperature the cook-time varied between 2 hours and 1 hour and 45 minutes (Tables 6.01, 6.02), which is more-or-less the same if preparing these sort of foods on a modern stove with metal cook-pots. Maintaining the correct amount of heat for a particular period of time was the key in the cooking process. Due to restrictions of interior space most of the cooking experiments took place outside during all weather conditions: if the cooking area was covered or sheltered by a wall >0.5 meter, and the pots and fire were juxtaposed to utilize both direct and radiating heat the cook-time was about the same.

As far as heating the vessels, many of the hypotheses proved correct, Section 4.1.2. The radiated heat created by the small mounds of coals placed between the legs allowed the bodies of the pots to warm (Betancourt 1980), if the food within the vessel required more heat than the vessel must be covered and/or more fuel added. Cooking jars could be placed directly on coals or next to them (Rutter 2004). These vessels could also be elevated using stones to place coals underneath if desired. Cooking dishes could be placed directly on a bed of coals in either an inverted or upright position (Betancourt 1980); however, the inverted position was more challenging to maintain because it is difficult to place the coals underneath the domed surface.

Boiling, simmering/stewing, and sautéing were the tested cooking techniques in sessions 1 and 2. To better understand a broader range of the relationships between vessel function and use and cooking techniques further experiments that include roasting and baking warrant investigation. Also, sessions 1 and 2 were more-or-less executed at sea level because the LM settlements at Mochlos and Papadiokambos are located in this elevation zone, but cooking at higher elevations could influence the cook-time and amount of fuel used because the temperature required for boiling is dependent on elevation. For example, at sea level the boiling point is 100°C, whereas at *ca.* 600 meters it is 98°C, and at *ca.* 1500 meters it is at 95°C (Rombauer and Becker 1995:145). Archaeologically, this could have an impact between how researchers working in various elevations on Crete recognize and interpret cooking activities. So, while there might not be a noticeable difference between the settlements below 600-700 meters, *i.e.* Gournia, Khania, Knossos, Kommos, Mochlos, Petras, Phaistos, and Zomithos, yet there could be for the higher elevation sites, such as the Kamaras Cave (*ca.* 1524 meters), located on the southern flank of Mount Ida overlooking the Mesara in central Crete (Dawkins and Laistner 1913). These sorts of questions are not the focus of this study, but should be addressed because they have a bearing on archaeological interpretations.

CHAPTER 7: DOMESTIC COOKING IN LM EAST CRETE

People prepare and consume food in many circumstances: the domestic illuminates best the conditions of daily life. Such contexts can greatly advance our understanding of LM society by showing how ancient people performed this task, essential for sustaining life. Archaeologically, identifying and defining the domestic kitchen is far from physically simple: let alone appreciating the social structures underlying the material.

In LM Crete very few built cooking structures are found. At Kommos at least three built cooking hearths are known, set on the ground floor in LMI-III domestic multifunctional spaces: they could have also served as a source of light and heat (Figure 1.02). One is located in the North House, the others are in the Oil Press House and in the Hilltop House (Shaw 1990:231-254, 1996:357). Other LMI and LMII-III spaces associated with cooking at Kommos are located outdoors, identified by concentrations of charcoal, cooking equipment and drinking vessels: in areas of the Civic Center (Rutter 2004) and near the LMI kiln (Shaw, *et al.* 2001).

These outdoor cooking spaces at Kommos are not necessarily considered to be domestic, but they are reminders that to cook one does not need a built structure. In fact, many LM cooking areas are identified more by concentrations of charcoal, cooking equipment, drinking and serving vessels and food remains than any built structure. At Palaikastro three possible kitchens in LMIB House N were identified by concentrations of charcoal, cooking equipment and animal bones (Figure 1.02). Cooking equipment was also found in the upper-story collapse over Room 3 indicating that individuals also cooked on the upper stories (Sackett, *et al.* 1965:263-268). In fact, new evidence suggests that people cooked on the roofs with portable hearths employing a suite of various sized tripod cooking pots and grills (per. comm. H. Sackett, Director of Palaikastro Excavations, 2012). At Pseira the excavators also propose that cooking activities primarily took place on the upper stories of the LMI houses (Figure 1.02). Only one is located on the ground floor in Building AF (Betancourt 2001:46-48, 147).

In this thesis domestic cooking contexts of LMI and LMII-III Mochlos and LMI Papadiokambos are examined. To explain how material culture associated with ancient kitchens is recovered and interpreted an outline of excavation methods, site formation processes and a critique of excavation methods is provided, Section 7.1. Following, is a detailed discussion of the LM Mochlos and Papadiokambos cook-pot suite, Section 7.2, and LM domestic food preparation and cooking activities, Section 7.3.

7.1 RECOVERY OF LM KITCHENS

The primary archaeological sites examined in the thesis are Mochlos and Papadiokambos, Sections 1.1, 1.4. At both sites the material culture associated with domestic cooking activities is well-preserved and the excavation, study, and publication are comparable and include examination of architecture, stone and ceramic finds, as well as floral and fauna remains (Soles 2003, 2008; Sofianou and Brogan 2009; Brogan, *et al.* 2011; Brogan, *et al.* 2012). To explain how material culture is recovered and interpreted by archaeologists working in Bronze Age Crete, an introduction of excavation methods is provided followed by a discussion of site formation processes and a critique of the methods utilized at Mochlos and Papadiokambos excavations that are concerned with identifying ancient kitchens.

Archaeological remains dating to the Bronze Age are well preserved in Crete and particularly in east Crete where the climate is relatively dry, Section 1.1. Another contributing factor to the preservation of Bronze Age material culture is that people built structures with stone foundations and stones walls on the ground floor and with the second, and possible third, stories constructed using preferentially mud-brick (Soles 2003, 2008;

Sofianou and Brogan 2009). Unlike wood structures, those made of stone do not decay, thus allowing the structures and the abandoned objects within to be more accessible for excavators to recover. Disintegrating mud-brick also provides a protective layer of bulk and efficiency. Discerning between floor levels and the cultural activity within each space can be challenging, because often these buildings did not collapse in a single episode, but gradually over time (per. comm. J. Soles, Co-Director of Mochlos Excavations in Crete, 2004—2013). In addition to the robust buildings, streets, often paved with stones, were laid within the settlements connecting buildings to each other, as well as to roads leading into and out of the settlement, *e.g.*, Gournia (Boyd 1904-1905; Watrous, *et al.* 2012), Mochlos (Seager 1912; Soles and Davaras 1992, 1994, 1996), Zakros (Platton 1971). This type of civil planning also created borders between structures that are at times easily defined during excavation.

The high degree of preservation of archaeological finds in Crete favors open-area excavation (Drewett 1999) in which the perimeters of structures are first found and then each room is excavated as a complete unit (Day 2009:4, 5). This is in contrast to the grid system (Drewett 1999) in which sites are excavated in squares that are separated by baulks (Drewett 1999). The advantages of open-area excavation are that it allows the excavator to correlate more easily finds from different depositional units within the site without the imposition of an arbitrary grid of unexcavated stratigraphy held within baulks. This excavation method provides flexibility, particularly for long-term projects, so that as needs arise due to topography, excavation strategy, or other factors, overall site management and fundamental recovery processes remain, but the strategy can be modified (Day 2009:4, 5). The downside to excavating a structure as a complete unit is that it requires a high level of competence, consistency in excavation staffing, and time in the field otherwise stratigraphic information is irretrievably lost because sections containing stratigraphy typically remain on the perimeter of the structures, or in localized sections (*e.g.*, pits, within buildings), rather than within it (per. comm. M. Eaby, Assistant Field Director to Azoria Excavations in Crete, 2012).

Open-area excavation methods with heavy soil sampling to identify organic remains were used to recover Bronze Age remains at Mochlos and Papadiokambos, yet each project experienced different challenges in the recovery and interpretation of finds. LMI remains located on the coastal plains at Mochlos (Soles 2003) and Papadiokambos (Sofianou and Brogan 2009) were recovered from deposits with single cultural layers, whereas the LMII-III Mochlos remains were recovered on the island where the entire Bronze Age sequence and some Hellenistic and Byzantine layers had accumulated, Sections 1.1, 1.4 (Soles and Davaras 1992, 1994, 1996; Soles 2008). Fortunately, the LMII-III cultural levels were the last to be deposited across the island and there are but limited areas of Hellenistic and Byzantine intrusion (Soles 2008), thus making it possible to securely identify cooking deposits inside and outside many of the remaining architectural features. Single-story stone structures with cooking deposits were located at Mochlos in the LMI Artisans' Quarters and Chalinomouri Farmhouse and the LMII-III settlement, Sections 1.1, 1.4. Cooking deposits located inside and outside two-story structures were recovered at Papadiokambos in House A.1, Sections 1.1, 1.4, 7.3.

The interpretation of artifact distribution plays a fundamental role in understanding past human behavior. These distributions form as a result of cultural (*e.g.*, discard of objects, alteration to structures, agricultural activity) and natural activity (*e.g.*, earthquakes, subsidence, vegetation growth, rodent burrowing, sediment accumulation) and can be utilized to identify the formation processes of archaeological deposits to better understand how to interpret ancient remains (Schiffer 1983). Burial in strata is one part of the processes by which materials entered the archaeological record. There is no simple divide between cultural and nature activity. For example, a pot (and its subsequent fragments) could have been abandoned, moved, thrown into a corner, drenched in rain, broken at a different time into smaller fragments, swept aside, buried, dug up when a hole was dug, and reburied before being sealed within archaeological strata, clearing an abandoned building (or dumping waste into it), or leveling an area for building, but objects can also be moved by animals, and other elements, such as wind and water. Approaches undertaken to provide insight into the question whether artifact distributions related to cooking deposits are cultural or natural in east Crete environmental parameters (*e.g.*, landform deposition, topography, geological make-up of the site, proximity to fault zones and coastline) and human activity in the twentieth century (*e.g.*, settlement patterns, use of land for grazing, use of land for agriculture) are considered below. This is essential in this thesis because the interpretations of the cooking deposits examined (Section 7.3) are founded on archaeological evidence and therefore subject to the complexities of site formation processes and the interpretation of contexts.

Crete has a diverse landscape with complicated weather patterns across the island, partially due to its extreme rocky topography that has been created by numerous tectonic and erosional events, Section 1.2. These environmental factors have undoubtedly influenced site formation processes. The drier climate in east Crete and limited settlement distribution and land use in the twentieth century (Soles 2003, 2008; Sofianou and Brogan 2009) has created a relatively undisturbed cultural landscape in the areas around Mochlos and Papadiokambos, Section 1.2. A primary destructive factor in site formation in Crete is tectonic activity, which has caused numerous coastal areas in east Crete to become submerged into the sea, so destroying large areas of sites and making them inaccessible to archaeologists, Section 1.2. For example at Mochlos, multiple episodes of earthquakes have caused damage during the prehistoric and historic periods, including the submergence of the land bridge that once connected the Cretan mainland to the settlement, which is currently an island, Sections 1.4, 5.1 (Soles and Davaras 1192, 1994, 1996; Soles 2003, 2008). At Papadiokambos tectonic activity has submerged the ancient coastline, which is now eroding away the northeastern part of House A.1 and other structures along the coastline (Sofianou and Brogan 2009). In fact, Papadiokambos is considered a rescue excavation for this reason (per. comm. C. Sofianou, Director of Kappa Delta Ephoria, 20006). Nevertheless, a significant amount of well-preserved ancient material culture has been recovered successfully, making interpretation of the finds and their relationship to one another key to understanding ancient cooking at Mochlos and Papadiokambos.

Excavation and study methods between Mochlos and Papadiokambos are compatible for a variety of reasons. First, the environmental parameters between the two sites are similar. Both are located on coastal alluvial plains created by the Ornos Mountains, Section 5.1. The bedrock and surrounding landscape offers a range of rocks and sediments that are suitable for building techniques that people during the LM period used to construct their homes and workshops, as mentioned previously in this discussion. Another factor is that the Mochlos and Papadiokambos projects share excavation objectives and methods, research facilities, and team members; however, when needed the excavation and study methods are restructured for the needs of the respective projects. The system is flexible and able to easily respond to changing circumstances. For example, interpretation of room function is a priority of each respective site. Ceramic materials from floor levels identified during excavation by various means (*e.g.*, change of color and texture in soil, architectural features, complete vessels) is cleaned and strewed together to find joining pieces with fragmented objects associated with the floor levels, as well as to find new objects. In each respective study, objects with full profile, or those approximately more than one-quarter extant are given catalogue numbers and studied in more detail to develop various typologies, *e.g.*, chronological, typological, technological. The remaining sherds are divided into vessel types, counted, and weighed to describe the deposits. The description of the ceramic objects found in situ, bulk sherd material, other artifact, architectural features and biological remains are all taken into consideration when determining room function. This allows for continuity in approach and interpretation, which is much needed when examining ancient cooking activities from multiple sites to better understand regional practices.

7.2 LM MOCHLOS AND PAPADIOKAMBOS COOK-POT SUITE

The methodological process of IACA (Section 3) has been used to examine LM cook-pots from Mochlos and Papadiokambos to define potting traditions in northeastern Crete from late in the Neopalatial (LMIB) to the Postpalatial (LMIIIB) period, Section 1.4. A time in the Aegean that sees many changes. Initially, island and mainland communities were rebuilding and reestablishing trade connections after the Theran eruption (LMIA-B) (Warburton 2009); then Crete underwent a veritable systems collapse in late LMIB (Hallagar 2010). The Final Palatial and Postpalatial periods (LMII-IIIB) witnessed the introduction of the New Order [*i.e.* Mycenaean rule (Preston 2008)], bringing mainland traditions (*i.e.* burial practices, Linear B writing), products and society to Crete, Section 1.4.

Fundamentally, the cook-pot suite at Mochlos and Papadiokambos are part of a broader LM Cretan tradition utilizing tripod cooking pots, cooking trays and cooking dishes, Section 4.1 (Figures 5.50; 5.64-5.72). Cooking jars were recovered only at Papadiokambos (Figure 5.53), surely fortuitously, as such jars are found in all regions in this time span. Tripod cooking pots are most prevalent, or at least the easiest identified

(Figure 4.08). These forms comprise a Minoan tradition, one that endures and is not much altered by external influences. Experimental work accomplished demonstrates that the closed, bowl-shape body of tripod cooking pots and cooking jars is well-suited for slow cooking, such as stewing all food types that are liquid based. The open form of cooking dishes, however, are better to quickly sauté, grill, or roast foods, prepare sauces and bake, Section 6.2.

7.3 LM DOMESTIC FOOD PREPARATION AND COOKING

The LM cook-pot typologies for Mochlos and Papadiokambos have been examined somewhat in isolation. There exist numerous other objects associated with food activities, such as vases for eating, drinking, serving and storing, as well as processing equipment. Some are included here to provide a broader view of how individuals approach food and cooking. Cultural and personal aspects cannot be accessed from the material object: we cannot determine the habits that regulated cooking and eating schedules, the company kept during a meal, how people ate, or what level of hygiene was practiced. The questions we can ask about ancient cooking practices are:

- *What types of remains are associated with food activities?*
- *Where did individuals prepare foods, cook, eat and drink?*
- *Does variation in cooking assemblages indicate specific types of cooking techniques?*
- *Did food-based activities occur in isolation or were they part of a range of daily domestic tasks?*

Excavated floor surfaces yield information on food activities—*i.e.* food preparation, cooking, eating; LMI and LMII-III deposits are examined and compared to discuss ancient cooking practices on Crete. Such are identified by the presence of two or more of the following items—charcoal, food remains, cooking and storage equipment, tools for grinding and cutting food, built hearths and cooking holes (Sackett, *et al.* 1965; Shaw 1990, 1996; Betancourt 2001; Soles 2003; 2008; Brogan and Barnard 2011). Eating and drinking activities are identified by the presence of cook-pots, cups, bowls, serving dishes, and food remains. The deposits examined are from: the living and working quarters of artisans, farmers, and fisherman (Soles 2003, 2008; Brogan, *et al.* 2011). The LMIB Artisans' Quarters and the Chalinomouri farmhouse located on the Mochlos Plain (Figures 1.02, 7.01, 7.02) are a primary focus. LMI cooking activities at House A.1 from Papadiokambos provide comaparanda and depth of perspective (Figures 1.02, 7.07). To investigate how time can influence cooking practices, LMII-III deposits from the Mochlos settlement are included (Figures 7.03-7.06). The following is an overview of the food remains and edible resources that these deposits have revealed. Future research will address food preparation and use issues.

Foodstuffs in the LM period broadly consist of supplies harvested from shallow coastal waters, from hunted and herded mammals, as well as cultivated and wild crops (Moody 2012, and the references therein). At Mochlos individuals enjoyed a varied diet: the occupants of the Artisans' Quarters and Chalinomouri farmhouse in LMI ate more seafood and less meat; whereas in the LMII-III the opposite was true (Reese, *et al.* 2004, 2011). In both phases people herded or farmed sheep/goat (*ovis/capra*), pig (*sus*) and cattle (*Bos*), and hunted or trapped wild hare (*Lepus*). In the LMI period individuals at Mochlos must have hunted or traded for deer as there are antler and bone remains found in Room 6 of the Chalinomouri farmhouse (Table 7.05:B; Soles 2003:107-110). This presence is unusual for this region and period: deer are typically associated with LMIII deposits in west and north-central Crete (Moody 2012).

Cereals and pulses mainly consisted of emmer (*Triticum dicoccum*), hulled barley (*Hordeum vulgare*), lentils (*Lens culinaris*), broad bean (*Vicia faba*) and dwarf chickling (*Lathyrus cicera s.l.*) (Reese, *et al.* 2004, 2011). By modern standards any of these can be ground into flour to make bread or thicken stews (Curtis 2001:183), and the legumes can be simmered to prepare thick or thin soups (Rombauer and Becker 1995:176). Tree and vine crops include olive (*Olea europaea*), fig (*Ficus carica*), almond (*Prunus amydalus*), strawberry tree (Arbutis unedo), carob (Ceratonia siliqua) and grapes (*Vitis vinifera*) (Reese, *et al.* 2004, 2011). All but the olive and carob can be eaten as fresh or dried fruits. Olive and almond are processed to produce oil (Foxhall 2007:131-218; Rombauer and Becker 1995:563), almond can also be ground into flour (Rombauer and Becker 1995:780) and carob is used to make sweetened floor and syrups (Rombauer and Becker 1995:550). Grapes are also used to make syrups, vinegars, and wine (McGovern 2003:1) and cereal grains can also be fermented into beer (McGovern 2009:269). (Note: All of the trees and the vine could also be used as hearth fuel.) A number of wild seeds were identified, the most prevalent were legumes—bitter vetch, (*Medicago*), grass (*Hordeum*), campion or catchflay (*Silene*) (Reese, *et al.* 2004, 2011). Listed in the LMI excavation publication once in the floor deposit of Room 6 in the Chalinomouri farmhouse (Soles 2003:111), fenugreek (*Trigonella*) should be mentioned because it is an exotic herb with medicinal properties and was cultivated in the Near East (Zohary and Hopf 2000:122).

The foods in House A.1 at Papadiokambos are similar to those at Mochlos, yet not as extensive in range. They include limpets, top shells and crabs, olives, grapes, figs, almonds, and legumes, as well as a limited amount of sheep/goat, pig and cattle bones. The enormous quantity (*i.e.* over 50 kgs) and vast size range of limpets (*Patella*) and top shell (*Monodonta*) stands out (Brogan, *et al.* 2013); Mochlos may have a greater variety of shellfish collected but typically only in relative hand-fulls (Reese, *et al.* 2004, 2011).

7.3.1 LMI and LMII-III Mochlos cooking practices

At Mochlos potters used local clay for domestic wares, including the cook-pots examined here, Sections 5.1, 5.2 (Figures 1.04, 4.11, 5.52). LMI and LMII-III tripod cooking pots were typically globular, or elongated globular, with everted rims and have either round-horizontal or oval-vertical handles set on the shoulders. There are exceptions, but the morphologies are broadly similar in LMI and LMIII, only the LMII-III vessels are larger, Section 5.2. This is not so with cooking dishes, where Types C and D were only introduced in the LMII-III period.

LMI accessory cooking equipment includes scuttles (Figure 7.10), presumably used to move coals about (Barnard, *et al.* 2003). These were also present in LMII-III deposits along with portable hearths and spit-rests (Figures 7.16; Soles 2008). LMI eating, drinking and serving equipment includes cups [*i.e.* conical, ogival, bell, rounded (Figure 7.08:A-H)] and bowls [*i.e.* knob-handled, horizontal handle (Figure 7.08:I-L)] (Barnard, *et al.* 2003). In the LMII-III period conical and ogival cups are still used, but variant bowl types emerge (*e.g.*, pulled-rim, shallow, deep), along with kylikes, loop-handed dippers and kraters (Figures 7.014, 7.15:A-D, N; Smith 2010). The presence such LMII-III objects is in keeping with other LMII-III sites where possible Mycenaean influence is felt—*i.e.* Palaikastro (Sackett and Popham 1970; MacGillivray 1997), Petras (Tsipopoulou 1997), Knossos (Warren 1997), Kommos (Watrous 1992), Khania (Hallager 2003). New fashions of serving and consuming are clearly indicated, but the actual foodstuffs may not differ.

Cooking installations also changed between the LMI and LMIII periods. LMIB cooking deposits are identified by a concentration of cooking equipment, food remains and charcoal (Brogan and Barnard 2011). LMII-III cooking deposits are identified by these items, but also include architectural remains of built hearths, cooking holes and cook sheds (Soles 2008). These structures are not, however, present in all houses. To better understand cooking practices in these communities, deposits from the LMI Artisans' Quarters and Chalinomouri farmhouse and the LMII-III settlement are examined below.

The first is a well-organized Neopalatial settlement directly across from the island: the Artisans' Quarters comprised of at least two, multi-room, single-story, buildings. Based on the division of private and workspace the excavators propose that individuals lived and worked here (Soles 2003). The craft compound was established in LMIB after the Theran eruption. At the eastern end of the plain at Chalinomouri was an independent farming complex: a one-story structure comprised of six rooms and attached porch (Figure 7.02) (Soles 2003:fig. 56). It is located in a river ravine next to the sea, which gives its inhabitants access to fresh and sea-water ecosystems. Based on the type and amount of botanical and faunal remains, the excavator proposes its occupants practiced subsistence farming and operated productions for wine and olive oil. There is evidence of weaving, stone vase making and pottery production, but not on a large scale (Soles 2003:103, 104).

Reoccupation at Mochlos during the LMII-III period took place approximately 30–40 years after the destruction and abandonment of the Neopalatial town: arguably when the Mycenaean Greeks believed to be in control of the palace at Knossos were expanding their control into east Crete (Soles 2008). Mochlos would have been a strategic location to establish a satellite governor and settlement because the new community could take advantage of the naturally protected harbor and agriculturally-productive plain, Section 1.3.3 (Soles 2008:6-9, 12-128). The Mochlos LMII-III settlement is located on the island, comprising 13 independent, single-story, houses (Figure 7.03). Several are distinguished by a separate cook shed located in an adjacent space (Soles 2008:6-8). Cook sheds are an LMIII architectural space that is enclosed, or semi-enclosed, where an abundant amount of cooking and food equipment is found along with charcoal and food remains (Hayden 1987; Hallager 1997:184, 185; Soles 2008:8). Cook sheds are considered interior spaces in this examination, but distinguished from living and working quarters, Section 1.3.3.

LMI Mochlos cooking deposits are identified primarily indoors, yet individuals also cooked outside—*i.e.* rear-yard, near potter's pit, behind Building A in the Artisans' Quarters and in the northwest yard of the Chalinomouri farmhouse (Figures 7.01, 7.02; Tables 7.0-7.04; Soles 2003:7-35, 36-38, 43-87). In most cooking spaces tools for craft production were also present, indicating that areas could be multifunctional and communal. For example, the largest interior area within the Artisans' compound is Room 10, Building B: alongside cooking equipment, eating, serving and storage vessels are present, as are also loom weights, ceramic work slabs, potter's wheels and a bat (Table 7.03). In the adjacent Room 2 (Building B) numerous cook-pots, eating and drinking vessels sit alongside stone tools for food processing, craft tools for weaving and metal work, as well as a scuttle and possibly the remains of a shrine (Table 7.03; Soles 2003:43-87). In Building A, Room 2 provides another example where a considerable amount of cooking equipment is found with numerous vessels of various types, loom weights and tools for metal work (Table 7.01; Soles 2003:7-35). Multifunctional spaces are also found at the LMI Chalinomouri farmhouse and in many of the LMII-III dwellings (Soles 2003:03-125). These spaces will be discussed in the paragraphs following the Artisans' Quarters.

Another LMI Mochlos characteristic of space-use is that more than one cooking area is identified in every structure. For example, in the Artisans' Quarters Building B there are at least three spaces with an abundant amount of charcoal, tripod cooking pots, cooking dishes, cooking trays, eating, drinking and storage vessels and food remains—*i.e.* Rooms 2, 10, rear yard annex (Room 13W), Room 3 is an enclosed space that is accessible only through the roof (Figure 7.01; Tables 7.03; Soles 2003:43-87; Brogan and Barnard 2011). In Building A (Artisans' Quarters) two relatively small enclosed rooms (Rooms 2, 10), similar to Room 3 (Building B), also have abundant charcoal, food remains, cooking equipment, numerous other vessels; various types of tools were found. It can only accessed from the roof (Figure 7.01; Table 7.01; Soles 2003:7-35). One exceptional find is the tripod cooking pot containing the butchered bones of two hares, an unidentified bird, a lizard or snake and sea snails (along with a crystal lens!) (Soles 2003:119; Reese, *et al.* 2004:69). Very few ethnographic parallels are appropriate. No other known LMIB cooking structures have been published. So further research must be conducted to understand these particular spaces in the Artisans' Quarters.

In Building B, Rooms 2 and 10 are the largest (Figure 7.01). In Room 2 there is one scattered concentration of charcoal, whereas in Room 10 there are two—one in the SE and the other in the NE corner. Both rooms have at least one tripod cooking pot, one or more cooking dishes and cooking trays indicating that a range of cooking techniques were practiced (Table 7.03:A; Soles 2003:43-87). Fish bones and shellfish are present in both rooms, but the only sheep/goat bones known were in Room 10 along with olive, plum and almond stones (Table 7.03:C; Soles 2003:43-87). At the SE corner of Building B is an attached annex (*i.e.* Room 13): here concentrations of charcoal, two tripod cooking pots, a tray and at least one cooking dish were found, primarily with fish bones and few sheep/goat bones (Table 7.03).

At the Chalinomouri farmhouse five out of six rooms have food related activities: the two largest spaces (Rooms 3 and 6) are adjacent and identified as multipurpose and communal. Craft production also most likely took place here: based on the presence of loom weights and polishers for stone vase production (Figure 7.02; Table 7.05; Soles 2003:107-112). In Room 3 the corner hearth had charred pig bones and fragments of three cooking dishes (Soles 2003:112), indicating that meat could have been grilled indoors over the hearth. Opposite the hearth in front of benches are limpet shells (Soles 2003:112), which could have been eaten raw, or prepared in one of the cooking dishes, Section 6.2. The associated vessels are scored basins, amphorae and jars (Figure 7.09:L, M-Q; Table 7.05). Room 6 is the largest in the Chalinomouri complex. It has four benches and a large stone platform to provide a congregational space. In the corner was a large cooking hearth full of olive wood charcoal; around it were two tripod cooking pots and a cooking dish. The scattered food remains in the room consist of pig, sheep/goat, wild deer, hare, limpets, olive, figs, grapes, almonds, and legumes. A few cups and a jug were found, but no other tablewares; storage jars, amphorae, and a scored basin are also present (Figures 7.08:A-G, 7.09:E-I; Table 7.05; Soles 2003:110). Based on the cooking experiments the legumes could have been simmered in the tripod cooking pots, and the meats and shell fish could have been stewed in the tripod cooking pot, sautéed, or dry roasted in the cooking dishes, Section 6.2.

In the LMI period at Mochlos the majority of the cooking spaces were indoors: multifunctional, communal spaces occur in the Artisans' Quarters and Chalinomouri farmhouse. There is also evidence that individuals cooked outside. Tripod cooking pots, cooking trays, and cooking dishes were often accompanied by other types of vessels and tools in the primary cooking areas in the Artisans' Quarters (*i.e.* Building B—Room 2, 10, 13W; possibly Building A—Room 2, 10). Sheep/goat, pig, hare, cattle and a minor amount of deer (but only at Chalinomouri), shellfish, cereals, and legumes were apart of their diet.

All of which could have been prepared in tripod cook pots; and the meat and shellfish could also have been prepared in cooking dishes. At this time experimental work has only focused on tripod cooking pots, cooking jars, and cooking dishes; future experiments will include cooking trays. However, they are an open shape that could have been used to achieve similar results as the cooking dishes.

In the LMII-III settlement individuals were continuing to process food, to cook and eat in both indoor and outdoor spaces (Soles 2008:5-128). As in the LMI period these spaces seem to be multifunctional. For example, in House Beta's cook shed loom weights were found a long side the cooking hole, with multiple stone tools for processing food: none of these items were found in the main room (Figure 7.04; Table 7.07; Soles 2008:69-72). In the court of House Gamma multiple loom weights are also found along with a polisher stone tool, a balance-pan, food processing and cooking equipment, and eating and drinking vessels (Figure 7.06; Table 7.11; Soles 2008:90-101).

Architectural structures in the forms of semi-circular hearths, cooking holes and cook sheds potentially influence how food activities were organized and what cooking techniques were used; however, not all dwellings had cook sheds (Soles 2008). In fact, the most monumental house in the settlement, House Alpha did not (Figure 7.03; Soles 2008:14-44). Here cooking activities appear to be primarily conducted indoors: compared to the other dwellings, few cook-pots and eating and drinking vessels were found (Soles 2008:76-82). Likewise, House Delta did not have a cook shed. Rather in Room 3 the remains of a semicircular hearth (*i.e.* exterior—0.60 m x 1.25 m, interior—0.25 m x 0.95 m) with fragments of mud plaster and burnt clay around its perimeter was found, along with butchered and burnt sheep/goat bones (Soles 2008:82). The burn-marks on the bone indicate that the meat was grilled or roasted (possibly in the cooking hole), rather than stewed in a tripod cooking pot, Section 6.2. The only cooking equipment, however, was located in Room 1 – a tripod cooking pot and a spit-rest (Figure 7.16:B), accompanied by cups, bowls, pigs, cattle, sheep/goat and bones, and limpet shells, and so signifying that individuals cooked, ate and drank here (Soles 2008:77).

To examine how architectural cooking features could have affected food-related activities, Houses Beta, Eta, Iota, and Gamma are discussed below (Figures 7.04-7.06; Tables 7.07-7.11).

Houses Beta and Eta are dwellings within a cluster of six houses located in the settlement's center (Soles 2008:60-72, 84-90) (Figure 7.04). Ceramic vessels, charcoal and food remains indicate that individuals cooked, ate and drank inside and outside (Tables 7.07, 7.08). Both houses had cook sheds with a built hearth and circular cooking hole (Soles 2008:69-71, 84-90). Additional activities were most likely practiced in these spaces, judging from the artifact assemblage: loom weights, stone tools for food processing and a knife and obsidian blades (Figure 7.17-7.20) capable of various tasks declare that weaving and food processing were undertaken in the cook shed of House Beta (Table 7.07). Only stone tools were found in the cook shed of House Iota (Table 7.08*).*

The question ask is, *How were fixed hearths and cooking holes used in these last structures?* House Beta is a rectangular building, with a main room and a cook shed located in the front yard (Figure 7.04; Soles 2008:69, 70). Inside the cook shed is a hard-packed clay floor with preserved traces of white plaster: a low platform hearth is set in the northwest corner of the room with a dugout, cooking hole (*ca.* 0.23 m-0.27 m wide and 0.9 m deep) lined with clay and a fired curved rim preserved *ca.* 0.05 m high (Soles 2008:70). Ash and coals [*i.e.* olive, oak, almond wood (Table 7.00:B)] filled the cooking hole (Soles 2008:70). Butchered bones of cattle, sheep/goat and pig where found in the surrounding yard

(Table 7.00:B; Soles 2008:70-72). Cups, bowls, a dipper and a krater were in the cook shed (Figures 7.14, 7.15:A-D, N, O), and two cooking dishes [*i.e.* Type AB (shallow rim), Type D (tall rim), Section 5.2], a cooking tray, two conical cups, storage jar and an amphora in the main room (Figure 7.15:S, T).

The presence of cooking dishes and cooking trays, food remains, and a little amount of charcoal in the main room of House Beta indicates that individuals ate indoors; however, eating, drinking and serving vessels where located in the cook shed (Soles 2008:69-72). Remains of sheep/goat, pig and numerous shellfish occurred in the main room: these foods can be grilled, dry roasted, or lightly sautéed in open vessels, *i.e.* cooking dish, Section 6.2 (Table 7.07:B). If foods were prepared in this manner in the cook shed, then carried to the main room to be consumed, then individuals could have eaten from the cooking dish or trays using utensils, bread, or their fingers to grab food rather than placing it in bowls. Eating vessels of organic materials (*e.g.*, wood) might have existed, and been lost to decomposition. Additionally, because cooking dishes and trays are open vessels they can be used for a variety of tasks, *e.g.*, holding lit coals to warm and dry interior spaces, air-drying a number of substances.

Tripod cooking pots were not found in House Beta, though a small amount of fava beans where found in the main room (Table 7.07:A, B). The presence of fava beans and the lack of closed vessels (well-suited for their stewing) serves as a caution when making probably untestable interpretations. Here, in the main room of House Beta are two large jars (*i.e.* pithoi), possibly to store items such as fava beans, and in the cook shed is a grinder and handstones/hammerstones. One way to prepare fava beans is to grind them into a flour that can then be used in a variety of ways. So are the fava beans here destined to become flour ... and not soup? This type of scenario raises the question of, *How do researchers interpret* *material remains that were used by people in the past but are also familiar to modern man, i.e. fava beans, cooking and storage vessels?* One way to test these assumption is through experimentation, which is one focus of this thesis, Section 6.2.

House Eta is a smaller two-room complex, with a covered porch offering passage through to the main room (Figure 7.4; Soles 2008:84, 85). The porch had two building phases. In phase 2 the north section was rebuilt and a cook shed was erected with a circular hearth in the southwest corner. Four stones created a cooking hole, ca. 0.34 m diameter, though no trace of clay was found on the interior like the one in House Beta. Concentrations of charcoal, food remains, *i.e.* butchered bones of cattle, sheep/goat, pig; shellfish (Table 4.10), were located in both phases of the porch, along with cups, bowls, cooking dishes [Types AB, C (shallow rims)] and a cooking tray (Table 7.08:A). No food remains were found indoors on the floor levels (Soles 2008:89, 90); indicating that either the occupants kept a tidy house or they primarily ate and drank outdoors (Soles 2008:86). Nevertheless, differences in the cooking assemblages between the two phases suggest that individuals cooked in phase 1 differently from those in phase 2.

In phase 1, three tripod cooking pots, three cooking dishes and one tray, concentrations of charcoal, and a fragment of a portable ceramic hearth (Figure 7.16:A) were unearthed on the porch. In phase 2 (after the hearth and cooking hole had been constructed) no tripod cooking pots or portable hearth are known, but two cooking dishes and a tray are present (Table 7.08:A). As previously discussed, the absence of tripod cooking pots, but the presence of a cooking hole, cooking dishes and trays is also observed at House Beta (Table 7.07:A). It is possible that with the introduction of the cooking hole, individuals used tripod cooking pots less, preferring to roast, or grill, foods in the cooking hole. Another alternative is that cooking dishes and trays could have been temporarily installed over the cooking holes to sauté, grill, or roast food, Section 6.2. Cooking holes in Houses Beta and Eta are between 0.23 m-0.34 m in length (Soles 2008:69, 70, 86), which creates an appropriate space for cooking dishes and larger trays to rest on, Section 5.2. (Note: Types AB, C and D cooking dish were found in House Eta, but none *in situ*; preventing any conclusion as to whether a specific type of cooking dish was associated with the cooking hole.) Because additional means of cooking are present (*i.e.* cooking holes in addition to hearth), a fewer number of cook-pots does not necessarily mean that less food was being prepared in a time; food could have been prepared in multiple ways and some cooking techniques (*i.e.* grilling) did not require vessels.

Houses Iota and Gamma also have cook sheds, but there is no evidence of a built hearth or cooking hole (Soles 2008:54-56, 90, 91, 98-99, 114-119, 123-135). House Iota is apart of the same central cluster of buildings as Houses Beta and Eta, while House Gamma, is an independent structure located in the northwest corner of the settlement (Figure 7.03).

The question asked is, *How can a cook shed without a cooking hole be used?* House Iota is a long narrow two-room structure with a partially enclosed cook shed on the southeast corner: it was occupied in the LMIIIA period (Figure 7.05; Soles 2008:50, 51, 54, 55). It is located at the highest elevation of the central cluster of houses (Figure 7.03). Eating and drinking vessels, cook-pots and food remains were found inside the cook shed and in the east yard and corridor, indicating that individuals could have eaten inside the cook shed or outdoors, but most likely not in the main room (unless the occupants were especially tidy because these items were not found here) (Table 7.09). Sheep/goat bones, shells of shallow-sea creatures, land snails, figs, and barley were scattered in the cook shed and yard (Table 7.09:B). Only cooking dishes and trays were found, indicating that the occupants might have preferred other means of cooking, *i.e.* grilling, roasting, sautéing, rather than boiling and stewing. This assemblage differs from the LMIIIA deposit of House Eta, where on the porch the occupants had all the cook-pot types—three tripod cooking pots, three dishes, one tray (Table 7.08). The presence of stone tools (*i.e.* handstone/hammerstone, saddle quern, Figure 7.19), cutting tools (*i.e.* obsidian blades, Figure 7.17) inside the cook shed suggest that this space was primarily used for food processing. Whereas heavier concentrations of charcoal, stone tools, storage jars, and cook-pots in the east yard adjacent to the cook shed and in the east corridor indicate that the outdoors spaces were primarily used for cooking, food preparation and possibly storage (Table 7.09:A, B).

House Gamma is a long rectangular structure located in the northwest area of the settlement: it too was occupied in LMIIIA (Figure 7.06; Soles 2008:90-101). It is divided into three sections: Rooms 1 and 2 at the western and eastern ends, and the cook shed and paved courtyard in between. Eating, drinking, possible food preparation, and weaving are activities practiced in Rooms 1 and 2 (Table 7.11); whereas the exterior spaces (*i.e.* southwest terrace below house, court) and cook shed were primarily used for cooking and food preparation. Loom weights are found in both phases of the court indicating that weaving was also practiced here (Tables 7.11:A). The abundant amount, and varied collection, of charcoal and food remains (*i.e.* cattle, sheep/goat, pig, fish, sea and land snails, limpets, figs, grapes) in the cook shed indicates that this space was the primary kitchen and that the court and southwest terrace were used when needed, or desired (Tables 7.11:B).

The occupants of House Gamma ate, drank, cooked and consumed food in both indoors and outdoors spaces. Only one tripod cooking pot was found on the southwest terrace with a cooking tray, bowls, cups, one kylikes, and one krater (Figure 7.14; Table 7.11:A). This distribution could indicate that the occupants either cooked, ate and drank on the terrace, or that food was prepared in the cook shed in the tripod cooking pot and then carried to the terrace to be eaten. The court outside the cook shed also had bowls, cups and kylikes, but with cooking dishes, rather than tripod cooking pots or cooking trays. The presence of eating and drinking vessels along with the cooking dish could signify that the occupants preferred using vessels to hold an individual portion to consume rather than eating communally out of the dish with utensils, bread, or their fingers. It is also possible that the food served in the cooking dish was liquid based and required cups and bowls. Indoors, a cooking tray was found in Room 1 along with the remains of sheep/goat and sea snails; two dishes were found in Room 2 with scattered remains of sheep/goat, hare, cattle, pig and sea snails. All of which could have been prepared in the dish, Section 6.2. The occupants either kept their house relatively tidy, or in the final phase of the dwelling they mainly ate and drank outdoors; there is a limited number of eating and drinking vessel inside (Tables 7.11).

Conclusions of LMI and LMII-III Mochlos cooking practices

Distinctions between individuals, who variously were engaged with craft production, farming and fishing, organized and potentially prepared similar types of food have been identified by examining and comparing the LMI and LMII-III Mochlos deposits associated with food activities. Individuals prepared foods in both communal, multifunctional spaces, indoors and outdoors, and using various cooking technologies and techniques. In the LMI period the presence of at least one tripod cooking pot in the examined deposits indicates that foods were most likely stewed or simmered. Not all LMII-III deposits had tripod cooking pots, indicating that individuals could have practiced other types of cooking techniques as well to prepare food.

This observation is reinforced by the appearance of new architectural features, such as cook sheds, cooking holes, built hearths, and new types of cooking equipment—*i.e.*

portable hearths and spit-rests: all introduced at Mochlos in the LMII-III period. Additionally, new drinking and serving vessels, such as kylixes, dippers and kraters were also introduced and produced in local materials (Smith 2010; Nodarou 2010). Alongside the new items in the LMII-III deposits, Minoan-style tripod cooking pot, cooking dishes, and cooking trays remain, albeit the tripod cooking pot is not as ubiquitous as in the LMI Artisans' Quarters and Chalinomouri farmhouse (Barnard, et al. 2003; Smith 2010; Brogan and Barnard 2011). Thus new cooking and serving items, as well as architectural features, were *added* to the LMI assemblage, rather than replacing it. Mycenaean-style cooking pots—*i.e.* jugs, amphorae—that are present at other Cretan sites are not seen at Mochlos (Hallager 1997). Mochlos may have been governed from afar under Mycenaean influence (Soles 2008) or even have been a mixed community with mainland foreigners, yet the fundamental ways of cooking were more embedded in Minoan culture with seasoning of a foreign influence than completely replaced.

7.3.2 LMI Papadiokambos cooking practices

At Papadiokambos the LMI cook-pot assemblages are more varied than at Mochlos. The cook-pot suite of all four vessel types examined in this thesis exists—tripod cooking pots, cooking jars, cooking trays, cooking dishes; Sections 5.1, 5.2 (Figures 1.04, 5.53). Two types of cooking dishes are present, Types AB and C (Figures 5.64-5.70). The majority of the vessels are produced from different phyllite-based clays, more associated with the East Crete Phyllite-Quartzite Series, Section 5.1. This scenario has also been identified to the east in the neighboring region of present-day Sitia, near the administrative center of Petras (Day 1995). These scenarios are very different than the local production and distribution practiced at Mochlos during this same time.

House A.1 at Papadiokambos is a large, two-story, building located directly on the coast. There are nine rooms on the ground level with a staircase leading to a number of rooms (Figure 7.07; Brogan, *et al.* 2012). Based on the biobotanical remains and the ceramic studies, the excavators argue that its inhabitants were engaged in crop processing, fishing and food preparation activities (Brogan, *et al.* 2013). The large quantity and vast size range of limpets, top shells and crabs indicate that the individuals preparing food in House A.1 collected the majority of their sustenance from the shallow coastal waters of the sea. Remains of olives, grapes, fig, almonds, and legumes are also present (Brogan, *et al.* 2013). Five cooking areas were identified, one outdoors on the South Porch, three indoors on the ground floor—Rooms 2, 5, 8, and possibly another upstairs (Figure 7.07; Brogan, *et al.* 2013). The cooking deposits on the South Porch and in Rooms 5 and 8 are discussed because the artifact assemblage for each is distinct from the other in terms of cook-pot use, yet the food remains are similar. [Note: Because this site is not fully published, a table has not been constructed that assembles the evidence for activities associated with food. Further additional domestic activities, such as craft production, are not included in this discussion, albeit numerous loom weight were found (pers. comm., C. Sofianou, 2006-current.)]

On the South Porch the cooking assemblage consists of one Type AB cooking dish full of limpet shells, one tripod cooking pot, one strainer, several cups, bits of a goat's jaw with no signs of burning and a bronze knife (Brogan, *et al.* 2013). Indoors the cooking areas in Rooms 5 and 8 are arranged in a similar fashion: each has a hearth, stone benches around the exterior and adjacent pantries that stored cook-pots, jugs, jars, and cups (Brogan, *et al.* 2013). Room 5, the larger of the two, functioned as a multipurpose room; whereas Room 8 appears to have been solely used for cooking and eating. In the south half of Room 5, equipment and botanical remains associated with processing olives and grapes were present

(Brogan, *et al.* 2013). In Room 5 the cooking assemblage consists of one spouted tripod cooking pot, a hearth with a series of five small stone mortars, sheep/goat, pig, and beef bones with no signs of burning, along with a heap of discarded burned limpets, partially crushed top shells and crabs. The cooking assemblage in Room 8 consists of a decorated cooking jar, a hearth and shellfish remains similar to those in Room 5 (Brogan, *et al.* 2013).

Based on the archaeological data and the experimental results the individuals cooking in House A.1 used cooking techniques such as sautéing and simmering/stewing for preparing mainly shellfish and some meats. Like the LMI and LMII-III deposits at Mochlos cooking activities took place indoors and outdoors in spaces that were also communal and multifunctional.

7.3.3 LMI Mochlos and LMI at Papadiokambos: comparing cooking techniques

The LMI spaces at Mochlos and Papadiokambos are similar in that the individuals were utilizing the same types of spaces to process and cook similar types of foods (Reese, *et al.* 2004; Brogan, *et al.* 2013). The individuals utilized slower methods of cooking associated with tripod cooking pots and cooking jars, as well as faster methods of sautéing, grilling, or roasting associated with cooking dishes and possible cooking trays, Section 6.2. A few distinctions between the LMI Mochlos Artisans' Quarters, Chalinomouri farmhouse and House A.1 at Papadiokambos can be made. Thus, it appears that the individuals in House A.1 at Papadiokambos consumed much more shellfish and less meat than at Mochlos. Also, there is a lack of cooking jars at Mochlos in the LMI and LMII-III period, whereas there are four cooking jars within House A.1 at Papadiokambos. Cooking jars in LMI deposits are also seen at Petras to the east (Tsipopoulou and Alberti 2011:fig. 34) and in central Crete at Knossos (Hood 2011:fig. 52) and Kommos (Rutter 2004) (Figure 4.08). Why they are not at Mochlos requires further investigation. By comparing the LMI deposits at the Artisans'

Quarters, Chalinomouri and Papadiokambos we can conclude that overall there is cultural cohesion based on cooking spaces and assemblages and the differences detected are related to either the individual's ways of engaging with these sorts of items to prepare and cook foods, or other factors that have yet to be identified.

CHAPTER 8: COOKING AND CULTURE: CULTURAL IMPLICATIONS ILLUMINATED BY COOK-POT STUDIES

Cooking is materialized within the archaeological record by the occurrence of diverse remains, such as cook-pots, architectural features that have been physically altered by fire, burnt and ashy soils, wood charcoal and food remains (Platon 1971; Shaw 1990). A cook-pot is used to prepare food by utilizing heat that is transferred to the vessel to warm the food within (Kingery 1955, 1989; Rye 1976; Bronitsky and Hamer 1986). It therefore can be isolated within this list because of its function, specific performance properties of the material used in its production and its greater likelihood of preservation compared to the organic components used in cooking. This thesis explores functional aspects and the cultural role of cook-pots to evaluate domestic cooking on the island of Crete during the LM period, *ca.* 1600-1190 BC. Two case studies target cooking contexts to investigate cook-pot production and function, in both space and time.

The cultural groups concerned are the settlements of Mochlos and Papadiokambos on the northeastern coast. Mochlos was a thriving harbor town in the LMI period; Papadiokambos was its contemporary. Mochlos was then abandoned for a generation; it was reoccupied when Mycenaean influence was strong on Crete (LMII-III). Essentially, the cook-pot suites at LMI Mochlos and Papadiokambos belong to a broader Minoan tradition that utilized open and closed vessels. The cook-pot suite primarily consists of tripod cooking pots, cooking jars, cooking trays, and cooking dishes; Sections 4.1, 5.2 (*Figure 1.04*). Experimental work using LM-style vessels produced using similar clays to the archaeological cook-pots found at Mochlos shows that closed, bowl-shape bodies were used for slow cooking (*i.e.* stewing liquid-based foods) and open vessels were better suited for sautéing, grilling, and baking foods. However, there are hidden aspects to producing and using these vessels and the associated actions are multifaceted and complex; Sections 6.1, 6.2.

This work encourages ceramic researchers to rethink how these tasks were performed, so as to understand better why choices were made that have materialized in the archaeological record. To this end an overview of Minoan and Mycenaean assemblages as they relate to domestic cooking is provided to draw these sorts of conclusions, Section 8.2.2. Principal results also include knowledge gained about cook-pot use by employing experimental methods, Section 8.2.1. Before the principle findings of this thesis are presented comes an overview of the methodology developed to summarize how the material was examined. To close, limitations of this study (Section 8.3) and future research (Section 8.4) are discussed.

8.1 METHODOLOGY

This examination of LM cook-pots in east Crete has constructed a platform for understanding better the possibilities and constraints of performing daily tasks of producing and using cook-pots in the Aegean Bronze Age. This is critical because evaluating how individuals in the past performed these actions provides a window onto past ways of living. In this thesis cooking is evaluated because it is an essential task that was probably performed on a daily basis and we can determine what sorts of actions fundamentally work and which do not. This has been achieved by using the technological typology of cook-pots developed through the Integrated Approach to Ceramic Analysis (IACA), Section 3.

IACA characterizes technological aspects of potting traditions by identifying interrelationships between people and pots in terms of production and use. It achieves this by focusing on key elements of the vessel's design. The aim is to better understand how ancient people performed various tasks. Significantly, characterization of vessels goes beyond defining the morphologies and fabric-types of potting traditions to incorporate an experimental component that enables models of production and use based on the *chaîne opératoire* to be evaluated. IACA is comprised of four stages of analysis that defines, develops, assesses and applies *technological analogy* of specific vessels types. The term *technological analogy* is used here to define the practical application of knowledge needed to produce and use specific types of ceramic vessels; based on similarities the vessels are grouped into an assemblage referred to as a *technological typology*. These stages are:

- Step 1: Define the technological typology.
- Step 2: Develop behavioral models.
- Step 3: Assesses behavioral models by experimentation.
- Step 4: Apply technological analogy and behavioral models to identify potential potting traditions.

This typology is distinct from others formed by solely utilizing stylistic and ceramic fabric analysis to define technological categories of cook-pots because the experimental component develops analogies based on potential actions so production, function, and use of the object can be more accurately defined. This typology is also better able to resolve the interface between potter/user and the cook-pot, which together are engaged in the acts of production and cooking. In this respect, knowledge of actions and processes extracted through experimentation can contribute significantly to informing the substantial sections of the *chaîne opératoire* which cannot be addressed solely through examining objects. This enhanced understanding of how individuals engaged with material objects allows testing and evaluation of hypothetical actions taken in the past that have materialized in the artifact.

8.2 PRINCIPAL FINDINGS

Principal findings concerning the experimental investigations of LM cook-pot production and use (Section 8.2.1) and the cultural aspects of cooking assemblages recovered from east Crete (Section 8.2.2) are discussed here. These topics have been divided into two sections to address the knowledge gained using both experimental and analytical means to explore daily life in LM Crete.

8.2.1 Findings based on experimental investigations of cook-pot production and use

Based on information gained from the experimental investigations it can be concluded that steps taken by individuals in the past to produce and use cook-pots were multifaceted and nonlinear. Information collected from steps 1 and 2 of IACA is based on an artifact being examined in isolation through a sequence of observations to define its morphological features and material properties. This differs considerably from the experimental data derived from step 3. The experimental component is dynamic in that multiple thoughts and actions were monitored simultaneously during experimental procedures. Furthermore, learning how to produce and use the LM-style cook-pots utilized greater sensory knowledge that incorporates an individual's physical senses (*i.e.* touch, sound, visual, smell, tastes) to better understand these processes than was required for steps 1 and 2.

The non-linear process of learning actions used to define the LM cook-pot typology is similar to the learning frameworks of the *chaîne opératoire* described by van der Leeuw (2008:227) that also considers cultural and environmental constraints that set boundaries on the production process, which may be exclusive of potters' 'know-how' and craft knowledge. He argues that taking the potter's perspective to understand why and how vessels were created is insightful in examining innovation of the material object, as well as in questioning why changes occurred by looking at sustainability in terms of human and environmental interaction. This is different from ceramic research that utilizes a linear approach to examine vessels, which works backwards using a formulaic sequence of cause-and-effect to reconstruct how vessels were produced.

Throughout the production process of the LM-style vessels I was confronted by having to handle a range of complex information that required a synthesis of my knowledge first as a trained potter and then as a researcher that recorded the physical characteristics of the archaeological vessels being replicated with constraints set by the natural environment in east Crete, *i.e.* material properties of the clay, temperature and atmosphere that effected the drying and firing. While forming the experimental vessels out of Mochlos clays that was similar to that of the ancient cook-pots (Sections 5.1, 6.1) I was continuously recalling learned potting skills when I took actions that did not produce favorable results. Through this challenge and change in actions, essential knowledge of the production process was gained because previously, based on examining the surfaces of tripod cooking pots, many ceramic researchers had defined these vessels as being wheel-thrown, Section 4.3. The significance of this approach has technological and anthropological viewpoints that challenge ceramic researchers' perception of wheel-technology as it relates to production practices and material properties of specific types of Cretan clays. These discoveries provide insight into the way ancient potters working at Mochlos organized the production process with respect to the limitations of LM wheel-technology and material properties of the clay. For example, based on my knowledge of pot-making, instead of wedging multiple lumps of clay to sit, or stand, at the wheel and make one pot after another, I was forced to set-up my working space and organize my time in a different manner. To make the pot, I wedged the clay, divided it into sections, rolled each into coils and carefully stacked them to form a vessel as my wheel turned. In between stacking and forming each coil a period of time lapsed to allow the partially formed vessel to dry so that it could hold the weight of another coil to finish the form for the vessel, Section 6.1. This process took extra space, bats for resting the vessels during and after production, and time compared to throwing vessels from a lump of clay, Section 2.1. Perhaps the production would quicken, if an assistant coil-made the forms and passed them to another potter to be finished on the wheel, or another set of actions were taken that have yet to be considered. This finding pushes the ceramic researcher to consider that some experimental procedures demonstrated a need for assistance and specific workshop tools, so indicating that LM cook-pot production required teams and their associate organization.

Likewise the cooking experiments were insightful regarding interactions between people and pots, as well as interactions between cook-pots, ingredients similar to those available during the LM period, and hearth-fire. By observing and assisting Alyounis, a trained chef with hearth-cooking experience, it became clear that he was not concerned with the vessel, but with how the food within it responded to the temperature of the fire and time. His perspective shows how examining cook-pots as a means of understanding ancient cooking practices may be utterly at variance with the concerns and practices of ancient cooks. This is where knowledge gained by experimentation can be merged with examination of the ancient material culture and ethnography to generate fresh insights into experiencing specific actions to better understand ancient life, which can develop a more holistic archaeological interpretation.

Observations were made concerning how the experimental cook-pots functioned during the cooking process (*e.g.*, cook-time; regulating cooking temperatures; cleaning, storage, and reuse; identifying use-wear marks - Section 6.3), which have applications of use that reaches a broader audience interested in domestic activities. Key observations along with applications are summarized below.

- Cook-time: From lightening the coals until the food was removed from the hearth, the cook time took *ca.* 2.5-3 hours regardless if one or multiple dishes were prepared; boiling, simmering/stewing took considerable more time than sautéing. This finding provides insight into how time constraints of hearth cooking are imposed on the organization of time when specific cooking techniques are practiced with hearth cooking is utilized. This can include a single individual organizing one or multiple home-based activities to be performed during this period of time, or sharing the task of hearth cooking so that individuals are free to be outside of the immediate area of the hearth, or people utilized techniques of maintaining temperature that gave them more flexibility to away from the hearth for longer periods of time that were not explored in this exercise.
- Regulating cooking temperature: This finding is complex because of the varying nature of fuel that includes type (*i.e.* types of wood charcoal, charcoal vs. wood), conditions (*i.e.* fresh-old, wet-dry), quantity used, and the relationship between placement of fuel and ceramic cook-pot. Overall adding fuel slowly so that food within it would not burn, or the vessel would not crack and covering the vessel can regulate the cooking temperature. Additionally, once the experimental tripod cooking pots and cooking jars with cooked food were removed from the hearth, the food within continued to cook, while the exteriors of the vessels cooled allowing one to handle them with ease. The implications are that the fuel needed preparation and regulation in order for it to efficiently maintain a hearth fire for cooking food. It also implies that a vessel can be used numerous times, as long as the individual is careful.

Another insight into daily cooking is that these vessels efficiently retained heat on their interiors while the exteriors cool enough for an individual to comfortably handle the vessel. This implies that food within the vessels can be prepared in one location and consumed in another. Also, hot or warm food could be eaten a considerable amount of time after the cooking activity ended.

- Cleaning, storage, and reuse: To clean the experimental cook-pots, the interiors were rinsed with water and burnt food was removed using bare hands or applying pressure with a cotton cloth and a mixture of water with sand and/or ash. The pots retained smells of cooked food, but it was difficult to distinguish between those used to cook legumes, meat, or seafood. Likewise, the strong aromas and tastes of specific types of food (*e.g.*, seafood, meat) did not remain within the vessels after cooking to taint tastes of subsequent dishes cooked in the same vessels. Ideas of sanitation and tastes are cultural. While these vessels could be cleaned and reused to prepare different types of dishes accordingly to my western perspective of sanitation and taste, my requirements here might not correlate to other modern or ancient cultures.
- Identification of ancient cook-pots: Initially, burnt or oily ingredients produced the discoloration on the experimental vessels. Discoloration from heat and soot happened, but it took multiple cooking sessions to appear. The soot accumulated under the rims, handles, and edge of the bases on the experimental tripod cooking pots and on the exterior wall on the cooking jars. The areas (*i.e.* underneath the vessels, tips of legs) that were closer to or come in contact with coals, or a hotter flame, were comparatively less discolored. Ceramic researchers can utilize this information to identify cook-pots in archaeological context where hearth and food remains, as well as concentrations of charcoal are not apparent or are absent.

Actions taken to produce Minoan-style experimental cook-pots and to cook in them is based on merging my modern-day western understanding of how to produce and use vessels with a knowledge gained by examining the ancient material culture recovered in east Crete. These results created a perspective of the ancient material culture that could not be acquired by mere examination of the LM cook-pots and describing their associated archaeological deposits. What follows now are the findings that consider cultural aspects of cooking on Crete during the LM period.

8.2.2 Findings considering cultural aspects of cooking

The Minoan island of Crete and the Mycenaean Greek mainland shared climate and landscape characteristics, which influenced the types of foods people accessed and how they cooked; Sections 1.2, 7.2 for Minoan Crete. These regions had a Mediterranean climate and varied landscapes (*e.g.*, mountain ranges, fertile plains, woods, coastlines), allowing individuals to practice food collecting, farming, hunting, and fishing. While there is a commonality in the ingredients used for cooking, there are definable differences between Minoan and Mycenaean cooking assemblages, indicating some cultural differences in how individuals prepared and cooked food. Much of what we know about domestic kitchens for these cultures is from indirect sources—*i.e.* cooking and serving assemblages, floral and faunal remains, Linear B tablets, architecture. An overview of Minoan and Mycenaean cook-pot assemblages and domestic architecture is explored below to compare differences in cooking style based on research from this thesis. The primary emphasis remains focused on Minoan cook-pot assemblages as these have a bearing on interpreting the LMII-III Mochlos assemblage.

Late Minoan cooking assemblages at Mochlos and Papadiokambos are comprised of deep bowl-shaped cook-pots [*i.e.* tripod cooking pots, cooking jars (the latter only at

Papadiokambos)] and open cooking dishes and trays; whereas Mycenaean mainland assemblages are comprised of cook-pots (*i.e.* tripod cooking pots, jugs, amphorae), cooking trays, griddles, and spit-rests—*i.e.* also referred to as "souvlaki trays", Section 4.1 (Furumark 1992:pl. 323; Hruby 2008:153, pl. XXVIIa; Lis 2008:147, pl. XXVIa—c). The differences between the Late Minoan and the Mycenaean cooking assemblages listed above (*i.e.* absence of cooking dishes, presence of spit-rests and griddles) suggests that the Mycenaean assemblages is more focused on grilling and roasting compared to the Minoan assemblage at Mochlos and Papadiokambos. Griddles are flat, round trays with shallow rims and evenly spaced circular impressions on the top surface and blackened surfaces underneath (Hruby 2008:153, pl. XXVIIa; Lis 2008:147, pl. XXVIa—c). Possible functions of griddles include baking, frying, and roasting (Blegen and Rawson 1966: 341; Hofstra 2000:63; Hurby 2008; Lis 2008). Spit-rests are large, rectangular trays with two high walls opposite each other with notches evenly spaced on the top (Lis 2006:fig. 3.3; Hruby 2008:154, pl. XXVIId), where skewers with meat could have been balanced on the notches above hot coals for grilling (Blegen and Rawson 1966:418; Lis 2006; Hruby 2008).

Based on the findings in this thesis there is a range of cooking techniques and cooking styles that could have been utilized during the LMI and LMII-III period on Crete. The experiments executed demonstrate that the deep-bowl shape of tripod cooking pots and cooking jars is best for boiling, simmering/stewing, and the open cooking dishes are best suited for frying (*i.e.* sauté), roasting, and baking. In terms of boiling and simmering/stewing multiple cooking jars and tripod cooking pots are found at Papadiokambos, whereas at Mochlos only tripod cooking pots are found in the LMI and LMIII levels. This suggests that while similar cooking techniques were used (*i.e.* boiling, simmering/stewing) at both sites, there is a difference in cooking style between the two settlements in the LMI period, and there is a cooking tradition of using tripod cooking pots that continues from LMI into the LMII-III periods at Mochlos. For example, to heat tripod cooking pots hot coals, or burning wood with a low flame that does not touch the underside of the vessel, was placed in the space underneath it created by the vessels' legs. In contrast, cooking jars were best heated by placing the lit fuel in close proximity, but not touching the vessels' bowl-shaped body, insuring that the food inside did not burn and the vessel did not crack, Section 6.2. The later technique of warming cooking jars requires more space and attention.

Tripod cooking pots and cooking jars with short necks, everted rims, and flat bases produced from local fabrics appear to dominate the Mochlos assemblage, suggesting that it was a common practice for individuals in the LMI and LMII-III periods to prepare food by boiling or simmering/stewing when using ceramic utensils; Sections 4.1, 5.1. This cooking technique was also practiced in the Mycenaean Greek mainland, but the cook-pot assemblage for boiling or simmering/stewing is more varied and includes tripod cooking pots and cooking jugs (*i.e.* vessels with one handle) and amphorae (*i.e.* vessels with two handles); often a ring base is attached to provide support on a flat surface, *i.e.* hearth (French 1967:177; Mountjoy 1993:117, 188, figs. 344—348; Tournavitou 1995:92—93, pls. 10, 13, 14; Lis 2006:fig. 2, 2008:pls. XXIVb, XXVa). Compared to Minoan cooking jars the ring base attached to Mycenaean cooking jugs and amphorae could be considered a distinct functional feature, because the bases of Minoan cooking jars are wider and flatter and do not need the extra support offered by a ring base. Also, this suggests that the vessel was not elevated on stones, but stood directly on the floor for cooking and serving.

Applying this knowledge gained by experimentation to the diversity of cook-pots in the Mycenaean assemblage suggests that individuals could have used different techniques to heat deep bowl-shaped cook-pots. For example, if one cooked using a Mycenaean cooking jug, than the side of the vessel opposite the handle could be placed close to a lit hearth to warm it, rather than surrounding it with hot coals like the technique used in the experiments to heat Minoan-style cooking jars. To regulate the heat within the vessel, fuel could be added or removed from the hearth, the contents within the cook-pot could be stirred, or the vessel could be moved using the handle. Based on the experimental work in this thesis, the handle remained a safe warm temperature allowing the vessel to be moved from one location to another, while the bodies of the cook-pots are typically too hot to touch with bare hands, Section 6.2. Ceramic researchers examining Mycenaean cook-pot material from the mainland have noted discoloration created by fire on the lower body of the cooking jugs opposite the handles (Tzedakis and Martlew 1999; Lis 2008; Kanta and Kontopodi 2011) indicating that this hypothesis of how to cook using a jug has some validity. This pattern of discoloration is also located on the lower bodies of Mycenaean amphorae (Tzedakis and Martlew 1999; Dabney, *et al.* 2004; Kanta and Kontopodi 2011) suggesting that to warm the vessels an individual would pick it by the handles and rotate it 180º to place it nearby a lit fire. The contrast between the discoloration and the morphologies of the Late Minoan cook-pots and the Mycenaean mainland cooking jugs and amphorae indicate that individuals within these two civilizations boiled and simmered/stewed food using different heating techniques.

New fashions of serving and consuming foods are present in the LMII-III domestic assemblages, but the actual foodstuffs may not have differed. Additional accessories and serving utensils produced and consumed locally are pulled-rim bowls, kylikes, kraters, scoops, dippers, and ladles (Smith 2008:61-65), as well as portable hearths and spit-rests (Soles 2011:60). The presence of these objects parallels other sites where Mycenaean influence is evident, such as Khania Kastelli in west Crete and Kommos in central Crete, Section 4.1. Scoops and dippers are bowl- or cup-shaped vessels with thick handles attached at the rim and often have a small pulled spout (Mountjoy 1993:71, 72, 118, figs. 151, 351). Scoops are also referred to as "ladles", and the handle shape distinguishes them from dippers (Tournavitou 1995:85—86, 91—92, pls. 13a, b, 14c). Dippers have high loop round, or oval, handles with one end attached at the rim and the other below. Ladles have thick handles attached at the rim and turn downwards to support the weight of the bowl (Furumark 1992:pl. 169; Mountjoy 1993:118, fig. 351). Souvlaki trays, dippers, and ladles are present in limited numbers in the LMII-III Mochlos assemblage, Section 7.2, suggesting that perhaps only specific dwellings held these items.

Between the LMI and LMII-III settlement there is a marked change in domestic architecture at Mochlos resulting most likely from a Mycenaean mainland influence (Soles 2008). LM Mochlos houses examined in this thesis are single-storey, rectangular structures constructed out of stone; Sections 1.3, 7.2. Cooking activities are identified by concentrations of charcoal, food and cook-pot remains (Soles 2003, 2008). In the LMI period the houses were multi-room and cooking spaces were primarily indoors and located in communal and multifunctional spaces—*i.e.* loom weights, balance-pan, stone tools, food processing equipment are found alongside cooking equipment; yet evidence concentrations of charcoal, food and cook-pot remains also supports outdoor cooking. This is in contrast to the one-to-three room structures built in the LMII-III settlement at Mochlos where several are distinguished by a cook shed located in an adjacent space; Sections 1.3, 7.2 (Soles 2008). Cook sheds are associated with LMIII buildings in other sites on Crete, such as Chrysokamino in east Crete, and Malia and Kommos in central Crete (Shaw 1990:233, 239; Driessen and Farnoux 1993, 1994:54-64; Nixon 1996; Floyd 2000). Cooking areas in the LMII-III settlement are also identified indoors and outdoors by concentrations of charcoal, food and cook-pot remains, but also by built structures such as cooking holes or hearths located on porches and inside the cooking sheds (Soles 2008). The locations of the fixed hearths in the cook sheds, rather than the main house, indicates that most likely their primary function was cooking, rather than providing heat or light. Fixed hearths at Mochlos resembled those produced on the Greek mainland found at Mycenae, Tiryns, Korakou, and Nichoria that were large and square-to-round in shape and constructed with a layer of clay and stones or sherds (Tournavitou 1990). In Crete this hearth-type continued into the LMIIIC period at sites that have a strong Mycenaean presence, such as Halamenos and Kavousi Vronda in east Crete, Kastrokephala in central Crete, and Kastelli Chania in west Crete (Kanta and Kontopodi 2011).

