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THE POLITICAL GEOGRAPHY OF A MYCENAEAN DISTRICT

THE ARCHAEOLOGICAL SURVEY AT IKLAINA

edited by

MICHAEL B. COSMOPOULOS



ATHENS 2016

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In memoriam

Douglas Edwards (1950-2008)

Kalliope Kalogerakou (1968-2014)

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PREFACE

The historic village of Iklaina is located approximately 14 km to the northeast of the modern town of Pylos. As early as 1909 Konstantinos Kourouniotis had reported ancient tools from the area, but it was not until 1954 that Iklaina became the object of targeted archaeological exploration. In July of that year Spyridon Marinatos came to the location Traghanes, about 2 km to the west of the village, to investigate reports of ancient artifacts found by the locals in their fields. During a four-day excavation he unearthed impressive finds, including thick walls, parts of a Cyclopean building, fragments of painted plaster, and copious amounts of Mycenaean pottery. Marinatos never returned to Iklaina and the site was left unexplored until the early 1990's, when Professor George Korres recommended that I continue its exploration. A preliminary reconnaissance was conducted in summer of 1997 and the Iklaina Archaeological Project (IKAP) was established later that year. Because Iklaina had been identified previously as one of the district capitals of the Mycenaean state of Pylos, our main objectives were to test this identification and then use Iklaina and the Pylian state as a case study for the investigation of the processes of state formation in Mycenaean Greece following a "bottom-up" approach – that is not from the perspective of the main palace, but from that of non-palatial settlements.

*Our first priority was to conduct a regional survey in order to place the site in its wider context and assess its standing in relation to other Mycenaean settlements in the area. The present volume presents the methods and results of that survey, conducted over the course of eight field seasons (1999-2006). Annual reports appeared in the *Praktika* of the Athens Archaeological Society for those years, but the final publication was put on hold because full-scale excavation followed immediately on the heels of the survey; this presented us with an opportunity to not only compare the survey results to those of the excavation, but also to recover stratified pottery that would allow us to understand and date more efficiently the ceramics that we had encountered during the survey.*

The Iklaina Archaeological Project is conducted under the auspices of the Athens Archaeological Society. To the Board, and especially the Secretary General Dr. Vasileios Petrakos, I would like to express my gratitude for the permits that have made our work possible and for his constant and unfailing support of our work. I am also

grateful to Professor George Korres for his recommendation to continue Marinatos' work at Iklaina and for his general advice on the archaeology of Messenia. A special thanks goes to the Greek Archaeological Service for allowing us to work in the area, especially Dr. Xenia Arapogianni, the Ephor during the years of the project, the archaeologists Georgia Hatzi, Evangelia Malapani, and Demosthenis Kosmopoulos, and the late Kostas Sikalias, then Chief Guard of the Pylos museum, all of whom facilitated our work in many different ways.

It is a pleasure to acknowledge the financial assistance of several institutions and foundations that made the project possible. In Canada, we received support from the Department of Classics of the University of Manitoba, for which I wish to thank the then Head of the Department, Rory Egan; and the Social Sciences and Humanities Research Council of Canada. In the US, from the Institute for Aegean Prehistory; and the University of Missouri-St. Louis, for which I wish to thank the Associate Provost for Academic Affairs, Joel Glassman. Publication of this book was made possible thanks to a subvention from the Department of Anthropology and Archaeology of the University of Missouri-St. Louis, for which I am thankful to the former and current Chairs, Susan Brownell and Patti Wright.

A great deal of gratitude goes to all the colleagues who year after year kept returning to Iklaina; it is their expertise, professionalism, and dedication that made this project possible. Deborah Ruscillo has been instrumental in helping to design and implement the strategy of the survey, as well as tending to the needs of the students and solving countless practical problems, large and small. Since the early years, Cynthia Shelmerdine and Joann Gulizio undertook the major task of studying the copious amounts of ceramic finds, one of the most crucial parts of our work. Chris Mundigler conducted the topographical work in often adverse terrains and under difficult conditions, helped with numerous practical problems that arose during the field work, and also produced many of the maps and images included in this volume. Several archaeologists led our teams in the field: Maria Antoniou, Allison Bowles, Alicia Carter, Robin and Sylvia Connor, Sarah Davies, Jennifer Glaubius, Jody Gordon, Evi Gorogianni, †Popi Kalogerakou, Ioanna Koukouni, Natasha Maravella, Dimitri Nakassis, Nancy Ralli, Andrew Scordmaglia, Amanda Slavin, and Mary Tsoulakou. Starting in 2002, the GPS equipment that †Douglas Edwards brought to the survey facilitated our work greatly; in 2003 and 2004 he was assisted by Justin Garland. Ian Cameron and Kevin Pluta covered our IT needs; field photos were taken by Steven Clarke and find photos by George Vdokakis; drawings of finds were executed by Yannis Nakas, Steven Clarke, and Yuki Furuya. Warm thanks are due to all the authors of the present volume, who joined us for successive seasons of fieldwork and prepared the chapters that are included in this book. I am thankful to Joann Gulizio for her editorial help and to Thomas Tartaron for reading the manuscript and offering insightful comments.

The Pylos tablet Qa 1294 includes the toponym a-pu₂-we, usually identified with the site of Iklaina. We use it on the cover of this book because we believe it is also the name of the wider district explored by our survey. For facilitation to use the tablet I thank Jack Davis, Sharon Stocker, Carol Hershenson, and Dimitris Nakassis.

Since the very first season, the villagers of Iklaina welcomed us with warm hospitality, which included generous refreshments for our teams and parties in the village square. For this kindness, hospitality, and graciousness we are all grateful.

This book is dedicated to the memory of two friends and members of the project, whom we lost prematurely. Douglas Edwards' and Popi Kalogerakou's high work ethic, congeniality, kindness, and humanity will be remembered fondly by all of us.

MICHAEL B. COSMOPOULOS

ST. LOUIS, SEPTEMBER 2015

ABBREVIATIONS

Chronology

A	Archaic
AD	<i>Anno Domini</i>
BC	Before Christ
Byz	Byzantine
c.	century
CL	Classical
EBA	Early Bronze Age
EH	Early Helladic
HL	Hellenistic
LBA	Late Bronze Age
LH	Late Helladic
LM	Late Minoan
MBA	Middle Bronze Age
MH	Middle Helladic
PG	Protogeometric
R	Roman

Measurements

C	Celsius
ca.	<i>circa</i>
cm	centimeter
diam.	diameter
dim.	dimensions
est.	estimated
h.	height
ha	hectares
km	kilometers
l.	length
m	meter
masl.	meters above sea level

max.	maximum
min.	minimum
ml	milliliter
mm	millimeter
th.	thickness
w.	width
wt.	weight

Other

ASTER	Advanced Spaceborne Thermal Emission and Reflection
CEM	Cemetery site
DEM	Digital Elevation Model
ESRI	Environmental Systems Research Institute
FP	Further Province
GDEM	Global Digital Elevation Model
GIS	Geographic Information Systems
GPS	Global Positioning System
HAB	Habitation site
HP	Hither Province
ICP-MS	Inductively coupled plasma-mass spectroscopy
IKAP	Iklaina Archaeological Project
IND	Industrial site
METI	ManTech Environmental Technology Inc.
MME	Minnesota Messenia Expedition
NASA	National Aeronautics and Space Administration
PN	“Palace of Nestor”
PRAP	Pylos Regional Archaeological Project
pXRF	portable X-ray fluorescence
USPED	Unit Stream Power - based Erosion/Deposition
vs.	versus

INTRODUCTION

Michael Cosmopoulos

The overarching purpose of the Iklaina Project is to study the processes that led to the formation of states in Mycenaean Greece. Mycenaean states were secondary first-generation states in the sense that they were the earliest states to appear in their respective areas, but their formation was affected by interactions with neighboring pre-existing states, especially Crete and Egypt.¹ According to the prevailing model, rooted in neoevolutionary theory, Mycenaean states were born from pre-existing autonomous regional polities, usually considered *chiefdoms*.² In Greece this process occurred during the final stages of the MH and the beginning of the LH period, when certain “paramount chiefs” or “Big Men” became more powerful than others and, through complex economic and sociopolitical processes, set their chiefdoms on the path to becoming the Mycenaean palace-based states.³ Other models have also been proposed, stemming from recent fieldwork⁴ and from theoretical approaches emphasizing not hierarchical ranking, but heterarchical relations of settlements;⁵ these models suggest that the situation is not as clear-cut as we had thought and that the developments that led to the creation of palatial states may not have been universal throughout Greece.

Testing these models in the field requires a broad framework of analysis that would combine diverse types of evidence. The Mycenaean state of Pylos lends itself uniquely to such an analysis for two reasons. First, it is the only Mycenaean state for which we have an extensive corpus of epigraphic evidence in the form of the Linear B tablets from the PN;⁶ these documents provide a great deal of information about

1. For the definitions of primary vs. secondary and first- vs. second-generation states, see Parkinson & Galaty 2007.

2. The difference between states and chiefdoms is usually defined in terms of the degree of formalization and monumentalization of their institutions (Wright 2004b).

3. Bennet 1995, 1998, 1999a, 2002, 2007a, 2008; Bennet & Shelmerdine 2001; Dabney & Wright

1990; de Fidio 2001; Galaty & Parkinson 1999, 2007; Palaima 1995; Palaima & Wright 1985; Shelmerdine 2001, 2006; Shelmerdine & Bennet 2008; Wright 1995a, 1995b, 2006, 2008.

4. Pullen & Tartaron 2007; Tartaron 2010.

5. Crumley 1995.

6. Blegen & Rawson 1966; Bennett 1955; Bennett & Olivier 1973, 1976; Palaima 1988, 2003, 2004.

key aspects of the Pylian state, ranging from geography, demography, and economy, to military organization, political institutions, and religion.⁷ Second, decades of intensive and extensive archaeological fieldwork have produced a great amount of archaeological data for the region of Messenia, making it one of the best-researched areas of Greece.⁸ The history of archaeological work conducted in southwest Peloponnese, along with detailed data and an excellent synthesis of the state of our knowledge on Mycenaean Messenia has been recently published by Richard Hope Simpson.⁹

The textual evidence suggests that the settlements in the territory of the state of Pylos were organized in a tight administrative structure, consisting of two “provinces” (“Hither” and “Further,” abbr. HP and FP) and sixteen or seventeen “districts” (nine in the HP and seven or eight in the FP).¹⁰ Although subject to the main palace, each district had its own governor (*ko-re-te*) and deputy governor (*po-ro-ko-re-te*), who resided in the town that functioned as the administrative capital of the district; district capitals carried the same name as their districts.

One of the facts established from the tablets is that a significant part of the economic, social, and political life of the Pylian state occurred outside the Palace, in the towns and villages of its territory. Although we know that non-palatial settlements played an important role in the operation of the state, until recently our evidence had been “centro-centric”, in the sense that it derived chiefly from the palatial capital. This lack of data from non-palatial settlements has resulted in an unbalanced picture of the formation and operation of the Pylian state, seen only from the perspective of its central capital.¹¹ To balance this one-sided view, we must shift our focus from the palatial capital to non-palatial settlements and from the state of Pylos as an overarching entity to individual districts by increasing the level of magnification of archaeological analysis to the maximum possible degree. We need to “zoom in”, so to speak, onto each district and examine it as a self-standing unit, in order to assess its function and status in relation to the palace and to other districts, and to reconstruct the nexus of its settlements, large and small. In the field, this requires an intensive coverage of

7. Chadwick 1972, 1973, 1976, 35-48; Shelmerdine 1973; Bintliff 1977; Cherry 1977; Sutton 1970; Palaima & Shelmerdine 1984; Morris 1986; Carothers 1992; Zangger et al. 1997; various contributions in Rehak 1995; Laffineur & Niemeier 1995; Wright 2004a.

8. For the history of research in Messenia, see Davis 2008, 23-78 and Hope Simpson 2014, 5-14.

9. Hope Simpson 2014.

10. Most Linear B scholars agree that there

were sixteen district capitals under the administrative and economic control of the PN. The discrepancy in the number of capitals in the Further Province is due to an inconsistency between PY Jn 829, which records seven capitals, and the Ma series, which lists eight (Bennet 2011, 152).

11. See the discussion of these models by Galaty & Parkinson 1999, 1; Bennet, 1999a and 2007b.

a solid block of land that is likely to represent the territory of a single district. The study of settlement patterns within each district allows us not only to investigate the operation of the state from the perspective of non-palatial settlements, but also to provide time-depth in reconstructing the history of settlement during the periods that led up to its formation.

The purpose of the Iklaina Archaeological Project is to apply such a bottom-up approach to the study of Mycenaean state formation and operation through the systematic investigation of one of the district capitals of the Pylian state. Until now only one other site that is likely to have been a district capital has been systematically investigated, that of Nichoria, identified by Shelmerdine as one of the district capitals

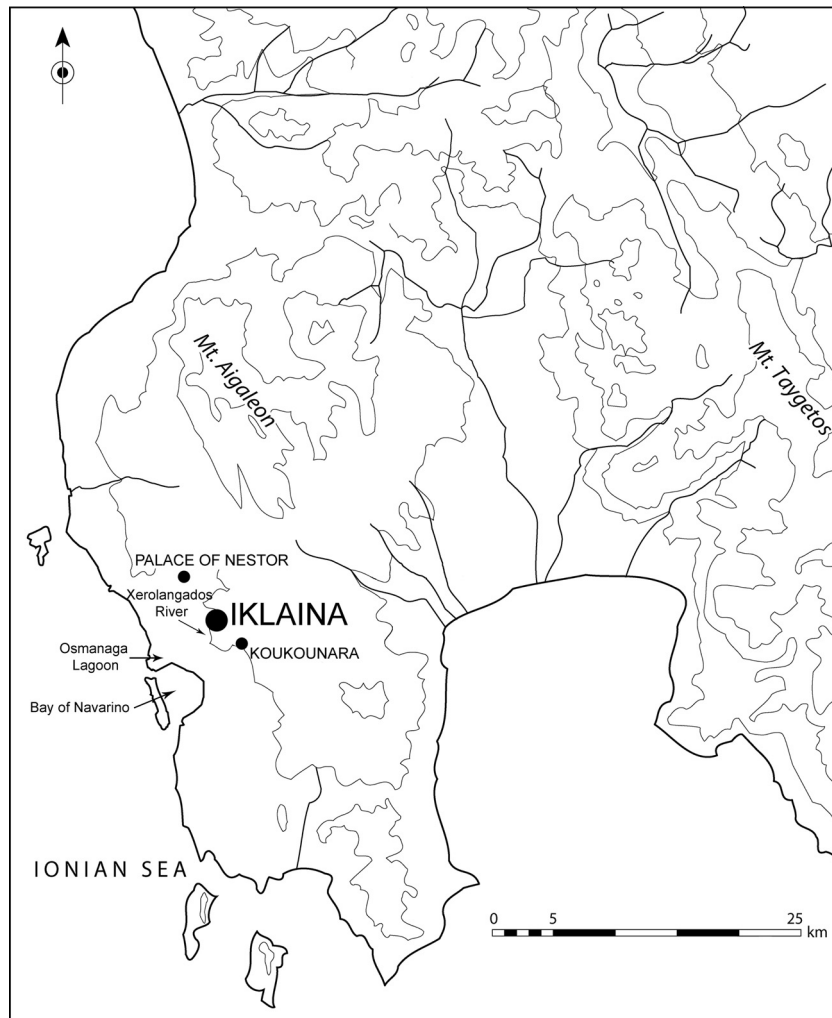


Fig. 1. Map of Messenia showing Iklaina, the PN, and Koukounara.



Fig. 2. The Iklaina plateau from the southeast (aerial photograph taken by the author).



Fig. 3. The mound from the east (aerial photograph taken by the author).

of the FP.¹² Unfortunately, the considerable erosion that this site has suffered reduced the amount of information that could be recovered, whereas the survey around the site did not include the entire territory of its district. Furthermore, a capital of the HP rather than the FP would lend itself more suitably to the analysis of the processes of state formation, especially as we intended to test the hypothesis that the FP may have been annexed later than the HP.¹³

The site that Marinatos tested at Traghanes has been identified by Richard Hope Simpson and confirmed by John Bennet as **a-pu₂*, one of the district capitals of the HP.¹⁴ It is located at the western end of an extensive plateau to the west of the modern village of Iklaina, approximately 6 km from the coast at Romanou and 4 km from the palace at Ano Englianos (fig. 1). The area is covered with olive groves and vineyards (fig. 2); to the west, north, and south, it is defined by a ravine, while to the east, it ascends gently towards the center of the plateau. Until 2009, when we excavated it, a large mound overgrown with vegetation dominated the western end of the plateau (fig. 3). As detailed below in the chapter on the Topographical Survey, this mound became the center of the Iklaina universe, in the sense that on it we established the benchmark from which our grid radiates. Since the beginning, the mound and the olive grove around it were called “the main site,” a description that has been maintained in this publication.

The survey part of the project lasted from 1999 to 2006 and consisted of an intensive investigation of a solid block of land around the main site, covering an area of about 22 km² and extending from the PN in the north to the Mycenaean center of Koukounara in the south. The rationale was that, if Traghanes had, indeed, been a district capital, a contiguous area around it extending up to the closest known major Mycenaean settlements, would be likely to comprise a large part of the territory of that district.

The main objective of the survey was not to reconstruct the history of the area *in the longue durée*, but rather to focus on settlement pattern and hierarchy during the Mycenaean period.¹⁵ The specific questions we set out to investigate concerned the size and importance of Iklaina during both the Early Mycenaean (leading up to the consolidation of the Pylian state) and the Late Mycenaean period (after the unification

12. Rapp & Aschenbrenner 1978; McDonald et al. 1983; McDonald & Wilkie 1992; Shelmerdine 1981.

13. Bennet 1999a; Bennet & Shelmerdine 2001. This theory can now be revised (see concluding chapter).

14. Chadwick 1972, 109; Hiller 1972; Hope Simpson 1981, 117: F17-F18; Bennet 1998; Cosmopoulos 2006a. In the tablets from the PN usually it appears in the locative/dative form *a-pu₂-we*.

15. See also the chapter on Archaeological Survey.

of the state of Pylos). Was Iklaina, in both periods, the major settlement in the area, or one of several similarly-ranked settlements? Is there another site in the region that could be a better candidate for a district capital? What was the hierarchy of Mycenaean settlements around Iklaina?

These issues pertain to the wider issue of the formation and operation of the Pylian state. Does the survey evidence support the hypothesis that the formation of this state was the result of a process of integration of previously independent regional polities? Can we determine whether district capitals were initially the administrative centers of chiefdoms, demoted to second-order settlements after their integration? These questions can only be answered through a research program combining both survey and excavation. In this volume we present the results of the survey in an effort to pave the way for a better understanding of the regional processes that affected the formation and operation of the Pylian state.

LANDSCAPE AND ENVIRONMENT

Jennifer Glaubius

INTRODUCTION

Discovery of sites and artifact scatters by the IKAP survey was both aided and hindered by the environment created through natural processes and human activities. Not only was the initial placement of sites and activity areas influenced by the resources available within the landscape, but the state of preservation of these sites and activity areas has been affected by both natural and anthropogenic changes to the environment, ranging from sediment deposition and soil erosion to agricultural tillage. The impact that such changes have had on artifact discovery is analyzed in this chapter, after a discussion of the landscape and environment of the major region of Iklaina.

GEOLOGY AND LANDFORMS

Almost all bedrock within the province of Messenia is sedimentary. The oldest sedimentary rocks are siliceous shales, limestones, dolomites, and flints that were deposited in the large Alpine syncline during the Mesozoic Era.¹⁶ During the Eocene when the Alpine/Hellenic orogeny began and continuing into the Miocene, sediments eroded from the uplifting mountains to the east and were deposited in water-covered Messenia as flysch interbedded with limestone.¹⁷ At the end of the Alpine orogeny in the Miocene, the conglomerate and marl limestone bedrock in the IKAP survey area was deposited while the area was still underwater.¹⁸ The limestone bedrock in this part of Messenia is soft and easily eroded, while the conglomerate bedrock is weathered with greater difficulty.

The bedrock of southwestern Messenia first emerged from the sea at the end of the Tertiary Period, when the present landforms began to take shape. Early in the

16. Loy 1970, 45-46; Zangger et al. 1997, 554-556.

17. Loy & Wright 1972, 40-41.

18. Loy 1970, 45; Zangger et al. 1997, 556. Fountoulis et al. 2014, 307 and Mariolakos et al. 1994, 372.

Pleistocene, all of the study area except for the part with conglomerate bedrock was submerged due to a period of land subsidence and elevated sea level, resulting in the deposition of shallow marine sediments.¹⁹ In the Late Pleistocene, the combination of lower sea level and tectonic uplift because of a major fault located to the north and east of the IKAP survey area raised the landscape above the sea again.²⁰ Because of the uplift, the marl limestone bedrock deposited during the Pliocene became an upland plain known as Kampos. Continued tectonic uplift and lowered sea level due to expansion of continental glacial ice sheets elsewhere in the world changed stream base level, which increased incision and general erosion of the land.²¹ Steep ravines were cut into the bedrock by the incising streams. When however ice sheets retreated, sea level rose to flood valleys carved during low sea level periods and deposited sediments in the valleys and ravines. The difference in sea level between high and low periods was at least 100 m.²²

Uplift and stream erosion in the IKAP survey area has continued throughout the Holocene epoch because of gradual tectonic uplift of the area. During the Quaternary Period, the IKAP survey area has been uplifted more than 400 m.²³ As a result of uplift the coastline that was near the edge of the western border of the IKAP survey area during the Mesolithic Period (ca. 7000 BC) has moved further to the west.²⁴ Today the IKAP survey area ranges in elevation from 46 m in the bottom of a ravine to 311 m on top of a plateau. Continued uplift has ensured that streams continue to cut steep ravines into the bedrock.

Even while the changes in sea level and tectonic uplift have powered stream erosion in the region, the underlying bedrock influenced the topography. The survey area contains two types of bedrock, which has been shaped into distinct drainage patterns. In the northern two-thirds of the survey area, where marl limestone predominates, ravines separate the land into long plateaus stretching from east to west in the Kampos plain (fig. 4). The parallel plateaus form the branches of the dendritic drainage patterns within that part of the study area. In the area of conglomerate bedrock in the southern one-third of the survey area (south of the village of Iklaina), the upland plain is dissected into smaller areas by ravines in all directions making travel around that area more difficult. That part of the survey area has a radial drainage pattern created by the conglomerate bedrock. The two drainage patterns displayed in the IKAP survey area are the direct result of differential erosion of the underlying bedrock.

19. Fountoulis et al. 2014, 315.

20. Zanger et al. 1997, 556; Fountoulis et al. 2014, 315-317.

21. Loy 1970, 52; Higgins & Higgins 1996, 63;

Fountoulis et al. 2014, 317-318.

22. Loy 1970, 52; Higgins & Higgins 1996, 12.

23. Kraft et al. 1980, 189.

24. *Ibid.* 202, fig. 6.

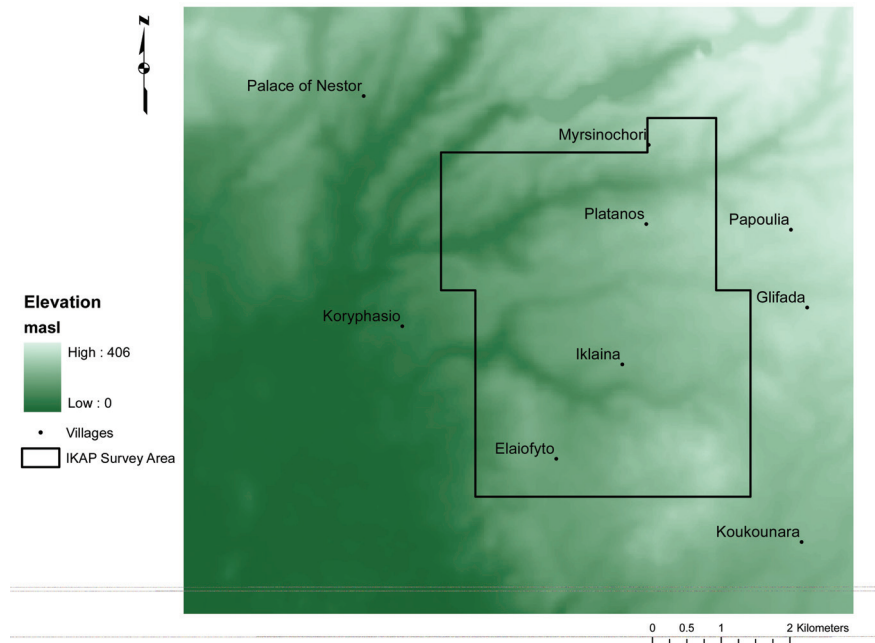


Fig. 4. Landforms in the IKAP survey area shown using the Digital Elevation Model (DEM). Source: The DEM is a composite of two ASTER GDEM files, N36E021 and N37E021. ASTER GDEM is a product of METI and NASA.

All of the IKAP survey area (fig. 1) is within a drainage basin of the Xerolagandos River with tributary streams just north and south of the village of Iklaina. Southwest of Iklaina the Xerolagandos River flows into a constructed channel with outlets into the Osmanaga Lagoon. Thus, sediment that was eroded and transported from the IKAP survey area by the Xerolagandos River has helped create the coastal plain along the Bay of Navarino and moved the shoreline from its original position closer to the survey area.

CLIMATE

The climate in Messenia today is typically Mediterranean with warm, dry summers and cooler, rainy winters. Since the last glacial period it has oscillated between wet and dry conditions. At the end of the last glacial maximum ca. 13,000 BC, Messenia had a wet climate, in part because of the increased moisture from water formerly locked up in glaciers.²⁵ The climate became drier during the Upper Dryas Period (8,500 B.C. to 6,000 BC) when precipitation was reduced and winds deposited silt blown from Africa in Mediterranean Europe.²⁶ After the Upper Dryas Period, precipitation increased again and was able to support vegetation that requires more

25. Bolle 2003, 21.

26. *Ibid.* 21.

water than is available today, such as hornbeam, fir, and beech trees.²⁷ During a period of aridization, when the subtropical pressure cells and the subpolar pressure belt reached their present positions around 2,800 BC, the climate once again became drier.²⁸ Since then, climatic conditions have been relatively stable, with the exception of short-term variations.

Such short-term variations have undoubtedly been present in the climate of Messenia, most notably during the Little Ice Age (ca. AD 1280-1850). In their study of the Little Ice Age in the Mediterranean, Grove and Rackham found archival evidence of four periods of extreme weather (1280-1830s; 1560s-1640s; 1670s-1715; and 1810s) when there were colder than usual winters, floods, droughts, and out-of-season rain in various parts of Mediterranean Europe.²⁹ No one factor was the cause for all of the periods of extreme weather, but volcanic eruptions, movements of pressure systems, and solar activity each played a part in at least one episode of extreme weather.³⁰ Although evidence for short-term climatic variation does not exist for Messenia, it is likely that there were periods of unusual weather events, such as droughts or floods, which impacted the landscape and the humans living in the area.

Current climatological information for Messenia is most readily available for the city of Kalamata, for which there are extensive data from 1956 until 1997, averaged by month (Table 1, Table 2).³¹ The highest monthly average temperatures are noted in July and August at just above 26 degrees C, while the lowest monthly average temperatures are noted in January and February at around 10 degrees C. On average, the summer months of June through August have less than twelve millimeters of precipitation per month and fewer than two days with rain, while December is by far the wettest month, with 152.6 millimeters and almost twelve days of rain.

MONTH	MIN.	MEAN	MAX.	MONTH	MIN.	MEAN	MAX.
January	5.7	10.2	15.3	July	18.1	26.4	31.1
February	5.7	10.6	15.5	August	18.4	26.3	31.3
March	6.8	12.3	17.1	September	16.2	23.2	28.7
April	8.9	15.2	19.9	October	13.2	18.9	24.7
May	12.4	19.7	24.3	November	9.9	14.8	20.5
June	16.0	24.1	28.8	December	7.2	11.7	16.7

Table 1. Average temperature (Celsius) by month for Kalamata, Greece. Source: Hellenic National Meteorological Service (2012).

27. Bolle 2003, 21; Zangger et al. 1997, 558.

28. Bolle 2003, 21; Grove & Rackham 2001, 150.

29. Grove & Rackham 2001, 133-137.

30. *Ibid.* 138-140.

31. Hellenic National Meteorological Service 2012.

MONTH	RAINFALL	MONTH	RAINFALL
January	111.7	July	4.2
February	94.1	August	11.3
March	73.0	September	29.1
April	48.5	October	85.3
May	25.6	November	137.4
June	7.5	December	152.6

Table 2. Average rainfall (mm) by month for Kalamata, Greece. Source: Hellenic National Meteorological Service (2012).

The difference in seasonal precipitation is due to the influence of the subpolar pressure belt in the winter, which brings precipitation into the Mediterranean region, and the Azores subtropical pressure cell, which heats the air and lessens the chances for rain.³² The lack of precipitation during the summer growing months drains the soil water as evapotranspiration exceeds rainfall.³³ This summer drought when soil water is drained is a key determinant for the natural vegetation within the area of Messenia.

VEGETATION

Human land use has modified vegetation in the IKAP survey area and Messenia to the point where very few areas with natural vegetation remain. Besides the introduction of plant species for agricultural production, human interference has determined whether an area was forested, used as pasturage, or covered with crops.

Pollen records from Osmanaga Lagoon studied by specialists on the PRAP survey traced vegetation changes over the past 8,000 years.³⁴ Pine and oak pollen decreased drastically just before 2000 BC and olive pollen increased, a trend which continued until ca. 1200 BC. Other cultivated plants first appearing during this period include rye, walnut trees, and flax. After 1200 BC, olive pollen levels dropped and deciduous oak pollen increased, showing the end of an agricultural intensification cycle, leading to a new increase in natural vegetation. This cycle of increased olive pollen, followed by re-establishment of natural vegetation, occurred twice more in the pollen record in the Hellenistic Period and Late Byzantine Period. Olive pollen again increased ca. AD 1700 and continues to be dominant in pollen samples, while deciduous oaks virtually disappeared from the record at the same time.

32. Bolle 2003, 22; Loy & Wright 1972, 38.

33. Loy & Wright 1972, 39.

34. Zangger 1998, 5-7; Zangger et al. 1997, 586-595.

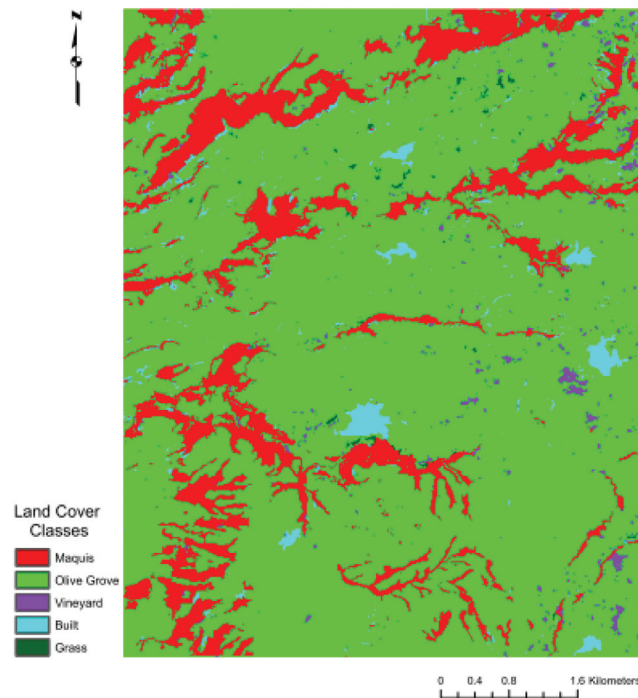


Fig. 5. Land use classification in IKAP survey area.

Classification of land cover ca. AD 2000 from Landsat satellite imagery shows that olive groves dominate the modern landscape of the IKAP study area (fig. 5). Scattered in the area are vineyards and gardens with fruit trees. None of the area is cultivated with grains at present. The other prominent type of vegetation in the IKAP survey area and Messenia besides olive trees is maquis, also known as macchia, a shrub community of various plant species. These species can include various trees, such as evergreen oaks like the holm oak, deciduous oak species such as valonia oak, pistachios, wild olive trees, and strawberry trees.³⁵ Other common maquis vegetation species include various shrubs like myrtle, tree heath, mock privet, carob, and phillyrea.³⁶ In many areas, maquis is found on steep or inaccessible hillsides and in ravines, which is also the case in the IKAP survey area. Patches of maquis surround the streams in the IKAP survey area. These small patches of maquis are the closest representative of natural vegetation present in the IKAP survey area today.

35. Zangger et al. 1997, 578; Wright 1972, 198.

36. Zangger et al. 1997, 578; Wright 1972, 198.

ENVIRONMENTAL PROCESSES

Once artifacts have been deposited in the landscape, their distribution is affected by natural and cultural processes that may transport, bury, or expose them. Cultural processes related to land use, such as road and building construction, and agricultural cultivation affect surface artifact distributions. Natural processes of sediment transport and deposition related to soil erosion may also affect artifact distributions. The effects of land use and soil erosion are analyzed in this section.

LAND USE AND AGRICULTURAL TILLING

The majority of land within the IKAP survey area is used for olive cultivation, followed by maquis vegetation in the ravines, urban areas and roads, and finally vineyards. The areas least impacted by land use are the ravines covered by maquis. Those areas are not tilled, so artifacts are not brought to the surface. Instead, based on the lack of tilling and the fact that the bottoms of ravines are depositional areas, any artifacts originally in the places covered by maquis are probably buried by sediment. Artifacts close to the surface in maquis-covered ravines are likely to have been transported from upslope and deposited within the ravine at a later time.

Statistical analysis of the relationship between land use and pottery count found by the IKAP survey illustrates the correlation between land use and amounts of pottery found³⁷. Because land use is a categorical measure, contingency table analysis with a Chi-Squared (X^2) test statistic was used to analyze its relationship to the amounts of pottery found. Table 3 shows the categories used in the statistical analysis. Olive and maquis were in their own categories, but vineyard, built, and grass land use were combined to ensure that the expected value was greater than one.³⁸ The X^2 value for this contingency table is 164.63, which has a p-value of less than 0.001. This indicates that there is a significant relationship between amount of pottery and land cover class. When low visibility squares (ground surface visibility less than thirty percent) are excluded from the analysis, the X^2 value is 37.07, and the p-value is less than 0.001 (see Table 4 for the contingency table).

37. Amount of pottery found per survey square is used instead of pottery density due to the uniform area of survey squares (2500 m²). This assumes that the entirety of each square was sur-

veyed, which was not the case for a small percentage of total number of squares surveyed.

38. Drennan 1996, 197.

LAND COVER CLASS				
Pottery Count	Maquis	Olive	Other	Total
Zero (0)	380	2357	25	2762
	<i>258.62</i>	<i>2466.09</i>	<i>37.28</i>	
Low (1-16)	47	1160	26	1233
	<i>115.46</i>	<i>1100.90</i>	<i>16.64</i>	
Medium (17-99)	8	511	9	528
	<i>49.44</i>	<i>471.43</i>	<i>7.13</i>	
High (>99)	2	139	3	144
	<i>13.48</i>	<i>128.57</i>	<i>1.94</i>	
Total	437	4167	63	4667

Table 3. Contingency table for correlation between land use and pottery count. Number of squares belonging to each class is listed with the expected frequency shown in italics.

LAND COVER CLASS				
Pottery Count	Maquis	Olive	Other	Total
Zero (0)	94	1568	4	1666
	<i>68.86</i>	<i>1583.87</i>	<i>13.26</i>	
Low (1-16)	32	981	12	1025
	<i>42.37</i>	<i>974.47</i>	<i>8.16</i>	
Medium (17-99)	7	440	7	454
	<i>18.77</i>	<i>431.62</i>	<i>3.61</i>	
High (>99)	2	116	3	144
	<i>5.00</i>	<i>115.04</i>	<i>0.96</i>	
Total	135	3105	26	3266

Table 4. Contingency table for correlation between land use and pottery amounts for squares with ground surface visibility of thirty percent or higher. Number of squares belonging to each class is listed with the expected frequency shown in italics.

Tables 5 and 6 show the difference between actual and expected values for each cell of the contingency tables (plus or minus 3 sectors) for all survey squares and only high visibility sectors. Both tables show the same general trend that for all categories except maquis, lower than expected number of squares are only found in the zero pottery range, while higher than expected number of squares were found in the low, medium, and high artifact ranges. The situation for maquis-covered squares is oppo-

site, with more squares than expected without pottery and fewer squares than expected in the low, medium, and high artifact ranges. That maquis is generally left undisturbed by agricultural tilling and construction explains the lower than expected amounts of pottery.

LAND COVER CLASS			
Pottery Count	Maquis	Olive	Other
Zero (0)	+	-	-
Low (1-16)	-	+	+
Medium (17-99)	-	+	0
High (>99)	-	+	0

Table 5. Difference between observed and expected values in contingency table (Table 3) for all squares. + is for higher than expected value; - is for lower; 0 is for close to expected value.

LAND COVER CLASS			
Pottery Count	Maquis	Olive	Other
Zero (0)	+	-	-
Low (1-16)	-	+	+
Medium (17-99)	-	+	+
High (>99)	0	0	0

Table 6. Difference between observed and expected values in contingency table (Table 4) for squares with ground surface visibility of thirty percent or higher. + is for higher than expected value, - is for lower than expected value, and 0 is for close to expected value.

Both olive groves and vineyards, as places where cultivation is presently taking place, are subject to movement of artifacts because of tilling. Experiments regarding re-survey of tilled fields in Italy have shown that artifacts are moved vertically through the soil profile by tilling, but with minimal horizontal movement.³⁹ Thus, fields that are tilled once or twice a year, such as many of the olive groves within the IKAP survey area, have varying pottery counts at different times of the year because

39. Ammerman 1985, 39-40.

of tilling. In addition to annual changes in number of discoverable artifacts, the act of planting trees in a vineyard or olive grove also displaces artifacts short distances.⁴⁰ Construction of agricultural terraces where the land is leveled first by scraping the ground that would lead to removal of artifacts, while artifacts may be transported into a field as a leveling fill is brought in.⁴¹ Thus, olive groves and vineyards have both horizontal and vertical movement of artifacts due to agricultural activities, but areas that have been terraced have the potential to contain more or fewer artifacts than were originally deposited.

SOIL EROSION

Soil erosion is the movement of loose soil particles by wind, agricultural tillage, or water. Wind erosion in Greece occurs mostly in the Aegean islands and is not a primary cause of erosion in Messenia.⁴² Tillage erosion comes from modern agricultural machinery exposing the subsoil and breaking up the soil structure.⁴³ A large amount of erosion in Messenia is caused by tilling the soil, which breaks up soil aggregates into smaller pieces and creates loose soil that can be easily moved by wind or water.⁴⁴ Water erosion is caused as precipitation from storm events moves soil downhill and water runs over the ground surface towards stream channels. Water-caused erosion is especially damaging on ground surfaces that are not covered with vegetation.⁴⁵ Most of the erosion from water in Greece occurs during the fall and winter months when intense rainfall hits the bare soil.⁴⁶

In the IKAP survey area the combination of tilling and intense rain events in the fall and winter months is responsible for most of the soil erosion. In general, most olive groves are tilled at least once a year to prevent growth of vegetation between the trees. In the soft marl limestone just north of the survey area, geomorphologists on PRAP found that in some cases topsoil had been entirely eroded away and farmers were tilling into the bedrock to create material for plant growth.⁴⁷ Personal observation of exposed limestone bedrock on the top of the ridge at the site of Katsimigas (Site 8) in July 2008 has shown that there are locations within the IKAP survey area where topsoil has been eroded away.

Soil erosion and deposition was modeled in the IKAP survey area using the Unit Stream-Powered Erosion/Deposition (USPED) model, which has been shown to be

40. *Ibid.* 86-88.

41. Kvapil 2012, 84.

42. Kosmas et al. 2006, 284.

43. Brady & Weil 2004, 120-121; Kosmas et al. 2006, 283.

44. Zangger et al. 1997, 571; Kosmas et al. 2006,

283.

45. Kosmas et al. 2006, 281.

46. Grove & Rackham 2001, 263-264, 268; Kosmas et al. 2006, 280.

47. Zangger et al. 1997, 571.

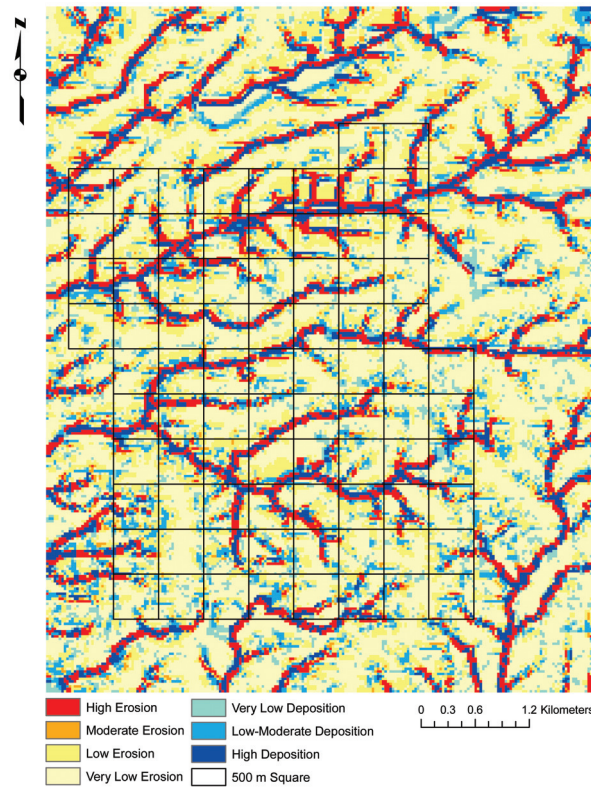


Fig. 6. Results of USPED erosion modeling in IKAP survey area categorized by amount of erosion/deposition (tons/ha/year).

more accurate than the Universal Soil Loss Equation (USLE) in mountainous areas.⁴⁸ The USPED model combines the stream-powered incision law based on flow of water across the landscape with the USLE factors of rainfall, land cover, soil erodibility, and agricultural support practice. Mapped USPED erosion/deposition rates (tons/ha/year) (fig. 6) are categorized to show patterns clearly: high erosion (less than negative twenty), moderate erosion (between negative twelve and negative twenty), low erosion (between negative one and negative twelve), very low erosion (zero to negative one), very low deposition (between zero and one), low to moderate deposition (between one and twenty), and high deposition (greater than twenty). The map in fig. 6 indicates that high erosion and deposition rates are primarily found in the ravines, where slope is greatest (high erosion) and topography has local lows for temporary storage (high deposition).

48. Pelacani et al. 2008, 331.

Statistical analysis of the relationship between pottery count and soil erosion/deposition shows that there is a significant correlation between them. USPED erosion/deposition rates were rescaled to the 50 m squares to allow for comparison with pottery counts within the squares (fig. 7). The scatterplot of pottery count and erosion/deposition rate (fig. 8) shows clustering around zero with a few 50 m squares having high erosion rates and high numbers of artifacts found. However, Spearman's Rank statistical analysis of the correlation between pottery count and erosion/deposition rate for all surveyed squares has an r_s value of -0.0291217 and the p-value is 0.04666. Excluding low visibility squares increases the significance of the results. When only sectors with visibility of thirty percent or higher, the r_s value is -0.04240937 and the p-value is 0.01536. Thus, areas with high erosion or deposition rates, excluding the ravines, require further research before excluding them as site locations due to low pottery counts.

An additional factor that may have influenced artifact distribution is agricultural terraces, which can prevent most of the soil erosion related to surface runoff. Terraces have been built to enhance agricultural cultivation in Mediterranean Europe for at least 3,000 years.⁴⁹ Well-maintained terraces reduce soil erosion, but once they are abandoned, terrace wall failures lead to an increase in landslides and landscape instability. Although abandonment of terraced fields eventually causes an increase of surface cover once tilling ceases, erosion increases immediately after a terraced field is abandoned.⁵⁰ Continual terracing gradually changes the shape of a hill, segmenting a hillside into multiple mini-hills with many of the geomorphic components - shoulder, side, and foot slope. The role of terracing in preventing soil loss and blocking artifact movement downslope has been documented in other parts of Greece,⁵¹ but has not yet been studied in great detail in Messenia. The presence of terracing in the IKAP area could mean that soil and artifacts did not move far downslope except where terrace wall failures promoted landslides.

CONCLUSION

The terrain that now forms the landscape of southwestern Messenia first emerged from the sea at the beginning of the Quaternary Period and continues to evolve today. The rough terrain of the conglomerate bedrock in the southern part of the IKAP survey area around the modern village of Elaiophyto posed difficulties for human settlement, reflected by the overall lack of artifacts. Ravines cut through the soft marl limestone of the Kampos plain in the northern part of the IKAP survey area separated

49. Grove & Rackham 2001, 112.

50. Koulouri & Giourga 2007, 279.

51. Krahtopoulou & Frederick 2008; Bevan & Conolly 2011.

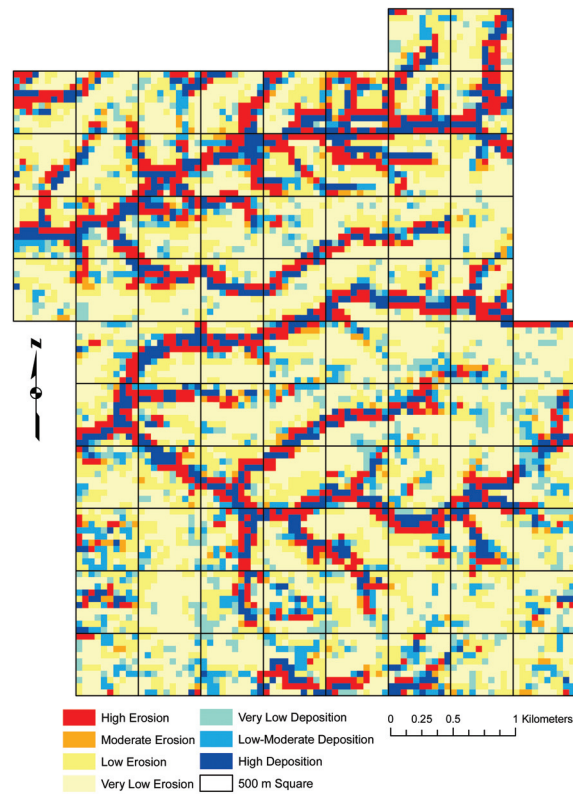


Fig. 7. Results of USPED erosion modeling in IKAP survey area categorized by mean amount of erosion/deposition (tons/ha/year) in each 50 m square.

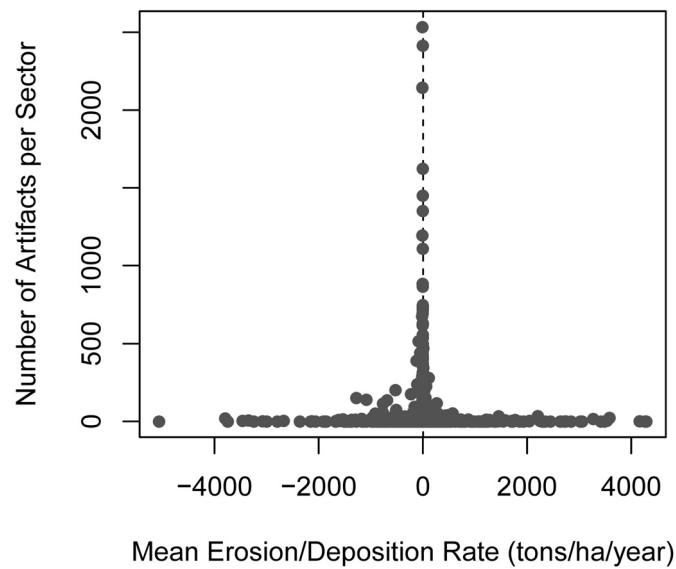


Fig. 8. Scatterplot showing the relationship between pottery count per square and sediment erosion/deposition rate from USPED model in tons/ha/year.

the land into fingers. The flat surfaces of this plain provided space for crops to grow and for settlements to form in many locations and during multiple time periods.

Although the natural environment provided the background for human settlement in the IKAP survey area, human modification of the natural environment has shaped the landscape into the present form. Very little natural vegetation has been left after millennia of agricultural cultivation and that only in the inaccessible ravines. The landscape itself has been shaped by construction of modern villages, roads, and agricultural structures.

These landscape modifications have also altered artifact distributions. Construction of various features across the terrain has moved buried artifacts to the surface and to different locations. Deep agricultural tilling during the past century has also brought artifacts to the land surface and smeared them laterally across the landscape. These movements of artifacts are evident from the mixed artifact ages found in many parts of the survey area. Although there has been movement of artifacts downslope in ravines by erosion processes, the construction of agricultural terraces probably curtailed much of the downwards movement. Erosion patterns confirm that most of the erosion and deposition of sediment occurs near and within the ravines. Thus, artifact distributions on the less sloping parts of the terrain indicate the general locations of sites taking into account lateral movement of artifacts, while concentrations of artifacts within ravines reflect transport of artifacts from upslope locations. Even with the movement of artifacts due to those processes, the distribution of artifacts across the landscape discovered by the Iklaina survey display an accurate picture of site distribution in this part of Messenia.

THE TOPOGRAPHICAL SURVEY AND SPATIAL REPRESENTATION

Chris Mundigler and †Douglas Edwards

INTRODUCTION

Archaeological fieldwalking and intensive field survey data collection during the first twelve years of the Iklaina Archaeological Project relied heavily on the integrity and accuracy of mapping the topographical, environmental, and cultural landscape of a large section of Messenia. While the survey methodology may have evolved considerably during the many seasons of the project, from basic manual survey techniques to sophisticated and cutting-edge Global Positioning System (GPS) and Geographic Information System (GIS) technologies (fig. 9; fig. 16), the overall intention of establishing an accurate and complete survey grid system and to plot and document the cultural and archaeological environment of the study area remained constant.

1999-2001, THE EARLY YEARS: MANUAL TOPOGRAPHIC TECHNIQUES

In the first three seasons (1999-2001), the survey was conducted using an Abney hand-level⁵² and tape measures. This system was used to generate simple 2D and 3D wire-frame topographic imaging of specific study areas that exhibited the greatest artifact concentrations. The topographic data of each area were collected by measuring the X, Y and Z (vertical and horizontal) coordinates of hundreds of points along a set grid of either two- or four-meter squares. These coordinates were manually processed using a calculator and trigonometry and then graphed in an early version of Surfer to produce images for analysis (fig. 10). Surfer is a powerful contouring, gridding and 3D surface mapping software for scientists and engineers.⁵³

In 1999 the grid was laid by sighting the Abney hand-level along the cardinal points with a compass along north-south/west-east intersecting lines from this benchmark to produce the 500 m and 50 m overall grids. To facilitate the laying of this cardinal grid, 50 m measuring tapes were laid out along the two axis lines and, once

52. A simple leveling tube with an inclinometer attached to provide the angle of slope to a known distant point.

53. For more information on Surfer software, see <http://www.goldensoftware.com/products/surfer> (last accessed August 31, 2015).

brought in line with the sighting instrument, physical grids were laid with stakes and survey line on the ground to mark out the squares for the fieldwalkers. This system proved to be adequate for the gross grid to be used, but not as accurate as we had hoped – passing the tape measures and survey lines over brush, around trees and up sloping hills all contributed, little by little, to inaccuracies. To rectify this, in 2000 and 2001 the survey team resorted to a different approach: while the Abney hand-level was still employed with acceptable results, instead of physical survey lines laid on the ground, the corner marks of the 50 m grid intersections and some linear guide marks were spray-painted directly on the ground. Where possible, the square coordi-

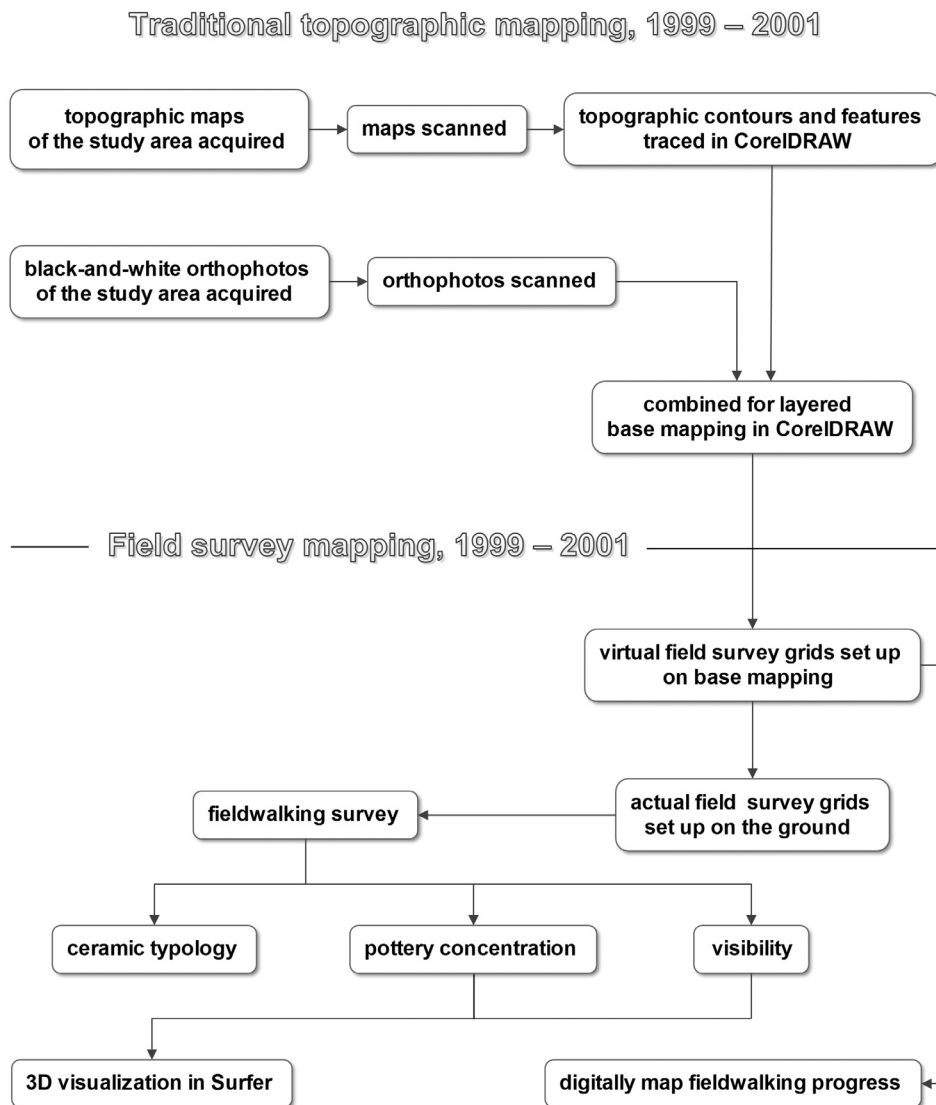


Fig. 9. Flowchart of traditional topographic and field survey mapping techniques used for IKAP 1999-2001.

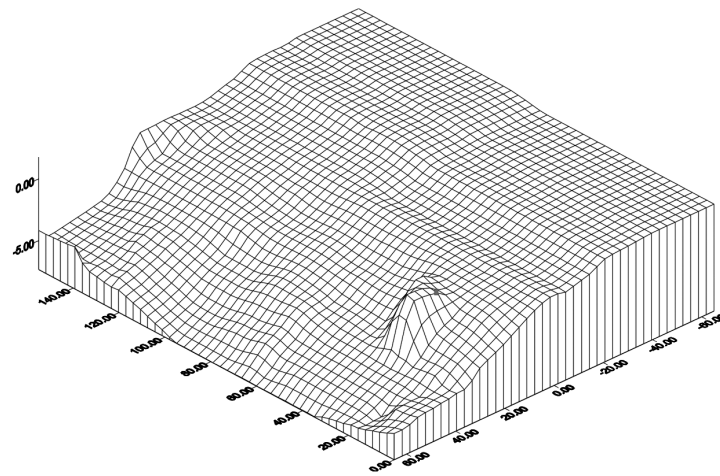


Fig. 10. 3D graphical representation of Abney hand-level survey data of benchmark excavation area, site 1.

nate references (e.g. N12a1, denoting the 500 m grid in upper case and 50 m grid in lower case) were also spray-painted near the corner register marks. This still involved the use of 50 m tapes, which were inherently terrain-challenged.

Also using this Abney system, a grid network was established consisting of large 500×500 m squares and within that smaller 50×50 m squares, all radiating from an established benchmark on the mound of Site 1 (the circle in the lower half of fig. 11).

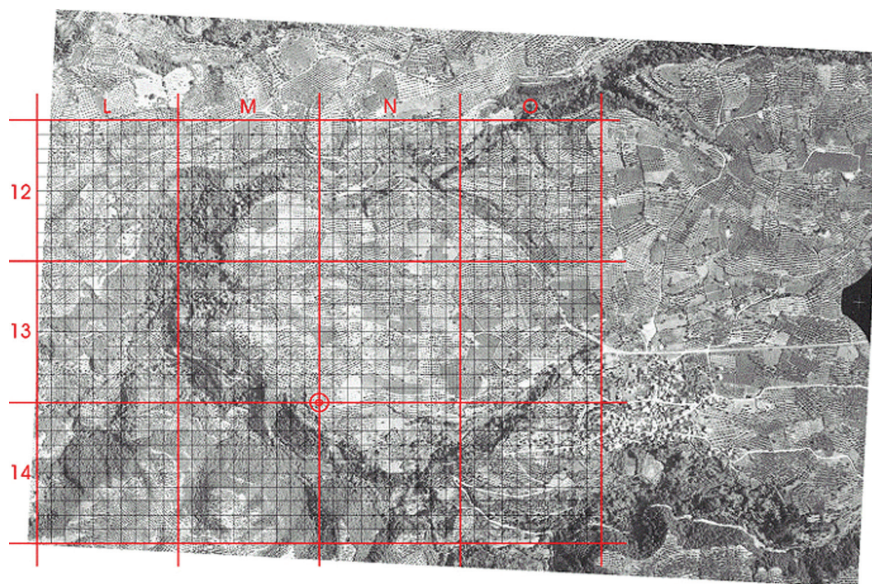


Fig. 11. 1:5000 aerial photo of the Iklaina plateau showing the 500 and 50 m grids (base photo Courtesy of Hellenic Army Geographical Service).

Initially, the team worked with xerographically reproduced 1:5,000 topographic maps obtained from the Greek Army Geographical Service (fig. 12a). Those maps were scanned and traced in a graphics application (CorelDraw) to produce an adequately reliable base map for the preliminary establishment of the permanent benchmark (or 0,0 coordinate for the entire project, fig. 12b), on what would become the main excavation site, as well as for a number of kilometers beyond for the early field-walk surveying (fig. 12c).

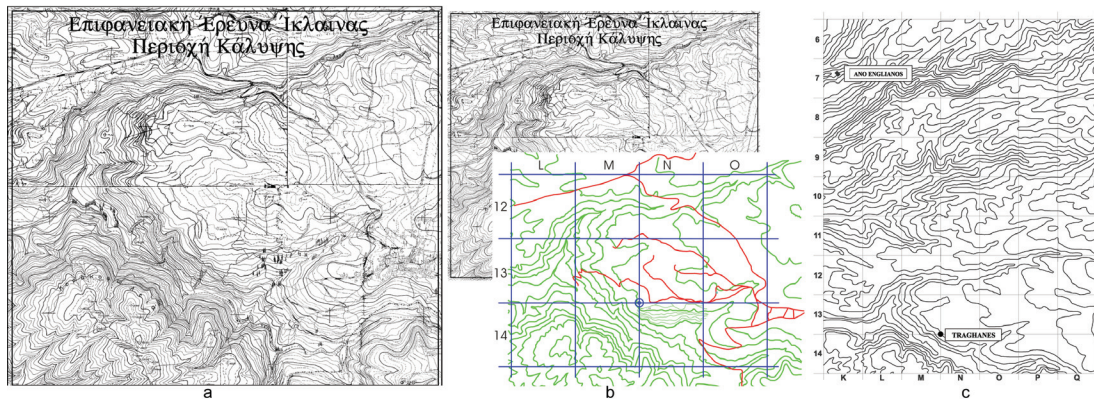


Fig. 12. a) 1:5,000 Greek Army maps; b) CorelDRAW plateau trace; c) CorelDRAW regional trace.

The IKAP survey benchmark was established on the mound that dominated the location Traghane (the black circle in the lower portion of fig. 12c ; cf. the aerial photograph in fig. 3). In the early stages of the project, a Greek Army aerial photograph (fig. 13a) was used to plot the fieldwalking grid and display the progress of the season's work (fig. 13b). The aerial photograph was digitally manipulated to align landmark and road features on the orthophoto with those found on the previously scanned and traced topographic map of the plateau (fig. 12b).

Also using the Surfer graphing package, it was possible to visually represent any finds and pottery concentrations from the fieldwalking within those grid squares as the season progressed, allowing the researchers to better understand the correlation between ground visibility and ceramic find-spots during the field work (fig. 14).

In the third season of the survey (2001) additional individual 1:5,000 topographic maps from the 1970's were large-format scanned and digitally assembled using photographic editing software to produce a mosaic raster base map (fig. 15), which covered an area of some 63 km² in addition to the original scanned base map of the plateau, which covered 4.5 km².

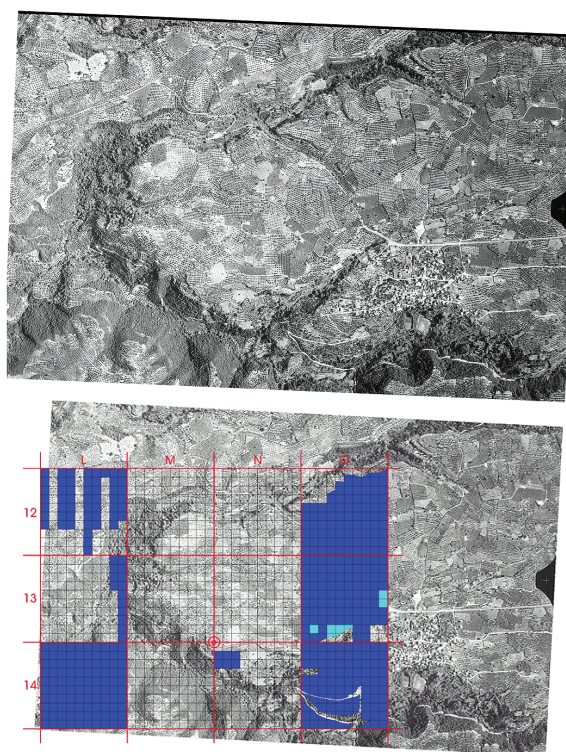


Fig. 13. Greek Army aerial photograph (top); aerial photograph with fieldwalking grid overlay (bottom).

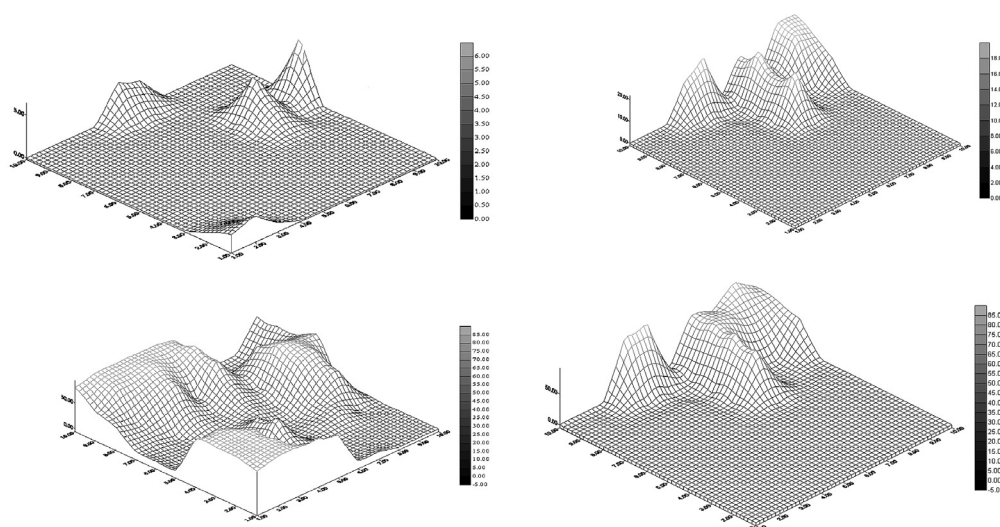


Fig. 14. Left upper and lower: L13 pottery concentration and L13 visibility 3D graphs; right upper and lower: N12 pottery concentration and N12 visibility 3D graphs.

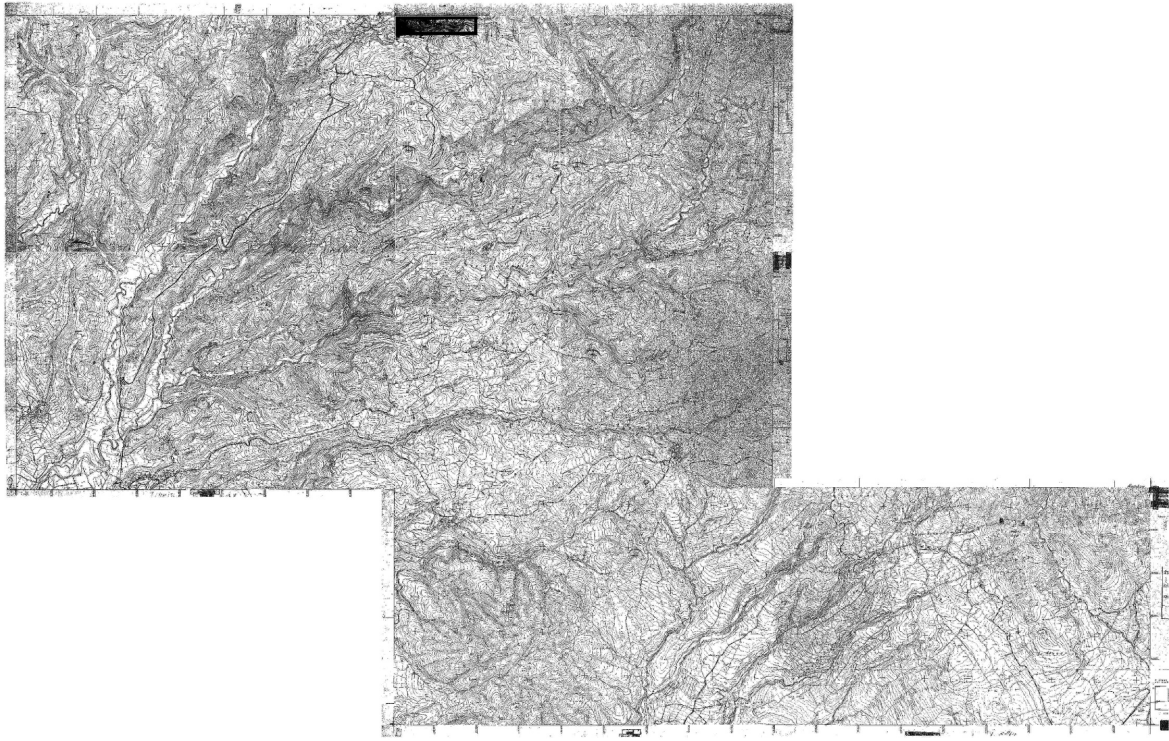


Fig. 15. 1970s 1:5,000 mosaic topographic basemap.

Subsequently, this mosaic composite was edited and georeferenced in a GIS package using the latitude and longitude coordinate system found along the edges of the original hardcopy maps.

The early Abney survey system was also incorporated into laying out the topographic grid needed for the geophysical magnetometry and electrical resistivity imaging that took place on the various IKAP areas that showed the most potential for cultural activity.⁵⁴

2002-2007, FROM HAND-LEVEL TO GPS

A higher degree of accuracy for the survey work was achieved in 2002 with the introduction of the very sophisticated and extremely accurate survey-grade Trimble⁵⁵ GPS units, which made tape measures, compasses, strings, and paint obsolete.

54. See below, chapter on the Geophysical Survey.

55. For more information on the Trimble GPS

units, see <http://www.trimble.com> (last accessed August 31, 2015).

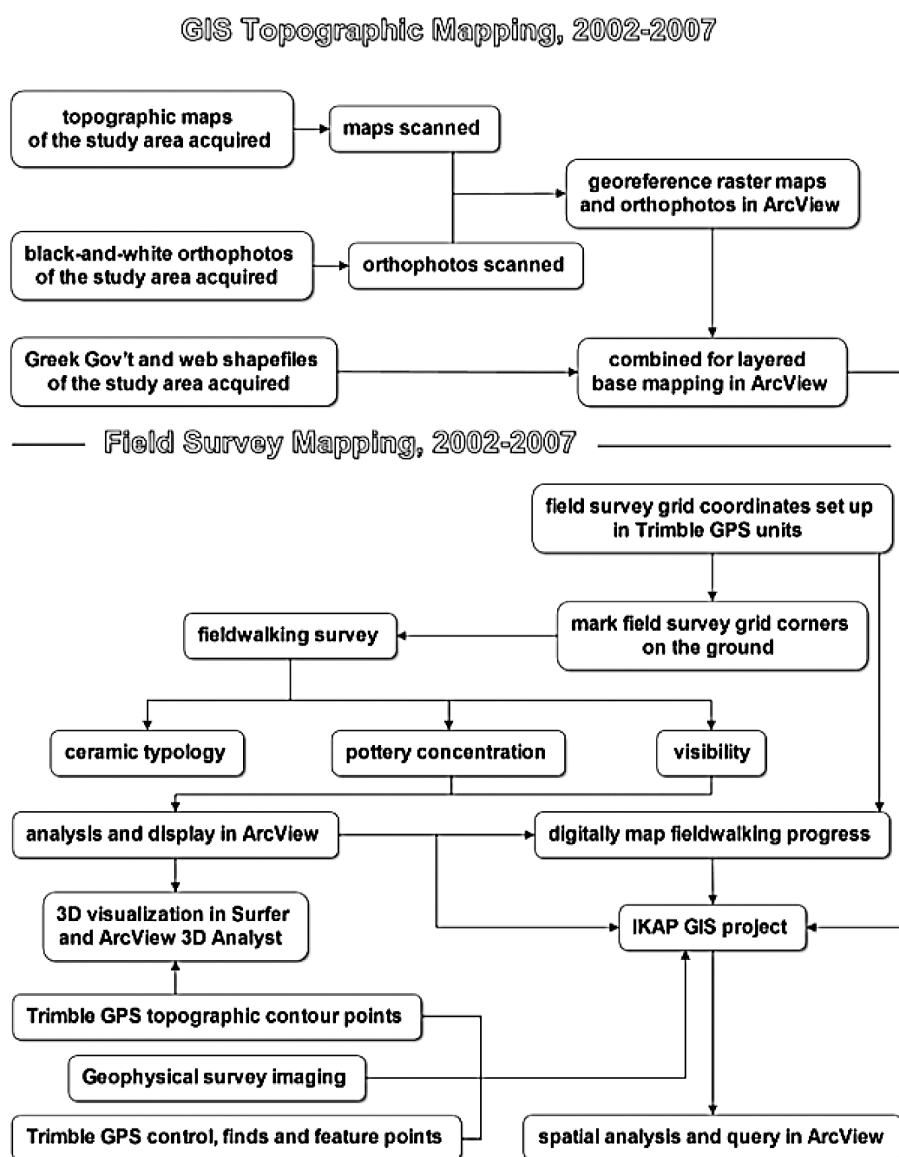


Fig. 16. Flowchart of GIS topographic and field survey mapping techniques used for IKAP, 2002-2007.

