PYLA-*KOUTSOPETRIA* I

ARCHAEOLOGICAL SURVEY OF AN ANCIENT COASTAL TOWN

By

William Caraher,
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and David K. Pettegrew

with contributions by

Maria Andrioti, P. Nick Kardulias, Dimitri Nakassis,
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Chapter 2

Intensive Survey

by William Caraher, Dimitri Nakassis, and David K. Pettegrew

Our goal in this chapter is to lay out the theoretical and methodological frameworks and the specific procedures that guided our survey of the Koutsopetria micro-region. Our principal methodological thesis is that intensification yields higher-resolution data that open up new possibilities for patterning and interpreting past land use. This chapter, which details the methods of pedestrian survey, should be read in conjunction with subsequent discussions of experiments (Chapter 3), distributional analysis (Chapter 5), and features (Chapter 6), as well as the results of geophysical survey and excavation currently being prepared for a second volume.

In the following sections, we detail the approaches we initially adopted for documenting and analyzing surface scatters and the development of these methods between 2004 and 2008. We outline the guiding principles and frameworks of high-resolution survey that drove our methodology (2.1), the specific procedures adopted in different phases of pedestrian survey (2.2), and the qualitative and quantitative nature of the distributional data (2.3). We also include in the final section (2.4) a discussion of the geological and geomorphological survey carried out in the earliest years of our survey, since it marks a form of methodological intensification that relates to the interpretation of artifact patterns. Collectively, these sections present the methodological contexts for understanding and interpreting the results that follow in subsequent chapters.

2.1. HIGH-RESOLUTION SURVEY

To judge from trends in scholarly literature, Mediterranean archaeological survey has become increasingly intensive in recent decades. Second-wave survey projects of the 1970s and 1980s introduced a more rigorous and systematic method for documenting surface assemblages (Cherry 1994; Galaty 2005), while recent projects have adopted even more intensive approaches — which we refer to as "high-resolution survey" — to address problems of recognition and to gain more information from artifact scatters. Archaeologists are today describing and analyzing human territories with greater precision and care than ever before through more intensive surface collection and robust sampling systems, artifact counting and distribution analysis, application of varied digital technologies, assessments of geomorphology, geophysical prospecting, experiments in survey method, and excavation, among others (for reviews of these trends, see Cherry 2002, 2004; Galaty 2005; Fish and Kowalewski 2009). The result of this shift is that researchers are able to parse complex and artifact-rich landscapes, but at the cost of time, resources, and spatial coverage. The question that has divided landscape archaeologists in recent years is whether the benefits of intensification (more information) justify the cost (less area examined). We adopted procedures for the investigation of the sites of the Pyla region in awareness of these trends and as stakeholders in the debate over intensification.

2.1.1. Survey Intensification, High-Resolution Approaches, and Micro-Regional Frameworks

There are manifold reasons that landscape archaeologists have adopted higher-resolution survey approaches and a focus on micro-regions. We highlight below five explanations that account for the trends: adaptation to Mediterranean landscapes, improved understanding of the relationship between sample and surface artifact populations, control over the cultural and natural processes creating archaeological landscapes, a new scholarly interest in the micro-region, and the application of survey methods to large sites like urban centers.

One of the most important reasons (1) for the recent increase in intensification is the realization that higher-resolution methods more accurately document the abundant material remains of Mediterranean landscapes. In the late 1970s, when survey was still relatively new in the Mediterranean, archaeologists noted that the "extensive methods" they were using (20–50 m walker spacing) were failing to record smaller sites in the landscape. The adoption of more intensive walker spacing (10–20 m) accounted for, in some estimates, 20 to 50 times the number of sites (Cherry 1983; Bintliff and Snodgrass 1985). Scholars also observed that their approaches to documenting the landscape, namely, recording high-density artifact scatters or "sites," frequently missed individual artifacts and lower-density scatters (Bintliff and Snodgrass 1988). Some surveyors began to record the presence of "off-site" scatters in addition to sites (Gallant 1986; Mee and Forbes 1997), and others abandoned site-based approaches altogether to assess the distribution of artifacts across the landscape. The recognition that *how* one looks at the surface tremendously affects what one finds led to more intensive strategies of fieldwalking and recording, resulting in more robust samples of the landscape. The intensification in landscape methods in recent years, including the use of smaller survey units to map the distribution of artifacts, marks a culmination of earlier efforts to account for the abundance of cultural material in Mediterranean landscapes (Caraher, Nakassis, and Pettegrew 2006).

A better understanding of the differences between a survey sample and the actual population of artifacts present on the surface and in subsurface deposits has encouraged more intensive collection of surface material and environmental data (2). Landscape archaeologists, for example, have commonly adopted experiments in recent years to measure the effects of factors that distort the sample of the surface, such as vegetation patterns, the amount of "background noise" (rocks, plants, and leaves on the surface that confuse and strain the eye), or the biases of collection strategies. High-resolution survey projects have also valued basic environmental "context" data, such as measurements of visibility and geomorphological studies, that assess how the landscape developed and affected cultural debris (Jameson et al. 1994: 228–46; James et al. 1997; Zangger et al. 1997; Tartaron et al. 2006). Many projects have adopted more intensive collection strategies to improve the sample of artifacts, such as, for example, "hoovering" or "vacuuming" techniques, which exhaustively gather all artifacts from a small area of space by collection on hands and knees (Chapter 3). All of these mark efforts to assess surface patterns more accurately and control for the contexts that distort the samples.

In a related vein, archaeologists have become very interested in understanding and controlling for the complex processes that produced and transformed artifact patterns over time (3). Surveyors, for example, have become deeply aware that archaeological "sites" documented in the landscape are hardly straightforward equivalents of ancient settlements (Dunnel 1992; Pettegrew 2001). Scholars now recognize that artifact scatters and architecture are, rather, aggregate clusters of human activity formed and changed over time through depositional human behaviors, such as habitation, discard, and abandonment, and transformational processes that include human activity, animal movement, rainfall, erosion, and earthquakes (Schiffer 1976, 1985, 1986; LaMotta and Schiffer 1999; Winther-Jacobsen 2010a, 2010b). Even the debris across the landscape today is not consistently discrete and well-bounded, but fluctuates between very low and very high densities.

In response, archaeologists have intensified their methods to understand and measure the processual nature of assemblages. The adoption of geomorphological assessments, as noted above, has given archaeologists the tools for understanding post-depositional processes affecting artifact scatters. Higher-resolution collection of artifacts has allowed archaeologists to discern ephemeral habitation depleted by behaviors of abandonment or taphonomy (Bintliff, Howard, and Snodgrass 1999) and more accurately record the histories of individual sites (Bintliff, Howard, and Snodgrass 2007). The application of digital tools such as databases and GIS platforms has allowed scholars to parse artifact distributions of different ages with relative ease. In other cases, surveyors have employed geophysical survey and excavation to understand how surface scatters relate to buried sites. New technologies and procedures have established a varied toolset for deconstructing, analyzing, and interpreting archaeological sites.

High-resolution surveyors have justified their approach with the recognition that the smaller region, or micro-region, forms an appropriate level for documenting human activity in the landscape (4). If survey projects in the 1960s–80s highlighted large regions as the proper arena for explaining settlement patterns and the relationship of town and countryside, more recent scholarship has accentuated the micro-regional niches that formed the basis of small worlds (Acheson 1997). As we outlined in the introduction, the most popular argument for the value of micro-regions has come from Horden and Purcell's *The Corrupting Sea* (2000). Their vision of the Mediterranean as a fluid network of thousands of unique micro-regions, each consisting of varied ecological niches, is uniquely suited to the spatial framework of high-resolution regional survey, which studies habitation, production, exchange, and environment in terms of smaller territories.

Finally (5), landscape archaeologists have intensified methods in order to document the most complex archaeological sites of the ancient world, the large urban sites that have left substantial surface remains. "Large-site," or "urban survey," is the name given to the systematic investigation of extensive sites, such as *polis* centers, palace complexes, villages, and other significant secondary settlements, that cover areas ranging from 5 to 100+ ha (Bintliff and Snodgrass 1988a; Alcock 1991; Cavanagh, Shipley and Crouwel 2002: 50–54; Rautman 2003: 22; Tartaron 2003: 41–42; Lolos, Gourley, and Stewart 2007; Johnson and Millett 2012). The investigation of large sites is common to world archaeology generally, but in the Mediterranean it has developed into its own unique subfield of regional studies (see, recently, Lolos, Gourley, and Stewart 2007. For investigations of large sites in other areas of the Mediterranean, see Perkins and Walker 1990; Hurtado 2000; Mušič, Slapšak, and Perko 2000; Tringham 2003; Poulter 2004). A Mediterranean environment replete with extensive urban centers, palace complexes, towns, villages, and villas demands archaeological study of the larger settlements along with the smallest. Moreover, survey has provided an effective counter to more intensive approaches such as excavation. Large-site survey has consequently emerged as a component of landscape archaeology bound to the interpretation and definition of surface scatters, usually without excavation (exceptions in Cyprus include Rautman 2003; Webb and Frankel 2004). The study of the high densities of artifacts across the largest sites of the Mediterranean has demanded high-resolution, yet efficient approaches to discern general patterns.

The collective result of all these developments in understanding Mediterranean landscapes has been a more focused examination of territory than ever before. In Greece, for example, pioneering first- and second-wave Greek survey projects in Kea, Laconia, Boeotia, Messenia, and Methana surveyed 10 to 70 km^2 of the territory. The EKAS project, in contrast, examined only 4.4 km^2 over the course of three field seasons. A comparison of recent projects in Cyprus with older projects, such as the Canadian Palaipaphos Survey and the Kalavasos Valley project, reveals similar differences in scale. High-resolution survey archaeology is producing dramatically more information about landscapes, but is covering much less territory.

Because a micro-regional framework and higher-resolution data have come at the cost of the amount of area covered, intensification has evoked increasing reaction and critique. As we outlined in the introduction, some archaeologists have accused high-resolution surveyors of "Mediterranean myopia," a myopic focus on micro-regions through increasing methodological rigor at the expense of the big-picture questions (Blanton 2001; Cherry 2003; Kowalewski 2008). By intensifying method or focusing on smaller regions, some have said, surveyors can no longer effectively answer broad questions about demographic cycles and flows, the relationship between town and countryside, and regional patterns and hierarchies of settlement (Stanish 2003). Other scholars, however, have advocated high-resolution, artifact-level methods for producing survey data at the scale and resolution necessary to reveal the dynamic character of the productive micro-region and to establish empirical signatures for different kinds of past human behaviors (Caraher, Nakassis, and Pettegrew 2006; Tartaron 2008; Winther-Jacobsen 2010b).

We believe that the discrete nature of Mediterranean micro-regions and their abundant material landscapes justify high-resolution approaches. This is not the place for a detailed defense of modern Mediterranean survey, but we would simply point out that the methods employed by any research project are always, whether implicitly or explicitly, a product of research questions shaped by local histories of fieldwork. One must not judge the intensification of survey methods in the Mediterranean by standards developed and utilized in other parts of the world, but according to the trajectories of our particular discourse about landscape. This volume, which marks our own contribution to this debate, aims to show the difference that higher-resolution approaches make in documenting an extensive "large site," which consists of multiple distinct occupations — Kokkinokremos, Vigla, and Koutsopetria —with different chronological phases and spatial focal points.