LMII-III reoccupation at Mochlos took place *ca.* 30–40 years after the destruction and abandonment of the Neopalatial town: arguably when the Mycenaean Greeks are believed to have been in control of central Crete and were expanding into the east (Soles 2008); Sections 1.3, 7.3. There are distinct differences between the LMI and LMII-III material culture at Mochlos; that taken into consideration for domestic cooking in this examination are ceramic cook-pot assemblages and architectural features associated with cooking activities. Architectural features express these changes in the physical environment surrounding the cooking processes clearly. New additions in the LMII-III ceramic cooking assemblages such as souvlaki trays, dippers, and ladles certainly exist, but they were produced and consumed locally *alongside* vessels with a clear and strong LMI pedigree. Mycenaean-style cook-pots, *i.e.* jugs, amphorae, griddles, that are present at other Cretan sites are absent at Mochlos; yet other Mycenaean imports and locally made Mycenaean-style products are present in other areas of the Mochlos settlement and cemetery; Sections 1.4, 7. (Smith 2005; Soles 2008, 2011). Mycenaean influence on Crete is evident not only in iconography (*e.g.*, Knossos frescoes) and the adoption of the Linear B script, but also in style of cooking. The work in this thesis demonstrates that in the case of Mochlos the LMII-III settlement appears to be hybridized with the adoption of some Mycenaean cooking styles alongside established Minoan cook-pots. The Mochlos inhabitants may have been essentially Minoan but influenced by some Mycenaean ways of cooking and eating, or perhaps could have been a mixed community including foreign elements who were Mycenaean but who also used Minoan cook-pots. The fundamental ways of cooking at Mochlos seem to be embedded in Minoan culture.

8.3 LIMITATIONS OF METHODS

This work encourages ceramic researchers to rethink how actions taken to produce and use cook-pots in the LM period in east Crete were performed and to understand better why choices were made that have materialized in the archaeological record. However, inherent limitations were encountered during the research and application of the methodology, of which the principal issues in terms of evidence for cooking installations, for cooking practices, and cooking techniques are discussed below.

The quality and accessibility of information on ancient cooking contexts has a direct impact on how ceramic researchers define and interpret cooking spaces and actions in the past. Identifying cooking contexts in the LM period has limitations because the archaeological evidence examined suggests that Minoans typically cooked in multiple areas within and outside domestic dwellings in spaces with very few built structures, thus it is challenging to recognize and clearly define cooking contexts. The experimental cooking sessions executed in this thesis suggest that multiple sessions must be undertaken before the physical evidence of cooking can be developed in a recognizable form—*i.e.* burnt and ashy soil, concentrations of charcoal, burnt food remains. This finding demonstrates that cooking spaces, which were used for a longer period of time (*i.e.* areas with 10 or more cooking sessions within a month) can be recovered by excavators more easily than those that were used less often or more sporadically. This inconsistency in recovery can limit the evidence of past cooking activities. Additional inconsistencies in the recovery of evidence for past cooking activities are generated when excavations of relevant contexts do not gather the full range of possible information on food and hearth remains, either because they do not apply appropriate field collection methods for organic remains (*e.g.*, systematic soil sampling, water floatation, residue analysis), or because preservation in the soil is very poor. In this respect the approach to past cooking activities that is outlined in this work is dependent on the quality of evidence found, the quality of the excavation, as well as the environmental conditions on site.

Finding appropriate ethnographic analogies for cooking practices was also a limitation encountered during this research, because there is a lack detailed information on how individuals handle various types of ceramic cook-pots for hearth cooking. Additionally, contextualization of the experimental and archaeological findings has been limited by the fact that very little is known about domestic life in the Minoan world. Unlike the Classical and later Greek culture, where texts illustrate to some degree the specific operational actions of the social aspects of domestic cooking, the Minoan culture has no such texts so far. Iconography is equally unhelpful. This gap in information influences the organization, undertaking, and interpreting of the experimental reconstructions examined in this thesis that also serve as analogies to better understand ancient daily life.

For these reasons it was essential to employ the methodological approach IACA to better understand the operational sequences of ancient cook-pot production and cooking. While this approach to examining the ceramic objects explores the physical remains of ancient cooking processes to explain the character of cook-pots in the archaeological record it cannot incorporate social aspects of domestic life in the ancient world. Because only physical actions and not the thoughts or the creative process behind these actions can be recorded some of the *chaîne opératoire* steps cannot be fully explored or reliably reconstructed. Additionally, there are inherent limitations in the experimental approach because the skill sets, the materials and tools available, and cultural context of the researcher differ from the ancient individual. To address these limitations cook-pots should be examined within the broader context of their respective site to better understand the relationships between cook-pots, cooking activities, and other physical remains of domestic life. To provide a broader scope further comparative studies between sites and regions can also be conducted. This approach requires a very large scale of analysis and should be completed once smaller scale studies, such as this thesis, is conducted.

8.4 FUTURE RESEARCH

Many topics of future research concerned with day-to-day living and social interaction activities have suggested themselves in the course of this thesis: a thesis that considers archaeological/anthropological, experimental, and theoretical perspectives on domestic cooking and eating practices. To advance our knowledge about Minoan culture this focused work utilizing IACA's methodology to examine domestic cooking in the harbor towns of east Crete can expand to include the examination of material culture concerned with cooking and eating activities recovered in administrative centers, including villas built in rural areas (*i.e.* Achladia in east Crete [Tsipopoulou and Vangetti 1995]) and the much larger palaces, *i.e.* Zakros, Petras, Knossos, Phaistos, Khania (Graham 1962; McEnroe 2010). These provided a forum for gathering, storage facilities for crops, and a place for artisan workshops. A comparative examination of material culture concerned with cooking activities between those recovered in domestic dwellings and administrative centers can shed light on how day-to-day living and social interaction activities like cooking and eating were organized in different social contexts—*e.g.*, building's function, size, accessibility to individuals. This comparative investigation will advance understanding of social organization and practices within Minoan culture.

Material culture associated with day-to-day cooking and feasting activities can be compared utilizing IACA's methodology to gain further insight into the organization of large-scale activities in Late Minoan culture. Fundamentally, feasting is the communal consumption of food and/or drink, which is a form of ritual activity that is typically semiotic in nature (Dietler and Hayden 2001:3; Dietler 2001). In practice, ethnographic studies have documented that cooking and food sharing in the context of feasting is organized differently than cooking for sustenance (Kirch 2001). To organize feasting activities there must be cooperation between individuals at the communal level to share in the workload and equipment (Kirch 2001). This is in contrast to domestic cooking where food preparation, cooking, serving, and cleaning can be performed by one or a few individuals that typically share immediate or close kin relationships, Section 2.2. For example, ethnographic studies of the Akha (an indigenous Hill Tribe in Thailand) feasting demonstrates that there is a concentrated effort by multiple individuals to collect cook-pots and serving vessels, to discard accumulated debris from hearth and garbage fires, to install and dismantle temporary kitchens, and to collect and display trophy objects associated with a particular feast, *i.e.* jaw or horns of large sacrificed animals (Clarke 2001).

Feasting activities in the Late Bronze Age on Crete and the Greek mainland are identified by the accumulation of distinctive patterns of butchered and burnt animal bones (*i.e.* remains of head and foot bones that suggest on-site butchering by specialists), drinking and serving vessels (*i.e.* cups, kylix, goblets, stemmed bowls, kraters, jugs, amphorae, dippers), ceramic cooking utensils (*i.e.* cook-pots, scuttles, griddles, souvlaki trays), and the presence of distinctive objects considered to have ritual significance, *i.e.* female and bovine figurines (Jameson 1958:223; Gesell 1985; Gesell, *et al.* 1995; Rupp and Tsipopoulou 1999; Borgna 2004b; Dabney, *et al.* 2004; Lis 2006; Cosmopoulos and Ruscillo 2014). Utilizing IACA's methodology to examine materials associated with feasting provides an experimental component with which to examine the actions and materials needed to produce and use cook-pots for large-scale cooking and eating events.

van der Leeuw's (2008) discussion on the *chaîne opératoire* of pottery production focused on why and how vessels were created rather than solely on the properties of the material object. IACA's methodology of examining ceramics with its experimental component aims to identify human actions and explore physical constraints within specific elements of the production *chaîne opératoire* and in cooking. This method of engagement explores ceramics through the agency of a potter and/or user rather than as the static material represented in traditional typologies of shape and fabric. In so doing it opens the way to developing phenomenological perspectives that relate empirical observations (*i.e.* experiential data) on the performance of specific tasks to the actions in pottery production and use that have been materialized in the ancient cook-pots and their cooking contexts.

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THE ART AND ARCHAEOLOGY OF COOKING: A COMPARATIVE STUDY OF LATE MINOAN COOK-POTS FROM MOCHLOS AND PAPADIOKAMBOS

Thesis submitted for the degree of Doctor of Philosophy at the University of Leicester

by

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"...no one is born a great cook, one learns by doing."

Julia Child

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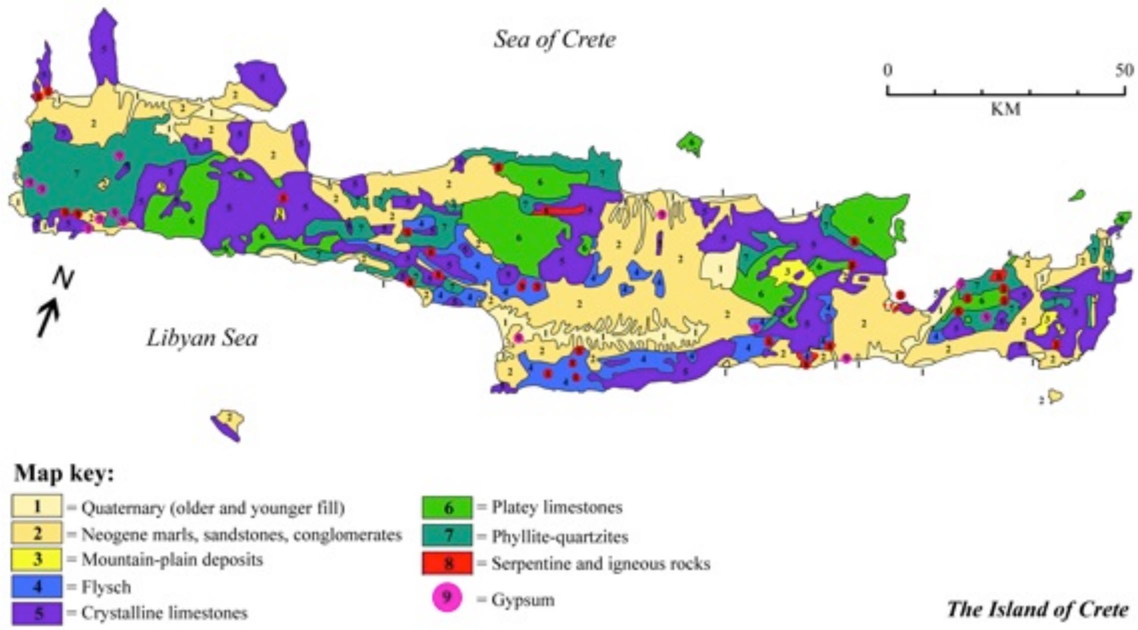


Figure 1.03 Geological map of Crete (after Rackham and Moody 1996:16).

Figure 1.04 LM cook-pots examined.

(A, B) Tripod cooking pots—elongated globular, globular. (C) Cooking jar. (D, E) Cooking dish—top, side view. (F, G) Cooking trays—with, without handles.

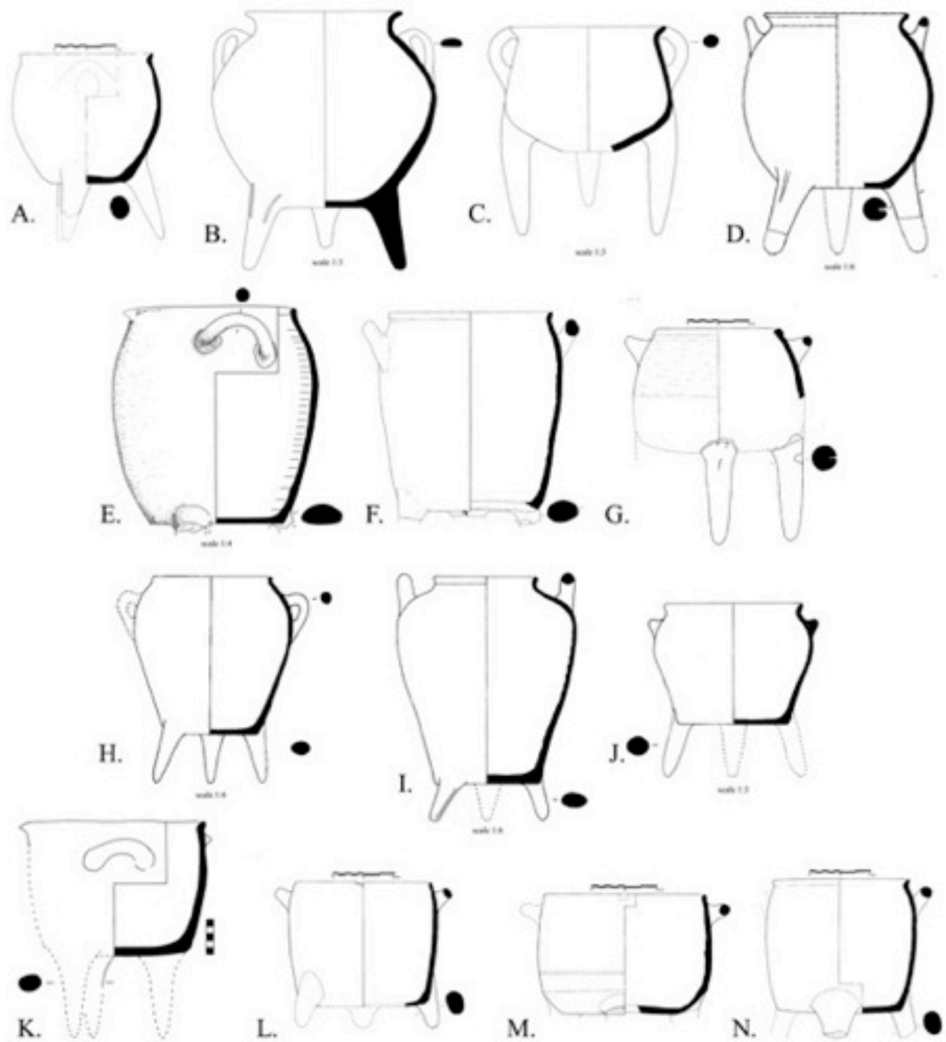


Figure 4.01 LM tripod cooking pots.

Globular: (A) (Rutter 2004:fig. 4.13:C11833), (B, C) (Hallager 2003:pls. 73:71-P0869, 74:71-P0833), (D) (Sackett and Popham 1965:fig. 17:P17). Elongated globular: (E) (Tsipopoulou and Alberti 2011:fig. 35), (F) (Rethemiotakis and Christakis 2011:fig. 16), (G) (Rutter 2004:fig. 4.3:C9430). Piriform: (H, I) (Sackett and Popham 1970:fig. 18:NP111, NP120), (J) (Sackett and Popham 1970:fig. 18:NP113). Cylindrical: (K) (Betancourt 1980:fig. 1:C103), (L—N) (Rutter 2004:figs. 4.4, 4.6, 4.13:C6926, C2848, C8251).

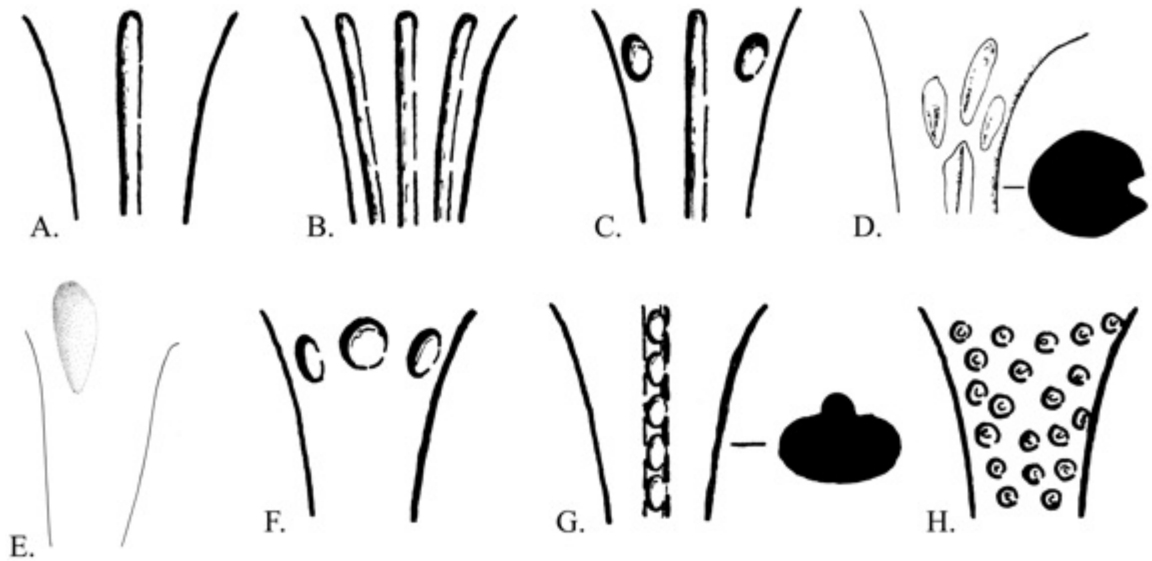


Figure 4.02 Decoration details of tripod cooking pot legs.

(A, B) Linear groves. (C) Linear grove between finger impressions. (D) Vertical slash with three above. (E, F) Finger impressions. (G) Vertical coil with impressions that mimic rope texture. (H) Circular impressions. (Hood, Warren, and Cadogan 1964:fig. 2A; Betancourt 1980:fig. 2:C1058; Smith 2010:fig. 83:IB.877).

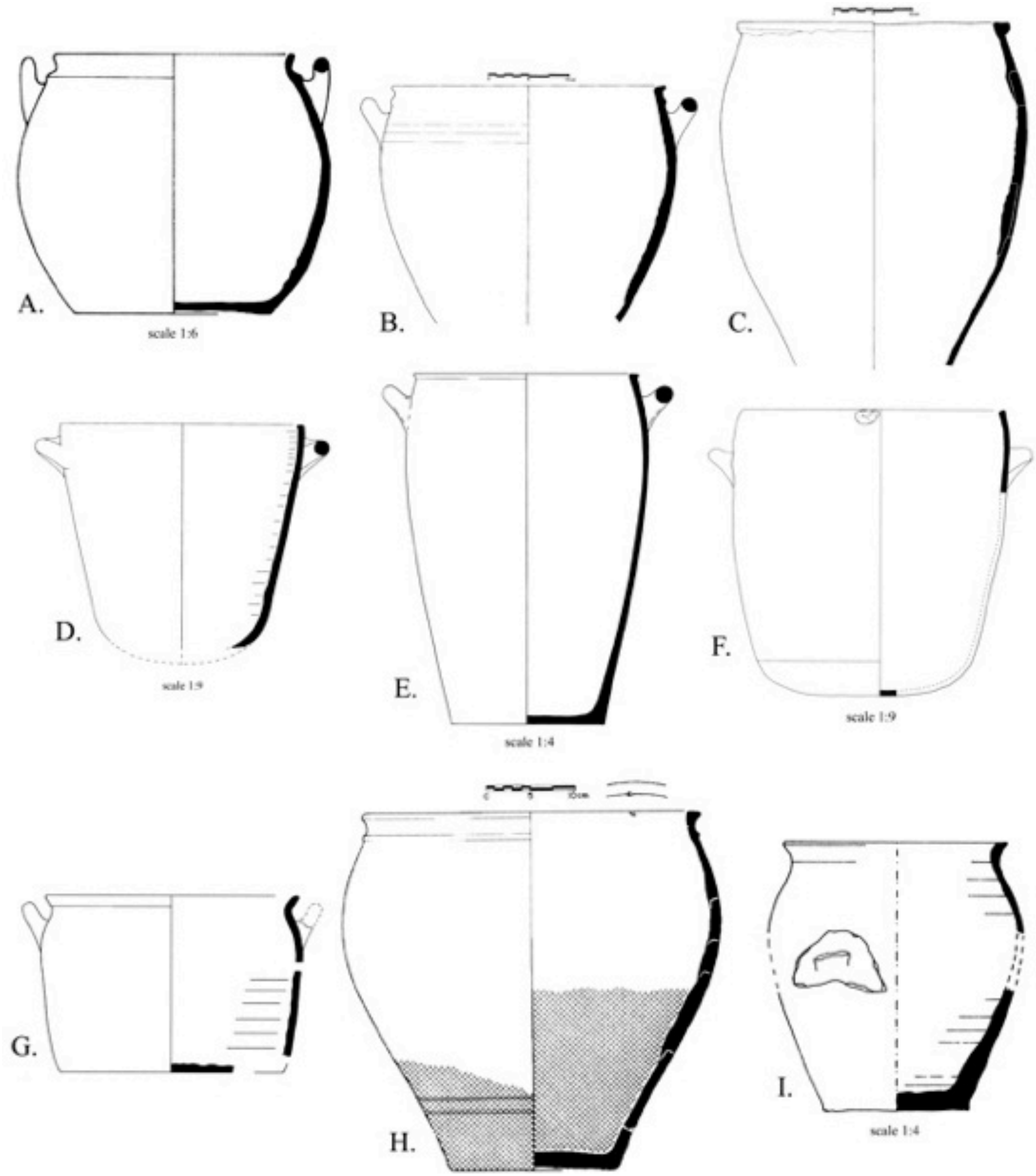


Figure 4.03 LM cooking jars.

(A) Globular (Sackett and Popham 1965:fig. 17:P29). (B, C) Elongated globular (Rutter 2004:figs. 4.15, 4.16:C2496, C6403). Cylindrical: (D, F) (Chatzi-Vallianou 2011:fig. 16:PIT.XIV.P3, PIT.XXII.A13), (E) (Hood 2011:fig. 52), (G) (MacGillivray 2007:fig. 4.24:584). Piriform: (H) (Rutter 2004:fig. 4.14:C8205), (I) (Tsipopoulou and Alberti 2011:fig.34).

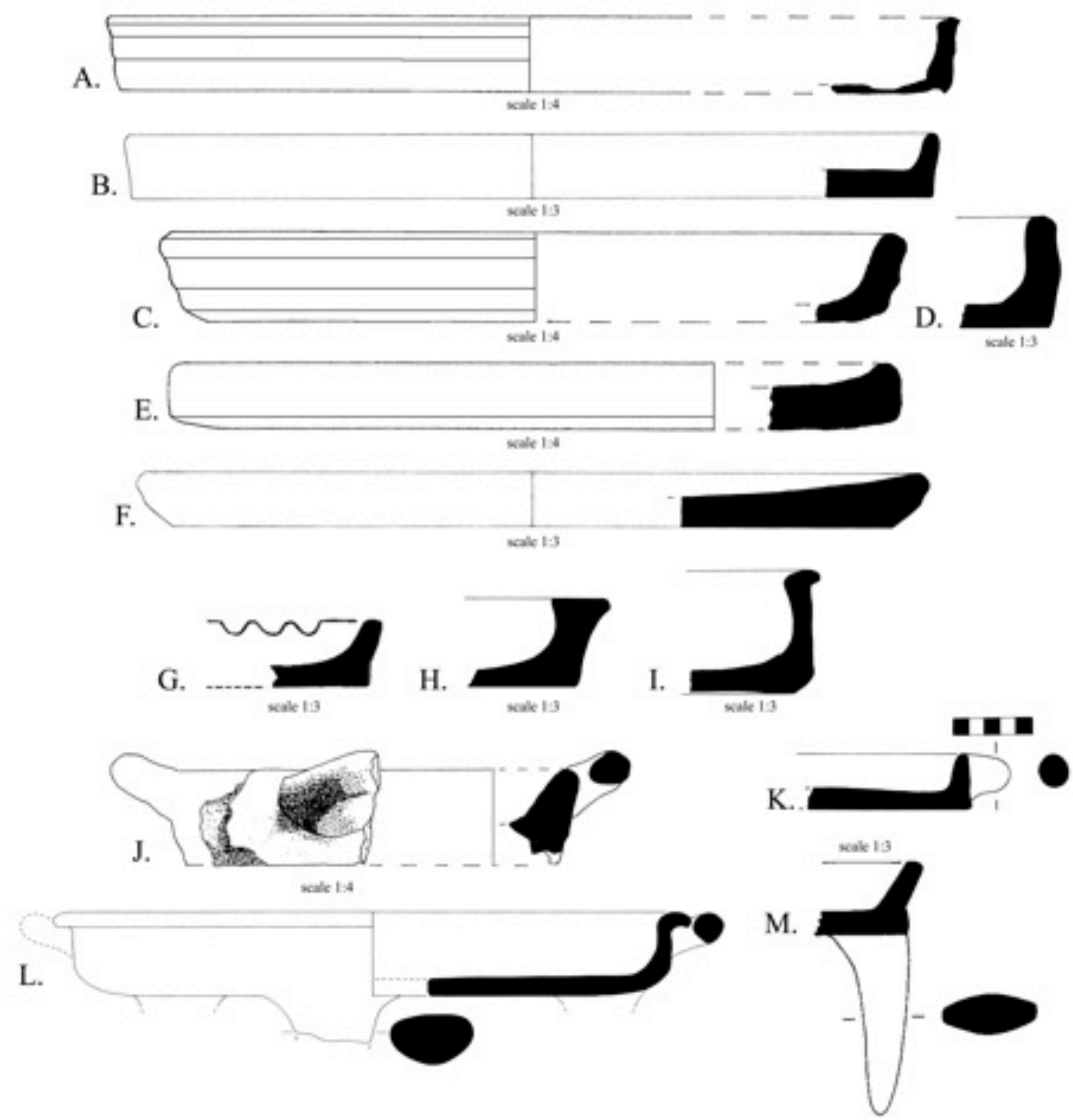


Figure 4.04 LM cooking trays.

Tray without legs: (A) (Tsipopoulou and Alberti 2011:fig. 42:P90/843), (B) (Hallager 2003:pl. 75:77-P1293), (C) (Tsipopoulou and Alberti 2011:fig. 42:P89/770), (D) (Hallager 2011:pl. 119:84-P2699), (E) (Tsipopoulou and Alberti 2011:fig. 42:P90/1215), (F) (Hallager 2011:pl. 119:71-P1461), (G) (Sackett and Popham 1965:fig. 11:n), (H, I) (Hallager 2011:pl. 119:84-P1709; 2003:pl. 75:77-P2018), (J) (Tsipopoulou and Alberti 2011:fig. 42:P89/812), (K) (Betancourt 1980: fig.4:C673). Tripod cooking tray: (L) (Banou 2011:fig. 1:d), (M) (Sackett and Popham 1970:fig. 22:9).

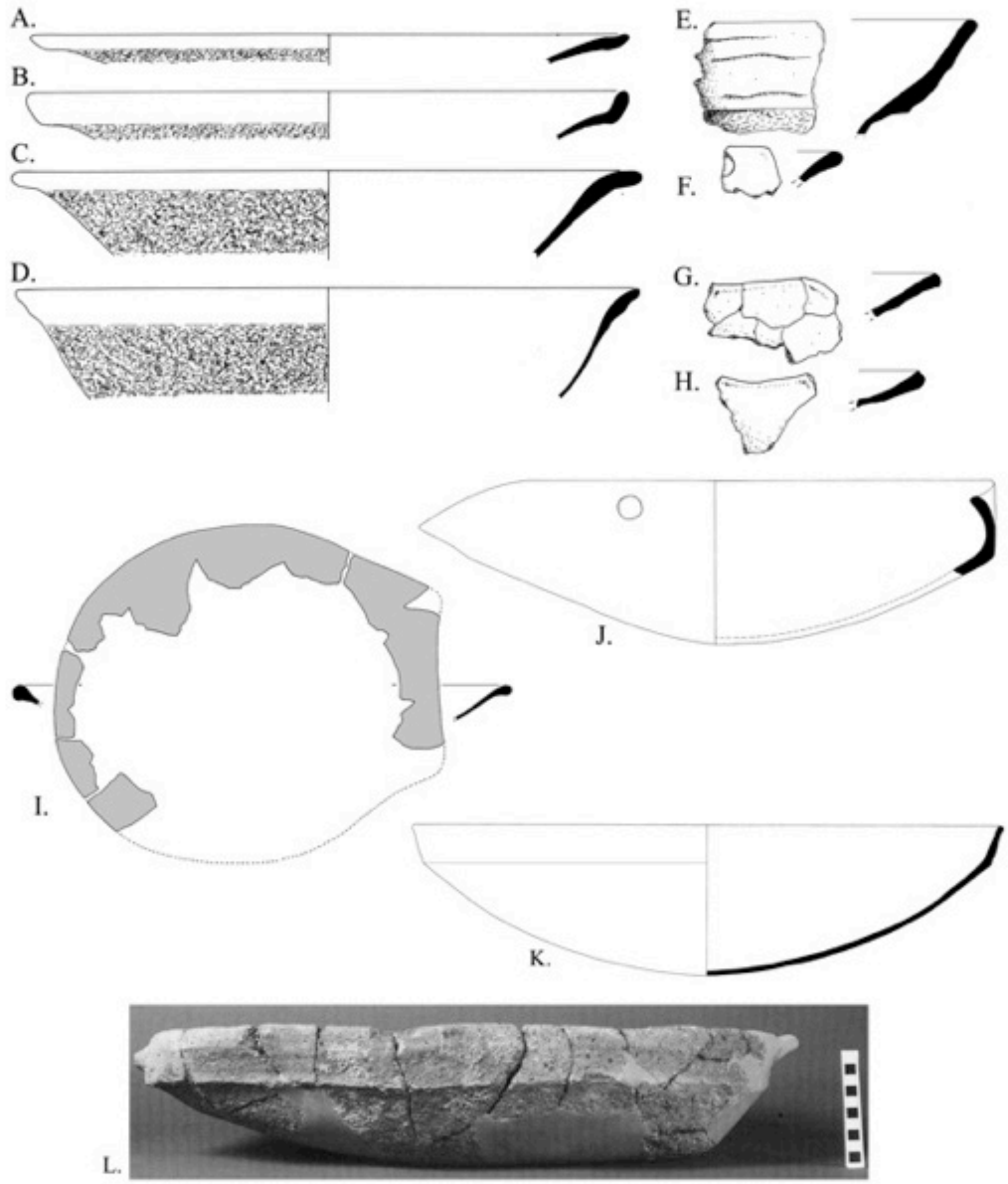


Figure 4.05 LM cooking dishes.

(A—D) (Popham 1984:fig. 16:A—D), (E—H) (Tsipopoulou and Alberti 2011:fig. 4:P90/1547, P90/1582, P90/1595, P90/1579), (I) (Barnard and Brogan 2003:fig. 51:IB.569), (J, K) (Hallager 2003:pl. 74:71-P0758; 2011:pl.119:70-P0694), (L) (Alberti 2012:fig. 3c).

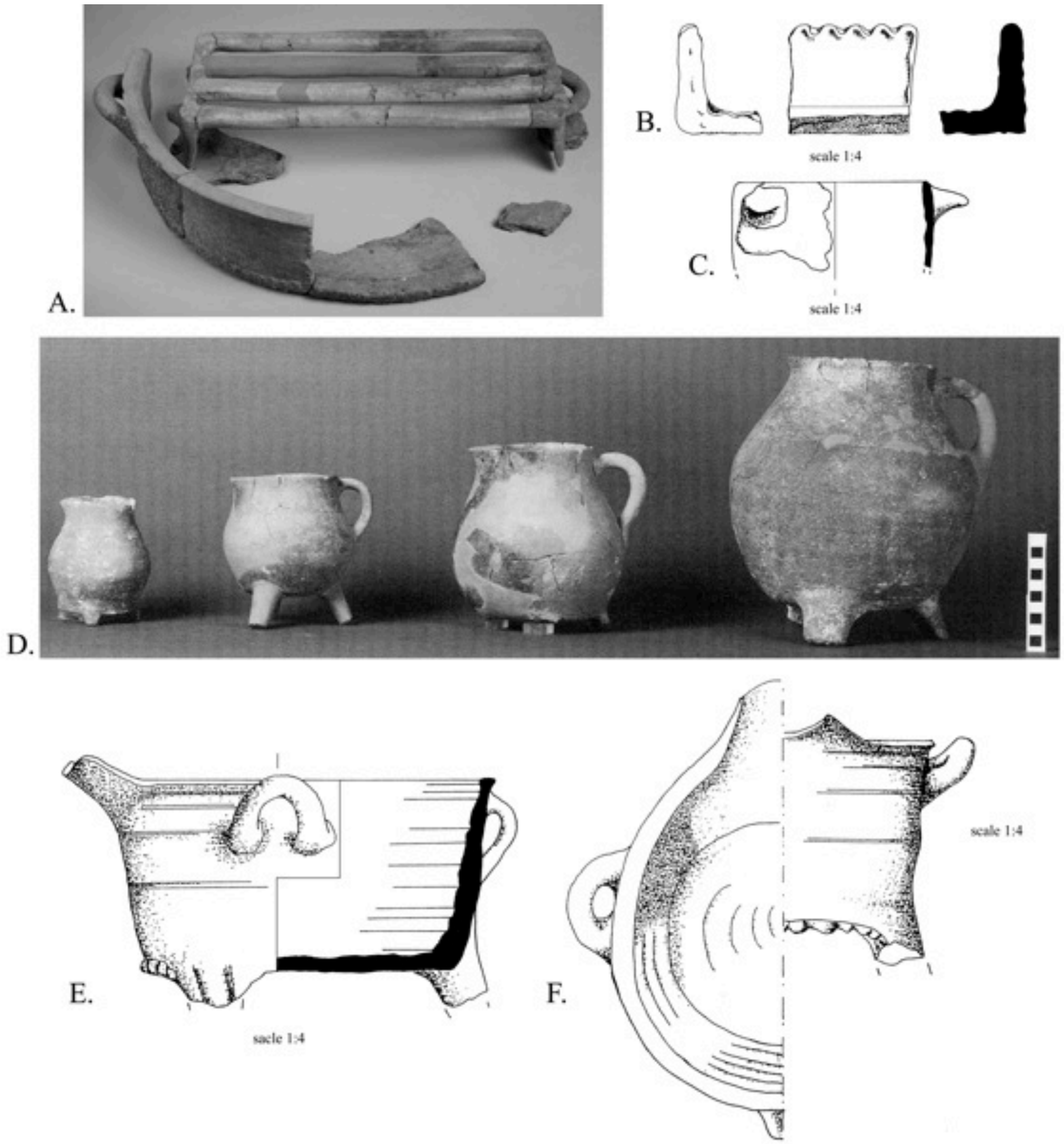


Figure 4.06 LM ceramic vessels and objects associated with cooking activities.

(A) Grill and portable hearth (Hemingway, *et al.* 2011:fig. 10a). (B) Fire-stands/spit-rests; (C) Small cooking pot with lug handles; (D) Cooking jugs (Alberti 2012:fig. 2a). (E, F) Tripod cooking pan with cylindrical profile (Tsipoulou and Alberti 2011:figs. 39, 41:P90/1589, 44:P89/519).

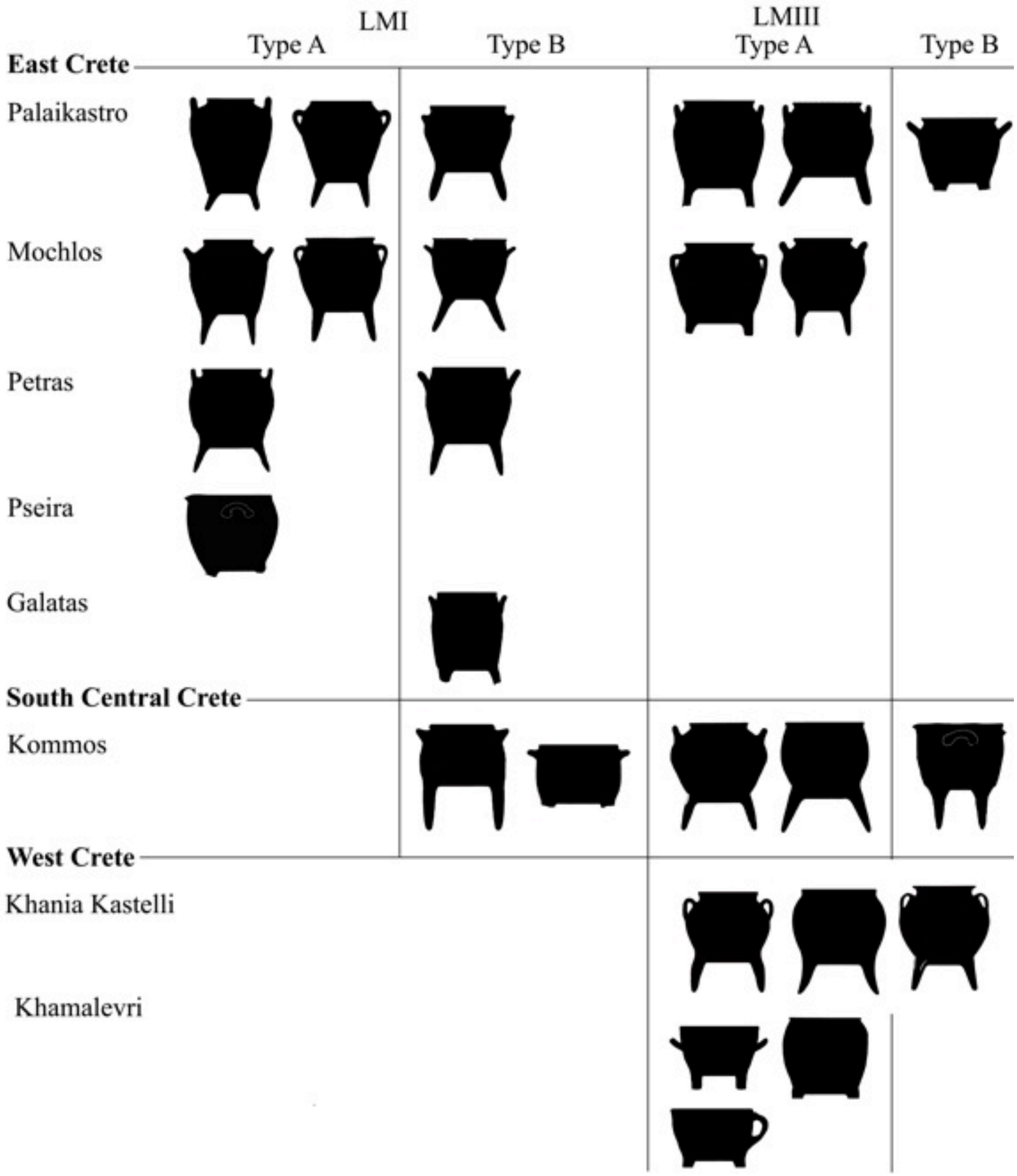


Figure 4.07 LM types A and B tripod cooking pots.

Chart constructed on published evidence; lack of image in figure does not mean that the shape does not exist at the site. Palaikastro: LMI (Sackett and Popham 1970:figs. 17:NP113; 18:NP111, NP120), LMIII (Sackett and Popham 1965:fig. 17:20); Mochlos LMI (Barnard and Brogan 2003:figs. 48:IB.500, IB.493, 49:IB.505), LMII-III (Smith 2010:fig:82:IIB.858, IB.863); Petras LMI (Alberti 2012:fig 1:A, B); Pseria LMI (Floyd 1998:fig. 3:BS/BV35);

Galatas LMI (Rethemiotakis and Christakis 2011:fig. 16); Kommos LMI (Rutter 2004: figs. 4.3:C9430, 4.6:C2848), LMIII (Betancourt 1980: fig.1:C103, C45; Watrous 1992:fig. 62:1654; Rutter 2004: fig.4.13:C11833); Khania Kastelli LMIII (Hallager 2003:pl. 73:71-P0869; 2011:pl. 117:82-P1263, 80-P1396); Khamalevri LMIII (Andreadaki-Vlasaki and Papadopoulou 1997:fig. 52:P13284, XAM:93/12, P13281).

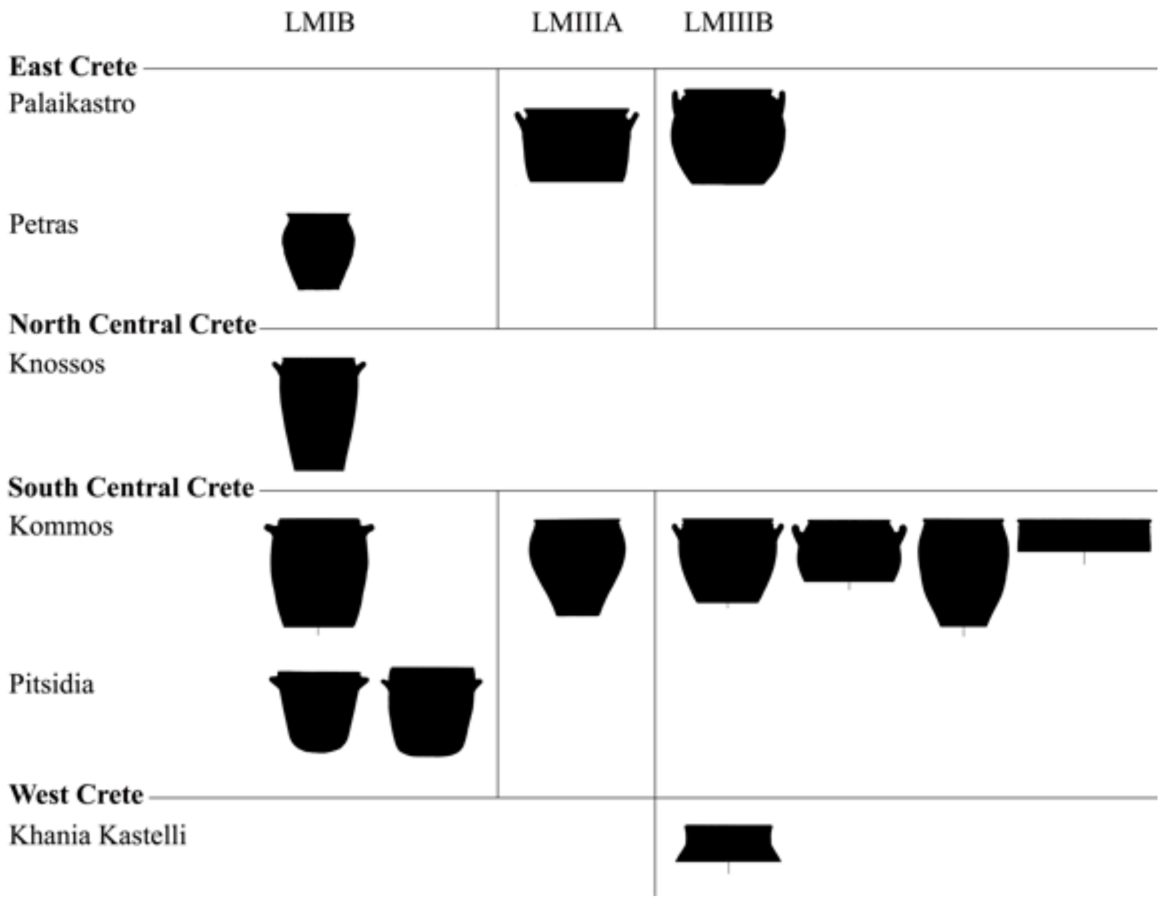


Figure 4.08 LM cooking jars.

Chart constructed on published evidence; lack of image in figure does not mean that the shape does not exist at the site. Palaikastro LMIII (Sackett and Popham 1965:fig. 17:P29, MacGillivray 2007:fig. 4.24:584); Petras LMI (Tsipopoulou and Alberti 2011:fig. 34); Knossos LMI (Hood 2011:fig. 52); Kommos LMI and LMIII (Rutter 2004:figs. 4.5:C2760, 4.14:C8205, 4.15:C2497, C2496, 4.16:C6403, C6402); Pitsidia LMI (Chatzi-Vallianou 2011:fig. 16:PIT.XIV.P3, PIT.XXII.A13); Khania Kastelli LMIII (Hallager 2011:pl. 119:77-P1709).

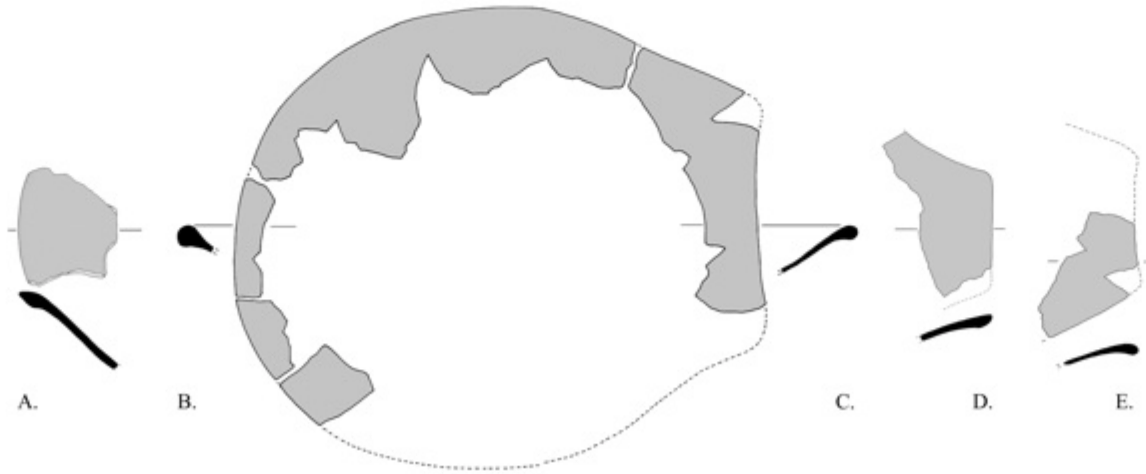


Figure 4.09 LMIB cooking dish from Mochlos Artisans' Quarters.

(A, B) Profiles from the bowl-end of the vessel; (C-E) Profiles from the spout-end of the vessel (Barnard and Brogan 2003:figs. 49:IB.525, 50:IB.536, 51:IB.569, IB.575).

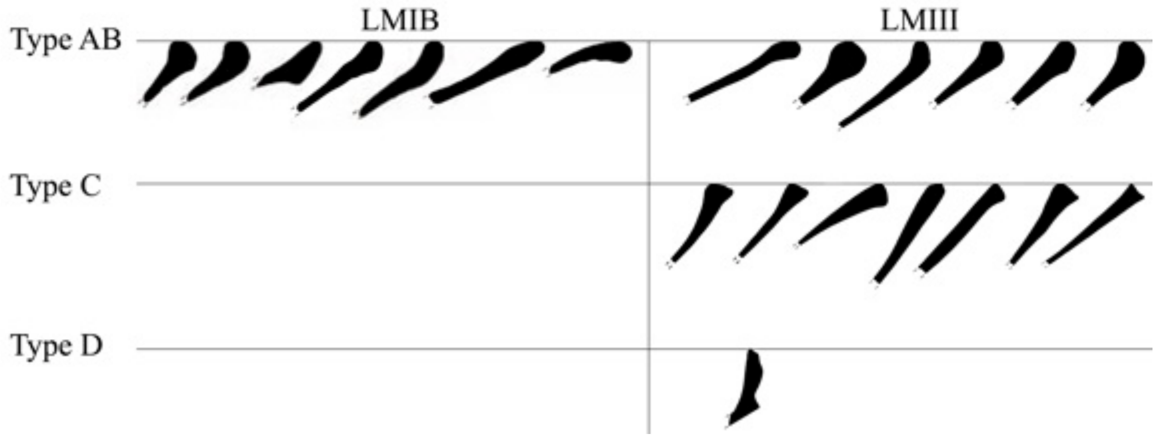


Figure 4.10 LM Mochlos cooking dish rim typology.

Type C and D dishes were not found in LMIB deposits. Additional Type D dishes were found in LMII-III deposits, but only one was drawn and published. (Barnard and Brogan 2003:figs. 50:IB.556, IB.547, IB.544, IB.542, IB.563, IB.528; 49:IB.514; Smith 2010:figs. 84:IIB.889, IIB.893, IIB.913, IIB.900, IIB.903, IIB.929, IIB.925, IIB.922, IIB.911, IIB.908, IIB.895; 85:IIB.936, IIB.937, IIB.935).

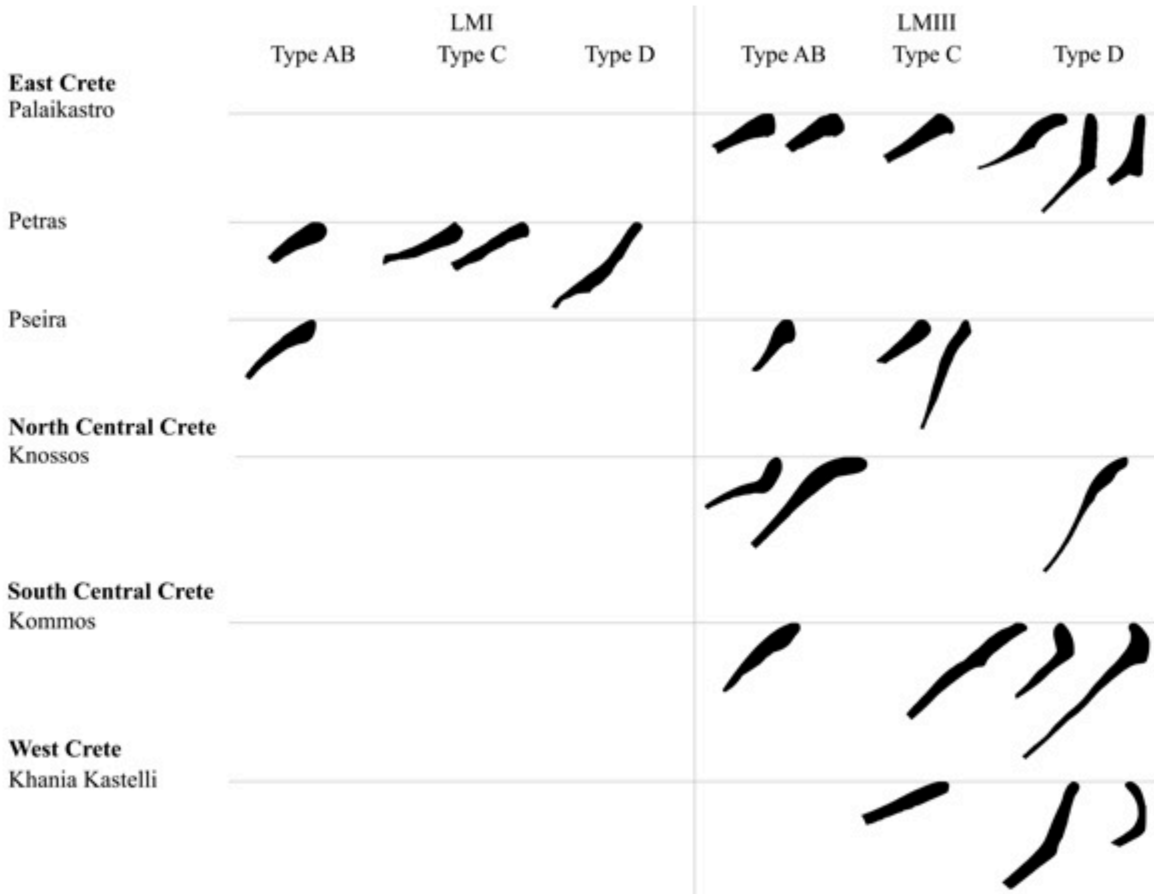


Figure 4.11 LM cooking dish rims.

Chart constructed on published evidence; lack of image in figure does note mean that the shape does not exist at the site. Palaikastro LMIII (Sackett and Popham, 1965:fig. 11:s, q, p; MacGillivray 2007:fig. 4.24:576—578); Petras LMI (Tsipopoulou and Alberti 2011:fig. 43:P90/1582, P90/1579, P90/1595, P90/1547); Pseira LMI (Floyd 1998:ill. 43:C), LMIII (Betancourt, et al. 1997:figs. 2:20, 25, 27); Knossos LMIII (Popham 1984:fig. 16); Kommos (Betancourt 1980:fig. 3:C911; Watrous 1992:figs. 63:1670, 64:1718, 1719); Khania Kastelli LMIII (Hallager 2003:pl. 74:77-P1963, 71-P0758; 2011: pl. 119:70-P0694).

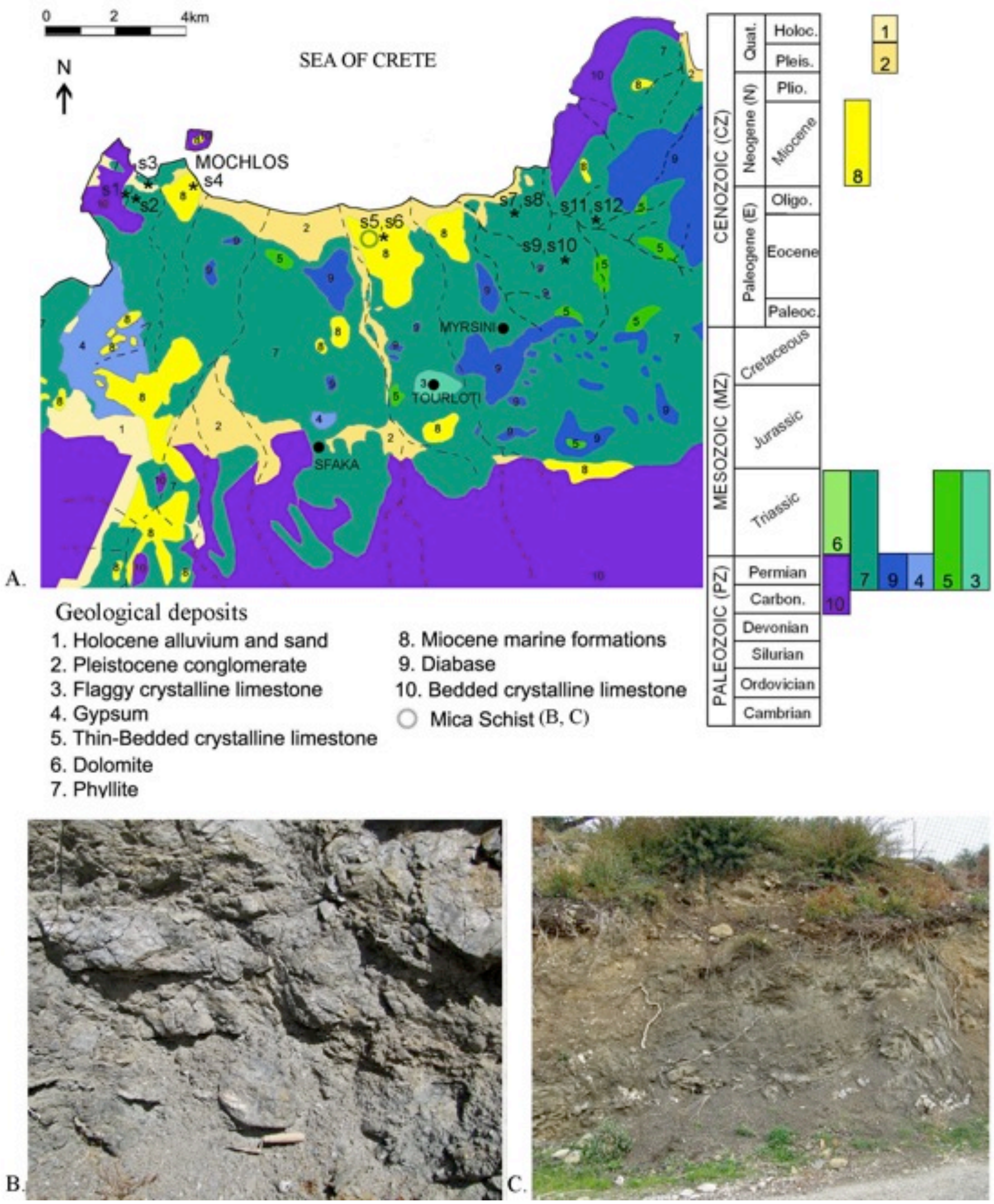


Figure 5.01 Geological map of Mochlos Plain (after Papastamatiou 1959a).

Black stars, "s" plus number, *i.e.*"s1", indicates location and associated catchment of sample. (A) Geological deposits. (B, C) Mica schist deposits that were originally mapped in Miocene deposits.

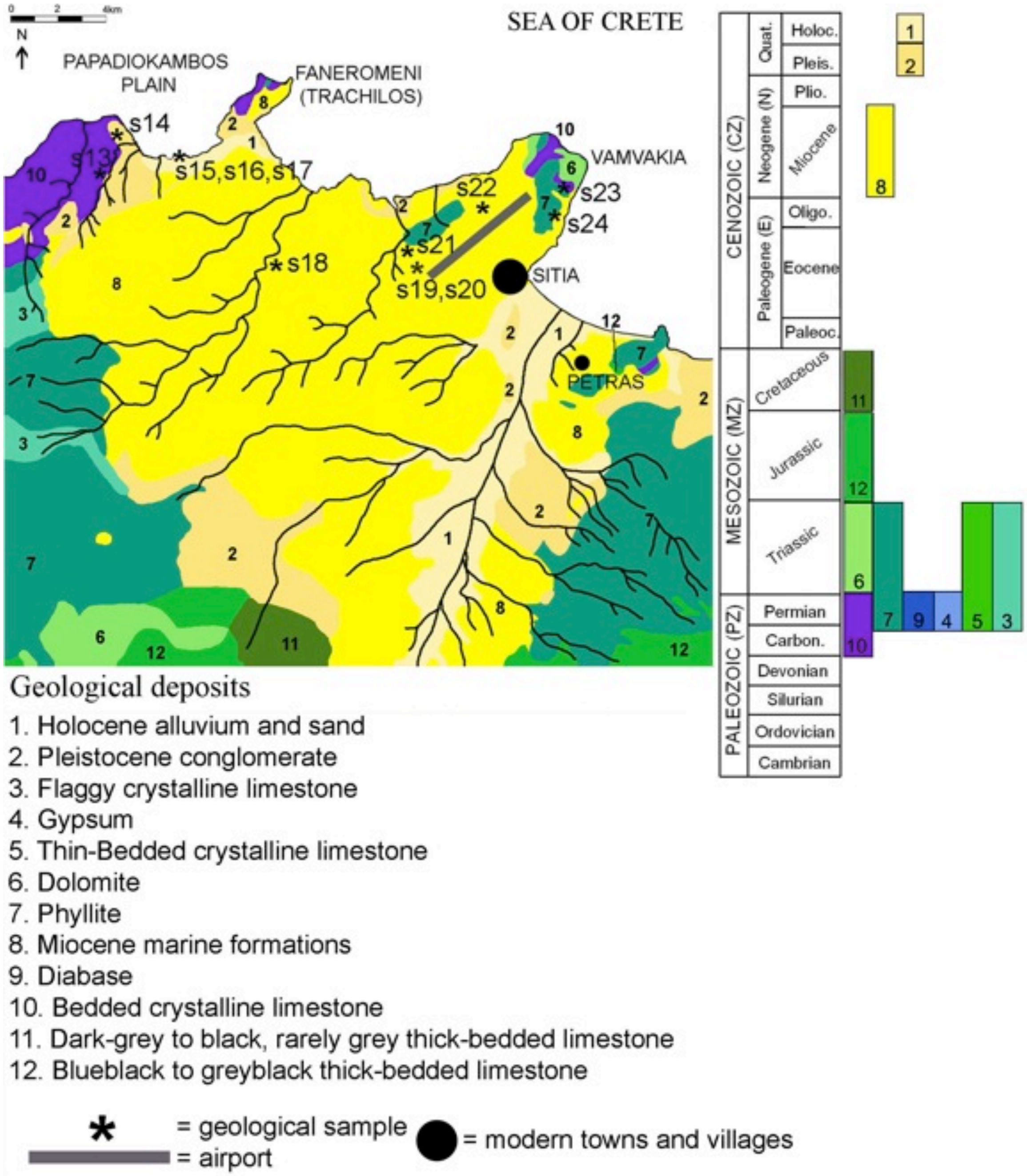


Figure 5.02 Geological map of Papadiokambos Plain and surrounding area of modern city of Sitia (after Papastamatiou 1959b).

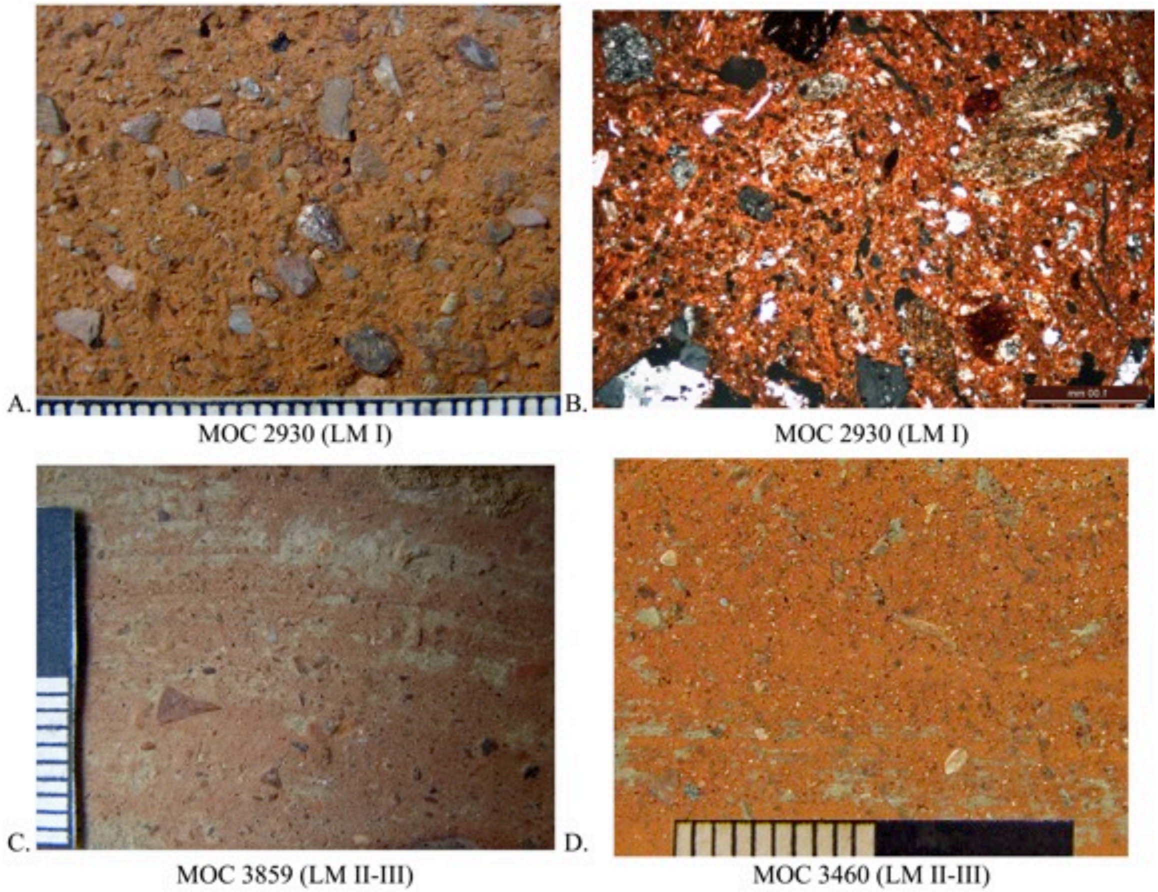


Figure 5.03 Mochlos Low-grade Metamorphic medium-coarse fabric.

Red-brown and purple inclusions: (A) hand-sample; (B) petrographic thin-section width of field in cross-polar. (C) Pink and red-brown inclusions in hand-sample. (D) Red-brown inclusions in hand-sample. Site catalogue numbers and chronology are below each image. Hand-sample with mm scale.

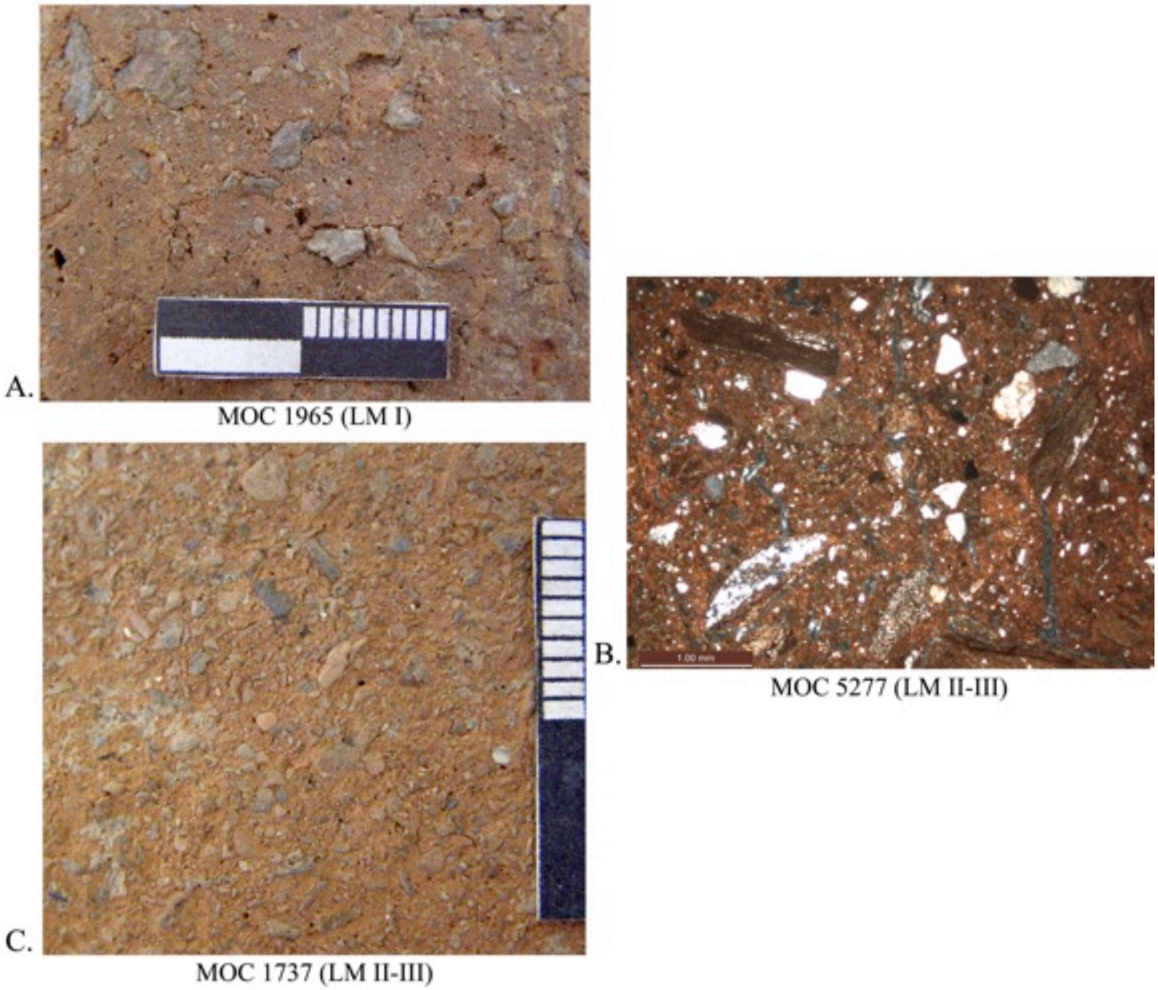


Figure 5.04 Mochlos Low-grade Metamorphic fabric.