In the early years of the project, GPS accuracy had been difficult to obtain, because the US military scrambled one of the two transmitted carrier waves from the satellites. These codes were unscrambled in 2000, so that even small handheld models could achieve an accuracy of 10-20 m, a far cry from the hundred or more meters in earlier years. The immediate result was that handheld units functioned admirably in providing general locations for features. Archaeological finds in the vicinity of navigational beacons from locations such as coast guard stations could provide even greater, some-

times even sub-meter, accuracy. Unfortunately for many areas, including southern Greece, such beacons did not exist during the early GPS surveys at IKAP, which made features and accessories like Trimble's BOB (Beacon-on-a-Belt) attachment to its latest handheld unit unusable.

Intensive surveys such as IKAP and site excavations require greater precision than the handheld units of the early 2000s permitted, but geodetic-quality survey with relative accuracies of 1 cm horizontal and 2 cm vertical provided the level of detail needed. GPS makes use of satellite signals and messages relayed to Earth that provide precise positions of satellites in relation to the receiver, in this case the GPS unit on a field survey. Generally a single unit, even if in communication with many satellites, will achieve an accuracy no higher than 10 m on the horizontal plane (X, Y axis) and 20 m on the vertical (Z axis). Receiving an additional signal from a ground-based reference station allows much greater accuracy and with the right equipment one can achieve sub-meter accuracy in real time. Some projects obtain the signals through coastal navigational devices that enable ships to plot their position accurately and others purchase time on special satellites that relay the position of the GPS satellites and their own position to one's GPS unit enabling sub-meter accuracy. Neither option, however, was available in the southern Peloponnese at the time. For that reason a third option, the implementation of survey-grade GPS units was deemed a more reasonable option. These units are designed for detailed construction work and are capable of centimeter accuracy in real time. They have been used quite successfully in intensive surveys, even to the point of plotting individual sherds within a defined area.⁵⁶

Such units have the ability to achieve a high degree of accuracy in real time, not through post-processing, as will be explained below. Such precision requires a GPS base station to be established at a known starting point, and working in conjunction with the mobile GPS units. For IKAP and the area around Iklaina in the Peloponnese, the latitude, longitude, and ellipsoidal height for the World Geodetic System 1984 coordinate matrix (abbr. WGS84) for the base station point was not known from any previous survey work. Using a HERE function on the Trimble unit, a provisional reference point was established with an error of 10 m on the horizontal and 20 m on the vertical (the same accuracy as any handheld GPS receiver). The same latitude, longitude and elevation was used during each survey so that all survey points taken relative to the base station were precise and accurate to the centimeter level. Later, when known and established WGS84 readings were recorded for the area, the survey team was able to connect the base point to those readings and accurately place the IKAP

56. Khirbet Qana Archaeological Project, [na/index.html](http://archaeology.pugetsound.edu/generalQana/index.html) (last accessed September 4, 2015). <http://archaeology.pugetsound.edu/generalQa->

survey within the real world. The Trimble roving units were used to take the surveyed positions of features, finds or survey points. Their position can be determined in two ways, post-processing and real-time kinematic, of which the second provides a more dynamic and accurate system.⁵⁷ For real-time kinematic, radios were added to both the base and the roving unit, allowing the base station to send its satellite data to the rover. In turn, the rover GPS unit quickly calculated the additional data and centimeter accuracy was achieved on both the vertical and horizontal, usually within a few seconds. The advantages were obvious: as with a Total Station, the position surveyed was known as soon as it was taken.

Because of this characteristic, the Trimble 4700 and 4800 roving units offered great flexibility in conducting the survey at IKAP. They were used to: establish a local grid

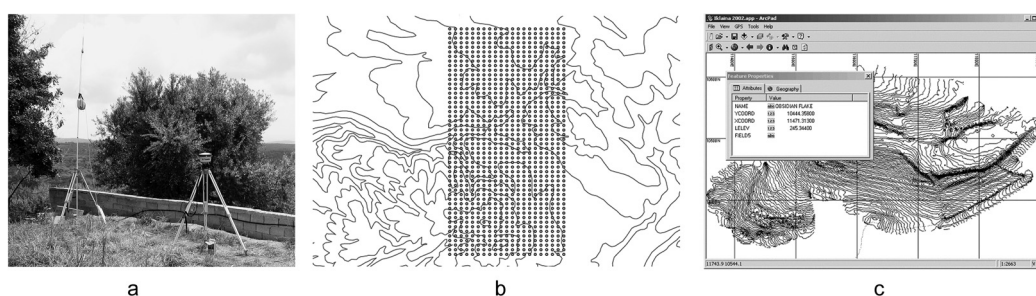


Fig. 17. a) Trimble base station with radio; b) GPS 50 m square plots; c) GPS contour and feature plots in ESRI's ArcPad.

that linked with the already existing grid of the earlier manual survey; lay out the 50x50 m squares that were surveyed by fieldwalking (fig. 17b); re-locate the squares for the survey teams when necessary; plot topographic contours of specific locations, along with their accompanying features and artifacts (fig. 17c); link the local grid to the WGS84 standard GPS grid and therefore to other grids as well, such as the Universal Transverse Mercator (UTM) system and the Hellenic Geodetic Reference System 1987 (Ελληνικό Γεωδαιτικό Σύστημα Αναφοράς 1987; HGRS87, ΕΓΣΑ'87) or Greek HATT projections; plot the points for the geophysical survey (fig. 19a); link local features to aerial views of the area; and transfer the data via Trimble Geomatics Office software for use and display in ESRI's ArcView and ArcPad GIS programs.

Besides this flexibility, the roving units seldom required the movement of the base station from its established location. The rovers, unlike more conventional survey

57. This was the system used in several archaeological projects, such as at Khirbet Qana in Israel,

Chersonesos in Ukraine, and Stymphalos in Greece (Edwards 2000 and 2002).

techniques, did not need line-of-sight to the base station since the radio signals, which were the real link, would often bend around hills and go through trees. Moreover, it was possible to attach the radio transmission antenna to a four meter stadia rod (fig. 18a), which allowed the antenna to be placed much higher and the radio signal to be sent over a much further area. In the 3 square kilometers that were topographically surveyed and mapped, it was only necessary to move the base station five times. The accuracy of the readings was never more than 10 cm on the horizontal and 30 cm on the vertical (for some of the roving contour work) and generally was between 2-5 cm horizontal and 3-7 cm vertical when particular fixed points were taken.

Establishing new base stations was relatively easy as well. A roving unit was placed on a new proposed base station site and allowed to obtain 180 different measurements of 5 or more satellites, which generally took about 5 minutes. X, Y and Z coordinates were usually achieved with an accuracy of ± 0.05 cm on the horizontal and ± 0.1 cm on the vertical in relation to the original base station. Again, this was often done without line-of-sight between the two units.

As mentioned previously, the grid consisted of large 500×500 m squares and smaller 50×50 m squares (fig. 11; cf. fig. 54). By convention, the northwest corner of

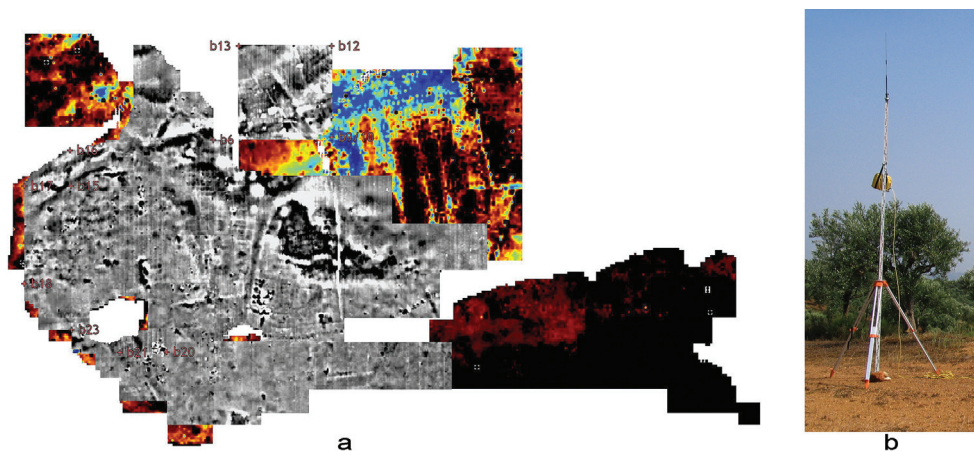


Fig. 18. a) GPS referenced geophysical imaging; b) Trimble antenna and radio on stadia rod.

each 500 m and 50 m square was used for the coordinate identification (e.g. N12a1). The obvious issue was how to locate the particular square on the ground. Conventionally this was done via standard theodolites or total stations which, however, tend to be cumbersome and subject to inaccuracies due to the varieties of vegetation and terrain that make line-of-sight readings difficult. The use of GPS units in the IKAP survey alleviated many of these problems. The benchmark, which served as the link to the entire grid system, was centered at a point established in 1999 on the mound

of the Traghanes site. Artificial X and Y coordinates (10,000 and 10,000 respectively) for the local grid were given as a starting point in setting out the 50×50 m squares for the survey. Through a process called “site calibration”, this artificial grid was linked with the WGS84 coordinates, the standard GPS coordinate system since 1987. The WGS84 readings also allow future conversions of individual points or the entire survey area to be displayed in a variety of projection systems from the UTM to the Greek HATT projections mentioned earlier. By convention, the elevation used for the benchmark, and to which all subsequent elevations were related, was also in the WGS84 system. With the base point established, the GPS roving units proceeded to lay out, or “stake-out”, the squares for survey.

The X and Y coordinates of the northwest corners of the squares were pre-entered into a Trimble GPS data collector the night before; the next day, using the stake-out function in the units, the precise location of the northwest corner of each 50×50 m small square was found quickly (generally with centimeter accuracy) and pinpointed by large nails in the ground with flagging tape that included the name of the square. Depending on the terrain, as long as radio contact continued between the base station and the rover units this process of stake-out progressed very quickly. An entire 500×500 m square (i.e. one hundred 50 m squares) could generally be set out in just a couple of hours, depending on the terrain. The occasional loss of the radio link between the base station and the rover units could change the accuracy of the stake-out (since the function does not work outside of real-time kinematic), and a radio link had to be re-established for the process to work accurately. By raising the radio antenna of the base station, as previously described, a much wider reception area was reached, even through branches of olive trees. The range often extended more than a kilometer and, as mentioned, the roving units were generally not in line-of-sight of the base station. When deep ravines, intervening hills or heavy foliage disrupted the signal, a new base station was established and the process was continued. An additional attractive feature of the stake-out function was the ability to relocate stakes that had been inadvertently knocked or moved, or could not be located by the fieldwalkers due to vineyards, high vegetation and other factors that affected visibility.

The accuracy of these units also allowed the recording of X, Y, Z coordinates for finds and features found in the course of the survey. This required a switch to a different data file in the unit (rather than setting up a survey instrument on a known point) and taking a reading on the artifact or feature. Several features could be surveyed with this method in a matter of seconds (generally for as long as it took to level the rover unit and push a button). The accuracy of the readings was generally 2 cm on the horizontal and 3 cm on the vertical, although more precise measurements were possible with time-averaged readings.

For automated topographic surveying, the Trimble 4700 and 4800 survey-grade

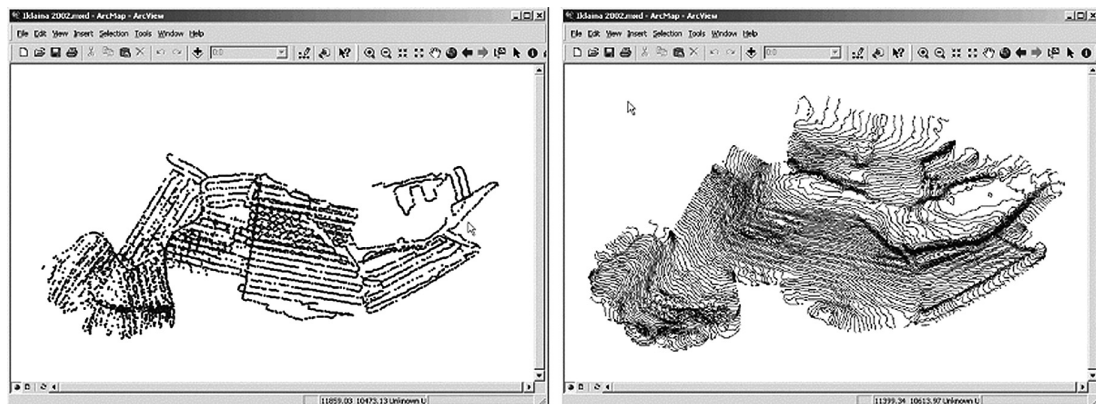


Fig. 19. a) and b) Trimble GPS automated topographic contour mapping in ESRI ArcView.

GPS and base station units were used as self-contained data collectors through a function called “continuous topo”, which allowed them to register points while the units were in motion for topographic contour walking. The distance between readings was flexible (generally, a point was taken every 2 m) and the process was only limited by the amount of memory in the data collectors. During the three-week IKAP season in 2002, three areas were contour mapped, each roughly 300×400 m in area (fig. 19a). Over 8000 points were taken on one day alone to create a contour map of the area around the principal benchmark (fig. 25a). The accuracy of the contours was about 20-30 cm. The points were readily transferred to GIS and converted to contours, which could also be linked spatially to the respective artifacts discovered and the distribution of the ceramics in the area (fig. 17c).

Generally, the most serious difficulties with taking topographic points in this way was excessive foliage, which broke up the radio signal between units, and the availability of less than the five satellites needed to make the system work accurately, caused by poor configurations in space or poor exposure to the sky, such as walking in deep valleys. Periodically, erratic walking patterns, due to vegetation or terrain, affected the coverage of an area creating unusual contours in the map (fig. 19a). This was readily remedied by plotting a number of X, Y coordinates around the edge of the area missed and then keying them into the data collector. The stake-out function on the data collector allowed the GPS team to return precisely to those areas later and continue the topographic survey. A mapping function in the data collectors showed when sufficient points had been taken to create a more representative contour of the area. Large amounts of the data downloaded from these roving units were subsequently fed into a laptop computer in the evenings, and ESRI’s ArcView software was used to further process and spatially display the day’s work.

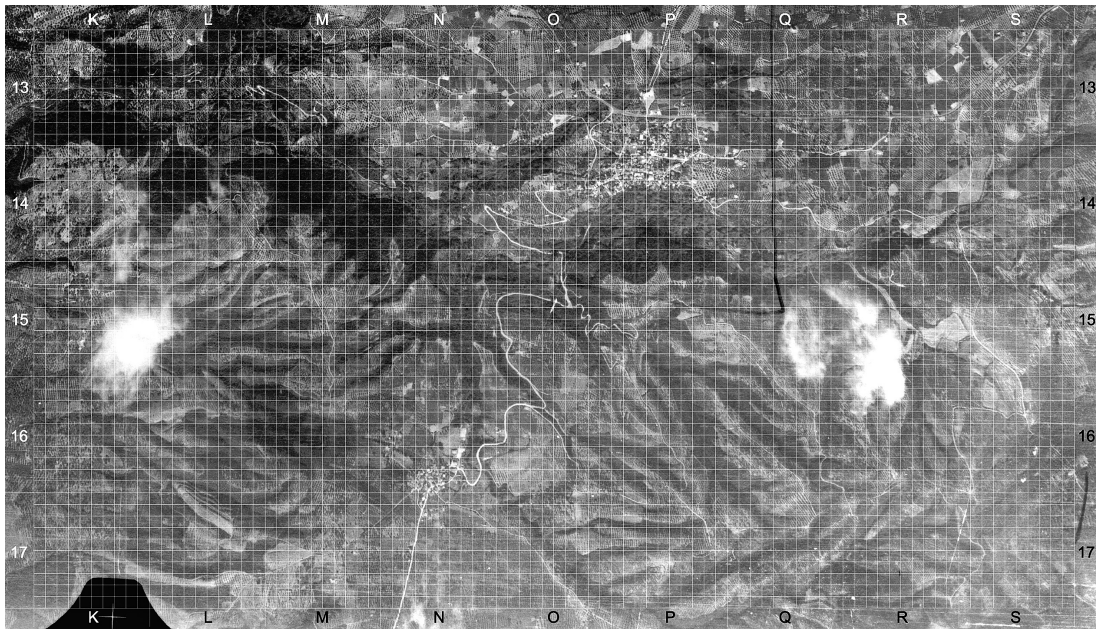


Fig. 20. Greek Army aerial photograph (1:30,000) overlaid with IKAP survey grid.

In addition to survey support and finds location mapping, the GPS units were also used to plot in key road features and Greek survey markers in order to georeference the project area to aerial photographs of the region in GIS. This allowed the survey team to cover the IKAP areas with accurate aerial photographs as guides. For this purpose, in 2003 high-resolution aerial orthophotos were obtained from the Greek Army at a scale of 1:30,000 (fig. 20). Special attention was given to obtaining very precise GPS control point data of significant features visible on the ground that also appeared on both the aerial photographs and the scanned 1:5,000 topographic maps. In this way, it has been possible to “rubber-sheet” the orthophoto (making certain control points on the aerial photograph line up with matching real-world coordinates in the GIS projection system) with the topographic raster map in the same local coordinate system used for all the GPS data acquisition and GIS mapping for IKAP.

GPS WITHIN THE GIS ENVIRONMENT

The increased accuracy of the survey-grade GPS permitted more precise locating of features than ever before and its compatibility with GIS allowed for sophisticated and multifaceted presentations of those data (fig. 21). GIS stores spatial geographic data about environmental features, surface and subsurface finds, and topographic contours in such a way as to make it available in context with the actual working

environment.⁵⁸ This is where it distinguishes itself from the simple digital mapping processes used earlier in the project. The major differences and benefits of a GIS over a digital mapping system are the ability to bring in various layers of information and georeference these layers to a global coordinate system, that allowed us to bring the project in line with other similar data or projects from other sources (such as the mapping of the adjoining Pylos Regional Archaeological Project).⁵⁹

While GIS may be a very advanced form of digital mapping, it comes into its own when used for quantitative analysis. It binds together all of the spatial and visual

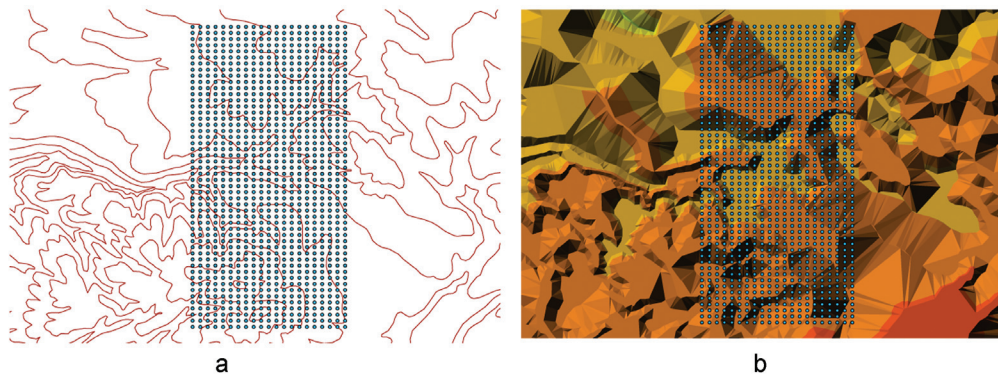


Fig. 21. Trimble GPS data representation in a) ESRI ArcView and b) ESRI 3D Spatial Analyst.

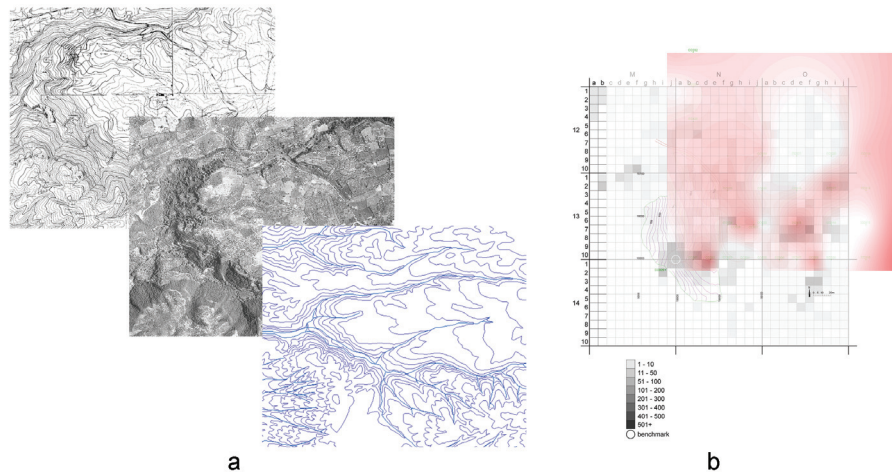
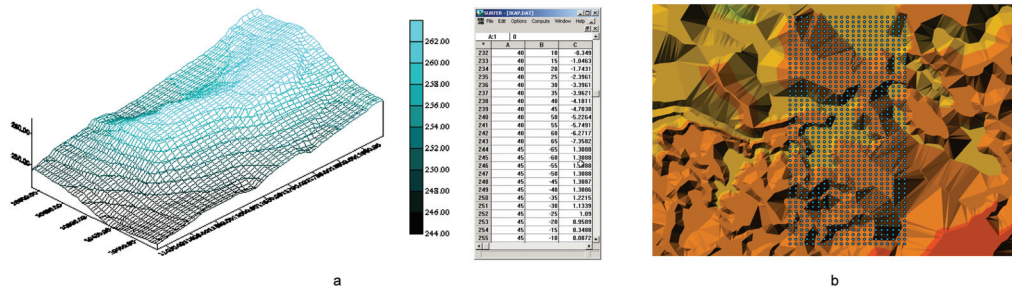


Fig. 22. a) Early topographic, orthophoto and GIS coverage of the Iklaina plateau; b) ceramic concentration and geophysical correlation in GIS.

58. Mundigler 2002.

59. <http://www.classics.uc.edu/prap> (last accessed August 31, 2015).



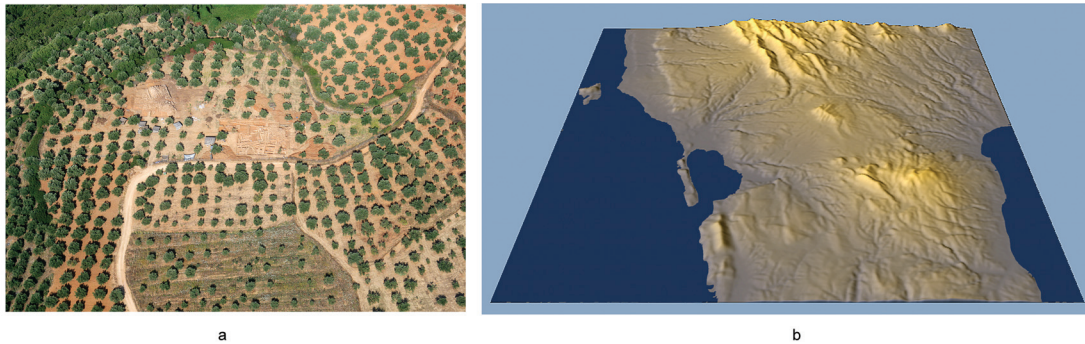


Fig. 24. a) Aerial photograph of Iklaina plateau; b) DEM of a portion of the IKAP study area.

tour, utility and cultural landmark layers from web-based repositories.⁶⁰ These became part of the geographic database to which the IKAP fieldwalking survey grids, special feature and finds layers, pottery concentration figures (fig. 23b), satellite and aerial photographs (fig. 24a), digital elevation models (DEMs, fig. 24b), and geophysical magnetometry and resistivity imaging were added. Any number of layers can be added in the future as both the Iklaina project and the GIS project grow and evolve to meet the needs of survey and analysis.

The facility to analyze the relationships between queried entities – how one feature might spatially or chronologically affect another – allowed the simple digital mapping process to evolve into a whole new realm of data interpretation. Through visualization of the pottery concentration in the GIS, for instance, it was possible to get a good sense of the areas of settlement over the whole IKAP study area, in context with landscape, topographic features and other finds, which can all be queried and analyzed in space and time.

The full potential of running ESRI's powerful and versatile ArcGIS package on laptops in the field allowed the survey and excavation personnel to enter data directly into the GIS while working in the field, on a daily basis. After the 2003 season, it became evident that many of the data collected in the field during the IKAP survey could be entered into the GIS directly onsite through the use of various forms within the application. Pottery concentration and surface visibility figures are two of the most obvious datasets which can be input on a daily basis in the field. Previously, those numbers were written in the team leaders' notebooks, manually extracted and typed into a spreadsheet, and then the quantitative data inserted into Surfer or Corel-

60. GIS Data Depot, <http://data.geocomm.com> (last accessed August 31, 2015).

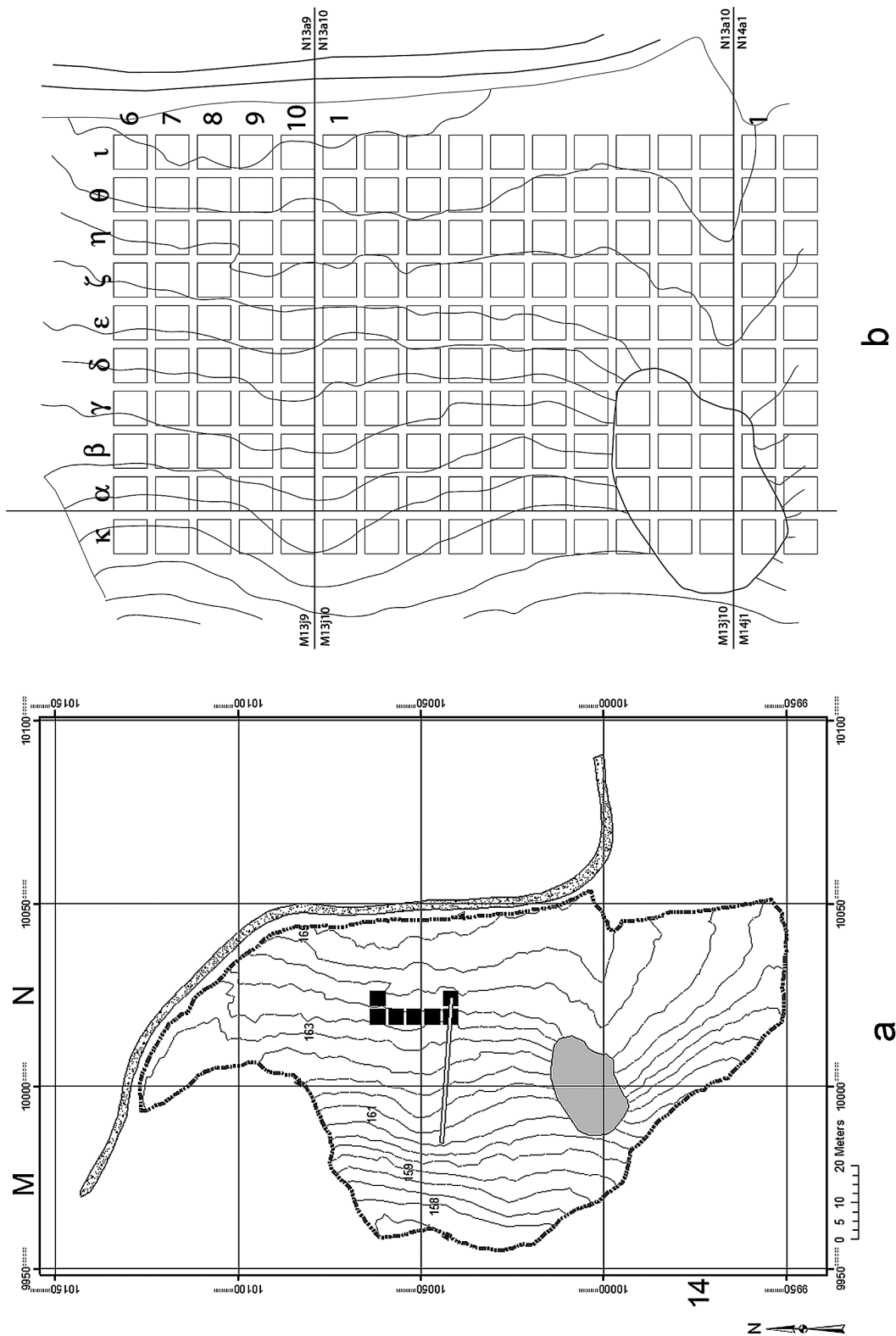


Fig. 25. GIS of a) Iklaina plateau excavation site; b) IKAP excavation square layout.

DRAW for visualization. By inputting data directly into digital forms in the field, in real time as the calculations were made, the number of human-generated errors in re-entering the data was reduced and the process of data entry was sped up immensely. These data automatically became part of the geodatabase incorporated into the GIS and could be seamlessly transferred with full integrity and no human intervention into the ArcGIS project at any time, allowing us to analyze relationships between different datasets. Before using the ESRI packages, this form of data visualization could only be done when the season was over and time was convenient. The use of these forms in the field, especially when entered into powerful laptops or tablets directly on-site using mobile software and applications, became especially useful during the excavation phase of the project, with high-integrity data logging of square features, finds and geometry as the most obvious application of this technology.

When excavation of significant areas of the Iklaina plateau began in 2006, the accuracy of the topographic mapping, gridding and layout were increased accordingly to accommodate the much smaller area involved (fig. 25). At the same time, the survey mapping and planning of the excavation project had evolved into one integrated and overarching system – GPS, used in conjunction with GIS to ensure the highest degree of accuracy and expediency possible.

Within this overall survey system, a smaller, integrated system of laser survey and total station placement of excavation squares, walls, features and objects was also coordinated into the GIS / GPS survey scheme.

IKAP has, over time, combined the real-time advantages of GIS in the field with the accuracy of survey-grade GPS and handheld GPS units, such as the Trimble GeoXT and the Garmin 60CSX, for sub-meter plotting and mapping (especially with post-processing) of the large, varied and rugged terrain of the survey area in southwestern Greece that is the topography and landscape of the Iklaina Archaeological Project.

THE GEOPHYSICAL SURVEY: IMAGING THE ARCHITECTURE AND SETTLEMENT STRUCTURE OF IKLAINA

Michael Boyd

INTRODUCTION⁶¹

The use of geophysical techniques in regional and site surveys, while not yet ubiquitous in Greece, is becoming increasingly common.⁶² The adaptation of techniques pioneered elsewhere to the challenging topography of Greece has gone hand-in-hand with the development of systems able to cope with large quantities of data so that it may now be fairly said that geophysics is firmly in the mainstream of field techniques in Greek archaeology. While not all surveys are successful, the potential is such that few new projects could now justifiably eschew this approach entirely.

Although often referred to as a prospection technique, geophysics is usually employed in the secondary stages of survey, once a site has been located by other means, such as the study of aerial photographs or field walking. At the most basic level, geophysics is a means of non-invasive sub-surface investigation capable of defining the extent and some of the qualities of an archaeological site. It is therefore a site-specific technique within the broader spectrum of geoarchaeological approaches, suitable for the site-specific aspects of field survey.⁶³ The place of geophysical survey within the overall design of IKAP should therefore be clear. IKAP's regional approach is centered on one key site and its hinterland. This focus on the archaeological site of Iklaina (site 1, "Traghanes"), leading ultimately to excavation at

61. I am grateful to Michael Cosmopoulos for inviting me to carry out and publish this work, and to other members of IKAP staff for assistance and support, in particular Chris Mundigler and Doug Edwards. Geophysical fieldwork is a team effort, with many of those listed in the preface of this volume having taken part at some point, and I extend my thanks to them, and most of all to the many hardworking and enthusiastic students who

helped gather these data year by year. The Fitch Laboratory of the British School at Athens, and its successive directors Ian Whitbread and Evangelia Kyriatzi with their staff Maria Papaconstantinou and Tania Gerousi, supported and facilitated the program in every way. The equipment used is owned and maintained by the Fitch Laboratory.

62. Sarris & Jones 2000.

63. Poulter 2007; Boyd 2007.

the site, demanded the application of site-specific techniques such as geophysics, in addition to the broader techniques of field survey. Iklaina is a fine demonstration of the place of geophysics in the range of field techniques.

In the modern age, no excavation, except of a very small site, can hope to replicate the large-scale excavation strategies of the pioneering years of archaeology. Geophysical survey, especially in combination with topographic survey and other geoarchaeological investigations, is currently the best technique available to archaeologists capable of providing an overview at the scale of the whole site. In the hierarchy of landscape-site-trench, the place of geophysics in IKAP is central to the investigation of the site as a whole (Table 7).

Landscape	Field survey (regional)
Site	Site specific approaches (e.g., geophysics)
Trench	Sub-site-specific detailed investigation (excavation)

Table 7. Geophysics in relation to field techniques.

Archaeological geophysics excels at the identification of architectural features and can also produce useful results in defining areas of destruction and unoccupied areas of a site. Some techniques (such as magnetic susceptibility)⁶⁴ are well-placed to define the edges of a site, while others (such as radar and resistance tomography)⁶⁵ specialize in producing results in three dimensions. For Iklaina, we chose the two “workhorse” techniques of geophysics: magnetometry and earth resistance surveys.

In magnetometry the instrument measures the strength of the earth’s magnetic field.⁶⁶ Readings are taken in a structured grid allowing for the comparison of readings across the surveyed area. The earth’s magnetic field varies both according to location on the globe and diurnally, but very small, localized fluctuations close to ground level can also be caused by variation in the near-surface geology, geomorphology, or archaeology. Magnetic survey captures these fluctuations and computer processing allows the data to be displayed as a continuous surface which highlights any variation. Archaeological factors that may impact magnetic readings include areas of burned destruction,⁶⁷ concentrations of fired material such as mud brick or even pot-

64. Clark 1996, 99-117, 174-182; Gaffney & Gater 2003, 44-46.

65. Clark 1996, 61-63, 171; Gaffney & Gater 2003, 60-61.

66. Scollar et al. 1990, 422-519; Clark 1996, 64-98, 174-175; Gaffney & Gater 2003, 36-42.

67. Boyd & Brodie 2008.

tery, and differences between materials such as building stone and the surrounding soil matrix.

Earth resistance surveys involve the passage of an electrical current through the earth.⁶⁸ Again readings are taken in a structured grid and processed into a continuous surface highlighting variation. The conductivity of the soil is based on the amount of moisture and in particular the dissolved electrolytes that facilitate the passage of the current. Ground moisture content can be affected by a number of environmental factors, but localized high-frequency variation can be caused by archaeological features. Walls, foundations, concrete areas, or areas of concentrated debris will stand out against the surrounding earth matrix as dry (high resistance) zones, while features such as ditches or pits may be more loosely packed than the surrounding matrix and thus form wetter (lower resistance) zones.

FIELD METHODOLOGY AND DATA PROCESSING

Geophysical survey was carried out annually from 2000 to 2005. The geophysical grid was established on the basis of the IKAP site grid (fig. 54), and individual geophysical survey grids were laid out using known points or, in later years, differential GPS (fig. 26). In general grids of 30×30 m, were used for the resistance survey, and 20×20 m for the magnetic survey; however grid sizes were varied in relation to topographic constraints.

Magnetic survey was carried out using a Geoscan FM-36 fluxgate gradiometer. An initial survey was carried out at Site 1 using a 1 m sample interval, but given the quality of the results it was decided to expand the survey to a larger area, including resurveying the original area, using a sample interval of 0.50 m (i.e. four readings per square meter). Many gradiometer surveys are directionally biased: the sample intensity along one axis can be up to four times as great as along the perpendicular axis. It was decided at Iklaina that the additional effort involved in gathering non-directionally biased data was well worth the undertaking: thus samples were spaced 0.50 m apart in each direction.

Resistance survey was carried out using a Geoscan RM-15 resistance meter. The probe interval was generally set to 0.50 m, which implies a depth penetration generally of the order of 0.50 m to 0.75 m, though large features more deeply buried can still be detected. The sample interval for resistance surveys was one reading per square meter.

All data were uploaded to a portable computer in the field for checking and initial processing was carried out daily, allowing for the results of one day's work to inform

68. Scollar et al., 1990, 307-374; Clark 1996, 27-63, 171-174; Gaffney & Gater 2003, 23-36.

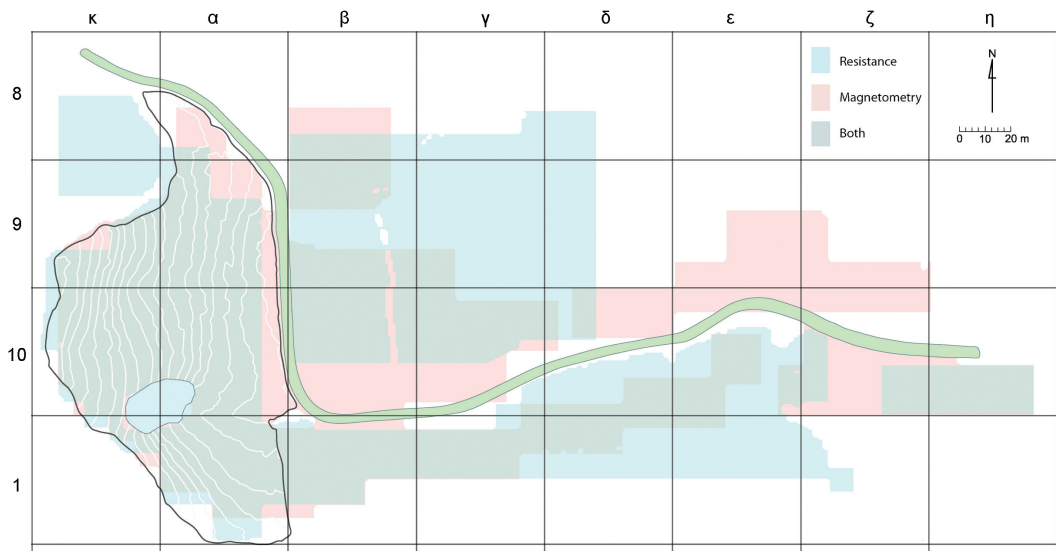


Fig. 26. Top: satellite image of Iklaina, showing the area covered by geophysical survey. Bottom: detail of area covered, showing site grid and landscape features, with the extent of magnetic and resistance survey.

the strategy for the next. Further processing was carried out in preparation for this report. As each stage in data processing acts to alter the original data, it is important to be clear about the steps carried out. Both methods measure values relative to an

arbitrary base point which may vary from individual grid to grid. In addition magnetic values vary diurnally and resistance values vary depending on the changing dryness in soil moisture.

The goal of interpretation is to isolate and understand patterns and variations in the data caused by subsurface archaeological features. One goal of data processing is to minimize variation in the background due (predictably) to methodological procedures and (unpredictably) to subsurface geology or geomorphology, or other (non-archaeological) issues. In building up a complete image of the survey, variations in background readings have been equalized between grids, and occasionally the dynamic range (the difference between background levels and reading levels indicating archaeological features) has been altered. Obviously spurious datapoints have been removed. However some spikes in the data, which one could not be certain were spurious, have been retained. Magnetic data have in some cases been further processed to remove "striping," an effect along the direction of traverse caused by slight misalignment of the instrument.

As noted, both techniques employed give relative, not absolute, values. For the magnetic survey, an arbitrary (magnetically "quiet") point was chosen and the machine's reading set to zero at the commencement of each grid. Thus the negative values in the magnetic survey simply indicate readings below the "zero" set at the arbitrary point, subsequently equalized across the whole survey. The resistance survey was carried out using a twin-probe arrangement whereby the electrical circuit was completed on each reading with one set of probes (current and potential difference) at a fixed, arbitrary point outside the grid, and one set of probes moving from reading point to reading point.

Survey in the field was carried out by the author with the help of numerous members of IKAP over the years. As magnetic survey is highly operator-sensitive, all magnetic survey was carried out personally by the author. This ensured the even quality of the results across the sites.

THE SURVEY

Earlier work by Marinatos at the main site had identified traces of substantial walls, and this prompted the decision to start work in this area using resistance as the preferred technique for locating substantial structures. The work of the first year detected several features that might have related to Marinatos' walls as well as confirming the importance of the "benchmark" area. Tests at the end of the 2000 season confirmed that fluxgate gradiometry would also produce useful results. In subsequent years work expanded to the east, confirming the large extent of the site, and coverage was extended to both instruments. By the end of the 2005 season, a total area of 27,388 m² (2.74 ha) had been covered by the magnetic survey at a sample density of four

per square meter (fig. 27). Resistance survey had similarly covered 30,590 m² (3.06 ha) at one reading per meter sample interval (fig. 28).

Both techniques have detected various types and scales of anomaly, many of which seem to relate directly to the Bronze Age occupation of the site. At the same time, traces of more recent activity complicate the picture, and it is sometimes difficult to distinguish between modern, archaeological, geological or geomorphological causes for different patterns in the data. Despite these caveats, geophysical survey at Iklaina was very successful, allowing us to map much of the central area of human habitation and revealing different zones within the site (cf. figs 34, 36, 39).

The resistance survey overall is characterized by relatively narrow linear anomalies that relate to subsurface architectural remains; much broader linear anomalies whose origin, perhaps agricultural, is uncertain; low frequency variation related to changing subsurface geology; and regularly-spaced high frequency anomalies which map the present day locations of olive trees. In general the resistance survey has detected some important details of the Bronze Age architecture, but provides an incomplete plan (fig. 39). The magnetic survey has been much more successful in that regard. Overall, the magnetic survey is characterized by high frequency variation in the range $\pm 5\text{nT}$, which includes most architectural features. Large scale stronger features register in the range -10nT – 20nT , and a few small features register much higher values, up to $\pm 200\text{nT}$. Most of these anomalies are here interpreted as archaeological, though some relate to modern features, such as the farm track running through the site, modern field boundaries, or modern garbage discard, and some others are difficult to interpret.

An overall interpretative plan of the site is shown in fig. 29. In the following discussion, different anomaly types are first isolated and discussed separately, and then an overall interpretation of results follows. The individual features discussed are referred to by Figure and feature number; e.g. feature 30A refers to feature A on fig. 30, while feature 33A refers to feature A on fig. 33. Strong magnetic features, both positive and negative, are first considered: these are often isolated and many are not clearly archaeological in nature. Next several less strong positive features are described in detail, and these are followed by the negative features which define most archaeological aspects of the site. Finally the anomalies present in the resistance data are considered.

STRONG MAGNETIC FEATURES (FEATURES 30A TO 30Z)

Strong magnetic features are indicated on fig. 30. Several of these may have an archaeological explanation, but others are likely to be due to modern material or disturbance. Features considered in this section measure at least $\pm 15\text{nT}$. It is also useful to compare their appearance on figs 27, 32, 33, 35.

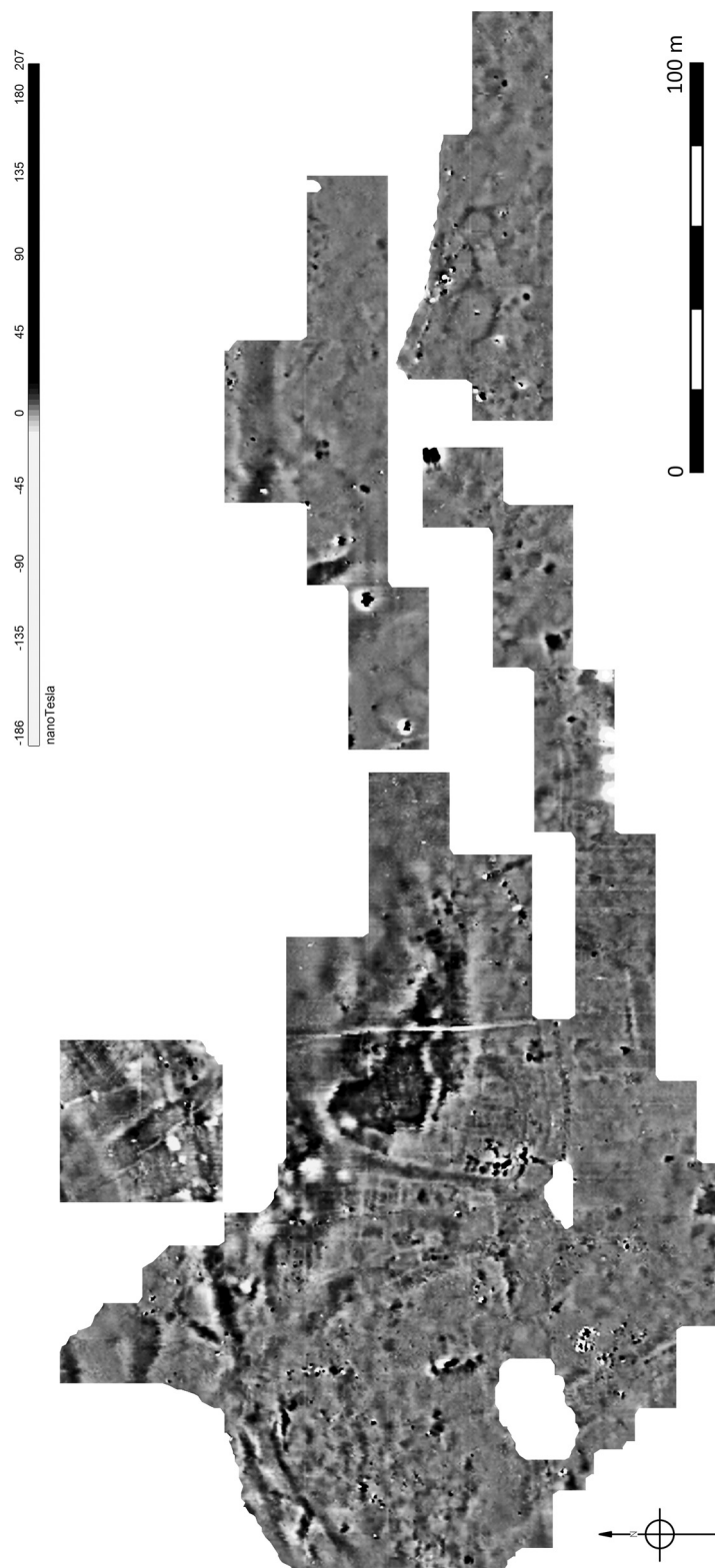


Fig. 27. Site 1. Results of fluxgate gradiometer survey.

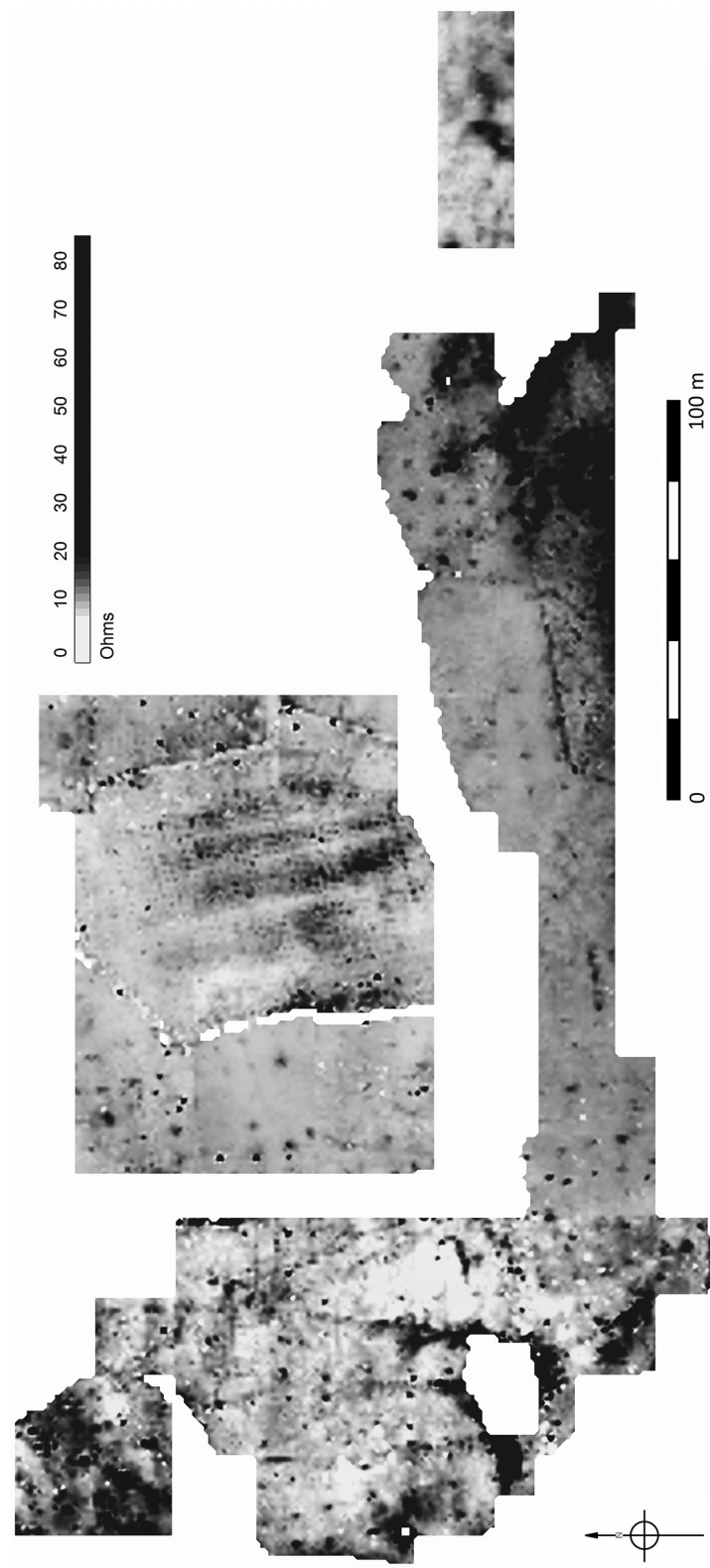


Fig. 28. Site 1. Results of resistance survey.

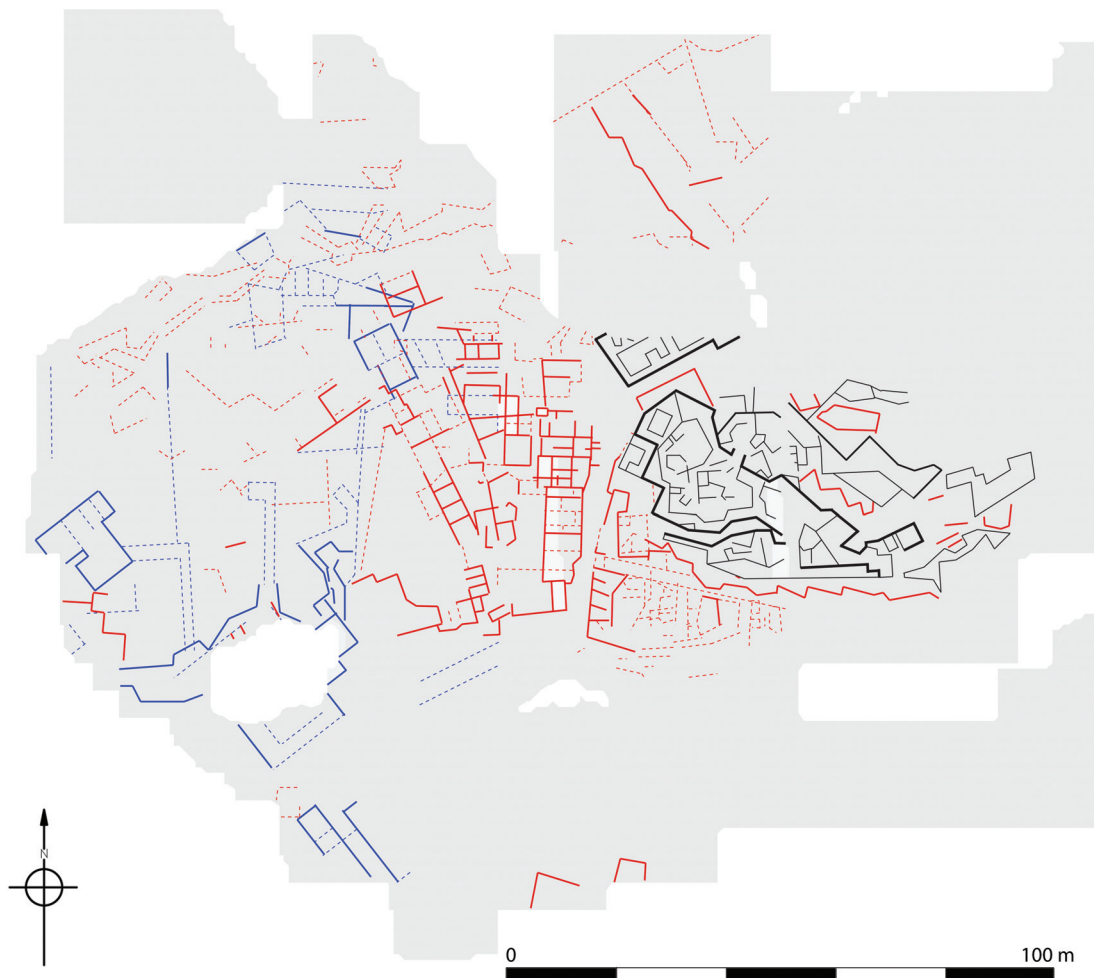


Fig. 29. Composite interpretation of magnetic and resistance data. The gray background indicates the total area covered by survey (but not necessarily by both instruments, and is here truncated to the east: compare fig. 26). Blue lines: resistance features; red lines: negative magnetic features; black lines: positive magnetic features. Some duplicate features have been removed: compare figs 34, 36, 39.

Features 30A, 30B, 30C and 30D (fig. 30) form an alignment of notably similar features. Each anomaly is circular in form, and approximately 3.30-3.90 m in diameter. These appear to be negative anomalies, in each case exceeding -204nT , without corresponding positive (dipole) or halo effect. These features are unlikely to be archaeological in origin. Feature 30E covers an area of approximately 6×5 m, and consists of a pair of strongly positive anomalies (up to 200nT) surrounded by a negative halo of approximately -25nT . The true strength of the positive anomaly may have exceeded

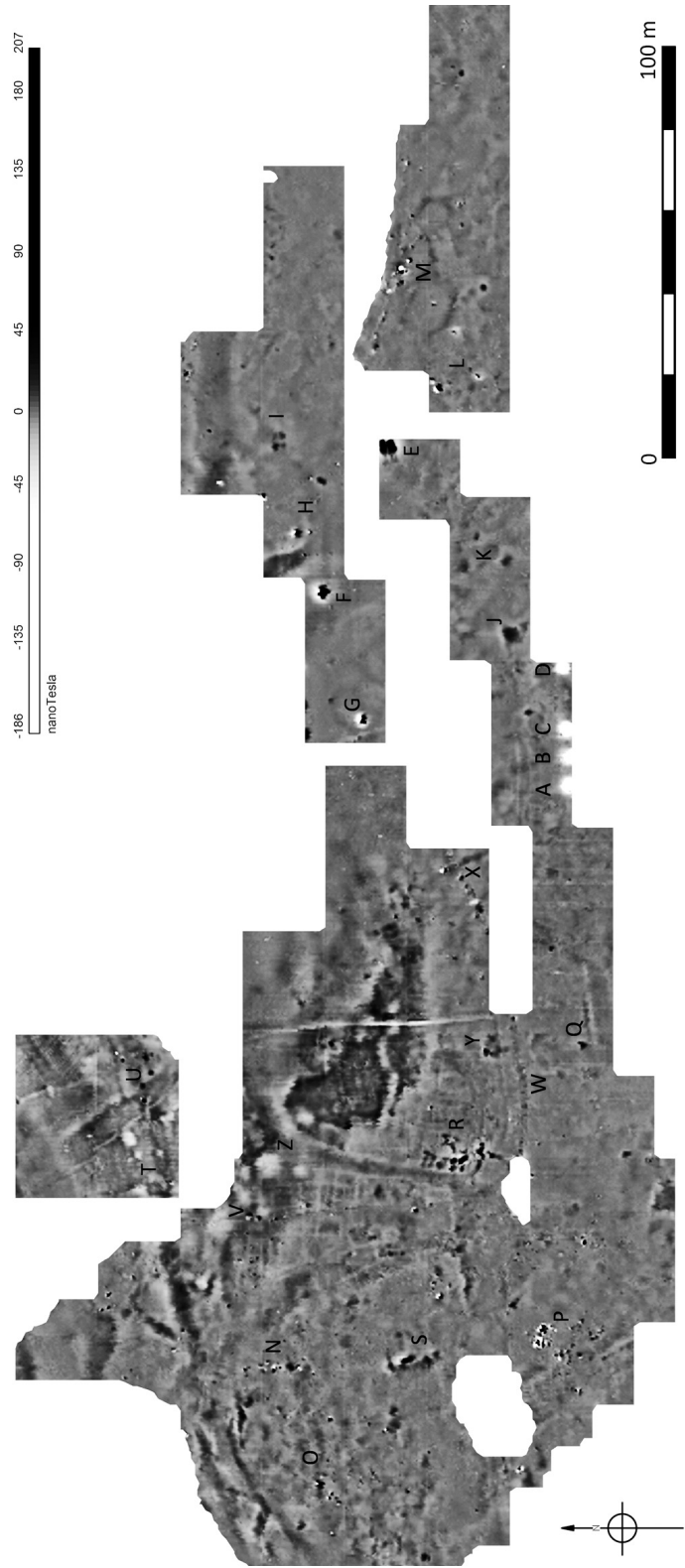


Fig. 30. Magnetic data, emphasizing the strongest magnetic features.

200nT, as the reading range of the instrument was set to ± 204 nT. The anomaly is truncated to the north and east by the edge of the survey area, and so may have been closer to 8 m wide. The shape of the anomaly is shown in cross-section in fig. 31. The northern positive anomaly is slightly weaker than that to the south. One possible archaeological explanation for these features is a feature such as a kiln or furnace exhibiting thermoremanent magnetism. The strong positive anomaly is characteristic of such features. The dual anomaly may result from the kiln walls, or alternatively (and perhaps more likely) two such features may be sited next to each other.

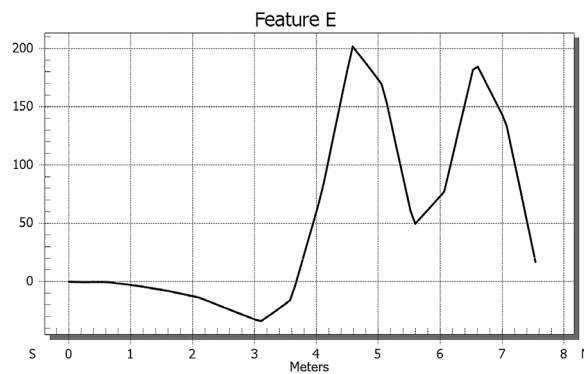


Fig. 31. Cross-section, from south to north, of feature 30E.

Feature 30F similarly exhibits a strong positive anomaly (up to 200nT, as with feature 30E at the limit of the set range of the instrument) surrounded by a negative halo (mainly about -25nT, though falling to -50nT to the north). In this case a single positive anomaly is at the center of a feature about 7 m wide. It is also possible that this feature may represent a kiln or furnace.

Feature 30G is also a large anomaly, approximately 3 m in diameter. In this case, however, it is a dipole anomaly, negative to the north and positive to the south, approximately ± 150 nT in each direction. This may be interpreted as an iron spike caused by near-surface metal débris. Such spikes are common in magnetometer surveys conducted over modern agricultural land and can be caused by discarded or lost items such as tools, machine parts, remnants of fencing, or even gun cartridges. Some of these will be noted below, but as most cannot be interpreted and probably do not relate to the Bronze Age occupation of the site, many of the minor spikes visible in the data are not further discussed here.

Several spikes are located near to points 30H and 30I. Those to the west of 30H are probably similar in nature to feature 29G, forming weaker anomalies because the

source is either smaller, or more deeply buried, or both. The positive anomaly just east of point H reaches 45nT in strength and is elongated in form, being approximately 3 m in length but only 1.5 m in width. This anomaly cannot easily be interpreted. At point I a group of four positive anomalies covers an area of about 5×4 m: the northwest peak reaches 35nT, while the other three are in the range of 12-18nT. It is again difficult to interpret these anomalies. Other small spike anomalies may be noted in the vicinity of point I.

Features 30J and 30K to the southwest are larger positive anomalies. Feature 30J is approximately square in shape, 4.50 m on each side, up to 35nT in strength, with a negative fringe on the north side (reaching -10nT). This may represent a small construction, although no corresponding evidence for this is present in the resistance data, which at this point registers a dip in readings. Again it may be suspected that a feature with a thermoremanent aspect, perhaps a destroyed kiln or furnace, may be responsible. It is also possible that a fired mud-brick feature close to the surface could be responsible. Feature 30K to the east is smaller, an elliptical feature of maximum diameter 3 m, with maximum anomaly strength of 20nT.

Several further small anomalies surround point 30L. The three most prominent northwest, southwest and northeast of 30L were probably caused by discarded metal. The positive anomaly to the southeast of point 30L measures up to 40nT with a slight negative halo (down to -10nT) surrounding it. At approximately 4 m across, this feature might be archaeological. Features in the vicinity of point 5 m and to the northwest and east of it are caused by the edge of the track (survey extends 3.50 m into the track in this area).

All of these stronger anomalies in the area to the east of the main site center give the impression of being isolated, single-cause anomalies (not part of an architectural complex, or caused by spreads of material). Moving to the west, the stronger features also include some isolated spikes. These have not been singled out for further discussion here, as they seem similar in nature to those discussed above. Examples include several visible on fig. 30 to the west and east of 30Q, to the northeast of 30P, and to the southwest of 30O. The modern track is visible in the data in this area also, as a series of linear anomalies running east-west near point 30W, and northeast-southwest at point 30X. The stronger dipole anomalies at point 30V, running north-south, are also the result of the track.

Feature 30N is a north-south anomaly measuring about 18 m. It consists of stronger, larger features at its southern end and multiple small high-frequency dipole anomalies at its north end: it is possible these two aspects are unconnected. It is broadly aligned with feature 30S to the south, but does not lie on one of the linear anomalies detected by resistance survey in this area. The main anomaly at the southern end is positive, up to 45nT, and about 2 m across. Feature 30N is difficult to interpret.

Feature 30O consists of another cluster to small dipole spikes with one larger anomaly which is also a dipole spike. This may be an area of discarded rubbish, though none was noted on the surface. Feature 30P, which covers an area up to 16 m north to south and 20 m east to west, is however certainly caused by an area of modern discard which was visible on the surface. Discarded food cans and agricultural items (machine parts, discarded packaging) were the cause. Feature 30P is a good control for the nature of an anomaly cluster caused by modern, surface-level discard. Feature 30O has a similar profile, whereas those of features 30N and 30R are somewhat different.

Feature 30Q is an isolated mainly positive anomaly, up to 50nT in strength, and about 2 m wide. The linear feature south of 30Q, more clearly visible in figs 27 and 35 is a modern field boundary.

Feature 30R is of great interest, given its location in relation to the other features recognized in its vicinity (and described in detail below; *cf.* fig. 32). The magnetically disturbed location covers an area of 15×9 m at most with the stronger features located in the southwest corner. There, four positive anomalies cover a total area about 4 m on each side. The two western spikes range up to about 50nT, while those to the east each reach 90nT. A fifth positive anomaly lies to the north and reaches about 30nT in strength. These anomalies are surrounded by negative haloes reaching between -10nT and -25nT. Other anomalies feature to the north, east and south of this core group. That to the south is an elongated linear positive anomaly, varying in strength from 40nT to 80nT, with a more prominent negative halo at the eastern end. At right angles, to the south, another feature measures up to 45nT. The latter is partly situated beneath the modern track, but it seems unlikely to be a modern feature unrelated to the other features described. At the north end of this feature group, another positive anomaly appears approximately square in shape and reaches 25nT. A similar anomaly strength is apparent to the east of this group.

Interpreting this group in isolation, it seems to represent an organized set of anomalies which is strongly dissimilar to the area of modern discard at feature 30P. Moreover, this area was bare soil when surveyed, and no modern material at all was visible on the surface. The anomalies are larger than those of feature 30P, and simple dipoles are absent. It therefore seems more likely that these anomalies are caused by a series of subsurface features exhibiting thermoremanent magnetism: kilns, furnaces, or similar features. The wider interpretation of these features in relation to the other archaeological features surrounding them will be considered further below.

The positive aspect of feature 30S is linear, about 13 m from north to south; at its north end it makes a 90° turn to the east, where it continues as a significant anomaly for 6 m. The feature varies in strength from 10nT to 30nT. South of this return, east of the main linear anomaly, a much stronger anomaly (up to 75nT) runs approxi-

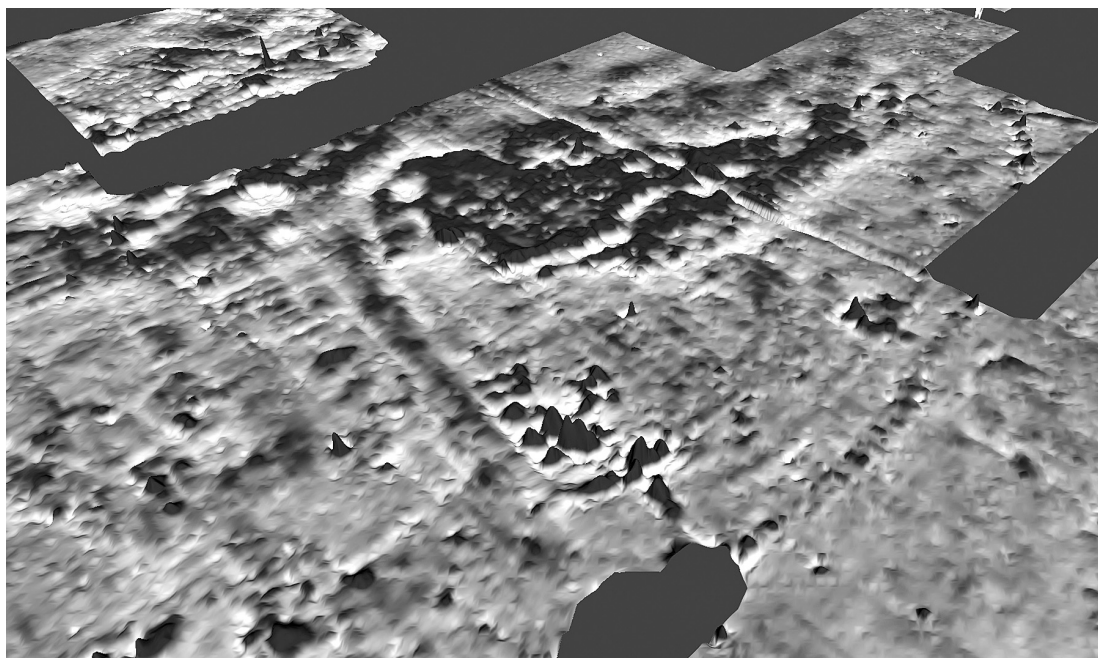


Fig. 32. Pseudo-3D visualization of the magnetic data from the southwest. Center: feature 30R. Background: feature 33A.

mately in parallel for 4 m. The latter feature shows most strongly on fig. 30. It has a significant negative component to the north (reaching -30nT), and overall the feature has negative components to the north and east. Unusually for the strong magnetic anomalies described in this section, this feature relates clearly to a corresponding resistance feature (the northward extension of feature 39E, discussed below), which is interpreted as stone-built, and which has been partly exposed by excavation. However, stone alone would be unlikely to produce the strong responses seen with feature 30S: it may be that this area was one of the locations of Marinatos' trenches, and the disturbance of excavation has caused the anomaly.

At points 30T and 30Z several distinctive negative features have been recorded. At 30T the largest is elliptical and measures 3.30 m at its maximum; it reaches -40nT with no appreciable positive component. Nearby features are much smaller but similarly lack a positive component. At 30Z even larger such features are visible, the largest reaching 7 m in diameter and -25nT in strength. These features seem to disrupt the regular patterns of architecture in this area, described below. The negative features at 30T and 30Z are probably all caused by a single factor. This may be related to the positive anomalies described for this area below (features 33A and 33B) or these features may be unrelated (and unexplained). It is possible that localized geological fac-

tors are relevant here. The small positive anomalies at point 30U in fact do have negative components and probably represent discarded metal.

Finally, the feature at point 30Y is located on the northern edge of the modern track but is probably not associated with it. Its maximum extent is 6 m east to west and 4 m north to south, though to the southwest a positive anomaly continues a further 2 m to the south. The anomaly reaches 30nT to the west and 20nT to the east. The feature has a characteristic double peak, similar to that of feature 30E (fig. 31), of approximately the same size: the interpretation of two thermoremanent features sited next to each other, suggested for feature 30E, may also be apposite here.

LESS STRONG POSITIVE MAGNETIC FEATURES (FEATURES 33A TO 33E)

This section considers positive features not included in the preceding section, measuring up to ca. 20nT. These are noted in fig. 33, which should be compared with figs 27, 29, 30, and 32.

Whereas the stronger features described in the preceding section are more likely to be caused by limited-scale factors such as thermoremanent magnetism or discarded metal, anomalies in the range ± 10 nT are more likely to be caused by archaeological features such as walls (of stone or mud brick), roads, ditches, and burned features. The division between negative features, discussed in the next section, and positive features, discussed here, is useful as different causes may be suggested for the different types of anomaly. The mean of all readings in the survey is 0.64nT, and the median 0.21nT; so a division between positive and negative based around 0nT is a reasonable approximation of a central division of readings departing from background.

Positive anomalies are those which exhibit a coherent magnetic response above background level. Buried structures built of stone may exhibit either a negative or a positive anomaly, depending on the nature of the stone employed. As will be outlined below, at Iklaina most stone-built features seem to give a negative response. Areas where anthropogenic fill has accumulated can give a slight positive response, due to the higher content of responsive debris versus unmodified soil. This may be relevant to the fill behind terraces, on top of roads, or in ditches. It can also enhance the outline of negative wall traces. The presence of burned material makes a significant contribution to this raised magnetic signal. However, *in situ* burned destruction might be expected to produce a stronger and more coherent signal.