2.1.2. Distributional Survey in Greece and Cyprus

Our immediate inspiration for applying high-resolution survey approaches in the Pyla region was our previous experience in two projects in Greece and Cyprus. Bill Caraher, Dimitri Nakassis, and David Pettegrew had supervisory roles in the Eastern Korinthia Archaeological Survey (EKAS), in the Corinthia, Greece, between 1999 and 2003, and R. Scott Moore participated as a ceramicist in the Sydney Cyprus Survey Project (SCSP). The two projects shared similar distributional approaches, chronotype collection procedures, and even some of the same archaeologists and geomorphologists. Our work with these projects strongly influenced the specific procedures we applied in PKAP.

As we were formulating our methods for the survey of Koutsopetria in 2003, we had just begun to seriously reflect on the survey methods employed in EKAS, the data resulting from the methods, and the interpretive potential and problems of the material. Our feeling at the time was that high-resolution methods had prevented the project from covering a significant amount of territory but had simultaneously opened up a whole range of possibilities for patterning and interpreting the landscape. Before our first season in Cyprus, our queries of the EKAS data revealed fascinating new insights on the "signatures" of rural habitation, the definition of archaeological sites, the effects of visibility on artifact density, poorly surviving historic periods (e.g., Ottoman), the differential visibility of successive periods (e.g., Early vs. Late Roman), and trade and economic connectivity. Our work with these projects also encouraged reflection on the nature and value of the chronotype system, which SCSP and EKAS employed to classify finds and collect pottery. This made us sensitive to the close relationship between archaeological method, survey data, and historical interpretations in drafting pictures of past landscapes. The first fruits of our reflection appeared in Caraher et al. 2005; Caraher, Nakassis, and Pettegrew 2006; Tartaron et al. 2006; Pettegrew 2007; Moore 2008.

The EKAS project was itself part of a larger extended family of high-resolution survey projects that included the Nikopolis Survey and the Australian *Paliochora*-Kythera Archaeological Survey in Greece, and the Sydney Cyprus Survey Project and the Troodos Archaeological Environmental Survey Project in Cyprus (for discussions of the methods of these projects, see Given et al. 1999; Coroneos et al. 2002; Given and Knapp 2003; Tartaron 2003; Gregory 2004; Caraher, Nakassis, and Pettegrew 2006; Tartaron et al. 2006). Besides sharing some personnel, staff, and organizers, these projects had in common their adoption of a range of higher-resolution methods, including artifact-level survey, gridded collection of "sites," experimental archaeology, geomorphological study, and geophysical survey, among others. These forms of intensification did not exclude more traditional extensive and intensive approaches to studying landscapes (see Tartaron 2003), but together they comprised a high-resolution approach to studying territories that resulted in smaller areas covered.

The specific procedures adopted for the study of Koutsopetria were consequently products of a specific methodological approach to survey that had developed to address particular problems in archaeological landscapes.

Fig. 2.1 *Fieldwalking in Zone 1.*

2.2. PEDESTRIAN SURVEY (2003–2008, 2010)

We knew from the beginning that the site of Koutsopetria was substantial and would warrant intensive sampling and artifact collection. As the project developed between 2003 and 2005, we developed a method to map the distribution of cultural material with a resolution high enough to assess chronological and functional diversity at the site, but not so great that we would never finish our work, overburden our ceramicists and storage facilities, or produce redundant data. We recognized the value of different techniques in sampling the landscape and considered which collection strategy would best represent the complexities of the archaeological record.

Our principal means of sampling the landscape was to lay out "tracts" or "survey units" of consistent size, which we then "fieldwalked" at systematic 10 m intervals, counting artifacts for each transect and collecting pottery and tiles in standardized ways (figs. 2.1–2.2). These sorts of "pedestrian survey" techniques parallel intensive methods practiced in most regional survey projects. In the following sections, we discuss the different phases of our survey that correspond to our investigation of four distinct "zones" of differing artifact density, topography, and method; chapter 5 will consider in detail the distributional character of these zones.

2.2.1. Reconnaissance Survey and Planning (2003)

Our initial assessment of the site of Koutsopetria took the form of a reconnaissance survey over a three-day period in 2003 that was designed to assess efficiently the broad patterns of cultural material across the coastal plain and surrounding ridges and define the borders of the site. The three project directors walked

Fig. 2.2 *Fieldwalking on Vigla.*

transects at intervals of 10 to 30 m (closer spacing when cultural material became denser), jotted brief notes about artifact densities (low, medium, and high) and features, and took GPS points at places that seemed significant. We noted, recorded, photographed, and occasionally collected a few diagnostic artifacts from each area. Much to our surprise, this informal walk across the plain demonstrated that artifacts extended in moderate to high densities half a kilometer parallel to the coast and inland to the north for some 300 m, an area of 18 ha (180,000 m^2). Aware that 18 ha was only a minimum estimate of site size, we recognized Koutsopetria as a substantial coastal settlement significantly larger than other published Roman and Late Antique villages documented on Cyprus. We realized that we needed to develop methods for the following seasons that would allow us to survey the entire area at a level of intensity sufficient for establishing control over the chronological and functional resolution of the artifact distributions.

In selecting our method of survey, we took into account two methodological traditions of Mediterranean survey. First, as noted earlier, our own positive experiences with EKAS and SCSP encouraged our adoption of a *distributional survey* approach that would focus on the artifact as the basic unit of analysis and record the number of artifacts across the landscape according to survey unit or "tracts" ranging in size from 2,000 to 10,000 m^2 (Caraher, Nakassis, and Pettegrew 2006). Second, we considered that many Mediterranean projects have made use of *gridded systematic surveys* of "sites" which control for the collection of artifacts through small spatial grid units (Redman and Watson 1970 provide the most well-known justification for this form of surface investigation). In the eastern Mediterranean, researchers have adopted gridded survey to refine the spatial, functional, and chronological character of sites discovered in regional survey (for examples, see Wright et al. 1990; Davis et al. 1997: 405–6, 428–30, 459–65, 467–69; Harrison 1998; Stone and Kampke 1998; Broodbank 1999; Given et al. 2001: 427; Manning et al. 2002: 7–16; Given and Meyer 2003: 35; Rautman 2003: 22–25; Tartaron et al. 2006).

In Greece and Cyprus, where we have worked, archaeologists have studied rural sites by employing small grid squares, often no larger than 10 m on a side, together with total collection of artifacts to produce higher resolution data and more robust assemblages (examples include Cherry et al. 1988; Wright et al. 1990: 606–7, 611–612, 619; Whitelaw 1991; Davis et al. 1997: 459–65).

These two traditions, one born in the recording of entire landscapes and the other developed out of the high-resolution investigation of small sites, have spawned a variety of approaches in the Mediterranean. As Table 2.1 indicates, surveyors of major settlements have typically used larger survey units or non-gridded "tracts" as a way of efficiently assessing their sites. However, this general trend is not absolute, for recent urban surveys have sometimes employed smaller units at larger sites (Lolos, Gourley, and Stewart 2007; Whitelaw 2012). In the intellectual climate outlined in this chapter, we may see even more intensive paradigms applied to large urban contexts, but there are certainly diminishing returns for intensification. As we will suggest in the next chapter, the key is determining the appropriate intensity to produce the desired results.

Aware of this broader literature about gridded collection and distributional approaches, we adopted a 40 × 40 m grid across the Koutsopetria plain as the most efficient way of sampling space

Table 2.1 Large sites surveyed in the eastern Mediterranean (ranked by size).

Archaeological Project	Site Name	Site Size (m²)	Unit Size (m²)	Ratio of Site Size to Unit Size	Number of Units Sampled	% of Unit Sampled	% of Site Sampled	% of Surface of Site Examined
Bradford-Cambridge Boeotia Project	Thespiai (town)	1,000,000+	50 × 60 (3,000)	333:1	598	ca. 33%	100%	33%
Nemea Valley Archaeological Project	Phlius (town)	1200000	(10,000-3,000)	400:1 to 120:1	484	100%	100%	100%
Pyla-*Koutsopetria* Archaeological Project	Koutsopetria (town)	300,000+	40 × 40 (1,600)	188:1	185	20%	31%	6%
Pylos Regional Archaeological Project	Palace of Nestor	300,000 to 200,000	20 × 20 (400)	750:1 to 500:1	484	100%	100%	100%
Maroni Valley Archaeological Survey Project	Maroni-*Petrera* (village)	100,000 to 50,000	50 × 50 (2,500)	40:1 to 20:1		ca. 8-16%		
Kalavasos-*Kopetra* Project	Kalavasos-*Kopetra* (village)	60000	20 × 20 (400)	150 : 1	77	100%	50%	50%
N. Keos	Kephala (Neolithic site)	22000	10 × 10 (100)	220:1	215	13%	100%	13%
N. Keos	Paoura (Neolithic site)	< 12,500	25 × 25 (625)	20:1	271	1%	100%	1%

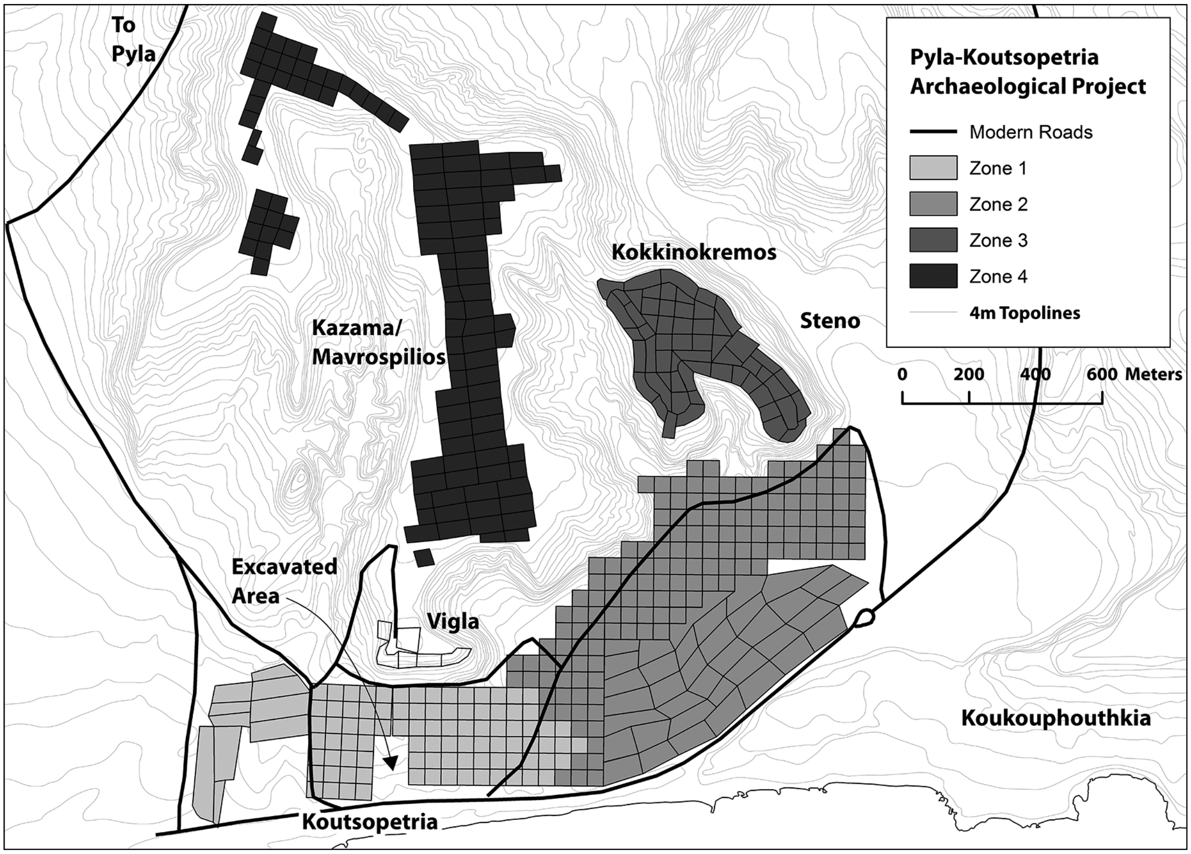

Fig. 2.3 *Map of zones of the PKAP survey area with modern toponyms and sites.*

at an *order of magnitude* smaller than the archaeological phenomenon that we intended to study (Van de Velde 2001: 25–26; this method stands in epistemological contrast to full coverage surveys that assume no prior knowledge of the archaeological phenomenon under investigation and therefore seek to collect all visible data within a survey unit in order to produce a "complete" dataset: see Fish and Kowalewski 1990). We put forth our approach as a compromise between highest-resolution gridded survey procedures (e.g., 5 × 5 m units) and less intensive transect walking of normal pedestrian survey (2,000–10,000 m^2). We believed that the resolution would be sufficient to understanding the patterns of functional and chronological data of the ancient settlement site, while avoiding the problems of collecting data that would not contribute to our understanding of the micro-region (Chapter 3). In the end, the survey grid at Koutsopetria provided total coverage of the coastal plain from the north–south road to Pyla to the area below Kokkinokremos, and generated fine archaeological resolution for mapping artifact densities across the site. Since the ratio of the area of Late Roman Koutsopetria to the size of grid squares (188:1) was consistent with, if not slightly better than, the ratio of site size to unit size for other large-site survey projects in the Mediterranean (Table 2.1), we felt justified that our approach to sampling Koutsopetria was appropriate in respect to the size of the settlement.