(A) Blue-grey inclusions in hand-sample. (C) Red-brown inclusions in hand-sample. (B) Blue-grey and red-brown inclusions (petrographic thin-section width of field in cross-polar). Site catalogue numbers and periods are below images. Hand-sample with mm scale.

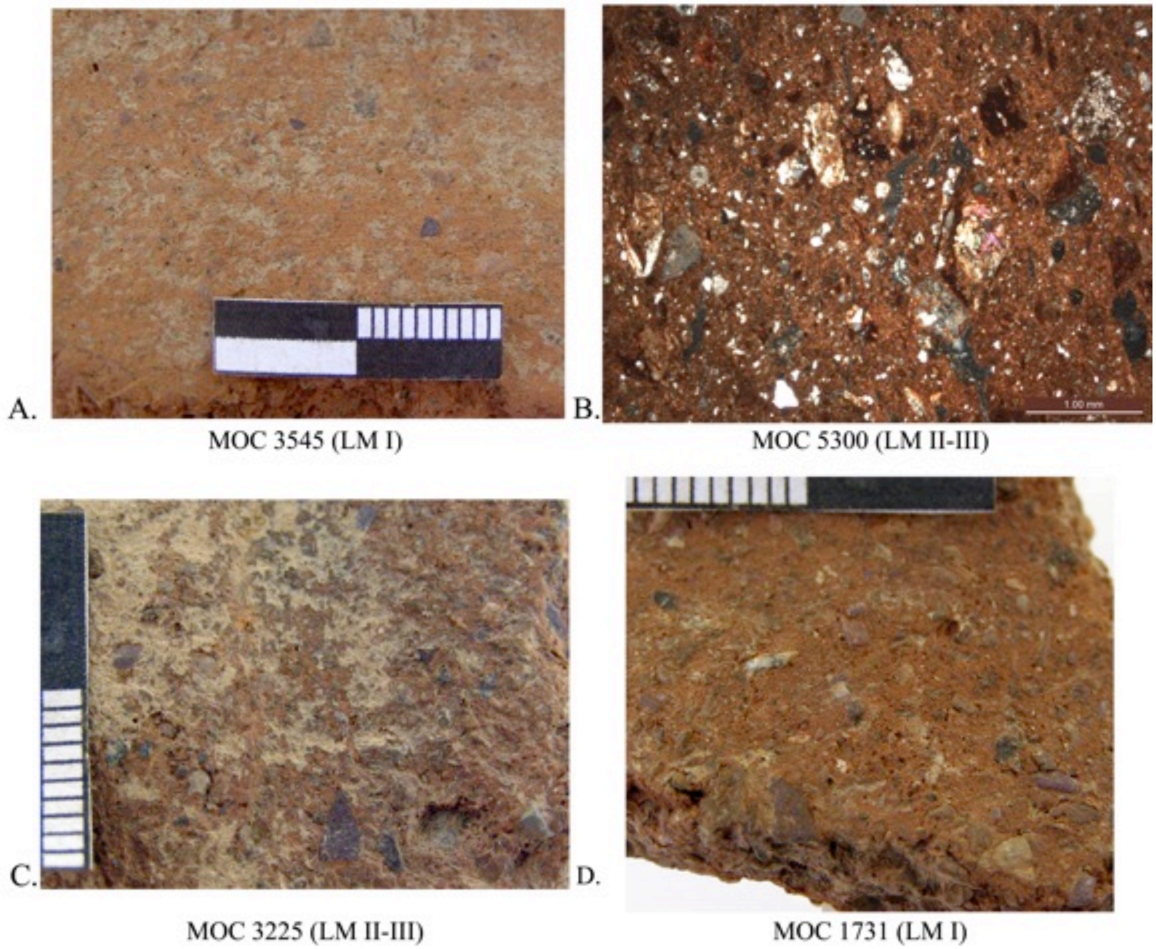


Figure 5.05 Mochlos Low-grade Metamorphic fabric with purple metamorphic inclusions.

(A, C, D) Hand-sample, mm scale; (B) petrographic thin-section width of field in cross-polar. Site catalogue numbers and periods are below images.

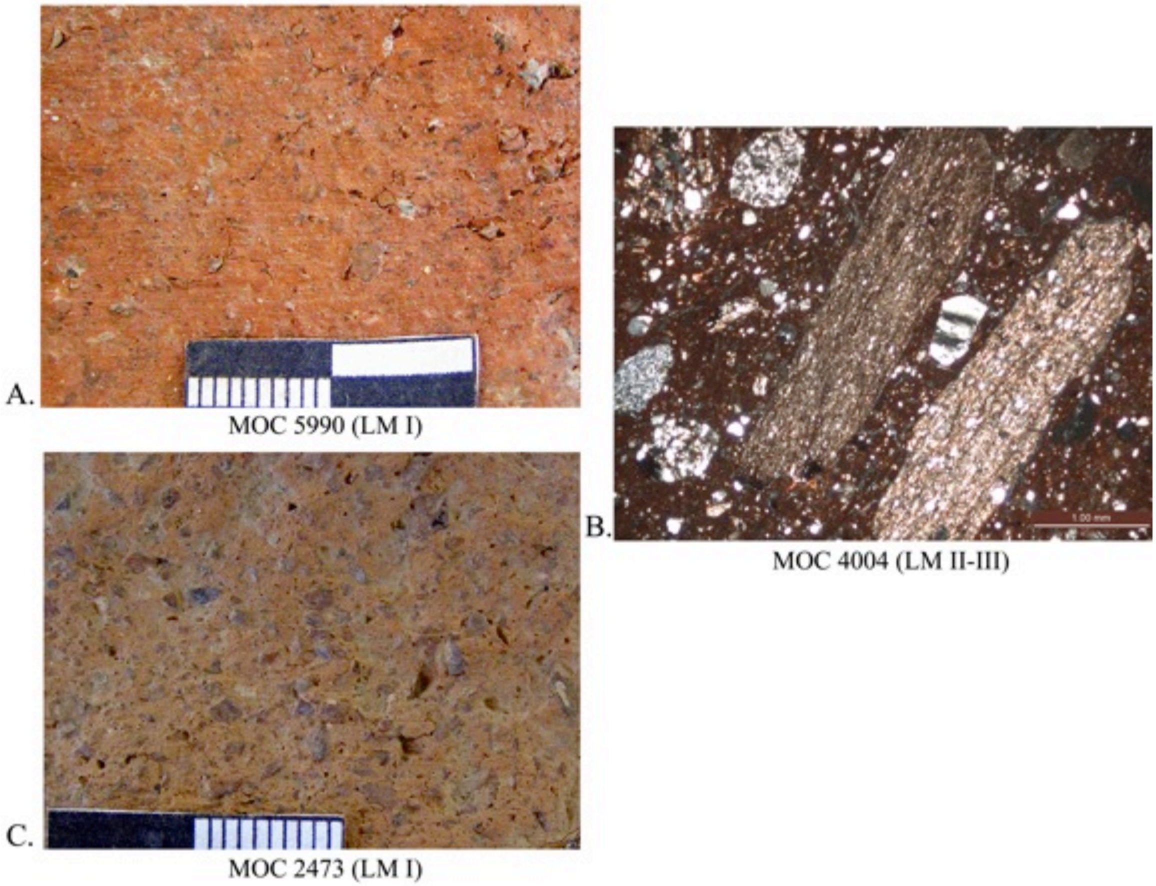


Figure 5.06 Mochlos Low-grade Metamorphic fabric with red-brown metamorphic inclusions.

(A, C) Hand-sample, mm scale; (B) petrographic thin-section width of field in cross-polar. Site catalogue numbers and periods are below images.

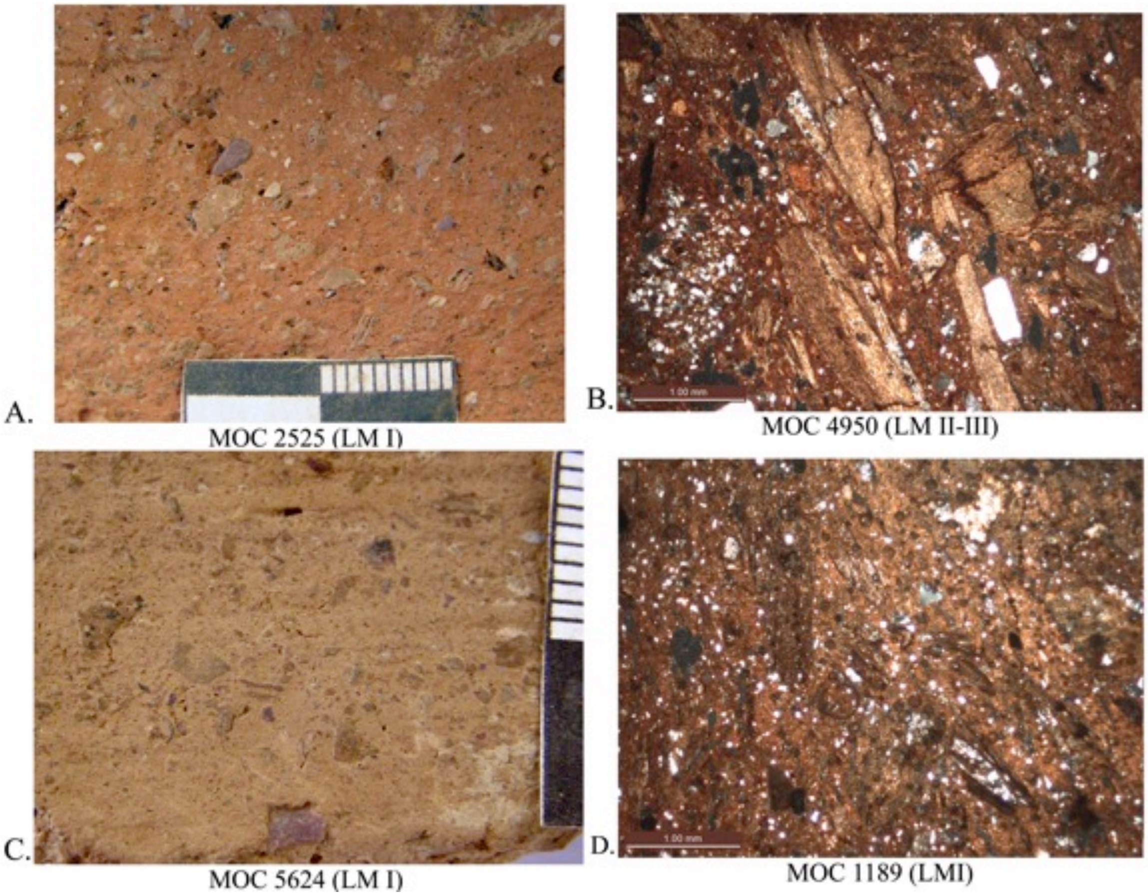


Figure 5.07 Mochlos Low-grade Metamorphic fabric with red-brown and purple metamorphic inclusions.

(A, C, D) Hand-sample, mm scale; (B) petrographic thin-section width of field in cross-polar. Site catalogue numbers and periods are below images.

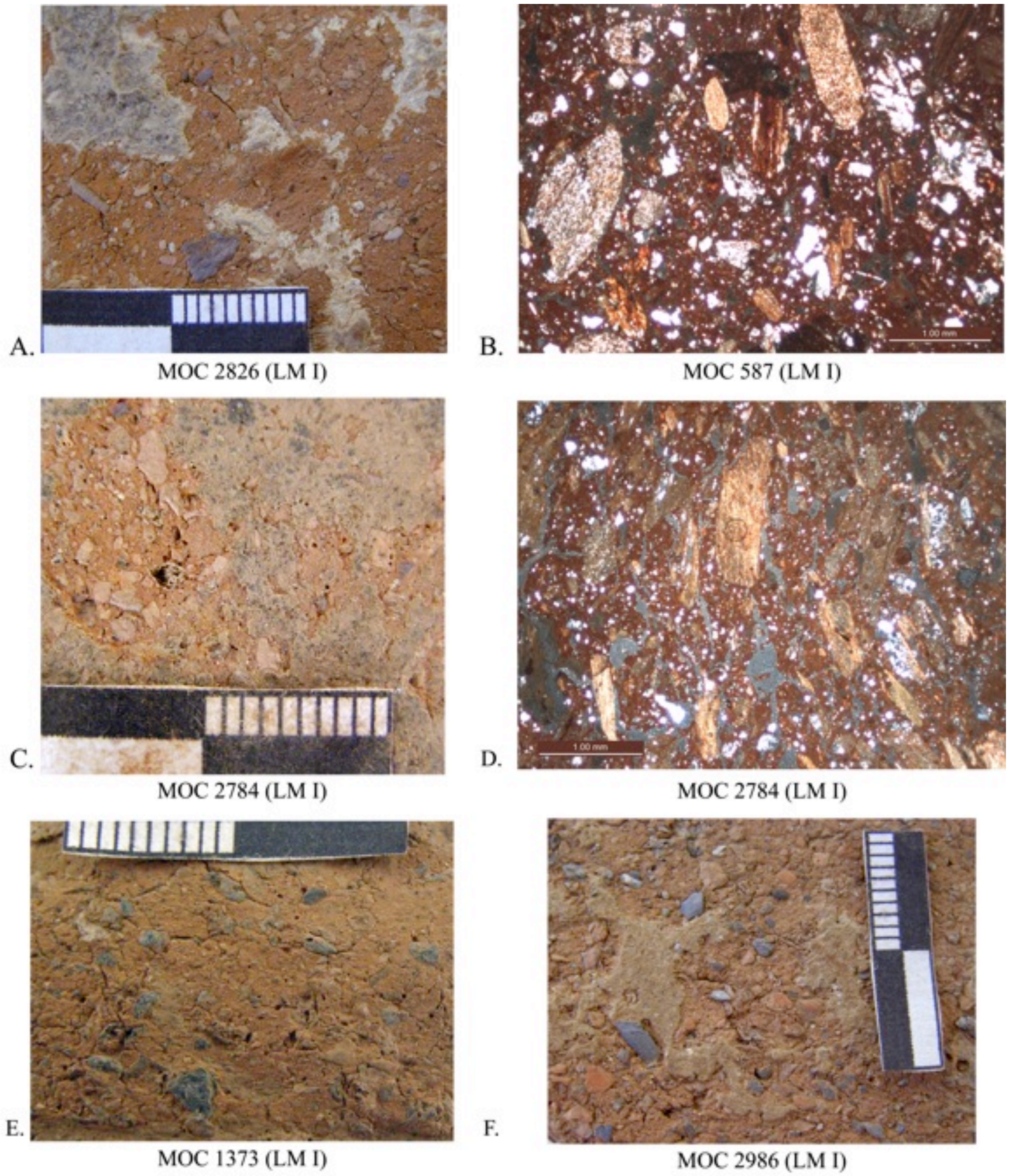
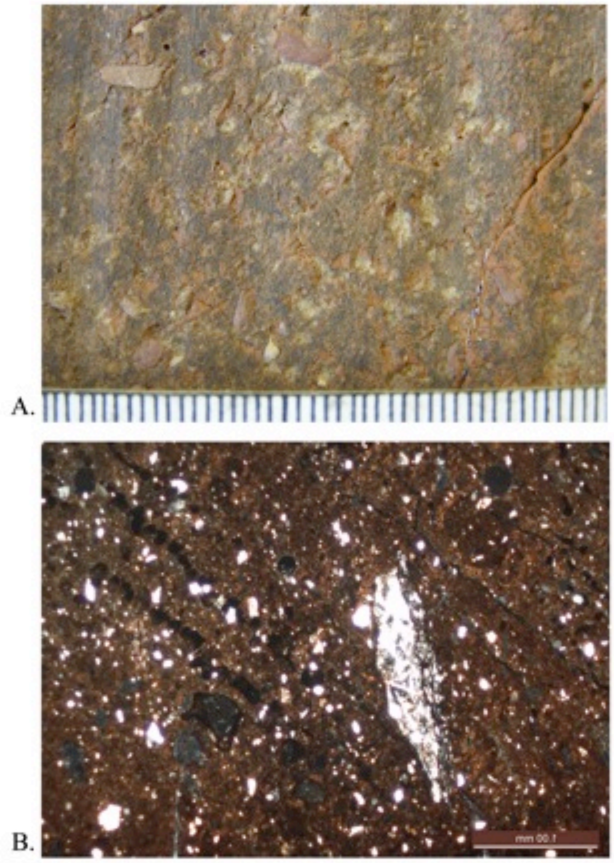


Figure 5.08 Mochlos Low-grade Metamorphic fabric with pink, red-brown and purple metamorphic inclusions.

(A, C, E, F) Hand-sample, mm scale; (B, D) petrographic thin-section width of field in cross-polar. Site catalogue numbers and periods are below images.



MOC 2326 (LM I)

Figure 5.09 Mochlos Low-grade Metamorphic medium-coarse with silver mica, red-brown and purple metamorphic inclusions.

(A) Hand-sample, mm scale; (B) petrographic thin-section width of field in cross-polar. Site catalogue number and period underneath images.

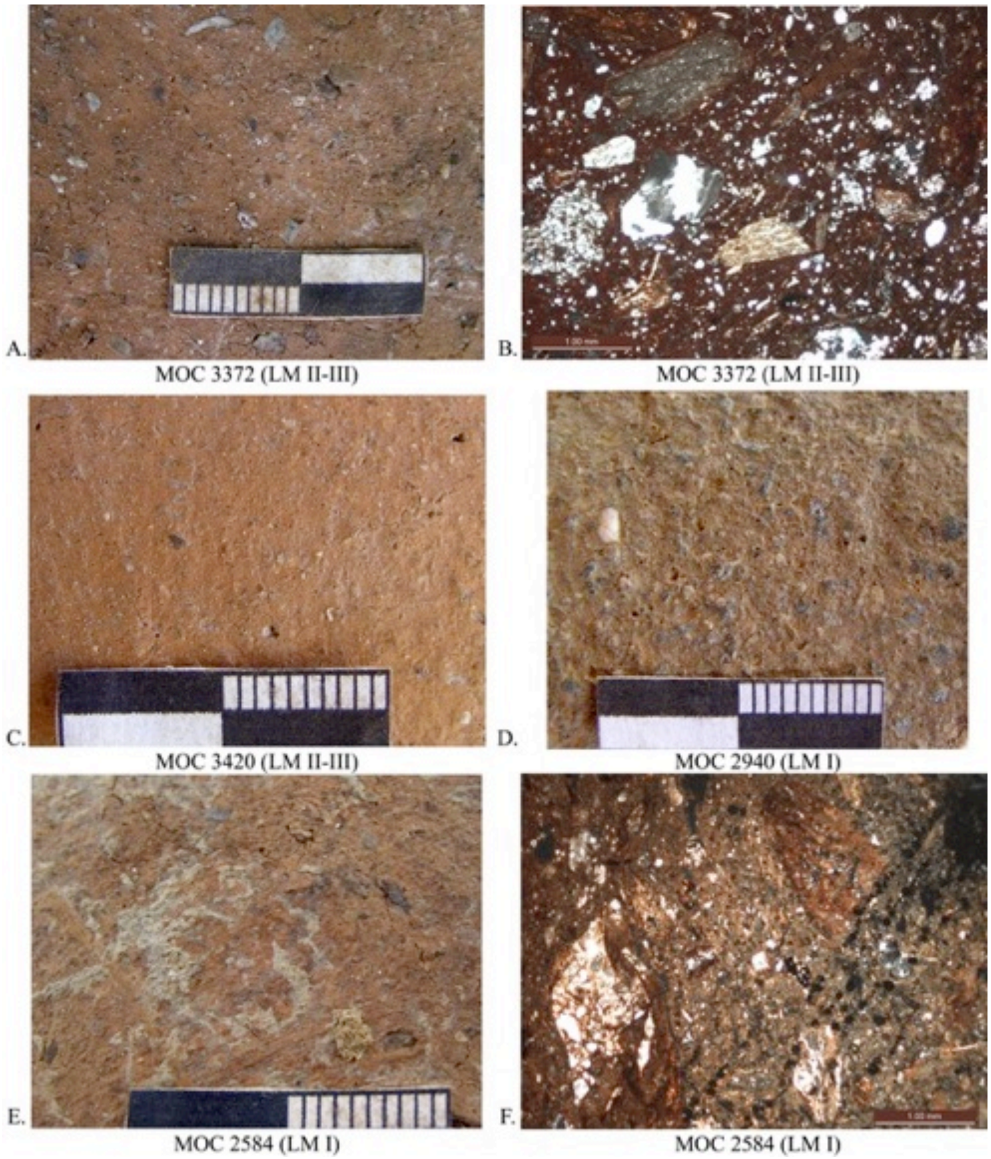


Figure 5.10 Mochlos Low-grade Metamorphic with silver mica fabric.

Blue-green-gray and red-brown inclusions: (A) hand-sample; (B) petrographic thin-section width of field in cross-polar. (D) Red-brown inclusions, hand-sample. Red-brown and purple inclusions: (E) hand-sample; (F) petrographic thin-section width of field in cross-polar. Site catalogue numbers and periods are below images. Hand-sample with mm scale.

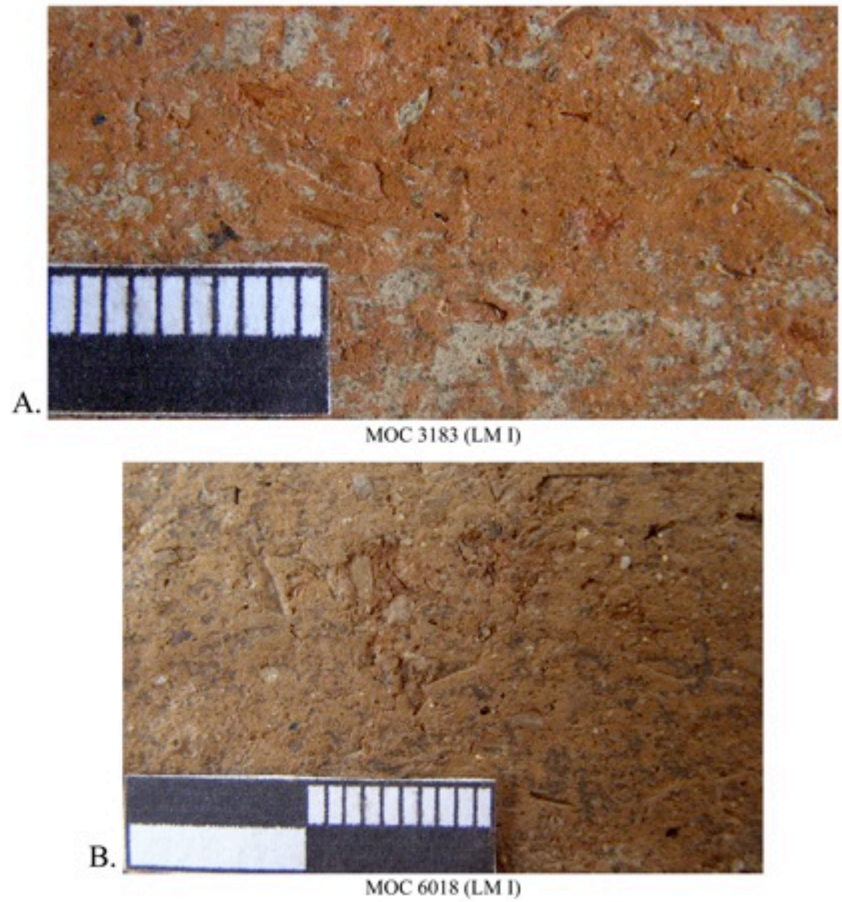


Figure 5.11 Mochlos Low-grade Metamorphic with chaff-temper fabric.

(A) Red-brown inclusions, hand-sample. (B) Purple inclusions, hand-sample. Hand-sample with mm scale. Site catalogue numbers and periods are below images.

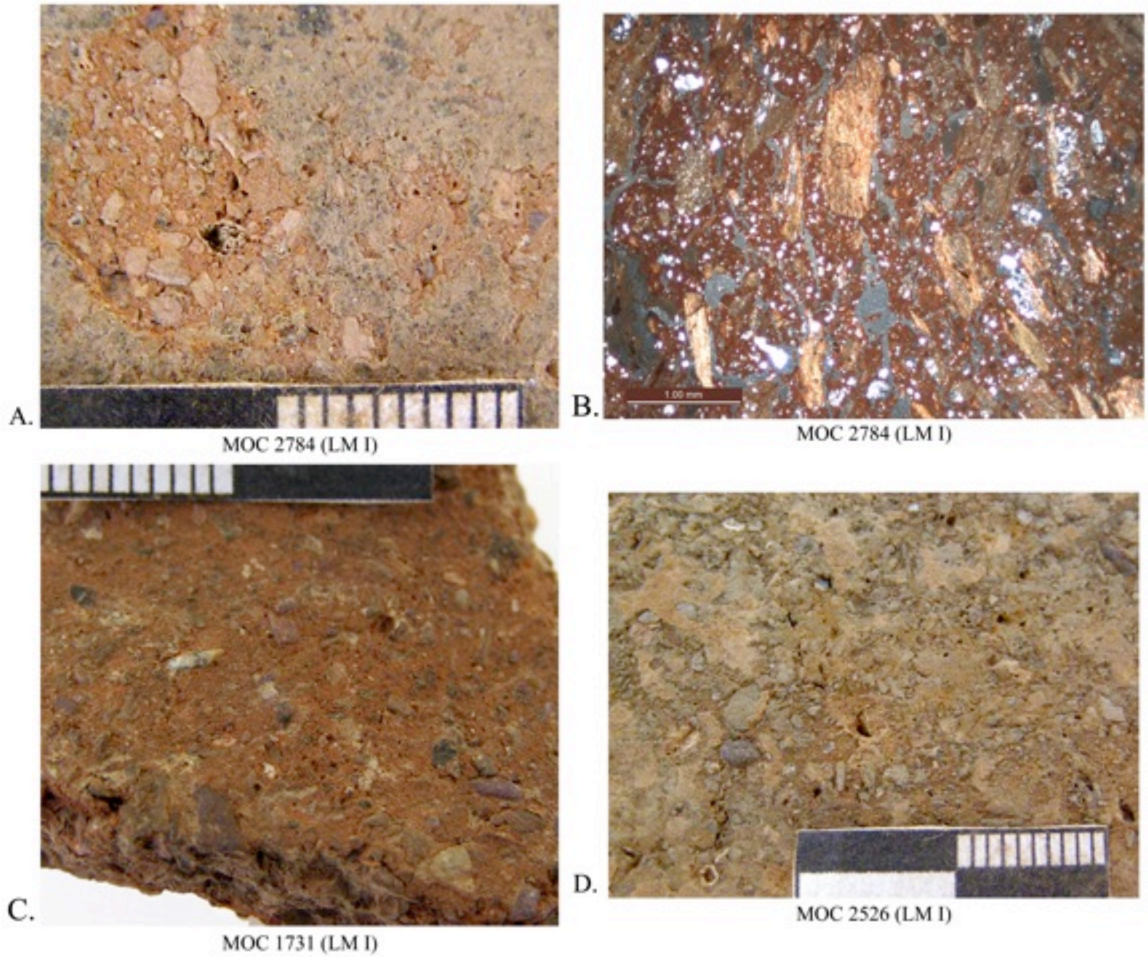


Figure 5.12 Mochlos Low-grade Metamorphic with calcareous inclusions.

(A—C) Pink and purple metamorphic inclusions. (D) Purple metamorphic inclusions. (A, C, D) Hand-sample with mm scale. (B) Petrographic thin-section width of field in cross-polar. Site catalogue numbers and periods are below images.

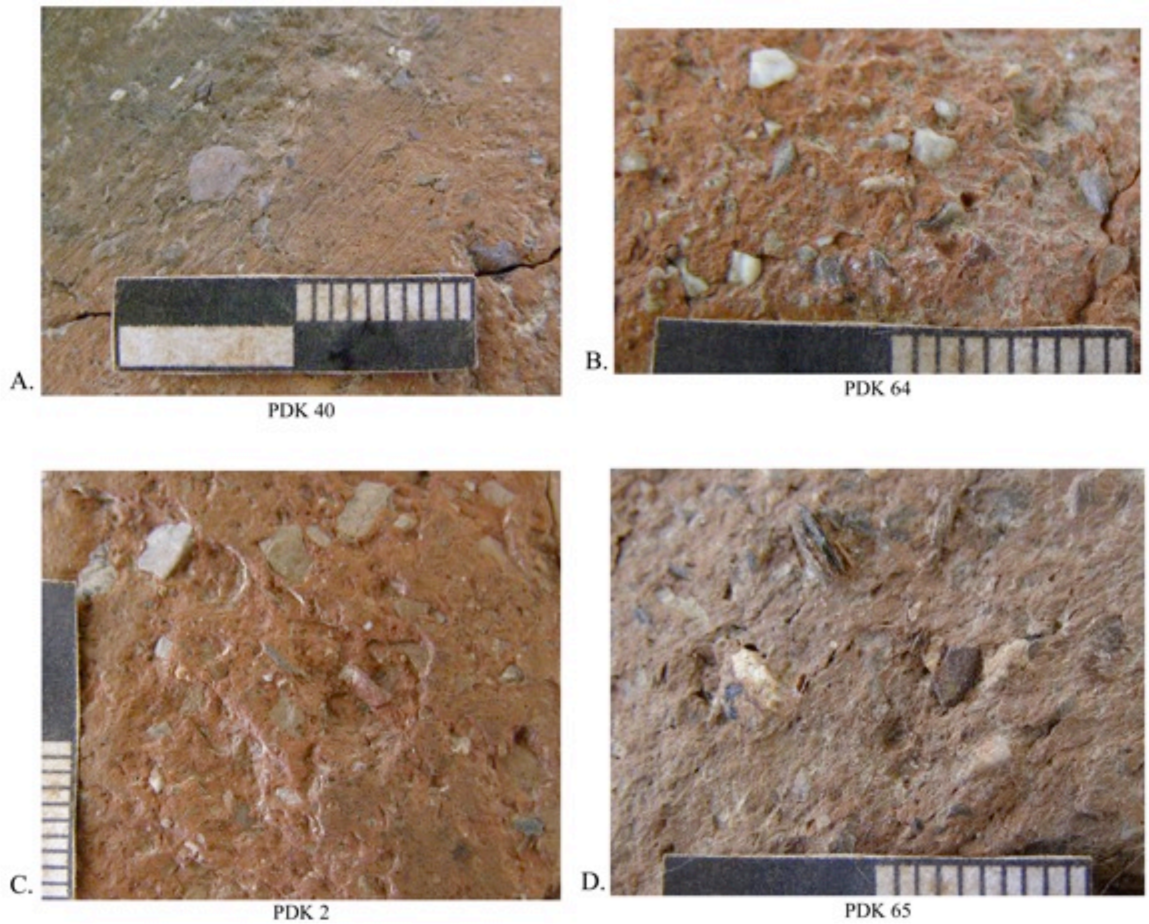


Figure 5.13 Papadiokambos macroscopic fabrics.

(A, B) Fabric 1. (C) Fabric 2. (D) Fabric 3. Hand-sample, mm scale. Site and catalogue numbers are below images.

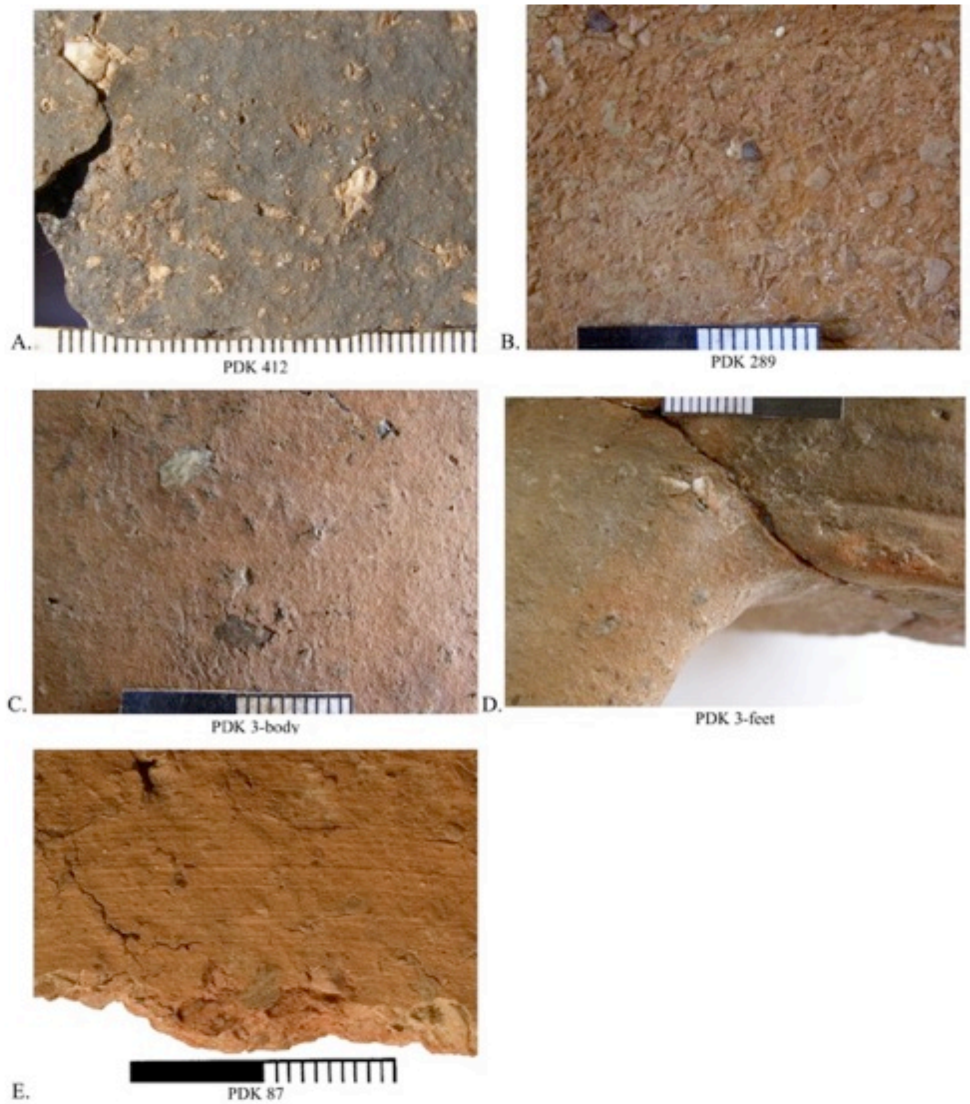


Figure 5.14 Papadiokambos macroscopic fabrics.

(A) Fabric 4. (B) Fabric 5. (C, D) Fabric 6. (E) Fabric 7. Hand-sample, mm scale. Site and catalogue numbers are below images.

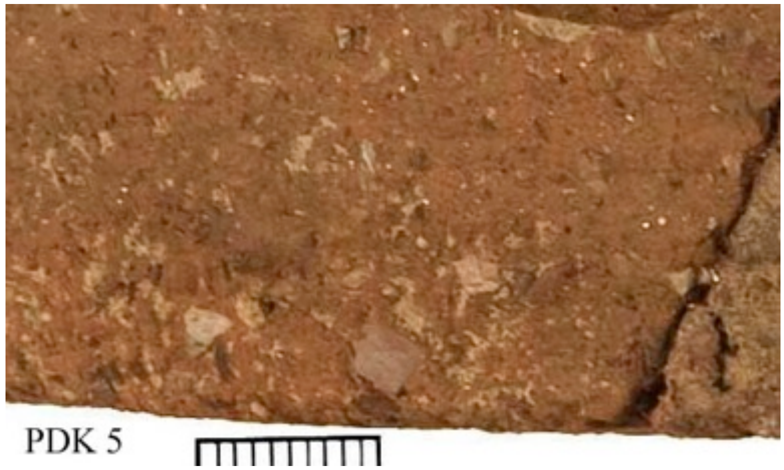


Figure 5.15 Papadiokambos macroscopic fabric.

Fabric 8. Hand-sample, mm scale. Site and catalogue number is below image.

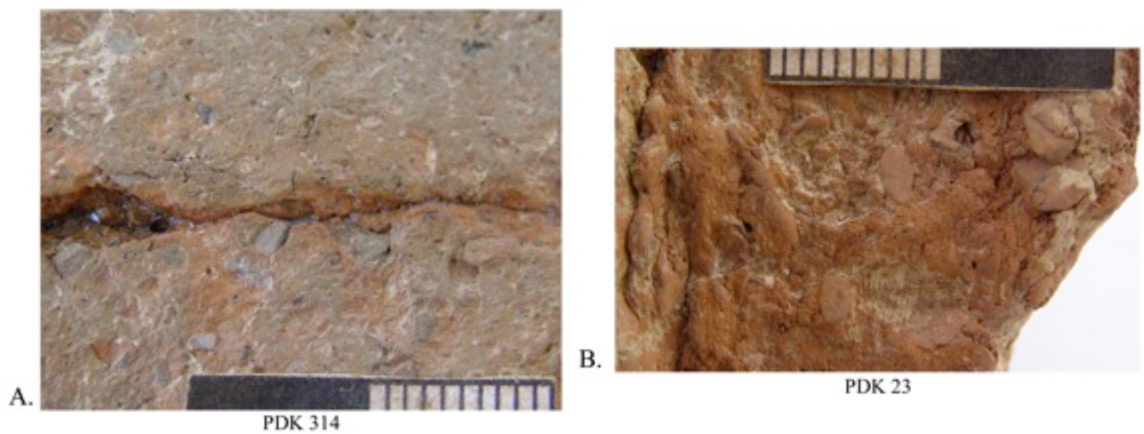
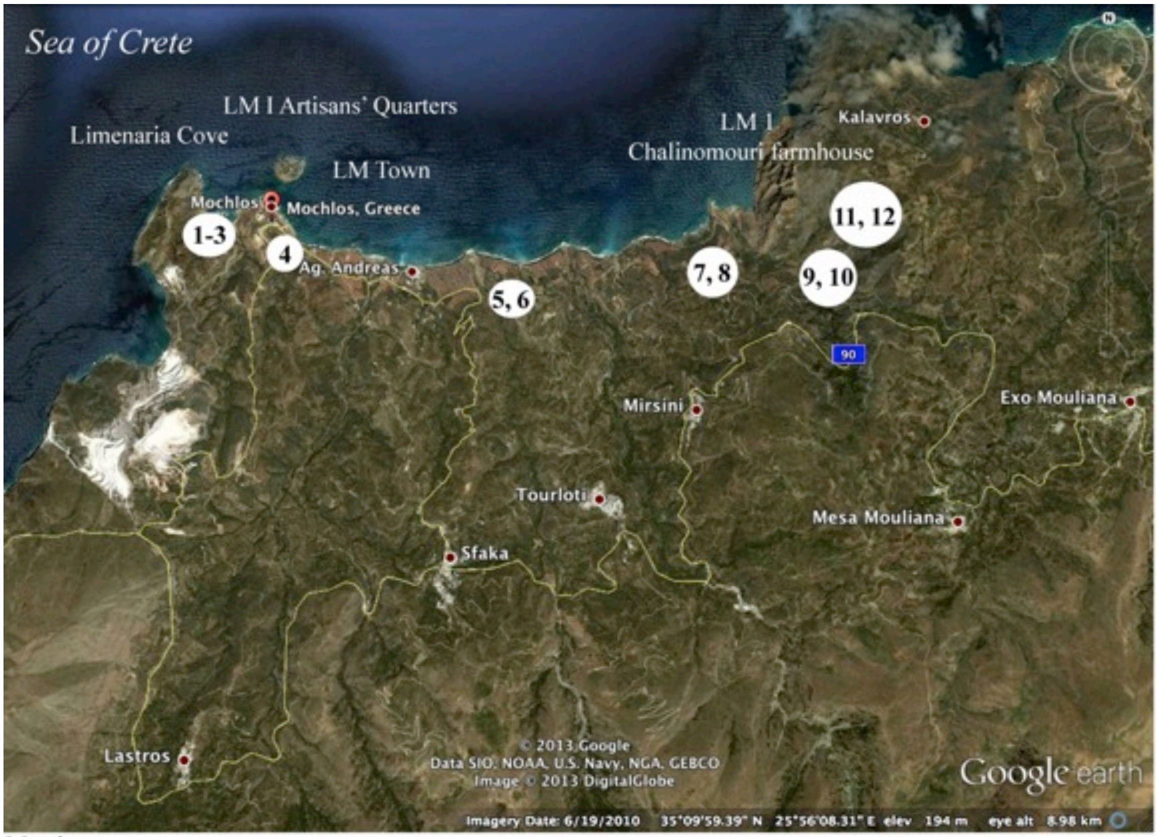


Figure 5.16 Papadiokambos macroscopic fabrics.

Fabric 9—(A) Coarse A, (B) Coarse B. Hand-sample, mm scale. Site and catalogue numbers are below images.



Map key:
Sample 1 = Purple Phyllite Hill Clay (PPH-C)
Sample 2 = Development Red Clay (DR-C)
Sample 3 = Marina Metamorphic Rocks (MM-R)
Sample 4 = Eleanor's House Clay (EH-C)
Sample 5 = Silver Mica-schist a (SM-Sa)
Sample 6 = Silver Mica-schist b (SM-Sb)
Sample 7 = Tower Road Red Clay (VTR-C)
Sample 8 = Tower Road Red Rock (VTR-R)
Sample 9 = Chalinomouri Metamorphic Rock a (CH-Ra)
Sample 10 = Chalinomouri Metamorphic Rock b (CH-Rb)
Sample 11 = Chalinomouri Purple Phyllite Clay a (CHPP-Ca)
Sample 12 = Chalinomouri Purple Phyllite Clay b (CHPP-Cb)

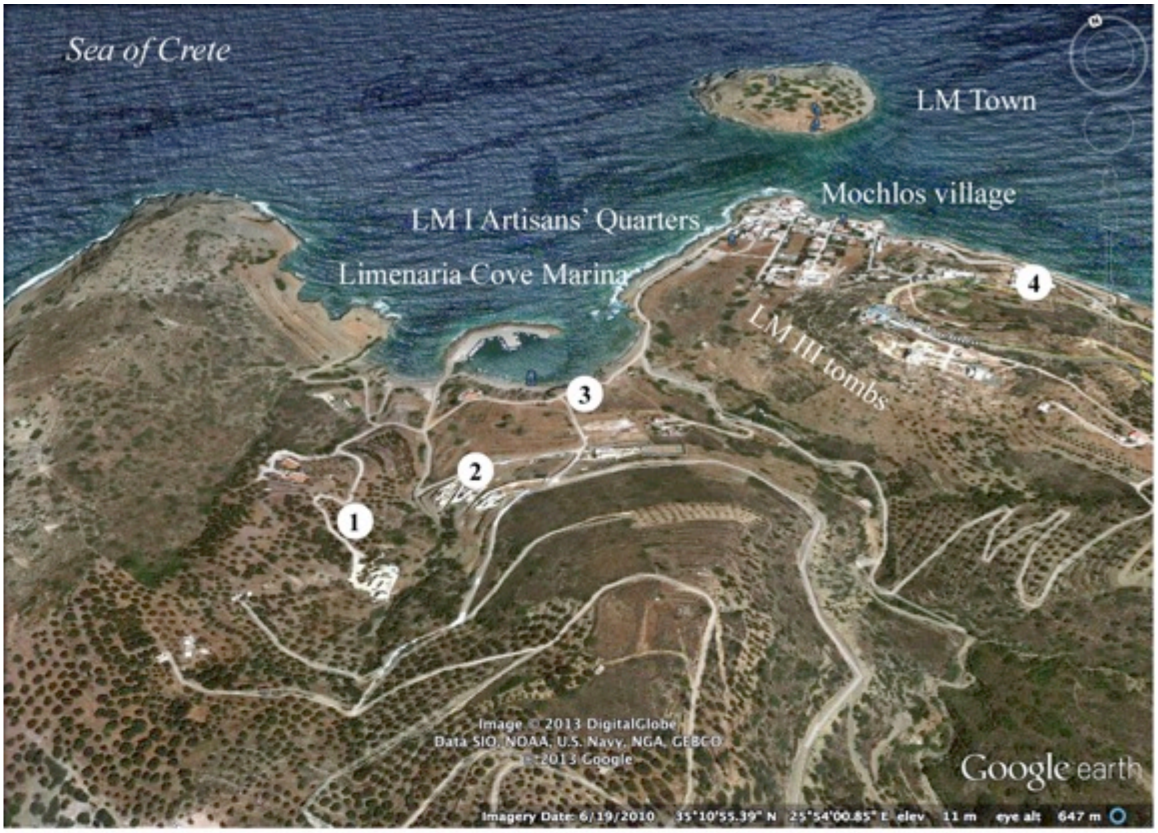
Figure 5.17 Mochlos Plain (Google earth 2013).

Location of geological samples 1-12.

Map key:
Sample 13 = I Clay (I-C)
Sample 14 = II Clay (II-C)
Sample 15 = III Red Clay (III-RC)
Sample 16 = III Tan Clay (III-TC)
Sample 17 = III Sand (III-S)
Sample 18 = Agii Pantes Gorge Clay (APG-C)
Sample 19 = Ea Clay (Ea-C)
Sample 20 = Eb Clay (Eb-C)
Sample 21 = Ec Rock (Ec-R)
Sample 22 = Airport Road Red Clay (ARR-C)
Sample 23 = C Red Clay (C-RC)
Sample 24 = D Red Clay (D-RC)

Figure 5.18 Papadiokambos Plain and modern city of Sitia (Google earth 2013).

Location of geological samples 13-24.



Map key:
Sample 1 = Purple Phyllite Hill Clay (PPH-C)
Sample 2 = Development Red Clay (DR-C)
Sample 3 = Marina Metamorphic Rocks (MM-R)
Sample 4 = Eleanor's House Clay (EH-C)

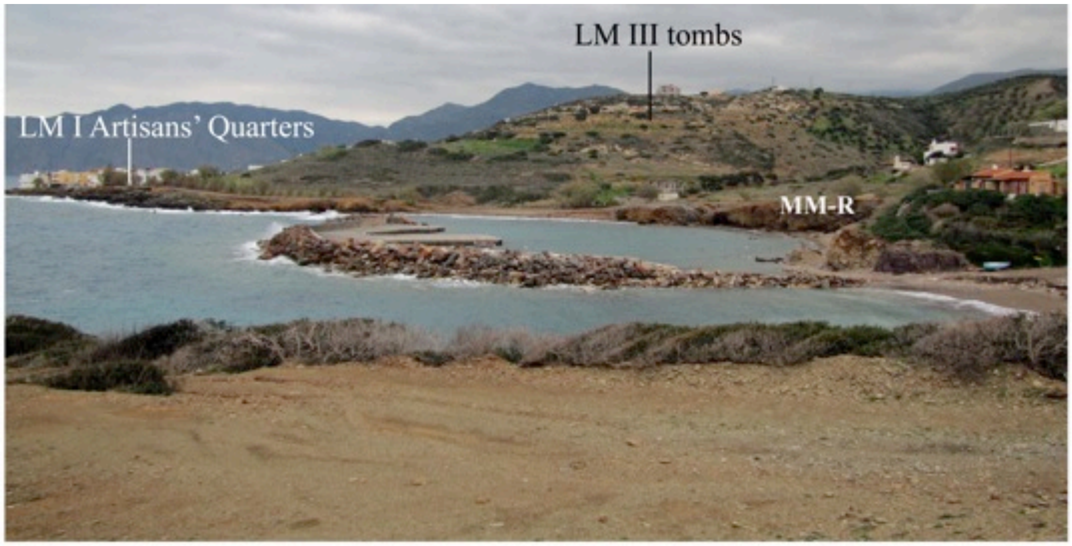
Figure 5.19 Western end of Mochlos Plain (Google earth 2013).

Location of geological samples 1-4.

Figure 5.20 Collecting clay at Mochlos Limenaria Cove, 2007.

(A) Standing at sample 1 [Purple Phyllite Hill clay (PPH-C)] looking east towards marina (sample 3), housing development that partially covers sample 2 [Development Red clay (DR-C)], and Mochlos. (B) Sample 2 exposed by construction. (C) Sample 1 exposed by road cut.

A.



B.

Figure 5.21 Standing at sample 3 [Marine Metamorphic Rocks (MM-R)], Mochlos Limenaria Cove marina, 2007.

(A) Standing at marina looking east towards Mochlos village, Artisans' Quarters LMI, and tombs LMII-III. (B) Marina Metamorphic rock sea cliff exposures south of the marina (sample 3).

Figure 5.22 Sample 4 [Eleanora's House clay (EH-C)], 2007.

(A) House foundation exposing ancient seabed, Miocene marine deposit (sample 4, EH-C, EH-R); it is covering by red soil. Scale: Giorgos Serkavkis ca.100 cm tall. (B) Standing in Mochlos village looking south.

Map key:
Sample 5 = Silver Mica-schist a (SM-Sa)
Sample 6 = Silver Mica-schist b (SM-Sb)

Figure 5.23 Central area of the Mochlos Plain with road leading towards Sfaka village (Google earth 2013).

Location of geological samples 5 and 6.

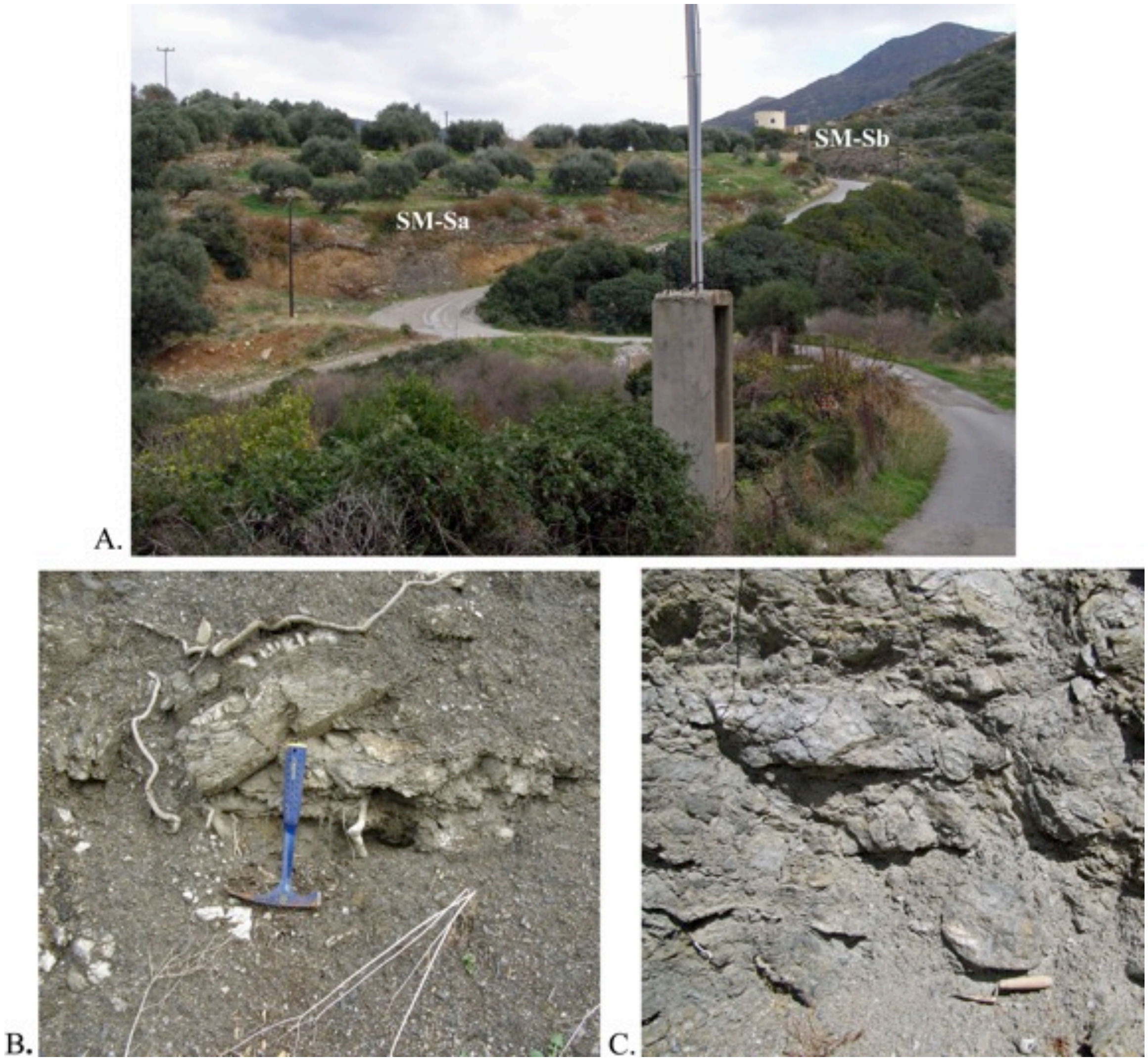


Figure 5.24 Samples 5 and 6 [Silver Mica-schist a, b (SM-Sa, SM-Sb)], 2009.

(A) Standing at junction between the road to Sfaka village and a field road that is parallel to the sea in the Mochlos Plain looking at samples 5 and 6. (B) Sample 5 is at the middle road bend and is flanked by brown-red soil (scale: Estwing chipping hammer is 28 cm long). (C) Sample 6 is at far road bend (Marshalltown trowel is 25 cm long.) Samples exposed by road cut.

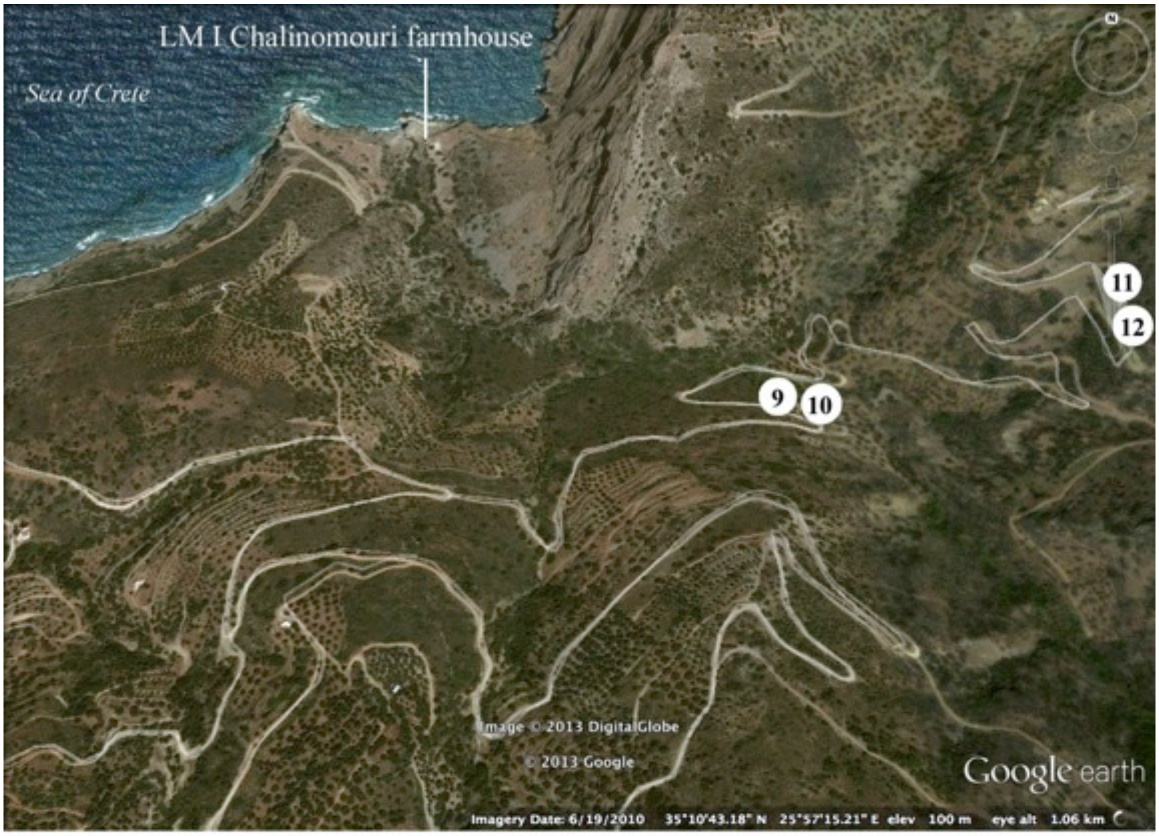
Map key:
Sample 7 = Tower Road Red Clay (VTR-C)
Sample 8 = Tower Road Red Rock (VTR-R)

Figure 5.25 Eastern end of the Mochlos Plain near Venetian Tower (Google earth 2013).

Location of geological samples 7 and 8.

Figure 5.26 Samples 7 and 8 [Venetian Tower Road Red clay, rocks (TTR-C, TRR-R)], 2009.

(A) Venetian Tower Road Red clay (sample 7) and metamorphic rocks (sample 8) in the Mochlos Plain. (B) Clay and (C) metamorphic rocks exposed by road cut. Scale: Estwing chipping hammer is 28 cm long.



Map key:
Sample 9 = Chalinomouri Metamorphic Rock a (CH-Ra)
Sample 10 = Chalinomouri Metamorphic Rock b (CH-Rb)
Sample 11 = Chalinomouri Purple Phyllite Clay a (CHPP-Ca)
Sample 12 = Chalinomouri Purple Phyllite Clay b (CHPP-Cb)

Figure 5.27 Eastern end of Mochlos Plain and Ornos Mountain foothills surrounding the coastal LMI Chalinomouri Farmhouse (Google earth 2013).

Location of samples 9—12 collected.

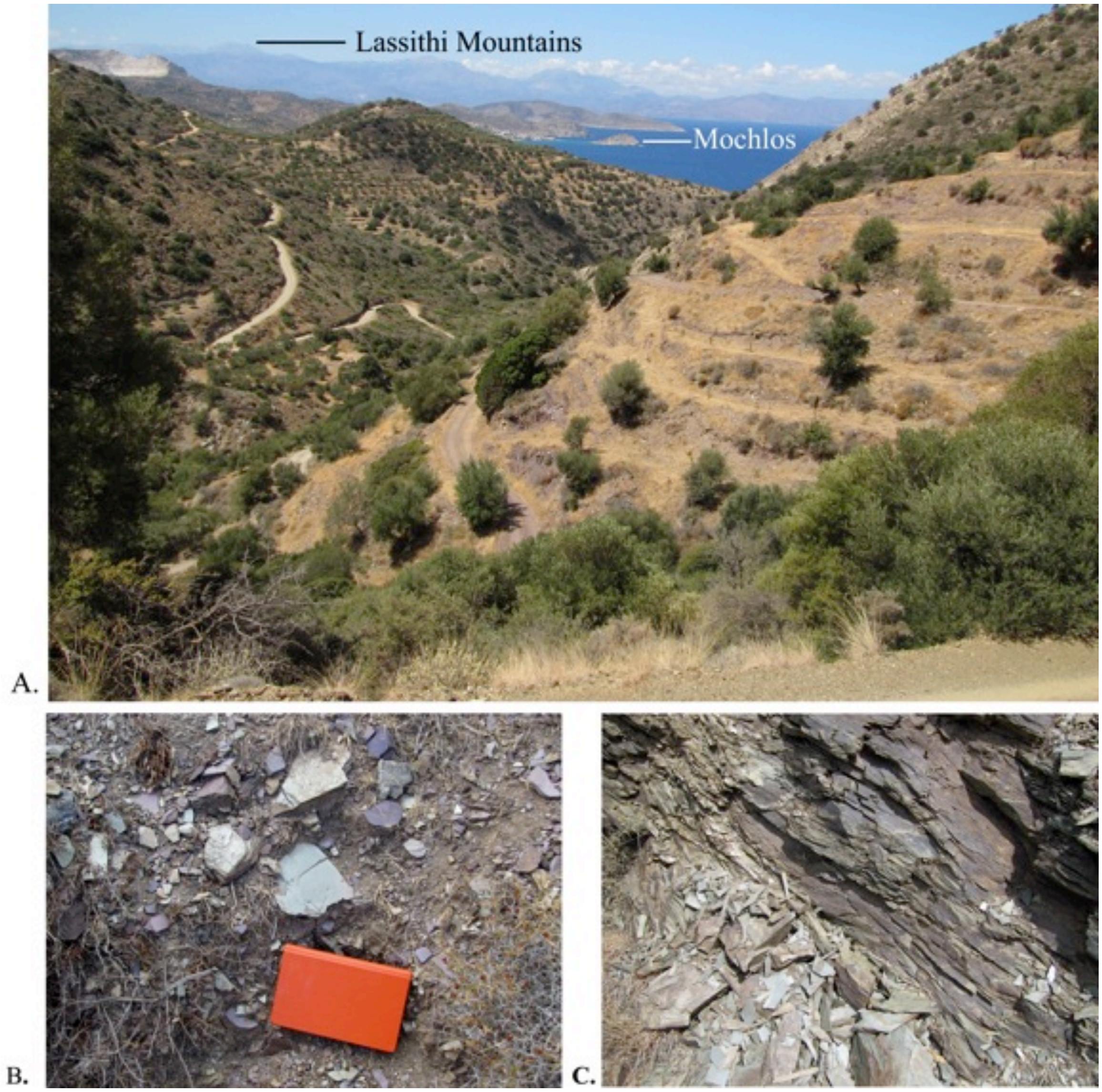


Figure 5.28 Samples 9 and 10 [Chalinomouri Rock a, b (CH-Ra, CH-Rb)], 2009.

(A) Eastern end of Mochlos Plain standing in Ornos Mountain foothills above the coastal LMI Chalinomouri farmhouse looking west towards Mochlos village and Lassithi Mountains. (B) Metamorphic rocks (sample 9): green, blue-gray, purple phyllite. Scale: Forestry Suppliers field book is 11.4 x 18.4 cm. (C) Green, blue-gray, and brown phyllite/slate (sample 10). Samples exposed by road cut.

Figure 5.29 Samples 9 and 10 [Chalinomouri Purple Phyllite clay (CHPP-Ca, CHPP-Cb)], 2009.

(A) Samples 9 and 10 located in Ornos Mountain foothills on the eastern end of Mochlos Plain. (B) Samples 9 and 10 are derived from phyllite. Scale: Estwing chipping hammer is 28 cm long. (C) Green-tan and purple phyllite contact; sample 10 derived from rock below. Scale: Forestry Suppliers field book is 11.4 x 18.4 cm. Samples exposed by road cut.

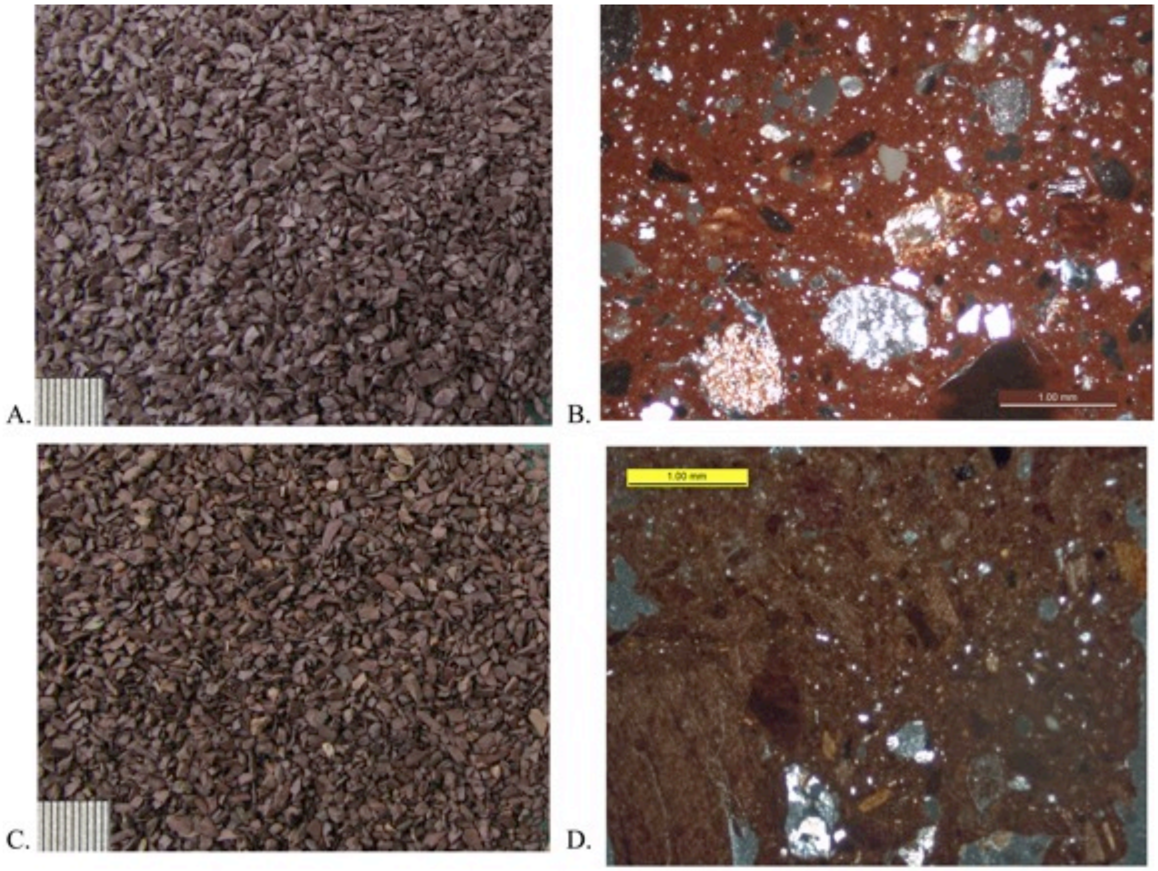


Figure 5.30 Mochlos Plain purple clay samples 1 and 10 cleaned and prepared.

Sample 1 (PPH-C): (A) metamorphic fragments from sample wet sieved through 2 mm screen, (B) fired clay sample with inclusions removed larger than 2 mm in petrographic thin-section width of field in cross-polar. Sample 10 (CHPP-C): (C) metamorphic fragments from sample wet sieved through 2 mm screen, (D) fired clay sample to 750°-850°C with inclusions removed larger than 2 mm in petrographic thin-section width of field in cross-polar. Hand-sample scale with mm.