As outlined elsewhere,⁶⁹ a burned destruction involving a building of mud brick can lead to the firing of the clay forming the bricks. Above the Curie points (565°C for magnetite, 675°C for hematite), the iron minerals in the clay acquire thermorema-

69. Boyd & Brodie 2008.

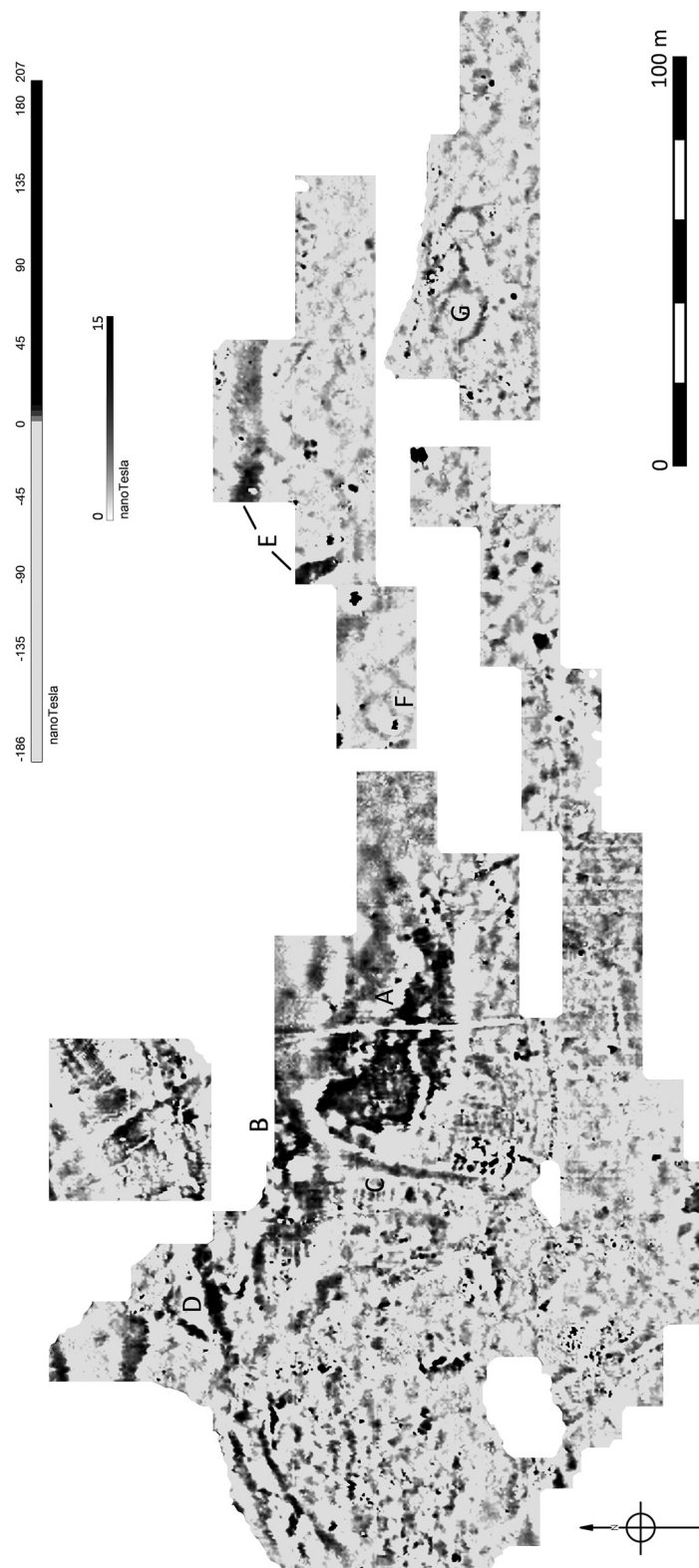


Fig. 33. Magnetic data, emphasizing positive magnetic features.

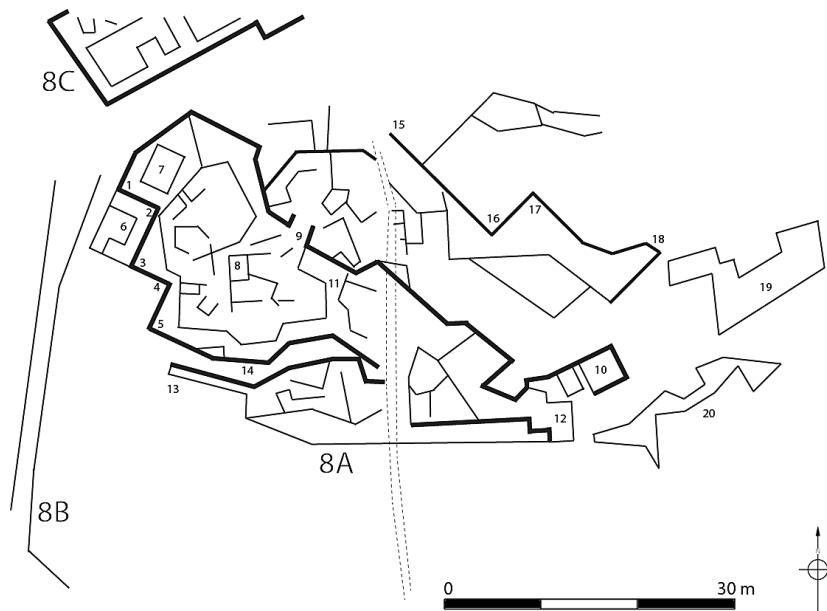


Fig. 34. Interpretation of features 33A, 33B and 33C.

nent magnetism. The preservation through baking of Linear B tablets at various sites has shown that burned destructions can indeed exceed these temperatures.⁷⁰ Post-depositional processes are likely to disrupt the remains and so strongly attenuate the magnetic signal, which otherwise could be expected to be very strong. Nonetheless, the survival of deposits of disturbed, burned mud brick, with some underlying wall segments *in situ*, should present a significant magnetic anomaly.

This is the interpretation suggested for the very large feature 33A (figs 32, 33, 34). As fig. 33 makes clear, this single feature stands out as the largest coherent and structured positive anomaly of the entire survey. It measures 55×32 m at its maximum extent. Its eastern end is narrower and less clearly structured than its western end. The magnetic response reaches 45nT at various points around the edge of the feature, though ca. 20nT is more usual. The feature appears on the west side as an irregular geometric shape, with eleven straight faces and five right-angles, all on the western and southern sides. To the east and south it is more amorphous, though still with sig-

70. The discovery of a Linear B tablet in 2010 with other burned ceramics in the western sector of Iklaina is indicative of the possibility of such events: Cosmopoulos 2010, 43-46. However, that

context predates the final use of the site and so may not relate to the suggested burned destruction described below, which is in the as yet unexcavated eastern sector.

nificant straight edges. The feature is largely positive: negative aspects are limited to the northwest corner and a winding linear anomaly running through the feature to the south (fig. 36). There are also fringes of negative readings on the northern sides of many of the linear positive anomalies. The interior of the feature on the west side is distinguished from the edges in being above background level but below the higher readings of the edges.

An interpretation of feature 33A is offered on fig. 34. Here thicker lines are used to indicate the outline of the feature, representing the stronger anomalies around its edge. It should be borne in mind when comparing figs 33 and 34 that different factors, including post-depositional, affect the data. It should also be considered that no excavation has yet been conducted here which might confirm this interpretation, unlike the western half of the site, where excavation has confirmed the basic interpretation (see further below). The interpretative plan of fig. 34 represents neither the original plan of the building(s) concerned, nor the precise disposition of subsurface features today. However it is the result of careful analysis of varying anomaly strengths and spreads, and together with figs 27, 30, 32, and 33 gives us considerable insight into the nature of this impressive feature. The feature has several points of detail worth noting (fig. 34). On the western and southern sides there are several right angles, at points 1, 2, 3, 4 and 5. The linear features in this area are interpreted as external walls. The area at point 6 might well form an entrance feature. Point 7, a rectangular negative area about 4×3 m, might form a small internal court. Elsewhere within the feature overall, values are enhanced well above the external background of around 0nT, averaging between 5nT and 10nT. Internal features are hard to discern; those tentatively noted on fig. 34 tend to be short, and oriented roughly east-west or north-south, weakly suggesting a network of small rooms, perhaps most evident around point 8. At point 9, it is possible that a break in the exterior wall forms an entrance to the complex. To the northeast of this, a possible enclosed area measures about 12×10 m, and could form an entrance enclosure, though this is far from clear.

Further east, the modern drainage channel (indicated by dotted lines on fig. 34) artificially seems to break the feature in half (fig. 33). Between points 9 and 10, about 36 m of a possible north-facing external wall-face is represented. However, an alternative interpretation at point 11 would see the complex divided in two at this point. The drainage channel makes it unclear whether the continuous line drawn between points 9 and 10 is the best interpretation. At point 10 a feature about 4×3 m is strongly represented in the data, marking the eastern terminus of this extended positive anomaly.

The southern border of the feature is also clearly seen in the data, although less well-defined as sharp changes in anomaly strength. It runs between points 12 and 13 on fig. 34. Immediately south of the features represented in fig. 34, a halo of negative

readings is visible in fig. 33, with readings averaging -5nT east of the drainage channel, and -10nT west of it. In fact, this phenomenon is visible around most of the feature, with stronger (-15nT) readings at the northwest corner, and around -10nT on the north side. What appears as a negative linear feature (point 14) between two strongly positive features seems to run into the main complex. There are two possible explanations for these negative features. One is that they are simply a component of the overall magnetic feature and are of little interpretative value. One would expect a negative component for a feature caused by thermoremanent magnetism. The second explanation, which seems less likely but should not be dismissed, is that the negative features should be interpreted largely as the main body of negative features is interpreted in the next section: as areas of lower magnetism caused by a lower component of soil, burned mud-brick and artefacts, and a much higher component of building stone. It is conceivable that these negative zones represent fallen building stone close to the modern surface. However one would expect some resistance response to fallen stones, even if rather faint, and none can be clearly detected (see further below). On balance the former explanation seems more likely than the latter, and indeed some combination of the two may be apposite.

Further related positive features lie to the east of the main area. Between points 15 and 18, with right-angles at points 16 and 17, a feature about 30 m long and up to 6 m thick exhibits a lower positive magnetic response of about 5nT. The right-angles at points 16 and 17 again suggest anthropogenic cause, and perhaps an external face at these points, but otherwise detail is lacking. Feature 19 further east is similar in nature and perhaps a continuation of the preceding feature. Finally feature 20 to the south is similarly enigmatic, though decidedly narrower and exhibiting a more angled appearance.

Feature 33B (fig. 33) is smaller than feature 33A, and is partly lost off the survey edge. However it appears to form the outline of a significant architectural feature of relatively simple plan. The minimum measurements for the feature are 21×10 m, with the width being defined in the data at its western end, but the length continuing beyond the survey edge. This is a broadly rectangular feature, though its southwest angle is slightly obtuse, and there is a jog in the southern edge at its eastern end. Evidence for its internal layout, including at least two internal spaces, is apparent both from areas of lowered response and from apparent cross walls, indicated on fig. 34. It seems likely that this is a regular architectural feature, and its positive aspect is probably to be interpreted, as with feature 33A, as thermoremanent, and the result of fire destruction of mud-brick walls (or superstructure). The walls appear thick (about 2 m), but this is probably at least in part due to the effects of collapse.

Feature 33C is about 37 m long. It is about 2 m thick at its southern end, widening out to about 5 m as it dissipates at its northern end. Its strength is consistently around

5nT along its length. Three explanations can be considered for this feature: the least likely is that it represents a wall, with a baked or subsequently burned mud-brick element in its superstructure. As will be seen in the section below, a wall of stone would have a different magnetic signature (and, of this size, would have been much more strongly attested in the resistance survey). Walls of this length and lacking angles or jogs are not attested elsewhere in the data. A second possibility is that this feature represents a ditch, a relatively deep elongated trench dug out through natural soil and refilled (either deliberately, or through taphonomic processes) with magnetically enhanced soil from the settlement. This would have led to a greater depth of such soil within the ditch than in the surrounding areas, creating the enhanced anomaly strength. It is difficult, however, to imagine the utility of such a ditch in this position – the water delivery systems at Englianos⁷¹ are quite different: narrower, less straight, and stone-lined. The faintly positive aspect of this feature in the resistance data (feature 39O, below) would also militate against this hypothesis. The third possibility is that this represents a pathway, track or road. As will be further discussed below, it seems to form one of the principal axes and divisions of the settlement, dividing the small, closely packed, stone-founded buildings to the west (blocks C and D: see below) from the complex of features to the east formed by feature 33A and the area to the south of it (blocks A and B: see below). It is however puzzling that its further course cannot be detected, though several explanations can be imagined for this: it may have been built over or otherwise damaged, and if at its southern end it turned east, it may be partly obscured by the current track (note that the north-south line of the current path is not coincident with feature 33C).

Feature 33D at the northwestern fringe of the survey area is superficially similar to feature 33C. It is however a stronger magnetic anomaly, reaching 30nT and averaging about 15nT. It also exhibits a corresponding negative anomaly on its northern side, which in places reaches -20nT, averaging about -10nT. This raises the possibility that this anomaly is caused by a buried metal feature, presumably modern. Feature 33D is strongest at its eastern end, where it measures some 31 m; however it continues further west, after a slight jog, and becomes a double linear feature, a further 57 m long (continuing beyond the edge of the survey area). These features are located at the edge of the modern terrace and another possibility is that they are drainage features. However, if they are of archaeological origin, mudbrick enclosure walls and drainage ditches are a possibility. If the interpretation of feature 33C as a road is correct, the stronger magnetic signatures may indicate here a different explanation for these superficially similar linear features.

71. Blegen & Rawson 1966, 332-336.

Two features are indicated at point 33E though they may relate to a single cause. The eastern part is about 15nT in strength, and forms a wide linear anomaly which dissipates in strength toward the east. There is a negative halo to the north, and the feature is up to 12 m wide, covering the full 40 m width of the survey in this area. It does not seem likely that this feature has an archaeological cause. This feature is within the area formerly planted in vines, and so its cause may be related to agricultural activity. The southern part of feature 33E is 13 m long, again continuing beyond the survey edge. Its central positive aspect measures up to 15nT in strength, with corresponding negative readings to the west and the east. The interpretation of this part of the feature is similarly obscure and may again be related to recent agricultural activity.

The weakly positive oval features at 33F and 33G are probably caused by vehicle movements between the olives. Similar surface features are visible in satellite photographs of Iklaina.

WEAKER NEGATIVE MAGNETIC FEATURES (FEATURES 36A1 TO 36E17)

This section considers the weaker negative magnetic features (not already described with the strong magnetic features above). These are shown in fig. 35 and interpreted in fig. 36. Two categories of anomaly are described here. The first, and most interesting, consist of narrow linear features measuring between about 5nT and 10nT below surrounding readings. These come together to form an organized plan, as may be apprehended by a glance at fig. 36. Some of these features are faint (and represented on fig. 36 by dotted lines) and may not be well-represented in fig. 27 or fig. 35: their existence has been determined by careful analysis of the data. However the main plan lines of the architectural features are clear and visible on figs 27, 32, and 35. The second category of anomaly consists of more amorphous features which are much more difficult to interpret. These are generally much wider anomalies than those in the first group, and often much less linear in nature. Their outlines are generally represented by dotted lines in fig. 36. In some cases below interpretations will be suggested, but often it has not been possible to suggest their origin.

For ease of discussion, blocks of architecture on major orientations have been given block designations (A-E) on fig. 36. Each feature which is mentioned in the following description – individual walls, or groups of walls forming rooms – is numbered separately on fig. 36. The outline characteristics of each major block are described first, followed by a detailed description. Block A is the equivalent in this reading range to feature 33A in the positive anomalies. It covers an area of approximately 35×65 m (slightly larger than indicated by the positive readings, above), on an orientation approximately 18° east of north. Block B is formed by a series of faint anomalies south of block A and east of feature 30R, an area of about 29×29 m, on

approximately the same orientation as block C. Block C is a group of rectilinear features to the west of blocks A and B oriented about 3° east of north. This block encompasses an area of about 52×25 m at maximum. Immediately to the west, on a different orientation (about 26° west of north), a distinct block of architectural features (block D) covers an area of 51×15 m at most. Block D is on the same orientation as feature 33B, to the north of block A. Blocks C and D appear to abut over a distance of about 33 m and it seems likely that one orientation succeeds and overlies the other (an issue clarified by subsequent excavation and discussed below). South of both blocks C and D lie further features on slightly differing orientations. Finally, block E is located to the south of the benchmark area (later excavated as the Cyclopean Terrace Complex). Although discernible features are fewer here, a consistent orientation of 28° west of north may be detected over an area about 27×20 m, and is also just discernible immediately to the north of the benchmark area. The orientation of block E is closely similar to that of block D. Elsewhere, mainly to the west and north of block D, multiple anomalies less clearly consistent with architectural remains have been noted. In some cases an interpretation is offered below.

BLOCK A

The large, coherent feature within Block A is principally defined by its positive magnetic component and has already been fully described above as feature 33A. The negative features strongly picked out in fig. 35 and mapped on fig. 36 do not add significantly to the interpretation of this area. It is worth noting here that the negative features clearly outline the overall block, averaging around -10nT in the stronger areas, and as low as -15nT to the north. The western side is defined along the edge of the linear feature 33C (see above), best interpreted as a road or track. Two major east-west linear features (features 36A1 and 36A2 on fig. 36), on slightly differing orientations, define the southern edge. The northern and eastern extent of the feature is not well defined by negative anomalies, with the exception of feature 36A3 (fig. 36), which, although not well-defined, has a basic orientation that corresponds approximately with that seen at point 36A4 on fig. 36. Few internal negative features are notable in block A.

BLOCK B

Blocks B and C share the same orientation, divided by the possible road or track, feature 33C (which is on a different orientation). The orientation of block B is different from the main orientation of block A, as well as that of feature 30R, both of which are aligned beside feature 33C. This may be an indication that feature 33C, feature 30R and block A are later features, if blocks B and C were originally a single large area on a single orientation, later modified. However, the edges of buildings at the



Fig. 35. Magnetic data, emphasizing negative magnetic features.



Fig. 36. Interpretative plan of negative magnetic features.

east end of block C also seem to respect feature 33C, so the explanation may be more complicated.

Most of the features within block B are very weakly defined. They appear to form a series of sub-rectangular and linear spaces, which may be interpreted as compartments and passageways. The former measure approximately 2 m in larger dimension; the latter are similar in width. The tentative interpretation in fig. 36 should not be regarded as very certain in individual features.

The west end of block B is dominated by the positive feature 30R, described in detail above. The strong positive features seem bounded by lower-strength linear negative anomalies, which are indicated on fig. 36. These may indicate walls, and their rectilinear aspect reinforces this impression. They seem to form clear boundaries for feature 30R on the west and south sides (the former forming a boundary with feature 33C), and less clearly to the north and east, and they also seem to form internal boundaries between the positive anomalies. It is possible that these negative features are simply a halo effect for the positive anomalies, but it may also be the case that they represent built features. The southwest corner of these features forms a major corner in the overall settlement plan, with the probable track feature 33C to the west and an area with few significant anomalies to the south. This corner finds its analog in feature 36C5 in block C, described below. Although not well-aligned, together they define the southern end of feature 33C and the border area between the built-up area to the north and the apparently more open area to the south.

BLOCK C

The negative features of block C are of exceptional interest, forming a coherent outline of Mycenaean buildings just below the surface, evident from the interpretative plan (fig. 36) and indeed from subsequent excavation.⁷² The boundary between block C and block D is clearly visible on fig. 36 as the change in orientation noted above. Individual features of block C will be described running approximately from south to north.

Feature 36C5 is an approximately rectangular feature measuring about 11×6 m, with a compartment at the eastern end 3×6 m. The latter is the strongest part of the overall anomaly, with linear features at around -7.5nT. This forms an important corner in the overall site plan as revealed magnetically. South of here, built features have not been recognized; west of feature 36C5, a second feature (36D12, described below with block D) continues the southern border of the built area, along a length of 31 m, although this is interrupted and at a slightly different angle in block D (see further

72. Cosmopoulos 2008, 2009, 2010.

discussion below). The east side of feature 36C5 forms the southwest corner of the probable track feature 33C. The northwest corner of feature 36C5 is not well-detected in the data, though a slight depression in readings in this area may be caused by collapsed walls in this area. Feature 36C5 is at a slight angle to the other features of block C, oriented about 5° west of them, or 2° west of north.

To the north, feature 36C6 forms a rectangular area with major and minor internal divisions. The maximum dimensions of the feature are 17.5×7.5 m, though it is narrower at the southern end (5.5 m wide). As reconstructed in fig. 36, it contains two major divisions, creating three “rooms” measuring (from south to north) 8.5×7.5 m, 7×7.5 m, and 2×7.5 m. Each of these “rooms” has further faint internal anomalies perhaps marking further divisions, perhaps at different depths. Within the central room an amorphous positive anomaly exceeds 25nT and covers an area up to 4×2 m. Although positive anomalies without clear interpretation are present throughout the survey, this is one of the strongest in this area (and is clearly seen on fig. 33, just south of the letter “C”). While the most likely explanation may relate to burned destruction in the area, it is tempting to speculate about the possibility of a large hearth in the center of this room, giving the whole complex of rooms a “megaron-like” aspect. It should, however, be noted that the observed length of the group of rooms, at 17.5 m, is significantly shorter than the canonical Mycenaean megara. The east edge of feature 36C6 forms part of the west edge of feature 33C. This seems non-linear at its south end. The western side of feature 36C6 borders an area with few features, which may have been more open.

Further north, a series of relatively well-defined compartments is designated feature 36C7 on fig. 36. Here at least 13 separate spaces have been identified, with in many cases further subdivision likely. These spaces range in size from about 2×2 m up to about 4×6 m. The strongest anomaly is formed by the northern edge where readings reach -10nT; at the southern linear feature dividing this area from feature 36C6 readings reach -8nT. Internal divisions vary from 0nT to -5nT against a background slightly above 0nT.

To the west, feature 36C8 is a well-defined rectangular area 6×5 m whose interior space features positive readings up to about 8nT. This corresponds to Unit E of the Iklaina excavation.⁷³ To the north of this a series of smaller compartments on the same orientation is partly indicated by the data. To the west, at feature 36C9, a larger space measuring about 6×8 m is visible, though the readings here and further north are affected by a zone of generally higher readings. It is still possible to detect linear anomalies within this zone, however, and these are indicated on fig. 36. These include

73. Cosmopoulos 2010, 48-49.

a coherent series of compartments at 36C10,⁷⁴ and further east at 36C11. Poorly defined features to the north and east of these are on a different orientation.

Buildings following the orientation of block C can be detected over an area 55 m long and up to 26 m wide. This area is generally very well defined, with the southern boundary at feature 36C5 described above, the eastern boundary formed in conjunction with the probable track feature 33C, and the western boundary formed by the interface with block D, on which more below. The northern boundary is not well-defined.

BLOCK D

Features running at 26° west of north can be detected over an area 65 m long to the west of block C. These features seem less dense than those of block C, and the overall plan is less easy to understand. As with block C, the southern-most feature is on a slightly different orientation from the rest of the block. The latter (feature 36D12) is well-defined to the south, at up to -11nT, and seems to describe a series of compartments to the east, each around 2.5×3.5 m. This feature corresponds to Building X of the Iklaina excavation, which has thick walls, and does not confirm the existence of the compartments.⁷⁵ A further series of compartments is seen at feature 36D13, and these seem to form the western edge of the built-up area. These are of the order of 4.5×4.5 m. Two are clearly defined, but their long east and west walls continue to the north and south. North of these, long linear features at 36D14 define walls partly excavated as Houses A and B of the Iklaina excavation.⁷⁶ To the south, at 36D15, a number of linear features on various orientations define the intersection between the two orientations of blocks C and D. As will be discussed further below, it is clear from those areas that have been excavated that only some features are detected in the magnetic data. Finally, feature 36D16, northwest of the others, is a square feature measuring 7.5×7.5 m, defined by linear anomalies rather broader than normal, measuring about -5nT. It is internally divided into two compartments.

BLOCK E

To the south of the benchmark area (the Cyclopean Terrace Complex of the excavation) several features on a consistent orientation 28° west of north (similar to that of block D) may be detected over an area of 29×16 m. These seem to project from the benchmark area and, after an interruption, continue at the edge of the survey area.

74. Part of Megaron Γ of the subsequent Iklaina excavation: Cosmopoulos 2009, 103-105; 2010, 46-48.

75. Building X: Cosmopoulos 2010, 40-41.

76. Houses A and B: Cosmopoulos 2008, 55-60; 2009, 101-103; 2010, 42-43.

The longest of the anomalies is 9.5 m in length, and up to -10nT in strength. These features have been excavated and the anomalies detected can be related to excavated walls, though as with block D, excavation has uncovered more complex and more numerous architectural features than those detected by the survey. A few features on the same orientation have been detected north of the benchmark area.

OTHER ANOMALIES

Numerous further weakly negative anomalies are indicated on fig. 36, often with a dashed line, to indicate the tentative nature of the interpretation. The long linear feature described above as feature 33D is represented here in its negative aspect by linear features noted along the northwest fringe of the survey area. In the western part of the survey area, between block D to the east and the benchmark area to the south, few secure features can be interpreted. Readings are generally disturbed in this area and difficult to interpret. Feature 17, to the west of the benchmark area, may be a built feature. It may relate to feature 39I in the resistance data, described below.

OVERVIEW OF RESISTANCE DATA

The resistance survey overall has been less successful than the magnetic survey in mapping and detailing areas of dense architecture. This is in part due to the lower sample interval of the resistance survey (one reading per square meter, as opposed to one reading per half-square-meter with the magnetic survey: hence the magnetic survey has four times the reading density of the resistance survey, and is thus much better placed for detecting architectural features that might be only 0.30 m or so thick). However, the resistance survey has detected features not well-elucidated by the magnetic survey, and so the two techniques have complemented each other quite well.

A glance at the overview of the resistance data in fig. 28 suggests the data can be viewed in three blocks. To the west, a number of important architectural features has been detected. To the south, far fewer features may be noted, and those that are most apparent (to the southeast) are probably modern in nature. To the north, the data seem dominated by broad linear features perhaps related to modern farming practices. However, even in the latter two blocks, archaeological features are also present.

The olive trees present throughout the survey area create positive anomalies in the data. This is caused by the presence of their root systems which consume water and hence can make the area immediately around the tree dryer than the soil between trees. Olive trees thus appear as rounded positive anomalies, often just a few ohms above surrounding readings, though sometimes creating a spike of 10Ω or more. Typ-

ically the effect is seen as an ellipse or circle of 2-4 m diameter, and their regular patterning in the data, often spaced at intervals of 8 m, makes their interpretation obvious. These features are not further discussed, but it is important to be able to recognize and dismiss them in examining the resistance data.

Some other modern features are clearly discernible in the data. A drainage ditch bisects the northern survey block (feature A on fig. 39) which is connected to a track running across the field at its northern end. A second drainage ditch is apparent at the eastern end of this block. East of drainage ditch 39A, most of the features noted in the interpretation are regarded as the result of modern agricultural practices. Some are narrow linear features and probably relate to recent field boundaries, but the main features are wide, broadly linear expanses of elevated resistance, covering most of the surveyed area east of the ditch 39A. These may be the result of damage to the subsurface through relatively deep ploughing.⁷⁷ This area was previously planted in vines (though now is an olive grove): ditches associated with the vines may in part be the cause of the strange anomalies in this area. It should be noted, however, that in the southeastern end of this survey block, notable quantities of surface pottery were recovered.

To the south, it is also likely that most of the features east of the line of drainage ditch 39A are of modern origin. Feature 39B is a field boundary and the additional line on the same orientation some 43 m west of the return in feature 39B is presumably part of the same system. The complex of ephemeral features around point 39C may in part be explained by repeated tractor routes through the field, prominently visible in several aerial photographs. The rectangular feature 39P is however very regular in form and some 20Ω above surrounding readings: this may represent a recent, small agricultural building; it is however possible this feature could be archaeological in nature. None of these features were surveyed magnetically, so it is not possible to compare the results. The features in the isolated survey block at the eastern end of the survey area are similarly difficult to interpret, as are those at the far northwest extension of the survey, which was somewhat downslope (and on a lower terrace): here the broad and featureless nature of the anomalies is similar to those of the northern block.

EVIDENCE FOR ARCHITECTURE IN THE RESISTANCE DATA

Good evidence for archaeological features is present in the western survey block and in the northern block to the west of the drainage ditch 39A. However, although

77. Cf. Boyd 2007, esp. fig. 1.

some anomalies are very clear, the majority are very slight in nature (differentiation from background of 5 Ω or less and irregular forms). Interpretation is in some cases aided by the clearer results of the magnetic survey and where this is the case this will be mentioned below. Otherwise some interpretations are tentative, and in some cases, erring on the side of caution, no interpretation is offered for possible archaeological anomalies.

The strongest anomalies show through clearly in the data and can be reasonably interpreted as stone-built features. Features 39D, 39E, 39F and 39G all form external aspects of the unsurveyable benchmark area, subsequently excavated as the Cyclopean Terrace Complex. Feature 39D is approximately rectangular in form and measures at most 16 $\times$ 7 m. This area was subsequently excavated and none of the internal detail present in the excavations is clear in the resistance data, but the approximate extent of the excavated Units T, S and Y is predicted.⁷⁸

To the east, feature 39E is a complex area of anomalies which appears to form a projection from the benchmark area which connects with a north-running anomaly. The latter runs north for some 15 m as a strong feature, and continues (with a slight northeast turn) as a fainter feature for another 35 m. A part of this feature north of the northeast corner of the Cyclopean Terrace Complex has been excavated in the recent campaigns (wall α).⁷⁹ At 20-30 Ω above background, this complex of features is strongly evidenced, even though it is hard to be precise about its form. The irregular form may simply be due to collapse.

A similar feature to the west, feature 39F, is an area of increased resistance some 10 m north of the northern edge of the Cyclopean Terrace Complex. It becomes a linear feature running north for at least 25 m, though is only a strong feature (20 Ω above background) for its first 7 m, subsequently only about 5 Ω above background. The linear part may be another wall, while the broader area of higher readings at the southern end may simply reflect collapsed masonry.

Further west, feature 39G is a strong (up to 60 Ω above background), broadly linear feature running approximately east-west. The feature is 15 m long as surveyed, but both its east and west ends are beyond the survey area. The feature becomes narrower toward its western end, and may be coming to an end near that point. It is about 6 m wide. Careful examination of the data has not allowed delineation of internal features, though the anomaly is strongest on its southern side, and is the only anomaly of such strength to be sustained over any distance (though the northwestern end of feature 39I, described below, is of similar strength). The most likely explanation is that in this area another strongly built feature, similar to the Cyclopean Terrace Complex

78. Cosmopoulos 2010, 34-38.

79. Cosmopoulos 2011.

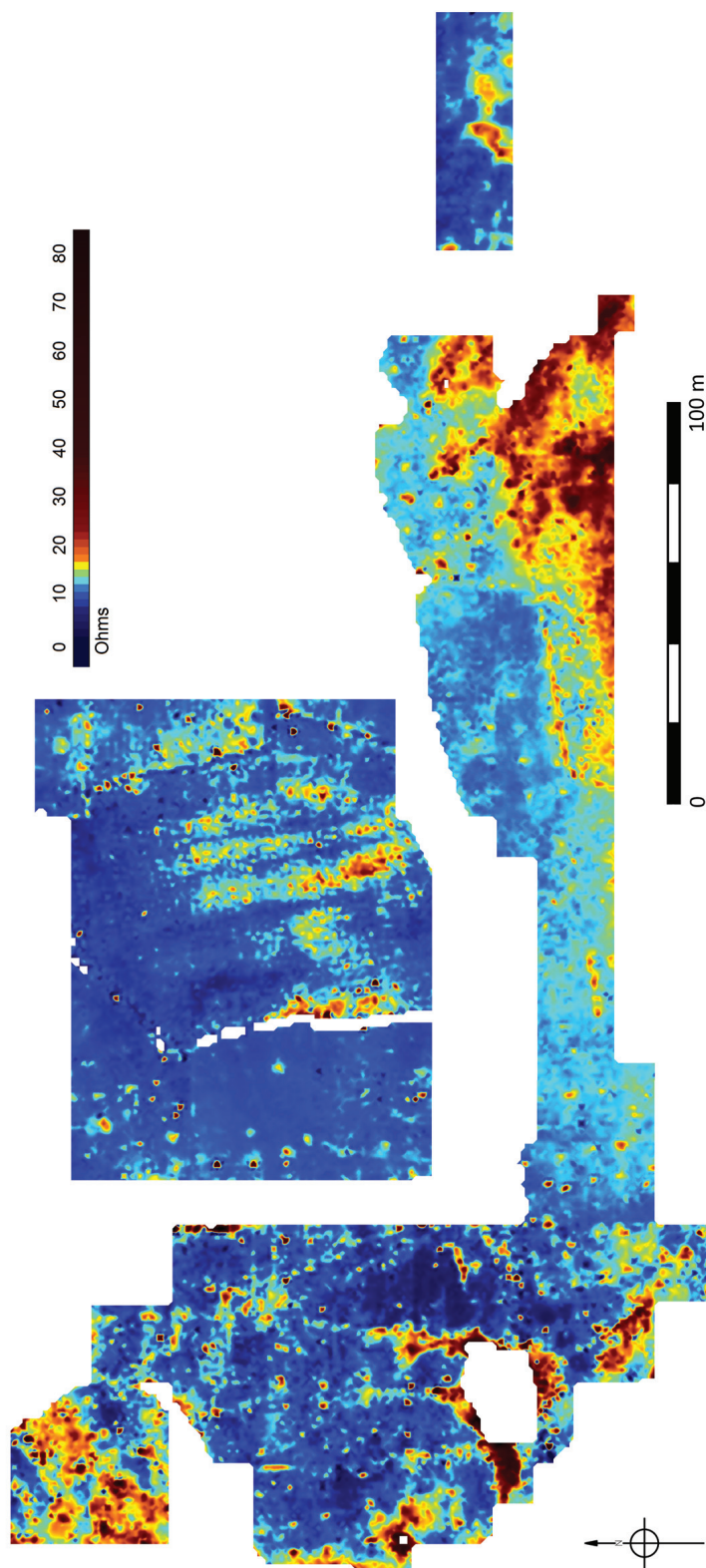


Fig. 37. Resistance data, emphasizing the strongest resistance anomalies.

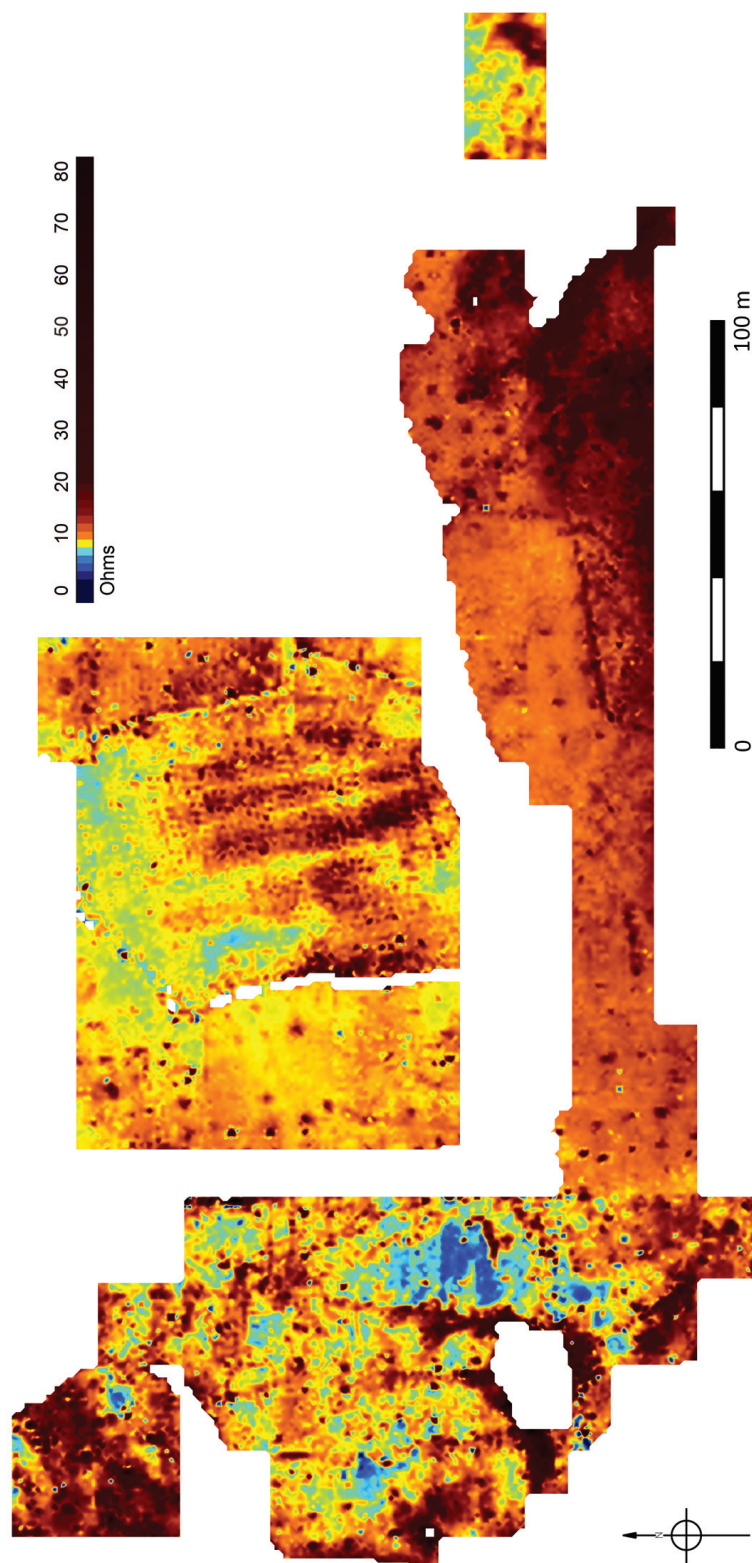


Fig. 38. Resistance data, emphasizing weaker resistance anomalies.

just to the east, must be located. It is just possible that bedrock close to the surface is causing the effect, but the archaeological explanation seems the more likely.

To the south, feature 39H is 16 m long on its clear eastern face. This probably corresponds to the excavated wall ST-002, with the return at the north end of the eastern face of feature 39H corresponding to the excavated wall ST-001.⁸⁰ However, the other features to the west in the resistance data are not well-represented in the excavation. They suggest the feature covers a total area of about 20×9 m, and may just continue slightly further south. The feature measures up to 30Ω above background to the east, and about 10Ω above background to the west. It is on the same orientation as features 39D and 39E.

To the northwest, feature 39I is one of the most significant of the resistance survey. It appears to outline a complete plan of a construction about 17 m long and 13 m wide at the northern end, and about 10 m wide at the southern end. The northern end is very strongly defined, reaching 50Ω above background. The plan is approximately rectangular at each end, with the two halves joined together by a narrower section in the middle. Some internal division is hinted at in the northern end. However, it seems likely this is a strongly-founded stone-built feature with solid floors, at least at the northern end. A faint linear feature runs east from its southern end and meets another faint, north-south linear feature which runs from feature 39G north for some 56 m. Its northern 7 m, marked as feature 39J on fig. 39, is much stronger and better defined than the remaining southern part of the feature, reaching 10Ω above background.

Feature 39K is approximately equivalent to feature 36D12 of the negative magnetic anomalies, and to the recently excavated as Building X.⁸¹ This feature reaches 20Ω above background and measures 10 m east-west, with a return measuring 4 m at the eastern end. This is similar to the excavated area of Building X, which features wide walls.

To the north of feature 39K, a series of very poorly defined linear anomalies lie at an angle equivalent to that of block D of the negative magnetic features. This orientation matches that of buildings subsequently excavated in this area. These anomalies are faintly detected and add little to the more detailed image offered by the magnetic data in this area. However they extend further to the north than is clearly seen in the magnetic data, covering a length of 54 m. Feature 39L, at the northern end, is better represented in the resistance data than in the magnetic. It is rectangular, 9.5×6 m, with a southern extension 7×5 m. The feature is at most 7Ω above background and its

80. Cosmopoulos 2010, 38-40.

81. Cosmopoulos 2011, pls 39-41.

raised internal level suggests a stone foundation or a layer of collapsed stone filling its interior, in contrast to the features immediately surrounding it.

To the north of feature 39L, feature 39M is a complex feature including several orientations, suggesting that parts of features of different periods make up the overall anomaly. Linear features are more clearly delineated at the eastern end, where both an east-west orientation and a second orientation, turned about 17° to the north, may be discerned. Further west, a series of small compartments is indicated, although the resolution is poor, and the underlying archaeological feature will undoubtedly be more complex in nature than indicated in fig. 39. Further north, some further linear anomalies may be detected, but these are very poorly defined, and some may not be archaeological in nature.

To the east of feature 39L, a few linear features on an east-west alignment equivalent to that of block C in the negative magnetic features may be seen. The clearest of these is feature N, which is in an area not well represented in the magnetic data, but suggests series of compartments 6 m wide and running for at least 18 m. These correlate with Megaron Γ of the recent excavation.⁸² Anomalies on this broad orientation continue on the other side of the modern track, where the edges of buildings correspond to negative magnetic feature 36C7. Immediately to the east of these, feature 39O corresponds to feature 33C, the probable path or road separating feature 33A from blocks C and D. It is represented in the resistance data over a distance of 28 m, running 3° east of north, and turning at its northern end a further 27° to the east. It appears to be about 2 m wide, with the eastern ends of the constructions of magnetic feature 33C7 mentioned above faintly visible as resistance features.

To the east of feature 39O, it is remarkable that the major magnetic feature 33A, interpreted as perhaps representing a large area of burned mud-brick, is barely to be detected. A few faintly linear features have been noted on fig. 39. The interpretation may be that the stone foundations of the building complex represented by feature 33A were either insubstantial, or are buried rather more deeply than those further west; it may be that both factors are relevant.

INTERPRETATION

Since the survey was completed in 2006, excavation at Iklaina has confirmed that both resistance and magnetic anomalies do indeed correspond with archaeological features. The excavation of complex Late Bronze Age architectural features has shown that the outlines detected by geophysical survey miss much of the detail found during

82. Cosmopoulos 2009, 103-105.

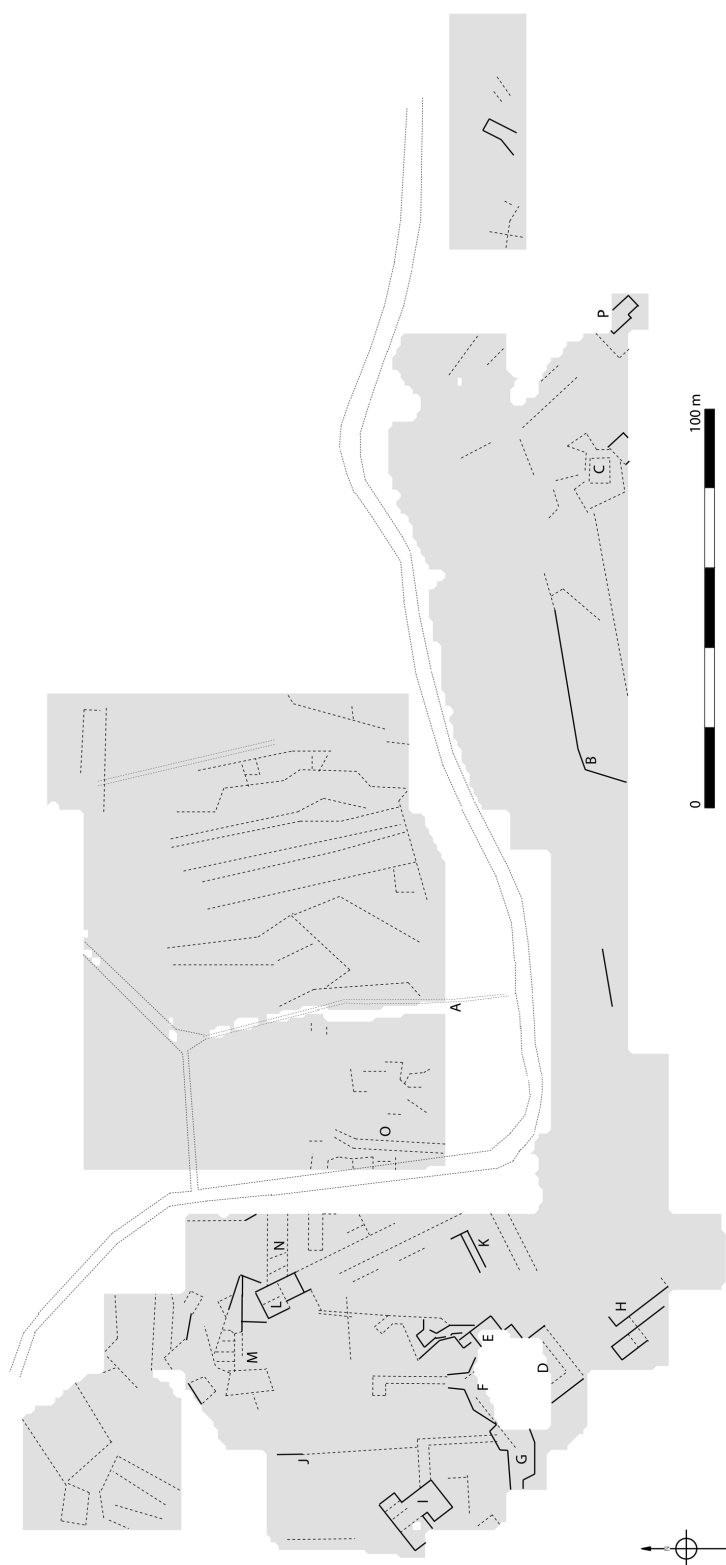


Fig. 39. Interpretation of resistance data.

excavation, as is to be expected. Survey has produced better results in certain parts of the site than in others, and the reasons for this are often not clear. However, the combined result of the two survey methods has, in the limited areas so far excavated, confirmed the accuracy of the interpretation, and this bodes well for confidence in the interpretation of the areas not yet excavated.

Survey has uncovered core and peripheral areas in the overall Iklaina site. The core areas are represented by blocks A, B, C and D (as defined above for negative magnetic features: fig. 36). Blocks A and B are divided from blocks C and D by the probable track feature 33C. Blocks C and D are easiest to interpret, both because of their clear and detailed appearance in the data, and because parts of both blocks have subsequently been excavated. Excavation showed that the buildings and orientation of block D pre-date those of block C. Block C consists of a series of well-planned buildings with internal divisions and external spaces. The details of block D are less clear but similarly consist of internal and external spaces. In both blocks some of the spaces seem rather large, but in some cases it may simply be that survey has not detected internal divisions, and so not much can be read into that. Apart from feature 33C dividing the core area in two, no further indications of routes of movement have been detected. To the east, in block B, the orientation matches that of block C and so may possibly be contemporary with it. Here however, to the north in block A, an area interpreted as the burned destruction of a mud-brick complex may simply be another block similar to C and D, destroyed in a conflagration. However the possibility is clearly present of this representing a complex of more specialized use. Its orientation differs again from blocks B, C and D, and on its west side it is tempting to reconstruct stronger walls with impressive entrances on the basis of the strong anomalies and right angles present in the data. If an impressive central complex, other than the Cyclopean Terrace Complex, exists at Iklaina, it may be preserved in block A, awaiting excavation.

Beyond these core areas, survey has detected numerous anomalies described above. These are often more isolated and so less amenable to interpretation. Some are clearly related to the area around the Cyclopean Terrace Complex (which was itself inaccessible during 2000-2005 and so could not be surveyed). Geophysical features to the south of this building can be shown to relate to subsequently excavated features, although the level of detail in the geophysics of these areas is notably poorer than the core area described above. Anomalies to the west and northwest of the Cyclopean Terrace Complex probably relate to another large and well-built structure. Long linear anomalies may well relate to stretches of walling originally noted by Marinatos.

Overall, survey has shown a densely occupied area of about 108×55 m at its greatest extent, with a further area to the west, about 62×100 m, containing significant,

though less dense, evidence of use in ancient times. Moreover, survey beyond these zones has confirmed that the edges of dense habitation have been reached, although some isolated features found beyond these zones may well be Bronze Age in date. It is interesting to compare this to the results of the fieldwalking survey (fig. 62). Pottery density was greatest around the Cyclopean Terrace Complex, and to the east of it (for up to 70 m). This area to the east is in fact rather quiet in the geophysical surveys, lying mainly to the south (and slightly downslope) of the main inhabited areas identified. It is to be suspected that the spread of pottery here is related to the slope, rather than to remains not found in the geophysical survey; this point will be clarified by further excavation. East of the farm track, the west part of feature 33A, feature 33C and in part block C are highlighted with raised levels of pottery collection; but while this correlates with feature 33C along its length, it does not correlate well with the east part of feature 33A and the western part of block C, or with block D. Further east, other areas of high pottery concentration do not correlate with major geophysical features. This rather mixed result emphasizes that the patterns of increasing and decreasing pottery density across the site do not necessarily correlate with preserved subsurface architecture.

It is also worth considering the soil chemistry study presented in the next chapter. There it is described how raised levels of magnesium, potassium, strontium and zinc are found at the same five sample points. One of these is located within feature 33A, perhaps confirming the hypothesis of burned destruction here. The other main concentration within the survey is east of the Cyclopean Terrace Complex and south of Building X, where, as noted above, a distinct increase in surface pottery was also noted, but where survey has not indicated near-surface architecture. Other concentrations are similarly not located in areas where geophysical survey has indicated finds. If excavation is carried out in these areas, it will be interesting to learn the cause of the increased levels of these elements – perhaps some more modern activity is responsible. Soil chemistry also located a copper concentration located on the west side of feature 33C, perhaps just at the wall of the building there.

CONCLUSIONS

Geophysical surveys of Bronze Age sites in Greece often suffer in their results in comparison with surveys of sites of later periods. The comparatively ephemeral nature of much Bronze Age architecture can lead to results that are difficult to interpret. In the present case, magnetic survey has produced a clear plan of subsurface architecture, with an additional large area of presumed burned destruction. Resistance survey has provided some confirmation of this and added further detail. Excavation

at key points has proven the accuracy of the technique, although in all cases, as is to be expected, the palimpsest of walls revealed in excavation is more complex than the outline plan produced by geophysics. The detail revealed in the present survey must cement the case for the routine use of geophysical prospection both as part of extensive surveys and prior to excavation in future projects in Greece.

SOIL CHEMISTRY AT IKLAINA

Catherine Scott, Michael L. Galaty, Timothy J. Ward, Christie Kokel Rodriguez

INTRODUCTION⁸³

This chapter presents the results of the chemical analyses of soil samples from Iklaina. The analyses were conducted using inductively coupled plasma – mass spectroscopy (ICP-MS) and aimed at producing additional information regarding intra-site organization of activity areas. More specifically, soil chemical analysis was used to distinguish broad activity areas at the main site (Site 1), such as those devoted to occupation and industry, versus those areas that may have been vacant. We focused on six elements: strontium, potassium, magnesium, lead, zinc, and copper. High levels of strontium typically indicate domestic occupation, while potassium and magnesium mark the presence of wood ash, and therefore places that were burned or where burning took place.⁸⁴ Lead, zinc, and copper may point to metal working.⁸⁵ The potential to identify metal working is particularly important at Iklaina, where, according to the Linear B tablets from Pylos, there should have been either smelting or working of bronze. As described below, the data from soil chemistry analysis also matched well the results of various other remote-sensing techniques used at Iklaina to investigate intra-site spatial organization, such as controlled surface collection, magnetometry, and electroresistivity.

Identification of large-scale, on-site activity areas has broad implications for Mycenaean archaeology. Determining how space was delineated and used on an archaeological site helps answer questions about its nature and function. The function of a site determines its structure, and so understanding how space was organized on a site is key to discovering how it was used. Use of space is sometimes difficult to reconstruct through excavation, in particular at large, complex sites such as Iklaina. By

83. We wish to thank the W. M. Keck Foundation and the National Science Foundation for the generous funding they have provided to The W. M. Keck Center for Instrumental and Biochemical

Comparative Archaeology at Millsaps College, where the analyses were conducted.

84. Middleton & Price 1996, 677-678.

85. Cook et al. 2005.

detecting the elemental signatures left behind by past human activities, soil chemistry analysis can reveal site structure in ways that avoid an over-reliance on artifacts and architecture alone.

Understanding the link between site structure and function is particularly important for Mycenaean archaeology in Messenia. Work done by PRAP led to the development of a site hierarchy for Messenia.⁸⁶ This hierarchy consists of the PN (first tier), district capitals (second tier), villages (third tier), and farms (fourth tier), determined by the size of the site as indicated by controlled surface collection of finds in archaeological survey. Iklaina is thought to be a second-tier site district capital, perhaps **a-pu₂*.⁸⁷ Because each site functioned differently within Mycenaean society, there should theoretically be clear structural differences between sites in each tier. Using Iklaina as an example, soil chemistry analysis should help identify and define the division of administrative, residential, and industrial spaces in Mycenaean sites, as well as Iklaina's own place in the archaeological landscape of Messenia. Soil chemistry can then be used in the future to distinguish second-tier capitals from other settlements, which is not always possible based on archaeological survey and Linear B data alone.

SOIL CHEMISTRY ANALYSIS IN ARCHAEOLOGY

Soil chemistry analysis is generally considered to originate with the work of Arrhenius in Sweden, whose 1929 study was the first to use soil phosphate to locate areas of human activity in the past.⁸⁸ Since then, the technique has developed along multiple trajectories, allowing archaeologists to employ it at various scales and at various levels of resolution in order to answer a number of different research questions. The type of soil chemistry analysis employed at Iklaina relied on the simultaneous analysis of multiple elements, and therefore this review will focus primarily on the development of such multi-element analyses. It is worth noting, however, that the other major branch within soil chemistry analysis is focused on the study of phosphorus, predominately through spot testing for site prospection.⁸⁹

There are two premises upon which soil chemistry rests: first, that different human activities introduce identifiable chemical residues into the matrix of the archaeological record; and second, that these residues can be identified by archaeologists – sometimes thousands of years later – through elemental analysis. The first of these premises is well understood and documented, though some processes of deposition are more apparent than others. For example, it is obvious that the burning of wood in

86. Davis 2008, 134-135.

87. Cosmopoulos 2006a, 2006b.

88. Arrhenius 1929.

89. E.g., Thurston 2002; Sarris et al. 2004; Salisbury 2012; but see Rypkema et al. 2007 for an alternate method.

hearth, disposing of waste in middens or animal pens, and industrial activities like metalworking and perfume production deposit large amounts of material into the soil at the locations where they take place. Soil chemistry studies have also found evidence for other sorts of less-obvious, more specialized activities⁹⁰ and can be used to complement other techniques that focus on archaeological “traces,” like micro-debitage analysis.

The second premise, that elemental residues are preserved for long periods and can be identified through elemental analyses, remains largely untested, which contributes to much of the ambiguity in soil chemistry. For the most part, the elements introduced into the soil matrix by human activities are immobile and resistant to leaching. Phosphorus – which is comparatively well understood and frequently discussed because of its importance to both archaeology and soil science – tends to bond quickly with elements common in most sediments (like iron and aluminum) and to remain stable for long periods of time.⁹¹ However, as Holliday and Gartner describe in their extensive review of phosphate analysis in archaeology,⁹² the variety of processes by which phosphorus is incorporated into the soil matrix causes it to be held in many different species and fractions, which can make extraction and analysis difficult. One of the advantages of multi-element analysis is, therefore, that such methods typically use total elemental extraction, reducing the possibility that significant fractions of any one element of interest, such as phosphorus, might be measured incorrectly. Unfortunately, the way in which elements are stored in the soil matrix also causes a significant disadvantage of multi-element analysis, as compared to phosphate analysis. The many elements which one considers during the course of a multi-element analysis are stored in the matrix in many different ways, and are therefore differentially subject to movement and leaching according to the chemical composition of the soil and the local environment. Thus, the soil chemistry of each element in a multi-element analysis must be considered separately, which is made difficult because there is limited discussion of such issues in the archaeological literature, especially as compared to phosphorus.

Though there are examples of soil chemistry studies using multiple elements from as early as the 1960's,⁹³ multi-element analyses, as they are conducted today, are a relatively recent development, made possible by technologies which allow for the rapid, simultaneous measurement of a large suite of elements. The most common methods used are atomic absorption spectroscopy (AAS), inductively coupled plasma-emis-

90. Such as jade processing at Piedras Negras: Parnell et al. 2002.

91. Holliday & Gartner 2007, 302.

92. *Ibid.*

93. Cook & Heizer 1965.

sions spectroscopy (ICP-ES), and inductively coupled plasma-mass spectroscopy (ICP-MS), though some recent studies have begun looking into the utility of portable x-ray fluorescence (pXRF) as well.⁹⁴ Due to the fact that all of these machines are able to produce data on a large number of elements (generally ranging from 20-60), soil chemistry studies have progressively moved towards the inclusion of more and more elements, followed by multivariate statistical analysis to determine which elements vary significantly within a particular context. Analyses using more elements have also helped to produce a large repository of data regarding the relationship between groups of elements and specific activities from sites around the world.

Based on the archaeological and soil chemical literature available, six elements were of particular interest at Iklaina (Table 8). We did not study phosphorus (P), since P is typically most useful during site identification. Generally speaking, P levels at Iklaina were very high across the site, making it less useful for determining activity areas.

ELEMENT	DEPOSITION	INDICATIVE OF
Magnesium (Mg)	Wood Ash	Hearths, Burning
Potassium (K)	Wood Ash	Hearths, Burning
Strontium (Sr)	Organic Waste	Occupation
Zinc (Zn)	Metalworking	Industry
Copper (Cu)	Metalworking	Industry
Lead (Pb)	Metalworking	Industry

Table 8. List of elements analyzed at Iklaina.

Magnesium (Mg) and potassium (K) are both extremely common elements considered in soil chemistry studies all over the world. Both elements are particularly indicative of burning, and K in particular is correlated with cooking.⁹⁵ As such, in combination, Mg and K are good indicators of the presence of hearths, domestic or otherwise.

Strontium (Sr) is also a common element studied in multi-element analyses. Like phosphorus, Sr is deposited in high quantities in human and animal waste, and is also produced by decaying bodies, though this last correlation is less likely to be use-

94. See Gauss et al. 2013 and Hayes 2013 on the use of pXRF in soil chemistry.

95. Clark & Tamimi 1984; Ottaway & Matthews 1988; Middleton & Price 1996; Entwistle

et al. 2000; Middleton 2004; King 2008; Hjulström & Isaksson 2009; Knudson & Frink 2010; Misarti et al. 2011; Vyncke et al. 2011; Dirix et al. 2013; Gauss et al. 2013; Milek & Roberts 2013.

ful within the context at Iklaina.⁹⁶ A study done by Knudson and Frink in Alaska has also suggested that Sr is correlated with fish processing.⁹⁷ In general, however, Middleton and Price argue that Sr is most useful as an indicator of occupation areas;⁹⁸ studies of Mesoamerican houses have shown that Sr tends to be distributed somewhat evenly across floors, whereas elements like the aforementioned Mg and K tend to have more limited distribution in and around features.⁹⁹

Zinc (Zn), copper (Cu), and lead (Pb) are also all generally agreed upon as useful elements for identifying functional areas within sites.¹⁰⁰ All are linked in one way or another to industry. Work done by Cook et al. at Roman sites in Britain is particularly useful in this regard.¹⁰¹ They were able to use these elements to differentiate industrial hearths from domestic hearths at sites where metalworking was known to have been performed. Cu is of particular interest at Iklaina, as there is epigraphic information suggesting that the people at Iklaina were working bronze.¹⁰²

Soil chemistry has, as of yet, had limited application in the Mediterranean, though it is a well-established technique in other regions of the world, including Britain, Scandinavia, and Mesoamerica. In Greece, both phosphate analysis and multi-element analysis have been applied as part of survey methodologies. The first example of this comes from the Laconia survey, in which Cavanagh et al. used phosphate analysis as a way to reassess the site boundaries of Roman-era farmsteads.¹⁰³ Bintliff et al. used multi-element analysis as an aid to site prospection, taking samples along extensive transects and identifying unusually high concentrations of trace metals.¹⁰⁴ More recently, two studies have been conducted at and around the site of Sagalassos in Turkey, one also oriented towards intra-site survey and the other towards household archaeology.¹⁰⁵ Work at Iklaina should therefore contribute to the growing literature on soil chemistry in the Mediterranean region.

BACKGROUND ON IKLAINA

According to information from the Linear B tablets concerning **a-pu₂*, there should be evidence for a variety of activities at Iklaina. First, because it is a district capital, the settlement should have been well populated and would have had an administra-

96. Ottaway & Matthews 1988; Middleton & Price 1996; Entwistle et al. 2000; Middleton 2004; Wilson et al. 2005; Pollard et al. 2007; King 2008; Dirix et al. 2013; Gauss et al. 2013; Milek & Roberts 2013; Misarti et al. 2011; Vyncke et al. 2011.

97. Knudson & Frink 2010.

98. Middleton & Price 1996, 679.

99. *Ibid.* 679-680.

100. Bintliff et al. 1992; Aston et al. 1998; Cook

et al. 2005; Pollard et al. 2007; Wilson et al. 2008; Hjulström & Isaksson 2009; Cook et al. 2010; Dirix et al. 2013; Gauss et al. 2013; Vyncke et al. 2011.

101. Cook et al. 2010.

102. Cosmopoulos 2006a, 217.

103. Cavanagh et al. 1988.

104. Bintliff et al. 1992.

105. Dirix et al. 2013 and Vyncke et al. 2011, respectively.

tive function. There should be evidence for a mix of private and public spaces. The tablets also indicate that a significant amount of bronze-working took place at **a-pu₂*, with seven of nine bronze smiths receiving allocations from the palace. There should be evidence for industrial spaces, perhaps segregated from other, non-industrial spaces. Finally, there seems to have been some ritual activity which took place at **a-pu₂* and the site may have even contained a shrine.¹⁰⁶ There should be evidence for gathering spaces, which would have lower elemental levels than surrounding areas.

IKAP's intensive regional survey between 1999 and 2006 produced various forms of archaeological spatial data, such as surface pottery concentrations (e.g. fig. 62) and geophysical survey (e.g. figs 27 and 28). For the purposes of soil chemistry analysis, the most applicable data have been combined with the archaeological and geophysical data.

Some of the buildings uncovered thus far through excavation at Iklaina appear to have been administrative in nature.¹⁰⁷ It seems likely that Iklaina's administrative zone was located at the western end of the settlement. The rest of the site may have been given over to domestic occupation, industrial activities, and public gatherings.

METHODS

A total of 31 samples were collected, primarily in four transects running east and one running north (see fig. 40).¹⁰⁸ Additional samples were also taken from what appears to be a burned area to the east – identified by the magnetometer – and a small terrace off the ridge to the southwest (CC029). Though we had originally hoped to take more samples to the south and west, the ridge which bounds the site limited sampling in those directions. The terrace itself had little more than 10 cm of soil above bedrock, so no additional samples beyond the one mentioned were taken. The samples were all collected with an Oakfield corer. After digging through the plow zone, the corer continued through approximately 30 cm of soil down to the cultural layer (except in the case of the terrace). Only the soil taken from the known cultural layer – approximately the bottom 10 cm – was collected for analysis.

The transects to the east and north were laid prior to sampling; the transects to the east extended 280 m east and 120 m north of the datum point on the eastern side, and 120 m north of the northern edge of the site. Though the site itself has been cleared, it is surrounded by fields of olive trees which have been ploughed regularly for at least the past 50 or 60 years. In 2009 there were some fields which had been recently ploughed, and others which had not been ploughed for the past few years.

106. Cosmopoulos 2006a, 217.

107. Cosmopoulos 2009.

108. Samples were collected over the course of

four days in the summer of 2009 with the help of Chris Mundigler and Jennifer Glaubius.

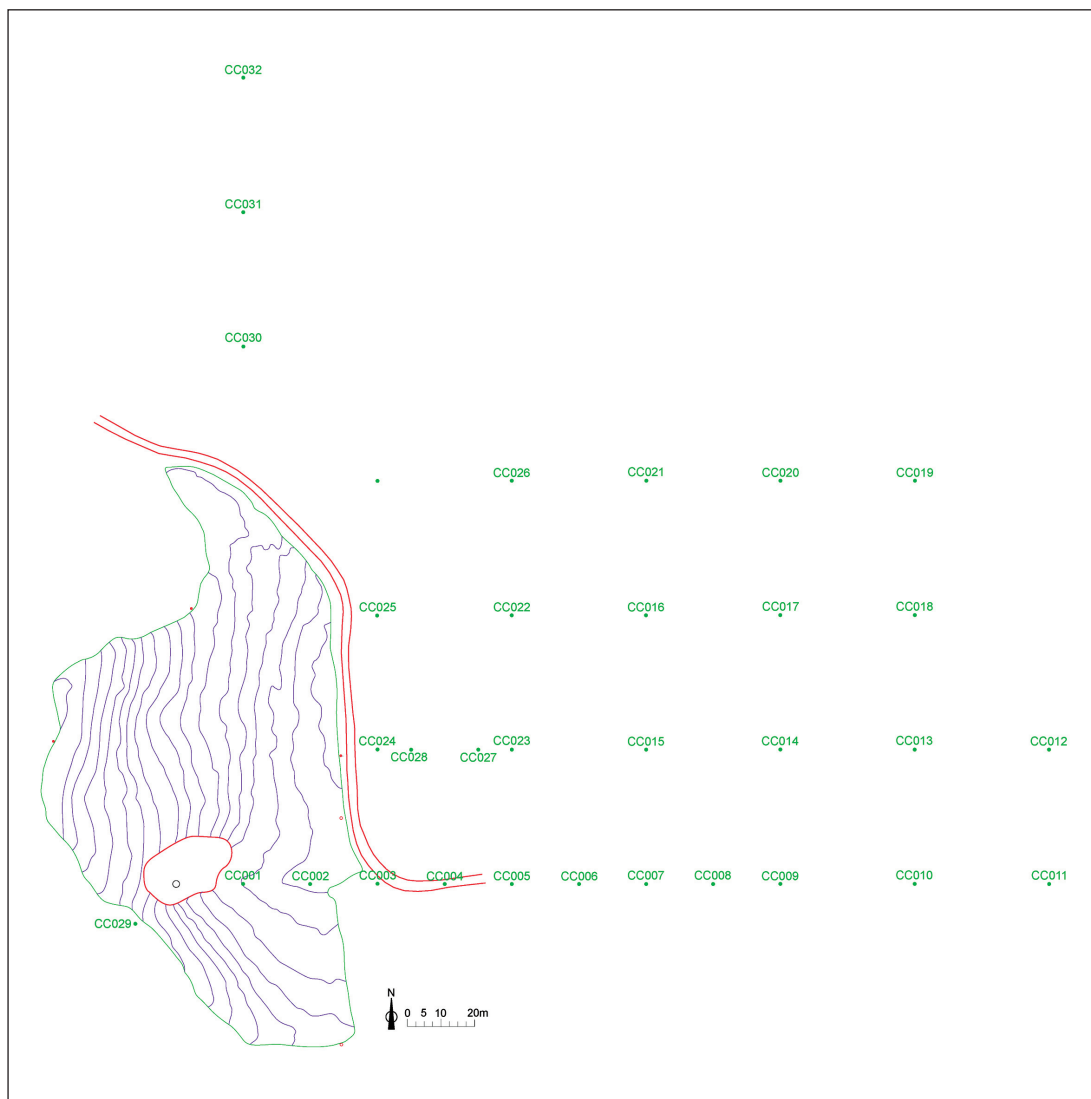


Fig. 40. Map of sample locations (created by Chris Mundigler, IKAP).

In the case of freshly ploughed fields, we dug down through the top layer of loose soil before taking the samples, in order to reach more easily the cultural layer and to avoid possible contamination from fertilizers and other chemicals. In the fields which had not been ploughed recently, the soil had hardened into furrows with a ca. 1.5 m distance between the top and bottom of the furrow; as such, the samples were taken from the lowest point possible.

The samples were taken to Athens and inspected by the Greek Institute of Geological and Mineral Exploration (IGME), before transported to the lab in the United States. In the lab, each sample was ground using a porcelain mortar and pestle, and

placed in a test tube. It was then run through a digestion microwave twice. In the first digestion, 100 micrograms of the sample were diluted with Hydrofluoric acid and Nitric acid and microwaved for thirty minutes at 180°C. For the second digestion, Boric acid was added, and the sample was microwaved again for 30 minutes at 180°C. After the digestion, each sample was placed into a 50 ml sample tube and diluted with 20 ml of a 1% Nitric acid solution. Finally, an aliquot was taken with a pipette syringe and diluted to 10 grams, again with a 1% Nitric acid solution.

The ICP-MS itself was tested every morning before any new samples were run. The first test was a sensitivity check, in which the machine had to produce results with a deviation under 5%. Tests were also run to make sure that the results were within 10% of the standard deviation when measured in parts per billion. Each sample was subsequently run at least two times, and the final numbers mapped represent an average of both runs.

RESULTS AND DISCUSSION

The analysis of the soil samples from Iklaina produced very interesting results. First of all, the soil chemical data are significantly patterned and strongly correlate with the map of surface pottery densities made prior to excavation (figs 41, 42, 43, 44). As described above, the elements we tested typically indicate some sort of activity, whether domestic occupation or industry; pottery concentrations tend to indicate the presence of sub-surface areas of human activity. The fact that the two datasets match supports the viability of soil chemistry as a large-scale method of data collection and prospection. Soil chemistry may serve, therefore, as a proxy indicator of subsurface archaeological remains and help guide decisions about where to excavate.

There also appear to be significant patterns in the soil elemental data. The maps for Mg, K, Zn, and Sr show the same basic pattern (figs 45, 46, 47, 48). Each element appears to peak in the same five spots (P1-P5). This would seem to suggest the presence of sub-surface structures of some sort. In particular, high levels of Mg, K, and Sr suggest the presence of houses,¹⁰⁹ while Zn in these areas further suggests some sort of industrial activity, perhaps smelting.¹¹⁰ Thus, there is good evidence from soil chemistry for a mixed-use domestic-industrial zone in the areas directly east of site center, close to the administrative buildings but not amongst them.

There is also a distinct chemical void on each of the maps, located to the north of the industrial zone, between the site center and the site's northeastern hinterland. This may indicate some sort of open space, such as a large courtyard or communal gath-

109. Middleton & Price 1996.

110. Cook et al. 2010.

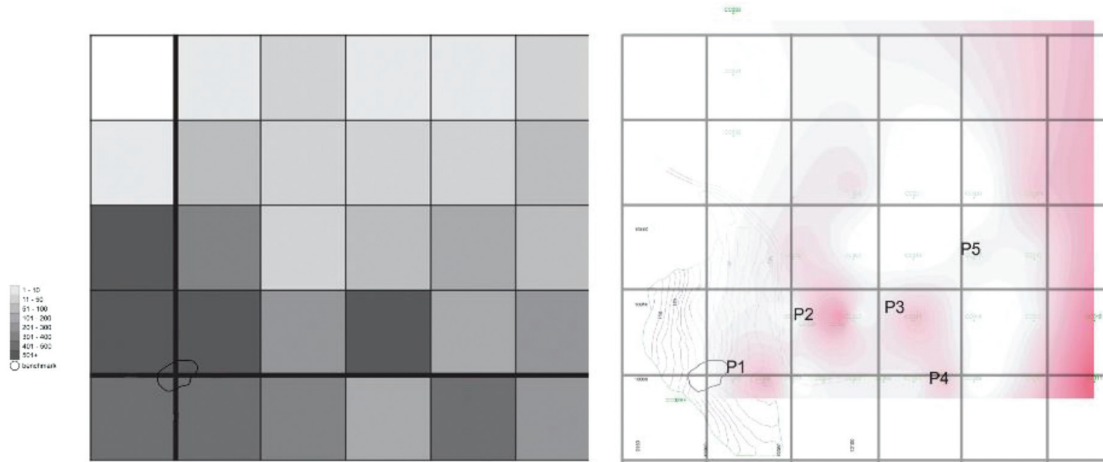


Fig. 41. Mg (right) and pottery concentrations (left; white represents lowest concentrations).