2.2.2. *Gridded Survey of Zones 1 and 2: The Coastal Plain below Koutsopetria (2004–2005)*

Our procedure for surveying survey units on the coastal plain was as follows. In 2004, we laid out a 40 × 40 m grid in the area east and west of the early Christian site excavated by Dr. Maria Hadjicosti (fig. 2.3). We recorded a 10 ha area of exceptionally high artifact density, which we quickly discerned as the center of a Late Roman coastal site. As our

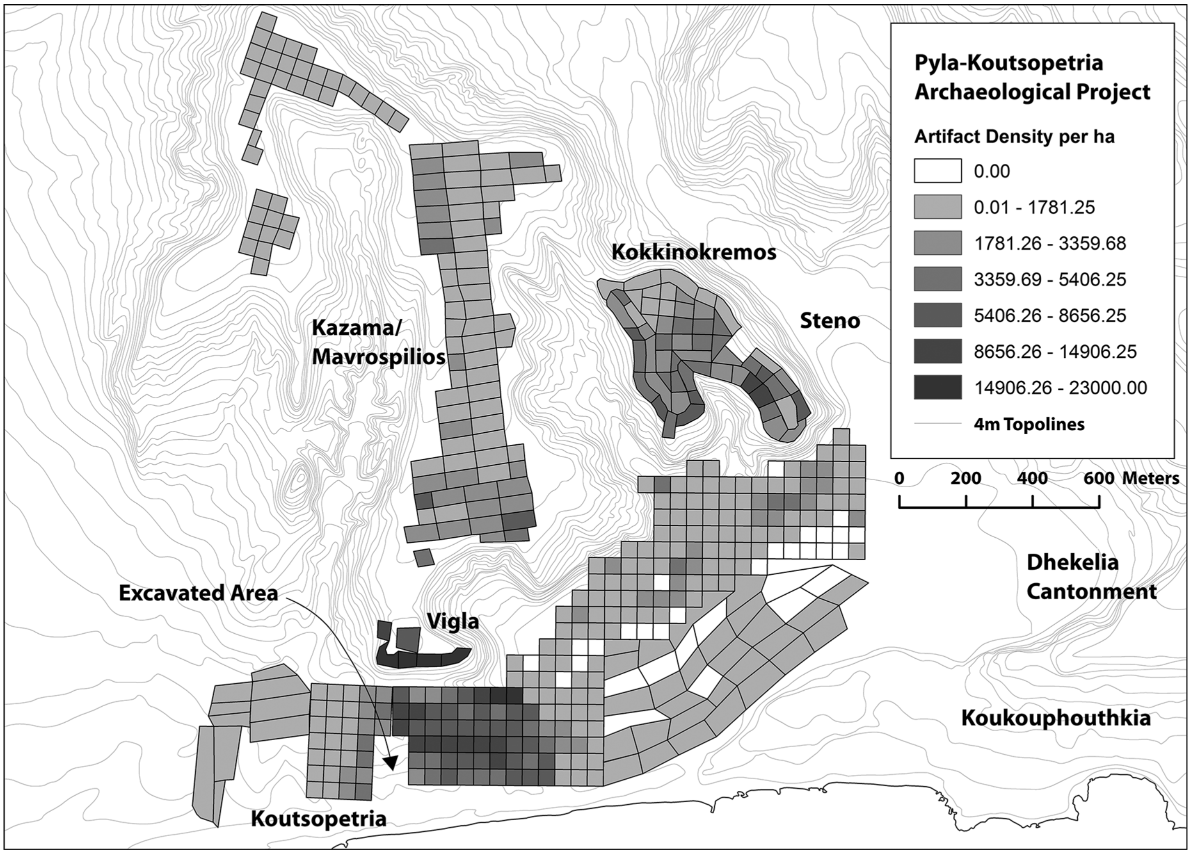

Fig. 2.4 *Total Artifact Density.*

procedure was to continue the grid of 40 × 40 m units until they no longer produced substantial scatters of artifacts, we extended our grid along the southern base of the coastal ridge for over a kilometer. Doing this identified a second zone of moderate to high artifact density constituted by relatively isolated high-density areas along the base of the Mavrospilios and Kokkinokremos ridgeline. Both of these areas, which we later designated Zones 1 and 2, produced high "site-level" artifact densities.

At the western and southeastern parts of the coastal plain, we discontinued our grid squares and used larger non-grid survey units. In the west, reconnaissance survey in 2003 and gridded survey in 2004 and 2005 had shown that artifact densities trailed off beyond 200 m of the excavated site of Koutsopetria (fig. 2.4), which justified a different approach. Pragmatic reasons also encouraged the change. This part of the survey area consisted of fields irrigated and cultivated on a day-to-day basis. As we did not have time to set up and carefully walk measured grid units, we surveyed these freshly harvested fields as they became available. We consequently employed survey units that were larger than the gridded units on the plain, although we made use of the same counting and collection methods adopted elsewhere.

In the southeastern part of the plain, our reconnaissance survey of 2003 had recorded an even more dramatic decline in density across a broad area of sandy soil just above sea level. The absence of artifacts here supported the conclusions of a geological study of the area indicating that the southern section of the coastal plain was once an ancient embayment, which had infilled only in recent times (Section 2.4). In this area, we used larger survey units (ave. 5,000 m^2; total area 16.2 ha) because we were certain we would not find much in the way of surface material and any material that we did find was unlikely to be related to local subsurface remains.

Despite the variation in size of survey units, we employed a consistent set of survey procedures throughout the plain (fig. 2.5). Fieldwalkers spaced at 10 m intervals walked transects across each unit, counting all artifacts and collecting artifacts according to the chronotype system (Section 2.3.2). Intensive methods followed those that were developed for the Eastern Korinthia Archaeological Survey (cf. Tartaron et al. 2006). Ten-meter spacing with two-meter-wide coverage produced in ideal conditions a 20% sample of the surface of a grid square of 1,600 m², although poor visibility reduced that examined sample to about 12% on average (Chapter 5) and surveyors underestimated the true quantity of artifacts on the surface (Chapter 3). We did monitor "walker efficiency," that is, the ability of a fieldwalker to recognize artifacts, but we discovered no great variation in the abilities of individual walkers (see Chapter 3 for the minor differences between experienced and inexperienced walkers). Fieldwalkers recorded features such as cut stone blocks, column fragments, and walls, as well as information that would help to locate the unit in space or contribute to the later interpretation of artifact patterns: location and toponym, evidence of current land use (e.g., olives, wheat, or barren), vegetation cover (e.g., weeds, trees, and phrygana), vegetation height in relation to the fieldwalker (e.g., ankle high, knee high, and waist high), condition of the soil, surface clast composition, and surface visibility (recorded at 10% intervals). These data sets provided the environmental context for assessing artifact densities across the whole of the survey region.

The survey of the coastal plain via grid squares and larger units for lower-density areas suggested evidence for two distinct "zones" of activity. We defined Zone 1 as the high-density area surrounding the basilica excavated by Dr. Hadjicosti. The 100 units in this zone, which represent an area of 19.8 ha, include 90 grid squares, each 1,600 m² in area, and 10 larger units along the western border that average 5,356 m². The southern border of the zone was the modern coastal road, the northern border the abrupt ridge of Koutsopetria, the western border the modern road to Pyla, and the eastern border the area of declining artifact densities. This abrupt reduction in the quantity of artifacts relates in part to the ancient embayment mentioned above, and in part to local disruptions associated with the installation of the treatment plant (fig. 2.6).

Zone 2 extended for over a kilometer along the base of the ridges of Mavrospilios and Kokkinokremos (fig. 2.7). The southern border was, like Zone 1, the coastal road linking Dhekelia and Larnaca; on the south, the zone captures the coastal area of the now in-filled embayment. Defining the eastern border were the Dhekelia Firing Ranges and a golf course. The northern border was the coastal ridgeline of Mavrospilios and Kokkinokremos that includes the steep valleys punctuating the southern slopes. The 192 units of Zone 2 represent an area of 42.6 ha and include 156 grid squares (1,600 m²) and 36 larger units in the south (4,766 m²).

The 2004 and 2005 surveys adopted identical methods to sample 246 grid squares (Units 1–252) over a total area of 39.4 ha and to delimit a site with two zones of moderate to high densities. The use of slightly larger survey units over an area of 23 ha highlights the "trailing off" of densities to both the southeast and west. Gridded survey demonstrated that this was a far more extensive scatter than we had estimated from the 2003 reconnaissance survey; more extensive, in fact, than many large sites investigated through gridded collection (cf. Table 2.1). The survey of the coastal plain required two seasons, followed by a study season in 2006.