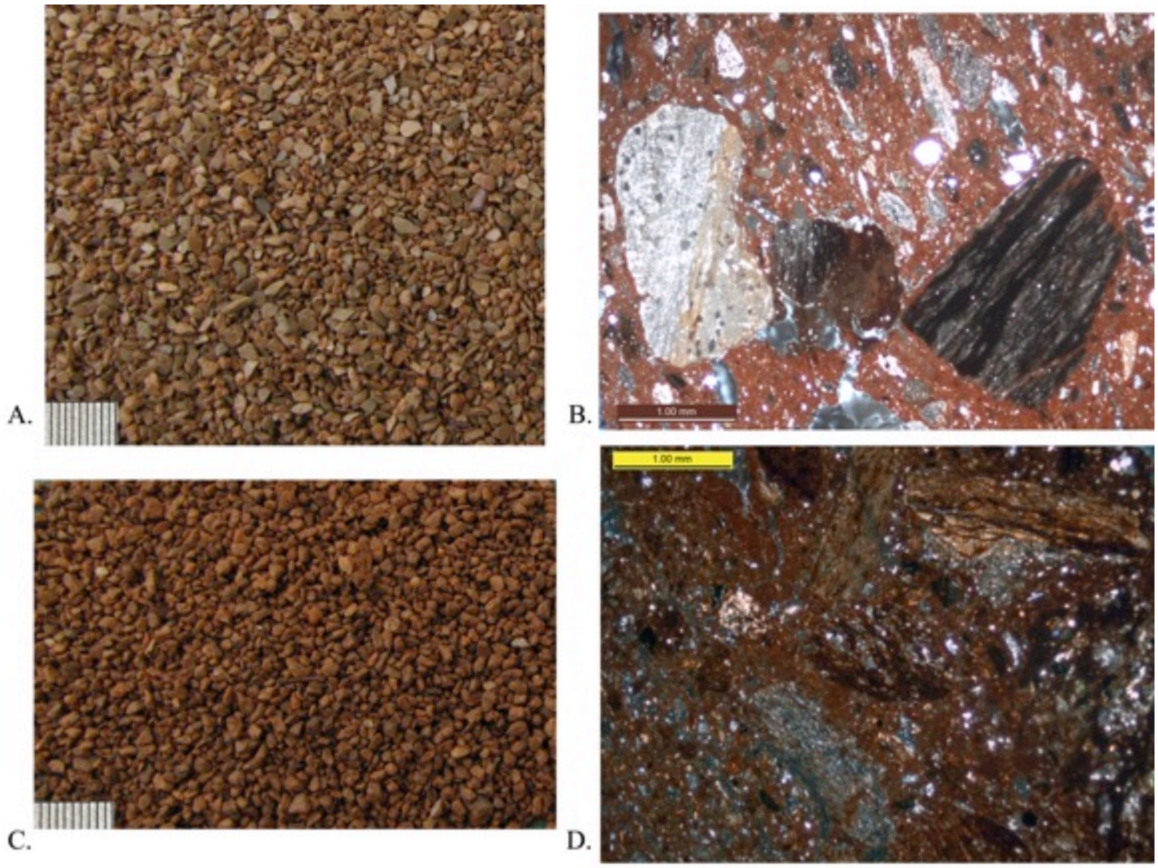


Figure 5.31 Mochlos Plain purple clay samples 2 and 7 cleaned and prepared.

Sample 2 (DR-C): (A) metamorphic fragments from sample wet sieved through 2 mm screen, hand-sample; (B) fired clay in petrographic thin-section width of field in cross-polar. Sample 7 (VTR-C): (C) metamorphic fragments from sample wet sieved through 2 mm screen, hand-sample; (D) fire clay to 750°-850°C with inclusions removed larger than 2 mm in petrographic thin-section width of field in cross-polar. Hand-sample scale with mm.

A.  B. 

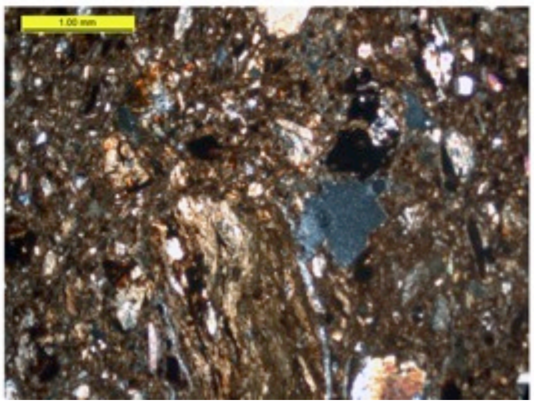
C.  D. 

Figure 5.32 Mochlos Plain silver mica-schist sample 5 cleaned and prepared.

(A) Metamorphic fragments from sample wet sieved through 2 mm screen, handle-sample; material from sample wet sieved through >0.5 mm screen. Fired SM-Sa sample to 750°-850°C with inclusions removed larger than 2 mm—(C) in petrographic thin-section width of field in cross-polar, (D) hand-sample. Hand-sample scale with mm.

Map key:
Sample 13 = I Clay (I-C)
Sample 14= II Clay (II-C)
Sample 15=III Red Clay (III-RC)
Sample 16=III Tan Clay (III-TC)
Sample 17=III Sand (III-S)

Figure 5.33 Liopetra uplands and Papadiokambos Plain (Google earth 2013).

Location of geological samples 13-17.

Figure 5.34 Papadiokambos samples 13 and 14 [I-Clay (IC), II-Clay (IIC)], 2009.

(A) Standing in Liopetra uplands on the western end of the Papadiokambos Plain looking towards samples 13 and 14. (B) Sample 13 (I-C), scale Greek soil pick is 35 cm long (C). Sample 14 (II-C), scale Greek soil scraping tool is 18 cm long. Samples exposed by road cut.

A.

B.

Figure 5.35 Sub-rounded and sub-angular rock fragments removed by wet sieving Papadiokambos red clay samples 13 and 14 (IC, IIC).

(A) Sample 13, (I-C). (B) Sample 14, (II-C). Scale in mm.

Figure 5.36 Papadiokambos samples 15 and 16 [tan clay (III-TC), red clay (III-RC)], 2009.

(A) Samples 15 (III-TC) and 16 (III-RC) beneath LMI Houses B.1, B.2. (B) Beach sand, pebbles, and boulders (sample 17, III-S). Scale: Estwing chipping hammer is 28 cm long. Samples exposed by sea.

Map key:
Sample 18=Agii Pantes Gorge clay (APG-C)

Figure 5.37 Geological sample 18 collected in Agii Pantes Gorge east of the Papadiokambos Plain, (Google earth 2013).

Figure 5.38 Agii Pantes Gorge (APG-C), sample 18.

(A) Agii Pantes Gorge, east of the Papadiokambos Plain; Faneromeni (Trachilos) peninsula in background. (B, C) White-gray marl exposed by road: sample 18 (APG-C). Scale: Greek soil pick is 35 cm long.

Map key:
Sample 19=Ea Clay (ea-C)
Sample 20=Eb Clay (Eb-C)
Sample 21=Ec Rock (Ec-R)
Sample 22=Airport Road Red Clay (ARR-C)
Sample 23=C Red Clay (C-RC)
Sample 24=D Red Clay (D-RC)

Figure 5.39 Periferiaki Aerodromiou Sitias (Greek National Road-E75) that runs outside of Sitia near the airport (Google earth 2013).

Location of geological samples 19-24.

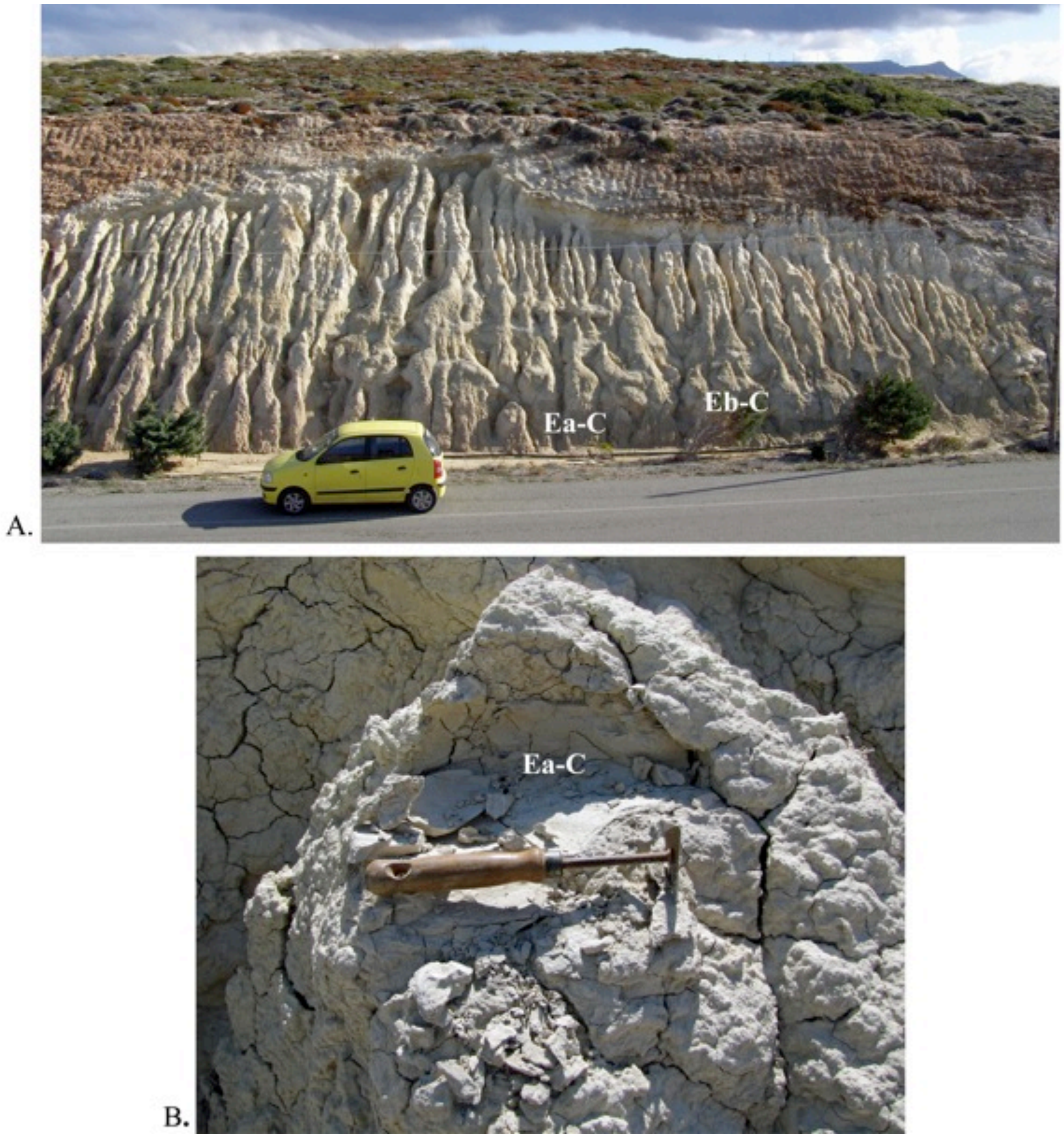


Figure 5.40 Clay and rock samples 19 and 20 [Ea clay (Ea-C), Eb clay (Eb-C)] on Periferiaki Aerodromiou Sitias (Greek National Road-E75).

(A) White-gray marl, samples 19, 20(Ea-C, Eb-C). (B) Sample 19 (Ea-C), scale Greek soil scraping tool is 18 cm long.

A.

B.

Figure 5.41 Rock sample 21 [Ec rock (Ec-R)] on Periferiaki Aerodromiou Sitias (Greek National Road-E75).

(A) Sample 21 (Ec-R), looking west towards Faneromeni (Trachilos) peninsula. (B) Detail of deflation of the topsoil by wind. Scale: sunglasses 14 cm wide.

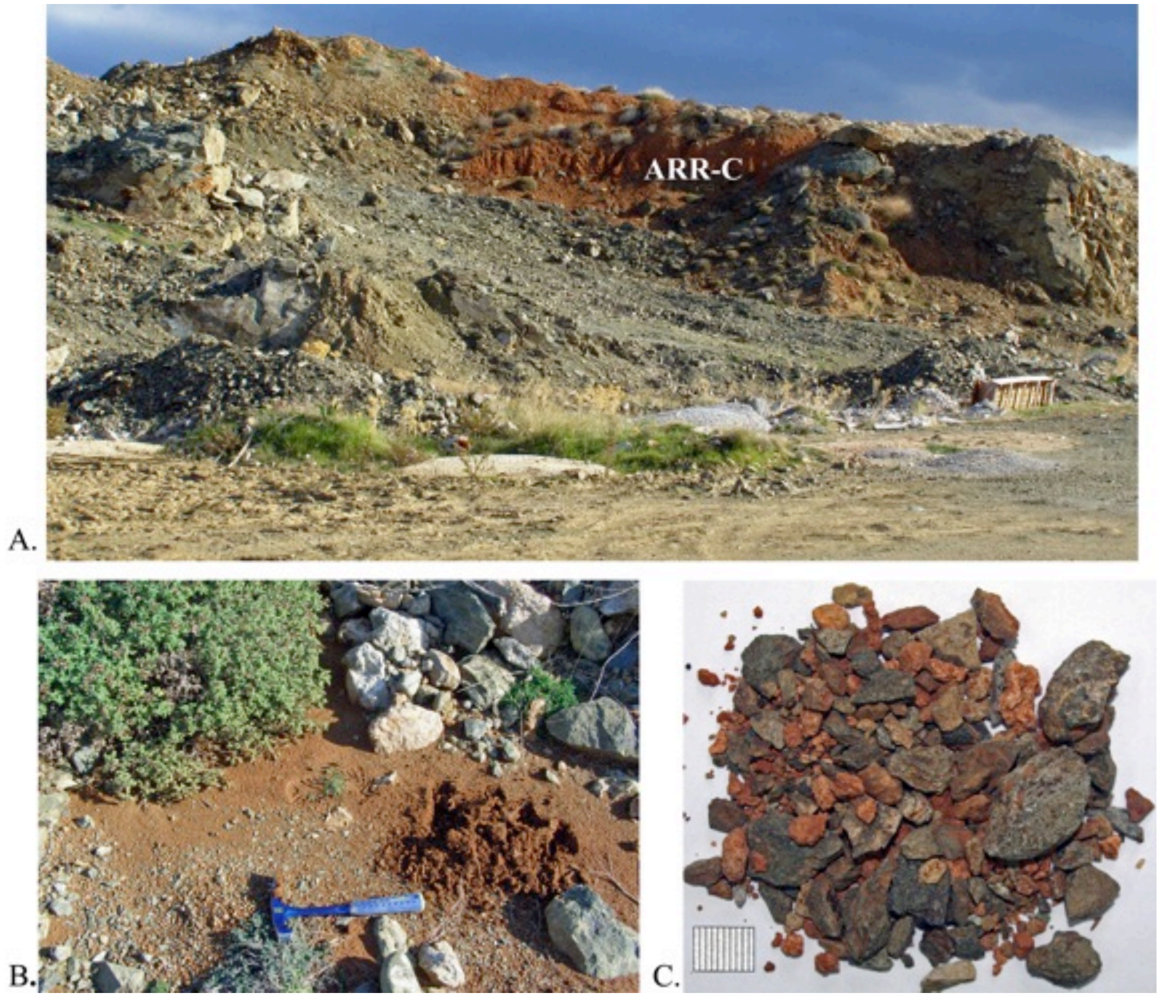


Figure 5.42 Clay and rock sample 22 [Airport Road Red clay (ARR-C)] on Periferiaki Aerodromiou Sitias (Greek National Road-E75).

(A) Sample 22 (ARR-C) and rocks. (B) ARR-C, scale: Estwing chipping hammer is 28 cm long. (C) Rock inclusions from ARR-C wet sieved sample, mm scale.

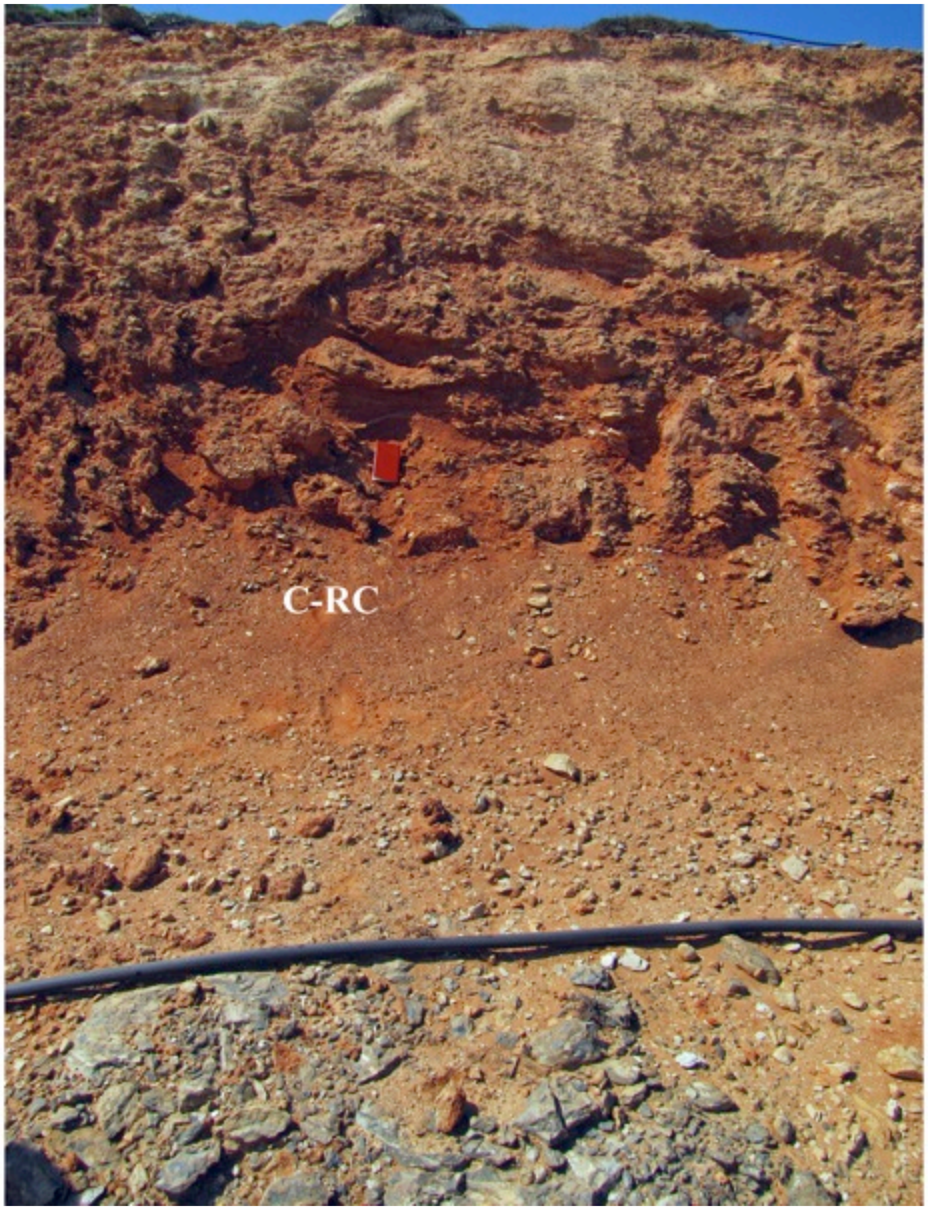


Figure 5.43 Sample 23 [C-red clay (C-RC)] exposed by Periferiaki Aerodromiou Sitias (Greek National Road-E75).

Scale: Forestry Suppliers field book is 11.4 x 18.4 cm.

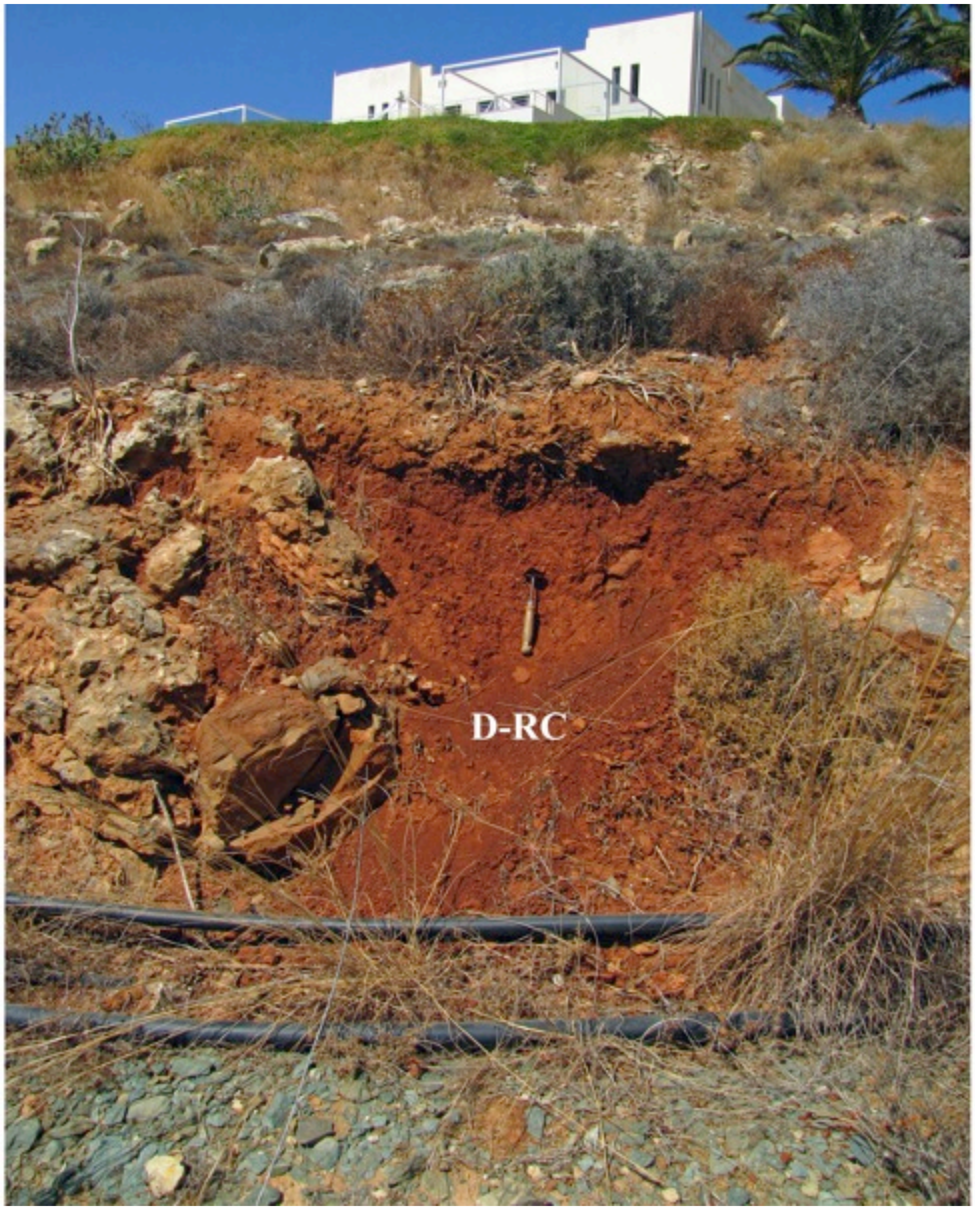


Figure 5.44 Sample 24 [D-red clay (D-RC)], exposed by Periferiaki Aerodromiou Sitias (Greek National Road-E75).

Scale: Greek soil scraping tool is 18 cm long.

Figure 5.45 Fired red clays from Papadiokambos Plain (samples 13, 14, 16) and Periferiaki Aerodromiou Sitias (Greek National Road-E75) (sample 22) broken apart after nine months due to spalling.

Not sure which sample is which because number of sample was inscribed on the clay bar. (A) Muncell (2000) 2.5YR 4/8, red. (B) Muncell (2000) 5YR 7/4-6/4, pink-light reddish brown. (C) Muncell (2000) 2.5YR 5/6-5/8, red. (D) Muncell (2000) 7.5YR 7/3, pink. Scale in mm.

Figure 5.46 Fire clay (samples 15, 23, 24) bar with 10 cm line drawn when clay was leather hard; fired to 750°-850°C, photograph taken one year after firing.

(A) Sample 23 (C-RC); unidentified cream substance leaching out of clay, possibly calc or salts. (B) Sample 15 (III-RC); calc inclusions (white specks) are causing clay to spall and break apart, as evidenced by numerous cracks. (C) Sample 24 (D-RC).

Figure 5.47 Fired tan clays from Agii Pantes Gorge (sample 18) and Periferiaki Aerodromiou Sitias (Greek National Road-E75) (samples 19, 20) broken apart after nine months due to spalling.

Not sure which sample is which because number of sample was inscribed on the clay bar. (A) Muncell (2000) 2.5Y 7/1, light grey. (B) Muncell (2000) 2.5Y 6/2, light brownish grey. (C) Muncell (2000) 10YR 7/1, 7/2, light grey.

Figure 5.48 Workable clays from Mochlos and Papadiokambos.

Fire (750°-850°C) bars with 10 cm line, image take one year after firing. Mochlos clays shrank to 9.5 cm: (A) sample 1 (PPH-C), (B) sample 2 (DR-C), (C) sample 7 (VTR-C). (D) Papadiokambos clay sample 15 (III-RC) expanded to 10.04 cm. Vamvakia Peninsula clays: (E) sample 23 (C-RC) shrank to 9.5 cm, (F) sample 24 (D-RC) shrank to 9 cm.

A.

B.

Figure 5.49 Mochlos purple (sample 1, PPH-C) and red-orange (sample 2, DR-C) clays collected in the Limenaria Cove.

(A) Unfired pinch pots. (B) Fire pinched pots (750°-850°C) in electric oven for 6 hours.

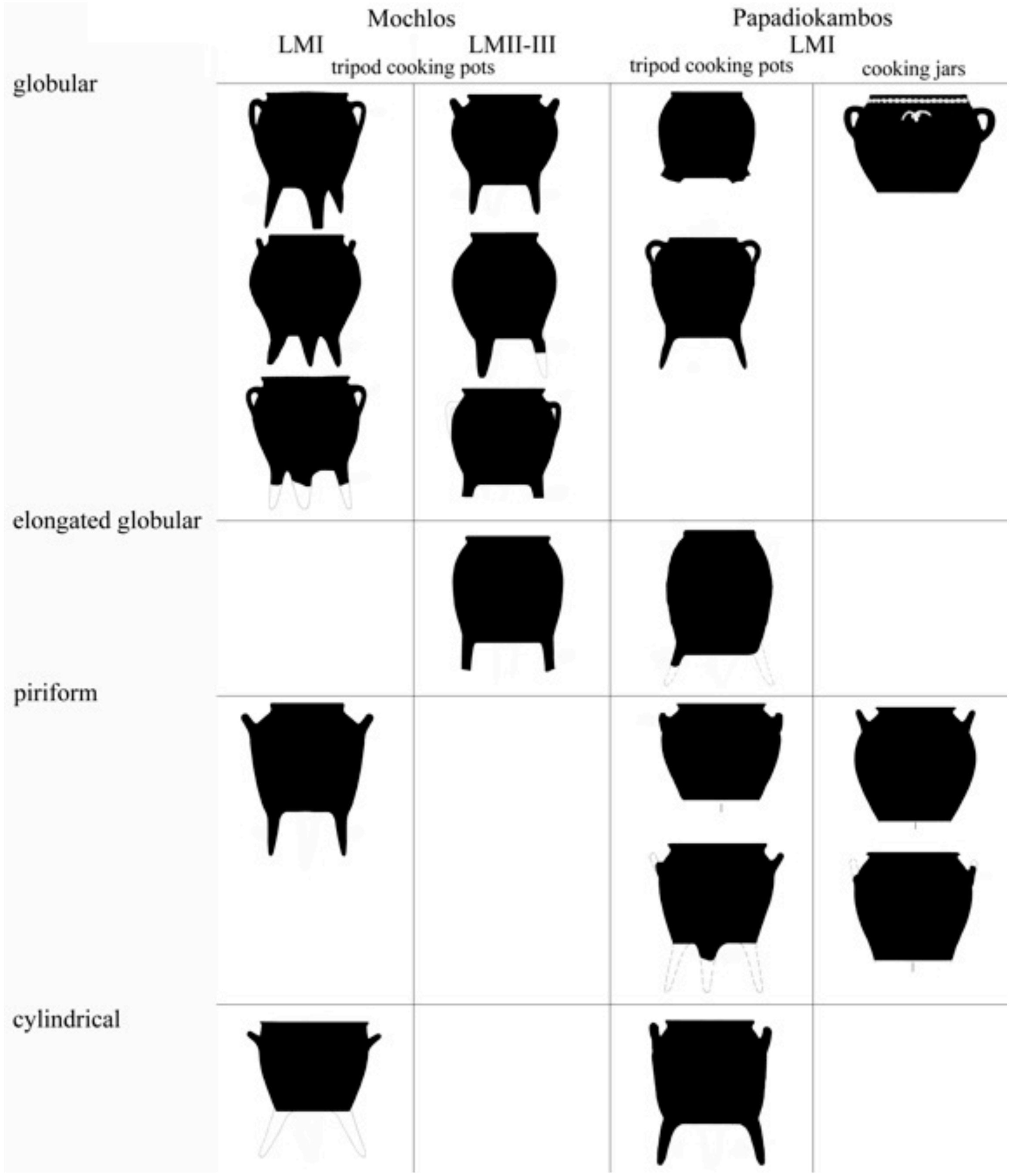


Figure 5.50 LM Mochlos and Papadiokambos tripod cooking pots and cooking jars.

Image is comprised of published vessels (after Barnard and Brogan 2003:figs. 47:IB.490, IB.491, 48:IB.493, IB.500, 49:IB.505; Smith 2010:figs. 82:IIB.858, IIB.863, 83:IIB.870, IIB.877).

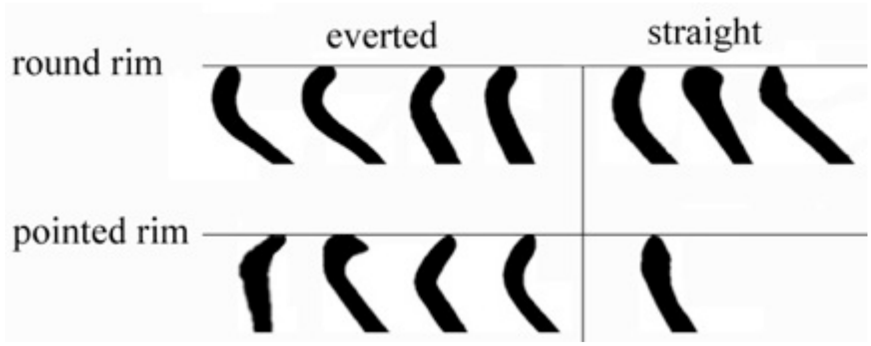


Figure 5.51 Rim profiles of LM Mochlos and Papadiokambos tripod cooking pots and cooking jars.

Image is comprised of published vessels (after Barnard and Brogan 2003:figs. 47:IB.490, IB.491, 48:IB.493, IB.500, 49:IB.505; Smith 2010:figs. 82:IIB.858, IIB.863, 83:IIB.870, IIB.877).

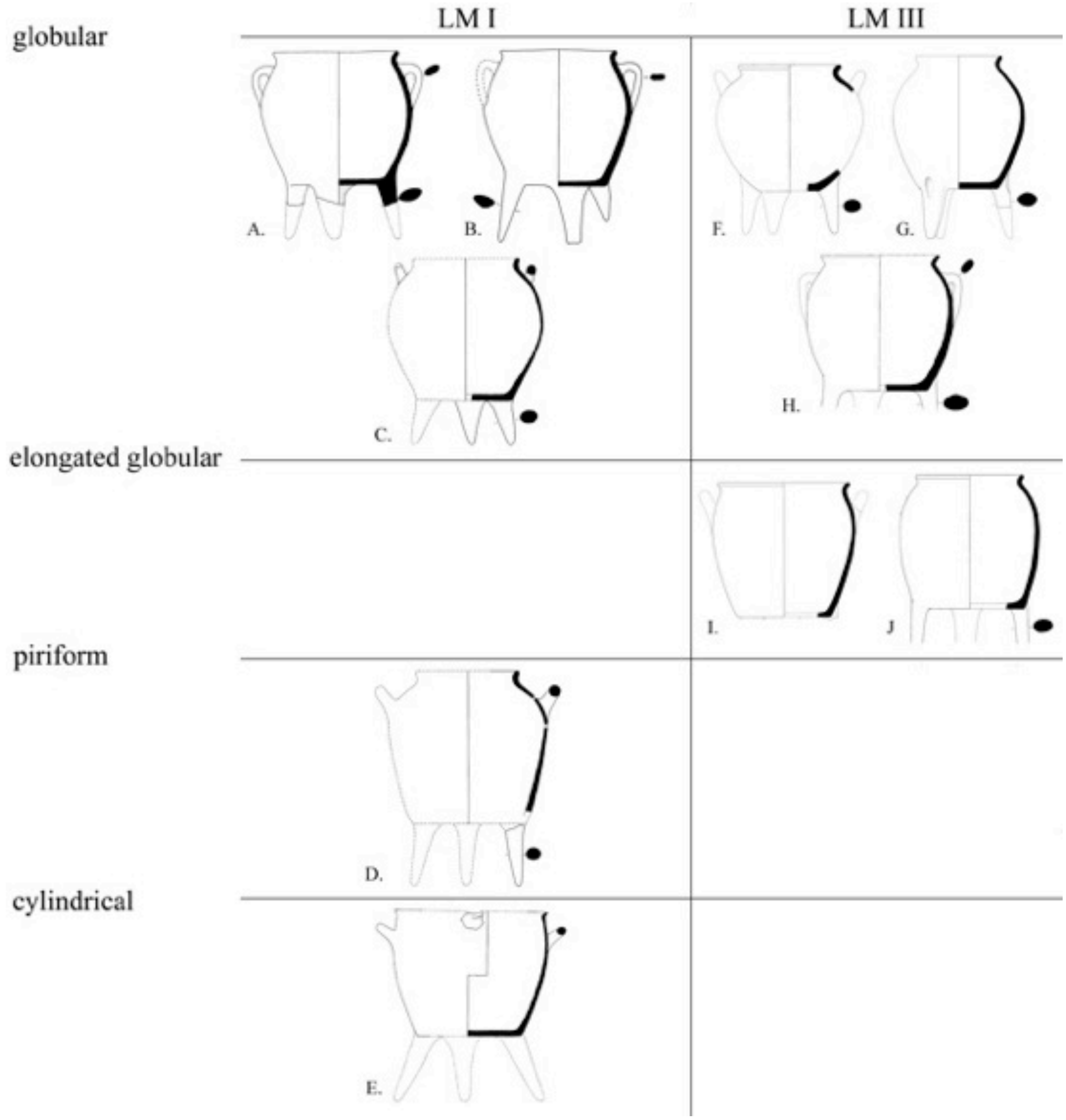


Figure 5.52 LM Mochlos tripod cooking pots.

(A) MOC0587, (B) MOC1043, (C) MOC0095, (D) MOC2931, (E) MOC3171, (F) MOC3566, (G) MOC6602, (H) MOC3371, (I) MOC3991, (J) MOC4004 (Barnard and Brogan 2003:figs. 47:IB.490, IB.491, 48:IB.493, IB.500, 49:IB.505; Smith 2010:figs. 82:IIB.858, IIB.863, 83:IIB.870, IIB.877). For dimensions refer to Tables 5.29:B, C, D; 5.30:B, C, D.

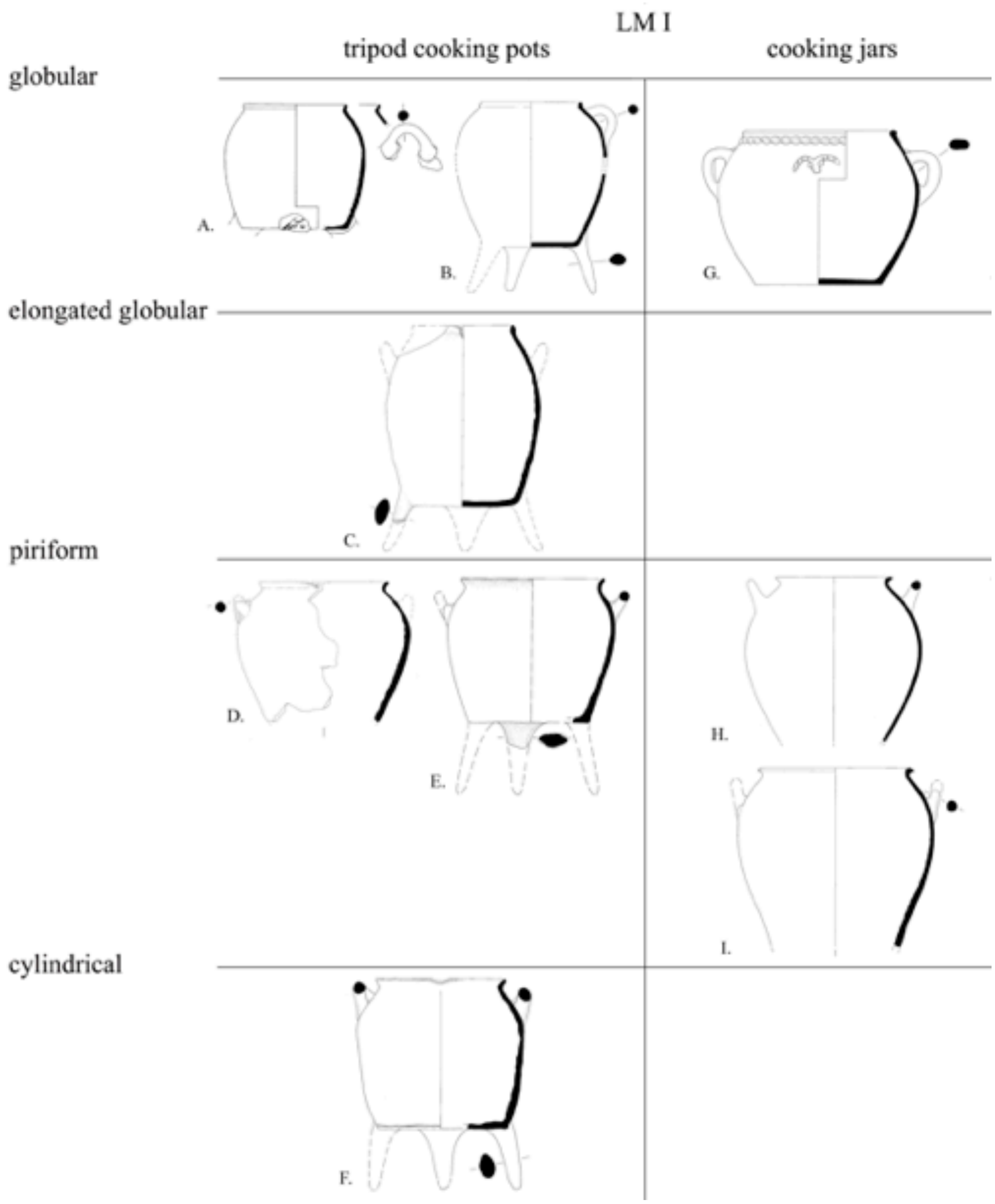


Figure 5.53 LMI Papadiokambos tripod cooking pots and cooking jars.

Site catalogue number is below vessel. (A) PDK0002, (B) PDK0314, (C) PDK0064, (D) PDK0554, (E) PDK0065, (F) PDK0003, (G) PDK0412, (H) PDK0032, (I) PDK0288, (J) PDK0003 (Brogan, *et al.* 2011:figs. 32, 33). For dimensions refer to Table 5.31:B, C, D.

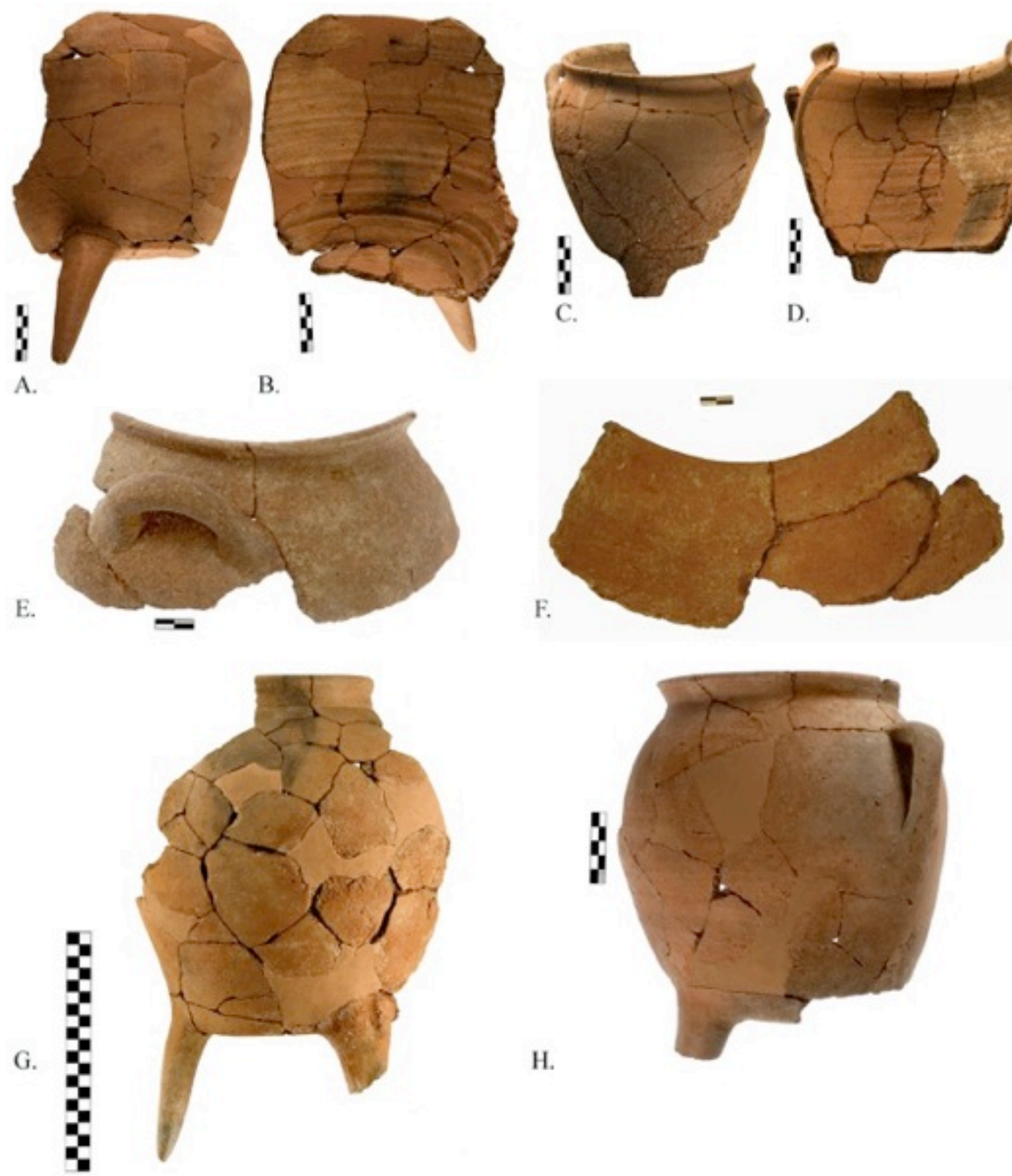


Figure 5.54 Surfaces of LM tripod cooking pots.

LMI vessels—PDK0040 (A) smooth exterior, (B) cream slipped surface, interior riling marks; PDK0065 (C) smooth exterior, (D) interior riling marks. LMII-III—MOC5990 (E) smooth exterior, (F) smooth interior; (G) MOC6602, smooth exterior; (H) MOC3372, smooth exterior.

Figure 5.55 LM handles attached to Mochlos and Papadiokambos tripod cooking pots and cooking trays.

Coil wrapped around handle end (indicated by arrows) to secure join between handle and vessel, arrows indicates coils: (A) LMI tripod cooking pot MOC2930, (B) LMI cooking tray MOC0344. Handle ends smoothed to vessel wall, no coil detected: LMI tripod cooking pots (C) PDK0314, (E) PDK0003; (D) LMII-III tripod cooking pot, MOC5990; LMI cooking trays—(F) MOC2801; (G) LMII-III cooking tray, MOC1595.

Figure 5.56 LM legs attached to Mochlos and Papadiokambos tripod cooking pots.

Underneath surfaces: (A) smoothed before legs were attached, MOC5485, (B) surface left rough before legs were attached, MOC3660. (C) Parallel scoring marks at based were legs were attached, PDK0002. (D, E) Smoothed end of leg to attached vessel, PDK0003. (F) Possible coil (indicated by arrows) used to secure join between leg and vessel, PDK0314.

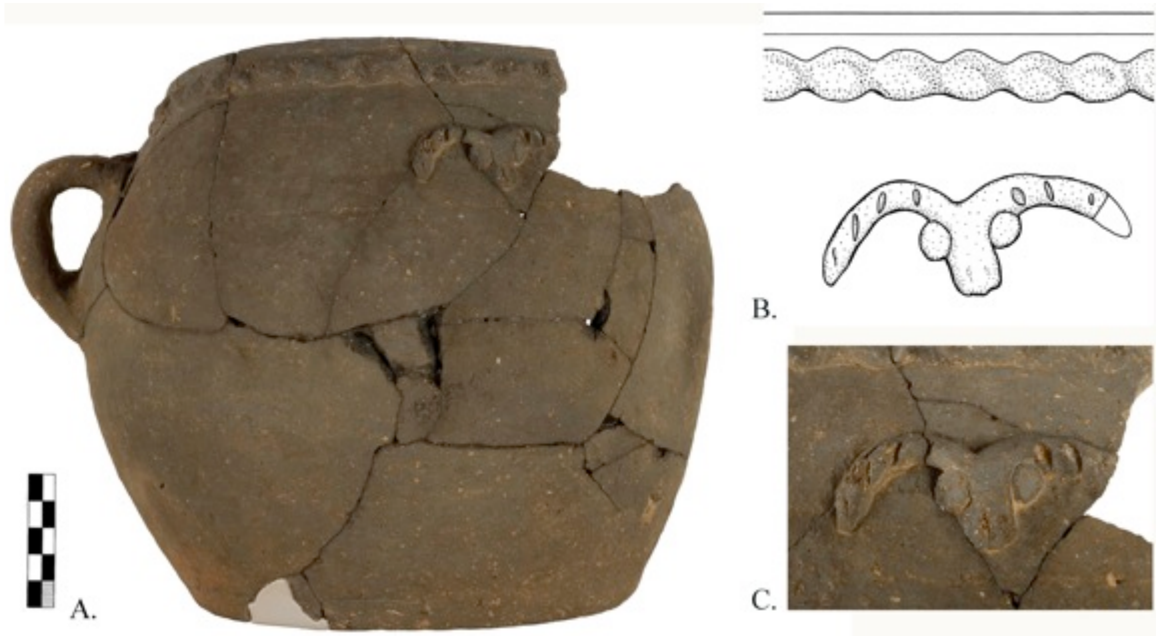


Figure 5.57 LMI spouted cooking jar (PDK0412) with plastic decoration of horned animal and rope decoration (Brogan, *et al.* 2011:figs. 32, 33).

(A) Front of vessel. (B, C) Detail of decoration.

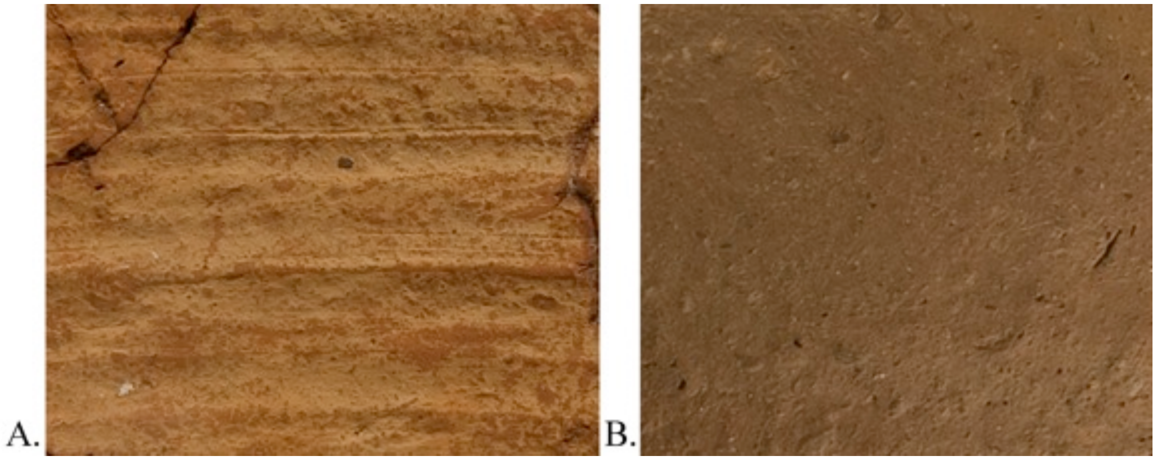


Figure 5.58 Surface finishes of tripod cooking pots, cooking jars, and cooking trays.

(A) Cream slipped interior. (B) Self-slipped exterior.

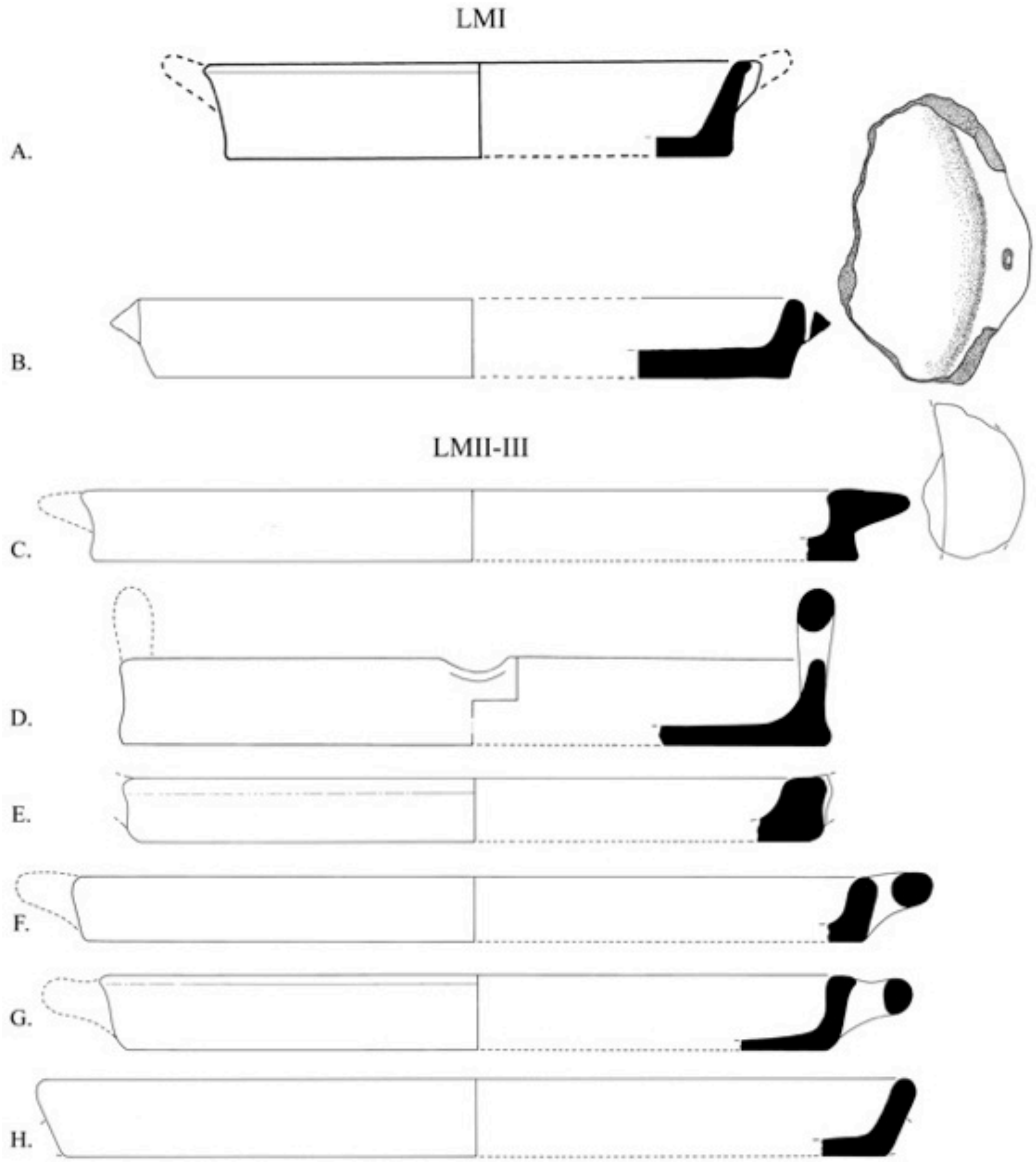


Figure 5.59 LM Mochlos cooking trays with handles.

(A) MOC0570 with handle scar. (B) MOC0474, pierced lug handle. (C) MOC6018, lug handle. (D) MOC 1595, round vertically set handle. Round horizontal handle: (E) MOC3183. (F) MOC0342. (G) MOC 0147. (H) MOC4951.

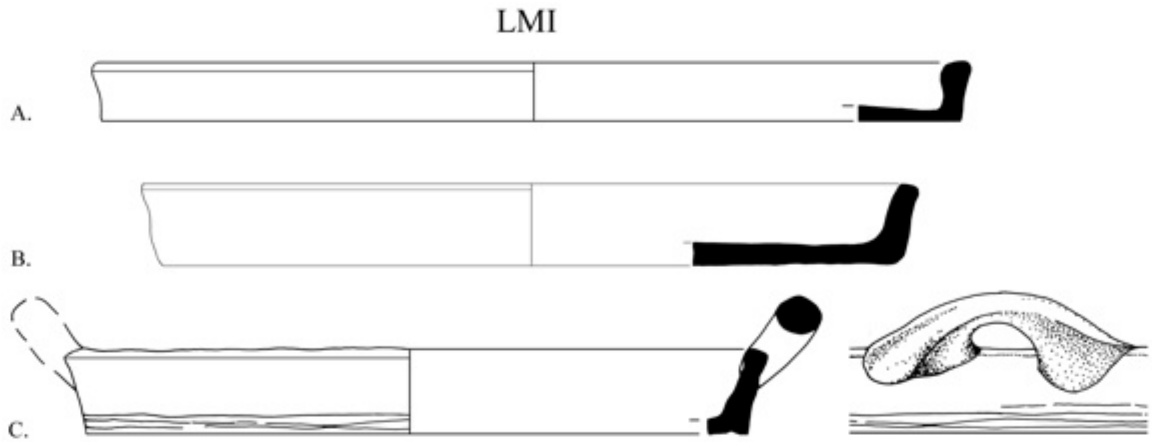


Figure 5.60 LMI Papadiokambos cooking trays.

(A) PDK0087. (B) PDK0514. (C) PDK0005, round horizontal handle.

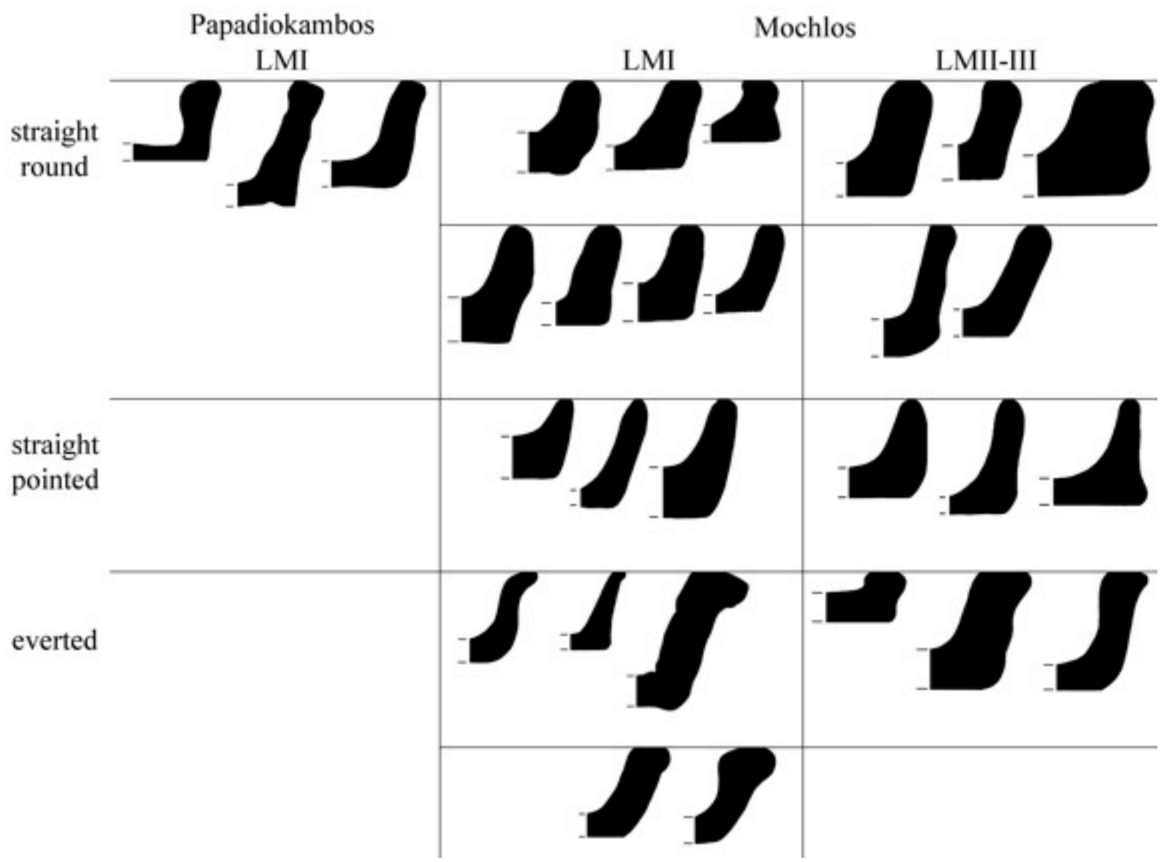


Figure 5.61 LM Mochlos and Papadiokambos cooking tray profiles.

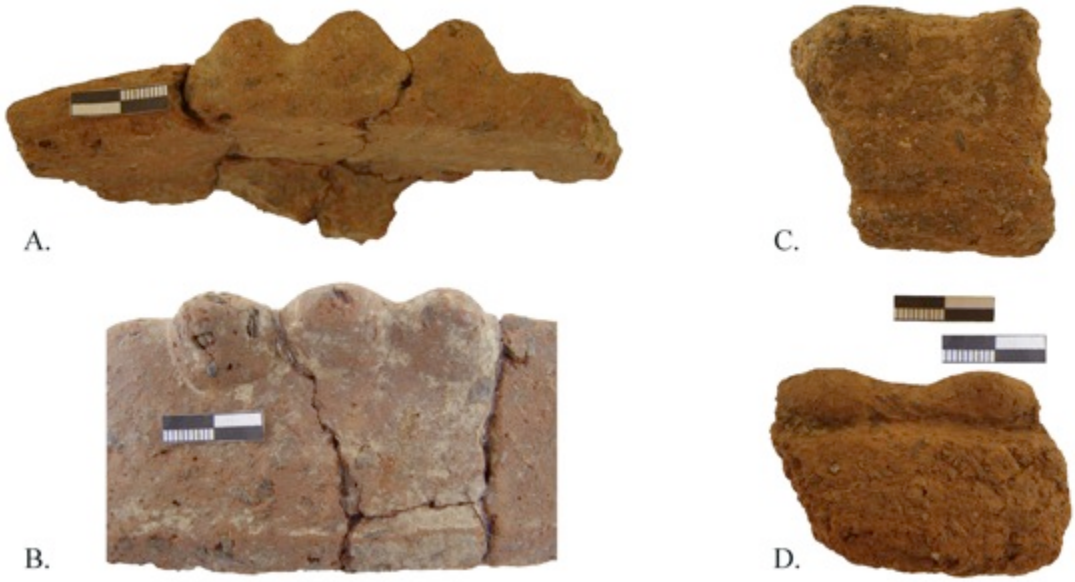


Figure 5.62 Added knobs attached to exterior wall of LMIB Mochlos cooking Trays.

(A, B) MOC1965, top view and exterior wall view. (C) MOC1907, exterior wall view, one and one-half knobs preserved. (D) MOC0187, exterior wall view, two knobs preserved.

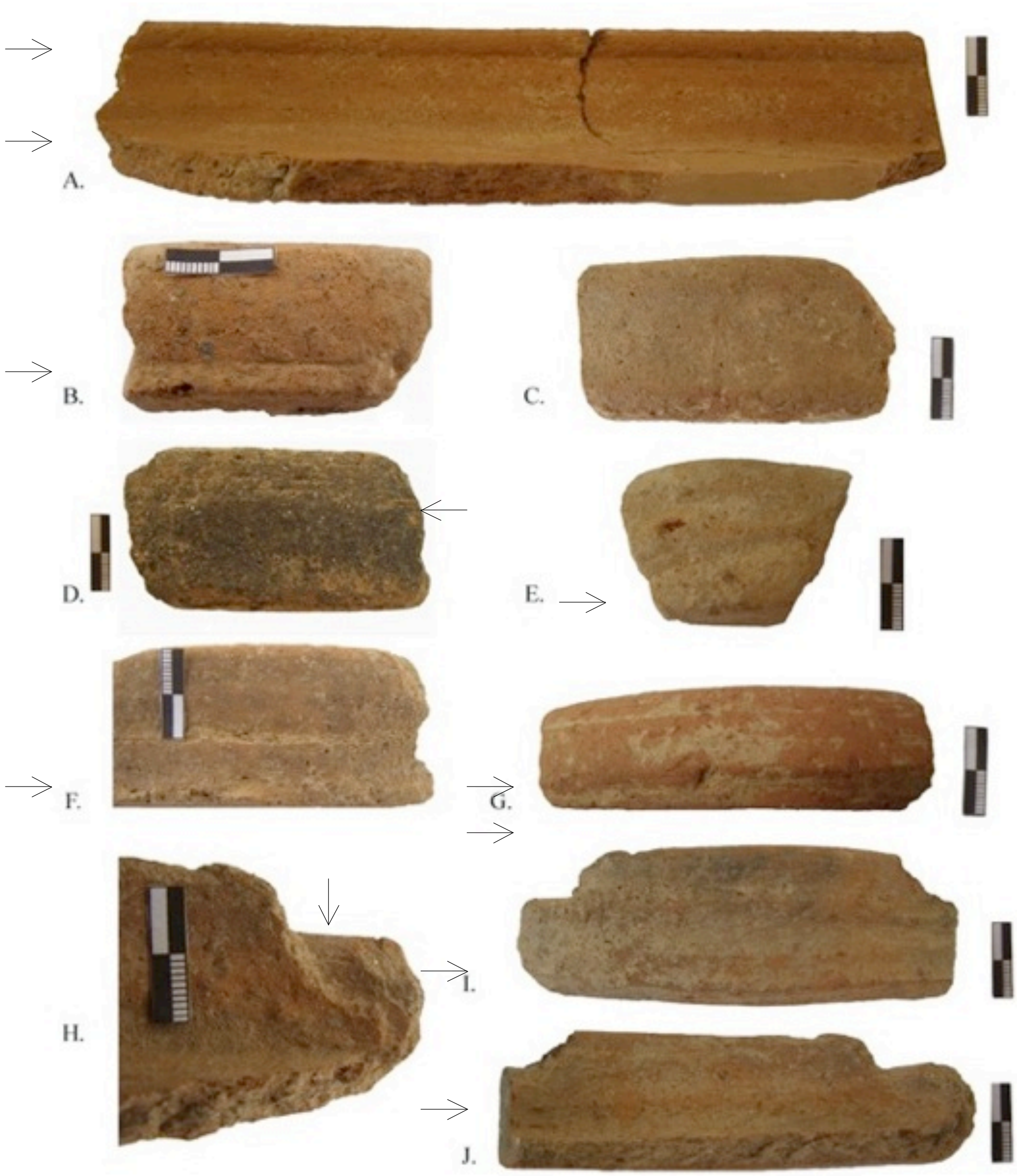


Figure 5.63 Details of LM cooking tray surfaces to hypothesize manufacturing processes.

Arrows identify possible coil joins: (A) LMI MOC0319, (B) LMI MOC1373, (D) LMI MOC2759, (E) LMI-III MOC4948, (F) LMI MOC5943, (G) LMII-III MOC3859. (H, I, J) Exposed coil at break on LMI cooking tray MOC4971.

Figure 5.64 LMI Papadiokambos cooking dishes.

(A) Type AB:PDK0017, (B) Type C:PDK0289, (C) Type C:PDK1486. Scale in cm.

Figure 5.65 LMI Papadiokambos cooking dish, PDK0151.

Conservator holding vessel compared to provide scale of complete vessel to an adult human.

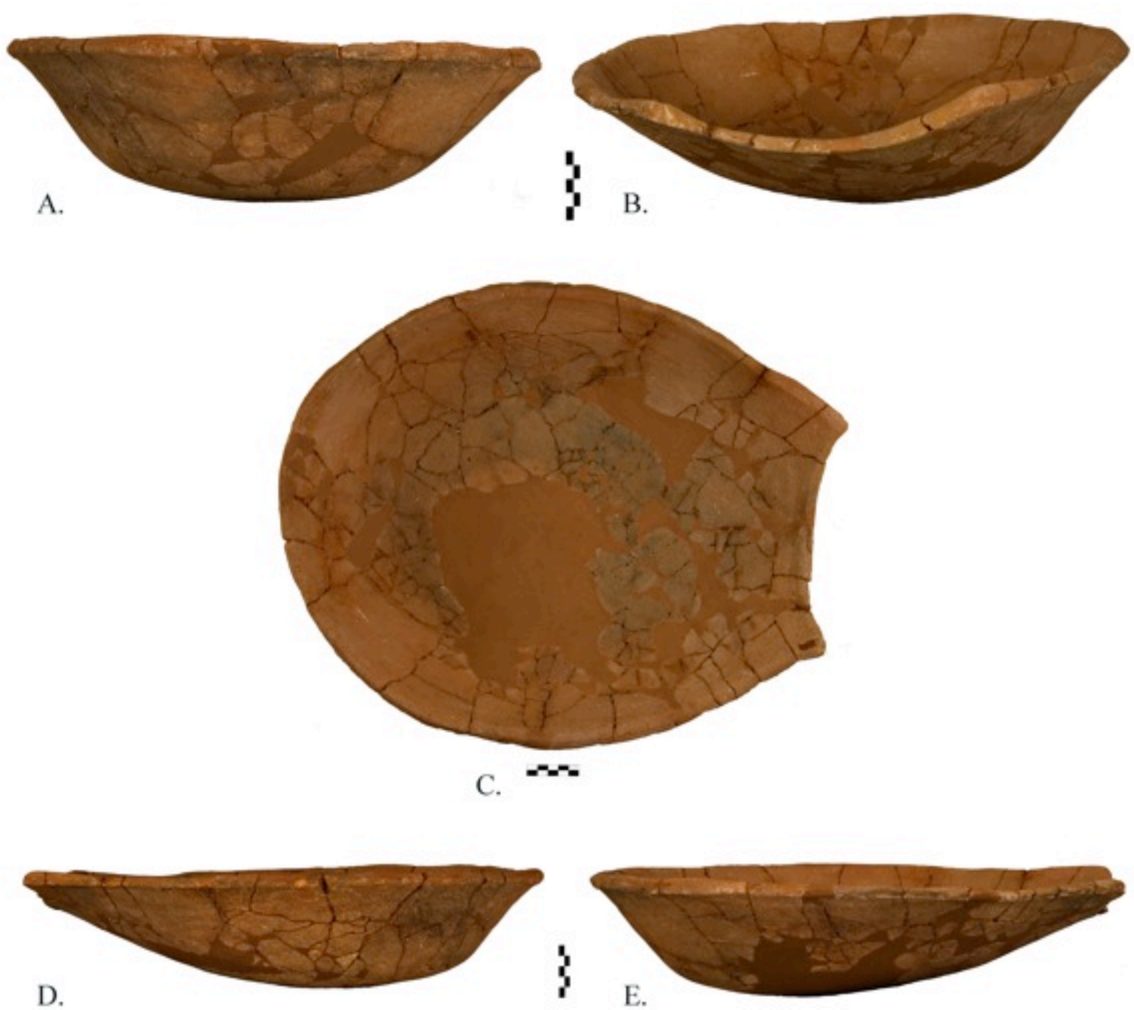


Figure 5.66 LMI Papadiokambos cooking dish, PDK0151.