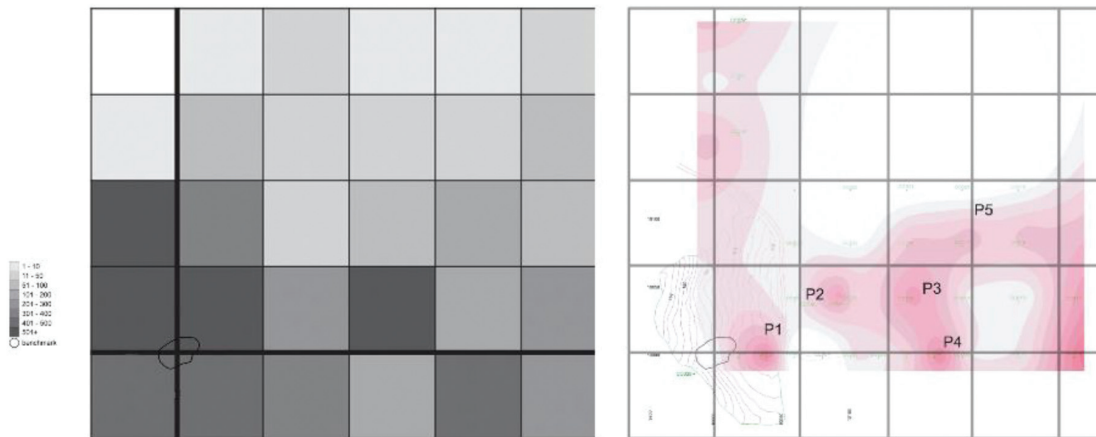


Fig. 42. K (right) and pottery concentrations (left; white represents lowest concentrations).

ering area, which was free from structures.¹¹¹ That it is situated at the edge of the settlement is certainly no accident, and reinforces the idea of an existing social hierarchy at Iklaina, which is reflected in the settlement's spatial organization.

The results from the soil chemistry analysis also provide more information on features observed through magnetometry and electroresistivity. As described above, feature 33A is the most significant feature mapped through geophysical survey. This fea-

111. Cavanagh & Mee 1984.

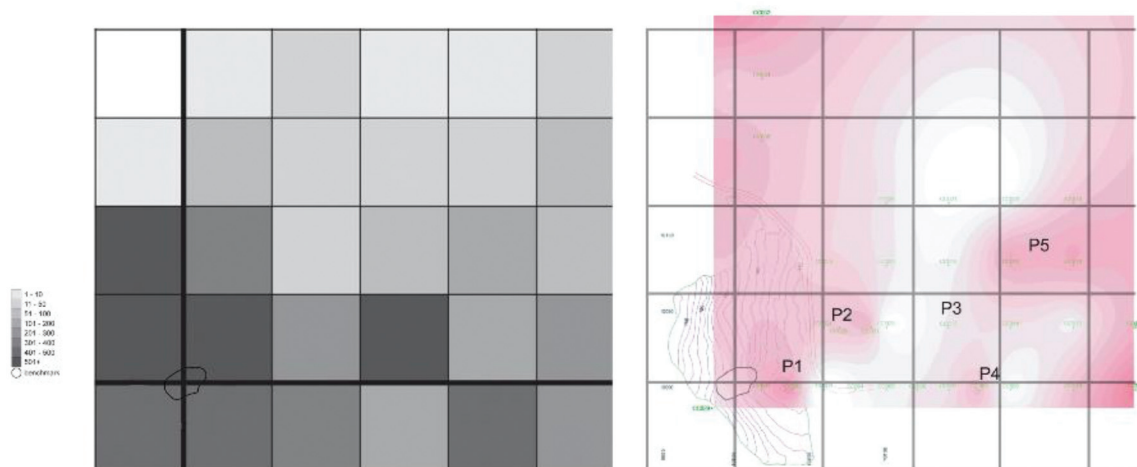


Fig. 43. Zn (right) and pottery concentrations (left; white represents lowest concentrations).

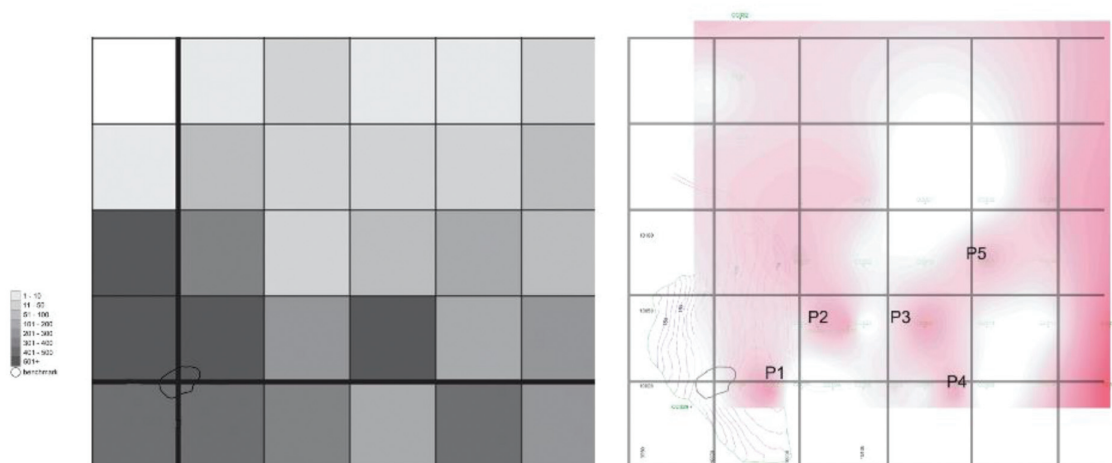


Fig. 44. Sr (right) and pottery concentrations (left; white represents lowest concentrations).

ture correlates directly with P2, is high in all four elements tested, and is also the area of highest Cu concentration, many times higher than all other samples (figs 49, 50, 51, 52). High levels of Zn and Cu provide good evidence for metal working in this part of the site. Feature 33A, which may be a large building, is surrounded by a halo of positive magnetism that may indicate wall fall, but is also characterized by relatively low soil-chemical concentrations. The possible road, Feature 33C, is likewise associated with relatively low concentrations. Finally, P4 and P5 are located close to features 30F and 30J, which may be kilns and are close to the area of highest lead concentration.

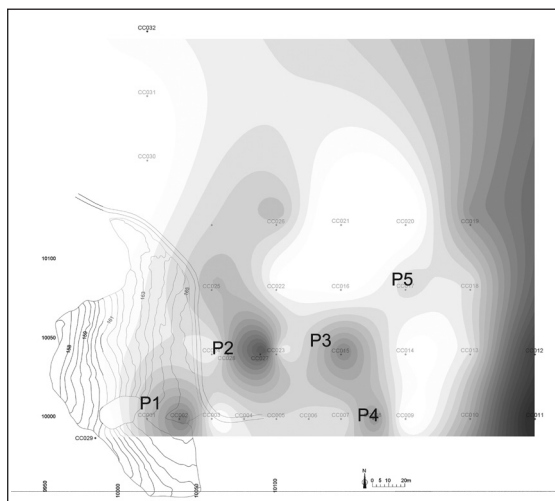


Fig. 45. Mg concentrations (white represents lowest concentrations).

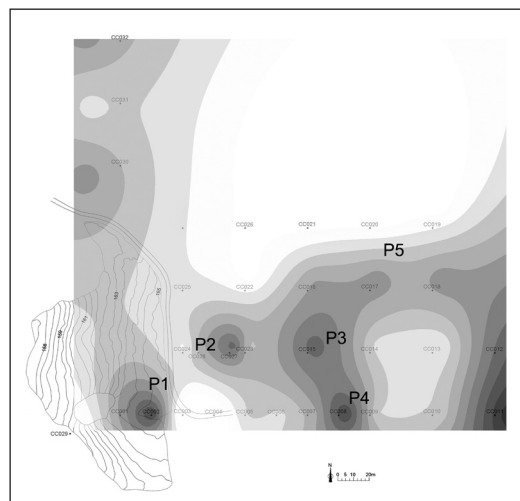


Fig. 46. K concentrations (white represents lowest concentrations).

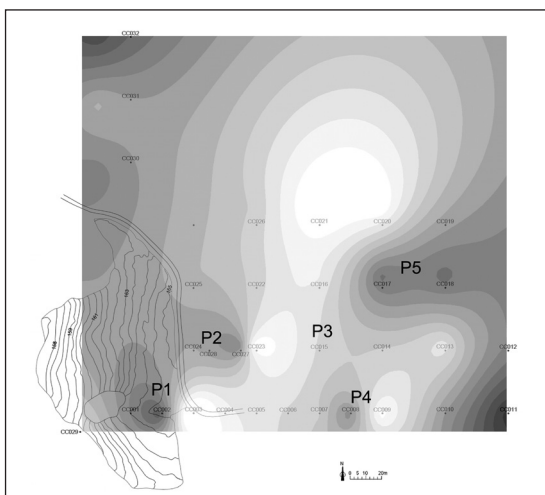


Fig. 47. Zn concentrations (white represents lowest concentrations).

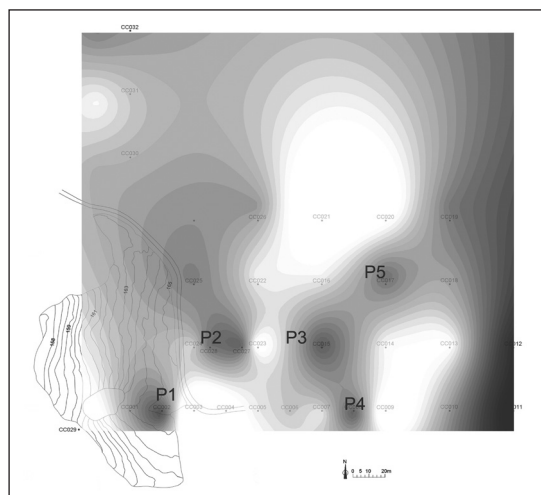


Fig. 48. Sr concentrations (white represents lowest concentrations).

CONCLUSIONS

As described at the beginning of this chapter, in conducting ICP-MS analysis of soils from Iklaina our primary goal was to investigate the organizational structure of the settlement by mapping activity areas. We managed to distinguish areas of indus-

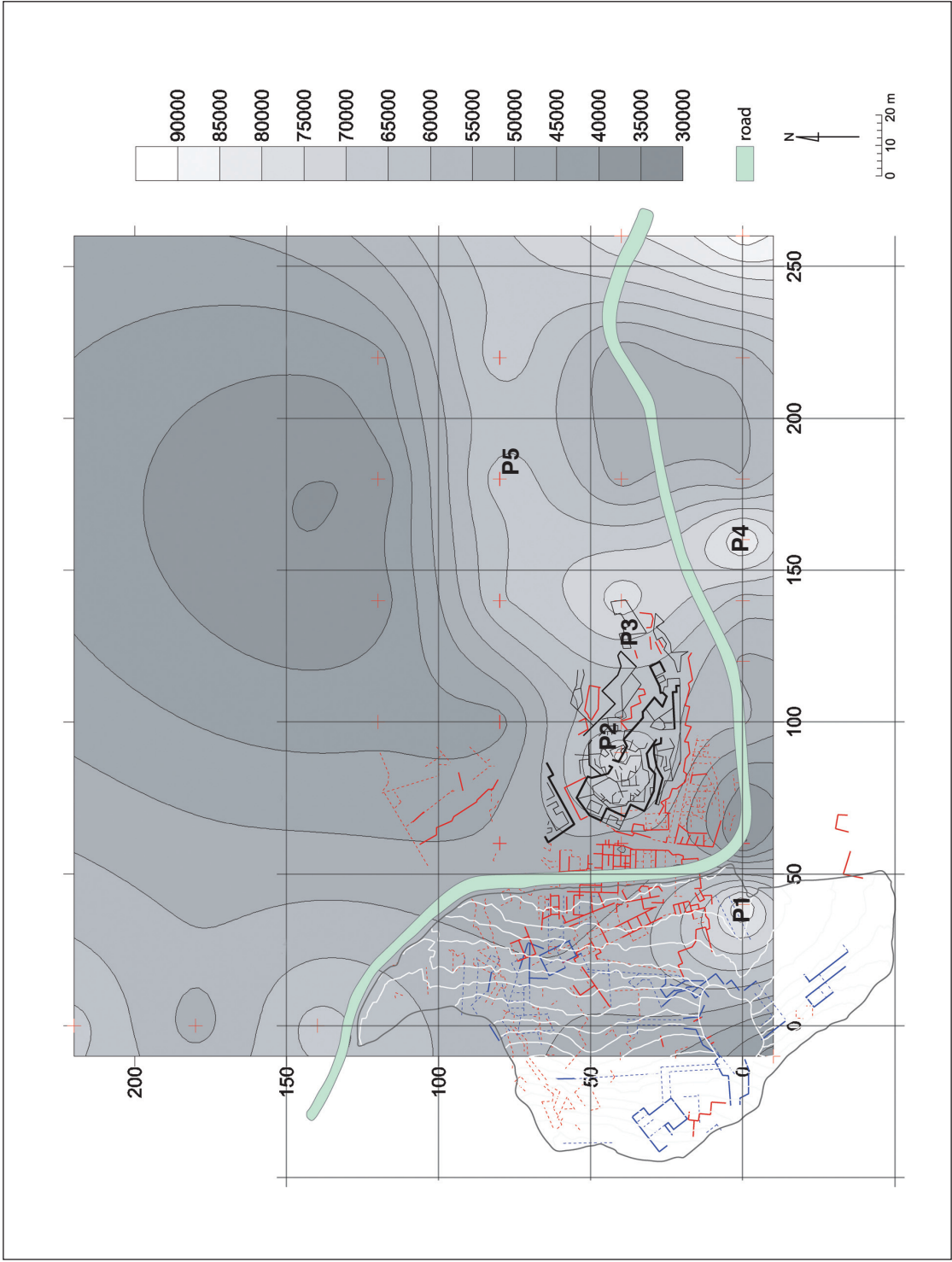


Fig. 49. Zn and geophysical results.

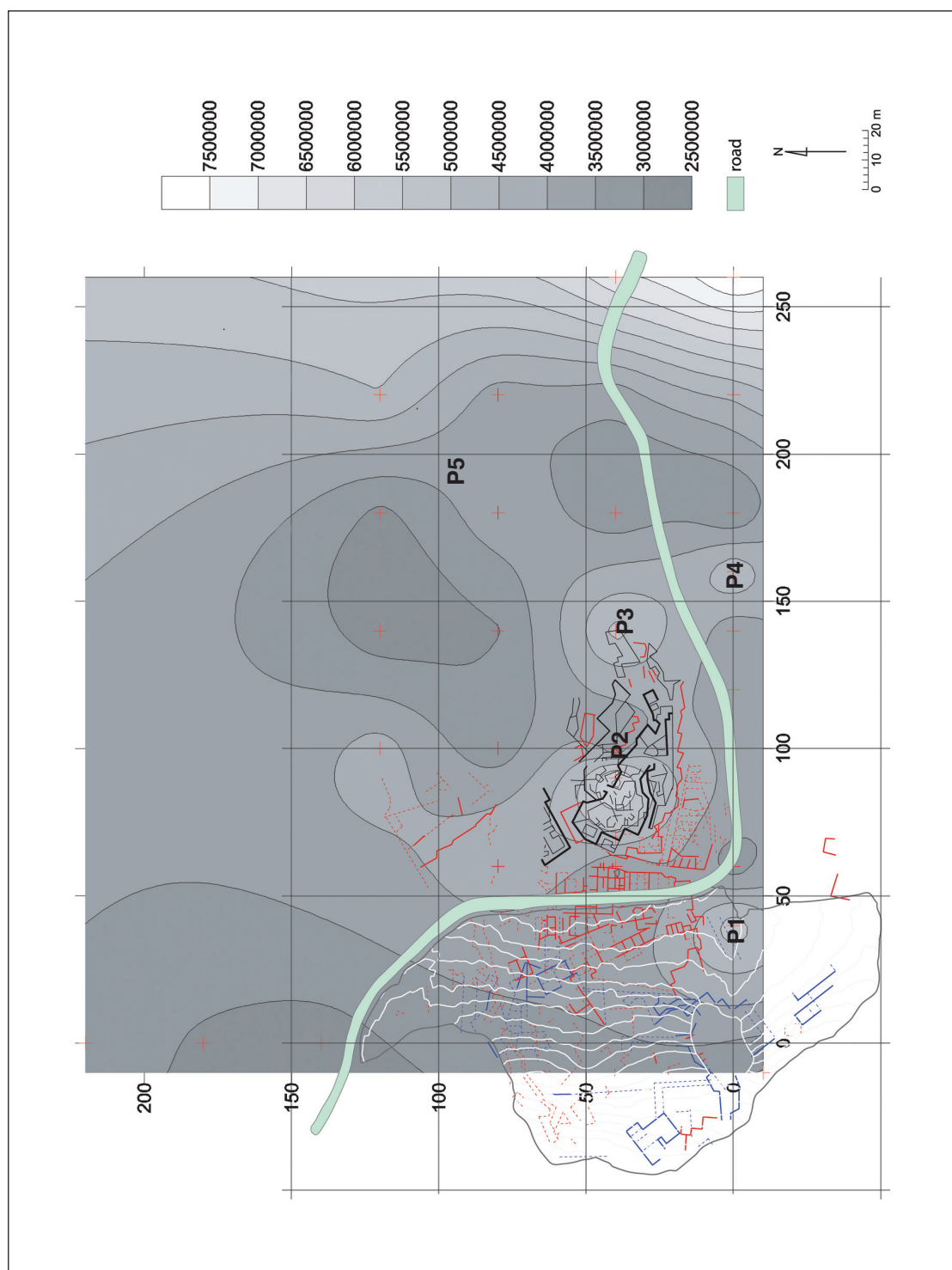


Fig. 50. Mg and geophysical results.

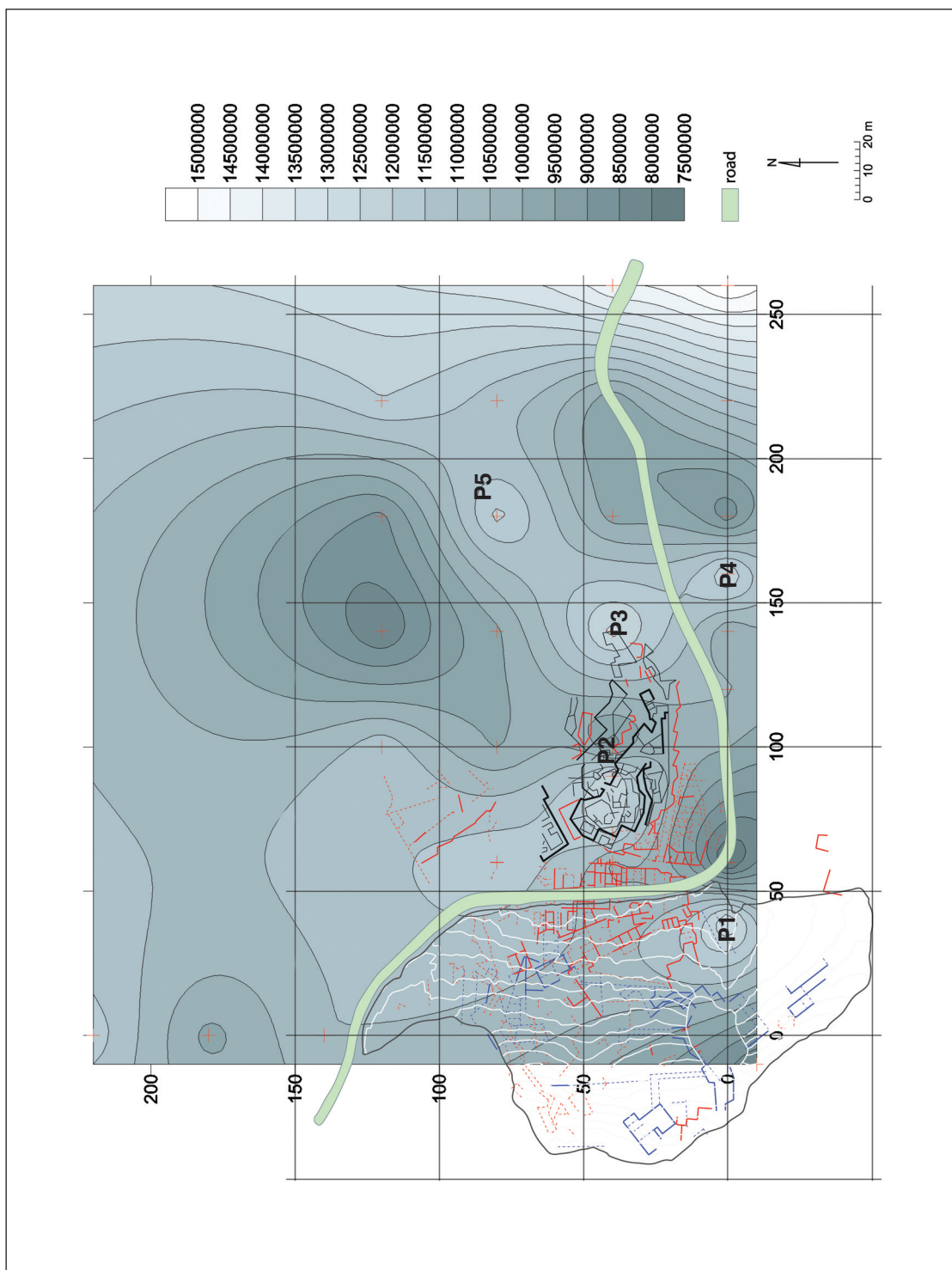


Fig. 51. Sr and geophysical results.

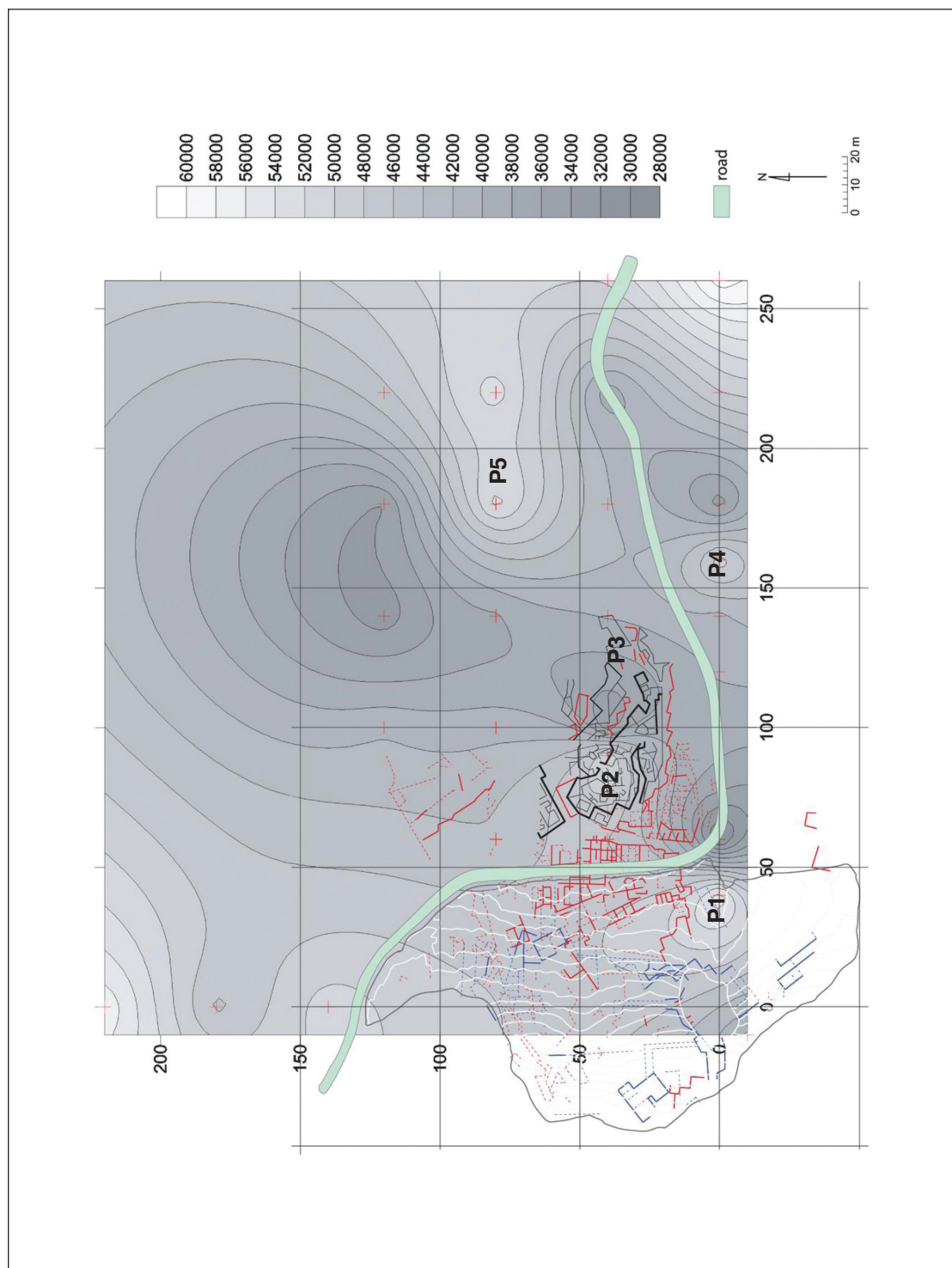


Fig. 52. K and geophysical results.

trial versus domestic activity based on soil chemistry. Domestic zones are high in K, Mg, Sr, while industrial zones are high in Zn. High levels of Cu and Pb in some areas may point to metal-working or kilns. The soil chemistry also clearly defines areas where there was a lot of activity as opposed to those where there was little, as evidenced by the void seen in the maps. It is not entirely clear what this latter feature is: it could indicate a field for agriculture or animals, or perhaps some sort of courtyard; it is hoped that its specific function will become clearer with the continuation of the excavation.

That said, the present significance of large-scale, on-site, multi-elemental soil-chemical analysis becomes most clear when one considers the importance of site organization and structure to understanding a settlement's position in the Messenian settlement hierarchy. Nichoria, for example, which has been fully excavated,¹¹² demonstrated little differentiation between administrative, residential, and industrial spaces, as compared to Iklaina. Rather, these sorts of divisions seem to be predominately a later "palatial" feature, reminiscent of the separation of the PN from the rest of its associated town by, possibly, a fortification wall.¹¹³ Why is it that Iklaina, which is still thought to be a second tier district capital like Nichoria, looks so much more like the palatial center than sites on its own tier of the settlement hierarchy? Might Iklaina's position in the Hither province, and its proximity to the palace, explain this phenomenon? Because the Linear B tablets do not indicate any particularly special relationship between **a-pu₂* and the palace, functional and perhaps chronological explanations currently seem to provide the best answers to these questions. If Iklaina was a settlement dedicated to industrial-scale metal working, this would have affected the spatial organization of the site. Likewise, given that **a-pu₂* had only recently been incorporated into the Pylian state, divisions of space that had been created at Pylos to emphasize social differences were only just coming on line at Iklaina at the time of its destruction and were scarcely present at Nichoria in the FP.

All these conclusions are, of course, preliminary. However, soil chemistry analysis has proved in the case of Iklaina to be a valid and significant survey technique. It is reliable, and can be employed over large areas; these conclusions suggest that it can produce information that could not be gathered in other ways prior to excavation. Though much more testing is required before soil chemistry data can be interpreted easily and accurately by archaeologists, these results suggest that there are high hopes for the future of this technique in archaeology. In short, soil chemistry analysis is potentially a very valuable survey tool for archaeological projects in the future, particularly in Mycenaean Greece.

112. McDonald & Wilkie 1992.

113. Davis 2008, 56; cf. Blegen et al. 1973, 8-18.

THE ARCHAEOLOGICAL SURVEY

Michael B. Cosmopoulos

SCOPE AND METHODS

The IKAP survey was not a self-standing project, but part of a larger program of research into Mycenaean administration and state formation. Our objective was not to reconstruct regional history in the *longue durée*,¹¹⁴ but to investigate settlement pattern and hierarchy in one of the districts of the kingdom of Pylos and determine whether Iklaina: *Traghanes* could have functioned as a district capital. Although we did record all surface artifacts that we encountered and included in the Gazetteer brief descriptions of all finds, this was done only so that a record of their existence could be preserved and made available to colleagues working in other periods.

The site-specific focus of our work dictated also another methodological decision, which was to adopt the “site” as the basic unit of analysis. It is now a common tenet that surface concentrations of artifacts constitute a more or less continuous archaeological landscape and that both large and small concentrations exist outside the traditionally defined sites. In recent years, surveys in Greece and around the Mediterranean have been paying increasingly more attention to such small concentrations, especially as various theoretical and methodological advances have increased artifact recovery rates; such advances include the development of intensive field methods, enhanced quantification techniques,¹¹⁵ and greater awareness of the biases involved with recovering survey datasets.¹¹⁶ A varied terminology, ranging from “non-sites” to

114. Which is often the case with current archaeological surveys in Greece (cf. Cherry et al. 1991; Davis 1998 and 2008; Cavanagh et al. 2002 and Cavanagh et al. 2005; Tartaron et al. 2006). The Saronic Harbors Archaeological Research Project (Tartaron et al. 2011) focuses on the Mycenaean period at Kalamianos, but has resulted from the discovery of the site during the broader diachronic Eastern Korinthias Archaeological Survey.

115. For earlier discussions, see Cherry et al.

1991, 46-47 and table 3.4, where comparative figures for background and on-site artifact densities from various surveys are presented. Cf. Plog 1978, 365; Gallant 1986, 408; also Nance 1981, 155 ff.

116. Such as visibility (Van Leusen 2002; Banning et al. 2006; Banning et al. 2011. Cf. also the earlier works by Wilkinson & Tucker 1995; Brown 1997, 42; and Taylor 2000); or post-depositional history (Bintliff et al. 2007; Millett et al. 2000; Taylor 2000; Van Leusen 2002).

“scatters” to “limited activity sites”,¹¹⁷ has been introduced to define small concentrations of surface finds and different suggestions have been put forward in order to explain them, ranging from remains of agricultural activities (e.g. manuring) to disposal of broken pottery and tiles, or places for the manufacture of lithic tools.¹¹⁸ Such distinctions have allowed the development of “off-site” or “siteless” approaches¹¹⁹ that are prevalent in many of today’s surveys. At the same time, some projects opt to preserve the “site” as the basic unit of analysis, but incorporate into their methodology tools that allow them to differentiate between areas within sites that were used for different purposes (indoor vs. outdoor, residential vs. agricultural vs. industrial, etc.), duration and intensity of use (intensive and longer-lasting vs. ephemeral and cursory use), or even depositional history (primary vs. secondary).¹²⁰

At Iklaina we made a conscious decision to focus on major concentrations of surface finds. This did not affect our ability to identify small concentrations, as our coverage was highly intensive (distance between our surveyors was 5 m — see next section). What it did affect was our ability to conduct exhaustive studies and quantifications of these small concentrations, an exercise that would have used up a significant part of our limited resources and would therefore have become counterproductive.¹²¹ The balance we struck was to follow a simple classification of surface concentrations in “sites” and “off-site scatters”: locations with significant concentrations of artifacts or with remains of architecture were classified as “sites”, smaller concentrations were classified as “off-site scatters”. What constituted a “significant” concentration of surface finds was largely determined by our rule of thumb, that loci with architecture and/or with more than twenty or thirty sherds per 50×50 m square extending over a sizeable area should be classified as sites (after factoring in ground visibility and other variables affecting depositional processes).

SELECTION OF AREA AND FIELD METHODS

The survey area was defined as a continuous block of land extending from the PN in the north to the site of Koukounara in the south (fig. 53), with the rationale that, if Iklaina/*a-pu₂ had, indeed, been a district capital, this block of land between the

117. See the discussion in Cherry et al. 1991, 20, 45 ff.

118. Bintliff & Snodgrass 1988, 507-508; Cherry et al. 1991, 50-52; Gallant 1986; Bintliff 2005; Caraher et al. 2006; Pettegrew 2007; Gouma et al. 2011.

119. Dunnell & William 1983. For Site vs. Siteless surveys, see also Wilkinson 2003; Caraher et

al. 2006; Bevan & Conolly 2004; Sullivan et al. 2007. For a discussion of “artifact-level” coverage, see Terrenato 2004, 37.

120. Bintliff et al. 2007.

121. Cf. Fentress 2000 and Terrenato 2004 for the issue of using too many human and time resources on the small concentrations of finds.

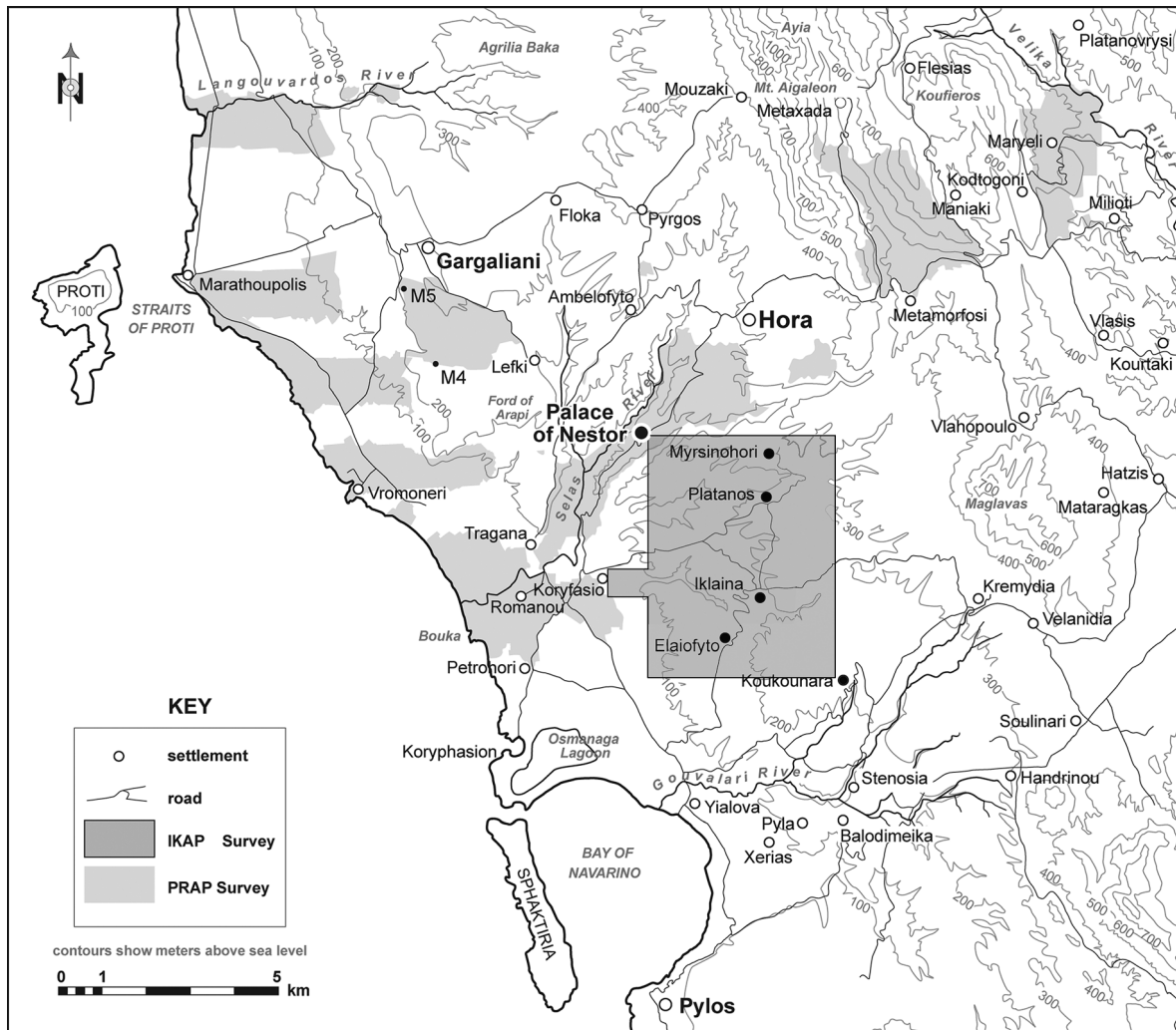


Fig. 53. Map of the IKAP survey area.

closest major centers in the north (PN) and in the south (Koukounara) would likely represent a large part of its territory. To the north, we connected our area to the area covered by PRAP, so that a large part of Messenia could be covered by intensive surface survey. As detailed above in the chapter on the Topographical Survey, the grid was laid out in 1998 and 1999 around the mound of the main site. The region was divided into large, 500×500 m squares named after a capital letter and a number (fig. 54). Each large square was further divided into 100 smaller ones, 50×50 m, named after a lowercase letter and a number. The small squares were thus designated as N14a1, N14a2, etc. Since we applied unified standards in assessing recovery conditions, such as land use and visibility, having all of our operations in a single grid sys-

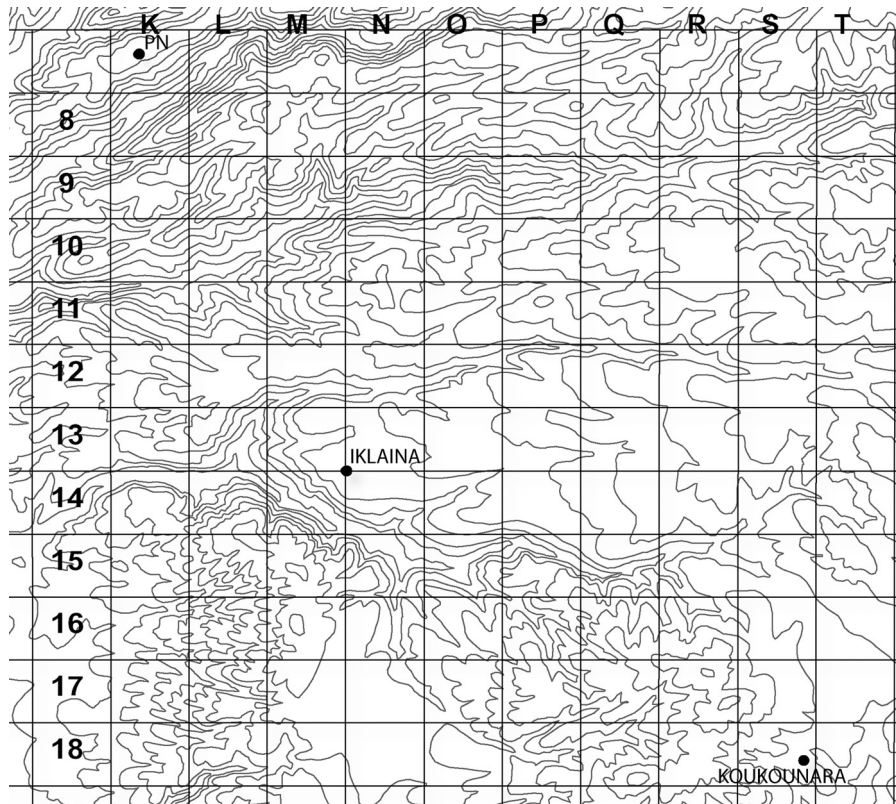


Fig. 54. The survey area with the large grid.

tem allowed us to conduct more accurate comparisons of surface densities across all field survey units.¹²²

In order to ensure the highest possible rates of identifying surface artifacts, we increased the intensification of coverage by reducing the space between surveyors to 5 m. This interval was selected to ensure that no surface find would go unnoticed, as each surveyor was responsible for a circular area of about 2.5 m radius around them.¹²³ Although this distance had to be decreased occasionally because of low visibility or increased because of rugged terrain, in general the teams did not have seri-

122. Cf. Bintliff 2000, 201.

123. Cf. Bintliff & Snodgrass 1985, 133, where it is argued that a team member can only detect effectively small artifacts in a range of 1-2 m around them. In fact, this depends on both the speed of

walking and the discipline of the team in maintaining a slow but steady pace, which allows for a slight "zig-zag" movement, instead of a straight line. See Cherry et al. 1991, 20 and n. 3 for interval among surveyors.

	Stems/bases	Rims	Handles	Bases	Bodies
Kylikes					
Bowls					
Cups					
Jars/ closed vessels					
Other					
Total					
Tiles-Bricks					
Grand total					

Fig. 56. Pottery count forms (used for 50×50 m squares).

tative information about the chronological distribution or functional character of artifacts. Instead, each surveyor counted as closely as possible the number of sherds they saw on the ground, alerting the team leaders to diagnostic material; the counts were entered into pottery count forms for each small square (fig. 56) and a qualitative assessment of the material was given by the team leaders in their notebooks. As our permit did not allow collection of artifacts, except for a very small number of diagnostic pieces, the vast majority of sherds were left in their places.

When a site was identified, it was plotted on the topographic map, measured, and drawn. Then, as much information as possible about its location, topography, physical environment, and natural resources was recorded and its possible center was defined as the area with the highest number of artifacts. If there was a point in the physical space with a significant drop in the frequency of surface finds, what lay beyond that point was considered the “halo” of a site; there was no numerical rule of thumb about what constituted a “significant drop”, but this was decided on a case-by-case basis. An important consideration was how surface concentrations of finds may have been affected by natural and cultural processes. Factors that may have affected the horizontal or vertical movement of artifacts were recorded, such as soil erosion, sediment transport, deposition by wind and water, bioturbation, agricultural tillage, and construction of terraces, roads, and other structures.¹²⁶ Factors that may have distorted data recovery by affecting visibility (such as weather, crops, spring growth, conditions of field, etc.) were recorded and visibility was expressed as a percentage of the area

126. Gallant 1986; Bintliff & Snodgrass 1988; Gouma et al. 2011. Bintliff 2005; Caraher et al. 2006; Pettegrew 2007;

	POTTERY			
PERIOD				
DENSITY (per 100 m ²)				
	Plain	Painted/Coated	Grooved	Other
Bases				
Rims				
Handles				
Body fragments				
Rooftiles/bricks				
DRAWINGS				
PHOTO ROLL				
PHOTO NOS.				

Fig. 57. Pottery database sheet (used for sites).

of the square that was clear and visible vs. the area that was not.¹²⁷ Survey was conducted in late May and early June (one of the practical compromises of this particular project), therefore, cereal fields were under stubble. Vineyards were relatively clear.

127. Cf. Schiffer & Klinger 1978, 7; Shennan 1985, 33 ff.

OBSIDIAN	Plain	Dent.	Backed	Pointed	Irreg	Round	Retouch.	Tab.	Con	Other
Blades										
Flakes										
Cores										
DRAWINGS										
PHOTO ROLL										
PHOTO NOS.										
LOOM- WEIGHTS	Conical	Pear- shaped	Disc- shaped	Other						
Date										
Parallels										
DRAWINGS										
PHOTO ROLL										
PHOTO NOS.										
STONE TOOLS										
Type										
Date										
Parallels										
DRAWINGS										
PHOTO ROLL										
PHOTO NOS.										

Fig. 58. Miscellaneous finds datasheet (used for sites).

Because of the permit restriction mentioned above, surface concentrations of finds had to be studied in the field. Temporary “labs” were set up at each site during field-walking,¹²⁸ where Shelmerdine, Gulizio, and Ruscillo, in coordination with the supervisor of the Greek Archaeological Service, determined if any artifacts should be collected; as mentioned above, only a miniscule number of diagnostic pieces were collected and the rest were studied, recorded on the forms shown in figs 57 and 58, and

128. Similar setup at the Eastern Korinthia Archaeological Survey (Tartaron et al. 2006).

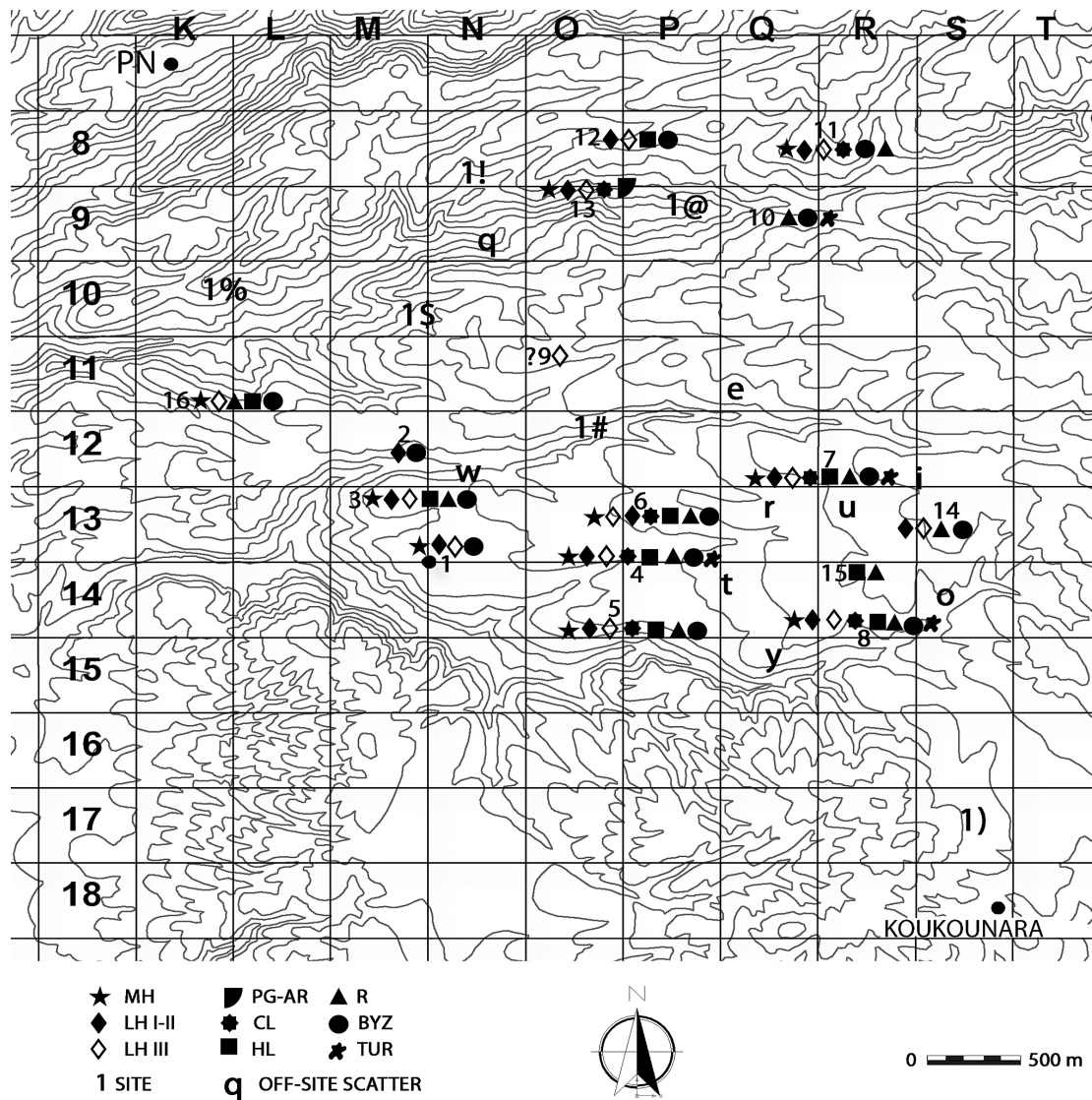


Fig. 59. Map showing the sites and off-site scatters (chronology includes both certain and possible sites).

then left on the spot. In order to compensate for the delay caused by studying a site during fieldwalking and to maintain the close coverage of the area, we had to increase the man-hours spent in the field.¹²⁹

129. On average 3 teams of 10 walkers each walked for three weeks (18 working days) each season, for 8 hours/day. This amounts to 30 walk-

ers × 18 days × 8 hours = 4,320 man hours for a total area of 22 km², or 196.3 man hours per km².

The sites discovered during each season were revisited at the end of the season for verification of data; all the sites were revisited in summer 2012, to check possible changes in the surface distribution of artifacts.¹³⁰ The sites and scatters are plotted on the map of fig. 59 and are discussed in the Catalogue below.

130. Cherry 1983, 398-399.

GAZETTEER OF SITES AND OFF-SITE SCATTERS

Michael B. Cosmopoulos, Cynthia Shelmerdine, Joann Gulizio,
Jennifer Glaubius¹³¹

For each site basic information is given: type (habitation-HAB, cemetery-CEM, industrial-IND), squares, size, elevation, chronological range of finds, description of topography, summary, and distribution of finds. There follows a catalogue of finds selected for publication from among those we were able to collect (see above, p. 98). Precise coordinates are not given in this publication in order to protect the sites from illegal activity. The sites and off-site scatters are shown in fig. 59. Descriptions of pottery fabrics conform to conventions explained in the chapter on Pottery and Other Ceramic Artifacts. All find measurements in the catalogue are in cm. Numbers preceded by the letter “C” (e.g. C0460) refer to numbers in the project database.

SITE 1: Traghanes

Type: HAB

Squares: M13i10, M13j9, M13j10, M14i1, M14i2, M14j1, M14j2, N13a9, N13a10, N13b10, N13c10, N13d9, N13d10, N13e8, N13e9, N13e10, N13f6, N13f7, N13f8, N13f9, N13f10, N13g6, N13g7, N13g10, N14a1, N14a2, N14a3, N14b1, N14b2, N14b3, N14c1, N14c2, N14c3, N14d1, N14d2, N14d3, N14e1, N14e2, N14e3, N14f1, N14f2, N14f3, N14g1, N14g2, N14g3, N14h1

Size: 120,000 m²

Elevation: 104-169 masl.

Periods: MH, LH I-II, LH IIIA-B, HL, Byz

This site is located in the southwestern corner of the Iklaina plateau, at the location Traghanes. To the east the terrain is flat and smooth, but to the north, west, and south it is surrounded by ravines. The site extends 400 m to the east and 300 m to the north. It is covered with olive groves and vineyards. A dirt road leading from the village of

131. We would like to thank Sarah A. James for her assistance with pottery of historical periods and Kevin M. Pluta for compiling the pottery illustrations.



Fig. 60. Aerial photo of site 1 (2008, showing the mound and the area excavated that year).

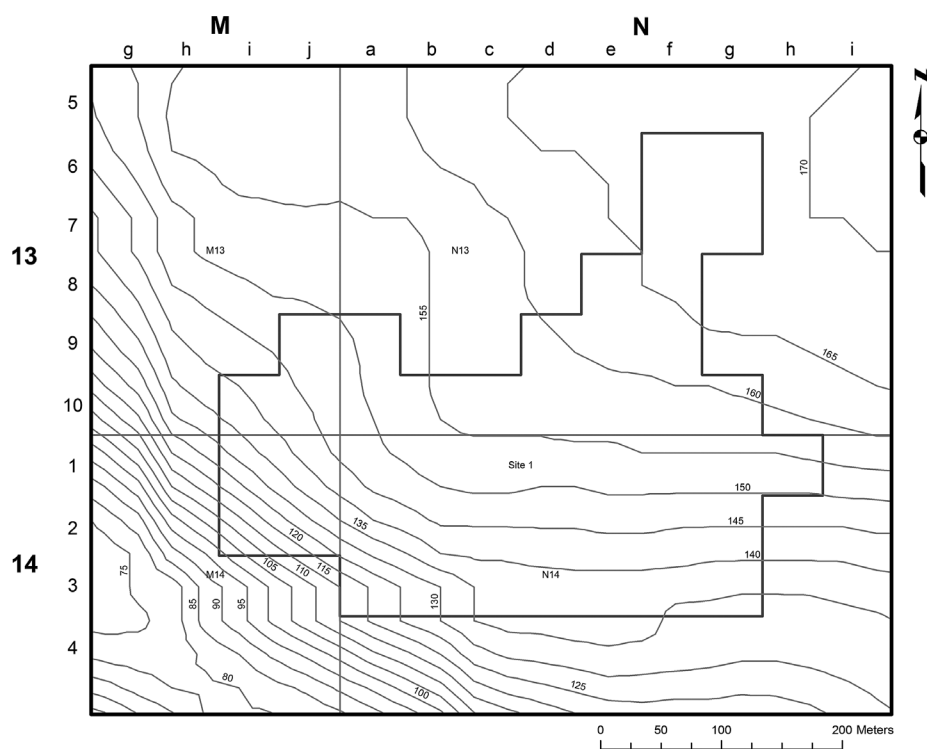


Fig. 61. Plan of site 1.

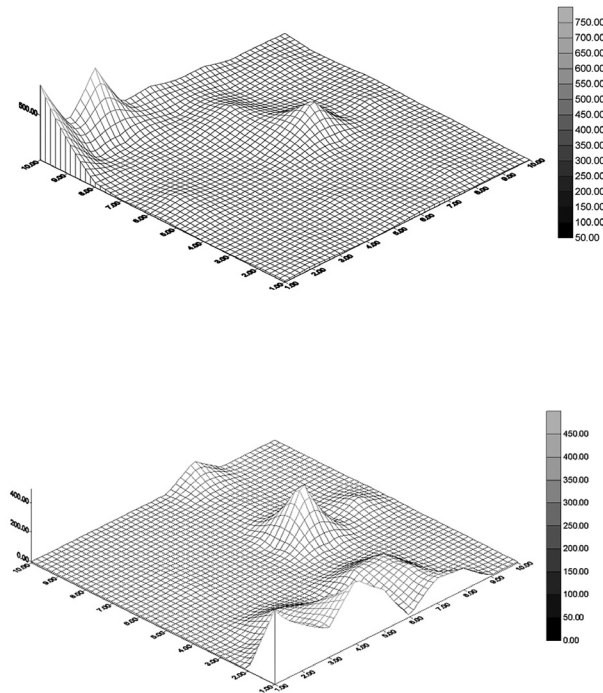


Fig. 62. Surface pottery concentrations squares N13 (top) and N14 (bottom). By Chris Mundigler.

Iklaina in the east to the bottom of the ravine in the west runs through the site. The soil of the area is vertic with cracks that appear when it dries out and the clay within the soil shrinks. Despite the agricultural tillage which brings buried artifacts to the surface, there are no obvious signs of soil erosion within the site. Farmers report ancient walls visible on the surface of the ground until the 1980s; these apparently have been dismantled by locals.

Large quantities of Bronze Age pottery were collected from all parts of the site, along with a small amount of Byzantine sherds. The earliest pieces are two crescent lug handles (1.1, 1.2), typical of EH III-MH I. The Middle Helladic pottery includes Local Minyan ware (1.3, 1.4) and coarse vessel fragments (1.6), some of them incised (1.5), but no matt-painted sherds. Bowl, basin and jar rims (1.7-1.10) and a spit stand (1.11) in Very Coarse Orange fabric may be Middle Helladic or Early Mycenaean; the same is true of several pieces in Hard Orange Ware (1.12-1.14). The Middle Helladic pottery is mostly concentrated in squares N13a10/b10, but Middle Helladic material is strewn over an area of 200×150 m around the benchmark, especially to the east and north.

The Early Mycenaean pottery seems to occupy an area larger than that of the Middle Helladic (200×400 m) to the east and north of the benchmark. It includes a few

painted sherds, among them a Vapheio cup base (1.15), but unpainted open vessels in the same Mycenaean Fine White Ware (1.16) predominate. The soft gritty Early Mycenaean Gray Orange Ware is typical for goblets (1.17-1.23) and bowls (1.24-1.25). Also common for both open and closed vessels, including pithoi, is a coarse fabric with tan grog inclusions (1.26-1.36). Goblets and jars in Mycenaean Orange Ware (1.37-1.39) have a broader date range extending into LH III.

The extent of Late Mycenaean finds is considerably larger, reaching the full extent of the site (about 12 ha). Late Mycenaean fine vessels are canonical in form and occur in the full range of normal fabrics. Late Mycenaean Fine Ware (e.g. 1.40) is used throughout LH IIIA-B, Late Mycenaean Fine Pink Ware (e.g. 1.43) in LH IIIA, and Palace Ware (e.g. 1.48) in LH IIIA2-B. Very few painted sherds were collected. A kylix rim seems to have a band below the rim (1.40), and banding is preserved on the lower bodies of two more decorated kylikes (1.41-1.42). Another kylix is coated red (1.43). A ring base with possible traces of paint on the interior comes from a monochrome or Group B deep bowl (1.59). Bands are preserved on a small stirrup jar (1.63) and an angular alabastron (1.64). Unpainted open shapes predominate, especially rounded and angular kylikes (1.44-1.56). Cups, kraters and basins are also attested (1.57-1.58, 1.60), but very few definite shallow angular bowls. There are a few sherds from small closed vessels on which no trace of paint can be seen (1.61-1.62, 1.65). Late Mycenaean Semi-fine Ware was used mostly for large jugs and jars (1.66), but a ladle handle (1.68) also illustrates this fabric. The Mycenaean orange fabric seems to continue in use, at least for jars and jugs (1.67). Among the Late Mycenaean coarse material are a jar base (1.70), a pithos base (1.71), and the top of a large storage/transport stirrup jar (1.69) in the Late Mycenaean Coarse Tan Ware typical for this shape. An open vessel and several pithos fragments with raised decorative bands in a red micaceous fabric (1.72-1.73) could not be closely dated. These micaceous sherds are examples of imports into the region, though at this point the origin for these fragments is uncertain. Kythera and Laconia are the most likely candidates and it is our hope that chemical and petrographic analysis of sherds in the same fabric from our excavation material will help pinpoint the region where these vessels were manufactured.

A few Byzantine sherds were also collected. Most belong to cookpots in coarse cooking fabric (1.75-1.78), but one glazed plate base (1.74) was also recovered.

Other ceramic finds are an Early Mycenaean loomweight (1.79), two Late Mycenaean figurines (1.80, a quadruped, and 1.81, a table or stool) and a Hellenistic mold-made draped figurine (1.82).

CATALOGUE

POTTERY

- 1.1** (C0460). Figs 63 and 66. M14i1. Handle of jar. Crescent lug handle, triangular section. Semi-fine hard light gray fabric (5YR 7/1) with small black stone inclusions; gritty yellowish red surface (5YR 5/8). Handmade. W. handle 2.3, wall th. 1.6. Cf. Deriziotis Aloni P33, P57, EH III-MH I (Stocker 2003); Nichoria P2072, MH I (McDonald & Wilkie 1992). EH III-MH I.
- 1.2** (C0466). Fig. 66. M13j9w. Handle of jar. Crescent lug handle, triangular section. Semi-fine hard light brown fabric (7.5YR 6/3) with small white and black stone inclusions; reddish yellow surface (5YR 7/6), smoothed. Handmade. W. handle 2.5, handle th. 1.7, wall th. 0.9. EH III-MH I.
- 1.3** (C0279). Fig. 63. M13j10w. Rim of bowl. Short everted rim, beveled on interior. Local Minyan ware; semi-fine hard reddish yellow fabric (7.5YR 6/6); gray exterior surface (7.5YR 6/1) surviving in places. Wheelmade. H. 2.5, wall th. 0.8. Cf. Nichoria P2453, MH II (McDonald & Wilkie 1992). MH II.
- 1.4** (C0258). Figs 63 and 66. M13j10w. Shoulder of closed vessel. Three shallow incised grooves on exterior; shown horizontal but orientation uncertain. Local Minyan ware; semi-fine hard reddish yellow fabric (5YR 6/6); very dark gray exterior surface (5YR 3/1). Wheelmade. 3.4×3.1, wall th. 0.7. MH II-III.
- 1.5** (C0243). Figs 63 and 66. M13j10w. Body sherd of closed vessel. Seven incised diagonal grooves above two horizontal grooves. Middle Helladic Coarse Ware; coarse fairly hard reddish yellow fabric (5YR 6/6) with small white stone inclusions. Handmade. 3.5×2.2, wall th. 0.7. MH I-III.
- 1.6** (C0453). Figs 63 and 66. M14i1. Lug handle of jar. Semicircular lug handle. Middle Helladic Coarse Ware; coarse hard pink fabric (7.5YR 7/4); reddish yellow surface (5YR 7/6). Handmade. W. handle 5.0, h. 3.6. Cf. Nisakouli burial urn, MH II-III. (Choremis 1969, 10 and fig. 1). MH II-III.
- 1.7** (C0061). Figs 63 and 66. N14d2. Rim of bowl. Convex horizontal rim; incurving upper body. Very Coarse Orange Ware; coarse hard pinkish gray fabric (7.5YR 6/2) with large rounded white and blue stone inclusions; light reddish brown surface (5YR 6/4). Handmade. Diam. rim est. 17 (<10%), h. 2.5, wall th. 0.5. MH I-LH IIB.
- 1.8** (C0458). Fig. 63. M14i1. Rim of basin. Rolled splaying rim. Very Coarse Orange Ware; coarse hard light brown fabric (7.5YR 6/4) with large rounded white and blue stone inclusions; reddish yellow surface (7.5YR 6/6). Handmade. H. 3.4, wall th. 0.9. MH I-LH IIB.
- 1.9** (C0416). Fig. 63. M13j10. Rim of wide-mouthed jar. Triangular flaring rim. Very Coarse Orange Ware; coarse hard pink fabric (7.5YR 7/3) with large rounded white and blue stone inclusions; reddish yellow surface (5YR 6/6). Handmade. H. 2.6, wall th. 0.6. MH I-LH IIB.
- 1.10** (C0817). Fig. 63. N14d1. Rim of jar. Downsloping rim. Very Coarse Orange Ware; coarse soft reddish yellow fabric (5YR 6/6) with small and large angular white stone inclusions. Handmade. H. 2.4, wall th. 0.8. MH I-LH IIB.
- 1.11** (C0450). Figs 63 and 66. M14i1. Base of spit

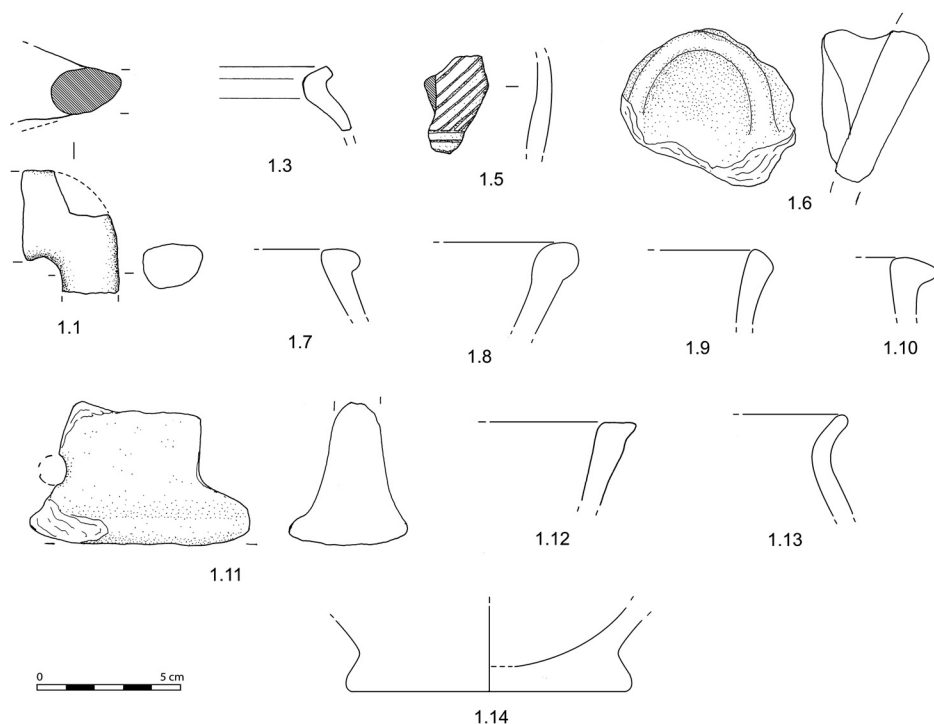


Fig. 63. Drawings of sherds from site 1. Middle Helladic to Early Mycenaean: 1.1-1.14.

stand. Flat base; part of one hole near base. Very Coarse Orange Ware; coarse reddish yellow fabric (5YR 7/8) with small angular and large round white and blue stone inclusions, and some small red clay inclusions; light brownish gray surface (2.5Y 6/2). Handmade. L. base 7.6, w. base 4.1, h. 4.9, wall th. 2.

Cf. Iklaina excavation P2598, P3069; Mene-laion, LH IIIA1 (Catling 2009, 93 and 429-430; ET195-197, fig. 104).

MH I-LH IIB.

- 1.12** (C0411). Fig. 63. M13j10. Rim of bowl. Horizontal splaying rim. Hard Orange Ware; semi-fine hard pink fabric (7.5YR 7/3) with a few small white inclusions; yellowish red surface (5YR 5/8), burnished black on exterior. Handmade. H. 3.2, wall th. 0.7. MH II-LH IIB.

- 1.13** (C0123). Figs 63 and 66. N14a1. Rim of

wide-mouthed jar. Thin everted rim. Hard Orange Ware; semi-fine hard sandy reddish yellow fabric (5YR 6/8); burnished black and smoothed on exterior. Wheel-made? Diam. rim est. 23 (<10%), h. 3.9, wall th. 0.7.

MH II-LH IIB.

- 1.14** (C0028). Fig. 63. N14c2. Base of jar. Raised base. Hard Orange Ware; semi-fine hard pale red to light red fabric (2.5YR 7/4-7/6) with small white and pink stone inclusions; mottled pink and black interior surface. Handmade? Diam. base 11.0 (30%), h. 2.4, wall th. 0.8.

MH II-LH IIB.

- 1.15** (C0074). N13a10. Base of Vapheio cup (FS 224 – Type II). Flat splaying base, slightly beveled. Traces of black paint on exterior. Mycenaean Fine White Ware; fine hard very pale brown fabric (10YR 8/2); slipped

- on exterior and interior. Wheelmade. Diam. base 6.0 (10%), h. 1.0, wall th. 0.4. LH I-IIA.
- 1.16** (C0118). Figs 64 and 66. N14b1. Base of cup or piriform jar. Raised base. Mycenaean Fine White Ware; fine white fabric (5Y 8/1); very little interior surface preserved. Wheelmade. Diam. base 4.5 (50%), h. 2.0. Cf. Nichoria P3161, LH I (McDonald & Wilkie 1992). LH I-IIIB2.
- 1.17** (C0039). Fig. 64. N14d1. Rim of goblet (FS 263/268). Fairly tall everted hollowed rim. Early Mycenaean Gray Orange Ware; semi-fine very soft gray fabric (2.5YR 5/1); brownish yellow surface (10YR 6/6). Wheelmade. H. 3.8, wall th. 0.8. Cf. Nichoria P3170, LH I, smaller diameter (McDonald & Wilkie 1992). LH I-IIA.
- 1.18** (C0107). Figs 64 and 66. N14c1. Rim of goblet (FS 263/268). Thin everted hollowed rim. Early Mycenaean Gray Orange Ware; semi-fine soft sandy light gray fabric (5Y 7/1) with a few very small black and white inclusions; reddish yellow surface (5YR 7/8). Wheelmade. Diam. rim 9.0 (10%), h. 2.2, wall th. 0.5. Cf. Nichoria P3345, LH IIA (McDonald & Wilkie 1992). LH I-IIA.
- 1.19** (C0053). Figs 64 and 66. N13c10. Rim of goblet (FS 263/268). Fairly tall everted rim, slightly convex on exterior. Early Mycenaean Gray Orange Ware; semi-fine very soft sandy reddish yellow fabric (5YR 6/8) with a few very small black and white inclusions. Wheelmade. Diam. rim 15.5 (10%), h. 3.1, wall th. 0.4. Cf. Nichoria P3153, LH I (McDonald & Wilkie 1992). LH I-IIA.
- 1.20** (C0473). Fig. 64. M14j1e. Rim of goblet (FS 263/268). Thin tall everted rim. Early Mycenaean Gray Orange Ware; semi-fine soft reddish yellow fabric (5YR 7/8). Wheelmade. H. 3.5, wall th. 0.5. Cf. Nichoria P3343, LH IIA and P3508, LH II (McDonald & Wilkie 1992). LH IIA-B.
- 1.21** (C0452). Fig. 66. M14i1. Foot of goblet (FS 263/268). Button base. Early Mycenaean Gray Orange Ware; semi-fine very soft light brown fabric (7.5YR 6/4); reddish yellow surface (5YR 6/8). Wheelmade. Diam. stem 2.5, h. 1.5. Cf. Nichoria P3151, LH I (McDonald & Wilkie 1992). LH I.
- 1.22** (C0050). Figs 64 and 66. N13c10. Foot of goblet (FS 263/268). Concave foot. Early Mycenaean Gray Orange Ware; semi-fine soft to very soft light gray fabric (10YR 7/1); reddish yellow exterior surface (5YR 6/8), interior surface not preserved. Wheelmade. Diam. foot 5.5 (70%), h. 3.3, wall th. 0.6. Cf. Nichoria P3403 and P3553, LH II (McDonald & Wilkie 1992). LH IIA-B.
- 1.23** (C0245). Figs 64 and 66. M13j10w. Foot of goblet (FS 263/268). Domed foot. Early Mycenaean Gray Orange Ware; semi-fine medium soft pink fabric (7.5YR 7/3); light red surface (2.5YR 7/8). Wheelmade. H. 3.7. Cf. Nichoria P3509, LH II (McDonald & Wilkie 1992). LH IIA-B.
- 1.24** (C0111). Fig. 64. N14b2. Rim of bowl. Horizontal T-shaped rim. Early Mycenaean Gray Orange Ware; semi-fine very soft reddish yellow fabric (7.5YR 7/6). Wheelmade. H. 2.2, wall th. 0.5. LH I-IIB.
- 1.25** (C0117). Figs 64 and 66. N14b1. Rim of large bowl. Downsloping rim. Early Myce-

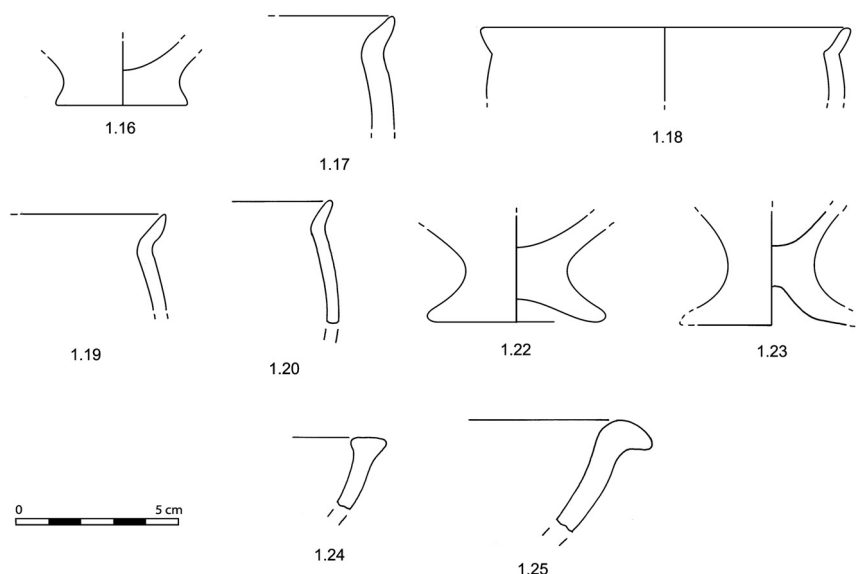


Fig. 64. Drawings of sherds from site 1. Early Mycenaean fine and semi-fine sherds: 1.12-1.25.

naean Gray Orange Ware; semi-fine medium hard pale yellow to light yellowish brown fabric (2.5YR 7/3-6/3) with small red inclusions; reddish yellow surface (5YR 6/8). Wheelmade. H. 3.9, wall th. 0.9.

LH I-IB.

- 1.26** (C0304). Figs 65 and 66. M13j9e. Rim of bowl. Convex nearly horizontal rim; incurving upper body. Tan Grog Ware; coarse soft reddish yellow fabric (5YR 6/6) with large tan grog inclusions. H. 4.4, wall th. 0.6-1.

MH III-LH IIB.

- 1.27** (C0124). Figs 65 and 66. N14a1. Base of bowl. Raised concave base. Tan Grog Ware; coarse hard light gray fabric (10YR 7/1) with large tan grog inclusions; reddish yellow surface (5YR 6/6), smoothed interior surface with possible purple-gray wash. Handmade. Diam. base 6.5 (100%), h. 3.3, wall th. 0.7.

MH III-LH IIB.

- 1.28** (C0472). Fig. 65. M14j1e. Rim of wide-mouthed jar. Flaring rim. Tan Grog Ware;

coarse hard pinkish gray fabric (7.5YR 6/2) with large tan grog inclusions; reddish yellow surface (5YR 6/6) with purple-gray wash. Handmade. H. 2.8, wall th. 0.9.