2.2.3. Zone 3: Kokkinokremos (2007)

In 2007, we corresponded with Michael Brown, then a doctoral student at the University of Edinburgh, to plan a geophysical survey on the ridge of Kokkinokremos for his dissertation study on the Late Bronze Age in Cyprus. In the following season, we partnered with him and Dr. Hadjicosti to initiate a program of research in the area that would involve geophysical work at Kokkinokremos and Koutsopetria as well as an intensive pedestrian survey of the broad plateau that comprises the site of Kokkinokremos. The goals of this pedestrian survey were 1) to produce a density map of the surface remains to assess better the size and intrasite functional organization of the Bronze Age

Unit Number: ____________ **Recorder** _____________

Date (mm/dd/yy): ____________ Start Time __________

End Time _________

Area / Toponym: ____________________________

Location & Description (Relate to other units & local topography: dimensions, distance and bearing to nearest landmarks, land use, etc…)

Survey Procedure

Walker Spacing [ ] Bearing (in degrees) [ ] Direction of walker array: FROM: [ ] TO: [ ]

Walker Initials	Sherds #	Tiles #	Lithics #	Other #	Walker Initials	Sherds #	Tiles #	Lithics #	Other #
1					9				
2					10				
3					11				
4					12				
5					13				
6					14				
7					15				
8					16				
					TOTAL				

Standard [ ] Unsurveyed [ ] Resurveyed [ ]

Number of Bags [ ] Photography (circle): Digital, B&W, Color

General Comments about Unit (identify "other"; nature of field procedures)

1

Fig. 2.5a *Survey Unit form, front.*

Vegetation & Land Use (check all that apply)

Evergreens ☐ Deciduous ☐ Scrub / Phrygana ☐ Maquis ☐
Grass / Weeds ☐ Barren ☐ Other ☐

Olives ☐ Vineyard ☐ Citrus ☐ Apricot ☐ Almonds ☐ Other Orchard/Grove ☐
Vegetation, Small-Leafed ☐ Veg., Broad-Leafed ☐ Greens ☐
Grain ☐ Grain Stubble ☐ Kalamboki ☐ Other ☐

Dominant vegetation height none | <=ankle | <=knee | <= waist | <=head | >head
Percent Visible (walked area, 0-100, by 10s) ☐
Comments on Vegetation & Land Use:

Field Conditions

Plowed? ☐ Unplowed? ☐
Soil Loose? ☐ Soil Compacted? ☐
Background Disturbance: None ☐ Light ☐ Moderate ☐ Heavy ☐
Sherd Crusting (check one) None ☐ Light ☐ Heavy ☐

Surface Clast Size (check one) Boulder (>300mm) ☐ Cobble (300-75mm) ☐ Coarse Gravel (75-19mm) ☐ Fine Gravel (19-5mm) ☐ Sand (<5mm) ☐
Comments on Field Conditions:

Features

2

Fig. 2.5b *Survey Unit form, back.*

Fig. 2.6 *Survey of Zone 1 (Koutsopetria), view from Vigla.*

settlement site, 2) to produce a record of artifacts to compare with the geophysical information, and 3) to produce density data for a prehistoric site to compare to the Late Roman site of Koutsopetria and the Hellenistic site of Vigla. The results of the regional survey of the Kokkinokremos ridge (later defined as Zone 3) we will discuss in Chapter 5. The results of the geophysical survey appeared in Brown's completed dissertation (Brown 2012).

While a grid of 40 × 40 m was appropriate for the topographically featureless and consistently cultivated coastal plain, the more topographically complex height of Kokkinokremos required procedural adjustments to take into account the shape of the hill and the limits of cultivation (fig. 2.8). A regular grid would have produced units across Zone 3 that included parts of the flat top of the hill and its sloping sides. This was problematic for two reasons. First, taphonomic processes affecting different areas of Kokkinokremos were variable, with a recent history of extensive plowing and cultivation on the plateau in contrast to uncultivated slopes overgrown with phrygana and weeds. Second, the perimeter wall noted by past researchers ran along the modern break in slope, with the Late Bronze Age settlement within the wall and the slopes outside and below. A regular grid would inevitably have left some units overlapping slope and plateau, combining different cultural and environmental patterns within the same units.

We surveyed Zone 3 using units that approximated the area of the grid squares on the Koutsopetria plain (1,600 m^2) while isolating changes in slope and surface conditions owing to cultivation. We generally kept units between 1,000 and 2,000 m^2, with an average unit size of 1,804 m^2; the 58 survey units covered an area of 10.5 ha.

Survey methods were identical to those at Koutsopetria despite the irregular shape of the units. These units included the level plowed top

Fig. 2.7 *Survey of Zone 2 (harbor area), view from Kokkinokremos.*

Fig. 2.8 *Survey of Slopes of Zone 3 (Kokkinokremos).*

Fig. 2.9 *Survey of Zone 4, with Vigla visible in the distance.*

of the plateau and those slopes gentle enough for fieldwalkers to survey safely. We laid out units by using hand-held compasses and laser rangefinders, and then used a GPS Trimble unit to record the corners of units. Rather steep cliffs marked the limits to our survey in this zone. As in the survey of the plain below, we noted and photographed, but did not always collect, larger and heavier items such as stone basins, stone vessels, and groundstone fragments.

2.2.4. Zone 4: The Broader Micro-Region (2006–2008)

Following the surveys of Zones 1–3, we conducted additional intensive survey of the coastal plateaus north of Koutsopetria and west of Kokkinokremos. We began with an efficient and informal walk across the region in 2006, with the goal of assessing terrain, cultural material present, and thresholds of artifact densities. Procedures were identical to the reconnaissance survey across the Koutsopetria plain in 2003. Our cursory examination of the ridges revealed that although there were scattered ceramic artifacts (broken pottery and tile) inland north of the coast, they did not appear to be continuous and constituted a threshold of density well below those of the Late Roman harbor site of Koutsopetria. There appeared to be no high-density areas north of the coastal site of Koutsopetria and Vigla, but this initial observation turned out to be misleading, as we later discovered a significant concentration of material of Cypro-Archaic to Hellenistic date just above the water plant and some localized concentrations elsewhere on the ridge.

In 2007 and 2008, we conducted tract-level distributional survey across these plateaus to place the exceedingly high artifact densities of the sites of Vigla, Koutsopetria, and Kokkinokremos within their broader archaeological context (fig. 2.9). Zone 4, as we later defined it, extended over 25.5 ha and 109 units. Rather than using a digital theodolite to lay out units precisely, our survey of this area employed hand-held GPS units and laser rangefinders. Unlike the regular grid used to survey the Koutsopetria plain, we expanded the survey unit size to accommodate the irregular shapes of the fields and cover terrain more efficiently. The units were usually 80 × 40 in size

Fig. 2.10 *View of the ridges in the survey area, from Kokkinokremos (photo by Brandon Olson).*

(3,200 m²), which we walked along the 80 m axis and recorded artifact densities at the 40 m point; we collected artifacts according to the chronotype sampling system using the 80 × 40 m unit (rather than the 40 m point). For units in the far northern part of the Kazama ridge, we reverted to 40 × 40 grid squares owing to local topography. The ridge throughout this area became quite narrow and it was difficult to arrange larger units consistently within the boundaries of the fields. With a larger average unit size for the entire zone of 2,344 m², we were able to survey the ridge more efficiently and quickly.

We later defined this entire area of ridgeline north of Vigla, Koutsopetria, and Kokkinokremos as Zone 4. The limit to Zone 4 to the south is the line of a *taphros*, or ditch, cut into the bedrock at the northern border of the height of Vigla. The presence of beehives filled with swarms of hostile, stinging bees and areas of dense overgrowth, however, prevented us from surveying as far south as the *taphros* itself. Steep, overgrown cliffs mark the northern and western boundaries of the zone. The fields in this zone were generally under cultivation and either fallow or filled with grain stubble.

The survey of Zone 4 produced some areas of moderate to high density, especially north of Vigla along the southern edge of the coastal plateau. These units have high visibility, low vegetation, and had recently been plowed. They produced a higher overall density (1,741 artifacts per ha) and a lower average visibility (51%) than the average for the entire zone (1,220 artifacts per ha). As these moderate- to high-density units were nearer to the ancient sites, it is logical to associate them with the broader cultural landscape of occupation to the south.

2.2.5. Vigla and the Ridge Survey (2006–2007, 2010)

The coastal site of Koutsopetria is bordered by a line of ridges that run along its northern edge and separate the site on the plain from the sites on the plateau (fig. 2.10). This line extends from the prominent rocky hilltop known as *Laksha tou*

Papa, northwest of Koutsopetria, to Mavrospilios in the east below the site of Kokkinokremos (although the ridges actually continue eastward beyond the survey area). As Lolos, Gourley, and Stewart have discussed (2007), Mediterranean surveyors have not often considered the value of ridge survey as an integral component of interpreting sites. The survey of the sides of ridges can potentially identify unique kinds of information, such as well-preserved pottery eroding out of slopes, or features (tombs, cut stone blocks, or walls) that survive better in uncultivated zones (fig. 2.10).

We had two main objectives in surveying the slopes. We were especially interested in whether there were tombs on the ridges associated with the settlements of Koutsopetria, Kokkinokremos, and Vigla. And we wanted to determine the relationship between high-density artifact scatters noted in the coastal plain at Koutsopetria and those on the ridges above and beyond. This was especially important for the eastern end of the site of Koutsopetria where the moderate to high artifact densities were unexpected (Zone 2), and we believed an inspection of the ridges would help to determine the relationship between areas on the plain and the higher-density areas on the top of the plateau. In the end, our survey of the ridges produced some interesting finds and helped to define the extent of activity on "marginal" parts of the survey area and the influence of erosion and other local depositional processes on the nature of the assemblage on the plain below.

We surveyed ridges in two ways. For two ridge segments, we followed the same procedures adopted elsewhere in walking 10 m intervals and collecting chronotype samples. As noted above, we systematically surveyed the ridge below Kokkinokremos (2007) in this manner. We also used the same procedures to survey the height of Vigla and its surrounding slope. We walked the unit on the top of the plateau (501) as a typical grid square and surveyed five units to the south and west (1400–1404) as larger irregular units that followed the contours of the slope and avoided the steep cliffs farther downslope. We kept the size of the units (ave. 1,983 m^2) on the slopes below Vigla relatively close to units from the plain (1,600 m^2). Artifact densities were especially high in these units.

Apart from the areas below Vigla and Kokkinokremos, however, our survey of ridges in 2006, 2007, and 2010 followed a different procedure because we were unable to carry out typical intensive survey owing to the steepness of the slopes and the density of vegetation. For most of the steep slopes that separated the coastal plain from the flat-topped ridgeline, we carried out a survey that was intensive but non-systematic and assessed artifacts in a qualitative manner. In practice, this meant that two to five fieldwalkers spaced at 10–20 m intervals walked along the slopes from west to east in accordance with the contours of the slope, navigating their way around thick vegetation, obstacles, and cliffs. Instead of counting artifacts, surveyors recorded observations about artifact densities (low, medium, or high) and collected artifacts that were exceptional (e.g., figurines) or highly diagnostic (rims, bases, handles, and decorated sherds). We documented all features by recording location (with GPS unit), measuring dimensions, taking digital photographs, and making basic descriptions. This feature information was integrated into the GIS digital structure of the survey region.

The survey of the ridge slopes resulted in a remarkable amount of qualitative data. We observed additional kinds of artifacts such as figurines (Chapters 4 and 5). In most of the ridgeline from Vigla east, we noted numerous pits, quarry cuttings, several walls, and tombs that relate to broader activities in the land. In one place, in particular, the ridge survey proved significant to our overall research. On the western end of the ridge, immediately below Vigla, our reconnaissance survey in 2006 documented cut stairs and a substantial wall along the ridge. Heavy rains and erosion prior to the 2007 season revealed that the wall was a fortification of ancient date. Low-altitude aerial photographs and excavations later helped us establish the chronology of this site, and we detail the results in a separate chapter devoted entirely to the fortifications (Chapter 6). The study of the finds from the excavation of this wall is currently being completed and prepared for a second volume.

2.2.6. Resurvey (2006, 2007, 2010)

The final form of pedestrian survey we carried out was *resurvey*. There are many reasons to resurvey the landscape, but the most important is that ground conditions change from year to year, revealing different artifacts and densities (Ammerman 1995). Given that pedestrian survey typically produces only a small sample of what lies beneath the surface, it is generally good practice to implement programs of resurvey as part of a project design.

As one example of the importance of resurvey for PKAP, well-preserved artifacts (such as carved marble basins, limestone settling basins, and enormous roof tiles) were revealed in 2006 by deep plowing in a previously uncultivated patch of coastal plain (fig. 2.11). This reexamination also revealed substantial new building materials and monumental architecture that allowed us to make reasonable estimations of subsurface architecture. As Volume 2 will detail, such knowledge factored directly into our placement of geophysical transects on the Koutsopetria plain.