Viewing angles: (A) Bowl, (B) spout, (C) interior, top view, (D, E) straight sidewalls (vessel in profile). Scale in cm.

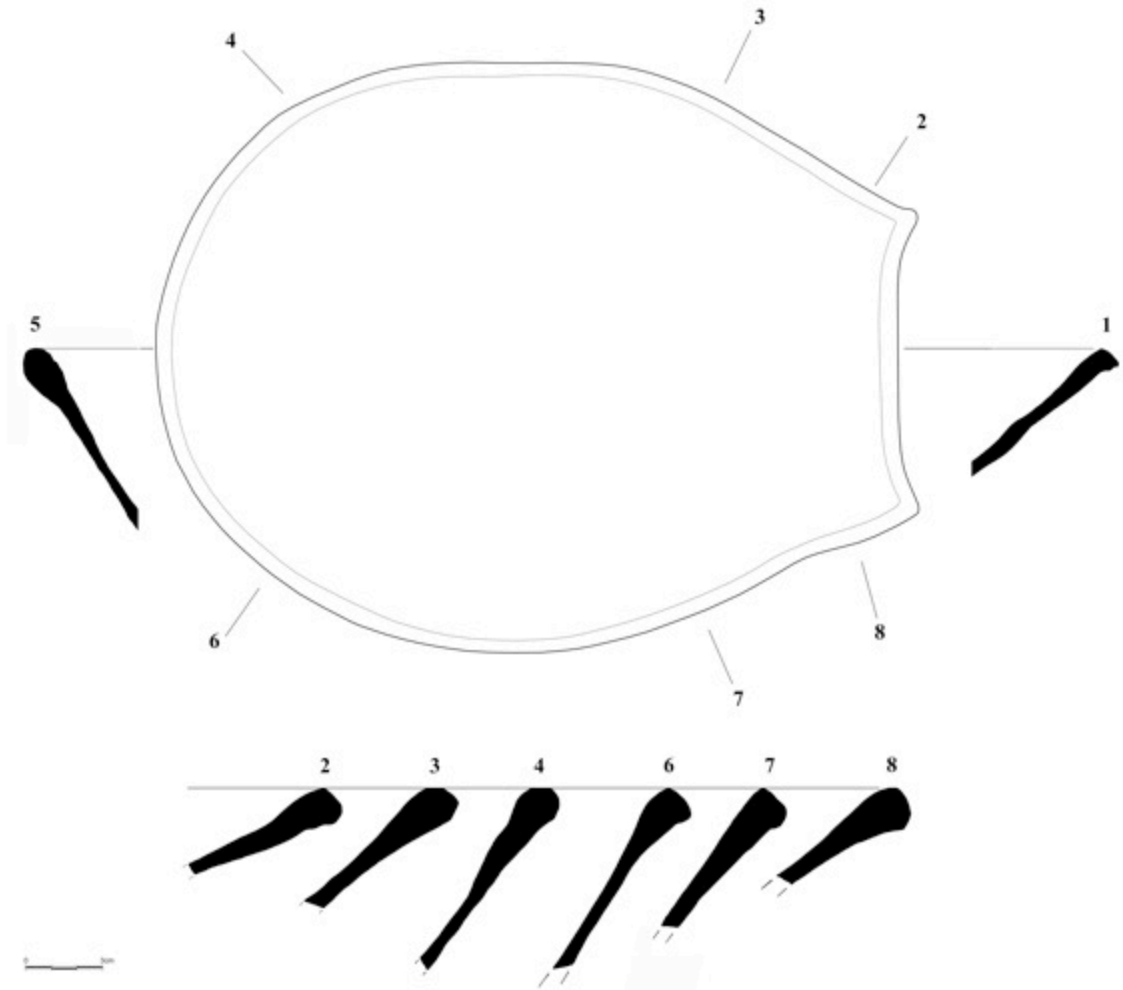


Figure 5.67 LMI Papadiokambos Type AB cooking dish PDK0151.

Vessel in top view. Rims: spout—1; side-wall near spout—2,3, 8, 7, bowl-end of vessel—4-6. Dimensions: ca. 51 cm width x 54 cm length. Capacity: 11 liters.

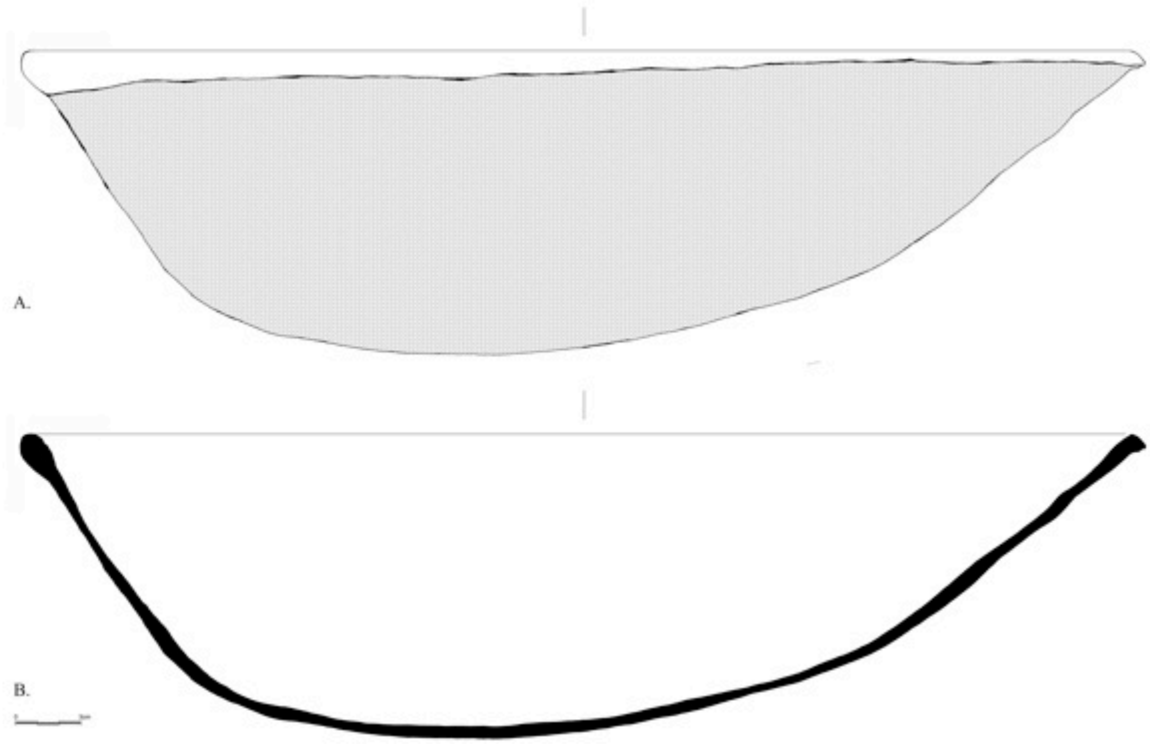


Figure 5.68 LMI Papadiokambos Type AB cooking dish PDK0151, side-view to illustrate scoop shape of the vessel.

(A) Side view of complete vessel. (B) Side view of vessel wall profile.

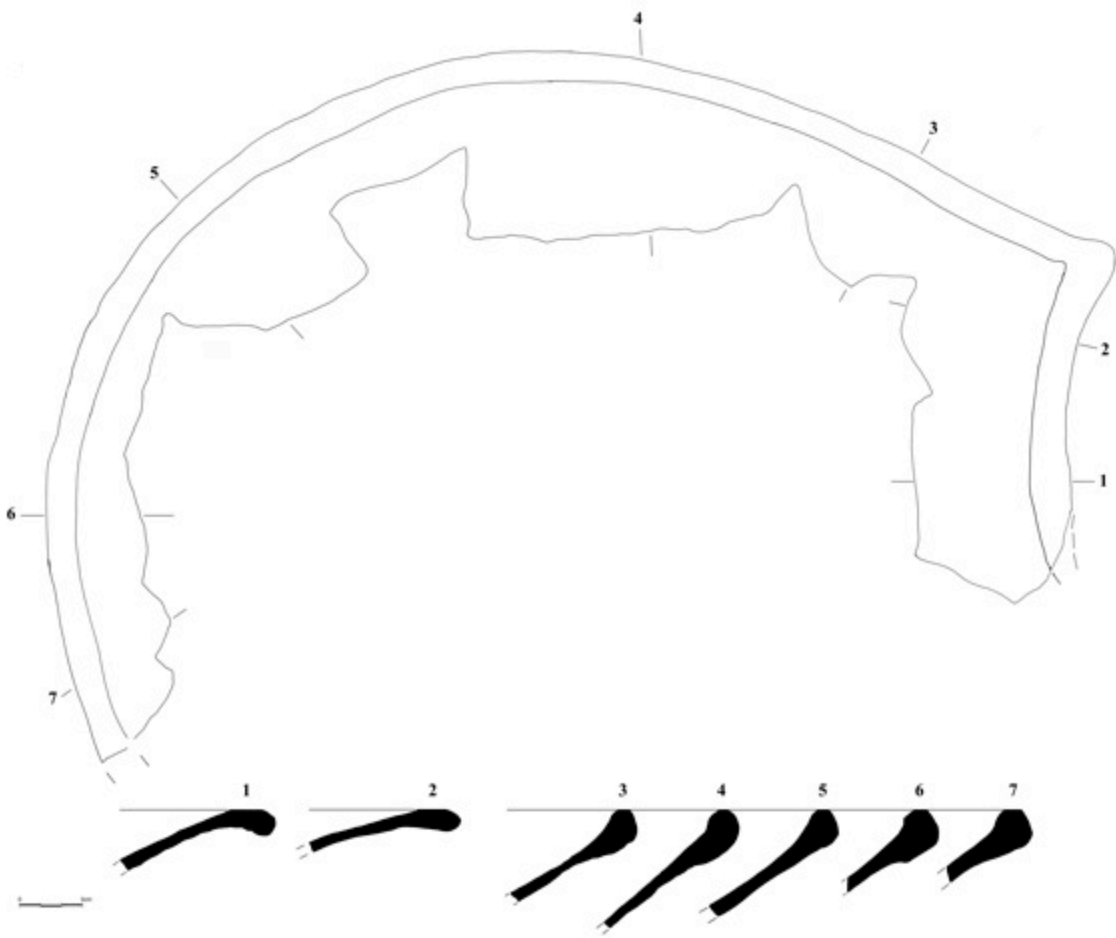


Figure 5.69 LMI Papadiokambos Type AB cooking dish PDK0289.

Vessel in top view. Rims: spout—1, 2; side-wall near spout—3, 4, bowl-end of vessel—5-7.

Dimensions: ca. 50 cm width x 56 cm length. Capacity: 8 liters.

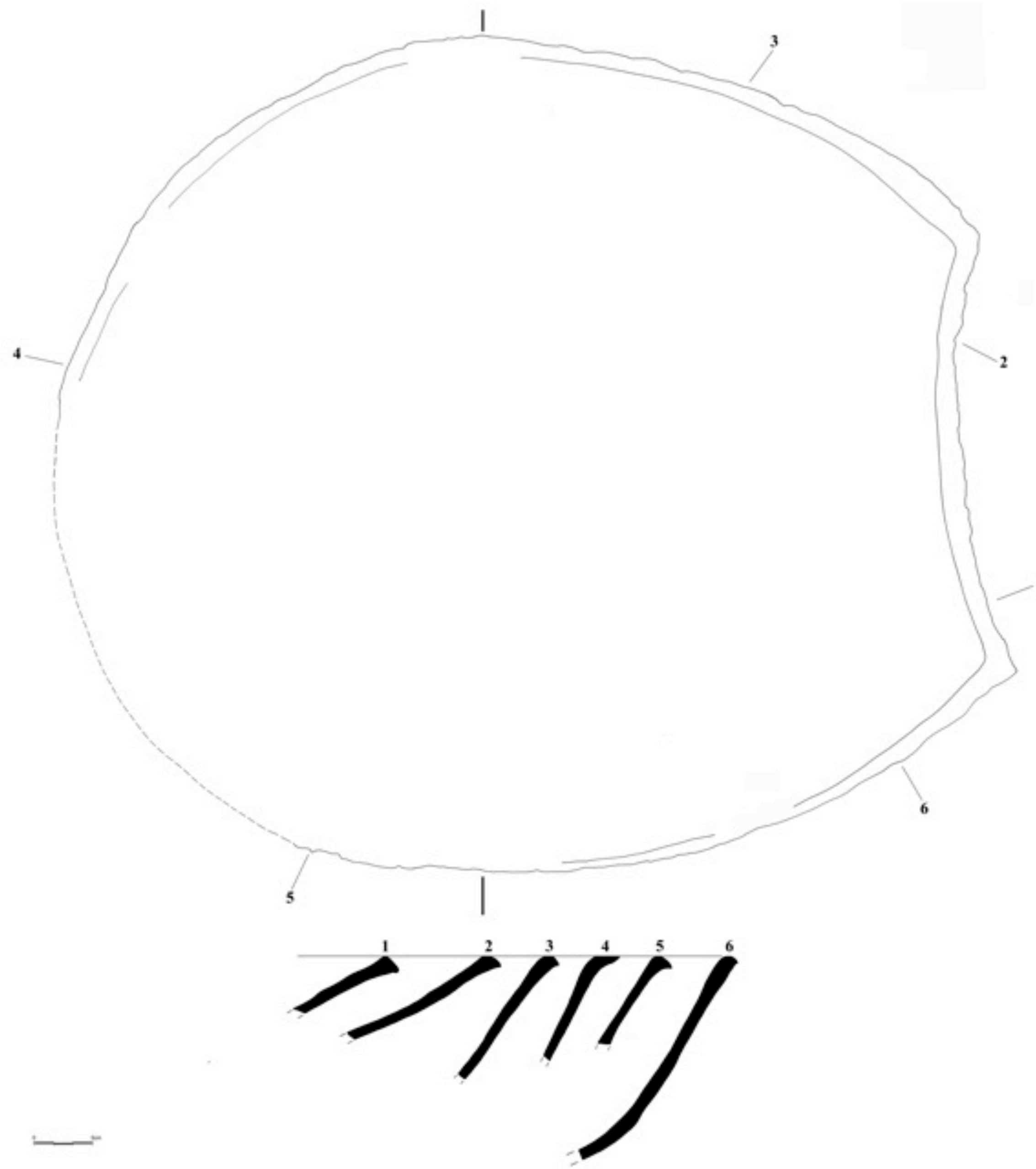


Figure 5.70 LMI Papadiokambos Type C cooking dish PDK0017.

Vessel in top view. Rims: spout—1, 2; side-wall near spout—3, 6, bowl-end of vessel—4, 5.

Dimensions: ca. 42 cm width x 42 cm length. Capacity: 15.5 liters.

Figure 5.71 Surface textures of LM Mochlos and Papadiokambos cooking dishes.

Type AB: (A, D) MOC5071-LMI, (B) MOC4771-LMI. Type C: (C, G) MOC3373-LMII-III, (E) PDK1452-LMI, (F) PDK1648-LMI, (H) PDK1030-LMI, (I) PDK1607. Samples C, E-I are not in study because they are not from secure cooking contexts; however, they are in image to illustrate the varying textures of LM cooking dishes.

Figure 5.72 Thumb impression on LM Mochlos cooking dishes.

(A) Interior. (B) Top. Scale in cm.

Figure 6.01a Production steps of potting LM style tripod cooking pots and cooking jars.

Processing clay sample 1 (PPH-C) and 2 (DR-C) collected from Limenaria Cove, Mochlos. (A) Cleaning raw clay through 2 mm screen. (B) Adding water to clay to become plastic for potting. (C) Kneading hydrated clay to remove air bubbles. (D) Rolling coils to form vessel body; wheel-fashioning (Roux and Courty 1998). (E, F) Adding coil to vessel body to build the wall.

Figure 6.01b

(G) Smoothing coils with fingers. (H) Using wooden tool to obliterate and shape coil joins. (I) Finishing body by turning top coil to form everted rim. (J) Examining body profile. (K) Making round horizontal handles. (L) Attaching legs to base.

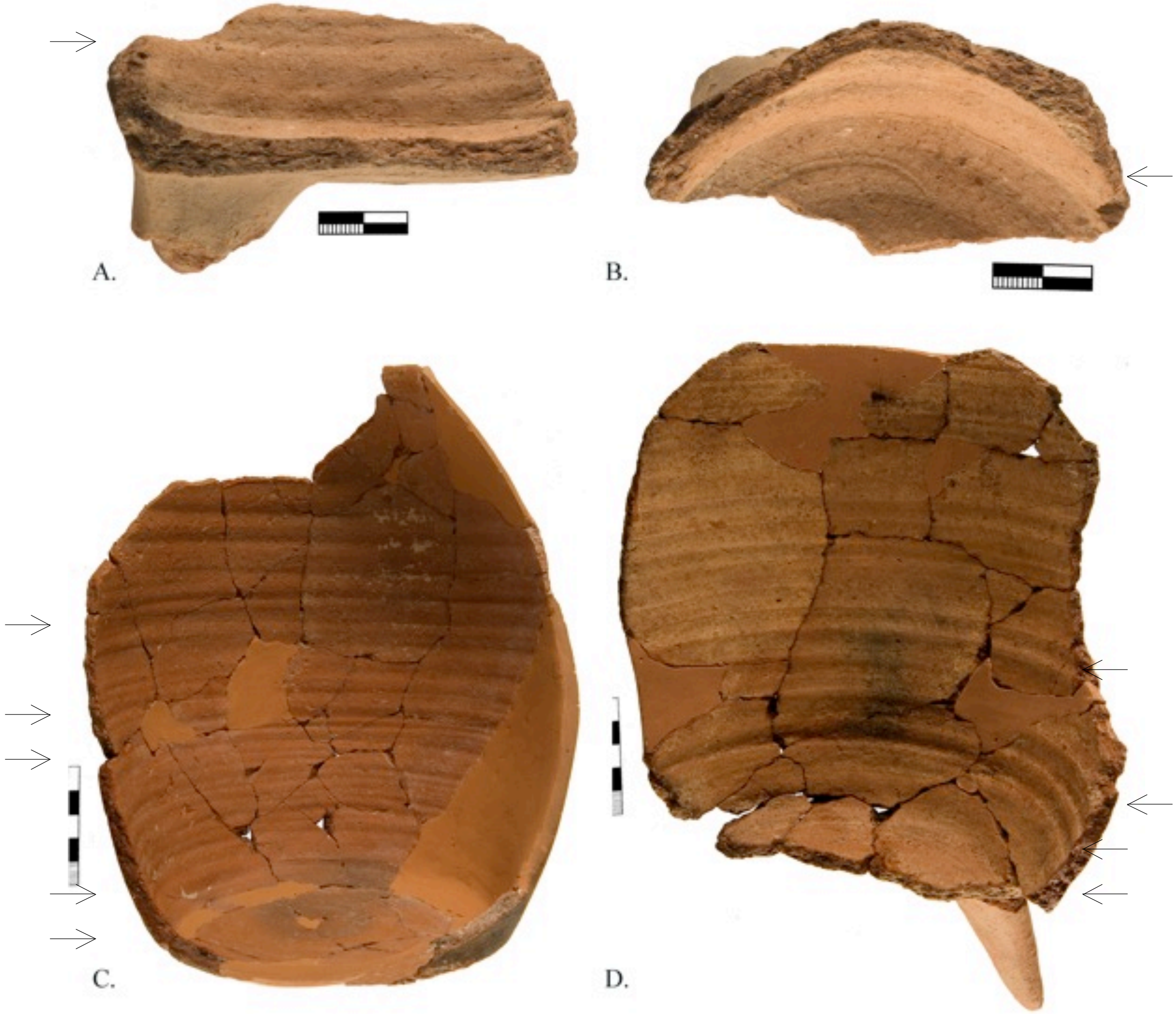


Figure 6.02 Interiors of LM tripod cooking pots; arrows indicate possible coil-joins. Revaluating ancient production processes of tripod cooking pots and cooking jars based on experimental potting with Mochlos clays. (A, B) LMI Mochlos tripod cooking pots (unpublished from island settlement) exposed coil at base (indicated by arrows); strengths hypothesis that some cook-pots were produced using wheel-fashioning (Roux and Courty 1998). Arrows indicate possible coil-joins on interior of LMI Papadiokambos tripod cooking pots that were identified as deep and shallow rilling-marks before experimental work—(C) PDK0064, (D) PDK0040.

Figure 6.03 Experimental vessels produced in the style of LM tripod cooking pots and cooking jars.

Clay use is from Limenaria Cove, Mochlos. Produced using a wheel-fashioning (Roux and Courty 1998). Vessels have 1.25-4.5 liter capacities. (A, B, C) Cooking jars large and small; small tripod cooking pot No. 1 before cooking. (D, E) Cooking jars large and small after cooking session1 and 2. After multiple rounds of cooking: (F) tripod cooking pot large No. 1, (G) tripod cooking pot large No. 2, (H) cooking jar small, (I) cooking jar tall, (J) cooking jar large, (K) tripod cooking pot small No. 1, (L) tripod cooking pot small No. 2.

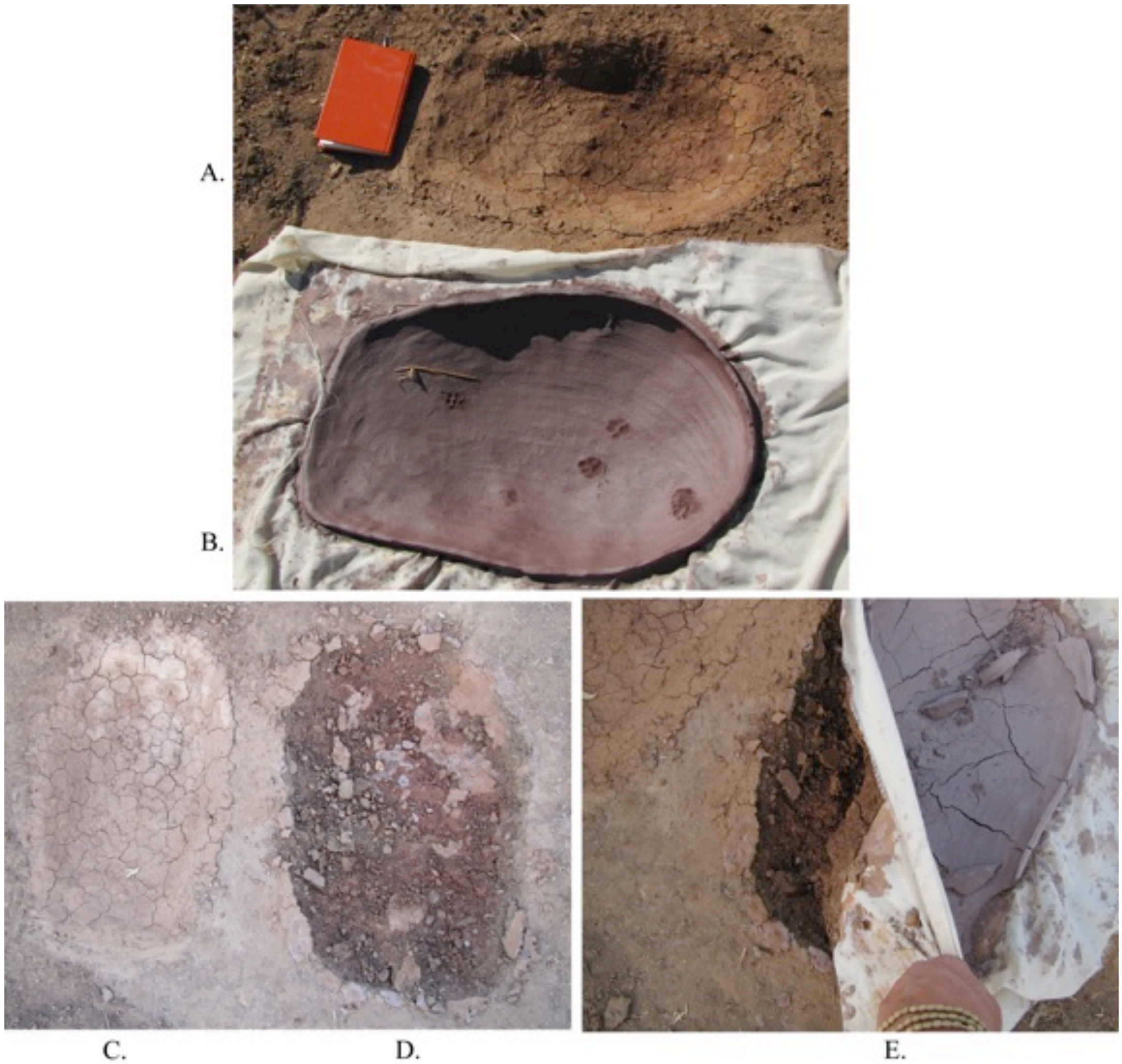


Figure 6.04 Production process of experimental cooking dishes in earth-cut molds.

Clay used is PPH-C from Limenaria Cove, Mochlos. one covered with slip, one covered with thin, fine woven cloth. (A, C) Slip-lined earth-cut mold. Cracked as clay dried; not successful. (B, D) Earth-cut mold lined with thin woven cotton cloth; successfully dried without cracking. (E) Experimental mold cracked apart as it was removed from mold.

A. B. C. D. E. F.

Figure 6.05 Production process of experimental cooking dishes in plaster mold.

Clay used is PPH-C from Limenaria Cove, Mochlos. (A) Making plaster mold by adding layers of cotton sheets and plaster. (B) Pressing thin clay sheets on surface saturated with olive oil. (C, D) Adding coil to make rim. (E, F) Smoothing interior surface of dish with water.

Figure 6.06 Finishing experimental cooking dish.

(A, B) Firing vessel in modern wood-burning oven. (C, D) Application of bees wax. (E) Interior of vessel. (F) Exterior of vessel.

Figure 6.07a Cooking foods available during the LM period in experimental LM style tripod cooking pots and cooking jars produced from Mochlos clays.

(A) Building hearth fire with olive wood and charcoal. (B) Preparing ingredients. (C) Warming pots and taking cooking notes of time and temperature. (D) Large cooking jar full of lentils next to coals. (E) Building stand out of cups for small cooking jar full of beef liver. (F) Large jar full on top of coals beginning to simmer.

Figure 6.07b

(G) Charcoal added to fire, hot coals under all vessels. (H) Simmering goat in small tripod cooking pot No. 1. (I) Octopus beginning to simmer in small cooking jar. (J) Octopus finished cooking. (K) Wooden lids wrapped with leather and soaked in water placed on vessel tops to hold heat, wood added to fire. (L) Lentils finished cooking in large jar.

Figure 6.07c

(A) Seafood soup in experimental cooking dish. (B) Lamb before added red wine in experimental cooking dish. (C) Jar with lentils. (D) Inverted experimental cooking dish to bake bread.

Figure 6.08 LM style experimental cooking jar small, produced out of DR-C.

(A) Vessel with two vertical round handle, rope decoration under rim, and coil joins on lower body. (B) Side of vessel with round vertical handle and coil joins on shoulder, between mid and lower wall. (C) Vessel front: stick pointing to calcareous spalling, light carbon on lower body with streaks of brunt food. (D) Underneath vessel: light carbon deposits, food remains. (E) Interior with burnt food residue from simmering beef liver; scrap marks from wooden spoon.

Figure 6.09 LM style experimental cooking jar large, produced out of PPH-C.

(A, B) Front and back of vessel with oval vertical handles: light carbon, heavy streaks of food. (C) Underneath vessel: cracks, light carbon, heavy streaks of food. (D) Interior: burnt simmering lentils.

Figure 6.10 LM style experimental tripod cooking pot small No. 1, produced out of DR-C.

(A) Front of vessel with spout. (B) Upper body: spout, round horizontal handle with light carbon from hearth fire, food streaks. (C) Back of vessel: light carbon on body and legs with heavier carbon on leg tips and lower body, and food streaks. (D) Top of vessel with spout and two round horizontal handles with light carbon on rim and shoulder. (E) Lower body at junction of leg and base: coil joins, light carbon on mid and upper body, heavy carbon on lower body and upper legs, streaks of burnt food. (F, G) Underneath vessel: cracked surface, light carbon on body, heavy carbon on leg tips, food streaks of burnt food.

Figure 6.11 LM style experimental tripod cooking pot small No. 2, produced out of DR-C.

(A, B) Front and back of vessel with round horizontal handles: light carbon underneath and body of vessel with dark carbon from hearth fire on leg tips and lower body. (C) Light-to-heavy carbon underneath vessel with heavy carbon in leg tips from hearth fire and streaks from burnt food. (D) Top of vessel: light carbon on rim and shoulders, brunt food on shoulder, tops of handle, on interior.

Figure 6.12 Identified carbon marks and burnt food by comparing LM style experimental cooking jars and LMI Papadiokambos tripod cooking pots.

LM style experimental cooking jar small: (A) exterior with heavier carbon marking on lower body, underneath rims and handles; (B) dark brown and black streaks and drops of burnt food on rim, handles, body. Vessel PDK0040: (C) exterior slight discoloration and light carbon on lower shoulder and body, (D) interior with cream slip and burnt food on lower body. Vessel PDK0064: (E) heavy carbon on body and exterior on leg; very light carbon on lower body from hearth fire, (F) burnt food on upper body and on interior.

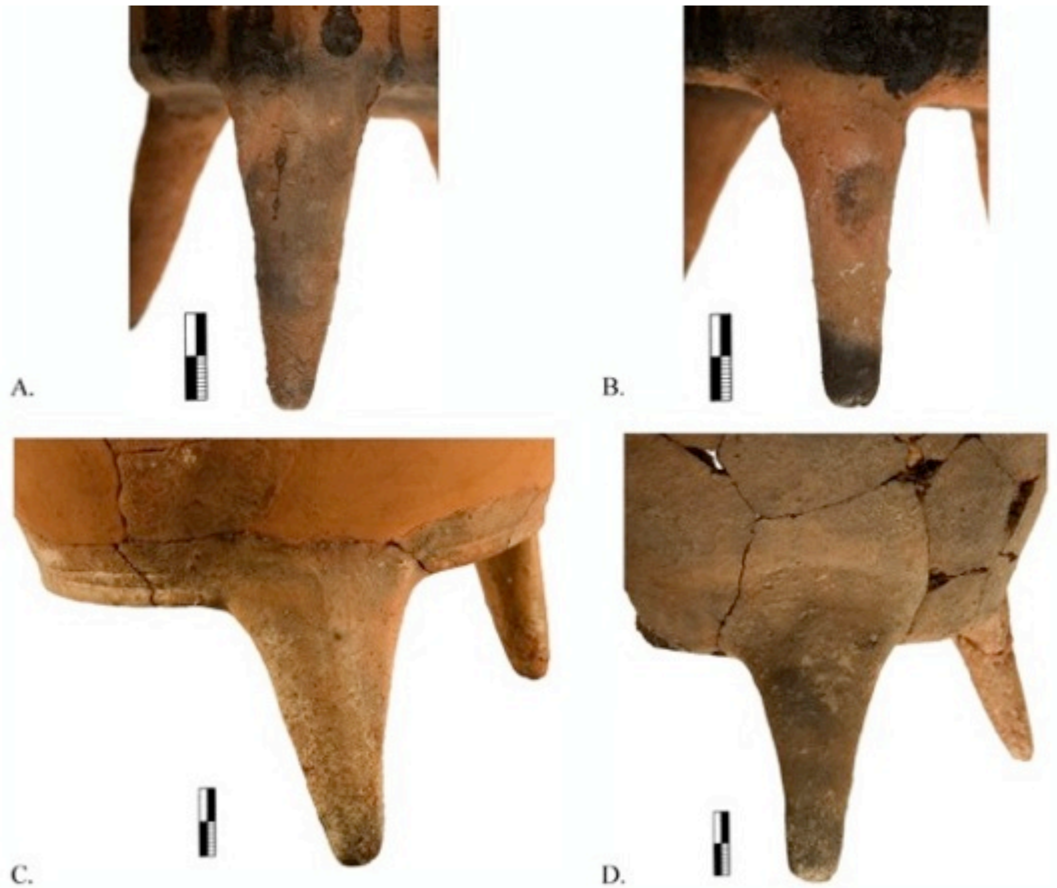


Figure 6.13 Identified carbon marks and burnt food by comparing the legs and lower body of LM style experimental tripod cooking pots and LMI Papadiokambos tripod cooking pots.

LM style experimental tripod cooking pot small No. 2: (A) exterior with light-to-medium carbon marking on lower body, upper leg, and tip with brunt food drips. (B) Heavy carbon on lower body and leg tip with heavy burnt food on body. Vessel PDK0003: (C) exterior slight discoloration and light carbon on lower body and upper leg, heavy carbon on tips. Vessel PDK0314: (D) medium-to-heavy carbon on body and exterior of leg, heavy carbon on leg tip.

Figure 6.14 Identified carbon marks and burnt food by comparing LM style experimental cooking jars and LMI Papadiokambos cooking jars.

(A) LM style experimental cooking jar large small: exterior with light-to-medium carbon marking underneath rim, on shoulder, sides of handles; heavy carbon underneath handles, mid and lower body; some carbon could be removed with water and rag. (B) LM style experimental cooking jar tall: exterior with light-to-medium carbon underneath rim, handles, on upper, mid, and lower body; heavy carbon and burnt food on mid and lower body. (C) Vessel PDK0003: slight discoloration from heat of fire underneath handle, mid-wall, lower body. (D) Vessel PDK0288: medium-to-heavy carbon on body, very heavy carbon on lower body, some blackened areas could be burnt food, but it is uncertain.

A.

B.

Figure 6.15 Identified carbon marks and burnt food by comparing the interior of LM style experimental cooking dish and LMI Mochlos cooking dish (MOC5071).

(A) Interior of LMIB Mochlos cooking dish. Darken areas are burnt foods, (B) Experimental cooking dish formed using Purple Phyllite Hill Clay from Limenaria Cove at Mochlos. Limpets, top shell, garlic and onion are sautéed in olive oil. The darkened areas are stains from the oil.

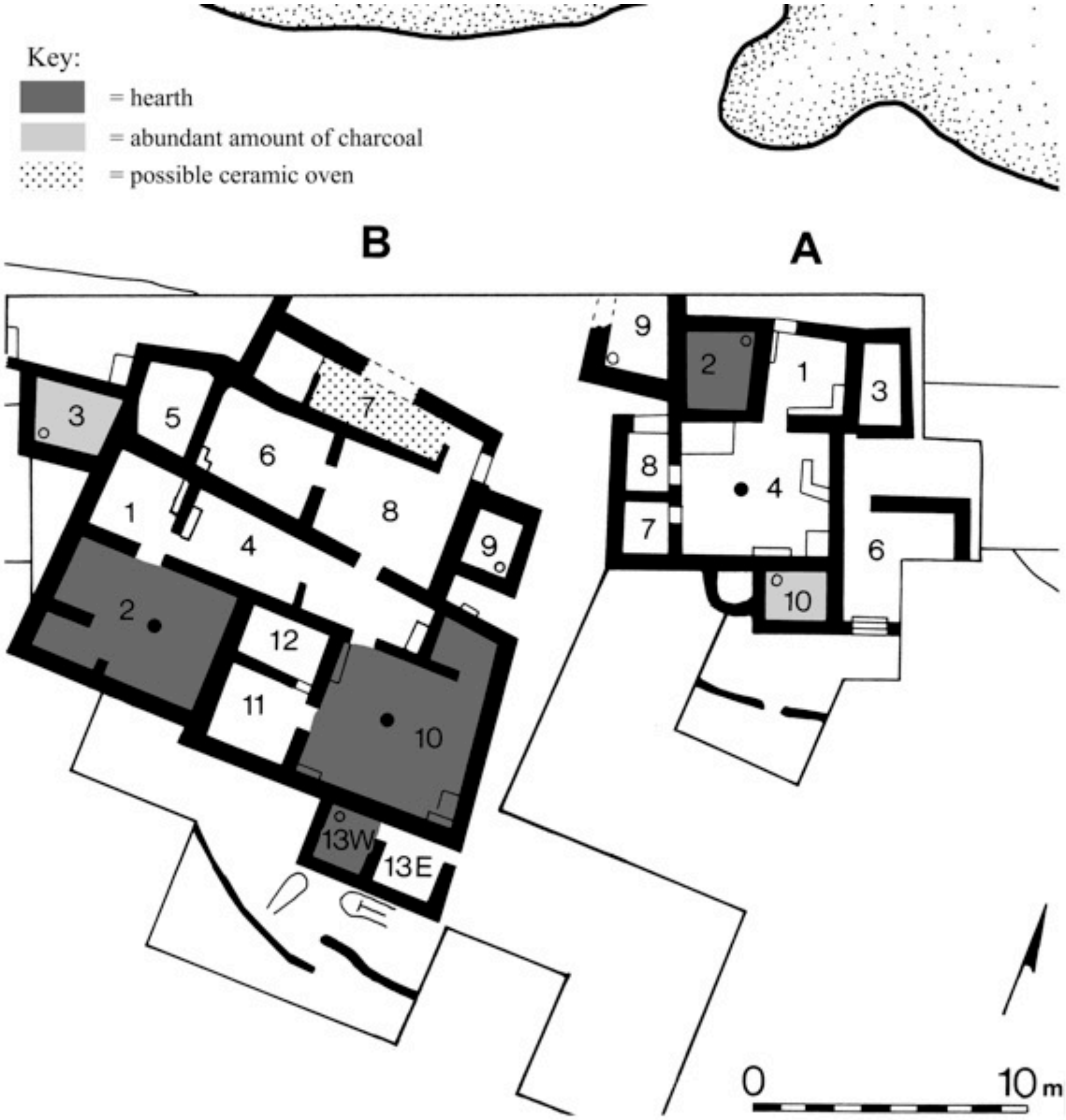


Figure 7.01 Cooking areas identified in LMI Mochlos Artisans' Quarters Buildings A and B (after Soles 2003:fig. 4).

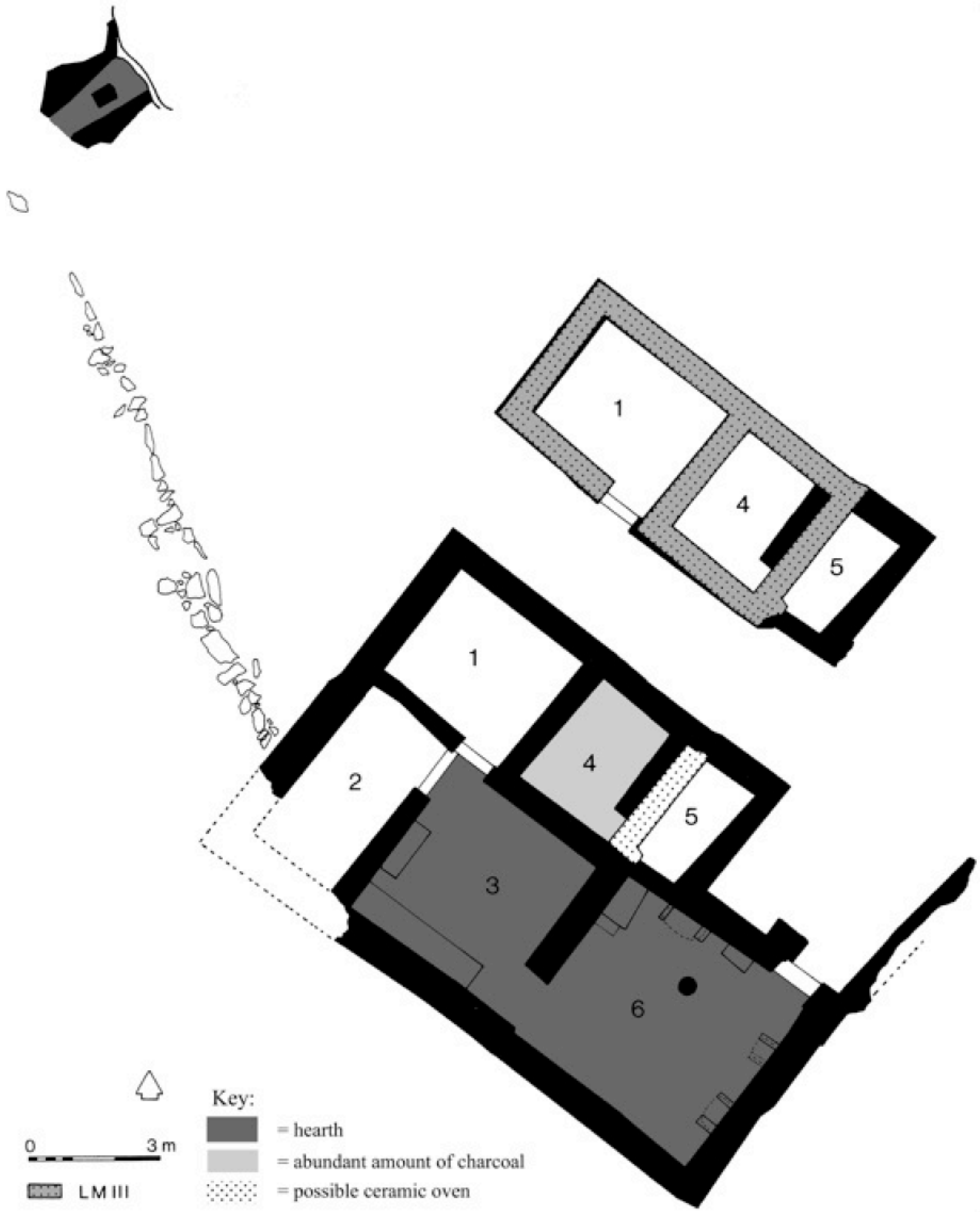


Figure 7.02 Cooking areas identified in Mochlos Chalinomouri Farmhouse (LMI, LMIII phases) (after Soles 2003:fig. 56).

Figure 7.03 LMII-III Mochlos settlement (Soles 2008:fig. 03).

Comprised of 13 houses; 11 have food preparation contexts examined.

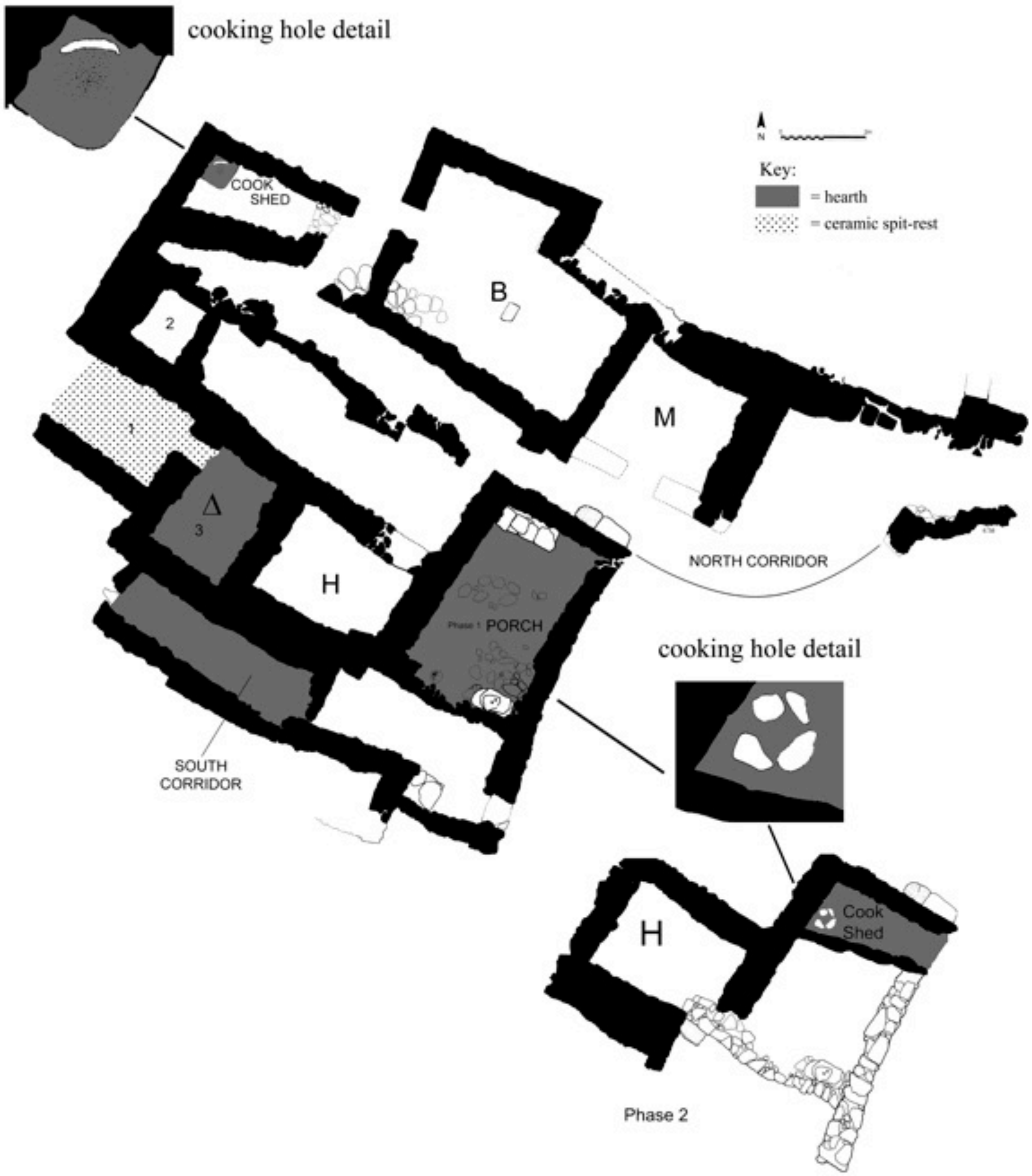


Figure 7.04 LMIII Mochlos Houses Beta, Delta and Eta; details of cooking holes in House Beta cook shed and porch of House H (after Soles 2008:figs. 29, 41A).

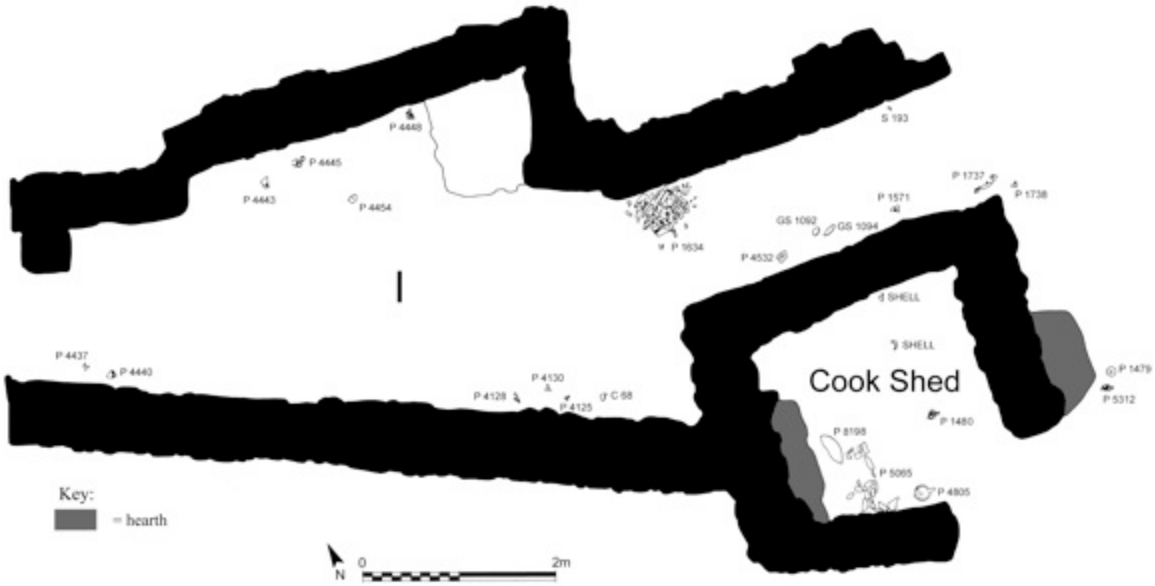


Figure 7.05 LMIIIA (phase 1) Mochlos House Iota (after Soles 2008:fig. 24).

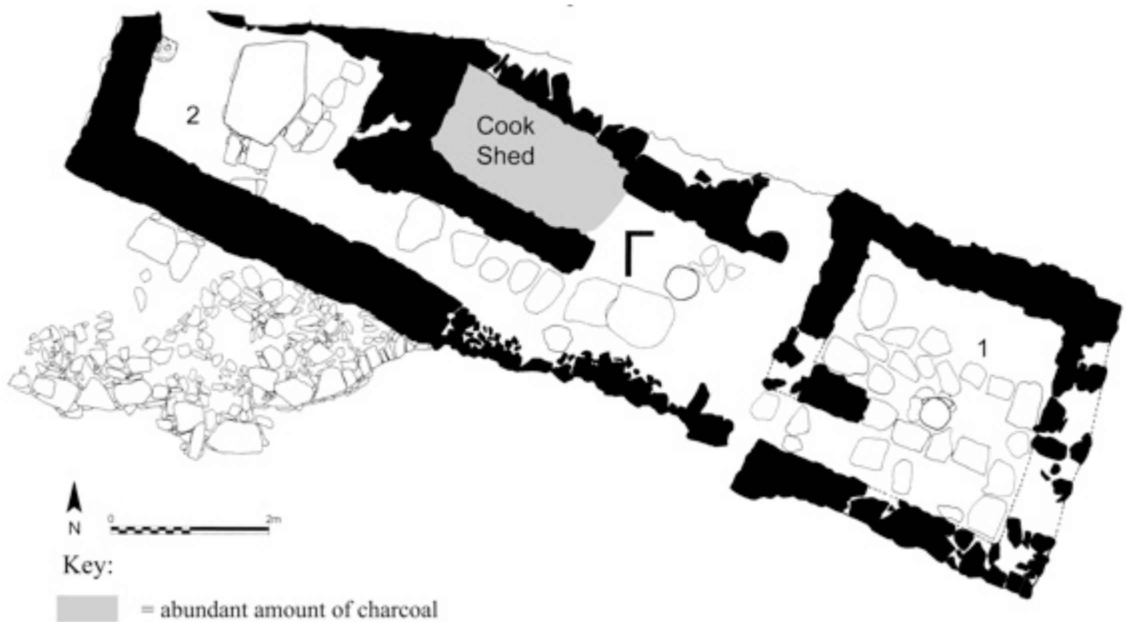


Figure 7.06 LMIII Mochlos House Gamma (after Soles 2008:fig. 66).

Figure 7.07 LMI Papadiokambos House A.1 (after Brogan, *et al.* 2012:fig. 1).

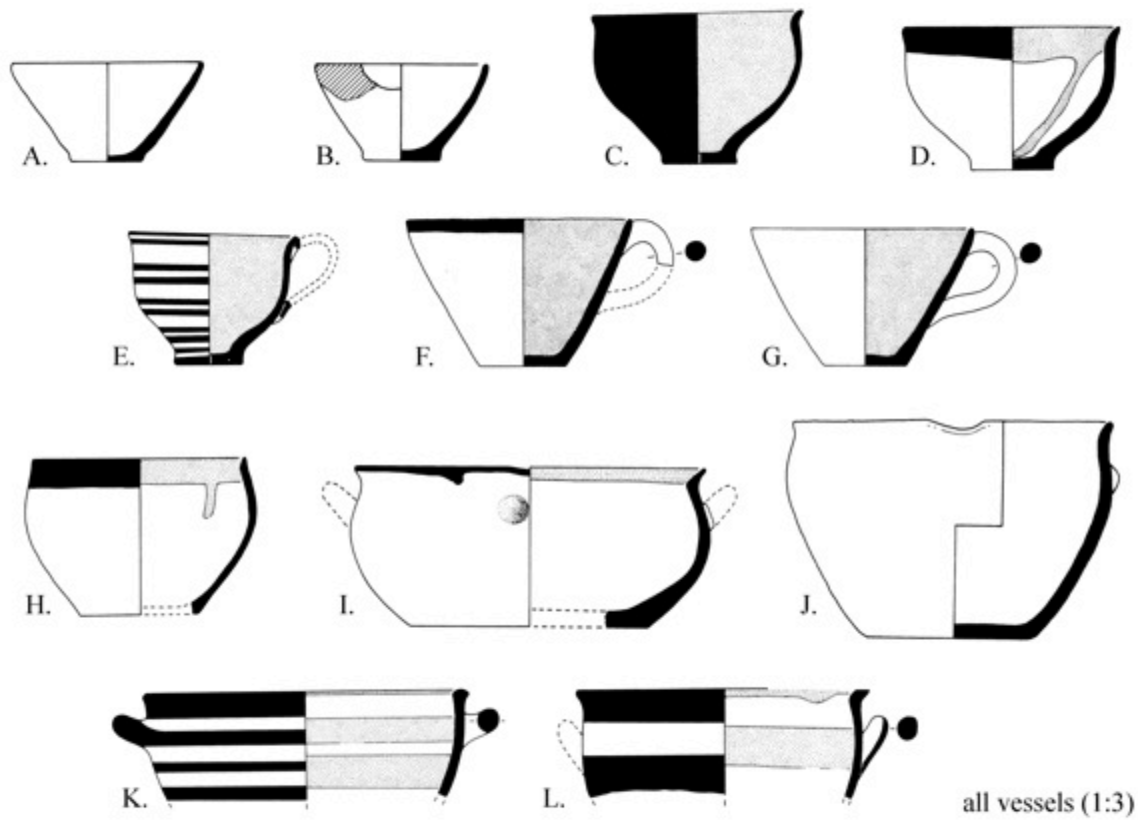


Figure 7.08 LMI cups and bowls.

Mochlos vessels. Similar objects are at Papadiokambos House A.1. Cups: (A) conical, (C, D) ogival, (E) bell, (F, G) large conical with handle, (H) rounded. (B) Conical cup lamp; bowls: (I, J) knob-handled, (K, L) horizontal handle (Barnard and Brogan 2003:figs. 2-4, 9, 10).

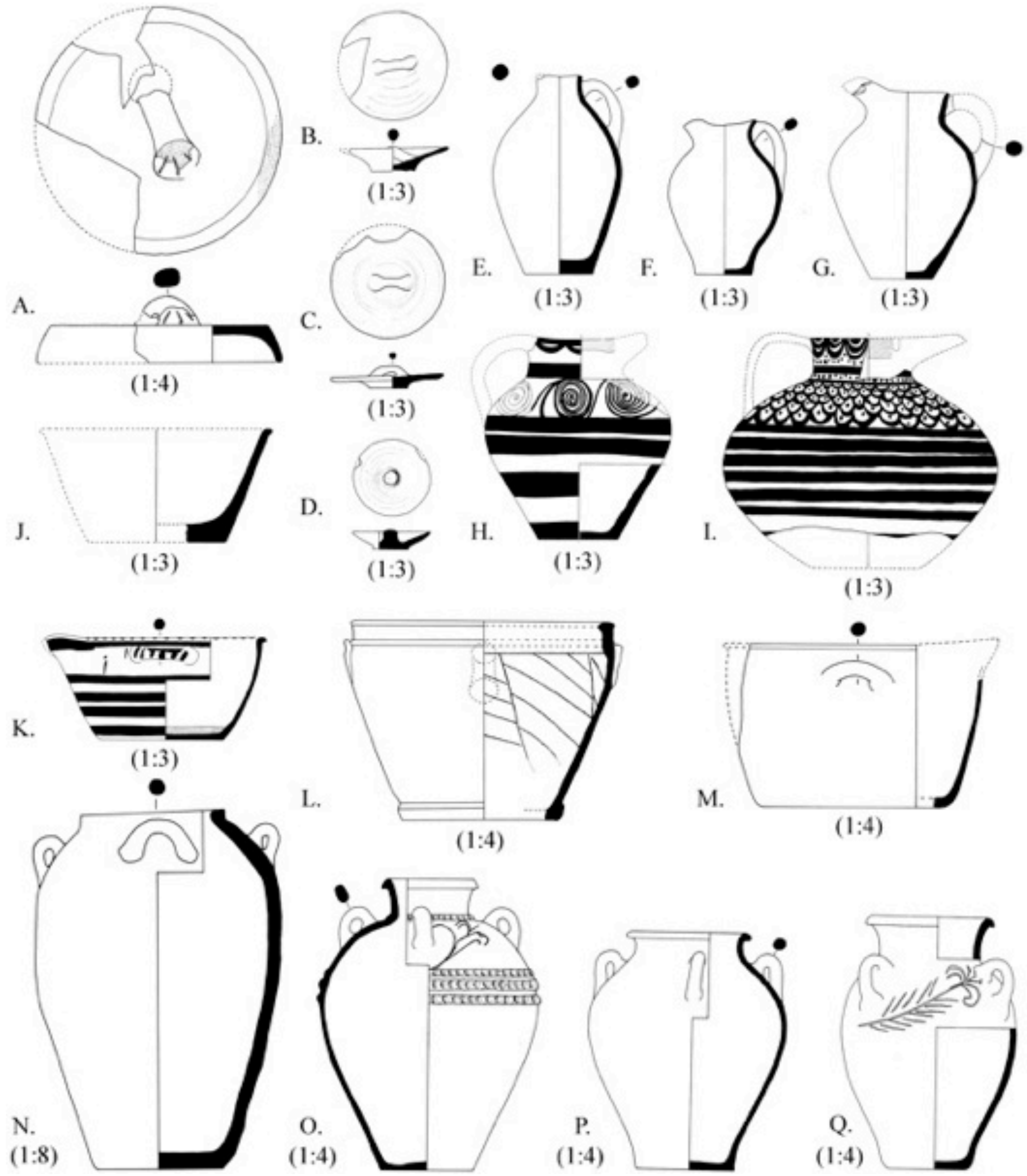


Figure 7.09 LMI vessels associated with storage, food processing and drinking.

Mochlos vessels. Similar objects are at Papadiokambos House A.1. (A-D) Lids; (E-I) jugs; (J) cooking bowl; (K) spouted bowl; (L, M) basins; (N) pithos; (O-Q) piriform jars (Barnard and Brogan 2003:figs. 11, 13, 14, 22-25, 44-46).

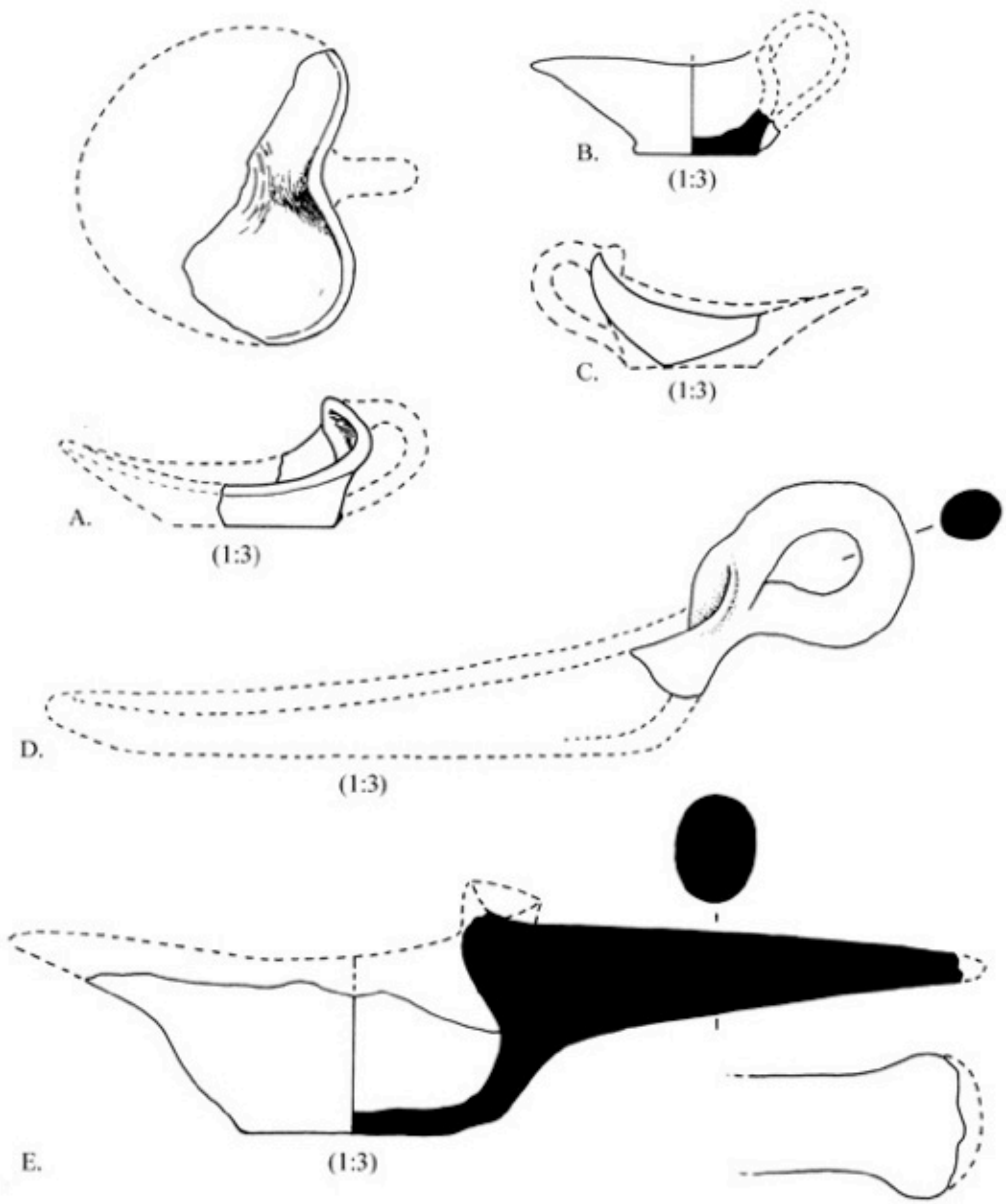


Figure 7.10 LMI fire scuttles presumably used to move hot coals about.

Mochlos objects from food preparation context. Similar objects are at Papadiokambos House A.1. (A) MOC0250, (B) MOC0801, (C) MOC2308, (E) MOC0074; (E) Found in ash deposit in outdoor oven/kiln at Chalinomouri Farmhouse MOC31117 (Barnard and Brogan 2003:fig. 53).

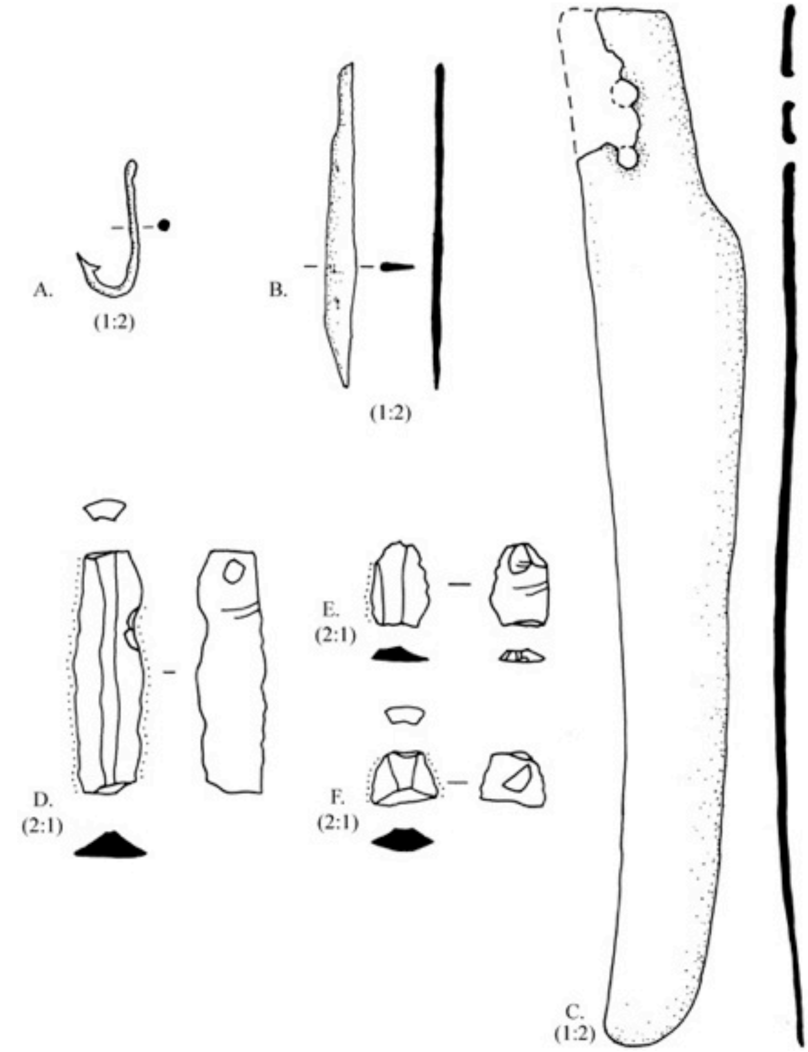


Figure 7.11 LMI fishing equipment and cutting instruments.

Mochlos objects from food preparation contexts. Similar objects are at Papadiokambos House A.1. (A) Small fishhook, MOCCA0024; Copper alloy blades: (B) MOCCA0023, (C) MOCCA0116; Obsidian blades: (D) MOCCS0267, (E) MOCCS0244, (F) MOCCS0247 (Soles 2004:fig. 20, 36, 37).