MH III-LH IIB.

- 1.29** (C0179). Figs 65 and 66. N13g6. Rim of jar. Horizontal everted rim with slightly concave upper surface; straight neck. Tan Grog Ware; coarse hard light gray fabric (10YR 7/2) with large tan grog inclusions; soft reddish yellow surface (5YR 7/8). Diam. rim 11.0 (10%), h. 3.4, wall th. 0.8.

MH III-LH IIB.

- 1.30** (C0474). Fig. 65. M14j1e. Handle of jar. Vertical round handle, top attachment at juncture of neck and shoulder. Tan Grog Ware; coarse gray fabric (7.5YR 6/1) with large tan grog inclusions; reddish yellow surface (5YR 6/6). Handmade. Diam. handle 2.5, h. with handle 5.5, wall th. 0.7.

MH III-LH IIB.

- 1.31** (C0178). Fig. 65. N13g6. Handle of jar. Bottom of vertical oval handle. Tan Grog

- Ware; coarse light brownish gray fabric (2.5Y 6/2) with large tan grog inclusions; reddish yellow surface (5YR 7/8). W. handle 3.0, h. 3.5, wall th. 0.7.
MH III-LH IIB.
- 1.32** (C0434). Fig. 65. M13j9. Base of jar. Raised base. Tan Grog Ware?; coarse medium hard very pale brown fabric (10YR 7/3) with a few red and tan grog inclusions and some small white stone inclusions; reddish yellow surface (5YR 5/8). Diam. base 6.0 (100%), h. 2.1, wall th. 0.8.
MH III-LH IIB.
- 1.33** (C0133). Fig. 65. N14a1. Rim of tripod. Incurving, flat-topped rim. Tan Grog Ware; coarse light gray fabric (7.5YR 7/1) with large tan grog and small white stone inclusions; reddish yellow surface (5YR 6/6). Handmade. H. 3.5, wall th. 0.7.
MH III-LH IIB.
- 1.34** (C0476). Fig. 65. M14j1e. Leg of tripod. Oval section. Tan Grog Ware; coarse hard gray fabric (7.5YR 6/1) with large tan grog and small white stone inclusions; red surface (2.5YR 6/8), smoothed. Handmade. H. 2.7, w. leg 3.4, th. leg 1.8.
MH III-LH IIB.
- 1.35** (C0251). Fig. 66. M13j10w. Body sherd of pithos (FS 13). Hatched to receive attached decorative band. Tan Grog Ware; coarse hard pinkish gray fabric (7.5YR 6/2) with large tan grog and small white stone inclusions; red surface (2.5YR 6/8). Handmade. H. 6.6, wall th. 2.1.
MH III-LH IIB2.
- 1.36** (C0329). Figs 65 and 66. M14i2. Shoulder of pithos (FS 13). Diagonally grooved raised decorative band. Tan Grog Ware; coarse pinkish gray fabric (7.5YR 6/2) with large tan grog and small white stone inclusions; red surface (2.5YR 6/8). Handmade. H. 6.3, wall th. 1.5.
MH III-LH IIB2.
- 1.37** (C0055). Fig. 67. N13c10. Rim of bowl. Short everted rim. Mycenaean Orange Ware; semi-fine fairly hard sandy reddish yellow fabric (5YR 6/8); possibly slipped or burnished on exterior. Wheelmade. H. 3.1, wall th. 0.6.
LH IIB-III A2.
- 1.38** (C0328). Figs 67 and 68. M14i2. Rim and handle of jar. Flaring rim, lip buried in vertical oval handle. Mycenaean Orange Ware; semi-fine reddish yellow fabric (5YR 6/8) with some small white inclusions. Wheelmade. W. handle 3.1, h. 3.3.
LH I-III B2.
- 1.39** (C0426). Fig. 67. M13j10. Base of jar. Raised base. Mycenaean Orange Ware; semi-fine fairly hard light brown fabric (7.5YR 6/3) with some small white stone and red clay inclusions; soft reddish yellow surface (5YR 6/8). Wheelmade. Diam. base 8 (25%), h. 3.2, wall th. 1.3.
LH IIIA1-B2.
- 1.40** (C0020). Fig. 68. N13d10. Rim of kylix (FS 257). Low flaring rim. Trace of wide brown band below rim on exterior. Late Mycenaean Fine Ware; fine soft light red fabric (2.5YR 7/6); very pale brown surface (10YR 8/3). Wheelmade. Diam. rim est. 19 (10%), h. 3.8, wall th. 0.5.
LH IIIA2-B1, probably LH IIIA2.
- 1.41** (C0033). Fig. 67. N13b10. Stem and lower body of kylix (FS 257/258B). Trace of reddish brown band at base of bowl. Late Mycenaean Fine Ware; fine soft very pale brown fabric (10YR 8/4). Wheelmade. Diam. stem 2.5, h. 3.1.
LH IIIA2-B1.
- 1.42** (C0338). Fig. 68. M14i2. Stem and lower body of kylix (FS 258B). Two thick black bands preserved on stem and lower body with possible traces of several thinner

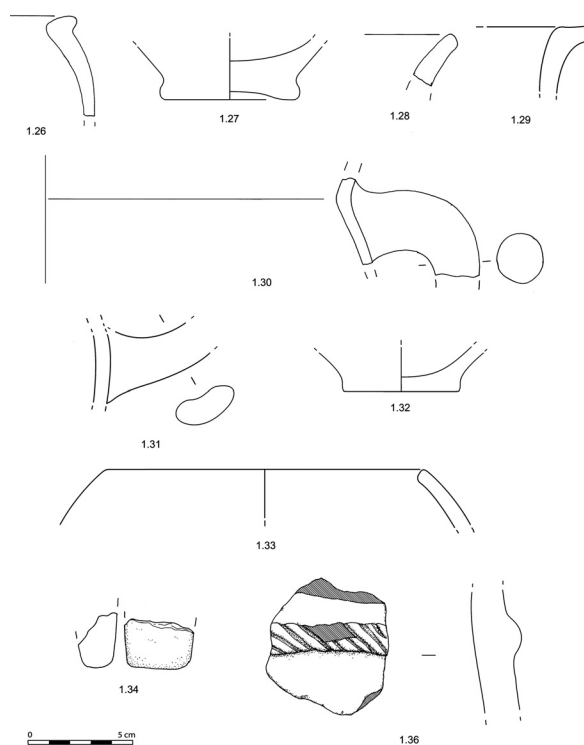


Fig. 65. Drawings of sherds from site 1. Early Mycenaean Tan Grog Ware: 1.26-1.36.

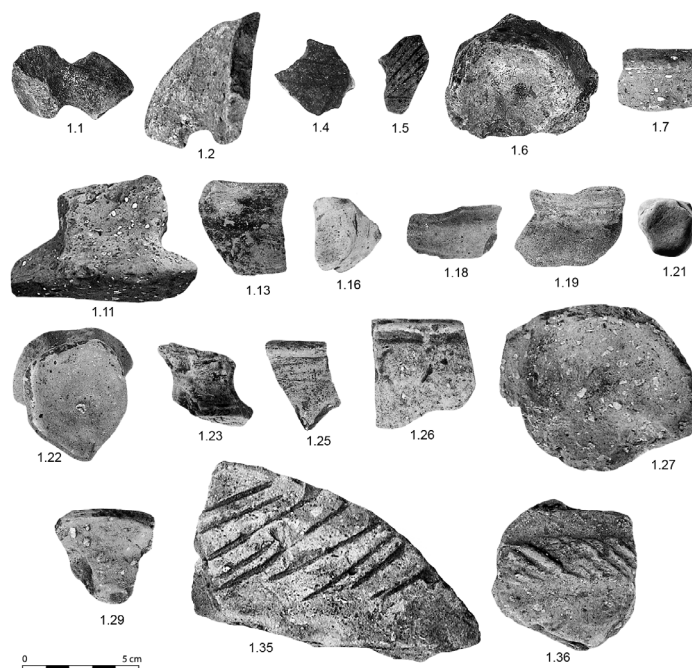


Fig. 66. Sherds from site 1. Middle Helladic to Early Mycenaean 1.1-1.36.

- lines above. Late Mycenaean Fine Ware; fine soft pink fabric (7.5YR 7/4); slipped on exterior. Wheelmade. H. 2.2.
LH IIIB1.
- 1.43** (C0119+C0120). Figs 67 and 68. N14a1. Rim of kylix (FS 264). Triangular everted rim. Coated red on exterior and interior. Late Mycenaean Fine Pink Ware; fine soft reddish yellow fabric (5YR 6/8). Wheelmade. Diam. rim 10.0 (10%), h. 2.3, wall th. 0.4. Cf. Nafplion study collection, LH IIIA2 (Mountjoy 1986, 90, fig. 108.2).
LH IIIA2.
- 1.44** (C0072). Figs 67 and 68. N13a10. Rim of kylix (FS 264). Thin everted rim. Palace Ware; fine soft pale yellow fabric (2.5Y 8/2). Wheelmade. H. 2.4, wall th. 0.5.
LH IIIA2.
- 1.45** (C0049). Fig. 67. N13c10. Rim of kylix (FS 265). Short everted rim. Palace Ware; fine soft pale yellow fabric (2.5Y 8/3). Wheelmade. Diam. rim est. 20 (10%), h. 4.5, wall th. 0.4.
LH IIIA2-B1.
- 1.46** (C0048). Fig. 67. N13c10. Rim of kylix (FS 265/266). Flaring lipless rim. Late Mycenaean Fine Ware; fine soft very pale brown fabric (10YR 8/3). Wheelmade. Diam. rim 11.0 (20%), h. 3.6, wall th. 0.5.
LH IIIB1-2.
- 1.47** (C0127). Figs 67 and 68. N14a1. Rim of kylix (FS 265). Flaring lipless rim. Palace Ware; fine soft pale yellow fabric (2.5Y 8/3). Wheelmade. Diam. rim est. 12 (<10%), h. 4.3, wall th. 0.5.
LH IIIB1-2.
- 1.48** (C0012). Figs 67 and 68. N13d9. Rim and handle of kylix (FS 265/266). Flaring lipless rim; wide thin vertical strap handle ends, top of handle attached to interior. Palace Ware; fine soft pale yellow fabric (5Y 8/2). Wheelmade. Diam. rim est. 17 (10%), w. handle 2.0, h. 3.1, wall th. 0.4.
LH IIIB1-2.
- 1.49** (C0047). Fig. 67. N13c10. Rim of angular kylix (FS 267). Short rounded rim; fairly deep upper body. Palace Ware; fine soft pale yellow fabric (2.5Y 8/3). Wheelmade. H. 3.1, wall th. 0.5.
LH IIIA2-B2.
- 1.50** (C0034). Fig. 67. N13b10. Rim of angular kylix (FS 267). Lipless rim; fairly deep upper body; carination on exterior only. Palace Ware; fine soft white fabric (10YR 8/1). Wheelmade. H. 2.5, wall th. 0.6.
LH IIIB1-2.
- 1.51** (C0009). Fig. 67. N13d9. Foot of kylix. Domed foot, squared edge. Late Mycenaean Fine Ware; fine soft yellow fabric (10YR 8/6). Wheelmade. Diam. foot 8 (25%), diam. stem 2.2, h. 4.5.
LH IIIA1-2.
- 1.52** (C0354). Fig. 67. M14i2. Foot of kylix. Concave foot with groove around underside near edge and notch near center. Palace Ware; fine very soft very pale brown fabric (10YR 7/3). Wheelmade. Diam. foot 6.5 (50%), h. 1.8.
LH IIIA2-B2.
- 1.53** (C0046). Figs 67 and 68. N13c10. Foot of kylix. Concave foot, beveled edge. Palace Ware; fine very soft pale yellow fabric (2.5Y 8/3). Wheelmade. Diam. foot 6.5 (100%), diam. stem 3.3, h. 2.6.
LH IIIA2-B2.
- 1.54** (C0037). Fig. 67. N14d1. Foot of angular kylix (FS 267). Flat string-cut foot, slight ridge on upper surface. Late Mycenaean Fine Ware; fine reddish yellow fabric (5YR 7/6); very pale brown surface (10YR 8/4). Wheelmade. Diam. foot 6.0 (30%), h. 1.9.
LH IIIA1-B2.
- 1.55** (C0114). Figs 67 and 68. N14b1. Foot to lower body of angular kylix (FS 267). Domed foot; fairly short thick stem. Palace Ware; fine very soft pale yellow fabric

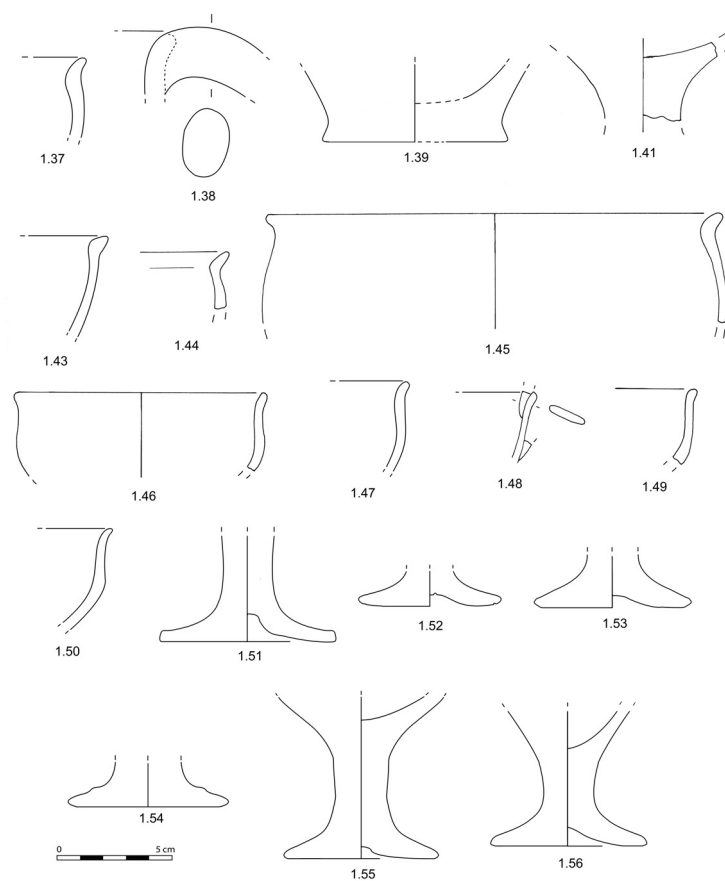


Fig. 67. Drawings of sherds from site 1. Mycenaean semi-fine and fine ware: 1.37-1.56.

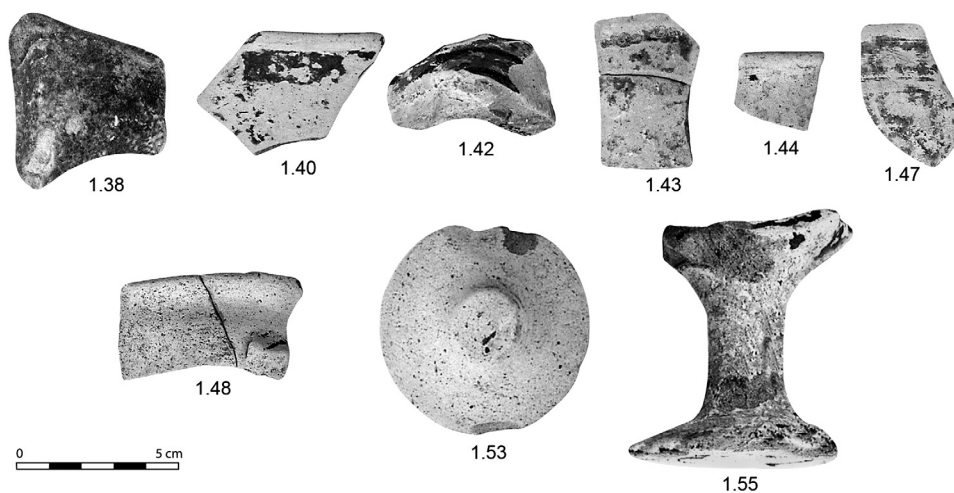


Fig. 68. Sherds from site 1. Late Mycenaean: 1.37-1.56.

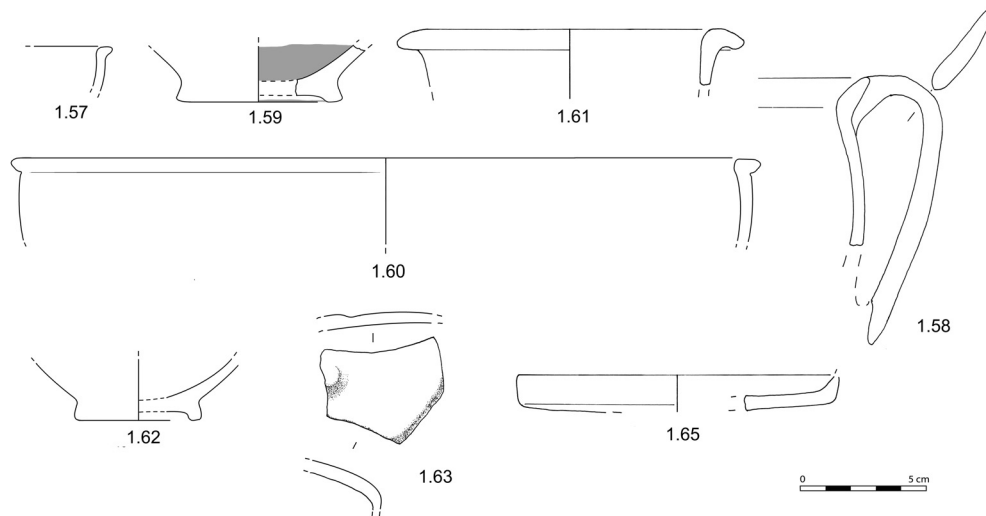


Fig. 69. Drawings of sherds from site 1. Late Mycenaean Fine Ware: 1.57-1.65.

(2.5Y 8/3). Wheelmade. Diam. foot 6.5 (100%), diam. stem 2.0, h. 7.4.

LH IIIA2-B2.

- 1.56** (C0007). Fig. 67. N13d9. Foot to lower body of angular kylix (FS 267). Concave foot; short stem. Palace Ware; fine very soft very pale brown fabric (10YR 8/3). Wheelmade. Diam. foot 6.5 (100%), diam. stem 2.4, h. 5.9, wall th. 0.6.

LH IIIA2-B2.

- 1.57** (C0128). Figs 69 and 71. N14a1. Rim of cup (FS 220/245). Horizontal everted rim. Late Mycenaean Fine Ware; fine soft very pale brown fabric (10YR 8/4); slipped. Wheelmade. Diam. rim est. 8 (10%), h. 2.3, th. 0.4.

LH IIIA1-2.

- 1.58** (C0527). Fig. 69. N14f1. Rim and handle of krater (FS 7/8). Tall everted rim; thin wide strap handle. Traces of brown stripe on handle edge. Late Mycenaean Fine Ware; fine very soft very pale brown fabric (10YR 8/3); slipped. Wheelmade. Diam. rim est. 22 (15%), h. with handle 10.2, w. handle 3.9, wall th. 0.5.

LH IIIA1-2.

- 1.59** (C0811). Figs 69 and 71. N14d1. Base of deep bowl (FS 284). Ring base. Possible traces of brown paint on interior and just inside ring on underside of base; monochrome or Group B deep bowl. Palace Ware; fine very soft very pale brown fabric (10YR 8/3). Wheelmade. Diam. base 7 (30%), h. 2.3, wall th. 0.6.

LH IIIB(1)-2.

- 1.60** (C0019). Fig. 69. N13d10. Rim of basin (FS 294). Horizontal everted rim. Palace Ware; fine soft pale yellow fabric (2.5Y 7/3). Wheelmade. Diam. rim est. 30 (<10%), h. 3.9, th. 0.6.

Cf. Nichoria P3865, LH IIIB2 (McDonald & Wilkie 1992).

LH IIIB1-2.

- 1.61** (C0340). Fig. 69. M14i2. Rim of piriform jar. Downsloping rim. Late Mycenaean Fine Ware; fine very soft pink fabric (5YR 7/4); pink surface (7.5YR 7/3). Wheelmade. Diam. rim 11.0 (15%), h. 2.4, wall th. 0.5.

LH IIIA2-B2.

- 1.62** (C0040). Fig. 69. N14d1. Base of piriform or stirrup jar. Ring base. Palace Ware; fine

- pale yellow fabric (2.5Y 8/2). Wheelmade. Diam. base 5.0 (25%), h. 2.7, wall th. 0.5. LH IIIA2-B2.
- 1.63** (C0043). Fig. 69. N14d1. Shoulder and false neck of stirrup jar. Shoulder of stirrup jar; base of false neck. Black ring around base of false neck. Palace Ware; fine soft pale yellow fabric (2.5Y 8/3). Wheelmade. H. 1.4, wall th. 0.6. LH IIIB1-2.
- 1.64** (C0327). Fig. 71. M14i2. Base of angular alabastron (FS 94). Flat beveled base. Two thin bands above thicker band on lower body, thin band around edge of underside. Late Mycenaean Fine Ware; fine soft pink fabric (7.5YR 7/4); slipped. Wheelmade. Diam. base 8.0 (20%), h. 2.5, wall th. 0.5. LH IIIA2-B2.
- 1.65** (C0008). Fig. 69. N13d9. Base of angular alabastron (FS 94). Flat base. Palace Ware; fine soft pale yellow fabric (2.5Y 8/3-4). Wheelmade. Diam. base 13.0 (25%), h. 1.3, wall th. 0.8. LH IIIA2-B2.
- 1.66** (C0309). Fig. 71. M13j9e. Rim and handle of jug (FS 105). Rim apparently slightly rounded, but buried in vertical oval handle; straight neck. Late Mycenaean Semi-fine Ware; semi-fine fairly hard pinkish gray fabric (7.5YR 6/2) with a few red clay inclusions; reddish yellow surface (7.5YR 6/6). Wheelmade. Interior Diam. rim 7 (17%), w. handle est. 3, h. 3. LH IIIA1-B2.
- 1.67** (C0413). Fig. 70. M13j10. Rim of jar or jug (FS 69, 105). Downsloping rim. Mycenaean Orange Ware; semi-fine soft red fabric (2.5YR 6/8). Wheelmade. Diam. rim est. 11 (<10%), h. 3.8, wall th. 0.5. LH IIIA1-B2.
- 1.68** (C0478). Figs 70 and 71. M14j1e. Handle of ladle (FS 311). End of oval handle, pierced. Late Mycenaean Semi-fine Ware; semi-fine hard reddish yellow fabric (5YR 7/6); perhaps slipped. L. handle 4.0, w. handle 2.9, handle th. 1.1. LH IIIA1-B2.
- 1.69** (C0104). Figs 70 and 71. N14d1. Disk of stirrup jar (FS 164). Narrow, slightly concave disk and upper part of thick oval handles of large stirrup jar of storage or transport type with hollow false neck. Late Mycenaean Coarse Tan Ware; very coarse hard pink fabric (7.5YR 7/3) with large white, blue and red stone inclusions; pink surface (7.5YR 8/3). Handmade. Diam. disk 7.8, w. handle 3.5, h. 4.8. Cf. Menelaion A378, A379 (Catling 2009). LH IIIB1-B2.
- 1.70** (C0425). Fig. 70. M13j10. Base of jar. Flat base. Late Mycenaean Coarse Ware; coarse light gray fabric (10YR 7/1) with large red clay inclusions; reddish yellow surface (5YR 7/6). Handmade. Diam. base est. 15 (10%), h. 3.7, wall th. est. 1 (variable). LH IIIA1-B2.
- 1.71** (C0113). Fig. 70. N14b2. Base of pithos (FS 13). Raised base, underside slightly convex. Late Mycenaean Coarse Ware; coarse medium hard light gray to gray fabric (5Y 6/1-7/1) with small white and black stone inclusions; reddish yellow surface (5YR 6/8). Handmade. Diam. base 15.0 (25%), h. 6.8, wall th. 1.3. LH IIIA1-B2.
- 1.72** (C0525). Fig. 70. N14f1. Rim of open vessel. Conical rim; spreading body. Oblique slashes on rim and one band of applied rope decoration preserved below rim. Micaceous Ware; very coarse gritty pale brown to light yellowish fabric (10YR 6/3-6/4) with silver mica and white, brown and blue stone inclusions. Handmade. H. 7.3, wall th. 1.6. Cf. Menelaion ST127-128 (Catling 2009) for micaceous vessels with oblique slashes on

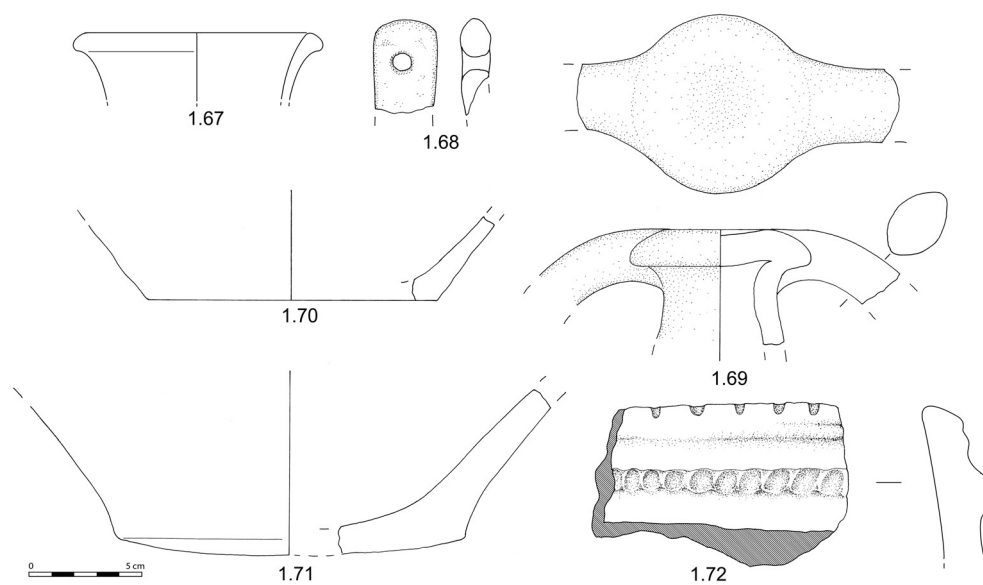


Fig. 70. Drawings of sherds from site 1. Late Mycenaean semi-fine and coarse wares: 1.66-1.73.

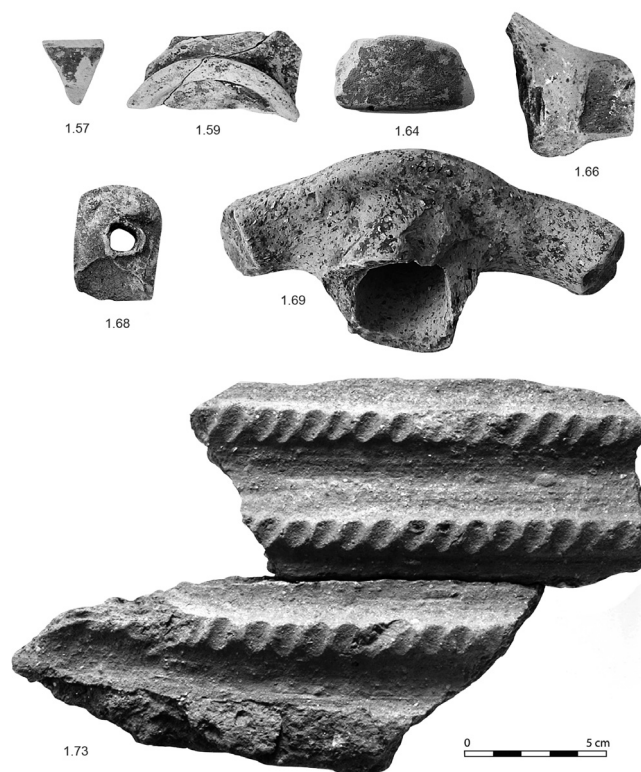


Fig. 71. Sherds from site 1. Late Mycenaean: 1.57-1.73.

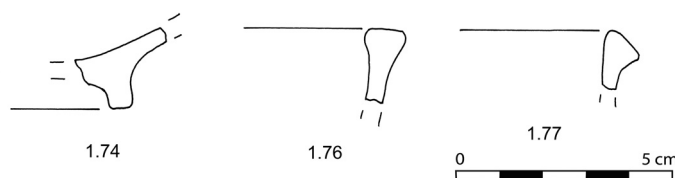


Fig. 72. Drawings of sherds from site 1. Historical pottery: 1.74-1.78.

rim, but different rim profiles; discussion p. 438-439 (date range of most examples LH IIA-III A1, of one, LH IIIB2-IIIC early). LH IIIA1-IIIB2.

- 1.73** (C1578 + C1736). Fig. 71. N13d10 (C1578), N14f1 (C1736). Body sherd of pithos (FS 13). Ribbed surface with rope decoration; three bands preserved and the broken edge of a fourth. Micaceous Ware; very coarse hard dusky red fabric (2.5YR 4/3) with silver mica and large white, blue and gray stone inclusions; reddish yellow surface (5YR 5/6-7.5YR 7/6). Handmade. H. 14, wall th. 1.9.

Cf. Menelaion A467, 262, 437, LH IIIB2-IIIC early (Catling 2009); Pylos No. 1147, 95, 394, Shape 55b, fig. 381, LH IIIB2 (Blegen & Rawson 1966).

LH IIIA1-IIIB2.

- 1.74** (C0161). Figs 72 and 74. N13f10. Base of plate. Ring base. Green glaze on interior. Byzantine-Frankish glazed ware; fine soft pink fabric (5YR 8/4); reddish yellow surface (5YR 7/6-7/8). Wheelmade. Diam. base 8.0 (15%), h. 1.5, wall th. 0.6. Byz-Frankish.

- 1.75** (C0164). Fig. 74. N13f10. Rim and handle of cookpot. Profile buried in strap handle attachment at rim. Byzantine cookware; semi-fine hard reddish yellow fabric (10YR 6/8) with small white stone inclusions. Wheelmade. H. 1.6.

Byz.

- 1.76** (C0271). Fig. 72. M13j10w. Rim of cookpot.

Triangular rim. Byzantine cookware; very coarse pink fabric (5YR 7/3) with small white and black stone inclusions; reddish yellow surface (5YR 6/6). Wheelmade. H. 2, wall th. 0.5.

Cf. PN 205MW15-4, Middle Byz. (Davis & Stocker 2013, 706, no. 81).

Byz.

- 1.77** (C0272). Fig. 72. M13j10w. Rim of cookpot. Rim perhaps downsloping; orientation uncertain. Byzantine cookware; coarse pink fabric (7.5YR 7/3) with small white and gray stone inclusions; reddish yellow surface (5YR 6/6). Wheelmade. H. 1.2.

Byz.

- 1.78** (C0064). Fig. 74. N14d2. Shoulder of cookpot. Five narrow horizontal grooves on exterior. Byzantine cookware; semi-fine hard olive gray fabric (5Y 4/2); reddish yellow surface (5YR 5/6). Wheelmade. H. 3.9, wall th. 0.6.

Byz.

OTHER CERAMIC ARTIFACTS

- 1.79** (C0428). Fig. 74. N13a9w. Top of loom-weight. One side of the top preserved, rectangular outline, pierced horizontally. Coarse light gray fabric (10YR 7/1-7/2) with tan grog and a few red clay inclusions; red surface (2.5YR 6/8). H. 3.4, w. 3.8, diam. hole 1.1.

Cf. Nichoria P2795-P2799, LH II-III A1 (McDonald & Wilkie 1992).

MH III-LH IIB.

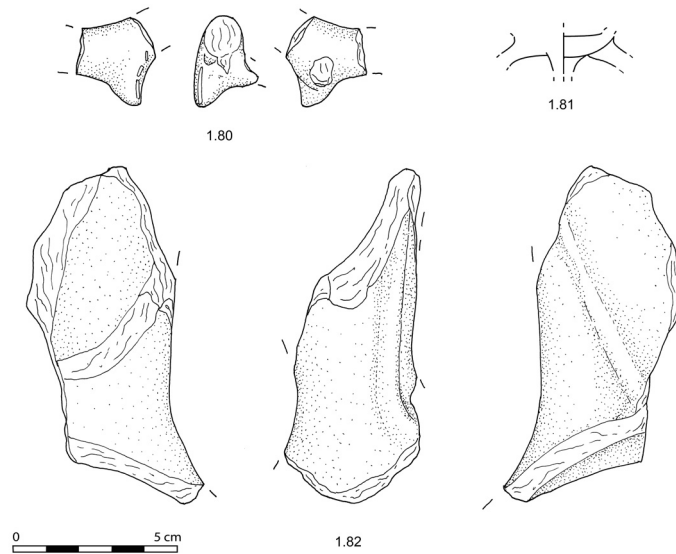


Fig. 73. Drawings of other ceramic artifacts from site 1: 1.79-1.82.

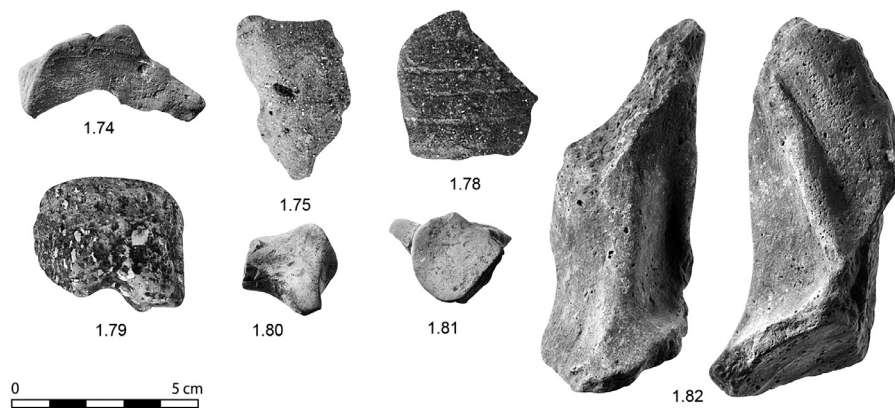


Fig. 74. Historical sherds and other ceramic finds from site 1: 1.74-1.82.

1.80 (C0430). Figs 73 and 74. M13j10e. Animal figurine. Torso with neck and front leg stumps of quadruped. Traces of reddish brown band along one leg. Late Mycenaean Fine Ware; fine soft pink fabric (7.5YR 7/3); reddish yellow surface (5YR 7/6), traces of slip. Handmade. H. 2.3, l. 2.5, diam. body 1.5, diam. leg 0.8 near top. Late LH IIIA2-B2.

1.81 (C0241). Figs 73 and 74. M13j10w. Table or stool figurine. Concave disc top and

stumps of three legs. Late Mycenaean Fine Ware; fine hard pink fabric (7.5YR 7/4); slipped. Handmade. H. 1.1, diam. disc 2.5. LH IIIA1-B2.

1.82 (C0150). Figs 73 and 74. N14e1. Female figurine. Hollow fragment of draped lower body. Ridge of fabric in back. Semi-fine hard reddish yellow fabric, burned (7.5YR 7/6). Moldmade. H. 9.7, w. 4.2, th. 1.1. HL.

LITHICS

- S013.** N14g1. Chert. Secondary cortical flake. Not utilized. L. 2.30, w. 1.83, th. 0.59, wt. 28.99.
- S014.** Fig. 111. M14j1. Chert. Indistinguishable utilization, no retouch, flake. Secondary cortical flake. Utilized. L. 1.30, w. 2.10, th. 0.25, wt. 25.98.
- S020.** M13j10. Chert. Percors/Bec on flakes. Secondary cortical flake. Not utilized. L. 2.24, w. 2.33, th. 0.48, wt. 27.79.
- S028.** Fig. 111. M13j10. Chert. Scraper, bilateral on flake. Secondary cortical flake. Utilized. L. 5.22, w. 2.32, th. 1.10, wt. 39.02.

- S029.** M13j10. Chert. Secondary cortical flake. Not utilized. L. 2.77, w. 2.88, th. 0.82, wt. 31.22.
- S030.** Fig. 111. M13j10. Chert. Scraper, side scraper. Secondary cortical flake. Utilized. L. 3.78, w. 2.19, th. 1.00, wt. 34.10.
- S031.** M14j1. Chert. Secondary cortical flake. Not utilized. L. 3.47, w. 3.21, th. 0.88, wt. 34.80.
- S034.** M13j10w. Chert. Indistinguishable utilization, no retouch, flake. Secondary cortical flake. Utilized. L. 2.68, w. 2.58, th. 0.86, wt. 29.37.

SITE 2

Type: CEM(?)

Squares: M12i6, M12j6

Size: 5000 m²

Elevation: 160 masl.

Periods: LH I-II; Byz

Site 2 is located on the north slope of the Iklaina plateau in squares j6 and the east end of i6 (fig. 77). Square i6 is a gentle slope with olive trees and a visibility of 20-30%. The south half of square j6 is steep and dominated by an overgrown scarp with minimal visibility. Here the slope is gentler and forms a steep mound to the west. The soil is soft limestone ("aspropoulia").

At a distance of 21 m from the northeast and 23 m from the southeast corners of the square, on the north slope of the mound, we found two openings covered by smoothed, roughly rectangular blocks of stone (fig. 75). The north edge and part of the upper flat surfaces of these stones are clearly visible. The stones are arranged along an elliptical line at a distance of 4.60 m from each other. The diameter of the east opening is 30×25 cm and of the west opening 20×10 cm. The depth of each opening is at least 2.30 m and in the interiors more rectangular stones are visible.

The finds noted in the field include 16 fragments of tile, 8 rims, 1 handle, and about 40 body sherds. A few pieces are LH I-II date but there is very little LH III. Other diagnostic material, including the tiles, is Byzantine. Only four sherds were collected: three are from Byzantine cookpots (2.2) and the fourth is a body sherd in Early Mycenaean Gray Orange Ware (2.1).

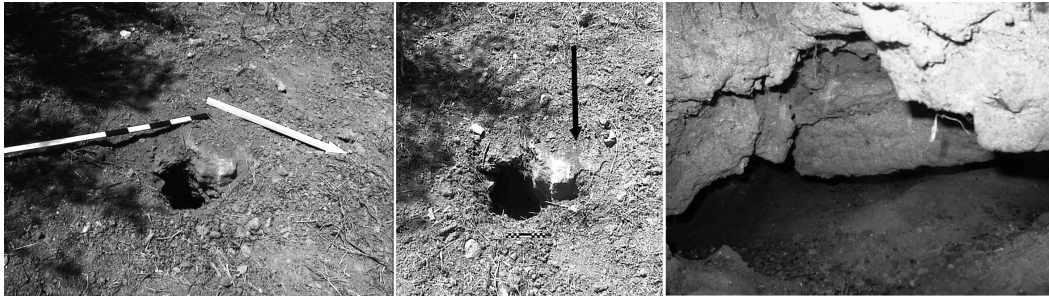


Fig. 75. Views of the openings on the ground (left and middle) and the cornerblock in the interior (right).

CATALOGUE

POTTERY

2.1 (C0512). Fig. 76. M12j6. Body sherd of undetermined closed vessel. Early Mycenaean Gray Orange Ware; semi-fine red fabric (2.5YR 6/8) with one tan grog inclusion. 2.1×2.2, wall th. 0.6. LH I-IIB.

2.2 (C0498). Fig. 76. M12j6. Rim and handle of cookpot. Vertical oval handle from flaring rim, straight neck. Byzantine cookware; coarse pinkish gray fabric (7.5YR 6/2) with many small white stone inclusions. Wheel-made. L. handle 2.6, w. handle 1.1. Byz.

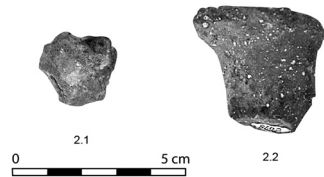


Fig. 76. Sherds from site 2.

SITE 3: Dendra

Type: HAB

Squares: M12e10, M12f10, M13d1, M13e1

Size: 22,500 m²

Elevation: 122-149 masl.

Periods: MH III-LH II, LH IIIA-B, CL-HL, HL-R, Byz

The northwest slope of the Iklaina plateau is covered with olive groves. High concentrations of finds were noted in an area extending over four squares, with the halo covering an additional 14 squares (fig. 77). The western part of the site is covered

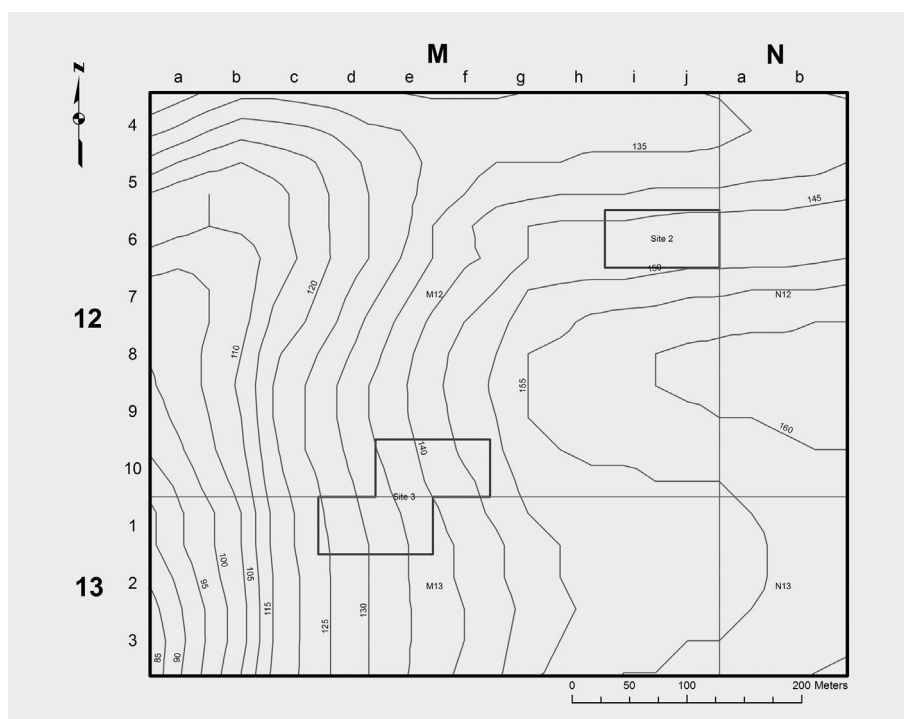


Fig. 77. Plan of sites 2 and 3.

with olive trees, including small olive groves in the north side of d1 where regular tillage brings artifacts to the ground surface. Conversely, the eastern part of the site is covered with thick vegetation that restricts visibility and was less likely to have been tilled shortly prior to survey. Dirt roads and paths cross the site; in the scarps there is a large number of sherds. The site commands an excellent view to the west, including the villages of Koryphasio, Romanou, and Traghana, as far as the Ionian Sea.

The highest concentrations of surface finds were recorded in the northeast corner of the site (M12f10), with lower, but still considerable numbers of artifacts found downslope to the west and southwest (M12e10, M13d1, M13e1). Finds include sherds of the LH I-II (strewn over an area of 70×100 m) and especially LH IIIA-B periods (over an area of 100×180 m), as well as fragments of clay roofing material, a few painted Laconian tiles, coarse sherds from storage vessels, an amphora toe, a black glazed lamp fragment and other black glazed pieces (probably 4th century BC to Hellenistic). A concentration of 130 Hellenistic tiles was found in M13d1. Further to the east and south of the above mentioned squares the number of finds decreases: in the open spaces between the bushes we found mostly coarse sherds, a few bricks and tiles, two flint blades and five sea shells (*Cerastoderma edule*).

The Bronze Age material collected includes a few Late Helladic sherds, in the full range from Early Mycenaean to LH IIIA-B. The Early Mycenaean material is coarse and semi-fine: two handles in Very Coarse Orange Ware and a handle (3.1) and body sherd in Tan Grog Ware are of Middle Helladic or Early Mycenaean date. Two Late Mycenaean sherds are from fine open vessels (3.2); Palace Ware is represented by one body sherd from an open vessel. Two coarse body sherds from jars and one from a pithos were also collected.

Historic material is more plentiful. Of Late Classical to Hellenistic date are a rim and three body sherds with dark red-brown paint/glaze, a body sherd with a thicker, redder surface and shiny red glaze on the interior, and several black glazed sherds, one from a lamp (3.3). Hellenistic to Roman material includes tile fragments (3.4, 3.6), a fine ware conical bowl rim, and several reddish yellow micaceous sherds, one of them a storage bin rim (3.5). A rolled bowl rim and a vertical strap handle are of Roman date. Byzantine material includes a fine small vertical oval handle and a fine bowl rim, a rim from a cookpot (3.7), and several tile fragments (3.8).

CATALOGUE

POTTERY

3.1 (C0197+203b). Fig. 79. M13e1. Handle of jar. Round probably vertical handle. Tan Grog Ware; coarse, dark reddish gray fabric (2.5YR 5/1) with many tan grog inclusions; red surface (2.5YR 6/8). Handmade. Diam. handle 2.0-2.3, l. handle 5.2.

MH III-LH IIB.

3.2 (C0201). Figs 78 and 79. M13e1. Foot of a goblet (FS 263) or stemmed bowl (FS 304). Domed foot. Late Mycenaean Fine Pink Ware; fine very soft light red fabric (2.5YR 7/8); very pale brown surface (10YR 8/3), smoothed. Diam. stem 3.4, h. 1.7.

LH IIIA1-2.

3.3 (C0493). Fig. 79. M12f10. Body sherd of lamp (Probably Broneer type X or Howland type 33A). Shoulder with edge of hole preserved. Black glaze coating on exterior and interior. Black glaze ware; fine pink fabric (7.5YR 7/4). Wheelmade. 1.8×1.4, wall th. 0.6.

HL.

3.4 (C0495). Fig. 79. M12f10. Edge of tile. Laconian tile. Raised edge; rough convex surface.

Coated black on concave surface and finished edge. Fine reddish yellow fabric (5YR 7/6). Moldmade. 10.8×9.0, wall th. 1.9.

HL.

3.5 (C0396). Fig. 79. M13d1. Rim of storage bin. Wide downsloping rim. Fine hard reddish yellow fabric (5YR 6/6) with small specks of silver mica. Wheelmade. H. 1.9, wall th. 0.7.

HL-R.

3.6 (C0503). Figs 78 and 79. M12e10. Edge of tile. Rolled edge. Fine pink fabric (7.5YR 7/4). Moldmade. 7.5×5.0, wall th. 1.8.

HL-R.

3.7 (C0397). Fig. 79. M13d1. Rim of cookpot. Horizontal everted rim. Byzantine cookware; coarse reddish yellow fabric (5YR 7/8) with white stone inclusions. Wheelmade. H. 2.2.

Byz.

3.8 (C0504). Fig. 79. M12e10. Fragment of tile. Fine very pale brown fabric (10YR 8/2); gritty surface. Moldmade. 6.0×3.8, th. 1.3.

Byz.

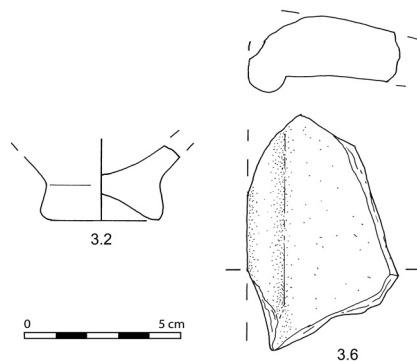


Fig. 78. Drawings of sherds from site 3.

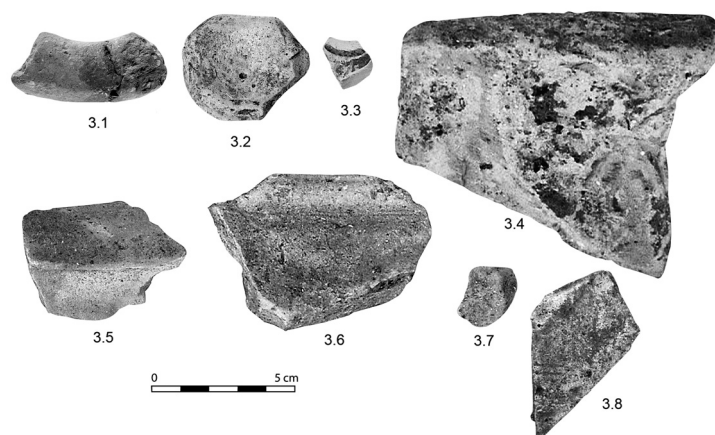


Fig. 79. Sherds from site 3.

SITE 4: Iklaina village

Type: HAB

Squares: O13c7, O13c8, O13d7, O13d8, O13e7, O13e8, O13f7, O13f8, O13g8, O13h7, O13i7, O13i8.

Size: 52,500 m²

Elevation: 161-174 masl.

Periods: MH, LH I-II, LH IIIA-B, CL?, HL, R, Byz

This site is located 300 m to the northwest of the outskirts of the village of Iklaina on land sloping from the north down towards the south (fig. 80). A bulldozed road runs in an east-west direction through squares g8, f8, e8, and d7, and separates the north and south sections of those squares. Below the bulldozed road in f8 is a citrus grove, itself formed from a bulldozer cut and fill. In squares d8 and e8 there is a pile

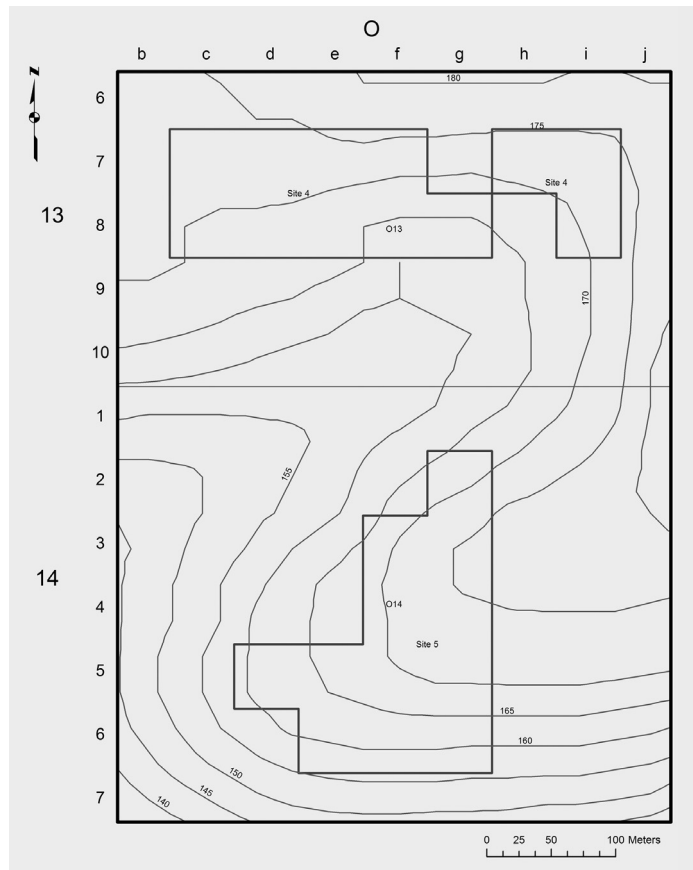


Fig. 80. Plan of sites 4 and 5.

of stones, probably associated with the farmhouse in those squares, with a large amount of pottery on and around it. Squares c7 and c8 on the western edge of the site are on a relatively flat piece of land covered by an olive grove and olive trees in a vineyard in c7. Artifacts were mostly densely concentrated in square d8 and surrounding squares covering an area of about 150×80 m, but the site is so heavily built that the precise size of the site could not be estimated. Overall, artifacts are found over an area of about 4 ha, but it was not possible to establish a chronological pattern in the spatial distribution of the finds.

Nearly all the material collected is extremely battered and broken. Only a few fragments are Bronze Age, spread over an area of 100×130 m. Middle Helladic cookware is represented by one rim (4.1), the Early Mycenaean period by a button base goblet foot and a cup rim (4.2, 4.3), a few coarse jar fragments, and one micaceous sherd. A red coated kylix rim (4.4) dates to LH IIIA2. Most of the Historic material collected is Late Classical to Byzantine in date, except for a stewpot with a ledge below the

rim on the exterior (4.5), which could be as early as Archaic. The Hellenistic material consists of plain vessels, mostly closed vessels (4.6, 4.8), and two glazed fragments: a table amphora rim (4.7) and a ring base with possible black glaze. Of Roman date are a bowl rim and an African Red Slip plate rim (4.9). A ribbed and a combed body sherd are of Late Roman to Byzantine date (4.10-4.11). The Byzantine pottery collected consists mostly of sherds in cooking fabric, along with fragments of a few other vessels and a tile.

CATALOGUE

POTTERY

- 4.1 (C0636). Fig. 82. O13d8. Rim of open vessel. Irregularly shaped everted rim. Middle Hellenistic Coarse Ware; coarse very dark gray burned fabric (5G 3/1) with small dark inclusions; red surface (2.5YR 5/6). Handmade. Diam. rim est. 15 (<10%), h. 3.0, wall th. 1.0.
MH I-III.
- 4.2 (C0689). Figs 81 and 82. O13h07. Foot of goblet (FS 263/268). Button base. Early Mycenaean Gray Orange Ware(?); coarse light gray fabric (7.5YR 7/1) with large tan grog inclusions; pink surface (7.5YR 7/4). Wheelmade (?). Diam. foot est. 6 (<10%), h. 2.5.
Cf. Nichoria P3151, LH I (McDonald & Wilkie 1992).
LH I.
- 4.3 (C0709). Fig. 82. O13i8. Rim of cup (FS 221?). Short rounded rim, deep body. Early Mycenaean Gray Orange Ware; semi-fine very soft light brownish gray fabric (10YR 6/2); reddish yellow interior surface (5YR 7/8), exterior surface completely eroded. Wheelmade? Diam. rim est. 16 (<10%), h. 1.7, wall th. 0.4.
LH IIA-B.
- 4.4 (C0702). Fig. 82. O13i7. Rim of kylix (FS 264/265). Flaring rim. Red-brown paint preserved on exterior below rim, vessel probably coated on exterior and interior. Late Mycenaean Fine Pink Ware; fine, fairly hard, pink fabric (5YR 8/3); worn surface. Wheelmade. H. 1.6, wall th. 0.7.
LH IIIA2.
- 4.5 (C0559). Figs 81 and 82. O13c7. Rim of stew-pot. Slightly downsloping flat-topped rim, with ledge below on exterior. Semi-fine reddish yellow fabric (5YR 6/8) with sand and some tan grog inclusions; red surface (2.5YR 5/8). Wheelmade. Diam. rim est. 17 (<10%), h. 1.8. (Stefanakis et al. 2007, 252, figs 6.7, 14.10-11).
A-CL.
- 4.6 (C0639). Fig. 82. O13d8. Rim of storage bin. Horizontal everted rim with bevel below on neck. Semi-fine pink fabric (7.5YR 7/4) with a few sandy inclusions. Wheelmade. Diam. rim est. 12-15 (<10%), h. 2.9, wall th. 0.7.
CL-HL.
- 4.7 (C0528). Fig. 82. O13c8. Rim of table amphora. Horizontal everted rim, molding below. Red glaze preserved on exterior and rim top. Fine reddish yellow fabric (5YR 6/6). Wheelmade. Diam. rim 10.0 (10%), h. 0.9, wall th. 0.4.
HL, transitional to R.
- 4.8 (C0627). Figs 81 and 82. O13e8. Rim and handle of transport amphora. Vertical oval handle from flaring, slightly everted rim. Fine hard reddish yellow fabric (5YR 6/8). Wheelmade. L. handle 1.8, w. handle 2.7, h. 5.9, wall th. 0.7.
HL-R.

4.9 (C0531). Fig. 82. O13c8. Rim of plate (Hayes 50). Lipless rim. African red slip ware; very fine soft red fabric (2.5YR 6/8); slipped. Wheelmade. Diam. rim est. 24 (<10%), h. 2.1, wall th. 0.4.
R.

4.10 (C0674). Fig. 82. O13f7. Body sherd of amphora (Late Roman amphora I). Ribbed on exterior. Ribbed ware; semi-fine reddish yellow fabric (5YR 7/6) with a few small white inclusions; pink surface (7.5YR 7/4). Wheelmade. 3.8×2.7, wall th. 0.9.
Late R-Byz.

4.11 (C0534). Fig. 82. O13c8. Body sherd of jar. Combed on exterior. Combed ware; semi-fine reddish yellow fabric (5YR 6/8) with a few small white inclusions; very worn surface. Wheelmade. 4.4×3.1, wall th. 1.0.
Byz.

LITHICS

S054. O13i7. Chert. Secondary cortical flake. Not utilized. L. 3.14, w. 1.88, th. 0.67, wt. 28.69.

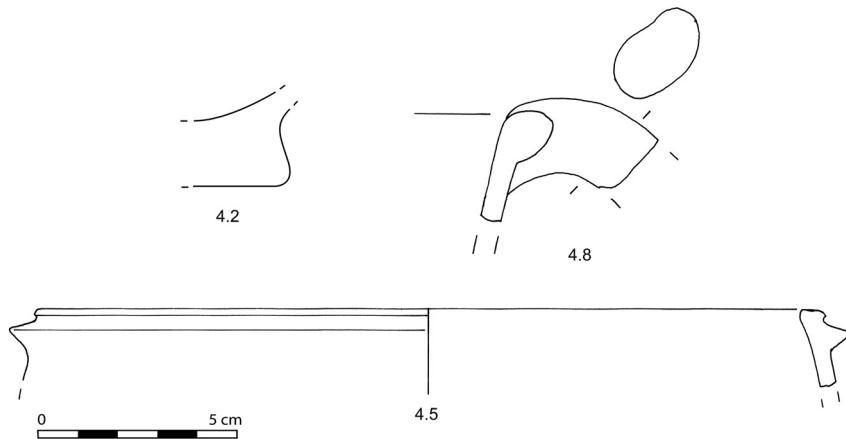


Fig. 81. Drawings of sherds from site 4.

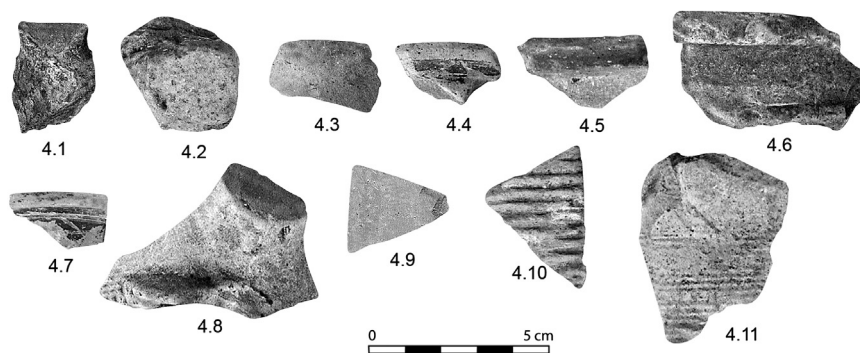


Fig. 82. Sherds from site 4.

SITE 5

Type: HAB

Squares: O14d5, O14e5, O14e6, O14f3, O14f4, O14f5, O14f6, O14g2, O14g3, O14g4

Size: 25,500 m²

Elevation: 156-176 masl.

Periods: MH?, LH I-II, LH IIIA-B, CL-HL, R, Byz

The site occupies the flat elongated summit of the hill immediately to the southeast of the Iklaina plateau, and is cut in two by the road leading from Iklaina to Elaiophyto (fig. 80). To the north of the road the land slopes down gently towards the northwest, in a series of terraces descending towards the dried stream bed. On the south side of the road, the land slopes down to the south and southwest. Some parts of squares f3, f4, g3, g4, and g5 are obscured by modern houses and the asphalt road. Otherwise land cover in this site consists of olive groves.

Square g2 is divided into two parts by a stream running roughly northwest-southeast. South of the stream, the elevation rises towards a hill in a series of terraces. It is noteworthy that as one approaches the hill, the density of Mycenaean artifacts rises sharply; Late Helladic sherds were found essentially in squares g3 and g4. Square g3 includes the upslope of the hill, which culminates in a sharp rise of about 3 m. On the plateau above is a plowed olive grove nestled between three fenced-in areas. For g3, 428 sherds were found near the south side of the terraced scarp, where the soil is darker brown, different than the light brown soil of the rest of the south part of the square. In f3, the upper olive grove continues that of g3, with the same strip of dark soil with high artifact density. To the north are several terraces, all with olive groves, of variable visibility. The northwest corner of the square is unsurveyable due to the thick foliage that follows the stream. The highest concentration of artifacts was found in the area with the dark soil under the terrace wall. Only the northwest quarter of g4 is surveyable, the rest being blocked off by fences and residential areas. Most kylix fragments were found in a single spot 12 m south of the north line of the square. Artifact density tapers off in h4, although visibility is low in that square due to the dense vines and grassy ground. In h3 there are a few noteworthy finds.

Because the site is overbuilt, a period-by-period distribution of the surface finds could not be established. The diagnostic Bronze Age material collected ranges in date from MH III/LH I to LH IIIB, though one tripod leg (5.1) in Very Coarse Orange Ware could be earlier. Two or three coarse fragments and an Early Mycenaean gray orange rim are Early Mycenaean. Most of the LH IIIA-B sherds come from fine ware open vessels, including kylikes (5.3-5.5) and a battered krater or stemmed bowl foot with traces of red paint on the exterior. Only a few sherds come from jugs (5.2) and jars. The Historic material includes a black glazed sherd probably of the 4th c. BC (5.6), but other pieces are Roman to Byzantine, in cookware and other coarse fabrics, includ-

ing a combed body sherd (5.7). A Byzantine tile fragment (5.8) was also recovered and catalogued.

CATALOGUE

POTTERY

- 5.1 (C0768). Fig. 84. O14g3. Leg of tripod. Small tapering leg, oval section. Very Coarse Orange Ware; coarse reddish yellow fabric (5YR 6/8) with white, blue and black stone inclusions. Handmade. H. 3.2, w. leg top 2.0, middle 1.7.
MH I-LH IIB.
- 5.2 (C0783). Figs 83 and 84. O14h03. Rim and handle of jug with cutaway neck (FS 135/136). Thick vertical strap/narrow oval handle from rolled everted rim. Mycenaean Fine White Ware; fine very pale brown fabric (10YR 8/2). Wheelmade. W. handle 2.3, h. 2.6.
LH IIIA1-B1.
- 5.3 (C0763). Figs 83 and 84. O14g4. Rim of kylix (FS 265/266). Rounded rim. Late Mycenaean Fine Ware; fine soft pink fabric (7.5YR 8/4); slipped. Wheelmade. H. 2.8, wall th. 0.3.
LH IIIA2-B2.
- 5.4 (C0770). Figs 83 and 84. O14g3. Rim of kylix (FS 265/266). Flaring lipless rim. Palace Ware; fine soft very pale brown fabric (10YR 8/3). Wheelmade. H. 2.7, wall th. 0.5.
LH IIIB1-2.
- 5.5 (C0764). Fig. 84. O14g4. Foot of angular kylix (FS 267). Flat string-cut foot. Palace Ware; fine soft very pale brown fabric (10YR 8/2-8/3). Wheelmade. Diam. foot 7.0 (25% preserved), h. 1.1.
LH IIIB1-2.
- 5.6 (C0758). Fig. 84. O14f3. Body sherd of small open vessel. Coated with black glaze on interior. Black glaze ware; very fine soft reddish yellow fabric (7.5YR 7/6). Wheelmade. 2.6×1.7, wall th. 0.6.
CL-HL. 4th c. BC.
- 5.7 (C0804). Fig. 84. O14g3. Body sherd of amphora. Combed on exterior. Combed ware; fine reddish yellow fabric (5YR 6/6). 2.4×1.5, wall th. 0.9.
Late R.
- 5.8 (C0756). Fig. 84. O14f3. Edge of tile. Beveled edge. Fine porous pink fabric (7.5YR 8/3). Moldmade. 10.3×5.5, th. 2.3.
Byz.

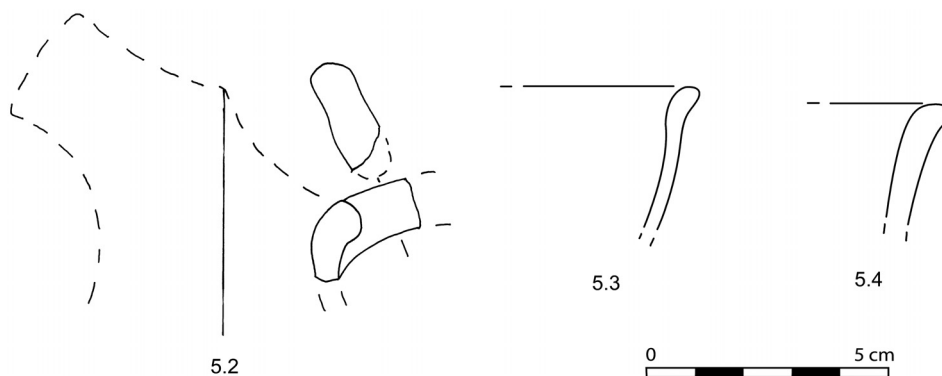


Fig. 83. Drawings of sherds from site 5.

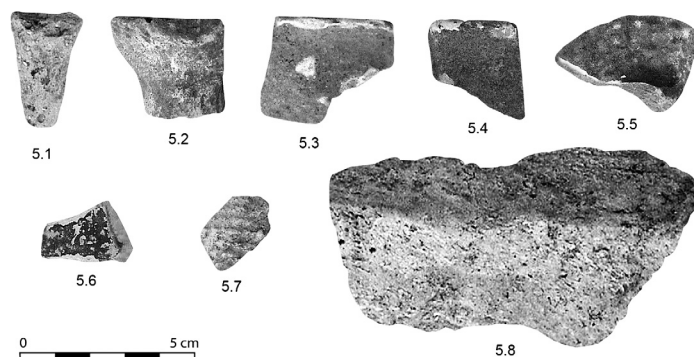


Fig. 84. Sherds from site 5.

SITE 6

Type: HAB

Squares: O12d5, O12e3, O12e5, O12f9, O12f10, O12g7, O12h1, O12h5, O12j9, O13h2, O13i2, O13j1, O13j2, P13a3

Size: 35,000 m²

Elevation: 184-191 masl.

Periods: MH?, LH I-II, LH IIIA-B, CL, HL, R, Byz

Site 6 is located northwest of the village of Iklaina and almost directly north of Site 4. The terrain is relatively flat with a very gentle slope downwards from the east towards the west. The squares of this site are covered in olive groves and there are no obvious signs of erosion in the immediate area.

Apart from two Laconian roof tiles (6.2), the material collected consists of small worn sherds, most dated with some uncertainty by fabric alone. The LH I-II sherds were found in O13h2, O13i2, O13j1, O13j2, and P13a3; chronological patterns in the spatial distribution of finds have not been noted. Several pieces are probably Early Mycenaean: a goblet foot (6.1) and a body sherd in Early Mycenaean Gray Orange Ware, and a Tan grog body sherd. Four coarse body sherds can be dated only broadly to MH I-LH IIB. The only Late Mycenaean pieces are two body sherds in Palace Ware dating to LH IIIA2-B2. The Laconian tiles confirm the presence of Classical to Hellenistic activity; a bowl rim and two handles are Hellenistic to Roman in date. Byzantine cookware is certainly present (6.3), as well as the base of a glazed Byzantine plate (6.4).

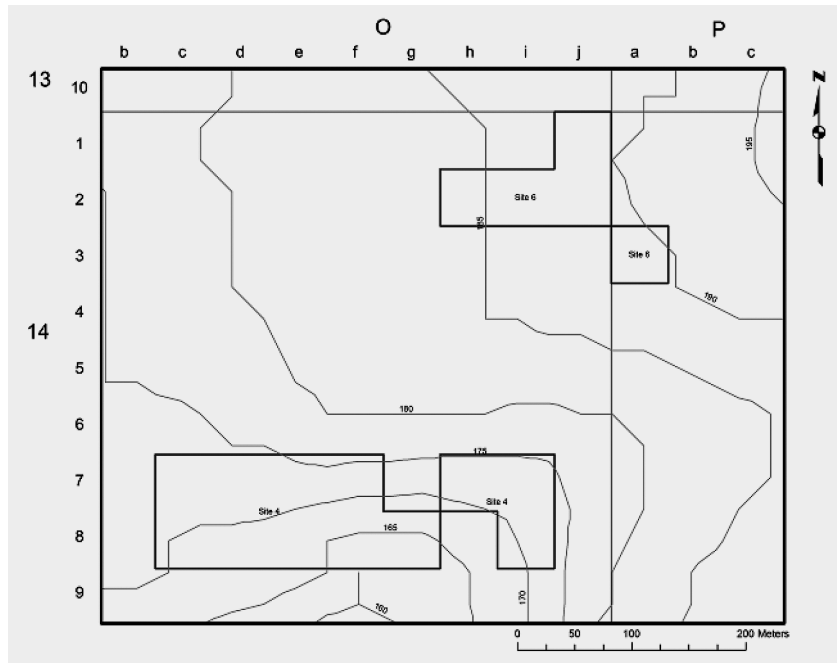


Fig. 85. Plan of sites 4 and 6 (cf. fig. 80).

CATALOGUE

POTTERY

- 6.1** (C0700). O13i2. Foot of goblet (FS 263/268). Slightly concave foot. Early Mycenaean Gray Orange Ware; semi-fine gray fabric (7.5YR 6/1) with tiny red inclusions; reddish yellow surface (5YR 7/8). H. 1.8. LH I-IIB.
- 6.2** (C0680). Fig. 87. O13j1. Two fragments of tile. Laconian cover tiles. Black glaze on upper surface. Fine pink fabric (7.5YR 7/3). Moldmade. Fragment A: 4.1×2.9, th. 1.2; fragment B: 3.5×2.6, th. 1.1.

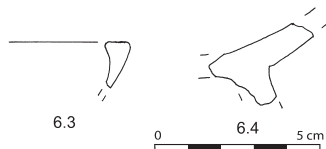


Fig. 86. Drawings of sherds from site 6.

CL-HL. 4th c. BC.

- 6.3** (C0682). Fig. 86. O13h02. Rim of cookpot. Small fragment, flat-topped, square in section. Byzantine cookware; semi-coarse gritty reddish yellow fabric (5YR 6/8-7/8) with prominent small white stone inclusions. Wheelmade. H. 1.9. Late R-Byz.
- 6.4** (C0729). Fig. 86. O13j2. Base of plate. Ring base. Traces of white glaze on interior. Byzantine-Frankish glazed ware; fine hard pink fabric (5YR 7/4). Wheelmade. H. 2.0. Byz-Frankish.

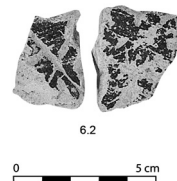


Fig. 87. Tiles from site 6.

LITHICS

S056. Fig. 110. O13j2. Chert. Scraper, end of retouched flake. Secondary cortical flake. Utilized. L. 3.10, w. 3.25, th. 0.75, wt. 36.10.

S057. O13j2. Chert. Secondary flake. Not utilized. L. 2.39, w. 2.78, th. 0.66, wt. 32.21.

S065. P13a3. Chert. Tertiary flake. Not utilized. L. 1.42, w. 2.31, th. 0.44, wt. 1.99.

SITE 7: Panagitsa

Type: HAB, CEM

Squares: P13i1, P13i2, P13i3, P13i4, P13j1, P13j2, P13j3, P13j4, Q12b10, Q12c10, Q12d9, Q12d10, Q12e8, Q12e9, Q12f7, Q12f8, Q12f9, Q12f10, Q12g7, Q12g8, Q13a1, Q13a2, Q13a3, Q13a4, Q13b1, Q13b2, Q13b3, Q13b4, Q13c1, Q13c2, Q13c3, Q13c4, Q13c5, Q13c6, Q13c7, Q13d1, Q13d2, Q13d3, Q13d4, Q13d5, Q13d6, Q13d7, Q13e1, Q13e2, Q13e3, Q13e4, Q13e5, Q13e6, Q13f5, Q13f6, Q13g6.