An even more important form of resurvey was the series of experimental units surveyed in 2004, 2006, and 2010. These experimental units proved essential for assessing the reliability of our method, so much that we have elected to discuss them separately in the next chapter.

2.3. DISTRIBUTIONAL DATA: COUNTING AND CHRONOTYPES

The previous section outlined how we organized the landscape to ensure that we consistently covered the various topographical areas of the Pyla micro-region. The goal in this section is to present our strategies for quantifying and collecting surface scatters and discuss why we chose them. Such sampling strategies are close to the core of all intensive survey because the manner in which one records artifacts in the landscape determines the kinds of archaeological and historical conclusions

Fig. 2.11 *Area of deep plowing at Koutsopetria.*

that one draws about past land use and settlement. We recorded the distribution of artifacts through total count (2.3.1) and chronotype collection (2.3.2).

2.3.1 Total Counts and Densities

Selecting a system for documenting artifact distributions is difficult because surface scatters represent complex aggregates of different processes, periods, and types that vary across space. The most common standard for documenting the material landscape is to map the distribution of "sites" across a landscape, that is, areas of exceptionally high artifact density or material. However, the "site" is a slippery concept that is ontologically problematic and methodologically difficult to define and delimit in the field (Dunnel 1992). Sites defined in the field may in fact be high-density artifact scatters resulting from overlapping layers of pottery of different periods (e.g., Hellenistic and Late Roman), in which case the concept does not retain its value when each of the periods is measured individually and separately (Caraher, Nakassis, and Pettegrew 2006).

On the other hand, some regional survey projects in the Mediterranean aim to record the *distribution of artifacts* (rather than sites) across the landscape, reflecting a belief that the quantity of artifacts presents a metric valuable for parsing the landscapes into different chronological and functional layers (Winther-Jacobsen 2010b). Distributional surveys typically count the total number of artifacts found in survey units or tracts. Since the 1970s, archaeologists have used tally counters to record the quantity of different kinds of artifacts within each fieldwalker's "swath:" potsherds, especially, but also tiles, stone artifacts, glass, and miscellaneous other objects. In some cases, these counts highlight low and high-density spots in the landscape that reflect real geological or cultural processes in the past such as occupation. In other cases, high-density scatters are the products of a complex mixture of processes that include aggregate settlement over long periods of time, high-intensity use in a single period, particular episodes of land use that produced large quantities of material, post-abandonment behaviors, and geological and geomorphological conditions. Assigning cultural significance and categories to places of high or low artifact density involves assessing the chronological and functional character of the artifact scatters.

PKAP fieldwalkers sampled the *total density* of artifacts in the area in a manner consistent with the procedures employed by those within its survey family, including the Eastern Korinthia Archaeological Survey and the Sydney Cyprus Survey Project. As noted earlier, fieldwalkers spaced at 10 m intervals walked transects across each unit counting with tally counters all pottery, tile, lithics, and other types of artifacts one meter to the right and left of the fieldwalkers' transect (cf. Tartaron et al. 2006 for review of this procedure.; note that "lithic artifacts" refer to chipped stone flint and chert; "other artifacts" denote all artifacts that are not pottery, tile, or lithics, and include materials such as glass, mortar, gypsum, marble revetment, cut stone, andesite, limestone bowls, metal, coins, and slag). Ten-meter spacing with two-meter-wide coverage produced a maximum surface sample of 20% for each survey unit as well as sub-unit data (four samples of a maximum of 5%) as each fieldwalker covered exactly the same percentage of the surface of the unit. The "total count" of artifacts for each survey unit was used to generate its "total density" (=total count divided by area). The variation of these densities over the landscape provides a coarse approximation of the areas of least and most intensive human activity through time.

2.3.2. Chronotype Collection

To assess the function and chronology of habitation and land use in any landscape, we analyzed a sample of the artifacts counted. The most commonly used system for sampling artifacts from sites and landscapes is *grab sampling*, which entails picking up all visible "diagnostic" artifacts, which are typically feature sherds such as rims, bases, and handles, or decorated body sherds. The advantage of the grab sample system is that it greatly reduces the number of artifacts collected and assigns some chronological and functional value to a site from a few identifiable artifacts. Its disadvantage, however, is that it requires fieldwalkers to determine which artifacts appear to be "diagnostic," which may result in the neglect of sherds that are more generic or less distinctive in appearance. The uncritical collection of large quantities of any particular artifact class can lead to misinterpretations of the landscape since it potentially gives one period or artifact type more prominence than another. As we have argued elsewhere, surveyors must develop a better appreciation of the inherent biases of grab samples (Caraher, Nakassis, and Pettegrew 2006; Tartaron et al. 2006). For example, Classical-Hellenistic black-glazed body sherds and Late Roman combed ware body sherds are highly visible in the landscape, while the body sherds of Early Roman utilitarian vessels are not (Pettegrew 2007). Without accounting for the differential visibility of artifacts, sampling strategies dependent on grab samples are likely to misrepresent the differences in quantity of artifacts of different periods and functions. Grab samples also favor features sherds and these typically represent less than 10% of the ceramic material visible on the surface (Chapter 3) and leave on the ground 90% of artifacts, many of which provide important functional and chronological clues to interpreting past human activities.

Some archaeologists have favored more robust and systematic sampling strategies that provide better assessments of the chronological and functional character of surface assemblages, highlight biases in recognition of artifacts, and reveal "hidden landscapes" poorly represented in regional survey (Bintliff, Howard, and Snodgrass 1999; Caraher, Nakassis, and Pettegrew 2006; Pettegrew 2007). The best way to avoid the problems of differential visibility noted above is to intensify the sample of artifacts through *total collection*, i.e., collecting all artifacts visible at a site or, in the case of distributional survey, in a survey swath. Total collection establishes a very robust sample of artifacts, which can add new information about a site (Winther-Jacobsen 2010b. See Chapter 3). However, it is practically impossible to implement this method over a large area or where artifact densities are high, since it yields enormous amounts of material that easily overwhelm ceramic specialists and the storage facilities, often without providing much new information (Section 3.3). Moreover, it is a mistake to conclude that total collection constitutes some kind of representative sample of all the material present, since the material visible on the surface forms only a fraction of the plowzone, let alone the full array of sub-surface assemblages or the original systemic assemblage (see Winther-Jacobsen 2010b). Our own experiments in total collection question whether the new information gained from total collection is worth the increased investment of resources of time, energy, and storage at a site as large as Koutsopetria (Chapter 3).

In contrast to both grab sampling and total collection, a number of surveys in the eastern Mediterranean have adopted variations of the *chronotype system*, which seeks to strike a balance between an efficient and representative sample. Timothy Gregory, a ceramicist, and Nathan Meyer, a data analyst, developed the system as part of the Sydney Cyprus Survey Project in an effort to produce more data for less analysis (Meyer 2003: 14–16; Meyer and Gregory 2003: 48–52; Gregory 2004). From its initial use in the SCSP project (Given et al. 1999), it was then refined for use in the Australian *Paliochora*-Kythera Archaeological Survey (Coroneos et al. 2002: 139–40), the Troodos Archaeological and Environmental Survey Project (Given et al. 2001), and the Eastern Korinthia Archaeological Survey (Tartaron et al. 2006). As an experimental system designed to deal with theoretical and practical problems in investigating surface scatters, its potentials and problems have been the subject of a range of recent discussions (Caraher, Nakassis, and Pettegrew 2006; Pettegrew 2007; Moore 2008; Winther-Jacobsen 2010b).

In the chronotype system, every artifact type (i.e., chronotype) fits into a chronological and descriptive hierarchy based on specific physical typological characteristics. Chronotypes range from the very precise (e.g., "African Red Slip Form 99 - rim sherd," or "Micaceous Water Jar - body sherd") to the very imprecise (e.g., "Medium-Coarse body sherd - Post-Prehistoric," or "Ancient Millstone"), but chronotypes are always assigned to a period, however narrow or broad. As a sampling strategy, the system compromises between less-systematic and lower-intensity grab sampling and the logistically problematic and higher-intensity total collection. In principle, each fieldwalker should collect a maximum of one rim, base, handle, and body sherd of each chronotype in his or her transect. If a walker has already collected a combed-ware body sherd and an ARS Form 50 rim, for example, she would not collect additional examples of combed-ware and ARS Form 50 rims found in the tract, but would count them as part of the total count and only collect additional examples of grooved body sherds of different thickness, color, and fabric. If four fieldwalkers walking at 10 m intervals in a 40 × 40 m square were to collect the unique objects visible in their swaths, each unit should produce as many as 16 examples of a single chronotype, corresponding to 4 rims, 4 bases, 4 handles, and 4 bodysherds of the same kind of pottery. A different color of the same chronotype, however, would warrant collecting an additional example, which means that the number of examples could theoretically be higher (see discussion of batches in 2.3.3 below).

Scholars have criticized the chronotype system for reasons that include both problems of quantification and implementation (see discussion in Caraher, Nakassis, and Pettegrew 2006; Tartaron et al. 2006; Pettegrew 2007; Moore 2008). In respect to the former, critics have noted that the system's elimination of duplicates prevents true quantification of total numbers of artifact types. The system allegedly produces qualitative rather than quantitative data, or simple indication of presence or absence of material. With no power to account for the frequency of types or periods, it is consequently not useful for relative representation of types and periods in the landscape.

We have argued elsewhere that the system does in fact allow one to quantify (Pettegrew 2007), but the quantification is a measure of the sample, i.e., the diversity of artifact types sampled, which provides a rough approximation of the relative quantities of types of artifacts visible. The system cannot shed light, of course, on the total quantity of artifacts of chronotypes *seen* in the swath but not collected because they are redundant. There is no way of knowing, for example, how many examples of Late Roman spirally grooved amphora body sherds were counted but not collected in a transect. Since the maximum total number of spirally grooved body sherds *collected* is in theory limited to the number of transects (but see below for the tendency to duplicate), the system is biased against particularly common types of artifacts that produce redundant sherds (Tartaron et al. 2006; Pettegrew 2007).

The second serious criticism concerns the implementation of the chronotype system during survey. Critics have suggested that fieldwalkers cannot confidently differentiate similarity and dissimilarity in the attributes (color, fabric, thickness, and surface treatment) that distinguish one chronotype from another, with the result that they systematically under-collect chronotypes. Moreover, when pottery is encountered in the field, dirt from the field further hinders chronotype identification during survey. In fact, studies have shown that fieldwalkers tend to "over-collect" chronotypes by collecting more artifacts than the chronotype system requires (Tartaron et al. 2006). Volunteers, who are instructed to collect when there is a question of duplication, end up gathering artifacts that they recognize as different in the field but that our ceramic analysts batch together into single chronotype categories. For this reason, certain broadly-defined chronotypes, such as "Medium-Coarse Ware, Ancient," are very overrepresented for survey units. The system aims to eliminate redundant sherds, but in practice our surveyors still end up collecting more sherds than they should according to the logic of the system.