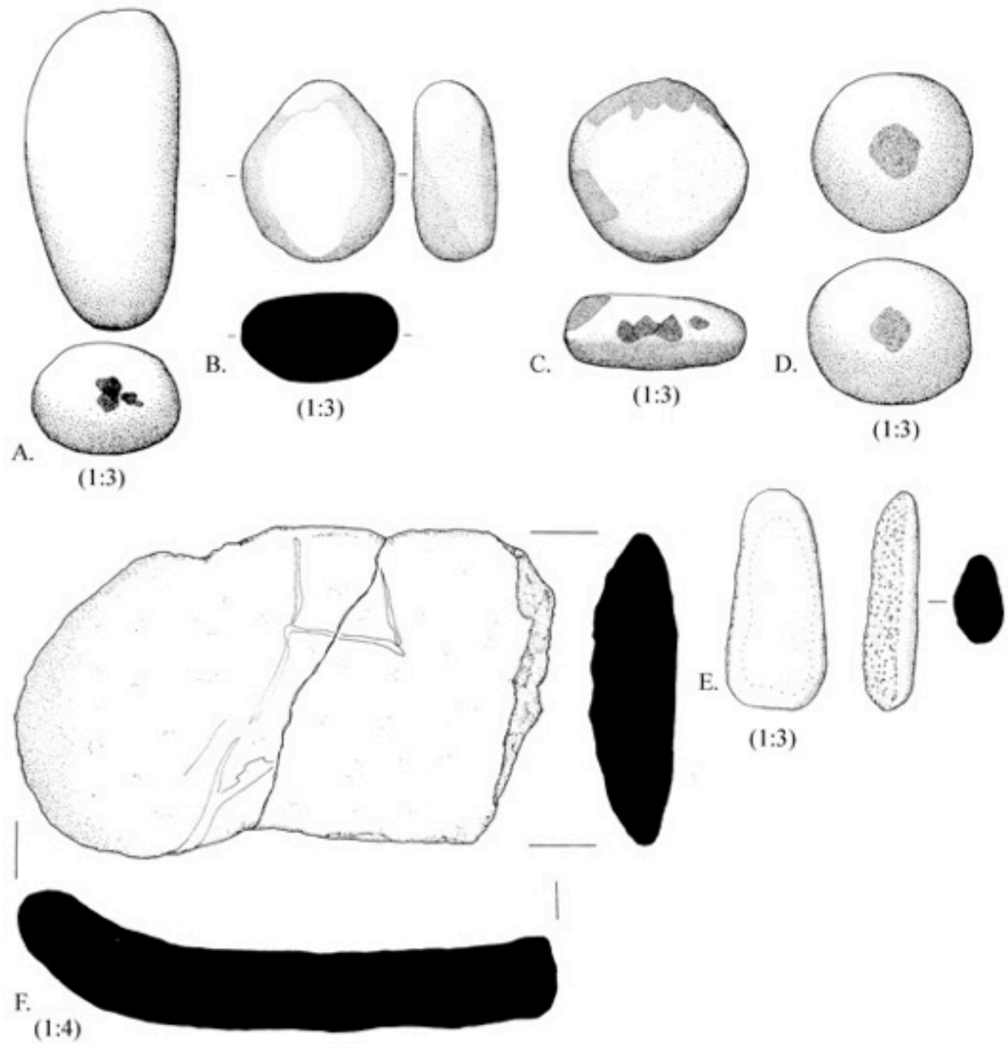


Figure 7.12 LMI stone tools associated with food processing.

Mochlos objects from food preparation contexts. Similar objects are at Papadiokambos House A.1. Hammerstones: (A) MOCGS0297, (C) MOCGS1260; Handstones: (B) MOCGS0522, (D) MOCGS0763; (E) Whetstone: MOCGS0684; (F) Saddle quern, MOCGS1270 (Soles 2004:fig. 23, 24, 28).

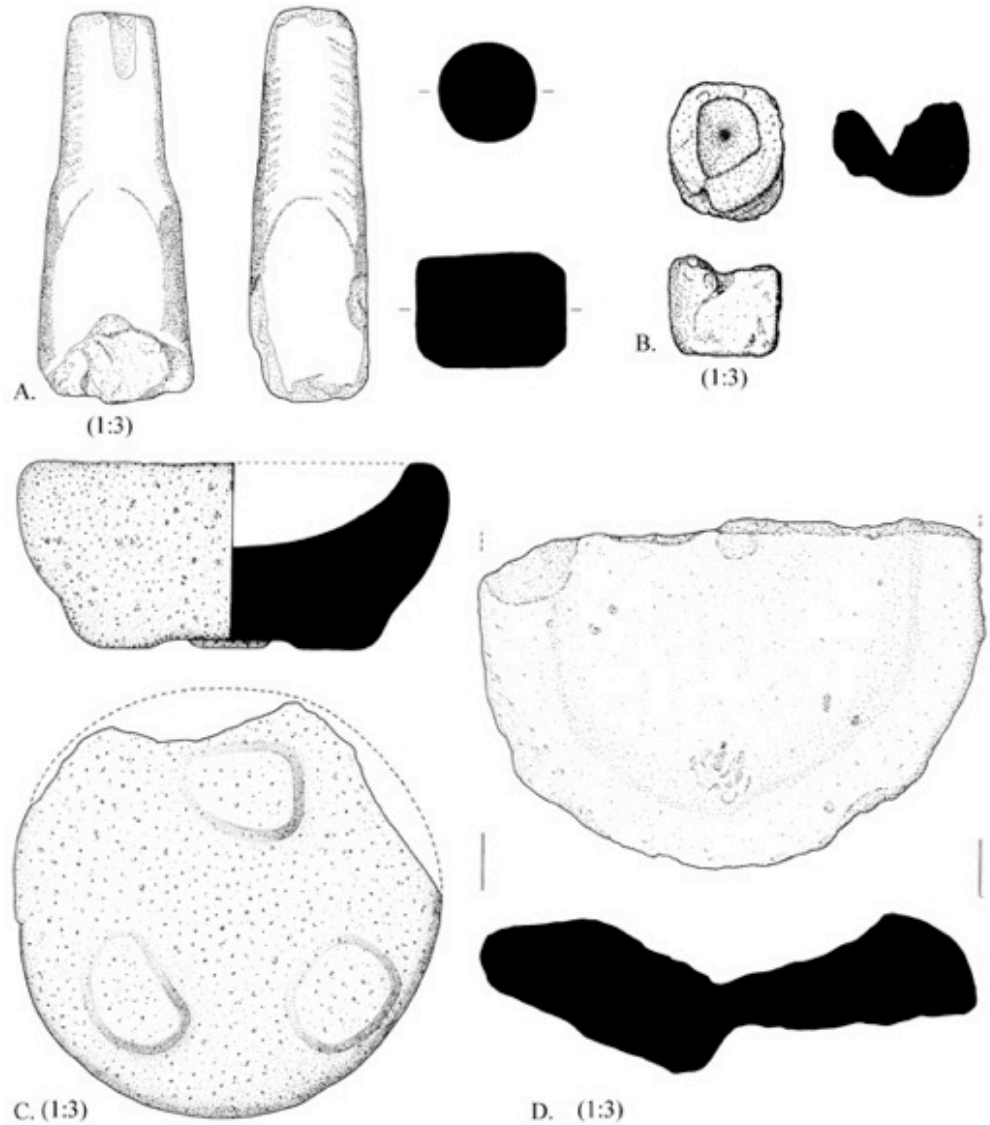


Figure 7.13 LMI stone pestle and mortals associated with food preparation.

Mochlos objects from food preparation contexts. Similar objects are at Papadiokambos House A.1. (A) Pestle, MOCGS0685; mortars: (B) cubic, MOCGS1131; (C) tripod, MOCGS0620; (D) circular, MOCGS0900 (Soles 2004:figs. 24, 29).

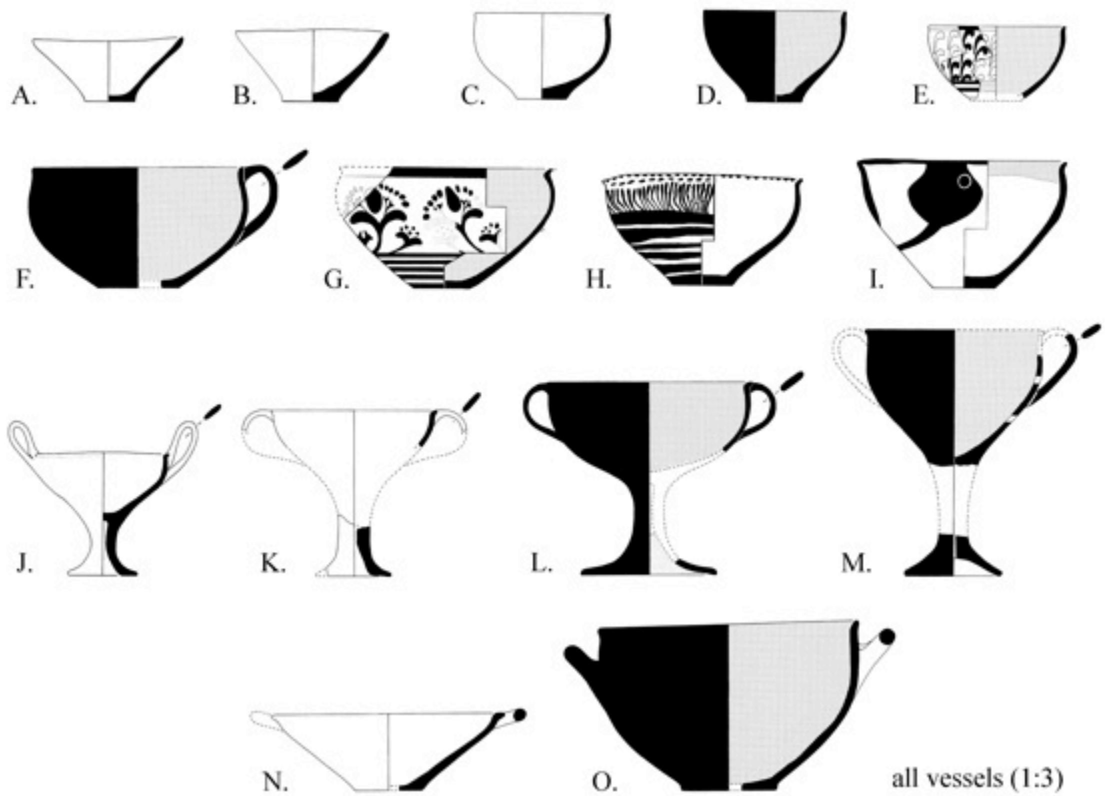


Figure 7.14 LMII-III cups and bowls.

From Mochlos. Cups (A, B) conical, (C, D) ogival, (E-G) deep; bowls (H, I) pulled-rim; (N) shallow, (O) deep; (J-M) kylikes (Smith 2010:figs. 1, 3, 5, 7, 8, 15, 16).

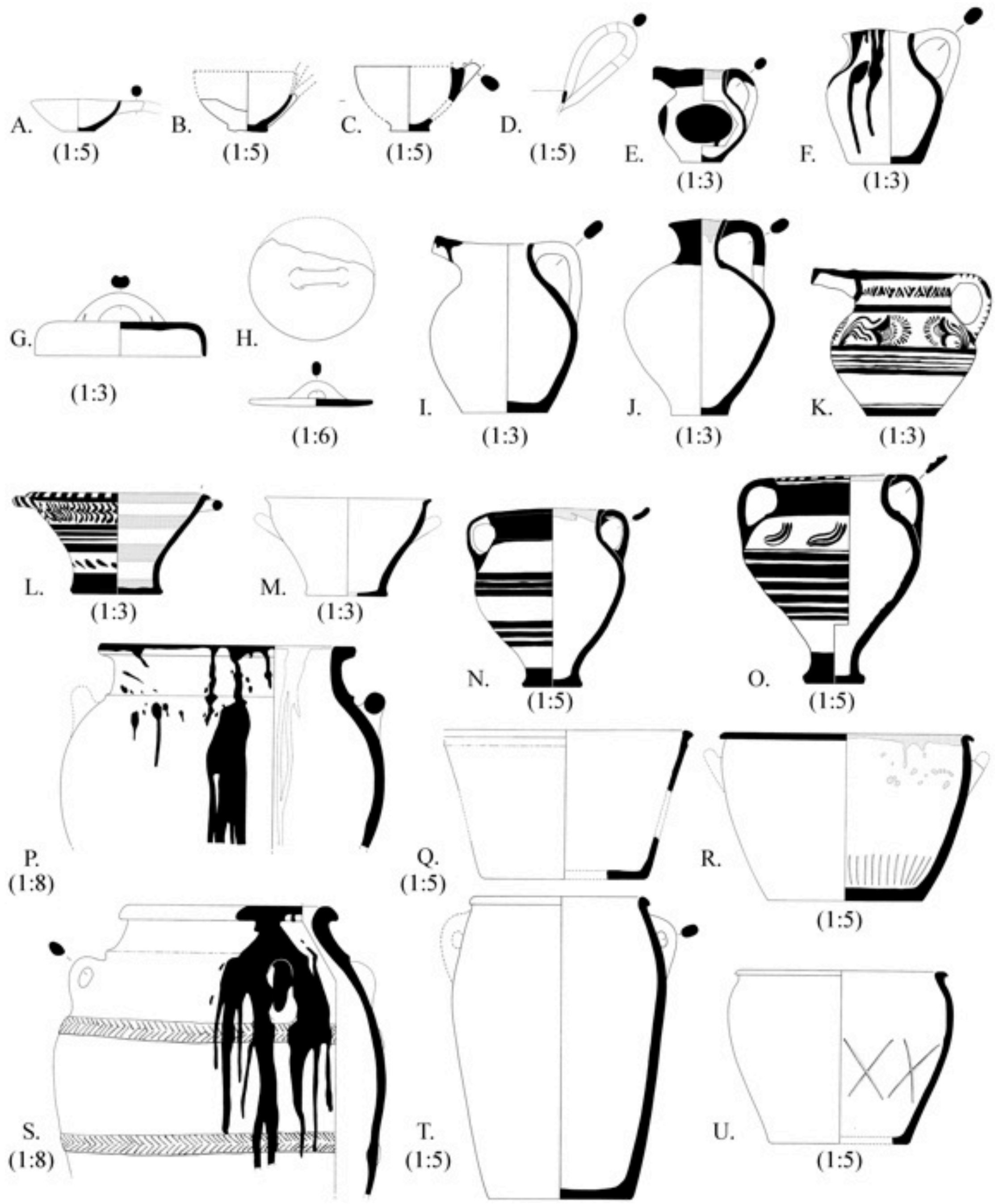


Figure 7.15 LMII-III vessels used for serving, food preparation and storage.

From Mochlos. (A-D) Dippers, (E, F, I-K) jugs, (G, H) lids, (L, M) kalathoi, (N, O) kraters, (P, S, T) pithoi, (Q, R, U) basins (Smith 2010:figs. 18, 20, 23-28, 30, 32, 33, 64, 73, 74).

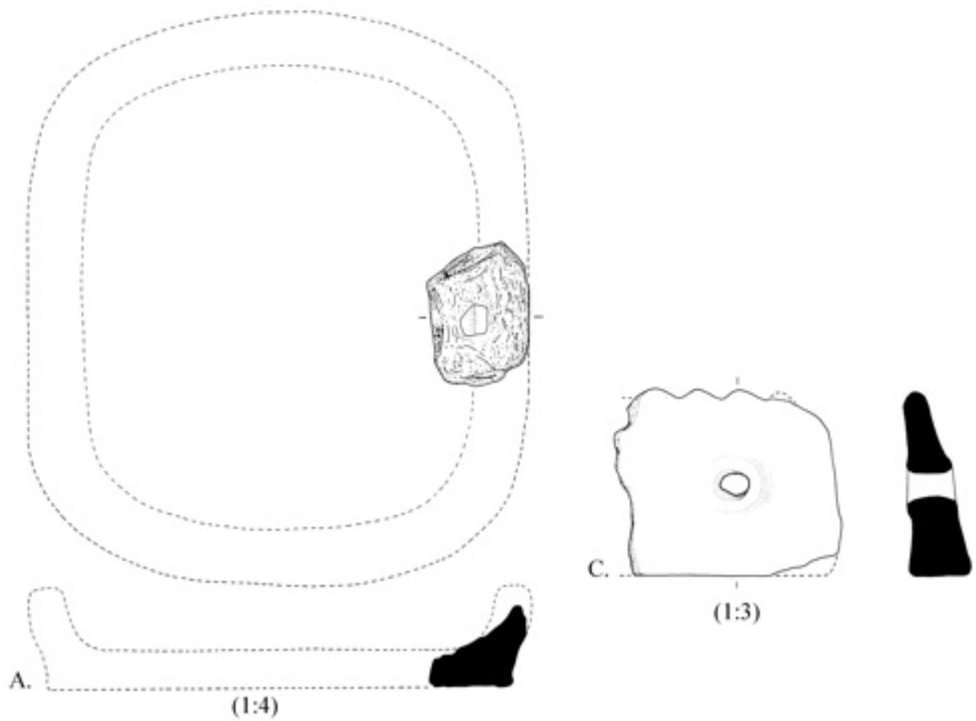


Figure 7.16 LMII-III ceramic objects associated with cooking.

Mochlos objects. (A) Ceramic hearth (MOCS0240); (B) spit stand (MOCS0241) (Soles 2011).

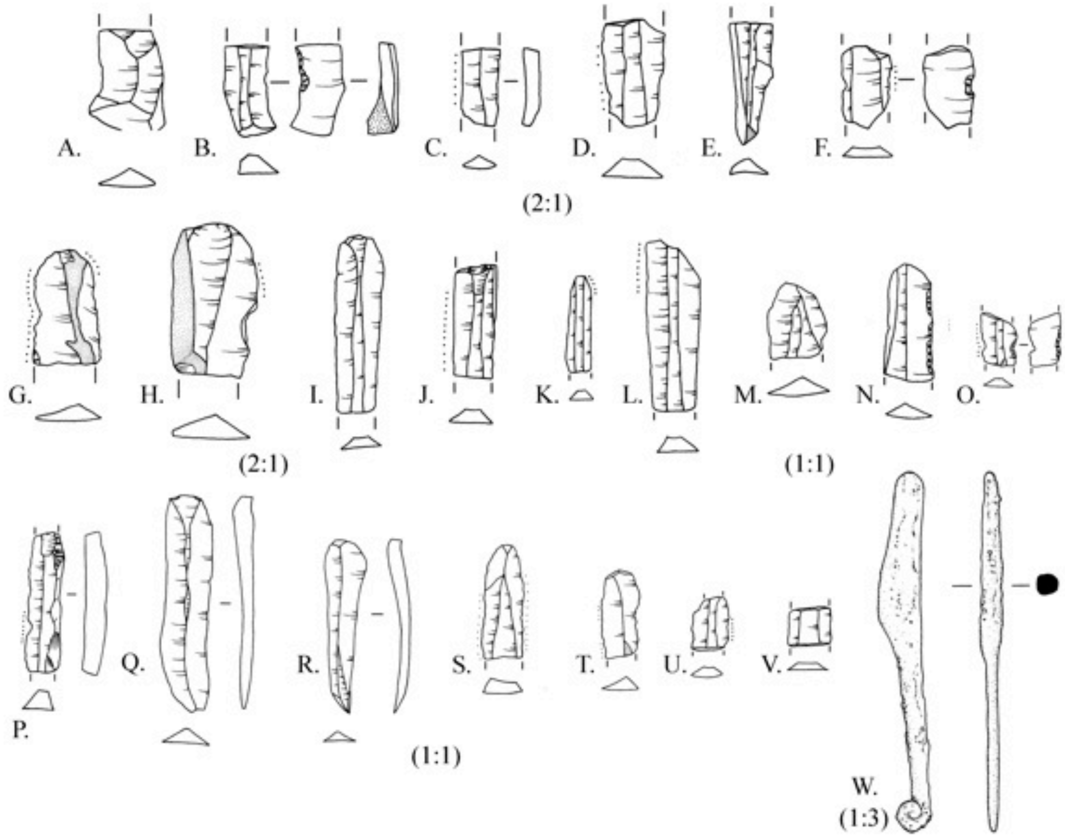


Figure 7.17 LMII-III stone and metal cutting instruments.

Mochlos objects associated with food contexts. Obsidian blades: (A) MOCCS0395.1, (B) MOCCS400.2, (C) MOCCS0395.3, (D) MOCCS0395.4, (E) MOCCS0519.1, (F) MOCCS0395.5, (G) MOCCS0198.2, (H) MOCCS0199.1, (I) MOCCS0203, (J) MOCCS0205.1, (K) MOCCS0205.2, (L) MOCCS1161.1, (M) MOCCS1161.2, (N) MOCCS0437, (O) MOCCS0533.1, (P) MOCCS0473, (Q) MOCCS0471.1, (R) MOCCS0471.2, (S) MOCCS0471.3, (T) MOCCS0471.4, (U) MOCCS0471.5, (V) MOCCS0475; (W) copper alloy knife, MOCA0067 (Soles 2011:figs. 26, 50, 51, 54-56).

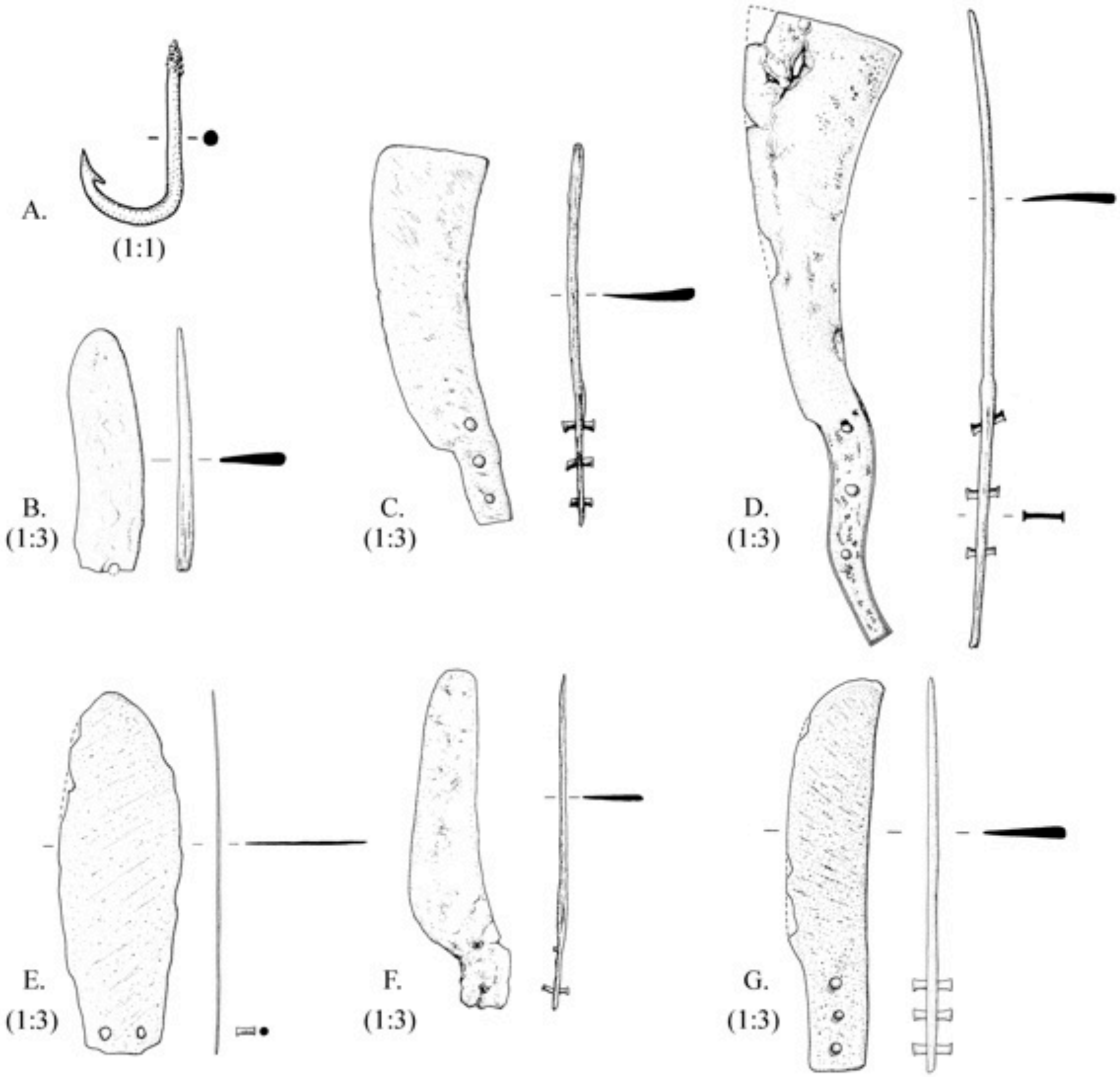


Figure 7.18 LMII-III fishing equipment and copper alloy blades.

Mochlos objects from settlement and cemetery. (A) Fish hook, MOCCA0148; cleavers: (C) MOCCA0135, (D) MOCCA0137; knives (B) MOCCA0146, (E) MOCSM11446, (F) MOCCA0095, (G) MOCSM11445 (Soles 2011:figs. 26-28).

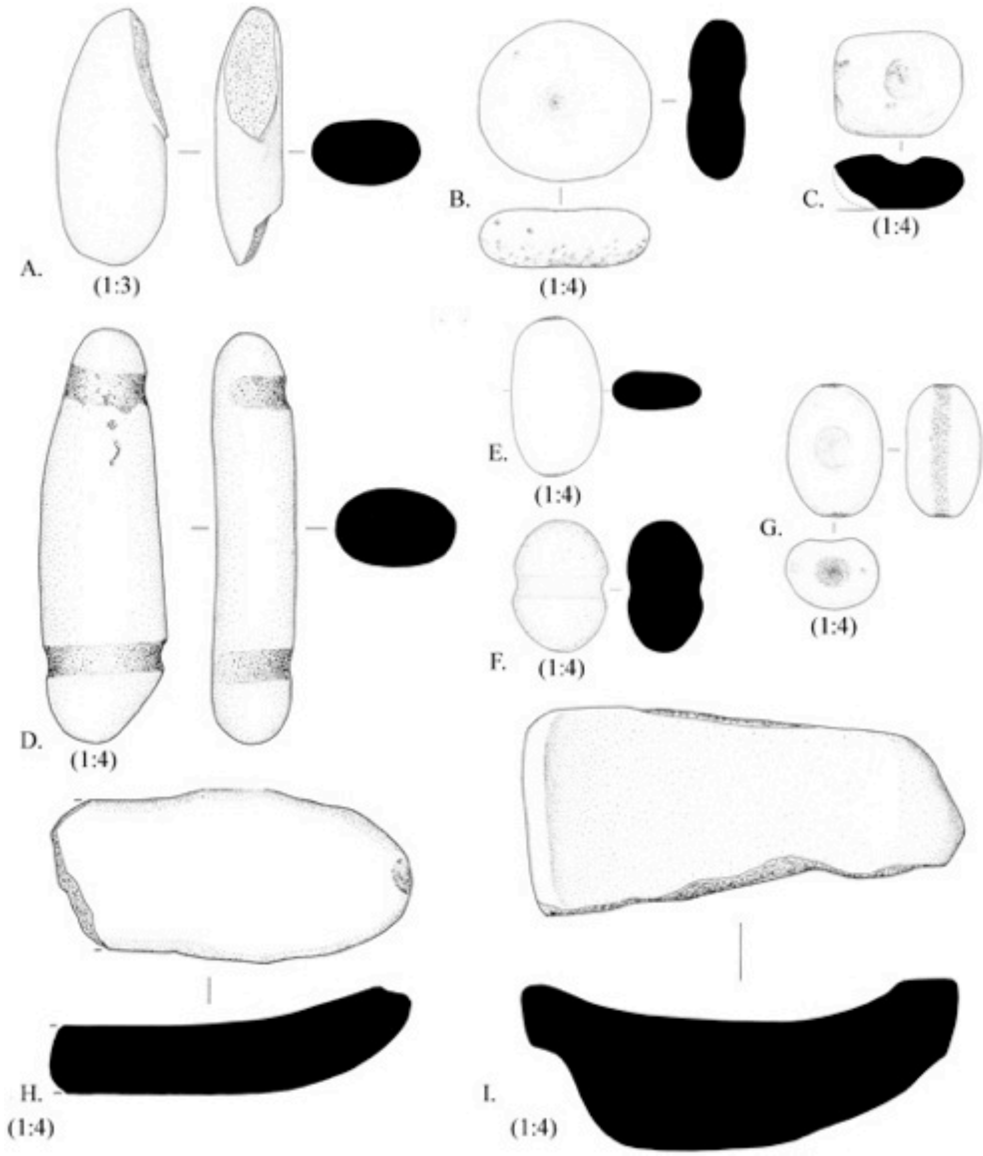


Figure 7.19 LMII-III stone tools for food preparation.

Mochlos objects from food contexts. Hammerstones: (C) MOCGS0454, (A) MOCGS1093, (B) MOCGS0552, (D) MOCGS1058, (E) MOCGS1060, (F) MOCGS1074, (G) MOCGS1058; saddle querns: (H) MOCGS0450, (I) MOCGS1114 (Soles 2011:figs. 37, 38, 42, 43).

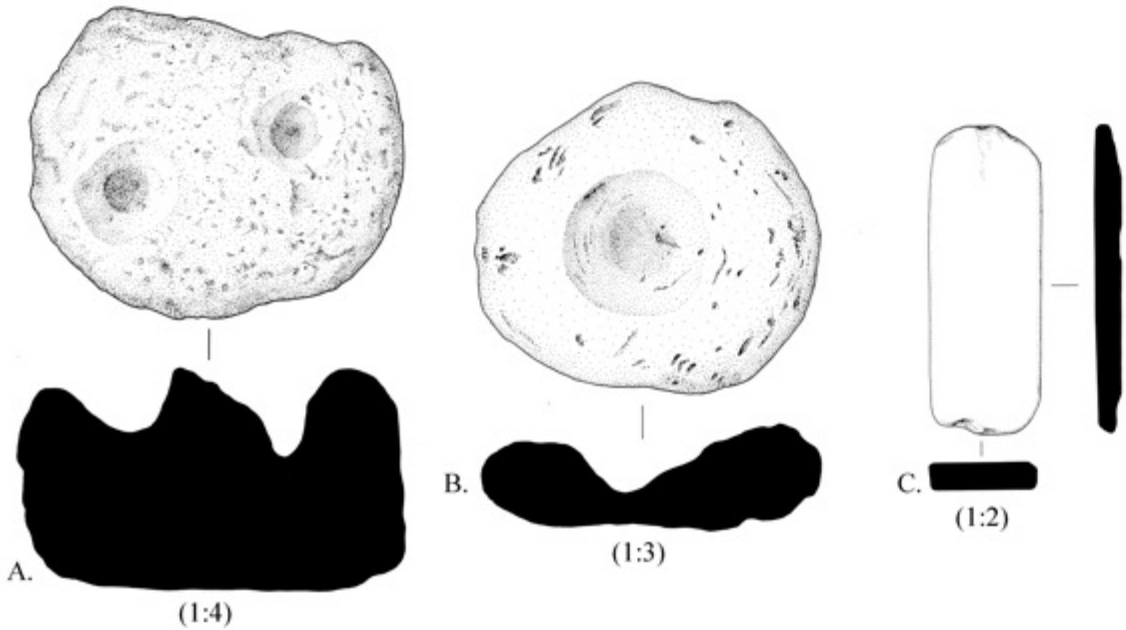


Figure 7.20 LMII-III stone tools for food preparation.

Mochlos objects. Mortars: (A) MOCSG1594, (B) MOCGS0664; (C) Whetstone, MOCSM11449 (Soles 2011:figs. 44, 45).

TABLES

Table 1.01 Minoan relative and absolute chronology.

Chronological divisions of Minoan culture		Lower chronology	Higher chronology
relative dating method based on Egyptian and to a lesser extent Mesopotamia			absolute dating method based on radiocarbon dating and dendrochronology
Platon (REF)	Evans (1921-1935)	Warren and Hankey (1989:169), EM-MMIII; Warren (2006), LM	Manning (1995:217)
Early Prepalatial	Early Minoan I	3650/3500-3000/2900	3100/3000-2700/2650
	Early Minoan IB/IIA		(2700)-2650
	Early Minoan II	2900-2300/2150	
	Early Minoan IIA		2650-2450/2350
	Early Minoan IIB		2450/2350-2200/2150
Late Prepalatial	Early Minoan III	2300/2150-2160/2025	2200/2150-2050/2000
	Middle Minoan IA	2160/1979-20th c.	2050/2000-1925/1900
Protopalatial	Middle Minoan IB	19th c.	1925/1900-1900/1875
	Middle Minoan II	19th c.-1700/1650	1900/1875-1750/1720
	Middle Minoan IIA(-B)		1750/1720-1700/1680
	Middle Minoan IIIA	1700/1650-1640/1630	
Neopalatial	Middle Minoan IIIB	1640/1630-1600	
	Middle Minoan IIIB/Late Minoan IA		1700/1680-1675/1650
	Late Minoan IA	1600/1580-1480	1675/1650-1600/1550
	Theran Eruption ca.	1550-1530	1628; 1613+-13 (Heinemeier, *et al.* 2009)
	Late Minoan IB	1480-1425	1600/1550-1490/1470
Final Palatial	Late Minoan II	1425-1390	1490/1470-1435/1405
	Late Minoan IIIA1	1390-1370/60	1435/1405-1390/1370
Postpalatial	Late Minoan IIIA2	1370/60-1340/30	1390/1370-1360/1325
	Late Minoan IIIB	1340/30-1190+-	1360/1325-1200/1190
LMIIIC	Late Minoan IIIC	1190+-1070+-	no date given

Table 1.02 Correlation of simplified Minoan relative and absolute chronologies to Mycenaean chronology (after Shelmerdine 2008:5, fig. 1.2).

High date	Minoan cultural division	Mycenaean cultural division	Low date
1750	MMIII	MHIII	1700
1700	LMIA	LHI	1600
1600	LMIB	LHIIA	1500
			1430
1490	LMII	LHIIB	1390
1430	LMIIIA1	LHIIIA1	1370/1360
1390	LMIIIA2	LMIIIA2	
1300	LMIIIB	LHIIIB	1300
1200	LMIIIC	LHIIIC	1200
1100			1100

Table 1.03 Late Minoan cook-pots examined.

Vessel Type	Mochlos		Papadiokambos	Vessel type totals:
	LMI	LMII-III	LMI	
tripod cooking pots	21	14	10	45
cooking jars	0	0	4	4
cooking trays	22	22	4	48
cooking dishes	12	36	11	59
Vessel by site totals:	55	72	29	156

Table 5.01 Summary of LM Mochlos fabric studies.

Morrison MACFA LM cook-pots	Barnard (2003); macroscopic name: coarse fabric (CF)	Day, *et al.* (2003) LM I petrographic name	Nodarou (2010) LM II-III petrographic name
Mochlos Low-grade Metamorphic medium-coarse	none	none	Semi-coarse Phyllite (Fabric 1B), most likely
Mochlos Low-grade Metamorphic medium-coarse with silver mica	none	none	
Mochlos Low-grade Metamorphic coarse	CF 1	Fine Phyllite (Group 9)	Coarse phyllite (Fabric 1a)
	CF 2, 3,4	Low Grade Metamorphic Rocks (Group 1)	none
	CF 5	Dark Phyllite (Group 4)	none
Mochlos Low-grade Metamorphic coarse with silver mica	CF 8	Red Metamorphic Fabric (Group 6)	Coarse fabric with muscovite mica-schist (Fabric 1c)
Mochlos Low-grade Metamorphic coarse with chaff-temper	none	none	Coarse phyllite (Fabric 1a)

Table 5.02 Summary of petrographic LMI Fine Phyllite (Day, *et al.* 2003:26-28).

Sample section:	6 vessels: 1 undecorated cooking vessel, 1 piriform jar, 4 miscellaneous vessels
Microstructure: (Whitbread 1995: 380, 381)	few-absent meso and macro planar voids, crude orientation with the long axes parallel with the vessel margins; common-few meso vesicles and few-rare macro and meso vugs; voids are double- to open-spaced; non-plastic inclusions show a very crude orientation with the long axes parallel with the vessel margins
Groundmass: (Whitbread 1995: 381, 382)	homogeneous; color differentiation between core and margins; core color: gray brown, orange brown (PPL), honey brown, orange (XP) in x25; margins color: orange, brown (PPL), red orange, bright orange (XP) in x25; optically active
Matrix:	moderately-poorly sorted; appears almost bimodal grain-size distribution; single-spaced; sub-angular, sub-rounded inclusions
Inclusions:	(c:f:v) 25:70:5; fine fraction: <0.1 mm; coarse fraction: 5-0.1 mm

Inclusions with frequency within matrix: predominant, dominant, frequent, common, few, very few are in table, those with rare and very rare are listed below (Kemp 1985:17)						
Type	Color	Texture	Angularity (Pettijohn, *et al.* 1973)	Size (mm long diameter)	Frequency within matrix (Kemp 1985:17)	Comments
phyllite metamorphosed siltstone-mudstone; chlorite-iron oxide phyllites	(PPL) yellow-orange, brown, gray-white, red-gray	very fine-grained	elongate, equant	< 5	dominant	composed: biotite mica, quartz; feldspar; segregation into mica-rich, quartz-rich; muscovite mica
polycrystalline quartz	not noted	not noted	equant, sub-angular	not noted	few	some grade into meta quartzite
slate	not noted	not noted	not listed	not noted	few	not noted
monocrystalline quartz	not noted	not noted	equant, sub-angular	not noted	few-rare	not noted
mudstone	dark red, gray	polygon ally cracked	sub-rounded, rounded	not noted	very few-rare	not noted
clinozoisite	not noted	not noted	equant, sub-angular, sub-rounded	not noted	very few-rare	not noted
limestone micrite (mainly), sparite (rarely)	not noted	not noted	not noted	not noted	very few-absent	sparse monocrystalline quartz

Additional non-plastic inclusions:
Rare:
chert
biotite laths
epidote-biotite mica rock fragments
plagioclase feldspar
sandstone (elongate, angular; composed: quartz grains in clay-rich matrix, some grade into schists, biotite mica laths, clinozoisite, some alkali, plagioclase feldspar; well-sorted to moderately-sorted, quartz arenite-sub arkose)
Very rare:
epidote
iron oxides
Very rare-Absent:
graywacke (composed: quartz, biotite and muscovite mica, alkali feldspar in a fine-grained quartz-rich matrix)
organic material [concentration of very well rounded grains, color: black (PPL), dark red (XP)]
muscovite mica
alkali feldspar
microfossils (formainifera)
quartz-iron oxide metamorphic rock fragments

Table 5.03 Summary of petrographic LMI Low Grade Metamorphic (Day, *et al.* 2003:15, 16).

Sample section:	8 vessels: 6 closed vessels, 1 amphora, 1 miscellaneous vessel
Microstructure: (Whitbread 1995: 380, 381)	rare-very rare macro and mega vugs, very rare-absent mega planar voids; meso planar voids have crude, long axes oriented parallel with the vessel margins; the voids are generally double-space.
Groundmass: (Whitbread 1995: 381, 382)	homogeneous; color: gray brown-paler brown (PPL), dark brown-dark red brown (XP) x40; color differentiation between core and margins in two samples; optically slightly active-optically moderately active
Matrix:	moderately-poorly sorted; appears almost bimodal grain-size distribution; packing of non-plastic inclusions: single- to double-spaced; sub-angular to sub-rounded inclusions
Textural concentration features (Tcf): (Whitbread 1995: 386)	rare; 2 different kinds clay pellets (probably): 1) few, sub-angular to rounded, black (PPL), very dark brown red (XP), clear boundaries with high optical density, discordant with the micromass, contains monocrystalline quartz; 2) few to very few, sub-angular to rub-rounded, dark red brown (PPL), dark reddish brown (XP), clear boundaries, high optical density, discordant with micromass, contains monocrystalline quartz, muscovite mica, chlorite
Inclusions:	(c:f:v) 25:70:5 to 35:58:7; fine fraction: <0.1 mm; coarse fraction: 2.5-0.1 mm

Inclusions with frequency within matrix: predominant, dominant, frequent, common, few, very few are in table, those with rare and very rare are listed below (Kemp 1985:17)						
Type	Color	Texture	Angularity (Pettijohn, *et al.* 1973)	Size (mm long dia.)	Frequency within matrix	Comments
Phyllite (a few grading into schist)	pale brown, yellow-orange, red, dark grayish brown	fine-grained	elongated	<2.25	dominant-few	composed: quartz, chlorite, biotite mica, large quartz
1) quartz-biotite schist; 2) quartz-muscovite schist; 3) biotite chlorite schist; 4) green schist	not noted	coarse, finer grained	sub-angular, sub-rounded, equant, elongated	<2.5	common-very few	composed: iron oxides, chlorite, some titanite (sphene)
monocrystalline quartz	not noted	not noted	equant, angular, sub-angular	not noted	common-very few	not noted
polycrystalline quartz	not noted	not noted	not listed	not noted	common-rare	boundaries sutured, stretched meta quartz
slate	(PPL) yellow-brown, orange-brown; (XP) dark red, brown	very fine-grained	elongated, sub-angular, sub-rounded	not noted	common-rare	not noted

Additional non-plastic inclusions:
Rare-absent:
sandstone (some partially metamorphosed; quartz grains broken down mechanically; contains: quartz, alkai feldspar, some amphibole; fine matrix in clay and quartz-rich)
amphibole (equant-elongated, moderate releif, pleochroism from pale yellow-yellow, first-lower second order interference colors in XP)
acid igneous rock fragments
siltstone (sub-rounded, equant, partically metamorphosed)
biotite laths
Greywacke
plagioclase feldspar
microfossils (calcareous, foraminifer, ostracods)
iron oxides
alkali feldspar
Chlorite
calcimudstone (micrite-sub-rounded)
Chert
mudstone (elongate, sub-angular, brown)
Very rare-absent:
muscovite mica
altered volcanic rock fragments

Table 5.04 Summary of petrographic LMI Dark Phyllite (Day, *et al.* 2003:20, 21).

Sample section:	2 samples: 1 closed vessel, 1 miscellaneous vessel
Microstructure: (Whitbread 1995: 380, 381)	common meso vesicles, few meso vugs and very rare macro vugs; common-few macro planar voids with the long axes oriented parallel with the vessel margins; voids are single- to double-spaced; non-plastic inclusions display a crude orientation with the long axes parallel with the vessel margins in one sample
Groundmass: (Whitbread 1995: 381, 382)	homogeneous; colors: pale yellowish brown-dark brown (PPL), dark reddish brown-dark brown (XP) x40; micromass is optically active to optically slightly active
Matrix:	poorly-moderately sorted; unimodal, but almost appears to be almost biomodal grain-size distribution; packing of non-plastic inclusions: single-spaced; sub-angular to sub-rounded inclusions
Textural concentration features (Tcf): (Whitbread 1995: 386)	few-rare; clay pellets (probably): dark brown (PPL, XP); boundaries: sharp, clear often with a surrounding void; display high optical density; equant-slightly elongated; concordant with micromass, contains non-plastic inclusions of monocrystalline quartz
Inclusions:	(c:f:v) ca. 35:60:5 to 30:60:10; fine fraction: 0.2 mm or less; coarse fraction: 4-0.2 mm

Inclusions with frequency within matrix: predominant, dominant, frequent, common, few, very few are in table, those with rare and very rare are listed below (Kemp 1985:17)						
Type	Color	Texture	Angularity (Pettijohn, *et al*. 1973)	Size (mm long diameter)	Frequency within matrix	Comments
phyllite	dark reddish-orange brown, yellowish-grayish brown	fine-grained	very elongated, equant, sub-angular, sub-rounded	<3	dominant	composed: biotite mica, quartz, chlorite; coarse quartz forms bands
slate	PPL, XP (x40) gray, green, yellowish brown	finer-grained than phyllite	very elongated, sub-rounded	<4	dominant-few	many grade into phyllite
quartz biotite schist	not noted	not noted	equant, angular, sub-angular	not noted	few-very few	proportions quartz, biotite mica; schistosity
chlorite biotite mica-schist	not noted	not noted	elongate-equant, sub-angular, sub-rounded	not noted	few-very few	composed: chlorite, biotite laths, folded
polycrystalline quartz	not noted	not noted	elongate-equant, angular to sub-angular	not noted	few-very few	metamorphosed sheared quartz; boundaries: very sutured
muscovite mica	not noted	not noted	not noted	not noted	few-absent	not noted

Additional non-plastic inclusions:
Very few-Rare:
sandstone (partially metamorphosed, coarse crystals of quartz showing strong alignment set in a very fine-grained grayish brown matrix, clay-rich matrix, some quartz prophyroclasts)
mudstone (red in PPL, XP; sub-rounded)
Rare-Very rare:
quartz biotite feldspar schist (composed: quartz, feldspar, biotite mica)
cataclasite (mechanically broken down grains of plagioclase and alkali feldspar rock fragments, some biotite mica and fine-grained quartz, clay-rich matrix)
Very rare-Absent:
garnet-quartz metamorphic rock fragment
Micrite
epidote quartz metamorphic rock fragment
Clinozoisite
Chlorite
muscovite chlorite schist
alkali feldspar
Epidote

Table 5.05 Summary of petrographic LMI Red Metamorphic (Day, *et al.* 2003:22, 23).

Sample section:	1 miscellaneous undecorated vessel
Microstructure: (Whitbread 1995: 380, 381)	few micro vesicles, rare macro vugs, few meso vugs, few meso planar voids; voids are open-spaced; voids display random orientation; non-plastic inclusions display very crude orientation of the long axes parallel to the vessel margins; non-plastic inclusions are mainly double-spaced
Groundmass: (Whitbread 1995: 381, 382)	homogeneous; slight color differentiation between core and margins; color: dark brown to red orange (PPL), red brown to red orange (XP) in x40; optically active
Matrix:	moderately sorted; unimodal grain-size distribution; single-spaced; angular, sub-rounded inclusions
Textural concentration features (Tcf): (Whitbread 1995: 386)	sub-angular, sub-rounded; dark brown (XP); orange brown, pale yellowish brown (PPL) 40x; some have surrounding voids, others have clear boundaries and are discordant with the micromass; their optical density is neutra-slightly high or low; grog (possible) composed: non-plastic inclusions of monocrystalline quartz, polycrystalline quartz, low grade metamorphic rock fragments, epidote, muscovite mica, boitite mica; their angularity, the darker coloration (XP)
Inclusions:	(c:f:v) 30:65:5; fine fraction: <0.1 mm; coarse fraction: 3.5-0.1 mm

Inclusions with frequency within matrix: predominant, dominant, frequent, common, few, very few are in table, those with rare and very rare are listed below (Kemp 1985:17)						
Type	Color	Texture	Angularity (Pettijohn, *et al*. 1973)	Size (mm long diameter)	Frequency within matrix (Kemp 1985:17)	Comments
phyllite (grains show strong alignment; original sedimentary lamination)	(PPL) light orange-brown, brown, dark reddish brown	not noted	elongate, sub-angular, sub-rounded	< 3.5	frequent	composed: some biotite mica rich, others muscovite mica rich; quartz coarser and always in bands,
quartz-biotite-muscovite schist	not noted	not noted	elongate, sub-angular, sub-rounded	not noted	common	variable amounts of biotite mica and muscovite mica; some folding is visible
monocrystalline quartz	not noted	not noted	equant, sub-angular	not noted	common	undulose and straight extinction
polycrystalline quartz	not noted	not noted	equant, sub-angular, sub-rounded	not noted	few	boundaries are sutured
muscovite mica	not noted	not noted	not noted	not noted	few	not noted

Additional non-plastic inclusions:
Rare:
iron oxide
biotitie mica
quartz-epidote-rich metamorphic rock fragment
Very rare:
green schist
titanite (sphene)
psammite (metamorphosed sandstone; composed: quartz grains (porphyroclasts) in a metamorphosed matrix of chlorite and biotite mica, iron oxides also present)

Table 5.06 Summary of petrographic LMII-III Coarse Phyllite Ia (Nodarou 2010:5, 6).

Sample section:	10 cook-pots: 5 tripod cooking pots, 3 cooking dishes, 2 cooking trays
Microstructure: (Whitbread 1995: 380, 381)	rare-very rare meso and macro vugs, very rare planar voids, very few meso planar voids and channels, occassionally displaying preferred orientation parallel to vessel margins; voids are single- to doubled-spaced; non-plastic inclusions are randomly oriented; evidence for organic tempering; secondary calcite present
Groundmass: (Whitbread 1995: 381, 382)	homogeneous; colors: yellowish brown to reddish brown (PPL) in x50, brown and dark reddish brown (XP), some color differentiation between core and margins; core-brown (PPL), dark gray brown (XP) in x25; margins-brown (PPL), dark brown (XP) in x25; optically moderately to inactive
Matrix:	fine; poorly sorted; bimodal grain-size distribution; packing of coarse fraction: closed- to single-spaced; packing of fine fraction: single- to open-spaced; it is matrix supported (wackestone texture)
Textural concentration features (Tcf): (Whitbread 1995: 386)	few to very few; equant, sa-sr; colors: translucent red-dark red, dark brown; some contain no inclusions, in others have inclusions consisting primarily of quartz; mode: 0.38 mm long diameter; size: 1.54-<0.2 mm long diameter
Inclusions:	(c:f:v) 60:33:7 to 45:51:4; fine fraction: <0.2 mm; coarse fraction: 6.9-0.2 mm

Inclusions with frequency within matrix: predominant, dominant, frequent, common, few, very few are in table, those with rare and very rare are listed below (Kemp 1985:17)

Type	Color	Texture	Angularity (Pettijohn, *et al*. 1973)	Size (mm long dia.)	Frequency within matrix	Comments
phyllite (very few cases: metamorphosed sandstones or mudstone/siltstone)	orange brown-golden brown (XP), very dark brown, silvery gray, greenish gray, purple	fine-grained	elongated	6.9-0.2	predominant-frequent	composed: biotite mica, quartz; rare white mica, some occur intergrowth with quartzite
monocrystalline quartz	not noted	not noted	equant	1.9-0.2	frequent	a-sa,
quartzite	not noted	not noted	equant-elongated	2.31-0.2	common-few	a-sa, some grading into chert, some display straining (quartzite-schist)
biotite mica	not noted	not noted	not noted	not noted	few	not noted
chert	not noted	fine-grained	equant	4.6-0.23	very few	sa-sr
white mica laths	not noted	not noted	not noted	not noted	very few	not noted

Additional non-plastic inclusions:
Very few-rare:
plagioclase feldspar (equant-slightly elongate, 1. 6-0.2 mm)
Very few-absent:
igneous rock fragments (1.9-0.77 mm, probably altered)
micrite (equant, 2.7-0.23 mm, composed: micrite, limestone, some contain quartz)
Rare:
Biotite
Very rare-absent:
sandstone (equant-slightly elongate, composed: quartz grains in fine-clay matrix, 2.35-0.38 mm)
epidote (equant, 0.3 mm long diameter)
fossils (foraminifera)

Table 5.07 Summary of petrographic LMII-III, Coarse Fabric with Muscovite Mica-schist Ic (Nodarou 2010:141, 142).

Sample section:	2 pithoi (MOC 03/088, MOC 03/086)
Microstructure: (Whitbread 1995: 380, 381)	very few meso and macro vugs, rare channels; voids and non-plastic inclusions are randomly oriented; voids single- to open-spaced
Groundmass: (Whitbread 1995: 381, 382)	homogeneous; MOC 03/088: core is slightly darker than margins: reddish brown to dark brown (PPL) x50; dark reddish brown (XP); micromass is optically inactive; MOC 03/086: matrix is brown (PPL) x50, golden brown (XP); micromass is optically active
Matrix:	poorly sorted; bimodal grain-size distribution; packing of non-plastic coarse inclusions: MOC 03/088 close- to double-spaced, MOC 03/086 close- to open-spaced; packing of fine fraction is close- to double-spaced; it is matrix supported with wackestone texture.
Inclusions:	(c:f:v) 47:50:3; fine fraction: <0.1 mm; coarse fraction: 3.45-0.1 mm

Table 5.08 Mochlos Low-grade Metamorphic macroscopic description of LM cook-pots.

Defining characteristics:	red and orange matrix with various colors of phyllite and low-grade metamorphic or high-grade sedimentary inclusions
Subgroups:	medium-coarse (15-20% ratio of inclusions to matrix) fragments <4 mm, but typically 2-3 mm.)
	coarse (25-30% ratio of inclusions to matrix) fragments <6-5 mm, but typically are 2-3 mm.
	coarse with silver mica (25-30% ratio of inclusions to matrix)
	coarse with chaff-temper (25-30% ratio of inclusions to matrix)
Texture of Fabric:	medium-coarse, coarse
Inclusion sorting:	moderate (medium-coarse), poor (coarse)
Paste description: (Wentworth scale)	The overall texture of the paste is made from sand-size grains that measure up to medium-sized and coarse-sized grains; the larger identified rock grains within the paste resemble the coarse inclusions that measure >0.5 mm. (See list below.) Some of the paste displays somewhat metallic luster.
Paste color: (Munsell 2000)	5YR 7/6-7/8, 5YR 6/6-6/8, 5YR 5/6-5/8 (reddish-yellow, yellowish-red); 2.5YR 6/6-6/8 (dark red)

Coarse fraction (inclusions 0.5< mm) identified using MACFA analysis						
Inclusion	Color	Texture	Hardness	Angularity (Pettijohn, *et al.* 1973)	Size (mm)	Frequency within matrix (Kemp 1985:17)
phyllite/slate	red-grey, red-brown, purple, pink, blue-green-grey (color range not present in all samples)	schistose, foliate	too small to sample	elongated, sub-rounded, sub-angular	0.5-6	Dominant
quartz, or quartzite	white, translucent, white-grey	too small to sample	too small to sample	sub-round, sub-angular	<3	Few
possible: metamorphic sedimentary fragment	red-brown, pink, blue-grey	too small to sample	too small to sample	elongated, sub-rounded, sub-angular	0.5-2	Few
calcareous material, effervesce with HCL	white-cream	too small to sample	too small to sample	round, many with irregular shaped edges	varies	not always present or in equal quantities and sizes
mica-schist	Silver	schistose, foliate	too small to sample	round, sub-round	1-3	not always present or in equal quantities and sizes
possible: fossils	white-cream	not noted	soft, powdery	not noted	2-4	very rare

Table 5.09 Correlating Mochlos LM Low-grade Metamorphic fabrics and cook-pot production.

Mochlos Low-grade Metamorphic fabrics for LM cook-pots	vessel type and chronology						vessel totals:
	tripod cooking pot		cooking tray		cooking dish		
	LM I	LM II-III	LM I	LM II-III	LM I	LM II-III	
Coarse: blue-grey, red-brown	1	1	8	6	1	9	26
Coarse: purple	0	1	1	2	1	6	11
Coarse: red-brown	3	5	2	6	1	3	20
Coarse: red-brown, purple	9	1	4	2	4	10	30
Coarse: pink, red-brown, purple	2	1	5	1	2	1	12
Medium-coarse: red-brown, purple	1	0	0	0	0	0	1
Medium-coarse: pink, red-brown	0	1	0	1	0	1	3
Medium-coarse: blue-gray, pink, red-brown	0	0	0	0	0	1	1
Medium-coarse with silver mica: red-brown, purple	1	0	0	0	0	0	1
Coarse with silver mica: red-brown	0	0	0	1	3	0	4
Coarse with silver mica: red-brown, purple	2	0	0	0	0	4	6
Coarse with silver mica: blue-grey, red-brown	0	0	1	0	0	1	2
Coarse with silver mica: blue-green-gray, red-brown	0	3	0	1	0	0	3
Coarse with chaff: red-brown, purple	0	0	1	2	0	0	3
fabric totals:	19	13	22	22	12	36	124

Table 5.10 LM Mochlos Low-grade Metamorphic fabrics with color variations of phyllite inclusions.

If present it is indicated by "yes."

Mochlos Low-grade Metamorphic fabrics								
phyllite color combinations		med-coarse	med-coarse with silver mica-schist	coarse	coarse with silver mica-schist	coarse with chaff-tempering	white-cream, soft-medium textured fragments (calcareous materials)	color combination totals:
1	purple	-	-	yes	-	-	yes	2
2	red-brown	-	-	yes	yes	-	yes	3
3	red-brown, purple	yes	yes	yes	yes	yes	yes	6
4	pink, red-brown	yes	-	-	-	-	yes	2
5	blue-grey, red-brown	-	-	yes	yes	-	yes	3
6	blue-green-grey, red-brown	-	-	-	yes	-	yes	2
7	pink, red-brown, purple	-	-	yes	-	-	yes	2
8	blue-grey, pink, red-brown	yes	-	-	-	-	yes	2
fabric totals:		3	1	5	4	1	8	22

Table 5.11 Papadiokambos LMI coarse wares associated with cook-pots.

macroscopic fabric group	macroscopic fabric sub-group	fabric number	Papadiokambos fabric name
metamorphic	red matrix	1	red matrix with brown-pink and red metamorphic inclusions
		2	red matrix with purple and brown-red metamorphic inclusions
		3	red matrix with red-black shiny, brown-red metamorphic inclusions with silver-white foliate metamorphic inclusions
	orange-tan matrix	4	orang-tan matrix with silver-blue metamorphic inclusions
		5	orange-tan matrix with purple metamorphic inclusions
		6	orange-tan matrix with milky-white quartz inclusions and some red-purple and brown metamorphic inclusions with various amounts of silver mica
		7	orange-tan matrix with brown-purple and red metamorphic inclusions with silver mica-schist
	tan matrix	8	tan matrix with brown-red, grey-blue metamorphic inclusions with silver mica-schist
metamorphic and sedimentary	orange-tan matrix	9	orange-tan matrix with fine-grained, soft, orange inclusions

Table 5.12 Papadiokambos LMI coarse metamorphic macroscopic fabric 1.

<table>
<tr><td>Defining characteristics:</td><td colspan="6">red matrix with brown-pink and red metamorphic inclusions</td></tr>
<tr><td rowspan="2">Subgroups:</td><td colspan="6">coarse A (25-30% ratio of inclusions to matrix)</td></tr>
<tr><td colspan="6">coarse B (25-30% ratio of inclusions to matrix) greater amount of silver mica inclusions within matrix</td></tr>
<tr><td>Texture of fabric:</td><td colspan="6">coarse</td></tr>
<tr><td>Inclusion sorting:</td><td colspan="6">poor</td></tr>
<tr><td>Paste description:
(Wentworth scale)</td><td colspan="6">The overall texture of the paste is made from sand-size grains that measure up to medium-sized and coarse-sized grains; the larger identified rock grains within the paste resemble the coarse inclusions that measure >0.5 mm. (See list below.) The paste in coarse A somewhat displays a metallic luster, whereas the paste in coarse B displays a metallic luster and is therefore considered micaceous.</td></tr>
<tr><td>Paste color: (Munsell 2000)</td><td colspan="6">2.5YR 5/6, 10R 5/6 (red)</td></tr>
<tr><td colspan="7">Coarse fraction (inclusions 0.5< mm) identified using MACFA analysis</td></tr>
<tr><td>Type</td><td>Color</td><td>Texture</td><td>Hardness</td><td>Angularity (Pettijohn, et al. 1973)</td><td>Size (mm)</td><td>Frequency within matrix (Kemp 1985:17)</td></tr>
<tr><td>phyllite/slate</td><td>brown-pink, red</td><td>schistose, foliate</td><td>too small to sample</td><td>sub-angular, sub-rounded</td><td>0.5-7</td><td>dominant</td></tr>
<tr><td>unknown</td><td>dark red-black</td><td>too small to sample</td><td>too small to sample</td><td>sub-angular, sub-rounded</td><td>0.5-3</td><td>few</td></tr>
<tr><td>unknown</td><td>milky-white</td><td>too small to sample</td><td>too small to sample</td><td>sub-angular, sub-rounded</td><td>0.5-2</td><td>few</td></tr>
<tr><td>possible: quartz, feldspar; meta or igneous rocks with quartz, feldspar</td><td>white, translucent</td><td>polycrystalline</td><td>too small to sample</td><td>rounded, sub-rounded</td><td>0.5-4</td><td>very few</td></tr>
<tr><td>mica-schist</td><td>silver</td><td>schistose, foliate</td><td>too small to sample</td><td>rounded, sub-rounded</td><td>2-4</td><td>rare in coarse A; common in coarse B</td></tr>
<tr><td>phyllite/slate</td><td>purple-red</td><td>schistose</td><td>too small to sample</td><td>rounded, sub-rounded</td><td>0.5-3</td><td>very rare</td></tr>
</table>

Table. 5.13 Papadiokambos LMI coarse metamorphic macroscopic fabric 2.

Defining characteristics:	red matrix with purple and brown-red-pink metamorphic inclusions					
Texture of fabric:	coarse (25-30% ratio of inclusions to matrix)					
Inclusion sorting:	poor					
Paste description: (Wentworth scale)	The overall texture of the paste is made from sand-size grains that measure up to medium-sized and coarse-sized grains; the larger identified rock grains within the paste resemble the coarse inclusions that measure >0.5 mm. (See list below.) Additional unidentified medium sized aplastic grains present within the matrix are white and black. The paste somewhat displays a metallic luster.					
Paste color: (Munsell 2000)	5YR 7/6-7/8, 5YR 6/6-6/8, 5YR 5/6-5/8 (reddish-yellow to yellowish-red); 2.5YR 6/6-6/8 (darker red)					
Coarse fraction (inclusions 0.5< mm) identified using MACFA analysis						
Type	Color	Texture	Hardness	Angularity (Pettijohn, *et al.* 1973)	Size (mm)	Frequency within matrix (Kemp 1985:17)
phyllite/slate	purple	schistose, fine-grain	too small to sample	sub-rounded	0.5-9	frequent
phyllite/slate	brown-red-pink	schistose, foliate	too small to sample	sub-angular, sub-rounded	0.5-8	common
possible: mudstone, siltstone, low-grade metamorphic rocks	red-pink	schistose, fine-grain	too small to sample	rounded, sub-rounded	0.5-9	few
calcareous material, effervesce with HCL	white-cream	too small to sample	soft, powdery	rounded	0.5-2	few
quartz	milky-white	too small to sample	too small to sample	sub-angular, sub-rounded	0.5-2	very few
possible: quartz, feldspar	white-translucent	polycrystalline	too small to sample	rounded, sub-rounded	0.5-3	very few

Table 5.14 Papadiokambos LMI coarse metamorphic macroscopic fabric 3.

<table>
<tr><td colspan="2">Defining characteristics:</td><td colspan="5">red matrix with red-black shiny metamorphic inclusions and brown-red metamorphic with silver-white foliate metamorphic inclusions</td></tr>
<tr><td colspan="2">Texture of fabric:</td><td colspan="5">coarse (25-30% ratio of inclusions to matrix)</td></tr>
<tr><td colspan="2">Inclusion sorting:</td><td colspan="5">poor</td></tr>
<tr><td colspan="2">Paste description:
(Wentworth scale)</td><td colspan="5">The overall texture of the paste is made from sand-size grains that measure up to medium-sized and coarse-sized grains; the larger identified rock grains within the paste resemble the coarse inclusions that measure >0.5 mm. (See list below.) The paste somewhat displays a metallic luster and is therefore considered micaceous.</td></tr>
<tr><td colspan="2">Paste color: (Munsell 2000)</td><td colspan="5">2.5YR 5/6, 10R 5/6 (red)</td></tr>
<tr><td colspan="7">Coarse fraction (inclusions 0.5< mm) identified using MACFA analysis</td></tr>
<tr><td>Type</td><td>Color</td><td>Texture</td><td>Hardness</td><td>Angularity (Pettijohn, et al. 1973)</td><td>Size (mm)</td><td>Frequency within matrix (Kemp 1985:17)</td></tr>
<tr><td>possible: mica-schist, gneiss</td><td>red-black and silver</td><td>schistose, foliate, polycrystalline</td><td>too small to sample</td><td>rounded, sub-rounded</td><td>0.5-8</td><td>frequent</td></tr>
<tr><td>phyllite/slate</td><td>brown, red</td><td>schistose, foliate,</td><td>too small to sample</td><td>angular, sub-angular</td><td>0.5-7</td><td>common</td></tr>
<tr><td>mica-schist</td><td>silver, silver-white</td><td>schistose, foliate, polycrystalline</td><td>too small to sample</td><td>rounded, sub-rounded</td><td>2-6</td><td>common</td></tr>
<tr><td>quartz</td><td>milky-white</td><td>too small to sample</td><td>too small to sample</td><td>sub-angular, sub-rounded</td><td>0.5-8</td><td>few</td></tr>
<tr><td>possible: meta, sedimentary rock</td><td>red-orange</td><td>too small to sample</td><td>too small to sample</td><td>rounded</td><td>0.5-2</td><td>few</td></tr>
</table>

Table 5.15 Papadiokambos LMI coarse metamorphic macroscopic fabric 4.

Defining characteristics:	orange-tan matrix with silver-blue metamorphic inclusions
Subgroups:	medium-fine (2-5% ratio of inclusion to matrix) fragments <4 mm
	medium-coarse (15-20% ratio of inclusions to matrix) fragments <4 mm
	coarse (25-30% ratio of inclusions to matrix) fragments <6-7 mm
Texture of fabric:	medium-fine, medium-coarse, coarse
Inclusion sorting:	poor
Paste description: (Wentworth scale)	The overall texture of the paste is made from sand-size grains that measure up to medium-sized and coarse-sized grains; the larger identified rock grains within the paste resemble the coarse inclusions that measure >0.5 mm. (See list below.)
Paste color: (Munsell 2000)	5YR 2/6 (reddish-yellow)

Coarse fraction (inclusions 0.5< mm) identified using MACFA analysis

Type	Color	Texture	Hardness	Angularity (Pettijohn, *et al.* 1973)	Size (mm)	Frequency within matrix (Kemp 1985:17)
phyllite/slate	silver-blue	schistose, fine-grained, foliate	too small to sample	sub-angular, sub-rounded	2-8	dominant
unknown	white, grey-blue	too small to sample	too small to sample	sub-angular	0.5-2	common
unknown	brown	too small to sample	too small to sample	sub-angular, sub-rounded	0.5-2	common
unknown	black	too small to sample	too small to sample	sub-angular, sub-rounded	0.5-2	common
unknown	red	too small to sample	soft, powdery	sub-angular, sub-rounded	0.5-4	common
mica-schist	silver	schistose, foliate	too small to sample	sub-rounded	2-8	few
quartz	milky-white	too small to sample	too small to sample	sub-angular	0.5-4	few
possible: quartz, feldspar	white-translucent	too small to sample	too small to sample	sub-angular	0.5-6	few
calcareous material, effervesce with HCL	white	too small to sample	soft, powdery	rounded	0.5-4	rare
mica-schist	white with silver mica	schistose, foliate	too small to sample	sub-angular	0.5-6	very rare

Table 5.16 Papadiokambos LMI coarse metamorphic macroscopic fabric 5.