Size: 127,500 m²

Elevation: 197-225 masl.

Periods: MH, LH I-II, LH IIIA-B, CL, HL, R, Byz, Turk

This extensive site is located almost exactly in the center of the Iklaina plateau to the northeast of the village of Iklaina and just to the west and southwest of the chapel "Panagitsa." The land slopes downwards from the north and east towards the southwest in a series of terraces (fig. 88). The present-day land cover of the site is primarily olive groves with a few dirt paths cutting through the area. The northern squares in Q12 have few signs of soil erosion, while in the southern squares, cobble-sized pieces of limestone are common in the tilled fields, which indicates that the limestone bedrock is being broken up and brought to the surface by tilling.

More than 3,000 sherds were noted, mostly fine and medium quality fragments from undecorated Mycenaean vases, as well as kylix stems, coarse pithos sherds, many tile fragments, and numerous pieces of slag, as well as forty-one fragments of human bones, which may belong to a destroyed or undetected burial. The bulk of the finds are Mycenaean, Byzantine and Turkish. The Bronze Age material collected ranges from Middle to Late Helladic in date, and includes diagnostic sherds of each phase. The Middle Helladic sherds seem to be distributed over an area of 100×100 m, the Early Mycenaean over an area of 100×80 m and the Late Mycenaean over an area of 500×200 m.

Some body sherds in cooking fabrics are recognizably Middle Helladic. Goblets, bowls and jugs in semi-fine orange fabrics (7.3-7.7) represent the Early Mycenaean period. A handmade miniature vessel in Early Mycenaean Gray Orange Ware (7.8) is interesting, since miniatures of this period are usually fine and wheelmade,¹³² though

132. Mountjoy 1986, 50 and fig. 56.

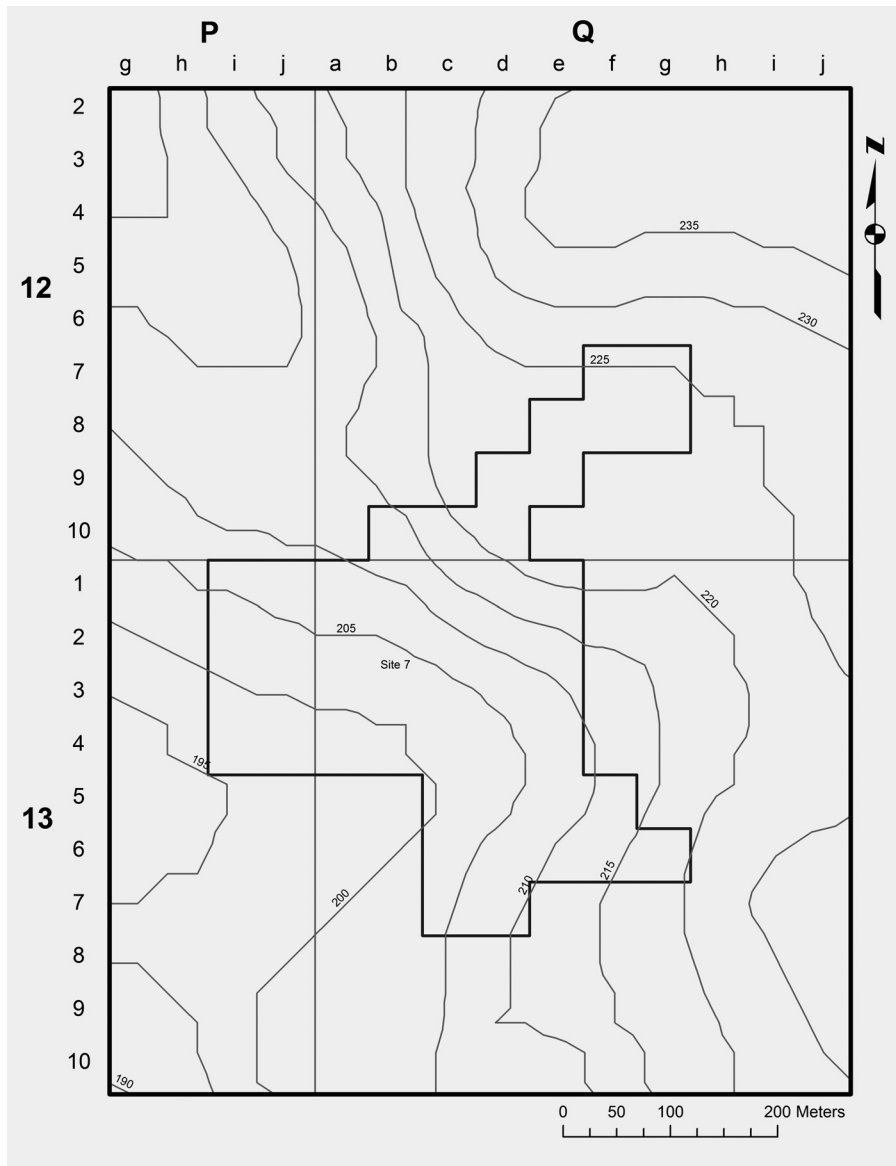


Fig. 88. Plan of site 7.

several examples of handmade miniatures in this fabric are attested in excavation material from Iklaina. Several body fragments of plain bowls and jars in Hard Orange Ware and a few coarse vessels in Tan Grog Ware (7.1-7.2) fall in the late Middle Helladic-Early Mycenaean range. A tripod leg in Mycenaean Orange Ware (7.9) cannot be closely dated.

Late Mycenaean fine open shapes occur in both Late Mycenaean Fine Ware and Palace Ware. Kylikes (7.11, 7.13-7.14) and shallow angular bowls (7.12) predominate,

but a few sherds from cups (7.15), goblets and stemmed bowls (7.10, 7.16) and basins (7.17) were also collected. Closed vessels are less common, but include fragments of jars and a pithos. Most of the Late Mycenaean pottery is unpainted, but a few body sherds have traces of paint on the exterior, interior or both.

Historic material is predominantly Hellenistic to Frankish in date. Diagnostic Hellenistic to Roman fragments come from pitchers and amphoras (7.19-7.20); there are also a few sherds from Roman cooking pots. Byzantine cookware (7.22) and tile (7.23) are common. There are also a few glazed body sherds from Byzantine to Frankish bowls (7.24) and plates, including a fragment of Sgraffito ware (7.21). Two glazed sherds are Turkish to Modern.

CATALOGUE

POTTERY

- 7.1 (C1218). Fig. 90. Q13b4. Rim of basin or jar. Horizontal everted rim. Tan Grog Ware; coarse hard yellowish red fabric (5YR 5/8) with large tan grog inclusions; yellowish brown surface (10YR 5/4), burned. H. 3.3, wall th. 1.1.
MH III-LH IIB.
- 7.2 (C1300). Fig. 90. Q13c1. Leg of tripod. Oval section, flanged at bottom. Tan Grog Ware; coarse reddish yellow fabric (5YR 6/8) with small tan grog inclusions. Handmade. H. 4.6, w. leg 3.2, th. leg 1.7.
MH III-LH IIB.
- 7.3 (C1187). Fig. 89. Q13b1. Rim of goblet (FS 263/268). Tall thin everted rim. Early Mycenaean Gray Orange Ware; semi-fine very soft gray fabric (7.5YR 5/1); red surface (2.5YR 6/8), trace of tan slip on exterior. Wheelmade. Diam. rim est. 15 (<10%), h. 1.8, wall th. 0.7.
LH I-IIB.
- 7.4 (C1239). Fig. 89. Q13c4. Foot of goblet (FS 263/268). Button base. Early Mycenaean Gray Orange Ware; semi-fine very soft yellowish red fabric (5YR 5/6); surface worn away. Wheelmade. Diam. foot 2.5 (40%), h. 1.6.
Cf. Nichoria P3151, LH I (McDonald & Wilkie 1992).
- LH I.
- 7.5 (C1251). Fig. 89. Q13c3. Foot of goblet (FS 263/268). Concave foot of large goblet. Early Mycenaean Gray Orange Ware; semi-fine hard very pale brown fabric (10YR 7/4); red surface (2.5YR 6/8). Wheelmade. Diam. stem 3.9, h. 2.3.
LH IIA-B.
- 7.6 (C1132). Fig. 89. Q13b3. Rim of bowl. Rounded everted rim. Early Mycenaean Gray Orange Ware; semi-fine very soft light yellowish brown fabric (10YR 6/4); reddish yellow surface (5YR 6/8). Wheelmade. H. 2.8, wall th. 0.6.
LH IIA-B.
- 7.7 (C1160). Fig. 90. Q13d3. Rim and handle of jug. Vertical round handle from rounded rim. Early Mycenaean Gray Orange Ware; semi-fine hard gray fabric (5YR 6/1) with red clay inclusions; reddish yellow surface (5YR 7/8). Wheelmade. Diam. handle 2.1, l. handle 6.1.
Cf. Nichoria P3314, LH IIA (McDonald & Wilkie 1992).
LH I-IIA.
- 7.8 (C1515). Fig. 90. Q12c10. Lower body of miniature closed vessel or goblet (FS 126). Rounded body; rough interior; broken edge of stem or raised base. Early Mycenaean Gray Orange Ware; semi-fine fairly soft light gray fabric (10YR 7/2); reddish yellow

- surface (5YR 6/6). Handmade. H. 4.1, wall th. 0.5.
LH I-IIB.
- 7.9** (C1157). Fig. 90. Q13d3. Leg of tripod. Straight leg, oval section, rounded bottom, pierced at top. Mycenaean Orange Ware; semi-fine red fabric (2.5YR 6/8) with a few large white stone inclusions; light red surface (2.5YR 7/6). Handmade. H. 6.6, w. leg 2.9, th. leg 2.1.
LH I-IIIB2.
- 7.10** (C1186). Fig. 89. Q13b1. Stem to lower body of goblet or stemmed bowl (FS 304/305). Concave foot. Late Mycenaean Fine Ware; fine soft light gray fabric (2.5Y 7/1); pink surface (5YR 8/4). Wheelmade. Diam. stem 2.4, h. 3.3.
LH IIIA1-B2.
- 7.11** (C1304). Fig. 89. Q13c1. Rim of angular kylix (FS 267). Short rounded everted rim, short upper body. Palace Ware; fine soft light gray fabric (2.5Y 7/2). Wheelmade. H. 2.7, wall th. 0.6.
LH IIIA2.
- 7.12** (C1168). Fig. 89. Q13d1. Rim and handle of shallow angular bowl (FS 295). Short everted, nearly horizontal rim with one side of horizontal strap handle; short upper body. Late Mycenaean Fine Ware; fine soft very pale brown fabric (10YR 8/3); slip preserved on interior. Diam. rim est. 13 (<10%), h. 1.7, wall th. 0.8.
Cf. Nichoria P3729, LH IIIA2 (McDonald & Wilkie 1992).
LH IIIA2.
- 7.13** (C1306). Fig. 90. Q13c1. Stem of kylix (FS 265/266). Tall stem tapering to bottom; domed foot. Late Myc. fine ware; fine soft reddish yellow fabric (7.5YR 7/4); pink surface (7.5YR 8/3). Wheelmade. Diam. stem top 2.8, bot. 2.1, h. 7.8.
LH IIIA2-B1.
- 7.14** (C1253). Fig. 89. Q13c3. Rim of kylix (FS 265/266). Short everted rim. Palace Ware; fine hard gray fabric (2.5Y 5/1), burned soft pale yellow surface (2.5Y 7/4). Wheelmade. H. 3.1, wall th. 0.4.
LH IIIA2-B2.
- 7.15** (C1177). Fig. 89. Q13b1. Rim of cup, perhaps spouted (FS 249). Flaring lipless rim. Late Mycenaean Fine Ware; fine soft very pale brown fabric (10YR 8/4). Wheelmade. H. 2.4, wall th. 0.4.
LH IIIA2-B2.
- 7.16** (C1175). Fig. 89. Q13b1. Foot of stemmed bowl (FS 304/305). Well-made deeply domed foot. Traces of black paint on exterior. Late Mycenaean Fine Ware; fine very pale brown fabric (10YR 8/4). Wheelmade. Diam. foot 7.0 (60% preserved), diam. stem 3.0, h. 1.5.
LH IIIA2-B2.
- 7.17** (C1176). Fig. 89. Q13b1. Rim of basin (FS 294). Downsloping rim. Palace Ware; fine soft very pale brown fabric (10YR 8/2). Wheelmade. Diam. est. 24 (<10%), h. 4.7, wall th. 0.9.
LH IIIA2-B2.
- 7.18** (C1252). Fig. 90. Q13c3. Foot of undetermined vessel. Pedestal foot. Fine hard reddish yellow fabric (7.5YR 7/6); pale buff slip on exterior. Wheelmade. Diam. foot est. 11 (<10%), h. 1.8, wall th. 0.5.
CL-HL.
- 7.19** (C1197). Figs 89 and 90. Q13b2. Rim and handle of pitcher. Flaring rim; wide vertical strap handle. Fine hard light gray fabric (5YR 7/1); reddish yellow surface (5YR 7/8), smoothing marks. Wheelmade. H. 2.8, wall th. 0.5, w. handle est. 5, handle th. 1.1.
HL-R.
- 7.20** (C1130). Fig. 90. Q13b3. Neck and handle of amphora. Coan amphora. Vertical strap handle with central rib from narrow neck. Fine fairly hard reddish yellow fabric (7.5YR 7/6). Wheelmade. L. handle 5.9, w. handle 5.2, handle th. 1.9.
HL-R.

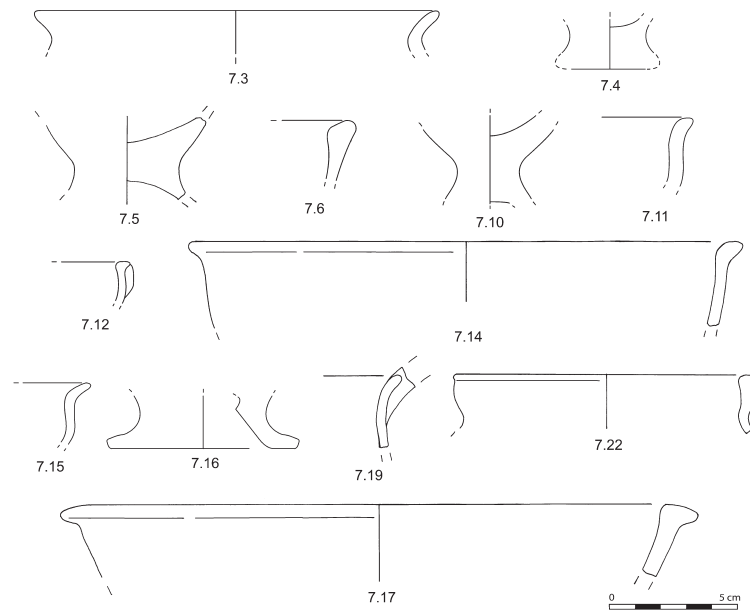


Fig. 89. Drawings of sherds from site 7.

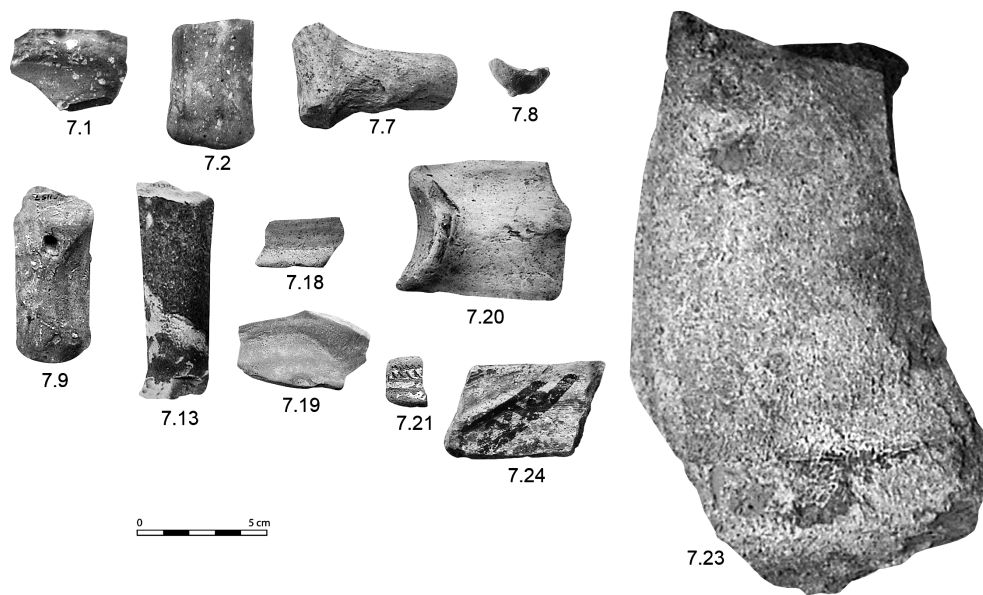


Fig. 90. Sherds from site 7.

7.21 (C1262). Fig. 90. Q13f5. Body of plate. Yellowish white glaze coating on interior. Incised design consisting of two rows of diagonal dashes above or below two hori-

zontal bands. Sgraffito ware; fine pink fabric (5YR 8/4). Wheelmade. 1.9×1.6, wall th. 0.6. Cf. Nichoria P1715, Middle Byz. (McDonald et al. 1983).

Mid. Byz.

- 7.22** (C1307). Fig. 89. Q13e1. Rim of cookpot. Vertical flat-topped rim. Byzantine cookware; semi-fine hard reddish yellow fabric (5YR 6/8) with small white stone inclusions. Wheelmade. Diam. rim est. 12 (<10%), h. 2.1, wall th. 0.5.

Cf. Nichoria P1743, Middle Byz. (McDonald et al. 1983); PN 205MW15-1, Middle Byz. (Davis & Stocker 2013, 700, no. 51).

Middle Byz.

- 7.23** (C1329). Fig. 90. Q13e1. Edge of tile. Beveled edge. Narrow groove along edge of upper surface. Fine hard pink porous fabric (5YR 8/3); upper surface covered with white accretion, underside rough. Mold-made. 21.3×10.7, th. 2.7.

Byz.

- 7.24** (C1150). Fig. 90. Q13d1. Body sherd of bowl. Dark brown zigzag between bands over brown glaze on interior. Byzantine-Frankish glazed ware; fine pink fabric (10R 8/4). Wheelmade. 4.9×1.5, wall th. 3.5. Frankish.

LITHICS

S066. Q13c3. Chert. Trimming flake. Not utilized. L. 1.17, w. 1.34, th. 0.21, wt. 0.38.

S069. Q13d1. Chert. Secondary flake. Not utilized. L. 1.79, w. 1.86, th. 0.50, wt. 1.66.

S079. P13i1. Chert. Secondary flake. Not utilized. L. 2.27, w. 3.14, th. 0.42, wt. 4.59.

S080. P13j1. Obsidian. Flake with retouch, continuous or discontinuous, inverse, unilateral. Secondary cortical flake. Utilized. L. 1.97, w. 2.21, th. 0.42, wt. 2.36.

S081. P13j1. Chert. Secondary flake. Not utilized. L. 3.41, w. 2.90, th. 0.77, wt. 9.72.

S082. P13j1. Chert. Secondary flake. Not utilized. L. 1.77, w. 2.74, th. 0.76, wt. 4.39.

S084. Fig. 111. Q12f7. Obsidian. Percors/Bec on flakes. Secondary flake. Not utilized. L. 2.21, w. 1.77, th. 0.41, wt. 1.59.

S093. Fig. 112. Q13d7. Chert. Blade with retouch, continuous or discontinuous, backed. Blade. Utilized. L. 1.47, w. 1.04, th. 0.38, wt. 0.88.

S109. Q13a2. Chert. Trimming flake. Not utilized. L. 0.94, w. 1.19, th. 0.15, wt. 0.14.

SITE 8: Katsimigas

Type: HAB, IND(?)

Squares: Q14a8, Q14b8, Q14b9, Q14c8, Q14c9, Q14d8, Q14d9, Q14e8, Q14e9, Q14f8, Q14f9, Q14f10, Q14g8, Q14g9, Q14g10, Q14h9, Q14i9, Q14j9, R14a8, R14a9

Size: 50,000 m²

Elevation: 174-208 masl.

Periods: MH, LH I-II, LH IIIA-B, G?, A?, CL, HL, R, Byz, Turk

Site 8 occupies an extensive area on the top and the south slope of the hill Katsimigas, southeast of the village of Iklaina (figs 91 and 109). The land slopes downwards from the north towards the south and southwest. The hillside is divided up by retaining walls into separate terraces. Some of the terrace walls are up to 5 m high and the drop between terraces is significant, with olive groves spread across the terrace levels. Groves of olive trees are spread across the terraces. Marl limestone bedrock is visible on the ground surface in small patches from Q14b9 to Q14i9, especially in Q14e9. Many cobble-sized limestone pieces are evident in the fields, indica-

tive that the limestone is being broken up under the ground surface by tilling. Parts of a polygonal wall that seems to run in a north-south direction can be seen in an opening of the thick vegetation: in the part that is visible one can see three rows of medium-sized stones (l. 0.30-0.40 m) with smaller stones wedged between them (fig. 92). Although this wall may be modern, it is interesting that LH IIIA-B sherds are wedged between the larger stones. Because of permit restrictions, we were not able to clear the vegetation and expose more of this wall.

Finds include large quantities of Mycenaean and other pottery, over a thousand pieces of slag, presumably from metallurgical operations, and other artifacts. The pottery covers a wide range of periods; although there was no clear spatial separation of material from different periods, the vast majority of the finds are Mycenaean. Middle Helladic Coarse Ware is present over an area of 100×60 m, including one body sherd with incised decoration (8.1); some Very Coarse Orange sherds (8.2) may be Middle Helladic or Early Mycenaean in date. Early and Late Mycenaean sherds are found over an area of 100×150 m. Several Early Mycenaean bowl and goblet fragments were collected; most are in semi-fine orange fabrics (8.4, 8.6), but one fine goblet (8.9) is of LH IIB-LH IIIA1 date. Other Early Mycenaean shapes represented include cups, coarse tripods (8.3, 8.7), and a pithos (8.8). Another bowl with a T-shaped rim (8.5) has both Early and Late Mycenaean parallels, and the fabric cannot be closely dated.

The Late Mycenaean material includes painted and unpainted fine and semi-fine wares, as well as some coarse fragments. Fine unpainted kylikes (8.10), shallow angular bowls (8.11) and cups are most common. A banded and an unpainted (8.12) piriform jar base and a coated stemmed bowl foot were also recovered. A few body sherds with red coating or bands are probably LH IIIA, and two kylix feet in Palace Ware are LH IIIA2-IIIB in date. Among the coarse ware are two pithos fragments.

The Historic pottery collected includes several small reddish yellow sherds with traces of black glaze on the exterior, interior or both (8.13). Most are Classical to Hellenistic in date, though one or two may be earlier. Most are in the Munsell range 7.5YR 7/2 to 7/6, but two are redder (5YR 7/6-7/8) and the glaze is better preserved and of better quality; they may be Attic imports. A Laconian roof tile (8.14) also dates to this period. Hellenistic and Roman material is sparse among the sherds collected, but some reddish yellow fragments of jars and bowls probably fall into this date range, as does a tile fragment. Late Roman to Byzantine cookware is certainly present, as is a Late Roman combed amphora shoulder (8.15) and several Byzantine to Frankish glazed plate bases (8.16).

Other ceramic material collected includes a LH IIIA-B animal figurine (8.18), one Mycenaean (8.17) and two Classical to Hellenistic (8.19, 8.20) loomweights and a Turkish pipe (8.21).

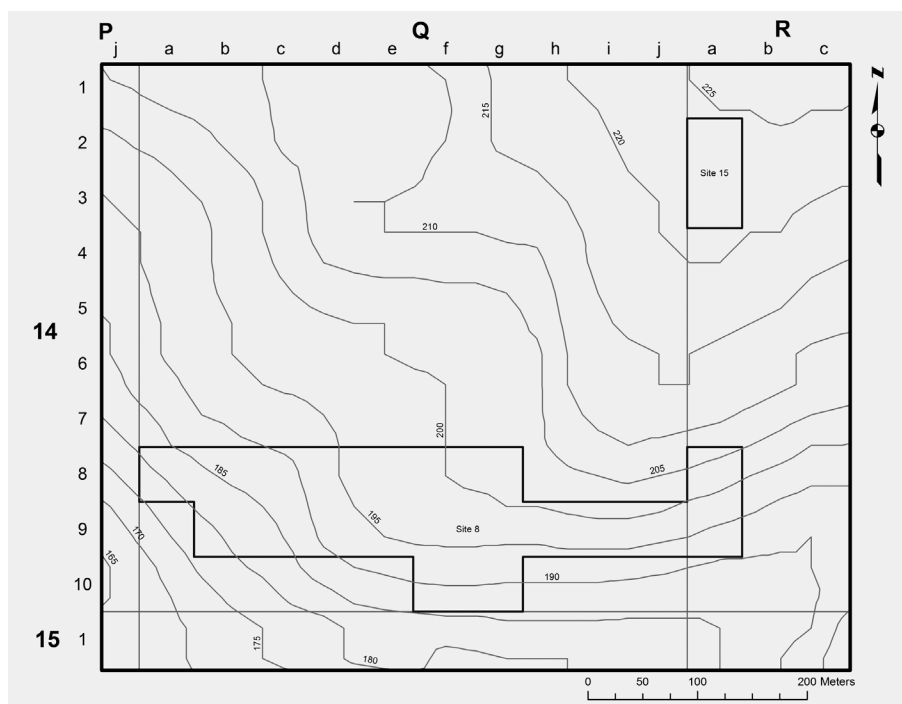


Fig. 91. Plan of sites 8 and 15.

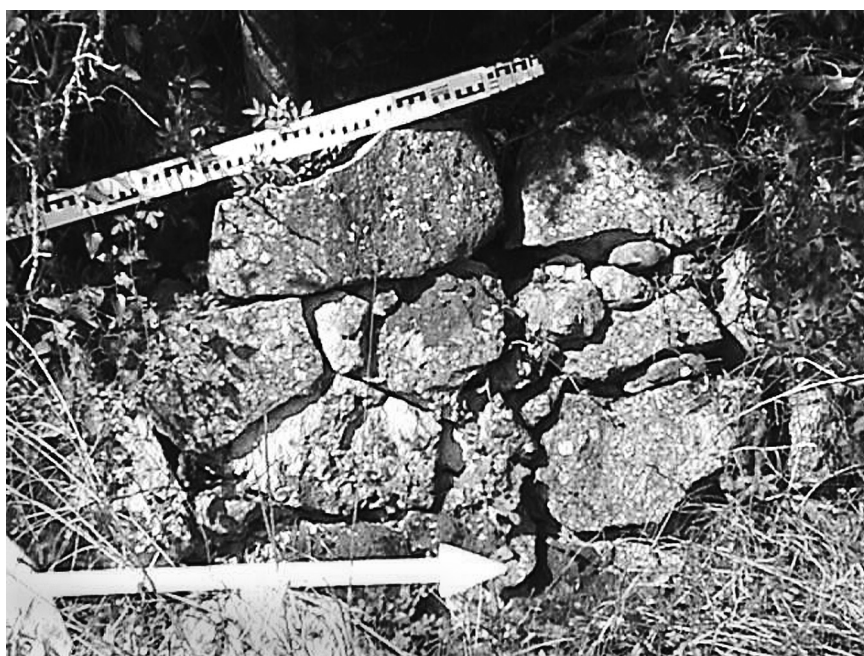


Fig. 92. View of the wall at Katsimigas (site 8) from the east.

CATALOGUE

POTTERY

- 8.1 (C1461). Fig. 94. Q14f9. Body sherd of open vessel. Five parallel incised grooves on exterior. Middle Helladic Coarse Ware; coarse hard gray fabric (7.5YR 5/1) with some white stone inclusions; brown surface (7.5YR 5/4), burnished. Handmade? 3.2×3.0, wall th. 0.9.
MH I-III.
- 8.2 (C1430). Fig. 94. Q14f9. Handle of large jar. Horizontal round handle on shoulder. Very Coarse Orange Ware; coarse red fabric (2.5YR 6/8) with large white stone inclusions. Handmade? Diam. handle 2.2, h. 5.7, wall th. 0.9.
MH I-LH IIB.
- 8.3 (C1349). Fig. 94. Q14f9. Leg of tripod. Small tapering leg with groove down center of exterior. Tan Grog Ware; coarse reddish yellow to very pale brown fabric (5YR 6/6-10YR 7/4) with tan grog and a few small white stone inclusions. Handmade. H. 4.4, w. leg 3.3, th. leg middle 1.8.
MH III-LH IIB.
- 8.4 (C1442). Fig. 93. Q14f9. Rim of bowl or goblet. Short everted rim, not sharply offset. Early Mycenaean Gray Orange Ware; semi-fine soft slightly gritty reddish yellow fabric (7.5YR 6/6); reddish yellow surface (5YR 6/8). Wheelmade. Diam. rim est. 9 (10%), h. 3.3, wall th. 0.6.
LH I-IIB.
- 8.5 (C1450). Fig. 93. Fig. 94. Q14f9. Rim of bowl. Horizontal T-shaped rim. Mycenaean Orange Ware; semi-fine medium hard very pale brown fabric (10YR 7/4); slightly gritty, reddish yellow surface (5YR 6/6), slipped. Handmade? H. 1.7, wall th. 0.7.
Cf. Nichoria, LH I (McDonald & Wilkie 1992, 479); Menelaion A477-A494 (Catling 2009, 263 and fig. 315).
- LH I-LH IIB2.
- 8.6 (C1473). Fig. 93. Q14f10. Foot of goblet (FS 263/268). Concave foot. Mycenaean Orange Ware; semi-fine soft very pale brown fabric (10YR 8/4); reddish yellow surface (7.5YR 6/6). Wheelmade. Diam. foot 6.5 (60%), diam. stem 4.3, h. 2.8.
LH IIA-B.
- 8.7 (C1474). Fig. 93. Q14f10. Leg to lower body of tripod. Short flattened leg. Early Mycenaean Gray Orange Ware; semi-fine fairly hard-fired mostly reddish yellow fabric (5YR 6/8) with a thin gray core; reddish yellow surface (7.5YR 7/6). Handmade. H. 4.2, l. leg 2.9, w. leg 2.5, th. leg middle 1.5, wall th. 0.8.
LH I-IIB.
- 8.8 (C1422). Figs 93 and 94. Q14c8. Rim of pithos (FS 13). Horizontal everted rim. Tan Grog Ware; coarse burned light gray fabric (10YR 7/1) with large tan grog inclusions; light reddish brown surface (5YR 6/4). Handmade. H. 6.9, w. rim 4.1, wall th. 2.7.
MH III-LH IIB2.
- 8.9 (C1429). Figs 93 and 94. Q14f9. Foot to lower body of goblet (FS 263/264/268/269). Domed foot with beveled edge, carefully made. Mycenaean Fine White Ware; fine fairly soft very pale brown fabric (10YR 8/2). Wheelmade. Diam. foot est. 7 (<10%), diam. stem 3.9, h. 5.1, wall th. 0.8. Cf. Nichoria P3492, LH II (McDonald & Wilkie 1992).
LH IIB-LH IIIA1.
- 8.10 (C1433). Fig. 93. Q14f9. Rim of kylix (FS 266). Short everted rim. Late Mycenaean Fine Ware; fine soft pink fabric (7.5YR 8/4). Wheelmade. Diam. est. 21 (10%), h. 2.2, wall th. 0.4.
LH IIIA2-B1.
- 8.11 (C1438). Fig. 93. Q14f9. Rim and handle of shallow angular bowl (FS 295). Rounded rim; end of horizontal strap handle. Palace

- Ware; fine very soft very pale brown fabric (10YR 8/3). H. 4.2, wall th. 0.5.
LH IIIA2-B2.
- 8.12** (C1451). Fig. 93. Q14f9. Base of piriform jar. Ring base. Late Mycenaean Fine Ware; fine pink fabric (7.5YR 8/3); very pale brown surface (10YR 8/4). Wheelmade. Diam. base 5.5 (50%), h. 3.0, wall th. 0.8.
LH IIIA1-B2.
- 8.13** (C1412). Fig. 94. Q14f10. Body sherd of oinochoe? Coated with good quality black glaze on interior. Black glaze ware; fine pink fabric (7.5YR 7/4); yellow surface (10YR 7/6). Wheelmade. 2.4×1.5, wall th. 0.4.
CL.
- 8.14** (C1525). Fig. 94. Q14j9. Edge of tile. Irregular rolled edge of Laconian cover tile. Trace of black glaze on concave upper surface. Fine fairly dense very pale brown fabric (10YR 8/3). Moldmade. 7.1×4.9, th. 1.9.
CL-HL.
- 8.15** (C1345). Fig. 94. Q14a8. Shoulder of amphora (Late Roman amphora I). Several thin horizontal incisions on exterior. Combed ware; fine reddish yellow fabric (5YR 7/6). Wheelmade. 2.4×1.8, th. 0.7.
Late R.
- 8.16** (C1342). Q14a8. Base of bowl or plate. Tall ring base. Traces of white glaze on interior. Byzantine-Frankish glazed ware; fine hard reddish yellow fabric (7.5YR 7/6). Wheelmade. Diam. base est. 10 (<10%), h. 2.2.
Byz-Frankish.
- surface smoothed. Handmade. H. 4.5, w. 4.0, th. 3.1, diam. hole 1.7.
Cf. Nichoria 2795-2799, LH II-III A (McDonald & Wilkie 1992).
LH I-III B2.
- 8.18** (C1471). Figs 93 and 94. Q14f10. Animal figurine. Torso, neck and front leg stumps of quadruped. Fugitive traces of black band on lower right side of torso. Late Mycenaean Fine Ware; fine medium hard very pale brown fabric (10YR 7/3); slipped on exterior. L. 5.1, diam. torso 1.5, h. 3.2.
LH IIIA2-B2.
- 8.19** (C1504). Figs 93 and 94. Q14h09. Lower part of loomweight. Pyramidal shape. Semi-fine reddish yellow fabric (7.5YR 6/6), with small stone inclusions in a fine matrix; burned. H. 3.9, rectangular base 3.5×3.1, wt. 30 grams.
Cf. Corinth no. 1193, 162, 171, pl. 76, 5th-4th c. BC (Davidson 1952).
CL.
- 8.20** (C1382). Fig. 94. Q14g9. Complete loomweight. Conical, with maximum diameter just above flat base. Small hole pierced horizontally near top. Coarse fabric, extremely burned and porous. H. 9.1, diam. at hole 2.9, diam. base 4.1-4.5, wt. 270 grams.
Cf. Corinth Profile XI pp. 155-156, 149 fig. 23, 3rd century BC (Davidson 1952).
HL.
- 8.21** (C1484). Figs 93 and 94. Q14g10. Fragment of Turkish pipe. One side of bowl preserved. Tip of two incised diagonal bands at top of rounded section. Fine hard very pale brown fabric (10YR 7/4); reddish yellow surface (5YR 6/8). max. Diam. 4.0, h. 3.3, wall th. 0.8.
Turk.
- OTHER CERAMIC ARTIFACTS*
- 8.17** (C1455). Figs 93 and 94. Q14f9. Top of loomweight. Rectangular in section. Large hole pierced horizontally near top. Middle-Late Helladic coarse ware; coarse hard-fired reddish yellow fabric (5YR 7/6);
- LITHICS*
- S086**. Q14f9. Chert. Secondary flake. Not utilized. L. 3.37, w. 3.05, th. 0.65, wt. 8.65.

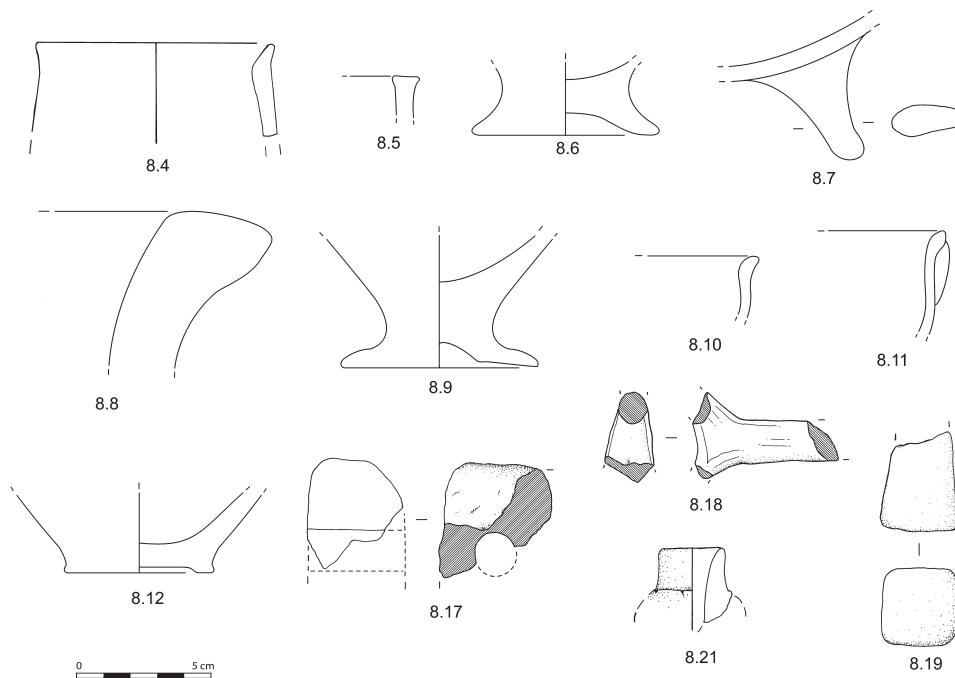


Fig. 93. Drawings of sherds and other ceramic artifacts from site 8.

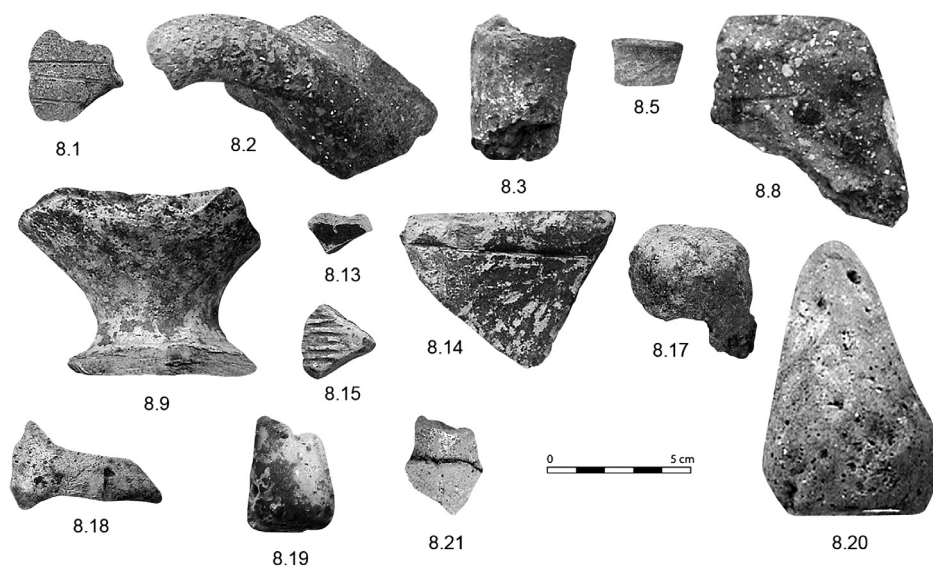


Fig. 94. Sherds and other ceramic artifacts from site 8.

S087. Q14f9. Chert. Sickie element, denticulate on flake. Secondary flake. Not utilized. L. 1.90, w. 2.80, th. 0.57, wt. 3.84.

S090. Q14f10. Quartz. Secondary flake. Not utilized. L. 2.16, w. 1.65, th. 0.30, wt. 1.59.

S091. Q14f10. Chert. Secondary cortical flake. Not utilized. L. 3.09, w. 3.24, th. 1.08,

wt. 7.92.

S092. Q14f10. Chert. Indistinguishable utilization, no retouch, blade. Blade. Utilized. L. 2.20, w. 1.64, th. 0.65, wt. 3.19.

S094. Q14g10. Chert. Secondary flake. Not utilized. L. 1.85, w. 1.20, th. 0.24, wt. 0.73.

SITE 9

Type: CEM (?)

Squares: O11a1

Size: 2,500 m²

Elevation: 226 masl.

Periods: LH III(?)

Site 9 is a deep circular opening dug in the soft limestone, on the boundary between two olive groves to the south of the road from Platanos to Iklaina, approximately 30 m to the south of a small field house and 20 m to the south of the northwest corner of square O11a1 (fig. 95). The opening has a diameter of approximately 3.50 m (east-west) × 3.60 m (north-south). It is filled with soft and fresh soil (probably a relatively recent fill), up to a depth of 1.0 to 1.5 m from the surface, but the visible parts of its walls are smooth and curved. It appears to be a chamber tomb, but needs testing through excavation.

About twenty sherds, mostly from Late Helladic III coarse open and closed vases were found around the opening of the depression, but none was collected.



Fig. 95. View of the opening in site 9 from the south.

SITE 10*Type:* CEM(?)*Squares:* Q9a5, Q9a6, Q9b5, Q9b6, Q9b7, Q9c5, Q9c6, Q9c7, Q9d7, Q9e7*Size:* 25,000 m²*Elevation:* 195-245 masl.*Periods:* R, Byz, Turk

This site is approximately 250 m to the northeast of the village Platanos (fig. 96). The landscape slopes downward from the southeast to the northwest separated by a series of terraces. The land cover of the site is entirely olive groves, with a north-south road running through c6 and c7 which splits the site into two. Soil cover seems to be thick with no evident signs of soil erosion, despite agricultural tillage.

An extensive surface concentration of pottery sherds of the Byzantine and Turkish occupation periods was noted, but limited resources at the time of the visit did not allow the collection of diagnostic pieces, except of a plate rim in African red slip ware (10.1).

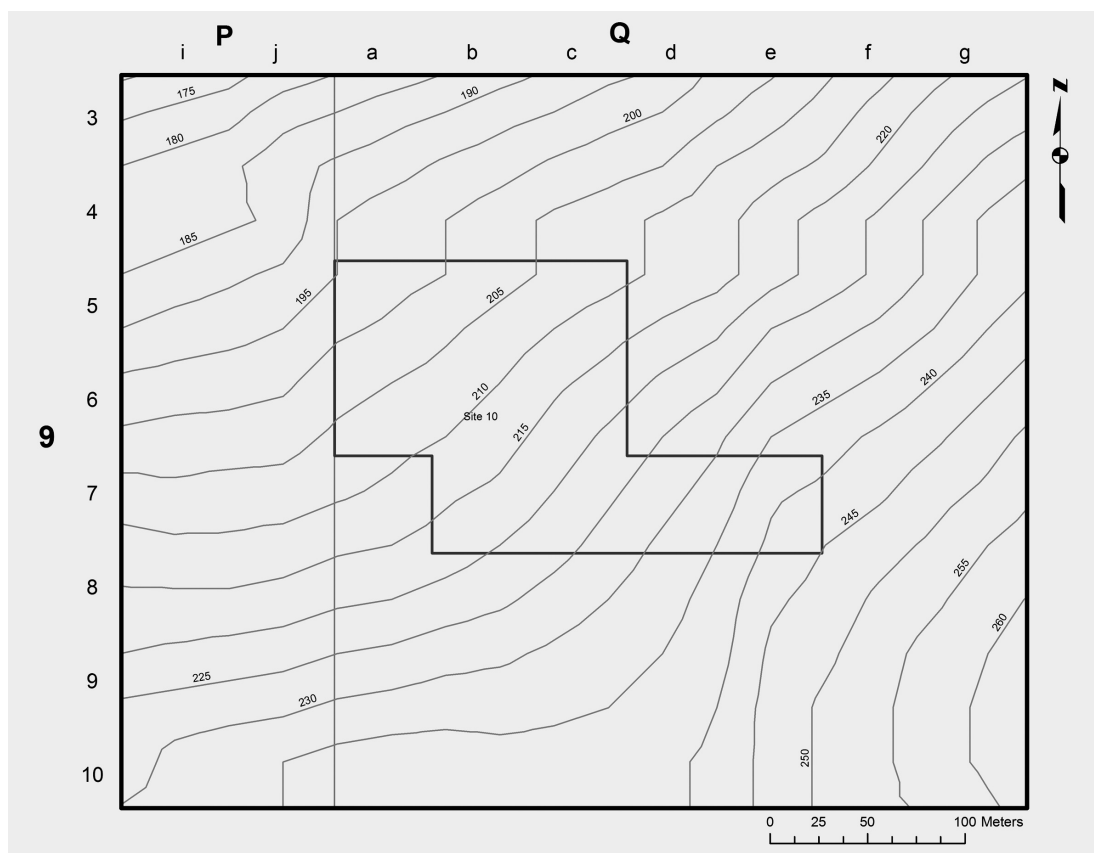


Fig. 96. Plan of site 10.

CATALOGUE

POTTERY

10.1 (C1544). Fig. 97. Q9a5-a6. Rim of plate
(Hayes 50). Lipless rim. Two parallel

grooves on exterior. African red slip ware;
fine hard red fabric (2.5YR 6/8); slipped.
Wheelmade. H. 2.2, wall th. 0.4.
R.

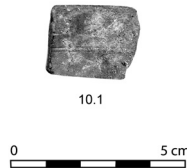


Fig. 97. Sherd from site 10.

SITE 11: Myrsinochori

Type: HAB

Squares: Q8d1, Q8d2, Q8e1, Q8e2, Q8f1, Q8f2, Q8g1, Q8g2, Q8h1, Q8h2, Q8i1, Q8i2,
Q8j1, Q8j2, Q8j3, R7a10, R8a1, R8a2, R8a3, R8b1, R8b2, R8b3

Size: 55,000 m²

Elevation: 232-275 masl.

Periods: MH, LH I-II, LH IIIA-B, CL, HL, Byz

Site 11 consists of olive groves and vineyards located at a distance of 300 m to the southeast of the village church and is the lower part of the slopes of the Myrsinochori ridge, in squares Q8h1-j3, R7a10, and R8a1-d3 (fig. 98). This site lies at a distance of approximately 900 m to the south of the Early Mycenaean tholos tombs at Routsí.¹³³ A large part of it is overbuilt and overgrown, especially towards its northwest end. Where the ground surface is clear of vegetation, erosion is evident from rills in the thin soil.

The surface material consists of Middle Helladic, Late Helladic, and Byzantine sherds, but they seem to be spatially separate, with the Middle and Late Helladic sherds concentrated in the eastern part of the site. The Middle Helladic pottery is strewn over an area of about 8,000 m² (100 m east-west × 80 m north-south). The Late Helladic pottery, on the other hand, covers a much larger area of about 200×130 m and comprises over 1,000 Late Helladic sherds, including LH IIIB kylikes, pithoi, and fine and coarse jars (including Palace Ware pieces), as well as a clay bovine figurine.

133. Hope Simpson 1981, no. F13.

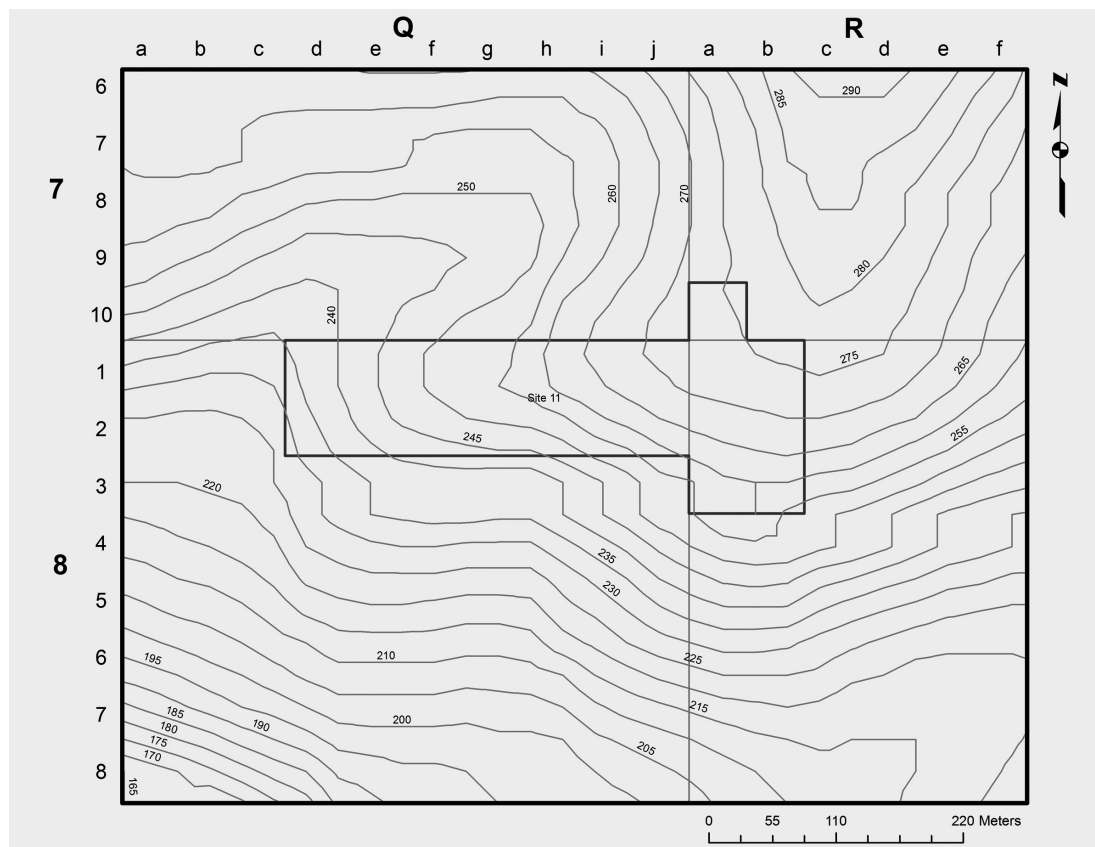


Fig. 98. Plan of site 11.

Pottery frequency ranges from 100 to 500 sherds per square, with visibility ranging from 30% to 90%. Some pieces appear to be MH-LH II, so we may consider the possibility that the site was used concurrently with the tombs and may, in fact, have been the settlement associated with them.

Most of the material collected dates to the Bronze Age. Middle Helladic pottery sherds are from coarse jars and cookpots, except for a well-made bowl base in Hard Orange Ware (11.1) with a yellow core and smoothed red surface. This piece and some of the coarse ware could be Early Mycenaean. The Late Mycenaean pottery includes both decorated (11.4) and unpainted kylikes (11.3), cups and a rhyton (11.2); a round horizontal handle comes from a deep or stemmed bowl (11.5). Among the handful of Historic sherds collected are an Archaic to Hellenistic black glazed body sherd (11.6) and some Byzantine cookware (11.7). A fragmentary Mycenaean animal figurine (11.8) was also collected.

CATALOGUE

POTTERY

- 11.1** (C1584). Figs 99 and 100. R8a2. Base of bowl. Flat base. Hard Orange Ware; fine hard yellow fabric (10YR 7/6); red surface (2.5YR 5/6), smoothed and burnished especially on interior. Wheelmade? Diam. base 4.0 (50%), h. 2.2, wall th. 0.9. MH II-LH IIB.
- 11.2** (C1552). Fig. 99. Q8j3. Body sherd of rhyton (FS 199). Irregular groove around body near top of sherd, probably post-depositional. Late Mycenaean Fine Ware; fine soft very pale brown fabric (10YR 7/3). Wheelmade. H. 3.3, max. Diam. 2.7, min. Diam. 1.8, wall th. near top 0.7. LH IIIA1-B2.
- 11.3** (C1601). Fig. 100. R8a1. Stem to lower body of kylix. Late Mycenaean Fine Ware; fine soft very pale brown fabric (10YR 8/3). Wheelmade. Diam. stem 2.0, h. 4.9. LH IIIA1-B2.
- 11.4** (C1547). Fig. 100. Q8i2. Body sherd of kylix (FS 257?). Two red bands preserved at base of bowl. Late Mycenaean Fine Ware; fine fairly hard reddish yellow fabric (5YR 7/6); pinkish white surface (7.5YR 8/2), mostly eroded away. Wheelmade. H. 2.3, wall th. 0.4. LH IIIA2.
- 11.5** (C1553). Fig. 100. Q8j3. Handle of deep bowl (FS 284) or stemmed bowl (FS 305). Horizontal round handle. Traces of black

paint indicating a fully coated handle. Late Mycenaean Fine Ware; fine hard very pale brown fabric (10YR 7/4). Wheelmade. Diam. handle 1.4, h. 6.0, wall th. 0.6.

LH IIIB1-2.

- 11.6** (C1555). Fig. 100. Q8h02. Body sherd of open vessel. Coated with black glaze on exterior and interior; worn and cracking glaze, rather brown in color. Black glaze ware; fine fairly hard reddish yellow fabric (5YR 7/6). Wheelmade. 4.3×3.2, wall th. 0.6. A-HL.

- 11.7** (C1600). Fig. 100. R8a1. Handle of cookpot. Vertical strap handle with central rib down center of upper surface. Byzantine cookware; semi-fine reddish yellow fabric (5YR 6/8) with some small white stone inclusions (fewer than usual for this fabric); reddish yellow surface (7.5YR 8/6-7/6). Wheelmade. W. handle 3.3, l. handle 3.7, handle th. 0.8.

Byz.

OTHER CERAMIC ARTIFACTS

- 11.8** (C1579). Figs 99 and 100. R8a2. Animal figurine. Neck, part of left front leg, stump of right front leg and most of torso of quadruped. Late Mycenaean Fine Ware; fine soft reddish yellow fabric (5YR 6/8); very pale brown surface (10YR 8/4); whitish slip on exterior. Handmade. Diam. torso 1.4, h. 2.6, l. 4.0, w. 2.5. LH IIIA1-B2.

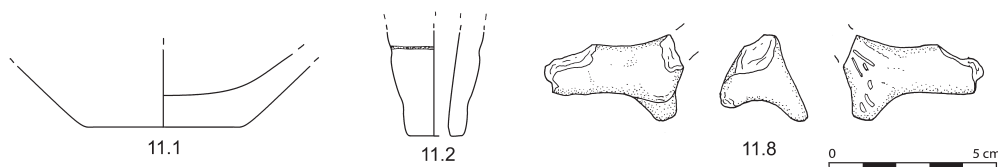


Fig. 99. Drawings of sherds and other ceramic artifacts from site 11.

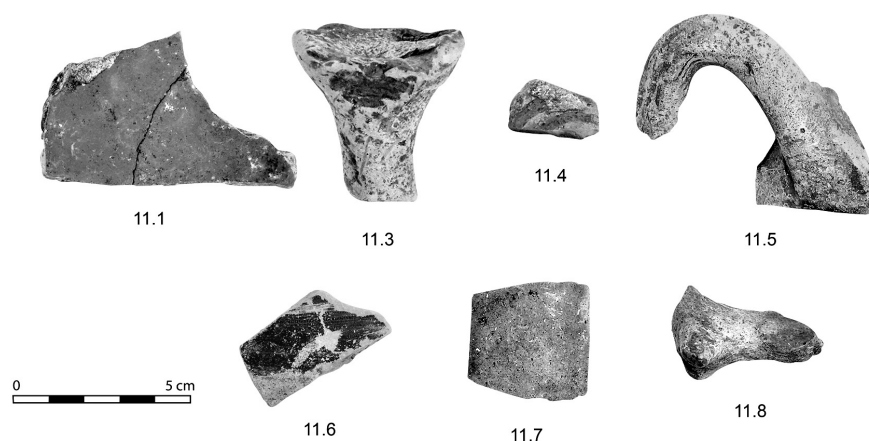


Fig. 100. Sherds and other ceramic artifacts from site 11.

SITE 12

Type: HAB

Squares: O8b2, O8b4, O8c2, O8d2, O8e2, O8f2,

Size: 15,000 m²

Elevation: 196-214 masl.

Periods: LH II, LH IIIA-B, (CL?-)HL, Byz

This site is located on a high plateau on the ridge immediately to the south of the Englianos ridge, with an unobstructed view in all directions (fig. 101). The plateau slopes down towards the west-southwest in a series of terraces, some with steep drops between terraces.

Along the steep scarp on the south slope of the plateau in squares f2 and part of f3 (area 50×60 m) were found approximately 200 sherds that appear to be Early Mycenaean, mixed with Hellenistic and Roman material.

Only a small amount of material was collected from this site and it was not possible to establish a period-by-period distribution of finds. The Bronze Age pottery is less well preserved and less diagnostic than the Historic. A semi-fine goblet foot (12.1) is certainly Early Mycenaean, and a few other sherds are dated to LH IIIA-B, based on their fabrics. These include a semi-fine jar base (12.2) and a pithos fragment with large red stone inclusions. Classical to Hellenistic material includes a Laconian roof tile, a black glazed oinochoe foot (12.3) and small kantharos foot (12.4). A glazed plate base (12.5) is Byzantine.

CATALOGUE

POTTERY

- 12.1** (C1565). Fig. 103. O8b2. Foot of goblet (FS 263/268). Concave foot. Early Mycenaean Gray Orange Ware; semi-fine gritty hard light brownish gray fabric (2.5Y 6/2); red surface (2.5YR 6/8). Wheelmade. Diam. stem est. 3.4, h. 2.4. LH IIA-B.
- 12.2** (C1562). Fig. 102. O8c2. Base of jar. Flat base. Late Mycenaean Semi-fine Ware; semi-fine soft reddish yellow fabric (7.5YR 7/6) with some small tan grog and red clay inclusions; pink exterior surface (7.5YR 7/4), prominent wheel marks on interior. Wheelmade. Diam. base 10 (10%), h. 3.9, wall th. 1.4. LH IIIA1-B2.
- 12.3** (C1575). Fig. 103. O8f2. Foot of oinochoe. Coated with black glaze on exterior. Decorative groove around edge. Black glaze ware; fine fabric, burnt. Wheelmade. Diam. foot 7.0 (15%), h. 1.3, th. 0.5. CL-HL. 4th-early 3rd c. BC.
- 12.4** (C1567). Fig. 103. O8e2. Foot of kantharos. Pedestal foot. Coated with black glaze on exterior side of foot. Black glaze ware; fine fairly soft reddish yellow fabric (5YR 7/8). Wheelmade. Diam. foot 4.5 (20%), h. 1.6. CL-HL.
- 12.5** (C1569). Figs 102 and 103. O8f2. Base of plate. Ring base. White glaze on interior; on top of this, brown linear design over green glaze. Byzantine-Frankish glazed ware; fine hard pinkish white fabric (5YR 8/2). Wheelmade. Diam. base 7.4 (100% preserved), h. 2.5, wall th. 0.6. Middle-Late Byz.

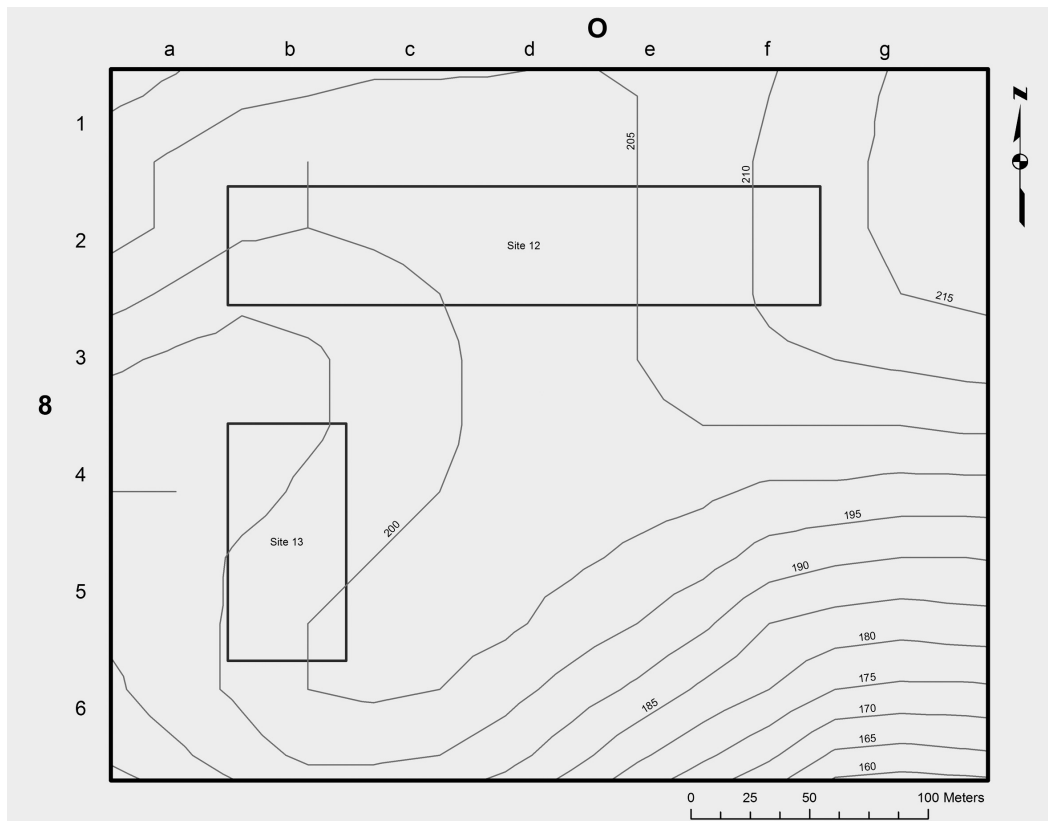


Fig. 101. Plan of sites 12 and 13.

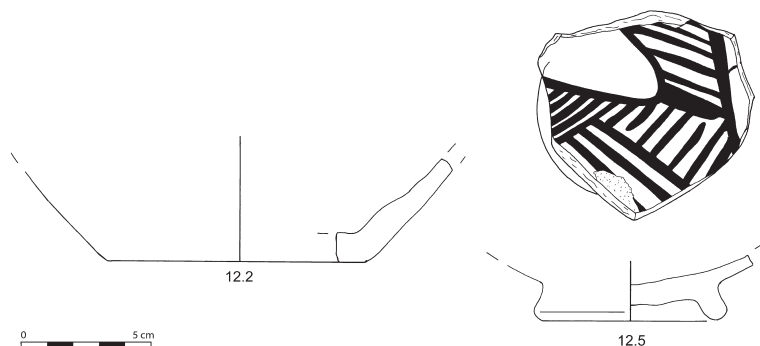


Fig. 102. Drawings of sherds from site 12.

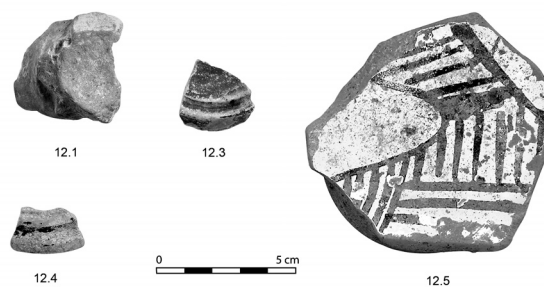


Fig. 103. Sherds from site 12.

SITE 13

Type: HAB, CEM(?)

Squares: O8b4, O8b5

Size: 5,000 m²

Elevation: 192-200 masl.

Periods: MH, LH I-II, LH IIIA-B, PG-A, CL

Site 13 is located at the bottom of the ravine approximately 800 m to the west/southwest of Myrsinochori (fig. 101). This is a depositional area with thick soil cover. All of the material collected was from square O8b4. About fifty-five Late Helladic sherds, some with paint, were found in this square, along with a few coarse sherds and some fragments of mudbrick. Although the number of Late Helladic sherds is small, in our area it is highly unusual for such good quality material to be found in one location. All but a few sherds are Bronze Age and it has not been possible to establish patterns in the spatial distribution of finds. Most are worn and datable by fabric only, including Middle Helladic body sherds in Local Minyan ware, and a few Early Mycenaean gray orange sherds. The Late Mycenaean material is more diagnostic, and includes LH IIIA2 kylix fragments with red paint (13.1-13.2), a LH IIIA2-B unpainted kylix stem (13.3) and a piriform jar base (13.4) in Palace Ware. The Historic material includes a Protogeometric to Archaic body sherd with streaky black paint

(13.5), and a small scrap with good Classical black glaze. No later material was detected.

CATALOGUE

POTTERY

13.1 (C1610). Fig. 104. O8b4. Rim of kylix (FS 264). Thin everted rim. Coated red on exterior and interior, only traces of paint preserved. Late Mycenaean Fine Ware; fine soft pink fabric (7.5YR 8/4). Wheelmade. Diam. rim est. 7 (10%), h. 1.5, wall th. 0.4. LH IIIA2.

13.2 (C1613). Figs 104 and 105. O8b4. Foot of kylix (FS 264/265). Domed foot. Coated red on upper surface. Late Mycenaean Fine Ware; fine medium hard very pale brown fabric (10YR 7/4); reddish yellow surface (5YR 7/6). Wheelmade. Diam. foot 6.3 (75%), h. 2.8. LH IIIA2.

13.3 (C1614). Fig. 105. O8b4. Stem to lower body of kylix (FS 265/266). Tall stem.

Palace Ware; fine fairly soft very pale brown fabric (10YR 8/2). Wheelmade. Diam. stem 2, h. 9, wall th. 0.4. LH IIIA2-B2.

13.4 (C1625). Figs 104 and 105. O8b4. Base of piriform jar. Torus base with slight rib halfway up foot, well-made. Coated black on exterior. Palace Ware; fine fairly soft white to very pale brown fabric (10YR 8/1-8/2). Wheelmade. Diam. base est. 7 (15%), h. 2.2. LH IIIA2-B2.

13.5 (C1647). Fig. 105. O8b4. Body sherd of jar. Coated streaky black on exterior. Fine hard pinkish gray fabric (7.5YR 7/2); pink near surface (7.5YR 7/3), slipped. Wheelmade. 4.8×3.7, wall th. 1.9. PG-A.

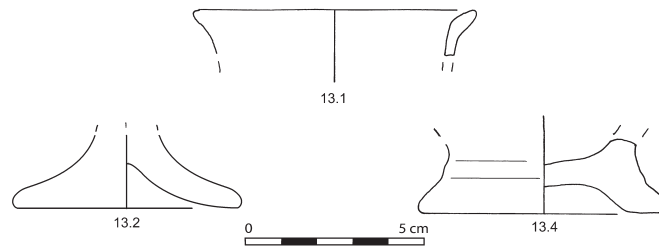


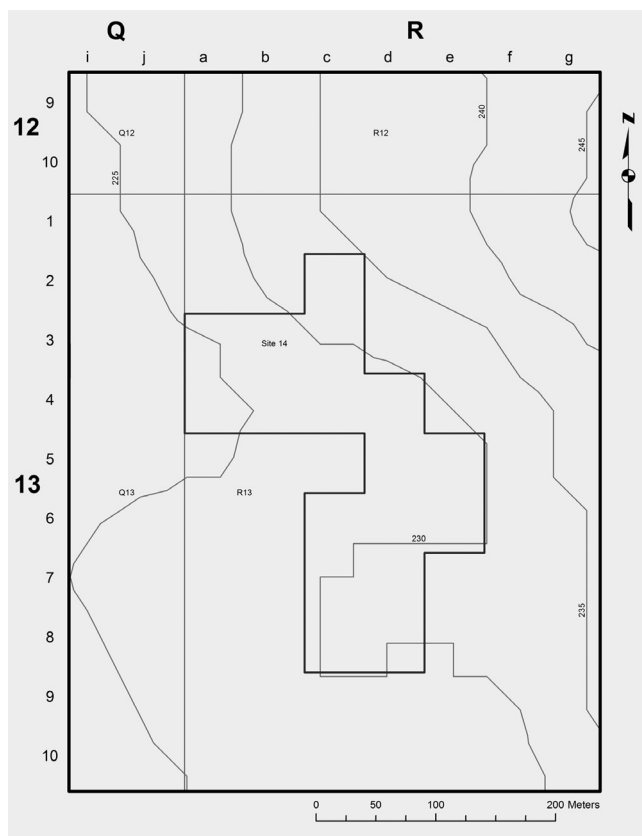
Fig. 104. Drawings of sherds from site 13.



Fig. 105. Sherds from site 13.

SITE 14*Type:* HAB, CEM*Squares:* R13a1, R13a3, R13a4, R13a5, R13b2, R13b3, R13b4, R13c2, R13c3, R13c4, R13c5, R13c6, R13c7, R13c8, R13d1, R13d4, R13d5, R13d6, R13d7, R13d8, R13e5, R13e6, R13e7, R13h1*Size:* 60,000 m²*Elevation:* 224-235 masl.*Periods:* LH I-II, LH IIIA-B, R, Byz

This site is located near the center of the Iklaina plateau, to the east of the village of Iklaina (figs 106 and 109). The land gently slopes from the north part of the site towards the road between Iklaina and Glyfada to the south, but in the western part of the site, the slope is a little steeper down towards the east. There are no obvious signs of erosion across the site and very few terrace walls. The southernmost squares are cut by the road between Iklaina and Glyfada. In R13c7 two scarps divide the slope into three levels. The lowest level consists of ploughed ground and olive trees, the

*Fig. 106. Plan of site 14.*

middle one is covered with vineyards and a few young olive trees, and the top one has an olive grove. On the middle level we found 89 human bones and 12 human teeth, but these were dispersed across the square and there were not any remains of structures that could be associated with them. Extensive modern contamination was noted in R13d6.

Few Mycenaean sherds from both fine (cups, bowls), semi-fine (**14.1**) and coarse vessels have been identified, among over 2,000 Roman and Byzantine sherds, including amphoras, Roman red wares, Roman ribbed ware, and sherds with green and/or brown glaze (**14.2**). The Mycenaean sherds were found in squares R13a5, R13c1, R13c2, R13c3, over an approximate area of 200×70 m, but it was not possible to distinguish between the distribution of LH I-II vs. that of LH III sherds.

CATALOGUE

POTTERY

- 14.1** (C1740). Fig. 107. R13b3. Stem of goblet (FS 263/268). Early Mycenaean Gray Orange Ware; semi-fine hard light gray fabric (10YR 7/2); reddish yellow surface (7.5YR 7/6), worn away in places. Wheelmade. Diam. stem 2.8. H. 2.1. LH I-IIA.

- 14.2** (C1725). Fig. 108. R13d6. Base of plate. Tall

ware; fine hard reddish yellow fabric (5YR 7/6). Wheelmade. Diam. 5.0 (25%), h. 1.7. Byz-Frankish.



Fig. 108. Sherd from site 14.

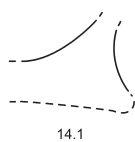


Fig. 107. Drawing of sherd from site 14.

ring base. Brown glaze over white glaze on interior. Byzantine-Frankish glazed

LITHICS

- S100.** R13e6. Obsidian. Secondary flake. Not utilized. L. 2.18, w. 2.01, th. 0.49, wt. 2.35.
S101. R13e6. Obsidian. Debris. Not utilized. L. 2.05, w. 2.79, th. 0.72, wt. 3.82.
S105. R13c7. Obsidian. Trimming flake. Not utilized. L. 0.85, w. 1.11, th. 0.24, wt. 0.23.
S107. R13d6. Chert. Trimming flake. Not utilized. L. 1.09, w. 1.00, th. 0.13, wt. 0.24.

SITE 15

Type: HAB

Squares: R14a2, R14a3, R14a4

Size: 5,000 m²

Elevation: 220-225 masl.