In our view, the advantages of the chronotype collection strategy outweigh its limitations, and make it preferable to the alternatives of total collection and grab sampling in artifact-rich environments. In contrast to the former, the use of the chronotype collection strategy in PKAP produced an assemblage that was only 44% of the total number of artifacts counted. This technique produced a record of the types of artifacts present in a unit while leaving over half of the material on the ground *in situ*. Moreover, the system is more systematic than grab samples, which ask fieldwalkers to determine whether sherds are diagnostic in the field and produce grosser, less systematic, and less robust samples. Indeed, inattention to the biases of grab sampling has often led archaeologists to misinterpret change in the landscape (Pettegrew 2007; Winther-Jacobsen 2010b). In chronotype collection, a more complete assemblage of rims, bases, sherds, and handles foregrounds the influence of particular type-fossils in shaping our perception of time and function in the landscape. And this level of "source criticism" ultimately makes our interpretations of change in occupation more circumspect and accurate (for "source criticism" of surface assemblages, see Rutter 1983; Alcock 1993: 49–53; Millett 1985, 1991, 2000a, 2000b; Caraher, Nakassis, and Pettegrew 2006: 21–26; Pettegrew 2007: 749–51).

We do not believe the chronotype system to be a methodological silver bullet that provides the perfect solution for any survey, but we do regard it as a sampling method that maximizes the production of interpretable data, limits the impact of survey on the archaeological landscape, and reduces cost in time and logistics. To verify the validity of the system, the PKAP project conducted a series of analyses and experiments that we will discuss in the next chapter.

2.3.3. Principles of Description and Analysis

In our survey, grid-squares and survey units represent the spatial unit that forms the basis for our sampling of the surface of the ground and the assemblage. As distributional and non-site surveys over the past three decades have recognized, the basic unit of analysis is not the archaeological site itself but the individual artifacts distributed in units across a micro-region. A distributional approach begins with the chronological and functional values of the total collection of artifacts to construct meaningful understandings of past activities in the landscape (Caraher, Nakassis, and Pettegrew 2006; Winther-Jacobsen 2010b). Our approach is to parse the archaeological landscape into its atomic units — the individual artifacts — and then reconstruct these units into broader historical patterns. By employing relational databases, GIS, and a particular sampling strategy (cf. Chapters 3 and 5), the finely-parsed landscape of artifacts marks the evidence for dynamic shifts in culture, economy, and society.

We feel this form of analysis contributes in an efficient way to realistic evaluations of the patterns and meaning of artifacts within their surface context. A distributional artifact-based approach gives archaeologists a tool to make inferences about the relationship between artifacts observed on the surface of the ground (the sample) and artifacts *actually present* on the surface (total population) — and even the empirical correlates to specific ancient behaviors, as Winther-Jacobsen has recently proposed (2010b). In distributional survey, archaeologists use basic quantification to describe, summarize, and interpret data collected from the landscape. We have highlighted three variables important to our quantification and statistical description of the landscapes in the Pyla region: density, diversity, and visibility.

Density

Total density is a measure of the aggregate quantity of artifacts left over time and visible on the surface today. We have computed artifact density per hectare (10,000 m^2) in order to make the figures more accessible. Our estimates of overall artifact density are based on counts produced by fieldwalkers in each unit, which represent, at maximum, a 20% sample of the surface of each unit. In optimal conditions, the total number of artifacts counted corresponds to the number of artifacts actually on the surface of the survey unit, although in reality, as Chapter 3 will show, the pedestrian procedure produces only a sample of artifacts visible according to our fieldwalking procedure. Within the limits of this sample, total artifact density nevertheless represents a coarse index for assessing past activities. Since we subjected the entire region to the same pedestrian procedure, the areas of high density define the culmination of various formation processes over time.

Diversity

Total density allows for the assessment of site formation processes over time, but it is an inherently coarse method for measuring land use in the landscape. The first step toward parsing the overall density patterns across the landscape involves identifying the various chronological and functional components of the scatter. Typological, chronological, and functional variations in the assemblage of artifacts collected from units are important indicators of the intensity and character of ancient activity in an area. Even when the total density of a unit is relatively low, a diverse assemblage might still point to vestigial patterns of particular kinds of land use. High artifact densities and low diversity, moreover, may suggest short but relatively intense occupation of areas. Diversity marks an independent category for drawing meaning from artifact assemblages.

Our basis for measuring diversity derives not from the total artifacts counted by the fieldwalkers, but from the sample of *collected artifacts*. This includes the individual chronotypes representing unique artifact types. As noted above, the chronotype system assigns every artifact to a category that combines aspects of chronology, function, extant part, and basic description of the fabric. Fieldwalkers collected unique artifacts (chronotypes), which ceramicists read for basic properties of material, fabric, color, size, weight, vessel part, decoration, and period. The databases combined with the spatial relationships stored in the project's GIS allowed us to produce patterns in the landscape according to typological, functional, and chronological values.

The chronotype system provided the project with a useful set of heuristic tools to pull apart aggregate artifact densities and determine the relationship between artifact scatters and past human activities. The chronotype system does not offer a single solution to the challenges of unpacking the complex patterns produced by intensive pedestrian survey, and we do not recommend it as the only or best method for sampling every landscape encountered in the Mediterranean basin. Nonetheless, the system does seem particularly well-suited to landscapes characterized by high artifact densities, since it produces a robust sample in an efficient manner.

If the count of chronotypes forms an important index of diversity in a unit, the *batch* marks a related but slightly different assessment. A "batch" denotes a group of similar pottery from a survey unit that shares the same chronotype, fabric, color, and vessel part to one another. A single batch, for example, could consist of four buff Late Roman 1 amphora handles. Red handles of the same shape and chronotype would be separated into their own batch, as would buff rims from the same amphora chronotype. Because batches are created and subdivided according to color and extant part, they form a more sensitive index of the diversity of material present in each unit than grouping artifacts by chronotypes alone. It is possible for there to be several batches of sherds identified as the same chronotype, such as "Late Roman 1 Amphora," with each one representing a different color, fabric, or extant part of the same basic ware. Since the chronotype system is at least partially hierarchical, these different batches could theoretically represent chronological and functional categories that fall outside of existing typologies. Returning again to our example of Late Roman 1 Amphora, different colors and fabrics likely represent different places of production and may indicate different contents and functions. Some Late Roman 1 amphorae could be imported vessels to the island and others may mark commodities prepared for trans-shipment from the settlement.

Visibility

The final feature that is important to our description of the surface record is the "visibility" of the surface recorded for each unit (Section 2.2.2, and fig. 2.5). Visibility is an important environmental factor that influences our ability to record the number of artifacts present. Total densities are less meaningful without understanding whether the surface of the ground was *actually* visible to the fieldwalker and how this and related factors influenced the ability to count and recover archaeological objects from the surface. Visibility encompasses a range of environmental factors in each unit, ranging from the height and nature of vegetation, to the amount of confusion generated by non-ceramic artifacts in the soil matrix, and the time of day and direction walked. We have focused on visibility over other factors, because we have found that the percentage of the surface visible represents the most influential factor in our ability to recover cultural material from the field.

Chapter 5 will frequently discuss visibility as a factor that influences our knowledge of diversity and density across the landscape. Generally,

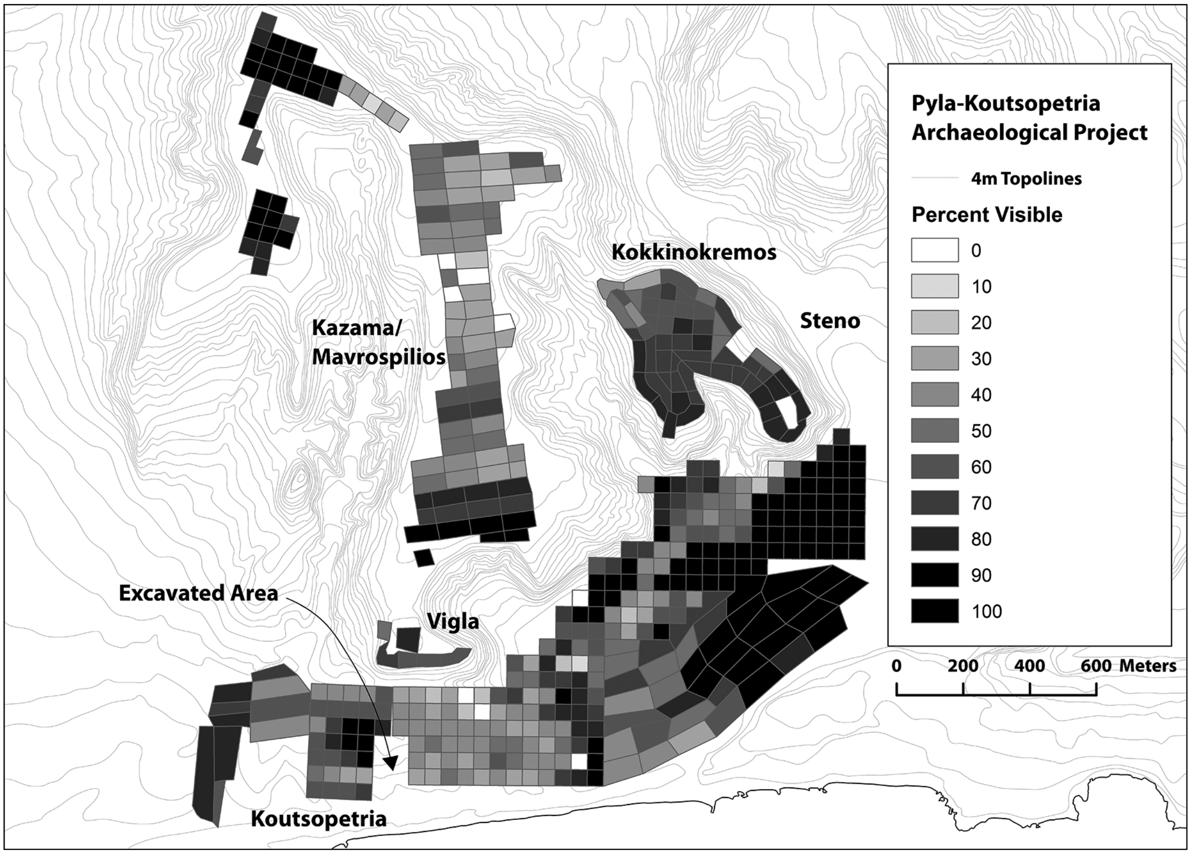

Fig. 2.12 *Map showing visibility in the survey area.*

the surface visibility across the micro-region was both relatively high (ave. 64%) and consistent (fig. 2.12). Most of our survey area was subject to cereal cultivation — 56% of units were covered with low grain stubble and 10% of units were covered with grain — which limited average visibility levels, respectively, to 63% (fields with grain stubble) and 60% (grain) (fig. 2.13). Most units (65%) also had some grass and weeds, and those units had average visibility of 63% (fig. 2.14). A small percentage of units (15%) with low scrubs had lower average visibility of 55% (fig. 2.15). In only a handful of units did walkers note pine trees, deciduous trees, maquis, apricots, *kalamboki* (maize), or small-leaf vegetation. No olives or vines were noted in the area.

A statistical correlation between visibility and density was strongest when surface conditions were limited and densities were high. There was a strong linear correlation (r^2=0.922) between density and visibility, for example, in units on the Koutsopetria plain with low surface visibility (20–50%) and high artifact densities (ave. 7,900 artifacts/ha). In these cases, a small increase in visibility correlated closely with an increase in density. However, outside this high-density artifact zone, visibility and density correlated rather poorly (r^2=0.548). It is significant to note, then, that artifact recovery rates did not consistently increase as visibility improved.

2.4. GEOLOGICAL AND GEOMORPHOLOGICAL SURVEY

Our previous work with the Eastern Korinthia Archaeological Survey project had trained us to value assessments of the natural and anthropogenic transformations of the landscape. In that survey, geomorphology was integrated into the fabric of the project (Tartaron et al. 2006). Team leaders joined up with geomorphology interns to lay out survey units that followed the natural breaks, the geomorphic boundaries, in the countryside. In

Fig. 2.13 *Grain stubble and grain in the survey area.*

Fig. 2.14 *Weeds in the survey area.*

Fig. 2.15 *Low scrub and shrubs in the survey area.*

continuous consultation with geomorphologists during the course of survey, archaeologists learned to recognize the evidence for the processes that made and remade the landscape over time.