<table>
<tr><td colspan="2">Defining characteristics:</td><td colspan="5">orange-tan matrix with purple metamorphic inclusions</td></tr>
<tr><td colspan="2" rowspan="2">Subgroups:</td><td colspan="5">coarse (25%-30 ratio of inclusions to matrix) fragments <4-6 mm</td></tr>
<tr><td colspan="5">very coarse (40-50% ratio of inclusions to matrix) fragments <6-8 mm</td></tr>
<tr><td colspan="2">Texture of fabric:</td><td colspan="5">coarse, very coarse</td></tr>
<tr><td colspan="2">Inclusion sorting:</td><td colspan="5">poor</td></tr>
<tr><td colspan="2">Paste description:
(Wentworth scale)</td><td colspan="5">The overall texture of the paste is made from sand-size grains that measure up to medium-sized and coarse-sized grains; the larger identified rock grains within the paste resemble the coarse inclusions that measure >0.5 mm. (See list below.)</td></tr>
<tr><td colspan="2">Paste color: (Munsell 2000)</td><td colspan="5">5YR 6/6 (reddish-yellow)</td></tr>
<tr><td colspan="7">Coarse fraction (inclusions 0.5< mm) identified using MACFA analysis</td></tr>
<tr><td>Type</td><td>Color</td><td>Texture</td><td>Hardness</td><td>Angularity (Pettijohn, et al. 1973)</td><td>Size (mm)</td><td>Frequency within matrix (Kemp 1985:17)</td></tr>
<tr><td>phyllite/slate</td><td>purple, purple-brown</td><td>schistose, fine-grained, foliate</td><td>too small to sample</td><td>angular, sub-rounded</td><td>0.5-6</td><td>dominant</td></tr>
<tr><td>calcareous material, effervesce with HCL; or feldspar</td><td>white</td><td>too small to sample</td><td>soft, powdery</td><td>irregular shape and boarders</td><td>0.5-8</td><td>common</td></tr>
<tr><td>Quartz</td><td>milky-white</td><td>too small to sample</td><td>too small to sample</td><td>sub-angular, sub-rounded</td><td>0.5-4</td><td>few</td></tr>
<tr><td>metamorphic rocks</td><td>red-brown</td><td>schistose, multi-grained</td><td>too small to sample</td><td>rounded, sub-rounded</td><td>0.5-6</td><td>few</td></tr>
<tr><td>Unknown</td><td>opaque-white</td><td>polycrystalline</td><td>too small to sample</td><td>sub-angular, sub-rounded</td><td>0.5-4</td><td>very few</td></tr>
<tr><td>possible: sedimentary rock, clay stone</td><td>orange-red</td><td>too small to sample</td><td>soft, powdery</td><td>rounded, sub-rounded</td><td>0.5-4</td><td>very few</td></tr>
</table>

Table 5.17 Papadiokambos LMI coarse metamorphic macroscopic fabric 6.

Fabric of vessel body and handles						
Defining characteristics:	orange-tan matrix with milky-white quartz inclusions and some red-purple and brown metamorphic inclusions with various amounts of silver mica					
Texture of matrix:	coarse (25%-30% ratio of inclusions to matrix)					
Inclusion sorting:	poor					
Paste description: (Wentworth scale)	The overall texture of the paste is made from sand-size grains that measure up to medium-sized and coarse-sized grains; the larger identified rock grains within the paste resemble the coarse inclusions that measure >0.5 mm. (See list below.)					
Paste color: (Munsell 2000)	2.5YR 5/6 (red)					
Coarse (inclusions 0.5< mm) fraction identified using MACFA analysis						
Type	Color	Texture	Hardness	Angularity (Pettijohn, *et al.* 1973)	Size (mm)	Frequeny within matrix (Kemp 1985:17)
quartz	milky-white	too small to sample	too small to sample	sub-angular, sub-rounded	0.5-6	common
phyllite/slate	red-purple, brown	schistose, fine-grain	too small to sample	sub-angular, sub-rounded	0.5-9	few
possible: metamorphic	white to tan-green	schistose, foilate	too small to sample	sub-angular, sub-rounded	0.5-7	very few
possible: meta igneous fragments	pink with white, translucent inclusions within rock matrix	polycrystalline	too small to sample	rounded, sub-rounded	2-6	rare
possible: quartz, feldspar	white, translucent	polycrystalline	too small to sample	sub-angular, sub-rounded	2-7	rare
Fabric of tripod legs						
Paste description: (Wentworth scale)	The overall texture of the paste is made from sand-size grains that measure up to medium-sized and coarse-sized grains; the larger identified rock grains within the paste resemble the coarse inclusions that measure >0.5 mm. (See list below.) Paste displays a metallic luster and is therefor considered micaceous.					
Coarse (inclusions 0.5< mm) fraction identified using MACFA analysis						
Type	Color	Texture	Hardness	Angularity (Pettijohn, *et al.* 1973)	Size (mm)	Frequency within matrix (Kemp 1985:17)
phyllite/slate	silver-brown	schistose, fine-grain	too small to sample	sub-angular, sub-rounded	0.5-8	frequent
silver mica schist	silver	schistose, foliate	too small to sample	sub-angular, sub-rounded	0.5-9	frequent
possible: metamorphic	red-purple, brown	schistose	too small to sample	sub-angular, sub-rounded	0.5-9	common
quartz	milky-white	too small to sample	too small to sample	sub-angular, sub-rounded	0.5-7	common

Table 5.18 Papadiokambos LMI coarse metamorphic macroscopic fabric 7.

<table>
<tr><td colspan="3">Defining characteristics:</td><td colspan="4">orange-tan matrix with brown-purple and red metamorphic inclusions with silver mica-schist</td></tr>
<tr><td colspan="3" rowspan="3">Subgroups:</td><td colspan="4">coarse A (25-30% ratio of inclusions to matrix)</td></tr>
<tr><td colspan="4">coarse B (25-30% ratio of inclusions to matrix) greater amount of silver mica and soft, powdery, white-cream fragments within matrix</td></tr>
<tr><td colspan="4">coarse C (25-30% ratio of inclusions to matrix) greater amount irregular shaped voids (e.g., square, round elongate) fragments <7 mm</td></tr>
<tr><td colspan="3">Texture of fabric:</td><td colspan="4">coarse</td></tr>
<tr><td colspan="3">Inclusion sorting:</td><td colspan="4">poor</td></tr>
<tr><td colspan="3">Paste description:
(Wentworth scale)</td><td colspan="4">The overall texture of the paste is made from sand-size grains that measure up to medium-sized and coarse-sized grains; the larger identified rock grains within the paste resemble the coarse inclusions that measure >0.5 mm. (See list below.)</td></tr>
<tr><td colspan="3">Paste color: (Munsell 2000)</td><td colspan="4">5YR 6/6 (reddish-yellow)</td></tr>
<tr><td colspan="7">Coarse fraction (inclusions 0.5< mm) identified using MACFA analysis</td></tr>
<tr><td>Type</td><td>Color</td><td>Texture</td><td>Hardness</td><td>Angularity (Pettijohn, et al. 1973)</td><td>Size (mm)</td><td>Frequency within matrix (Kemp 1985:17)</td></tr>
<tr><td>phyllite/slate</td><td>brown-purple, red</td><td>schistose, fine-grained</td><td>too small to sample</td><td>sub-angular, sub-rounded</td><td>0.5-7</td><td>dominant</td></tr>
<tr><td>mica-schist</td><td>silver, silver-blue</td><td>schistose</td><td>too small to sample</td><td>sub-angular, sub-rounded</td><td>0.5-6</td><td>very few</td></tr>
<tr><td>possible: meta or sed rock</td><td>red-brown</td><td>schistose</td><td>too small to sample</td><td>rounded</td><td>0.5-4</td><td>few</td></tr>
<tr><td>quartz</td><td>milky-white</td><td>too small to sample</td><td>too small to sample</td><td>angular</td><td>0.5-4</td><td>rare</td></tr>
<tr><td>calcareous materials, effervesce with HCL</td><td>white</td><td>too small to sample</td><td>soft, powdery</td><td>rounded</td><td>0.5-4</td><td>few to rare</td></tr>
</table>

Table 5.19 Papadiokambos LMI coarse metamorphic macroscopic fabric 8.

Defining characteristics:	tan matrix with brown-red, grey-blue metamorphic inclusions with silver mica-schist
Texture of fabric:	coarse (25-30% ratio of inclusions to matrix)
Inclusion sorting:	moderate
Paste description: (Wentworth scale)	The overall texture of the paste is made from sand-size grains that measure up to medium-sized and coarse-sized grains; the larger identified rock grains within the paste resemble the coarse inclusions that measure >0.5 mm. (See list below.) Paste displays a metallic luster and is therefore considered micaceous.
Paste color: (Munsell 2000)	7.5YR 5/3, 5/4 (brown)

Coarse fraction (inclusions 0.5< mm) identified using MACFA analysis						
Type	Color	Texture	Hardness	Angularity (Pettijohn, *et al.* 1973)	Size (mm)	Frequency within matrix (Kemp 1985:17)
phyllite/slate	brown-red	schistose, fine-grain, foliate	too small to sample	sub-angular	0.5-6	frequent
phyllite/slate	grey-blue	schistose, fine-grain, foliate	too small to sample	sub-angular	0.5-6	frequent
silver mica-schist	silver	schistose, foliate	too small to sample	sub-rounded	0.5-6	common
quartz	milk-white	too small to sample	too small to sample	sub-angular, angular	0.5-5	very few
possible: meta igneous rocks	pink with white and translucent inclusions in matrix	polycrystalline	too small to sample	rounded, sub-rounded	2-6	rare
possible: quartz, feldspar	white, translucent	polycrystalline	too small to sample	sub-angular, sub-rounded	2-7	rare

Table 5.20 Papadiokambos LMI coarse metamorphic and sedimentary macroscopic fabric 9.

<table>
<tr><td colspan="2">Defining characteristics:</td><td colspan="5">orange-tan matrix with fine-grained, soft, orange inclusions</td></tr>
<tr><td colspan="2" rowspan="3">Subgroups:</td><td colspan="5">medium-fine (2-5% ratio of inclusion to matrix)</td></tr>
<tr><td colspan="5">coarse A (25-30% ratio of inclusions to matrix) fragments <4 mm</td></tr>
<tr><td colspan="5">coarse B (25-30% ratio of inclusions to matrix) fragments <8 mm</td></tr>
<tr><td colspan="2">Texture of fabric:</td><td colspan="5">medium-fine, coarse</td></tr>
<tr><td colspan="2">Inclusion sorting:</td><td colspan="5">poor</td></tr>
<tr><td colspan="2">Paste description:
(Wentworth scale)</td><td colspan="5">The overall texture of the paste is made from sand-size grains that measure up to medium-sized and coarse-sized grains; the larger identified rock grains within the paste resemble the coarse inclusions that measure >0.5 mm. (See list below.)</td></tr>
<tr><td colspan="2">Paste color: (Munsell 2000)</td><td colspan="5">2.5YR 5/6 (red)</td></tr>
<tr><td colspan="7">Coarse fraction (inclusions 0.5< mm) identified using MACFA analysis</td></tr>
<tr><td>Type</td><td>Color</td><td>Texture</td><td>Hardness</td><td>Angularity (Pettijohn, et al. 1973)</td><td>Size (mm)</td><td>Frequency within matrix (Kemp 1985:17)</td></tr>
<tr><td>possible: mudstone, silt-stone</td><td>orange</td><td>schistose, fine-grain</td><td>Soft</td><td>angular, sub-rounded</td><td>0.5-8</td><td>dominant</td></tr>
<tr><td>possible: meta, sedimentary rock</td><td>red, red-brown</td><td>schistose</td><td>too small to sample</td><td>sub-rounded</td><td>0.5-2</td><td>very few</td></tr>
<tr><td>unknown</td><td>dark brown or black</td><td>too small to sample</td><td>too small to sample</td><td>sub-angular, sub-rounded</td><td>0.5-2</td><td>very few</td></tr>
<tr><td>quartz</td><td>milky-white</td><td>too small to sample</td><td>too small to sample</td><td>sub-angular, sub-rounded</td><td>0.5-2</td><td>rare</td></tr>
</table>

Table 5.21 Papadiokambos LMI coarse metamorphic macroscopic fabrics with orange-tan matrix groups and vessel production.

Papadiokambos coarse ware metamorphic fabric red matrix		vessel type								
fabric number	sub-group	cup	bowl	jug	jar	pithos	amphora	basin	cook-pot	fabric total:
1	coarse A	0	0	0	3	0	0	0	3	6
	coarse B	0	0	1	5	2	0	0	0	8
2	none	0	0	2	0	0	0	0	7	9
3	none	0	0	0	1	0	0	0	3	4
orange-tan matrix										
4	medium-fine	1	0	0	0	0	0	0	0	1
	medium-coarse	0	0	0	2	0	0	0	0	2
	coarse	0	0	0	3	2	0	3	8	16
5	coarse	0	1	0	2	1	1	0	2	7
	very coarse	0	0	0	0	0	0	1	0	1
6	none	0	0	0	0	0	0	0	2	2
7	coarse A	0	0	0	0	2	1	0	1	4
	coarse B	0	0	0	0	0	1	0	0	1
	coarse C	0	0	0	1	0	0	0	0	1
tan matrix										
8	none	0	0	0	0	0	0	1	1	2
sedimentary and metamorphic fabric orange-tan matrix										
9	medium-fine	2	0	1	0	0	0	0	0	3
	coarse A	0	0	0	0	0	0	0	1	1
	coarse B	0	0	0	0	0	0	1	1	2
	fabric totals:	3	1	4	17	7	3	6	29	70

Table 5.22 Papadiokampos LMI coarse macroscopic fabrics associated with cook-pots.

Papadiokambos LMI coarse fabrics			cook-pot type				
			tripod cooking pot	cooking jar	cooking tray	cooking dish	vessel totals:
metamorphic	red matrix	Fabric 1 (coarse A)	1	2	0	0	3
		Fabric 2	2	0	0	5	7
		Fabric 3	1	0	2	0	3
	orange-tan matrix	Fabric 4 (coarse)	2	2	0	4	8
		Fabric 5 (coarse)	0	0	0	2	2
		Fabric 6	2	0	0	0	2
		Fabric 7 (coarse A)	0	0	1	0	1
	tan matrix	Fabric 8	0	0	1	0	1
sedimentary and metamorphic	orange-tan matrix	Fabric 9 (coarse A)	1	0	0	0	1
		Fabric 9 (coarse B)	1	0	0	0	1
		fabric totals:	10	4	4	11	29

Table 5.23 Mochlos geological samples.

sample		locality	collected below surface (cm)	Longtitude °E	Latitude °N	lithotype	geological formation (Papastamatiou 1959a)
1	Purple Phyllite Hill Clay (PPH-C)	Limenaria Cove, Mochlos	50-60	3894541	672613	purple soil-clay	Permian-Triassic
2	Development Red Clay (DR-C)	Limenaria Cove, Mochlos	80-90	3894537	672811	red-orange soil-clay	Permian-Triassic
3	Marina Metamorphic Rocks (MM-R)	Limenaria Cove, Mochlos	100-150	3894636	672863	purple, maroon, green-tan rocks	Permian-Triassic
4	Eleanor's House Clay (EH-C)	Mochlos village	ca. 450	no points	no points	white-yellow marl	Miocene
5	Silver Mica-schist a (SM-Sa)	plain past Sfaka village road, Mochlos	200-250	3894083	675348	mica-schist erroded	Miocene, Permian-Triassic
6	Silver Mica-schist b (SM-Sb)	plain past Sfaka village road, Mochlos	100	3894082	675449	mica-schist fragments	Miocene, Permian-Triassic
7	Venetian Tower Road Red Clay (VTR-C)	road above Venentian tower, Mochlos	50-60	3894232	677182	red-orange soil-clay	Permian-Triassic
8	Venetian Tower Road Red Rock (VTR-R)	road above Venentian tower, Mochlos	70-80	3894232	677182	green-tan rock	Permian-Triassic
9	Chalinomouri Metamorphic Rock a (CH-Ra)	east end of Mochlos Plain	at surface	3894339	678295	green, blue-gray, purple rock	Permian-Triassic
10	Chalinomouri Metamorphic Rock b (CH-Rb)	east end of Mochlos Plain	at surface	3894341	678293	green, blue-gray, brown	Permian-Triassic
11	Chalinomouri Purple Phyllite Clay a (CHPP-Ca)	east end of Mochlos Plain	150-200	3894788	678261	purple soil-clay	Permian-Triassic
12	Chalinomouri Purple Phyllite Clay b (CHPP-Cb)	east end of Mochlos Plain	150-200	3894788	678261	purple soil-clay	Permian-Triassic

Table 5.24 Macroscopic characteristics of Mochlos clay samples.

Sample number:	1	2	4	7	11
Sample name:	Purple Phyllite Hill Clay	Development Red Clay	Eleanor's House Clay	Venetian Tower Road Red Clay	Chalinomouri Purple Phyllite Hill Clay, a
Abbreviation	PPH-C	DR-C	EH-C	VTR-C	CHPP-Ca
Location:	Limenaria Cove, Mochlos	Limenaria Cove, Mochlos	Mochlos village	Mochlos Plain	Chalinomouri, Mochlos
Munsell (2000) of unfired clay:	10R 4/3	2.5YR 4/8, 5/8	2.5Y7/3	2.5YR 4/8, 5/8	10R 4/3
	weak red	red	pale yellow	red	weak red
Author's name of unfired clay:	purple	red-orange	tan	red-orange	purple
Munsell (2000) of fired clay (750º-850º C, 6 hours):	2.5YR 6/4, 5/4	5YR 5/8	2.5Y 8/3	10R 4/6	10R 5/3, 5/4
	light reddish brown, reddish brown	reddish yellow	pale yellow	red	weak red
Author's name of fired clay:	purple	red-orange	yellow	red-orange	purple
Angularity of inclusions:	sub-rounded, sub-angular	sub-rounded, sub-angular	no inclusions	sub-rounded, sub-angular	sub-rounded, sub-angular
Dominant inclusion:	purple phyllite	green, silver, brown, purple phyllite		green-tan phyllite	purple phyllite with some tan-green phyllite
Workability for potting: *	plastic	plastic	not plastic	plastic	not plastic
Feel when wet: **	greasy	semi-dry	dry	semi-dry	semi-dry
Wet-to-fired Shrinkage, 750º-850º C, 6 hours (Peterson and Peterson 2003:140).	(10-9.5)/9.5 x 100= 5%	(10-9.5)/9.5 x 100= 5%	not calculated	(10-9.5)/9.5 x 100= 5%	not calculated
Apparent porosity using modified water absorption test (Peterson 2002).	(48g-44g)/44 x 100 = 9%	(73g-66g)/66 x 100 = 11%	not calculated	(88g-77g)/77 x 100 = 14%	not calculated

Sample number:	12
Sample name:	Chalinomouri Purple Phyllite Hill Clay, b
Abbreviation	CHPP-Cb
Location:	Chalinomouri, Mochlos
Munsell (2000) of unfired clay:	10R 4/3
	weak red
Author's name of unfired clay:	purple
Munsell (2000) of fired clay (750º-850º C, 6 hours):	10R 5/3, 5/4
	weak red
Author's name of fired clay:	purple
Angularity of inclusions:	sub-rounded, sub-angular
Dominant inclusion:	tan-green phyllite and some purple phyllite
Workability for potting:*	not plastic
Feel when wet:**	semi-dry
Wet-to-fired Shrinkage, 750º-850º C, 6 hours (Rice 1987: 351; Peterson and Peterson 2003: 140).	not calculated
Apparent porosity using modified water absorption test (Rice 1987: 352; Peterson 2002).	not calculated

Workability for potting (Rye 1987:146)*	
plastic:	The condition when clay can be transformed into a new shape without tearing or breaking.
not plastic:	Clay cannot be transformed into a new shape.
Feel when wet (based on personal experience with clay from 1990-current)****	
greasy:	smooth, elastic, has a shiny quality in light
semi-dry:	smooth, elastic, can crack while drying, can be brittle if small amount of water was used to make plastic
dry:	brittle, cracks while drying, if dries on your hands it pulls your skin

Table 5.25 Papadiokambos geological samples.

sample		locality	collected below surface (cm)	Longtitude °E	Latitude °N	lithotype	geological formation (Papastamatiou 1959b)
13	I Clay (I-C)	historical ruins, Liopetra uplands	50-60	no points	no points	orange-red soil-clay	Permian or Carboniferous
14	II Clay (II-C)	road, coastal Chapel, Liopetra uplands	10	no points	no points	maroon soil-clay	Pliocene (Diluvium)
15	III Red Clay (III-RC)	B.1, B.2, Papadiokambos coastline	60-80	no points	no points	red soil-clay	Holocene (Alluvium)
16	III Tan Clay (III-TC)	B.1, B.2, Papadiokambos coastline	50	no points	no points	yellow-tan soil-clay	Holocene (Alluvium)
17	III Sand (III-S)	B.1, B.2, Papadiokambos coastline	surface	no points	no points	beach sand, pebbles, boulders	Holocene (Alluvium)
18	Agii Pantes Gorge Clay (APG-C)	road cut, Agii Pantes gorge	200	no points	no points	marl	Miocene
19	Ea Clay (Ea-C)	Periferiaki Aerodromiou Sitias (E75)	350-400	3898379	690219	marl	Miocene
20	Eb Clay (Eb-C)	Periferiaki Aerodromiou Sitias (E75)	350-400	3898379	690219	marl	Miocene
21	Ec Rock (Ec-R)	Periferiaki Aerodromiou Sitias (E75)	surface	3898379	690219	metamorphic, sedimentary rocks	Miocene
22	Airport Road Red Clay (ARR-C)	Periferiaki Aerodromiou Sitias (E75)	surface	3898582	692125	red soil-clay	Miocene
23	C Red Clay (C-RC)	Periferiaki Aerodromiou Sitias (E75)	200	3899637	692111	red soil-clay	Permian-Triassic or Triassic
24	D Red Clay	Periferiaki Aerodromiou Sitias (E75)	200-220	3899181	692167	red soil-clay	Miocene or Permian-Triassic

Table 5.26 Characteristics of Papadiokambos, Agii Pantes, and Periferiaki Aerodromiou Sitias (E75) clay samples.

Sample number:	13	14	15	16	18
Sample name:	I Clay	II Clay	III Red Clay	III Tan Clay	Agii Pantes Gorge Clay
Abbreviation	I-C	II-C	III-RC	III-TC	APG-C
Location:	Liopetra uplands	Liopetra uplands	Papadiokambos coast	Papadiokambos coast	Aggii Pantes Gorge
Munsell (2000) of unfired clay:	2.5YR 5/8	2.5YR 3/4, 3/6	2.5YR 3/4	10YR5/4	5Y8/1
	red	dark reddish brown, dark red	dark reddish brown	yellowish brown	white
Author's name of unfired clay:	red-peach	purple-red	red	tan	white-grey
Munsell (2000) of fired clay (750º-850º C, 6 hours):	spalled**	spalled**	5YR 5/6	spalled**	spalled*
			yellowish red		
Author's name of fired clay:			orange-red		
Angularity of inclusions:	sub-rounded, sub-angular, angular	sub-rounded, sub-angular, angular	sub-rounded, sub-angular, rounded, angular	sub-rounded, sub-angular, rounded, angular	no inclusions
Dominant inclusion:	sedimentary metamorphic; tan, greens, red; very few: milky-white quartz, purple phyllite	sedimentary metamorphic; tan, dark brown, greens. tan-green	sedimentary, metamorphic, possible igneous or minerals associated with igneous rocks	sedimentary, metamorphic, possible igneous or minerals associated with igneous rocks	
Workability for potting: ***	plastic	plastic	plastic	not plastic	plastic
Feel when wet: ****	semi-dry	semi-dry	semi-dry	dry	dry
Wet-to-fired Shrinkage, 750º-850º C, 6 hours (Peterson and Peterson 2003:140).	not calculated	not calculated	Damaged due to spalling; length is 10.04 cm.	not calculated	not calculated
Apparent porosity using modified water absorption test (Peterson 2002).	not calculated	not calculated	(132g-111g)/111 x 100 = 19% (cracking apart due to spalling)	not calculated	not calculated

Sample number:	19	20	22	23	24
Sample name:	Ea Clay	Eb Clay	Airport Road Red Clay	C Red Clay	D Red Clay
Abbreviation	Ea-c	Eb-C	ARR-C	C-RC	D-RC
Location:	Periferiaki Aerodromiou Sitias (E75)	Periferiaki Aerodromiou Sitias (E75)	Periferiaki Aerodromiou Sitias (E75)	Periferiaki Aerodromiou Sitias (E75)	Periferiaki Aerodromiou Sitias (E75)
Munsell (2000) of unfired clay:	5Y8/1	5Y8/1	2.5YR 5/6	2.5YR 5/8	2.5YR 5/8
	white	white	red	red	red
Author's name of unfired clay:	white-grey	white-grey	red-orange	red-orange	red-orange
Munsell (2000) of fired clay (750º-850º C, 6 hours):	spalled*	spalled*	spalled**	2.5YR 6/6	10R 4/8
				light red	red
Author's name of fired clay:				pink	red-orange
Angularity of inclusions:	no inclusions	no inclusions	sub-rounded, sub-angular, rounded	sub-rounded, sub-angular, rounded	sub-rounded, sub-angular, rounded
Dominant inclusion:			sedimentary fragments, possible metamorphic	sedimentary fragments, possible metamorphic	sedimentary fragments, possible metamorphic
Workability for potting:***	not plastic	not plastic	plastic	plastic	plastic
Feel when wet: ****	dry	dry	semi-dry	semi-dry	semi-dry
Wet-to-fired Shrinkage, 750º-850º C, 6 hours (Peterson and Peterson 2003:140).	not calculated	not calculated	not calculated	(10-9.5)/9.5 x 100= 5%	(10-9)/9 x 100= 11%
Apparent porosity using modified water absorption test (Peterson 2002).	not calculated	not calculated	not calculated	(75g-65g)/65 x 100 = 15%	(100g-87g)/87 x 100 = 15%

spalled*: The colors of three unidentified Miocene samples are: 2.5Y 6/2 (light brownish grey), 7/1 (light grey); 10YR 7/1, 7/2 (light grey).

spalled**: The colors of four unidentified red clay samples are: 2.5YR 4/8, 5/6-5/8 (red), 5YR 7/4-6/4 (pink-light reddish brown), 7.5YR 7/3 (pink).

Workability for potting (Rye 1987:146)***	
plastic:	The condition when clay can be transformed into a new shape without tearing or breaking.
not plastic:	Clay cannot be transformed into a new shape.
Feel when wet (based on personal experience with clay from 1990-current)** **	
greasy:	smooth, elastic, has a shiny quality in light
semi-dry:	smooth, elastic, can crack while drying, can be brittle if small amount of water was used to make plastic
dry:	brittle, cracks while drying, if dries on your hands it pulls your skin

Table 5.27 Characteristics of Mochlos and Papadiokambos, Agii Pantes, and Periferiaki Aerodromiou Sitias (E75) rock samples.

Sample number:	3	5	6	8	9
Sample name:	Marina Metamorphic Rocks	Silver Mica-schist, a*	Silver Mica-schist, b*	Venetian Tower Road Red Rock	Chalinomouri Metamorphic Rock, a
Abbreviation	MM-R	SM-Sa	SM-Sb	VTR-R	CH-Ra
Location:	Limenaria Cove, Mochlos	Mochlos Plain	Mochlos Plain	Mochlos Plain	Chalinomouri, Mochlos
Munsell (2000) when appropriate:	none	2.5Y 5/3, 5/4 light olive brown	2.5Y 5/2 greyish brown	none	none
Author's name of color:	purple, maroon, green-tan, blue-grey	brown-olive	grey	green-tan	green, blue-grey, purple
Angularity of inclusions:	sub-rounded, sub-angular	sub-rounded, rounded	sub-rounded, rounded	sub-rounded, sub-angular	sub-rounded, sub-angular
Inclusions type:	phyllite, quartzite, other metamorphic	silver mica-schist	silver mica-schist	phyllite	phyllite
Comments:	none	semi-plastic	none	none	same type of fragments in clay

Sample number:	10	17	21
Sample name:	Chalinomouri Metamorphic Rock, b	III Sand	Ec Rock
Abbreviation	CH-Rb	III-S	Ec-R
Location:	Chalinomouri, Mochlos	Papadiokambos coast	Periferiaki Aerodromiou Sitias (E75)
Munsell (2000) when appropriate:	none	none	none
Author's name of color:	green, blue-grey, brown	grey, blue-grey, purple, maroon, brown, green, milky-white, translucent	pale and dark brown, tan, green
Angularity of inclusions:	sub-angular, angular	sub-rounded, sub-angular, rounded, angular	sub-angular, angular
Inclusions type:	phyllite	beach sand	metamorphic, sedimentary
Comments:	none	igneous, metamorphic, sedimentary	none
* Silver Mica-schist, a and b are Munsell for grains size less than 0.5 mm.			

Table 5.28 Morphological description of LMI Mochlos tripod cooking pots.

A. Body and rim profile, handle shape and orientation, leg shape. Complete assemblage is represented; 21 vessels.

vessel type	sample	date	body profile	rim profile	handle shape	handle orientation	leg shape	tip shape
tripod	MOC0095	LMI	globular	everted round	round	horizontal	oval	pointed
tripod	MOC0587	LMI	globular	everted round	flat-oval	vertical	oval	none
tripod	MOC0853	LMI	elongated globular	everted round	none	none	leg scar	none
tripod	MOC1043	LMI	globular	everted round	oval	vertical	flat-oval	square
tripod	MOC1189	LMI	globular	everted round	round	horizontal	oval	pointed
tripod	MOC2322	LMI	globular	everted round	none	none	leg scar	none
tripod	MOC2326	LMI	globular	everted round	none	none	leg scar	none
tripod	MOC2525	LMI	globular	everted round	none	none	round-oval	square
tripod	MOC2526	LMI	globular	everted round	round	horizontal	leg scar	none
tripod	MOC2584	LMI	elongated globular	straight pointed	round	horizontal	leg scar	none
tripod	MOC2930	LMI	globular	straight round	round	horizontal	leg scar	none
tripod	MOC2931	LMI	piriform	everted round	round	horizontal	oval	square
tripod	MOC3007	LMI	globular	everted round	none	none	leg scar	none
tripod	MOC3085	LMI	none	none	none	none	round-oval	none
tripod	MOC3171	LMI	cylindrical	everted round	round	horizontal	leg scar	none
tripod	MOC3660	LMI	none	none	none	none	round-oval	square
tripod	MOC3877	LMI	elongated globular	everted round	round	horizontal	leg scar	none
tripod	MOC3879	LMI	elongated globular	everted round	round	horizontal	leg scar	none
tripod	MOC4085	LMI	globular	everted round	none	none	leg scar	none
tripod	MOC4773	LMI	none	none	none	none	oval	square
tripod	MOC5485	LMI	elongated globular	none	round	horizontal	oval	none

B. Handle description includes: handle shape and orientation, diameter of cross section, preserved handles and legs. Only vessels with preserved handles and legs are listed in table; 12 vessels.

vessel type	sample	date	handle shape	handle orientation	handle dimensions (cm)	handles preserved	legs preserved
tripod	MOC0095	LMI	round	horizontal	1.3 x 1.3	1	1
tripod	MOC0587	LMI	flat-oval	vertical	0.8 x 2.5	1	1
tripod	MOC1043	LMI	oval	vertical	0.8 x 2.3	1	3
tripod	MOC1189	LMI	round	horizontal	1.3 x 1.3	1	1
tripod	MOC2526	LMI	round	horizontal	1.6 x 1.6; 1.7 x 1.8	2	1
tripod	MOC2584	LMI	round	horizontal	scar	none	none
tripod	MOC2930	LMI	round	horizontal	1.3 x 1.4	1	none
tripod	MOC2931	LMI	round	horizontal	1.8 x 2	1	1
tripod	MOC3171	LMI	round	horizontal	1.6 x 1.6	1	none
tripod	MOC3877	LMI	round	horizontal	1.1 x 1.1	1	none
tripod	MOC3879	LMI	round	horizontal	scar	none	none
tripod	MOC5485	LMI	round	horizontal	1.5 x 1.5	1	1

C. Leg description includes: number of preserved legs per vessels, shape, diameters of cross sections, length. Only vessels with preserved legs are listed in table; 11 vessels.

vessel type	sample	date	legs preserved	leg shape	tip shape	cross section diameter (cm)	leg length (cm)	tip diameter (cm)
tripod	MOC0095	LMI	2	oval	pointed	2 x 2.6	7.6; 8	0.5 x 0.5
tripod	MOC0587	LMI	1	oval	none	broken close to body	not complete	none
tripod	MOC1043	LMI	3	flat-oval	square	1.5 x 3.3	11.5; 11; 6.5	0.8 x 2.4
tripod	MOC1189	LMI	1	oval	pointed	1.9 x 2.7	7.7	1 x 1.3
tripod	MOC2525	LMI	1	round-oval	square	2.3 x 3	8.5	0.5 x 1
tripod	MOC2526	LMI	1	oval	pointed	2.2 x 2.8	8.4	0.7 x 0.7
tripod	MOC2931	LMI	1	oval	square	2 x 2.5	9.9	0.3 x 1
tripod	MOC3085	LMI	1	round-oval	broken close to body	broken close to body	not complete	none
tripod	MOC3660	LMI	1	round-oval	square	1.7 x 1.7	6.4	0.8 x 0.8
tripod	MOC4773	LMI	1	oval	square	2.1 x 3.3	9	0.6 x 1.4
tripod	MOC5485	LMI	1	oval	none	2 x 3.5	not complete	none

D. Rim and based diameters.

vessel type	sample	date	body profile	rim profile	rim diameter (cm)	base diameter (cm)
tripod	MOC0095	LMI	globular	everted round	18	16
tripod	MOC0587	LMI	globular	everted round	21	17.5
tripod	MOC0853	LMI	elongated globular	everted round	20	none
tripod	MO1043	LMI	globular	everted round	21	16
tripod	MOC1189	LMI	globular	everted round	16	16.5
tripod	MOC2322	LMI	globular	everted round	16	none
tripod	MOC2326	LMI	globular	everted round	19	none
tripod	MOC2525	LMI	globular	everted round	18	16
tripod	MOC2526	LMI	globular	everted round	18	16
tripod	MOC2584	LMI	elongated globular	straight pointed	32	none
tripod	MOC2930	LMI	globular	straight round	15	none
tripod	MOC2931	LMI	piriform	everted round	24	none
tripod	MOC3007	LMI	globular	everted round	too small	none
tripod	MOC3085	LMI	none	none	none	16
tripod	MOC3171	LMI	cylindrical	everted round	17	16
tripod	MOC3660	LMI	none	none	none	13
tripod	MOC3877	LMI	elongated globular	everted round	10	none
tripod	MOC3879	LMI	elongated globular	everted round	13	none
tripod	MOC4085	LMI	globular	everted round	16	none
tripod	MOC4773	LMI	none	none	none	18
tripod	MOC5485	LMI	elongated globular	none	none	18

E. Surface finish and auxiliary features.

vessel type	sample	date	body profile	rim profile	surface finish	pulled spout	added plastic decoration
tripod	MOC0095	LMI	globular	everted round	self-slip	none	none
tripod	MOC0587	LMI	globular	everted round	self-slip	none	none
tripod	MOC0853	LMI	elongated globular	everted round	self-slip	none	none
tripod	MOC1043	LMI	globular	everted round	self-slip	none	none
tripod	MOC1189	LMI	globular	everted round	self-slip	none	none
tripod	MOC2322	LMI	globular	everted round	self-slip	yes	none
tripod	MOC2326	LMI	globular	everted round	self-slip	yes	none
tripod	MOC2525	LMI	globular	everted round	self-slip	none	none
tripod	MOC2526	LMI	globular	everted round	self-slip	none	none
tripod	MOC2584	LMI	elongated globular	straight pointed	self-slip	none	none
tripod	MOC2930	LMI	globular	straight round	self-slip	none	none
tripod	MOC2931	LMI	piriform	everted round	self-slip	none	none
tripod	MOC3007	LMI	globular	everted round	self-slip	yes	none
tripod	MOC3085	LMI	none	none	self-slip	none	none
tripod	MOC3171	LMI	cylindrical	everted round	self-slip	yes	none
tripod	MOC3660	LMI	none	none	self-slip	none	none
tripod	MOC3877	LMI	elongated globular	everted round	self-slip	none	none
tripod	MOC3879	LMI	elongated globular	everted round	self-slip	none	none
tripod	MOC4085	LMI	globular	everted round	self-slip	yes	none
tripod	MOC4773	LMI	none	none	self-slip	none	none
tripod	MOC5485	LMI	elongated globular	none	self-slip	none	none

Table 5.29 Morphological description of LMII-III Mochlos tripod cooking pots.

A. Body and rim profile, handle shape and orientation, leg shape. Complete assemblage is represented; 14 vessels.

vessel type	sample	date	body profile	rim profile	handle shape	handle orientation	leg shape	tip shape
tripod	MOC3372	LMII-III	globular	everted round	oval	vertical	oval	none
tripod	MOC3420	LMII-III	globular	none	flat-oval	vertical	leg scar	none
tripod	MOC3566	LMII-III	globular	everted round	none	none	oval	square
tripod	MOC3628	LMII-III	none	everted round	none	none	leg scar	none
tripod	MOC3726	LMII-III	none	everted round	none	none	leg scar	none
tripod	MOC3991	LMII-III	elongated globular	everted round	round	horizontal	leg scar	none
tripod	MOC4004	LMII-III	elongated globular	everted round	none	none	oval	none
tripod	MOC4009	LMII-III	elongated globular	everted round	none	none	leg scar	none
tripod	MOC5267	LMII-III	globular	everted round	none	none	leg scar	none
tripod	MOC5275	LMII-III	none	everted round	none	none	leg scar	none
tripod	MOC5300	LMII-III	elongated globular	everted round	round	horizontal	leg scar	none
tripod	MOC5625	LMII-III	none	everted round	none	none	leg scar	none
tripod	MOC5990	LMII-III	globular	everted round	round	horizontal	leg scar	none
tripod	MOC6602	LMII-III	globular	everted round	none	none	oval	square

B. Handle description includes: handle shape and orientation, diameter of cross section, preserved handles, preserved legs. Only vessels with preserved handles and legs are listed in table; 5 vessels.

vessel type	sample	date	handle shape	handle orientation	handle dimensions (cm)	handles preserved	legs preserved
tripod	MOC3372	LMII-III	oval	vertical	1.8 x 2.2	1	1
tripod	MOC3420	LMII-III	flat-oval	vertical	1.3 x 2.6	1	none
tripod	MOC3991	LMII-III	round (scar)	horizontal (scar)	scar	none	none
tripod	MOC5300	LMII-III	round	horizontal	1.9 x 2	1	none
tripod	MOC5990	LMII-III	round	horizontal	1.8 x 1.8	1	none

C. Leg description includes: number of preserved legs per vessel, shape, diameters of cross sections, length. Only vessels with preserved legs are listed in table; 4 vessels.

vessel type	sample	date	legs preserved	leg shape	tip shape	cross section diameter (cm)	leg length (cm)	tip diameter (cm)
tripod	MOC3372	LMII-III	1	oval	none	2.8 x 4.4	not complete	none
tripod	MOC3566	LMII-III	1	oval	square	2 x 2.8	9.5	0.8 x 1.8
tripod	MOC4004	LMII-III	1	oval	none	3.6 x 4.7	not complete	none
tripod	MOC6602	LMII-III	1	oval	square	2.5 x 3	10.5	0.8 x 1.8

D. Rim and based diameters.

vessel type	sample	date	body profile	rim profile	rim diameter (cm)	base diameter (cm)
tripod	MOC3372	LMII-III	globular	everted round	27	18
tripod	MOC3420	LMII-III	globular	none	21	none
tripod	MOC3566	LMII-III	globular	everted round	19	10.5
tripod	MOC3628	LMII-III	none	everted round	31	none
tripod	MOC3726	LMII-III	none	everted round	21	none
tripod	MOC3991	LMII-III	elongated globular	everted round	22	20
tripod	MOC4004	LMII-III	elongated globular	everted round	20	20.5
tripod	MOC4009	LMII-III	elongated globular	everted round	20	none
tripod	MOC5267	LMII-III	globular	everted round	22	none
tripod	MOC5275	LMII-III	none	everted round	too small	none
tripod	MOC5300	LMII-III	elongated globular	everted round	15	none
tripod	MOC5625	LMII-III	none	everted round	25	none
tripod	MOC5990	LMII-III	globular	everted round	20	none
tripod	MOC6602	LMII-III	globular	everted round	19	17

E. Surface finish and auxiliary features.

vessel type	sample	date	body profile	rim profile	surface finish	spouted rim	added plastic decoration
tripod	MOC3372	LMII-III	globular	everted round	self-slip	none	none
tripod	MOC3420	LMII-III	globular	none	self-slip	none	none
tripod	MOC3566	LMII-III	globular	everted round	self-slip	none	none
tripod	MOC3628	LMII-III	none	everted round	self-slip	none	none
tripod	MOC3726	LMII-III	none	everted round	self-slip	none	none
tripod	MOC3991	LMII-III	elongated globular	everted round	self-slip	none	none
tripod	MOC4004	LMII-III	elongated globular	everted round	self-slip	none	none
tripod	MOC4009	LMII-III	elongated globular	everted round	self-slip	none	none
tripod	MOC5267	LMII-III	globular	everted round	self-slip	none	none
tripod	MOC5275	LMII-III	none	everted round	cream slip interior	yes	none
tripod	MOC5300	LMII-III	elongated globular	everted round	self-slip	none	none
tripod	MOC5625	LMII-III	none	everted round	self-slip	none	none
tripod	MOC5990	LMII-III	globular	everted round	self-slip	none	none
tripod	MOC6602	LMII-III	globular	everted round	self-slip	none	none

Table 5.30 Morphological description of LMI Papadiokambos tripod cooking pots and cooking jars.

A. Body and rim profile, handle shape and orientation, leg shape. Complete assemblage is represented; 14 vessels: 4 cooking jars, 10 tripod cooking pots.

vessel type	sample	date	body profile	rim profile	handle shape	handle orientation	leg shape	tip shape
cooking jar	PDK0032	LMI	piriform	everted pointed	round	horizontal	jar	none
cooking jar	PDK0288	LMI	piriform	everted pointed	round	horizontal	jar	none
cooking jar	PDK0412	LMI	globular	straight round	oval	vertical	jar	none
cooking jar	PDK0540	LMI	none	everted round	round (scar)	horizontal (scar)	jar	none
tripod	PDK0002	LMI	globular	everted round	round	horizontal	leg scar	none
tripod	PDK0003	LMI	cylindrical	everted round	round	none	oval	square
tripod	PDK0011	LMI	none	everted round	round	horizontal	leg scar	none
tripod	PDK0012	LMI	none	none	none	none	oval	none
tripod	PDK0023	LMI	none	none	none	none	oval	none
tripod	PDK0040	LMI	elongated globular	straight round	none	none	round-oval	point
tripod	PDK0064	LMI	elongated globular	straight pointed	none	none	oval	none
tripod	PDK0065	LMI	piriform	everted round	round	none	oval	none
tripod	PDK0314	LMI	globular	straight pointed	round	vertical	oval	square
tripod	PDK0554	LMI	piriform	everted round	round	horizontal	leg scar	none

B. Handle description includes: handle shape and orientation, diameter of cross section, preserved handles, preserved legs. Only vessels with preserved handles and legs are listed in table; 9 vessels.

vessel type	sample	date	handle shape	handle orientation	handle dimensions (cm)	handles preserved	legs preserved
cooking jar	PDK0032	LMI	round	horizontal	1.5 x 1.5	1	jar
cooking jar	PDK0288	LMI	round	horizontal	1.5 x 1.5	1	jar
cooking jar	PDK0412	LMI	oval	vertical	1.5 x 2.8	1	jar
tripod	PDK0002	LMI	round	horizontal	1.5 x 1.5; 1.5 x 1.5	2	none
tripod	PDK0003	LMI	round	horizontal	1.8 x 2.2	1	1
tripod	PDK0011	LMI	round	horizontal	1.3 x 1.5	1	none
tripod	PDK0065	LMI	round	horizontal	1.7 x 1.8	1	1
tripod	PDK0314	LMI	round	vertical	1.5 x 1.5	1	1
tripod	PDK0554	LMI	round	horizontal	1.8 x 1.8	1	none

C. Leg description includes: number of preserved legs per vessels, shape, diameters of cross sections, length. Only vessels with preserved legs are listed in table; 7 vessels.

vessel type	sample	date	legs preserved	leg shape	tip shape	cross section diameter (cm)	leg length (cm)	tip diameter (cm)
tripod	PDK0003	LMI	1	oval	square	2.3 x 3.7	9.3	0.7 x 1.5
tripod	PDK0012	LMI	1	oval	none	broken close to body	not complete	none
tripod	PDK0023	LMI	1	oval	none	2 x 2.5	not complete	none
tripod	PDK0040	LMI	1	oval	pointed	2.7 x 3.7	12.5	0.7 x 1.5
tripod	PDK0064	LMI	1	oval	none	broken close to body	not complete	none
tripod	PDK0065	LMI	1	oval	none	broken close to body	not complete	none
tripod	PDK0314	LMI	1	round-oval	square	1.8 x 2	7.3; 7.5	0.5 x 1.5

D. Rim and based diameters.

vessel type	sample	date	body profile	rim profile	rim diameter (cm)	base diameter (cm)
cooking jar	PDK0032	LMI	piriform	everted pointed	20-24	none
cooking jar	PDK0288	LMI	piriform	everted pointed	23.5	none
cooking jar	PDK0412	LMI	globular	straight round	22	18
cooking jar	PDK0540	LMI	none	everted round	22	none
tripod	PDK0002	LMI	globular	everted round	20	18.5
tripod	PDK0003	LMI	cylindrical	everted round	19.5	19.5
tripod	PDK0011	LMI	none	everted round	18	none
tripod	PDK0012	LMI	none	none	none	17
tripod	PDK0023	LMI	none	none	none	too small
tripod	PDK0040	LMI	elongated globular	straight round	none	18
tripod	PDK0064	LMI	elongated globular	straight pointed	17	17.5
tripod	PDK0065	LMI	piriform	everted round	18.5	15.7
tripod	PDK0314	LMI	globular	straight pointed	15.5	15
tripod	PDK0554	LMI	piriform	everted round	22	none

E. Surface finish and auxiliary features.

vessel type	sample	date	body profile	rim profile	surface finish	spouted rim	added plastic decoration
cooking jar	PDK0032	LMI	piriform	everted pointed	clay slip same as vessel	none	none
cooking jar	PDK0288	LMI	piriform	everted pointed	self-slip	none	none
cooking jar	PDK0412	LMI	globular	straight round	self-slip	yes	yes
cooking jar	PDK0540	LMI	none	everted round	clay slip same as vessel	yes	none
tripod	PDK0002	LMI	globular	everted round	clay slip same as vessel	none	none
tripod	PDK0003	LMI	cylindrical	everted round	clay slip same as vessel	yes	none
tripod	PDK0011	LMI	none	everted round	self-slip	none	none
tripod	PDK0012	LMI	none	none	self-slip	none	none
tripod	PDK0023	LMI	none	none	self-slip	none	none
tripod	PDK0040	LMI	elongated globular	straight round	cream slip interior	none	none
tripod	PDK0064	LMI	elongated globular	straight pointed	clay slip same as vessel	yes	none
tripod	PDK0065	LMI	piriform	everted round	self-slip	none	none
tripod	PDK0314	LMI	globular	straight pointed	cream slip interior	none	none
tripod	PDK0554	LMI	piriform	everted round	clay slip same as vessel	yes	none

Table 5.31 Body profiles of LM tripod cooking pots from Mochlos and Papadiokambos.

Data used to construct tables are recorded in Tables 5.28:A, 5.29:A, 5.30:A.

A. LMI Mochlos vessels.

LMI Mochlos tripod cooking pots	everted round	everted pointed	straight round	straight pointed	no preserved rim	body profile totals:
globular	10	0	1	0	0	11
elongated globular	3	0	0	1	1	5
piriform	1	0	0	0	0	1
cylindrical	1	0	0	0	0	1
no preserved body	0	0	0	0	3	3
rim profile totals:	15	0	1	1	4	21

B. LMII-III Mochlos vessels.

LMII-III Mochlos tripod cooking pots	everted round	everted pointed	straight round	straight pointed	no preserved rim	body profile totals:
globular	0	5	0	0	1	6
elongated globular	0	4	0	0	0	4
piriform	0	0	0	0	0	0
cylindrical	0	0	0	0	0	0
no preserved body	0	4	0	0	0	4
rim profile totals:	0	13	0	0	1	14

C. LMI Papadiokambos vessels.

LMI Papadiokambos tripod cooking pots						
	everted round	everted pointed	straight round	straight pointed	no preserved rim	body profile totals:
globular	1	0	0	1	0	2
elongated globular	0	0	1	1	0	2
piriform	2	0	0	0	0	2
cylindrical	1	0	0	0	0	1
no preserved body	1	0	0	0	2	3
rim profile totals:	5	0	1	2	2	10

Table 5.32 Body profiles of LM cooking jars from Papadiokambos.

Data used to construct tables are recorded in Table 5.30:A.

LMI Papadiokambos cooking jars						
	everted round	everted pointed	straight round	straight pointed	no preserved rim	body profile totals:
globular	0	0	1	0	0	1
elongated globular	0	0	0	0	0	0
piriform	0	2	0	0	0	2
cylindrical	0	0	0	0	0	0
no preserved body	1	0	0	0	0	1
rim profile totals:	1	2	1	0	0	4

Table 5.33 Correlating rim diameter and body profile for LM tripod cooking pots from Mochlos and Papadiokambos.

Data used to construct tables are recorded in Tables 5.28:D, 5.29:D, 5.30:D.

A. LMI Mochlos vessels.

LMI Mochlos tripod cooking pots						
	globular	elongated globular	piriform	cylindrical	no preserved body	body profile totals:
10	0	1	0	0	0	1
13	0	1	0	0	0	1
15	1	0	0	0	0	1
16	3	0	0	0	0	3
17	0	0	0	1	0	1
18	3	0	0	0	0	3
19	1	0	0	0	0	1
20	0	1	0	0	0	1
21	2	0	0	0	0	2
24	0	0	1	0	0	1
32	0	1	0	0	0	1
no rim diameter	1	1	0	0	3	5
rim diameter (cm) totals:	11	5	1	1	3	21

B. LMII-III Mochlos vessels.

LMII-III Mochlos tripod cooking pots						
	globular	elongated globular	piriform	cylindrical	no preserved body	body profile totals:
15	0	1	0	0	0	1
19	2	0	0	0	0	2
20	1	2	0	0	0	3
21	1	0	0	0	1	2
22	1	1	0	0	0	2
25	0	0	0	0	1	1
27	1	0	0	0	0	1
31	0	0	0	0	1	1
no rim diameter	0	0	0	0	1	1
rim diameter (cm) totals:	6	4	0	0	4	14

C. LMI Papadiokambos vessels.

LMI Papadiokambos tripod cooking pots						
	globular	elongated globular	piriform	cylindrical	no preserved body	body profile totals:
15.5	1	0	0	0	0	1
17	0	1	0	0	0	1
18	0	0	0	0	1	1
18.5	0	0	1	0	0	1
19.5	0	0	0	1	0	1
20	1	0	0	0	0	1
22	0	0	1	0	0	1
no rim diameter	0	1	0	0	2	3
rim diameter (cm) totals:	2	2	2	1	3	10

Table 5.34 Correlating rim diameter and body profile for LMI cooking jars from Papadiokambos.

Data used to construct table is recorded in Table 5.30:D.

LMI Papadiokambos cooking jars						
	globular	elongated globular	piriform	cylindrical	no preserved body	body profile totals:
20-24	0	0	1	0	0	1
22	1	0	0	0	1	2
23.5	0	0	1	0	0	1
no rim diameter	0	0	0	0	0	0
rim diameter (cm) totals:	1	0	2	0	1	4

Table 5.35 Correlating handle shape and orientation with body profile for LM tripod cooking pots from Mochlos and Papadiokambos.

Data used to construct tables are recorded in Tables 5.28:A, 5.29:A, 5.30:A.

A. LMI Mochlos vessels.

	LMI Mochlos tripod cooking pots					
	globular	elongated globular	piriform	cylindrical	no body preserved	body and rim profile totals:
round horizontal	4	2	1	1	0	8
round vertical	0	0	0	0	0	0
flat-oval horizontal	0	0	0	0	0	0
flat-oval vertical	1	0	0	0	0	1
oval horizontal	0	0	0	0	0	0
oval vertical	1	0	0	0	0	1
handle scar	0	2	0	0	0	2
no preserved handle	5	1	0	0	3	9
handle shape and orientation totals:	11	5	1	1	3	21

B. LMII-III Mochlos vessels.

LMII-III Mochlos tripod cooking pots						
	globular	elongated globular	piriform	cylindrical	no body preserved	body and rim profile totals:
round horizontal	0	1	0	0	0	1
round vertical	1	0	0	0	0	1
flat-oval horizontal	0	0	0	0	0	0
flat-oval vertical	1	0	0	0	0	1
oval horizontal	0	0	0	0	0	0
oval vertical	1	0	0	0	0	1
handle scar	0	1	0	0	0	1
no preserved handle	3	2	0	0	4	9
handle shape and orientation totals:	6	4	0	0	4	14

C. LMI Papadiokambos vessels.

	LMI Papadiokambos tripod cooking pots					
	globular	elongated globular	piriform	cylindrical	no body preserved	body and rim profile totals:
round horizontal	1	0	1	0	1	3
round vertical	1	0	0	0	0	1
flat-oval horizontal	0	0	0	0	0	0
flat-oval vertical	0	0	0	0	0	0
oval horizontal	0	0	0	0	0	0
oval vertical	0	0	0	0	0	0
handle scar	0	0	1	1	0	2
no preserved handle	0	2	0	0	2	4
handle shape and orientation totals:	2	2	2	1	3	10

Table 5.36 Correlating handle shape and dimension of cross section for LM tripod cooking pots from Mochlos and Papadiokambos.

Data used to construct tables are recorded in Tables 5.28:B, 5.29:B, 5.30:B. Only vessels with handle cross sections preserved are listed in table.

A. LMI Mochlos vessels.

LMI Mochlos tripod cooking pots	round horizontal	round vertical	flat-oval horizontal	flat-oval vertical	oval horizontal	oval vertical	dimension of cross sections totals:
0.8 x 2.3	0	0	0	0	0	1	1
0.8 x 2.5	0	0	0	1	0	0	1
1.1 x 1.1	1	0	0	0	0	0	1
1.3 x 1.3	2	0	0	0	0	0	2
1.3 x 1.4	1	0	0	0	0	0	1
1.5 x 1.5	1	0	0	0	0	0	1
1.6 x 1.6	2	0	0	0	0	0	2
1.8 x 2	1	0	0	0	0	0	1
handle shape (cm) totals:	8	0	0	1	0	1	10

B. LMII-III Mochlos vessels.

LMII-III Mochlos tripod cooking pots	round horizontal	round vertical	flat-oval horizontal	flat-oval vertical	oval horizontal	oval vertical	dimension of cross sections totals:
1.3 x 2.6	0	0	1	0	0	0	1
1.8 x 1.8	1	0	0	0	0	0	1
1.8 x 2.2	0	0	0	0	0	1	1
1.9 x 2	1	0	0	0	0	0	1
handle shape (cm) totals:	2	0	1	0	0	1	4

C. LMI Papadiokambos vessels.

LMI Papadiokambos tripod cooking pots							
	round horizontal	round vertical	flat-oval horizontal	flat-oval vertical	oval horizontal	oval vertical	dimension of cross sections totals:
1.3 x 1.5	1	0	0	0	0	0	1
1.5 x 1.5	1	1	0	0	0	0	2
1.7 x 1.8	1	0	0	0	0	0	1
1.8 x 1.8	1	0	0	0	0	0	1
1.8 x 2.2	1	0	0	0	0	0	1
handle shape (cm) totals:	5	1	0	0	0	0	6

Table 5.37 Correlating handle shape and orientation with body profile for LMI cooking jars from Papadiokambos.

Data used to construct table is recorded in Table 5.30:A. Only vessels with handles preserved are listed in table.

	LMI Papadiokambos cooking jars					
	globular	elongated globular	piriform	cylindrical	no body preserved	body and rim profile totals:
round horizontal	0	0	2	0	1	3
round vertical	0	0	0	0	0	0
flat-oval horizontal	0	0	0	0	0	0
flat-oval vertical	0	0	0	0	0	0
oval horizontal	0	0	0	0	0	0
oval vertical	1	0	0	0	0	1
no preserved handle	0	0	0	0	0	0
handle shape and orientation totals:	1	0	2	0	1	4

Table 5.38 Correlating handle shape and dimension of cross section for LMI cooking jars from Papadiokambos.

Data used to construct tables are recorded in Tables 5.30:B. Only vessels with handle cross sections preserved are listed in table.

LMI Papadiokambos cooking jars	round horizontal	round vertical	flat-oval horizontal	flat-oval vertical	oval horizontal	oval vertical	dimension of cross sections totals:
1.5 x 1.5	2	0	0	0	0	0	2
1.5 x 2.8	0	0	0	0	0	1	1
handle shape (cm) totals:	2	0	0	0	0	1	3

Table 5.39 Correlating leg shape with body profile for LM tripod cooking pots from Mochlos and Papadiokambos.

Data used to construct tables are recorded in Tables 5.28:A, 5.29:A, 5.30:A. Only vessels with legs preserved are listed in table.

A. LMI Mochlos vessels.

LMI Mochlos tripod cooking pots						
	globular	elongated globular	piriform	cylindrical	no body preserved	body and rim profile totals:
oval with pointed tip	2	0	0	0	0	2
oval with square tip	0	0	1	0	1	2
oval no tip preserved	1	1	0	0	0	2
flat-oval with pointed tip	0	0	0	0	0	0
flat-oval with square tip	1	0	0	0	0	1
flat-oval with no tip preserved	0	0	0	0	0	0
round-oval with pointed tip	0	0	0	0	0	0
round-oval with square tip	1	0	0	0	1	2
round-oval with no tip preserved	0	0	0	0	1	1
leg scar	6	4	0	1	0	11
leg shape totals:	11	5	1	1	3	21

B. LMII-III Mochlos vessels.

	LMII-III Mochlos tripod cooking pot					
	globular	elongated globular	piriform	cylindrical	no body preserved	body and rim profile totals:
oval with pointed tip	0	0	0	0	0	0
oval with square tip	2	0	0	0	0	2
oval no tip preserved	1	1	0	0	0	2
flat-oval with pointed tip	0	0	0	0	0	0
flat-oval with square tip	0	0	0	0	0	0
flat-oval with no tip preserved	0	0	0	0	0	0
round-oval with pointed tip	0	0	0	0	0	0
round-oval with square tip	0	0	0	0	0	0
round-oval with no tip preserved	0	0	0	0	0	0
leg scar	3	3	0	0	4	10
leg shape totals:	6	4	0	0	4	14

C. LMI Papadiokambos vessels.

	LMI Papadiokambos tripod cooking pots					
	globular	elongated globular	piriform	cylindrical	no body preserved	body and rim profile totals:
oval with pointed tip	0	0	0	0	0	0
oval with square tip	1	0	0	1	0	2
oval no tip preserved	0	1	1	0	2	4
flat-oval with pointed tip	0	0	0	0	0	0
flat-oval with square tip	0	0	0	0	0	0
flat-oval with no tip preserved	0	0	0	0	0	0
round-oval with pointed tip	0	1	0	0	0	1
round-oval with square tip	0	0	0	0	0	0
round-oval with no tip preserved	0	0	0	0	0	0
leg scar	1	0	1	0	1	3
leg shape totals:	2	2	2	1	3	10

Table 5.40 Correlating the shapes of legs cross sections and tips for LM tripod cooking pots from Mochlos and Papadiokambos.

Data used to construct tables are recorded in Tables 5.28:C, 5.29:C, 5.30:C. Only vessels with legs preserved are listed in table.

A. LMI Mochlos vessels.

leg shape: LMI Mochlos tripod cooking pots	oval	flat-oval	round-oval	cross sections totals:
square tip	2	1	2	5
pointed tip	3	0	0	3
no preserved tip	2	0	1	3
handle shape totals:	7	1	3	11

B. LMII-III Mochlos vessels.

leg shape: LMII-III Mochlos tripod cooking pots	oval	flat-oval	round-oval	cross sections totals:
square tip	2	0	0	2
pointed tip	0	0	0	0
no preserved tip	2	0	0	2
handle shape totals:	4	0	0	4

C. LMI Papadiokambos vessels.

leg shape: LMI Papadiokambos tripod cooking pots	oval	flat-oval	round-oval	cross sections totals:
square tip	1	0	1	2
pointed tip	1	0	0	1
no preserved tip	4	0	0	4
handle shape totals:	6	0	1	7

Table 5.41 Correlating leg shape and dimension of cross section for LM tripod cooking pots from Mochlos and Papadiokambos.

Data used to construct tables are recorded in Tables 5.28:B, 5.29:B, 5.30:B. Only vessels with legs cross section preserved are listed in table.

A. LMI Mochlos vessels.

LMI Mochlos tripod cooking pots				
	oval	flat-oval	round-oval	dimension of cross sections totals:
1.5 x 3.3	0	1	0	1
1.7 x 1.7	0	0	1	1
1.9 x 2.7	1	0	0	1
2 x 2.5	1	0	0	1
2 x 2.6	1	0	0	1
2 x 3.5	1	0	0	1
2.1 x 3.3	1	0	0	1
2.2 x 2.8	1	0	0	1
2.3 x 3	0	0	1	1
broken close to body	1	0	1	2
leg shape totals:	7	1	3	11

B. LMII-III Mochlos vessels.

LMII-III Mochlos tripod cooking pots				
	oval	flat-oval	round-oval	dimension of cross sections totals:
2 x 2.8	1	0	0	1
2.5 x 3	1	0	0	1
2.8 x 4.4	1	0	0	1
3.6 x 4.7	1	0	0	1
handle shape totals:	4	0	0	4

C. LMI Papadiokambos vessels.

LMI Papadiokambos tripod cooking pots				
	oval	flat-oval	round-oval	dimension of cross sections totals:
1.8 x 2	0	0	1	1
2 x 2.5	1	0	0	1
2.7 x 3.7	1	0	0	1
2.3 x 3.7	1	0	0	1
broken close to body	3	0	0	3
handle shape totals:	6	0	1	7

Table 5.42 Correlating vessel and leg shape and leg length for LM tripod cooking pots from Mochlos and Papadiokambos.

Data used to construct tables are recorded in Tables 5.28:B, 5.29:B, 5.30:B. Only vessels with leg lengths preserved are listed in this table.

A. LMI Mochlos vessels.

		LMI Mochlos tripod cooking pots								
		6.4	7.6; 8 (2 legs)	8	8	9	9	10	11.5; 11; 6.5 (3 legs)	vessel and leg shape totals:
oval	globular	0	1	1	1	0	0	0	0	3
	elongated globular	0	0	0	0	0	0	0	0	0
	piriform	0	0	0	0	0	0	1	0	1
	cylindrical	0	0	0	0	0	0	0	0	0
	no body preserved	0	0	0	0	0	0	0	0	0
flat-oval	globular	0	0	0	0	0	0	0	1	1
	elongated globular	0	0	0	0	0	0	0	0	0
	piriform	0	0	0	0	0	0	0	0	0
	cylindrical	0	0	0	0	0	0	0	0	0
	no body preserved	0	0	0	0	0	0	0	0	0
round-oval	globular	0	0	0	0	1	0	0	0	1
	elongated globular	0	0	0	0	0	0	0	0	0
	piriform	0	0	0	0	0	0	0	0	0
	cylindrical	0	0	0	0	0	0	0	0	0
	no body preserved	1	0	0	0	0	1	0	0	2
	leg length totals:	1	1	1	1	1	1	1	1	8

B. LMII-III Mochlos vessels.

LMII-III Mochlos tripod cooking pots				
		9.5	10.5	vessel and leg shape totals:
oval	globular	1	1	2
	elongated globular	0	0	0
	piriform	0	0	0
	cylindrical	0	0	0
	no body preserved	0	0	0
flat-oval	globular	0	0	0
	elongated globular	0	0	0
	piriform	0	0	0
	cylindrical	0	0	0
	no body preserved	0	0	0
round-oval	globular	0	0	0
	elongated globular	0	0	0
	piriform	0	0	0
	cylindrical	0	0	0
	no body preserved	0	0	0
	leg length totals:	1	1	2

C. LMI Papadiokambos vessels.

LMI Papadiokambos tripod cooking pots					
		7.3; 7.5 (2 legs)	9.3	13	vessel and leg shape totals:
oval	globular	0	0	0	0
	elongated globular	0	0	1	1
	piriform	0	0	0	0
	cylindrical	0	1	0	1
	no body preserved	0	0	0	0
flat-oval	globular	0	0	0	0
	elongated globular	0	0	0	0
	piriform	0	0	0	0
	cylindrical	0	0	0	0
	no body preserved	0	0	0	0
round-oval	globular	1	0	0	1
	elongated globular	0	0	0	0
	piriform	0	0	0	0
	cylindrical	0	0	0	0
	no body preserved	0	0	0	0
	leg length totals:	1	1	1	3

Table 5.43 Correlating vessel shape and surface treatment for LM tripod cooking pots from Mochlos and Papadiokambos.

Data used to construct tables are recorded in Tables 5.28:E, 5.29:E, 5.30:E.

A. LMI Mochlos vessels.

LMI Mochlos tripod cooking pots					
		self-slipped	clay slip same as vessel	cream slip on interior	body profile totals:
globular	everted round	10	0	0	10
	everted pointed	0	0	0	0
	straight round	1	0	0	1
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
elongated globular	everted round	3	0	0	3
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	1	0	0	1
	no preserved rim	1	0	0	1
piriform	everted round	1	0	0	1
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
cylindrical	everted round	1	0	0	1
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
no body preserved	everted round	0	0	0	0
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no rim preserved	3	0	0	3
	vessel surface finishes totals:	21	0	0	21

B. LMII-III Mochlos vessels.

LMII-III Mochlos tripod cooking pots					
		self-slipped	clay slip same as vessel	cream slip on interior	body profile totals:
globular	everted round	5	0	0	5
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no preserved rim	1	0	0	1
elongated globular	everted round	4	0	0	4
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
piriform	everted round	0	0	0	0
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
cylindrical	everted round	0	0	0	0
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
no body preserved	everted round	3	0	1	4
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no rim preserved	0	0	0	0
	vessel surface finishes totals:	13	0	1	14

C. LMI Papadiokambos vessels.

LMI Papadiokambos tripod cooking pots					
		self-slipped	clay slip same as vessel	cream slip on interior	body profile totals:
globular	everted round	0	1	0	1
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	1	1
	no preserved rim	0	0	0	0
elongated globular	everted round	0	0	0	0
	everted pointed	0	0	0	0
	straight round	0	0	1	1
	straight pointed	0	1	0	1
	no preserved rim	0	0	0	0
piriform	everted round	1	1	0	2
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
cylindrical	everted round	0	1	0	1
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
no body preserved	everted round	1	0	0	1
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no rim preserved	2	0	0	2
	vessel surface finishes totals:	4	4	2	10

Table 5.44 Correlating vessel shape and surface treatment for LMI cooking jars from Papadiokambos.

Data used to construct table are listed in Table 5.30:E.

LMI Papadiokambos cooking jars					
		self-slipped	clay slip same as vessel	cream slip on interior	body profile totals:
globular	everted round	0	0	0	0
	everted pointed	0	0	0	0
	straight round	1	0	0	1
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
elongated globular	everted round	0	0	0	0
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
piriform	everted round	0	0	0	0
	everted pointed	2	0	0	2
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
cylindrical	everted round	0	0	0	0
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no preserved rim	0	0	0	0
no body preserved	everted round	1	0	0	1
	everted pointed	0	0	0	0
	straight round	0	0	0	0
	straight pointed	0	0	0	0
	no rim preserved	0	0	0	0
	vessel surface finishes totals:	4	0	0	4

Table 5.45 Late Minoan tripod cooking pots with spouted rims.