Periods: HL, R

This site is located in a fairly flat area on the Traghanes plateau, south of the road between Iklaina and Glyfada (figs 91 and 109). The northernmost square included in the site has a vineyard in the eastern half and the western half is an open grassy space. The southern square of the site is in an olive grove. There are no obvious signs of erosion at this site.

Approximately 200 sherds belonging to Hellenistic black glazed and Roman cooking pots were found in squares R14a3 and a4, but none was collected.

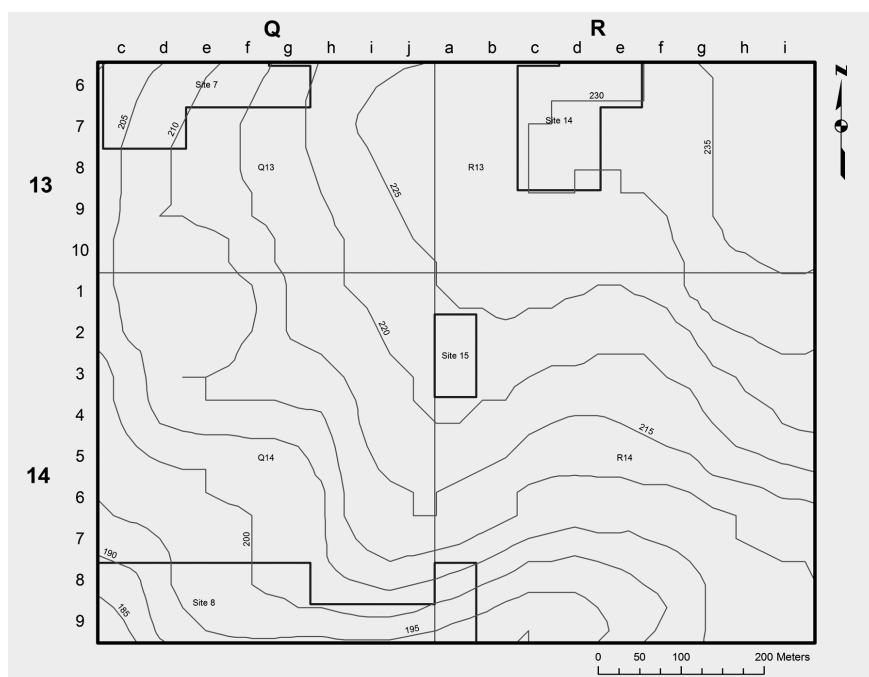


Fig. 109. Plan showing locations of sites 7, 8, 14, and 15.

SITE 16

Type: HAB

Squares: K11d7, K11d8, K11d10, K11e7, K11e8, K11e9, K11f7, K11f8, K11g2, K11g7, K11g8, K11h1, K11h2, K11h7, K11h8, K11h9, K11h10, K11i10, K11i2, K11i7, K11i8, K11j2, K11j7, K11j8, K11j10, L11a7, L11a8, L11a9.

Size: 62,500 m²

Elevation: 110-130 masl.

Periods: MH?, LH III?, R, Byz

This extensive site is located on the north slope of the ridge to the south of the Englianos ridge, approximately 1.5 km from the PN. The entire slope is covered with olive groves. Approximately 1,200 sherds were counted over an area of 50×80 m. and 11 were collected for further study. All the catalogued sherds date to the Roman and Byzantine periods, except for a kylix foot (C1768) in Palace Ware. Some coarse pieces may be MH. The historical sherds include two Roman red glazed fragments (lipless rim and a body sherd) and several examples from Byzantine cookpots (e.g. C1715-C1716). None of these pieces were selected for publication, due to their poor preservation and small size.

Off-site Scatters

Several small surface concentrations of finds have been noted in the area investigated (only the LH Scatters 1-15 are shown in fig. 59).

1. N9h5/h6	LH (also R)
2. N12d10	LH
3. Q11b7	LH
4. O13h1	LH
5. Q14a3	LH
6. Q15d1	LH
7. R13b3	LH
8. S12a10	LH
9. S14c4	LH
10. S17h3	LH
11. N8g8	LH (also CL/HL, BYZ)
12. P9f3	LH
13. O12f3	LH
14. M10h9	LH
15. K10i4	LH
16. L12 a3/d3/j4/a3/c5/c4	(BYZ)
17. L12f10	(R)
18. L13h6	(CL/HL)
19. L14f6	(BYZ)
20. M8j1	(CL/HL)
21. N12a5/a6	(BYZ)
22. N15d10/e10	(BYZ)
23. O10g4	(BYZ)
24. O12 j5/j8/j10/j4/h8/f9/d5/d4/g5/g1	(BYZ) (T)
25. O12f5	(CL/HL)
26. O13a5/c2	(AR-BYZ)

27. P11d5	(CL/HL)
28. P8b7	(HL/BYZ)
29. P8f2/j3	(CL)
30. P9i5	(CL/HL)
31. Q11d4	(BYZ)
32. Q11g4	(CL)
33. Q12f9/f10	(BYZ)
34. Q14b3/h6	(AR-HL)
35. Q14d8	(AR-BYZ)
36. Q14f9	(AR-HL)

Table 9. List of off-site scatters

POTTERY AND OTHER CERAMIC ARTIFACTS

Cynthia Shelmerdine, Joann Gulizio

INTRODUCTION

As noted above,¹³⁴ the Iklaina Archaeological Project was allowed to collect only a small percentage of the pottery observed in the field.¹³⁵ Ceramic experts accompanied the teams of field walkers and analyzed most of the finds on site, while team leaders recorded their observations. The material that was collected and catalogued does not necessarily represent all periods noted at a given site and unfortunately cannot provide statistically significant information about the number and distribution of ceramic types. It has allowed us, however, to offer an overview of the pottery from the various phases of Greek prehistory and later periods that was found in the survey area and to make comparisons both within the region of Messenia and to a limited extent with other areas of Greece. Messenian material provides our best comparanda for the survey material. The more complete and preserved excavation material will offer a better comparisons to sites outside of this region.

Approximately 50,000 sherds were counted, but only 1,785 sherds were collected for detailed study. Of those, 171 representative sherds and 10 ceramic small finds were selected for publication and are fully described in the Catalogue that accompanies the entry for each site. The catalogue numbers of published sherds discussed in this chapter are indicated in bold (e.g. **8.2**). Unpublished sherds are referred to by their inventory number and site (e.g. C1590, Site 11).

It should be noted at the outset that our study of the survey material was hindered to some extent by the condition of the pottery. Most sherds are quite small and often were encrusted with soil and/or silicate deposits. Initial attempts to clean the pottery with soft brushes damaged their surfaces, so only soft sponges could be used. Other methods of cleaning were attempted, including immersion in a weak hydrochloric

134. See discussion of field methods in the Archaeological survey chapter.

135. For the permit restrictions see *supra*, p. 98.

acid solution, but all were ineffective. Similar problems were encountered with material from the PRAP survey and from Nichoria.¹³⁶ The least destructive and most successful method of cleaning sherds was with a scalpel, but this method was far too time-consuming to use on every sherd. It was only undertaken on those whose surfaces might reveal evidence for painted decoration. Despite these difficulties, the cleanliness of the pottery did not greatly affect our ability to accurately identify and date sherds. A greater problem was the overall scrappiness of the sherds themselves. Messenian clay is soft; sherds wear easily and in the process any paint may be lost, in some cases along with the original surface.¹³⁷

Much of the pottery from our survey, and from Messenia in general, is unpainted and the fragments are small. Dating sherds to a single phase has often been impossible, since the standard typology is based on established changes in decorative motifs and full profiles. In some cases the date range given is quite broad, reflecting possible rather than probable dates. However, a number of different fabric classes were identified based on clay color, texture and inclusions. In addition, ongoing excavation at Site 1 (Iklaina: Traghanes) has greatly improved our understanding and dating of the various wares recognized in the survey. The result is a typology of fabric classes, some specific to the site of Iklaina and its immediate surroundings, others commonly found throughout Messenia. In fact, many of these fabrics were first noted in the excavations at Nichoria and in the PRAP survey. For each we give the name, the characteristics and the date range during which it seems to occur. It is our hope that this classification system will be useful at other sites in Messenia and will provide a better understanding of unpainted pottery in the region.

This chapter is organized in chronological phases from the Early Helladic to the Byzantine to Frankish period. Fine and semi-fine wares are presented first and then coarse wares. The terms “fine” and “semi-fine” refer primarily to thin-walled vessels made with fairly pure clays containing few to no visible inclusions and usually consist of small open shapes, especially table wares. Coarse ware fabrics contain numerous and/or large inclusions; vessels are often large and thick-walled and of types typically used for storage or cooking. Within these sections, wares typical of the period are described and a discussion of painted and unpainted shapes follows. Open shapes are discussed before closed shapes, because the evidence for the former among the survey material is much more abundant.

136. McDonald & Wilkie 1992, 467.

137. Mountjoy 1999, 306.

EARLY HELLADIC POTTERY

The Early Helladic period is hardly, if at all, represented in the Iklaina survey. Excavation material from Iklaina tells the same story: only a clay “anchor”-type amulet can be dated to the Early Helladic period (EH III), but even that was found in a Middle Helladic destruction level.¹³⁸ Bowls with T-shaped rims are fairly common in a variety of fabrics, but none are in Early Helladic fabrics; rather they occur in wares typical of the Middle Helladic, Early and even Late Mycenaean periods. The earliest pieces collected from the survey are three crescent lug handles from Site 1 (1.1, 1.2 and C0447). The type is datable to the range EH III-MH I, but in the absence of other Early Helladic material these handles are discussed below in the section on Middle Helladic pottery.

MIDDLE HELLADIC POTTERY

FINE AND SEMI-FINE WARES

The first point to note is the absence of Matt-Painted Ware from the Iklaina survey. The poor condition of the pottery may be partly to blame, but this ware is also rare in the excavation material from the site. Three distinct fine and semi-fine wares dating to the Middle Helladic period were identified in the survey: Minyan, Local Minyan and Hard Orange Wares. Semi-fine fabrics are defined as those with a fairly fine matrix, but very small inclusions that make the core grittier than fine wares. The surfaces may be smooth or gritty. *True Gray Minyan* ware is fine and typically hard-fired, with a brown core (e.g. 10YR 7/3, 10YR 7/6) and a black or yellow-brown highly burnished surface (e.g. 5YR 5/6, 2.5YR 7/6). It is very rare at Iklaina, in both survey and excavation. Only one sherd from the survey can be considered true Minyan ware, though the excavation has yielded more. The survey example is a body sherd from a bowl (C1595, Site 11) with a black burnished interior surface.

Much more common in Messenia is the variant referred to here as *Local Minyan*. It is not as hard fired as true Minyan ware; thus it erodes easily and the original burnished surface is usually not preserved. Several stages of erosion can sometimes be seen on the same vessel: 1) with a somewhat burnished surface preserved; (2) with a smoothed, washy brown surface; and (3) with a very powdery surface. Most common is stage 2, resulting in a brown surface color (e.g. 7.5YR 5/2) and a pinkish gray or reddish yellow core (e.g. 7.5YR 6/2 or 5YR 6/8). It is possible that most Local Minyan vessels were never fired or burnished to the level of true Minyan ware. Some Local

138. Cosmopoulos 2008, 52, pl. 56ß (top row left).

Minyan sherds have the black surface of true Minyan Ware, but are not as hard fired; they may contain small stone (C1590, Site 11) and grog (C1599, Site 11) inclusions. Shapes are those typical of true Minyan ware: a kantharos (C1665, off-site), several bowls (1.3 and C0279 from Site 1) and a few closed vessels (1.4 and C0258 from Site 1). The date range for both true Minyan and Local Minyan is MH II-III.

Hard Orange Ware is a semi-fine hard-fired fabric; the surface is often very smooth and burnished or polished, but occasionally slightly gritty. Colors range from orange, dark orange or brown with a smooth surface (e.g. 5YR 7/8), to almost red with a grittier surface (e.g. 2.5YR 5/8-6/8). Some vessels are coated with a yellowish slip. Bowls, spouted bowls and basins of MH III-LH IIB are particularly common in this fabric and some flaring rims probably belong to wide-mouthed jars. The particularly well-burnished examples of this ware resemble a red version of Minyan ware, a type identified in the PRAP survey¹³⁹ and in recent excavations at the PN.¹⁴⁰ One example from the Iklaina survey, a flat bowl base (11.1) is perhaps the closest to this so-called “Red Minyan” fabric. However, the term “Minyan” suggests a purely Middle Helladic date, whereas our excavation data suggest that Hard Orange Ware remains in use through LH IIB. It may be the case that the well-burnished examples of Hard Orange Ware are more typical of MH II-III when burnished pottery was more prevalent and those with a grittier surface are more typical of LH I-IIB. We are noticing in excavation material that other Middle Helladic fabrics also occur in diagnostic Early Mycenaean shapes, including goblets in Local Minyan ware and button-based jugs in Middle Helladic Coarse Ware. We hope that better stratified deposits in the Iklaina excavations will clarify this issue. Given the uncertainty, the full range for this ware is given here as MH I-LH IIB.

A few other pieces discussed below are classified as semi-fine, but do not fall into a well-defined fabric category.

SHAPES

Given the scarcity of Middle Helladic fine and semi-fine wares from the survey, few distinctive shapes have been identified. Both open and closed vessels are attested. Open shapes are primarily bowls, though the canonical Middle Helladic kantharos is also attested (C1665, off-site). Closed shapes are typically jars, especially of the wide-mouthed variety. The degree of wear makes it difficult in most cases to tell whether a piece is wheelmade or handmade; this is particularly true for sherds in Hard Orange Ware. At the very least, both techniques seem to be represented.

139. Davis et al. 1997, 436-437.

140. Pers. comm. with Salvatore Vitale, June 2014.

Open vessels

The body sherd C1595 (Site 11) in Minyan ware has already been discussed above. Two bowl rims and several body sherds in Local Minyan ware were collected. C0192 (off-site) is a short triangular rim sherd, similar to one found by the PRAP survey;¹⁴¹ 1.3 is a beveled rim, similar in profile to the MH II “Argive Minyan” bowl rims from Nichoria.¹⁴² Of the body sherds, C1665 (off-site) is carinated and probably comes from a kantharos; C1590 and C1599 (both from Site 11) are from undetermined open vessels. Bowl rims and bases in Hard Orange Ware were also collected; they include a horizontal splaying rim (1.12), a rounded rim (C0240, Site 1), and a well-burnished flat bowl base (11.1). Two varieties of bowl rims in this fabric that are common from the excavation are not attested in the survey material: a slightly T-shaped rim and a type sloping down toward the interior.

Jar

As noted above, three crescent lug handles from Site 1 (1.1, 1.2, and C0447) are the earliest pieces from the survey. They belong to large jars and are semi-fine in texture with small stone inclusions. This is a type well attested at the Middle Helladic I site of Deriziotis Aloni near the PN and also present at Nichoria.¹⁴³ 1.4 is a shoulder fragment in Local Minyan ware with three shallow parallel grooves incised on the exterior. In Hard Orange Ware a thin everted rim of a wide-mouthed jar (1.13) and several jar bases from Site 1 were collected: 1.14 and C0420 are raised bases and C0442 is flat. Several belly handles also come from jars: C0389 (off-site), C0429 (Site 1) and C1264 (Site 7) are round in section and C0369 (Site 1) is oval.

COARSE WARES

Coarse fabrics have a rougher core than the finer fabrics. The size and number of visible inclusions increases with coarseness, both in the core and on the surfaces. Two coarse fabrics originate in this phase and are typical of it: Middle Helladic Coarse Ware and Very Coarse Orange Ware. Middle Helladic Coarse Ware may continue into LH I and Very Coarse Orange Ware into LH IIB; a few fragments from the excavation suggest that it was used into LH III, but none of the survey examples are this late. In addition, a general class of *Middle-Late Helladic* Coarse ware is present that does not seem to change much from MH I to LH IIB. Middle-Late Helladic coarse ware

141. Davis et al. 1997, 436-437: C92-166-04 (MH), 436, fig. 13.9.

142. McDonald & Wilkie 1992, 73-74, 102-103: P2424-P2460; P2453 (MH II) is a close parallel.

143. Stocker 2003, 362-363: P33, P57 (EH III-MH I); McDonald & Wilkie 1992, 46, 86: P2072 (MH I).

sherds are discussed here with Middle Helladic Coarse Wares, though it is possible that some were manufactured later.

Middle Helladic Coarse Ware generally has a smoothed surface and few obvious inclusions. Coarser examples, however, can have tan grog inclusions. The exterior surface is often mottled with a variety of colors including reddish yellow (e.g. 5YR 6/6-7/6), weak red (e.g. 2.5YR 6/4), light red (e.g. 2.5YR 7/6), pink (e.g. 7.5YR 7/4) and light brown (e.g. 7.5YR 6/3). The core color also varies considerably, ranging from gray hues, such as pinkish gray (e.g. 7.5YR 6/2-7/2 and 5YR 6/2), light gray (e.g. 7.5-10YR 7/1-7/2), light brownish gray (e.g. 10YR 6/2) and dark gray (e.g. 7.5YR 4/1) to pink or pale hues, such as pink (e.g. 7.5YR 7/4), reddish yellow (e.g. 5YR 6/6) and very pale brown (e.g. 10YR 7/3). Examples can have a very black exterior or interior surface, smoothed or burnished and a few examples are decorated on the exterior with incised linear patterns. Shapes in this fabric are primarily large jars and cooking vessels, but some open shapes are attested. The date range is MH I-LH I. Among the survey finds, only twenty examples of Middle Helladic Coarse Ware were collected and four of those were selected for publication (1.5, 1.6, 4.1 and 8.1).

Very Coarse Orange Ware is distinguished by prominent stone inclusions that often protrude from the surface. These inclusions can be white, red, blue and/or gray. Most often the surface color appears bright orange, with colors in the reddish yellow range (e.g. 5YR 6/6-6/8, 7.5YR 6/6-7/6), but can also range from light reddish brown (e.g. 5YR 6/4) to light brownish gray (e.g. 2.5Y 6/2). Core colors can vary greatly, including pale brown (e.g. 10YR 6/3), light brown (e.g. 7.5YR 6/4), and pinkish gray (e.g. 7.5YR 6/2). This fabric is used for both open and closed vessels. Though it is not yet closely datable, Iklaina excavation material suggests a date range between MH I and LH IIB, since Very Coarse Orange sherds seem to occur most frequently in levels dominated by Middle Helladic and Early Mycenaean pottery. A few sherds in this fabric from the excavation, however, are from Late Mycenaean shapes and contexts; further research may clarify its development. Approximately fifty sherds in this fabric were collected and seven examples from three different sites are published in this volume (1.7-1.11, 5.1, and 8.2). As far as we know, this fabric has not yet been found outside of Messenia.

DECORATED POTTERY

Matt painted ware was not recovered during the survey and very little has been found in the excavation, but three body sherds provide evidence for Middle Helladic incised decoration. One is the shoulder of a closed vessel in Local Minyan ware (1.4) with three shallow incised grooves on the exterior. The other pieces are in Middle Helladic Coarse Ware. Seven incised diagonal grooves appear above two horizontal

grooves on the exterior of the closed vessel (1.5).¹⁴⁴ An open vessel (8.1) has five parallel grooves on the exterior.

Incised decoration, especially on Middle Helladic Coarse Ware, is quite common in Messenia.¹⁴⁵ Similar decoration has been found at Nichoria on both Minyan and coarse ware sherds.¹⁴⁶ The greatest quantity of incised decoration on Middle Helladic Coarse Ware at Nichoria occurs in MH I-II, with a notable decline in MH III.¹⁴⁷ The coarse Iklaina fragments are probably MH I-II also, but we have extended the range to include MH III, to reflect possible dates. The PRAP survey and the PN also yielded at least 16 pieces of coarse MH pottery with incised decoration.¹⁴⁸

UNDECORATED POTTERY

SHAPES

Coarse vessels of the Middle Helladic period include both open and closed vessels. Open shapes are usually in the form of large bowls or basins and closed shapes are predominantly large, thick-walled jars, often of the wide-mouthed variety. Vessels specifically used for cooking, such as tripods and small jars with flaring rims, as well as equipment like spit stands (also known as “souvlaki” stands) are also attested. Most examples appear to be handmade, based partly on the irregular thickness of the vessel walls and the coarseness of the vessels, especially those in Very Coarse Orange Ware.

Bowl/Basin

Bowls and basins occur in both Middle Helladic Coarse and Very Coarse Orange fabrics. One bowl rim (4.1) in Middle Helladic Coarse Ware is published here; it is slightly everted and quite irregularly shaped, suggesting that it was handmade. Another Middle Helladic Coarse bowl rim (C0283, Site 1) is triangular and has a smoothed exterior and interior surface. Bowl rims in Very Coarse Orange Ware are often thickened at the top (C0821, Site 1), forming a slight T-shape (C0830 and C0831, both off-site); this feature is paralleled at other Messenian sites and continues into the Early Mycenaean period.¹⁴⁹ A convex horizontal rim (1.7) has an incurving wall pro-

144. Perhaps similar to the decoration found on a jug from Malthi, Valmin 1938, 290, Pl. I, no. 1.

145. *Ibid.* 136-239, 284-290 referred to at Malthi as ‘Adriatic ware’.

146. Minyan ware: McDonald & Wilkie 1992, 52, 92: P2209, P2211, and P2216 (MH I); pp. 59, 104-105: P2478, P2492 (MH II). Coarse ware: McDonald & Wilkie 1992, 45-46, 48, 55 (MH I), 97-98: P2312,

P2314, P2325; pp. 64, 113: P2656-P2658 (MH II).

147. McDonald & Wilkie 1992, 68.

148. Davis et al. 1997, 438: (POSI B7, fig. 13:15, Pl. 89:b; POSI D1, fig. 13:16). Blegen et al. 1973, 9, fig. 123:17-27, fig. 134; 28, fig. 133.

149. McDonald & Wilkie 1992, 65, 115: P2693[?] (MH II); Blegen et al. 1973, 63-64, fig. 104, 159; Davis et al. 1997, 436.

file. Short everted bowl rims in Very Coarse Orange Ware, though attested (C0110, Site 1) are much less common. A large, rolled splaying rim (1.8) probably belongs to a basin.

It is difficult to identify coarse bowl bases among the survey material, because their shape is similar to those of closed vessels. A smoothed interior is the main criterion for determining that a vessel was open as opposed to closed. Only two possible bases could belong to Middle Helladic Coarse bowls (C0325 and C0471, both from Site 1) and neither was selected for publication due to their worn and battered condition. C0471 is a raised base and C0325 has a concave underside. In Very Coarse Orange Ware, one slightly raised base (C0819, Site 1), which has traces of shaping marks and a smoothed interior surface, was also collected.

Jar/Wide-mouthed jar

Jars in Middle Helladic Coarse and Very Coarse Orange Wares have been identified by a variety of rims, bases and handles. Two flaring rims in Middle Helladic Coarse Ware (C0326, Site 1 and C1174, Site 7) belong to wide-mouthed jars. In Very Coarse Orange Ware, downsloping (1.10) and rolled flaring rims (C0363, Site 1) are common. Wide-mouthed jars in this fabric can also have triangular flaring rims (1.9). One fairly tall jar neck fragment (C0042, Site 1) flares outward toward the rim and belly with the wall thickness tapering considerably as it approaches the rim of the vessel.

Handles are attached to Middle Helladic Coarse jars both horizontally and vertically. In Very Coarse Orange examples, horizontal handles are usually round or oval in section (C0229, off-site) and can be attached to the shoulder (8.2) or belly (C0400, off-site). Vertical handles in this fabric are typically oval in section (C0449, Site 1 and C1193, Site 7). A semi-circular lug handle in Middle Helladic Coarse Ware (1.6) finds close parallels in a burial pithos from the site of Nisakouli on display in the Pylos Museum,¹⁵⁰ and a large coarse jar from Gargaliani: *Kanalos* identified by the PRAP survey.¹⁵¹ C0324 (Site 1), also in Middle Helladic Coarse Ware, is rectangular in section and has a concave upper surface.

Of the few jar bases that could be identified, both raised and flat are attested. C1642 (off-site) is a raised base in Middle Helladic Coarse Ware that has a brown

150. Choremis 1969, 10, fig. 1. Choremis (p. 12) dates the pottery around the end of the Middle Helladic period (MH III), but Howell (McDonald & Wilkie 1992, 76, 78) characterizes it as including both MH II and MH III.

151. Davis et al. 1997, 437-438 and n. 185. The authors cite a similar handle from a Middle Helladic deposit at the PN, currently on display in Hera Museum (Room II, Case 33).

washy slip on its exterior surface. In Very Coarse Orange Ware, C0810 (Site 1) is a raised base and C0126 (Site 1) is flat and slightly convex.

Pithos

Only one possibly Middle Helladic pithos fragment was collected. C1491 (Site 8) is a wide horizontal everted rim, triangular in section. It is in Very Coarse Orange fabric, so the date is uncertain. The piece itself is very worn and broken. The evidence for pithoi in this region is much more abundant during the Early and Late Mycenaean periods than during the Middle Bronze Age.

Spit Stand

One spit stand (a.k.a “souvlaki stand”) in Very Coarse Orange Ware was collected from the survey: **1.11** has a flat base with part of the wall preserved. Though this is the only example recovered from the survey, numerous spit stands were found in excavation at Iklaina and these have greatly enhanced our understanding of this specialized shape.¹⁵² Spit stands from Iklaina occur in a variety of fabrics commonly used during the Middle and Late Helladic periods. All are of Scheffer’s Type A, single supports used in pairs, with indentations along the rim to hold the spits.¹⁵³ The standard shape of these supports is an inverted T, with one vertical and one sloping side. Based on excavation material, we have determined that the flat base is usually wider and better finished on the vertical side, and traces of burning are more frequent on the sloping side. Moreover, the edges of preserved holes are a little smoother on the vertical side, suggesting that it was the exterior. Unfortunately, the rim of **1.11** is not preserved; however, it is clear that a portion of its wall has been pierced with a hole near its base, probably for carrying.

Tripod

Middle Helladic tripods from the survey are identified by leg fragments only; unfortunately, it is unclear from the survey material alone what tripod rims and bases look like. Originally a Minoan shape, the tripod seems to have been introduced into the mainland sometime during the Middle Helladic period.¹⁵⁴ Excavations at Iklaina, however, have revealed a number of tripods in Middle Helladic coarse, Very coarse orange, and Middle-Late Helladic coarse wares, and it seems from these better preserved vessels that rims were typically incurving.¹⁵⁵ This is likely a regional Messen-

152. Gulizio & Shelmerdine, forthcoming.

1997, 440-441.

153. Scheffer 1984.

155. Gulizio & Shelmerdine, forthcoming.

154. McDonald & Wilkie 1992, 480; Davis et al.

ian feature well attested at Nichoria.¹⁵⁶ One example of a tripod with an incurving rim from outside of Messenia was found at Mitrou, but is much later, dating to LH IIIB2.¹⁵⁷

Tripod legs vary from vessel to vessel in both thickness and height. C1443 (Site 8) is a fairly thick stump from a tripod leg in Middle Helladic Coarse Ware ; it has two finger depressions along the center on its exterior surface. In Very Coarse Orange Ware, a fairly tall, tapering tripod leg (5.1) has an oval section. Shorter and wider legs are also common (C1188, Site 7) and one example in this ware is pierced near the top (C1138, Site 7), either for suspension or as a firing hole, which would allow heat to penetrate more easily. It is fairly common among our excavated material for tripod feet to be pierced in this manner. Tripod legs also occur in Middle-Late Helladic coarse fabric; C1077 (Site 7) is fairly tall and tapers toward the bottom.

SUMMARY REMARKS

The Middle Helladic pottery from the Iklaina is unusual in that no painted decoration was noted. This is true of both survey and excavation material. The Minyan, Local Minyan and coarse material are typical of Messenia; similar material is cited above from Nichoria, Nisakouli, and the PN. The incised decoration, the Local Minyan bowl (1.3), and the jar with lug handles (1.6) have good MH II parallels. The crescent lug handles from Site 1 jars (1.1, 1.2, and C0447) recall the Middle Helladic I deposit at Deriziotis Aloni near the PN.

EARLY MYCENAEAN POTTERY

FINE AND SEMI-FINE WARES

Two fine and semi-fine fabrics identified in the survey material are typical of the Early Mycenaean period: Mycenaean fine white and Early Mycenaean Gray Orange Wares. In some instances, the date range offered for these fabrics may either begin in the Middle Helladic period (MH III) or continue into the Late Mycenaean period. In addition to these two primarily Early Mycenaean fabrics, two semi-fine wares (Hard orange and Mycenaean orange) were also used for shapes that may belong to this phase. Mycenaean Orange Ware continues to be used throughout the Late Mycenaean period (to LH IIIB2) and Hard orange begins to be used in the Middle Helladic period (perhaps all the way back to MH I). A full description of the Hard orange pottery class is provided above among the Middle Helladic wares.

156. McDonald & Wilkie 1992, 494, 537: P3637 and P3638 (LH IIIA1).

157. Lis, 2012, 87-88 and fig. 17.

The *Mycenaean fine white* fabric is typically harder and better fired than Late Mycenaean Fine Wares (see below). The fabric is very fine with few to no inclusions and the core color appears whitish with Munsell colors ranging from pinkish white (e.g. 7.5YR 8/2) to very pale brown (e.g. 10YR 8/2).¹⁵⁸ The surface is often slipped and the vessels are usually well-made. Given the inferior quality of sherds recovered from the surface, which are often very worn and stripped of their original surface, Mycenaean Fine White Ware can be mistaken for Palace Ware, a fabric common in LH IIIA2-B that is similar in color but softer and almost never slipped. Mycenaean Fine White Ware is rare among the survey material. Approximately 16 pieces were collected, many of them undiagnostic body sherds. Of these, three sherds have been selected for publication (1.15, 1.16, and 5.2). All our examples of Early Mycenaean painted decoration occur in this fabric.

Early Mycenaean Gray Orange Ware has a semi-fine and soft to very soft matrix and often feels quite gritty. Sherds in this fabric usually have a gray or brownish core and an orange surface color. When sufficiently soft and gritty, sherds that are orange from surface to core are included in this ware. Core colors usually range from gray (e.g. 5YR 5/1-6/1), to light gray (e.g. 2.5-10YR 7/1), to pale brown (e.g. 10YR 6/3), to very pale brown (e.g. 10YR 7/4-8/4). Surface colors are often reddish yellow (e.g. 5YR 6/6-7/6, 7.5YR 6/6-6/8), yellowish red (e.g. 5YR 5/6) or red (e.g. 2.5YR 5/6, 2.5YR 6/8). The most common shape is the goblet, but other forms occur, including large jars, cups and small bowls. Based on identifiable shapes that typically occur in this fabric, the date range seems to be LH I-IIB, though it is our impression from Iklaina excavation material that this fabric begins in MH III, is more common in LH I-IIA than in LH IIB. Sherds in this fabric were also widespread among the PRAP material from the PRAP survey.¹⁵⁹

Mycenaean Orange Ware is similar to Early Mycenaean Gray Orange Ware but lacks the gray core color and is not as soft and gritty. Sherds in this fabric are semi-fine, ranging from soft to medium hard and varying in color from very orange to pinkish orange with Munsell colors in the reddish yellow range (e.g. 5YR 6/6-7/6). Some small inclusions may be present. A wide range of vessels occurs in this fabric, including both standard Early and Late Mycenaean shapes. Consequently, we give it the full date range of LH I-IIIB2. This fabric too is attested in the PRAP survey material.¹⁶⁰

158. Dickinson (1974, 114) notes that this fabric is typical of the south Peloponnese.

159. Davis et al. 1997, 442.

160. *Ibid.* 442.

PAINTED POTTERY

Only a few sherds from the Early Mycenaean period provide evidence for painted decoration and all of them are in Mycenaean Fine White Ware. No motifs are preserved. A Vapheio cup base (1.15) is a flat, splaying base with slightly beveled edges. This feature suggests a Type II Vapheio cup, which is most commonly attested in LH I,¹⁶¹ but can continue into LH IIA.¹⁶² Traces of a black band are preserved on its exterior. A few body sherds from open vessels are coated on both exterior and interior with either black (C1606, Site 13) or brown (C1618, Site 13) paint, while horizontal bands occur on other body sherds (C1405, Site 8).

UNPAINTED POTTERY

SHAPES

Although a number of shapes belonging to the Early Mycenaean period have been identified among the survey material, the majority of sherds belong to open vessels, with the undecorated goblet being by far the most common.

Goblet (FS 263/268)

The earliest goblet shapes are in Early Mycenaean Gray Orange Ware and can be identified by their distinctive rims and bases. Rims with hollowed lips (1.17 and 1.18) and sometimes convex exterior lip profiles (1.19) date to LH I-IIA. Button bases, such as 1.21, 4.2, and 7.4, are indicative of LH I. Standard LH IIA-B goblet types are attested by rims, a wide vertical strap handle (C1296, Site 7) and foot fragments. The rims are fairly thin, tall and everted, including 1.20 and 7.3. LH II goblet feet are typically broader than their LH I predecessors and can have either concave (1.22, 7.5, and 12.1), or domed (1.23) undersides. LH II goblets are also attested in Mycenaean Orange Ware. Rims in this fabric are tall and everted (C1640, off-site) and feet are typically broad with concave undersides (8.6 and C1475, Site 8). Interestingly, no specifically LH I goblets are attested in Mycenaean Orange Ware, perhaps suggesting that this fabric becomes more popular in the later phases of the Early Mycenaean period (LH II) and continues into LH III. 8.9 is the foot to lower body of a large well-made goblet in Mycenaean Fine White Ware. The edge of the foot is beveled, and the date is probably LH IIB-IIIA1.

161. Dickinson 1974, 115.

162. Mountjoy 1986, 15, 33.

Miniature Vessel (FS 126)

Only one example of a miniature vessel (7.8) was recovered from the survey. It is handmade in Mycenaean Orange Ware and its shape is uncertain; it could either be a goblet with the stump of its stem preserved or a closed vessel with raised base. Other miniatures in the same fabric are found in excavation material at Iklaina.¹⁶³

Bowl/Basin

Bowls and basins in Early Mycenaean Gray Orange Ware occur in a wide variety of rim profiles, including horizontal, slightly T-shaped (1.24), everted (7.6), and downsloping (1.25). All these profiles are attested elsewhere, though it is hard to find illustrated parallels for the T-shaped rim in this period.¹⁶⁴ A short everted bowl rim (C1453, Site 8) preserves the end of a horizontal strap handle similar to shallow angular bowls of the Late Mycenaean period.¹⁶⁵ Several flat (C0071 and C0246, both from Site 1) and a raised base (C1133, Site 7) in this fabric are from either bowls or jars. A flat-topped horizontal rim of a basin (C1182, Site 7) in Mycenaean Orange Ware is also attested. Bowl rims also occur in Hard Orange Ware: 1.12 is horizontal and splaying and C0240 (Site 1) is rounded. These pieces could date as early as MH I and are discussed in more detail above along with the Middle Helladic pottery.

Cup/Small open vessel

Very few clear examples of cups were identified in the survey material, probably a result of the difficulty in recognizing these shapes among poorly preserved surface finds. In many cases, small rim fragments clearly belong to open shapes, but cannot be more specifically assigned. In addition, many bases (especially flat and raised bases) recovered from the survey could belong to either open or closed shapes.

One raised base (1.16) in Mycenaean Fine White Ware, whose shape finds a close parallel at Nichoria,¹⁶⁶ could belong to either a cup or a piriform jar. Cups in Early Mycenaean Gray Orange Ware have a wide range of rim profiles, including rounded (4.3) and short everted (C1436, Site 8). A conical cup rim (FS 204) in Mycenaean Orange Ware (C0088, off-site) is also attested, as well as the flat base of a thin-walled cup (C1476, Site 8) in the same fabric. Other open shapes with short everted rims

163. Gulizio 2013.

164. McDonald & Wilkie 1992, 479.

165. Shallow bowls with horizontal strap handles are attested as early as LH I at Korakou in Yellow Minyan ware (Davis 1979, 247 no. 201 and fig. 10). Other early examples of decorated strap-hand-

dled bowls occur at Ayios Stephanos (Rutter & Rutter 1976, 55 no. 840 and Ill. 17, early LH IIA) and at Asine (Frizell 1980, 48, nos. 142-143 and fig. 8 with pl. 3, LH IIB-III A1).

166. McDonald & Wilkie 1992, 479, 524: P3161 (LH I).

occur in this fabric, but the sherds are too fragmentary to identify their specific shapes. Examples include the rim of a bowl (1.37) that seems to be transitional from Early to Late Mycenaean and based on the rim profile dates between LH IIB and IIIA2, and two everted, nearly horizontal rims: C0257 (Site 1) and C1184 (Site 7), both which could be either Early or Late Mycenaean in date.

Closed vessel

Only two definite examples of closed vessels in Mycenaean Fine White Ware were recovered: 5.2 is a jug with a cut-away neck (FS 135) and C1493 (Site 8) is a body sherd near the base of a closed vessel. As noted above, the raised base 1.16 could be from a piriform jar or a cup. Jars and jugs in Early Mycenaean Gray Orange Ware are attested by a jug rim with a handle attached at the rim (7.7),¹⁶⁷ a ring base (C0066, Site 1), and a raised concave base (C0262, Site 1), as well as by a variety of handle fragments. Several round horizontal handles (C1426, C1427 and C1435) were recovered from Site 8 and a few vertical handles, either strap (C1064, off-site), or oval (C0086, off-site) in section, were also found. Jars are also attested in Mycenaean Orange Ware, including a flaring rim with a vertical oval handle (1.38) and an irregular round horizontal handle (C0250, Site 1). Other fragments of jars in Hard Orange Ware, which are discussed in more detail along with the Middle Helladic pottery, include the rim of a wide-mouthed jar (1.13), a raised base (1.14), a flat base (C0442, Site 1) and a few round horizontal handles (C0429, Site 1 and C0389, off-site).

Tripod

Tripods in the Early Mycenaean period can occur in both semi-fine and coarse fabrics (see further discussion above on Middle Helladic tripods). Among the semi-fine wares, examples of small tripod legs are attested in Early Mycenaean Gray Orange Ware (C1516, Site 7) and in Mycenaean Orange Ware (8.7). Larger examples were also recovered, including a pierced tripod leg (7.9) that is oval in section. The leg is quite straight and its bottom edge is rounded.

COARSE AND SEMI-COARSE WARES

Coarse wares of the Early Mycenaean period typically occur in one of four fabric classes. *Very Coarse Orange* and *Middle-Late Helladic coarse* wares are described in detail in the previous section, since they originated during the Middle Helladic period. Also in use now are *Tan Grog Ware* and *Micaceous Ware*. The former is identified by a soft,

167. Very similar to one from Nichoria: McDonald & Wilkie 1992, 487, 528: P3314 (LH IIA).

fairly fine matrix with tan inclusions that are actually more likely to be clay than grog. This fabric is attested in the PRAP survey material, where the inclusions are referred to as grog.¹⁶⁸ We are keeping this terminology for consistency. Core color is usually gray in appearance with Munsell colors ranging from light gray (e.g. 10YR 7/2), to light brownish gray (e.g. 2.5Y 6/2, 10YR 6/2), to pinkish gray (e.g. 5YR-7.5YR 6/2) to gray (e.g. 2.5Y 6/1, 7.5YR 6/1), but can also appear light brown or reddish with Munsell colors in reddish yellow (e.g. 5YR 6/6-6/8), red (e.g. 2.5YR 6/6-6/8) and brown (e.g. 7.5YR 5/2-5/4). Post-use burning turns the surface turns gray and the inclusions almost white. Some sherds in this fabric are coated with a purple-gray wash (1.28). This fabric may date as early as MH III and continues into LH IIB, though it continues in pithoi to LH IIIB2.

A number of highly micaceous sherds were recovered from the survey and excavation at Iklaina. No examples from the site of Iklaina and the surrounding area contain gold mica. Rather, micaceous sherds from this site have silver mica inclusions and are fairly hard fired with either a dark orange to red or a brown matrix. Core Munsell colors include reddish yellow (e.g. 7.5YR 7/6), dusky red (e.g. 2.5YR 4/3), yellowish red (e.g. 5YR 6/6) or pale brown to light yellowish brown (e.g. 10YR 6/3-6/4). Surface colors, when different from the core, are typically reddish yellow (e.g. 5YR 5/6-7.5YR 7/6). Sherds can be from either small, thin-walled vessels or large pithoi. It is possible that three different classes of micaceous exists: (1) small, thin-walled vessels with a dark orange to red matrix; (2) pithoi with a dark orange to red matrix; and (3) pithoi with a brown matrix. Larger examples also have a variety of small stone inclusions. The presence of mica indicates that these pieces are imports; Kythera and Laconia are likely sources. Similar examples of this fabric can be found at Nichoria,¹⁶⁹ the Menelaion,¹⁷⁰ and Ayios Stephanos,¹⁷¹ where they seem to occur in primarily Early Mycenaean contexts. Likewise at Iklaina, micaceous sherds from the excavation seem to be found most frequently in levels dominated by Early Mycenaean pottery. Many examples, however, are from pithoi, whose fabrics typically have an

168. Davis et al. 1997, 437, 441. The discussion also mentions an example from Nichoria: McDonald & Wilkie 1992, 122: P2854 (MH III); however the reference there is merely to "grit temper." Grog inclusions are also noted at the Menelaion: Catling 2009, e.g. p. 425 in reference to Early Mycenaean tripods.

169. McDonald & Wilkie 1992, 480, 525: P3177 (LH I); pp. 488, 526, 527, 533: P3224, P3225, P3226, P3274, P3505 (LH II).

170. Primarily in Early Mycenaean contexts:

Catling 2009, 438-439, referred to as "Micaceous Coarse Red ('Coarse Red Gritty'): NB156, ST114, ST127-128, WN140, AB81-82, NS117-118, and MI20; WS52 is cited in error. One example in a similar fabric dates to the Middle Helladic period: Catling 2009, 334: MH32.

171. Rutter & Rutter 1976, 57-58, Ill. 18: nos. 969-971; Taylour & Janko 2008, 206-208, referred to as "Micaceous Minoan." Large and small vessels are represented, including some painted; for MH and LH examples, see index s.v. wares.

extended period of use, and some comparanda from outside of Messenia suggest a date as late as LH IIIB.¹⁷² We therefore offer a fairly broad date range for these vessels: LH I-IIIB2. Only five Bronze Age micaceous sherds were recovered from the survey and two were selected for publication: **1.72** and **1.73**.

SHAPES

Shapes in Tan Grog Ware are primarily pithoi, large closed vessels, wide-mouthed jars and tripod cooking vessels, though some open bowl shapes have been found. Most examples of micaceous pottery are from large storage vessels or pithoi.

Open vessels

A few open shapes in Tan Grog Ware are attested in both rim and base fragments. One convex, nearly horizontal bowl rim (**1.26**) with an incurving wall profile has been published and another lipless incurving rim with the beginning of a handle preserved (C0305, Site 1) may be from either a bowl or a tripod (which typically have incurving rims, see below). A horizontal everted rim (**7.1**) could be from either a bowl or wide-mouthed jar. A raised concave base of a large bowl (**1.27**) has a smoothed interior and may preserve evidence for purple-gray wash, a characteristic of the Early Mycenaean period.¹⁷³

Only one sherd in Micaceous Ware may be from a small open vessel (C0631, Site 4). It is a very broken, short everted rim with very little profile preserved. The wall thickness (0.6 cm) suggests that it is from a small vessel and is the only micaceous example from the survey that is not from a large storage jar or pithos. However, examples of small, thin-walled micaceous vessels are fairly well-attested in excavation material.

Jar

Large, closed vessels in Tan Grog Ware are far more prevalent than open shapes. Rims have a variety of profiles including horizontal everted with a slightly concave upper surface (**1.29**) or flaring (**1.28**) that may be from a wide-mouthed jar. The latter example has a purple-gray wash over its reddish yellow surface. The bases of jars in this fabric are usually raised (**1.32**, C0475 from Site 1, and C1294 from Site 7), less fre-

172. D'Agata 2005, 121, fig. 6. The author notes similarities with material from Kommos: Watrous 1992, 154, nos 1342 (C4134, LH IIIA2-IIIB) and 1629 (C4077, LH IIIB). Based on large quantities of this fabric found during the Kythera survey, she be-

lieves the Cretan examples were imported from that island.

173. McDonald & Wilkie 1992, 488, 532: P3498 (LH II).

quently flat (C1229, Site 7). Handles from large coarse jars are typically vertical, as attested by an oval handle (1.31) and two round handles (3.1 and 1.30); the top of the latter is attached at the base of the jar neck. However, horizontal jar handles also occur: C0443 (Site 1), C1082 and C1326 (both from Site 7), and C1598 (Site 11).

One rim fragment in Micaceous Ware (1.72) has a brown core color and is likely from a large, open-mouthed storage vessel. The rim is conical and has piecrust slashes along the top edge. The body profile is fairly straight and one band of rope decoration is preserved below the rim.

Pithos

A number of pithos fragments in Tan Grog Ware were recovered from the survey, many of which are large body sherds. Pithos rims in this fabric are typically horizontal and everted (8.8); bases can be either flat (C0306, Site 1) or raised (C1472, Site 8). A few body sherds offer evidence for raised decorative rope bands: 1.36 and C0381 (off-site). Another body sherd, probably from the shoulder of a pithos (1.35) preserves hatching marks to receive an attached decorative band.

Two large joining body sherds in Micaceous Ware (1.73) are from a large pithos. Three bands of rope decoration and the broken edge of a fourth are preserved. The straight profile of these sherds suggests that it was a substantially large vessel. Another pithos fragment (C1737, Site 1) in a very similar fabric also has two bands of rope decoration.

Tripod

A number of coarse tripods in Tan Grog Ware were found in the Iklaina survey. Tripods are easily identifiable both by their characteristic incurving rims (1.33) and legs oval in section (1.34). One published example of a tripod leg has a groove down the center of the exterior (8.3) and another splays at the bottom (7.2). As noted above, incurving tripod rims seems to be a feature unique to Messenia at this early stage.¹⁷⁴ The only published example from outside the region is from Mitrou and dates to LH IIIB2.¹⁷⁵

SUMMARY REMARKS

It is difficult to compare the IKAP survey material to pottery from major Mycenaean sites, especially those outside of Messenia. Most discussions of Early Mycenaean pottery identify the characteristics of each phase based on decoration or are

174. See *supra* n. 156.

175. Lis 2012, 87-88 and fig. 17.

concerned with the introduction of the Mycenaean style into the Greek mainland, again with the emphasis on decorated pottery.¹⁷⁶ Unfortunately, very little painted pottery came to light in this survey. In fact, the predominance of unpainted pottery seems to be a feature of Mycenaean pottery in Messenia in general. Therefore, it is not surprising that the closest parallels in shape and fabric are from excavated sites within the region, such as the PN and Nichoria, and from the PRAP survey. Other settlement deposits with Early Mycenaean material similar to that from our survey include East House on Peristeria Hill and Traghana: *Voroulia*; these sites also contain larger quantities of plain undecorated wares. The prevalence of open shapes, particularly goblets, observed in the Iklaina survey is very typical of material from these Messenian sites. The profiles also exhibit some distinctive Messenian characteristics. Among these are LH I goblet handles attached at the shoulder rather than the rim, and incurving tripod rims (1.33 and perhaps C0305, Site 1). Finally Tan Grog and Early Mycenaean Gray Orange Wares seem to be a Messenian preference. The micaceous pieces 1.72 and 1.73 have connections further afield.

LATE MYCENAEAN POTTERY

Most of the identifiable LH IIIA-B pottery from the survey, whether collected or observed in the field, is in one of several common fine fabrics. The reason is partly that small open shapes, especially kylikes, are extremely common, as well as easy to recognize. It is also true, however, that semi-fine and coarse fabrics of these periods are not especially distinctive and they tend to be used for larger, often closed vessels that generate more body sherds than features. As a result, the broad categories Mycenaean Orange Ware and especially Middle-Late Helladic coarse ware reflect a necessary caution in dating.

FINE AND SEMI-FINE WARES

Late Mycenaean pottery most commonly occurs in three different fine fabrics. *Late Mycenaean Fine Ware* is the most generic, with the widest date range. This fabric is soft to very soft, varying in color from pink to buff hues. Sub-categories of this class can be distinguished (buff surface over pink core, buff throughout), but are not chronologically significant. Core colors range from very pale brown (e.g. 10YR 8/2-8/3) or pale yellow (e.g. 2.5Y 8/2-8/3, 5Y 8/2, 2.5YR 8/2-8/3) to pink (e.g. 5YR 7/3-8/4, 7.5YR 7/4-8/4) and reddish yellow (e.g. 5YR 7/6, 7.5YR 7/6-8/6). The surface

176. Dickinson 1972, 1974; Dietz 1980, 1991; Lolos 1987; Mountjoy 1986, 1999; Rutter & Rutter 1976.

color is most often very pale brown (e.g. 10YR 8/2-8/4), but pink (e.g. 7.5YR 8/3-8/4) is also possible and sometimes both occur on the same vessel. Shapes consist primarily of table wares, such as kylikes, cups, deep bowls, shallow angular bowls and kraters. Vessels may be painted or plain and the surface may be slipped. The date range for this fabric is LH IIIA1-B2.

Late Mycenaean Fine Pink Ware is a sub-category of Late Mycenaean Fine Ware that does seem to be chronologically significant. It is fine and soft to medium hard and pink throughout core and surface. Munsell colors are typically pink (e.g. 5YR 7/3-8/4, 7.5YR 7/4-8/4) or reddish yellow (e.g. 5YR 7/6, 7.5YR 7/6-8/6). Like Late Mycenaean Fine Ware, it is used primarily for small open vessels. Shapes in this fabric typically belong to LH IIIA1-2.

Palace Ware is named for the white, pale green or pale yellow fabric found in great quantities in Pantries 18-22 of the PN.¹⁷⁷ The greenish color comes from the overfiring of the kaolinites used for Late Mycenaean fine fabrics.¹⁷⁸ The fabric is usually soft to very soft. Core and surface color are usually the same and include white (e.g. 2.5Y 8/1-10YR 8/1), very pale brown (e.g. 10YR 8/2-8/3), pale yellow (e.g. 2.5Y 8/2-8/3, 5Y 8/2, 2.5YR 8/2-8/3) and less often pink (e.g. 7.5YR 7/3-7/4, 7.5YR 8/3-8/4). Occasionally, very small black inclusions are present. The overlap in color with Mycenaean Fine White Ware (see above in Early Mycenaean section) makes it difficult to assign some harder-fired sherds to one or the other of these two fabrics. As with the other Late Mycenaean Fine Wares, Palace Ware is commonly used for table wares, such as kylikes, cups, deep bowls and shallow angular bowls. A few thicker-walled closed vessels in this fabric have also been identified, however. Only rarely are vessels in this fabric slipped or painted. It appears in LH IIIA2 but is most common in LH IIIB.

Two semi-fine fabrics were also in use during LH IIIA-B. *Mycenaean Orange Ware*, described above in the section on Early Mycenaean pottery, continues, at least for jugs and jars.¹⁷⁹ *Late Mycenaean Semi-fine Ware* is introduced in LH IIIA. The fabric is a slightly coarser version of Late Mycenaean Fine Ware. It is fairly well-fired and quite fine in texture, though in most cases some small inclusions are visible. The surface can be buff with a pink core or sherds can be buff from surface to core. Munsell color ranges are very pale brown (e.g. 10YR 8/2-8/4), pale yellow (e.g. 2.5Y 8/2-8/3, 5Y 8/2, 2.5YR 8/2-8/3), pink (e.g. 5YR 7/3-8/4, 7.5YR 7/4-8/4) or reddish yellow (e.g. 5YR 7/6, 7.5YR 7/6-8/6). This fabric is typically used for jars and other large closed vessels. Its date range is LH IIIA1-B2.

177. Davis et al. 1997, 448; Blegen & Rawson 1966, 119-132, 351-352.

178. Galaty 2010, 233.

179. Thomas 2005, 518, 524-526.

PAINTED POTTERY

Few of the LH IIIA-B sherds collected show any trace of paint and no identifiable motifs have been preserved. This is partly because many sherds are either lacking their original surfaces due to post-depositional processes or have lost their paint. It does, however, seem that much of the pottery was simply unpainted. The excavation material from both Iklaina and Nichoria reinforces this impression.¹⁸⁰ Pieces that do retain evidence of painted decoration, however, are of well-known types. Nearly all are from open vessels. Typical of LH IIIA2 are several kylikes with red paint. Two red bands are preserved on the lower body of a decorated kylix (FS 256/257) in Late Mycenaean Fine Ware (11.4). A slightly everted rim (C0054, Site 1, FS 257) has a monochrome red interior and traces of a red band just below the rim on the exterior; the exterior band probably extended up and over the rim. Kylikes of both FS 256 and FS 257 with monochrome interiors (a Minoan characteristic) are common at Ayios Stephanos.¹⁸¹ Several kylikes are probably fully monochrome (FS 264): a rim (13.1) and a well-made domed foot (13.2) in Late Mycenaean Fine Ware, and two rims (4.4 and 1.43) and a body sherd (C1605, Site 13) in Late Mycenaean Fine Pink Ware. The paint on 4.4 is reddish brown; the other pieces have the brighter red paint characteristic of LH IIIA2. Of the same date are a shallow cup rim (FS 220) in Late Mycenaean Fine Ware (C0668, Site 4), with traces of red paint on the exterior, and the rim and handle scar of a cup with horizontal handles (FS 245) with red paint on the interior (C1692, off-site).

Several other sherds date to LH IIIB. Two kylix stems (FS 258B) have traces of black bands on the stem and lower body, one in Palace Ware (C0143, Site 1) and one in Late Mycenaean Fine Ware (1.42) are LH IIIB1. Some deep bowl fragments were also identified. C0010 (Site 1) is a ring base in Late Mycenaean Fine Ware with traces of a black band at the bottom of the bowl. 1.59 in Palace Ware is another ring base with possible traces of brown paint on the interior and a ring of paint on the underside; it belongs to a monochrome, monochrome interior or Group B deep bowl of LH IIIB2. A horizontal round handle (11.5) in Late Mycenaean Fine Ware was probably coated black and belongs to a deep or perhaps a stemmed bowl.

A few other pieces fall within the range LH IIIA2-B1. These include three decorated kylikes (FS 257/258) in Late Mycenaean Fine Ware. 1.40 is a rim with traces of a wide brown band just below the rim; its rather tall flaring lip makes an LH IIIA2 date likely. 1.41 is a lower body with brown bands and C1548 (Site 11) is a domed foot with black bands.

180. McDonald & Wilkie 1992, 467.

181. Taylour & Janko 2008, 305, 335.

The rest of the LH IIIA-B painted material cannot be as closely dated; the following pieces are all in Late Mycenaean Fine Ware unless noted otherwise. Most are from open vessels. The stemmed bowl (FS 304/305) is represented by two feet with black coated or banded stems: **7.16** and C1348 (Site 8) and another on which no paint is actually preserved (C1156, Site 7). An everted Palace Ware rim with black bands on the interior and exterior (C1721, off-site) is also from a stemmed bowl. A krater rim with a broad strap handle (**1.58**, FS 7/8) retains some brown paint on the handle edge. C1700 (off-site) is the downsloping rim of a large basin (FS 294) with monochrome dark brown interior and red bands on the exterior below and possibly at the rim. Two smaller bowl bases have traces of paint: a flat base (C0125, Site 1) has black paint on the exterior and interior and a roughly shaped raised base (C0526, Site 1) has reddish paint on the interior. C0766 (Site 5) is a ring base, 14 cm in diameter and thus large for a deep bowl; the interior is coated black as far as preserved.

Only three fragments of closed vessels are painted. **1.64** is the banded base of an angular alabastron (FS 94). Piriform jars are represented by **13.4**, a nicely made black coated torus base and by a vertical strap handle (C0001, Site 1) in Palace Ware with the edges painted black.

UNPAINTED POTTERY

SHAPES

Fine undecorated pottery is the best represented category of Late Mycenaean pottery in the survey material collected. As at most settlement sites, open shapes are more frequent than closed and the majority of identifiable pieces come from rounded and angular kylikes, shallow angular bowls and larger basins. All have typical profiles. Several varieties of cups are present, as are goblets, stemmed bowls and deep bowls, but no certain fragments of mugs were collected. The rhyton and the conical cup are represented by one fragment each. Closed shapes are infrequent; again the range is typical, including small stirrup and piriform jars and larger jugs and jars. In the Iklaina excavation material also open shapes are more common than closed, but their range and quantity is greater: conical cups, kraters and even rhyta are all well represented, in addition to the vessel types that dominate the survey material.

Krater (FS 8/9, 281)

The only krater rim recovered from the survey (**1.58**) is discussed above under the decorated pottery. Among the unpainted material, a broad vertical strap handle in Palace Ware (C0422, Site 1) is assigned to FS 8/9 (LH IIIA2-B). Two Late Mycenaean Fine Ware bases were also collected. A torus foot (C0835, off-site) to sloping lower body is probably FS 8 (LH IIIA2), rather than FS 9 (LH IIIB), which is straight-sided

above the foot. A ring base (C0514, off-site) with a diameter of 11 cm is the only sure example of the ring-based krater FS 281 (LH IIIB).

Rhyton (FS 199)

Only one example of a rhyton was recovered in the survey, though a number of rhyton fragments, both painted and undecorated, were found in the excavation. **11.2** is a lower body in Late Mycenaean Fine Ware, dating broadly to LH IIIA-B. It has an irregular groove around the body that may be post-depositional.

Conical cup (FS 204)

Only one possible conical cup rim (C0088, off-site) was collected in the survey, though the shape is very common in the excavation material. It is in Mycenaean Orange Ware and belongs to the general date range LH I-IIIB2. A few small flat bases could also belong to this shape, but are discussed below under shallow angular bowls (FS 295).

Cup (FS 220, 245, 249)

The evidence for cups is limited. All the examples discussed here are in Late Mycenaean Fine Ware. The shallow cup (FS 220) has one vertical strap handle; the cup with two horizontal handles (FS 245) is very similar in rim profile. Thus the rim fragment **1.57** could belong to either shape. The flaring lipless rim **7.15** probably belongs to the spouted variety (FS 249). A raised base (C1191, Site 7), with a diameter of only 4.5 cm may also be from a cup. Several small vertical strap handles belong to cups or to small kylikes and a few small horizontal round handles (C0423, Site 1 and C1179, Site 7) with a diameter of only 1 cm or less may belong to cups (FS 245) rather than deep bowls (FS 284).

Dipper (FS 236) and Ladle (FS 311)

A high-swung vertical strap handle in Palace Ware (C0515, off-site) probably belongs to a dipper (FS 236); the oval section and the fabric suggest a date of LH IIIA2-B. The pierced end of a ladle handle (**1.68**, FS 311) in Late Mycenaean Semi-fine Ware was also collected.

Goblet (FS 264) and Stemmed bowl (FS 304/305)

A fine foot to lower body of a goblet (**8.9**) was discussed above with Early Mycenaean goblets, but its date range may extend into LH IIIA1. Several more domed feet could belong to goblets or to stemmed bowls. **7.10** and C1432 (Site 8) in Late Mycenaean Fine Ware belong to the general range LH IIIA-B. A small example in Late Mycenaean Fine Pink Ware (**3.2**) should date to LH IIIA. Several round handles could belong to stemmed bowls, but they are discussed below under deep bowls (FS 284).

Kylix (FS 264/265/266, 267)

Of all vessels, kylix sherds were by far the most often noted and collected. Both angular and rounded varieties are common in Late Mycenaean fine and Palace Wares and a few examples are attested in Mycenaean Orange Ware also. A fairly tall sharply offset rim of the rounded variety (C1196, Site 7, FS 264) in Late Mycenaean Fine Ware dates to LH IIIA1 or early LH IIIA2. Rim profiles of LH IIIA2-B (FS 265/266) are well represented: **8.10** and C1677 (off-site) are short everted, **5.3** and C1185 (Site 7) are rounded, **1.46** is flaring and lipless. This last profile is typical of LH IIIB. The foregoing are all in Late Mycenaean Fine Ware, but the same range of profiles exists in Palace Ware: **1.45**, **7.14** and C0414 (Site 1) are short everted, C1026 (Site 7) is rounded, **1.47**, **1.48** and **5.4** are flaring and lipless. Also in Palace Ware is **1.44**, a rather taller everted rim of LH IIIA2 rather than LH IIIB. C1695 (off-site) is an everted rim of a large example, 18+ cm in diameter, in Mycenaean Orange Ware. Tall stems and well-made domed or concave feet are also assigned to rounded kylikes: **1.51**, **7.13** and C0056 (Site 1) in Late Mycenaean Fine Ware and **13.3**, C0809 (Site 1) and C0524 (Site 1) in Palace Ware.

Angular kylix rims (FS 267) are easily confused with shallow angular bowl rims (see below), but the following are likely examples in Palace Ware: **1.50** has a lipless rim and a deep upper body and dates to LH IIIB, while **7.11** has a shorter upper body is probably LH IIIA2. **1.49** is a short rounded rim with a fairly deep upper body and falls into the LH IIIA2-IIIB range. Two flaring rims from Site 1 (C0035 and C0148) could belong to either angular kylikes or shallow angular bowls. String-cut feet such as **1.54** and C1061 (Site 7) in Late Mycenaean Fine Ware and **5.5**, C0172 (Site 1) and C0296 (off-site) in Palace Ware also belong to angular kylikes, as do a few examples with short stems and straight lower body profiles, including **1.55** and **1.56**. Not enough is preserved of **11.3** to determine whether this kylix was angular or rounded.

Several feet and stems in Late Mycenaean Fine Pink Ware are assigned to LH IIIA1-2 by reason of their fabric: C1520 and C1198 (both from Site 7), C1449 (Site 8) and C1682 (off-site).

Kylix handles as a rule start out proportionally thinner in section and wider in LH IIIA and grow thicker and narrower late in that period and into LH IIIB. Both types were collected: C0713 (Site 5) in Late Mycenaean Fine Ware and C1468 (Site 8) in Mycenaean Orange Ware are examples of the earlier type and C0761 (Site 5) of the later; all three are attached to worn or broken rims. C1745 (Site 8) in Late Mycenaean Fine Pink Ware is thick and narrow enough to suggest a date late in LH IIIA2 rather than LH IIIA1. Several small vertical strap handle fragments could belong either to kylikes or to cups: C0121 (Site 1) in Late Mycenaean Fine Ware and C1746 (Site 8) in Late Mycenaean Fine Pink Ware.

Deep bowl (FS 284)

In addition to the decorated deep bowl bases mentioned above, several round handles were collected that could belong to stemmed or deep bowls. C0816 (Site 1) is in Late Mycenaean Fine Ware and several other are in Palace Ware: C0002 and C0297 (both from Site 1); C0092 and C1661 (both off-site).

Shallow angular bowl and shallow basin (FS 294, 295)

7.12 in Late Mycenaean Fine Ware and **8.11** in Palace Ware are small shallow angular bowl rims (FS 295) with the end of a horizontal strap handle preserved. The short upper body of the former suggests a date in LH IIIA2 rather than LH IIIB. C0820 (Site 1) and C0752 (Site 5), both in Late Mycenaean Fine Ware, are rims from somewhat larger examples of FS 295; the handle end is preserved on the former. Several flat or slightly raised bases with smaller diameters may belong to small shallow angular bowls or to conical cups (FS 204): C0130, C0266 and C0298 (all from Site 1) and C1681 (off-site). C0266 and C0298 are in Late Mycenaean Fine Ware, the other two in Palace Ware. The large basin (FS 294) is also well represented in several fabrics. Of LH IIIA date are two horizontal rims in Late Mycenaean Fine Pink Ware: C0815 (Site 1) has an estimated diameter of 20 cm; C1169 (Site 7) is a small fragment, diameter uncertain, but the wall thickness of 0.8 cm suggests a large vessel. Two more rims are in Palace Ware: **1.60** has good LH IIIB parallels; the downsloping rim **7.17** has the general date LH IIIA2-IIIB. A flat base in Palace Ware (C0825, Site 1) with a diameter of 6 cm probably also belongs to this shape. Of the same general date is a horizontal basin rim (C1051, Site 7) in Mycenaean Orange Ware.

Closed shapes

Very little of the material collected comes from closed vessels and none of it can be closely dated. **1.65** is the base of an angular alabastron (FS 94) in Palace Ware. **1.61** is the downsloping rim of a small piriform jar in Late Mycenaean Fine Ware; a small sharply curved horizontal round handle (C0517, off-site) in Palace Ware is probably from the same shape. Three ring bases could belong to small piriform or stirrup jars: **8.12** in Late Mycenaean Fine Ware and **1.62** and C1404 (Site 8) in Palace Ware.

Fragments of jugs and jars in several fabrics were collected, but it is difficult to assign most of them to specific shapes or dates. Fine ware examples include a rolled amphora rim (C0022, Site 1, FS 69) in Late Mycenaean Fine Ware and a thick vertical strap handle (C1670, off-site) in Late Mycenaean Fine Ware with a concave upper surface, perhaps from a jug. Several flat bases with diameters in the range of 5-6 cm are from small closed vessels: C0041 and C0339 (both from Site 1) in Late Mycenaean Fine Ware and C0822 (Site 1) in Palace Ware. The collection also contains a number of semi-fine fragments. C0282 (Site 1) and C1758 (Site 8) are flaring lipless rims from wide-

mouthed jars and C0132 (Site 1) is the neck of a jug or amphora. **1.66**, C1580 (Site 11) and C0366 (Site 1) are vertical oval handles; the first two are attached at the rim, the third at the neck. **12.2** is a flat jar base. All of these pieces are in Late Mycenaean Semi-fine Ware. Mycenaean Orange Ware was discussed above in the section on Early Mycenaean pottery, but several more pieces in this fabric are Late Mycenaean: a downsloping jar or jug rim (**1.67**), a thick oval handle from the shoulder of an amphora (C1550, Site 11), a horizontal round handle attached to the body of a large jar (C0522, off-site) and a raised jar base (**1.39**).

COARSE WARES

Some coarse vessels possibly dating to the Late Mycenaean period belong to the generic class called Middle-Late Helladic coarse ware; these are discussed in the Middle Helladic section above. Two types of coarse wares are typical of the Late Mycenaean period. *Late Mycenaean Coarse Ware* is similar in color to Late Mycenaean Semi-fine Ware, but can have a grayish or brownish core. It often has many inclusions, typically red, white and blue stones of various sizes and/or red clay. Core Munsell colors include very dark gray (e.g. 10YR 3/1), pinkish gray (e.g. 5YR 7/1) and reddish yellow (e.g. 2.5YR 6/8). For the surface, Munsell colors include pink (e.g. 7.5YR 8/4), reddish yellow (e.g. 7.5YR 8/6), yellowish brown (e.g. 7.5YR 5/6) and yellow (e.g. 7.5YR 7/6). Most of the vessels in this fabric are large thick-walled jars, pithoi and other storage and closed vessels. Its date range is LH IIIA1-B2.

Late Mycenaean Coarse Tan Ware is hard-fired and very coarse, with many black stone inclusions. Core and surface may be tan or buff throughout, or they can have a slight pinkish hue. Munsell colors range from very pale brown (e.g. 10YR 8/2-8/3), pale yellow (e.g. 2.5Y 8/2-8/3, 5Y 8/2), or pink (e.g. 7.5YR 7/3-8/3). Preliminary chemical analysis shows that the fabric is not local.¹⁸² It is hoped that further work will establish its relationship to published fabric groups for this shape.¹⁸³ Large transport stirrup jars typically occur in this fabric. Its date range is LH IIIA1-B2.

CLOSED SHAPES

No sherds from coarse open vessels were collected. The most distinctive closed shape is the large transport/storage stirrup jar (FS 164). **1.69** is the disc with handles, the only fragment collected in Late Mycenaean Coarse Tan Ware. In smaller stirrup jars the proportionally narrow disc with rounded edges is a sign of LH IIIB date.¹⁸⁴

182. Pers. comm. with M. Galaty, Summer 2014.

183. Haskell et al. 2011.

184. Mountjoy 1986, 79.

In the large transport/storage type (FS 164), discs with these characteristics are more often convex, but some LH IIIB examples have a depression in the disc top like **1.69**.¹⁸⁵ A few sherds in Late Mycenaean Coarse Ware were also collected. **1.70** is the flat base of a jar and **1.71** is the raised base of a pithos (FS 13). A few body sherds and two handles probably from closed vessels complete the collection. The handle C0808 (Site 1) is roughly shaped, almost square in section; C1228 (Site 7) is round.

SUMMARY REMARKS

As is typical of Messenia, the pottery from the Iklaina survey is very worn and paint is fugitive. Some banding survives on painted pieces, but not any decorative motives. Both the red paint typical of LH IIIA2 and the black paint typical of LH IIIB are attested. The only unusual feature is the monochrome interior of one LH IIIA2 kylix (C0054, Site 1), paralleled at Ayios Stephanos and a possible sign of Minoan influence.¹⁸⁶ The great majority of the pottery from the survey is unpainted, as is typical of excavated Messenian settlements.¹⁸⁷ Late Mycenaean settlement pottery is fairly consistent across regions in both fabrics and range of shapes. Our material is well within the normal repertoire, exhibiting the usual predominance of fine open shapes, particularly kylikes, shallow angular bowls and larger basins. Rim and base profiles are also standard. The collected material is well matched in all respects to the PRAP survey, as well as to excavated sites like Nichoria, the Menelaion and Tsoungiza.¹⁸⁸ Very little coarse pottery was collected; the most interesting piece is the large coarse stirrup jar **1.69**. As noted, this is not a local piece; we hope to determine its likely origin by chemical and petrographic analysis.

SUBMYCENAEAN TO ARCHAIC POTTERY

Very little pottery from the survey belongs to the Submycenaean to Archaic periods. Sherds from these phases are often thin-walled, usually have a brownish fabric color and, if decorated, can have a streaky brown coating. All of these features are typical of these periods in Messenia, and are well represented in the PRAP survey material.¹⁸⁹

185. Haskell et al. 2011, 15, Typegroup XI.

186. *Supra* p. 176 and n. 181.

187. McDonald & Wilkie 1992, 467; Blegen & Rawson 1966, 350-353.

188. Davis et al. 1997, 445-451; McDonald & Wilkie 1992, 495-517, Catling 2009, *passim*; Thomas 2005, 2011.

189. Davis et al. 1997, 452.

PAINTED POTTERY

Only one Greek historical sherd from the survey contains a decorative element; unfortunately it is very poorly preserved and the date is uncertain. A body sherd of a small closed vessel (C1496, off-site) has faint traces of either concentric circles or spirals in black glaze. If it is a concentric circle, it could date as early as the Protogeometric period; if a spiral, it could be as late as Hellenistic. The earliest pieces of historical pottery from the survey are two body sherds from closed vessels: C1644 (off-site) has streaky brown coating on its exterior, and C0384 (off-site) has prominent wheel marks and three black horizontal bands on its exterior. These two pieces date between the Submycenaean and Protogeometric periods.

One sherd can be fairly securely dated to the Protogeometric period. C1509 (Site 8) is a body sherd of an open vessel with prominent grooves on its exterior and traces of dull brown-black paint. Two other sherds could be Protogeometric or Archaic. **13.5** is the body sherd of a jar, coated streaky black on the exterior, and C1505 (off-site) is the downsloping rim of a large bowl in a whitish fabric, probably coated on the exterior and interior. Two additional body sherds coated with better quality black glaze are probably Archaic or Classical in date (see also below on **11.6**): C1352 (Site 8) is a fragment of an open vessel with a trace of black glaze on the interior and a brownish surface color; a jar shoulder with a horizontal rib at the base of the neck (C1409, Site 8) is coated on the exterior. Lastly, C0587 (off-site) is small raised jar base of the Archaic or Classical period, in a pinkish fabric with a black glazed band just above the foot.