Enriched by this experience, we made it a point from the start to collect geological, environmental, and geomorphological data to interpret the settlement of Koutsopetria. We gathered a range of data, such as visibility and land use, that related directly to the interpretation of individual units of the survey territory (Section 2.2.2, fig. 2.5 above). We also consulted Dr. Jay Noller, a geomorphologist and soil scientist, for feedback and assessments about the movement of soils in the area. Our reconnaissance survey in 2003, for example, documented a tremendous drop in artifact densities at the eastern end of Zone 1, which seemed to confirm the hypothesis of earlier scholars (Karageorghis and Demas 1984; Leonard 2005) that the low-lying sandy zone had once been an embayment and natural harbor. Involving soil scientists was integral to our research design and key to our assessment of the history of the area.

Consultation with Dr. Jay Noller from 2004 to 2006 contributed directly to our work in a number of concrete ways. Most immediately, Noller provided advice, feedback, and assessments. Our survey, for instance, documented a 200-m-wide gap in artifact densities at Koutsopetria between Zones 1 and 2, immediately south of the Mavrospilios and Kokkinokremos ridges, and in soils of different composition. Although we suspected that this discontinuity in archaeological materials was associated with the construction of the water treatment facility east of Vigla, Noller's observations helped us to understand the specific lines of disturbance in the landscape. (We later learned that the construction of the water facility plant involved large-scale excavations for its foundations and routing pipes through the easternmost

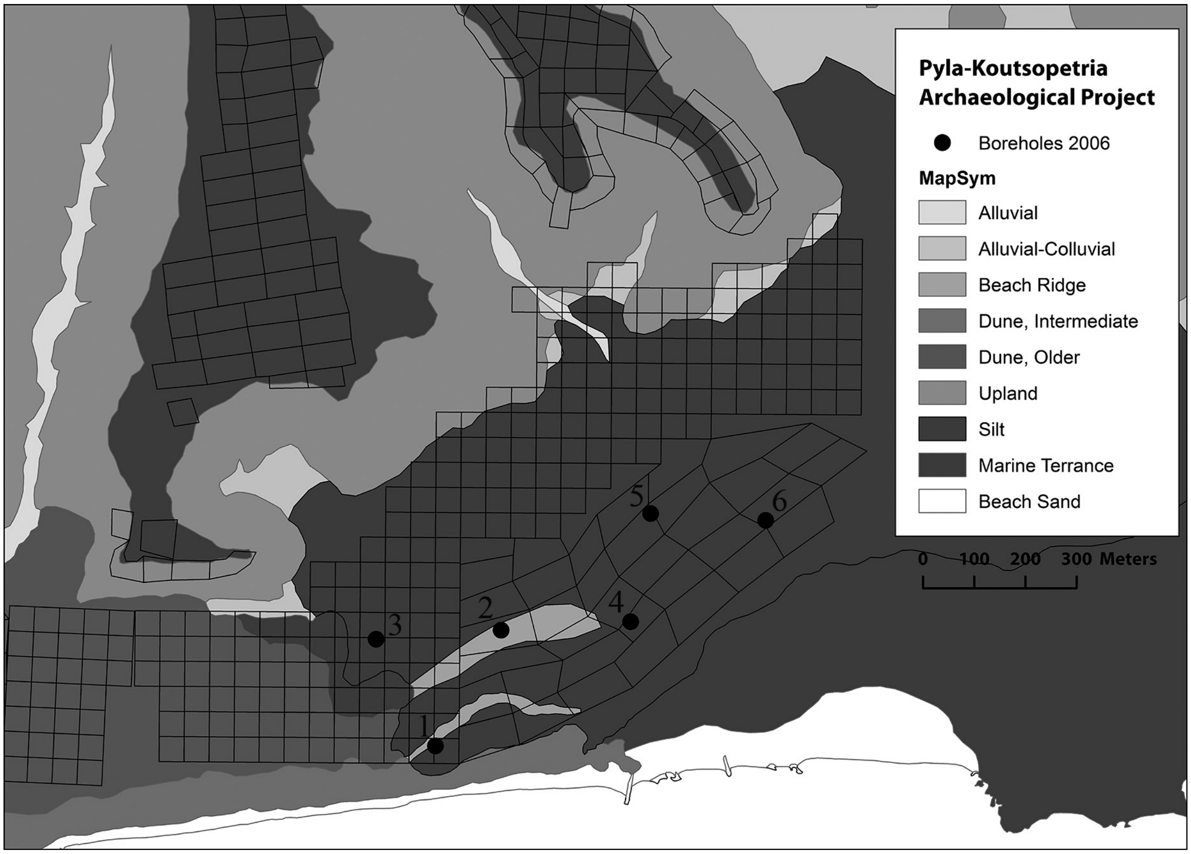

FIG. 2.16 *Geological map of the Pyla-*Koutsopetria *region showing the location of bore holes.*

section of the high-density areas associated with Koutsopetria proper.) Noller also showed us parts of the landscape, such as fields near Mavrospilios and Kokkinokremos, where artifacts probably washed in through several ancient riverbeds.

A more significant outcome of this consultation and collaboration was the production of a map of the region in terms of the soils of the surface (fig. 2.16) and subsequent coring samples. On several occasions in 2004, Noller visited the sites of the region, recording notes about geomorphology and preparing a geological map of the area based on library research and discussions with other geologists. This initial assessment provided clear justification for viewing the low-lying area as a potential ancient harbor site. Noller's study also demonstrated the uniqueness of this embayment in Cypriot coastal geography and called for a more intensive examination. In 2005, in collaboration with the Cyprus Geological Survey Department, drilling operations were conducted in the area of the suspected embayment. The following sections summarize the results of the initial geological survey (2004–2005) and a preliminary report of the drilling operations (Noller and Zomeni 2006).

2.4.1. Geological and Archaeological Survey of the Embayment in the Koutsopetria Region (2004–2005)

During the course of a geomorphological survey of the entire Cypriot coastline, Noller and colleagues at the Cyprus Geological Survey Department (GSD) identified the lowland south of Kokkinokremos as having the definitive characteristics of a prehistoric to historic harbor, with lacustrine and alluvial Holocene silts extending for some 500–700 m inland, interrupted only by a Holocene alluvial fan at the mouth of a drainage west of the Kokkinokremos ridge. Their investigations identified a definitive paleocoastline in this lowland, recognized as a low curvilinear ridge of

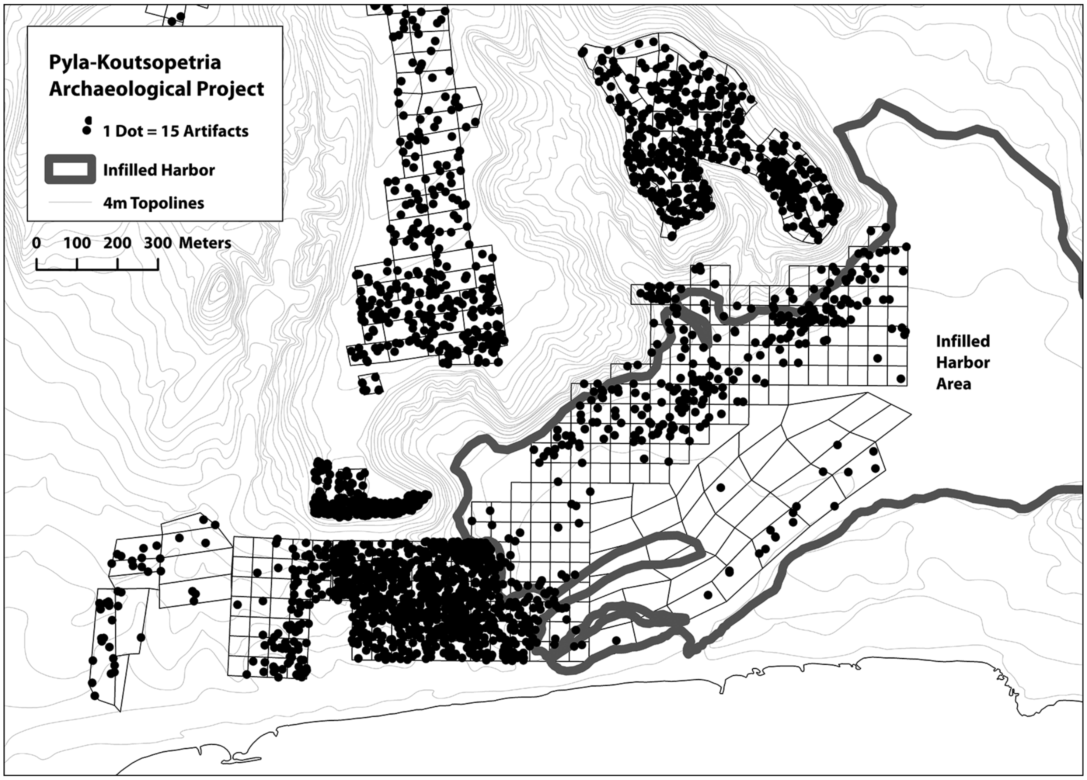

Fig. 2.17 *Distribution map of the area of the embayment, showing total density.*

shelly sand deposits 150 m inland from the current beach and running parallel with the coastal road. This low ridge enclosed a bay of 42.5 ha in surface area and protected it from waves.

Southeast of the embayment, Noller documented an east–west trending Pleistocene marine terrace dating older than 80,000 years BP that would have provided further internal shelter from the prevailing southerly winds. The southern exposure of this ridge, called Koukouphoukthia, is the location of a Late Bronze Age cemetery and settlement (Catling 1963: 168). The entrance to the embayment fell between this Pleistocene marine terrace and the extension where the remains of the Venetian fortification are visible.

Our surface survey of this embayment produced only a low-density scatter of water-worn artifacts. Of the 192 survey units incorporated within the embayment, 89 produced fewer than 10 artifacts, and 25 produced no artifacts at all (fig. 2.17). Densities were largely insubstantial, except close to the modern roads in the southwestern corner of the infilled embayment. For the entire area, the mean density of 752 artifacts/ha is markedly lower than density of 2,960 artifacts/ha for the survey in general. Most of the artifacts date specifically to the seventeenth century or later (fig. 2.20; compare figs. 2.18 and 2.19), a pattern consistent with the dates suggested by the core samples (below) and the remains of the Venetian fortification. Artifacts of Late Roman date along the western and northern edge of Zone 2 may be explained by smearing through plowing. Early Modern artifacts in the area of the estuary proper suggest a *terminus ante quem* for the final infilling of the bay in the Medieval and post-Medieval periods.