A. LMI Mochlos vessels.

LMI Mochlos tripod cooking pots				
		rim with spouts	rim without spouts	body profile totals:
globular	everted round	4	6	10
	everted pointed	0	0	0
	straight round	0	1	1
	straight pointed	0	0	0
	no preserved rim	0	0	0
elongated globular	everted round	0	3	3
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	1	1
	no preserved rim	0	1	1
piriform	everted round	0	1	1
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no preserved rim	0	0	0
cylindrical	everted round	1	0	1
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no preserved rim	0	0	0
no body preserved	everted round	0	0	0
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no rim preserved	0	3	3
	rim with spout totals:	5	16	21

B. LMII-III Mochlos vessels.

LMII-III Mochlos tripod cooking pots				
		rim with spouts	rim without spouts	body profile totals:
globular	everted round	0	6	6
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no preserved rim	0	0	0
elongated globular	everted round	0	4	4
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no preserved rim	0	0	0
piriform	everted round	0	0	0
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no preserved rim	0	0	0
cylindrical	everted round	0	0	0
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no preserved rim	0	0	0
no body preserved	everted round	1	3	4
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no rim preserved	0	0	0
	rim with spout totals:	1	13	14

C. LMI Papadiokambos vessels.

LMI Papadiokambos tripod cooking pots				
		rim with spouts	rim without spouts	body profile totals:
globular	everted round	0	1	1
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	1	1
	no preserved rim	0	0	0
elongated globular	everted round	0	0	0
	everted pointed	0	0	0
	straight round	0	1	1
	straight pointed	1	0	1
	no preserved rim	0	0	0
piriform	everted round	1	1	2
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no preserved rim	0	0	0
cylindrical	everted round	1	0	1
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no preserved rim	0	0	0
no body preserved	everted round	0	1	1
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no rim preserved	0	2	2
	rim with spout totals:	3	7	10

Table 5.46 LMI cooking jars with spouted rims.

LMI Papadiokambos cooking jars				
		rim with spouts	rim without spouts	body profile totals:
globular	everted round	0	0	0
	everted pointed	0	0	0
	straight round	1	0	1
	straight pointed	0	0	0
	no preserved rim	0	0	0
elongated globular	everted round	0	0	0
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no preserved rim	0	0	0
piriform	everted round	0	0	0
	everted pointed	0	2	2
	straight round	0	0	0
	straight pointed	0	0	0
	no preserved rim	0	0	0
cylindrical	everted round	0	0	0
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no preserved rim	0	0	0
no body preserved	everted round	1	0	1
	everted pointed	0	0	0
	straight round	0	0	0
	straight pointed	0	0	0
	no rim preserved	0	0	0
	rim with spout totals:	2	2	4

Table 5.47 Morphological description of LMI Mochlos cooking trays.

Complete assemblage is represented; 22 vessels.

A. Rim profile; rim, base diameters; wall height.

vessel type	sample	date	rim profile	rim diameter	base diameter	wall height
tray	MOC0187	LMI	everted	40	38	3.1 - 3.3
tray	MOC0319	LMI	round straight	40	38	none
tray	MOC0344	LMI	round straight	too small	too small	3
tray	MOC0474	LMI	round straight	38 - 40	37 – 39	4
tray	MOC0570	LMI	everted	16	16	2.8 - 3.1
tray	MOC1372	LMI	round straight	28	28	3.1
tray	MOC1373	LMI	round straight	40 - 42	38	2.8
tray	MOC1906	LMI	everted	15 - 20	14 – 19	3.2
tray	MOC1907	LMI	everted	37 - 40	36 – 39	3.8
tray	MOC1965	LMI	everted	49 - 52	47 – 50	4.7 - 5
tray	MOC1968	LMI	pointed straight	24	20	5.2
tray	MOC1974	LMI	round straight	38 - 43	36 – 41	2.9
tray	MOC2447	LMI	round straight	32 - 34	34 – 36	3.4
tray	MOC2759	LMI	round straight	38	40	2
tray	MOC2801	LMI	round straight	37 - 40	35 – 39	2.8
tray	MOC2826	LMI	round straight	31 - 32	29 – 30	3
tray	MOC2877	LMI	pointed straight	26 - 28	26 – 28	2.4
tray	MOC2905	LMI	pointed straight	too small	too small	3.4
tray	MOC2908	LMI	round straight	28	28	2
tray	MOC2986	LMI	pointed straight	36	36	3.9 - 4.1
tray	MOC4971	LMI	pointed straight	16	16	3.1 - 3.2
tray	MOC5943	LMI	pointed straight	34	32	3.3 - 3.7

B. Includes: handle type, placement, diameters.

vessel type	sample	date	handle type	handle placement	handle diameter	handles preserved
tray	MOC0187	LMI	none	none	None	none
tray	MOC0319	LMI	none	none	None	none
tray	MOC0344	LMI	round (scar)	side of rim	None	none
tray	MOC0474	LMI	pierced lug	side of rim	1.2 (thick)	1
tray	MOC0570	LMI	round (scar)	side of rim	None	none
tray	MOC1372	LMI	none	none	None	none
tray	MOC1373	LMI	none	none	None	none
tray	MOC1906	LMI	none	none	None	none
tray	MOC1907	LMI	none	none	None	none
tray	MOC1965	LMI	none	none	None	none
tray	MOC1968	LMI	none	none	None	none
tray	MOC1974	LMI	none	none	None	none
tray	MOC2447	LMI	none	none	None	none
tray	MOC2759	LMI	none	none	None	none
tray	MOC2801	LMI	round horizontal	side of rim	1.4 x 1.5	1
tray	MOC2826	LMI	round horizontal	side of rim	1.3 x 1.6	1
tray	MOC2877	LMI	none	none	None	none
tray	MOC2905	LMI	none	none	None	none
tray	MOC2908	LMI	none	none	None	none
tray	MOC2986	LMI	none	none	None	none
tray	MOC4971	LMI	none	none	None	none
tray	MOC5943	LMI	none	none	None	none

C. Includes: surface finish, spout, and added knobs.

vessel type	sample	date	rim profile	surface finish	spout	added knobs
tray	MOC0187	LMI	everted	self-slip	none	2 pres. knobs set on side of rim (1.3 x 2)
tray	MOC0319	LMI	round straight	self-slip	none	none
tray	MOC0344	LMI	round straight	self-slip	none	none
tray	MOC0474	LMI	round straight	cream slip	none	none
tray	MOC0570	LMI	everted	self-slip	none	none
tray	MOC1372	LMI	round straight	cream slip	none	none
tray	MOC1373	LMI	round straight	cream slip	none	none
tray	MOC1906	LMI	everted	self-slip	none	none
tray	MOC1907	LMI	everted	none preserved	none	1 and 1.5 knobs pres. set on side of rim (0.9 x 1.9)
tray	MOC1965	LMI	everted	self-slip	none	3 knobs set on side of rim (ca. 1.7 x 2)
tray	MOC1968	LMI	pointed straight	self-slip	none	none
tray	MOC1974	LMI	round straight	self-slip	none	none
tray	MOC2447	LMI	round straight	self-slip	none	none
tray	MOC2759	LMI	round straight	cream slip	none	none
tray	MOC2801	LMI	round straight	cream slip	none	none
tray	MOC2826	LMI	round straight	cream slip	none	none
tray	MOC2877	LMI	pointed straight	self-slip	none	none
tray	MOC2905	LMI	pointed straight	self-slip	none	none
tray	MOC2908	LMI	round straight	self-slip	none	none
tray	MOC2986	LMI	pointed straight	self-slip	none	none
tray	MOC4971	LMI	pointed straight	self-slip	none	none
tray	MOC5943	LMI	pointed straight	cream slip	none	none

Table 5.48 Morphological description of LMII-III Mochlos cooking trays.

Complete assemblage is represented; 22 vessels.

A. Rim profile; rim, base diameters; wall height.

vessel type	sample	date	rim profile	rim diameter	base diameter	wall height
tray	MOC0147	LMII-III	everted	26	24 – 26	3
tray	MOC0342	LMII-III	round straight	26 - 27	26	2.8
tray	MOC1531	LMII-III	round straight	45	not recorded	5.2
tray	MOC1595	LMII-III	pointed straight	26	26	4
tray	MOC1668	LMII-III	pointed straight	< 46	< 46	3.9
tray	MOC1776	LMII-III	pointed straight	37	36	3.4
tray	MOC1778	LMII-III	round straight	too small	too small	2.3
tray	MOC3177	LMII-III	round straight	32	30	4.5
tray	MOC3183	LMII-III	round straight	38	35	3.3
tray	MOC3224	LMII-III	round straight	too small	too small	3.3
tray	MOC3307	LMII-III	round straight	< 48	< 48	2.3
tray	MOC3338	LMII-III	everted	22	22	1.5
tray	MOC3859	LMII-III	round straight	20	20	1.8
tray	MOC3994	LMII-III	round straight	38 - 40	37 – 39	3.5
tray	MOC4948	LMII-III	pointed straight	13	13	3.4
tray	MOC4950	LMII-III	pointed straight	36	34	3.2 - 3.4
tray	MOC4951	LMII-III	round straight	36	34	3.6 - 3.9
tray	MOC4953	LMII-III	pointed straight	34	30	3.4
tray	MOC5281	LMII-III	pointed straight	20	20 – 22	2.3
tray	MOC5313	LMII-III	round straight	43	42	2.5 - 2.8
tray	MOC6018	LMII-III	round straight	43	42	3.2
tray	MOC6655	LMII-III	everted	33	32	3.6

B. Includes: handle type, placement, diameters.

vessel type	sample	date	handle type	handle placement	handle diameter	handles preserved
tray	MOC0147	LMII-III	round horizontal	side of rim	1.3 x 1.5	1
tray	MOC0342	LMII-III	round horizontal	side of rim	1.5 x 1.8	1
tray	MOC1531	LMII-III	lug (scar)	below rim	none	none
tray	MOC1595	LMII-III	round vertical	side of rim	1.8 x 1.9	1
tray	MOC1668	LMII-III	none	none	none	none
tray	MOC1776	LMII-III	none	none	none	none
tray	MOC1778	LMII-III	none	none	none	none
tray	MOC3177	LMII-III	none	none	none	none
tray	MOC3183	LMII-III	round (scar)	side of rim	none	none
tray	MOC3224	LMII-III	none	none	none	none
tray	MOC3307	LMII-III	none	none	none	none
tray	MOC3338	LMII-III	none	none	none	none
tray	MOC3859	LMII-III	none	none	none	none
tray	MOC3994	LMII-III	none	none	none	none
tray	MOC4948	LMII-III	none	none	none	none
tray	MOC4950	LMII-III	none	none	none	none
tray	MOC4951	LMII-III	round (scar)	mid-wall to base	none	none
tray	MOC4953	LMII-III	none	none	none	none
tray	MOC5281	LMII-III	none	none	none	none
tray	MOC5313	LMII-III	none	none	none	none
tray	MOC6018	LMII-III	semicircular lug	side of rim	0.5 - 1.5; 1.5 - 1.9	2
tray	MOC6655	LMII-III	semicircular lug (scar)	side of rim	none	none

C. Includes: surface finish, spout, added knobs.

vessel type	sample	date	rim profile	surface finish	spout	added knobs
tray	MOC0147	LMII-III	everted	self-slip	none	none
tray	MOC0342	LMII-III	round straight	self-slip	none	none
tray	MOC1531	LMII-III	round straight	self-slip	none	none
tray	MOC1595	LMII-III	pointed straight	self-slip	yes	none
tray	MOC1668	LMII-III	pointed straight	self-slip	none	none
tray	MOC1776	LMII-III	pointed straight	self-slip	none	none
tray	MOC1778	LMII-III	round straight	self-slip	none	none
tray	MOC3177	LMII-III	round straight	self-slip	none	none
tray	MOC3183	LMII-III	round straight	self-slip	none	none
tray	MOC3224	LMII-III	round straight	self-slip	none	none
tray	MOC3307	LMII-III	round straight	self-slip	none	none
tray	MOC3338	LMII-III	everted	self-slip	none	none
tray	MOC3859	LMII-III	round straight	self-slip	none	none
tray	MOC3994	LMII-III	round straight	self-slip	none	none
tray	MOC4948	LMII-III	pointed straight	self-slip	none	none
tray	MOC4950	LMII-III	pointed straight	self-slip	none	none
tray	MOC4951	LMII-III	round straight	self-slip	none	none
tray	MOC4953	LMII-III	pointed straight	cream slip	none	none
tray	MOC5281	LMII-III	pointed straight	self-slip	none	none
tray	MOC5313	LMII-III	round straight	self-slip	none	none
tray	MOC6018	LMII-III	round straight	self-slip	none	none
tray	MOC6655	LMII-III	everted	self-slip	none	none

Table 5.49 Morphological description of LMI Papadiokambos cooking trays.

Complete assemblage is represented; 4 vessels.

A. Rim profile; rim, base diameters; wall height.

vessel type	sample	date	rim profile	rim diameter	base diameter	wall height
tray	PDK0005	LMI	round straight	34	33	4.2 - 4.3
tray	PDK0087	LMI	round straight	34	34	3.1
tray	PDK0478	LMI	round straight	too small	too small	4.6
tray	PDK0514	LMI	round straight	38.6	38	4.1

B. Includes: handle type, placement, diameters.

vessel type	sample	date	handle type	handle placement	handle diameter	handles preserved
tray	PDK0005	LMI	round horizontal	side of rim	1.8 x 2	1
tray	PDK0087	LMI	none	none	None	none
tray	PDK0478	LMI	lug	set at rim	None	none
tray	PDK0514	LMI	none	none	None	none

C. Includes: surface finish, spout, added knobs.

vessel type	sample	date	rim profile	surface finish	spout	added knobs
tray	PDK0005	LMI	round straight	none	none	2 knobs pres. set on side of rim (ca. 1 x 1.4 cm)
tray	PDK0087	LMI	round straight	self-slip	none	none
tray	PDK0478	LMI	round straight	none	none	none
tray	PDK0514	LMI	round straight	none	none	none

Table 5.50 LM cooking tray rim profiles.

Data used to construct tables are recorded in Tables 5.47-5.49.

	LM cooking trays			
	round straight	pointed straight	Everted	assemblage totals:
Mochlos LMI	11	6	5	22
Mochlos LMII-III	12	7	3	22
Papadiokambos LMI	4	0	0	4
rim profile totals:	27	13	8	48

Table 5.51 Correlating LM cooking tray rim profile and diameters.

Data used to construct tables are recorded in Tables 5.47-5.49.

A. LMI Mochlos vessels.

	LMI Mochlos cooking trays			
	round straight	pointed straight	everted	rim diameter (cm) totals:
16	0	1	1	2
24	0	1	0	1
28	2	0	0	2
34	0	1	0	1
36	0	1	0	1
38	1	0	0	1
40	1	0	1	2
15-20	0	0	1	1
26-28	0	1	0	1
31-32	1	0	0	1
32-34	1	0	0	1
37-40	1	0	1	2
38-40	1	0	0	1
38-43	1	0	0	1
40-42	1	0	0	1
49-52	0	0	1	1
too small	1	1	0	2
rim profile totals:	11	6	5	22

B. LMII-III Mochlos vessels.

LMII-III Mochlos cooking trays				
	round straight	pointed straight	everted	rim diameter (cm) totals:
13	0	1	0	1
20	1	1	0	2
22	0	0	1	1
26	0	1	1	2
32	1	0	0	1
33	0	0	1	1
34	0	1	0	1
36	1	1	0	2
37	0	1	0	1
38	1	0	0	1
43	1	0	0	1
45	1	0	0	1
<46	1	1	0	2
<48	1	0	0	1
26-27	1	0	0	1
38-40	1	0	0	1
too small	2	0	0	2
rim profile totals:	12	7	3	22

C. LMI Papadiokambos vessels.

LMI Papadiokambos cooking trays				
	round straight	pointed straight	everted	rim diameter (cm) totals:
34	2	0	0	2
38.6	1	0	0	1
too small	1	0	0	1
rim profile totals:	4	0	0	4

Table 5.52 Correlating LM cooking tray rim profiles and wall heights.

Data used to construct tables are recorded in Tables 5.49, 5.50.

A. LMI Mochlos vessel

	LMI Mochlos cooking trays			
	round straight	pointed straight	everted	wall height (cm) totals:
2	2	0	0	2
2.4	0	1	0	1
2.8	2	0	0	2
2.9	1	0	0	1
3	2	0	0	2
3.1	1	0	0	1
3.2	0	0	1	1
3.4	1	1	0	2
3.8	0	0	1	1
4	1	0	0	1
5.2	0	1	0	1
2.8-3.1	0	0	1	1
3.1-3.2	0	1	0	1
3.1-3.3	0	0	1	1
3.3-3.7	0	1	0	1
3.9-4.1	0	1	0	1
4.7-5	0	0	1	1
none	1	0	0	1
rim profile totals:	11	6	5	22

B. LMII-III Mochlos vessels.

LMII-III Mochlos cooking trays				
	round straight	pointed straight	everted	wall height (cm) totals:
1.5	0	0	1	1
1.8	1	0	0	1
2.3	1	1	0	2
2.8	1	0	0	1
3	0	0	1	1
3.2	1	0	0	1
3.3	2	0	0	2
3.4	0	3	0	3
3.5	1	0	0	1
3.6	0	0	1	1
3.9	0	1	0	1
4	0	1	0	1
4.5	1	0	0	1
5.2	1	0	0	1
2.5-2.8	1	0	0	1
3.2-3.4	0	1	0	1
3.6-3.9	1	0	0	1
rim profile totals:	11	7	3	21

C. LMI Papadiokambos vessels.

LMI Papadiokambos cooking trays				
	round straight	pointed straight	everted	wall height (cm) totals:
3.1	1	0	0	1
4.1	1	0	0	1
4.6	1	0	0	1
4.2-4.3	1	0	0	1
rim profile totals:	4	0	0	4

Table 5.53 LM cooking tray with handle type and orientation.

Data used to construct tables are recorded in Tables 5.47-5.49.

	Cooking trays Mochlos		Papadiokambos	
	LMI	LMII-III	LMI	handle shape and orientation totals:
round horizontal, side of rim	2	3	1	6
round vertical, side of rim	0	1	0	1
round scar, side of rim	2	1	0	3
round scar, mid-wall to base	0	1	0	1
pierced lug, side of rim	1	0	0	1
semi-circular lug, side of rim	0	1	0	1
semi-circular lug scar, side of rim	0	1	0	1
lug, at rim	0	0	1	1
lug scar, below rim	0	1	0	1
no preserved handle	17	13	2	32
LM assemblage total:	22	22	4	48

Table 5.54 Morphological description of LMI Mochlos cooking dishes.

Complete assemblage is represented; 12 vessels.

A. Rim shape, part of vessel, rim type, surface textures.

vessel type	sample	date	preserved part of vessel	rim type	interior texture	exterior texture
cooking dish	MOC0358	LMI	body	AB	smooth	rough
cooking dish	MOC1726	LMI	body	AB	smooth	rough
cooking dish	MOC1985	LMI	body	AB	smooth	rough
cooking dish	MOC2473	LMI	spout	AB	smooth	rough
cooking dish	MOC2594	LMI	body/ spout	AB	smooth	rough
cooking dish	MOC2690	LMI	body	AB	smooth	rough
cooking dish	MOC2784	LMI	body/ spout	AB	smooth	rough
cooking dish	MOC2940	LMI	body/ spout	AB	smooth	rough
cooking dish	MOC3659	LMI	body	AB	smooth	rough
cooking dish	MOC3802	LMI	body	AB	smooth	rough
cooking dish	MOC4771	LMI	body/ spout	AB	smooth	rough
cooking dish	MOC5071	LMI	body	AB	smooth	rough

B. Rim height, wall thickness at rim and body, capacity, thumb impressions.

vessel type	sample	date	rim height (cm)	wall thickness at rim (cm)	wall thickness at body (cm)	capacity	thumb impressions
cooking dish	MOC0358	LMI	1.7	1.3	0.5 - 0.6	unknown	yes
cooking dish	MOC1726	LMI	0.5	1.1 - 1.4	0.3 - 1	unknown	none
cooking dish	MOC1985	LMI	0.5	1.2	0.7	unknown	none
cooking dish	MOC2473	LMI	1	1.7	1.3	unknown	none
cooking dish	MOC2594	LMI	1.3	0.9	0.6	unknown	none
cooking dish	MOC2690	LMI	2.5	0.9	0.4	unknown	none
cooking dish	MOC2784	LMI	0.9 - 1.6	0.5 - 0.7	0.5	unknown	none
cooking dish	MOC2940	LMI	1.2	1.3	0.5	unknown	none
cooking dish	MOC3659	LMI	0.9 - 1.6	0.9 - 1.3	0.1 - 0.4	unknown	none
cooking dish	MOC3802	LMI	1.7	1	0.4 - 0.6	unknown	yes
cooking dish	MOC4771	LMI	1 - 1.9	1.2	0.4	unknown	none
cooking dish	MOC5071	LMI	1.5	1.2 - 1.5	0.5	unknown	none

Table 5.55 Morphological description of LMII-III Mochlos cooking dishes.

Complete assemblage is represented; 36 vessels.

A. Rim shape, part of vessel, rim type, surface textures.

vessel type	sample	date	preserved part of vessel	rim type	interior texture	exterior texture
cooking dish	MOC1666	LMII-III	body	AB	smooth	rough
cooking dish	MOC1671	LMII-III	body	AB	smooth	rough
cooking dish	MOC1731	LMII-III	spout, body	AB	smooth	rough
cooking dish	MOC1737	LMII-III	spout, body	AB	smooth	rough
cooking dish	MOC1738	LMII-III	body	AB	smooth	rough
cooking dish	MOC1777	LMII-III	body	AB	smooth	rough
cooking dish	MOC1778	LMII-III	body	AB	smooth	rough
cooking dish	MOC3181	LMII-III	body	D	smooth	rough
cooking dish	MOC3225	LMII-III	body	D	smooth	rough
cooking dish	MOC3304	LMII-III	body	AB	smooth	rough
cooking dish	MOC3306	LMII-III	body	C	smooth	irregular
cooking dish	MOC3460	LMII-III	body	C	smooth	irregular
cooking dish	MOC3523	LMII-III	body	C	smooth	rough
cooking dish	MOC3545	LMII-III	spout, body	AB	smooth	rough
cooking dish	MOC3575	LMII-III	body, spout	AB	smooth	rough
cooking dish	MOC3605	LMII-III	spout, body	AB	smooth	irregular
cooking dish	MOC3721	LMII-III	body	C	smooth	irregular
cooking dish	MOC3897	LMII-III	body	D	smooth	rough
cooking dish	MOC4001	LMII-III	body	C	smooth	irregular
cooking dish	MOC4003	LMII-III	body	AB	smooth	irregular
cooking dish	MOC4006	LMII-III	body	AB	smooth	rough
cooking dish	MOC4018	LMII-III	body	AB	smooth	irregular
cooking dish	MOC4021	LMII-III	body	AB	smooth	rough
cooking dish	MOC4028	LMII-III	body	C	smooth	irregular
cooking dish	MOC4029	LMII-III	body	AB	smooth	rough
cooking dish	MOC4421	LMII-III	spout, body	AB	smooth	irregular
cooking dish	MOC4949	LMII-III	body	AB	smooth	rough
cooking dish	MOC4952	LMII-III	body	D	smooth	rough
cooking dish	MOC5042	LMII-III	body	AB	smooth	rough
cooking dish	MOC5277	LMII-III	body	C	smooth	irregular
cooking dish	MOC5615	LMII-III	spout, body	AB	smooth	irregular
cooking dish	MOC5621	LMII-III	spout, body	AB	smooth	rough
cooking dish	MOC5624	LMII-III	body, bowl	AB	smooth	rough
cooking dish	MOC5626	LMII-III	body	AB	smooth	irregular
cooking dish	MOC5627	LMII-III	spout, body	AB	smooth	irregular
cooking dish	MOC7046	LMII-III	body	AB	smooth	rough

B. Rim height, wall thickness at rim and body, capacity, thumb impressions.

vessel type	Sample	date	rim height (cm)	wall thickness at rim (cm)	wall thickness at body (cm)	capacity	thumb impressions
cooking dish	MOC1666	LMII-III	2.4	1.4 - 1.6	0.7 - 0.8	unknown	none
cooking dish	MOC1671	LMII-III	1.1	1.3	0.4 - 1.7	unknown	none
cooking dish	MOC1731	LMII-III	1.1 - 1.8	1.5	1	unknown	none
cooking dish	MOC1737	LMII-III	0.7 (spout); 1.5 (wall)	1.3 - 1.5	0.3 - 0.5	unknown	none
cooking dish	MOC1738	LMII-III	1.5	1.1	0.5 - 0.6	unknown	none
cooking dish	MOC1777	LMII-III	1.2	1.4	0.6	unknown	none
cooking dish	MOC1778	LMII-III	1.9 - 2	1.2	0.6	unknown	none
cooking dish	MOC3181	LMII-III	3	1.1	0.5	unknown	none
cooking dish	MOC3225	LMII-III	3.5	0.8	0.6 - 0.7	unknown	none
cooking dish	MOC3304	LMII-III	1.5	1.4	0.8	unknown	none
cooking dish	MOC3306	LMII-III	1.3	1.4	0.5	unknown	none
cooking dish	MOC3460	LMII-III	0.1	1.5	0.7	unknown	none
cooking dish	MOC3523	LMII-III	0.2	1.1 - 1.5	0.4 - 0.7	unknown	none
cooking dish	MOC3545	LMII-III	1.4 (spout); 2.2 (wall)	1.3 - 1.5	0.4 - 0.6	unknown	none
cooking dish	MOC3575	LMII-III	1.2	1.2	0.5	unknown	none
cooking dish	MOC3605	LMII-III	0.1 (spout); 0.7 - 1.1 (wall)	0.8 - 1.1	0.6	unknown	none
cooking dish	MOC3721	LMII-III	0.5	1.2 - 1.5	0.5	unknown	none
cooking dish	MOC3897	LMII-III	3	1.1	0.3	unknown	none
cooking dish	MOC4001	LMII-III	0.2	1	0.6	unknown	none
cooking dish	MOC4003	LMII-III	0.1	0.7 - 1	0.4 - 0.6	unknown	none
cooking dish	MOC4006	LMII-III	0.1	0.8	0.5	unknown	none

cooking dish	MOC4018	LMII-III	0.1 - 0.2	1.1 - 1.2	0.6	unknown	none
cooking dish	MOC4021	LMII-III	2	0.8 - 1 cm	0.4	unknown	none
cooking dish	MOC4028	LMII-III	0.1	1.6 - 1.8	0.5	unknown	none
cooking dish	MOC4029	LMII-III	0.1	1.5	0.6	unknown	none
cooking dish	MOC4421	LMII-III	0.6	1 - 1.2	0.3 - 0.4	unknown	none
cooking dish	MOC4949	LMII-III	2	1	0.4	unknown	none
cooking dish	MOC4952	LMII-III	3.5	1.1 - 1.4	0.5	unknown	none
cooking dish	MOC5042	LMII-III	1.9	1.3	0.3 - 0.4	unknown	none
cooking dish	MOC5277	LMII-III	1.1	1	0.6	unknown	none
cooking dish	MOC5615	LMII-III	0.1(spout), 1.4 (wall)	0.6 - 0.9	0.4 - 0.7	unknown	none
cooking dish	MOC5621	LMII-III	1.3	1 - 1.3	0.6 - 0.7	unknown	none
cooking dish	MOC5624	LMII-III	0.9	1.5	0.5	unknown	none
cooking dish	MOC5626	LMII-III	0.2	1.2	0.3 - 0.7	unknown	none
cooking dish	MOC5627	LMII-III	1.5	0.9 - 1	0.5	unknown	yes
cooking dish	MOC7046	LMII-III	1.1	1.3	0.4	unknown	none

Table 5.56 Morphological description of LMI Papadiokambos cooking dishes.

Complete assemblage is represented; 11 vessels.

A. Rim shape, part of vessel, rim type, surface textures.

vessel type	sample	date	preserved part of vessel	rim type	interior texture	exterior texture
cooking dish	PDK0004	LMI	spout, body	C	smooth	irregular
cooking dish	PDK0017	LMI	complete profile	C	smooth	irregular
cooking dish	PDK0151	LMI	complete profile	AB	smooth	rough
cooking dish	PDK0289	LMI	complete profile	AB	smooth	rough
cooking dish	PDK1485	LMI	complete profile	C	smooth	irregular
cooking dish	PDK1486	LMI	spout, body	C	smooth	irregular
cooking dish	PDK1732	LMI	body	C	smooth	irregular
cooking dish	PDK1733	LMI	body	C	smooth	irregular
cooking dish	PDK1734	LMI	body	C	smooth	irregular
cooking dish	PDK1735	LMI	spout, body	C	smooth	irregular
cooking dish	PDK1736	LMI	body	AB	smooth	rough

B. Rim height, wall thickness at rim and body, capacity, thumb impressions.

vessel type	sample	date	rim height (cm)	wall thickness at rim (cm)	wall thickness at body (cm)	capacity (liters)	thumb impressions
cooking dish	PDK0004	LMI	0.1	0.3 - 0.4	0.9	unknown	none
cooking dish	PDK0017	LMI	0.1 - 0.24	0.2 - 0.9	0.5 - 0.9	15.5	none
cooking dish	PDK0151	LMI	0.2 - 1.5	0.5 - 0.9	0.3 - 0.7	11	none
cooking dish	PDK0289	LMI	0.9 - 1.5	0.5 - 0.9	0.5 - 0.7	unknown	none
cooking dish	PDK1485	LMI	0.1 - 0.2	1	0.4	unknown	none
cooking dish	PDK1486	LMI	0.1	0.6 - 1	1 - 0.6 (spout), 0.8 (body)	12.5	none
cooking dish	PDK1732	LMI	0.8	1	0.3	unknown	none
cooking dish	PDK1733	LMI	0.1	1.1	0.3 - 0.4	unknown	none
cooking dish	PDK1734	LMI	0.1	0.3 - 0.6	0.5 - 0.3	unknown	none
cooking dish	PDK1735	LMI	0.1	1.5 (spout). 1.3 (body)	0.3 - 0.6	unknown	none
cooking dish	PDK1736	LMI	1.1	0.8 - 0.9	0.5	unknown	none

Table 5.57 LM cooking dish rim profiles.

Data used to construct tables are recorded in Tables 5.54-5.56.

LM cooking dishes				
	Type AB	Type C	Type D	assemblage totals:
Mochlos LMI	12	0	0	12
Mochlos LMII-III	25	7	4	36
Papadiokambos LMI	3	8	0	11
cooking dish type totals:	40	15	4	59

Table 5.58 Correlating LM cooking dish rim profiles and exterior surface features to gain insight into vessel production.

Data used to construct tables are recorded in Tables 5.54-5.56.

LM cooking dishes				
		irregular	rough	assemblage totals:
Mochlos LMI	Type AB	0	12	12
	Type C	0	0	0
	Type D	0	0	0
Mochlos LMII-III	Type AB	7	18	25
	Type C	6	1	7
	Type D	0	4	4
Papadiokambos LMI	Type AB	0	3	3
	Type C	8	0	8
	Type D	0	0	0
cooking dish exterior texture totals:		21	38	59

Table 6.01 Experimental cooking session 1: log

Date: Cooking Tripods_November 2010 Stefi's House

Cook: 1st cook in small tripod cooking pots No. 1 and No. 2

Food cooked: (1) vessel No. 1-octopus in beer, (2) vessel No. 2-sepia in white wine

Placed cooked: Covered outdoor porch

Weather: rainy, windy

Activity	Cooking notes	Temperature of coals (Celcius)*	Running time
preparing coals and vessels	bed of coals were lit on ground	0-400	17:15
	0.5 cup of olive oil rubbed into each vessel	400	17:45
	warmed vessel near burning coals	400-433	
cooking	placed a few coals underneath pots	433	18:15
	placed a few more coals underneath pots to make a pile, did not touch legs	458-520	
	wind causing coal temperature to fluxuate and drop; add more coals underneath vessels and covered with foil to maintain and raise temperature inside vessels	508, 484, 495, 461	
	steam is rising from vessels and food starting to smell		18:25
	octopus started to boil, turning from white-grey to pink, smelling onions, garlic cooking		18:40
	heavy steam in both vessels	cannot read	18:44
	vessels are too hot to touch, but handles are cool enough to touch and can use them to move the vessel if careful		18:48
	sepia pot sizzeling	416	18:51
	octopus continues to boil and spilling out		18:54
	seapia pot steaming and needs water; added 0.5 cup of hot water; added more coals underneath vessel	529	18:59
	octopus heavy boil; turning more pink	621	
	to retain heat in octopus vessel, adding more coals		19:02
	sepia is still only steaming, not boiling yet		19:04
	can feel coal temperatures are down by hand; color is grey and white; thermalcouple is not realiable and being burnt	cannot read	19:22
	sepia is simmering, onions are now clear; added more coals		
	sepia now boiling		19:26
	vessel No. 1 (sepia) legs are darker in color from heath fire		
	vessel No. 2 (octopus) legs are darker in color due to food boiling over		
	sepia fully boiling		19:30
	both vessels boiling, food is smelling good, coals are added underneath vessels; vessels very hot can hot handles to stir food within		19:39
	foil lids from vessels removed so liquid can evaporate		19:52
	coals are completely white		19:58
	both vessels are removed from coals by handles and light cloth		20:00

* Thermocouple burnt and destroyed by coals during cooking.

Table 6.02 Experimental cooking session 2: log

Date: November 2010; 1st cook in small tripod cooking pots No. 1 and No. 2; INSTAP

Food cooked: large cook (1) large cooking jar lentils, (2) small cooking jar liver, (3 and 4) Small tripod cooking pot No.1 and No.2 warming up octopus and sepia previously cooked

Cooking place and conditions: outdoor hearth; cool, slightly windy

No temperature record because thermocouple is broken. Used color of coals and hearth flame as a guide for heat.

Activity	Cooking notes	Color of coals	Running time
preparing hearth and vessels	built circular stone hearth, piled olive wood and olive wood charcoals, lit coals	black, flames orange, yellow	16:30
	poured 0.5 cup of olive oil in large and small cooking jar, and small tripod cooking pot No. 1 and No. 2; vessels placed by fire to warm vessels	coals orange, red, grey, white; flame yellow	17:13
preparing food	cooking rim side down with dome surface exposed to warm for bread baking		17:19
	large jar: lentils, garlic, onions, coriander, water in vessel		17:26
	small tripod cooking pot No. 1: octopus previously cooked in pot warming slowly until other food is cooked		
	small tripod cooking pot No. 2: sepia previously cooked in pot warming slowly until other food is cooked		
cooking	lentil jar: moved coals around vessel to raise heat		17:28
	sea food soup cooking dish: oil inside cooking dish		17:30
	sea food soup cooking dish: garlic and onion in oil		17:31
	sea food soup cooking dish: corriander, top shell, limpets, crab in dish		17:34
	sea food soup cooking dish: crab has changed from a brown color to a red color		17:40
	sea food cooking dish: honey, grape syrup, red wine vinegar, water, green onions, thyme		17:41
	sea food cooking dish: soup boiling		17:47
	lentil jar: steaming, placed foil lid on top of vessel		17:47
	lamb cooking dish: cooking dish on coals to warm		17:47
	lamb cooking dish: lamb laid on the dish (no oil!) to get the fat from the lamb into the dish, turned when needed		17:50
	lamb cooking dish: add onion and garlic		17:56
	lamb cooking dish: add red wine and reduced		18:04
	lentil jar: coming to boil		18:06
	lentil jar: adding little hot water		18:10
	liver jar: raised jar on small ceramic cups, placed coals underneath to warm it up		18:13
	liver jar: hot to touch on interior, add oil and sauteed onion and garlic		18:25
	sea food cooking dish: stir as needed		18:32
	lamb cooking dish: removed		18:34

	liver jar: onion and garlic are clear, add liver for light frying		18:36
	liver jar: grape syrup, chestnut paste, sea salt added to jar		18:43
	sea food cooking dish: off the fire and set aside		18:43
	liver jar: steaming and lightly simmering, want to cook slow		18:53
	lentil jar: water is a dusty color and thickening		19:06
	small tripod cooking pots No. 1 and No. 2: placed coals underneath to warm previously cooked octopus and sepia		19:12
	lentil jar: lentils are finished cooking, removed from coals, poured oil in vessel	coals orange, white	19:20
	liver jar: steaming, covered with lid, added coals		19:21
	liver jar: slow boil		19:31
	small tripod cooking pots No. 1 and No. 2: octopus and sepia started to boil		
	liver jar: boiling, lid removed to allow liquid to evaporate		
	liver jar: removed from coals		19:40
	small tripod cooking pots No. 1 and No. 2: removed from coals		

Table 7.01 Mochlos Artisans' Quarters Building A (LMIB), interior spaces (Soles 2003:7-35).

Floor remains associated with food activities. If it is present the number of objects is indicated, or "yes" is written in the box.

A. Ceramic objects.

Mochlos context:		Artisans' Quarters Building A (LMIB)				
		Room 2	Room 4	Room 1	Room 9	Room 10
		Main kitchen (?)	Main workroom	Workroom	poorly preserved	LM III disturbed
		hearth, storage	eat, drink	eat, drink	food preparation	cook, eat, drink
Pottery sherd count of cups and cook-pots:		29 kg.	1080 kg.	30.4 kg.	7 kg.	7 kg.
		63% cups	36% cups	44% cups	45% cups	62% cups
		17% cook	9% cook	12% cook	8% cook	20% cook
Cook-pot:	tripod	4	1	-	-	-
	Dish	14	-	1	-	1
	Tray	3	-	2	1	-
	bowl	2	-	-	-	-
	strainer	2	-	2	-	-
Ceramic eating and drinking vessels:	bowl	6	-	-	-	1
	Cup	72	5	3	-	3
	Jug	3	3	6	-	1
Ceramic storage vessels:	pithos	6	5	8	-	1
Ceramic miscellaneous:	lid or spinning bowl	-	-	1	2	-
Ceramic tools:	conical cup lamp	-	2	-	-	-
	lamp	-	-	-	1	-
	loom weight	4	6	-	-	-
	work slab	-	2	-	-	-
	mold	1	-	2	-	-
	polisher	1	-	-	-	-
Ceramic fire tools:	firebox	-	-	-	-	1
	scuttle	2	-	3	-	-

B. Metal and stone objects.

Mochlos context:		Artisans' Quarters Building A (LMIB)				
		Room 2	Room 4	Room 1	Room 9	Room 10
		Main kitchen (?)	Main workroom	Workroom	poorly preserved	LM III disturbed
		hearth, storage	eat, drink	eat, drink	food preparation	cook, eat, drink
Copper alloy objects:	fish hook	1	-	-	-	-
	Knife	1	-	-	-	-
	tweezers	1	-	-	-	-
Copper alloy materials:	ingot fragment	-	1	1	-	-
	scrap	-	3	-	-	-
	waste	4	3	-	1	-
Lead:	scrap	2	-	-	-	-
Stone tools possibly used for food preparation:	whetstone	-	1	-	-	-
	saddle quern	-	1	-	-	-
	mortar	-	-	-	-	1
	obsidian blade	3	1	-	-	-
Stone tools and materials:	red ocher	-	3	-	-	-
	serpentinite	-	1	-	-	-
	unfinished vase	-	1	-	-	-
	mold	-	-	1	-	-
	anvil	-	-	-	-	1
	drill guide	-	-	1	-	-
	drill core	-	-	1	-	-
	grinder	-	-	1	-	-
	piercer/engraver	1	-	2	-	-
	burnisher	-	-	1	-	-
	polisher	2	2	2	-	-

C. Organic remains.

Mochlos context:		Artisans' Quarters Building A (LMIB)				
		Room 2	Room 4	Room 1	Room 9	Room 10
		Main kitchen (?)	Main workroom	Workroom	poorly preserved	LM III disturbed
		hearth, storage	eat, drink	eat, drink	food preparation	cook, eat, drink
Mammal, bird, reptile:	bird, eggshell	-	yes	-	-	-
	Canis	yes	-	-	-	-
	lizard, snake	-	yes	-	-	-
	Ovis/capra	yes	yes	-	-	yes
	Rodent	yes	yes	-	-	-
	Sus	yes	-	-	-	-
	Testudo	yes	-	-	-	-
Fish:	barracuda	yes	-	-	-	-
	sea breams	yes	yes	-	-	-
	Spicara	-	yes	-	-	-
Shell:	*Cerastoderma*	-	yes	-	-	-
	Charonia	-	yes	-	-	-
	Murex	yes	yes	yes	-	-
	Patella	yes	yes	-	-	-
	Pisania	yes	yes	-	-	-
	sea snails	yes	yes	-	-	-
	Spondylus	yes	-	-	-	-
Marine invertebrates:	*Eriphia*	-	yes	-	-	-
	Paracentrotus	yes	yes	-	-	-
Land invertebrates:	land snails	-	yes	-	-	-
Botanical:	*Cerealia, Hordeum*	yes	-	-	-	-
	Ficus carica	yes	yes	-	-	-
	Glaucium	-	yes	-	-	-
	Lathyrus cicera/sativus	yes	-	-	-	-
	Lens culinaris	yes	-	-	-	-
	Olea europaea	yes	yes	-	-	-
	Portulaca	-	yes	-	-	-
	Prunus amygdalus	-	yes	-	-	-
	Vicia faba	yes	-	-	-	-
Wood charcoal:	*Juniperus*	yes	-	-	-	-
	Labiatae	yes	-	-	-	-
	Olea eurpaea	yes	yes	-	yes	yes
	Pinus halepensis	yes	-	-	-	-
	Platanus	yes	-	-	-	-
	Pomoideae	yes	-	-	-	-
	Prunus	yes	yes	-	-	-
	Quercus	yes	yes	yes	-	-

Table 7.02 Mochlos Artisans' Quarters Building A (LMIB), exterior spaces (Soles 2003:36-38).

Ceramic, copper alloy, stone tools, organic floor remains associated with food activities. If it is present the number of objects is indicated, or "yes" is written in the box.

Mochlos context:		Artisans' Quarters Building A (LMIB)
		Rear Yard and Potter's Pit
		surface, floor
		cook, food prep
Pottery sherd count of cups and cook-pots:		not available
		not available
		not available
Cook-pots:	dish	5
	tray	1
	strainer	1
Ceramic eating and drinking vessels:	cup	4
Ceramic miscellaneous:	lid or spinning bowl	1
Ceramic tools:	loom weight	1
	work slab	5
Ceramic fire tools:	firebox	1
Copper alloy objects:	knife	1
Stone tools possibly used for food preparation:	obsidian blade	1
Stone tools:	unfinished vessel	1
	polisher	1
Shell:	*Charonia*	yes
	Patella	yes
	Spondylus	yes
Botanical:	*Olea europaea*	yes

Table 7.03 Mochlos Artisans' Quarters Building B (LMIB), interior spaces (Soles 2003:43-87).

Floor remains associated with food activities. If it is present the number of objects is indicated, or "yes" is written in the box.

A. Ceramic objects.

Mochlos context:		Artisans' Quarters Building B (LMIB)					
		Room 10	Room 2	Room 3	Room 5	Room 7	Room 9
		hearths: SE, NE	hearth	cook, food preparation	eat, drink	ceramic oven (?)	cook, eat, drink, storage, food prep
Pottery sherd count of cups and cook-pots:		38 kg.	12 kg.	17 kg.	3 kg.	9 kg.	21 kg.
		13% cup	41% cup	53% cup	18%	34% cup	31% cup
		9% cook	24% cook	21% cook		9% cook	28% cook
Cook-pot:	Tripod	1	3	-	1	-	-
	Dish	8	2	4	1	1	7
	Tray	1	3	-	-	1	2
Ceramic eating and drinking vessels:	Bowl	1	1	1	-	-	-
	Cup	2	5	10	1	-	10
	Jug	-	-	1	-	1	-
Ceramic storage vessels:	Jar	4	2	2	-	3	-
	Pithos	2	-	-	-	-	-
Ceramic miscellaneous:	Lid	1	1	-	-	-	2
Ceramic tools:	loom weight	2	2	2	1	5	1
	Mold	-	1	-	-	-	-
	work slab	7	1	-	-	2	-
	Bat	3	-	1	-	-	1
	potters wheel	1	-	-	-	1	-

B. Metal and stone objects.

Mochlos context:		Artisans' Quarters Building B (LMIB)					
		Room 10	Room 2	Room 3	Room 5	Room 7	Room 9
		hearths: SE, NE	hearth	cook, food preparation	eat, drink	ceramic oven (?)	cook, eat, drink, storage, food prep
Copper alloy objects:	Knife	-	-	1	-	-	-
Copper alloy materials:	Strip	-	-	-	-	-	1
	Scrap	1	-	-	-	1	4
	waste	-	-	-	-	-	2
Stone tools possibly used for food preparation:	lens	-	-	-	1	-	-
	saddle quern	-	1	-	-	-	-
	mortar	1	-	-	-	-	-
	obsidian blade	1	-	-	-	-	1
Stone tools and materials:	hammerstone	-	3	2	-	-	-
	unfinished vessel	-	1	-	-	-	-
	polisher	-	1	-	-	-	-
	abrader	-	-	-	-	1	-
	balance weights	-	-	-	-	2	-
	pivot stone	1	-	-	-	1	-
	rubber	1	-	-	-	-	-
	circular percussive	1	-	-	-	-	-
	drill guide	1	2	-	-	1	-
	grinder	-	1	-	-	-	-
	weight	1	-	-	-	2	-
	palette	1	-	-	-	-	-

C. Organic remains.

Mochlos context:		Artisans' Quarters Building B (LMIB)					
		Room 10	Room 2	Room 3	Room 5	Room 7	Room 9
		hearths: SE, NE	hearth	cook, food preparation	eat, drink	ceramic oven (?)	cook, eat, drink, storage, food prep
Mammal, bird, reptile:	*Bos*	-	-	yes	-	-	-
	bird, eggshell	-	-	-	yes	-	-
	Canis	-	-	-	-	-	yes
	Lepus	-	-	-	yes	-	-
	lizard, snake	-	-	-	yes	-	-
	Ovis/capra	yes	-	yes	yes	-	yes
	Rodent	-	-	yes	yes	-	yes
	Sus	-	-	yes	yes	-	-
Fish:	sea breams	yes	-	yes	-	-	yes
	Serranus cabrilla	-	yes	-	-	-	-
	Sparisoma cretense	-	-	-	-	-	yes
	Spicara	-	yes	yes	-	-	yes
Shell:	*Cerastoderma*	-	-	yes	-	-	-
	Charonia	-	yes	-	-	yes	-
	Glycymeris	-	-	yes	-	-	-
	Murex	yes	yes	yes	-	-	-
	Patella	yes	yes	yes	yes	yes	yes
	sea snails	yes	yes	yes	yes	yes	-
Marine invertebrates:	*Eriphia*	-	-	-	-	-	yes
	Paracentrotus	yes	-	yes	-	yes	yes
	Theodoxus	-	-	yes			yes
Botanical:	*Ficus carica*	yes	yes	-	-	-	yes
	Glaucium	yes	-	-	-	-	-
	Olea europaea	yes	yes	yes	-	yes	yes
	Prunus amygdalus	yes	yes	yes	-	-	yes
	Vitis vinifera	-	-	-	-	-	yes
Wood charcoal:	*Ceratonia siliqua*	-	-	-	-	yes	-
	Cupressus sempervirens	yes	-	-	yes	-	-
	Juniperus	-	-	-	-	-	yes
	Olea eurpaea	yes	-	yes	-	yes	yes
	Pinus halepensis	yes	-	yes	-	-	-
	Pistacia	-	-	yes	-	-	-
	Populus	-	-	-	-	yes	-
	Prunus	yes	-	-	-	-	yes
	Quercus	yes	-	yes	-	-	yes
	Tamarix	-	-	-	yes	-	yes

Table 7.04 Mochlos Artisans' Quarters Building B (LMIB), exterior space (Soles 2003:77-83).

Ceramic, copper alloy, stone and organic floor remains associated with food activities. If it is present the number of objects is indicated, or "yes" is written in the box.

Mochlos context:		Artisans' Quarters Building B (LMIB)
		Room 13W
		hearth
Pottery sherd count of cups and cook-pots:		14 kg.
		47% cup
		25% cook
Cook-pot:	tripod	2
	dish	1
	tray	1
Ceramic eating and drinking vessels:	cup	11
	jug	1
Ceramic storage vessels:	jar	1
Ceramic tools:	loom weight	1
Stone tools possibly used for food preparation:	whetstone	1
Mammal, bird, reptile:	*Ovis/capra*	yes
Shell:	*Murex*	yes
	Patella	yes
	sea snails	yes
Marine invertebrates:	*Paracentrotus*	yes
Botanical:	*Olea europaea*	yes
	Vitis vinifera	yes

Table 7.05 Mochlos Chalinomouri farmhouse (LMIB), interior spaces (Soles 2003:03-125).

Floor remains associated with food activities. If it is present the number of objects is indicated, or "yes" is written in the box.

A. Metal and stone objects.

Mochlos contexts:		Chalinomouri farmhouse (LMIB)				
		Room 6	Room 3	Room 2	Room 1	Room 4
		hearth, eat, drink, food prep	hearth, eat, drink, food prep	dry/cold storage	eat, storage	hearth (?), eat
Pottery sherd count of cups and cook-pots:		11 kg.	12 kg.	8 kg.	1 kg.	-
		8% cook	27% cook			
Cook-pots:	Tripod	1	-	-	1	1
	Dish	1	3	-	2	3
	Tray	-	-	-	-	-
Ceramic eating and drinking vessels:	Cup	2	-	2	-	-
	Jug	1	-	1	-	-
Ceramic storage vessels:	Jar	3	3	7	1	-
	Pithos	1	-	4	1	-
Ceramic miscellaneous:	Lid	1	-	-	1	-
Ceramic tools:	loom weight	1	-	-	-	1
Ceramic fire tools:	Scuttle	-	-	-	-	-
Stone tools possibly used for food preparation:	Grinder	-	-	1	-	-
	hammerstone	-	-	1	-	-
	obsidian blade	-	-	1	-	-
Stone tools:	polisher/applicator	1	-	-	-	-
	pivot stone:	-	-	-	1	-
	drill guide	-	1	1	-	-

B. Organic remains.

Mochlos contexts:		Chalinomouri farmhouse (LMIB)				
		Room 6	Room 3	Room 2	Room 1	Room 4
		hearth, eat, drink, food prep	hearth, eat, drink, food prep	dry/cold storage	eat, storage	hearth (?), eat
Mammal, bird, reptile:	unidentified mammal	-	-	-	-	-
	deer	yes	-	-	-	-
	Ovis/capra	yes	yes	yes	yes	yes
	rodent	-	-	yes	yes	-
	Sus	yes	yes	-	yes	yes
Fish:	sea breams	yes	-	-	-	-
Shell:	*Charonia*	-	-	yes	yes	-
	Murex	-	-	-		yes
	Patella	-	yes	yes	yes	yes
	sea snails	-	-	yes	-	-
	Spondylus	-	-	-	-	-
Marine invertebrates:	*Eriphia*	-	-	yes	-	-
	Paracentrotus	-	-	yes	-	-
	Theodoxus	-	-	yes	-	-
Botanical:	*Asphodelus*	-	-	-	-	-
	Ficus carica	-	-	-	yes	-
	Olea europaea	yes	-	-	-	-
	Prunus amygdalus	yes	-	-	-	-
	Rosaceae	-	-	yes	-	-
	Silene	-	-	-	yes	-
	Trigonella	yes	-	-	-	-
	Trifolium	-	-	-	-	-
	Vitis vinifera	-	-	-	yes	-
Wood charcoal:	*Ficus carica*	-	-	yes	-	-
	Olea eurpaea	yes	yes	-	-	yes
	Pinus halepensis	-	-	-	yes	-
	Pistacia	-	-	-	yes	-

Table 7.06 Mochlos Chalinomouri farmhouse (LMIB), exterior spaces (Soles 2003:103-125).

Floor remains associated with food activities. If it is present the number of objects is indicated, or "yes" is written in the box.

A. Metal and stone objects.

Mochlos contexts:		Chalinomouri farmhouse (LMIB)		
		SE Porch, Entrance	NW Yard	
		food preparation	eat	oven
Pottery sherd count of cups and cook-pots:				
Cook-pots:	Tripod	-		1
	Dish	-	3	1
	Tray	1	-	3
Ceramic eating and drinking vessels:	Cup	-	-	-
	Jug	-	-	-
Ceramic storage vessels:	Jar	-	-	-
	Pithos	-	-	-
Ceramic miscellaneous:	Lid	-	-	-
Ceramic tools:	loom weight	-	1	-
Ceramic fire tools:	Scuttle	-	-	1
Stone tools possibly used for food preparation:	Grinder	1	-	-
	hammerstone	-	-	-
	obsidian blade	-	-	-
Stone tools:	polisher/applicator	-	-	-
	pivot stone	-	-	-
	drill guide	-	-	-

B. Organic remains.

Mochlos contexts:		Chalinomouri farmhouse (LMIB)		
		SE Porch, Entrance	NW Yard	
		food preparation	eat	oven
Mammal, bird, reptile:	unidentified mammal	-	-	yes
	Deer	-	-	-
	Ovis/capra	yes	-	-
	Rodent	-	-	-
	Sus	yes	-	-
Fish:	sea breams	-	-	-
Shell:	*Charonia*	-	-	-
	Murex	-	-	-
	Patella	-	-	-
	sea snails	-	-	-
	Spondylus	-	-	-
Marine invertebrates:	*Eriphia*	-	-	-
	Paracentrotus	-	-	-
	Theodoxus	-	-	-
Botanical:	*Asphodelus*	-	-	yes
	Ficus carica	-	-	-
	Olea europaea	-	-	-
	Prunus amygdalus	-	-	-
	Rosaceae	-	-	-
	Silene	-	-	-
	Trigonella	-	-	-
	Trifolium	-	-	yes
	Vitis vinifera	-	-	-
Wood charcoal:	*Ficus carica*	-	-	-
	Olea eurpaea	-	-	yes
	Pinus halepensis	-	-	-
	Pistacia	-	-	-

Table 7.07 Mochlos House Beta (LMIII) (Soles 2008:69-72).

Floor remains associated with food activities. If it is present the number of objects is indicated, or "yes" is written in the box.

A. Ceramic, metal and stone objects.

Mochlos context:		House Beta (LMIII)	
		main room eat, drink, storage	Cook shed cooking hole
Cook-pot:	Tripod	-	-
	Dish	2	-
	Tray	1	-
Ceramic eat and drink vessel:	Cup	-	1
Ceramic storage vessel:	Pithos	2	-
Ceramic tools:	loom weight	-	4
Copper alloy object:	Knife	-	1
Stone tool:	Grinder	-	1
	Handstone Hammerstone	-	2
	obsidian blade	-	3

B. Organic remains.

Mochlos context:		House Beta (LMIII) main room eat, drink, storage	House Beta (LMIII) Cook shed cooking hole
Mammal, bird, reptile:	*Bos*	-	yes
	Ovis/capra	yes	yes
	Sus	yes	yes
Shell:	*Charonia*	yes	yes
	Murex	yes	yes
	Patella	yes	-
	Pisania	-	yes
	sea snails	yes	yes
Marine invertebrates:	*Eriphia*	yes	yes
	Paracentrotus	yes	-
Land invertebrates:	land snails	-	yes
Botanical remains:	*Medicago*	yes	-
	Vicia faba	yes	-
Wood charcoal:	*Olea eurpaea*	-	yes
	Pistacia lentiscus	yes	-
	Prunus	-	yes
	Prunus amygdalus	-	yes
	Prunus bruttia	-	yes
	Prunus spinosa	-	yes
	Quercus	yes	yes

Table 7.08 Mochlos House Heta (LMIIIA, LMIIIB) (Soles 2008:84-90).

Organic and inorganic food remains associated with food activities. If it is present the number of objects is indicated, or "yes" is written in the box.

<table>
<tr><td colspan="2" rowspan="3">Mochlos Context:</td><td colspan="4">House Heta (LMIII)</td></tr>
<tr><td>yard</td><td>porch (LMIIIA)</td><td>porch (LMIIIB)</td><td>cook shed (LMIIIB), hearth with 4 stones creating cooking hole</td></tr>
<tr><td>eat, drink</td><td>cook, eat, drink</td><td>cook, eat, drink</td><td>cook</td></tr>
<tr><td rowspan="3">Cook-pot:</td><td>Tripod</td><td>-</td><td>3</td><td>-</td><td>-</td></tr>
<tr><td>Dish</td><td>1</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td>Tray</td><td>1</td><td>1</td><td>1</td><td>-</td></tr>
<tr><td rowspan="5">Ceramic eat and drink vessel:</td><td>Bowl</td><td>7</td><td>5</td><td>1</td><td>-</td></tr>
<tr><td>Cup</td><td>1</td><td>2</td><td>1</td><td>-</td></tr>
<tr><td>Dipper</td><td>2</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Krater</td><td>-</td><td>1</td><td>1</td><td>-</td></tr>
<tr><td>Kylikes</td><td>2</td><td>1</td><td>-</td><td>3</td></tr>
<tr><td rowspan="2">Ceramic storage vessel:</td><td>Jar</td><td>1</td><td>2</td><td>-</td><td>-</td></tr>
<tr><td>Pithos</td><td>-</td><td>1</td><td>-</td><td>-</td></tr>
<tr><td rowspan="3">Stone tools possibly used for food preparation:</td><td>handstone</td><td rowspan="2">-</td><td rowspan="2">1</td><td>-</td><td rowspan="2">1</td></tr>
<tr><td>hammerstone</td><td>-</td></tr>
<tr><td>saddle quern</td><td>1</td><td>1</td><td>-</td><td>-</td></tr>
<tr><td rowspan="4">Mammal, bird, reptile:</td><td>Bos</td><td>-</td><td>-</td><td>yes</td><td>-</td></tr>
<tr><td>bird, eggshell</td><td>-</td><td>yes</td><td>-</td><td>-</td></tr>
<tr><td>Ovis/capra</td><td>-</td><td>yes</td><td>yes</td><td>-</td></tr>
<tr><td>Sus</td><td>-</td><td>possible</td><td>yes</td><td>-</td></tr>
<tr><td>Fish:</td><td>sea breams</td><td>-</td><td>yes</td><td>-</td><td>-</td></tr>
<tr><td rowspan="7">Shell:</td><td>Barbatia</td><td>-</td><td>yes</td><td>-</td><td>-</td></tr>
<tr><td>Charonia</td><td>-</td><td>yes</td><td>yes</td><td>yes</td></tr>
<tr><td>Murex</td><td>-</td><td>yes</td><td>yes</td><td>-</td></tr>
<tr><td>Patella</td><td>-</td><td>yes</td><td>yes</td><td>yes</td></tr>
<tr><td>Pisania</td><td>-</td><td>yes</td><td>yes</td><td>-</td></tr>
<tr><td>sea snails</td><td>-</td><td>-</td><td>yes</td><td>yes</td></tr>
<tr><td>Venus verrucossa</td><td>-</td><td>-</td><td>-</td><td>yes</td></tr>
<tr><td rowspan="2">Marine invertebrates:</td><td>Eriphia</td><td>-</td><td>yes</td><td>yes</td><td>-</td></tr>
<tr><td>Paracentrotus</td><td>-</td><td>yes</td><td>-</td><td>-</td></tr>
<tr><td>Land invertebrates:</td><td>land snails</td><td>-</td><td>-</td><td>yes</td><td>-</td></tr>
</table>

Table 7.09 Mochlos House Iota (LMIIIA) (Soles 2008:49-60).

Floor remains associated with food activities. If it is present the number of objects is indicated, or "yes" is written in the box.

A. Ceramic and stone objects.

Mochlos context:		House Iota (LMIIIA)		
		Cook shed		exterior east corridor
		interior	E yard	
		cook, food prep	cook, food prep, storage (?)	
Cook-pot:	tripod	-	-	-
	dish	2	-	2
	tray	4	1	-
Ceramic eat and drink vessel:	bowl	1	-	1
	cup	1	-	-
	krater	-	1	-
Ceramic storage vessel:	jar	-	1	-
	pithos	-	1	1
Stone tools possibly used for food preparation:	handstone	7	-	-
	hammerstone			
	saddle quern	1	-	1
	obsidian blade	2	-	-

B. Organic remains.

Mochlos context:		House Iota (LMIIIA)		
		Cook shed		exterior east corridor
		interior	E yard	
		cook, food prep	cook, food prep, storage (?)	
Mammal, bird, reptile:	*Ovis/capra*	yes	yes	yes
	rodent	-	-	yes
	Sus	-	-	-
Shell:	*Charonia*	yes	yes	yes
	Murex	yes	-	yes
	Patella	yes	yes	yes
	sea snails	yes	yes	yes
Marine invertebrates:	*Eriphia*	-	-	-
	Paracentrotus	-	-	yes
Land invertebrates:	land snails	yes	-	yes
Botanical remains:	*Cerealia, Hordeum*	-	yes	yes
	Vitis vinifera	-	yes	yes
Wood charcoal:	*Pinus halepensis*	-	yes	yes
	Prunus	-	yes	yes
	Prunus amygdalus	-	-	-
	Quercus	-	yes	yes

Table 7.10 Mochlos House Gama (LMIIIA), interior spaces (Soles 2008:90-101).

Floor remains associated with food activities. If it is present the number of objects is indicated, or "yes" is written in the box.

A. Ceramic and stone objects.

<table>
<tr><th colspan="2" rowspan="3">Mochlos context:</th><th colspan="4">House Gama (LMIIIA)</th></tr>
<tr><th colspan="2">Room 1</th><th rowspan="2">Room 2</th><th rowspan="2">cook shed, hearth (?)</th></tr>
<tr><th>(Phase 2)</th><th>Phase (1)</th></tr>
<tr><th colspan="2"></th><th>eat, drink</th><th>cook, food preparation (?)</th><th>eat, drink</th><th>cook, food preparation</th></tr>
<tr><td rowspan="3">Cook-pot:</td><td>tripod</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>dish</td><td>-</td><td>-</td><td>2</td><td>1</td></tr>
<tr><td>tray</td><td>1</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="4">Ceramic eating and drinking vessels:</td><td>bowl</td><td>-</td><td>-</td><td>3</td><td>-</td></tr>
<tr><td>cup</td><td>1</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>krater</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>kylikes</td><td>-</td><td>-</td><td>2</td><td>-</td></tr>
<tr><td rowspan="2">Ceramic storage vessels:</td><td>jar with plastic added lily decoration</td><td>1</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>pithos</td><td>1</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Ceramic miscellaneous:</td><td>lid</td><td>1</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">Ceramic tools:</td><td>loom weight</td><td>2</td><td>1</td><td>-</td><td>3</td></tr>
<tr><td>lamp</td><td>1</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="5">Stone tools possibly used for food preparation:</td><td>handstone</td><td>1</td><td>3</td><td rowspan="2">12</td><td>-</td></tr>
<tr><td>hammerstone</td><td>1</td><td>1</td><td>-</td></tr>
<tr><td>saddle quern</td><td>-</td><td>1</td><td>-</td><td>-</td></tr>
<tr><td>mortar</td><td>-</td><td>-</td><td>1</td><td>-</td></tr>
<tr><td>obsidian blade</td><td>2</td><td>-</td><td>-</td><td>6</td></tr>
<tr><td rowspan="2">Stone tools:</td><td>balance-pan weight</td><td>-</td><td>1</td><td>-</td><td>-</td></tr>
<tr><td>burnisher</td><td>-</td><td>1</td><td>-</td><td>-</td></tr>
</table>

B. Organic remains.

Mochlos context:		House Gama (LMIIIA)			
		Room 1		Room 2	cook shed, hearth (?)
		(Phase 2)	Phase (1)		
		eat, drink	cook, food preparation (?)	eat, drink	cook, food preparation
Mammal, bird, reptile:	*Bos*	-	-	yes	yes
	Lepus	-	-	yes	-
	Ovis/capra	yes	yes	yes	yes
	rodent	-	-	-	yes
	Sus	-	-	yes	yes
Fish:	sea breams	-	-	-	yes
Shell:	*Charonia*	yes	-	yes	yes
	Murex	yes	-	-	yes
	Patella	yes	-	yes	yes
	Pisania	-	-	-	yes
	sea snails	-	-	yes	yes
Marine invertebrates:	*Paracentrotus*	-	-	yes	yes
Land invertebrates:	land snails	-	-	-	yes
Botanical:	*Ficus carica*	-	-	-	yes
	Vitis vinifera	-	-	-	yes
Wood charcoal:	*Olea eurpaea*	yes	yes	-	yes
	Pinus brutia	-	-	-	yes
	Platanus	-	-	-	yes
	Prunus	-	-	-	yes
	Prunus amygdalus	-	-	-	-
	Quercus	-	-	-	yes
	Tamarix	-	-	-	yes

Table 7.11 Mochlos House Gama (LMIIIA), exterior spaces (Soles 2008:90-101).

Floor remains associated with food activities. If it is present the number of objects is indicated, or "yes" is written in the box.

A. Ceramic and stone objects.

Mochlos context:		House Gama (LMIIIA)		
		SW terrace and area below	Court	
			Phase 2 floor over court	Phase 1 floor
		food preparation, eat, drink, possible cook	Eat, drink, cook, food preparation	food preparation
Cook-pot:	tripod	1	-	-
	dish	-	1	2
	tray	1	1	-
Ceramic eating and drinking vessels:	bowl	6	2	1
	cup	2	3	1
	krater	1	-	1
	kylikes	1	1	1
Ceramic storage vessels:	jar	1	-	-
Ceramic tools:	loomweight	-	3	2
Stone tools possibly used for food preparation:	handstone	24	-	-
	hammerstone		-	-
	saddle quern	1	-	2
	grinder	-	1	-
	mortar	-	-	-
	obsidian blade	-	-	1
Stone tools:	polisher	-	2	-
	balance-pan weight	-	1	-

B. Organic remains.

Mochlos context:		House Gama (LMIIIA)		
		SW terrace and area below	Court	
			Phase 1b floor over court	Phase 1a floor
		food preparation, eat, drink, possible cook	cook, food preparation	food preparation
Mammal, bird, reptile:	*Bos*	-	-	yes
	Lepus	-	-	-
	Ovis/capra	yes	yes	yes
	rodent	-	-	-
	Sus	possible	-	-
Fish:	sea breams	-	-	-
Shell:	*Charonia*	yes	yes	yes
	Murex	-	yes	yes
	Patella	yes	yes	yes
	Pisania	-	-	-
	sea snails	-	yes	yes
Marine invertebrates:	*Paracentrotus*	yes	-	-
Land invertebrates:	land snails	-	-	-
Botanical:	*Ficus carica*	-	yes	-
	Vitis vinifera	-	-	-
Wood charcoal:	*Olea eurpaea*	yes	yes	-
	Pinus brutia	-	-	-
	Platanus	-	-	-
	Prunus	-	-	-
	Prunus amygdalus	yes	-	-
	Quercus	-	-	-
	Tamarix	-	-	-