UNPAINTED POTTERY

Only one example of an undecorated sherd could date as early as the Archaic period: a flat everted rim of a small jug, with a rib on the straight neck (C0911, off-site); it is in a hard-fired pink fabric with white slip.

CLASSICAL TO HELLENISTIC POTTERY

FINE AND SEMI-FINE WARES

The most diagnostic feature of Classical to Hellenistic pottery is the high gloss black finish on the surface of the pottery, resulting from a slipped surface fired in a reduction environment and traditionally referred to as *Black glaze ware*. During the Hellenistic period, the black gloss coating can appear almost silvery. Sherds are hard-fired and have a wide range of fabric colors. The most common are pink (e.g. 7.5 YR 7/4), pinkish gray (e.g. 7.5YR 6/2), reddish brown (e.g. 5YR 4/4), reddish yellow (e.g. 5YR 7/6), red (e.g. 2.5YR 6/), and gray (e.g. 10YR 6/1). The lighter colored fabrics

are typical of Messenia, and likely represent local manufacture. Pieces in a darker red fabric are probably imports.

PAINTED POTTERY

No examples of Black or Red Figure pottery, typical of the Classical period were collected, nor any pieces of West Slope ware or mold-made bowls, such as those commonly produced in the Hellenistic period.

A well-made pedestal base of a kantharos (C1541, off-site) dates to the 4th or 3rd century BC. The foot is divided into three rounded sections, and black glaze is preserved in the grooves on the exterior on the underside. Four body sherds from small vessels with good quality black glaze were recovered from the survey. 8.13 and C1556 (off-site) are coated on the interior, C1285 and C1284 (both off-site) on the exterior and interior. All likely date to the Classical period, based on the quality of the glaze and surface treatment. A few glazed sherds could be more closely dated to the Hellenistic period. 3.3 is the shoulder of a lamp, of Broneer type X or Howland type 33A, with the edge of its fill hole preserved and black glaze coating on the exterior and interior. Also of this period are a torus base (C0038, Site 1) with black glaze on the edge of the foot, and a body sherd (C0501, off-site) with brown-black glaze on the interior.

Some fragments with black glaze can be dated generally to the Classical to Hellenistic range. Those published here are the pedestal foot of a kantharos (12.4), an oinochoe foot (12.3) of the 4th-early 3rd century BC, and a body sherd from an open vessel (5.6). Another body sherd (11.6) may be as early as the Archaic period. Approximately 15 other diagnostic sherds were collected, but were not well enough preserved to warrant publication. However, they do document the shapes present in the local assemblage. All are off-site unless otherwise noted. Cups and bowls are attested by a few rims, bases and handles. C0465 is the horizontal everted rim of a bowl, and C1506 is a slightly flaring lipless cup rim. Two ring bases from open vessels include C1497, coated on the exterior and interior, and C1128, which may have traces of black glaze on its interior. Another ring base (C0395) with traces of black glaze on the underside of the base, could be from an open or closed vessel. Two small pedestal bases are likely from cups: C0388, which has grooves around the side of the foot preserving black glaze, and C1706. C1126 is a narrow vertical strap handle from a cup; another wider strap handle (C1148) may be from an open or closed vessel. Rims of closed vessels with black glaze on the exterior include a downsloping rim (C0492, Site 3) and a broken rim and neck (C0441). A raised, slightly concave base (C1499) preserves black glaze in two grooves along the side of the base. Two round horizontal handles (C1423, Site 8 and C0377) were also collected. A body sherd of a closed vessel (C0154, Site 1) preserves several shallow ribs and traces of black glaze on the exterior surface.

Ten Laconian tile fragments with black glaze on their convex surfaces also date to the Classical to Hellenistic periods. Four examples are published here: **6.2A** and **B**, **3.4** with a raised edge, and **8.14** with an irregular rolled edge. Other fragments include C1350 (Site 8) and C1566 (Site 12), as well as C0664, C0924, C0940 and C1542 (off-site). Three more fragments have reddish brown paint (C0461, C0462 and C1526, off-site). C0461 preserves a lipped corner.

UNDECORATED POTTERY

A number of undecorated sherds also date to the Classical to Hellenistic periods. Assessing specific forms, however, is often difficult, since the sherds are small and worn. Open vessels exhibit some variety in rim shape, including a low flaring bowl rim (C1127, off-site), a thicker rounded bowl rim (C0705, Site 4), and a number of thin short everted rims, like C0778 from Site 5. Bases from cups or other small open vessels can be concave (C1710, off-site), raised concave (C0542, Site 4), or ring-based (C1341, Site 8 and C1417, off-site). Site 7 yielded two handles from open vessels: a vertical strap handle (C1000) and a small oval vertical handle (C1011), which may be from a bowl. Two additional rims could be Hellenistic in date: C1194 (Site 7) is short and flaring and C1459 (Site 8) is rounded; both seem to be from open vessels.

Only three rims from undecorated closed vessels belong to the Classical to Hellenistic periods: a horizontal everted rim of a storage bin (**4.6**) with a bevel on its neck; a slightly downsloping, flat-topped rim of a stewpot (**4.5**) with a ledge below the rim on its exterior; and a tall flaring rim of a wide-mouthed jar (C1180, Site 7). The latter two are probably Hellenistic. A number of bases give also some indication of closed vessels from this phase. Three possible amphora toes were collected, all of which were off-site: C0826 is fairly shallow; C1325 curves inward at the top of the toe and flares outward, and C1654 has a torus edge and a concave underside. A flat base of a small closed vessel (C1340) was recovered from Site 8. Lastly two vertical oval handles (C1069, off-site and C1225, Site 7) are likely from large storage bins.

A few additional bases and a handle could belong to either open or closed vessels. **7.18** and C1664 (off-site) are pedestal feet. **7.18** is fairly tall and C1664 is elaborately made with grooves around the foot. A small neatly-made torus base (C1075) and a concave foot (C1305) were found at Site 7. C1701 (off-site) is a twisted spiral handle.

Several undecorated sherds from our collection could not be more accurately dated than the Hellenistic to Roman periods. Open vessels are best attested by downsloping bowl rims (C0421, Site 1 and C0676, Site 6), and short everted basin rims (C0068, Site 1 and C1456, Site 8). C1167 (Site 7) is flaring. Closed vessels include a flaring pitcher rim (**7.19**) in semi-fine fabric with a wide vertical strap handle attached at the rim, the flaring, slightly everted rim of a transport amphora (**4.8**) with a vertical oval han-

dle, and the downsloping rim of a storage bin (3.5) with small specks of silver mica inclusions. 7.20 is a vertical strap handle with a central rib attached to the neck of an amphora, probably Coan. A few rounded rims may also be from closed vessels: C0640 (Site 4), C0942 (off-site) and C0769 (Site 5). Two vertical oval handles (C1668 and C1714, both off-site) in semi-fine fabric probably belong to pitchers; a larger coarser example (C0398, off-site) has a ridge on the upper surface. Two rims of uncertain vessels preserve a groove below the lip (C0547, off-site and C0632, Site 4). A tall ring base (C0382, off-site) may be from an open or closed vessel. Two tile fragments lacking any traces of black glaze could be also Hellenistic or Roman in date: C0774 (off-site) and 3.6, which preserves the rolled edge of the tile.

ROMAN POTTERY

Roman pottery is easily identifiable by three distinct surface treatments. Most table wares are in Roman red glazed wares, whereas utilitarian vessels can be Combed or Ribbed. *Roman red glazed ware* has a high-gloss red finish, resulting from a slipped surface fired in an oxidizing environment. A variety of red wares exist, including African red slip, Italian and Eastern Sigillatas. They are typically hard-fired with a range of fabric colors. African red slip sherds often have a red (2.5YR 6/8) core, whereas the fabric of Eastern Sigillata examples is pink (7.5YR 8/4) or reddish yellow (7.5YR 6/8). Unfortunately, few examples of Roman table wares were found in the Iklaina survey, and in most cases, the surfaces are so poorly preserved that it is often not possible to distinguish accurately between the types of Roman red wares.

The terms combed and ribbed are both in use to describe the surface treatments of some Roman pottery. As we use them, *Combed ware* describes thin horizontal incisions on the exterior surface of the vessel, whereas in *Ribbed ware*, the exterior surface itself is uneven, forming ridges and grooves. Examples are often hard-fired and, though typically considered coarse wares, their fabrics are mostly free of inclusions. Fabric colors are typically reddish yellow (5YR-7.5YR 7/6), pink (5YR-7.5YR 8/4), pale yellow (2.5YR 7/4) and very pale brown (10YR 8/2-8/4). Ribbed ware sherds often have a whitish or tan slip on the exterior. Most pieces in these classes are from large, thick-walled closed vessels, typically used for storage or transport.

Several cooking vessel fragments from the Late Roman to Byzantine periods were also recovered. Cookware fabric from this period is typically quite coarse with white (less frequently blue and/or black) stone inclusions. Fabric colors range from reddish yellow (5YR 6/8), pale brown (10YR 6/3), to gray (7.5YR 6/1). It is very similar to Byzantine cookware discussed in more detail in the following section.

RED GLAZED POTTERY

The earliest example of a sherd with a glossy red slip on the exterior and on the top of its rim may be either Late Hellenistic or Roman in date. It is a horizontal rim of a table amphora (4.7) with a molding just below the lip. Seven other red slip sherds of Roman date were recovered from the survey. Four are likely examples of African red slip: 4.9, 10.1 and C1667 (off-site), and are lipless plate rims (Hayes 50), 10.1 with two parallel grooves on the exterior; C0234 (off-site) is a small body sherd with small mica inclusions. One shoulder of an open vessel, perhaps a bowl (C1712, off-site) in Italian Sigillata ware has a sharply inverted rim with two ridges below a rib on the exterior. It is coated on the exterior and interior. The other two sherds may be of the Eastern Sigillata A variety, given their pinker fabric colors. One is a lipless rim of an open vessel (C1707, off-site) with a glossy red slip on the interior and exterior. The other is a body sherd (C1728, Site 14) with traces of red slip on the interior.

COMBED AND RIBBED POTTERY

Five examples of Combed ware were found. Two fragments of Late Roman amphoras are published here: the shoulder fragment 8.15 and a body sherd 5.7. Two other body sherds (C1035, Site 7 and C1420, off-site) are typical examples of this ware.

At least fifteen examples of Ribbed ware were found, nearly half of them from Site 7,¹⁹⁰ where large quantities of slag were also recovered. All examples are body sherds, most from amphora shoulders, like 4.10, and C1208 and C1297 (both from Site 7). At least seven examples have a whitish slip on the exterior (C1256, off-site and C1265, Site 7). One fairly coarse and seemingly burnt example (C1209, Site 7) may be a fragment of a cooking vessel.

UNDECORATED POTTERY

Approximately 19 undecorated sherds dating to the Roman period were recovered from the survey. Most are undiagnostic body sherds; only a few are worth further discussion. A rounded flaring rim of a wide-mouthed vessel (C0691) was found at Site 4 and a low pedestal foot (C1390, off-site) seems to belong to a shallow bowl. C1514 (off-site) is a body sherd of a closed vessel with two parallel grooves incised on its exterior. One fragment of a moulded lamp (C0015, off-site) was also collected.

Six fragments of cooking vessels date to the Late Roman to Byzantine periods. C0921 (off-site), is a triangular everted rim. A second rim, C0906 (off-site), appears to

190. Ribbed sherds from Site 7 include C1058, C1093, C1155, C1208, C1209, C1265, and C1297.

be rounded and incurving, but is somewhat obscured by a vertical strap handle attached to it. Another strap handle from the rim of a cookpot (C0904, off-site), and three body sherds (C0918 and C1107, both off-site; C0931, Site 6) were also collected.

BYZANTINE TO FRANKISH POTTERY

Byzantine to Frankish fine wares are identifiable in sherd material by a range of glazed surface treatments. A number of sherds decorated in the Sgraffito style were recovered. Other decorated sherds contain linear decoration in a variety of colored glazes, including green, white, brown, pale yellow, and may be Byzantine or Frankish in date. Undecorated sherds are typically made in a coarse cooking fabric.

DECORATED POTTERY

Sgraffito ware is characteristic of the Middle Byzantine period. It is a glazed ware incised with decorative motifs that reveal the contrasting color of the underlying clay. Six examples were recovered, one of which is published here (7.21). The glaze color is typically white, sometimes with a yellowish hue, and the incised decoration is often linear. One motif, possibly depicting the feathers of a bird (C1543, off-site), was also collected. 7.21 has an incised design consisting of two rows of diagonal dashes above or below two horizontal bands. This piece closely parallels P1715 from Nichoria.¹⁹¹ Most examples of Sgraffito ware are on body sherds of plates, most of which are fairly small and scrappy with only traces of incised decoration.¹⁹² The only exception is a ring base (C1521, off-site) which, though very battered and worn, appears to be decorated with two parallel framing grooves on its interior.

Some glazed sherds contain traces of linear decoration, but often not enough is preserved to reconstruct the complete design. The best examples are the base of a Middle-Late Byzantine plate (12.5) with a brown linear design over green and white glaze, and a Frankish bowl fragment (7.24) with brown glaze and a black zigzag pattern between bands. Others include a raised concave base (C0556, off-site) with black dripped glaze on its interior, a ring base from a thick-walled vessel (C0564, off-site) that has green glaze with black linear decoration, a lipless plate rim (C1001, Site 7) with a white glazed band at the rim and traces of black glazed decoration on the interior over a white glaze, and a body sherd at the broken rim of a plate or bowl (C0986, off-site) with diagonal bands in brown glaze extending from a rim band.

191. McDonald et al. 1983, 382: P1715 (Middle Byz).

192. C1538, Site 7 and C1386, off-site.

GLAZED POTTERY

Byzantine to Frankish glazed ware from the survey is represented primarily by fragments of open shapes, especially plates and bowls. Only a few rims were recovered, including two lipless rims: C1779 (off-site) has green over white glaze on its interior, and C0554 (off-site) traces of yellowish red glaze both on the interior and on the top of the rim. Feature pieces are primarily ring bases and have a variety of glazes, with green and white being the most common. The best examples of green glazed bases are 1.74, C1731 (off-site) and C0563 (off-site). White glazed sherds include 6.4, 8.16 and C1387 (off-site). In all cases, the glaze is on the interior of the vessel. Two examples with brown glaze were recovered: 14.2 is a tall ring base of a plate with brown glaze over white on the interior, and C1730 (Site 14) is a body sherd with brown glaze on the exterior. Another ring base (C0146, Site 1) is coated with pale yellow glaze on the interior with traces of orange glaze on top of it. Lastly, two plate or bowl bases (C1006 and C1048, both from Site 7) are glazed red on their interiors.

UNDECORATED POTTERY

Only one very worn body sherd (4.11) dating to the Byzantine period is combed on the exterior. Otherwise, undecorated Byzantine pottery from the survey consists primarily of cooking vessels. *Byzantine cookware* is a hard-fired, gritty, coarse fabric with white (and less frequently black and/or gray) stone inclusions. Fabric colors are most often reddish yellow (5YR-10YR 6/8-7/8), pink (5YR-7.5YR 7/3), and pinkish gray (7.5YR 6/2). Some examples are ribbed on the exterior; all are probably locally made.

A little over 100 pieces of Byzantine cookware were recovered. Rims with vertical handles, such as 1.75 and 2.2, are the most identifiable shape and occur with some frequency at Nichoria.¹⁹³ The shape of the rim can vary considerably, including flat-topped (6.3), triangular (1.76), downsloping (1.77), flaring (2.2), horizontal everted (3.7) and T-shaped (C0508, offsite and C1523, Site 7). Vertical strap handles attached at the rim are the most common and occur at sites throughout our survey area. More elaborate handles have a central ridge on the upper side (11.7). Bases are typically flat (C0166 and C0889, both off-site). Narrow horizontal grooves on the shoulders of these cookpots (e.g. 1.78) are also attested.

Sixteen Byzantine tile fragments were also collected. Tiles from this phase are usually quite thick, (1.2-3.4 cm) and porous. Fabric colors include very pale brown (10YR 8/2), pink (5YR-7.5YR 8/3) and less frequently reddish yellow (5YR 6/8). Edges of

193. McDonald et al. 1983, 384: P1743 (Middle Byz.).

tiles are often bevelled, such **5.8**, **7.23**, C0405 (off-site) and C0928 (off-site). **7.23** has a narrow groove along the edge of its upper surface. Edges can also be triangular (C1112, off-site), tapering (C1173, Site 7) or straight (C1330, Site 7).

SUMMARY REMARKS

Pottery from the historical periods of Greece, with the exception of the Byzantine to Frankish period, is not well-attested in the Iklaina survey area. Most fine ware pottery sherds of the Protogeometric through Hellenistic period are easily identified by their characteristic black coating; however, the majority of our examples are small, scrappy body sherds, providing little information about the range of shapes used during these phases. Recognizable surface treatment on Roman coarse wares, such as ribbing and combing, attests to Roman presence in the region, though little evidence for typical Roman fine wares, such African red slip or Sigillata wares, was found. In comparison, Byzantine to Frankish pottery is much more abundant, though still less abundant than the prehistoric pottery. Most of the material consists of cooking vessels and tile fragments; glazed pottery is much rarer. The same is true of material from the PRAP survey and from the Medieval assemblage at the PN, and the range of shapes and fabrics is consistent across all three projects.¹⁹⁴

OTHER CERAMIC ARTIFACTS

Very few ceramic artifacts other than pottery were noted during the Iklaina survey. Two Bronze Age loomweights were collected, both in coarse fabrics: **1.79** is in Tan Grog Ware, a fabric likely to be Early Mycenaean; **8.17** is in Middle-Late Helladic coarse ware and is dated generally to LH I-IIIB2. Only the tops are preserved, but it is clear they are not the Minoan discoid type found by the PRAP survey at POSI B1 (Hora: *The PN*).¹⁹⁵ They are coarser than the LH II-III A loomweights of similar shape from Nichoria.¹⁹⁶ One loomweight is Hellenistic in date. **8.19**, the lower part of a pyramidal loomweight, is also in a coarse fabric; it may date to the 5th-4th c. BC.¹⁹⁷ **8.20** is a complete coarse conical weight weighing 270 grams. It is worn and somewhat irregular, so that the beveling appears sharper on one side and more rounded on the other. The coarse fabric and the shape resemble Corinth Profile XI (3rd century BC).¹⁹⁸ Two Roman loomweights were also collected. C0186 (off-site) is a complete pyramidal

194. Davis et al. 1997; (Davis & Stocker 2013).

195. Davis et al. 1997, 453.

196. McDonald & Wilkie 1992, 688-689, 711:

2795-2799 (LH II-III A).

197. Davidson 1952, no. 1193, 162, 171, pl. 76.

198. *Ibid.* 155-156, 149 fig. 23.

example, in a fine fabric (5YR 7/8, surface 5YR 6/8). It is 4.6 cm. tall and the base is 2.9×2.9. It is pierced horizontally at the top. The shape resembles 1st century AD coarse examples from Corinth.¹⁹⁹ C1485 (off-site) is the pierced top of a loomweight of similar shape and fabric (5YR 6/3, surface 5YR 6/8).

Five Late Mycenaean animal figurines were identified: **1.80**, **8.18**, **11.8**, C0058 (Site 1) and C0833 (off-site). In the first four cases, only the torso is preserved, with the stumps of the neck and front legs. Traces of banding survive on the leg of **1.80** and the lower right side of the torso of **8.18**. Not much can be seen, but both figurines appear to belong to the Linear rather than the Wavy group, giving a date range of late LH IIIA2-B.²⁰⁰ No paint survives on **11.8**, C0058 or C0833, which are therefore dated generally to LH IIIA-B. C0833 preserves the horns, neck and front leg stumps of a bull. A small figurine from Site 1 (**1.81**) represents a three-legged stool or small table; it is slipped, but may not have been painted. Elsewhere examples occur in both LH IIIA and LH IIIB contexts.²⁰¹ One Hellenistic figurine was collected **1.82**. It is the lower body of a draped hollow female figurine, 9.7 cm. high.

Finally, **8.21** is a fragment of a Turkish pipe, or chibouk. Part of the bowl survives, with two incised diagonal bands preserved at the top of the rounded section. A similar pipe was found by the PRAP survey at the Turkish-Modern site of Koryphasio:*Pisaski* (POSI B6).²⁰²

199. *Ibid.* no. 1202-1204, 162, 171, pl. 77.

200. French 1971, 151-158.

201. *Ibid.* 173.

202. PRAP SF 0080: http://docs.classics.uc.edu/fmi/xsl/prap/sfinds_single.xml?-recid=108 (Last accessed August 2014).

CHIPPED AND GROUND WORKED STONE

James Newhard

INTRODUCTION

This chapter presents an analysis of the chipped and ground stone, which consists of eighty-one pieces of stone – eighty chipped stone artifacts and one ground stone quern. Both of these categories will be discussed in greater detail below. Twenty-three additional pieces of stone were collected, but were found to be devoid of human working.

Analysis of the stone artifacts occurred in 2001 and 2005. All pieces were analyzed under natural light in the museum storeroom at the Pylos Museum. Length, width, and thickness were measured to the nearest 0.1 mm using standard laboratory calipers and each object was weighed using a daily-calibrated digital scale with a ± 0.01 g tolerance. All chipped and ground stone objects were also inspected with a 25x hand lens for signs of utilization. Data were collected for each object, recorded on a standardized form, entered into a relational database, and manipulated using SPSS. Techno-typological assignments were made using a system developed for diachronic lithic characterization,²⁰³ based largely upon that developed for the Argolid Exploration Project.²⁰⁴

CHIPPED STONE

Chipped stone tool production is dependent upon many factors, specifically those elements affecting raw material acquisition, tool production, and tool maintenance. The variables will reflect differing social expectations and practices, technical constraints of the raw material, and the overall “cost” of the tool in terms of both acquisition and investment in production methods. While the variables are numerous, a close analysis of the assemblage can illuminate the strategies behind the particular acquisition, production and use of chipped stone in a given site or region.²⁰⁵

203. Newhard 2001, 2003, 2007.

204. Kardulias & Runnels 1995.

205. Perlès 1992, 227.

The chipped stone artifacts have been split into two categories, based upon material (chert and obsidian). The categorization is necessary because of likely differences in acquisition strategies between chert and obsidian, as well as possible variances in function, which would translate into divergent tool types and production strategies.

Measurements were taken using the bulb of percussion and the direction of its radiating bands as the length axis, and using the widest part of the piece 90° from the length as the width axis. Thickness was measured at the thickest part of the piece after the bulb of percussion or, in its absence, the thickest section of the piece.

CHERT

Seventy pieces of chert were collected by the project, accounting for 89% of the overall chipped-stone assemblage (Table 10) – a percentage similar to the one found by PRAP (83%).²⁰⁶ The recovered material from IKAP therefore falls within the pattern for other assemblages in Messenia – obsidian appears to have been a resource acquired for specific tasks, but was by no means the predominant resource used for stone tools. The chert pieces were small and the assemblage varied widely in terms of macroscopic properties.

Material	N	%
chert	70	89
obsidian	7	9
quartz	1	1
siliceous limestone	1	1
Total	79	100

Table 10. Distribution of chipped-stone material.

ACQUISITION

Although studies in other areas of Greece have grouped chert assemblages according to a variety of methods to potentially identify sources,²⁰⁷ the limited quantity of material recovered by IKAP would make similar studies in this context suspect. Furthermore, the geological context of Messenia (predominantly consisting of conglomerate paleo-beach deposits and other shallow-water deposits) and the small size of the artifacts would suggest that the majority – if not the entire chert assemblage – was obtained from local geological contexts which represent secondary depositional environments. In short, the chert objects and the regional geology suggest that a for-

206. Parkinson & Cherry 2010, table 1.

207. Newhard 2003, 2007; Blitzer 1992.

aging strategy was employed for raw material acquisition, most likely embedded within other activities such as agro-pastoralism.

PRODUCTION

The dominant production method consisted of a flake core technology, determined by the lack of prismatic blades, cores, or rejuvenation flakes, and the presence of multi-directional cores and flakes.²⁰⁸ Many of the recovered flakes exhibited cortex or weathering rinds, reflecting their origin from eroded local conglomerates. These flake blanks showed minimal modification, further suggesting that the acquisition and production strategies employed were those of an *ad hoc* and foraging nature.

UTILIZATION

The tool types observed are found in Table 11 (figs 110, 111 and 112). Expanded descriptions for these tool types have been stated elsewhere.²⁰⁹ The small size of the assemblage makes characterization of the tool industry problematic. The majority of tools consisted of utilized flakes or tool types requiring minimal modification (e.g. scrapers, notches, sickle elements). The data from the chert flaked stone artifacts suggest that acquisition practices were expedient and the items were used for *ad hoc* purposes.

TOOL TYPE	CHERT	OBSIDIAN	GRAND TOTAL
Utilization, no retouch	10		10
on blade	3		3
on flake	7		7
Utilization, retouched	2	1	3
on blade	1		1
on flake	1	1	2
Backed flake	1		1
Scraper	6		6
Notched flake	3		3
Sickle element	3		3
Perçoir	4	1	5
Points	3		3
Foliate	2		2
Indeterminate	1		1
Grand Total	32	2	34

Table 11. Flaked stone tool types, split by material.

208. Similar approaches to production are attested frequently, such as in the Argive Plain (Newhard 2003), the southern Argolid (Kardulias & Runnels 1995), Messenia (Parkinson & Cherry

2010), Laconia (Carter & Ydo 1996), and Arkadia (Carter 2003).

209. Newhard 2001.

OBSIDIAN

Seven pieces of obsidian were collected, consisting of 9% of the overall chipped-stone assemblage. In the IKAP project area, the ratio of obsidian to chert is roughly 1 to 9, which is similar to the proportions reported by the Pylos Regional Archaeological Project²¹⁰ and the excavations at Nichoria.²¹¹ The quantity and proportion of obsidian to chert suggests acquisition via a down-the-line exchange model,²¹² possibly initiated from a point along the coast such as I04 (Romanou), discovered by PRAP in the 1990s.²¹³

The obsidian assemblage primarily consists entirely of flakes or debris. No prismatic blades, the principal obsidian tool blank, were found by IKAP. The extremely low number of pieces prevents any discussion about production strategies or utilization patterns (Tables 11-12).

GROUND STONE

A single saddle quern was retrieved from the survey (fig. 113), consistent with forms and dimensions of other examples found dated to the Bronze Age.²¹⁴ The example from IKAP was made from sandstone, accordant with local material availability.

Blank Type	N
debris	2
secondary cortical flake	1
secondary flake	2
tertiary flake	1
trimming flake	1
Total	7

Table 12. Obsidian blank types.

CONCLUSIONS

The small size of the overall assemblage makes the pronouncement of wide-ranging conclusions difficult. However, some specific comments can be made with confidence. The assemblage is consistent with the flaked-stone production practices in

210. Parkinson & Cherry 2010, table 2b.

211. Blitzer 1992.

212. Renfrew 1972.

213. Davis et al. 1997.

214. Runnels 1981.

place between the Neolithic and Late Bronze Age. Four pieces (**S003**, **S023**, **S052**, **S056**) exhibited a thick cross section (fig. 110). Two of these (**S023** and **S052**) had their proximal ends preserved, exhibiting wide, unfaceted platforms. These four pieces would be consistent with a Middle Palaeolithic date. A scraper (**S008**) may also be tentatively dated to this period, although the form is attested in LBA contexts as well.²¹⁵ There was no spatial clustering of these pieces.

The lithic assemblage from IKAP contributes in a small fashion to the greater understanding of chipped stone production practices in the southwestern Peloponnese. The chief raw material was chert, most likely retrieved from local sources. Obsidian represented a small proportion of the assemblage, which is consistent with the ratio recovered by the Pylos Regional Archaeological Project. Within their discussion of obsidian acquisition, Parkinson and Cherry suggest a down-the-line acquisition pattern, although with some hesitancy given the ease of access to Melos via Kythera.²¹⁶ While the obsidian finds from IKAP support such a system, one would expect the material to be predominantly in a final blank form, with signs of re-use and retouch. Assuming that prismatic blades were the ultimate goal of obsidian lithic production, it is peculiar that no prismatic blades were found within the survey area. Instead, obsidian consisted of a range of flake types. Owing to the small size of the assemblage, further discussion is extremely problematic.

While the idea of Kythera acting as an intermediary is appealing, particularly given recent work on this island,²¹⁷ recent modeling via GIS suggests that communication routes were more prone to use overland routes than previously considered.²¹⁸ Further modeling within GIS, incorporating suggested cultural associations and geographic constraints, should assist in refining the potential means by which obsidian and other exotic materials were obtained by those living in Bronze Age Messenia.

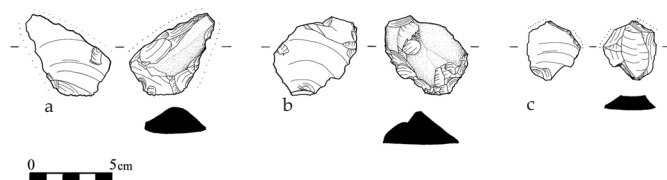


Fig. 110. Scrapers, possibly of Palaeolithic date. a) **S003**; b) **S023**; c) **S056**.

215. Newhard 2007, fig. 13a, 13b.

216. Parkinson & Cherry 2010, 44.

217. Bevan 2002; Broodbank 2000.

218. Newhard et al. 2014.

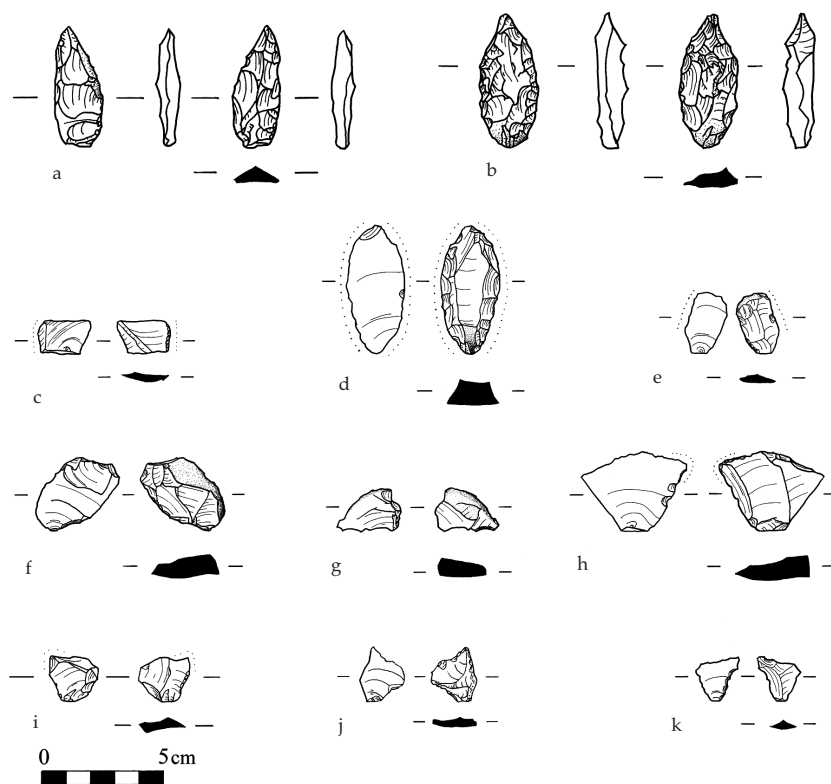


Fig. 111. Bifaces (a, b); scrapers (c, d, e, f, g); and perçoirs (h, i, j, k). a) S104; b) S103; c) S014; d) S028; e) S048; f) S030; g) S043; h) S032; i) S072; j) S084; k) S051.

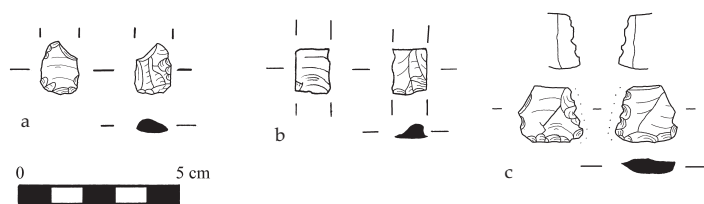


Fig. 112. Prismatic blades (a, b) and sickle element (c). a) S093; b) S095; c) S074.

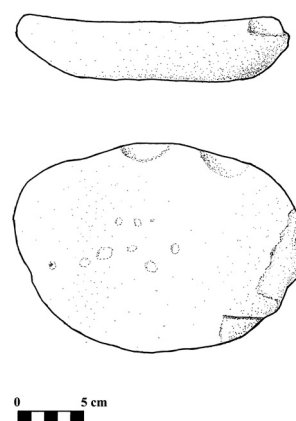


Fig. 113. Sandstone saddle quern (S064).

CHIPPED STONE CATALOGUE

Cat. No.	Site No.	Grid	Material	Tool Type	Blank Type	Utilized?	L.	W.	Th.	Wt.
S001		N13i9	chert		primary flake	NO	1.54	2.61	0.55	27.31
S002		N13b8	chert	Notched piece, flake	secondary cortical flake	YES	3.78	2.69	1.09	36.99
S003		N13b5	chert	Scraper, side scraper	secondary cortical flake	YES	5.77	3.52	1.68	66.86
S004		N13b5	obsidian		debris	NO	3.40	1.50	1.28	31.50
S008		N14i3	chert	Indistinguishable Utilization, no retouch, flake	secondary flake	YES	3.19	2.07	0.55	28.17
S009		M12h7	chert		blade	NO	3.12	1.84	1.02	32.37
S011		N13j10	chert		flake core	NO	2.62	1.49	1.25	30.50
S012		M14i10	chert		tertiary flake	NO	1.47	1.49	0.32	25.45
S013	1	N14g1	chert		secondary cortical flake	NO	2.30	1.83	0.59	28.99
S014	1	M14j1	chert	Indistinguishable utilization, no retouch, flake	secondary cortical flake	YES	1.30	2.10	0.25	25.98
S015		M13e2	chert	Flake with retouch, continuous or discontinuous, backed	primary flake	YES	2.97	1.94	0.50	27.98
S018		M12c5/6	chert		secondary cortical flake	NO	2.98	2.07	0.68	30.30
S020	1	M13j10	chert	Perçoirs/Bec, on flakes	secondary cortical flake	NO	2.24	2.33	0.48	27.79
S021		M13g3	chert	Indistinguishable utilization, no retouch, flake	secondary flake	YES	2.34	1.18	0.42	26.22
S022		M13f4	chert		primary flake	NO	1.58	1.17	0.29	25.43
S023		M13f4	chert		primary flake	NO	4.59	5.14	1.87	68.66
S024		M13h5	chert		secondary flake	NO	2.22	3.04	0.57	30.30
S025		M13h7	chert	Perçoirs/Bec, on flakes	secondary flake	NO	3.39	2.83	0.73	30.74

Cat. No.	Site No.	Grid	Material	Tool Type	Blank Type	Utilized?	L.	W.	Th.	Wt.
S027		N13i9	chert		secondary flake	NO	2.92	1.86	0.41	28.30
S028	1	M13j10	chert	Scraper, bilateral on flake	secondary cortical flake	YES	5.22	2.32	1.10	39.02
S029	1	M13j10	chert		secondary cortical flake	NO	2.77	2.88	0.82	31.22
S030	1	M13j10	chert	Scraper, side scraper	secondary cortical flake	YES	3.78	2.19	1.00	34.10
S031	1	M14j1	chert		secondary cortical flake	NO	3.47	3.21	0.88	34.80
S032		M13i5	chert	Sickle Element, retouched flakes	secondary flake	YES	3.24	4.22	0.90	38.29
S034	1	M13j10w	chert	Indistinguishable utilization, no retouch, flake	secondary cortical flake	YES	2.68	2.58	0.86	29.37
S035		M13a3	chert	Notched Piece, flake	secondary flake	YES	2.64	3.01	0.74	32.93
S036		M13l8	chert	Notched Piece, flake	secondary cortical flake	NO	3.27	3.42	0.74	34.79
S040		M13j2	chert			NO	2.04	3.07	0.57	30.22
S042		M13f6	chert		flake core	NO	6.66	7.55	5.65	60.00
S043		M12i10	chert	Flake w. retouch, continuous or discontinuous, alternating, bilateral	primary flake	NO	1.79	2.77	0.80	28.48
S044		M13i7	chert		secondary cortical flake	NO	2.40	1.10	0.89	27.83
S045		M13j2	chert	Scraper, end of unknown blank	flake core	YES	3.18	2.05	1.62	35.37
S047		M13f3	chert		tertiary flake	NO	1.40	3.20	1.35	30.31
S048		O13c7	chert	Indistinguishable utilization, no retouch, blade	crested	YES	2.48	1.43	0.47	26.86
S049		O13b8	chert	Scraper, racloir	primary flake	NO	4.00	3.83	0.74	4.04

Cat. No.	Site No.	Grid	Material	Tool Type	Blank Type	Utilized?	L.	W.	Th.	Wt.
S051		O13c2	chert	Perçoirs/Bec, on flakes	primary flake	NO	1.57	1.79	0.30	25.64
S052		O13a5	chert		primary flake	NO	2.09	1.59	0.54	27.07
S054	4	O13i7	chert		secondary cortical flake	NO	3.14	1.88	0.67	28.69
S056	6	O13j2	chert	Scraper, end of retouched flake	secondary cortical flake	YES	3.10	3.25	0.75	36.10
S057	6	O13j2	chert		secondary flake	NO	2.39	2.78	0.66	32.21
S060		O13i4	chert		tertiary flake	NO	1.61	2.32	0.36	26.49
S065	6	P13a3	chert		tertiary flake	NO	1.42	2.31	0.44	1.99
S066	7	Q13c3	chert		trimming flake	NO	1.17	1.34	0.21	0.38
S067		Q13j1	chert		secondary flake	NO	2.14	2.28	0.90	4.86
S068		Q13j1	chert		secondary cortical flake	NO	1.75	2.09	0.62	3.27
S069	7	Q13d1	chert		secondary flake	NO	1.79	1.86	0.50	1.66
S070		Q14d10	chert		secondary cortical flake	NO	2.12	1.99	0.30	1.38
S072		Q13h6	chert	Scraper, distal end of flake	secondary flake	YES	1.83	1.94	0.59	2.59
S074		Q14c3	chert	Sickle Element, denticulate on flake	secondary flake	YES	1.75	1.94	0.40	2.12
S075		Q14f2	chert		secondary cortical flake	NO	2.44	2.08	0.69	3.72
S076		Q13g10	chert	Indistinguishable Utilization, no retouch, flake	secondary flake	YES	2.50	3.06	0.73	5.74
S077		Q13h10	chert	Indistinguishable utilization, no retouch, flake	secondary cortical flake	YES	2.61	2.43	0.58	4.47
S079	7	P13i1	chert		secondary flake	NO	2.27	3.14	0.42	4.59

Cat. No.	Site No.	Grid	Material	Tool Type	Blank Type	Utilized?	L.	W.	Th.	Wt.
S080	7	P13j1	obsidian	Flake w. retouch, continuous or discontinuous, inverse, unilateral	secondary cortical flake	YES	1.97	2.21	0.42	2.36
S081	7	P13j1	chert		secondary flake	NO	3.41	2.90	0.77	9.72
S082	7	P13j1	chert		secondary flake	NO	1.77	2.74	0.76	4.39
S084	7	Q12f7	obsidian	Perçoirs/Bec, on flakes	secondary flake	NO	2.21	1.77	0.41	1.59
S085		Q12e10	chert	Indistinguishable utilization, no retouch, flake	secondary flake	YES	2.01	2.20	0.53	2.94
S086	8	Q14f9	chert		secondary flake	NO	3.37	3.05	0.65	8.65
S087	8	Q14f9	chert	Sickle Element, denticulate on flake	secondary flake	NO	1.90	2.80	0.57	3.84
S089		P13b2	chert		tertiary flake	NO	1.56	1.52	0.38	1.13
S090	8	Q14f10	quartz		secondary flake	NO	2.16	1.65	0.30	1.59
S091	8	Q14f10	chert		secondary cortical flake	NO	3.09	3.24	1.08	7.92
S092	8	Q14f10	chert	Indistinguishable utilization, no retouch, blade	blade	YES	2.20	1.64	0.65	3.19
S093	7	Q13d7	chert	Blade w. retouch, continuous or discontinuous, backed	blade	YES	1.47	1.04	0.38	0.88
S094	8	Q14g10	chert		secondary flake	NO	1.85	1.20	0.24	0.73
S095		R13e4	chert	Indist. utilization, no retouch, blade	blade	YES	1.40	1.10	0.44	1.00
S096		M8b2	obsidian		tertiary flake	NO	1.42	1.33	0.33	0.54
S097		R13e10	chert		secondary cortical flake	NO	2.03	2.68	0.48	3.67
S098		R14c4	chert		tertiary flake	NO	1.00	1.79	0.27	0.81
S099		R13f4	chert		secondary flake	NO	3.22	1.80	0.58	3.62
S100	14	R13e6	obsidian		secondary flake	NO	2.18	2.01	0.49	2.35
S101	14	R13e6	obsidian		debris	NO	2.05	2.79	0.72	3.82

Cat. No.	Site No.	Grid	Material	Tool Type	Blank Type	Utilized?	L.	W.	Th.	Wt.
S103			chert	Foliate point, on whatever blank	secondary cortical flake	YES	5.47	2.35	1.06	13.85
S104			chert	Foliate point, on whatever blank	secondary flake	NO	4.92	1.91	0.84	7.09
S105	14	R13c7	obsidian		trimming flake	NO	0.85	1.11	0.24	0.23
S106		S15c8	chert		debris	NO	1.23	1.06	0.35	0.53
S107	14	R13d6	chert		trimming flake	NO	1.09	1.00	0.13	0.24
S108		R14c2	chert	Projectile point, indeterminate	unknown	NO	1.06	1.45	0.37	0.54
S109	7	Q13a2	chert		trimming flake	NO	0.94	1.19	0.15	0.14

MYCENAEAN HABITATION IN THE REGION OF IKLAINA

Michael B. Cosmopoulos, Cynthia Shelmerdine

SURVEY RESULTS

In total IKAP identified sixteen sites and thirty-six off-site scatters in its target area (fig. 59). Evidence for human presence before the MH period is scanty. Four tools may be Middle Palaeolithic,²¹⁹ but recognizable Neolithic sherds are absent. Early Helladic remains are also absent, with the exception of three crescent lug handles, which can only be dated to the general range EH III-MH I.²²⁰

It is in the MBA that the first concrete signs for human presence in the area appear, with six certain and four possible MH sites (fig. 114). The earliest and richest material comes from Traghanes, where MH I, MH II, and MH III pottery has been found at the west end of the plateau, covering an area of approximately 3 ha around the mound. This site has yielded the richest repertoire of MH wares, including Local Minyan, and pieces in Very coarse (possibly as early as MH I) and Hard orange (MH II-III). The existence of a MH settlement here has been confirmed by the excavation, which brought to light a late MH destruction level.²²¹ The second larger MH site is Panagitsa (Site 7), where MH pottery is found over an area of 1 ha and comprises mostly cooking pots, but not any Local Minyan or Incised wares. The other MH sites appear to have been considerably smaller, with coarse MH sherds spread over areas ranging from 0.25 ha (Site 16?)²²² to 0.6 ha (Site 8) to 0.8 ha (Site 11, but overgrowth and overbuilding cover part of this site). The extent of the MH habitation of Sites 4, 5, and 13 could not be calculated. Most sites (1, 3?, 4, 5?, 6? 7, 8) are located in the Iklaina plateau and in the gently sloping flat areas to the east, but Sites 11 and 13 are on the north side of the ravine. Notable is the absence of any signs of MH habitation

219. See fig. 110.

220. In addition to these pieces, a clay anchor amulet of EH III type was found in the excavation, but in a MH level (*supra* p. 159).

221. Cosmopoulos 2008, 52-54.

222. Although the use of this site in the MH is uncertain, since it yielded only two MH sherds and would not meet the definition of a "site" during this period.

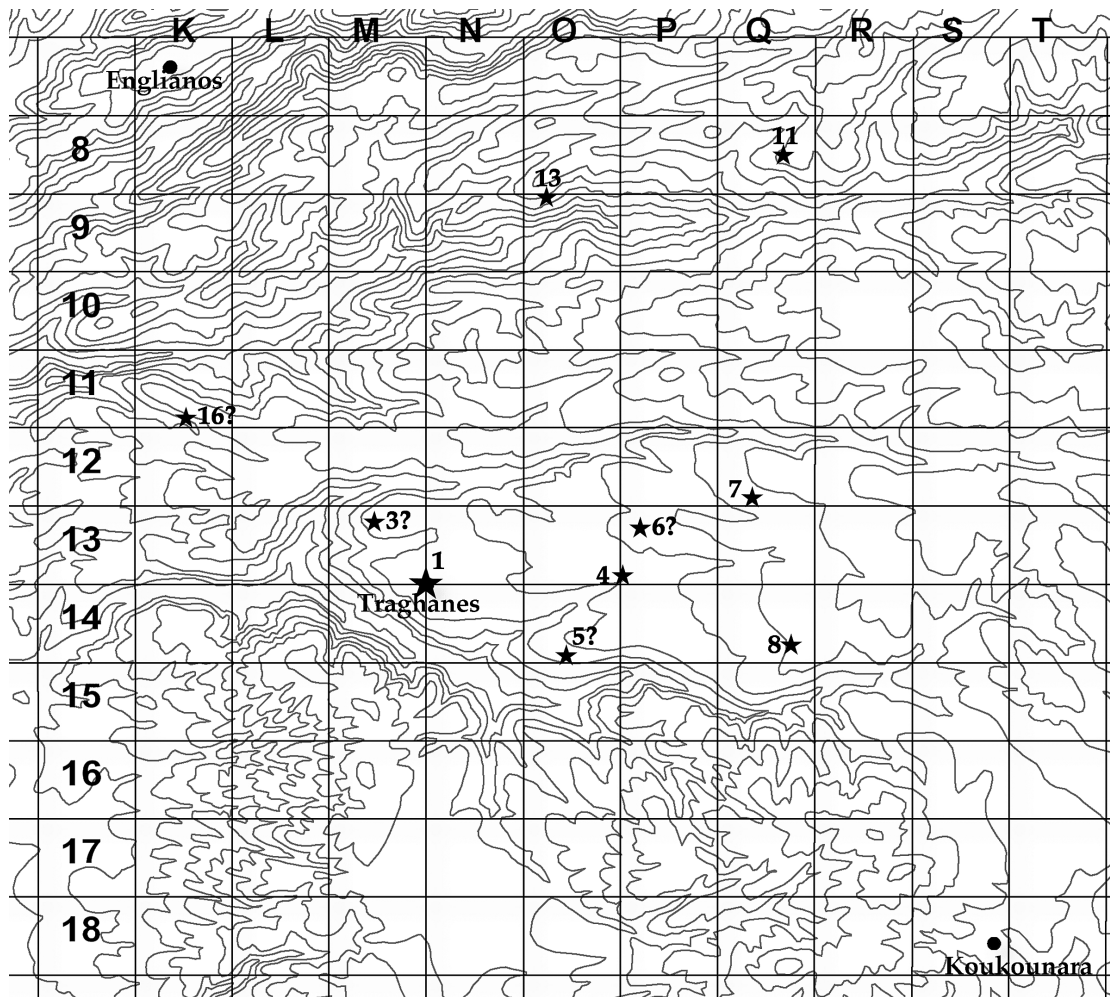


Fig. 114. Distribution map of MH sites.

to the south of the PN (with the possible exception of 16?) and also in the region between the Iklaina plateau and Koukounara. Overall, the picture that emerges from the area suggests that Traghanes was the earliest and largest MH settlement, surrounded by a handful of smaller sites.

The Early Mycenaean period is marked by strong continuity from the MH, as almost all MH sites have also yielded LH I-II material (fig. 115; Site 16 is the exception). In addition to the sites that continue from the MH period, a number of sites come into use for the first time: these are sites 2, 12, and 14, and perhaps also 3, 5, and 6. Of these, Site 2 is a possible tholos tomb, whereas Sites 3, 5, 6, and 14 are located in flat areas with rich fertile soils. Site 12 is located in a cultivable plateau, but also has access to pasture areas on the slopes surrounding the plateau. The size

of the Early Mycenaean sites cannot always be estimated, but in general they appear to have been larger than their MH predecessors. The largest one continues to be Traghane (the area covered by LH I-II sherds is about 8 ha), followed by Myrsinochori (Site 11, 4 ha), Katsimigas (Site 8, 3.75 ha), and Sites 3, 6 and 7 (2.5-3 ha). As with the MH period, there are no Early Mycenaean sites in the region between Traghane and Koukounara, with the exception of one off-site scatter (Scatter 10) on a plateau about 100 m to the north of Koukounara.

Overall, in the Early Mycenaean period we note an increase in the number of sites, especially in cultivable areas, suggesting a possible expansion in areas with agricultural potential. The size of the settlement at Traghane, combined with the large quantity and good quality of its pottery (including painted, as well as fine unpainted pottery and a wide range of open and closed shapes) suggest an important center. The discovery of substantial LH I-II buildings at the excavation confirm that by the Early Mycenaean period this site has emerged as the dominant settlement.

A strong element of continuity can be noted between the Early and Late Mycenaean periods, as the majority of LH I-II sites continue to be used in LH III; the only possible exception is Site 2 (fig. 115). The absence of LH III material from this site, a possible tholos tomb, may indicate that by the LH III period the tomb had gone out of use, although the surface material is so minimal that valid conclusions cannot be drawn. In this period all LH sites reach their maximum sizes (see next section). Traghane has yielded the largest quantity and best quality of surface finds, including fine painted and unpainted pottery, whereas figurines and lithics were recovered from Early Mycenaean levels during the excavation. All scatters from LH I-II have also yielded LH III material. To the northwest of Traghane Site 16 comes back into use, and to the north is a new site (Site 9, possible chamber tomb). In general, Late Mycenaean habitation is found in two main clusters, one on the Iklaina plateau and in the flat areas to the east, and a second one to the northeast of the ravine.

Extensive remains of post-Bronze Age periods were also encountered, most abundantly of the Byzantine period, but also Classical, Hellenistic, and Roman. For reasons explained in the Introduction, these fall outside the scope of the present book. The material is openly available to scholars working in post-Bronze Age periods to consult. For the distribution of post-Bronze Age sites see fig. 59.

SITE SIZE AND FUNCTION

One of the objectives of the IKAP survey was to assess the function of Traghane and test the hypothesis that this site was one of the district capitals of the Pylian state. If Traghane were indeed the administrative center of its surrounding area, we would expect it to be the largest and most important settlement, second in size and impor-

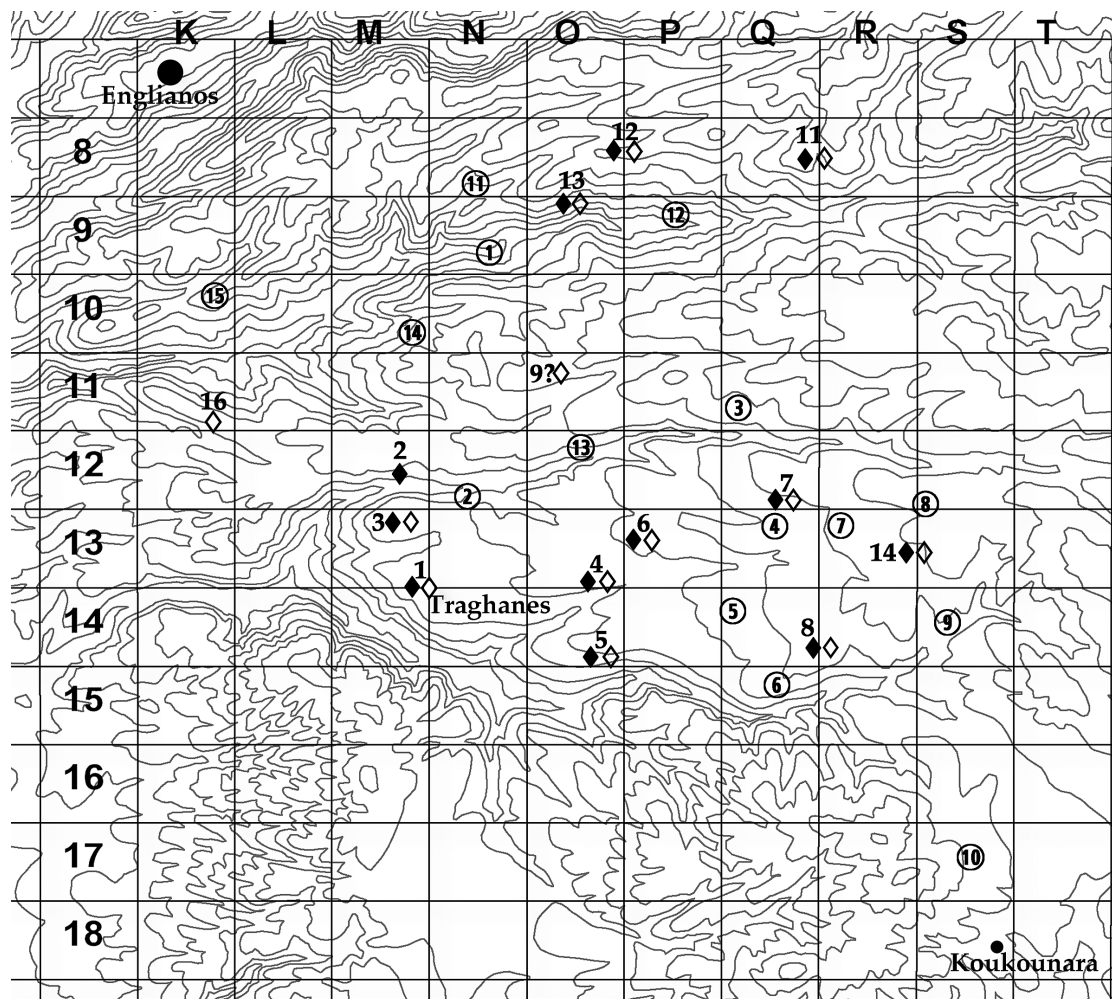


Fig. 115. Distribution map of LH sites and off-site scatters (for legend see fig. 59).

tance only to the PN; if not, we would expect that it would be one of several settlements of equal size and importance, and that perhaps the district capital would be another as yet unidentified settlement.

The archaeological survey, combined with the results of the soil chemistry analysis, show that Traghaneas was an extensive settlement. The area occupied by the LH I-II and especially the LH III sherds is approximately 12 ha, almost four times larger than the estimate of 3 ha given by MME.²²³ In fact, the entire west part of the plateau is covered with artifacts of many periods (mostly LH, but also Late Classical-early Hel-

223. McDonald & Rapp 1972, 272. Cf. Cosmopoulos 2006a, 220.

lenistic, and early Byzantine), extending over an area of no less than 100 ha. Although these concentrations represent different smaller sites, they form a more or less continuous carpet of artifacts over many parts of the plateau. Besides the size of the site, the quantity and quality of artifacts were impressive: over 10,000 sherds, the vast majority Mycenaean, were found on the surface only from the immediate area around the mound, plus several thousands of sherds were found in the other parts of the site.²²⁴ Around this mound artifact density peaked to almost 900 sherds per 50×50 m square: this amounts to almost 3,600 sherds per ha, which is approximately seven times higher than the densities recorded by PRAP for Ano Englianos (575.6 sherds).²²⁵ The importance of this site has been confirmed by the excavation, which has brought to light a monumental building complex (presumably the administrative part of the settlement), a religious area, houses, and workshops. These findings confirm the separation of residential areas from specialized activity locations, which is indicated by the soil chemistry analyses (peaks in Sr suggesting residential areas, peaks in Zn suggesting industrial areas, and peaks in Cu and Pb suggesting metallurgical operations) and the geophysical survey (e.g. Feature 33D may indicate enclosure walls or drainage ditches, Feature 33A possibly burned mudbricks from a building complex, Feature 33C possibly a road, Features 30E, 30F and 30J perhaps kilns and/or furnaces). The commanding setting and large size of this site, the quantity and quality of the finds, the architectural remains, and the lack of any other comparable settlements in the target area are compatible with the identification of *Traghanes* as a major center and support its identification as a district capital, very likely **a-pu₂*. The possible existence of a tholos tomb (Site 2) and a chamber tomb (Site 9) reinforce this possibility.

One of the most important conclusions of our work is the close correspondence between the results of the archaeological-geophysical-soil chemistry surveys and the remains uncovered by the excavation.²²⁶ Surface artifact densities are the highest in the area between the Cyclopean Terrace Complex (covered by the mound at the time of the survey) and the cluster of Units A-E. The features of the geophysical survey

224. More fine sherds from *Traghanes* are stored in the storage rooms of the Pylos museum from earlier surface collections by Professor George Korres and Dr. Aphrodite Hassiakou, whom we thank for allowing us to see the material.

225. Bennet & Shelmerdine 2001, 137. This difference is probably due to the fact that the PRAP numbers refer to the areas *around* and not *over* the main palace site; it would have been interesting to

compare the densities from the surface area of the palace at Englianos before excavation, with those of *Traghanes*. When Blegen and Kourouniotis visited Ano Englianos in 1938 they found “great quantities” of (mostly undecorated Mycenaean) pottery on the slopes all around the summit (Blegen & Kourouniotis 1939, 559).

226. E.g. Hohokam sites in Arizona, Downum & Brown 1998, 122.

correspond well to excavated features (Feature 39H with wall ST-036, 36D12 with Building X, 36D14 with Houses A and B, 36C8 with Unit E, 36C10 with Megaron Γ); and the peaks in chemical elements accurately represent the residential and industrial areas excavated (see previous paragraph). The evidence seems to be in agreement with that from other sites where excavation followed survey, the major difference between surface and subsurface remains being not in the nature or distribution of these remains, but in their state of preservation: as a rule, surface remains are more worn due to weathering and recent agricultural activities.²²⁷

The other LH sites in the area are considerably smaller than Traghanes. The site at Myrsinochori (Site 11) lies approximately 3.5 km to the northeast of Traghanes. At 2.6 ha this is a medium-sized site that has yielded both LH I-II and LH IIIA-B pottery of fine quality, as well as animal figurines. It is possible that this site is the settlement to which the two well-known tholos tombs of Myrsinochori: *Routsis* belonged. Given the presence of tholos tombs, it is possible that the extent of the surface finds underrepresents the size and importance of this settlement and its importance for the political dynamic of the region remains uncertain. A group of four sites (Sites 3, 4, 7, 8) seem to have been between 1 and 2 ha in size. At Dendra (Site 3), near the edge of the plateau, a heavy concentration of LH IIIA-B pottery is spread over an area of a little less than 2 ha. The location has access to the rich soils of the plateau and is a prime candidate for a small agricultural settlement. Iklaina Village (Site 4), approximately 800 m to the east of Traghanes, occupies the top and north slopes of a plateau at the westernmost edge of the modern village of Iklaina and has an estimated size of about 1.3 ha, although the area is overbuilt and the Mycenaean site was certainly larger. The site has access to the fertile valley towards the north, as well as the pasture fields of the surrounding area. Panagitsa (Site 7) is a large site in later periods, but the LH area seems to have been around 1.5 ha. The site has access to fertile lands and could have been an agriculture-focused village. Katsimigas (Site 8) is about 1.5 ha in size, with a dense concentration of surface finds (over 20,000 sherds, mostly LH). The special importance of Katsimigas is demonstrated by over one thousand pieces of slag, which may suggest the existence of a metallurgical center, although the verdict on this will have to wait the scientific analyses of the slag.²²⁸ Other finds include Mycenaean bovid figurines, conical spindle whorls, terracotta loomweights, stone querns, and several lithics. Given the references in the Pylos tablets (Jn 693, Ma 124) to the bronze smiths of **a-pu₂*, it is tempting to see in this site the location of the

227. Millett et al. 2000.

228. *Supra* p. 138. The slag will be analyzed at a later date together with ceramics and lithics, as

part of a larger program of characterization studies that we will undertake once the necessary funding has been secured.

Mycenaean metallurgical installations. The site would have been ideal for metalworking operations: it is found on an exposed ridgetop, where the wind would provide the necessary draft for furnaces and it would have access to a good supply of timber that appears to have been present in the area after 1400 BC.²²⁹ If this site were, indeed, the place for metallurgical operations for *a-pu₂*, we could visualize a model in which some industrial operations took place also away from the administrative center at Traghanes. Katsimigas may also offer a solution to a topographical problem that McDonald pointed out forty years ago, when he suggested that the shortest and most direct route from the FP to Ano Englianos would have led from the Kazarma-Neromilos area to Chilia Choria and then followed the modern route that branches off towards Kremmydhia and Iklaina.²³⁰ The problems with this suggestion were that a) the ravines and ridges in the area run northeast-southwest and would have crossed this road perpendicularly; and b) that there were not any known mounds, tholoi, or LH sites along such a route. The Iklaina ridge, however, from Katsimigas to Traghanes curves towards the north and would have offered a possible path for such road, while Katsimigas could have been a site that marked this road.

The rest of the LH surface finds are found in scatters of 0.25 ha or so. Some of them are found near cultivable lands and may have been farms. Others are near pasture lands. The more remote scatters may represent remains of manuring or remnants of other activities of limited scope.

SETTLEMENT HIERARCHY AND THE LINEAR B TOPONYMS

The IKAP survey data presented above suggest that the LH III sites in our target area can be ranked in four groups, on the basis of their size and quantity and quality of finds (fig. 116):

- a) Ano Englianos, with an area of about 18 ha²³¹
- b) Traghanes, with an area of about 12 ha
- c) Dendra, Iklaina village, Panagitsa, Katsimigas, Myrsinochori (1.3-2.6 ha)
- d) Several scatters under 1 ha.

This hierarchy is similar to the one that PRAP established for its own target areas, which cut across multiple districts of both the HP and the FP. According to PRAP,

229. Zangger et al. (1997, 589-592) suggest that after a period of deforestation and spreading of steppe and phrygana between 1600 and 1400 BC, the vegetation of the area was enriched by several

types of trees, including plane trees, walnut trees, and Judas trees.

230. McDonald 1964, 232.

231. Davis et al. 1997, 422-423.

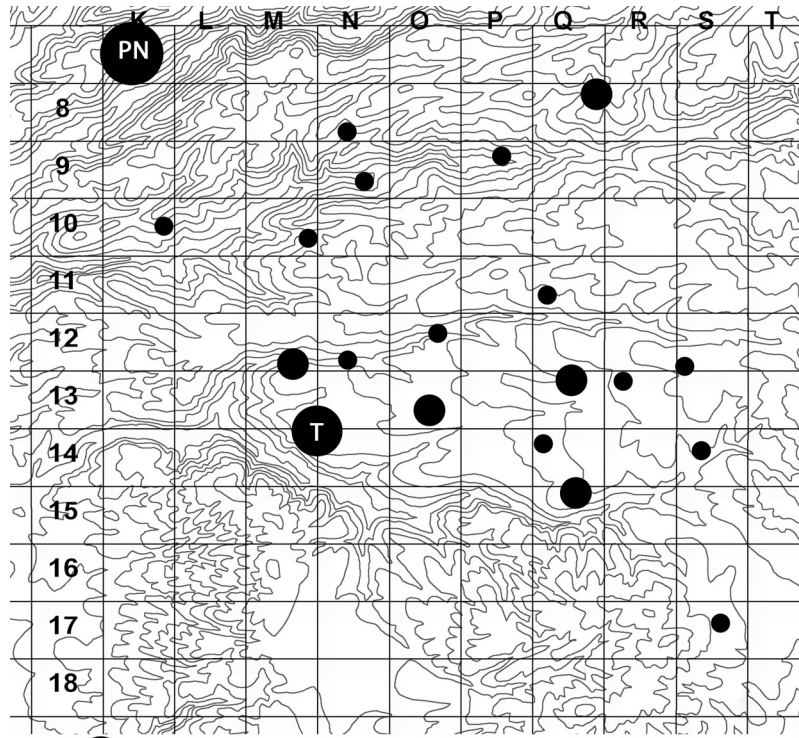


Fig. 116. Distribution map of site hierarchy of sites in the IKAP region in the Late Mycenaean period.

Messenian sites can also be structured in four tiers, on the basis of their size, function, and economic importance:²³²

a) the palatial capital at Ano Englianos, the largest site in the entire Messenia (estimates of the area it would have occupied in LH IIIB range from 12 to 14-15 ha²³³ or even 18 ha);²³⁴

b) about 20 large sites with surfaces ranging from 2 to 5 ha;

c) about 100 medium-sized sites (smaller than 2 ha);

d) and a large number of very small sites.

There is one important difference between these findings and those of the Iklaina survey: the exceptional size of Traghanes. It is much larger than the settlement of Nichoria (5 ha), whose identification as the district center *ti-mi-to-a-ke-e* has been generally accepted.²³⁵ Indeed, after the PN and Traghanes, the next largest site identified

232. Bennet 1998, 123-24; see also Bennet and Shelmerdine 2001, 136.

233. Bennet & Shelmerdine 2001.

234. Davis et al. 1997, 422-423.

235. Shelmerdine 1981.

so far in Messenia is Aithaia: *Ellinika* (Ancient Thouria); besides this, there are only three settlements that reach 5 ha.²³⁶ The three largest LH III sites identified by PRAP are even smaller: Koryfasio: *Beylerbey* (> 3.2 ha), Romanou: *Romanou* (2.5 ha) and Gargaliani: *Ordines* (2.1 ha).²³⁷ Traghanes is thus closer in area to the palatial center than to other sites, even potential district capitals.

The picture that emerges from the archaeological record is also similar to the hierarchy of settlements revealed by the inscriptional evidence. From the Linear B tablets, we know that to the eyes of the central capital at the PN, Mycenaean settlements were structured in four tiers, on the basis of their administrative and economic importance:

a) at the top of the hierarchical scale was the palatial capital of Pylos (*pu-ro*), functioning as the political and economic center of the state (possibly with Leuktron at the top of the hierarchy in the FP);

b) at the second tier were the district capitals, which seem to have had administrative, economic, and political functions;

c) at the third tier were several villages that, because of their specialized economic activities, appear to have been of special interest to the palace;

d) at the fourth tier were a number of smaller villages or settlements, of lesser economic importance and smaller size, in which the palace did not seem to have had a strong interest.

This four-tier hierarchy gives us a clear picture of how the settlements within each district were structured and it is important that the hierarchy that PRAP and the tablets indicate for the entire Pylian state is confirmed by the evidence in an area that is likely to represent the territory of an individual district.

A closer look at the sites of each tier can help illuminate another problem, that of identifying places mentioned in the Linear B tablets with actual archaeological sites. Whereas direct identifications of single archaeological sites can be made for sites at the higher tiers (certainly for Pylos, fairly securely for Iklaina and Nichoria), it is very difficult to establish such identifications for other sites. What is possible, however, is a comparison of settlements *within each tier* of the hierarchy. If we could isolate different types of settlements on the ground and then tried to match these types of settlements with the types attested in the Linear B tablets, we might have a chance at identifying sites belonging to different levels of the hierarchical scale. Several scholars have attempted to match the district centers with larger sites identified in this way.²³⁸

236. Hope Simpson 2014, 20-29; the three are Nichoria, Yialova: *Palaiochori* (5.4 ha) and Stoupa: *Ancient Leuktra* (5 ha).

237. Davis et al. 1997, 423.

238. Carothers 1992; Bennet 1999b; Hope Simpson 2014.

They reach different conclusions, but there is general agreement that Hope Simpson's identification of Traghanes as the second-tier center **a-pu₂* is correct.²³⁹

THE FORMATION OF THE PYLIAN STATE

One of the hypotheses we are investigating at Iklaina is that the formation of the Pylian state was the result of a process of integration of regional polities into the administrative nexus of Pylos. A major component of this hypothesis is that before the consolidation of the Pylian state, district capitals were the capitals of independent polities, demoted to second-order settlements after their integration into this state. The presence of tholos tombs in Messenia has long been a reliable indicator that competing power centers operated at this time.²⁴⁰ Moreover, current theory holds that Mycenaean states developed out of hierarchically networked groups rather than heterarchically structured corporate entities.²⁴¹ How does the evidence from Iklaina fit this picture?

The results of the IKAP survey provide confirmation that a clear hierarchy of settlements had emerged already by the Early Mycenaean period, with Traghanes as the dominant settlement and a number of smaller satellite settlements. The sheer size of the settlement at Traghanes, combined with its prominent location and the large volume and fine quality of the finds, contrasts with the smaller size, lack of fine pottery, and agricultural focus of the other Early Mycenaean sites. The post-survey excavation of a large building (Building T) has confirmed that already in the Early Mycenaean period this was the dominant site and suggests that the settlements in this area were not structured heterarchically, but in a hierarchical network. This hierarchy continued in the Late Mycenaean period, even after Traghanes had been integrated into the Pylian state (and presumably become subordinate to the PN).

As far as the hierarchical place of Iklaina is concerned, in the periods leading up to the unification of the Pylian state there is now sufficient evidence from both the survey and the excavation at Iklaina to suggest that Iklaina and the PN were on the same hierarchical rank, possibly seats of independent and competing chiefdoms. In this scenario, one may wonder whether the cluster of three Early Mycenaean sites (11, 12, 13) located to the north of Iklaina may have been located at a frontier or a contested periphery between the two sites. In the Late Mycenaean period, after the consolidation of the Pylian state, Traghanes became a second-tier settlement. However, it

239. Hope Simpson 1981, 147. See also *supra* 35-36.
p. 5.

240. Davis et al. 1997, 420-421; Bennet 2007b,

241. Parkinson & Galaty 2007.

differs from Nichoria, the other known settlement of similar status, in at least two important aspects:

1) Size. Until now we had thought that the further from the PN secondary centers were, the more growth they experienced in LH IIIA-B: “one is tempted to say they are permitted to grow, as close neighbours are not.”²⁴² And yet, Iklaina clearly represents a case of a major LH IIIA-B settlement that grew and flourished *in proximity* to the PN. Furthermore, the architecture found in the excavation suggests considerable investment in labor and resources in a site that appears to have been a subordinate, though important, settlement.

2) Organization of space. As noted above, the organization of space at Nichoria is not clearly differentiated.²⁴³ At Iklaina, the results of the soil chemistry analyses agree with those of the excavation in showing a clear separation of administrative, residential, and industrial space, which is not the case with Nichoria.

These differences are the more striking as we now know, thanks to the excavation of Iklaina, that both sites were incorporated into the Pylian state at about the same time (the end of LH IIIA1 or the beginning of LH IIIA2). Previously it was thought that the Hither Province had been integrated first, perhaps by the end of LH II, and that Nichoria subsequent incorporation had marked the expansion of the state across Mt. Aigaleon and into the Further Province.²⁴⁴ In this respect, IKAP has allowed us to fine-tune our knowledge about the administrative development of the Pylian state. A possible explanation for the differences between Iklaina and Nichoria might be that second-order centers in the Hither Province were treated differently from those in the Further Province. While bronzeworking went on at both sites, for example, Iklaina appears to have been an industrial center, supervising large-scale metallurgical activity both on-site and also perhaps at a smaller settlement in the vicinity. Another might be simply that Iklaina was a much larger and richer settlement than Nichoria even in the Early Mycenaean period. It is clear in any case that its pre-existing social and administrative divisions continued after it became part of the Pylian state, and were not challenged by the central authority.

242. Shelmerdine 2001, 128.

243. *Supra* p. 92.

244. Bennet 1999a, 13-15 and 2007b, 35-36;
Davis et al. 1997, 420-421.

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THE BOOK

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