To the north of the embayment, we documented a distinct change in soil color during our intensive survey in 2005, running roughly parallel to the coastal ridge. This color change marked the division between terrigenous (alluvial and colluvial) sediments and marine sediments. It also corresponded to a transition point in artifact scatters. Very few artifacts derive from the area of marine sediments, suggesting that this

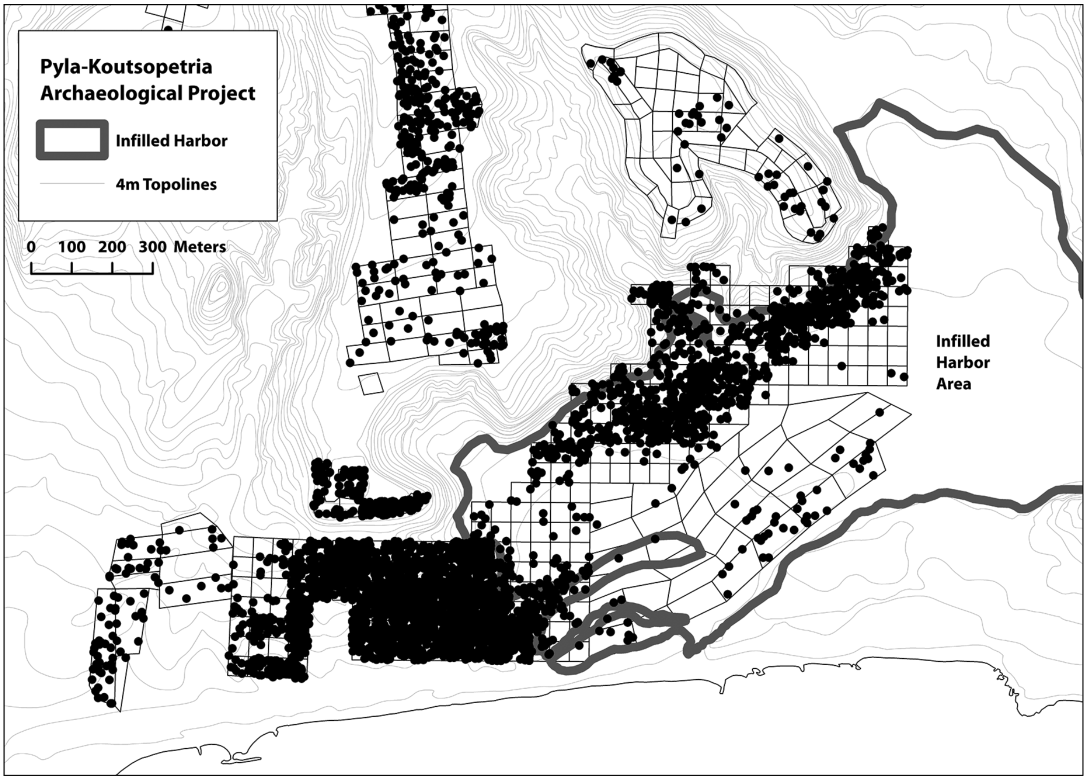

Fig. 2.18 *Distribution map of the embayment showing density of Late Roman artifacts. 1 dot = 1 artifact.*

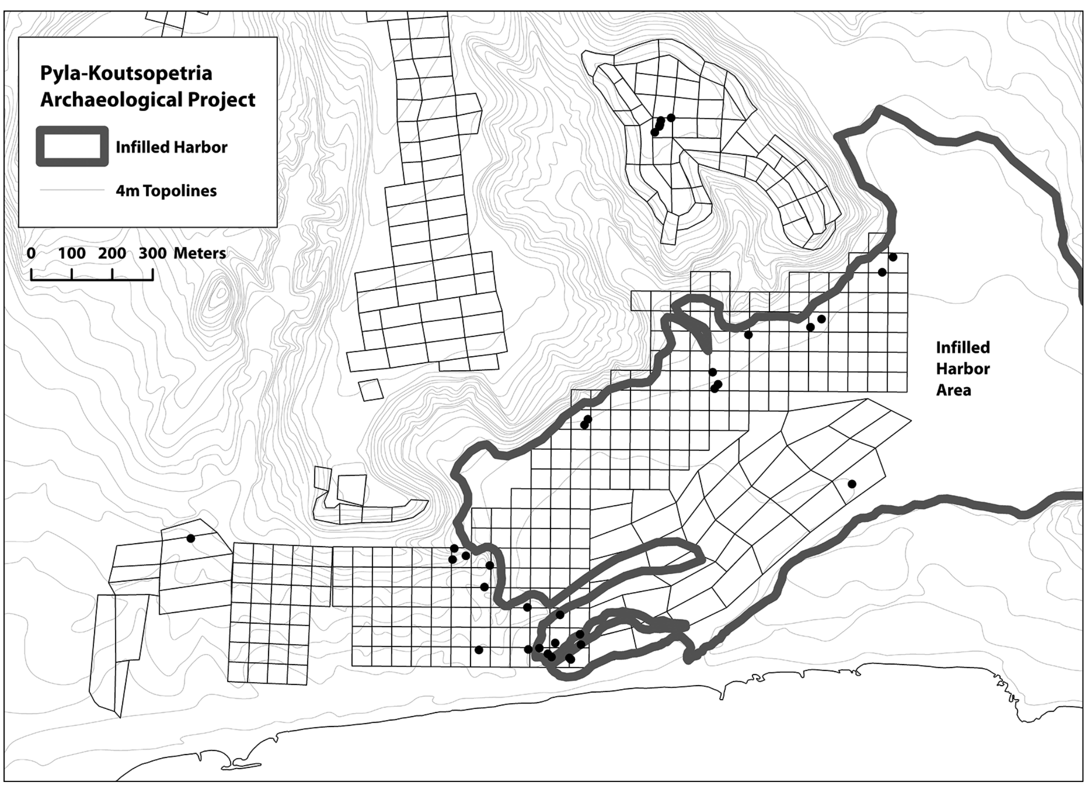

Fig. 2.19 *Distribution map of the embayment showing density of Medieval artifacts. 1 dot = 1 artifact.*

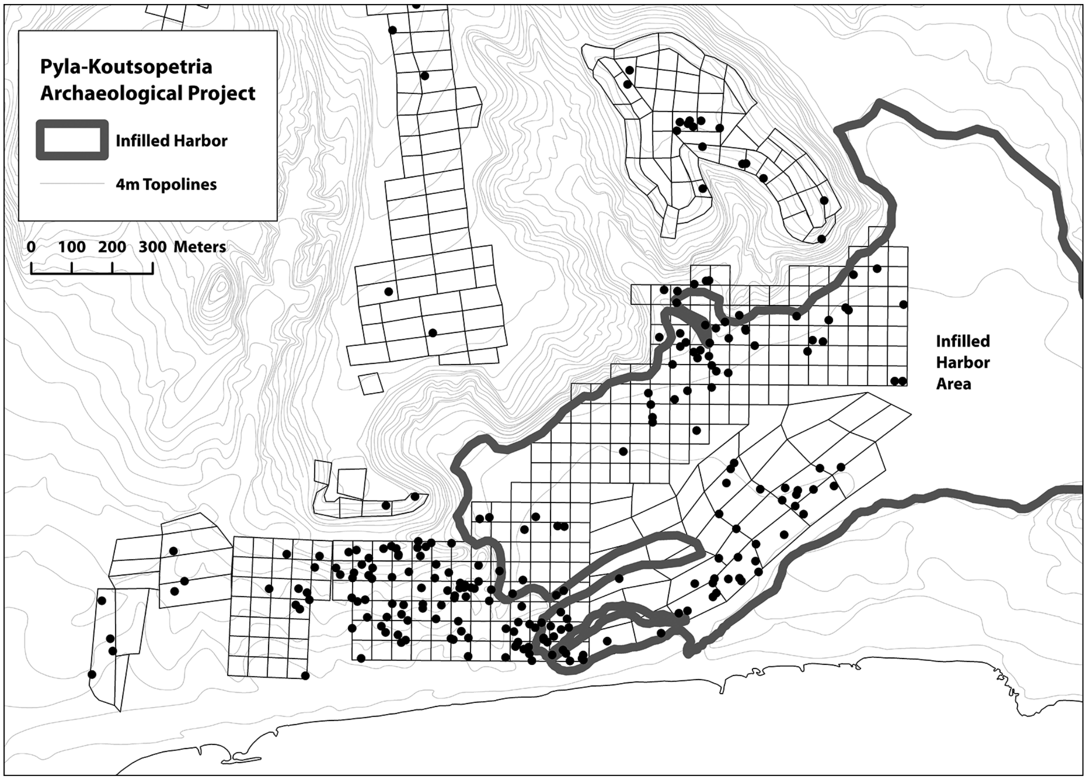

Fig. 2.20 *Distribution map of the embayment showing density of Modern artifacts. 1 dot = 1 artifact.*

area remained unavailable for use during the Late Roman period (fig. 2.18). A low to moderate density of Late Roman artifacts, however, began immediately where the surrounding terrigenous sediments started. These were deposited along the former coastline of Late Antique date now situated several hundred meters inland from the present beach.

2.4.2. The Core Samples (2005)

More definitive evidence about the nature, depth, and age of the sediments on the plain came from a series of core samples in 2005 and 2006. In collaboration with the Cyprus Geological Survey, Noller and a team of researchers extracted cores from Koutsopetria by using air-rotary technology mounted on a truck. The soil samples were taken from the low-lying sandy fill between the Kokkinokremos ridge to the north and the low sea-side ridge of Koukoufouthkia to the south. The goal of extracting cores was to verify the existence of the ancient embayment, determine its depth, and ascertain the chronology for infilling.

2.4.2.1. The Boreholes

The half dozen boreholes were placed over a narrow band of coastal plain parallel to the coastal road (fig. 2.16), running 700 m across the entire length of Zone 2 and 30–400 m north of the current coastline. Drilled to varying depths between 5 and 27 m (ave. depth 17 m), the deepest samples came from boreholes 4 and 5 that penetrated 24–27 m below surface. Boreholes 1, 4, and 5 were designed to extract materials from the mouth of the estuary, borehole 2 to capture finer-grained sediments, and borehole 3 to sample sediments in the context of the archaeological site of Koutsopetria immediately to the west.

2.4.2.2. Preliminary Results

At the time of the fieldwork, the teams noted fine-grained marine sediments such as shelly, pebbly sand and silty sand, shelly silt, sandstone, and clay, as well as fossils like algae, sea glass, and shell. The cores demonstrated that in some locations of the coastal plain (boreholes 4 and 5), such sediments penetrate well over 20 m below surface before bedrock appears. The dominance of sandy sediments in the sample made extraction particularly difficult and has delayed full publication, but the marine character of the sediments and the depth of the cores generally confirm an interpretation of the area as an ancient estuary.

As we await the final analysis of the core samples extracted in 2005 and 2006, our conclusions about the geological history of the estuary are necessarily tentative. Yet the results of the archaeological survey support the conclusions reached by Noller and Zomeni in their preliminary analysis (2006: 1):

> The core evidence shows that the lowland was indeed a bay for all known occupations of the area — from Late Bronze Age until sometime after the Venetian Period… Nowhere else in Cyprus do we know of such a large, enclosed bay.

Even as the geological team noted no cultural material in their core samples, our surface survey has yielded very few artifacts, and most are recent. When exactly the sediments from the Pyla area watershed began to fill in the embayment and raise the land surface to within a meter of modern sea level is unknown, but it must have occurred sometime after the Medieval era. Throughout the pre-modern age, the estuary apparently offered a natural harbor for a full range of human activities.

2.5. CONCLUSIONS

The new breed of distributional survey presents an opportunity for archaeologists to explore the relationship between their methods of assessment, terms of definitions, and archaeological interpretations and historical conclusions. High-resolution surveys represent significant investments of time and energy; consequently they offer a fruitful opportunity for exploring the meaning and patterns of distributions of cultural material. The advent of more intensive survey procedures, experiments, and artifact recording systems now allow archaeologists to move beyond maps of site locations and measures of total artifact density to analyze the patterns of artifact distributions in the landscape over time. Parsing landscapes and sites not only produces more meaningful occupational biographies and diachronic histories but also finer assessments of intra-site functional variation.